Appendix A
Glossary

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Glossary

This glossary defines terms that are used throughout this East Bay RCIS. Additional terms and extended definitions are provided in the *Regional Conservation Investment Strategies Program Guidelines* (Program Guidelines), Section 2, *Standard Terminology* (California Department of Fish and Wildlife 2018).

Terms and Definitions

Term	**Definitions**
adaptive management and monitoring strategy	A component of an RCIS that incorporates an adaptive management process that is informed by periodic monitoring of the implementation of both conservation actions and habitat enhancement actions.[1] Adaptive management means using the results of new information gathered through a monitoring program to adjust management strategies and practices to help provide for the conservation of focal species and their habitats. A monitoring strategy is the periodic evaluation of monitoring results to assess the adequacy of implementing a conservation action or habitat enhancement action and to provide information to direct adaptive management activities to determine the status of the focal species, their habitats, or other natural resources.[2]
administrative draft	A substantially complete draft of a Natural Community Conservation Plan (NCCP) that is released after January 1, 2016, to the general public, plan participants, and CDFW.
advance mitigation	Compensatory mitigation for impacts on ecological resources (species and their habitat) and other natural resources that is implemented prior to impacts occurring.
Assembly Bill 2087	Amended CFGC Chapter 9, Sections 1850–1861 to create the California Department of Fish and Wildlife's RCIS program (Program). The Program encourages public agencies to develop RCISs, using the best available science to identify regional conservation priorities and other actions to help California's vulnerable species populations. The Program provides additional tools and mechanisms to complement and enhance existing programs and increase options for project proponents, including public infrastructure agencies, to create compensatory mitigation that supports regional conservation priorities in advance of impacts.

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[1] Fish & G. Code, § 1856, subdivisions (b)(1) and (f)(14)

[2] Adapted from Fish and Game Code section 2805, subdivisions (a) and (g).

Term	Definitions
Bay Area Regional Advance Mitigation Planning (RAMP) Technical Advisory Committee	A committee comprised of state and federal agencies, three Congestion Management Agencies (Contra Costa Transportation Authority, Solano Transportation Authority, and Santa Clara Valley Transportation Authority), the East Contra Costa County Habitat Conservation Plan/Natural Communities Conservation Plan Conservancy, and the Santa Clara Valley Habitat Agency. The Bay Area RAMP Technical Advisory Committee provided feedback on technical issues and draft elements of the RCIS planning process.
biodiversity	The full array of living things considered at all levels, from genetic variants of a single species to arrays of species and arrays of genera, families, and higher taxonomic levels; includes natural communities and ecosystems.
California Fish and Game Code (CFGC)	State code amended by Assembly Bill 2087 to provide for a regional RCIS program (CFGC 1850–1861).
California State Coastal Conservancy (Coastal Conservancy)	The proponent of this East Bay RCIS. See *RCIS proponent*.
California Wildlife Habitat Relationships - CWHR	System that contains the life history, geographic range, habitat relationships, and management information for more than 700 regularly occurring species of amphibians, reptiles, birds, and mammals in the state. It can generate lists of species by geographic location or habitat type and provides information on expert opinion–based habitat suitability ranks for each species within each habitat type (California Department of Fish and Wildlife 2017).
climate change vulnerability	Refers to the degree to which an ecological system, natural community, habitat, or individual species is likely to be adversely affected as a result of changes in climate and is often dependent on factors such as exposure, sensitivity, and adaptive capacity.
compensatory mitigation	Actions taken to fulfill, in whole or in part, mitigation requirements under state or federal law or a court mandate.
conservation, conserve	The use of habitat and other natural resources in ways such that they may remain viable for future generations. This includes permanent protection of such resources. See *permanently protect*.
conservation action	An action identified in an RCIS that, when implemented, would permanently protect or restore, and perpetually manage, conservation elements, including focal species and their habitats, natural communities, ecological processes, and wildlife corridors. In contrast, a habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat – see habitat enhancement action. A conservation action is developed to achieve one or more conservation objectives. A conservation action may be implemented through a variety of conservation investments or MCAs. A conservation action that is implemented through an MCA would create conservation credits to be used as compensatory mitigation.

Term	Definitions
conservation bank	Permanently protected land managed for its natural resource values, with an emphasis on targeted resources. May include habitat restoration or creation in addition to protecting federally or state listed species and their habitats.[3] See *mitigation bank.*
conservation easement	A perpetual conservation easement that complies with Chapter 4 (commencing with Section 815) of Title 2 of Part 2 of Division 2 of the Civil Code.[4]
conservation element	An element that is identified and analyzed in an RCIS that will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Conservation elements include focal species and their habitats, natural communities, biodiversity, habitat connectivity, ecosystem functions, water resources, and other natural resources. Conservation elements may benefit through both conservation investments and MCAs.
conservation goal	Broad, guiding principle that describes a desired future condition for a focal species, other species, or other conservation element. Each conservation goal is supported by one or more conservation objectives.
conservation investment	Conservation actions or habitat enhancement actions that are implemented under an approved RCIS, but the implementer does not create credits through an MCA with CDFW. Conservation investments are typically funded by public agencies and nonprofit or other philanthropic organizations.
conservation planning unit (CPU)	A discrete geographic unit of conservation based on HUC 10 watershed boundaries. The CPU focuses conservation actions in a spatially explicit manner.
conservation priority	A conservation or habitat enhancement action (e.g., land acquisition, restoration, or habitat enhancement) that is identified based on its importance for benefiting and contributing to the conservation of focal species and their habitats, or other conservation elements within an RCIS area.
conservation purpose	Statement or statements in an RCIS that identify focal species and other conservation elements within the RCIS area and which outline conservation actions or habitat enhancement actions that, if implemented, will sustain and restore these resources.
conservation strategy	The strategy for restoring viability of focal species. Comprises four elements: conservation goals, conservation objectives, conservation actions, and conservation priorities.
Core Team	Representatives from the Coastal Conservancy, Contra Costa Transportation Agency, the East Contra Costa County Habitat Conservancy, Metropolitan Transportation Commission, The Nature Conservancy, and AECOM. Responsible for coordinating and developing this East Bay RCIS.
creation (of natural community or focal species' habitat)	The creation of a specified resource condition where none existed before. Also see *establishment*.

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[3] https://www.wildlife.ca.gov/Conservation/Planning/Banking

[4] *Conservation easement* includes a conservation easement as defined in Civil Code section 815.1 and an agricultural conservation easement as defined in Pub. Resources Code, § 10211.

Term	Definitions
critical habitat	Habitat designated as critical[5] refers to specific areas occupied by a federally-listed species at the time it is listed, and that are essential to the conservation of the species and that may require special management considerations or protection. Critical habitat also includes specific areas outside occupied habitat into which the species could spread and that are considered essential for recovery of the species.
ecological function	Ecological function refers to the roles and relationships (e.g., predator and prey relationships) of organisms within an ecological system, and the processes (e.g., pollination, decomposition) that sustain an ecological system. See also, *ecosystem function.*
ecological resources	Species, habitat, biological resources, and natural resources identified in an RCA or RCIS. Also see *conservation element and natural resources.*
ecoregion, subecoregion	As used in this document, ecoregion means a USDA Section (Goudey and Smith 1994) and sub-ecoregion means a portion of the USDA Section or USGS Hydrological Units (assigned hydrological unit codes; HUC).[6] The U.S. Department of Agriculture (USDA) describes four geographic levels of detail in a hierarchy of regional ecosystems including domains, divisions, provinces, and sections. Sections are subdivisions of provinces based on major terrain features, such as a desert, plateau, valley, mountain range, or a combination thereof.
ecosystem	A natural unit defined by both its living and non-living components; a balanced system of the exchange of nutrients and energy. See *habitat*.
ecosystem function	The ecosystem processes involving interactions between physical, chemical, and biological components, such as dynamic river meander, floodplain dynamism, tidal flux, bank erosion, and other processes necessary to sustain the ecosystem and the species that depend on it.
ecosystem services	The beneficial outcomes to humans from ecosystem functions such as supplying of oxygen; sequestering of carbon; moderating climate change effects; supporting the food chain; harvesting of animals or plants; providing clean water; recharging groundwater; abating storm, fire, and flood damage; pollinating and fertilizing for agriculture; and providing scenic views.
endemic	A species, subspecies, or variety found only in a specified geographic region.
enhancement	A manipulation of an ecological resource or natural resource that improves a specific ecosystem function. An enhancement does not result in a gain in protected or conserved land, but it does result in an improvement in ecological or ecosystem function.

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[5] 16 U.S.C. § 1532(5)(a)

[6] The United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey (USGS), and the Environmental Protection Agency (EPA). The Watershed Boundary Dataset (WBD) was created from a variety of sources from each state and aggregated into a standard national layer for use in strategic planning and accountability. Available: http://datagateway.nrcs.usda.gov.

Term	Definitions
essential connectivity areas	Those areas essential for ecological connectivity between natural landscape blocks, as depicted in the Essential Connectivity Map prepared as part of CEHC Project,[7] or other connectivity report, plan, or map approved by CDFW or that represents best available science.
establishment	The manipulation of the physical, chemical, or biological characteristics present on a site to develop an aquatic or terrestrial habitat resource for Focal Species. Establishment will result in a gain in resource area and/or function. Also see *creation*.
focal species	Sensitive species that are identified and analyzed in an RCIS and will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Focal species may benefit through both conservation investments and MCAs. See also, *sensitive species*, *special-status species*, and *non-focal species*.
gap analysis	An analysis that identifies gaps between land areas that are rich in biodiversity and areas that are managed for conservation.
habitat	An ecological or environmental area that is, or may be, inhabited by a species of animal, plant or other type of organism. It is also the physical and biological environment that surrounds, influences, and is utilized by a species' population and is required to support its occupancy.
habitat connectivity	The capacity of habitat to facilitate the movement of species and ecological functions.
habitat enhancement action	An action identified in an RCIS that, when implemented, is intended to improve the quality of wildlife habitat, or to address risks or stressors to wildlife. A habitat enhancement action is developed to achieve one or more conservation objectives. A habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. In contrast, a conservation action would permanently protect or restore, and perpetually manage, conservation elements – see Conservation Action. Examples of habitat enhancement actions include improving in-stream flows to benefit fish species, enhancing habitat connectivity, and controlling or eradicating invasive species. A habitat enhancement action may be implemented through a variety of conservation investments or MCAs. A habitat enhancement action that is implemented through an MCA would create habitat enhancement credits intended for use as compensatory mitigation for temporary impacts.[8]

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[7] California Essential Habitat Connectivity Project. Available: https://www.wildlife.ca.gov/conservation/planning/connectivity/CEHC.

[8] Fish & G. Code, § 1856, subdivision (d) states that "…the habitat enhancement action shall remain in effect at least until the site of the environmental impact is returned to pre-impact ecological conditions."

Term	Definitions
habitat conservation plan (HCP)	Habitat Conservation Plan. A planning document that is required as part of an application for an incidental take permit under the federal Endangered Species Act. HCPs provide for partnerships with non-federal parties to conserve the ecosystems upon which listed species depend, ultimately contributing to their recovery. HCPs describe the anticipated effects of the proposed taking, how those impacts will be minimized or mitigated, and how the HCP is to be funded.[9]
Hydrologic Unit Code (HUC)	A code identifying a unique hydrologic unit.[10]
Implementing Entity	The organization designated in an NCCP and associated Implementing Agreement that is responsible for implementing the NCCP. Implementing Entities can be non-profit organizations, joint-powers authorities, local governments (such as cities or counties), or others.
in-lieu fee program	An agreement between a regulatory agency or agencies (state, federal, or local) and a single sponsor which must be a public agency or non-profit organization. Under an in-lieu-fee agreement, the mitigation sponsor collects funds from permittees in lieu of providing permittee-responsible compensatory mitigation required under the U.S. Army Corps of Engineers or a state or local aquatic resource regulatory program. The sponsor uses the funds pooled from multiple permittees to create one or more sites under the authority of the agreement to compensate for aquatic resource functions lost as a result of the permits issued.
indicator species	A species, the presence or absence of which is indicative of a particular habitat, community, or set of environmental conditions (Lincoln et al. 1998).
invasive species	Invasive species means, with regard to a particular ecosystem, a non-native organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health.[11] Also see *non-native species*.
keystone species	A species whose impacts on its community or ecosystem are much larger than would be expected from its abundance or a species whose loss from an ecosystem would cause a greater-than-average change in other species populations or ecosystem processes and whose continued well-being is vital for the functioning of a whole community (Groom et al 2006).
land conversion	The conversion of natural and agricultural land to other land uses through the process of development.
land cover type	The dominant feature of the land surface discernible from aerial photographs and defined by vegetation, water, or human uses.

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[9] https://www.fws.gov/endangered/esa-library/pdf/hcp.pdf

[10] The United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey (USGS), and the Environmental Protection Agency (EPA). The Watershed Boundary Dataset (WBD) was created from a variety of sources from each state and aggregated into a standard national layer for use in strategic planning and accountability. Available: http://datagateway.nrcs.usda.gov.

[11] Obama, Barack – the White House, Executive Order -- Safeguarding the Nation from the Impacts of Invasive Species. December 5, 2016. Available: https://obamawhitehouse.archives.gov/the-pressoffice/2016/12/05/executive-order-safeguarding-nation-impacts-invasive-species.

Term	**Definitions**
mitigation bank	Permanently protected land managed for its natural resource values, with an emphasis on federally or state listed species and their habitats. Typically requires the restoration or creation of aquatic resources.[12] See *conservation bank*.
mitigation credit agreement (MCA)	An agreement between CDFW and one or more persons or entities that identifies the types and numbers of credits the person(s) or entity(ies) proposes to create by implementing one or more conservation actions or habitat enhancement actions. An MCA includes the terms and conditions under which those credits may be used. The person or entity may create and use, sell, or otherwise transfer the credits upon CDFW's approval that the credits have been created in accordance with the MCA. To enter into an MCA with CDFW, a person or entity shall submit a draft MCA to CDFW for its review, revision, and approval. An MCA may only be created within an area where an RCIS has been approved.
natural community	A group of organisms living together and linked together by their effects on one another and their responses to the environment they share (Sawyer et el. 2009). A general term often used synonymously with vegetation community and aquatic community.
Natural Community Conservation Plan (NCCP)	A plan developed pursuant to the Natural Community Conservation Planning Act (Fish and Game Code sections 2800-2835) which identifies and provides for the regional protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity.32 An NCCP allows for take of species listed under CESA, as well as other, non-listed species.
natural resources	Biological and ecological resources including species and their habitats, Waters of the State, Waters of the United States, wetlands, and natural communities. See *ecological resources* and *conservation element*.
non-focal species	Species that are not "focal species", as defined in these Guidelines, but which are associated with a focal species or other conservation element and will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Non-focal species may benefit through both conservation investments and MCAs. See also, *focal species*, *sensitive species*, and *special-status species*.
non-native species	Any species introduced to California after European contact and as a direct or indirect result of human activity (California Invasive Plant Council 2006). See *invasive species*.
objective	A concise, measurable statement of what is to be achieved and that supports a conservation goal. The objective should be based on the best available scientific information to conserve the focal species or other conservation elements for which the conservation goal and objective is developed. It should be measurable by using a standard metric or scale (i.e., number, percent), in a region (e.g., county, watershed, jurisdictional area) over a period of time (e.g., years).
permanently protect	Permanent protection means: (1) recording a conservation easement and (2) providing secure, perpetual funding for management of the land, monitoring, legal enforcement, and defense.

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[12] https://www.wildlife.ca.gov/Conservation/Planning/Banking

Term	Definitions
Plan Bay Area 2040	A long-range integrated transportation and land-use/housing strategy through 2040 for the San Francisco Bay Area. Meets the requirements of Senate Bill 375, which requires development of a sustainable communities strategy to accommodate future population growth and reduce greenhouse gas emissions from cars and light trucks (Metropolitan Transportation Commission 2013).
population	The number of individuals of a particular taxon inhabiting a defined geographic area.
pressure	See *stressor, pressure*.
protected area	Public or private lands protected through legal or other effective means, where the primary intent of land management is to manage the land for open space use and habitat.
RCIS area	The geographic area encompassed by an RCIS.
RCIS proponent	The public agency or group of public agencies developing an RCIS for review and approval by CDFW and who is responsible for the technical and administrative updates of an RCIS.
recovery	The process by which the decline of an endangered or threatened species is halted or reversed or threats to its survival are neutralized, so that its long-term survival in nature can be ensured. Recovery entails actions to achieve the conservation and survival of a species (U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998), including actions to prevent any further erosion of a population's viability and genetic integrity. Recovery also includes actions to restore or establish environmental conditions that enable a species to persist (i.e., the long-term occurrence of a species through the full range of environmental variation).
recovery area	Area identified in a draft or approved recovery plan for a federally listed species.
recovery goal	An established goal, usually quantitative, in a recovery plan that identifies when a listed species is restored to a point at which the protections of the federal Endangered Species Act or California Endangered Species Act are no longer required.
recovery plan	A document published by USFWS, NMFS, or CDFW that lists the status of a listed species and the actions necessary to remove the species from the endangered species list.
Regional Advance Mitigation Planning (RAMP)	A comprehensive approach to mitigating unavoidable biological resource impacts potentially caused by infrastructure projects, such as roads and levees, before infrastructure projects are constructed. Initiated in 2008 by a coalition of infrastructure agencies, natural resource agencies, nongovernmental organizations, and academic researchers.[13]

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[13] http://www.water.ca.gov/conservationstrategy/cs_ramp.cfm

Term	Definitions
regional conservation investment strategy (RCIS)	Information and analyses to inform nonbinding and voluntary conservation actions and habitat enhancement actions that would advance the conservation of focal species and their habitats, natural communities, and other conservation elements. The RCIS provides nonbinding, voluntary guidance for the identification of conservation priorities, investments in ecological resource conservation, or identification of priority locations for compensatory mitigation for impacts on species and natural resources. RCISs are intended to provide scientific information for the consideration of public agencies and are voluntary. RCISs do not create, modify, or impose regulatory requirements or standards, regulate the use of land, establish land use designations, or affect the land use authority of, or exercise of discretion by, any public agency. RCISs are required if MCAs are to be developed.
Regional Conservation Investment Strategies Program Guidelines (Program Guidelines)	Guidelines for regional conservation investment strategies, published in support of Assembly Bill 2087 (California Department of Fish and Wildlife 2018).
rehabilitation	Manipulation of a piece of land with the goal of repairing natural or historic ecosystem functions to degraded habitat or natural resources. This results in an improvement in ecological or ecosystem functions, but it does not result in a gain in area.
restore, restoration	Manipulation of a site with the goal of returning species, habitat, and ecological and ecosystem functions to a site that historically supported such species, habitat, and functions, but which no longer supports them due to the loss of one or more required ecological factors or as a result of past disturbance. Compare with *conservation*, *preserve*, and *rehabilitation*.
sensitive species	Any special-status species identified by a state or federal agency. See also, *focal species* and *special-status species*.
special-status species	For the purpose of the Program, a species identified as endangered, threatened, or candidate under state or federal law; as rare or fully protected under state law; or otherwise identified by CDFW through the approval of an RCIS. See also, *focal species* and *sensitive species*.
Species of Greatest Conservation Need (SGCN)	Species of Greatest Conservation Need are selected, for each state, to indicate the status of biological diversity in the state, specifying at-risk species that have the greatest need for conservation. The latest SGCN list for the state of California is found in the California State Wildlife Action Plan 2015 Update (California Department of Fish and Wildlife 2015).
Species of Special Concern (SSC)	Species of Special Concern[14] is an administrative designation and carries no formal legal status. The intent of designating SSCs is to: 1) focus attention on animals considered potentially at conservation risk by CDFW, other state, local and federal governmental entities, regulators, land managers, planners, consulting biologists, and others; 2) stimulate research on poorly known species; and 3) achieve conservation and recovery of these animals before they meet CESA criteria for listing as threatened or endangered.

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[14] https://www.wildlife.ca.gov/Conservation/SSC

Term	Definitions
Stakeholder Group	Established by the Core Team to include input from stakeholder agencies and organizations that would use this East Bay RCIS.
strategy term	The initial 10-year period of RCIS approval. May be extended by CDFW after review.
stressor, pressure	Stressor is a degraded ecological condition of a focal species or other conservation element that resulted directly or indirectly from a negative impact of pressures such as habitat fragmentation. A pressure is an anthropogenic (human-induced) or natural driver that could result in changing the ecological conditions of a focal species or other conservation element. Pressures can be positive or negative depending on intensity, timing, and duration. Negative or positive, the influence of a pressure to the target focal species or other conservation elements is likely to be significant.
State Wildlife Action Plan - SWAP	The California State Wildlife Action Plan (SWAP) is a CDFW publication developed to address the highest conservation priorities of the state, providing a blueprint for actions necessary to sustain the integrity of California's diverse ecosystems.[15] CDFW also created companion plans to support SWAP 2015 implementation through collaboration with partner agencies and organizations. The companion plans identify shared priorities among partner organizations to conserve natural resources in nine sectors that are experiencing significant pressures affecting natural resources (California Department of Fish and Wildlife 2015).[16]
watershed	An area or ridge of land that contains a common set of streams and rivers that all drain into one location such as a marsh, stream, river, lake, or ocean.
working land	An area where people live and work in a way that allows ecosystems or ecosystem functions to be sustained (e.g., farms, ranches). Human activities are done in a way that minimizes disturbance on native plants and animals while still retaining the working nature of the landscape.

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[15] https://www.wildlife.ca.gov/SWAP/Final

[16] https://www.wildlife.ca.gov/SWAP/Final/Companion-Plans

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Appendix B
Regulatory Processes

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Regulatory Processes

It is anticipated that this East Bay Regional Conservation Investment Strategy (RCIS) will inform implementation of conservation actions and conservation enhancements, as well as implementation of projects that will require mitigation (e.g., transportation projects). When undertaking any type of ground-disturbing or vegetation-manipulating activities, it is important to consider that the action taken may affect resources regulated by one or more agency and may require one or more regulatory permits. This appendix provides a brief overview of the key regulations and implementing agencies.

When developing permit applications to these agencies, a key consideration is whether the proposed project is located in an area that is covered by an existing permitting program or regional program (i.e., conservation plan) for compensatory mitigation. In addition, it is important to consider how this RCIS and other existing permitting programs are applicable to the different regulatory agencies that may have purview over the project. To that end, this appendix also provides guidance related to established programs and guidance on how the information in this East Bay RCIS can be used to support mitigation requirements of different regulatory agencies.

1.1 Regulatory Overview

The following sections provide a high-level overview of the laws and regulations typically involved in project permitting where the proposed activity may disturb aquatic and other biological resources, including state- and federally listed threatened and endangered species. The purpose of this overview is to provide basic guidance on regulations that may relate to proposed projects. Table B-1 summarizes the regulatory guidance direction from natural resource agencies that was solicited during development of the Regional Advance Mitigation Planning Program document (State of California Coastal Conservancy and Metropolitan Transportation Commission 2018). The guidance introduces a number of mechanisms that these resource agencies may be able to use in concert with the East Bay RCIS, which will be approved by the California Department of Fish and Wildlife (CDFW).

Table B-1. Regulatory Guidance from Natural Resource Agencies

Agency	Applicable laws and policies	Information needed in RCIS	Engagement/ support	Mechanism (in-lieu fee, programmatic biological opinion, etc.)
NOAA Fisheries	ESA Section 7(1)(a), Magnussen Stevens Fisheries Conservation and Management Act	ESA listed fisheries and critical habitat (salmon, steelhead, and green sturgeon), Essential Fish Habitat	Memorandum of Understanding	Project-specific consultation – mitigation banks, ILF Batched consultation – projects whose impacts are known
			Letter of Support	Programmatic consultation – covers multiple project sites or types Programmatic biological opinion

Agency	**Applicable laws and policies**	**Information needed in RCIS**	**Engagement/ support**	**Mechanism (in-lieu fee, programmatic biological opinion, etc.)**
			Interagency review team	Restoration tied to funding
EPA – Corps	Army Corps/EPA Compensatory Mitigation Rule, 33 CFR, Part 332, commencing with section 332.1., 2008; CWA Section 404(b)1 guidelines; mitigation monitoring guidelines	Water and wetlands resources, watershed scale Mitigation prioritization language Performance/ success criteria Wetland delineation In-perpetuity protections Accounting (if different projects are contributing to the mitigation)	Input and support regarding watershed approach to compensatory mitigation ILF (NFWF)	Project specific consultation – mitigation banks, ILF programs Programmatic mitigations plans/frameworks Mitigation bank credit purchases
USFWS	ESA Section 7 (1)(a), Final Endangered Species Act Compensatory Mitigation Policy, 81 FR 95316-95349.; Eagle Act; USFWS Guidance for the Establishment, Use, and Operation of Conservation Banks, 2003	Habitat conservation plans, recovery plans, critical habitat designations	Programmatic mitigation strategies, landscape scale conservation guidance for mitigation	Programmatic mitigation agreements, mitigation banks, ILF programs
CDFW	Official Policy on Conservation Banks - California Natural Resources Agency, 1995; California conservation banking statute: Fish and Game Code sections 1797 - 1799; Regional Conservation Investment Strategy statute: Fish and Game Code sections 1850-1861; CDFW RCIS and MCA guidance, NCCPs	Outline in RCIS guidelines	RCIS	Natural Communities Conservation Plans, Mitigation Credit Agreements
San Francisco Bay or Central Valley	CWA Section 401, Porter-Cologne Water Quality Control Act	Urban creek restoration and enhancement opportunities, include linear feet	Input and support regarding watershed approach to	Participation in IRT; Letter of support; MOU

Agency	Applicable laws and policies	Information needed in RCIS	Engagement/ support	Mechanism (in-lieu fee, programmatic biological opinion, etc.)
Regional Water Quality Control Board		credits, diversity of water type, geomorphic context	compensatory mitigation and/or focused compensatory mitigation approaches (i.e., for impacts to first and second order streams)	

Acronyms:

CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
ESA	Federal Endangered Species Act
ILF	ILF International
IRT	Interagency Review Team
MCA	mitigation credit agreement
MOU	Memorandum of Understanding
NFWF	National Fish and Wildlife Federation
NOAA	National Oceanic and Atmospheric Administration
RCIS	Regional Conservation Investment Strategy
Corps	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

Federal Clean Water Act

The Clean Water Act (CWA) is the primary federal law that protects the physical, chemical, and biological integrity of the nation's waters, including lakes, rivers, wetlands, and coastal waters. Programs conducted under the CWA are directed at both point source pollution (e.g., waste discharged from outfalls and filling of waters) and nonpoint source pollution (e.g., runoff from parking lots). Under the CWA, the U.S. Environmental Protection Agency (EPA) and state agencies set effluent limitations and issue permits under CWA Section 402, which governs point-source discharges of wastes to waters. The U.S. Army Corps of Engineers (Corps) applying its regulations under guidelines issued by EPA, issues permits under CWA Section 40, which governs the circumstances under which dredged or fill material may be discharged to waters. Section 402 and Section 404 permits are the primary regulatory tools of the CWA. EPA has oversight over all CWA permits issued by the Corps. Sections 404, 401, and 402 are discussed further below.

Section 404

Regulated by the Corps, CWA Section 404 regulates the discharge of dredged or fill material to waters of the U.S., such as streams and wetlands. The Corps issues two types of permits under Section 404: general permits (either nationwide permits or regional permits) and standard permits (either letters of permission or individual permits). General permits are issued by the Corps to streamline the Section 404 process for nationwide, statewide, or regional activities that have minimal direct or cumulative environmental impacts on the aquatic environment. Standard permits are issued for activities that do not qualify for a general permit (i.e., that may have more than a minimal adverse environmental impact).

Issuance of a Section 404 permit often requires the Corps to consult with National Marine Fisheries Service (NMFS) and/or the U.S. Fish and Wildlife Service (USFWS) to comply with Section 7 of the federal Endangered Species Act (ESA). This consultation addresses the federally listed species that may be affected by the action requiring a permit from the Corps. In cases where a federal species permit already exists to address the action requiring a permit from the Corps (such as is the case for regional habitat conservation plans (HCPs) established under ESA Section 10), the consultation under ESA Section 7 may be greatly streamlined.

Section 401

Regulated by the local Regional Water Quality Control Board (RWQCB), CWA Section 401 allows states the authority to certify federal permits for discharges to waters, such as 404 permits. States may review proposed federal permits (e.g., Section 404 permits) for compliance with state water quality standards. The federal permit cannot be issued if the state denies certification. In the Bay Area, the San Francisco Bay Regional Water Quality Control Board is responsible for issuing Section 401 Water Quality Certifications, which certify that a proposed action is compliant with state water quality standards. In the far eastern portion of Contra Costa County in the East Bay RCIS area the Central Valley RWQCB has these responsibilities.

Section 402

Regulated by the local RWQCB, CWA Section 402 requires a National Pollutant Discharge Elimination System (NPDES) permit for all construction projects disturbing one acre or greater of land, as well as municipal, industrial and commercial facilities that discharge wastewater or stormwater into a surface water of the U.S. All NPDES permits are written to ensure that receiving waters meet the state's water quality standards. The NPDES Program is a federal program delegated to the State of California for implementation by the State and RWQCBs.

Federal Endangered Species Act

USFWS and NMFS administer the ESA. The ESA requires these agencies to maintain lists of threatened and endangered species and affords substantial protection to listed species. NMFS's jurisdiction under ESA is limited to the protection of marine mammals, marine fishes, and anadromous fishes;[1] all other species are subject to USFWS jurisdiction. The ESA includes mechanisms that provide exceptions to the Section 9[2] take prohibitions. These are addressed in ESA Section 7 for federal actions and ESA Section 10 for non-federal actions.

Section 7

Section 7 of the ESA requires all federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat critical to such species' survival. To ensure that its actions do not result in jeopardy to listed species or in the adverse modification of critical habitat,[3]

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[1] *Anadromous fishes* are fish that spend part of their life cycle in the ocean and part in fresh water. NMFS has jurisdiction over anadromous fish that spend the majority of their life cycle in the ocean.

[2] https://www.fws.gov/endangered/laws-policies/section-9.html

[3] *Critical habitat* is defined as specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described in the *Federal Register*.

each federal agency must consult with USFWS or NMFS—or both—regarding federal agency actions that may affect listed species. Consultation begins when the federal agency submits a written request for initiation to USFWS or NMFS, along with the agency's biological assessment of its proposed action, and when USFWS or NMFS accepts that biological assessment as complete. If USFWS or NMFS concludes that the action is not likely to adversely affect a listed species, the action may be conducted without further review under the ESA. Otherwise, USFWS or NMFS must prepare a written biological opinion describing how the agency's action will affect the listed species and its critical habitat.

If the biological opinion concludes that the proposed action would jeopardize the continued existence of a listed species or adversely modify its critical habitat, the opinion will suggest "reasonable and prudent alternatives" that would avoid that result. If the biological opinion concludes that the proposed action would take a listed species but would not jeopardize its continued existence, the biological opinion will include an incidental take statement. *Incidental take* is take that is "incidental to, and not intended as part of, an otherwise lawful activity."[4] The incidental take statement specifies an amount of take that is allowed as a result of the action and whether reasonable and prudent measures may be required to minimize the impact of the take.

Section 10

In cases where federal land, funding, or authorization is not required for an action by a non-federal entity, the take of listed fish and wildlife species can be permitted by USFWS and/or NMFS through the Section 10 process. Private landowners, corporations, state agencies, local agencies, and other nonfederal entities must obtain a Section 10(a)(1)(B) incidental take permit for take of federally listed fish and wildlife species "that is incidental to, but not the purpose of, otherwise lawful activities."

The take prohibition for listed plants is more limited than for listed fish and wildlife. Under Section 9(a)(2)(B) of the ESA, endangered plants are protected from "removal, reduction to possession, and malicious damage or destruction" in areas that are under federal jurisdiction. Section 9(a)(2)(B) of the ESA also provides protection to plants from removal, cutting, digging up, damage, or destruction where the action takes place in violation of any state law or regulation or in violation of a state criminal trespass law. Thus, the ESA does not prohibit the incidental take of federally listed plants on private or other non-federal lands unless the action requires federal authorization or is in violation of state law. Although Section 10 incidental take permits are only required for wildlife and fish species, the Section 7(a)(2) prohibition against jeopardy applies to plants, and issuance of a Section 10(a)(1)(B) incidental take permit cannot result in jeopardy to a listed plant species.

National Environmental Policy Act

Federal agencies are required to consider all environmental effects of a proposed action under the National Environmental Policy Act (NEPA). NEPA documentation of the environmental impact analysis (e.g., environmental impact statement) must be made available for public notice and review. Compliance with NEPA is required for any federal action, such as issuance of a federal permit or federal funding. Issuance of an incidental take permit under ESA Section 10 constitutes a federal action and would require compliance with NEPA; in this scenario, the lead federal agency would be USFWS and/or NMFS.

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[4] 64 CFR 60728

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.), requires federal agencies to take into account the effects of their actions proposed on properties eligible for inclusion in the National Register of Historic Places. "Properties" are defined as "cultural resources," which includes prehistoric and historic sites, buildings, and structures that are listed on or eligible to be listed on the National Register of Historic Places. An undertaking is defined as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency. The issuance of a permit by a federal agency (such as for a Section 404 permit) is an undertaking subject to Section 106 of the NHPA.

State Porter-Cologne Water Quality Control Act

Regulated by the local RWQCB, the Porter-Cologne Water Quality Control Act is the primary state law concerning water quality. It authorizes the State Board and Regional Boards to prepare management plans such as regional water quality plans to address the quality of groundwater and surface water. The Porter-Cologne Water Quality Control Act also authorizes the Regional Boards to issue waste discharge requirements defining limitations on allowable discharge to waters of the state. In addition to issuing Section 401 certifications on Section 404 applications to fill waters, the Regional Boards may also issue waste discharge requirements for such activities. Because the authority for waste discharge requirements is derived from the Porter-Cologne Water Quality Control Act and not the CWA, waste discharge requirements may apply to a somewhat different range of aquatic resources than do Section 404 permits and Section 401 Water Quality certifications. Applicants that obtain a permit from the Corps under Section 404 must also obtain certification of that permit by the RWQCB with jurisdiction over the project site. The San Francisco Bay RWQCB has jurisdiction over most of the East Bay RCIS area, while the Central Valley RWQCB has jurisdiction over the far eastern portion of Contra Costa County in the RCIS area (California State Water Resources Control Board 2018a).

The RWQCBs designate beneficial uses and establish water quality objectives for the state's waters through development of basin plans under the Porter-Cologne Water Quality Control Act (Porter-Cologne Act), federal CWA, and general provisions of California Water Code Section 13000. The water quality objectives include both quantitative and narrative targets that may differ depending on the specific beneficial uses being protected. Narrative objectives are established for parameters such as color, suspended and settleable material, oil and grease, biostimulatory substances, and toxicity. Numeric objectives can include such parameters as dissolved oxygen levels, temperature, turbidity, pH, and concentrations of specific chemical constituents such as trace metals and synthetic organic compounds.

The San Francisco Bay RWQCB has produced a combined application form for Section 401 certification and waiver of Waste Discharge Requirements to ensure that applicants do not need to file both a report of waste discharge and an application for Section 401 certification (California State Water Resources Control Board 2018b). For projects in the Central Valley RWQCB jurisdiction, applicants will need to complete an Application/Report of Waste Discharge (Form 200) for discharge to land and groundwater. For discharges to surface waters, applicants will also need to complete a General Information Form (Form 1) and the appropriate federal NPDES permit application form (California State Water Resources Control Board 2018c).

State Lake or Streambed Alteration Agreement

A project applicant is required to enter into a streambed alteration agreement with the CDFW when a proposed project would substantially divert, obstruct, or change the natural flow of a river, stream or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed.[5] Through this process, CDFW can impose conditions on a project to ensure that no net loss of wetland values or acreage will be incurred. Strictly speaking, the agreement is not a permit but, rather, a mutual agreement between CDFW and the applicant; however, it serves a similar regulatory and protective function. CDFW cannot provide a streambed alteration agreement until after the California Environmental Quality Act (CEQA) review is complete.

California Endangered Species Act

The California Endangered Species Act (CESA) prohibits take of wildlife and plants listed as threatened or endangered by the California Fish and Game Commission. *Take* is defined under the California Fish and Game Code (CFGC) (more narrowly than under the ESA) as any action or attempt to "hunt, pursue, catch, capture, or kill." Therefore, take under the CESA does not include "the taking of habitat alone or the impacts of the taking."[6] Rather, the courts have affirmed that under the CESA, "taking involves mortality."

Like the ESA, the CESA allows exceptions to the prohibition for take that occurs during otherwise lawful activities. The requirements of an application for incidental take under CESA are described in CFGC 2081. Incidental take of state-listed species may be authorized if an applicant submits an approved plan that minimizes and "fully mitigates" the impacts of this take.

Natural Community Conservation Planning Act

In 1991, California's Natural Community Conservation Planning Act (NCCP Act)[7] was enacted to implement broad-based planning that balances appropriate development and growth with conservation of wildlife and habitat. Pursuant to the NCCP Act, local, state, and federal agencies are encouraged to prepare natural community conservation plans (NCCPs) to provide comprehensive management and conservation of multiple species and their habitats under a single plan, rather than through preparation of numerous individual plans on a project-by-project basis. The NCCP Act is broader in its orientation and objectives than are the ESA and the CESA. Preparation of an NCCP is voluntary. The primary objective of the NCCP is to conserve natural communities at the ecosystem scale while accommodating compatible land use. To be approved by CDFW, an NCCP must provide for the conservation of species and protection and management of natural communities in perpetuity within the area covered by permits. *Conservation* is defined, in summary, by the NCCP Act and the CFGC as actions that result in the delisting of state-listed species. Thus, NCCPs must contribute to the recovery of listed species or prevent the listing of non-listed species rather than just mitigate the effects of covered activities. This recovery standard is one of the major differences between a NCCP and an HCP prepared to satisfy ESA or CESA.

The 1991 NCCP Act was replaced with a substantially revised and expanded NCCP Act in 2002. The revised NCCP Act established new standards and guidance on many facets of the program, including scientific information, public participation, biological goals, interim project review, and approval criteria. The new NCCP Act took effect on January 1, 2003.

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[5] CFGC 1602.

[6] *Environmental Council of Sacramento v. City of Sacramento*, 142 Cal. App. 4th 1018 (2006).

[7] CFGC 2800 *et seq.*

California Environmental Quality Act (CEQA)

Like NEPA, CEQA requires applicants to evaluate environmental impacts associated with a proposed action. In addition, CEQA requires significant environmental impacts associated with proposed actions to be reduced to a less-than-significant level through implementation of avoidance, minimization, or mitigation measures unless overriding considerations are identified and documented that make the mitigation measures or alternatives infeasible. CEQA applies to certain activities in California undertaken by either a public agency or a private entity that must receive some discretionary approval from a California government agency.

1.2 Existing Permitting Programs

The *East Contra Costa County HCP/NCCP* (HCP/NCCP) (Jones & Stokes 2006) and the *East Alameda County Conservation Strategy* (EACCS) (ICF International 2010) are two regional permitting programs currently in place in the East Bay RCIS area. These two programs are summarized below.

East Contra Costa County HCP/NCCP

The East Contra Costa County HCP/NCCP permit area includes 174,018 acres in East Contra Costa County, including areas within the cities of Brentwood, Clayton, Oakley, and Pittsburg (Jones & Stokes 2006). It also includes areas within the county defined by a combination of political, ecological, and hydrologic factors. Watershed boundaries were used to define the inventory area wherever possible.

Most projects in the HCP/NCCP permit area—which is entirely within the RCIS area—will be subject to the HCP/NCCP and will use that plan's species permits (for both state and federal listed species). The HCP/NCCP is designed so that project applicants pay a fee to the East Contra Costa County Habitat Conservancy to address compensatory mitigation needs, and there is no need to consider further compensatory mitigation needs for species. The HCP/NCCP also has established a regional general permit with the Corps[8]. The permit allows projects covered by the HCP/NCCP to receive an expedited permit from the Corps and to use HCP/NCCP fees to address impacts on waters of the United States.

This East Bay RCIS will not factor into listed focal species permitting or compensatory mitigation needs for projects that are covered by the HCP/NCCP.

East Alameda County Conservation Strategy

The East Alameda County Conservation Strategy (EACCS) (ICF International 2010) is a biologically based, comprehensive conservation strategy that provides guidance for the protection and mitigation of focal special-status species and sensitive habitats.[9] The geographic area of the EACCS includes the cities of Livermore, Dublin, and Pleasanton as well as most of the county east of Interstate 680. In addition to the Cities and County, a number of agencies participated in the development of the EACCS, including Alameda County Waste Management Authority, Alameda County Congestion Management Agency, Zone 7 Water Agency, and East Bay Regional Park District.

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[8] Section 401 Water Quality Certification is required for activities to be authorized by the Regional General Permit.

[9] Although EACCS will not provide permits under Section 404 of the CWA for impacts on wetlands or other waters, Section 404 permitting is expected to be streamlined substantially as a result. EACCS does not include certifications under Section 401 or waste discharge permits under the Porter-Cologne Water Quality Control Act. These authorizations, if required, must be obtained separately.

The goal of developing the EACCS was to streamline the ESA and the CESA permitting processes by establishing standardized avoidance and minimization measures and mitigation ratios for 15 focal species. The plan was developed in coordination with the Alameda County Resource Conservation District, Natural Resource Conservation Service, USFWS, CDFW, and the San Francisco Bay RWQCB.

On May 31, 2012, USFWS issued a programmatic biological opinion for the EACCS, incorporating the avoidance and minimization measures and mitigation ratios. Currently, project applicants that follow the avoidance and minimization measures and mitigation ratios established by the EACCS enjoy faster permitting with reduced negotiation time. Another key component of the EACCS was the inclusion of Appendix G (ICF International 2010), providing guidance from the San Francisco Water Board. That guidance is included below.

Water Quality Objectives for Use in Designing and Implementing Projects with Impacts on Creeks or Wetlands

The San Francisco Bay RWQCB is charged with maintaining the beneficial uses of waters of the United States in the San Francisco Bay Region, as presented in the San Francisco Bay Basin Water Quality Control Plan (Basin Plan) (San Francisco Bay Regional Water Quality Control Board 2015). If a project will affect waters of the state (as defined by the California State Water Resources Control Board [SWRCB]), project applicants are required to apply to the San Francisco Bay RWQCB for waste discharge requirements (waters of the State of California) or for CWA Section 401 certification (waters of the United States). The board reviews applications for waste discharge requirements and certifications to ensure that potential impacts on waters of the United States have been avoided and minimized to the maximum extent practicable.

To assist project applicants in designing projects to avoid and/or minimize impacts on waters of the State, the San Francisco Water Board developed a technical reference circular that provides guidance for applicants on how to design projects that protect and restore stream and wetland system functions (San Francisco Bay Regional Water Quality Control Board 2003). Project applicants are encouraged to consult this circular when developing projects with potential impacts on creeks or wetland

The East Alameda County Conservation Strategy, Appendix G, includes guidelines for water quality objectives for use in designing and implementing projects with impacts to creeks or wetlands (ICF International 2010). The following information in this subsection is from that appendix.

Projects that affect creeks or wetlands should strive to achieve three water quality objectives—watershed hydrology, stream dynamic equilibrium, and stream and wetland system habitat integrity.

- **Watershed hydrology.** The hydrologic connectivity between headwaters and estuary, surface water and groundwater, and landscape, floodplain, and stream channel should be protected to produce the pattern and range of flows necessary to support beneficial uses identified in the Basin Plan and a functional ecosystem.
- **Stream dynamic equilibrium.** Stream attributes, including hydrologic and sediment regimes, vegetation communities, channel forms, slopes, and floodplain areas, should be protected in a manner so as not to arrest natural hydrogeomorphic processes nor accelerate an imbalance resulting in excessive erosion or deposition of sediment, cause nuisance, or otherwise adversely affect beneficial uses. Over time, watershed processes contribute to a dynamic balance between sediment loads and surface water flows, which produce complex, fluctuating, and resilient systems.

- **Stream and wetland system habitat integrity.** Stream and wetland system habitats should be maintained by protecting the type, amount, and complexity of wetland and riparian vegetation, the extent of riparian areas, and the substrate characteristics necessary to support aquatic life.

Achievement of these water quality objectives protects and restores the physical integrity and associated functionality of stream and wetland systems, which include perennial, intermittent, and ephemeral streams and wetlands and their associated riparian areas. The following four principles should be used in developing projects in order to achieve the water quality objectives.

- **Water quality functions and land use.** Functioning stream and wetland systems provide a wide range of water quality benefits that support the beneficial uses identified in the Basin Plan. Many land use activities have the potential to substantially degrade water quality functions of stream and wetland systems. Therefore, project applicants should recognize the intrinsic connections between land use activities and the structures, processes, and functions of stream and wetland systems.
- **No net loss.** Stream and wetland system areas, functions, and beneficial uses in the region have been substantially degraded from historical levels because of human activities. Therefore, the remaining resources are especially valuable. Projects and associated mitigation measures should be consistent with the California Wetlands Conservation Policy (No Net Loss Policy, Executive Order W-59-93) to ensure no net loss and to achieve a long-term net gain in the quantity, quality, and permanence of stream and wetland system areas, functions, and beneficial uses.
- **Climate change adaptation.** Stream and wetland system protection and restoration are a critical element of a strategy for reducing adverse impacts of greenhouse gas emissions and adapting the region’s water resource management to account for the adverse impacts of climate change and sea level rise. Protecting and restoring stream and wetland system functions, including floodwater storage, groundwater recharge, carbon sequestration (e.g., in riparian vegetation and wetland soils that are rich in organic matter), and maintaining aquatic life and wildlife habitat connectivity are important to mitigate for the adverse impacts of climate change.
- **Watershed approach.** Many water quality and ecosystem problems are best identified, prioritized, addressed, and solved using a watershed approach. A watershed approach helps to address cumulative impacts on water quality, and encourages the development of watershed plans and partnerships that coordinate the planning, use, and protection of stream and wetland system resources. Project applicants should consider their project’s impacts when multiple individual impacts add to or interact with other impacts in a watershed, resulting in cumulative adverse impacts on water quality. Project applicants should include all appropriate and practicable measures to avoid and minimize potential direct, secondary, and cumulative temporary and permanent impacts on water quality and beneficial uses

Tables B-2 through B-4 summarize goals for achieving the water quality objectives.

Table B-2. Watershed Hydrology Goals for Stream and Wetland System Functions

Runoff flow and volume

Maintain site runoff and transport characteristics (i.e., timing, magnitude, duration, time of concentration, and discharge pathways of runoff flow) such that post-project flow rates and durations mimic pre-project levels. Where practicable, incorporate measures to restore natural runoff patterns (e.g., enhance soil infiltration capacity and increase the storage of runoff) in watersheds that have been substantially altered from their predevelopment conditions.

Hydrologic connectivity

Maintain lateral, vertical, and longitudinal flow pathways, including connectivity between stream channels, riparian areas, floodplains, and wetlands; surface water and groundwater; and ocean or estuary-to-headwaters at adequate levels to protect stream and wetland system functions and beneficial uses, including the maintenance of, and access to, a diverse range of habitats for aquatic life and wildlife.

Natural flow regime

Maintain the natural variation of flows and hydrograph characteristics (i.e., timing, magnitude, duration, and time of concentration) such that the range of flows including low, channel forming, and flood flows are of a magnitude and duration to achieve the following goals.

- Sustain channel morphology and balance sediment transport.
- Support riparian vegetation community maintenance.
- Provide adequate flows and velocities during low flow months to satisfy aquatic life and wildlife habitat requirements.
- Maintain seasonal flows that permit the migration or free movement of migratory fish and access to floodplain and off-channel habitat (e.g., sloughs and permanently or seasonally flooded wetlands) for aquatic life.

Table B-3. Stream Dynamic Equilibrium Goals for Stream and Wetland System Functions

Channel form and processes

Where channels are modified, design projects with proper channel form (e.g., channel shape, width/depth ratio), sinuosity, slope, and floodplain areas such that the balance between sediment loads and surface flows is attained for a range of low to high discharges. This goal promotes natural bank erosion as a desirable attribute of stream and wetland systems while requiring that projects avoid causing excessive erosion or deposition of sediment in and around the project area, creating hydraulic constrictions (e.g., undersized culverts), or requiring ongoing channel maintenance (e.g., dredging to maintain channel capacity, ongoing bed and bank repair). Where practicable, restore channel dimensions and slopes, riparian vegetation communities, floodplain, meander belt, and geomorphic adjustment zone widths, and adequate side slopes from the top of the banks to the top of the floodplain terraces in areas where geomorphic dynamic equilibrium has been affected.

Drainage network

Maintain the naturally occurring pattern and density of perennial, intermittent, and ephemeral streams, as well as associated aquatic habitats (e.g., wetlands) that transport water, materials, energy, and organisms through the watershed (i.e., the drainage network). Avoid changing the natural runoff pathways by filling, piping, ditching, or culverting.

Gullies and headcuts

Avoid formation or expansion of headcuts and gullies. Design projects with proper channel slope and avoid reducing the landscape infiltration capacity and increasing runoff, which may lead to soil erosion and gully formation or expansion.

Table B-4. Stream and Wetland System Habitat Integrity Goals for Stream and Wetland System Functions

Floodplain and riparian areas

Maintain floodplains and/or riparian areas of adequate width to provide water quality functions such as floodwater and sediment storage, water quality enhancement, and maintenance of aquatic life and wildlife habitat. Establishment and protection of functioning riparian areas is one of the most straightforward and effective strategies to protect water quality and this strategy is a critical element in adapting to the impacts of climate change including changes in rainfall and runoff patterns.

Wetland hydrology

Maintain the natural hydrologic regimes of wetlands, including their hydroperiods and levels of hydrologic connectivity to other aquatic habitats, at levels sufficient to support hydrophytic vegetation (where naturally present), aquatic life and wildlife habitat, and other associated beneficial uses.

Wetland and riparian vegetation

Maintain wetland and riparian vegetation (both woody and herbaceous) such that the type, amount, and complexity are adequate to maintain water temperatures appropriate to the needs of aquatic life, withstand site-specific erosive forces, and supply large woody debris of sufficient quantities to maintain aquatic habitat.

Habitat connectivity

Avoid creating unnatural barriers between or within stream/wetland systems and upland habitats (e.g., in-stream structures that restrict fish migration or encroachments on floodplains that restrict wildlife movement along a riparian corridor). These barriers affect migration corridors and dispersal systems connecting aquatic life and wildlife with resources and refuges. Protecting stream and wetland system corridors can increase the resiliency of biodiversity by providing migration corridors as aquatic life and wildlife adapt to the impacts of climate change on habitat conditions and distribution.

1.3 Compensatory Mitigation Approach

Once an RCIS is approved by CDFW, an applicant may prepare a mitigation credit agreement (MCA) and request its approval by CDFW. An MCA identifies the type and number of credits a person or entity proposes to create by implementing one or more conservation actions[10] or habitat enhancement actions[11], as well as the terms and conditions under which those credits may be used. MCAs enable advance mitigation, which is compensatory mitigation for estimated impacts on

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[10] The CDFW RCIS Program Guidelines (California Department of Fish and Wildlife 2018) define a conservation action as an action identified in an RCIS that, when implemented, would permanently protect or restore, and perpetually manage, conservation elements, including focal species and their habitats, natural communities, ecological processes, and wildlife corridors. In contrast, a habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. A conservation action is developed to achieve one or more conservation objectives. A conservation action may be implemented through a variety of conservation investments or MCAs. A conservation action that is implemented through an MCA would create conservation credits to be used as compensatory mitigation.

[11] The RCIS Program Guidelines (California Department of Fish and Wildlife 2018) define a habitat enhancement action as an action identified in an RCIS that, when implemented, is intended to improve the quality of wildlife habitat, or to address risks or stressors to wildlife. A habitat enhancement action is developed to achieve one or more conservation objectives. A habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. In contrast, a conservation action would permanently protect or restore, and perpetually manage, conservation elements. A habitat enhancement action may be implemented through a variety of conservation investments or mitigation credit agreements (MCAs). A habitat enhancement action that is implemented through an MCA would create habitat enhancement credits intended for use as compensatory mitigation for temporary impacts.

ecological resources (species and their habitat) and other natural resources that contributes to the fulfillment of regional conservation priorities and that is implemented prior to impacts occurring. A person or entity, including a state or local agency, private entity, or nongovernmental organization, can enter into an MCA with CDFW for a single site, a suite of sites, or even a region within an RCIS area. Credits created through an MCA can be used to "fulfill compensatory mitigation requirements established under any state or federal environmental law, as determined by the applicable local, state, or federal regulatory agency, including compensatory mitigation requirements to compensate for take or other adverse impacts of activities authorized pursuant to the California Endangered Species Act, to reduce adverse impacts to fish or wildlife resources, or both, from activities authorized pursuant to a lake or streambed alteration agreement to less than substantial, or to mitigate significant effects on the environment pursuant to the California Environmental Quality Act."[12]

This East Bay RCIS was designed with the intent that it not only meets compensatory mitigation requirements of CDFW under the CESA, but that it also supports compliance with state and federal water-related regulations and the ESA. Guidance on how this East Bay RCIS can support implementation of compensatory mitigation for separate, but related, regulations is provided below.

Compliance with the Clean Water Act and the Porter-Cologne Water Quality Control Act

An RCIS can provide information and analysis useful for identifying conservation actions and habitat enhancements to fulfill compensatory mitigation requirements under federal and state water quality protection laws. For example, both federal and state guidance for compensatory mitigation for impacts on aquatic resources stress the need for a *watershed approach* to compensatory mitigation. As mentioned above, this approach considers the importance of landscape position and resource type of compensatory mitigation projects for the sustainability of aquatic resource functions within the watershed.

In 2008, the Corps and EPA adopted regulations governing compensatory mitigation for impacts on waters of the United States authorized in permits issued pursuant to CWA Section 404 (the Compensatory Mitigation Rule).[13] The Compensatory Mitigation Rule requires the Corps to ". . . use a watershed approach to establish compensatory mitigation requirements in [Corps] permits to the extent appropriate and practicable."[14] The Rule defines a watershed approach as:

> . . . an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and locations of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource functions and services caused by activities authorized by [Corps] permits. The watershed approach may involve consideration of landscape scale, historic and potential aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resources when determining compensatory mitigation requirements for [Corps] permits.[15]

The ultimate goal of a watershed approach is to ". . . maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation

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[12] CFGC 1856(c)

[13] 33 CFR Part 332

[14] 33 CFR 332.3(c)(1)

[15] 33 CFR 332.2

sites."[16] Similarly, the State Water Resources Control Board proposes to require an almost identical watershed approach to compensatory mitigation as identified in its *Draft Procedures for Discharges of Dredged or Fill Materials to Waters of the State* (Draft Procedures) (California State Water Resources Control Board 2016)

The information needs identified for a watershed approach under the Compensatory Mitigation Rule and State Water Resources Control Board's Draft Procedures are almost identical. Where a watershed plan is available, it can be the basis of the watershed approach. A *watershed plan* is defined as follows.

> . . . a plan developed by federal, tribal, state, and/or local government agencies or appropriate non-governmental organizations, in consultation with relevant stakeholders, for the specific goal of aquatic resource restoration, establishment, enhancement, and preservation. A watershed plan addresses aquatic resource conditions in the watershed, multiple stakeholder interests, and land uses. Watershed plans may also identify priority sites for aquatic resource restoration and protection. Examples of watershed plans include special area management plans, advance identification programs, and wetland management plans.[17]

Where a watershed plan is not available, a watershed approach to compensatory mitigation may be based on the following elements.

> . . . analysis of information regarding watershed conditions and needs, including potential sites for aquatic resource restoration activities and priorities for aquatic resource restoration and preservation. Such information includes: current trends in habitat loss or conversion; cumulative impacts of past development activities, current development trends, the presence and needs of sensitive species; site conditions that favor or hinder the success of compensatory mitigation projects; and chronic environmental problems such as flooding or poor water quality.[18]

An RCIS is intended to provide information, analysis, and a process that supports a watershed approach to compensatory mitigation. The Corps, EPA, and applicable RWQCBs are included in the process of developing an RCIS in an effort to ensure that the RCIS provides accurate and up-to-date information and analysis regarding the watersheds and aquatic resources within the RCIS strategy area.

This East Bay RCIS includes information and analysis regarding aquatic resources that can be used for compensatory mitigation under the federal CWA and the Porter-Cologne Act in several ways. Project applicants can use the information to develop and site permittee-responsible mitigation actions in connection with a specific permit or project. Mitigation bankers can use the information to develop and site mitigation banks that generate mitigation credits. Public agencies can use the information to develop and establish in-lieu fee programs that generate mitigation credits. In each of these cases, the approval of the Corps and/or the applicable RWQCB would be required. However, this RCIS could be useful in developing mitigation proposals for their approval by avoiding and minimizing impacts to resources located in conservation priority areas and directing mitigation investments to conservation priorities as identified in the RCIS.

MCAs that meet the requirements of relevant Corps, EPA, and RWQCB mitigation regulations and policies could also be used to generate mitigation credits for compensatory mitigation under the CWA and Porter-Cologne Act. CDFW approval of an MCA does not authorize the creation of mitigation credits under the CWA or Porter-Cologne Act. However, if the Corps or RWQCB determines that an MCA meets relevant federal requirements under the CWA and Porter-Cologne Act, they could allow the MCA to create mitigation credits that can be used under those acts. For

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[16] 33 CFR 332.3(c)(1)

[17] 33 CFR 332.2:25, lines 872–878.

[18] 33 CFR 332.3(c)(3):29, lines 1030–1948.

example, the Corps and EPA could determine that the MCA meets Compensatory Mitigation Rule regulations and policies for in-lieu fee programs and could approve the MCA as an in-lieu fee program-enabling instrument. By fulfilling relevant Corps and EPA requirements and obtaining their approval, the MCA could then be used to create mitigation credits that could be used to comply with the CWA. Similarly, the RWQCB could determine that such mitigation credits are consistent with Porter-Cologne Act requirements for purposes of a CWA Section 401 certification.

Compliance with the Federal Endangered Species Act

An RCIS can provide information and analysis for identifying conservation actions and habitat enhancements to fulfill compensatory mitigation requirements under federal wildlife protection laws. For example, in December 2016, the USFWS published their final compensatory mitigation policy under the ESA.[19] For compensatory mitigation under the federal ESA, USFWS prefers the following mitigation conditions.

- Compensatory mitigation projects sited within priority conservation areas identified in landscape-scale conservation plans.
- Compensatory mitigation projects implemented in advance of impacts.
- Mitigation mechanisms that consolidate compensatory mitigation on the landscape.

USFWS has also described the following standards for compensatory mitigation.

- Siting compensatory mitigation in locations identified in landscape-scale conservation plans or mitigation strategies in areas that will meet conservation objectives and provide the greatest long-term benefit to the species.
- Providing compensatory in-kind mitigation for the species affected by the proposed action.
- Providing metrics to measure the ecological functions at compensatory mitigation sites that are science-based, quantifiable, consistent, repeatable, and related to the conservation goals for the species.
- Providing benefits beyond those that would have otherwise occurred through routine or required practices or actions.
- Achieving conservation objectives within a reasonable timeframe or for at least the duration of the impacts.
- Securing the compensatory mitigation by durable means, including adequate legal, real estate, and financial protections that ensure its success.
- Providing accountability in case compensatory mitigation fails to meet its conservation objectives.
- Providing for appropriate and effective engagement of local communities and stakeholders.

This East Bay RCIS is intended specifically to provide information, analysis, and a process that supports compensatory mitigation that meets all of these criteria. (In some cases, a future MCA would meet the criteria.) USFWS and the NMFS have been involved in the process of developing this East Bay RCIS to ensure that that it provides accurate and up-to-date information and analysis regarding species listed under the ESA.

This East Bay RCIS includes information and analysis regarding federally listed species that can be used for compensatory mitigation under the ESA in a variety of ways. They can be used by project

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[19] 81 FR 95316–95349.

applicants to develop and site permittee-responsible mitigation actions in connection with a specific permit or project. They can be used by mitigation bankers to develop and site conservation banks that generate mitigation credits. And they can be used by public agencies to develop and establish in-lieu fee programs that generate mitigation credits. In each of these cases, the approval of USFWS or NMFS would be required. However, this East Bay RCIS could be useful in developing mitigation proposals for their approval.

USFWS or NMFS could also incorporate or refer to an RCIS in regulatory designations and analyses, such as recovery plans, critical habitat designations, HCPs, and biological opinions. For example, USFWS or NMFS could determine that the mitigation strategies or actions of an RCIS meet the requirements of Section 7 of the ESA and include them in a biological opinion for one or several projects in the RCIS area.

MCAs that meet the requirements of relevant USFWS or NMFS mitigation regulations and policies could also be used to generate mitigation credits for compensatory mitigation under the ESA. As described above, MCA-based mitigation credits are provided for under the ESA with USFWS or NMFS approval.[20] For example, USFWS could determine that the MCA meets regulations and policies for conservation banks and could approve the MCA as a programmatic (umbrella) conservation bank-enabling instrument. Or USFWS or NMFS could determine that the MCA meets its policies for in-lieu fee programs and could approve the MCA as an in-lieu fee program-enabling instrument.

This RCIS anticipates that CDFW's Mitigation Credit Agreement guidelines, expected to be released in the fall of 2018, will provide details about how mitigation credits developed through an MCA can be used to satisfy mitigation needs for the broad range of regulatory processes discussed in this appendix. Project proponents are encouraged to coordinate early with regulatory agencies that have permitting authority over their projects to determine whether, and how, the East Bay RCIS can be used to inform their mitigation needs, and whether credits created through an MCA could be used to satisfy compensatory mitigation requirements.

1.4 References

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[20] CFGC 1856(c)

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Appendix C
Public Outreach

Appendix C
Public Outreach

East Bay RCIS Stakeholder Group

The following organizations and agencies were invited to participate in the East Bay RCIS Stakeholder Group. If the organization participated the individual participants are listed.

- Alameda County Resource Conservation District: Leslie Koenig and Katherine Boxer Latipow
- Alameda County Transportation Commission, Carolyn Clevenger and Vivek Bhat
- American Farmland Trust: Kara Heckert and Serena Unger
- Brentwood Agricultural Land Trust
- Brentwood Land Trust: Ron Brown
- Business Industry Association: Lisa Vorderbrueggen
- California Department of Fish and Wildlife: Shannon Lucas, Ami Olson, and Ron Unger
- California Natural Resources Agency: Brady Moss
- Caltrans, District 4: JoAnn Cullom and Melanie Brent
- Center for Biological Diversity
- City of Livermore: Andy Ross and Steve Stewart
- City of Pleasanton
- Contra Costa Transportation Authority: Hisham Noeimi and Randy Iwasaki
- Contra Costa County Resource Conservation District: Chris Lim and Elissa Robinson
- County of Alameda: Liz McElligott
- East Bay Leadership Council: Josh Huber
- East Bay Regional Parks District: Sandra Hamlat and Erich Pfeuhler
- East Contra Costa County Habitat Conservancy: Abby Fateman and John Kopchik
- Greenbelt Alliance: Joel Devalcourt
- John Muir Land Trust: Linus Eukel
- Ohlone Audubon: Evelyn Cormier
- San Francisco District Army Corps of Engineers: Frankie Malamud-Roam
- Save Mount Diablo: Ted Clement, Seth Adams, and Juan Pablo Galvan
- Sonoma County Land Trust: Wendy Eliot
- State Coastal Conservancy: Laura Cholodenko and Matthew Gerhart
- Stop Waste: Brian Mathews

- Tri-Valley Conservancy: Laura Mercier
- University of California Cooperative: Shelia Barry
- Walnut Creek Watershed Council: Bob Simmons and Lesley Hunt
- Wetland advocates: Lisa Belenky, Arthur Feinstein, Carin High, Beth Huning, Julian Meisler, Barbara Salzman
- Zone 7 Water Agency: Elke Rank

Regulatory Agency Outreach

The following regulatory agencies were invited to participate in the development of the East Bay RCIS through agency-specific meetings as well as participation in the Stakeholder Group.

- California Department of Fish and Wildlife–Region 3
- California Department of Fish and Wildlife–Headquarters
- Environmental Protection Agency–Region 9
- National Marine Fisheries Service–Central Coast
- San Francisco Bay Conservation and Development Commission (BCDC)
- San Francisco Bay Regional Water Quality Control District
- State Water Resources Control Board
- U.S. Army Corps of Engineers, San Francisco District
- U.S. Fish and Wildlife Service–Bay-Delta Region
- U.S. Fish and Wildlife Service–Pacific Southwest Region
- U.S. Fish and Wildlife Service–Sacramento Branch

RAMP Technical Advisory Committee

- Alameda County Transportation Commission
- California Department of Fish and Wildlife–Headquarters
- California Department of Fish and Wildlife–Region 3
- California Natural Resources Agency
- Contra Costa Transportation Authority
- Caltrans Headquarters
- Caltrans, District 4
- East Contra Costa County Habitat Conservancy
- Environmental Protection Agency–Region 9
- Metropolitan Transportation Commission

- National Marine Fisheries Service–Central Coast
- San Francisco Bay Conservation and Development Commission
- San Francisco Bay Regional Water Quality Control District
- San Francisco Bay Regional Water Resources Control Board
- Santa Clara County Habitat Conservancy
- Santa Clara Valley Transportation Authority
- Solano Transportation Authority
- State Water Resources Control Board
- Environmental Protection Agency
- U.S. Fish and Wildlife Service

Public Meeting Attendees

In order to meet regulation requirements, a public meeting was held on October 24, 2016 at East Bay Regional Park District Headquarters, in Oakland, California. The public meeting was held as part of a regularly-scheduled Park Advisory Committee meeting.

Park Advisory Committee Members at the Time of the Public Meeting

- Linda Best
- Bruce Beyaert
- Julie Bueren
- Colin Coffey
- Richard Godfrey
- Michael Gregory
- Adele Ho
- Bruce Kern
- Jeremy Madsen
- John Mercurio
- Mona Palacios
- Rick Rickard
- Elissa Robinson
- Olivia Sanwong
- Robert “Bob” Simmons
- Lou Ann Texeira

- Laura Thompson
- Peter Volin
- Robert Wilkins
- Benjamin Yee

General Public Attendees

- Kelly Abreu
- William Yragui

Public Meeting Summary and Comments

The Public Meeting, as required by AB 2087, for the East Bay RCIS was held at the East Bay Regional Parks District office on October 24, 2016. The meeting was announced a month in advance (September 22, 2016) via email distributed to: Alameda and Contra Costa County planning directors/managers, clerks, and lead/senior planners (representing all cities/counties); the full East Bay RCIS stakeholder list (compilation of individuals representing conservation, transportation, regulatory agencies); and the Bay Area RAMP TAC. Additionally, the notice was posted in hard copy at the EBRPD office and posted on the State Coastal Conservancy (SCC) website (see below for public meeting notice, public meeting agenda [held as part of the East Bay Regional Park District's Park Advisory Committee October Meeting], and memorandum included with the Advisory Committee Meeting materials).

During the meeting Liz O'Donoghue of The Nature Conservancy (TNC) addressed oral comments. Comment cards along with a factsheet about the RCIS were distributed during the meeting to facilitate receipt of written comments. No written comments were received during the meeting. On October 31, 2018 an email was received from Bruce Beyaert in response to the public meeting. This email is considered the only written comments received as a result of the public meeting. Below are the two comments provided by Mr. Beyaert:

"*1. Mitigation sites should be at or near the location impacted adversely. There has been great controversy in the past when trustee agencies have diverted funds compensating for impairment of fish & wildlife habitat in Richmond to their favorite projects in Sonoma and Solano Counties, even though the City of Richmond and EBRPD recommended that the money should be invested to restore habitat in Richmond, including Hoffman Marsh and three other identified sites.*

2. Parks, open space and conservation public agencies, land trusts and others routinely carry out habitat and species protection, restoration and enhancement projects and land acquisitions as part of their organization's mission, using their own funds supplemented by grants from public agencies and private donors. The conservation benefits of these projects, especially those carried out by public agencies or private parties using public funds, should not be monetized, sold or used as mitigation credits. The RCIS would cause a net loss of habitat and/or species if the benefits of these projects were used to mitigate damages caused by construction projects elsewhere."

Comments were addressed through follow-up emails with TNC, SCC, and AECOM staff. A conference call meeting was held on December 19, 2016 with Mr. Beyaert to discuss these items. Both comments are really aimed at the development of Mitigation Credit Agreements under the RCIS, rather than the RCIS itself. The group agreed to item #1, and the RCIS describes proximity as a factor in considering mitigation sites. We discussed item #2 and how a conservation organization could receive funding for mitigation on one project and then apply their own general fund or grant funds to other valuable projects that don’t have a source of mitigation funding.

No other written public comments have been received to date. Public comments are anticipated during the public comment period for the East Bay RCIS after it has been submitted to and deemed complete by California Department of Fish and Wildlife.

From: Cholodenko, Laura@SCC
Sent: Thursday, September 22, 2016 5:47 PM
Subject: Notice of Public Meeting: East Bay Regional Conservation Investment Strategy

Interested parties are invited to attend a meeting of the East Bay Regional Park District (EBRPD) Park Advisory Committee to be held at 7:00 PM on October 24, 2016 at EBRPD Headquarters, 2950 Peralta Oaks Court, Oakland, CA, 94605. The meeting agenda will include an item which allows interested parties to receive information about a proposed East Bay Regional Conservation Investment Strategy (RCIS) and to provide comments. Regional Conservation Investment Strategies are new, voluntary, landscape-scale conservation planning tools that will identify conservation priorities to guide public and private conservation actions, such as habitat protection or restoration. Guided by state legislation (AB 2087), the State Coastal Conservancy is sponsoring development of an RCIS for the East Bay region, which includes all of Alameda and Contra Costa Counties. Once the East Bay RCIS is approved by the California Department of Fish and Wildlife (Department), conservation actions identified in the RCIS could be used to develop mitigation credit agreements with the Department for transportation and other projects. The East Bay RCIS is part of a broader effort to implement regional advance mitigation planning in the Bay Area to facilitate landscape-scale conservation while improving the delivery of transportation projects.

Interested persons may provide oral and written comments at said time and place. Written comments may also be sent to the State Coastal Conservancy, Attn: East Bay RCIS, 1515 Clay Street, 10th Floor, Oakland CA 94612. Written comments should be provided by November 4, 2016.

Laura Cholodenko, Project Manager
State Coastal Conservancy
1330 Broadway, 13th Floor
Oakland, CA 94612
(510) 286-0752

East Bay
Regional Park District

TO: PARK ADVISORY COMMITTEE

FROM: BRUCE KERN, CHAIR

SUBJECT: PARK ADVISORY COMMITTEE OCTOBER MEETING

Date: **October 24, 2016**

Time:
6:15 p.m. PAC Executive Subcommittee
(Kern, Mercurio, Best, Wilkins, Gregory, Ho)
1. Review Goals for 2017
2. Designate PAC Officer Nominating Committee

REGULAR MEETING

7:00 p.m.
1. Approval of Minutes – September 26, 2016
2. Introductions
3. Board Member Comments – Director Lane

PUBLIC HEARING

7:15 p.m.
1. Regional Advanced Mitigation Program (RAMP) – Regional Conservation Frameworks
Presentations by:
Matt Gerhart – San Francisco Bay Area Regional Manager, California Coastal Conservancy
Liz O'Donoghue – Director of Infrastructure and Land Use, The Nature Conservancy
Kathryn Gaffney – Conservation Planner, ICF International

7:35 p.m.
2. Questions from PAC Members about the Public Hearing

REGULAR MEETING (continued)

7:45 p.m.
4. Public Comments
5. Presentations:
(R) a. Goals – Bruce Kern, Chair PAC, Erich Pfuehler, Government Affairs Manager
(I) b. Community Services/Volunteer Program Review– Ira Bletz, Regional Interpretive & Recreation Services Manager and Jeremy Saito, Recreation Supervisor
(I) c. Camping Program Update – Jim O'Connor, AGM Operations

8:30 p.m.
6. PAC Member Comments
7. Report from the Chair – Bruce Kern
8. Board Committee Reports
9. Status of Recommendations
10. Old Business
11. New Business
12. Adjournment

Next Meeting – November 28, 2016

(A) Action (I) Information (R) Recommendation

ATTACHMENTS

1. RAMP Memo
2. Goals Memo
3. Community Services/Volunteer Program Memo
4. Camping Program Update
5. 2016 Work Plan
6. Status of Recommendations
7. Articles & Correspondence

East Bay
Regional Park District

PARKS ADVISORY COMMITTEE

Meeting of October 24, 2016

TO: Parks Advisory Committee

STAFF REPORT PREPARED BY: Liz O'Donoghue, The Nature Conservancy

SUBJECT: East Bay Regional Conservation Investment Strategy

RECOMMENDATION

This is an informational item only.

Regional Conservation Investment Strategy

On September 22, 2016, Governor Brown signed AB 2087[1] into law. This new law establishes a conservation planning tool called a Regional Conservation Investment Strategy (RCIS) to promote the conservation of species, habitats, and other natural resources and enable advance mitigation for public infrastructure projects. An RCIS provides a non-regulatory assessment and analysis of conservation needs in a region including habitat connectivity and climate resilience. Entities can use an RCIS approved by the California Department of Fish and Wildlife to guide voluntary investment in conservation actions (protection, restoration and enhancement) in advance of projects' impacts, and secure mitigation credit agreements for that investment. Mitigation credit agreements provide a way to link mitigation to larger regional conservation goals, reduce the transaction costs, decrease the time required to obtain mitigation approval, and provide assurances to project proponents that advance mitigation investments will be counted and credited for future development permits.

Pilot: East Bay RCIS

Four RCISs have been initiated in California as pilots to apply the new legislation; one of the four pilot projects is the East Bay RCIS: Alameda and Contra Costa counties. The East Bay RCIS development is led by a team consisting of The Nature Conservancy, State Coastal Conservancy (SCC), Contra Costa Transportation Authority (CCTA), the East Contra Costa County Habitat Conservancy and the Metropolitan Transportation Commission (MTC). The East Bay RCIS has been guided by regulatory agencies and a stakeholder group representing interests across the two counties. The East Bay RCIS will be consistent and coordinated with the East Contra Costa HCP/NCCP and will help enable the CCTA's support for an Advance Mitigation program as part of Measure X.

The project builds on existing efforts to develop a Regional Advance Mitigation Planning process for the Bay Area with a focus on transportation projects, sponsored by MTC and SCC as part of Plan Bay Area 2040.

The intention in bringing the East Bay RCIS to the Parks Advisory Committee is to notify the public of this work as required by AB 2087, describe the process and desired outcomes in greater detail, and solicit feedback and reactions from both the Committee and the public about the work that is being accomplished. We appreciate the opportunity to present the pilot to the Committee and the public, and look forward to receiving feedback and public comment on the work.

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[1] http://www.leginfo.ca.gov/pub/15-16/bill/asm/ab_2051-2100/ab_2087_bill_20160922_chaptered.pdf

Appendix D
Letters of Support and Consistency

Coastal
Conservancy

January 23, 2019

Charlton H. Bonham
Director
California Department of Fish and Wildlife
1416 Ninth Street
Sacramento, CA 95814

Subject: East Bay Regional Conservation Investment Strategy

Dear Mr. Bonham:

In accordance with Cal. Fish and Game Code Section 1852(a), we, the California State Coastal Conservancy (Coastal Conservancy) are writing to request that the California Department of Fish and Wildlife (CDFW) approve the East Bay Regional Conservation Investment Strategy (RCIS), as it would contribute to meeting state conservation goals and public infrastructure goals. The RCIS area comprises all of Alameda and Contra Costa Counties. This area is of statewide importance for conservation, as it supports numerous rare and endangered species; contains important bayland, wetland, riparian, and oak woodland habitats; and features critical areas for wildlife connectivity, including essential habitat connectivity linkages.

The RCIS would facilitate current efforts to safeguard these and other conservation values by contributing to smart growth principles, including informed planning for conservation, urbanization, and public infrastructure that are important to the Coastal Conservancy and the numerous local, state, and federal conservation agencies and organizations working in the region. This RCIS will help focus acquisition, restoration, or enhancement where it will have the largest benefit for focal species and other conservation elements.

The RCIS area encompasses all of the permit area of the East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (ECCC HCP/NCCP)—a regional conservation plan approved in 2007 by the U.S. Fish and Wildlife Service and CDFW. This RCIS was developed in coordination with the East Contra Costa County Habitat Conservancy, the entity implementing the ECCC HCP/NCCP, and was designed to complement the ECCC HCP/NCCP, both within and beyond the ECCC HCP/NCCP's permit area. As such, this RCIS was prepared consistent with Section 1852(c)(10), that states that for an RCIS to be approved by CDFW, an RCIS shall include "provisions ensuring that the strategy is consistent with and complements any administrative draft natural community conservation plan, approved natural community conservation plan, or federal habitat conservation plan that overlaps with the strategy area."

By using a science-based approach to identify areas of high conservation value in the region, this RCIS will also aid the development of public infrastructure projects by helping agencies avoid and minimize their project impacts and then identify priority conservation actions for compensatory mitigation, including as part of advance mitigation programs. It is expected that a number of transportation projects will be designed and proposed for construction in the next three to 10 years in the RCIS area. Some of these projects will not have their compensatory mitigation needs met by the ECCC HCP/NCCP because the activities are not in the permit area or otherwise covered by the ECCC HCP/NCCP's permits. The RCIS was developed in consideration of these and other transportation projects as part of a collaborative effort with the Metropolitan Transportation Commission, Caltrans, and The Nature Conservancy to establish a regional advance mitigation planning program in the San Francisco Bay Area.

The RCIS will also inform the mitigation needs of other projects occurring in the RCIS area, including ongoing development in the 30 cities addressed by this East Bay RCIS (outside the ECCC HCP/NCCP's permit area), installation or replacement of large-scale utilities, and water supply and flood infrastructure projects.

The Coastal Conservancy appreciates CDFW's efforts to review and approve this conservation strategy. If you have any questions, please contact Laura Cholodenko at (510) 286-0752.

Sincerely,

Matt Gerhart
Bay Area Program Manager

Cc: Rick Macedo, Habitat Conservation Planning Branch Chief, CDFW
Ronald Unger, Landscape Conservation Planning Program Manager, CDFW

EAST CONTRA
COSTA COUNTY
HABITAT
CONSERVANCY

City of Brentwood

City of Clayton

City of Oakley

City of Pittsburg

Contra Costa County

January 31, 2019

Mr. Ron Unger
Landscape Conservation Planning Program Manager
California Department of Fish and Wildlife
1416 9th Street, 12th Floor
Sacramento, CA 95814

RE: Draft East Bay Regional Conservation Investment Strategy Consistency with the East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan

Dear Mr. Unger,

I am writing to provide a letter consistent with Fish and Game Code section 1852(c)(10) regarding the East Bay Regional Conservation Investment Strategy ("RCIS") as it relates to the East Contra Costa County Habitat Conservation Plan / Natural Community Conservation Plan ("ECCC HCP/NCCP" or "Plan").

The East Contra Costa County Habitat Conservancy ("Conservancy") is the implementing entity for the ECCC HCP/NCCP. I have reviewed the relevant sections of the draft East Bay RCIS and have determined that its guidance is consistent with the ECCC HCP/NCCP, and the draft RCIS has the ability to direct conservation efforts to complement the conservation objectives of the ECCC HCP/NCCP. The draft RCIS includes provisions ensuring that the RCIS's conservation goals, objectives and actions will not preclude the HCP/NCCP from achieving its goals, objectives, and actions or the NCCP's conservation strategy.

I expect when reviewing projects within the ECCC HCP/NCCP permit area that propose to use a Mitigation Credit Agreement (MCA), CDFW will ensure:

1) Design criteria and AMMs identified in the HCP/NCCP are incorporated into projects as the failure to include those elements in a project can negatively impact the ECCC HCP/NCCP Preserve System lands and other protected open space within the region (eg, wildlife movement corridors, creating edge effects, watershed hydrology, etc.);
2) The MCA and mitigation strategy for a project in the ECCC HCP/NCCP area meets or exceeds the mitigation and conservation that would be required if the project had been permitted through the ECCC HCP/NCCP; and

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3) All land acquisition, restoration, or other conservation completed through an MCA has secure funding for management and monitoring in perpetuity that is consistent with the regional conservation standards established in the ECCC HCP/NCCP.

I look forward to working with CDFW staff to ensure that MCAs, RCIS updates, RCIS amendments and other documents developed related to the RCIS are also consistent with the successful implementation of the ECCC HCP/NCCP.

Respectfully,

Abigail Fateman
Executive Director

Appendix E
Evaluation of Species for Inclusion as Focal Species

Appendix E
Evaluation of Species for Inclusion as Focal Species

Appendix E presents the evaluation of special-status species that occur in the RCIS area for inclusion as focal species in this East Bay RCIS. Wildlife and fish are addressed in Tables E-1a through E-1d and plants are addressed in E-2a through E-2d. The evaluation tables follow a three-step process, which is discussed in Chapter 2, *Environmental Setting and the Built Environment*, Section 2.2.6.1, *Selection Process*. The results of the analysis are provided in the tables below.

Table E-1a. Wildlife and Fish, Step 1

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**SWAP-SGCN**	**SWAP-CV**
Invertebrates						
Apodemia mormo langei	Lange's metalmark butterfly	E	–	G5T1	Y	N
Bombus caliginosus	Obscure bumble bee	–	–	G4?	Y	N
Bombus crotchii	Crotch bumble bee	–	–	G3G4	Y	N
Bombus occidentalis	Western bumble bee	*	–	G2G3	Y	N
Branchinecta conservatio	Conservancy fairy shrimp	E	–	G2	Y	N
Branchinecta longiantenna	Longhorn fairy shrimp	E	–	G1	Y	N
Branchinecta lynchi	Vernal pool fairy shrimp	T	–	G3	Y	N
Branchinecta mesovallensis	Midvalley fairy shrimp	–	–	G2	N	N
Coelus gracilis	San Joaquin dune beetle	–	–	G1	Y	N
Danaus plexippus	Monarch butterfly	*	–	G4T2T3	Y	N
Efferia antiochi	Antioch efferian robberfly	–	–	G1G2	Y	N
Eucerceris ruficeps	redheaded sphecid wasp			G1B3	N	N
Helminthoglypta stiversiana williamsi	William's bronze shoulderband snail	–	–	G2G3T1	Y	N
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	–	–	G2?	N	N
Hydroporus leechi	Leech's skyline diving beetle	–	–	G1?	N	N
Hygrotus curvipes	Curved-foot hygrotus diving beetle	–	–	G1?	Y	N
Ischnura gemina	San Francisco forktail damselfly	–	–	G2	N	N
Lepidurus packardi	Vernal pool tadpole shrimp	E	–	G4	Y	N
Linderiella occidentalis	California fairy shrimp	–	–	G2G3	N	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**SWAP-SGCN**	**SWAP-CV**
Metapogon hurdi	Hurd's metapogon robberfly	–	–	G1G3	Y	N
Perdita scitula antiochensis	Antioch andrenid bee	–	–	G1T1	Y	N
Speyeria callippe callippe	Callippe silverspot butterfly	E	–	G5T1	Y	N
Sphecodogastra antiochensis	Antioch Dunes halcitid bee	–	–	G1	Y	N
Fish						
Acipenser medirostris	Green sturgeon	T	SSC	G3	Y	Y
Archoplites interruptus	Sacramento perch	–	SSC	G5T2T3	Y	N
Entosphenus tridentate	Pacific lamprey	–	–	G4	Y	Y
Hypomesus transpacificus	Delta smelt	T	T	G1	Y	Y
Mylopharodon conocephalus	Hardhead	–	SSC	G3	Y	N
Oncorhynchus mykiss	Central California Coastal steelhead	T	SSC	G5T2T3Q	Y	Y
Oncorhynchus mykiss	Central Valley steelhead	T	–	G5T2Q	Y	Y
Oncorhynchus tshawytscha	Central Valley fall/late fall–run Chinook salmon	SC	SSC	G5	Y	Y
Oncorhynchus tshawytscha	Central Valley spring-run Chinook salmon	T	T	G5	Y	Y
Oncorhynchus tshawytscha	Winter-run Chinook salmon	E	E	G5	Y	Y
Spirinchus thaleichthys	Longfin smelt	C	T	G5	Y	Y
Amphibians						
Ambystoma californiense	California tiger salamander (Central CA DPS)	T	T	G2G3	Y	Y
Rana boylii	Foothill yellow-legged frog	*	C	G3	Y	Y
Rana draytonii	California red-legged frog	T	SSC	G2G3	Y	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**SWAP-SGCN**	**SWAP-CV**
Reptiles						
Anniella pulchra	Northern California legless lizard	–	SSC	G3G4T2 T3Q	Y	N
Emys marmorata	Western pond turtle	*	SSC	G3G4	Y	N
Masticophis flagellum ruddocki	San Joaquin coachwhip (=whipsnake)	–	SSC	G5T2T3 ?	Y	N
Masticophis lateralis euryxanthus	Alameda whipsnake	T	T	G4T2	Y	N
Thamnophis gigas	Giant garter snake	T	T	G2	Y	N
Birds						
Accipiter cooperii	Cooper's hawk	–	SSC	G5	N	N
Accipiter striatus	Sharp-shinned hawk	–	SSC	G5	N	N
Agelaius tricolor	Tricolored blackbird	*	Candidate	G5T1T2	Y	N
Ammodramus savannarum	Grasshopper sparrow	–	SSC	G5	Y	N
Aquila chrysaetos	Golden eagle	–	FP, SSC	G5	N	N
Asio flammeus	Short-eared owl	–	SSC	G5	Y	N
Asio otus	Long-eared owl	–	SSC	G5?	Y	N
Athene cunicularia	Burrowing owl	–	SSC	G4	Y	N
Buteo regalis	Ferruginous hawk	–	SSC	G4	N	N
Buteo swainsoni	Swainson's hawk	–	T	G5	Y	Y
Charadrius alexandrinus nivosus	Western snowy plover	T	SSC	G3T3	Y	Y
Circus cyaneus	Northern harrier	–	CSC	G5	Y	N
Elanus leucurus	White-tailed kite	–	FP	G5	N	N
Falco columbarius	Merlin	–	–	G5	N	N
Falco mexicanus	Prairie falcon	–	–	G5	N	N
Falco peregrinus anatum	American peregrine falcon	D	FP	G4T4	N	N
Haliaeetus leucocephalus	Bald eagle	D	E; FP	G5	Y	N
Lanius ludovicianus	Loggerhead shrike	–	SSC	G4	Y	N
Laterallus jamaicensis coturniculus	California black rail	–	T; FP	G3G4T1	Y	Y
Pandion haliaetus	Osprey	–	CSC	G5	N	N
Pelecanus occidentalis californicus	California brown pelican	D	E; FP	G4T3	Y	Y
Progne subis	Purple martin	–	SSC	G5	Y	N
Rallus obsoletus obsoletus	Ridgway's rail	E	E; FP	G5T1	Y	Y

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**SWAP-SGCN**	**SWAP-CV**
Setophaga petechia	Yellow warbler	–	SSC	G5	Y	N
Sterna antillarum (=albifrons) browni	California least tern	E	E; FP	G4T2T3Q	Y	Y
Mammals						
Antrozous pallidus	Pallid bat	–	SSC	G5	Y	N
Corynorhinus townsendii townsendii	Townsend's big-eared bat	–	C	G3G4	Y	N
Eumops perotis californicus	Western mastiff-bat	–	SSC	G5T4	N	N
Lasionycteris noctivagans	Silver-haired bat	–	–	G5	N	N
Lasiurus cinereus	Hoary bat	–	–	G5	N	N
Microtus californicus sanpabloensis	San Pablo vole	–	SSC	G5T1T2	Y	Y
Myotis evotis	Long-eared myotis	–	–	G5	Y	N
Myotis thysanodes	Fringed myotis	–	–	G4	Y	N
Myotis yumanensis	Yuma myotis	–	–	G5	N	N
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	–	SSC	G5T2T3	N	N
Puma concolor	Mountain lion	-	-	-	N	N
Reithrodontomys raviventris	Salt marsh harvest mouse	E	E; FP	G1G2	Y	N
Sorex vagrans halicoetes	Salt marsh wandering shrew	–	SSC	G5T1	Y	N
Taxidea taxus	American badger	–	SSC	G5	Y	N
Vulpes macrotis mutica	San Joaquin kit fox	E	T	G4T2	Y	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**SWAP-SGCN**	**SWAP-CV**

Key

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
* = Under review for listing under the federal Endangered Species Act.
– = no listing.

State

(CDFW July 2016, *Special Animals List*, Available: *https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406*)
E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
C = a candidate for listing under the California Endangered Species Act.
SSC = listed as a California special of special concern by the California Department of Fish and Wildlife
FP = listed as a fully protected by the California Department of Fish and Wildlife
– = no listing.

Global

(Nature Serve 2015. Available http://explorer.natureserve.org/granks.htm)
G1 = critically imperiled- high risk of extinction due to extreme rarity (often 5 or fewer populations)
G2 = imperiled- high risk of extinction due to very restricted range, very few populations (often 20 or fewer populations)
G3 = vulnerable- moderate risk of extinction due to restricted range and very few populations (often 80 or fewer populations)
G4 = apparently secure- uncommon but not rare
G5 = secure- common, widespread and abundant
G#G# = Range rank; numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.
? = inexact numeric rank
Q = Questionable taxonomy; taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid.
T# = Infraspecific taxon; the status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.
Rules for assigning T-ranks follow the same principles outlined above for global conservation.

State Wildlife Action Plan (SWAP)

(CDFW 2015, State Wildlife Action Plan, Available: https://www.wildlife.ca.gov/SWAP)
SGCN = Species of Greatest Conservation Need
CV = Climate Vulnerable
Y = Yes
N = No

Table E-1b. Wildlife and Fish, Step 2

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Invertebrates											
Apodemia mormo langei	Lange's metalmark butterfly	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Bombus caliginosus	Obscure bumble bee	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Bombus crotchii	Crotch bumble bee	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Bombus occidentalis	Western bumble bee	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Branchinecta conservatio	Conservancy fairy shrimp	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Branchinecta longiantenna	Longhorn fairy shrimp	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Branchinecta lynchi	Vernal pool fairy shrimp	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Branchinecta mesovallensis	Midvalley fairy shrimp	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Coelus gracilis	San Joaquin dune beetle	0	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Danaus plexippus	Monarch butterfly	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Efferia antiochi	Antioch efferian robberfly	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Eucerceris ruficeps	redheaded sphecid wasp	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Helminthoglypta stiversiana williamsi	William's bronze shoulderband snail	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Hydroporus leechi	Leech's skyline diving beetle	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Hygrotus curvipes	Curved-foot hygrotus diving beetle	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Ischnura gemina	San Francisco forktail damselfly	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Lepidurus packardi	Vernal pool tadpole shrimp	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Linderiella occidentalis	California fairy shrimp	0	1	1	1	1	TRUE	TRUE	FALSE	TRUE	TRUE
Metapogon hurdi	Hurd's metapogon robberfly	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Perdita scitula antiochensis	Antioch andrenid bee	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Speyeria callippe callippe	Callippe silverspot butterfly	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Sphecodogastra antiochensis	Antioch Dunes halcitid bee	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					**Filtering of Species →**				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Fish											
Acipenser medirostris	Green sturgeon	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Archoplites interruptus	Sacramento perch	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Entosphenus tridentate	Pacific lamprey	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Hypomesus transpacificus	Delta smelt	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Mylopharodon conocephalus	Hardhead	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Oncorhynchus mykiss	Central California Coastal steelhead	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Oncorhynchus mykiss	Central Valley steelhead	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Oncorhynchus tshawytscha	Central Valley fall/late fall–run Chinook salmon	0	1	1	1	1	TRUE	TRUE	FALSE	TRUE	TRUE
Oncorhynchus tshawytscha	Central Valley spring-run Chinook salmon	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Oncorhynchus tshawytscha	Winter-run Chinook salmon	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Spirinchus thaleichthys	Longfin smelt	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE

		Criteria					Filtering of Species →				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Amphibians											
Ambystoma californiense	California tiger salamander (Central CA DPS)	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Rana boylii	Foothill yellow-legged frog	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Rana draytonii	California red-legged frog	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Reptiles											
Anniella pulchra	Northern California legless lizard	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Emys marmorata	Western pond turtle	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Masticophis flagellum ruddocki	San Joaquin coachwhip (=whipsnake)	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Masticophis lateralis euryxanthus	Alameda whipsnake	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Thamnophis gigas	Giant garter snake	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Birds											
Accipiter cooperii	Cooper's hawk	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Accipiter striatus	Sharp-shinned hawk	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE

		Criteria					**Filtering of Species**				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Agelaius tricolor	Tricolored blackbird	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Ammodramus savannarum	Grasshopper sparrow	0	1	1	1	1	TRUE	TRUE	FALSE	TRUE	TRUE
Aquila chrysaetos	Golden eagle	1	0	1	1	1	TRUE	FALSE	FALSE	TRUE	TRUE
Asio flammeus	Short-eared owl	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Asio otus	Long-eared owl	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Athene cunicularia	Burrowing owl	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Buteo regalis	Ferruginous hawk	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Buteo swainsoni	Swainson's hawk	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Charadrius alexandrinus nivosus	Western snowy plover	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Circus cyaneus	Northern harrier	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Elanus leucurus	White-tailed kite	1	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Falco columbarius	Merlin	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Falco mexicanus	Prairie falcon	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Falco peregrinus anatum	American peregrine falcon	1	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Haliaeetus leucocephalus	Bald eagle	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Lanius ludovicianus	Loggerhead shrike	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Laterallus jamaicensis coturniculus	California black rail	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Pandion haliaetus	Osprey	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Pelecanus occidentalis californicus	California brown pelican	1	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Progne subis	Purple martin	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Rallus obsoletus obsoletus	Ridgway's rail	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Setophaga petechia	Yellow warbler	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Sterna antillarum (=albifrons) browni	California least tern	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Mammals											
Antrozous pallidus	Pallid bat	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Corynorhinus townsendii townsendii	Townsend's big-eared bat	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Eumops perotis californicus	Western mastiff-bat	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					**Filtering of Species**				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Lasionycteris noctivagans	Silver-haired bat	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Lasiurus cinereus	Hoary bat	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Microtus californicus sanpabloensis	San Pablo vole	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Myotis evotis	Long-eared myotis	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Myotis thysanodes	Fringed myotis	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Myotis yumanensis	Yuma myotis	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Puma concolor	Mountain lion	0	0	1	1	1	TRUE	FALSE	FALSE	TRUE	TRUE
Reithrodontomys raviventris	Salt marsh harvest mouse	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Sorex vagrans halicoetes	Salt marsh wandering shrew	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Taxidea taxus	American badger	0	1	1	1	1	TRUE	TRUE	FALSE	TRUE	TRUE
Vulpes macrotis mutica	San Joaquin kit fox	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**

Key

Criteria

Status = The species is listed by state or federal resource agencies as threatened or endangered, or is a candidate for such listing; or the species is reasonably expect to be considered for listing within 10 years of East Bay RCIS approval. This includes species covered by a regional NCCP or HCP that overlaps the RCIS area.

Rarity = The species is recognized by NatureServe as Critically Imperiled (G1) or Imperiled (G2) globally, or is described as a Species of Greatest Conservation Need (SGCN) or Climate Vulnerable (CV) in the State Wildlife Action Plan, or is recognized by CNPS as Rare, Threatened, or Endangered in California and elsewhere (1B) or Rare, Threatened or Endangered in California but is more common elsewhere (2B).

Occur = The species is known or likely to occur in the RCIS area. Occurrence data should be based on credible evidence. Some species may not be present in the RCIS area at the time this RCIS is developed but could have a reasonable expectation to expand their range into the RCIS area within 10 years following RCIS development.

Data = Drawing on best available science and emerging data, sufficient data on the species' life history, habitat requirements, and occurrence in the RCIS area are available to propose viable conservation actions.

Provide Other Conservation Benefit = If a species does not meet the above criteria but provides some other conservation benefit, it can be included as a focal species. These species may not necessarily be declining or vulnerable, but they can help inform the conservation strategy in ways that declining species may be unable to do. These species may include area-dependent species, umbrella species, indicator species, or keystone species

0 = Does not meet criteria FALSE = Does not meet filter category
1 = Meets Criteria TRUE = Meets filters category

Table E-1c. Wildlife and Fish, Step 3

		Step 3	
Scientific Name	**Common Name**	**Rationale for Additional Prioritization**	**Included as Focal Species**
Invertebrates			
Apodemia mormo langei	Lange's metalmark butterfly	On protected land	No
Bombus caliginosus	Obscure bumble bee	Will not need mitigation	No
Bombus crotchii	Crotch bumble bee	Criteria	No
Bombus occidentalis	Western bumble bee	Will not need mitigation	No
Branchinecta conservatio	Conservancy fairy shrimp	Will not need mitigation	No
Branchinecta longiantenna	Longhorn fairy shrimp	N/A	Yes
Branchinecta lynchi	Vernal pool fairy shrimp	N/A	Yes
Branchinecta mesovallensis	Midvalley fairy shrimp	On protected land	No
Coelus gracilis	San Joaquin dune beetle	Criteria	No
Danaus plexippus	Monarch butterfly	Will not need mitigation	No
Efferia antiochi	Antioch efferian robberfly	Criteria	No
Eucerceris ruficeps	redheaded sphecid wasp	Criteria	No
Helminthoglypta stiversiana williamsi	William's bronze shoulderband snail	Criteria	No
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	Criteria	No
Hydroporus leechi	Leech's skyline diving beetle	Criteria	No
Hygrotus curvipes	Curved-foot hygrotus diving beetle	Criteria	No
Ischnura gemina	San Francisco forktail damselfly	Will not need mitigation	No
Lepidurus packardi	Vernal pool tadpole shrimp	N/A	Yes
Linderiella occidentalis	California fairy shrimp	Will not need mitigation	No
Metapogon hurdi	Hurd's metapogon robberfly	Criteria	No
Perdita scitula antiochensis	Antioch andrenid bee	Criteria	No
Speyeria callippe callippe	Callippe silverspot butterfly	N/A	Yes
Sphecodogastra antiochensis	Antioch Dunes halcitid bee	Criteria	No

		Step 3	
Scientific Name	**Common Name**	**Rationale for Additional Prioritization**	**Included as Focal Species**
Fish			
Acipenser medirostris	Green sturgeon	Will not need mitigation	No
Archoplites interruptus	Sacramento perch	Will not need mitigation	No
Entosphenus tridentate	Pacific lamprey	Will not need mitigation	No
Hypomesus transpacificus	Delta smelt	Will not need mitigation	No
Mylopharodon conocephalus	Hardhead	Will not need mitigation	No
Oncorhynchus mykiss	Central California Coastal steelhead	N/A	Yes
Oncorhynchus mykiss	Central Valley steelhead	N/A	Yes
Oncorhynchus tshawytscha	Central Valley fall/late fall–run Chinook salmon	Will not need mitigation	No
Oncorhynchus tshawytscha	Central Valley spring-run Chinook salmon	Will not need mitigation	No
Oncorhynchus tshawytscha	Winter-run Chinook salmon	N/A	Yes
Spirinchus thaleichthys	Longfin smelt	N/A	No
Amphibians			
Ambystoma californiense	California tiger salamander (Central CA DPS)	N/A	Yes
Rana boylii	Foothill yellow-legged frog	N/A	Yes
Rana draytonii	California red-legged frog	N/A	Yes
Reptiles			
Anniella pulchra	Northern California legless lizard	N/A	Yes
Emys marmorata	Western pond turtle	Will not need mitigation	No
Masticophis flagellum ruddocki	San Joaquin coachwhip (=whipsnake)	Will not need mitigation	No
Masticophis lateralis euryxanthus	Alameda whipsnake	N/A	Yes
Thamnophis gigas	Giant garter snake	N/A	Yes
Birds			
Accipiter cooperii	Cooper's hawk	Criteria	No
Accipiter striatus	Sharp-shinned hawk	Criteria	No
Agelaius tricolor	Tricolored blackbird	N/A	Yes

		Step 3	
Scientific Name	**Common Name**	**Rationale for Additional Prioritization**	**Included as Focal Species**
Ammodramus savannarum	Grasshopper sparrow	Will not need mitigation	No
Aquila chrysaetos	Golden eagle	N/A	Yes
Asio flammeus	Short-eared owl	Uncommon species in the study area.	No
Asio otus	Long-eared owl	Rare breeder within study area.	No
Athene cunicularia	Burrowing owl	N/A	Yes
Buteo regalis	Ferruginous hawk	Criteria	No
Buteo swainsoni	Swainson's hawk	N/A	Yes
Charadrius alexandrinus nivosus	Western snowy plover	Will not need mitigation	No
Circus cyaneus	Northern harrier	Will not need mitigation	No
Elanus leucurus	White-tailed kite	Criteria	No
Falco columbarius	Merlin	Criteria	No
Falco mexicanus	Prairie falcon	Criteria	No
Falco peregrinus anatum	American peregrine falcon	Criteria	No
Haliaeetus leucocephalus	Bald eagle	Occasional nester in East Bay	No
Lanius ludovicianus	Loggerhead shrike	Will not need mitigation	No
Laterallus jamaicensis coturniculus	California black rail	N/A	Yes
Pandion haliaetus	Osprey	Criteria	No
Pelecanus occidentalis californicus	California brown pelican	Criteria	No
Progne subis	Purple martin	Rare breeder within RCIS area.	No
Rallus obsoletus obsoletus	Ridgway's rail	Will be covered by other saltmarsh species	No
Setophaga petechia	Yellow warbler	Criteria	No
Sterna antillarum (=albifrons) browni	California least tern	Only known colony is off Alameda	No
Mammals			
Antrozous pallidus	Pallid bat	Criteria	No
Corynorhinus townsendii townsendii	Townsend's big-eared bat	Not enough data to create conservation strategy	No
Eumops perotis californicus	Western mastiff-bat	Criteria	No
Lasionycteris noctivagans	Silver-haired bat	Criteria	No
Lasiurus cinereus	Hoary bat	Criteria	No

		Step 3	
Scientific Name	**Common Name**	**Rationale for Additional Prioritization**	**Included as Focal Species**
Microtus californicus sanpabloensis	San Pablo vole	Criteria	No
Myotis evotis	Long-eared myotis	Criteria	No
Myotis thysanodes	Fringed myotis	Rare in RCIS area	No
Myotis yumanensis	Yuma myotis	Criteria	No
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	Criteria	No
Puma concolor	Mountain lion	N/A	Yes
Reithrodontomys raviventris	Salt marsh harvest mouse	Will be covered by other saltmarsh species	No
Sorex vagrans halicoetes	Salt marsh wandering shrew	Criteria	No
Taxidea taxus	American badger	Will not need mitigation	No
Vulpes macrotis mutica	San Joaquin kit fox	N/A	Yes

Table E-1d. Wildlife and Fish, Rationale and Additional Information

Scientific Name	**Common Name**	**Rationale and Additional Information**
Invertebrates		
Apodemia mormo langei	Lange's metalmark butterfly	Only found on Antioch Dunes, located on protected USFWS land.
Bombus caliginosus	Obscure bumble bee	Found in coast areas from northern Washington to southern California. 181 CNDDB occurrences in California. ICUN analysis suggests very high population decline range-wide.
Bombus crotchii	Crotch bumble bee	Exclusive to coastal California east towards the Sierra-Cascade Crest; less common in western Nevada, 232 CNDDB occurrences in California.
Bombus occidentalis	Western bumble bee	Known from Great Basin, the Rocky Mountains and Alaska, 282 CNDDB occurrences in California.
Branchinecta conservatio	Conservancy fairy shrimp	Historically occurred in the RCIS area
Branchinecta longiantenna	Longhorn fairy shrimp	Many occurrences in Solano County.
Branchinecta lynchi	Vernal pool fairy shrimp	Covered by EACCS and addressed by HCP/NCCP.
Branchinecta mesovallensis	Midvalley fairy shrimp	Covered by EACCS and addressed by HCP/NCCP.
Coelus gracilis	San Joaquin dune beetle	Of the 53 occurrences in CNDDB, 22 (41.5%) are on protected lands. Covered by HCP/NCCP.
Danaus plexippus	Monarch butterfly	378 CNDDB occurrences along the coast from Baja to Mendocino.
Efferia antiochi	Antioch efferian robberfly	Species is not well studied, only two CNDDB occurrences in the study area.
Eucerceris ruficeps	redheaded sphecid wasp	Species is not well studies, only one CNDDB occurrences in the study area.
Helminthoglypta stiversiana williamsi	William's bronze shoulderband snail	Species' ecology is not well understood, one CNDDB occurrence.
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	Little is known about species' habitat.
Hydroporus leechi	Leech's skyline diving beetle	Little is known about species' habitat.
Hygrotus curvipes	Curved-foot hygrotus diving beetle	Little is known about species' habitat.
Ischnura gemina	San Francisco forktail damselfly	Very localized in urban areas; endemic to wetlands in the San Francisco Bay Area.
Lepidurus packardi	Vernal pool tadpole shrimp	Covered by HCP/NCCP.
Linderiella occidentalis	California fairy shrimp	CNDDB occurrences throughout Sacramento Valley and central California in hardpan or sandstone depressions.
Metapogon hurdi	Hurd's metapogon robberfly	One CNDDB occurrence in Contra Costa County possibly extirpated.

Scientific Name	Common Name	Rationale and Additional Information
Perdita scitula antiochensis	Antioch andrenid bee	Species life history and distribution are not well understood, two CNDDB occurrences in Contra Costa county.
Speyeria callippe callippe	Callippe silverspot butterfly	Addressed by EACCS
Sphecodogastra antiochensis	Antioch Dunes halcitid bee	Restricted to Antioch Dunes, which is a protected area. One CNDDB occurrence.
Fish		
Acipenser medirostris	Green sturgeon	The distinct population segment that occurs in the study area spawns primarily in the mainstem of the Sacramento River.
Archoplites interruptus	Sacramento perch	Moves through Bay on way to spawning habitat; spawns in Abbotts Lagoon within the protected Point Reyes National Seashore in Marin.
Entosphenus tridentate	Pacific lamprey	Would benefit from salmonid conservation strategy.
Hypomesus transpacificus	Delta smelt	Many occurrences in Contra Costa and Solano Counties.
Mylopharodon conocephalus	Hardhead	Widely distributed in streams at low to mid-elevations in the Sacramento-San Joaquin and Russian River drainages.
Oncorhynchus mykiss	Central California Coastal steelhead	Occurs in Alameda, Marin, Napa, San Mateo, Santa Clara and Sonoma Counties. Addressed by EACCS.
Oncorhynchus mykiss	Central Valley steelhead	Many occurrences in Alameda, Contra Costa, and Solano Counties.
Oncorhynchus tshawytscha	Central Valley fall/late fall–run Chinook salmon	Moves through Bay on way to spawning habitat.
Oncorhynchus tshawytscha	Central Valley spring-run Chinook salmon	Moves through Bay on way to spawning habitat.
Oncorhynchus tshawytscha	Winter-run Chinook salmon	Moves through Bay on way to spawning habitat.
Spirinchus thaleichthys	Longfin smelt	Occurrences in Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties.
Amphibians		
Ambystoma californiense	California tiger salamander (Central CA DPS)	Covered by HCP/NCCP and SCVHP. Addressed by EACCS.
Rana boylii	Foothill yellow-legged frog	Covered by HCP/NCCP and SCVHP. Addressed by EACCS.
Rana draytonii	California red-legged frog	Covered by HCP/NCCP and SCVHP. Addressed by EACCS.
Reptiles		
Anniella pulchra	Northern California legless lizard	Covered by HCP/NCCP.

Scientific Name	Common Name	Rationale and Additional Information
Emys marmorata	Western pond turtle	Covered by HCP/NCCP and SCVHP. 1159 CNDDB occurrences. Aquatic habitat generalist.
Masticophis flagellum ruddocki	San Joaquin coachwhip (=whipsnake)	Majority of range is not within the study area.
Masticophis lateralis euryxanthus	Alameda whipsnake	Covered by EACCS and addressed by HCP/NCCP.
Thamnophis gigas	Giant garter snake	Covered by HCP/NCCP.
Birds		
Accipiter cooperii	Cooper's hawk	Widespread forest generalist. Populations have increased by >200% between 1970 and 2014.
Accipiter striatus	Sharp-shinned hawk	Widespread forest generalist. Populations have increased by 68% between 1970 and 2014.
Agelaius tricolor	Tricolored blackbird	Covered by HCP/NCCP and SCVHP. Addressed by EACCS. Greater than 50% of population lost between 1970 and 2014. High vulnerability due to small population and range.
Ammodramus savannarum	Grasshopper sparrow	Uncommon in the study area.
Aquila chrysaetos	Golden eagle	Covered by EACCS and addressed by HCP/NCCP. Habitat generalist in western U.S./Mexico. Area-dependent species.
Asio flammeus	Short-eared owl	Uncommon species in the study area.
Asio otus	Long-eared owl	Rare breeder within study area.
Athene cunicularia	Burrowing owl	Covered by HCP/NCCP and SCVHP. Addressed by EACCS.
Buteo regalis	Ferruginous hawk	Species found in western U.S./Mexico. Breeds in grassland habitat outside study area. Populations have increased by 39% between 1970 and 2014, with a population estimate of 110,000.
Buteo swainsoni	Swainson's hawk	Covered by HCP/NCCP, recent occurrences in Santa Clara County.
Charadrius alexandrinus nivosus	Western snowy plover	Many occurrences in Alameda, Marin, Napa San Mateo, Contra Costa, and Santa Clara Counties. Limited to coastal beach and salt ponds. Threatened by development and human recreation.
Circus cyaneus	Northern harrier	Breeds throughout California. Nests in tidal, brackish and freshwater marshes, and other wet, vegetated areas.
Elanus leucurus	White-tailed kite	Many occurrences in Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, and Sonoma Counties.
Falco columbarius	Merlin	Uncommon in the study area, does not breed in study area.
Falco mexicanus	Prairie falcon	Common in California, 458 CNDDB occurrences.
Falco peregrinus anatum	American peregrine falcon	Not enough regular nesting occurrences in Bay Area. This species has been federally delisted due to recovery.
Haliaeetus leucocephalus	Bald eagle	Not enough regular nesting occurrences in Bay Area. This species has been federally delisted due to recovery.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Lanius ludovicianus	Loggerhead shrike	Significant declines (74%) of population between 1970 and 2014. Occurs in grasslands in Alameda and Contra Costa County.
Laterallus jamaicensis coturniculus	California black rail	Many occurrences in Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, and Sonoma Counties.
Pandion haliaetus	Osprey	Population has increased by more than 200% between 1970 and 2014.
Pelecanus occidentalis californicus	California brown pelican	This species has been federally delisted due to recovery; common and widespread in the study area.
Progne subis	Purple martin	Uncommon breeder; in the study area, nests local on the coastal ridges of Marin County and isolated locations in the Santa Cruz Mountains.
Rallus obsoletus obsoletus	Ridgway's rail	Many occurrences in saltmarsh habitat around the Bay fringe.
Setophaga petechia	Yellow warbler	Occurs throughout California, more commonly in southern California.
Sterna antillarum (=albifrons) browni	California least tern	Many occurrences in Alameda, Contra Costa, San Mateo, Santa Clara, and Solano Counties.
Mammals		
Antrozous pallidus	Pallid bat	Locally common species in low elevation of California. 405 CNDDB occurrences.
Corynorhinus townsendii townsendii	Townsend's big-eared bat	Covered by HCP/NCCP but not enough data to create a mitigation strategy.
Eumops perotis californicus	Western mastiff-bat	Uncommon resident in southeastern San Joaquin Valley and Coastal Ranges from Monterey Co. southward through southern California.
Lasionycteris noctivagans	Silver-haired bat	Very uncommon in the study area, Of 138 CNDDB occurrences, one in Alameda County in 1920.
Lasiurus cinereus	Hoary bat	The most widespread bat in North America. Found throughout California.
Microtus californicus sanpabloensis	San Pablo vole	Questions about status remain in relation to California voles, which occur on the opposite shore from where San Pablo Vole lives. 8 CNDDB occurrences in Contra Costa County.
Myotis evotis	Long-eared myotis	Widespread but uncommon in its range. Occurs along the entire coast in a variety of wooded habitat. No CNDDB occurrences in the study area.
Myotis thysanodes	Fringed myotis	Widespread in California, occurring in all but the Central Valley and Colorado and Mojave deserts. 3 CNDDB occurrences in Sonoma County.
Myotis yumanensis	Yuma myotis	Common and widespread in California. Uncommon in the Mojave and Colorado desert regions. Uncommon above 8,000 feet.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	Subspecies status is unresolved.
Puma concolor	Mountain lion	Good indicator of habitat connectivity; area-dependent species.
Reithrodontomys raviventris	Salt marsh harvest mouse	Many occurrences in Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, Sonoma Counties.
Sorex vagrans halicoetes	Salt marsh wandering shrew	Little data available on the life history of this species. The current distribution and status in unknown.
Taxidea taxus	American badger	Addressed by EACCS.
Vulpes macrotis mutica	San Joaquin kit fox	Covered by HCP/NCCP and SCVHP. Addressed by EACCS.

USFWS = U.S. Fish and Wildlife Service; CNDDB = California Natural Diversity Database; ICUN = International Union for Conservation of Nature; RCIS = regional conservation investment strategy; EACCS = *East Alameda County Conservation Strategy*; HCP/NCCP = *East Contra Costa County Habitat Conservation Plan/ Natural Community Conservation Plan*; SCVHP = *Santa Clara Valley Habitat Plan*

Table E-2a. Plants, Step 1

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**CRPR**	**SWAP Status**
Acanthomintha lanceolata	Santa Clara thornmint	–	–	G4	4.2	N
Allium sharsmithae	Sharsmith's onion	–	–	G2	1B.3	N
Amsinckia grandiflora	Large flowered fiddleneck	E	E	G1	1B.1	N
Amsinckia lunaris	Bent-flowered fiddleneck	–	–	G2?	1B.2	N
Androsace elongata subsp*. acuta*	California androsace	–	–	G5?T3T4	4.2	N
Arctostaphylos auriculata	Mt. Diablo manzanita	–	–	G2	1B.3	N
Arctostaphylos manzanita subsp. *laevigata*	Contra Costa manzanita	–	–	G5T2	1B.2	N
Arctostaphylos pallida	Pallid manzanita	T	E	G1	1B.1	Y
Aspidotis carlotta-halliae	Carlotta Hall's lace fern	–	–	G3	4.2	N
Astragalus nuttallii var. *nuttallii*	Nuttall's milk-vetch	–	–	G4T4	4.2	N
Atriplex cordulata	Heartscale	–	–	G3T2	1B.2	N
Atriplex coronata var. *coronata*	Crownscale	–	–	G4T3	4.2	N
Atriplex depressa	Brittlescale	–	–	G2Q	1B.2	N
Balsamorhiza macrolepis var. *macrolepis*	Big-scale balsamroot	–	–	G2	1B.2	N
Blepharizonia plumosa	Big tarplant	–	–	G2	1B.1	Y
Calandrinia breweri	Brewer's calandrinia	–	–	G4	4.2	N
California macrophylla	Round-leaved filaree	–	–	G2	1B.2	Y
Calochortus pulchellus	Mt. Diablo fairy lantern	–	–	G2	1B.2	N
Calochortus umbellatus	Oakland star-tulip	–	–	G4	4.2	N
Campanula exigua	Chaparral harebell	–	–	G2	1B.2	N
Carex comosa	Bristly sedge	–	–	G5	2B.1	N
Castilleja ambigua subsp. *ambigua*	Salt marsh owl's-clover	–	–	G4T5	4.2	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**CRPR**	**SWAP Status**
Caulanthus coulteri var*. lemmonii*	Lemmon's jewelflower	–	–	G3	1B.2	N
Centromadia parryi subsp. *congdonii*	Congdon's spikeweed	–	–	G3T2	1B.2	Y
Chloropyron maritimus subsp. *palustris*	Point Reyes bird's-beak	–	–	G4?T2	1B.2	N
Chloropyron molle subsp. *hispidum*	Hispid salty bird's-beak	–	–	G2T2	1B.1	N
Chloropyron molle subsp. *molle*	Soft bird's-beak	E	R	G2T1	1B.2	N
Chloropyron palmatum	Palmate-bracted bird's-beak	E	E	G1	1B.1	N
Chorizanthe cuspidata var. *cuspidata*	San Francisco Bay spineflower	–	–	G2T1	1B.2	N
Cicuta maculata var. *bolanderi*	Bolander's water-hemlock	–	–	G5T4	2B.1	N
Cirsium andrewsii	Franciscan thistle	–	–	G3	1B.2	N
Clarkia breweri	Brewer's clarkia	–	–	G4	4.2	N
Clarkia concinna subsp. automixa	Santa Clara red-ribbons	–	–	G5?T3	4.3	N
Clarkia franciscana	Presidio clarkia	E	E	G1	1B.1	Y
Collomia diversifolia	Serpentine collomia	–	–	G4	4.3	N
Convolvulus simulans	Small-flowered morning-glory	–	–	G4	4.2	N
Cordylanthus nidularis	Mt. Diablo bird's-beak	–	R	G1	1B.1	Y
Delphinium californicum subsp. *interius*	Hospital Canyon larkspur	–	–	G3T3	1B.2	N
Delphinium recurvatum	Recurved larkspur	–	–	G3	1B.2	N
Deinandra bacigalupii	Livermore tarplant	E	CE	G1	1B.2	Y
Dirca occidentalis	Western leatherwood	–	–	G2	1B.2	N
Eleocharis parvula	Small spikerush	–	–	G5	4.3	N
Erigeron biolettii	Streamside daisy	–	–	G3?	3	N
Eriogonum nudum var. *psychicola*	Antioch Dunes buckwheat	–	–	G5T1	1B.1	N
Eriogonum truncatum	Mt. Diablo buckwheat	–	–	G2	1B.1	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**CRPR**	**SWAP Status**
Eriogonum umbellatum var. *bahiiforme*	Bay buckwheat	–	–	G5T3	4.2	N
Eriophyllum jepsonii	Jepson's woolly sunflower	–	–	G3	4.3	N
Eryngium aristulatum var. *hooveri*	Hoover's button-celery	–		G5T1	1B.1	N
Eryngium racemosum	Delta coyote-thistle	–	E	G1Q	1B.1	N
Erysimum capitatum var. *angustatum*	Contra Costa wallflower	E	E	G5T1	1B.1	N
Eschscholzia rhombipetala	Diamond-petaled California poppy	–	–	G1	1B.1	N
Extriplex joaquiniana	San Joaquin spearscale = San Joaquin saltbush	–	–	G2	1B.2	N
Fissidens pauperculus	Minute pocket-moss	–	–	G3?	1B.2	N
Fritillaria agrestis	Stinkbells	–	–	G3	4.2	N
Fritillaria falcata	Talus fritillary	–	–	G2	1B.2	N
Fritillaria liliacea	Fragrant fritillary	–	–	G2	1B.2	N
Galium andrewsii subsp. gatense	Serpentine bedstraw	–	–	G5T3	4.2	N
Helianthella castanea	Diablo helianthella	–	–	G2	1B.2	N
Hesperevax caulescens	Hogwallow starfish	–	–	G3	4.2	N
Hesperolinon breweri	Brewer's western flax	–	–	G2	1B.2	N
Hibiscus lasiocarpos var. *occidentalis*	Rose-mallow	–	–	G5T2	1B.2	N
Hoita strobilina	Loma Prieta hoita	–	–	G2	1B.1	Y
Holocarpha macradenia	Santa Cruz tarplant	T	E	G1	1B.1	N
Horkelia cuneata subsp. *sericea*	Kellogg's horkelia	–	–	G4T2	1B.1	N
Iris longipetala	Coast iris	–	–	G3	4.2	N
Juglans hindsii	Northern California black walnut	–	–	G1	1B.1	N
Lasthenia conjugens	Contra Costa goldfields	E	–	G1	1B.1	Y
Lasthenia ferrisiae	Ferris's goldfields	–	–	G3	4.2	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**CRPR**	**SWAP Status**
Lathyrus jepsonii var. *jepsonii*	Delta tule pea	–	–	G5T2	1B.2	N
Legenere limosa	Legenere	–	–	G2	1B.1	N
Leptosyne hamiltonii	Mt. Hamilton coreopsis	–	–	G2	1B.2	N
Leptosiphon acicularis	Bristly leptosiphon	–	–	G3	4.2	N
Leptosiphon ambiguus	Serpentine linanthus	–	–	G4	4.2	N
Leptosiphon grandiflorus	Large-flowered linanthus	–	–	G3	4.2	N
Lessingia hololeuca	Wooly-headed lessingia	–	–	G3?	3	N
Lessingia tenuis	Spring lessingia	–	–	G4	4.3	N
Lilaeopsis masonii	Mason's lilaeopsis	–	R	G2	1B.1	N
Limosella australis	Delta mudwort	–	–	G4G5	2B.1	N
Lomatium observatorium	Mt. Hamilton lomatium	–	–	G1	1B.2	N
Madia radiata	Showy madia	–	–	G2	1B.1	Y
Malacothamnus hallii	Hall’s bush mallow	–	–	G2	1B.2	N
Meconella oregana	Oregon meconella	–	–	G2G3	1B.1	N
Micropus amphibolus	Mt. Diablo cottonweed	–	–	G3G4	3.2	N
Microseris sylvatica	Sylvan microseris	–	–	G4	4.2	N
Monardella antonina subsp. *antonina*	San Antonio Hills monardella	–	–	G4T1T3Q	3	N
Monolopia gracilens	woodland woollythreads	–	–	G3	1B.2	N
Myosurus minimus subsp. *apus*	Little mousetails	–	–	G5T2Q	3.1	N
Navarretia cotulifolia	Cotula navarretia	–	–	G4	4.2	N
Navarretia gowenii	Lime ridge navarretia	–	–	G1	1B.1	N
Navarretia nigelliformis subsp. *nigelliformis*	Adobe navarretia	–	–	G4T3	4.2	N
Navarretia nigelliformis subsp. *radians*	Shining navarretia	–	–	G4T2	1B.2	N
Navarretia prostrata	Prostrate navarretia	–	–	G2	1B.1	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**CRPR**	**SWAP Status**
Oenothera deltoides subsp. *howellii*	Antioch Dunes evening primrose	E	E	G5T1	1B.1	N
Perideridia gairdneri subsp. *gairdneri*	Gairdner's yampah	–	–	G5T4	4.2	N
Phacelia phacelioides	Mt. Diablo phacelia	–	–	G2	1B.2	N
Pinus radiata	Monterey pine	–	–	G1	1B.1	N
Piperia michaelii	Michael's rein orchid	–	–	G3	4.2	N
Plagiobothrys diffusus	San Francisco popcornflower	–	E	G1Q	1B.1	N
Polygonum marinense	Marin knotweed	–	–	G2Q	3.1	N
Ranunculus lobbii	Lobb's aquatic buttercup	–	–	G4	4.2	N
Ribes victoris	Victor's gooseberry	–	–	G4	4.3	N
Sanicula saxatilis	Rock sanicle	–	R	G2	1B.2	N
Senecio aphanactis	Chaparral ragwort	–	–	G3	2B.2	N
Streptanthus albidus subsp. peramoenus	Most beautiful jewelflower	–	–	G2T2	1B.2	N
Streptanthus hispidus	Mt. Diablo jewelflower	–	–	G2	1B.3	N
Suaeda californica	California seablight	E	–	G1	1B.1	N
Trifolium hydrophilum	Saline clover	–	–	G2	1B.2	N
Viburnum ellipticum	Oval-leaved viburnum	–	–	G4G5	2B.3	N

		Status				
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**CRPR**	**SWAP Status**

KEY

Federal

E = listed as endangered under the federal Endangered Species Act.

T = listed as threatened under the federal Endangered Species Act.

– = no listing.

State

E = listed as endangered under the California Endangered Species Act.

T = listed as threatened under the California Endangered Species Act.

R = listed as rare under the California Endangered Species Act

– = no listing.

Global (NatureServe 2015. Available http://explorer.natureserve.org/granks.htm)

G1 = Critically imperiled; at very high risk for extinction.

G2 = Imperiled; at high risk for extinction.

G3 = Vulnerable; at moderate risk for extinction.

G4 = Apparently secure; uncommon but not rare.

G5 = Secure; common, widespread and abundant.

G#G# = Range rank; numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.

T# = Infraspecific Taxon; the status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

Q = Questionable taxonomy; taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid.

Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1.

California Rare Plant Rank (CRPR) (California Native Plant Society 2016. Available http://www.cnps.org/cnps/rareplants/ranking.php)

1B = plants rare, threatened or endangered in California and elsewhere.

0.1 - seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)

0.2 - moderately threatened in California (20-80% of occurrences threatened/moderate degree of immediacy of threat)

State Wildlife Action Plan (SWAP)(CDFW 2015, State Wildlife Action Plan, Available: https://www.wildlife.ca.gov/SWAP

Y = Yes

N = No

Table E-2b. Plants, Step 2

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Acanthomintha lanceolata	Santa Clara thornmint	0	0	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Allium sharsmithae	Sharsmith's onion	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Amsinckia grandiflora	Large flowered fiddleneck	1	1	1	1	1	TRUE	TRUE	TRUE	TRUE	TRUE
Amsinckia lunaris	Bent-flowered fiddleneck	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Androsace elongata subsp. acuta	California androsace	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Arctostaphylos auriculata	Mt. Diablo manzanita	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Arctostaphylos manzanita subsp. laevigata	Contra Costa manzanita	0	1	1	1	1	TRUE	TRUE	FALSE	TRUE	TRUE
Arctostaphylos pallida	Pallid manzanita	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Aspidotis carlotta-halliae	Carlotta Hall's lace fern	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Astragalus nuttallii var. *nuttallii*	Nuttall's milk-vetch	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Atriplex cordulata	Heartscale	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Atriplex coronata var. *coronata*	Crownscale	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Atriplex depressa	Brittlescale	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Balsamorhiza macrolepis var. *macrolepis*	Big-scale balsamroot	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Blepharizonia plumosa	Big tarplant	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Calandrinia breweri	Brewer’s calandrinia	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
California macrophylla	Round-leaved filaree	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Calochortus pulchellus	Mt. Diablo fairy lantern	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Calochortus umbellatus	Oakland star-tulip	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Campanula exigua	Chaparral harebell	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Carex comosa	Bristly sedge	0	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Castilleja ambigua subsp. *ambigua*	Salt marsh owl’s-clover	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Caulanthus coulteri var. *lemmonii*	Lemmon’s jewelflower	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Centromadia parryi subsp. *congdonii*	Congdon’s spikeweed	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Chloropyron maritimus subsp. *palustris*	Point Reyes bird’s-beak	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Chloropyron molle subsp. *hispidum*	Hispid salty bird's-beak	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Chloropyron molle subsp. *molle*	Soft bird's-beak	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Chloropyron palmatum	Palmate-bracted bird's-beak	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Chorizanthe cuspidata var. *cuspidata*	San Francisco Bay spineflower	0	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Cicuta maculata var. *bolanderi*	Bolander's water-hemlock	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Cirsium andrewsii	Franciscan thistle	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Clarkia breweri	Brewer's clarkia	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Clarkia concinna subsp. *automixa*	Santa Clara red-ribbons	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Clarkia franciscana	Presidio clarkia	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Collomia diversifolia	Serpentine collomia	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Convolvulus simulans	Small-flowered morning-glory	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Cordylanthus nidularis	Mt. Diablo bird's-beak	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Delphinium californicum subsp. *interius*	Hospital Canyon larkspur	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Delphinium recurvatum	Recurved larkspur	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Deinandra bacigalupii	Livermore tarplant	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Dirca occidentalis	Western leatherwood	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Eleocharis parvula	Small spikerush	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Erigeron biolettii	Streamside daisy	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Eriogonum nudum var. *psychicola*	Antioch Dunes buckwheat	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Eriogonum truncatum	Mt. Diablo buckwheat	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Eriogonum umbellatum var. *bahiiforme*	Bay buckwheat	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Eriophyllum jepsonii	Jepson's woolly sunflower	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Eryngium aristulatum var. *hooveri*	Hoover's button-celery	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Eryngium racemosum	Delta coyote-thistle	1	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Erysimum capitatum var. *angustatum*	Contra Costa wallflower	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Eschscholzia rhombipetala	Diamond-petaled California poppy	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Extriplex joaquiniana	San Joaquin spearscale = San Joaquin saltbush	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Fissidens pauperculus	Minute pocket-moss	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Fritillaria agrestis	Stinkbells	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Fritillaria falcata	Talus fritillary	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Fritillaria liliacea	Fragrant fritillary	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Galium andrewsii subsp. *gatense*	Serpentine bedstraw	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Helianthella castanea	Diablo helianthella	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Hesperevax caulescens	Hogwallow starfish	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Hesperolinon breweri	Brewer’s western flax	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Hibiscus lasiocarpos i occidentalis	Rose-mallow	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Hoita strobilina	Loma Prieta hoita	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Holocarpha macradenia	Santa Cruz tarplant	1	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Horkelia cuneata subsp. *sericea*	Kellogg's horkelia	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Iris longipetala	Coast iris	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Juglans hindsii	Northern California black walnut	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Lasthenia conjugens	Contra Costa goldfields	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Lasthenia ferrisiae	Ferris's goldfields	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Lathyrus jepsonii var. *jepsonii*	Delta tule pea	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Legenere limosa	Legenere	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Leptosyne hamiltonii	Mt. Hamilton coreopsis	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Leptosiphon acicularis	Bristly leptosiphon	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Leptosiphon ambiguus	Serpentine linanthus	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Leptosiphon grandiflorus	Large-flowered linanthus	0	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Lessingia hololeuca	Wooly-headed lessingia	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Lessingia tenuis	Spring lessingia	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Lilaeopsis masonii	Mason's lilaeopsis	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Limosella australis	Delta mudwort	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Lomatium observatorium	Mt. Hamilton lomatium	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Madia radiata	Showy madia	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Malacothamnus hallii	Hall's bush mallow	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Meconella oregana	Oregon meconella	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Micropus amphibolus	Mt. Diablo cottonweed	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Microseris sylvatica	Sylvan microseris	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Monardella antonina subsp. *antonina*	San Antonio Hills monardella	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Monolopia gracilens	woodland woollythreads	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Myosurus minimus subsp. *apus*	Little mousetails	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Navarretia cotulifolia	Cotula navarretia	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Navarretia gowenii	Lime ridge navarretia	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE

		Criteria					**Filtering of Species**				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Navarretia nigelliformis subsp. nigelliformis	Adobe navarretia	1	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Navarretia nigelliformis subsp. *radians*	Shining navarretia	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Navarretia prostrata	Prostrate navarretia	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Oenothera deltoides subsp. *howellii*	Antioch Dunes evening primrose	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Perideridia gairdneri subsp. *gairdneri*	Gairdner's yampah	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Phacelia phacelioides	Mt. Diablo phacelia	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Pinus radiata	Monterey pine	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Piperia michaelii	Michael's rein orchid	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Plagiobothrys diffusus	San Francisco popcornflower	1	1	0	1	0	FALSE	FALSE	FALSE	FALSE	FALSE
Polygonum marinense	Marin knotweed	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Ranunculus lobbii	Lobb's aquatic buttercup	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Ribes victoris	Victor's gooseberry	0	0	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Sanicula saxatilis	Rock sanicle	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE

		Criteria					Filtering of Species				
Scientific Name	**Common Name**	**Status**	**Rarity**	**Occur**	**Data**	**Provides Other Conservation Benefit**	**Enough Data Available AND**	**Qualifies as Rare OR**	**Has Special Status OR**	**Provides Additional Conservation Value**	**Meets Screening Criteria**
Senecio aphanactis	Chaparral ragwort	0	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Streptanthus albidus subsp. peramoenus	Most beautiful jewelflower	1	1	1	1	0	TRUE	TRUE	TRUE	FALSE	TRUE
Streptanthus hispidus	Mt. Diablo jewelflower	1	0	1	1	0	TRUE	FALSE	FALSE	FALSE	FALSE
Suaeda californica	California seablight	1	1	1	0	0	FALSE	FALSE	FALSE	FALSE	FALSE
Trifolium hydrophilum	Saline clover	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE
Viburnum ellipticum	Oval-leaved viburnum	0	1	1	1	0	TRUE	TRUE	FALSE	FALSE	TRUE

KEY

Status = The species is listed by state or federal resource agencies as threatened or endangered, or is a candidate for such listing; or the species is reasonably expect to be considered for listing within 10 years of East Bay RCIS approval. This includes species covered by a regional NCCP or HCP that overlaps the RCIS area.

Rarity = The species is recognized by NatureServe as Critically Imperiled (G1) or Imperiled (G2) globally, or is described as a Species of Greatest Conservation Need (SGCN) or Climate Vulnerable (CV) in the State Wildlife Action Plan, or is recognized by CNPS as Rare, Threatened, or Endangered in California and elsewhere (1B) or Rare, Threatened or Endangered in California but is more common elsewhere (2B).

Occur = The species is known or likely to occur in the RCIS area. Occurrence data should be based on credible evidence. Some species may not be present in the RCIS area at the time this RCIS is developed but could have a reasonable expectation to expand their range into the RCIS area within 10 years following RCIS development.

Data = Drawing on best available science and emerging data, sufficient data on the species' life history, habitat requirements, and occurrence in the RCIS area are available to propose viable conservation actions.

Provide Other Conservation Benefit - If a species does not meet the above criteria but provides some other conservation benefit, it can be included as a focal species. These species may not necessarily be declining or vulnerable, but they can help inform the conservation strategy in ways that declining species may be unable to do. These species may include area-dependent species, umbrella species, indicator species, or keystone species

0 = Does not meet criteria
FALSE = Does not meet filter category
1 = Meets Criteria
TRUE = Meets filters category

Table E-2c. Plants, Step 3

Scientific Name	**Common Name**	**Rationale for Exclusion from Focal Species List**	**Included as Focal Species**
Acanthomintha lanceolata	Santa Clara thornmint	Criteria	N
Allium sharsmithae	Sharsmith's onion	Criteria	N
Amsinckia grandiflora	Large flowered fiddleneck	All occurrences on protected land	N
Amsinckia lunaris	Bent-flowered fiddleneck	Criteria	N
Androsace elongata subsp. acuta	California androsace	Criteria	N
Arctostaphylos auriculata	Mt. Diablo manzanita	Most occurrences on protected land	N
Arctostaphylos manzanita subsp. laevigata	Contra Costa manzanita	All but one occurrence on protected land	N
Arctostaphylos pallida	Pallid manzanita	N/A	Focal
Aspidotis carlotta-halliae	Carlotta Hall's lace fern	Criteria	N
Astragalus nuttallii var. *nuttallii*	Nuttall's milk-vetch	Criteria	N
Atriplex cordulata	Heartscale	Will not need mitigation	N
Atriplex coronata var. *coronata*	Crownscale	Criteria	N
Atriplex depressa	Brittlescale	N/A	Focal
Balsamorhiza macrolepis var. *macrolepis*	Big-scale balsamroot	Will not need mitigation	N
Blepharizonia plumosa	Big tarplant	N/A	Focal
Calandrinia breweri	Brewer's calandrinia	Criteria	N
California macrophylla	Round-leaved filaree	N/A	Focal
Calochortus pulchellus	Mt. Diablo fairy lantern	N/A	Focal
Calochortus umbellatus	Oakland star-tulip	Criteria	N
Campanula exigua	Chaparral harebell	Will not need mitigation	N
Carex comosa	Bristly sedge	Criteria	N
Castilleja ambigua subsp. *ambigua*	Salt marsh owl's-clover	Criteria	N
Caulanthus coulteri var. *lemmonii*	Lemmon's jewelflower	Criteria	N
Centromadia parryi subsp. *congdonii*	Congdon's spikeweed	N/A	Focal
Chloropyron maritimus subsp. *palustris*	Point Reyes bird's-beak	Will not need mitigation	N

Scientific Name	**Common Name**	**Rationale for Exclusion from Focal Species List**	**Included as Focal Species**
Chloropyron molle subsp. *hispidum*	Hispid salty bird's-beak	Will not need mitigation	N
Chloropyron molle subsp. *molle*	Soft bird's-beak	Will not need mitigation	N
Chloropyron palmatum	Palmate-bracted bird's-beak	N/A	Focal
Chorizanthe cuspidata var. *cuspidata*	San Francisco Bay spineflower	Criteria	N
Cicuta maculata var. bolanderi	Bolander's water-hemlock	Criteria	N
Cirsium andrewsii	Franciscan thistle	Will not need mitigation	N
Clarkia breweri	Brewer's clarkia	Criteria	N
Clarkia concinna subsp. *automixa*	Santa Clara red-ribbons	Criteria	N
Clarkia franciscana	Presidio clarkia	N/A	Focal
Collomia diversifolia	Serpentine collomia	Criteria	N
Convolvulus simulans	Small-flowered morning-glory	Criteria	N
Cordylanthus nidularis	Mt. Diablo bird's-beak	Both occurrences in Mt. Diablo State Park	N
Delphinium californicum subsp. *interius*	Hospital Canyon larkspur	Will not need mitigation	N
Delphinium recurvatum	Recurved larkspur	N/A	Focal
Deinandra bacigalupii	Livermore tarplant	N/A	Focal
Dirca occidentalis	Western leatherwood	Will not need mitigation	N
Eleocharis parvula	Small spikerush	Criteria	N
Erigeron biolettii	Streamside daisy	Criteria	N
Eriogonum nudum var. *psychicola*	Antioch Dunes buckwheat	On protected land	N
Eriogonum truncatum	Mt. Diablo buckwheat	Criteria; will not need mitigation	N
Eriogonum umbellatum var. bahiiforme	Bay buckwheat	Criteria	N
Eriophyllum jepsonii	Jepson's woolly sunflower	Criteria	N
Eryngium aristulatum var. *hooveri*	Hoover's button-celery	Will not need mitigation	N
Eryngium racemosum	Delta coyote-thistle	Criteria	N
Erysimum capitatum var. *angustatum*	Contra Costa wallflower	On protected land	N
Eschscholzia rhombipetala	Diamond-petaled California poppy	Will not need mitigation	N
Extriplex joaquiniana	San Joaquin spearscale = San Joaquin saltbush	N/A	Focal

Scientific Name	**Common Name**	**Rationale for Exclusion from Focal Species List**	**Included as Focal Species**
Fissidens pauperculus	Minute pocket-moss	Criteria	N
Fritillaria agrestis	Stinkbells	Criteria	N
Fritillaria falcata	Talus fritillary	Criteria	N
Fritillaria liliacea	Fragrant fritillary	N/A	Focal
Galium andrewsii subsp. *gatense*	Serpentine bedstraw	Criteria	N
Helianthella castanea	Diablo helianthella	Majority of occurrences are on protected land	N
Hesperevax caulescens	Hogwallow starfish	Criteria	N
Hesperolinon breweri	Brewer's western flax	N/A	Focal
Hibiscus lasiocarpos var. *occidentalis*	Rose-mallow	Criteria	N
Hoita strobilina	Loma Prieta hoita	N/A	Focal
Holocarpha macradenia	Santa Cruz tarplant	Criteria	N
Horkelia cuneata subsp. *sericea*	Kellogg's horkelia	Criteria	N
Iris longipetala	Coast iris	Criteria	N
Juglans hindsii	Northern California black walnut	Will not need mitigation	N
Lasthenia conjugens	Contra Costa goldfields	N/A	Focal
Lasthenia ferrisiae	Ferris's goldfields	Criteria	N
Lathyrus jepsonii var. *jepsonii*	Delta tule pea	Will not need mitigation	N
Legenere limosa	Legenere	Will not need mitigation	N
Leptosyne hamiltonii	Mt. Hamilton coreopsis	Will not need mitigation	N
Leptosiphon acicularis	Bristly leptosiphon	Criteria	N
Leptosiphon ambiguus	Serpentine linanthus	Criteria	N
Leptosiphon grandiflorus	Large-flowered linanthus	Criteria	N
Lessingia hololeuca	Wooly-headed lessingia	Criteria	N
Lessingia tenuis	Spring lessingia	Criteria	N
Lilaeopsis masonii	Mason's lilaeopsis	N/A	Focal
Limosella australis	Delta mudwort	Will not need mitigation	N
Lomatium observatorium	Mt. Hamilton lomatium	Will not need mitigation	N
Madia radiata	Showy madia	N/A	Focal
Malacothamnus hallii	Hall's bush mallow	On protected land	N
Meconella oregana	Oregon meconella	Will not need mitigation	N
Micropus amphibolus	Mt. Diablo cottonweed	Criteria	N
Microseris sylvatica	Sylvan microseris	Criteria	N
Monardella antonina subsp. *antonina*	San Antonio Hills monardella	Criteria	N

Scientific Name	**Common Name**	**Rationale for Exclusion from Focal Species List**	**Included as Focal Species**
Monolopia gracilens	woodland woollythreads	On protected land Mt. Diablo SP	N
Myosurus minimus subsp. *apus*	Little mousetails	Criteria	N
Navarretia cotulifolia	Cotula navarretia	Criteria	N
Navarretia gowenii	Lime ridge navarretia	Criteria	N
Navarretia nigelliformis subsp. *nigelliformis*	Adobe navarretia	Criteria	N
Navarretia nigelliformis subsp. *radians*	Shining navarretia	Criteria	N
Navarretia prostrata	Prostrate navarretia	On protected land	N
Oenothera deltoides subsp. *howellii*	Antioch Dunes evening primrose	On protected land	N
Perideridia gairdneri subsp. *gairdneri*	Gairdner's yampah	Criteria	N
Phacelia phacelioides	Mt. Diablo phacelia	All occurrences on Mt. Diablo SP	N
Pinus radiata	Monterey pine	Criteria	N
Piperia michaelii	Michael's rein orchid	Criteria	N
Plagiobothrys diffusus	San Francisco popcornflower	Criteria	N
Polygonum marinense	Marin knotweed	Criteria	N
Ranunculus lobbii	Lobb's aquatic buttercup	Criteria	N
Ribes victoris	Victor's gooseberry	Criteria	N
Sanicula saxatilis	Rock sanicle	N/A	Focal
Senecio aphanactis	Chaparral ragwort	Criteria	N
Streptanthus albidus subsp. peramoenus	Most beautiful jewelflower	N/A	Focal
Streptanthus hispidus	Mt. Diablo jewelflower	Criteria	N
Suaeda californica	California seablight	Criteria	N
Trifolium hydrophilum	Saline clover	Will not need mitigation	N
Viburnum ellipticum	Oval-leaved viburnum	Will not need mitigation	N

Table E-2d. Plants, Rationale and Additional Information

Scientific Name	Common Name	Rationale and Additional Information
Acanthomintha lanceolata	Santa Clara thornmint	Species has limited distribution throughout California but not restricted to the study area.
Allium sharsmithae	Sharsmith's onion	7 CNDDB occurrences in Alameda and Santa Clara Counties. Affinity to serpentine soil.
Amsinckia grandiflora	Large flowered fiddleneck	Not covered by HCP/NCCP or addressed by EACCS, only occurrences in study area are transplanted.
Amsinckia lunaris	Bent-flowered fiddleneck	Most CNDDB occurrences are vague and need additional fieldwork. Insufficient information to create conservation strategy.
Androsace elongata subsp. *acuta*	California androsace	Species has limited distribution throughout California but not restricted to the study area.
Arctostaphylos auriculata	Mt. Diablo manzanita	17 CNDDB occurrences in Contra Costa County, 11 extant occurrences mostly on protected lands. Covered by HCP/NCCP
Arctostaphylos manzanita subsp. *laevigata*	Contra Costa manzanita	10 CNDDB occurrences in Contra Costa County on protected land.
Arctostaphylos pallida	Pallid manzanita	Nine occurrences in Contra Costa and Alameda Counties.
Aspidotis carlotta-halliae	Carlotta Hall's lace fern	Species has limited distribution throughout California but not restricted to the study area.
Astragalus nuttallii var. *nuttallii*	Nuttall's milk-vetch	Species has limited distribution throughout California, but not restricted to the study area.
Atriplex cordulata	Heartscale	Most CNDDB occurrences are vague and need additional fieldwork. Insufficient information to create conservation strategy.
Atriplex coronata var. coronata	Crownscale	Species has limited distribution throughout California but not restricted to the study area.
Atriplex depressa	Brittlescale	Covered by HCP/NCCP.
Balsamorhiza macrolepis var. *macrolepis*	Big-scale balsamroot	12 CNDDB occurrences in Alameda, Napa, Santa Clara, Solano, and Sonoma Counties. 5 extant occurrences in Alameda, Santa Clara, Solano, and Sonoma Counties.
Blepharizonia plumosa	Big tarplant	Covered by HCP/NCCP and addressed by EACCS.
Calandrinia breweri	Brewer's calandrinia	Species has limited distribution throughout California, but not restricted to the study area.
California macrophylla	Round-leaved filaree	Covered by HCP/NCCP.
Calochortus pulchellus	Mt. Diablo fairy lantern	Covered by HCP/NCCP.
Calochortus umbellatus	Oakland star-tulip	Species has limited distribution throughout California, but not restricted to the study area.
Campanula exigua	Chaparral harebell	17 CNDDB occurrences in Alameda, Contra Costa, and Santa Clara Counties.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Carex comosa	Bristly sedge	Likely extirpated from the study area.
Castilleja ambigua subsp. *ambigua*	Salt marsh owl's-clover	Species has limited distribution throughout California, but not restricted to the study area.
Caulanthus coulteri var. *lemmonii*	Lemmon's jewelflower	86 CNDDB occurrences in Alameda, Fresno, Kern, Kings, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, and Ventura Counties. The two occurrences in Alameda are historical.
Centromadia parryi subsp. *congdonii*	Congdon's spikeweed	Addressed by EACCS
Chloropyron maritimus subsp. *palustris*	Point Reyes bird's-beak	68 CNDDB occurrences in Alameda, Humboldt, Marin, San Francisco, San Mateo, Santa Clara, and Sonoma Counties. The majority of CNDDB occurrences in the study area are on protected land.
Chloropyron molle subsp. hispidum	Hispid salty bird's-beak	35 CNDDB occurrences in Alameda, Kern, Merced, Placer, and Solano Counties. 2 extant occurrences in Alameda and Solano Counties.
Chloropyron molle subsp. *molle*	Soft bird's-beak	27 occurrences in Contra Costa County and counties north.
Chloropyron palmatum	Palmate-bracted bird's-beak	Of 26 occurrences, only one in study area; Addressed by EACCS.
Chorizanthe cuspidata var. *cuspidata*	San Francisco Bay spineflower	All extant occurrences in Santa Cruz County, all occurrences in the study area are considered possibly extirpated and from the late 1800's.
Cicuta maculata var. bolanderi	Bolander's water-hemlock	Insufficient information, most CNDDB occurrences are vague and need additional information.
Cirsium andrewsii	Franciscan thistle	27 CNDDB occurrences in Marin, Contra Costa, San Francisco, San Mateo, and Sonoma Counties, the majority on protected land.
Clarkia breweri	Brewer's clarkia	Species has limited distribution throughout California, but not restricted to the study area.
Clarkia concinna subsp. *automixa*	Santa Clara red-ribbons	Species has limited distribution throughout California, but not restricted to the study area.
Clarkia franciscana	Presidio clarkia	4 occurrences in San Francisco and Oakland.
Collomia diversifolia	Serpentine collomia	Species has limited distribution throughout California, but not restricted to the study area.
Convolvulus simulans	Small-flowered morning-glory	Species has limited distribution throughout California, but not restricted to the study area.
Cordylanthus nidularis	Mt. Diablo bird's-beak	One occurrence known from Mount Diablo State Park.
Delphinium californicum subsp. *interius*	Hospital Canyon larkspur	22 CNDDB occurrences in Alameda, Contra Costa, and Santa Clara Counties. 2 extant occurrences in Santa Clara County on private land. 10 extant occurrences on protected land in Alameda and Contra Costa Counties.
Delphinium recurvatum	Recurved larkspur	Covered by HCP/NCCP and addressed by EACCS.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Deinandra bacigalupii	Livermore tarplant	All occurrences in Alameda County, addressed by EACCS.
Dirca occidentalis	Western leatherwood	Widespread in the study area, 65 CNDDB occurrences in Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Sonoma Counties; the majority of which have insufficient information.
Eleocharis parvula	Small spikerush	Species has limited distribution throughout California, but not restricted to the study area.
Erigeron biolettii	Streamside daisy	Insufficient information- taxonomically problematic
Eriogonum nudum var. *psychicola*	Antioch Dunes buckwheat	One CNDDB occurrence in Contra Costa County on protected land.
Eriogonum truncatum	Mt. Diablo buckwheat	Thought to be extinct until recently rediscovered in 2005 on Mt Diablo, where it is protected on State Park land. 6 CNDDB occurrences in Contra Costa and Solano County. Insufficient information, occurrences are based on historical records. All CNDDB records are from the 1930s or earlier.
Eriogonum umbellatum var. *bahiiforme*	Bay buckwheat	Species has limited distribution throughout California, but not restricted to the study area
Eriophyllum jepsonii	Jepson's woolly sunflower	Species has limited distribution throughout California, but not restricted to the study area.
Eryngium aristulatum var. *hooveri*	Hoover's button-celery	CNDDB occurrences in Alameda and Santa Clara counties, and San Benito County within the Santa Clara RCIS boundary.
Eryngium racemosum	Delta coyote-thistle	Only one of 26 occurrences in study area. This occurrence, located in Contra Costa County, is considered possibly extirpated.
Erysimum capitatum var. *angustatum*	Contra Costa wallflower	Only found on Antioch Dunes National Wildlife Refuge, managed for species.
Eschscholzia rhombipetala	Diamond-petaled California poppy	3 extant CNDDB occurrences in Alameda County. Extirpated from Contra Costa County.
Extriplex joaquiniana	San Joaquin spearscale = San Joaquin saltbush	Covered by HCP/NCCP and addressed by EACCS.
Fissidens pauperculus	Minute pocket-moss	Insufficient information, CNDDB occurrences in the study area are vague and need additional information.
Fritillaria agrestis	Stinkbells	Species has limited distribution throughout California, but not restricted to the study area.
Fritillaria falcata	Talus fritillary	8 CNDDB occurrences in Alameda and Santa Clara Counties.
Fritillaria liliacea	Fragrant fritillary	77 occurrences in CNDDB, nearly all located throughout study area, covered by SCVHCP.
Galium andrewsii subsp. *gatense*	Serpentine bedstraw	Species has limited distribution throughout California but not restricted to the study area.
Helianthella castanea	Diablo helianthella	Covered by HCP/NCCP.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Hesperevax caulescens	Hogwallow starfish	Species has limited distribution throughout California, but not restricted to the study area.
Hesperolinon breweri	Brewer's western flax	Covered by HCP/NCCP.
Hibiscus lasiocarpos var. *occidentalis*	Rose-mallow	Insufficient information, the majority of CNDDB occurrences in Contra Costa and Solano Counties are vague and need additional fieldwork.
Hoita strobilina	Loma Prieta hoita	Covered by SCVHCP.
Holocarpha macradenia	Santa Cruz tarplant	Most occurrences in the study area are extirpated, not core area for species.
Horkelia cuneata subsp. *sericea*	Kellogg's horkelia	Extirpated from Alameda County. Insufficient information; CNDDB occurrences in San Francisco, San Mateo, and Marin are vague and need additional information.
Iris longipetala	Coast iris	Species has limited distribution throughout California, but not restricted to the study area.
Juglans hindsii	Northern California black walnut	I3 extant CNDDB occurrences in Lake, Napa, and Contra Costa Counties
Lasthenia conjugens	Contra Costa goldfields	Current occurrences throughout the study area.
Lasthenia ferrisiae	Ferris's goldfields	Species has limited distribution throughout California, but not restricted to the study area.
Lathyrus jepsonii var. *jepsonii*	Delta tule pea	Majority of CNDDB occurrences in Contra Costa, Napa, and Solano
Legenere limosa	Legenere	17 CNDDB occurrences in Alameda, Napa, San Mateo, Santa Clara, and Solano Counties, the majority of which are on protected land.
Leptosyne hamiltonii	Mt. Hamilton coreopsis	2 CNDDB occurrences in Alameda County and 18 in Santa Clara County.
Leptosiphon acicularis	Bristly leptosiphon	Species has limited distribution throughout California, but not restricted to the study area
Leptosiphon ambiguus	Serpentine linanthus	Species has limited distribution throughout California, but not restricted to the study area
Leptosiphon grandiflorus	Large-flowered linanthus	Species has limited distribution throughout California, but not restricted to the study area
Lessingia hololeuca	Wooly-headed lessingia	Insufficient information- taxonomically problematic.
Lessingia tenuis	Spring lessingia	Species has limited distribution throughout California, but not restricted to the study area
Lilaeopsis masonii	Mason's lilaeopsis	197 occurrences, many inside of the study area.
Limosella australis	Delta mudwort	59 CNDDB occurrences in Solano, San Joaquin, Sacramento and Contra Costa Counties.
Lomatium observatorium	Mt. Hamilton lomatium	4 CNDDB occurrences in Santa Clara and Stanislaus counties.
Madia radiata	Showy madia	Covered by HCP/NCCP.
Malacothamnus hallii	Hall's bush mallow	29 CNDDB occurrences mainly in Santa Clara and Contra Costa Counties.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Meconella oregana	Oregon meconella	9 CNDDB occurrences in Contra Costa, Monterey, San Luis Obispo and Santa Clara Counties. Candidate for listing in Oregon and threatened in Washington.
Micropus amphibolus	Mt. Diablo cottonweed	Insufficient information- taxonomically problematic.
Microseris sylvatica	Sylvan microseris	Species has limited distribution throughout California, but not restricted to the study area.
Monardella antonina subsp. *antonina*	San Antonio Hills monardella	Insufficient information- taxonomically problematic.
Monolopia gracilens	woodland woollythreads	CNDDB occurrences in Alameda, Contra Costa, San Mateo, and Santa Clara Counties.
Myosurus minimus subsp. *apus*	Little mousetails	Insufficient information- taxonomically problematic.
Navarretia cotulifolia	Cotula navarretia	Species has limited distribution throughout California, but not restricted to the study area.
Navarretia gowenii	Lime ridge navarretia	2 CNDDB occurrences in Contra Costa County and one in Stanislaus County.
Navarretia nigelliformis subsp. *nigelliformis*	Adobe navarretia	Covered by HCP/NCCP but not enough data and likely no occurrences.
Navarretia nigelliformis subsp. *radians*	Shining navarretia	72 CNDDB occurrences, many in central coast California and central valley. 4 extant occurrences within the study area; 2 with insufficient information, one in Contra Costa County, and one on DOE land – Lawrence Livermore Lab.
Navarretia prostrata	Prostrate navarretia	60 CNDDB occurrences, many in central coast California and central valley. 3 extant CNDDB occurrences in Alameda county.
Oenothera deltoides subsp. *howellii*	Antioch Dunes evening primrose	Only found on Antioch Dunes National Wildlife Refuge, managed for species.
Perideridia gairdneri subsp. *gairdneri*	Gairdner's yampah	Species has limited distribution throughout California but, not restricted to the study area.
Phacelia phacelioides	Mt. Diablo phacelia	13 CNDDB occurrences mainly in Contra Costa, Santa Clara, and Stanislaus Counties.
Pinus radiata	Monterey pine	Common introduced species in the study area. Native stands do not occur in the study area.
Piperia michaelii	Michael's rein orchid	Species has limited distribution throughout California, but not restricted to the study area.
Plagiobothrys diffusus	San Francisco popcornflower	Most occurrences in Santa Cruz County, the two records in the study area are vague and historic.
Polygonum marinense	Marin knotweed	Insufficient information- taxonomically problematic
Ranunculus lobbii	Lobb's aquatic buttercup	Species has limited distribution throughout California, but not restricted to the study area.
Ribes victoris	Victor's gooseberry	Species has limited distribution throughout California, but not restricted to the study area.

Scientific Name	**Common Name**	**Rationale and Additional Information**
Sanicula saxatilis	Rock sanicle	Seven occurrences in Santa Clara and Contra Costa Counties, all but one located on UC or State Park property.
Senecio aphanactis	Chaparral ragwort	Most CNDDB occurrences in southern California. Occurrences in the study area are poor and outdated.
Streptanthus albidus subsp. peramoenus	Most beautiful jewelflower	Covered by SCVHCP,
Streptanthus hispidus	Mt. Diablo jewelflower	8 occurrences in Contra Costa County.
Suaeda californica	California seablight	All study area occurrences are transplants, numerous occurrences in San Luis Obispo County
Trifolium hydrophilum	Saline clover	Endemic to central coastal California in Alameda, Contra Costa, Colusa (?), Lake, Monterey, Napa, Sacramento, San Benito, Santa Clara, Santa Cruz, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma, and Yolo counties. 32 CNDDB occurrences in the study area.
Viburnum ellipticum	Oval-leaved viburnum	28 CNDDB occurrence in northern California within and outside of the study area. 17 occurrences in Alameda, Contra Costa, Napa, Solano, and Sonoma counties.

USFWS = U.S. Fish and Wildlife Service; CNDDB = California Natural Diversity Database; ICUN = International Union for Conservation of Nature; RCIS = regional conservation investment strategy; EACCS = *East Alameda County Conservation Strategy*; HCP/NCCP = *East Contra Costa County Habitat Conservation Plan/ Natural Community Conservation Plan*; SCVHP = *Santa Clara Valley Habitat Plan*

Appendix F
Focal Species Profiles

F.1 Longhorn fairy shrimp (*Branchinecta longiantenna*)

Regulatory Status

- **State:** None
- ***Federal:*** Endangered
- ***Critical Habitat:*** Final critical habitat designated for four vernal pool crustaceans and eleven vernal pool plants (U.S. Fish and Wildlife Service 2006a)
- ***Recovery Planning:*** Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service 2005a)

Distribution

General

Longhorn fairy shrimp is extremely rare. The species is known to occur in pools located in a mix of alkali sink and scrub plant communities. The four known populations of this species are located within the Carrizo Plain National Monument, San Luis Obispo County; within the San Luis National Wildlife Refuge Complex, Merced County; within the Brushy Peak Regional Preserve, Alameda County; and within the Vasco Caves Preserve, near the town of Byron in Contra Costa County (U.S. Fish and Wildlife Service 2005a). Three of the four populations are found in public lands that are protected and managed for vernal pool species (U.S. Fish and Wildlife Service 2005a). The Livermore Vernal Pool Region is listed as a core recovery area (U.S. Fish and Wildlife Service 2005a). There are 18 California Natural Diversity Database (CNDDB) occurrences within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 18 known occurrences, 3[1] (16.7%) are within the RCIS area in southeast Contra Costa County. This occurrence is located within designated critical habitat for the species in the Livermore Vernal Pool Region near Byron.

Natural History

Longhorn fairy shrimp lives in vernal pools and is dependent on the ecological characteristics of seasonal variations within those pools. These characteristics include duration of inundation and

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[1] The three occurrences are effectively in the same location and appear as only one occurrence on Figure F-1.

presence or absence of water at specific times of the year (i.e., ponding 6 to 7 weeks in winter and 3weeks in spring) (Eriksen and Belk 1999).

Longhorn fairy shrimp is an omnivorous filter-feeder (Eriksen and Belk 1999). It is a component of the planktonic crustacea within vernal pools and can occur in densities as high as 200 per liter of water (Eriksen and Belk 1990).

Predator consumption of fairy shrimp cysts (resting eggs) aids in distributing populations. Predators expel viable cysts in their excrement, often at locations other than where they were consumed (Wissinger et al. 1999). If conditions are suitable, these transported cysts may hatch at the new location and potentially establish a new population. Cysts can also be transported in mud carried on the feet of animals, including livestock that may wade through their habitat (Eriksen and Belk 1999). Beyond inundation of the habitat, the specific cues for hatching are largely unknown (Eriksen and Belk 1999), although temperature is believed to play a role. Longhorn fairy shrimp has been reported to co-occur with vernal pool fairy shrimp (*Branchinecta lynchi*) throughout its range.

Ecological Requirements

Longhorn fairy shrimp occurrences are rare and highly disjunct with specific pool characteristics largely unknown (U.S. Fish and Wildlife Service 2003). Typical habitat for listed fairy shrimp in California include vernal pools, seasonally ponded areas within vernal swales, ephemeral freshwater habitats and artificial habitats (railroad toe-drains, roadside ditches, abandoned agricultural drains, ruts left by heavy construction vehicles, and depressions in firebreaks) (Eng et al. 1990, U.S. Fish and Wildlife Service 2005a). Longhorn fairy shrimp inhabits pools with a variable water quality from, clear to rather turbid pools (U.S. Fish and Wildlife Service 2005a). This species inhabits a variety of vernal pools types which include clear-water depressions in sandstone outcroppings near the city of Tracy, grass-bottomed pools in Merced County, and claypan pools around Soda Lake in San Luis Obispo County (Eriksen and Belk 1999). Within the RCIS area, longhorn fairy shrimp occur in the Livermore Vernal Pool Region in small, sandstone outcrop pools (U.S. Fish and Wildlife Service 2005a). Vernal pools in California that support longhorn fairy shrimp are both loam and sandy loam, shallow, alkaline pools, and sandstone depressions (U. S. Fish and Wildlife Service 1994).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

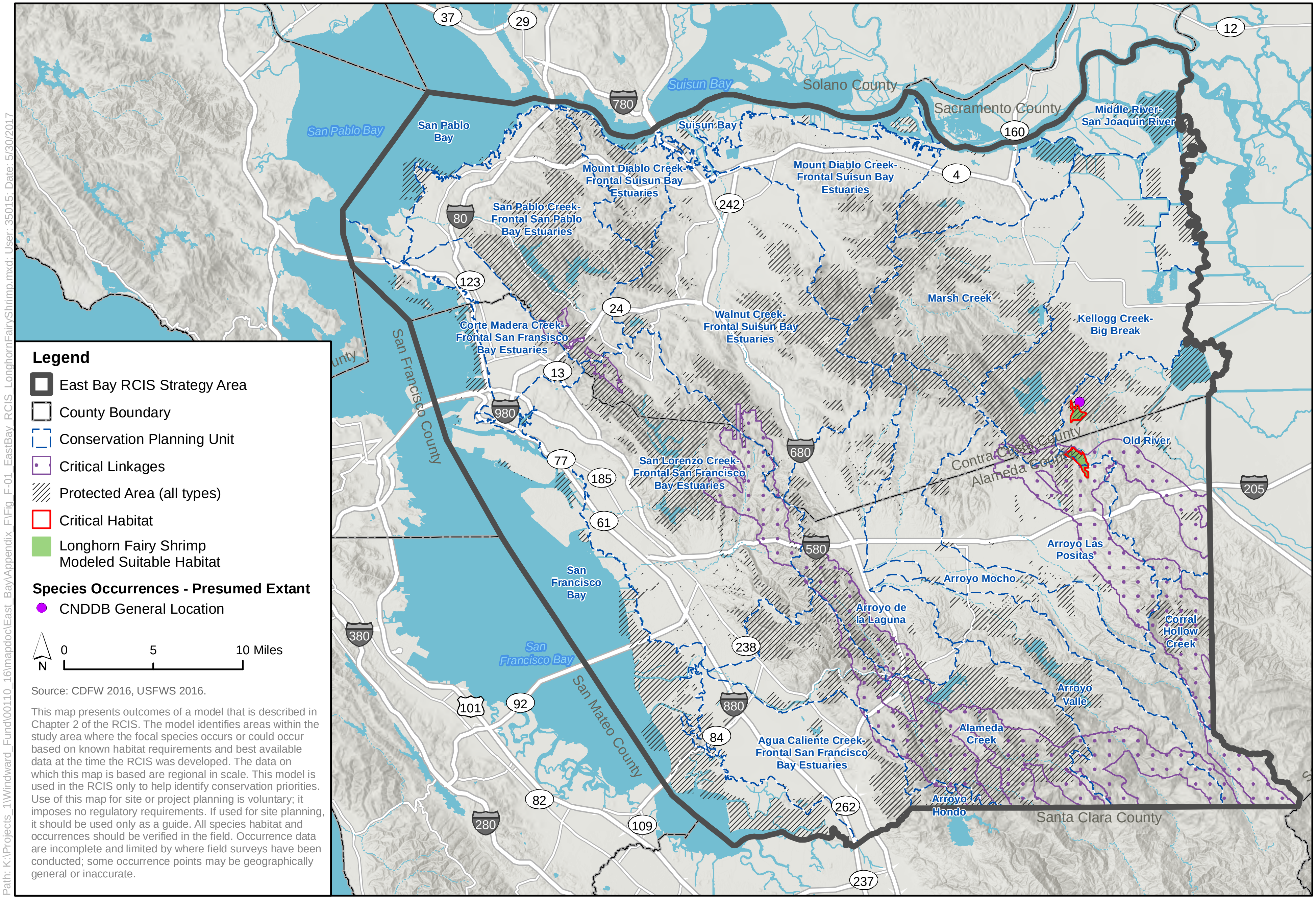
The area within longhorn fairy shrimp designated critical habitat (U.S. Fish and Wildlife Service 2006a) is modeled as longhorn fairy shrimp habitat.

Rationale

Designated critical habitat is used to model longhorn fairy shrimp habitat because the critical habitat captures the localized distribution of this species in the RCIS area. The habitat distribution model for longhorn fairy shrimp does not use land cover types because the mapping of vernal pools does not capture the localized, occupied habitat of this species in the RCIS area.

Model Results

Figure F-1 displays the critical habitat for longhorn fairy shrimp within the RCIS area. Two areas of critical habitat, one in Contra Costa County and one in Alameda County, are located near the border between the two counties on the eastern side of the RCIS area.



Source: CDFW 2016, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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ICF

Figure F-1

Longhorn Fairy Shimp Modeled Suitable Habitat

F.2 Vernal pool fairy shrimp (*Branchinecta lynchi*)

Regulatory Status

- ***State:*** None
- ***Federal:*** Threatened
- ***Critical Habitat:*** Final critical habitat designated for four vernal pool crustaceans and eleven vernal pool plants (U.S. Fish and Wildlife Service 2006a)
- ***Recovery Planning:*** Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service 2005a)

Distribution

General

Vernal pool fairy shrimp is found from southern Oregon to southern California, through the Central Valley, and west to the central Coast Ranges. Disjunct populations occur in San Luis Obispo County, Santa Barbara County, and Riverside County. In southern Oregon, it is located in two vernal pool habitats within the Agate Desert area of Jackson County (U.S. Fish and Wildlife Service 2005a, California Department of Fish and Wildlife, Natural Diversity Database 2016). Although vernal pool fairy shrimp is distributed more widely than other fairy shrimp species, it is generally uncommon throughout its range and rarely abundant where it does occur (Eng et al. 1990, Eriksen and Belk 1999). There are 737 CNDDB occurrences for this species within its California range.

Within the RCIS area

Of the 737 known CNDDB occurrences in California, 23 (3.1%) are within the RCIS area. These occurrences are within the eastern half of the RCIS area in designated critical habitats for the species located in the Livermore Vernal Pool Region near Vasco Hills, the Byron Airport, and near Brentwood within the vicinity of Marsh Creek (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 2005a). Vernal pool fairy shrimp may also be found elsewhere throughout the RCIS area in vernal pool habitats; the lack of occurrence records could be due to a lack of survey effort.

Natural History

Vernal pool fairy shrimp is adapted to the environmental conditions of its ephemeral habitats. One adaptation is the ability of vernal pool fairy shrimp eggs, or cysts, to remain dormant in the soil when its vernal pool habitats are dry. The cysts survive the hot, dry summers and cool, wet winters. When pools and swales refill in fall and winter some, but not all, of the eggs may hatch. The egg bank in the soil may comprise eggs from several years of breeding (U.S. Fish and Wildlife Service 2005a, 2007). Beyond inundation of habitat, the specific cues for hatching are unknown, although temperature and conductivity (solute concentration) are believed to play a large role (Helm 1998, Eriksen and Belk 1999).

Vernal pool fairy shrimp is an omnivorous filter-feeder. In general, all fairy shrimp species indiscriminately filter particles that include bacteria, unicellular algae, and micrometazoa (Eriksen and Belk 1999). The precise size of items these fairy shrimp are capable of filtering is currently unknown; however, fairy shrimp species will attempt to consume whatever material they can fit into their feeding groove and do not discriminate based upon taste, as do some other crustacean groups (Eriksen and Belk 1999).

Planktonic Crustacea are important in the food web, as they represent a high-fat, high-protein resource for migratory waterfowl. Mallard (*Anas platyrhynchos*), green-winged teal (*A. crecca*), bufflehead (*Bucephala albeola*), greater yellowlegs (*Tringa melanoleuca*), and killdeer (*Charadrius vociferus*) all forage actively in vernal pools on invertebrate and amphibian fauna during the winter months (Silveira 1996, Bogiatto and Karnegis 2006).

Predator consumption of vernal pool fairy shrimp cysts aids in distributing populations of fairy shrimp. Predators (e.g., birds and amphibians) expel viable cysts in their excrement, often at locations other than where they were consumed. If conditions are suitable, these transported cysts may hatch at the new location and potentially establish a new population. Cysts are also transported by wind and in mud carried on the feet of animals, including livestock that may wade through fairy shrimp habitat. This type of dispersal aids ephemeral pool crustaceans in exploiting a wide variety of ephemeral habitats (Erickson and Belk 1999).

Habitat Requirements

This species is entirely dependent on the aquatic environment provided by the temporary waters of natural vernal pool and playa pool ecosystems as well as the artificial environments of ditches and tire ruts (King et al. 1996, Helm 1998, Erikson and Belk 1999). The temporary waters this species inhabits fill in the fall and winter during the beginning of the wet season, dry in late spring at the beginning of the dry season, and remain desiccated throughout the summer (Helm 1998, Eriksen and Belk 1999). The temporary waters fill directly from precipitation as well as from runoff from their watersheds (Williamson et al. 2005, Rains et al. 2006, 2008, O'Geen et al. 2008). The watershed extent that is necessary for maintaining the hydrological functions of the temporary waters depends on a number of complex factors, including the hydrologic conductivity of the surface soil horizons; the continuity and extent of hardpans and claypans underlying non-clay soils; the existence of a perched aquifer overlying the pans; slope; effects of vegetation on evapotranspiration rates; compaction of surface soils by grazing animals; and other factors (Pyke and Marty 2005, Williamson et al. 2005, Rains et al. 2006, 2008, O'Geen et al. 2008).

The temporary waters that are habitat for vernal pool fairy shrimp are extremely variable and range from clear sandstone pools with little alkalinity to turbid vernal pools on clay soils with moderate alkalinity (King et al. 1996; Eriksen and Belk 1999). Common wetland plant species that co-occur with vernal pool fairy shrimp include toad rush (*Juncus bufonius*), coyote thistle (*Eryringium* spp.), downingia (*Downingia ornatissma* or *D. bicornuta*), goldfields (*Lasthenia* spp.), woolly marbles (*Psilocarphus* spp.), and hair grass (*Deschampsia* spp.) (King et al. 1996, Helm 1998, Eriksen and Belk 1999). Vernal pool fairy shrimp is also occasionally been found in degraded vernal pool habitats and artificially created seasonal pools (Helm 1998).

Vernal pool fairy shrimp commonly co-occurs with California fairy shrimp (*Linderiella occidentalis*), Conservancy fairy shrimp (*Branchinecta conservatio*), and vernal pool tadpole shrimp (*Lepidurus packardi*). Midvalley shrimp (*B. mesovallensis*) and longhorn fairy shrimp occur within the range of vernal pool fairy shrimp but are typically found in different habitats (U.S. Fish and Wildlife Service 2005a, 2007).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The vernal pool fairy shrimp habitat model is adapted from the East Alameda County Conservation Strategy (ICF International 2010). Modeled habitat for vernal pool fairy shrimp is defined as the alkali wetland, seasonal wetland, and vernal pool land cover types in the RCIS area. Critical habitat is also added to the model to capture occupied habitat. The model excludes the San Francisco Bay, San Pablo Bay, and Suisun Bay watersheds because wetlands suitable habitat for vernal pool fairy shrimp is not present. The model is not refined to account for seasonal wetlands that don't provide suitable habitat conditions because of dense vegetation or unsuitable hydroperiod, which is not mapped in the RCIS's GIS land cover dataset.

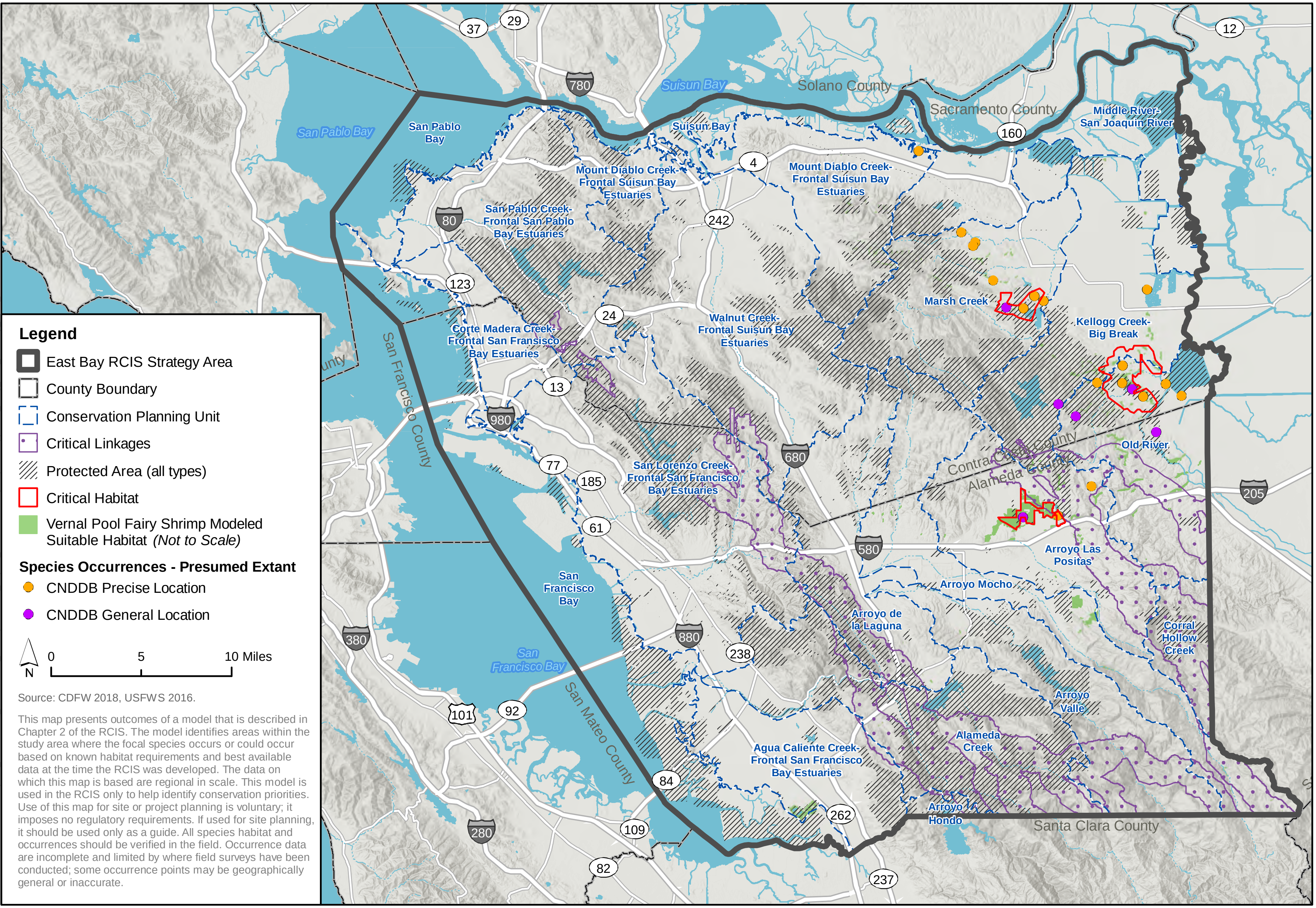
Rationale

This species requires depressional features that become inundated in the winter and hold water for a minimum of 18 days for reproduction (U.S. Fish and Wildlife Service 2006a). Other suitable microhabitats occur at scales too small to be mapped (e.g., swales or small depressions); however, critical habitat is added to the model in an attempt to capture these occupied or potential habitat areas.

Seasonal wetlands in the San Francisco Bay, San Pablo Bay, and Suisun Bay watersheds are excluded from the habitat model. This RCIS used BAARI wetland land cover types within the RCIS's seasonal wetland land cover classification (Chapter 2, *Environmental Setting and the Built Environment*, Section 2.2.5.3, *Wetland and Bayland Land Cover* and Table 2-3b). These wetlands adjacent to San Francisco Bay, San Pablo Bay, and Suisun Bay are not suitable habitat for vernal pool fairy shrimp (except for a small complex of vernal pools on the Don Edwards National Wildlife Refuge).

Model Results

Figure F-2, displays modeled habitat for vernal pool fairy shrimp within the RCIS area. Small patches of habitat are located in eastern Contra Costa and Alameda Counties and along the western edge of the Bay between the cities of Alameda and Newark. Small patches of habitat occur in the northern two units of critical habitat in the RCIS area, as vernal pools, alkali wetland, and seasonal wetland are patchily distributed in these units of critical habitat. Modeled habitat is considerably more widespread in the southern-most unit of critical habitat in the RCIS area.



Source: CDFW 2018, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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Figure F-2
Vernal Pool Fairy Shimp Modeled Suitable Habitat

F.3 Vernal pool tadpole shrimp (*Lepidurus packardi*)

Regulatory Status

- ***State:*** None
- ***Federal:*** Endangered
- ***Critical Habitat:*** Final critical habitat designated for four vernal pool crustaceans and eleven vernal pool plants (U.S. Fish and Wildlife Service 2006a)
- ***Recovery Planning:*** Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service 2005a)

Distribution

General

Vernal pool tadpole shrimp is currently distributed across the Central Valley and Bay Area. This species is uncommon, even where vernal pool habitats occur. The largest concentration of vernal pool tadpole shrimp occurrences are found in the Southeastern Sacramento Vernal Pool Region, where the species occurs on a number of public and private lands in Sacramento County. The easternmost known location is around 3,500 feet in elevation in the central Sierra Nevada foothills (Merced County), with the westernmost known locations in the Bay Area (Alameda County). There are 320 CNDDB occurrences for this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 320 CNDDB occurrences, three (1.0%) are within the RCIS area. These occurrences are in southern Fremont in the Warms Springs parcel of the Don Edwards National Wildlife Refuge system. This area is within the Central Coast Vernal Pool Region and is designated critical habitat for the species. One occurrence is in southern Antioch.

Natural History

Vernal pool tadpole shrimp is adapted to the environmental conditions of its ephemeral habitats. One adaptation is the ability of vernal pool tadpole shrimp eggs, or cysts, to remain dormant in the soil when their vernal pool habitats are dry. The cysts survive the hot, dry summers and cool, wet winters. When the pools refill in fall and winter, some, but not all, of the eggs may hatch. The egg bank in the soil may comprise eggs from several years of breeding (U.S. Fish and Wildlife Service 2005a, 2007). Beyond inundation of habitat, the specific cues for hatching are unknown, although temperature and conductivity (solute concentration) are believed to play a large role (Helm 1998, Eriksen and Belk 1999).

Is species is omnivorous, with a strong preference for animal matter. Individuals filter detritus for micrometazo, and will capture and consume live invertebrates, including fairy shrimp and other vernal pool tadpole shrimp, amphibian larvae, and carrion (U.S. Fish and Wildlife Service 2005a, 2007).

Planktonic Crustacea are important in the food web, as they represent a high-fat, high-protein resource for migratory waterfowl. Mallard, green-winged teal, bufflehead, greater yellowlegs, and killdeer all forage actively in vernal pools on invertebrate and amphibian fauna during the winter months (Silveira 1996, Bogiatto and Karnegis 2006).

Predator consumption of vernal pool tadpole shrimp cysts aids in distributing populations of tadpole shrimp. Predators (e.g., birds and amphibians) expel viable cysts in their excrement, often at locations other than where they are consumed. If conditions are suitable, these transported cysts may hatch at the new location and potentially establish a new population. Cysts are also transported by wind and in mud carried on the feet of animals, including livestock that may wade through vernal pool tadpole shrimp habitat. This type of dispersal aids ephemeral pool crustaceans in exploiting a wide variety of ephemeral habitats (Eriksen and Belk 1999).

Habitat Requirements

This species is entirely dependent on the aquatic environment provided by the temporary waters of natural vernal pool and playa pool ecosystems, as well as the artificial environments of ditches and tire ruts (King et al. 1996, Helm 1998, Eriksen and Belk 1999). The temporary waters vernal pool tadpole shrimp inhabits fill in the fall and winter during the beginning of the wet season and dry in late spring at the beginning of the dry season and remain desiccated throughout the summer (Helm 1998, Eriksen and Belk 1999). The temporary waters fill directly from precipitation as well as from runoff from their watersheds (Williamson et al. 2005, Rains et al. 2006, 2008; O'Geen et al. 2008). The watershed extent necessary for maintaining the hydrological functions of the temporary waters depends on a number of complex factors, including the hydrologic conductivity of the surface soil horizons; the continuity and extent of hardpans and claypans underlying non-clay soils; the existence of a perched aquifer overlying the pans; slope; effects of vegetation on evapotranspiration rates; compaction of surface soils by grazing animals; and other factors (Marty 2004, Pyke and Marty 2005, Williamson et al. 2005, Rains et al. 2006, O'Geen et al. 2008).

The temporary waters that are habitat for vernal pool tadpole shrimp are extremely variable and range from clear sandstone pools with little alkalinity to turbid vernal pools on clay soils with moderate alkalinity (King et al. 1996, Eriksen and Belk 1999). Common wetland plant species that co-occur with vernal pool tadpole shrimp include toad rush, coyote thistle, downingia, goldfields, woolly marbles, and hair grass (King et al. 1996, Helm 1998 Plattencamp 1998, Eriksen and Belk 1999).

Vernal pool tadpole shrimp commonly co-occur with California fairy shrimp. Conservancy fairy shrimp, and vernal pool fairy shrimp. Midvalley shrimp and longhorn fairy shrimp occur within the range of vernal pool tadpole shrimp but are typically found in different habitats (U.S. Fish and Wildlife Service 2005a, 2007).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The vernal pool tadpole shrimp habitat model is adapted from the East Alameda County Conservation Strategy (ICF International 2010). Modeled habitat for vernal pool tadpole shrimp is defined as the alkali wetland, seasonal wetland and vernal pool land cover types in the RCIS area. Critical habitat is also added to the model to capture occupied habitat. The model excludes the San

Francisco Bay, San Pablo Bay, and Suisun Bay watersheds because suitable wetland habitat for vernal pool fairy shrimp is not present. The model is not refined at a micro-scale to account for unsuitable seasonal wetland habitat (e.g., vegetation density or hydroperiod), which is not mapped at the scale of the RCIS's GIS land cover dataset.

Rationale

Vernal pool tadpole shrimp requires depressional features that become inundated in the winter and hold water for a minimum of 41 days for reproduction (U.S. Fish and Wildlife Service 2006a). Other suitable microhabitats occur at scales too small to be mapped (e.g., swales or small depressions); however, critical habitat is added to the model in an attempt to capture these occupied or potential habitat areas.

Seasonal wetlands in the San Francisco Bay, San Pablo Bay, and Suisun Bay watersheds are excluded from the habitat model. This RCIS used BAARI wetland land cover types within the RCIS's seasonal wetland land cover classification (Chapter 2, *Environmental Setting and the Built Environment*, Section 2.2.5.3, *Wetland and Bayland Land Cover* and Table 2-3b). These wetlands adjacent to San Francisco Bay, San Pablo Bay, and Suisun Bay are not suitable habitat for vernal pool fairy shrimp (except for a small complex of vernal pools on the Don Edwards National Wildlife Refuge).

Model Results

Figure F-3 displays modeled habitat for vernal pool tadpole shrimp within the RCIS area. Small patches of habitat are located eastern Contra Costa and Alameda Counties and along the western edge of the Bay on the Don Edwards National Wildlife Refuge.

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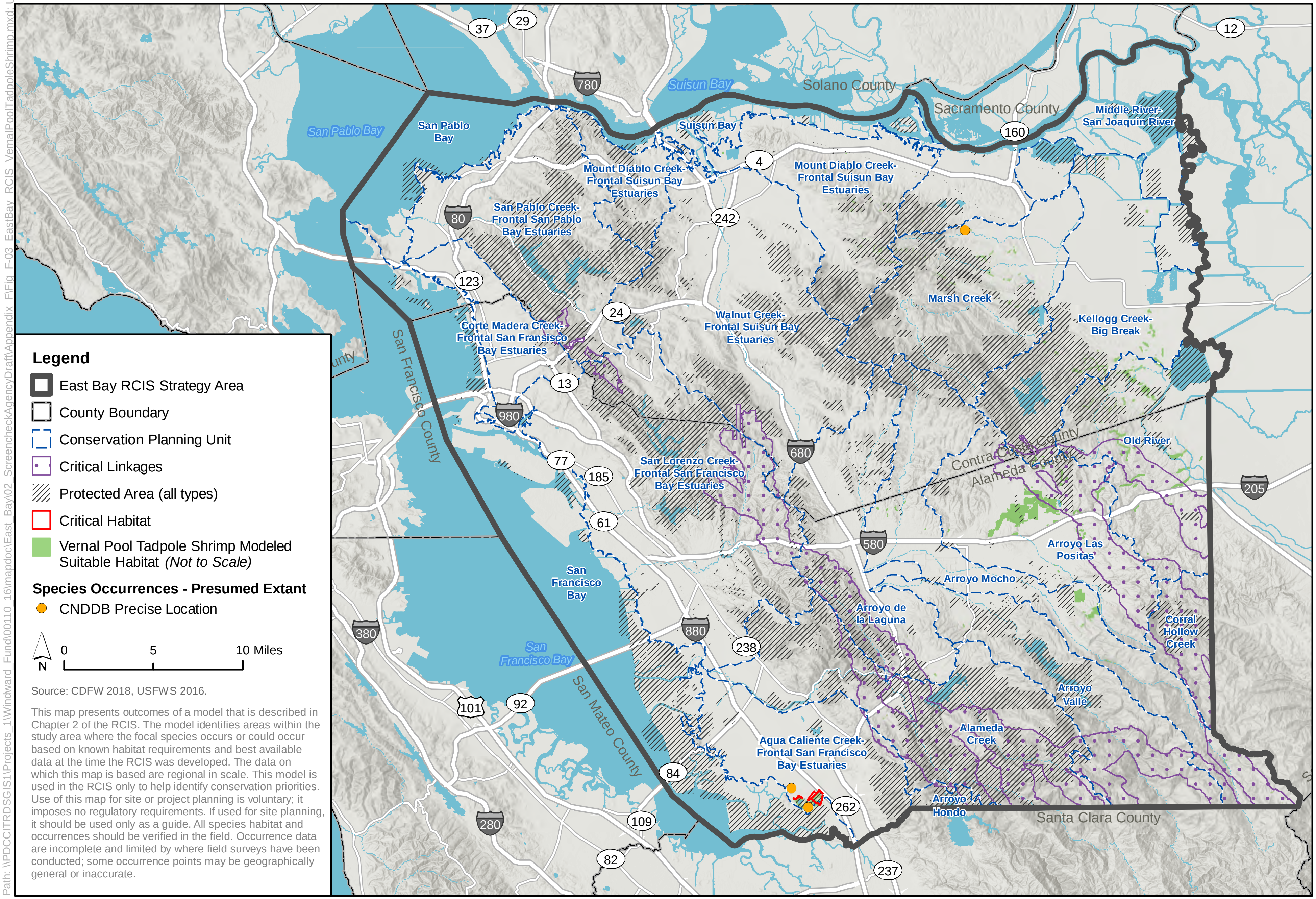

Source: CDFW 2018, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-3
Vernal Pool Tadpole Shimp Modeled Suitable Habitat

F.4 Callippe silverspot butterfly (*Speyeria callippe callippe*)

Regulatory Status

- ***State:*** None
- ***Federal:*** Endangered
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Callippe silverspot butterfly is endemic to the Bay Area. It is also commonly called the San Francisco silverspot butterfly (U.S. Fish and Wildlife Service 2009). USFWS recognizes two populations of callippe silverspot butterfly: a San Bruno Mountain population in San Mateo County and a Cordelia Hills population in Solano County. A population previously known to occur at a city park in Alameda County is believed to have been extirpated. Three possible callippe silverspot populations (near Sears Point in Sonoma County and near Pleasanton and Milpitas in Alameda County) have not been taxonomically verified (U.S. Fish and Wildlife Service 2009). A closely related subspecies, *S. callippe comstocki*, is difficult to distinguish from *S. callippe callippe.* There are seven CNDDB occurrences for this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the seven CNDDB occurrences, no occurrences are within the RCIS area, but there have been records of occurrences in the hills near Pleasanton (U.S. Fish and Wildlife Service 2009, as cited in East ICF International 2010). Historically, populations of callippe silverspot butterfly were known from northwestern Contra Costa County southward to the Castro Valley area of Alameda County (Arnold 2008).

Natural History

Females lay eggs in the dried remains of the host plant *Viola pedunculata* (common names are California golden violet or Johnny jump-up) or on the surrounding debris. Larvae feed on the native violet host plant, whereas adults mainly feed on nectar sources, including native mints and native and nonnative thistles (U.S. Fish and Wildlife Service 2009).

Callippe silverspot butterfly has one adult flight season per year (U.S. Fish and Wildlife Service 2017a). The adult flight season is about 6 to 8 weeks in length, starting in mid-May and terminating in mid-July. When available, the adult silverspot feed on nectar plants including mints, especially *Monardella*, and thistles, such as *Silybum*, *Carduus*, and *Cirsium*, and California buckeye (*Aesculus californica*) (Arnold 1981). The blooming period of these nectar plants coincides with callippe silverspot butterfly flight season, allowing it to continuously feed during this time period. Adults tend to congregate on hilltops, a behavior known as hilltopping, where they search for potential mates.

Callippe silverspot butterfly occurs in grasslands where its sole larval food plant, Johnny jump-ups (*Viola pedunculata*), grows. Because the leaves of Johnny jump-ups are typically dry by the start of the adult flight season, females frequently lay their eggs in or near areas where Johnny jump-ups grow. For this reason, newly hatched larvae do not feed before they find a suitable diapause location. When Johnny jump-ups sprout during the following winter, the larvae have to search for the food plant. Larvae feed exclusively on the Johnny jump-ups plant. Also, developing larvae usually feed at night, but crawl off of the food plant and hide nearby during the daytime. Thus, short distance dispersal, probably on the order of tens of feet, occurs routinely during the larval stage (U.S. Fish and Wildlife Service 2009).

Habitat Requirements

Callippe silverspot butterfly occurs in hilly terrain with a mixture of topographic relief. It has been observed in both grazed and ungrazed grasslands. Adults will visit the margins of oak woodlands and riparian areas in search of nectar, as well as disturbed areas if favored nectar plants grow there (Arnold 1981). The three primary habitat requirements of callippe silverspot butterfly are:

- grasslands with the proper topography supporting its larval food plants;
- hilltops near suitable habitat for mate location; and
- nectar plants, which can occur in grasslands or nearby oak woodlands, riparian areas, or disturbed areas.

Proper topography refers to the areas with cooler north and east facing slopes with fairly dense occurrences of both the larval host plants and nectar sources. Continuous grassland is also important because it supports a variety of nectar sources (Weiss and Murphy 1990, Weiss et al. 1993). Because the butterfly has been observed flying distances of approximately 1 mile (Thomas Reid Associates 1981), these three habitat features do not necessarily have to be immediately adjacent to each other.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The callippe silverspot butterfly habitat model is adapted from the East Alameda County Conservation Strategy (ICF International 2010). Modeled habitat for callippe silverspot butterfly is defined as the alkali grassland, barren/rock, California annual grassland, serpentine grassland, and serpentine rock outcrop land cover types in the RCIS area. The model extent is restricted to the East Bay Hills/Western Diablo Range and Livermore Hills and Valley ecoregions.

Rationale

Callippe silverspot butterfly occurs in grasslands and associated rocky habitats where its host plant Johnny-jump ups is present. Since Johnny-jump ups are a common species in grasslands of the San Francisco Bay Area, the model extent is limited to areas where this species has historically been observed and is most likely to occur.

Model Results

Figure F-4 displays the modeled habitat for callippe silverspot butterfly within the RCIS area. Modeled habitat is scattered throughout the central portion of the RCIS area. The model excludes dense urban areas, such as the cities along Highway 242 in eastern Contra Costa County, areas with dense aquatic habitat (the Delta), and heavily wooded areas (much of Mount Diablo State Park).

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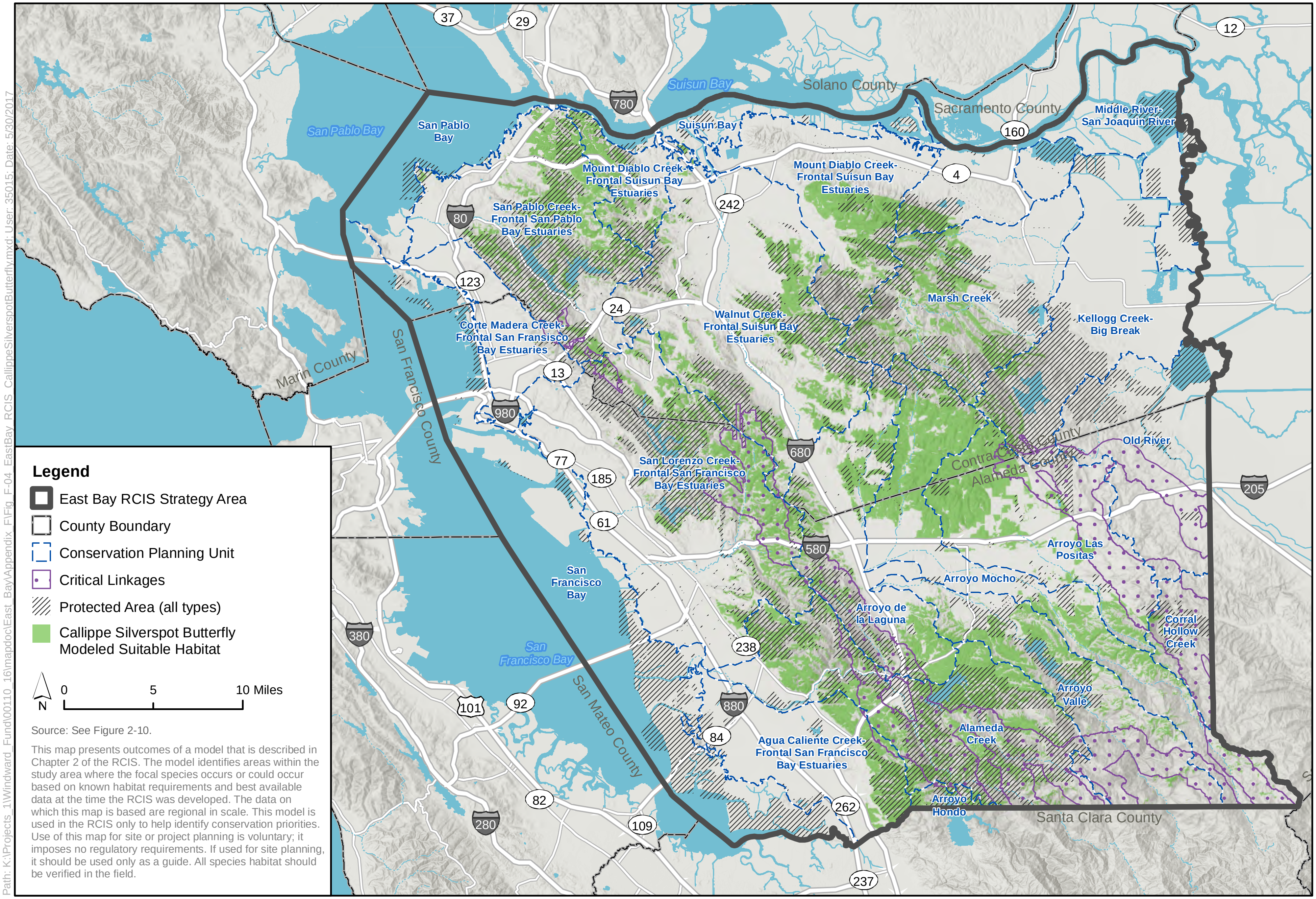

Source: See Figure 2-10.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat should be verified in the field.

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Figure F-4
Callippe Silverspot Butterfly Modeled Suitable Habitat

F.5 Central Valley Steelhead (*Oncorhynchus mykiss*)

Regulatory Status

- ***State:*** None
- ***Federal:*** Threatened
- ***Critical Habitat:*** Final critical habitat for Central Valley steelhead distinct population segment (DPS) was designated on September 2, 2005 (70 *Federal Register* [FR] 52488–52627). Where designated, critical habitat includes the entire width of the stream channel defined by the ordinary high-water line (as defined by Corps in 33 Code of Federal Regulations [CFR] 329.11) or the bankfull elevation where the ordinary high-water line has not been defined.
- ***Recovery Planning:*** Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon, and Central Valley Spring-run Chinook Salmon, and the Distinct Population Segment of California Central Valley Steelhead (National Marine Fisheries Service 2014)

Distribution

General

The Central Valley steelhead DPS includes naturally spawned anadromous steelhead originating below natural and constructed impassable barriers from the Sacramento and San Joaquin Rivers and their tributaries; excludes such fish originating from San Francisco and San Pablo Bays and their tributaries. This DPS does include steelhead from two artificial propagation programs: the Coleman National Fish Hatchery and Feather River Fish Hatchery Programs (National Marine Fisheries Service 2014. There are 31 CNDDB occurrences of this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Central Valley steelhead occurs in the San Francisco Bay Delta during migration into and out of freshwater streams. Juvenile fish also use the San Francisco Bay Delta as rearing habitat when moving out to the ocean. Central Valley steelhead critical habitat within the RCIS area encompasses the upper San Francisco Estuary and Delta, from San Pablo Bay to the eastern and northeastern boundaries of the RCIS area.

Natural History

Steelhead have a complex life history and may follow a variety of life-history patterns, including some that may exhibit anadromy (i.e., migrate to the ocean to mature as adults) or freshwater residency (i.e., are not migratory and reside their entire life in fresh water). The relationship between these two life-history forms when they occur together is poorly understood. Intermediate life-history patterns also exist and include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to nearshore ocean areas. These life-history patterns do not appear to be genetically distinct, and individuals exhibiting different life-history patterns have been observed interbreeding (Shapovalov and Taft 1954).

Adult steelhead in this DPS leave the ocean and enter fresh water to spawn when winter rains occur and water temperatures drop. Increased streamflow during runoff events appears to provide adults with cues that stimulate migration and allows improved conditions for fish to pass obstructions and shallow areas on their way upstream. Optimal migration temperatures are from 46° to 52°F (California Department of Fish and Game 1996). The season for upstream migration of Central Valley steelhead adults lasts from late October through the end of May, but typically the bulk of migration occurs between mid-December and mid-April. The preferred water temperature range for steelhead spawning is 39° to 52°F (California Department of Fish and Game 1996). Freshwater steelhead rearing sites contain suitable instream flows, water quantity and quality (e.g., water temperatures 39° to 73°F [Moyle 2002]). The exact timing and rate of migration depend on several factors, including stream discharge, water temperature, the maturity of the fish, the behavior of the population, and possibly other factors.

Central Valley steelhead typically matures after 1 or 2 years in the ocean, with males commonly maturing in 1 year and females in 2 years. Steelhead fecundity is relatively high. A 22-inch female produces around 4,800 eggs, and a 30-inch fish produces an average of 9,000 to 10,000 eggs (Shapovalov and Taft 1954). By comparison, a 12-inch non-anadromous rainbow trout may produce closer to 1,000 eggs. Steelhead may survive spawning, return to the ocean, and return to spawn again. Repeat spawners may make up as much as 30% of the run, but typically only a relatively low percentage survive to spawn more than twice.

Non-anadromous rainbow trout typically mature in their second or third year, although the range is from 1 to 5 years. Spawning of rainbow trout occurs from February through June.

Ecological Requirements

Central Valley steelhead requires conditions that support spawning habitat, freshwater rearing habitat, freshwater migration corridors, and ocean habitat in order to complete its life cycle.

Spawning habitat for Central Valley steelhead primarily occurs in mid to upper elevation reaches or immediately downstream of dams located throughout the Central Valley that contain suitable environmental conditions (e.g., seasonal water temperatures, substrate, and dissolved oxygen) for spawning and egg incubation and floodplain connectivity to form and maintain physical habitat conditions that support juvenile growth and mobility, provide forage species, and include cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Spawning areas and migratory corridors may also function as rearing habitat for juveniles, which feed and grow before and during their outmigration (National Marine Fisheries Service 2014).

Optimal freshwater migration corridors (including river channels, channels through the Delta, and the Bay-Delta estuary) support mobility, survival, and food supply for juveniles and adults. Migration corridors should be free from obstructions (passage barriers and impediments to migration), provide favorable water quantity (instream flows) and quality conditions (seasonal water temperatures), and contain natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks (National Marine Fisheries Service 2014).

Most juvenile steelhead rear in coastal marine waters for approximately 1 to 2 years before returning to the Central Valley rivers as adults to spawn. During their marine residence, steelhead forage on krill and other marine organisms. Offshore marine areas with water quality conditions and food, including squid, crustaceans, and fish (fish become a larger component in steelhead diet later in life [Moyle 2002]) that support growth and maturation are important habitat elements (National Marine Fisheries Service 2014).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

This RCIS uses the critical habitat designation for Central Valley steelhead within Contra Costa and Alameda Counties in the San Francisco Bay Delta to model habitat for Central Valley Steelhead. Central Valley steelhead occurs in the Delta during migration into and out of freshwater streams. Juvenile fish also use the Delta as rearing habitat when moving out to the ocean. Spawning habitat does not occur in the RCIS area for Central Valley steelhead.

Rationale

Central Valley steelhead uses the San Francisco Bay Delta as a migratory pathway to and from the Sacramento River and San Joaquin River and their tributaries, which are used for spawning and subsequent movement downstream by juvenile fish. Critical habitat includes primary constituent elements for migratory habitat. These include: estuarine areas free of obstruction and excessive predation with water quality and quantity and salinity conditions supporting juvenile and adult transitions between fresh and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation (National Marine Fisheries Service 2005).

Model Results

Figure F-5 displays the modeled habitat for Central Valley steelhead within the RCIS area. All suitable habitat for Central Valley steelhead is limited to the Delta and migratory pathways to and including the San Francisco Bay waters.

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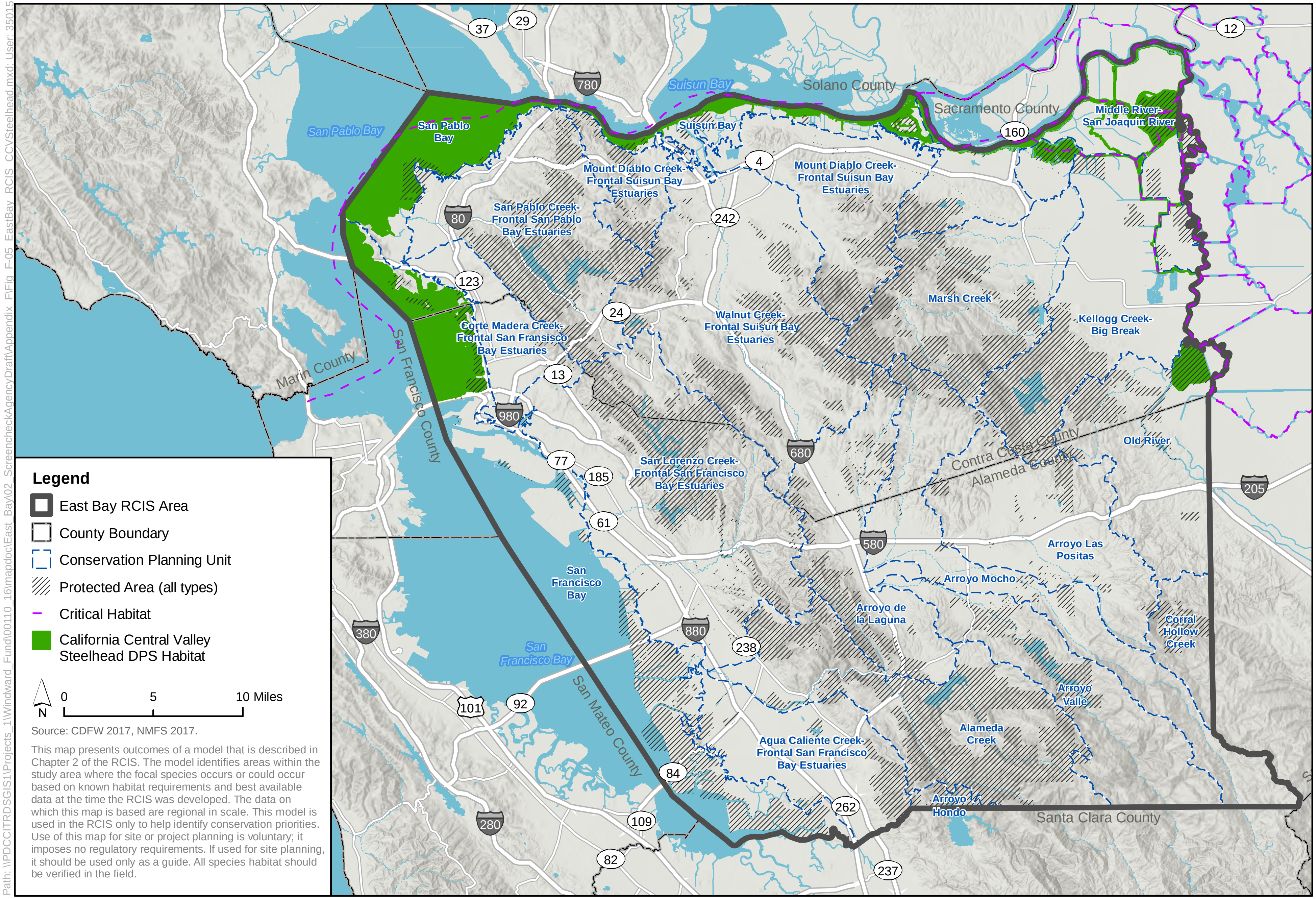


Source: CDFW 2017, NMFS 2017.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat should be verified in the field.

Figure F-5
Steelhead Trout (California Central Valley DPS) Habitat in the RCIS Area

F.6 Central California Coast Steelhead (*Oncorhynchus mykiss*)

Regulatory Status

- ***State:*** None
- ***Federal:*** Threatened
- ***Critical Habitat:*** Final critical habitat for Central California Coast steelhead DPS designated by NMFS on September 2, 2005 (70 FR 52488–52627). Where designated, critical habitat includes the entire width of the stream channel defined by the ordinary high-water line (as defined by Corps in 33 CFR 329.11) or the bankfull elevation where the ordinary high-water line has not been defined.
- ***Recovery Planning:*** Coastal Multispecies Recovery Plan for the California Coastal Chinook Salmon, Northern California Steelhead, and Central California Coast Steelhead (National Marine Fisheries Service 2016)

Distribution

General

Central California Coast steelhead DPS is comprised of winter-run steelhead populations that spawn and rear from the Russian River in Sonoma County, tributaries to the San Francisco/San Pablo Bay system, and stretches south to Aptos Creek in Santa Cruz County (National Marine Fisheries Service 2011). This species is still present in most of the coastal streams in their historic range, though abundance may be reduced and/or distribution within individual basins may be restricted.

Within the RCIS area

Leidy et al. (2005) lists five streams with known populations of anadromous steelhead: Pinole Creek and its tributary Simas Creek, Wildcat Creek, Codornices Creek, and San Leandro Creek. Leidy et al. (2005) also lists Mount Diablo Creek, Alhambra Creek, San Pablo Creek, Sausal Creek and its tributaries Shepherd Creek and Palo Seco Creek, and Lion Creek and its tributary Horseshoe Creek as unknown if they contain anadromous steelhead; however, these streams are listed as having one or more life stages of rainbow trout within the watershed below impassable barriers.

The CNDDB includes an occurrence record from 1999 of 40 to 100 adults in Alameda Creek below Sunol Dam (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Steelhead have a complex life history and may follow a variety of life-history patterns, including some that may exhibit anadromy (i.e., migrate to the ocean to mature as adults) or freshwater residency (i.e., are not migratory and reside their entire life in fresh water). The relationship between these two life-history forms when they occur together is poorly understood. Intermediate life-history patterns also exist and include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to nearshore ocean areas.

These life-history patterns do not appear to be genetically distinct, and individuals exhibiting different life-history patterns have been observed interbreeding (Shapovalov and Taft 1954).

Adult steelhead in this DPS leave the ocean and enter fresh water to spawn when winter rains have been sufficient to raise stream flows and, for many coastal streams, breach the sandbars that form at the mouths during the summer. Increased streamflow during runoff events appears to provide adults with cues that stimulate migration and allows improved conditions for fish to pass obstructions and shallow areas on their way upstream. The season for upstream migration of Central California Coast steelhead adults lasts from late October through the end of May, but typically the bulk of migration occurs between mid-December and mid-April. The exact timing and rate of migration depend on several factors, including stream discharge, water temperature, the maturity of the fish, the behavior of the population, and possibly other factors.

Central California Coast steelhead typically matures after 1 or 2 years in the ocean, with males commonly maturing in 1 year and females in 2 years. Steelhead fecundity is relatively high. A 22-inch female produces around 4,800 eggs, and a 30-inch fish produces an average of 9,000 to 10,000 eggs (Shapovalov and Taft 1954). By comparison, a 12-inch non-anadromous rainbow trout may produce closer to 1,000 eggs. Spawning of Central California Coast steelhead occurs primarily from December through March or early April. Steelhead may survive spawning, return to the ocean, and return to spawn again. Repeat spawners may make up as much as 30% of the run, but typically only a relatively low percentage survive to spawn more than twice.

Non-anadromous rainbow trout typically mature in their second or third year, although the range is from 1 to 5 years. Spawning of rainbow trout occurs from February through June.

Ecological Requirements

Smith (1999) also describes two distinct habitat types used by Central California Coast steelhead and resident trout. Primary habitat consists of shaded pools of small, cool, low-flow upstream reaches typical of the original steelhead habitat in the region. In addition, they use warm water habitats below some dams or pipeline outfalls, where summer releases provide high summer flows and fast water feeding habitat. Trout metabolic rate, and thus food demand, increases with temperature. Trout rely heavily on insect drift for food, and drift increases with flow velocity. Under conditions of low flow and high temperatures, trout have increasing difficulty obtaining sufficient food to meet metabolic costs. Smith and Li (1983) found that in Uvas Creek, a relatively warm stream with summer maximum water temperatures of 73°F to 77°F, steelhead move into higher velocity microhabitats in riffles and runs where sufficient food can be obtained. These habitats are created by summer releases from an upstream reservoir.

Steelhead select spawning sites with gravel substrate and sufficient flow velocity to maintain circulation through the gravel, providing a clean, well-oxygenated environment for incubating eggs. Preferred flow velocity is in the range of 1 to 3 feet per second (Raleigh et al 1986). Preferred gravel substrate is in the range of 0.25 to 4 inches in diameter for steelhead (Bjornn and Reiser 1991). Non-anadromous rainbow trout prefer spawning gravel in the range of 0.25 to 2.5 inches in diameter.

After emergence from the gravel, fry inhabit low velocity areas along the stream margins. As they feed and grow, they gradually move to deeper and faster water. In central California streams, steelhead typically rear for one or two years. Parr larger than 6 inches are more frequently found in deeper waters where low velocity areas are in close proximity to higher velocity areas and cover is provided by boulders, undercut banks, logs, or other objects. Heads of pools generally provide classic conditions for older trout. Trout can inhabit very small streams, particularly in coastal areas.

Food and cover are key factors for rearing steelhead (Mason and Chapman 1965, Shapovalov and Taft 1954). During the high flows, reduced food abundance, and lower temperatures occurring in winter, steelhead may move down into the substrate or find other cover. Backwater habitat, small tributaries, or other low velocity areas may also be important winter habitat. Juvenile steelhead feed primarily on aquatic invertebrates and terrestrial insects. These fish typically take up position in the stream current and capture drifting organisms or rise to the surface to take prey items that have fallen into the stream. Active invertebrates may be taken off the substrate, and occasionally small fish and snails are eaten. Feeding may occur at any time but often peaks at dawn and dusk. Trout are primarily visual feeders, so high turbidity can reduce feeding activity. Feeding activity also can be reduced during winter when temperature and activity levels are lower.

Upper lethal temperatures for adult Pacific salmonids are in the range of 75°F to 77°F for continuous long-term exposure (Brett et al. 1982). Preferred temperatures for steelhead parr range from 54°F to 64°F, although optimum growth rates may occur at slightly higher temperatures if food is abundant. Temperatures also influence the smoltification process. In some studies, steelhead have exhibited decreased migratory behavior and decreased seawater survival at temperature in excess of 55°F (Zaugg and Wagner 1973, Adams et al.1975).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for Central California Coast steelhead capture migration, spawning, and rearing habitats, although the paucity of available reach-specific habitat and environmental data preclude distinguishing among habitat types. Designated critical habitat is used to model migratory and rearing habitat in San Francisco Bay, San Pablo Bay, and Suisun Bay. Known population and occurrence information in Contra Costa and Alameda Counties from Leidy et al. (2005) and NMFS (2016) are used to model spawning and rearing habitat in RCIS area streams.

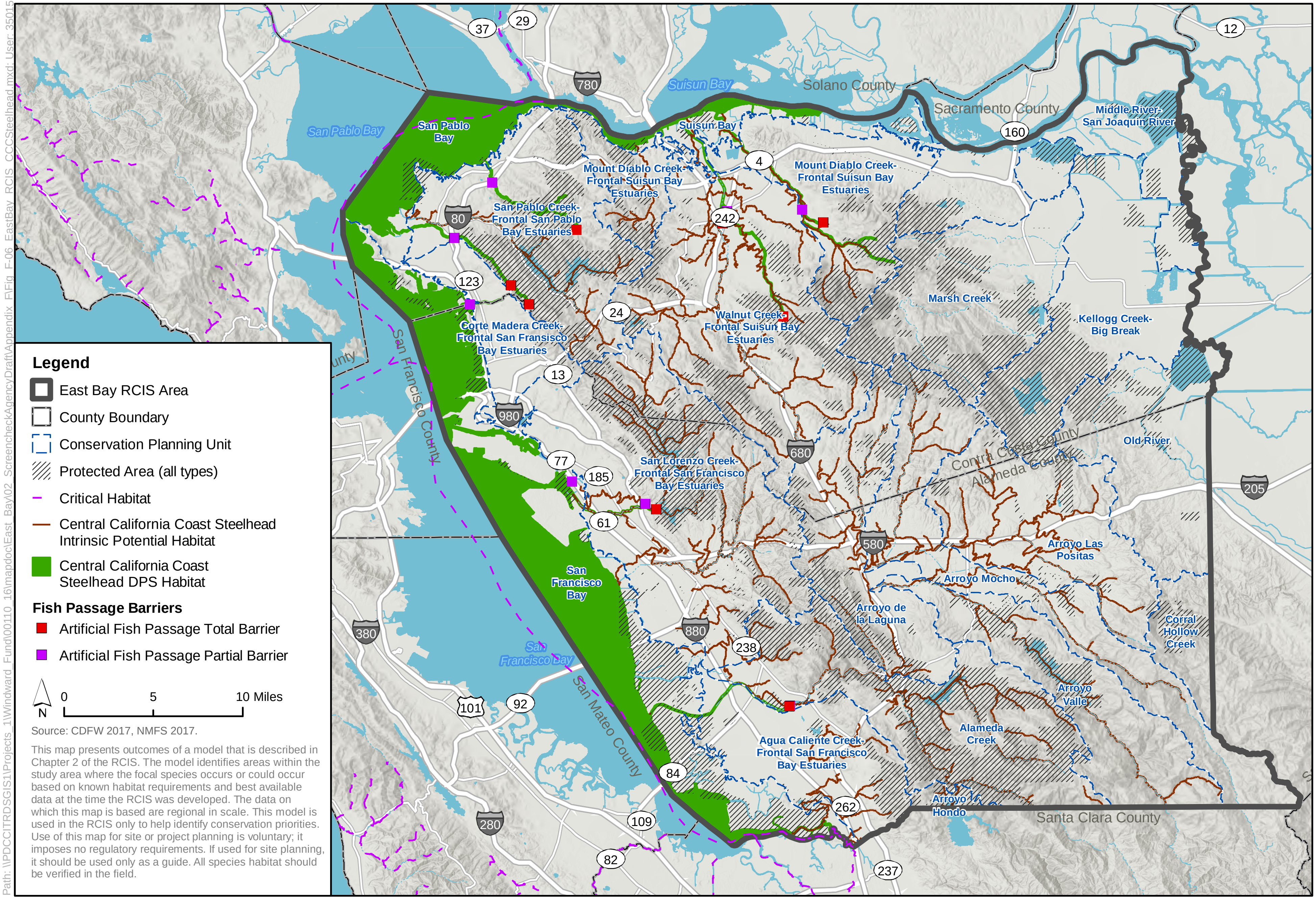
Access to potentially suitable spawning and rearing habitat is blocked by numerous barriers. Intrinsic potential habitat mapped by NMFS (National Marine Fisheries Habitat 2016) is used to model potentially suitable habitat, including habitat upstream of barriers to passage. Location and other information on fish passage barriers are from the California Fish Passage Assessment Database (CalFish 2017).

Rationale

Central California Coast steelhead use the RCIS area for migration, spawning, and rearing. Critical habitat primary constituent elements include: freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; freshwater rearing sites with adequate water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; forage supporting juvenile development and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks (National Marine Fisheries Service 2005).

Model Results

Figure F-6 displays the modeled habitat for Central California Coast steelhead within the RCIS area. The majority of suitable habitat is primarily limited to streams with perennial flow and suitable water temperatures downstream of reservoirs. Artificial and natural total barriers to passage represent the upstream limit of anadromous habitat in the RCIS area.



Source: CDFW 2017, NMFS 2017.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat should be verified in the field.

Figure F-6
Steelhead Trout (Central California Coast DPS) Habitat in the RCIS Area

F.7 Sacramento River Winter-run Chinook salmon (*Oncorhynchus tshawytscha*)

Regulatory Status

- ***State:*** Endangered
- ***Federal:*** Endangered
- ***Critical Habitat:*** Final critical habitat for Sacramento River winter-run Chinook salmon was designated on June 16, 1993 (58 *Federal Register* [FR] 33213–33219). Where designated, critical habitat includes the entire width of the stream channel defined by the ordinary high-water line (as defined by Corps in 33 Code of Federal Regulations [CFR] 329.11) or the bankfull elevation where the ordinary high-water line has not been defined.
- ***Recovery Planning:*** Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon, and Central Valley Spring-run Chinook Salmon, and the Distinct Population Segment of California Central Valley steelhead (National Marine Fisheries Service 2014)

Distribution

General

Sacramento River winter-run Chinook salmon is endemic to the Sacramento River and its upper tributaries. Historically, the species ranged from the mouth of the Sacramento River to the McCloud River in Siskiyou County. Its historical range has been minimized by major diversion dams near Redding and Red Bluff. Currently, spawning and rearing are limited to the Sacramento River below Keswick Dam as access to its original habitat is blocked by Keswick and Shasta Dams.

Within the RCIS area

Adult winter-run Chinook salmon is known to occur in the RCIS area (Contra Costa County), from December to July, when migrating through the San Francisco Estuary and up the Sacramento River to reach its spawning grounds (California Department of Fish and Wildlife, Natural Diversity Database 2017, National Marine Fisheries Service 2014). From November to July, emigrating juveniles occur in the RCIS area (Contra Costa County) when travelling through the San Francisco Bay, San Pablo Bay, and Suisun Bay estuaries to mature in the ocean. Critical habitat within the RCIS area encompasses the San Francisco Bay Estuary, to San Pablo Bay, and up to the mouth of the Sacramento River at Sherman Island.

Natural History

Chinook salmon exhibit two generalized freshwater life history types (Healey 1991). Stream-type adults enter fresh water months before spawning and juveniles reside in fresh water for a year or more following emergence, whereas ocean-type adults spawn soon after entering fresh water and juveniles migrate to the ocean as fry or parr in their first year. Winter-run Chinook salmon is somewhat anomalous in that it has characteristics of both stream- and ocean-type races (Healey 1991). Adults enter fresh water in winter or early spring, and delay spawning until spring or early summer (stream-type). The maximum suitable water temperature for holding is 59 to 60°F (National Marine Fisheries Service 2014). However, juvenile winter-run Chinook salmon migrate to sea after only 4 to 7 months of river life (ocean-type). Adequate instream flows and cool water temperatures are more critical for the survival of Chinook salmon exhibiting a stream-type life history due to over-summering by adults and/or juveniles.

Sacramento River winter-run Chinook salmon spawns during the summer months (late April through mid-August, peaking in June and July) between Keswick Dam and Red Bluff Diversion Dam (Vogel and Marine 1991). Spawning sites include those stream reaches with clean loose gravel, in swift, relatively shallow riffles or along margins of deeper river reaches (National Marine Fisheries Service 2014).

Sacramento River winter-run Chinook salmon fry begin to emerge from gravel in late June to early July and continue through October (Fisher 1994). Fry then seek lower velocity nearshore habitats with riparian vegetation and associated substrates important for providing aquatic and terrestrial invertebrates, predator avoidance, and slower velocities for resting (National Marine Fisheries Service 1996). This edge habitat also provides slower water velocities for resting (National Marine Fisheries Service 1996). As they grow larger, they will move into deeper water with higher velocities, but still need velocity refugia (Healey 1991). Emigrating juveniles pass the Red Bluff Diversion Dam beginning as early as mid-July, typically peaking in September, and can continue through March in dry years (Vogel and Marine 1991, National Marine Fisheries Service 2014). Many juveniles apparently rear in the Sacramento River below Red Bluff Diversion Dam for several months before they reach the Delta (Williams 2006). From 1995 to 1999, all outmigrating fry passed the Red Bluff Diversion Dam by October, and all outmigrating presmolts and smolts passed the Red Bluff Diversion Dam by March (Martin et al. 2001). Both spawning areas and migratory corridors also function as rearing habitat for juveniles, which feed and grow before and during their outmigration. Nonnatal, intermittent tributaries also may be used for juvenile rearing.

The majority of spawners are 3 years old. Adults tend to enter fresh water as sexually immature fish, migrate far upriver, and delay spawning for weeks or months. Prespawning activity requires an area of 200 to 650 square feet. The female digs a nest, called a redd, with an average size of 165 square feet, in which she buries her eggs after they are fertilized by the male (California Department of Fish and Game 1998).

Juveniles inhabit nearshore coastal marine waters for typically 2 to 4 years before adults return to Central Valley rivers to spawn. During their marine residence, Chinook salmon forage on krill, squid, and other marine invertebrates and a variety of fish such as northern anchovy, sardines, and Pacific herring.

Ecological Requirements

Sacramento River winter-run Chinook salmon requires conditions that support spawning habitat, freshwater rearing habitat, freshwater migration corridors, estuarine, and ocean habitat to complete their life cycle. Freshwater migration corridors should be free from obstructions (passage barriers and impediments to migration), provide favorable water quantity (instream flows) and quality conditions (National Marine Fisheries Service 2014), and contain natural cover such as submerged and overhanging large wood, native aquatic vegetation, large woody debris, rocks and boulders, side channels, and undercut banks. Migratory corridor conditions are strongly affected by the presence of passage barriers, which can include dams, unscreened or poorly screened diversions, and degraded water quality. Adults hold in pools for several months before spawning.

Estuarine migration and juvenile rearing habitats should be free of obstructions (i.e., dams and other barriers) and provide suitable water quality, water quantity (river and tidal flows), and salinity conditions to support juvenile and adult physiological transitions between fresh and salt water. Natural cover, such as submerged and overhanging large wood, native aquatic vegetation, and side channels, provide juvenile foraging habitat and cover from predators. Tidal wetlands and seasonally inundated floodplains have also been identified as high-value foraging and rearing habitats for juveniles migrating downstream through the estuary.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

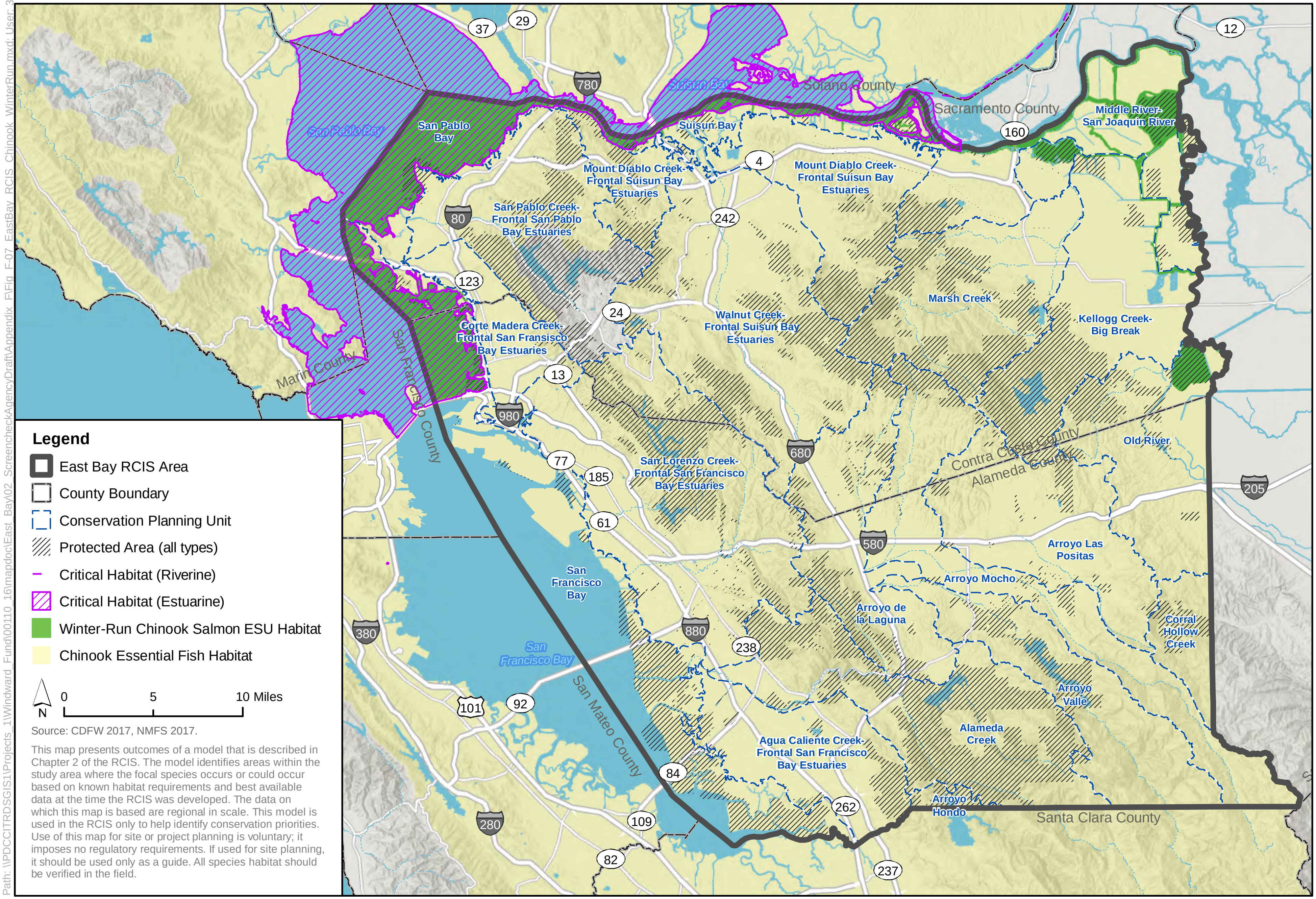
Designated critical habitat (National Marine Fisheries Service 1993) is used to model estuary habitat in San Francisco Bay, San Pablo Bay, and Suisun Bay. Critical habitat and habitat identified in the recovery plan are used to model migratory and rearing habitat in the northeastern portion of the RCIE area. Spawning habitat for winter-run Chinook salmon does not occur in the RCIS area.

Rationale

The primary constituent elements for designated critical habitat is freshwater and estuarine migratory habitat free of obstructions, have good water quality and quantity, and provide natural cover so fish can escape predators (National Marine Fisheries Service 1993).

Model Results

Figure F-7 displays the modeled habitat for Sacramento River winter-run Chinook salmon within the RCIS area. All suitable habitat for winter-run Chinook salmon is limited to the Delta and migratory pathways to and including the Bay waters.



Legend

- ▣ East Bay RCIS Area
- ☐ County Boundary
- ⬚ Conservation Planning Unit
- ▨ Protected Area (all types)
- – Critical Habitat (Riverine)
- ▨ Critical Habitat (Estuarine)
- 🟩 Winter-Run Chinook Salmon ESU Habitat
- 🟨 Chinook Essential Fish Habitat

N

0 5 10 Miles

Source: CDFW 2017, NMFS 2017.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat should be verified in the field.

Path: \\PDCCITRDSGIS1\Projects_1\Windward_Fund\00110_16\mapdoc\East_Bay\02_Screencheck\AgencyDraft\Appendix_F\Fig_F-07_EastBay_RCIS_Chinook_WinterRun.mxd; User: 35015; Date:

Figure F-7
Chinook Salmon (Sacramento River Winter-Run Chinook Salmon ESU) Habitat in the RCIS Area

F.8 California tiger salamander (*Ambystoma californiense*)

Regulatory Status

- ***State:*** Threatened
- ***Federal:*** Threatened
- ***Critical Habitat:*** Final critical habitat designated for California tiger salamander, central population (U.S. Fish and Wildlife Service 2005b).
- ***Recovery Planning:*** Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*) (U.S. Fish and Wildlife Service 2017b)

Distribution

General

California tiger salamander is endemic to California. It is distributed throughout grasslands and low foothill regions, up to 3,940 feet in elevation, though most are known from elevations below 1,500 feet (Shaffer et al. 2013). The Central California DPS of this species occurs in coastal regions across 32 counties from Butte County south to northeastern San Luis Obispo County, and the Central Valley, including the Sierra Nevada foothills. There are 1,050 CNDDB occurrences of this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 1,050 CNDDB occurrences, 341 (32.5%) are within the RCIS area. The majority of these occurrences are in the eastern half of the RCIS area; particularly near Los Vaqueros Reservoir, Round Valley Regional Preserve, Vasco Caves Regional Preserve, Altamont, Tassajara, and the Sunol and Ohlone Regional Wilderness areas. Critical habitat is within the RCIS area east of Doolan Canyon, between the cities of Dublin and Livermore.

Natural History

California tiger salamander uses aquatic and terrestrial habitats at different stages in its life cycle. Adults emerge from underground burrows to breed, but only for brief periods during the year. Adults migrate during rainy night between November and April, although migrating adults have been observed as early as October and as late as May (Trenham et al. 2001). Eggs are laid singly or in clumps on submerged and emergent vegetation and on submerged debris in shallow water. In ponds without vegetation, females lay eggs on objects on pond bottoms (Stebbins 1972, Shaffer and Fisher 1991, Barry and Shaffer 1994, Jennings and Hayes 1994). After breeding, adults leave breeding ponds and return to their refugia (e.g., small mammal burrows). After approximately two weeks, salamander eggs begin to hatch into larvae. Once larvae reach a minimum body size they metamorphose into terrestrial juvenile salamanders. The amount of time spent in the larval stage and the size of individuals at the time of metamorphosis is dependent on many factors. Larvae in small ponds develop faster, while larvae in larger ponds that retain water for a longer period tend to be larger at time of metamorphosis. At a minimum, ten weeks living in ponded water are needed to complete metamorphosis, but in general, development is completed in 3 to 6 months (Petranka 1998, U.S. Fish and Wildlife Service 2017b). If a pond dries prior to metamorphosis, larvae will desiccate and die (U.S. Fish and Wildlife Service 2000). Juveniles disperse from aquatic breeding sites to upland habitats after metamorphosis (Storer 1925, Holland et al. 1990).

Aquatic larvae feed on algae, small crustaceans, and small mosquito larvae for about six weeks after hatching (U.S. Fish and Wildlife Service 2000). Larger larvae feed on zooplankton, amphipods, mollusks, and smaller tadpoles of Pacific tree frogs (*Pseudacris regilla*), California red-legged frogs, western toads (*Anaxyrus boreas*) and western spadefoot toad (*Spea hammondii*) (Zeiner et al. 1988, U.S. Fish and Wildlife Service 2000). Adults eat earthworms, snails, insects, fish, and small mammals (Stebbins 1972).

Ecological Requirements

Adults breed and lay eggs primarily in vernal pools and other ephemeral ponds that fill in winter and often dry out by summer (Loredo et al. 1996); they sometimes use ephemeral and permanent human-made ponds (e.g., stock ponds), reservoirs, and small lakes that do not support predatory fish or bullfrogs (Stebbins 1972, U.S. Fish and Wildlife Service 2017b). Streams in riparian forests or woodlands are rarely used for reproduction, but this species has been reported in ditches with seasonal wetland habitat and in slow-flowing swales and creeks with riparian habitat (Alvarez et al. 2013).

California tiger salamander is particularly sensitive to the duration of ponding in aquatic breeding sites. Because of its long developmental period, the longest lasting seasonal ponds or vernal pools are the most suitable type of breeding habitat for this species; these pools are also typically the largest in size (Jennings and Hayes 1994). A minimum of 10 weeks are required to complete metamorphosis (Feaver 1971); however, four to five months is usually required (Shaffer and Trenham 2005). Aquatic sites suitable for breeding should pond or retain water for a minimum of 10 weeks. Optimum breeding sites are ephemeral and should dry down for at least 30 days before the rain being in the fall (around August or September) to prevent nonnative predators from establishing (U.S. Fish and Wildlife Service 2017b). The U.S. Fish and Wildlife Service (2017) states that, to remain viable, California tiger salamander populations require at least four ponds on preserves of no less than 3,398 acres, and that the ponds should have variation in depth and ponding duration so that at least some fill during different environmental conditions (e.g., low annual rainfall).

Suitability of habitat is proportional to the abundance of upland refuge sites are near aquatic breeding sites. This species primarily uses California ground squirrel (*Otospermophilus beecheyi*) burrows as refuge sites (Loredo et al. 1996, Trenham and Shaffer 2001), as well as Botta's pocket gopher burrows (Barry and Shaffer 1994, Jennings and Hayes 1994) and man-made structures. California tiger salamander also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990). The presence and abundance of California tiger salamander in many areas is limited by the number of small-mammal burrows available. Loredo et al. (1996) emphasized the importance of California ground squirrel burrows as refugia, and suggested that a commensal relationship exists between California tiger salamander and California ground squirrel, with California tiger salamander benefiting from the burrowing activities of California ground squirrels. In a study conducted near Concord, California, Loredo et al. (1996) found that California ground squirrel burrows were used almost exclusively as refuge sites by California tiger salamanders.

The proximity of refuge sites to aquatic breeding sites also affects the suitability of salamander habitat. California tiger salamander is known to travel distances up to 1.54 miles from breeding sites (Searcy and Shaffer 2011) and tend to live between approximately 100 yards and 1.16 mile from breeding sites, with an average (50%) migration distance of 0.35 mile (Searcy and Shaffer 2011). Based on capture data from a single-season study at Olcott Lake in Jepson Prairie Preserve (Solano County), Trenham and Shaffer (2005) estimated that 95 percent of adults and subadults occurred within approximately 0.4 mile of the breeding pond. However, their model also suggested that 85 percent of subadults were concentrated between 0.1 and 0.4 mile from the pond. During a 5-year study of a proposed housing development in the northwestern Contra Costa County, Orloff (2011) recorded the majority of captured individuals at least 0.5 mile from the nearest breeding pond, and continuing work at Olcott Lake has documented a few individuals moving up to 0.6 mile from the pond (Trenham pers. comm. in Orloff 2011). Therefore, although individuals may migrate up to 1.4 miles from breeding sites, migration distances are likely to be less in areas supporting refugia closer to breeding sites. Habitat complexes that include upland refugia relatively close to breeding sites are considered more suitable because predation risk and physiological stress probably increases with migration distance.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The California tiger salamander habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). Modeled potential breeding habitat within the RCIS area includes all wetland and pond natural community types, (excluding the aquatic-unnatural and reservoir land cover types) that occur below 3,600 feet in elevation. Modeled potential upland habitat extends 1.3 miles around all areas designated as breeding habitat (ICF International 2012), excluding all baylands, agriculture and urban natural communities. The model also excludes, bay flats, and Delta ecoregions to remove saline aquatic habitats.

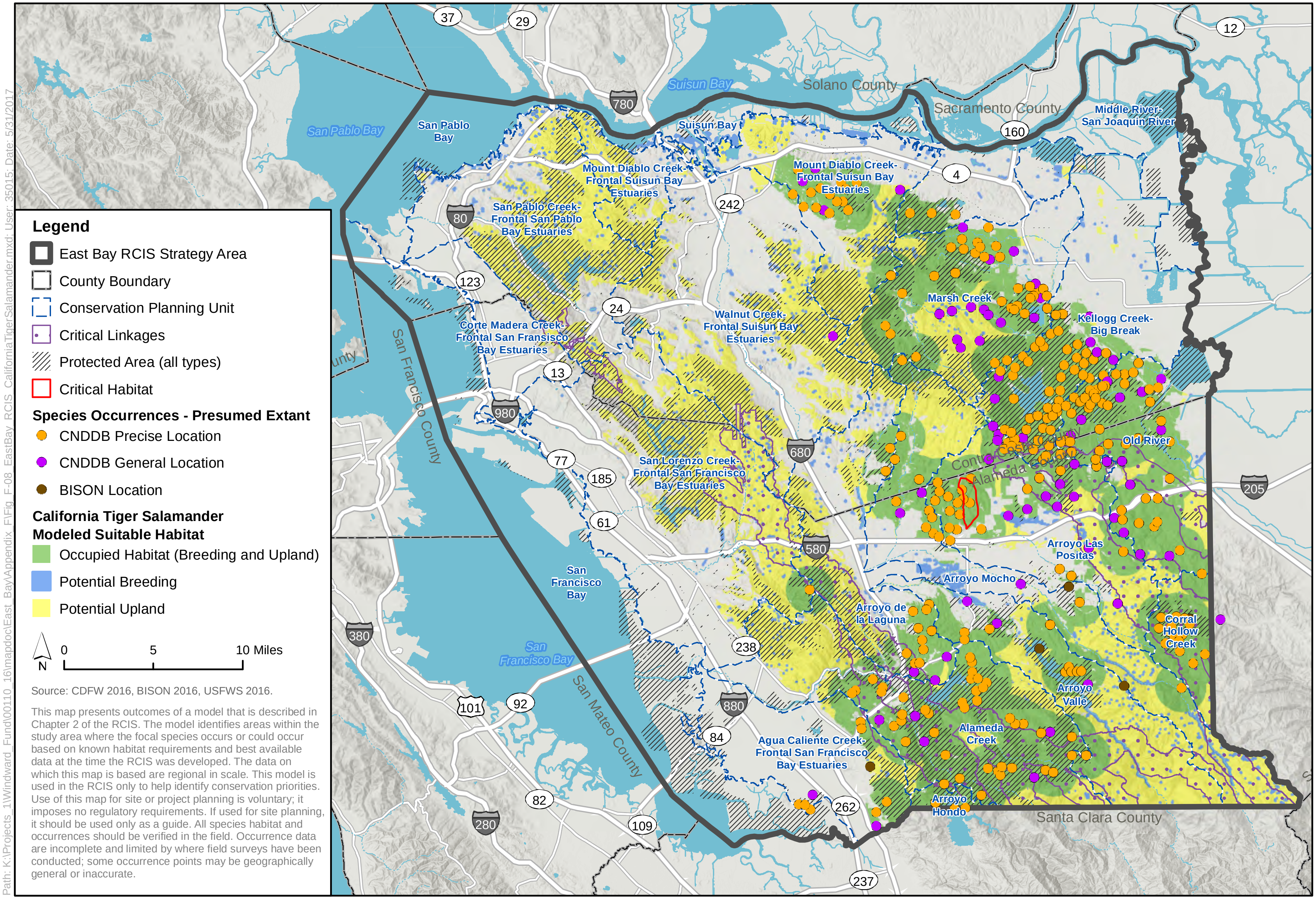
In addition to the potential breeding and upland habitat, occupied habitat is modeled by buffering 1.3 miles around extant California tiger salamander CNDDB records. Only the suitable aquatic breeding and upland refugia land cover types described above are included as occupied habitat. This method for modeling occupied habitat is similar to the methodology used to display occupied habitat in the recovery plan for this species (U.S. Fish and Wildlife Service 2017b).

Rationale

California tiger salamander requires two major habitat components: aquatic breeding sites and upland or refuge sites. California tiger salamander inhabits valley and foothill grasslands and the grassy understory of open woodlands, usually within 1.3 miles of water and a maximum elevation of 3,940 feet (U.S. Fish and Wildlife Service 2017b, ICF International 2012). California tiger salamander breeds and lays eggs primarily in vernal pools and other ephemeral ponds that fill in winter and often dry out by summer (Loredo et al. 1996); it sometimes uses permanent human-made ponds (e.g., stock ponds), reservoirs, and small lakes that do not support predatory fish or bullfrogs (Stebbins 1972; Zeiner et al. 1988). Streams are rarely used for reproduction.

Model Results

Figure F-8 displays the modeled habitat for California tiger salamander within the RCIS area. The model output identifies potential breeding habitat, potential upland habitat, and occupied habitat based on known records and the dispersal distances the species is known to travel. Suitable habitat is modeled throughout the undeveloped lands in the RCIS area, primarily due to the even distribution of aquatic habitat in the non-urban portions of the RCIS area. The known occurrences and designated critical habitat areas are shown within the modeled habitat. Aquatic breeding habitat in the RCIS area may be under-mapped, due to the seasonal nature of some aquatic breeding habitat. Site-specific conditions should be surveyed to determine whether habitats on the site would support California tiger salamander.



Source: CDFW 2016, BISON 2016, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-8
California Tiger Salamander Modeled Suitable Habitat

F.9 Foothill yellow-legged frog (*Rana boylii*)

Regulatory Status

- ***State:*** Candidate Threatened
- ***Federal:*** Under review. Petitioned action may be warranted
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Foothill yellow-legged frog is found throughout Northern California, west of the Cascades and Sierra Nevada ranges and south to Kern County at elevations from sea level to 4,500 feet. It is estimated that the species currently occupies only 45% of its historical range in California (Thomson et al. 2016). Larger populations are still found from the Oregon border south to Sonoma County. Populations are scattered at remnant locations from Sonoma County south to the Salinas River watershed, coastal Big Sur, and San Luis Obispo watershed (San Luis Obispo County). There are 873 CNDDB occurrences of this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 873 CNDDB occurrences, 11 (1.3%) are within the RCIS area. The majority of the occurrences within the RCIS area are located in the Cedar Mountain Ridge area of Alameda County.

Natural History

Foothill yellow-legged frog occurs in perennial rocky stream and rivers with sunny banks and deep shaded pools, can be found in smaller tributaries and nearby uplands during high flow events (Bourque 2008, Leidy et al. 2009, Thomson et al. 2016). Masses of eggs are attached to gravel or rocks in moving water near stream margins (Zeiner et al. 1988). In California, this species generally breeds between March and early June (Storer 1925, Grinnell et al. 1930, Wright and Wright 1949, Jennings and Hayes 1994).

Breeding and oviposition occur at margins in relatively wide shallow channel sections, where microhabitats experience decreased variation of flows (Thomson et al. 2016). In a study on the Eel River along the northern coast of California, individuals chose sites to lay eggs and timed egg laying to avoid fluctuations in river stage and current velocity associated with changes in river discharge (Kupferberg 1996). This suggests that stable flow and current velocities are important to create suitable reproductive sites. After oviposition, a minimum of approximately fifteen weeks is required to reach metamorphosis, which typically occurs between July and September (Storer 1925, Jennings 1988). Larvae reach sexual maturity in one to two years in males and two to three years in females (Thomson et al. 2016).

Radiotelemetry studies have uncovered insights into general terrestrial movements (Thomson et al. 2016). In several studies, travel rates range from 100 to 1386 meters/day (328 to 4547 feet/day) with females moving father than males. The average distance from water was less than 3 meters (10 feet) in all seasons, although adults occasionally used upland habitat up to 40 meters (approximately 131 feet) from streams for winter refugia to avoid floods following large rain events (Bourque 2008, Thomson et al. 2016).

Ecological Requirements

Foothill yellow-legged frog requires shallow, flowing water in small to moderate-sized streams with at least some cobble-sized substrate (Jennings 1988, Bourque 2008, Thomson et al. 2016). This habitat is believed to favor oviposition (Storer 1925, Fitch 1938, Zweifel 1955) and refuge habitat for larvae and postmetamorphs (Hayes and Jennings 1988, Jennings 1988). Foothill yellow-legged frog is usually absent from habitats where introduced aquatic predators, such as various fishes and bullfrogs, are present (Hayes and Jennings 1988, Kupferberg 1996, Thomson et al. 2016). Typical breeding and egg deposition occurs in stream habitat that has little to no slope (U.S. Forest Service 2011). The species deposits its egg masses on the downstream side of cobbles and boulders over which a relatively thin, gentle flow of water exists (Storer 1925, Fitch 1936, Zweifel 1955, Kupferberg 1996). The timing of oviposition typically follows the period of high-flow discharge from winter rainfall and snowmelt (Jennings and Hayes 1994, Kupferberg 1996). The embryos have a critical thermal maximum temperature of 79°F (Zweifel 1955).

Diet of the larval stage appears to be herbivorous with a preference for algae with epiphytic diatoms, while metamorphs and adults are known to ingest terrestrial and aquatic insects. Thus, the abundance of floating algae indicates the quality of larval food resources (Thomson et al. 2016).

A diversity of overstory habitat types are suitable for both breeding and upland refugia habitat, including hardwood forest, conifer forest, chaparral, riparian, and wet meadows. Individuals favor habitat with more than 20% shading, but generally don't occur areas with too much cover (greater than 90%), likely due to a lack of basking sites (Hayes and Jennings 1988, Jennings 1988). This species prefers low to moderate stream gradients, particularly for breeding (Smith pers. comm., as cited in Hayes et al. 2016), but during the non-breeding season juvenile and adults may migrate to higher gradient streams.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The foothill yellow-legged frog habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). Model parameters are intended to capture habitat associations as well as the hydrodynamic features that create the most suitable in stream conditions for foothill yellow-legged frog. Modeled habitat is classified as breeding and foraging habitat, and low-use habitat. Modeled habitat includes a 165-foot buffer around rivers and streams associated with the following communities: conifer forests, woodlands, riparian woodlands, and shrublands.

Breeding/Foraging Habitat: All land cover types in conifer forest, riparian woodland and woodland natural communities, as well as alkali grassland, annual grassland and serpentine grassland within

165 feet of primary streams. Primary Streams are named perennial and intermittent streams above reservoirs with slopes ranging from 0-11%.

Low-use Habitat: All land cover types in riparian woodland and woodland natural communities, as well as alkali grassland, annual grassland and serpentine grassland within 165 feet of secondary streams. Secondary streams are named perennial and intermittent streams above reservoirs with slopes ranging from 11-18%.

Rationale

Foothill yellow-legged frog is a stream-dwelling amphibian that requires shallow, flowing water, in perennial streams containing riffles with cobble sized or larger substrate, typically with low gradients (Jennings 1988, H.T. Harvey and Associates 1999, U.S. Forest Service 2011, Thomsen et al. 2016). The species has been documented up to 165 feet from water (Zeiner et al. 1988). A buffer of 165-feet around all breeding and foraging habitat is considered upland habitat. This species typically uses streams with slopes of lower gradient (e.g., < 6.5%) (Kupferberg 1996, Ibis Environmental Inc. 2003). Sections of streams with low gradient slopes are identified as potential breeding or foraging habitat. Using a range of slopes below 6.5% did not include many stream lengths known to be occupied by foothill yellow-legged frog. The range of slope had to be expanded to 0-11% to capture occupied stream lengths. The use of apparently higher slope streams to identify breeding and foraging habitat is likely an artifact of the slope data (e.g., inaccuracies), rather than a true reflection of the slopes of streams used by foothill-yellow legged frog for breeding and foraging.

Moderate gradient streams (11-18 % slope) are classified as low-use habitat. Because the RCIS slope data appear to overestimate the slopes of streams, the streams identified as low-use are overlaid onto the RCIS stream layer to identify a range of slope in the RCIS slope data that characterizes streams defined as low-use. By including streams that haven’t had occupancy confirmed, we compensate for under-surveyed areas. Although low-use habitat (moderate gradient streams or rivers) may not support the species and likely have fewer conservation opportunities for this species, those areas are retained in the model because occurrences have been documented in such habitat.

Model Results

Figure F-9 displays the modeled habitat for foothill yellow-legged frog within the RCIS area. The model identifies breeding/foraging habitat and low-use habitat. Breeding/foraging habitat consists of areas most likely to support breeding activities typically found in wider, slow moving sections of rivers and streams with boulder, cobble, and gravel deposits associated with low and moderate gradient slopes. Low-use habitat captures segments of the rivers and streams that would most likely be used for movement between suitable breeding habitats in the same watersheds. Because of the fluctuation in flow rates found along the rivers and streams, primary and secondary habitats may shift locations both within and between years. Site-specific conditions should be surveyed to determine whether habitats on the site would support foothill yellow-legged frog.

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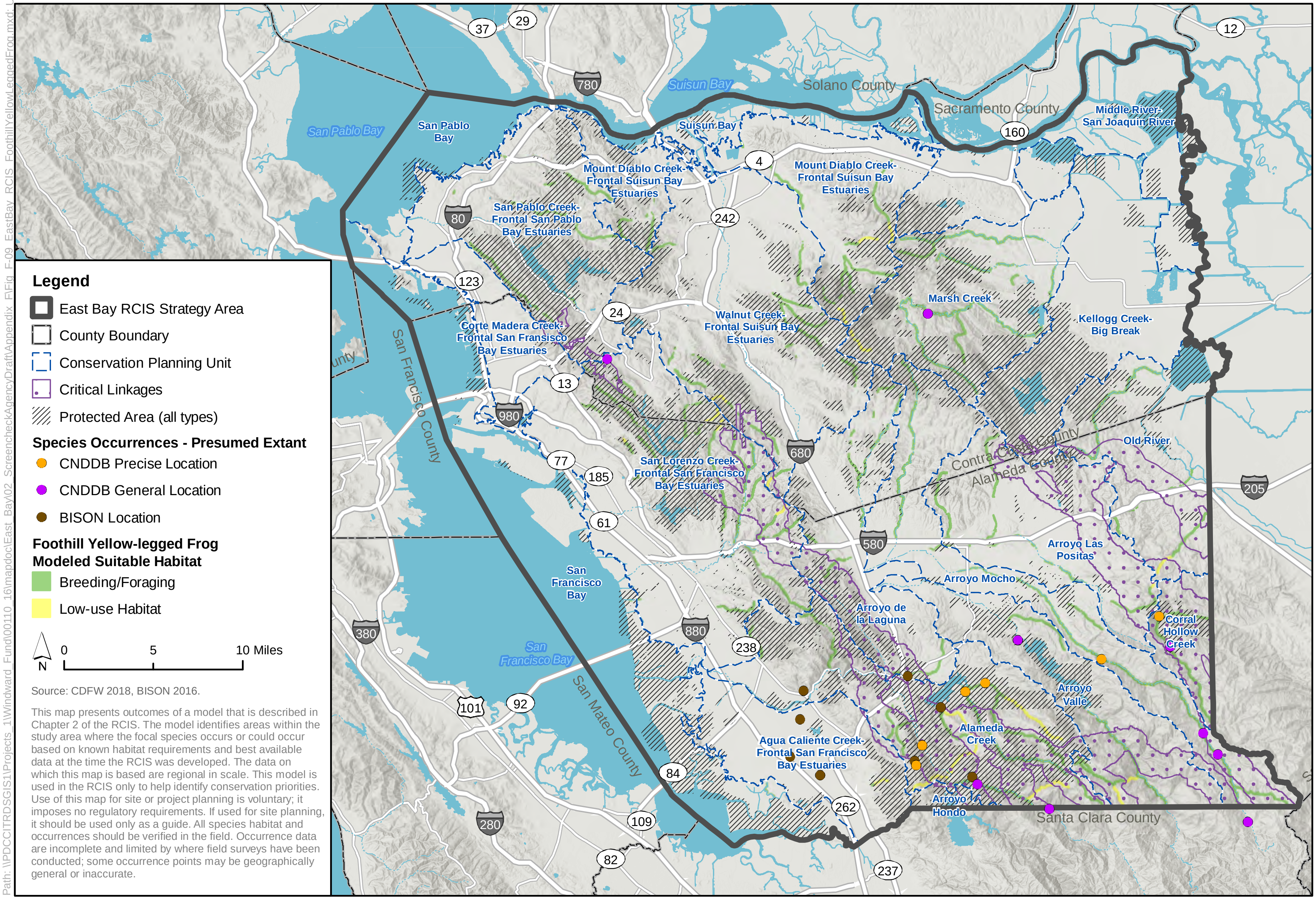


Source: CDFW 2018, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-9
Foothill Yellow-legged Frog Modeled Suitable Habitat

F.10 California red-legged frog (*Rana draytonii*)

Regulatory Status

- ***State:*** Species of Special Concern
- ***Federal:*** Threatened
- ***Critical Habitat:*** Final revised critical habitat designation for California red-legged frog (U.S. Fish and Wildlife Service 2010a)
- ***Recovery Planning:*** Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*) (U.S. Fish and Wildlife Service 2002)

Distribution

General

California red-legged frog is endemic to California and Baja California, Mexico, at elevations ranging from sea level to approximately 5,000 feet. It has been extirpated from 70% of its former range including the floor of the Central Valley, and now is found primarily in coastal drainages of central California, from Marin County, California, south to northern Baja California (U.S. Fish and Wildlife Service 2002). Currently, populations are known from the San Francisco Bay Area and Coast Ranges, in addition to declining populations in the Transverse and Peninsular Ranges, though it is absent from a large portion of its range. Very few populations are now known from Ventura, Los Angeles, and Riverside Counties (Thomson et al. 2016). There are a total of 1,404 CNDDB occurrences within the species' range (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 1404 CNDDB occurrences, 359 (25.6%) are within and clustered around designated critical habitat, which encompasses a significant amount of the RCIS area. The densest area with occurrences is near the Round Valley and Vasco Caves Regional Preserves, which are located between the cities of Livermore (Alameda County) and Brentwood (Contra Costa County).

Natural History

California red-legged frog breeds from November through April (Storer 1925, U.S. Fish and Wildlife Service 2002). Males usually appear at the breeding sites 2 to 4 weeks before females. Females are attracted to calling males. Females lay egg masses containing about 2,000 to 5,000 eggs, which hatch in 6 to 14 days, depending on water temperatures (U.S. Fish and Wildlife Service 2002). Those eggs develop into tadpoles in 20–22 days. Larvae metamorphose in 3.5 to 7 months, typically between July and September (Storer 1925, Wright and Wright 1949, U.S. Fish and Wildlife Service 2002, Thomson et al. 2016). Males usually attain sexual maturity at 2 years of age and females at 3 years of age.

This species consumes a wide variety of prey. Adult frogs typically feed on aquatic and terrestrial insects, crustaceans, and snails (Stebbins 1985, Hayes and Tennant 1985), as well as worms, fish, tadpoles, smaller frogs (e.g., *Pseudacris regilla*), and occasionally mice (*Peromyscus* spp.) (U.S. Fish and Wildlife Service 2002). Aquatic larvae are mostly herbivorous algae grazers (Jennings et al.

1992). Feeding generally occurs along the shoreline of ponds or other watercourses and on the water surface. Juveniles appear to forage during both daytime and nighttime, whereas subadults and adults tend to feed more exclusively at night (Hayes and Tennant 1985).

During summer, adults disperse from breeding habitat to forage and seek summer habitat if water is not available (U.S. Fish and Wildlife Service 2002). Individuals may move over 2 miles up or down drainages from breeding sites (Rathbun et al. 1993). Dispersing frogs have been recorded to cover distances from 0.25 mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger 1998). These dispersal movements are generally straight-line, point-to-point migrations rather than following specific habitat corridors. Dispersal distances are believed to depend on the availability of suitable habitat and prevailing environmental conditions. On rainy nights, individuals may roam away from aquatic sites as much as one mile. Individuals often move away from water after their first winter and disperse in response to receding water, which often occurs during the driest time of the year (U.S. Fish and Wildlife Service 2005c, Thomson et al. 2016).

Ecological Requirements

California red-legged frog is found in a variety of aquatic habitats, mostly commonly in lowlands and foothills in streams, creeks, stock ponds, freshwater marshes, and lagoons (U.S. Fish and Wildlife Service 2002). Breeding sites include a variety of aquatic habitats—larvae, tadpoles, and metamorphs use streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons (Thomson et al. 2016). Breeding adults are commonly found in deep (more than 2 feet) still or slow-moving water with dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988). Adults have also been observed in shallow sections of streams that are not shrouded by riparian vegetation (Thomson et al. 2016). Generally, streams with high flows and cold temperatures in spring are unsuitable for eggs and tadpoles. Stock ponds are frequently used if ponds are managed to provide suitable hydroperiod, pond structure, vegetative cover, and control of nonnative predators (Stebbins 2003, Thomson et al. 2016). Riparian corridors provide cool moist soil under shrubs or other vegetation where frogs can find refuge.

Upland dispersal habitat may include shelter under boulders, rocks, logs, industrial debris, agricultural drains, watering troughs, abandoned sheds, or hayricks. Individuals will also use small mammal burrows, incised streamed channels, or areas with moist leaf litter up to 300 feet from water any time of year and can be encountered in smaller, even ephemeral bodies of water in a variety of upland settings (Jennings and Hayes 1994, U.S. Fish and Wildlife Service 2002).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The California red-legged frog habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). Model parameters for California red-legged frog are intended to capture breeding, refugia, and dispersal habitat. Breeding habitat includes all wetland and pond land cover types (excluding the reservoir and aquatic-unnatural land cover types) within conifer forest, cultivated agriculture, grassland, woodland, riparian woodland, and shrubland land cover types. To capture refugia habitat, a 100-foot buffer is applied to all breeding habitat. Dispersal habitat includes all suitable land cover types within a 2-mile buffer of the breeding habitat, which includes all of the land cover types in the conifer forest, cultivated agriculture, grassland, riparian woodland, and shrublands natural communities. The model also excludes the bay terraces/lower Santa Clara Valley, bay flats, and Delta ecoregions to remove saline aquatic habitats.

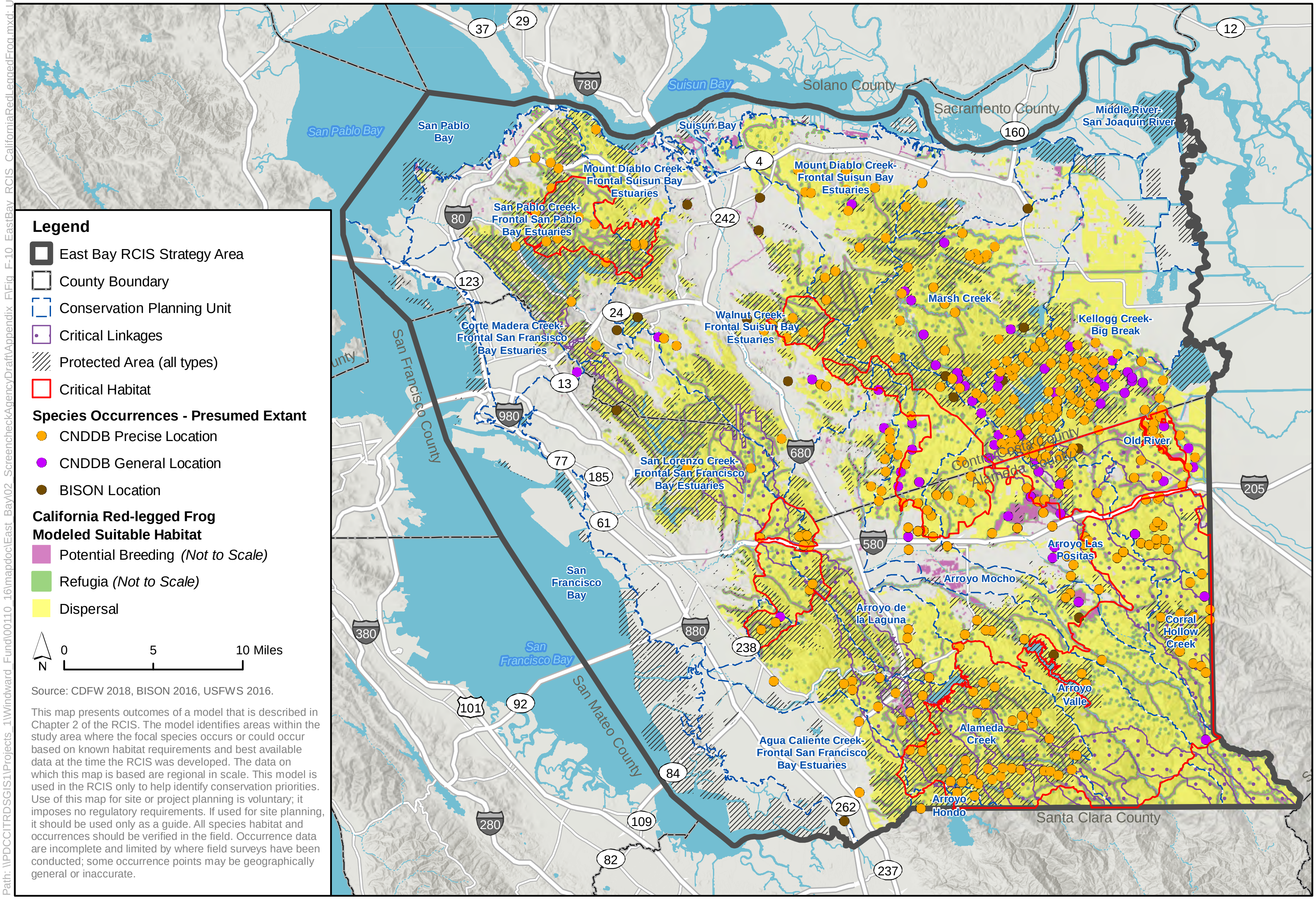
Rationale

Breeding habitat: Breeding sites used by adults include a variety of freshwater aquatic habitats (Stebbins 1985, Hayes and Jennings 1988, U.S. Fish and Wildlife 2010a, Thomson et al. 2016). Larvae, tadpoles, and metamorphs use streams, deep pools, backwaters within streams and creeks, ponds (including stock ponds), and marshes. Breeding adults are commonly found in deep (more than 2 feet), still or slow-moving water with dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988). Adult frogs have also been observed in shallow sections of streams that are not shrouded by riparian vegetation. Generally, streams with high flows and cold temperatures in spring are unsuitable for eggs and tadpoles. All existing ponds and streams surrounded by undeveloped land (i.e., non-urban areas) within the RCIS area are, therefore, considered potential suitable breeding habitat (ICF International 2012).

Dispersal and refugia habitat: Individuals may move over 2 miles up or down drainages from breeding sites and have been observed using adjacent riparian woodlands up to 100 feet from the water (Rathbun et al. 1993). As ponds dry out, individuals disperse from breeding sites to other areas with water or to temporary shelter or aestivation sites. For this reason, all grassland, shrublands, woodland, riparian woodland, and conifer forest land cover types within 100 feet of primary habitat are characterized as upland refugia. Dispersing individuals have been recorded to cover distances from 0.25 mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger 1998). This habitat may include small mammal burrows, incised stream channels, shelter under boulders, rocks, logs, leaf litter, agricultural drains, watering troughs, abandoned sheds, or unused farm equipment (Jennings and Hayes 1994, Thompson 2016). Dispersal and migration movements may be along long-established historic migratory pathways that provide specific sensory cues that guide the seasonal movement of the frogs (Stebbins 2002). Dispersal distances are believed to depend on the availability of suitable habitat and prevailing environmental conditions. However, because the actual movement patterns in these habitats are generally not known, the model conservatively estimates that all grassland, shrublands, woodland, riparian woodland, conifer forest, and cultivated agriculture land cover types beyond 100 feet but within a radius of two miles from all potential breeding sites are potential migration and/or aestivation habitat (ICF International 2012).

Model Results

Figure F-10 displays the modeled breeding, refugia, and dispersal habitat for California red-legged frog within the RCIS area. Suitable habitat is modeled throughout the undeveloped lands in the RCIS area, primarily due to the even distribution of aquatic habitat in the non-urban portions of the RCIS area.



Source: CDFW 2018, BISON 2016, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-10
California Red-legged Frog Modeled Suitable Habitat

F.11 Northern California legless lizard (*Anniella pulchra*)

Regulatory Status

- ***State:*** Species of Special Concern
- ***Federal:*** None
- ***Critical Habitat:*** *N/A*
- ***Recovery Planning:*** *N/A*

Distribution

General

The Northern California legless lizard is endemic to California (Parham and Papenfuss 2013). The species ranges from Antioch in Contra Costa County south through the Coast and Transverse ranges. Similar species within the same genus *Anniella*, collectively called "California legless lizards" were considered conspecific until recently. California legless lizards occur in the Peninsular Ranges, along the western edge of the Sierra Nevada, and parts of the San Joaquin Valley and Mojave Desert to El Consuelo in Baja California (Hunt 1983, Thomson et al. 2016). California legless lizards range extends from near sea level on the Monterey Peninsula to approximately 6,000 feet above sea level in the Sierra Nevada foothills. There are 93 CNDDB occurrences of these species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 93 CNDDB occurrences, eight (8.6%) are of Northern California legless lizard within the RCIS area. The occurrences are all in Contra Costa County, concentrated around the Cities of Antioch and Oakley. One occurrence is within the Antioch Dunes National Wildlife Refuge; others are in the developed areas surrounding the refuge (California Department of Fish and Wildlife, Natural Diversity Database 2017).

Natural History

Northern California legless lizard is a small, slender lizard with eyelids but no legs, smooth shiny scales, and a blunt tail. This lizard can be confused with a snake, but snakes have no eyelids (Papenfuss and Parham 2013).

Northern California legless lizard lives mostly underground, burrowing in loose sandy soil. Individuals are active mostly during the morning and evening, where they may be found resting just below warmed surface substrate or foraging beneath the surface of loose soil or leaf litter which has been warmed by the sun (Papenfuss and Parham 2013, Thomson et al. 2016)); however, individuals have been found above ground at night when substrate temperatures remain warm (> 70°F) for extended durations (Jennings and Hayes 1994). Legless lizards can tolerate low temperatures, compared to other California lizards, which allows activity in cool conditions (Papenfuss and Parham 2013), consistent with the behavior of fossorial lizards not known to bask in direct sunlight.

Northern California legless lizard forages in loose soil, sand and leaf litter during the day. Both adult and juvenile lizards are insectivorous and feed primarily on larval insects, beetles, termites, and spiders. The lizards hunt by hiding beneath leaf litter or substrate and ambushing its prey (Thomson et al. 2016).

Legless lizards are live-bearing and breed in early spring to July. Litters consist of 1 to 4 young, typically two, born between September and November, after a gestation period of 4 months (Jennings and Hayes 1994). Young do not reach sexual maturity until 2 to 3 years and females may not reproduced every year (Goldberg and Miller 1985). Individuals appear to show high site fidelity over the short term; marked legless lizards have been recaptured less than 33 feet from their original capture location after a period of 2 months (Miller 1944); however, movement ecology of the legless lizard is generally unknown.

Ecological Requirements

Northern California legless lizard is restricted to habitats with sandy or loose loamy soils such as under sparse vegetation of coastal sand dunes, chaparral, pine-oak woodland, open grassland, desert scrub, or near sycamores, cottonwoods, or oaks that grow on stream terraces (Gorman 1957, Stebbins 1985, Thomson et a. 2016). The species is often found under or close to logs, rocks, old boards, and the compacted debris of woodrat nests (Jennings and Hayes 1994, Papenfuss and Parham 2013). Rocky soils or areas disturbed by agriculture, sand mining, or other human uses are not suitable habitat (Miller 1944, Bury 1972, Hunt 1983, Stebbins 1985). Soil moisture is essential for legless lizards to conserve energy at high temperatures; it also allows shedding to occur (Jennings and Hayes 1994).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The Northern California legless lizard model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) Modeled habitat includes all land cover types in the grassland, shrublands, and woodland natural communities, as well as several of the several of the cultivated agriculture land cover types, including cropland, orchard, and vineyard. These land cover types are limited to soil map units that contain any percentage of sandy or sandy loam soils. The model also excludes habitat outside of the following outside of the following three (Hydrologic Unit Code [HUC] 12) subwatersheds: Dutch Slough-Big Break, Lower Marsh Creek, and Markley Canyon-San Joaquin River.

Rationale

Northern California legless lizard occurs primarily in areas with sandy or loose loamy soils where those soil are present, across an array of land cover types (Jennings and Hayes 1994, Stebbins 2003). The sandy loam soils of stabilized dunes, referred to locally as “sand mounds,” seem to be especially favorable habitat (Bettelheim and Thayer 2006). Because legless lizards can occur in some developed areas where naturally sandy soils are present (Thomson et al. 2016, Bettelheim pers. comm.), agricultural and semi-natural developed cover types (nonnative woodland and turf) underlain by sandy or loose loamy soils are included in the model.

Model Results

Figure F-11 displays the modeled habitat for Northern California legless lizard within the RCIS area. The model output identifies small, scattered patches of habitat in eastern Contra Costa County in the northeastern corner of the RCIS area. The modeled habitat is highly fragmented because most of the potential habitat exists within a larger matrix of urban development.

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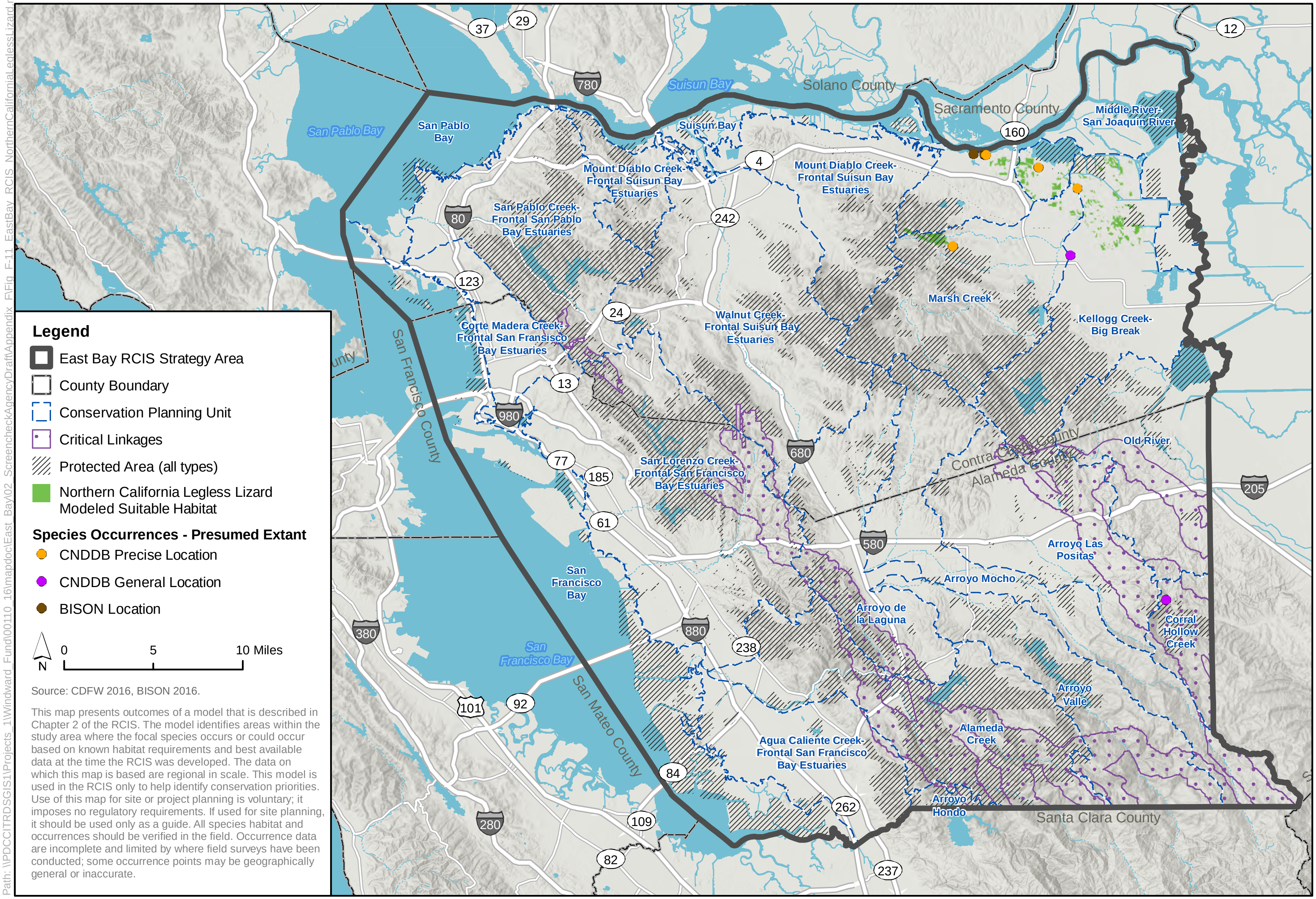

Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-11
Northern California Legless Lizard Modeled Suitable Habitat

F.12 Alameda whipsnake (*Masticophis lateralis euryxanthus*)

Regulatory Status

- ***State:*** Threatened
- ***Federal:*** Threatened
- ***Critical Habitat:*** Final designation of critical habitat for Alameda whipsnake (U.S. Fish and Wildlife Service 2006b)
- ***Recovery Planning:*** Draft Recovery Plan for Chaparral and Scrub Community Species East of Bay, California (U.S. Fish and Wildlife Service 2003)

Distribution

General

Alameda whipsnake is a subspecies of the California whipsnake (*Masticophis lateralis*). Alameda whipsnake's range is restricted to the inner Coast Ranges in western and central Contra Costa and Alameda Counties (U.S. Fish and Wildlife Service 2000a). The historical range of the Alameda whipsnake has been fragmented into five disjunct populations (U.S. Fish and Wildlife Service 2003): Tilden–Briones, Oakland–Las Trampas, Hayward–Pleasanton Ridge, Sunol–Cedar Mountain, and the Mount Diablo–Black Hills (U.S. Fish and Wildlife Service 2003). There are 164 CNDDB occurrences for this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 164 CNDDB occurrences, 164 (100%) are within the RCIS area[2]. Occurrences are throughout both Contra Costa and Alameda Counties within or near designated critical habitat. Critical habitat for this species consists of large swaths of land that run northwest to southeast within the RCIS area.

Natural History

Adult Alameda whipsnakes are active primarily during the spring mating season and during late summer and early fall. Courtship and breeding commence soon after emergence from winter hibernacula in March (Swain 1994). Mating occurs from late March through mid-June (U.S. Fish and Wildlife Service 2000). Whipsnakes lay a clutch of 6 to 11 eggs (Stebbins 2003), probably in loose soil or under logs or rocks (Zeiner et al. 1988). Egg incubation lasts about 3 months and young appear in late summer and fall, from August to November (Swaim 1994). According to Swaim (1994), females will use grassland habitat for egg laying and males use grassland during the mating season in spring (U.S. Fish and Wildlife Service 2006b). Little else is known about habitat requirements for breeding and egg laying (Zeiner et al. 1988). Swaim (1994) documented that courtship and mating occur near the female's hibernaculum. During the breeding season, males

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[2] Because all 164 occurrences are mapped to the 22 7.5 minute quadrangles within the RCIS area, the occurrences are stacked on top of each other, and there only appears to be 22 points.

exhibit more movement throughout their home range, while females remain sedentary from March until egg laying (Swaim 1994). The snakes generally retreat into winter hibernacula from November through March; however, short, above-ground activity such as basking in the immediate vicinity of the hibernaculum may occur during this time (U.S. Fish and Wildlife Service 2011).

Home-range size for males in Alameda and Contra Costa counties vary in size from 4.7 to 21.5 acres (mean = 13.5 acres). Home-range size for females was 7.2 and 9.6 acres (Swaim 1994). When movements of individual snakes were monitored (2 males and 1 female), results indicated that individuals have more than one core area (are of concentrated use) and most of the home range was not used. Both males and females repeatedly returned to core retreat areas within their home range after intervals of non-use. These snakes exhibited overlap in use of these relatively large home ranges, and there was no evidence of territorial behavior (Swaim 1994).

A daytime predator and forager, whipsnakes prey upon a variety of vertebrate species, including frogs, lizards, nestling birds, and rodents (Zeiner et al. 1988). Studies indicate that the Alameda whipsnake prefers lizard prey and may be a feeding specialist (Swaim 1994). Occupied areas usually support a prey base of at least two lizard species, especially the western fence lizard (*Sceloporus occidentalis*) (Stebbins 2003), and whipsnake populations thrive when lizards are abundant (McGinnis 1992, as cited in U.S. Fish and Wildlife Service 2002). Alameda whipsnake is semi-arboreal and can escape into or hunt within shrubs or trees (U.S. Fish and Wildlife Service 2011).

Ecological Requirements

The Alameda whipsnake occurs primarily in large patches of coastal scrub and chaparral communities, but also forages in a variety of other communities in the inner Coast Range, including grasslands, open woodlands, and riparian (Swaim 1994, Alvarez et al. 2005, U.S. Fish and Wildlife Service 2006b, U.S. Fish and Wildlife Service 2011). Rock outcrops with deep crevices or abundant rodent burrows are important habitat components for overnight dens, refuges from predators and excessive heat, and foraging (Swaim 1994, U.S. Fish and Wildlife Service 2006b). Grassland areas that are linked to scrub by rock outcrops or river corridors are also considered important habitat (U.S. Fish and Wildlife Service 2000).

Alameda whipsnake requires open and partially open, low-growing shrub communities for many of its biological needs. This habitat provides cover during dispersal, cover from predators, and a variety of microhabitats for thermoregulation (Swaim 1994). However, a portion of the greater landscape matrix can include closed or nearly closed scrub areas, including rock lands, and sparser grasslands (U.S. Fish and Wildlife Service 2006b). Whipsnake habitat must consist of a mix of sunny and shady sites to provide a range of temperatures for the snake’s activities (Swaim 1994). A sparse shrub canopy is ideal because it provides a visual barrier from avian predators (Swaim 1994).

Other important habitat features include small mammal burrows, talus, and other forms of shelter that provide snakes with alternative habitats for temperature regulation, protection from predators, egg-laying sites, and winter hibernaculum.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The Alameda whipsnake model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy.

Core Habitat: All shrubland land cover types.

Perimeter Core Habitat: A perimeter zone (around core habitat) of all adjacent grassland and woodland land cover types within 500 feet of the shrubland core habitat are also considered core habitat for this species. Core habitat is defined as home range areas in which individuals find shelter, breed, hibernate, and spend the majority of their time foraging.

Movement Habitat: All areas of annual grassland, woodland, and riparian woodland within a 1-mile radius of core/perimeter core habitat.

Modeled habitat within the East Contra Costa County HCP/NCCP inventory area is clipped to the range shown on the East Contra Costa County HCP/NCCP Alameda whipsnake habitat distribution model. In Alameda County, modeled habitat is restricted to USFWS recovery areas and critical habitat (U.S. Fish and Wildlife Service 2006).

Rationale

Core Habitat: Direct observations of Alameda whipsnakes and radio telemetry data on movement patterns have shown that individuals tend to establish home ranges primarily within coastal scrub habitat, but also frequently move into adjacent grassland, oak savanna and occasionally oak woodland (Jennings 1983, Stebbins 1985, Swaim 1994). Most telemetry locations are within 170 feet of scrub habitat, but individuals have been tracked to 500 feet (Swaim 1994). Individuals can remain in grasslands for periods ranging from a few hours to several weeks. Males use grasslands primarily during the mating season in spring; females use these areas mostly after mating, possibly in their search for suitable egg-laying sites (Swaim 1994). Rock outcrops provide sites for efficient thermoregulation, shelter retreats, and foraging. Within core habitats, individuals most commonly occur on east, south, southeast and southwest facing slopes (Swaim 1994), but may also use north facing slopes in more open stands of scrub habitat (McGinnis 1990, Swaim, pers. comm. in U.S. Fish and Wildlife Service 2000).

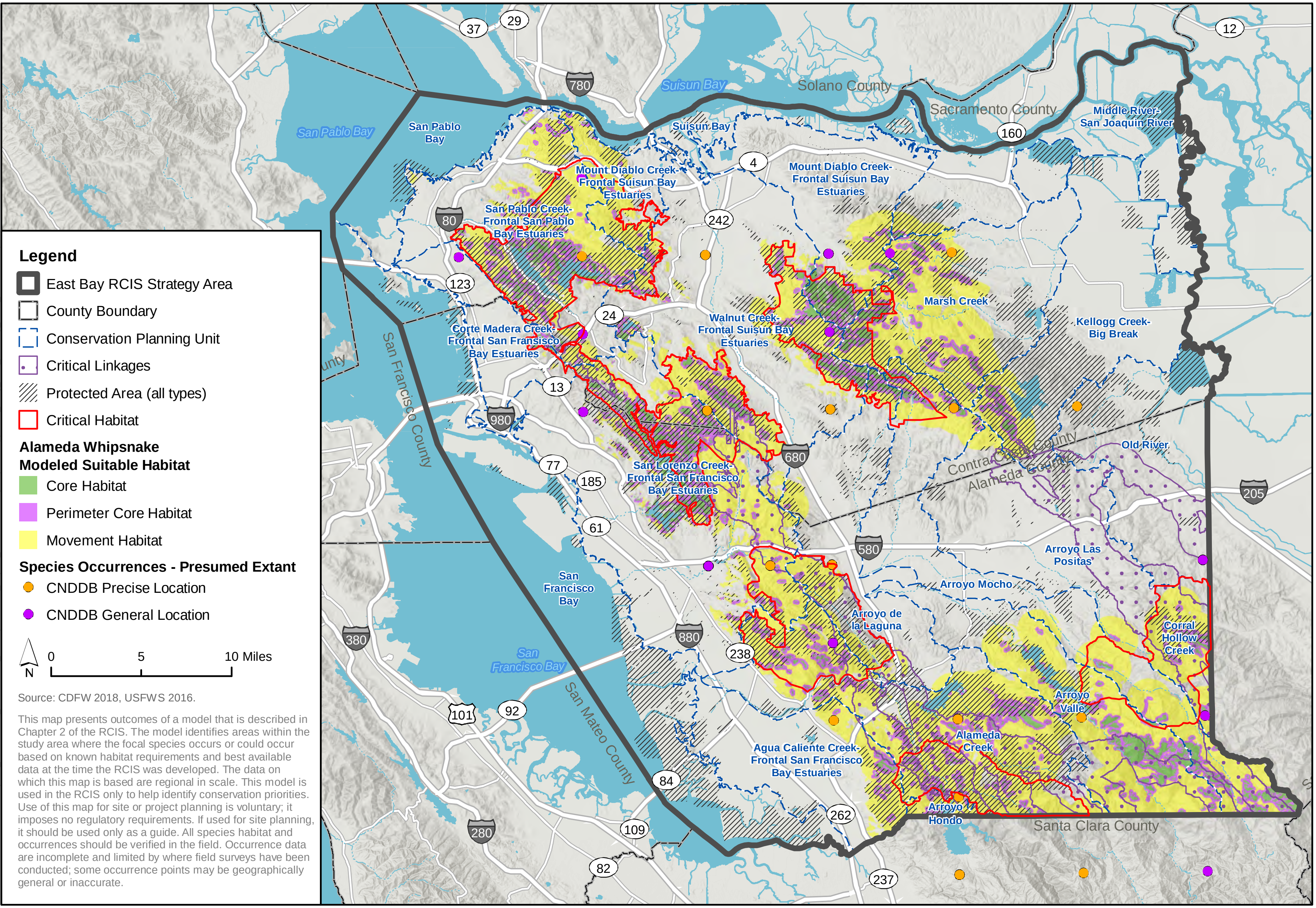
Perimeter Core Habitat: Adult males commonly move long distances away from their core areas during the breeding season (Swaim 2000). Juveniles and hatchlings disperse annually away from their natal core areas in search of new habitats. A recent review of Alameda whipsnake locality data revealed that numerous individuals have been observed at distances significantly greater than 500 feet from scrub habitat (Swaim 2000). These distances range from 0.1 mile to 4 miles. The 4-mile record appears to be anomalous; the next longest distance being 1.5 miles and most records were less than 1mile (mean for the 10 values = 0.46 miles).

Movement Habitat: Because movement data are limited (Swaim 2000), a conservative estimate of 1.0 mile is used to define the potential dispersal/movement distance away from core coastal scrub habitat. Within this radius, however, it is unknown what pathways the snakes may take. Rock outcrops probably facilitate long distance movements in these areas, but are apparently not essential (Swaim 1994, 2000). Individuals have been located over 3,000 feet from scrub in areas where no significant rock outcrops were present between the closet patch of scrub and the location where the snake was found. For these reasons, the model includes all grassland and oak savanna areas within a 1-mile radius of all core/perimeter core habitat as suitable movement habitat.

Due to the nuances of Alameda whipsnake habitat in Alameda County, recovery units and critical habitat are used to restrict the extent of potential habitat, consistent with the East Alameda County Conservation Strategy (ICF International 2012).

Model Results

Figure F-12 displays the modeled habitat for Alameda whipsnake within the RCIS area. Modeled habitat is distributed throughout most of the East Bay Hills and the southeastern corner of the RCIS area. Within the East Contra Costa County HCP/NCCP inventory area, the model includes the eastern slopes of Mt. Diablo and much of the surrounding foothills in the western and southwestern portions of the RCIS area.



Source: CDFW 2018, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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Figure F-12
Alameda Whipsnake Modeled Suitable Habitat

F.13 Giant garter snake (*Thamnophis gigas*)

Regulatory Status

- ***State:*** Threatened
- ***Federal:*** Threatened
- ***Critical Habitat:*** *N/A*
- ***Recovery Planning:*** Recovery Plan for the Giant Garter snake (*Thamnophis gigas*) (U.S. Fish and Wildlife Service 2017c)

Distribution

General

Giant garter snake is a large aquatic garter snake endemic to wetlands in California's Central Valley. Historically, its range extended throughout the Central Valley from Butte County south to Kern County (Fitch 1940, Hansen and Brode 1980). Because of extensive land development, giant garter snake populations have become fragmented with primarily small, isolated populations remaining. Since the 1940s, the species has been extirpated from the southern end of its range. The current range extends from near Gridley in Butte County to Mendota Wildlife Area in Fresno County (Fisher et al. 1994). There are 328 CNDDB occurrences for this species (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 328 CNDDB occurrences, four (1.2%) are within the RCIS area. The occurrences are all located in northeast Contra Costa County on Jersey, Bethel, and Bouldin Islands.

Natural History

Described as among California's most aquatic garter snakes (Fitch 1940), giant garter snake is associated with low-gradient streams, and Central Valley floor wetlands and marshes; it has adapted successfully to regions of rice agriculture (U.S. Fish and Wildlife Service 2016).

Spending cool winter months in dormancy or periods of reduced activity, giant garter snakes typically emerge from underground overwintering sites in late March to early April and remain active through October, although, the specific timing of annual activity is subject to varying seasonal weather conditions. Daily activity consists of emerging from burrows after sunrise, basking to warm bodies to active temperatures, and foraging or courting for the remainder of the day (Hansen and Brode 1993). Upon emerging from underground overwintering sites, males immediately disperse in search of mates and breeding takes place from March into early May. Females brood young internally, giving birth to live young from late July through early September (Hansen and Hansen 1990). Young immediately disperse and seek shelter to absorb their yolk sacs, after which they molt and begin feeding on their own. Brood size ranges from 10 to 46 young, with a mean of 23.1 (n=19) (Hansen and Hansen 1990).

Activity generally peaks during spring emergence and courtship from April into June, whereupon activity diminishes until a second peak is observed after females give birth (Hansen and Brode 1993, Wylie et al. 1997, U.S. Fish and Wildlife Service 1999b, Hansen 2004). Giant garter snakes then remain actively foraging and occasionally courting until the onset of cooler fall temperatures.

Overwintering typically occurs in burrows and crevices near active season foraging habitat (Hansen 2004). Although giant garter snakes tend to overwinter near aquatic habitat, individuals have been noted using burrows as far as 164 feet from marsh edges during the active season, and retreating as far as 820 feet from the edge of wetland habitats while overwintering, presumably to reach hibernacula above the annual high water mark (Wylie et al. 1997, U.S. Fish and Wildlife Service 1999).

Giant garter snakes feed on small fishes, tadpoles, and small frogs (Hansen 1980; U.S. Fish and Wildlife Service 1999), while juveniles probably consume insects and other small invertebrates.

Ecological Requirements

Habitats typically include permanent or seasonal water, mud bottoms, and vegetated dirt banks (Fitch 1940, Hansen and Brode 1980). This species appears to be mostly absent from permanent waters that support established populations of predatory game fishes; from streams and wetlands with sand, gravel, or rock substrates; and from riparian woodlands lacking suitable basking sites, prey populations, and cover vegetation (Hansen and Brode 1980, Rossman and Stewart 1987, Brode 1988, U.S. Fish and Wildlife Service 1999). It may also avoid natural or artificial waterways that undergo routine dredging, mechanical or chemical weed control, or compaction of bank soils (Hansen and Brode 1993).

Giant garter snake is associated with aquatic habitats characterized by the following features: 1) sufficient water during its active season (typically early spring through mid-fall) to supply cover and food such as small fish and amphibians; 2) emergent, herbaceous wetland vegetation, such as cattails (*Typha* spp.) and bulrushes (*Schoenoplectus* [formerly *Scirpus*] spp.), accompanied by vegetated banks to provide basking and foraging habitat and escape cover during the active season; 3) upland habitat (e.g., bankside burrows, holes, and crevices) to provide short-term refuge areas during the active season; and 4) high ground or upland habitat above the annual high water mark to provide cover and refuge from flood waters during the dormant winter period (Hansen and Brode 1980, Hansen 1998).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The giant garter snake habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006). Model parameters are intended to capture core and movement habitat. Core habitat is suitable aquatic habitat, which includes the aquatic-undefined, aquatic-unnatural, perennial freshwater marsh, pond, and seasonal wetland land cover types or areas within 7.5 feet of suitable waterways (using the National Hydrography Dataset layer) including canals/ditches and rivers/streams in the RCIS area. Seven and one-half feet is used as a buffer around linear waterways to estimate the width of canals, ditches and other waterways used by giant garter snake. Movement habitat is defined as California annual grassland, cultivated-undetermined, and cropland land cover types within 900 feet[3] of core habitat. Modeled habitat is limited to the Delta ecoregion to exclude habitat outside of this species' known range.

Rationale

Giant garter snake inhabits agricultural wetlands and associated waterways, including sloughs, irrigation and drainage canals, ponds, low-gradient streams, and adjacent uplands (U.S. Fish and Wildlife Service 2017c). Areas in the RCIS area west of Marsh Creek are not considered within the range of giant garter snake (Hansen pers. comm., U.S. Fish and Wildlife Service 2017c).

Model Results

Figure F-13 displays the modeled habitat for giant garter snake within the RCIS area. Modeled habitat is located within the network of islands, streams, and canals in the Delta in the northeastern corner of the RCIS area. Suitable core habitat, with only a slight amount of movement habitat, also lines the edge of the bay from the city of Martinez to the city of Pittsburg.

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[3] Because the actual movement patterns of giant garter snake are not known, a conservative estimate of 900 feet is used to define the potential movement habitat requirements for this species, consistent with the East Contra Costa County HCP/NCCP.

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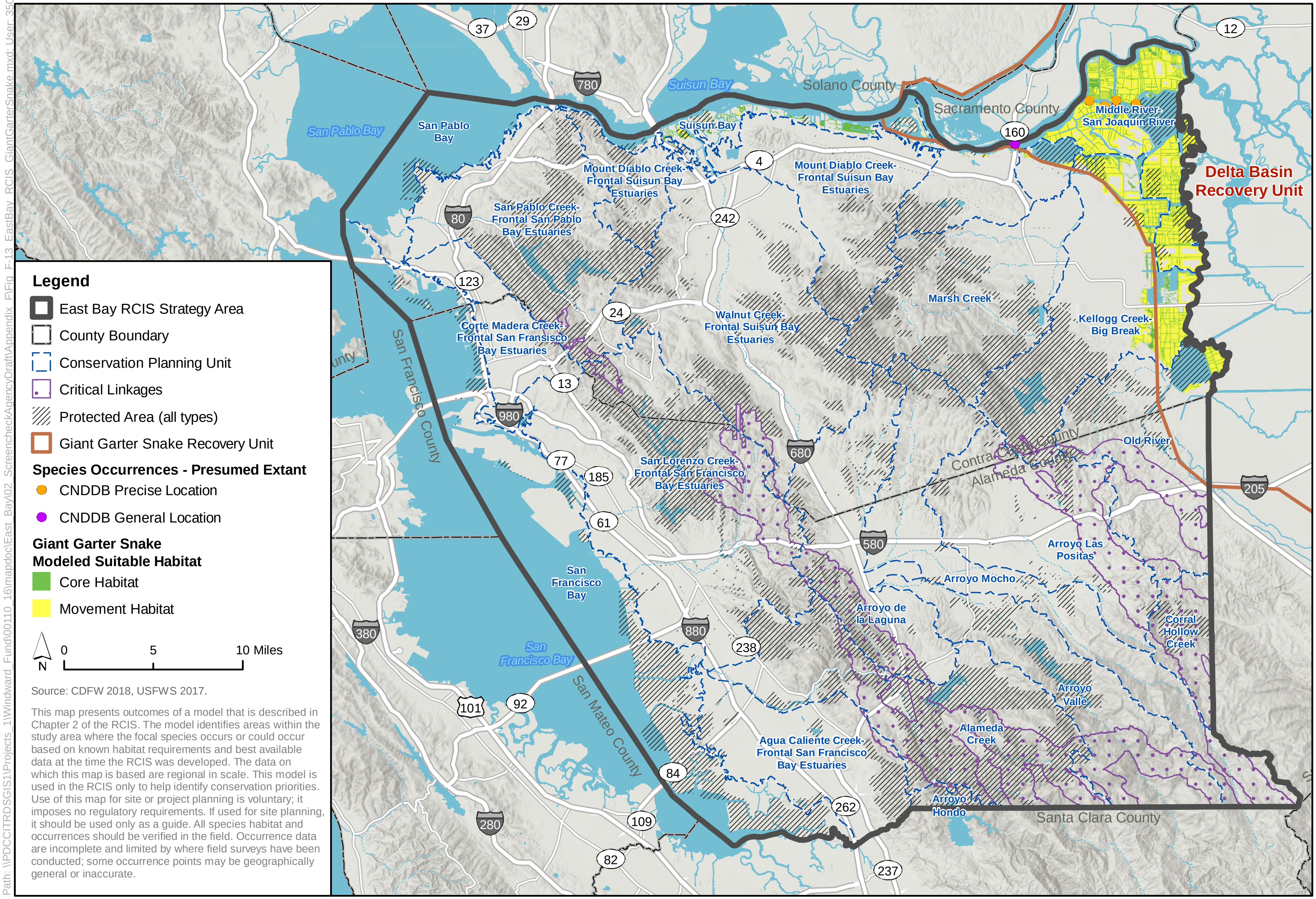


Source: CDFW 2018, USFWS 2017.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-13
Giant Garter Snake Modeled Suitable Habitat

F.14 Tricolored blackbird (*Agelaius tricolor*)

Regulatory Status

- ***State:*** Threatened
- ***Federal:*** Under review. Petitioned action may be warranted
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Tricolored blackbird is nearly endemic to California, with more than 99% of the global population occurring in the state, and other populations in Oregon, Washington, Nevada, and western coastal Baja California, Mexico (Meese et al. 2014). In California, tricolored blackbird occurs in the Central Valley and in coastal areas from Sonoma County to San Diego County. This species locally breeds in northeastern California and along the California coast from Humboldt to San Diego Counties. In winter, it is widespread along the Central Coast and Bay Area. There are 907 CNDDB occurrences for this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 659 CNDDB occurrences, 19 (2.9%) are within the RCIS area. The occurrences are scattered throughout the RCIS area in breeding and foraging habitat for this species. The Tricolored Blackbird Portal (University of California, Davis 2018) identifies 42 locations as having potential breeding habitat currently or historically, including six sites with observed aggregations or colonies.

Natural History

Tricolored blackbird, which get its name from its distinctive white band below its red shoulder patch, is closely related to red-winged blackbird, but the two species differ substantially in their breeding ecology. Red-winged blackbird pairs defend individual territories, while tricolored blackbird is among the most colonial of North American passerine birds (Bent 1958, Orians 1961a, 1961b, 1980, Orians and Collier 1963, Payne 1969, Beedy and Hamilton 1997). Breeding colonies historically attracted thousands of birds. In the 1930s, a single colony in Glenn County was estimated to include as many as 200,000 nests (approximately 300,000 adults) (Neff 1937). In more recent years, as many as 20,000 or 30,000 tricolored blackbird nests have been recorded in cattail marshes of 9 acres or less (DeHaven et al. 1975a), and individual nests may be built less than 1.5 feet apart (Neff 1937). The average size of breeding colonies varies among geographic regions and nesting substrate (Graves et al. 2013). Tricolored blackbird's colonial breeding system may have adapted to exploit a rapidly changing environment where the locations of secure nesting habitat and rich insect food supplies were ephemeral and likely to change each year (Orians 1961a, Orians and Collier 1963, Collier 1968, Payne 1969).

An itinerant breeder, tricolored blackbird generally moves to different breeding location after the first breeding attempt, with most birds nesting first in the San Joaquin Valley, and subsequently moving north (Hamilton 1998, Wilson et al. 2016). In the northern Central Valley and northeastern California, individuals move after their first nesting attempts, whether successful or unsuccessful (Beedy and Hamilton 1997). Banding studies indicate that significant movement into the Sacramento Valley occurs during the post-breeding period (DeHaven et al. 1975b). Although when breeding conditions are favorable, a second breeding attempt may occur in the same or adjacent locations (Meese 2006, 2007, 2008). Comparable movements have not been reported in southern California, where the species is believed to be resident.

Ecological Requirements

Tricolored blackbird has three basic requirements for selecting breeding colony sites: open, accessible water; a protected nesting substrate, including either flooded, thorny, or spiny vegetation; and a suitable foraging space such as grasslands, agricultural lands, and open woodland, providing adequate insect prey within a few miles of the nesting colony (Hamilton et al. 1995, Beedy and Hamilton 1997, Meese et al. 2014). Historically, tricolored blackbirds nested primarily in freshwater marshes dominated by cattails (*Typha* spp.) and bulrushes (*Schoenoplectus* [formerly *Scirpus*] spp.), with colony sites occurring to a lesser extent in were in willows (*Salix* spp.), blackberries (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), or nettles (*Urtica* spp.) (Neff 1937). An increasing percentage of tricolored blackbird colonies since the 1980s and 1990s have been reported in Himalayan blackberry (*Rubus discolor*) (Cook 1996), and some of the largest recent colonies have been in silage and grain fields (e.g., triticale) (Hamilton et al. 1995, Beedy and Hamilton 1997, Hamilton 2000).

In the East Bay, tricolored blackbird occurs in smaller marshes and wetlands, often supported by artificial stock ponds or water retention impoundments (California Department of Fish and Wildlife 2017a). Colony size in the East Bay is much smaller than is found in the Central Valley, often 10’s to 100’s of pairs rather than 1000’s (University of California, Davis 2018).

During winter, large flocks also congregate in pasturelands in southern Solano County and near dairies on Point Reyes Peninsula in Marin County (Beedy and Hamilton 1999). Other birds winter in the Central Valley and central and southern San Joaquin Valley. Concentrations of more than 15,000 wintering tricolored blackbirds may gather at one location and disperse up to 20 miles to forage (Neff 1937, Beedy and Hamilton 1999). Individual birds may leave winter roost sites after less than three weeks and move to other locations (Collier 1968), suggesting winter turnover and mobility. In early March and April, most birds vacate wintering areas in the Central Valley and along the coast and move to breeding locations in the Sacramento and San Joaquin Valleys (DeHaven et al. 1975b).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The tricolored blackbird habitat model is adapted from the East Contra Costa HCP/NCCP (Jones & Stokes 2006).

Core Breeding Habitat: Perennial freshwater marsh and ponds adjacent (i.e., touching the boundary) to primary foraging habitat.

Primary Foraging Habitat: All grassland land cover types, and seasonal wetland, vernal pool, alkali wetland, cropland, and cultivated-undetermined land cover types.

Secondary Foraging Habitat: Orchards and vineyards.

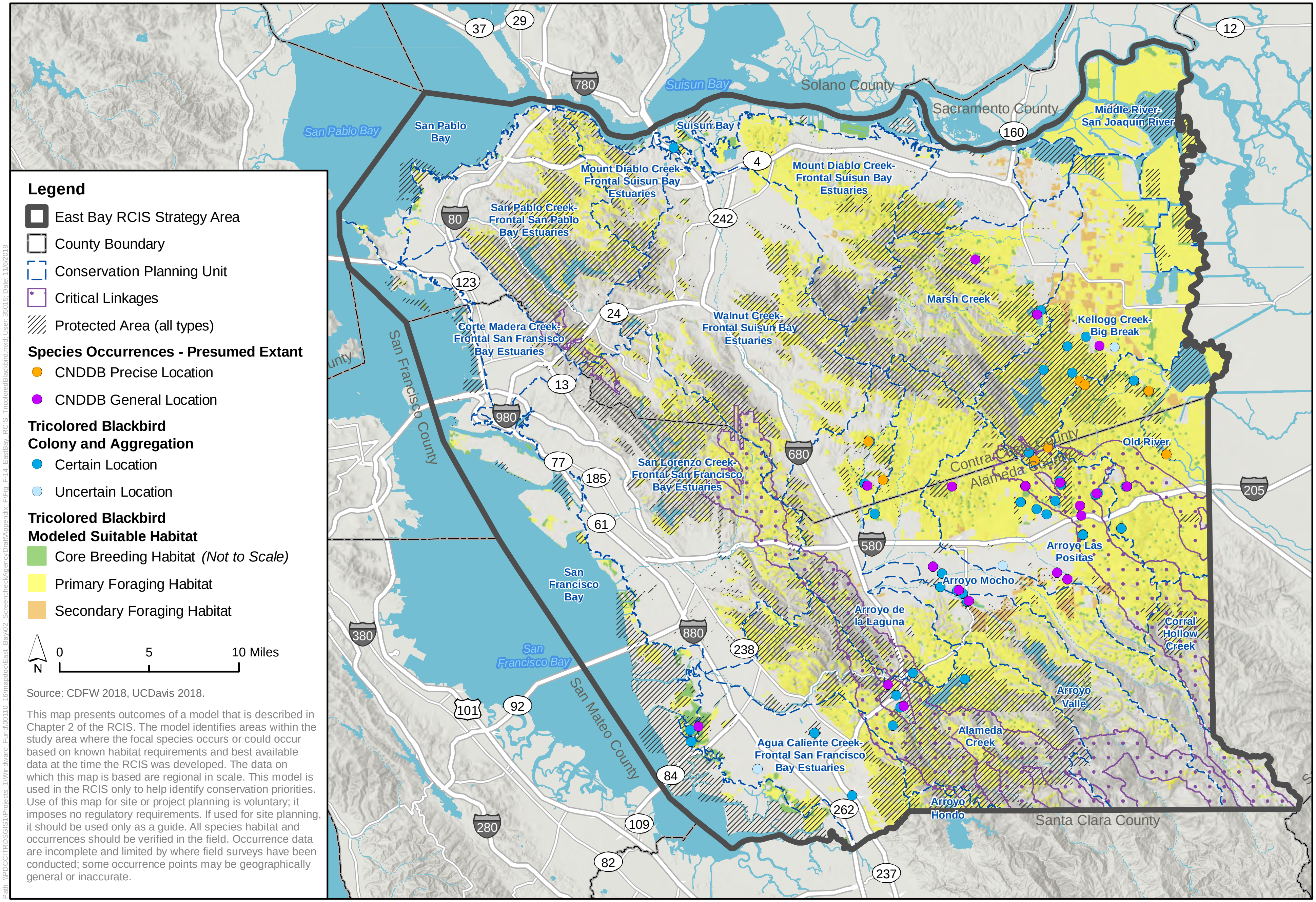
Rationale

Tricolored blackbird historically occurred within the Central Valley associated with emergent freshwater marshes dominated by cattails or bulrushes, with some colonies occurring in willows, blackberries, thistles, and nettles associated with sloughs and natural channels (Neff 1937). More recent colonies have been observed in a diversity of upland and agricultural areas (Collier 1968, Cook 1996, Hamilton 2004), riparian scrublands and woodlands (Orians 1961, DeHaven et al 1975a, Beedy et al. 1991, Hamilton et al. 1995, Beedy and Hamilton 1999).

Small breeding colonies have been documented at public and private lakes, reservoirs, and parks surrounded by shopping centers, subdivisions, and other urban development. Adults from these colonies generally forage in nearby undeveloped upland areas. Beedy and Hamilton (1999) predict that these small, urban wetlands and upland foraging habitats may continue to accommodate tricolored blackbirds in the future unless they are eliminated entirely by development. High-quality foraging areas include irrigated pastures, lightly grazed grasslands, dry seasonal pools, mowed alfalfa fields feedlots, and dairies (Beedy and Hamilton 1999). Lower quality foraging habitats include cultivated row crops, orchards, vineyards, and heavily grazed rangelands. Since selection of breeding sites is strongly correlated with the presence of suitable foraging habitat, core breeding habitat is restricted to areas adjacent to suitable primary foraging habitat in the RCIS area.

Model Results

Figure F-14 displays the modeled habitat for tricolored blackbird within the RCIS area. Suitable habitat is modeled throughout most of the undeveloped lands in the RCIS area. The habitat model likely overestimates potential breeding habitat, as not all areas mapped as perennial freshwater marsh and pond provides suitable breeding habitat. Site-specific conditions should be assessed to determine whether habitats on the site could support tricolored blackbird.



Source: CDFW 2018, UCDavis 2018.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-14
Tricolored Blackbird Modeled Suitable Habitat

Path: \\PDCCITRDSGIS1\Projects_1\Windward_Fund\00110_16\mapdoc\East_Bay\02_Screencheck\AgencyDraft\Appendix_F\Fig_F-14_EastBay_RCIS_TricoloredBlackbird.mxd; User: 35015; Date: 11/6/2018

F.15 Golden eagle (*Aquila chrysaetos*)

Regulatory Status

- ***State:*** Fully Protected, Species of Special Concern
- ***Federal:*** Fully Protected
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Golden Eagle is found across the Northern Hemisphere from approximately 20 to 70°N. In North America, golden eagle ranges from northern Alaska through the western states and Great Plains to Mexico, with some breeding and wintering locations in eastern North America (Kochert et al. 2002). Within California, golden eagle is a year-round resident generally inhabiting mountainous and hilly terrain throughout the open areas of the state. There are 311 CNDDB occurrences of this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 311 CNDDB occurrences, 24 (7.7%) are within the RCIS area. The majority of these are in the foothills and grasslands of the eastern half of the RCIS area; particularly near Los Vaqueros Reservoir, Round Valley Regional Preserve, Vasco Caves Regional Preserve, Mendenhall Springs, Tassajara, and the Sunol and Ohlone Regional Wilderness areas.

Natural History

Nests are built on protected cliffs, elevated rocky substrates or trees near forest edges or in small stands near open fields (Bruce et al. 1982, Hunt et al. 1995, 1998). Nest building can occur almost any time of year (Brown 1976). Nests are very large, between 5 to 6 feet wide and 2 feet high, and can grow very large from continuous use and augmentation over many years (Kochert et al. 2002). Tree nests tend to be constructed in large, mature oak and eucalyptus trees (Peeters and Peeters 2005), including several species of oak (*Quercus* spp.), foothill pine (*Pinus sabiniana* and *P. coulteri*), California bay (*Umbellularia californica*), eucalyptus (*Eucalyptus* spp.), and western sycamore (*Plantanus racemosa*) (Hunt et al. 1998). Individuals routinely construct and maintain multiple nests in their breeding territories, rotating use among them over the years. These alternative nest sites, which may number more than a dozen per territory, are often separated by distances of 0.5 mile, or more depending on breeding densities. Pairs often tend and refurbish more than one nest each year, but reuse intervals for individual nests may extend to several years or more (Kochert et al. 2002, Driscoll 2010).

Mating occurs from late January to August, with peak activity in March to July. Eggs are laid from early February to mid-May. Clutch size varies from 1 to 4 eggs, but 2 is the most common size (Brown 1976, Johnsgard 1990, Hunt et al. 1995). Incubation lasts 41 to 45 days (Beebe 1974), and the fledging period is about 72 to 84 days (Johnsgard 1990). The young usually remain dependent on their parents for as long as 11 weeks afterward. Individuals show high breeding site fidelity and migratory golden eagles, at least adults, tend to show high winter site fidelity (Kochert et al. 2002). Breeding success tends to vary depending upon local prey abundance (Driscoll 2010).

Mammals make up 80 to 90 percent of a golden eagle's diet (Kochert et al. 2002). They prey mostly upon rabbits, hares, and rodents, but also take other mammals, birds, reptiles, and some carrion (Olendorff 1976, Hunt et al. 1998). California ground squirrel (*Otospermophilus beecheyi*) and black-tailed jackrabbit (*Lepus californicus*) are the two most important prey species within the RCIS area (Hunt et al. 1998). Where ground squirrel is favored as prey, the inter-annual cycling of breeding activity tends to be less pronounced. Golden eagles typically hunt by using favorite perches located near areas that have regular updrafts to facilitate soaring to heights from which they can scan their hunting areas (Johnsgard 1990), but will also fly low, following the contours of the land to surprise prey. Where quantified (e.g., in southwest Idaho), foraging distances average around 0.6 mile during the breeding season and 1.9 miles during winter (Marzluff et al. 1997), but excursion distances of several miles are not uncommon.

Habitat Requirements

Golden eagle uses a wide variety of habitats and use nearly all terrestrial habitats of the western United States except densely forested areas, and generally avoids densely populated and agricultural areas. In the interior central Coast Ranges of California, this species favors open and semi-open grasslands and oak savanna, with lesser numbers in oak woodland and open shrublands (Hunt et al. 1998). Secluded cliffs with overhanging ledges are usually used for nesting, but and large trees are also used for nesting and cover (Driscoll 2010). High quality habitat includes nesting substrates protected from weather and predators, sufficient prey populations, updrafts and thermals for soaring and hunting, and isolation from disturbance (Johnsgard 1990, Driscoll 2010). Preferred territory sites include those that have a favorable nest site, a dependable food supply (medium to large mammals and birds), and broad expanses of open country for foraging. Hilly or mountainous country where takeoff and soaring are supported by updrafts is generally preferred to flat habitats.

Breeding densities are directly related to territorial spacing, distribution of available habitat, and foraging requirements for the species, including abundance of prey (Driscoll 2010). Hunt et al. (1998) report a 317-square mile area near Livermore supported at least 44 pairs of golden eagles in 1997, with a density of 1 pair per 7.3 square miles. The RCIS area supports high densities of prey animals in areas with regular updrafts that facilitate hunting. Where prey are abundant, home ranges tend to be smaller than where prey animals are less dense (Kochert et al. 2002, Driscoll 2010). Territory size has been estimated to average approximately 48 square miles in northern California (Smith and Murphy 1973), but can vary largely with habitat conditions. During the breeding season, home range has been found to average from approximately 7.8 to 12.7 square miles (Kochert et al. 2002) and year-round home range size has been found to average between 7.9 and 12.5 square miles (Phillips and Beske 1982, Platt 1984, both as cited in Kochert et al. 2002).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The golden eagle model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). Model parameters for golden eagle are intended to capture habitat associated with nesting and foraging.

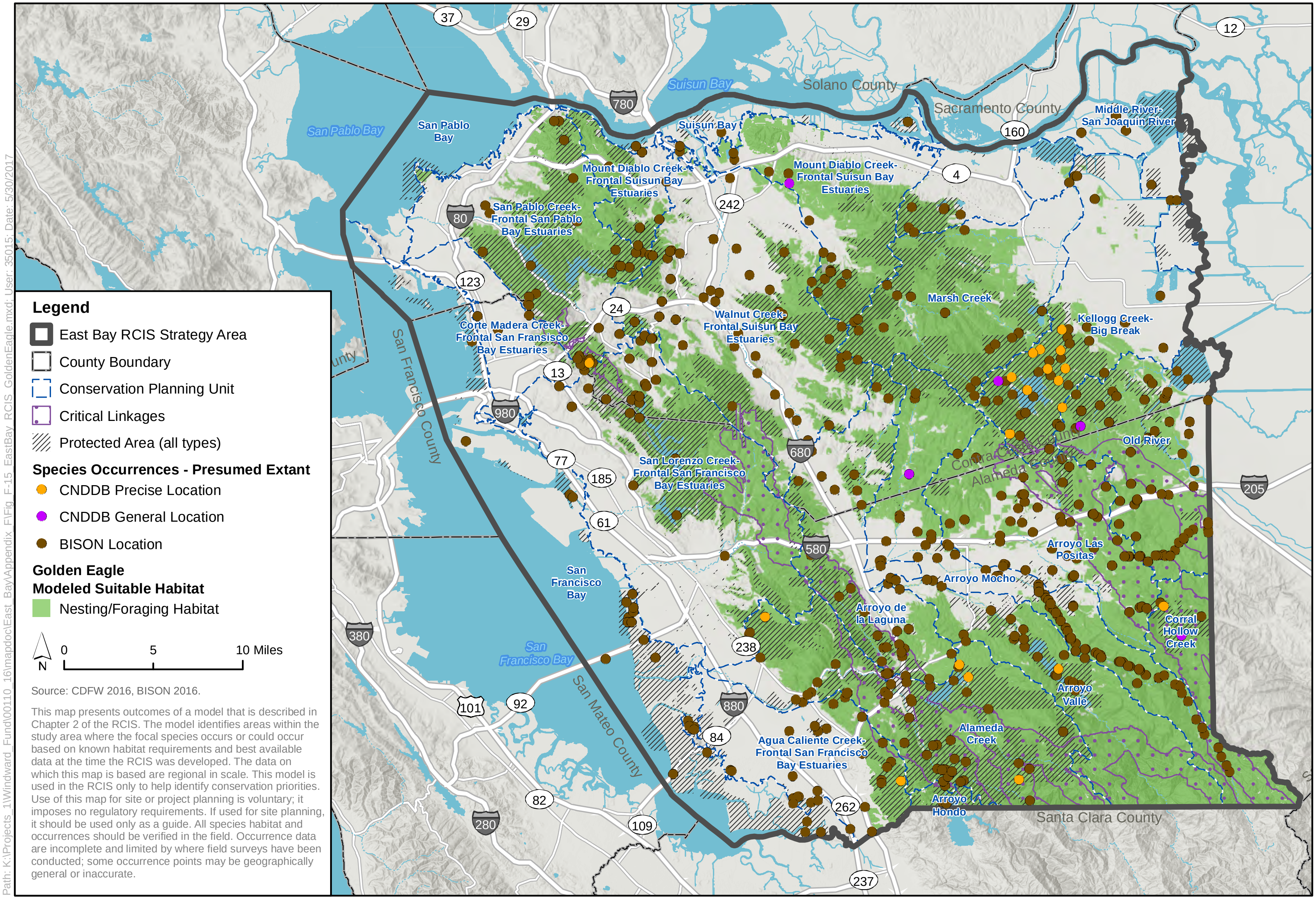
Modeled habitat includes all of the woodland, riparian woodland, and grassland land cover types, as well as the ornamental woodland land cover type.

Rationale

In the interior central Coast Ranges of California, golden eagle uses nearly all terrestrial habitats except urban, aquatic, turf, orchards, vineyards, and densely forested areas. This species favors open grasslands and oak savanna, with lesser numbers in oak woodland and open shrublands (Hunt et al. 1998).

Model Results

Figure F-15 displays the modeled habitat for golden eagle within the RCIS area. Suitable habitat is modeled throughout most of the RCIS area, excluding the ecoregions identified above and developed areas.



Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-15
Golden Eagle Modeled Suitable Habitat

F.16 Burrowing owl (*Athene cunicularia*)

Regulatory Status

- **State:** Species of Special Concern
- ***Federal:*** None
- **Critical Habitat:** N/A
- **Recovery Planning:** N/A

Distribution

General

Burrowing owl is found west of the Mississippi River throughout non-mountainous areas of western North America, from the Great Plains grasslands in southern portions of the western Canadian provinces south through the United States into Mexico (Poulin et al. 2011). In California, burrowing owl range extends throughout lowlands from the northern Central Valley to Mexico, with a small population in the Great Basin bioregion in northeast California (Cull and Hall 2007) and the desert regions of southeast California (Gervais et al. 2008). This species is absent from the coast north of Sonoma County and from high mountain areas such as the Sierra Nevada and the Transverse Ranges extending east from Santa Barbara County to San Bernardino County. There are 1,811 CNDDB occurrences of this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 1,811 CNDDB occurrences, 171 (9.4%) are within the RCIS area. The majority of these occurrences are near the regional preserves between Dublin, Livermore, and Brentwood, and within the city limits of Brentwood, Oakley, and Antioch.

Natural History

Burrowing owl is a small, fossorial owl, between 7.5 and 9.8 inches long. This species is mostly a year-round resident in California, but some northern California individuals may migrate as far as Central American during the winter. Burrowing owl is found at elevations as high as 5,300 feet in Lassen County and on larger offshore islands (Zeiner et al. 1988). Burrowing owls are active yearlong and hunt during the day or night, frequently perching at burrow entrances. Burrowing owls in California typically begin pair formation and courtship in February or early March, when adult males attempt to attract a mate. Like other owls, burrowing owls breed once per year in an extended reproductive period, during which most adults mate monogamously. Both sexes reach sexual maturity at one year of age. Clutch sizes vary, and the number of eggs laid is proportionate to prey abundance (the more prey that is available, the more eggs owls tend to lay). Clutches in museum collections in the western United States contain 1–11 eggs (Murray 1976). The incubation period is 28–30 days. The female performs all incubation and brooding and is believed to remain continually in the burrow while the male does all the hunting. Young begin emerging from the nest burrow when about two weeks old, and they remain closely associated with their nest burrow or nearby satellite burrows for several weeks (Thomsen 1971). Young fledge at 44 days but remain near the burrow and join the adults in foraging flights at dusk (Rosenberg et al. 2009).

Dispersal of adults (post-breeding dispersal) and juveniles (natal dispersal) after breeding or fledging is an important life history component that has received increased study in recent years. Dispersal distances of 33 miles to roughly 93 miles have been observed in California for adults (post-breeding dispersal) and juveniles (natal dispersal), respectively (Gervais et al. 2008), although individuals vary in their movement patterns. While part of this variation may be attributed to environmental variation, Catlin and Rosenberg (2014) hypothesized that sex, fledging date, and sibling relationships can also be important after studying post-fledging movements of 34 juvenile owls in the Imperial Valley between June, 2002 and April, 2003. Long-distance dispersal may account for observed low genetic differentiation among resident burrowing owl populations in California, suggesting that the patchy and discontinuous nature of burrowing owl habitat does not, by itself, isolate subpopulations (Korfanta et al. 2005).

Ecological Requirements

Throughout its range, burrowing owl requires habitats with three basic attributes: open, well-drained terrain; short, sparse vegetation generally lacking trees; and underground burrows or burrow facsimiles (Klute et al. 2003, Gervais et al. 2008). Burrowing owls select sites that support short vegetation, even bare soil, presumably because they can easily see over it. However, they will tolerate tall vegetation if it is sparse. Owls will perch on raised burrow mounds or other topographic relief, such as rocks, tall plants, fence posts, and debris piles, to attain good visibility (Poulin et al. 2011). Burrowing owls occupy grasslands, deserts, scrublands, agricultural areas (including pastures and untilled margins of cropland), earthen levees and berms, coastal uplands (especially by over-wintering migrants) (California Department of Fish and Wildlife, Natural Diversity Database 2016), and urban vacant lots, as well as the margins of airports, golf courses, and roads (Gervais et al. 2008). This species burrows underground and depends on burrowing mammals, primarily ground squirrel (*Otospermophilus beecheyi*), for burrow construction (California Department of Fish and Wildlife, Natural Diversity Database 2016). Structures such as culverts, piles of concrete rubble, and pipes are also used as nest sites. Artificial nest boxes are also frequently used (Poulin et al. 2011). Burrowing owls have strong nest site fidelity and return to the same nest areas year after year. Seventy-four percent of occupied burrows were reoccupied at Moffett Airfield between 1992 and 1994 (Trulio 1994).

During the breeding season, burrowing owls also need enough permanent cover and taller vegetation within their foraging range to provide them with sufficient insect prey, which makes up their primary diet. Burrowing owls will also feed on small mammals, birds, amphibians, and reptiles, as well as carrion (Green et al. 1993, Plumpton and Lutz 1993, Gervais et al. 2000, York et al. 2002). In California, the California vole (*Microtus* californicus) is a primary prey speices (Gervais and Anthony 2003). Adults tend to forage close to their nest during the breeding season but have been recorded hunting up to 1.7 miles away (Gervais and Anthony 2003). Home range size is undetermined, but appears to be a function of distance from the nest site (Shuford and Gardali 2008). Foraging area selection does not appear to be habitat based, as owls in the same region have been observed foraging in different types of cropland. Inter-nest distances, which indicate the limit of an owl's territory, have been found to average between 198 and 695 feet (Thomsen 1971, Haug and Oliphant 1990). Nocturnal foraging can occur up to a few miles away from burrows, and owls concentrate their hunting uncultivated fields, ungrazed areas, and other habitats with an abundance of small mammals (Haug and Oliphant 1990).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The burrowing owl habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). Model parameters are intended to capture breeding and foraging habitat and low-use habitat.

Suitable Breeding and Foraging Habitat: All grassland land cover types and the seasonal wetland land cover type.

Suitable Low-use Habitat: The cropland and cultivated- undetermined land cover types.

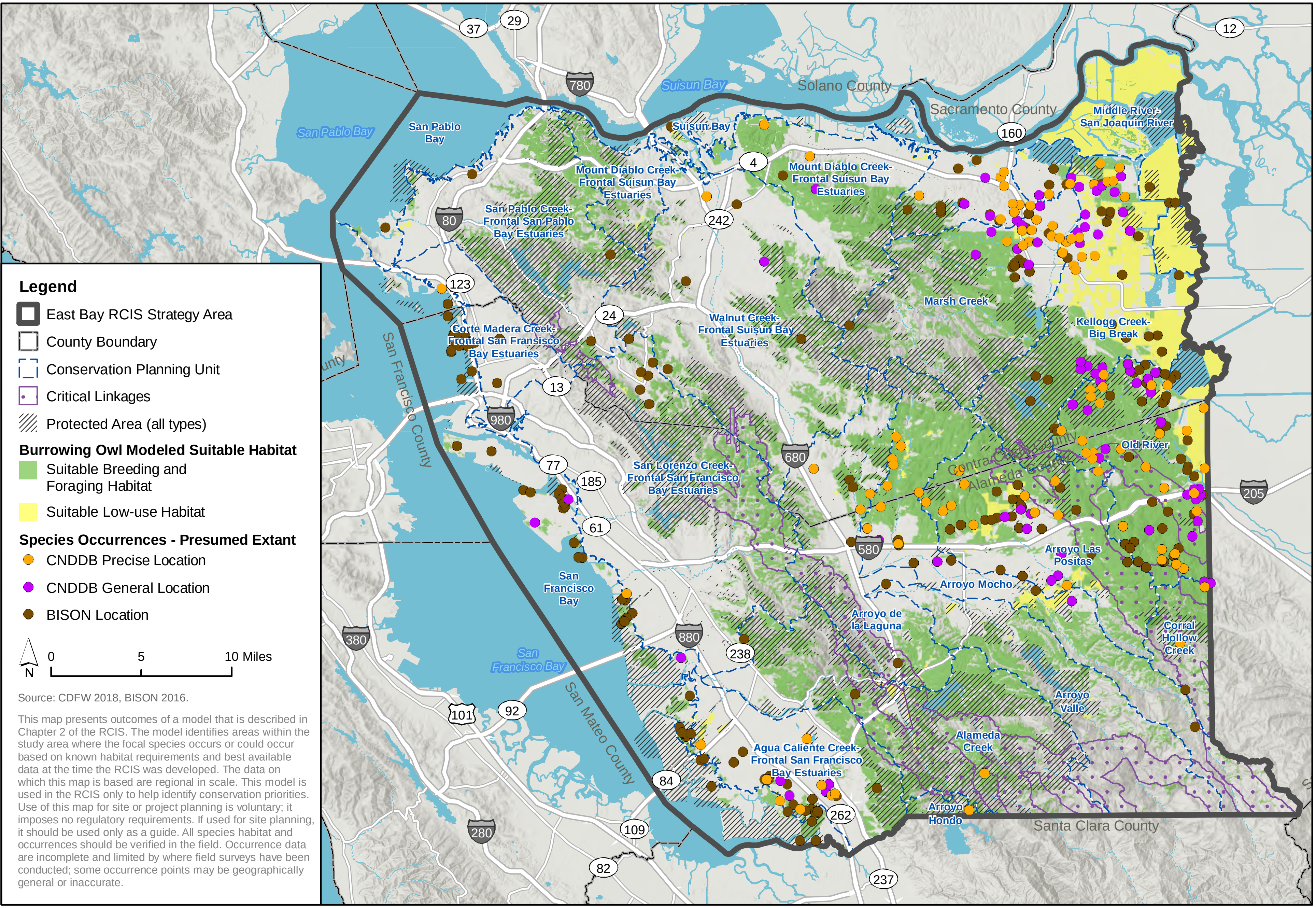
Rationale

Burrowing owl typically occurs in dry, open, shortgrass, treeless plains often associated with burrowing mammals (Poulin et al. 2011). Golf courses, cemeteries, road allowances within cities, levees, and ruderal borders around agricultural fields, airports, and vacant lots in residential areas are also used for breeding and foraging. Within the RCIS area, these habitats are represented by the annual grassland, alkali grassland, serpentine grassland, barren/rock, and the seasonal wetland land cover types. Burrowing owls also use agricultural areas occasionally when they are fallow or continually in the margins of these fields. To account for the occasional use of fallow agricultural fields, cropland and cultivated-undetermined land cover types are modeled as low-use habitat.

Model Results

Figure F-16 displays the modeled habitat for burrowing owl within the RCIS area. Suitable breeding and foraging habitat is modeled throughout most of the undeveloped lands in the RCIS area. Suitable low-use habitat is primarily in the eastern portion of the RCIS area. The habitat model likely overestimates the amount of burrowing owl habitat in the RCIS area, as not all areas mapped as habitat provide suitable breeding habitat based on the presence or absence of ground squirrel burrows and grass height/vegetation, which is not identified in the RCIS's land cover data.

Path: \\PDCCITRDSGIS1\Projects_1\Windward_Fund\00110_16\mapdoc\East_Bay\02_ScreencheckAgencyDraft\Appendix_F\Fig_F-16_EastBay_RCIS_BurrowingOwl.mxd; User: 35015; Date: 8/29/2018



Source: CDFW 2018, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-16
Burrowing Owl Modeled Suitable Habitat

F.17 Swainson's hawk (*Buteo swainsoni)*

Regulatory Status

- ***State:*** Threatened
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Swainson's hawk is generally a complete migrant, breeding in North America and wintering primarily in South America (Woodbridge 1998). Until 1990, few credible winter records had been reported for Swainson's hawk in California. More recent winter records indicate that Swainson's hawk can be found overwintering, though rarely, in suitable habitat in the Central Valley, and southwestern California (eBird 2018) and in the Sacramento-San Joaquin River Delta (Erickson et al. 1990, Yee et al. 1991, Herzog 1996, eBird 2018).

In California, Swainson's hawk is uncommon resident and migrant during the breeding season in desert, shrubsteppe, grassland, and agricultural habitats in the Central Valley and Great Basin bioregions (Woodbridge 1998). The largest population of breeding Swainson's hawk in California is located in the middle of the Central Valley between Sacramento and Modesto, and in the northern San Joaquin Valley. There are 2,337 CNDDB occurrences of this species within California, from Modoc County to San Diego County (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 2,337 CNDDB occurrences, 38 (1.6%) are within the RCIS area. These occurrences are concentrated in agricultural lands in the northeast corner of the RCIS area. The majority of occurrences are within eastern Contra Costa County.

Natural History

Swainson's hawks exhibit a high degree of nest site fidelity, using the same nests, nest trees, or nesting stands for many years (England et al. 1997). Swainson's hawks arrive on their breeding grounds in late February and early March in the Central Valley and in mid-April in the Great Basin. Pairs are monogamous and may maintain bonds for many years (England et al. 1997). Immediately upon arrival onto breeding territories, breeding pairs begin constructing new nests or repairing old ones. One to four eggs are laid in mid- to late April, followed by a 30- to 34-day incubation period. Nestlings begin to hatch by mid-May followed by an approximately 20-day brooding period. Young remain in the nest until they fledge in 38 to 42 days after hatching (England et al. 1997). By late August - October, most Swainson's hawks migrate to the Pampas of southern South America (Bechard et al. 2010).

Ecological Requirements

Breeding

Swainson's hawks are typically present in California from early March, when individuals arrive on breeding grounds, through mid-October, when birds have departed for wintering grounds in Central and South America. Swainson's hawk's habitat generally consists of large, flat, open, undeveloped landscapes that include suitable grassland and/or agricultural foraging habitat and sparsely distributed trees for nesting (Bechard et al. 2010). Swainson's hawks usually nests in large, native trees such as valley oaks (*Quercus lobata*), cottonwoods (*Populus fremontia*), and willows (*Salix* spp.), although nonnative trees such as eucalyptus (*Eucalyptus* spp.) are also used (Bechard et al. 2010). Swainson's hawks may nest in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, trees in windbreaks, and on the edges of remnant oak woodlands (Bechard et al. 2010). Nesting areas are within easy flying distance to foraging habitat such as alfalfa or hay fields.

Home ranges are highly variable depending on cover type, and fluctuate seasonally and annually with changes in vegetation structure (e.g., growth, harvest) (Estep 1989, Woodbridge 1991, Babcock 1995). Smaller home ranges consist of high percentages of alfalfa, fallow fields, and dry pastures (Estep 1989, Woodbridge 1991, Babcock 1995). Larger home ranges were associated with higher proportions of cover types with reduced prey accessibility, such as orchards and vineyards, or reduced prey abundance, such as flooded rice fields.

Foraging

Historically, Swainson's hawks foraged in grass-dominated and desert habitats throughout most of lowland California. Over the past century, conversion of much of the historic range to agricultural use has shifted the nesting distribution into open agricultural areas that mimic grassland habitats or otherwise provide suitable foraging habitat. Agricultural uses that provide suitable foraging habitat include a mixture of alfalfa and other hay crops, grain, row crops, and lightly grazed pasture with low-lying vegetation that support adequate rodent prey populations (Estep 1989, Bechard et al. 2010).

Swainson's hawks regularly forage across a very large landscape compared with most raptor species. Data from Estep (1989) and England et al. (1995) indicate that it remains energetically feasible for Swainson's hawks to successfully reproduce when food resources are limited around the nest and large foraging ranges are required. Radio-telemetry studies indicate that breeding adults in the Central Valley routinely forage as far as 18.7 miles from the nest (Estep 1989, Babcock 1995). Swainson's hawks hunt primarily from the wing, searching for prey from a low-altitude soaring flight, 98 to 295 feet above the ground and attack prey by stooping toward the ground (Estep 1989). During late summer, the diet of post-breeding adults and juveniles includes an increasing amount of insects, including grasshoppers and dragonflies. Dragonflies may constitute a major proportion of the diet of post-breeding and migrant birds. In alfalfa and corn crops in Idaho, post-breeding flocks also forage primarily on grasshoppers (Johnson et al. 1987). Dragonflies are also the primary prey for wintering birds in Argentina (Jaramillo 1993). Following their arrival on breeding grounds, Swainson's hawks shift their diet to include larger prey such as small rodents, rabbits, birds, and reptiles (England et al. 1997). This shift to a higher quality diet is prompted by nestlings' nutritional demands during rapid growth and the adults' high energetic costs of breeding.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The Swainson's hawk habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and draft Antioch HCP/NCCP (ICF, in-development). Model parameters for Swainson's hawk are intended to capture habitat associated with nesting and foraging. Modeled habitat is limited to the following HUC-12 watersheds to correspond to the region of the RCIS area where Swainson's hawk is known to nest: Brushy Creek, Clifton Court Forebay, Dutch Slough-Big Break, Jersey Island-Taylor Slough, Kirker Creek-Frontal Suisun Bay Estuaries, Lower Kellogg Creek, Lower Marsh Creek, Lower Old River, Markley Canyon-San Joaquin River, Middle River-San Joaquin River, Mount Diablo Creek-Frontal Suisun Bay Estuaries, Mountain House Creek, Suisun Bay Estuaries, Upper Kellogg Creek, and Upper Marsh Creek.

Nesting habitat:

- Below 150 feet elevation - Includes all riparian woodland and ornamental woodland land cover types. Nesting habitat is limited to the riparian areas along Marsh Creek (buffered perpendicular to the stream line by 550 feet from Marsh Creek) and the following watersheds, as used in the East Contra Costa County HCP/NCCP and Antioch HCP/NCCP (Contra Costa County 2003): Lower Marsh Creek, Upper Marsh Creek, Kellogg Creek, Brushy Creek, and East County Delta Drainages. These Contra Costa County data watersheds are merged with the following National Hydrography Dataset Hydrologic Unit Code-12 subwatersheds: Brushy Creek, Clifton Court Forebay, Lower Old River, Mountain House Creek and Upper Kellogg Creek. All areas west of the Marsh Creek buffer are not included as nesting habitat.
- Below 800 feet elevation – includes all riparian woodland, ornamental woodland, blue oak woodland, coast live oak forest and woodland, foothill pine – oak woodland, mixed oak woodland and forest, and valley oak woodland land cover types within the following watersheds in the East Contra Costa County HCP/NCCP and Antioch HCP/NCCP (Contra Costa County 2003): East Antioch Creek, West Antioch Creek, East County Delta Drainages, and Lower Marsh Creek; and the Briones Valley watershed from the CalWater 2.2.1 dataset (California Interagency Watershed Mapping Committee 1999).

Agricultural Foraging Habitat: All cropland and cultivated-undetermined at or below 500 feet in elevation are considered agricultural foraging habitat.

Natural Foraging Habitat: All grassland land cover types (except barren), seasonal wetland and alkali wetland land cover types below 150 feet elevation. The same land cover types are included as natural foraging habitat if they are between 150 – 500 feet elevation, with low to moderate slope (<20%), and if they are contiguous with those suitable grassland land cover types below 150 feet.

Rationale

Nesting Habitat: In the RCIS area, Swainson's hawk nests in the northeast portion of the RCIS area, primarily in Contra Costa County. Nest trees are located in riparian corridors and trees within foraging habitat (often lone trees or in small stands) (Bechard et al. 2010). At the time the East Contra Costa County HCP/NCCP was developed (2006), Marsh Creek in Contra Costa County, was considered the western extent of Swainson's hawk's breeding range in the RCIS area (Estep, pers. comm.; Sterling, pers. comm., as cited in Jones & Stokes 2006). Since the East Contra Costa County

HCP/NCCP was finalized, Swainson's hawk appears to be expanding its breeding range from the Central Valley (i.e., Brentwood and Byron) to the oak savannah and oak woodland east of Deer Valley Road, based on three recent nest records south of Deer Valley (two in 2007, one in 2016). There are also three recent nest records near SR 4 in northern Antioch (California Department of Fish and Wildlife, Natural Diversity Database 2016).

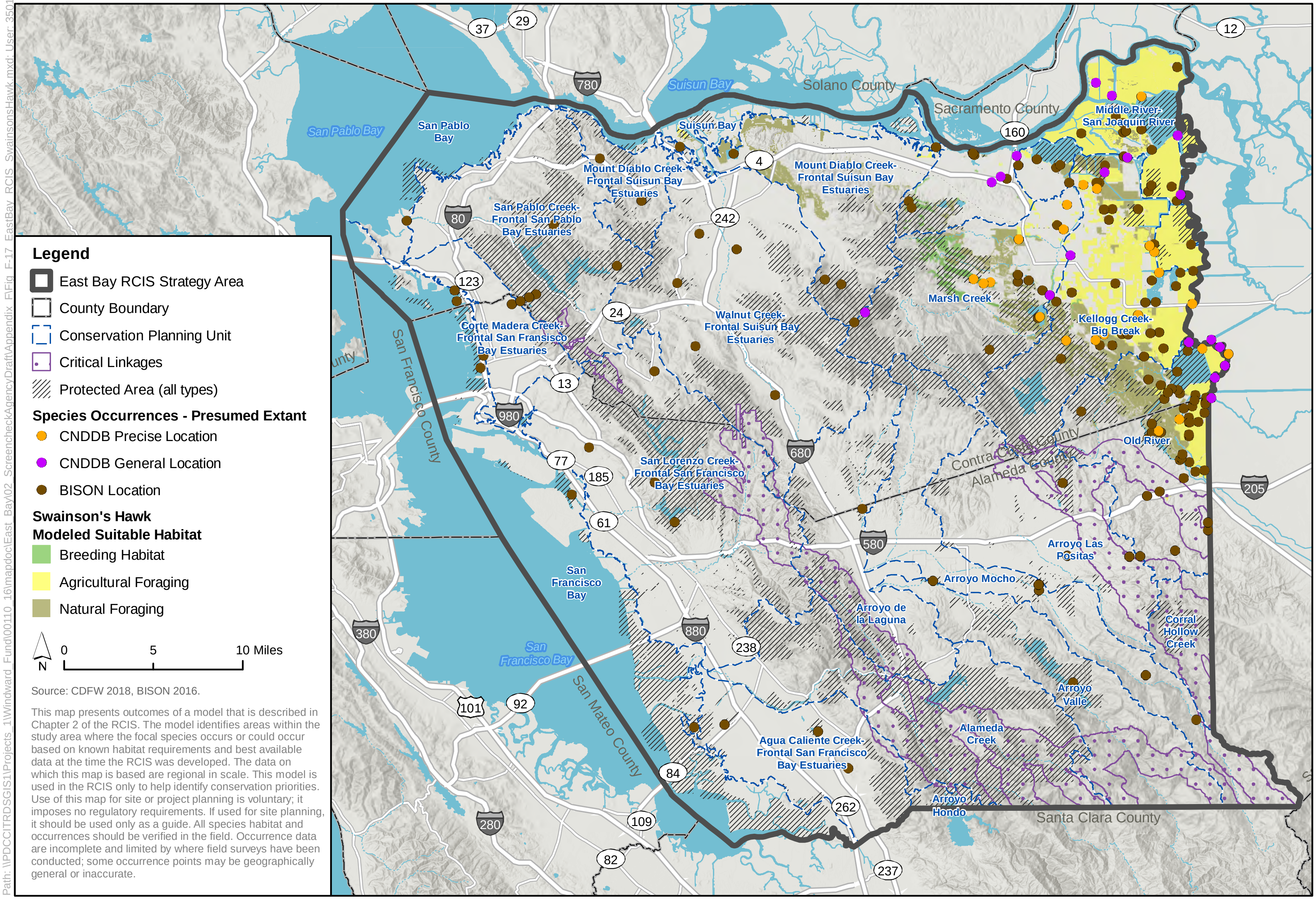
The inclusion of oak savannah and oak woodland below 800 feet is intended to capture trees on the lower foothills near large expanses of grassland or pasture that may support nesting Swainson's hawks in the future.

Natural Foraging Habitat: Historically, Swainson's hawks are believed to have foraged in upland and seasonally flooded perennial grasslands (Woodbridge 1998). Swainson's hawks in the RCIS area are unlikely to forage above approximately 500 feet in elevation except in areas with gentle slopes adjacent to agricultural areas; foraging west of Deer Creek is also highly unlikely (Swainson's Hawk Technical Advisory Committee for the Antioch HCP/NCCP, pers. comm., as cited in ICF in-development). The 500 foot elevational limit for natural foraging habitat is used in this model to exclude these areas based on the guidelines provided by Swainson's hawk experts.

Agricultural Foraging Habitat: In the Central Valley, Swainson's hawks now forage primarily in low-growing crop areas and perennial grasslands (Estep 1989). Preferred foraging habitats include alfalfa, fallow fields, beet, tomato, and other low-growing row or field crops, dry-land and irrigated pasture, rice land during the non-flooded period, and cereal grain crops (Estep 1989). Individual birds or nesting pairs may use over 15,000 acres of habitat or range up to 18 miles from the nest in search of prey (Estep 1989, Babcock 1995).

Model Results

Figure F-17 displays the modeled habitat for Swainson's hawk within the RCIS area. Modeled nesting habitat is located primarily within the Marsh Creek and the Suisun Bay watershed north of the Marsh Creek watershed. Many nest trees are not captured within nesting habitat because nest trees are often lone trees or in small stands of trees within foraging habitat. Natural foraging habitat is found primarily in the lower elevations of the Diablo Range south and east of agricultural habitats in the northeast portion of the RCIS area, and interspersed within agricultural foraging habitat.



Source: CDFW 2018, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-17
Swainson's Hawk Modeled Suitable Habitat

F.18 California black rail (*Laterallus jamaicensis coturniculus*)

Regulatory Status

- ***State:*** Fully Protected, Threatened
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

California black rail occurs in California, Arizona, northern Baja California (Mexico), and the Colorado River Delta in Sonora, Mexico. This subspecies appears to be composed of three clearly distinct metapopulations. The first and most numerous coastal group inhabits tidal marshes mainly in the northern Bay Area, with smaller occurrences at sites from Bodega Bay to northwest Baja California. The second, intermediate-sized Central Valley group occurs at interior wetlands of Butte, Nevada, Placer, San Joaquin, and Yuba Counties. The third, much smaller Lower Colorado/Salton Trough group occurs primarily at Mittry Lake, Arizona, with additional occurrences along the Lower Colorado River from Bill Williams River to Laguna Dam, and at isolated locations in the Salton Trough (Eddleman et al. 1994, Aigner et al. 1995, Girard et al. 2001, Richmond et al. 2008). There are 238 CNDDB occurrences of this subspecies within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 238 CNDDB occurrences, 31 (13.0%) are within the RCIS area. These occurrences are predominately along the RCIS area boundary in shallow tidal areas in both Contra Costa and Alameda Counties.

Natural History

The breeding season begins as early as February with pair formation and extends through approximately early to mid-June. Egg laying peaks around May 1 (Eddleman et al. 1994). California black rail is mostly resident, although there is some local movement from San Pablo Bay south to the southern San Francisco Bay (Evens et al. 1991). At these locations, seasonal movements, including juvenile dispersal and adult relocation to other wetland breeding sites, occur each year sometime during the nonbreeding season between approximately August and February (Tecklin 1999).

Black rails are monogamous birds. They build cup nests with a woven canopy in dead or new emergent vegetation over shallow water less than 1.2 inches in depth (Eddleman et al. 1994). They initiate egg laying within a few days after nest construction is complete. Rails in California usually lay one single brood with an average clutch size of six eggs (range equals three to eight eggs) (Eddleman et al. 1994). Occasionally, there are multiple nesting attempts but there is no evidence of multiple broods being produced. The incubation period ranges from 17 to 20 days and both adults apparently incubate the eggs (Flores and Eddleman 1993); however, there are very limited data on this period. After hatching, the semiprecocial young leave the nest within a day, but at least one parent continues to brood the young for several additional days (Eddleman et al. 1994). Limited information is available on length of brooding period, timing of fledging, parental care, or reproductive success.

California black rails have small home ranges in the breeding season. In north San Francisco Bay tidal marshes, Tsao et al. (2009) found fixed-kernel home ranges (representing 95% utilization distribution) to average 1.5 acres and core use areas (representing the 50% utilization distribution) to average 0.3 acre. Studies of other rail species showed increased home range sizes outside of the breeding season (Bookhout and Stenzel 1987, Conway 1990); however, black rails in Arizona, where water levels remain steady throughout the year, showed no difference in home range size across seasons (Flores and Eddleman 1991).

The species is assumed to be an opportunistic daytime feeder that forages exclusively in wetland habitat, presumably on or near the ground at the edges of emergent vegetation. Its diet consists of insects, small mollusks, amphipods, and other invertebrates, and seeds from bulrushes (*Schoenoplectus* spp.) and cattails (*Typha* spp.) (Eddleman et al. 1994).

Ecological Requirements

California black rail inhabits saltwater, brackish, and freshwater marshes (Grinnell and Miller 1944, Manolis 1978, Spautz et al. 2005). A highly secretive and rarely observed bird, it appears to have a preference in coastal areas for tidal salt marshes dominated by dense pickleweed (*Salicornia pacifica*) with an open structure below (Tsao et al. 2009). This provides a dense canopy for protective cover while providing nesting habitat and accessibility below the canopy (Evens and Page 1983). Rails are susceptible to predation by herons, egrets, northern harriers, short-eared owls, and several mammalian predators. A dense canopy that provides optimal cover is essential for survival.

California black rails tend to be associated with areas where *Schoenoplectus* (formerly *Scirpus* spp.) and pickleweed border each other. Evens et al. (1991) found California black rails in areas with a mosaic of *Juncus* (40%), *Schoenoplectus* (30%), *Triglochin* (10%), *Grindelia* (<10%), *Distichlis* (less than 10%), and *Typha* (less than 10%). In Suisun Marsh, presence of California black rails occurs in conjunction with a pickleweed-alkali heath-American bulrush plant association in the high marsh zone. Data from Spautz et al. (2005) indicate that California black rails prefer marshes that are close to water (bay or river), large, away from urban areas, and saline to brackish with a high proportion of *Salicornia*, *Grindelia*, *Bolboschoenus maritimus* ssp. *paludosus* (formerly *Scirpus maritimus*), *Juncus*, and *Typha*. Escape cover is critical to these birds. Nests consist of loosely made, deep cups either at ground level or slightly elevated. Nests are concealed in dense marsh vegetation near the upper limits of tidal flooding (California Department of Water Resources 2001).

At Suisun Marsh, low marsh habitats dominated by *Schoenoplectus acutus* and *S. californicus* do not provide breeding habitat, but they are used by California black rails for foraging. Upland transition zones provide both foraging habitat and refuge during extreme high tide events. Wetlands that are intensively managed (e.g., by mowing and discing) for waterfowl generally provide only marginal habitat for California black rails, while less intensively managed shallow-water areas may provide more suitable habitat. Collectively, managed wetlands are considered secondary habitat compared to tidal middle and high marsh wetlands (California Department of Water Resources 2001).

Away from coastal estuaries and salt marshes, California black rails are restricted to breeding in freshwater marshes with stands of tule, cattail, bulrush, and sedge (*Carex* spp.) (Eddleman et al. 1994). These sites are very shallow (usually less than 1.2 centimeters), but require a perennial water source. A relatively narrow range of conditions is required for occupancy and successful breeding. Water depth is an important parameter for successful nest sites, because rising water levels can prevent nesting or flood nests and reduce access to foraging habitat (Eddleman et al. 1994). Too little water will lead to abandonment of the site until the water source is reestablished. Primary factors determining their presence are annual fluctuations in water levels and shallow water depth (less than 1.2 centimeters) (Rosenberg et al. 1991, Eddleman et al. 1994, Conway et al. 2002).

No information is available on minimum patch size for the California black rail in the Central Valley and Delta Region; however, in the foothills of the central Sierra Nevada, wetlands greater than one acre are more likely to support populations that persist over time, though California black rail have been found in wetlands as small as 0.2 acres (Tecklin 1999, Richmond et al. 2010). The discovery of these Sierra Nevada populations suggests that the species is able to colonize isolated habitat patches (Aigner et al. 1995, Trulio and Evens 2000).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

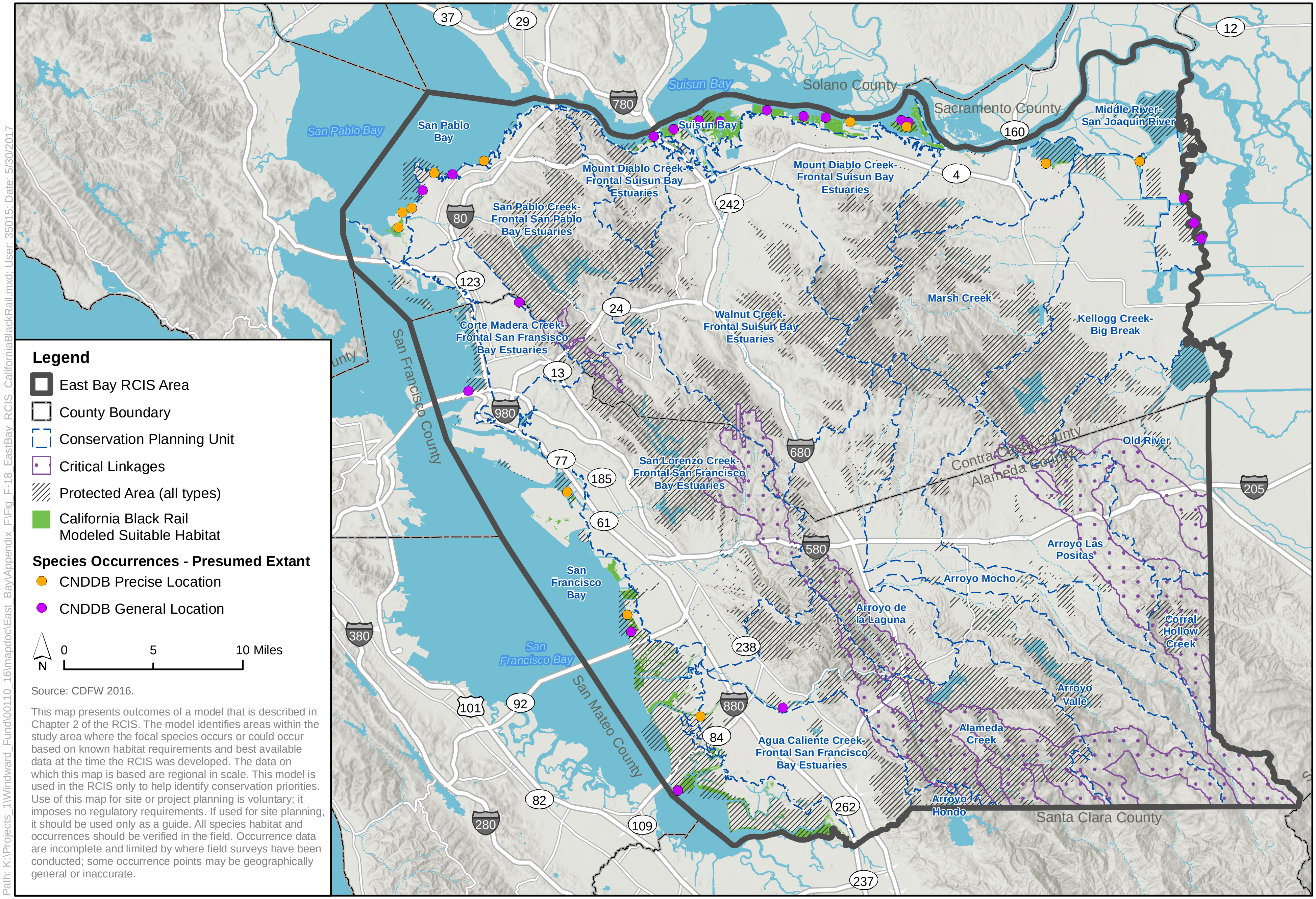
Modeled habitat for California black rail is defined as tidal vegetation land cover type in the RCIS area.

Rationale

California black rails are restricted to areas of tidal marsh habitat with dense cover of upland vegetation to provide protection from predators when rails must leave marsh habitats during high tides (Eddleman et al. 1994). Typical associated vegetation includes pickleweed in salt marshes and bulrush in less saline habitats (Evens et al. 1991, Harvey et al. 1999).

Model Results

Figure F-18 displays the modeled habitat for California black rail within the RCIS area. Potential habitat is located along the Bay in the northwestern corner of the RCIS area between the cities of Hayward and Newark and along the northern edge of the RCIS area between the cities of Martinez and Pittsburg.



Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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Figure F-18
California Black Rail Modeled Suitable Habitat

F.19 San Joaquin kit fox (*Vulpes macrotis mutica*)

Regulatory Status

- ***State:*** Threatened
- ***Federal:*** Endangered
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** Recovery Plan for Upland Species of the San Joaquin Valley, California (U.S. Fish and Wildlife Service 1998)

Distribution

General

San Joaquin kit fox occurs in some areas of suitable habitat on the floor of the San Joaquin Valley and in the surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains from Kern County north to Contra Costa, Alameda, and San Joaquin Counties (U.S. Fish and Wildlife Service 1998). There are 977 known occurrences of this species within California (California Department of Fish and Wildlife, Natural Diversity Database 2016). The largest extant populations of kit fox are in Kern County (Elk Hills and Buena Vista Valley) and San Luis Obispo County in the Carrizo Plain Natural Area (U.S. Fish and Wildlife Service 1998).

Within the RCIS area

Of the 977 CNDDB occurrences, 39 (4%) are within the RCIS area (California Department of Fish and Wildlife, Natural Diversity Database 2016). These occurrences are within a corridor of open area spanning north of Concord (Contra Costa County) running southeast past Livermore (Alameda County). The majority of occurrences are located just south of Pittsburg (Contra Costa County) southeast through the Altamont region east of Livermore (Alameda County).

Natural History

The diet of San Joaquin kit foxes varies seasonally and geographically, based on local availability of potential prey. In the northern portion of their range, San Joaquin kit foxes most commonly prey on California ground squirrels (*Otospermophilus beecheyi*), cottontails (*Sylvilagus auduboni*), black-tail jackrabbits (*Lepus californicus*), kangaroo rats (*Dipodomys* spp.), and pocket mice (*Perognathus* spp.) (Hall 1983, Orloff et al. 1986, U.S. Fish and Wildlife Service 1998). Secondary prey taken opportunistically may include ground-nesting birds, reptiles, and insects (Laughlin 1970). In Contra Costa and Alameda counties, California ground squirrels are a primary prey (Orloff et al. 1986), though in other locations, San Joaquin kit fox appear to be strongly linked to the ecology of kangaroo rats (Cypher et al. 2000, U.S. Fish and Wildlife Service 2010b).

San Joaquin kit foxes can, but do not necessarily, breed their first year. Sometime between February and late March, two to six pups are born per litter (Zoellick et al. 1987, Cypher et al. 2000). The annual reproductive success for adults can range between 20% and 100% (mean: 61%;) and 0 and 100% for juveniles (mean: 18%) (Cypher et al. 2000). Population growth rates generally vary with reproductive success, and kit fox density is often related to both current and the previous year's prey availability (Cypher et al. 2000). Prey abundance is generally strongly related to the previous year's precipitation, particularly drought conditions (Cypher et al. 2000, Dennis and Otten 2000, U.S. Fish and Wildlife Service 2010b).

San Joaquin kit foxes may range up to 20 miles at night during the breeding season and somewhat less (6 miles) during the pup-rearing season (Girard 2001). The species can readily navigate a matrix of land use types. Home ranges vary from less than one square mile up to approximately 12 square miles (Spiegel and Bradbury 1992, White and Ralls 1993). The home ranges of pairs or family groups of San Joaquin kit foxes generally do not overlap (White and Ralls 1993).

Ecological Requirements

San Joaquin kit fox occurs in a variety of habitats, including grasslands, scrublands, vernal pool areas, alkali meadows and playas, and an agricultural matrix of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands (U.S. Fish and Wildlife Service 1998a). San Joaquin kit foxes prefer areas with loose-textured soils (Grinnell et al. 1937, Egoscue 1962), suitable for digging, but can occur on virtually every soil type. Dens are generally located in open areas with grass or grass and scattered brush, and seldom occur in areas with thick brush. They are seldom found in areas with shallow soils due to high water tables (McCue et al. 1981) or impenetrable bedrock or hardpan layers (O'Farrell and Gilbertson 1979, O'Farrell et al. 1980). However, San Joaquin kit foxes may occupy soils with a high clay content where they can modify burrow dug by other animals, such as California ground squirrels, kangaroo rats, and badgers (Orloff et al. 1986, Cypher et al. 2012).

Cypher et al. (2013) mapped the remaining distribution and suitability of habitat within the San Joaquin kit fox's range, classifying habitat into one of three categories of quality: highly suitable, moderately suitable, or low suitability. Habitat attributes most important to San Joaquin kit fox were land cover, terrain, and low vegetation density. Highly suitable habitat includes saltbush scrublands (*Atriplex polycarpha, A. spinifera*) and grassland dominated by red brome, while moderately suitable habitat includes alkali sink scrublands and grassland dominated by wild oats species (*Avena* spp.). Highly suitable habitat also includes flat or gently rolling terrain (i.e. average slopes less than 5 percent), with suitability declining as the average slope increases and terrain becomes more rugged. Other land cover types and anthropogenic habitat (e.g. agriculture and urban areas) were considered to have low suitability.

San Joaquin kit foxes use numerous dens throughout the year. San Joaquin kit foxes generally modify and use dens constructed by other animals, such as ground squirrels (Jensen 1972, Morrell 1972, Hall 1983, Berry et al. 1987), as well as human made structures (B.L. Cypher pers. comm., as cited in U.S. Fish and Wildlife Service 1998). Dens are used for temperature regulation, shelter from inclement weather, reproduction, and escape from predators. Hall (1983) documented a family of 7 kit foxes that used 43 dens in 1 year, while 1 other individual used 70 dens (K Ralls, pers. comm., as cited in Williams et al. 1998). Koopman et al. (1998) found that individuals within the Naval Petroleum Reserves use an average of 11.8 different dens each year, and den use does not differentiate between sexes. The number of dens used varied among seasons, with more dens used during the dispersal season than during the breeding or pup-rearing seasons. Den changes are believed to be primarily in response to a need to avoid coyotes, although local depletion of prey and increases in external parasites in the dens may also influence this behavior (Egoscue 1956 in Williams et al. 1998).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The San Joaquin kit fox habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). The East Contra Costa County HCP/NCCP and East Alameda County Conservation Strategy differentiate higher-quality core habitat from low-use habitat. This RCIS combines these two types of habitat into a single type, denning and movement habitat, which includes all the habitat modeled by the East Contra Costa County HCP/NCCP and East Alameda County Conservation Strategy. This RCIS models one habitat type to capture all San Joaquin kit fox habitats in the RCIS area, rather than distinguishing core habitat from lower quality habitat, because the RCIS area is at the northern extent of the San Joaquin kit fox's range and only supports a satellite population (i.e., no core populations) (U.S. Fish and Wildlife Service 2010b).

Denning and movement habitat is defined as:

- All grassland land cover types;
- Valley oak woodland within 500 feet of grassland land cover types;
- Seasonal wetlands that shared a boundary with grassland land cover types or valley oak woodlands within 500 feet of grassland land cover types;
- Blue oak woodland, coast live oak forest and woodland, foothill-pine oak woodland, and mixed oak woodland and forest land cover types within 100 feet of the following.
    - All grassland land cover types.
    - Valley oak woodland within 500 feet of grassland land cover types.
    - Seasonal wetlands that shared a boundary with grassland land cover types or valley oak woodlands within 500 feet of grassland land cover types; and
- Cultivated agriculture land cover types within 1 mile of the following.
    - All grassland land cover types.
    - Valley oak woodland within 500 feet of grassland land cover types.
    - Seasonal wetlands that shared a boundary with grassland land cover types or valley oak woodlands within 500 feet of grassland land cover types.

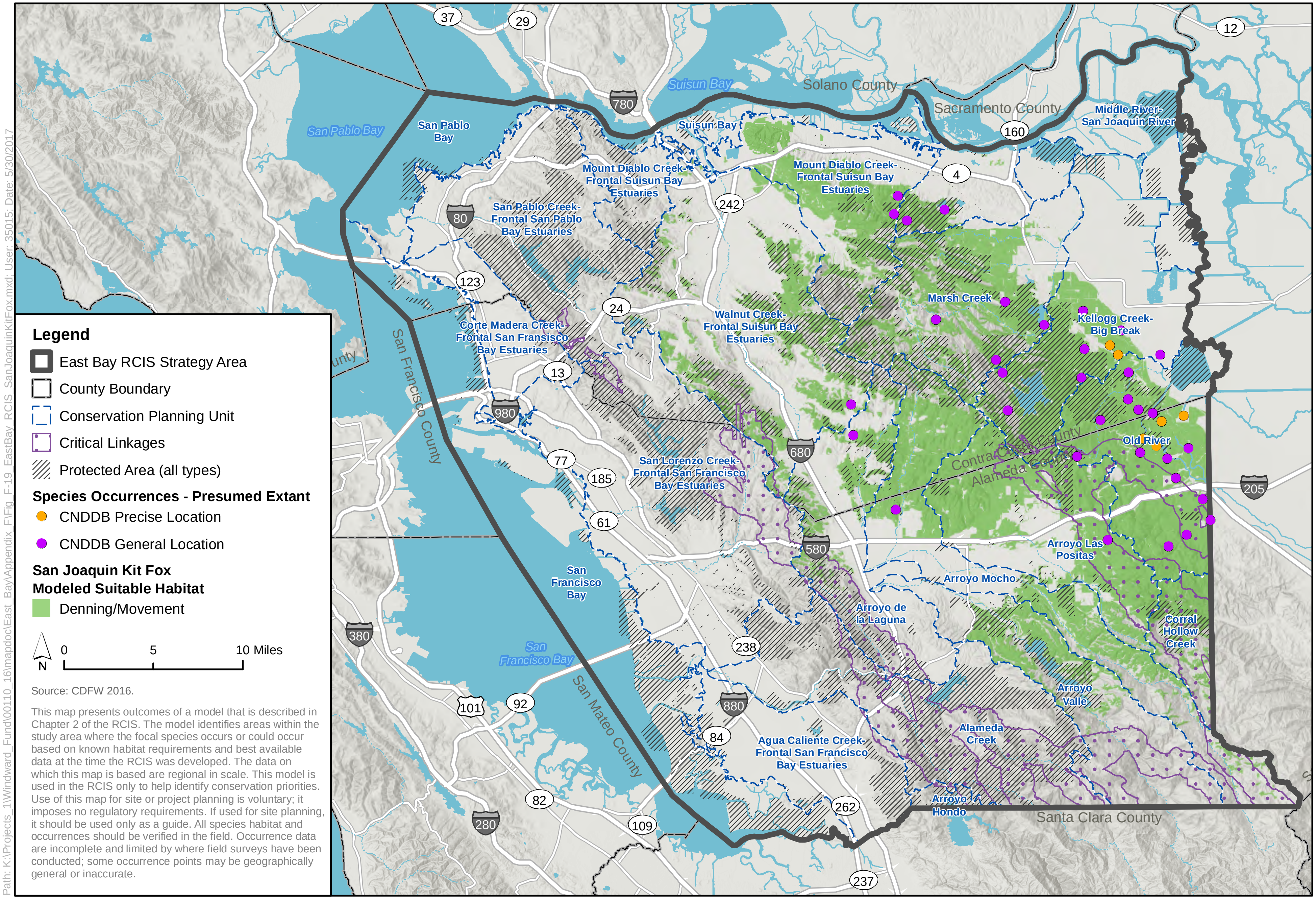
Denning and movement habitat is also limited to the following watersheds (HUC 10): Arroyo Las Positas, Arroyo Mocho, Corral Hollow Creek, Marsh Creek, Mount Diablo Creek-Frontal Suisun Bay Estuaries, Old River, Walnut Creek-Frontal Suisun Bay Estuaries and subwatersheds (HUC 12): Alamo Creek, Dry Creek-Arroyo Valle, Lake Del Valle-Arroyo Valle, Lower Kellogg Creek, Markley Canyon-San Joaquin River, South San Ramon Creek.

Rationale

In the northern part of its range (including San Joaquin, Alameda, and Contra Costa Counties) where most habitat on the valley floor has been eliminated, San Joaquin kit foxes now occur primarily in foothill grasslands (Swick 1973, Hall 1983, U.S. Fish and Wildlife Service 1998), valley oak savanna, and alkali grasslands (Bell 1994). They prefer habitats with loose-textured soils (Grinnell et al 1937, Hall 1946, Egoscue 1962, Morrell 1972), suitable for digging, but occur on virtually every soil type, where they can modify burrow dug by other animals such as ground squirrels (Orloff et al. 1986). Less frequently they occur adjacent to and forage in tilled and fallow fields and irrigated row crops (Bell 1994). These foxes will den within small parcels of native habitat that are surrounded by intensively maintained agricultural lands (Knapp 1978) and adjacent to dryland farms (Jensen 1972, Orloff et al. 1986, U.S. Fish and Wildlife Service 1998). San Joaquin kit foxes are known to use agricultural areas within the RCIS area in these ways (Jones & Stokes 2006).

Model Results

Figure F-19 displays the modeled habitat for San Joaquin kit fox within the RCIS area. Suitable denning and movement habitat is modeled throughout the undeveloped lands in the eastern portion of the RCIS area.



Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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ICF

Figure F-19
San Joaquin Kit Fox Modeled Suitable Habitat

F.20 Mountain lion (*Puma concolor*)

Regulatory Status

- **State:** None
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning**: N/A

Distribution

General

Mountain lion range widely throughout the Americas, from the Canadian Yukon to the Strait of Magellan. More than half of California is prime mountain lion habitat. Mountain lion studies around California provide a crude estimate of between 4,000 and 6,000 mountain lions statewide (California Department of Fish and Wildlife 2007).

Within the RCIS area

Much of the oak woodland and coniferous forest in the mountains and foothills in the RCIS area is potential mountain lion habitat. Mountain lions are common at relatively low densities in these habitats.

Natural History

Mountain lion, also known as cougar, puma, panther, and catamount, is the largest wildcat in North America. Mountain lions are solitary mammals that are very territorial and avoid other individuals except during courtship (Link et al. 2005). Mountain lions become sexually mature at 24 months of age, but will not breed until they have established a home range. The mating season is commonly from December to March, but can occur at any time during the year. Gestations is 82 to 96 days and litter size is 2 to 4 kittens. The mother raises the kittens alone, nursing them for two months, at which time she teaches them to hunt. Young remain with the mother for 1.5 to 2 years (Defenders of Wildlife 2017). Because male mountain lions have larger home ranges than females, one male may mate with multiple females in a given year. Males can live 10 to 12 years in the wild and females normally live longer. Female progeny will establish a territory adjacent to their mother, while males will disperse far distances from their natal area (Link et al. 2005).

Mountain lions primarily prey upon deer (Allen et al. 2015), but will also eat smaller animals such as coyote, porcupines, and raccoons. They usually hunt at night but will also hunt at dusk and dawn (National Geographic 2017, Defenders of Wildlife 2017, California Department of Fish and Wildlife 2017b). Allen et al. (2015) found that mountain lions will also hunting during diurnal hours as opportunities arise, especially during summer when young ungulates are available.

Ecological Requirements

Mountain lions inhabit a wide range of habitats in search for food and shelter (Hornocker and Negri 2009). Mountain lions are found wherever deer are present, generally in foothills and mountains, as well as deserts (Logan and Sweanor 2001). They can also be found in areas with rural human development. Mountain lions prefer habitat with steep canyons, rock outcroppings and boulders, or with enough brush to aid their ambush hunting style (Link et al. 2005). Females use daybeds when rearing young. They may settle while raising young, to protect from weather, and to rest but otherwise are always on the move, making daybeds as they go. Daybeds are usually caves or shallow nooks on a cliff face or rock outcrop. In less mountainous daybed areas are located in forested area, thickets or under large roots or fallen trees (Link et al. 2005).

Because they are territorial and have low population densities, mountain lions require large areas of habitat (Logan and Sweanor 2001). Studies indicate that mountain lion densities range from zero to 10 lions per 100 square miles (California Department of Fish and Wildlife 2007). Adult males roam widely, covering a home range of 50 to 150 square miles, depending on time of year, terrain, and availability of prey. Females home ranges are about that half of males (Link et al. 2005). Beier (1993) found that mountain lions can survive in areas as small as 849 square miles, but any smaller and they are at risk of extinction from habitat patches. Beier also found that if as few as one to four mountain lions per decade immigrate into a small population, the probability of population persistence increases.

Corridors for movement are important for this wide-ranging species in fragmented landscapes. Dickson et al. (2005) found that in Southern California, riparian vegetation was most often used for movement, and grassland, woodland and urbanized site were least used for movement. Dickson et. al. (2005) also found that mountain lion avoided 2-lane paved roads for migration, but dirt roads facilitated movement.

Modeled Habitat Distribution in the RCIS Area

A habitat model for mountain lion is not included in this RCIS. This species ranges widely throughout a broad range of habitats in the mountains and foothills, and data for mountain lion habitat use in the RCIS are not readily available to refine a land cover-based model. Rather, Bay Area Critical Linkages (Penrod et al. 2013) are used to identify functional connections between habitats for mountain lion (Chapter 3, *Conservation Strategy*).

F.21 Pallid manzanita (*Arctostaphylos pallida*)

Regulatory Status

- **State:** Endangered, California Rare Plant Rank 1B.1
- **Federal:** Threatened
- **Critical Habitat:** N/A
- **Recovery Planning:** Recovery Plan for Pallid Manzanita (U.S. Fish and Wildlife Service 2015)

Distribution

General

Pallid manzanita is endemic to the Bay Area in the northwestern extremity of the Diablo Range. All known occurrences are within 7 miles of the Bay (U.S. Fish and Wildlife Service 2015). Two geographic areas, both within the RCIS area, support naturally occurring populations of pallid manzanita: Huckleberry Ridge in Alameda County and Sobrante Ridge in Contra Costa County (U.S. Fish and Wildlife Service 2015). There are eight CNDDB occurrences of pallid manzanita within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

All eight (100%) of known CNDDB occurrences are within the RCIS area, on Huckleberry Ridge in Alameda County and Sobrante Ridge in Contra Costa County. A small planted population consisting of two stands occurs at Tilden Park (U.S. Fish and Wildlife Service 2015, California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Pallid manzanita is a perennial evergreen shrub, 6 to 13 feet in height with rough gray or reddish bark (California Native Plant Society 2018, U.S. Fish and Wildlife Service 2015). This species has pale green, glaucous leaves, hairy terminal branches and pinkish-white bell shaped flowers that form dense inflorescences. Pallid manzanita blooms from December to March (Calflora 2018) with peak blooming occurring between January and March (Baldwin et al. 2012). Bees are important pollinators (Amme and Havlik 1987, as cited in U.S. Fish and Wildlife Service 2015).

Pallid manzanita can grow in densely vegetated areas but is shade-intolerant (Amme and Havlik 1987, as cited in U.S. Fish and Wildlife Service 2015) and requires open patches with direct sunlight. Fire is required for natural seed germination, but a too frequent fire regime may deplete the soil seed bank. Plants that survive wildfire may resprout from a basal burl. In the absence of fire, mechanical disturbance as a result of vegetation management activities may cause seeds to germinate (U.S. Fish and Wildlife Service 2015). Pallid manzanita can also reproduce vegetatively from a process called layering, where partially or fully buried branches produce roots (U.S. Fish and Wildlife Service 2015).

Ecological Requirements

Pallid manzanita occurs in broadleaf upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub habitat (California Native Plant Society 2017). Although this species can occur in forest and woodland habitat, it is shade intolerant and will die if shaded by larger trees and shrubs; pallid manzanita is most concentrated in areas of barren soils contained within these vegetation types. Pallid manzanita occurs on shallow, well-drained soils that formed from material weathered from sandstone, mudstone, and shale. This species appears only to grow on these soils in areas that experience maritime summer fog, and have not been found on the same substrates where summer air and soils temperatures are higher. Pallid manzanita occurs between approximately 600 and 1,500 feet in elevation. Pallid manzanita is codominant with other woody shrubs and shrub-form trees such as brittle leaf manzanita (*A. crustacea*), California huckleberry (*Vaccinium ovatum*), golden chinquapin (*Chrysolepis chrysophylla minor*) and several shrub-forms of oaks (*Quercus* spp.) (U.S. Fish and Wildlife Service 2015).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for pallid manzanita are defined as the following land cover types on loam and clay loam soil: northern mixed chaparral/chamise chaparral, northern coastal scrub/Diablan sage scrub, coast live oak forest and woodland, and redwood forest. Potential habitat is limited to areas between 600 and 1,500 feet in elevation. The model also uses four subwatersheds (HUC 12), which capture tributary systems, to approximate areas subject to maritime summer fog. These subwatersheds are Pinole Creek-Frontal San Pablo Bay Estuaries, Sausal Creek-Frontal San Francisco Bay Estuaries, San Leandro Creek, and San Pablo Creek.

Rationale

Pallid manzanita is a component of the maritime chaparral/scrub vegetation type and appears to be co-dominant with other woody shrubs and shrub-form trees on shallow-well drained soil. This species also occurs in coast live oak forest and woodland and redwood forest, but mainly occurs on roadcuts and within forest gaps. Pallid manzanita is only known to occur in areas that experience a high frequency of dry season fog. This species occurs in elevation between 656 and 1,460 feet above sea level (U.S. Fish and Wildlife Service 2015). The extent of the habitat model is limited to the watersheds with extent occurrences to avoid overestimating the amount of suitable habitat in the RCIS area.

Model Results

Figure F-20 displays the modeled habitat for pallid manzanita within the RCIS area. Modeled habitat is located on the western edge of the Diablo Range, south of Interstate 80 and north of Interstate 580. Modeled habitat is located in both undeveloped and urban areas within the cities of Berkeley, Oakland, and El Cerrito, otherwise known as the East Bay Hills.

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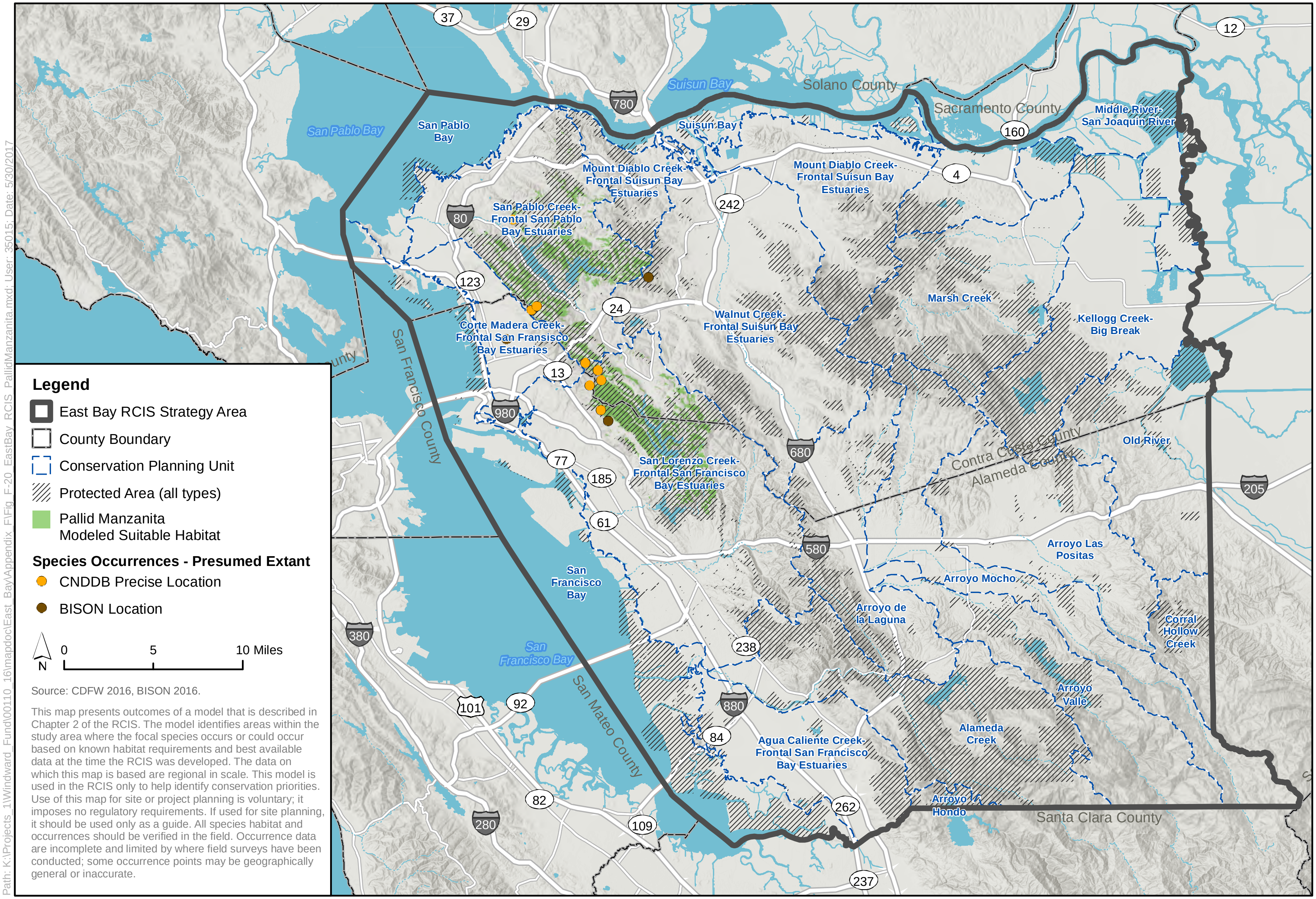


Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-20
Pallid Manzanita Modeled Suitable Habitat

F.22 Brittlescale (*Atriplex depressa*)

Regulatory Status

- **State:** California Rare Plant Rank 1B.2
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** N/A

Distribution

General

Brittlescale occurs along the western side of the Great Valley from Glenn County to Merced County and the small valleys of the inner Coast Ranges. It occurs in the broad flood basins of the valley floor and on alluvial fans associated with the major streams draining from the inner Coast Range foothills. There are 60 CNDDB occurrences of brittlescale within California (California Department of Fish and Wildlife, Natural Diversity Database 2016, Jones & Stokes 2006).

Within the RCIS area

Brittlescale occurs primarily east of the Diablo Range crest near the eastern boundary of the RCIS area. Most CNDDB occurrences are located north of Interstate 580, between the cities of Antioch and Livermore. There is also one anomalous brittlescale occurrence in the southwestern corner of Alameda County at the Don Edwards San Francisco Bay National Wildlife Refuge. Of the 60 known CNDDB occurrences, 19 (32%) are within the RCIS area (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Brittlescale is a small annual herb native and endemic to California. It generally grows prostrate and rarely exceeds one foot in height. Its blooming period is from April to October (California Native Plant Society 2018), with peak blooming occurring in June and August (Baldwin et al. 2012).

Ecological Requirements

Brittlescale occurs in chenopod scrub, meadows and seeps, playas, valley and foothill grassland, and vernal pool habitat on alkali scalds and alkali clay soils of the Pescadero and Solano series. It is rarely found on the margins of alkali vernal pools, or alkaline marshes or riparian areas. The primary habitat for brittlescale is near the edge of the inundation or saturation zone (Nomad Ecology 2016). Brittlescale is found from 0 to 1,055 feet in elevation (Jones & Stokes 2006, California Native Plant Society 2017). Species commonly associated with brittlescale including saltbush species (*Atriplex* spp.), saltgrass (*Distichlis spicata*), barley species (*Hordeum* spp.), and common tarplant (*Centromadia pungens*).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

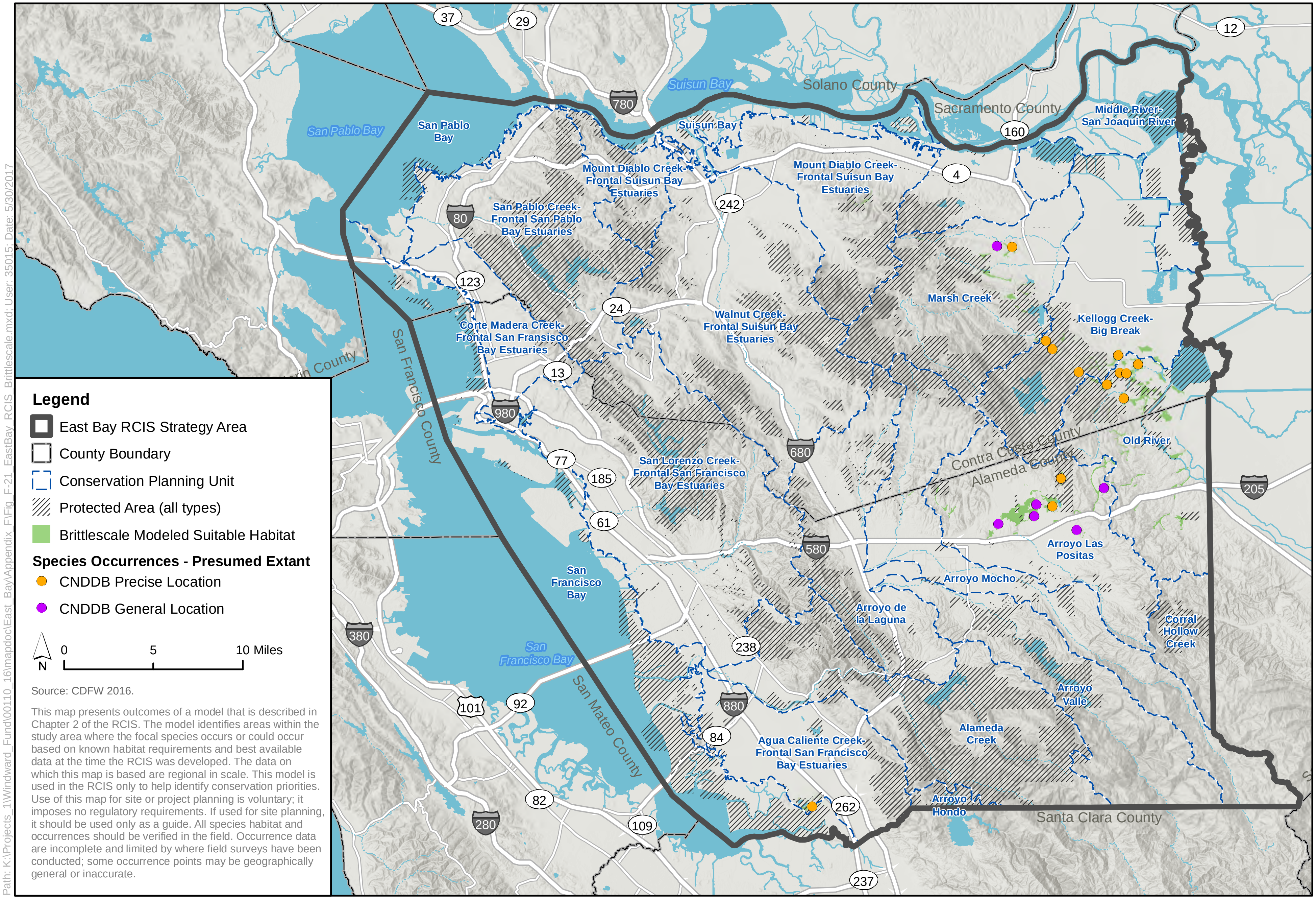
The brittlescale habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006). Model parameters for brittlescale are defined as the alkali grassland, alkali wetland, and vernal pool land cover types on soil map units containing any portion of the Pescadero or Solano soil series. The model is restricted to elevations between 0 and 1,055 feet.

Rationale

Brittlescale occurs on alkali soils of the Pescadero and Solano series. Brittlescale typically occurs in barren areas within alkali grassland, alkali meadow, and alkali scrub. It is occasionally found on the margins of alkali vernal pools (Jones & Stokes 2006, Baldwin et al. 2012, California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2018). It occurs in the broad flood basins of the Central Valley floor and on alluvial fans associated with the major streams draining from the inner Coast Range foothills. It is generally found at low elevations but has been collected up to 1,055 feet above sea level (California Native Plant Society 2018).

Model Results

Figure F-21 displays the modeled habitat for brittlescale within the RCIS area. Modeled habitat is located on the east side of the Diablo Range and in Livermore Valley, as well as in the Don Edwards San Francisco Bay National Wildlife Refuge.



Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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Figure F-21
Brittlescale Modeled Suitable Habitat

F.23 Big tarplant (*Blepharizonia plumosa*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.1
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Big tarplant is endemic to California and is found primarily in eastern Contra Costa, eastern Alameda and western San Joaquin Counties, with smaller populations in Stanislaus and Solano Counties. There are 46 CNDDB occurrences of big tarplant within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Big tarplant is located in grassland habitat east of the Diablo Range crest. Most occurrences are present in Contra Costa County near Antioch and Bryon Hot Springs. There is also a small cluster of occurrences in Alameda County near the eastern boundary of the RCIS area in the Carnegie State Vehicular Recreation Area and surrounding private land. The occurrences of big tarplant in the developed areas near the cities of Walnut Creek, Pittsburg, and Antioch are assumed to be extirpated. Of the 46 known CNDDB occurrences, 28 (61%) are within the RCIS area (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Big tarplant is an herbaceous annual that grows to between 1 and 3 feet tall. Seedlings appear in early spring, but the plants do not begin to bloom until mid-summer. The blooming period, during which the plants produce many heads with white flowers, generally occurs between July-October., with peak blooming in September (Calflora 2018, Baldwin et al. 2012). Big tarplant can hybridize with glandular big tarweed (*Blepharizonia laxa*), which is more widely distributed. The two species, which often occur in adjacent populations, can be differentiated by the disk pappus (i.e., bristles or scales on inferior ovary) length (i.e., much shorter in glandular big tarplant), the amount and color of the simple and glandular hairs on the stems and leaves, the chemical compounds produced by the glands, and by genetic markers (Baldwin et al. 2001, Gregory et al. 2001, Preston pers. comm., as cited in Jones & Stokes 2006). The two species can hybridize, but the hybrids are infertile (Baldwin et al. 2001).

Ecological Requirements

Big tarplant occurs in valley and foothill grassland on clay and clay-loam soils of the Altamont soil series. This species usually occurs on dry hills and plains on slopes and in burned areas on north and northeast facing slopes. Big tarplant is found from 98 to 1,656 feet in elevation (ICF International

2010, California Native Plant Society 2017). Species commonly associated with big tarplant include oat grass species (*Avena* spp.), brome species (*Bromus* spp.), buckwheat species (*Eriogonum* spp.), tarplant species (*Holocarpha obonica*, *Holocarpha virgata*), and purple needlegrass (*Stipa pulchra*) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

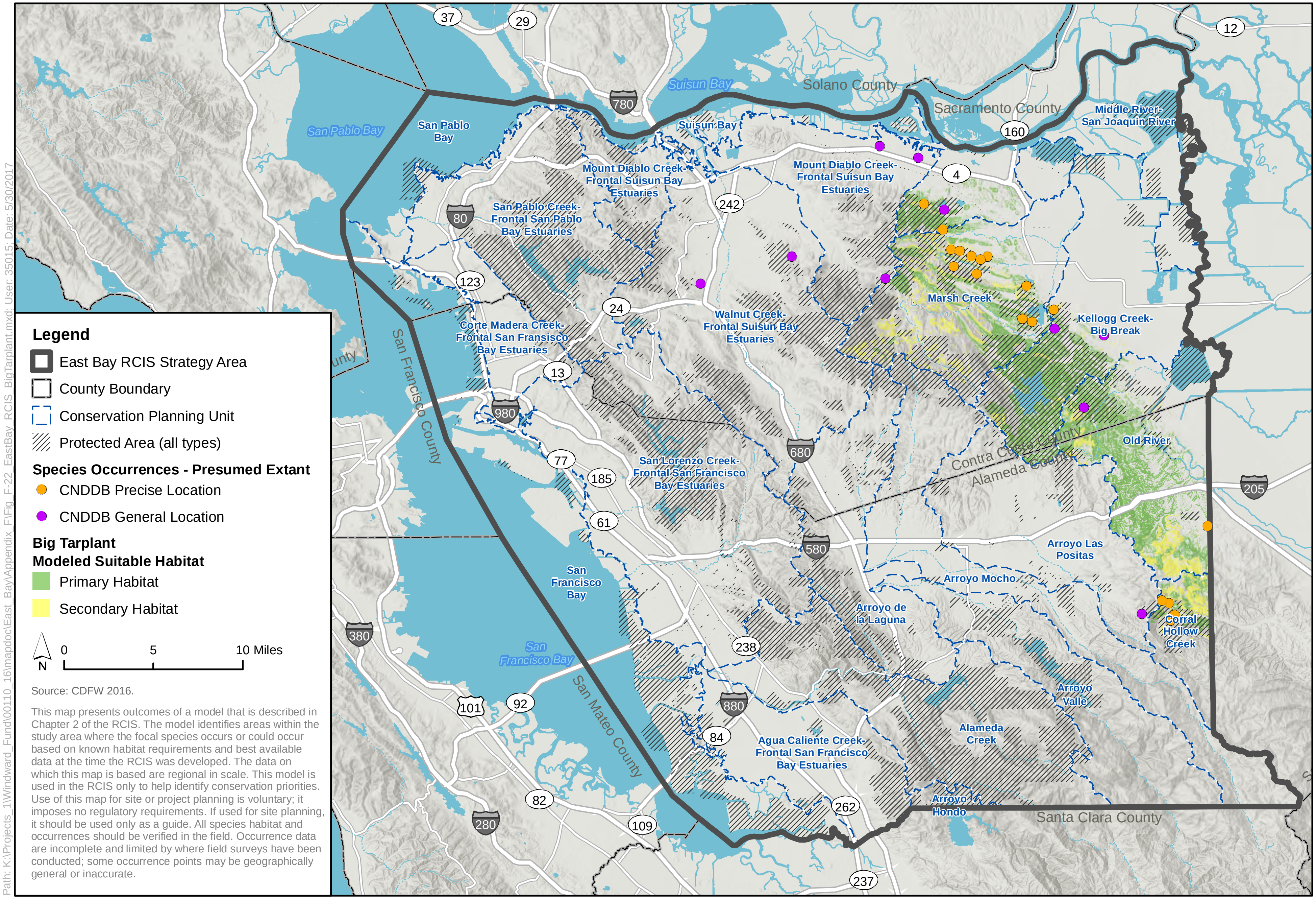
The big tarplant habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010). Both primary and secondary habitats for big tarplant are defined as the California annual grassland habitat land cover type east of the Diablo Range crest. Primary habitat is restricted to soil map units with any percentage of Altamont soil series, while secondary habitat for big tarplant includes all other soil types. Both primary and secondary habitats are restricted to elevations between 0 and 1,827 feet and slopes between 10 and 31 degrees.

Rationale

Big tarplant occurs in annual grassland on clay to clay-loam soils, usually on slopes and often in burned areas, below 1,500 feet elevation (Jones & Stokes 2006, Baldwin et al. 2012, California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2018). In Contra Costa County, the occurrences are primarily on soils of the Altamont series (National Resource Conservation Service 2016).

Model Results

Figure F-22 displays the modeled habitat for big tarplant within the RCIS area. Primary and secondary habitat are located in undeveloped areas in east Contra Costa and Alameda Counties, from Antioch to the eastern edge of the RCIS area east of the city of Livermore. Primary habitat is concentrated along the Contra Costa-Alameda County boundary, while secondary habitat is concentrated south of Interstate 580.



Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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ICF

Figure F-22
Big Tarplant Modeled Suitable Habitat

F.24 Fragrant fritillary (*Fritillaria liliacea*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.1
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** Recovery Plan for Serpentine Soil Species of the Bay Area (U.S. Fish and Wildlife Service 1998)

Distribution

General

Fragrant fritillary is endemic to the San Francisco Bay area and central coastal California (California Department of Fish and Wildlife, Natural Diversity Database 2016). This species occurs in Alameda, Contra Costa, Marin, Monterey, San Benito, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties at elevations from 0 to 1,345 feet. There are 81 CNDDB occurrences of fragrant fritillary within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 81 CNDDB occurrences, eight (12.1%) are within the RCIS area (California Department of Fish and Wildlife, Natural Diversity Database 2016). These occurrences are located in the East Bay Hills east of San Leandro and south of the city of Walnut Creek. Two general occurrences are located in the cities of Piedmont and Danville that may be extirpated.

Natural History

Fragrant fritillary is a perennial bulbiferous herb between 4 and 14 inches tall with nodding white flowers. This species blooms from February through April, with the peak blooming period between March and April. The growing period for the species is year round. Little research has been conducted on pollination, but it is likely that this species hosts a variety of pollinators, including bees, wasps, beetles, flies and butterflies. Seeds in the *Fritillaria* genus are generally dispersed by wind. Pollination and dispersal may occur incidentally by birds and mammals (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012).

Ecological Requirements

Fragrant fritillary occurs in cismontane woodland, coastal prairie, coastal scrub, and valley and foothill grassland, in both upland and seasonally saturated areas (California Native Plant Society 2016). This species has a weak affinity for serpentine soils and also grows on clay and other soil types (California Department of Fish and Wildlife, Natural Diversity Database 2016, Calflora 2016). This species has also been observed growing in California annual grassland. Some species commonly associated with fragrant fritillary include purple needlegrass, blue dicks (*Dichelostemma capitatum*), soap plant (*Chlorogalum pomeridianum*), common muilla (*Muilla maritima*), shining pepperweed

(*Lepidium nitidum)*, purple clarkia (*Clarkia purpurea*), California buttercups (*Ranunculus californicus*), California poppy (*Eschscholzia californica*) and coyote brush (*Baccharis pilularis*) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The fragrant fritillary habitat model is adapted from the Santa Clara Valley HCP/NCCP (this species is not covered by the East Contra Costa County HCP/NCCP, Antioch HCP/NCCP, or addressed by the East Alameda County Conservation Strategy). Fragrant fritillary is often found on serpentine soils in grassland, but also on other soils types in grassland, oak woodland, and coastal scrub habitat. Model parameters are included for primary and secondary habitat, as fragrant fritillary tends to occur on serpentine soils in the RCIS area. Primary habitat within the RCIS area is defined as the serpentine grassland land cover type between zero and 1,500 feet in elevation on slopes with all degrees of steepness. Secondary habitat is defined as the California annual grassland, northern coastal scrub/Diablan sage scrub and blue oak woodland, valley oak woodland, coast live oak forest and woodland, and mixed oak woodland and forest land cover types between 0 and 1,500 feet in elevation on slopes with all degrees of steepness. The eastern extent of modeled habitat in the RCIS area is limited to areas east of Mount Diablo.

Rationale

Fragrant fritillary is known to primarily occur on serpentine soils within grasslands in RCIS area. The species may also occur on non-serpentine soils in grasslands, oak woodland, and coastal scrub up to 1,500 feet (ICF International 2012). Because most of the RCIS area falls within primary or secondary habitat for this species, the model is limited to west of Mount Diablo, where the species is most likely to occur based on known occurrences and the dominance of serpentine soils in grasslands.

Model Results

Figure F-23 displays the modeled habitat for fragrant fritillary within the RCIS area. Primary habitat is located in very small areas where serpentine soils are present.[4] Secondary habitat is found throughout most of the RCIS area from the north to south ends of the RCIS area east of the Diablo Range crest.

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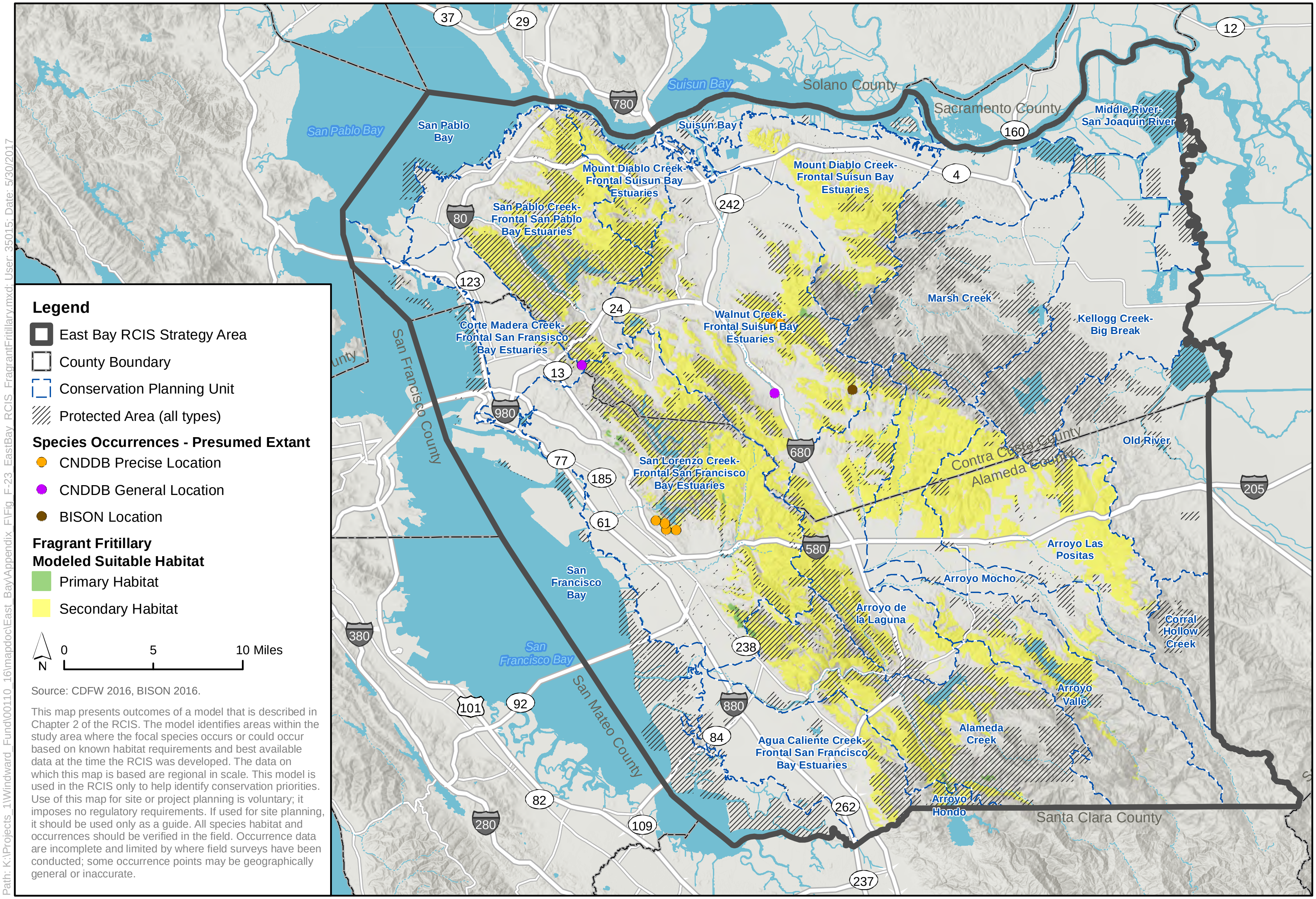
[4] The symbol used for the occurrences points may overlap primary habitat and obscure it from view.



Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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ICF

Figure F-23
Fragrant Fritillary Modeled Suitable Habitat

F.25 Round-leaved filaree (*California macrophylla*)

Regulatory Status

- ***State:*** None
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Round-leaved filaree ranges from southern Oregon through California into northern Mexico (Gillespie 2003). In California, this species has been observed from Shasta County to San Diego County on the Coast Ranges and in the Central Valley (Calflora 2016). Most of the occurrences within the last 6 years have been identified in southern California. There are 153 CNDDB occurrences of California round-leaved filaree within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 153 known CNDDB occurrences, 15 (10%) are within the RCIS area. These occurrences are scattered throughout the RCIS area in eastern Contra Costa and Alameda Counties. Approximately half of these occurrences are general locations (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Round-leaved filaree is an annual or biennial herb native to California that generally grows prostrate and has a leafless stalk. The plants bloom between March and May, with most blooming occurring in April, producing small (< 1 inch), white flowers (Baldwin et al. 2012, California Native Plant Society 2017). The flowers are self-pollinating (Gillespie 2003).

Ecological Requirements

Round-leaved filaree occurs in foothills from 50 to 3,937 feet in elevation (Jones & Stokes 2006, California Native Plant Society 2017, California Department of Fish and Wildlife, Natural Diversity Database 2016), but is most common from 200 to 2,000 feet in elevation (California Department of Fish and Wildlife, Natural Diversity Database 2016). Round-leaved filaree occurs in cismontane woodlands and valley and foothill grasslands on heavy clay soils. It has been found in nonnative grassland on clay soil with relatively low cover of annual grasses (Jones & Stokes 2002, 2003). It has been hypothesized that round-leaved filaree does not compete as well on other soils types and has adapted to the less favorable soil conditions of this low productivity environment (Gillespie 2003). Some species commonly associated with round-leaved filaree include blow-wives (*Achyrachaena mollis*), Munz' onion (*Allium munzii*), wild celery (*Apiastrum angustifolium*), small-flowered morning glory (*Convolvulus simulans*), Hall's tarplant (*Deinadra halliana*), Mediterranean mustard (*Hirschfeldia incana*), and arroyo lupine (*Lupinus succulentus*).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The round-leaved filaree habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006). Primary and secondary habitats for round-leaved filaree are defined as the California annual grassland habitat land cover type on clay and clay loam soils. Primary habitat is limited to elevations between 200 and 2,000 feet, and secondary habitat is limited to elevations between 2,000 and 4,000 feet.

Rationale

Round-leaved filaree generally occurs in grasslands on friable clay soils of the Altamont soil series (California Native Plant Society 2018, Jones & Stokes 2006). This species has been found in nonnative grassland on clay soils with relatively low cover of annual grasses (Jones & Stokes 2002b, 2003). It most often occurs in foothill locations at elevations between 200 and 2,000 feet, but it has been collected from locations as low as 30 feet and as high as 4,000 feet (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Model Results

Figure F-24 displays the modeled habitat for round-leaved filaree within the RCIS area. Primary habitat is located mostly in eastern Contra Costa and Alameda Counties, primarily east of Interstate 680 in undeveloped area, with small patches in hills above the San Francisco Bay in the western half of the RCIS area. Secondary habitat is sparse in the RCIS area, with small patches in eastern Alameda County east of the city of Livermore and along the southern edge of Mount Diablo.

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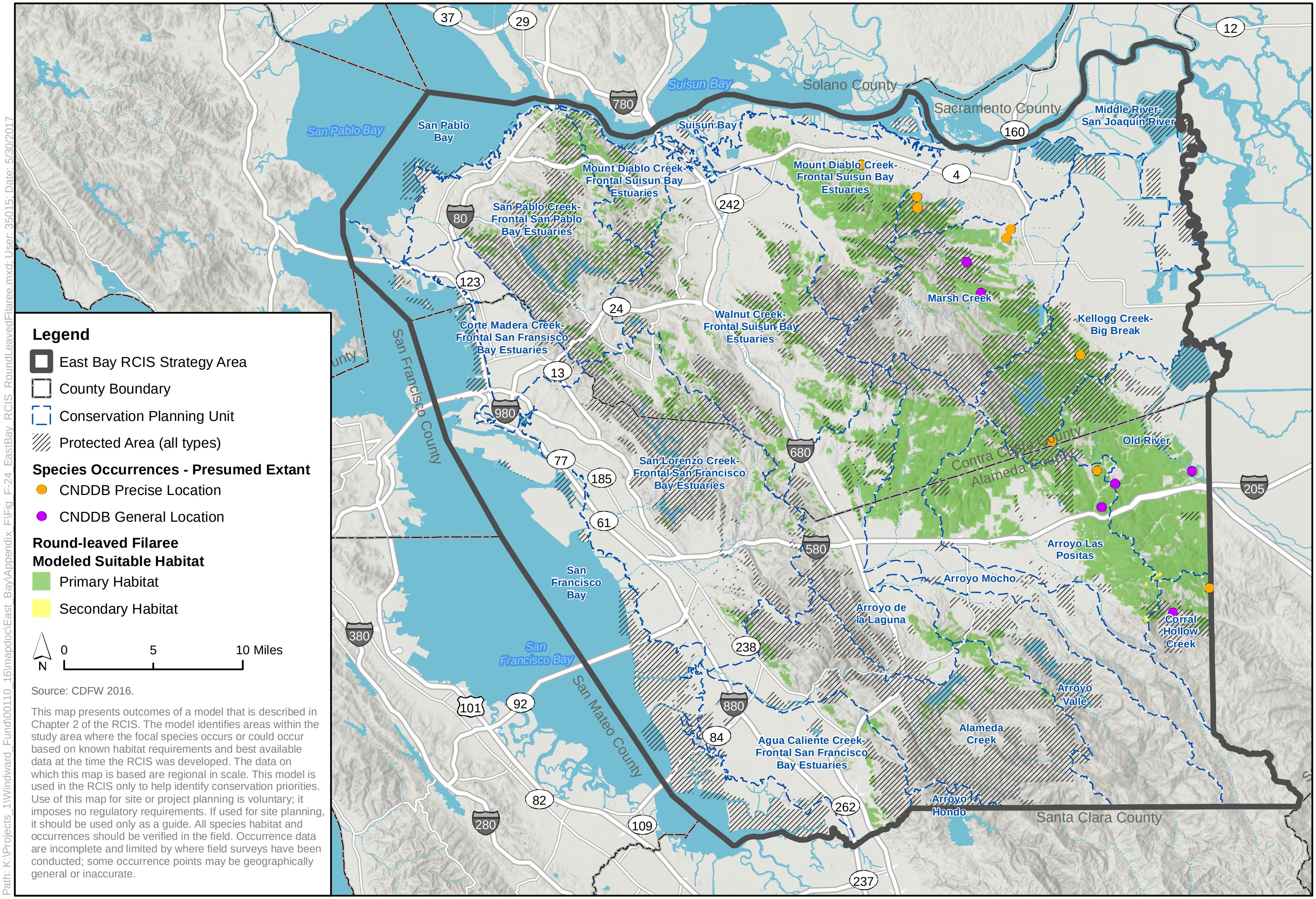

Legend

▣ East Bay RCIS Strategy Area

☐ County Boundary

⬚ Conservation Planning Unit

▨ Protected Area (all types)

Species Occurrences - Presumed Extant

● CNDDB Precise Location

● CNDDB General Location

Round-leaved Filaree Modeled Suitable Habitat

🟩 Primary Habitat

🟨 Secondary Habitat

Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-24
Round-leaved Filaree Modeled Suitable Habitat

F.26 Mount Diablo fairy lantern (*Calochortus pulchellus*)

Regulatory Status

- **State:** California Rare Plant Rank 1B.2
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** N/A

Distribution

General

Mount Diablo fairy lantern is endemic to California and occurs in the Diablo Range in Contra Costa County. There are 40 CNDDB occurrences of Mount Diablo fairy lantern within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

All 40 (100%) of the CNDDB occurrences are within the RCIS area. Mount Diablo fairy lantern occurs in the foothills of the Diablo Range in eastern Contra Costa County, with scattered occurrences in the northwestern corner of the RCIS area and in the East Bay Hills. These occurrences are mostly located on lands managed by the California Department of Parks and Recreation, East Bay Recreation and Park District, Contra Costa Water District, and City of Walnut Creek, with several populations occurring on privately owned land or land of unknown ownership. One occurrence has been documented in Alameda County in Las Trampas Regional Park (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Mount Diablo fairy-lantern is a bulbiferous perennial herb that grows 4 to 12 inches tall (Baldwin et al. 2012). It blooms from April through June, with most flowering occurring in May, and, produces bright yellow, pendant flowers (Baldwin et al. 2012). Fiedler (1987) reported that the Mount Diablo fairy lantern has low seed survival and seedling establishment, low adult mortality and slow growth. Fiedler (1987) found two size-classes of reproductive individuals in this species. This species also hybridizes with Oakland mariposa lily (*Calochortus umbellatus*) (Baldwin et al. 2012).

Ecological Requirements

Mount Diablo fairy-lantern grows in dense wooded habitats, including oak woodland and riparian woodland in shaded areas with an open to intermittent understory of shrubs and grasses on northern facing slopes. This species is rarely found in chaparral (Baldwin et al. 2012, California Department of Fish and Wildlife, Natural Diversity Database 2016, Nomad Ecology 2012). This species occurs at elevations ranging from 98 to 3,850 feet in elevation, but is most common between 200 and 2000 feet elevation (Jones & Stokes 2006, California Native Plant Society 2017, California

Department of Fish and Wildlife, Natural Diversity Database 2016). Species associated with Mount Diablo fairy lantern include manzanita species (*Arctostaphylos* spp.) and oak species (*Quercus* spp.), foothill pine, California buckeye, poison oak (*Toxicodendron diversiloba*), California sagebrush (*Artemesia californica*), toyon (*Heteromeles arbutifolia*), and California bay-laurel.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The Mount Diablo fairy lantern habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006). Modeled habitat for Mount Diablo fairy lantern is mapped as northern mixed chaparral/chamise chaparral, blue oak woodland, foothill pine-oak woodland, valley oak woodland, coast live oak forest and woodland, mixed oak woodland and forest, montane hardwood, and mixed riparian forest and scrub land cover types between 650 and 2,600 feet in elevation. The model is clipped to the outer limits of three (HUC 10) watersheds: Mount Diablo Creek-Frontal Suisun Bay Estuaries, Marsh Creek, and Walnut Creek-Frontal Suisun Bay Estuaries to limit the modeled habitat to portions of the RCIS area where this species occurs.

Rationale

Mount Diablo fairy-lantern is endemic to the Diablo Range in Contra Costa County, ranging in elevation between approximately 650 and 2,600 feet (Jones & Stokes 2006, Baldwin et al. 2012). Mount Diablo fairy-lantern grows on grassy slopes and in openings in chaparral and oak woodland communities (California Department of Fish and Wildlife, Natural Diversity Database 2016). Mount Diablo fairy lantern is a conspicuous, well-surveyed species, and thus it is unlikely that it occurs in Alameda County where there are no documented CNDDB occurrences; therefore the model excludes habitat where there are no CNDDB occurrences.

Model Results

Figure F-25 displays the modeled habitat for Mount Diablo fairy lantern within the RCIS area. Modeled habitat occurs on Mount Diablo, which coincides with the location of most of the CNDDB occurrences. Modeled habitat is also located in undeveloped areas in the East Bay Hills between Oakland and Danville and along the western city limit boundaries of the cities of Martinez, Pleasant Hill, and Walnut Creek.

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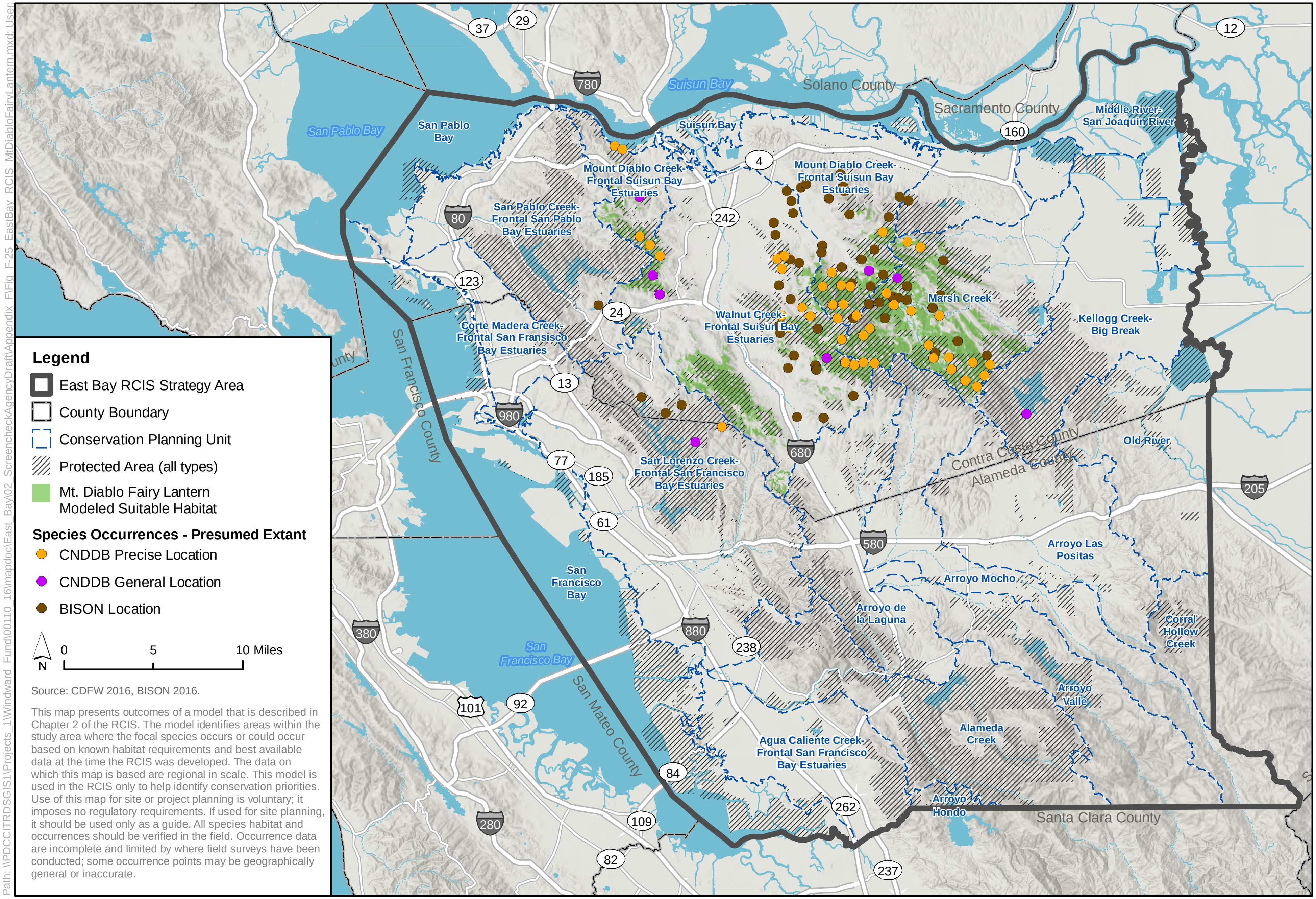

Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-25
Mount Diablo Fairy Lantern Modeled Suitable Habitat

F.27 Congdon's tarplant (*Centromadia parryi* subsp. *congdonii*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.1
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Congdon's tarplant is distributed along the coast of California along the inner and outer South Coast Ranges between Solano and San Luis Obispo counties. Populations are clustered in the East and South Bay, Salinas Valley and Los Osos Valley. There are 78 CNDDB occurrences of Congdon's tarplant within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 78 known CDDB occurrences, 41 (44%) are within the RCIS area. The majority of these occurrences are in undeveloped California annual grassland habitat east of the cities of San Ramon, Dublin, and Livermore. Scattered occurrences are also in the southwestern and northeastern corner of the RCIS area, but based on a review of aerial imagery, some of these occurrences may be extirpated to due development (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Congdon's tarplant is an annual herb up that grows up to 28 inches tall. Congdon's tarplant has small yellow compound flowers that blooms from May to November, with the peak blooming period between August and October. The growing period for this species is from approximately March to November (Baldwin et al. 2012, California Native Plant Society 2016, Calflora 2016). Species-specific pollination has not been documented, but other *Centromadia* species in the San Francisco Bay Area host a variety of pollinators, including bees, wasps, beetles, flies and butterflies. It is assumed that seeds are dispersed during storm events by strong winds and by overland sheet flow during precipitation. Pollination and dispersal may occur incidentally by birds and mammals present in occupied habitat.

Ecological Requirements

Congdon's tarplant occurs in California annual grassland and disturbed sites such as agriculture fields or golf courses on lower slopes, flats, swales, and floodplains (Baldwin et al. 2012). Although this species occurs in broader terrestrial landscapes, it requires localized mesic areas where water collects for a longer period of time. The species can be associated with heavy clay, alkaline or saline soils. Congdon's tarplant can persist along tidal marsh edges at the tidal marsh-alluvial grassland ecotone. This species typically occurs in colonies and is more common in areas that have a lower density of nonnative annual grasses. Occurrences in the RCIS area are associated with species such as Italian ryegrass (*Festuca perennis*), saltgrass, pickleweed, bird's foot trefoil (*Lotus corniculatus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), swamp grass (*Crypsis schoenoides*), rabbit's foot grass, alkali heath, alkali mallow (*Malvella leprosa*), and other nonnative grasses. Hybridization with the subspecies *Centromadia parryi* ssp. *rudis* was reported for the North Livermore Road population (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Potential habitat for Congdon's tarplant is defined as the California annual grassland and alkali grassland land cover types on clay, clay loam and silty clay loam soils. The model is restricted to elevations between 0 and 750 feet.

Rationale

The Congdon's tarplant habitat model is adapted from the East Alameda County Conservation Strategy (ICF International 2010). Congdon's tarplant is often associated with seasonally wet areas including terraces, swales, floodplains, as well as grasslands and ruderal or disturbed areas (Baldwin et al. 2012, ICF International 2010). This species is documented to occur up to 750 feet in elevation (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Model Results

Figure F-26 displays the modeled habitat for Congdon's tarplant within the RCIS area. Modeled habitat is most prominent in eastern Contra Costa and Alameda Counties. Small habitat patches are also found in the northwestern and southwestern corners of the RCIS area and along the eastern border of the cities of San Ramon, Dublin, and Livermore.

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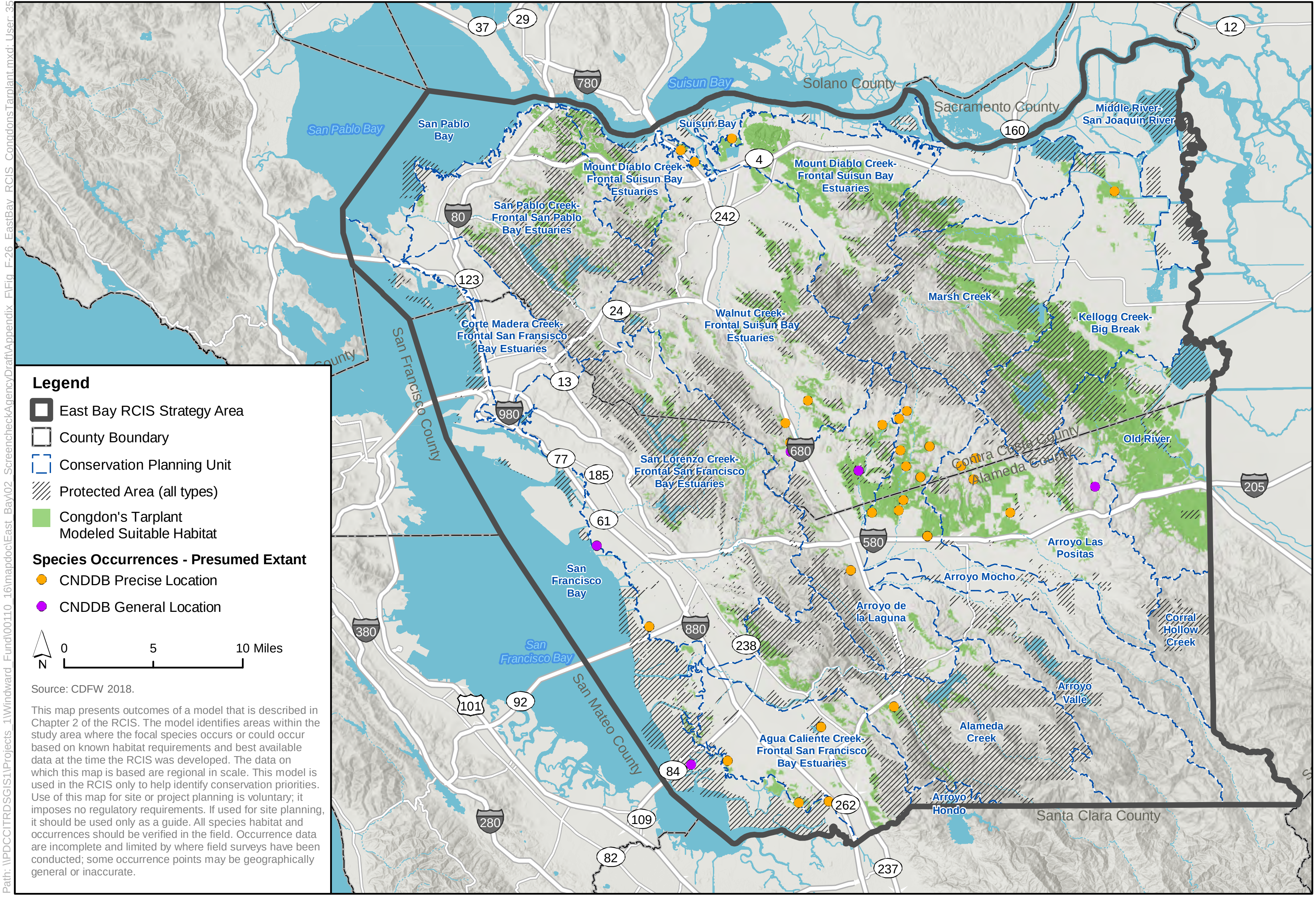

Source: CDFW 2018.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-26
Congdon's Tarplant Modeled Suitable Habitat

F.28 Palmate-bracted bird's-beak (*Chloropyron palmatum*)

Regulatory Status

- ***State:*** Endangered, California Rare Plant Rank 1B.1
- ***Federal:*** Endangered
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** Recovery Plan for Upland Species of the San Joaquin Valley, California (U.S. Fish and Wildlife Service 1998)

Distribution

General

Palmate-bracted bird's beak is endemic to California from northern Sacramento Valley to the San Joaquin Valley with a large population in Alameda County at Springtown Alkali Sink. The range roughly falls within the Solano-Colusa, Livermore, and San Joaquin Valley Vernal Pool Regions. Palmate-bracted bird's beak occurs in Alameda, Colusa, Fresno, Glenn, Madera, San Joaquin, and Yolo Counties. There are 18 CNDDB occurrences of Palmate-bracted bird's beak within California (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 1998).

Within the RCIS area

Palmate-bracted bird's beak occurs in the Springtown Wetlands Reserve in the city of Livermore, on property owned by the City of Livermore and CDFW, as well as private property. Of the 18 known CNDDB occurrences, one (6%) is located within the RCIS area (Figure F-27) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Palmate-bracted bird's-beak is an annual herb that grows to 12 inches tall. Palmate-bracted bird's-beak is hemiparasitic, meaning that it manufactures its own food but obtains additional water and nutrients from the roots of other (host) plants, such as saltgrass (California Department of Fish and Wildlife 2014). This species blooms from May through October, with peak blooming in August. Bumblebees (*Bombus* spp.) are important pollinators of this species (Center for Conservation Biology 1994). Seeds are dispersed by water, making local hydrology very important to the extent of a population.

Ecological Requirements

Palmate-bracted bird's beak occurs in chenopod scrub and valley and foothill grassland habitat. This species is restricted to seasonally flooded, saline-alkali soils in lowland plains and basins at elevation of less than 500 feet in elevation. The suitability of microhabitats depends primarily on soil pH and to a lesser extent on soil layering, salinity, and moisture (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 1998). Associated plant species include iodine bush (*Allenrolfea occidentalis*), alkali heath (*Frankenia salina*), Great Valley gum plant (*Grindelia camporum*), and Parry's rough tarplant (U.S. Fish and Wildlife Service 1998, California Department of Fish and Wildlife, Department of Fish and Wildlife 2014).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model for this species is not include in this RCIS because of the low number of occurrences in the RCIS area and the uncertainty in its localized habitat requirements. A habitat model based on known habitat requirements mapped at a regional scale would greatly overestimate available habitat.

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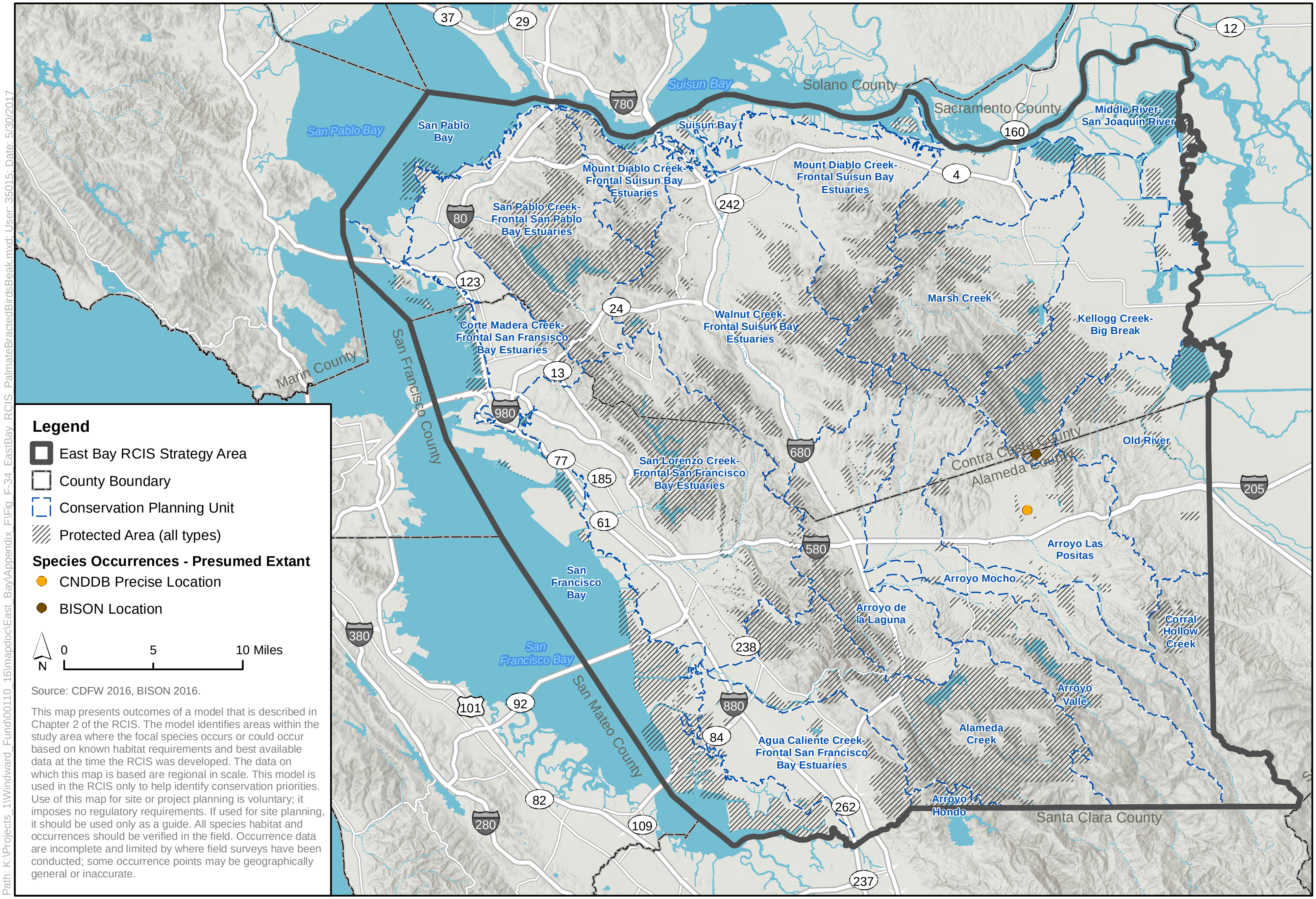

Source: CDFW 2016, BISON 2016.

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Figure F-27
Occurrences of Palmate-bracted Bird's Beak within the RCIS Strategy Area

F.29 Presidio clarkia (*Clarkia franciscana*)

Regulatory Status

- ***State:*** Endangered, California Rare Plant Rank 1B.1
- ***Federal:*** Endangered
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** Recovery Plan for Serpentine Soil Species of the Bay Area (U.S. Fish and Wildlife Service 1998)

Distribution

General

Presidio clarkia is endemic to the Bay Area and occurs only in San Francisco and Alameda Counties. There are three CNDDB occurrences of presidio clarkia within California (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 2010b).

Within the RCIS area

Presidio clarkia is known from two locations in highly urbanized areas of the Bay Area: the Presidio within the city and county of San Francisco and the Oakland Hills in Redwood Regional Park and surrounding land ownerships. Of the three known Presidio clarkia occurrences, one (33%) is located within the RCIS area (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 2010c).

Natural History

Presidio clarkia is a showy annual wildflower that grows up to 16 centimeters tall. The blooming period for Presidio clarkia is May through July, with peak blooming in June (Baldwin et al. 2012, California Department of Fish and Wildlife 2017c, California Native Plant Society 2018). Presidio clarkia can self-pollinate by shedding pollen directly on the stigma (female reproductive part), and the species is thought to be predominantly self-pollinated in natural populations (U.S. Fish and Wildlife Service 1998, 2010c).

Ecological Requirements

Presidio clarkia is a strict serpentine endemic, which means that this species only occurs on serpentine soils (U.S. Fish and Wildlife Service 1998). Presidio clarkia occurs on serpentine soils in open, generally unshaded areas of coastal scrub and valley and foothill grasslands (California Department of Fish and Wildlife 2017c). This species occurs from 82 to 1,099 feet in elevation (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 2010b). Native plant associations include species such as most beautiful jewel flower (*Streptanthus albidus* ssp. *peramoenus*), blue wildrye (*Elymus glaucus*), blue-eyed grass (*Sisyrinchium bellum*), California brome (*Bromus carinatus*), California oatgrass (*Danthonia californica*), California poppy, coast buckwheat (*Eriogonum latifolium*), coastal onion (*Allium dichlamydeum*), common yarrow (*Achillea millefolium*), dwarf plantain (*Plantago erecta*), golden yarrow (*Eriophyllum confertiflorum*), Ithuriel's spear (*Triteleia laxa*), junegrass (*Koeleria macrantha*), ocean-bluff bluegrass (*Poa unilateralis*), and purple needlegrass (*Nassella pulchra*). Associated nonnative plant species include French broom (*Genista monspessulana*), pampas grass (*Cortaderia selloana*), and slender wild oats (*Avena barbata*). (U.S. Fish and Wildlife Service 2010c)

Modeled Habitat Distribution in the RCIS Area

Model Parameters

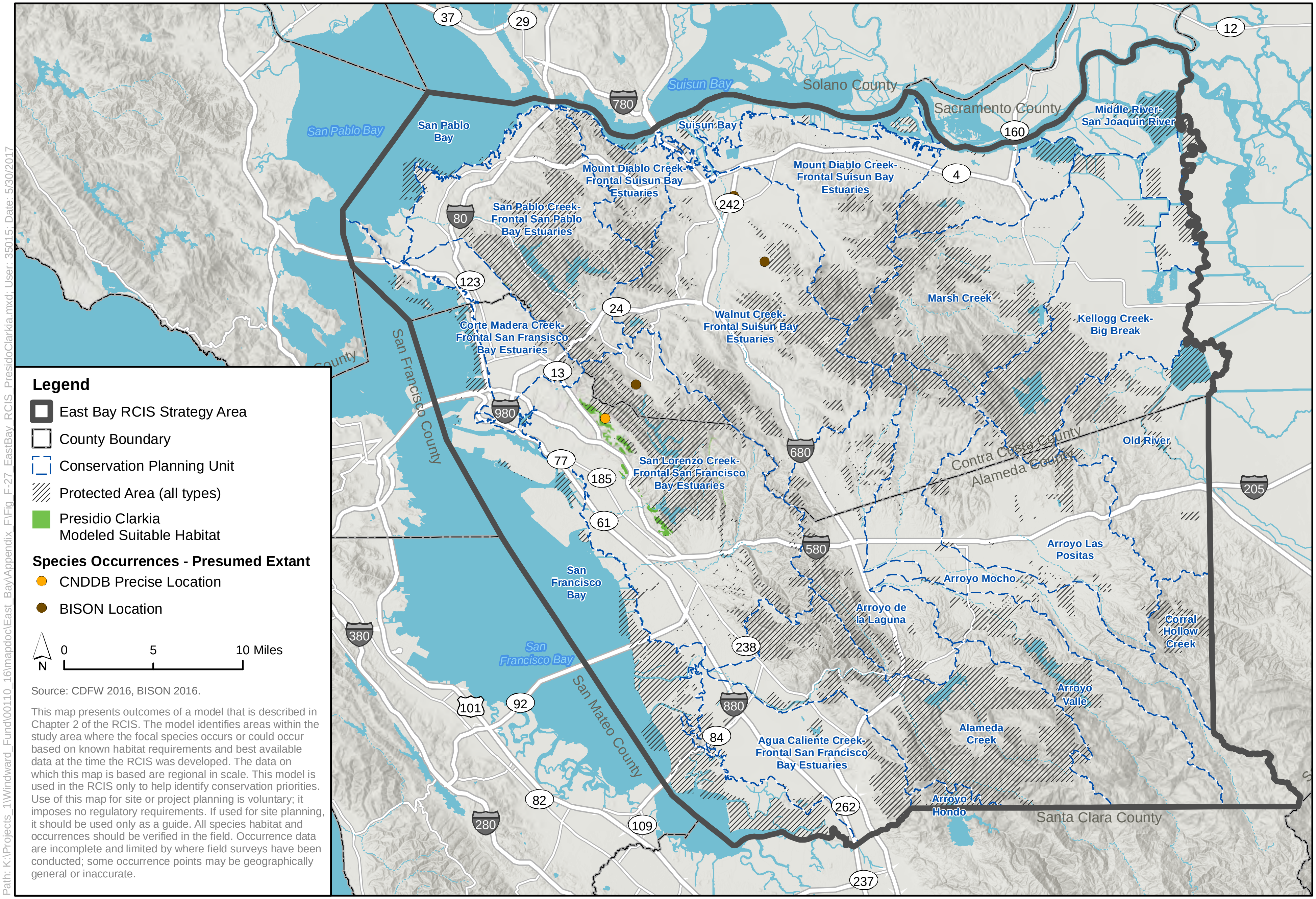
Potential habitat for Presidio clarkia is defined as serpentine grassland. Serpentine conifer, serpentine hardwood, and serpentine chaparral are also included in the model to incorporate the habitat types that overlap the known occurrence in the East Bay Hills. However, the use of land cover types alone is a poor predictor of potential habitat, in that they overlap less than half of the CNDDB occurrences. To account for this, serpentine soils with serpentine components greater than 30% are also included in the model. Because Presidio clarkia occurs in the urbanized East Bay Hills, the inclusion of serpentine soils accounted for small patches of undeveloped habitat within the urban land cover type that is on serpentine soils.

Rationale

Presidio clarkia is restricted to serpentinite outcrops or soils derived from serpentinite. The species is found exclusively on serpentine grasslands and serpentine coastal scrub habitat (California Department of Fish and Wildlife, Natural Diversity Database 2016, U.S. Fish and Wildlife Service 2010b).

Model Results

Figure F-28 displays the modeled habitat for Presidio clarkia within the RCIS area. Modeled habitat is clustered around the one CNDDB occurrence in the East Bay Hills where serpentine soils are present.



Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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Figure F-28
Presidio Clarkia Modeled Suitable Habitat

F.30 Livermore tarplant (*Deinandra bacigalupii*)

Regulatory Status

- ***State:*** Endangered, California Rare Plant Rank 1B.1
- ***Federal:*** N/A
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Livermore tarplant is endemic to the Bay Area and occurs only in Alameda County. There are four CNDDB occurrences of big tarplant within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

All four (100%) of the CNDDB occurrences are within the RCIS area (Figure F-29). Livermore tarplant occurs within the eastern portion of the Livermore Valley in the foothills of the Diablo Range. Populations are clustered in occurrences located within a 3-mile radius of each other in the Altamont Creek watershed that feeds Las Positas Creek. Two of the populations are near Greenville Road in Livermore and the other two populations are in the district of Springtown in Livermore (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

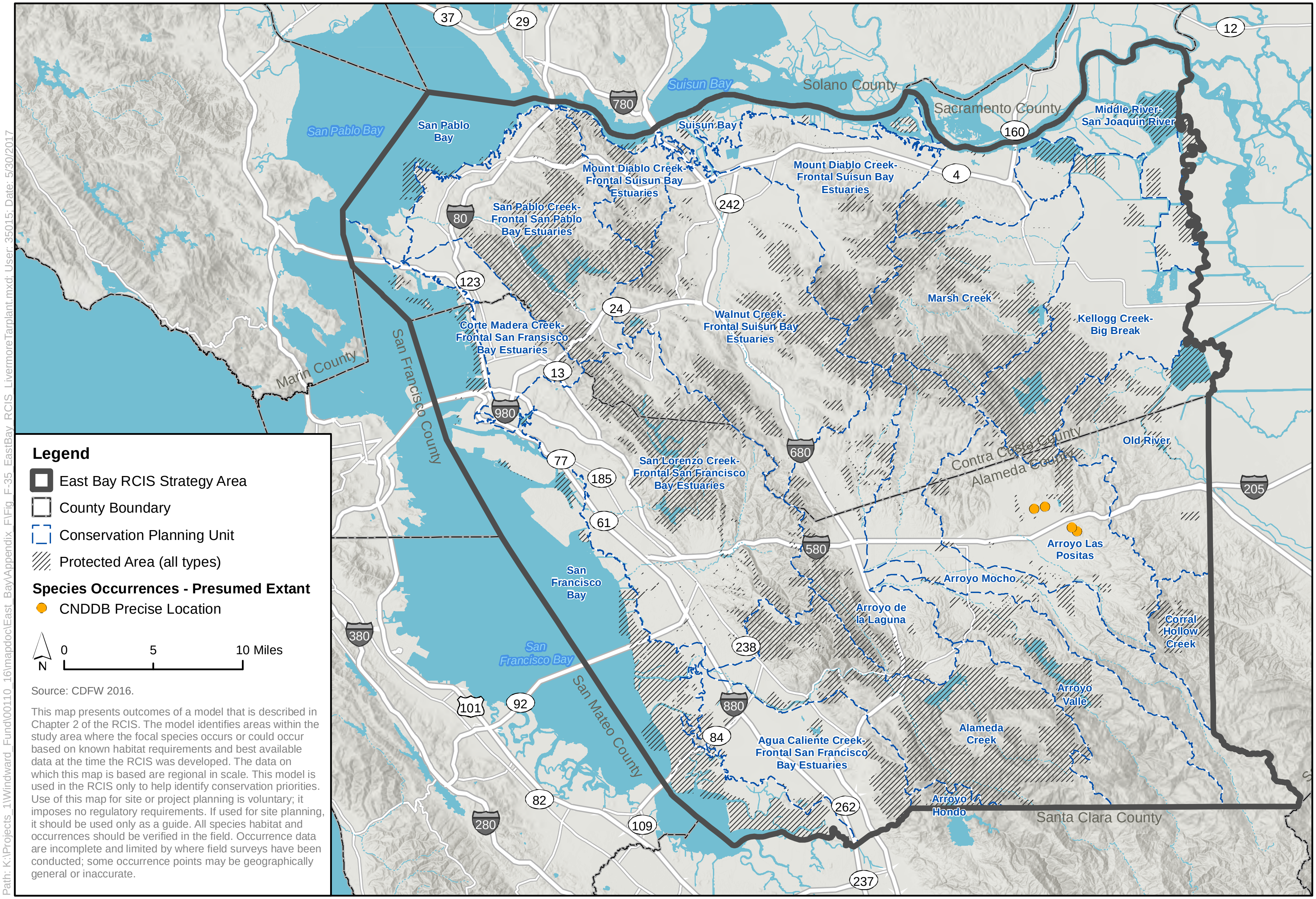
Livermore tarplant is an annual herb that grows to a height of approximately 4 to 16 inches. Livermore tarplant blooms from June through October, with peak blooming occurring in August, (Baldwin et al. 2012, California Department of Fish and Wildlife 2017d, California Native Plant Society 2018). Light and temperature are thought to play an important role is seed germination, and seeds may germination with the onset of the first fall/winter rains (Gregory et al. 2001). Unidentified beetles and bees have been observed pollinating Livermore tarplant flowers; this species does not effectively self-pollinate. Livermore tarplant seed production occurs during the summer and fall months (Bartosh 2014, as cited in California Department of Fish and Wildlife 2017d).

Ecological Requirements

Livermore tarplant occurs in alkaline grasslands and alkali meadows/seeps/vernal pools in areas devoid of vegetation such as alkali scalds. This species occurs on poorly drained, seasonally dry, highly alkaline Pescadero and Solano series soils of sedimentary parent material. Livermore tarplant is found from 492 to 606 feet in elevation (Jones & Stokes 2016, California Native Plant Society 2017d). Livermore tarplant is commonly observed growing with brome species (*Bromus* spp.), saltgrass, alkali heath, iodine bush, brittlescale, salt dodder (*Cuscuta salina*), annual hair grass (*Deschampsia danthonioides*), fescue species (*Festuca* spp.), toad rush (*Juncus bufonius* var. *bufonius*), sickle grass (*Parapholis incurva*), sticky sand-spurrey (*Spergularia macrotheca* var. *longistyle*), and small-headed clover (*Trifolium microcephalum*).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model for this species is not included in this RCIS because of the low number of occurrences in the RCIS area and the uncertainty in its localized habitat requirements. A habitat model based on known habitat requirements mapped at a regional scale would result greatly overestimate available habitat.



Source: CDFW 2016.

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Figure F-29
Occurrences of Livermore Tarplant within the RCIS Strategy Area

F.31 Recurved larkspur (*Delphinium recurvatum*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.2
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Historically, recurved larkspur was widely distributed in California's Great Valley, ranging from Butte County to Kern County. Most of the known occurrences are in Kern, Tulare, and San Luis Obispo Counties. The species now appears to be very rare outside the southern San Joaquin Valley (Jones & Stokes 2006). There are 85 CNDDB occurrences of recurved larkspur within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 85 CNDDB occurrences, four (5%) are within the RCIS area, specifically near Clifton Court Forebay and Byron. Only one of these occurrences is a precise CNDDB occurrence (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Recurved larkspur is a perennial herb that grows to a height of approximately 7 to 24 inches. It blooms from March through June, with peak blooming occurring in April (Baldwin et al. 2012, California Native Plant Society 2018).

Ecological Requirements

Recurved larkspur occurs on sandy or clay alkaline soils, generally in annual grasslands or in association with saltbush scrub or valley sink scrub habitats, ranging in elevation from 100 to 2,000 feet (California Department of Fish and Wildlife, Natural Diversity Database 2016). Species commonly associated with recurved larkspur include saltbush (*Atriplex* spp.), brome species (*Bromus* spp.), saltgrass, common tarplant, red stork's bill (*Erodium cicutarium*), alkali heath, alkali goldenbush (*Isocoma acradenia* var. *bracteosa*), California goldfields (*Lasthenia californica*), alkali sacaton (*Sporobolus airoides*), and bush seepweed (*Suaeda nigra*) (ICF International 2010).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The recurved larkspur habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006) and the East Alameda County Conservation Strategy (ICF International 2010).

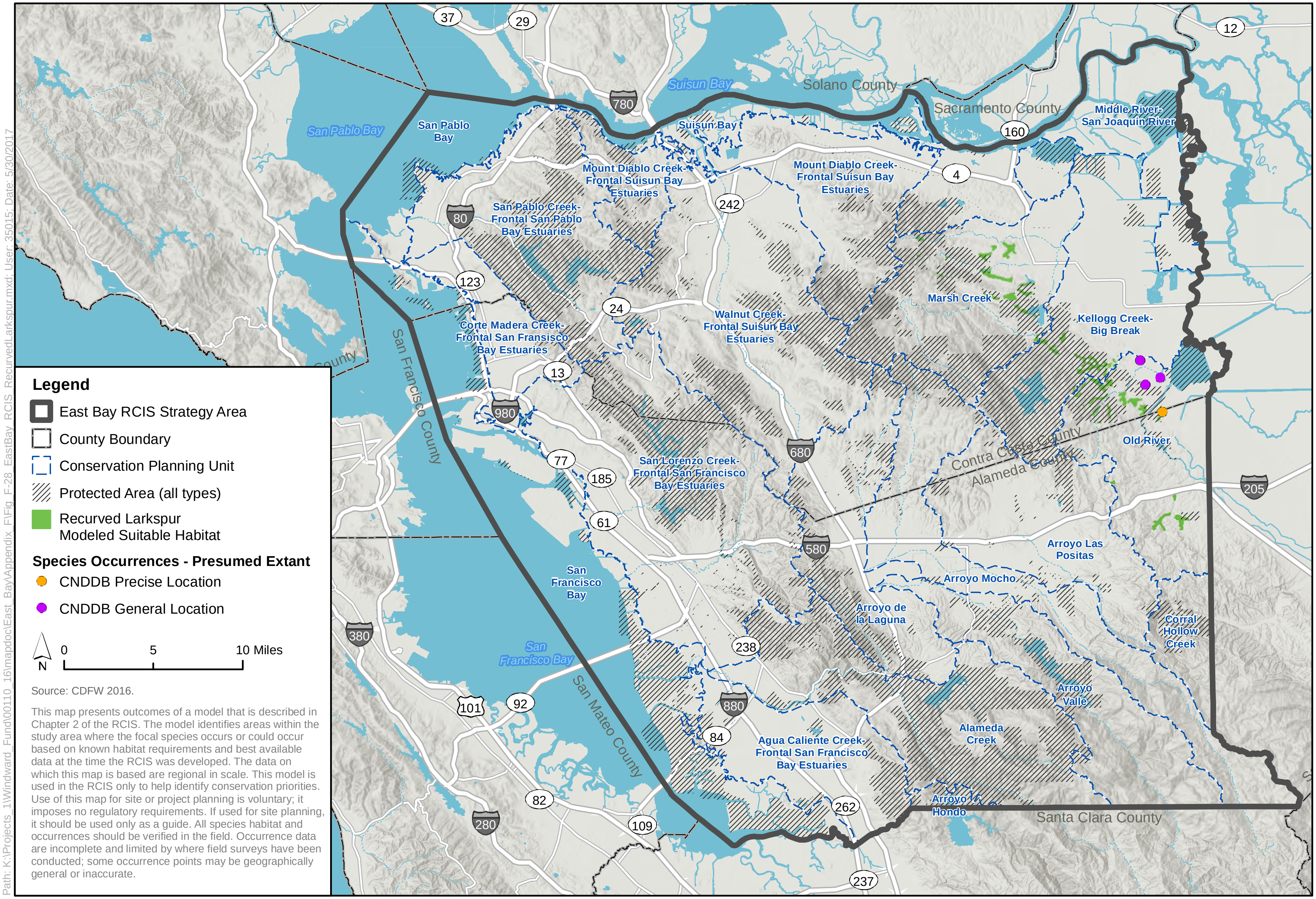
Modeled habitat for recurved larkspur is defined as alkali grassland land cover types on soil map units containing any portion of the Pescadero or Solano soil series. The model is restricted to elevations between 100 to 2,000 feet. Given that there are very few occurrences of recurved larkspur in the RCIS area, the model excludes habitat west of the Diablo Range crest as to not grossly overestimate the amount of potential habitat.

Rationale

Recurved larkspur occurs on sandy or clay alkaline soils (i.e., on soils of the Pescadero or Solano soil series) (National Resource Conservation Service 2016, Bartosh pers. comm.), generally in annual grasslands or in association with saltbush scrub or valley sink scrub habitats, ranging in elevation from 100 to 2,000 feet above sea level (Jones & Stokes 2006, California Native Plant Society 2018, California Department of Fish and Wildlife, Natural Diversity Database 2016).

Model Results

Figure F-30 displays the modeled habitat for recurved larkspur within the RCIS area. Scattered patches of potential habitat run northwest to southeast between the cities of Antioch and Brentwood to the Contra Costa County line with Alameda County. There are also a few small patches of habitat east of the city of Livermore in Alameda County near Interstate 580.



Source: CDFW 2016.

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ICF

Figure F-30
Recurved Larkspur Modeled Suitable Habitat

F.32 San Joaquin spearscale (*Extriplex joaquinana*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.2
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

San Joaquin spearscale occurs along the western side of the Great Valley from Glenn County to Merced County and in the small valleys of the inner Coast Ranges, including the Livermore Valley. It occurs in the broad flood basins of the valley floor and on alluvial fans associated with the major streams draining from the inner Coast Range foothills. It is generally found below 1,055 feet (ICF International 2010), but can occur up to approximately 2,790 (Zacharias 2012). There are 96 CNDDB occurrences of San Joaquin spearscale within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 96 CNDDB occurrences, 48 (50%) are within the RCIS area and are concentrated in the foothills south and east of Mount Diablo (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

San Joaquin spearscale is an annual herb between 1 and 3 feet tall. It blooms from April through October, with peak blooming between April and July (Baldwin et al. 2012, California Native Plant Society 2018).

Ecological Requirements

San Joaquin spearscale typically occurs in alkali grassland and alkali meadow, on the margins of alkali scrub, and in grasslands. It occurs on clay soils, often in areas of high alkalinity (Baldwin et al. 2012, California Native Plant Society 2018). Species associated with San Joaquin spearscale include iodine bush, crownscale (*Atriplex coronata*), brittlescale, common spikeweed, palmate-bracted bird's-beak, saltgrass, alkali heath, low barley (*Hordeum depressum*), Mediterranean barley, Italian ryegrass (*Lolium multiflorum*), western niterwort (*Nitrophila occidentalis*), Parish's pickleweed (*Salicornia subterminalis*), large-flowered sand-spurrey (*Spergularia macrotheca*) and bush seepweed (*Suaeda moquinii*) (Jones and Stokes 2006).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

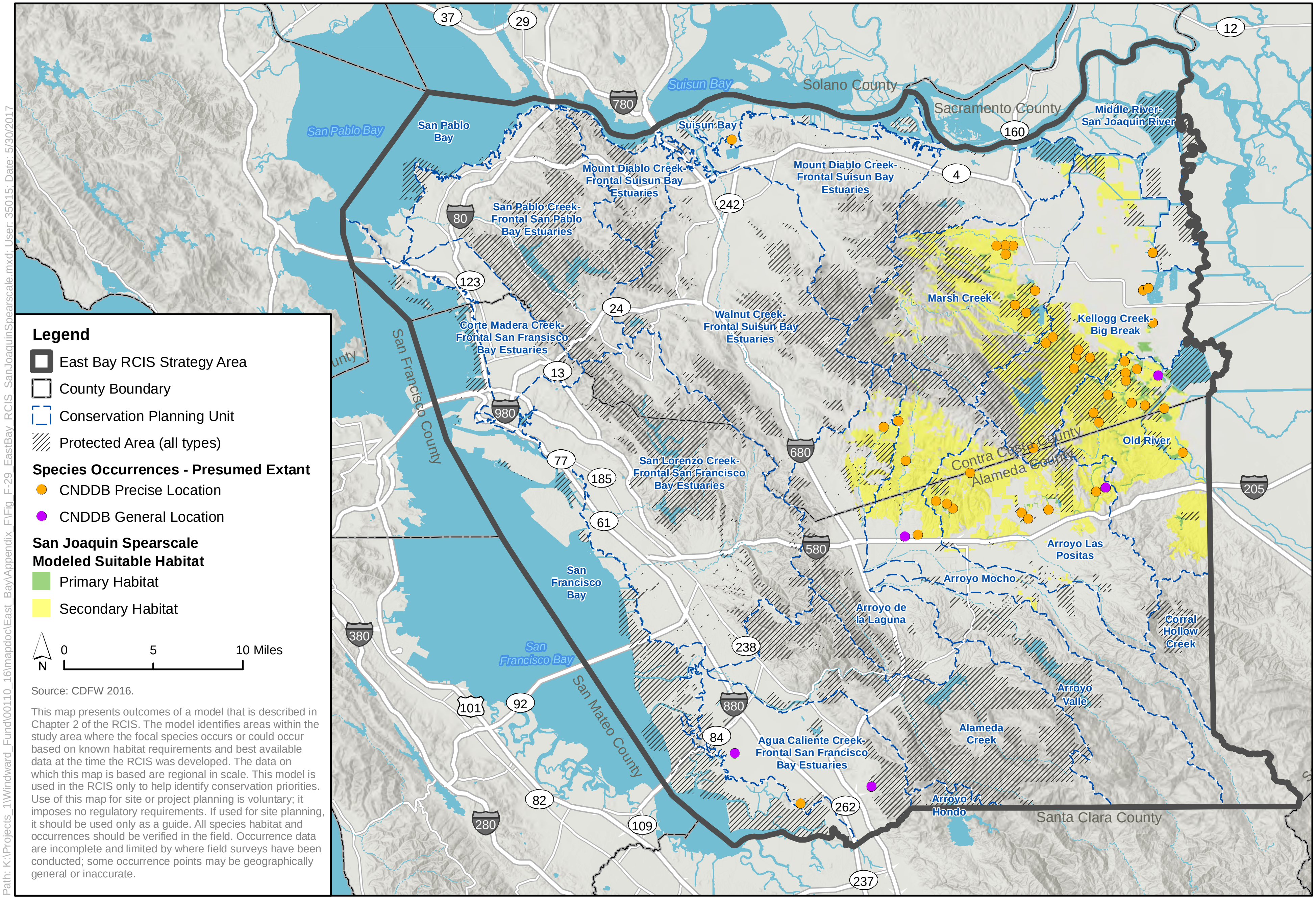
The San Joaquin spearscale habitat model is adapted from the East Alameda County Conservation Strategy (ICF International 2010). Primary habitat for San Joaquin spearscale is defined as the alkali grassland and alkali wetlands land cover type. Secondary habitat is defined as the California annual grassland land cover type. Both primary and secondary habitats exclude areas above 1,055 feet in elevation. The model is limited to the following watersheds (HUC-12) with known occurrences of San Joaquin spearscale, to reduce overestimation of potentially suitable habitat: Alamo Creek, Brushy Creek, Clifton Court Forebay, Dutch Slough-Big Break, Lower Arroyo Las Positas, Lower Arroyo Mocho, Lower Kellogg Creek, Lower Marsh Creek, Lower Old River, Upper Arroyo Las Positas, Upper Kellogg Creek, and Upper Marsh Creek.

Rationale

San Joaquin spearscale occurs in alkali meadow and scald and alkali wetland. The species can also occur in California annual grassland and is mostly restricted to elevations below 1,055 feet (ICF International 2010, California Department of Fish and Wildlife, Natural Diversity Database 2016).

Model Results

Figure F-31 displays the modeled habitat for San Joaquin spearscale within the RCIS area. Most of the modeled habitat is located in Contra Costa County, with a smaller amount of habitat in Alameda County near the northern county boundary. Primary habitat for San Joaquin spearscale is limited to small, scattered patches near the northeastern boundary of the RCIS area. Secondary habitat is more expansive, with most habitat located east of Interstate 680 and north of Interstate 580.



Legend

▣ East Bay RCIS Strategy Area

☐ County Boundary

⬚ Conservation Planning Unit

▨ Protected Area (all types)

Species Occurrences - Presumed Extant

● CNDDB Precise Location

● CNDDB General Location

San Joaquin Spearscale Modeled Suitable Habitat

🟩 Primary Habitat

🟨 Secondary Habitat

N

0 5 10 Miles

Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-31
San Joaquin Spearscale Modeled Suitable Habitat

F.33 Brewer's western flax (*Hesperolinon breweri*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.2
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Brewer's western flax (also commonly known as Brewer's dwarf flax) is endemic to California where it is restricted to Mount Diablo and the adjacent foothills in the east Bay Area and to the Vaca Mountains of the southern interior North Coast Ranges in Contra Costa, Napa, and Solano Counties (Hickman 1993, California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2017). Brewer's western flax occurs below 3,100 feet above sea level (California Native Plant Society 2018). There are 25 CNDDB occurrences of Brewer's western flax within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 25 CNDDB occurrences, 19 (76%) are within the RCIS area. These occurrences are located around Mount Diablo and the adjacent foothills.

Natural History

Brewer's dwarf flax is an annual herb that grows 2 to 8 inches tall (Baldwin et al. 2012). This species has flowers generally clustered at inflorescence tips and large, yellow petals (relative to other species). Brewer's dwarf flax blooms from May through July (California Native Plant Society 2016), with peak blooming occurring in June (Baldwin et al. 2012).

Ecological Requirements

Brewer's western flax is associated with grassland, oak woodland, and chaparral communities (California Native Plant Society 2017). This species is strongly associated with serpentine soils, but can also occur on other soil types (California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2017). The species grows on rocky soils on serpentine, sandstone, or volcanic substrates. Brewer's western flax typically appears in areas with low vegetative cover, such as the transition zone between grassland and chaparral or open areas in chaparral. Plant species associations include chamise (*Adenostoma fascicularis*), manzanita (*Arctostaphylos* spp.), wild oat, (*Avena* spp.), fairy-lantern (*Calochortus* spp.), buckbrush (*Ceanothus cuneatus*), toyon, needlegrass (*Stipa* spp.), downy navarretia (*Navarretia pubescens*), Kellogg's yampah (*Perideridia kelloggii*), foothill pine, oak (*Quercus* spp.), and jewelflower (*Streptanthus* spp.) (Jones and Stokes 2006).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The Brewer's western flax habitat model is adapted from the East Contra Costa County HCP/NCCP (Jones & Stokes 2006). Modeled habitat for Brewer's western flax includes the northern mixed chaparral/chamise chaparral, serpentine chaparral, blue oak woodland, foothill pine-oak woodland, coast live oak forest and woodland, mixed oak woodland and forest, montane hardwood, and valley oak woodland land cover types between 100 and 3,100 feet elevation. Potential habitat also includes a 500-foot buffer into the California annual grassland and serpentine grassland land cover type to account for edges between these land cover types where Brewer's western flax may occur. Modeled habitat is limited to watersheds that are west of Interstate 680.

Rationale

Brewer's western flax occurs between approximately 100 and 3,100 feet above sea level on rocky soils on serpentine, sandstone, or volcanic substrates (California Native Plant Society 2018). It is associated with grassland, oak woodland, and chaparral communities. It typically appears in areas with low vegetative cover, such as the transition zone between grassland and chaparral or open areas in chaparral (Jones & Stokes 2006, California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2018). The model is restricted to potentially suitable habitat east of Interstate 680, as this species appears to have a restricted range in the RCIS area, limited to east of Interstate 680 (Ivan Parr, pers. comm., Danny Slakey, pers comm.).

Model Results

Figure F-32 displays the modeled habitat for Brewer's western flax in the RCIS area. Modeled habitat includes the eastern slopes of Mt. Diablo and much of the surrounding foothills in the eastern and half of the RCIS area.

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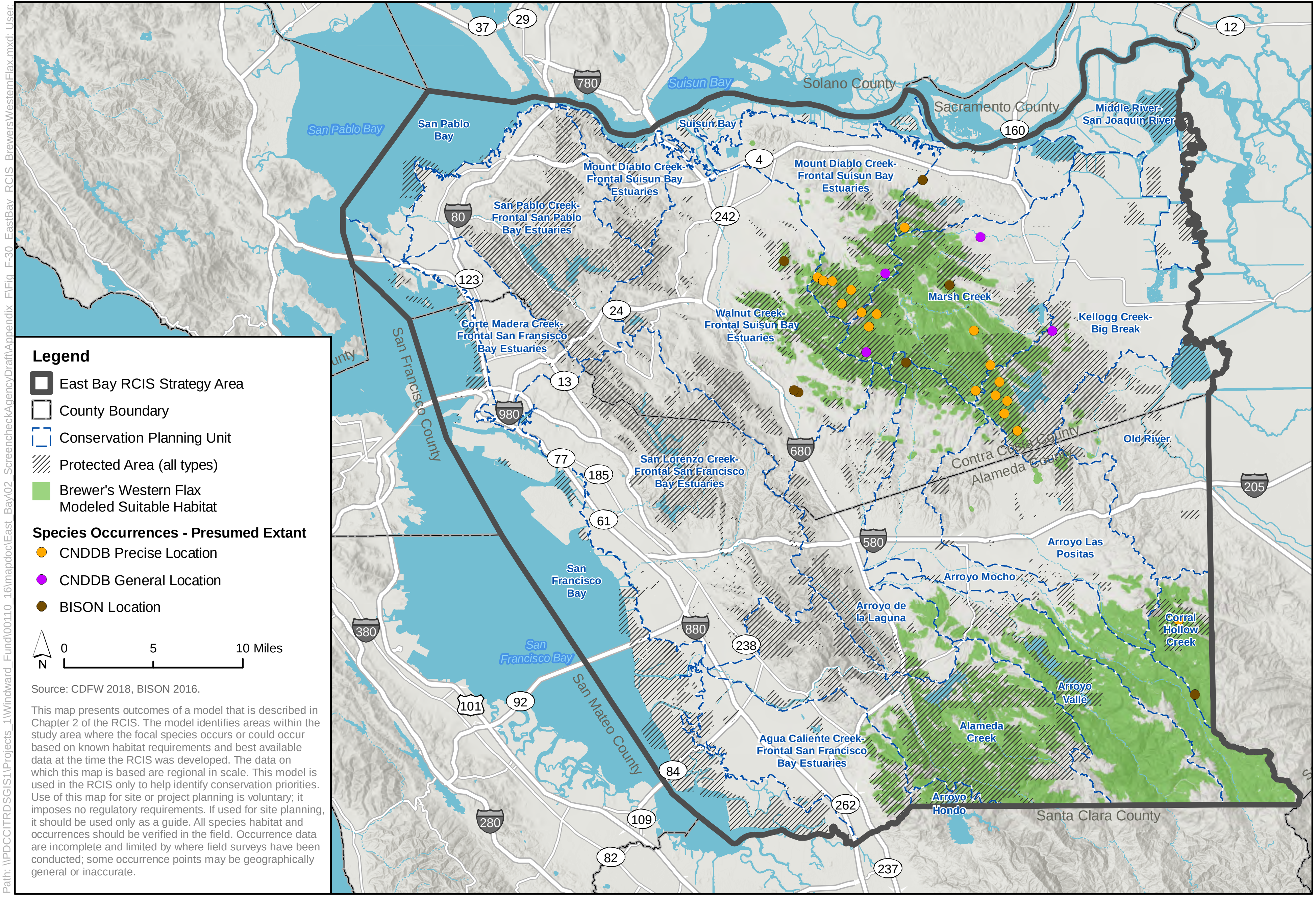

Source: CDFW 2018, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-32
Brewer's Western Flax Modeled Suitable Habitat

F.34 Loma Prieta hoita (*Hoita strobilina*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.1
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** Recovery Plan for Serpentine Soil Species of the Bay Area (U.S. Fish and Wildlife Service 1998)

Distribution

General

Loma Prieta hoita is endemic to the Bay area. This species occurs in Alameda, Contra Costa, and Santa Clara Counties. There are 29 CNDDB occurrences of Loma Prieta hoita within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 29 Loma Prieta hoita CNDDB occurrences, three (10.3%) are within the RCIS area. One of the CNDDB occurrences is a precise location documented in the northwestern corner of the RCIS area near the city of San Pablo. The other two general occurrences are located in the Oakland Hills and on undeveloped land in the southeastern corner of the RCIS area (Figure F-33) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Loma Prieta hoita is a perennial shrub that grows up to 3 feet tall with three leaflets per leaf and dense terminal clusters of purple flowers. This species blooms from May to October, with the peak blooming period between March and July. The growing period for the species is year round (Baldwin et al. 2012, California Native Plant Society 2016, Calflora 2016). Little research has been conducted on reproduction for this species, but it is likely that this species hosts a variety of pollinators, including bees, wasps, beetles, flies and butterflies. It is assumed that this species disperses by wind and water, especially when individuals are growing near channels where seeds can be carried downstream. Pollination and dispersal may occur incidentally by birds and mammals present in occupied habitat.

Ecological Requirements

Loma Prieta hoita occurs in cismontane woodland, chaparral, and riparian woodland (California Native Plant Society 2016). This species grows at elevations between 100 and 2,000 feet. Loma Prieta hoita is strongly associated with serpentine soils, but can also occur on other soil types (California Department of Fish and Wildlife, Natural Diversity Database 2016, Calflora 2016). It generally grows as an understory shrub on moist, shaded slopes and/or near gullies and drainages. This species has also been observed growing on rocky soils. Some species commonly associated with Loma Prieta in the RCIS area include leather oak, coast live oak, California bay, big leaf maple (*Acer* *macrophyllum*), toyon, California coffeeberry (*Frangula californica*), California blackberry (*Rubus ursinus*), Torrey's melica (*Melica torreyana*), sticky monkeyflower (*Mimulus auranticus*) poison oak and coyote brush (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model for this species is not included in this RCIS because of the low number of known occurrences (3) in the RCIS area; this species distribution is too sparse, and GIS data are mapped at too coarse a scale to reasonably model the habitat for this species in the RCIS area. Two of the three occurrences are mapped with low accuracy and therefore are not a good predictor for modeled habitat. A habitat model mapped at a regional scale greatly overestimate suitable habitat and would not be useful for informing the conservation strategy and mitigation planning.

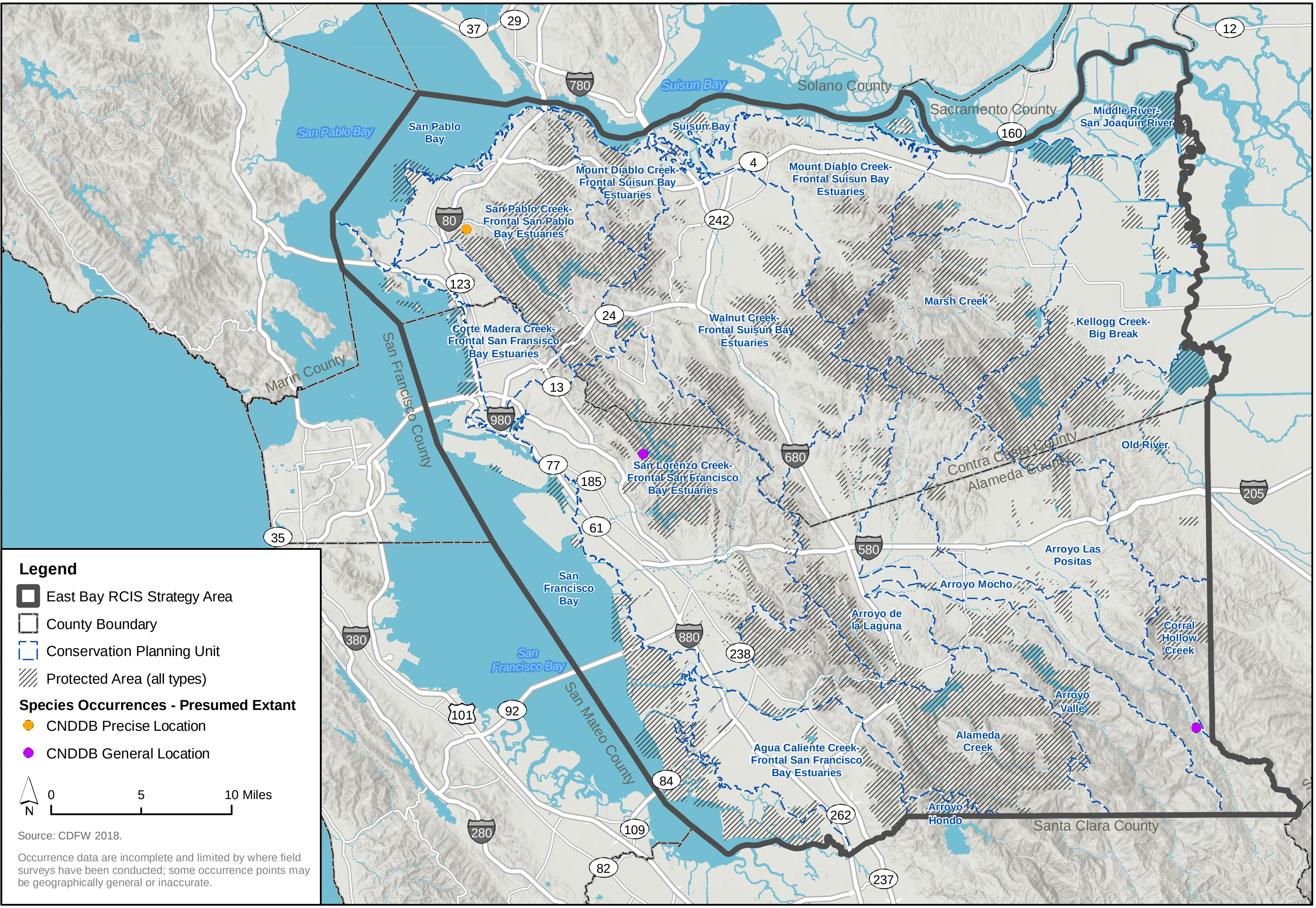

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Figure F-33
Loma Prieta Hoita Occurrences

F.35 Contra Costa goldfields (*Lasthenia conjugens*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.1
- ***Federal:*** Endangered
- ***Critical Habitat:*** Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon (U.S. Fish and Wildlife Service 2006a).
- ***Recovery Planning:*** Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service 2005a).

Distribution

General

Contra Costa goldfields is endemic to California and occurs in valley and foothill grassland, vernal pools, alkaline playas, and cismontane woodland (California Native Plant Society 2017). The species is known from Mendocino County to the north to Santa Barbara County to the south up to 1,450 feet in elevation. There are 23 extant CNDDB occurrences of Contra Costa goldfields within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 23 CNDDB occurrences, 4 (17.4%) are within and the RCIS area. Three of the CNDDB occurrences are precise locations and are documented at the immediate northwestern and southwestern corners of the RCIS area. The remaining general occurrence is located along the western edge of the city of Hayward. Critical habitat within the RCIS area is near Black Diamond Mines Regional Park, Vasco Hills and Caves, Byron Vernal Pool Complex, south of Concord, Pinole, and along the South Bay from San Leandro to the Alameda-Santa Clara County boundary (Figure F-34) (U.S. Fish and Wildlife Service 2006a, California Department of Fish and Wildlife, Natural Diversity Database 2016).

Life History

Contra Costa goldfields is an annual flowering plant that grows 4 to 12 inches tall. The daisy-like flower heads are terminal, solitary, and are golden-yellow (Ornduff 1993, U.S. Fish and Wildlife Service 2005a). This species is adapted to the ephemeral aquatic conditions of vernal pools, and likely germinates in response to fall rain, matures, and sets seed in a single growing season (U.S. Fish and Wildlife 2005a.)

Contra Costa goldfields flowers from March through June, and likely pollinated by solitary bees (family Andrenidae) and various insects, including beetles (Coleoptera), flies (Diptera), true bugs (Hemiptera), bees and wasps (Hymenoptera), and moths and butterflies (Lepidoptera). Mechanism of seed dispersal is unknown, though seed structure suggest that wind dispersal is not a likely mechanism (Ornduff 1976). As with other vernal pool species, Contra Costa goldfields likely forms a persistent seed bank (U.S. Fish and Wildlife Service 2005a).

Ecological Requirements

Contra Costa goldfields occurs in vernal pools, swales, and low depressions in open grassland (U.S. Fish and Wildlife 2005a, California Department of Fish and Wildlife, Natural Diversity Database 2016). This species has been found in three types of vernal pools: northern Basalt Flow, Northern Claypan, and Northern Volcanic Ashflow (U.S. Fish and Wildlife Service 2005a). The most commonly reported plant associations are Italian ryegrass, popcorn flower (*Plagiobothrys* spp.), coyote thistle species (*Eryngium* spp.), other goldfields (*Lasthenia* spp.) and downingia species (*Downingia* spp.) (U.S. Fish and Wildlife Service 2005a, California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model for Contra Costa goldfields is not developed for the RCIS area. All of the occurrences in Contra Costa County and many of those in Alameda County may be extirpated and therefore are not a good predictor for modeled habitat. The Livermore Alkali Sink, which is the largest area of potential habitat in the RCIS area, has been surveyed extensively and Contra Costa goldfields has not been identified.

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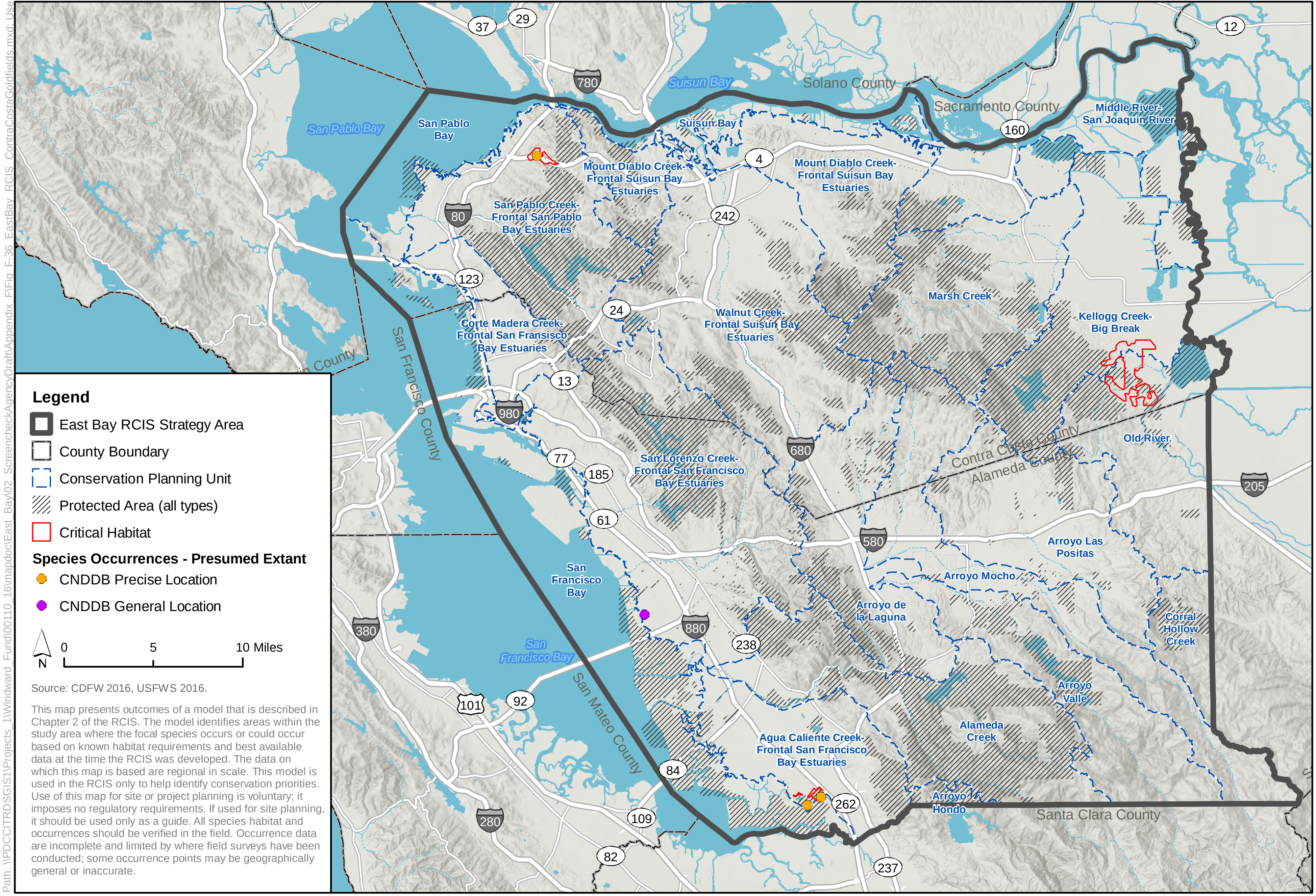

Source: CDFW 2016, USFWS 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Figure F-34

Occurrences of Contra Costa Goldfields within the RCIS Strategy Area

F.36 Mason's lilaeopsis (*Lilaeopsis masonii*)

Regulatory Status

- ***State:*** Rare, California Rare Plant Rank 1B.1
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Mason's lilaeopsis is endemic to California and is distributed throughout freshwater and brackish marshes and riparian scrub in Alameda, Contra Costa, Marin, Napa, Sacramento, San Joaquin, Solano, and Yolo Counties (Fiedler et al. 2007, California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2017). The species is locally common in Suisun Bay (California Native Plant Society 2017). There are 196 CNDDB occurrences of Mason's lilaeopsis within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 196 CNDDB occurrences, 69 (35%) are within and the RCIS area and are concentrated along the northern and northeastern borders of Contra Costa County.

Natural History

Mason's lilaeopsis is a perennial rhizomatous herb 3 inches tall with thread-like green leaves that resemble grass. The inflorescence consists of few to several umbels of minute white or maroon flowers that are much shorter than the leaves (Baldwin et al. 2012, California Native Plant Society 2018). The species spreads by rhizomes, and can disperse by water over great distances (Affolter 1985). Mason's lilaeopsis is capable of self-fertilization but insects may enhance pollination and seed set (Mathias and Constance 1977). Seeds of this species are very small, and little is known about recruitment and establishment through seed germination (Fiedler et al. 2007).

Ecological Requirements

Mason's lilaeopsis occurs in intertidal marshes and swamps, on mud-banks and flats along eroded streambanks, sloughs, and rivers in the tidal zone. The species can be associated with freshwater wetlands, brackish marshes, and riparian scrub where influenced by saline water (Fiedler et al. 2007, Solano County Water Agency 2012, California Department of Fish and Wildlife, Natural Diversity Database 2016). This species grows in muddy or silty soils formed through river deposition or river bank erosion (California Department of Fish and Wildlife, Natural Diversity Database 2016). Many populations are ephemeral and can exploit newly deposited or exposed sediments (California Native Plant Society 2018). Mason's lilaeopsis is found at elevations below 32 feet in elevation. This species blooms between April and November, with peak blooming occurring between May and June (Baldwin et al. 2012, California Native Plant Society 2018). Some species commonly associated with Mason's lilaeopsis in the RCIS area include bulrush (*Scirpus* spp.), tufted hairgrass (*Deschampsia cespitosa*), rushes (*Juncus* spp.), spikerush (*Eleocharis* spp.), saltgrass, willows (*Salix* spp.) and pickleweed.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Potential habitat for Mason's lilaeopsis is defined as areas within 150 feet of, but not overlain by, National Hydrography Dataset (U.S. Geological Survey 2016) areas for layers defined as canal/ditch, foreshore, sea/ocean, and perennial stream/river. National Hydrography Dataset data are used instead of land cover types because they more accurately account for the small strips of land along waterways where Mason's lilaeopsis occurs; the datasets used to create the land cover types do not include the level of detail necessary to capture these features without including a large amount of additional unsuitable habitat. Potential habitat is limited to areas below 32 feet in elevation (Jones & Stokes 2006, California Department of Fish and Wildlife, Natural Diversity Database 2016) and within the following HUC-12 subwatersheds: Clifton Court Forebay, Dutch Slough-Big Break, Jersey Island-Taylor Slough, Kirker Creek-Frontal Suisun Bay Estuaries, Lower Kellogg Creek, Lower Old River, Markley Canyon-San Joaquin River, Middle River-San Joaquin River, Suisun Bay, Suisun Bay Estuaries, and Suisun Bay Islands.

Rationale

Mason's lilaeopsis occurs in freshwater or brackish tidal zones, on muddy or silty soils formed through river deposition or river bank erosion. This species is found at or below 32 feet in elevation (California Department of Fish and Wildlife 2018). Modeled habitat is limited to the 10 subwatersheds in eastern Contra Costa where this species is known to occur, to avoid greatly overestimating the extent of habitat in the RCIS area.

Model Results

Figure F-35 displays the modeled habitat for Mason's lilaeopsis in the RCIS area, which is almost entirely in Contra Costa County. Potential habitat lines the Delta from Martinez to the southeastern corner of Contra Costa County. A tiny amount of potential habitat stretches across the Contra Costa County line into Alameda County.

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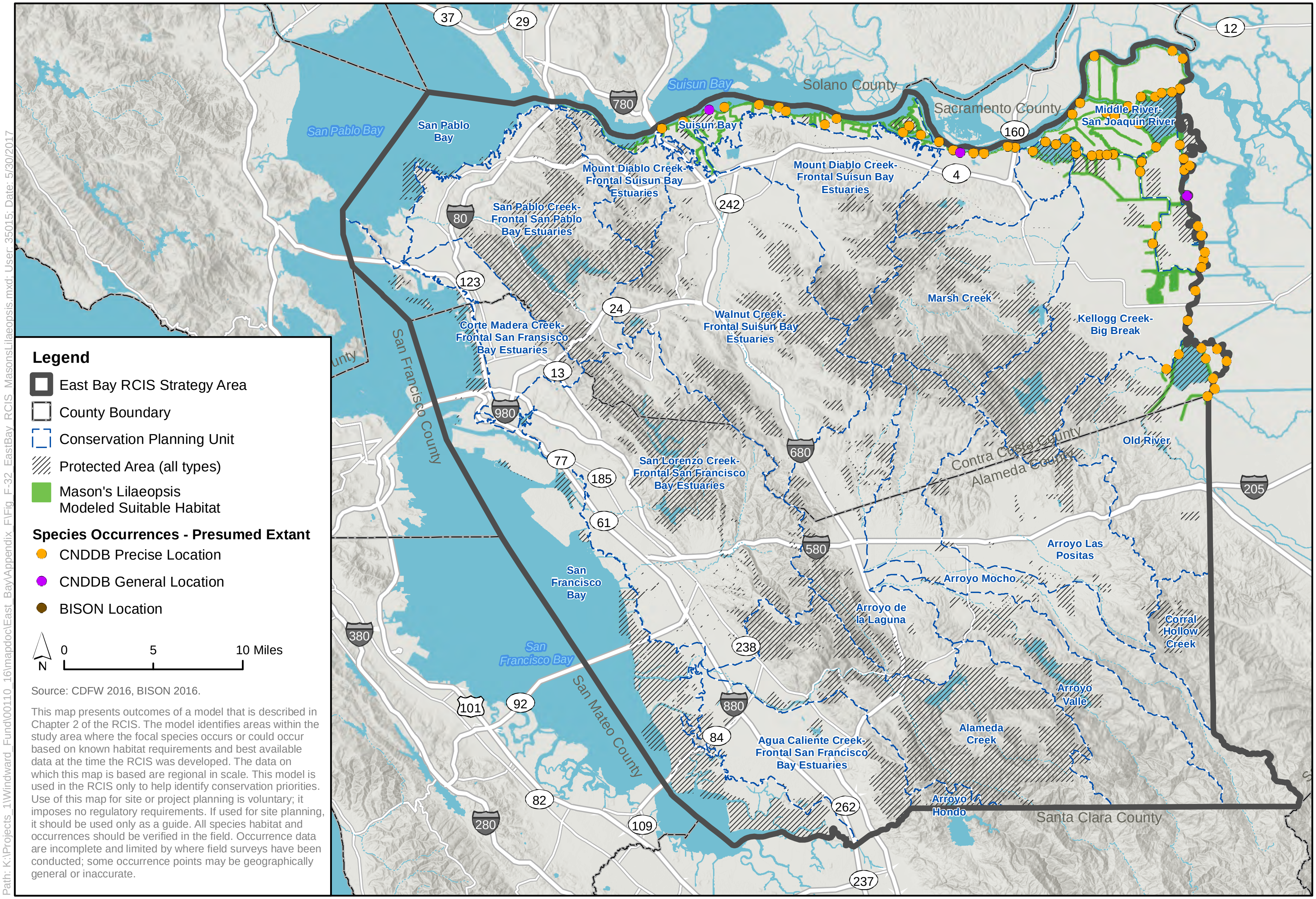


Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

ICF

Figure F-35
Mason's Lilaeopsis Modeled Suitable Habitat

F.37 Showy madia (*Madia radiata*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.1
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Showy madia is known from scattered populations in the interior foothills of the South Coast Ranges, as well as valley and foothill grassland. It can be found between 80 and 3,700 feet in elevation (Hickman 1993, California Department of Fish and Wildlife, Natural Diversity Database 2016). There are 52 CNDDB occurrences for showy madia within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 52 CNDDB occurrences, two (4%) are within the RCIS area and both are near the city of Antioch (Figure F-36) (California Department of Fish and Wildlife, Natural Diversity Database 2016). Both occurrences are historical (i.e., before 1941); one occurrence was identified in Lone Tree Valley and the other was identified on the edge of a cultivated grain field in adobe soil (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

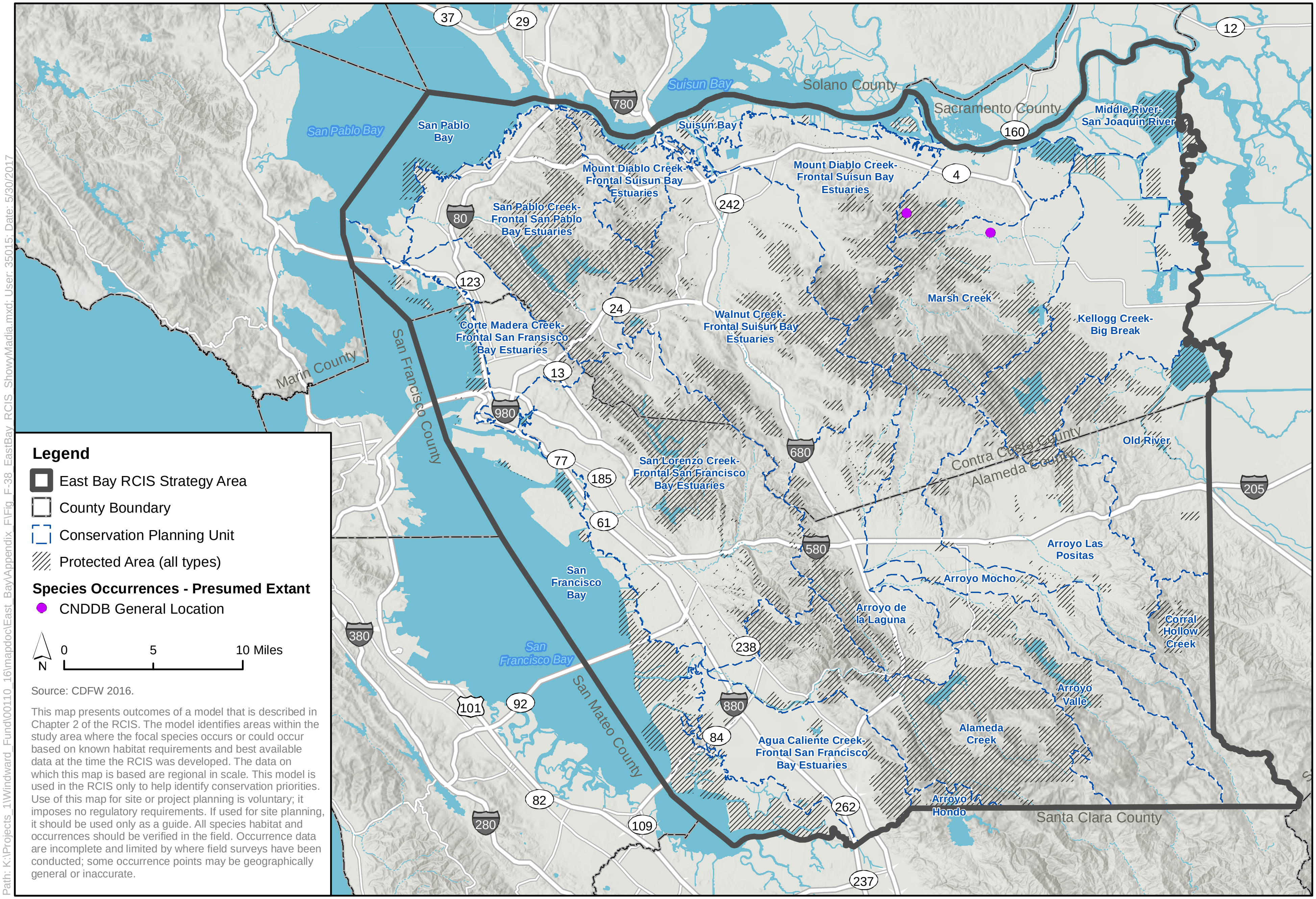
Showy madia is an annual herb that grows up to 35 inches tall with golden yellow flower heads. The yellow flowers grown in showy open flat-topped clusters. This species blooms from March to May, with the peak blooming period in April (Baldwin et al. 2012).

Ecological Requirements

Showy madia grows in cismontane woodland and valley and foothill grasslands (California Department of Fish and Wildlife, Natural Diversity Database 2016, California Native Plant Society 2018). This species grows at elevations between 65 and 4,000 feet in elevation (Baldwin et al. 2012). Showy madia is typically found in grassy opening or among sparse shrubs rather than under closed canopy. This species is strongly associated with adobe clay soils and is rarely found on serpentine Some species commonly associated with showy madia in the RCIS area include fiddleneck (*Amsinckia* spp.), brome (*Bromus* spp.), wild oats species (*Avena* spp.), Sandberg bluegrass (*Poa secunda*), chia (*Salvia columbaria*), and phacelia (*Phacelia* spp.) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area.

A habitat distribution model for this species is not included in this RCIS because of the low number of occurrences in the RCIS area and the uncertainty in its localized habitat requirements. A habitat model based on known habitat requirements mapped at a regional scale would result in a model that greatly overestimates available habitat.



Source: CDFW 2016.

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Figure F-36
Occurrences of Showy Madia within the RCIS Strategy Area

F.38 Rock sanicle (*Sanicula saxatilis*)

Regulatory Status

- ***State:*** Rare, California Rare Plant Rank 1B.2
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** N/A

Distribution

General

Rock sanicle is endemic to the Bay Area in Contra Costa and Santa Clara counties. There are seven CNDDB occurrences of rock sanicle within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the seven CNDDB occurrences, three (42.9%) are within the RCIS area, specifically within Mount Diablo State Park (Figure F-37).

Natural History

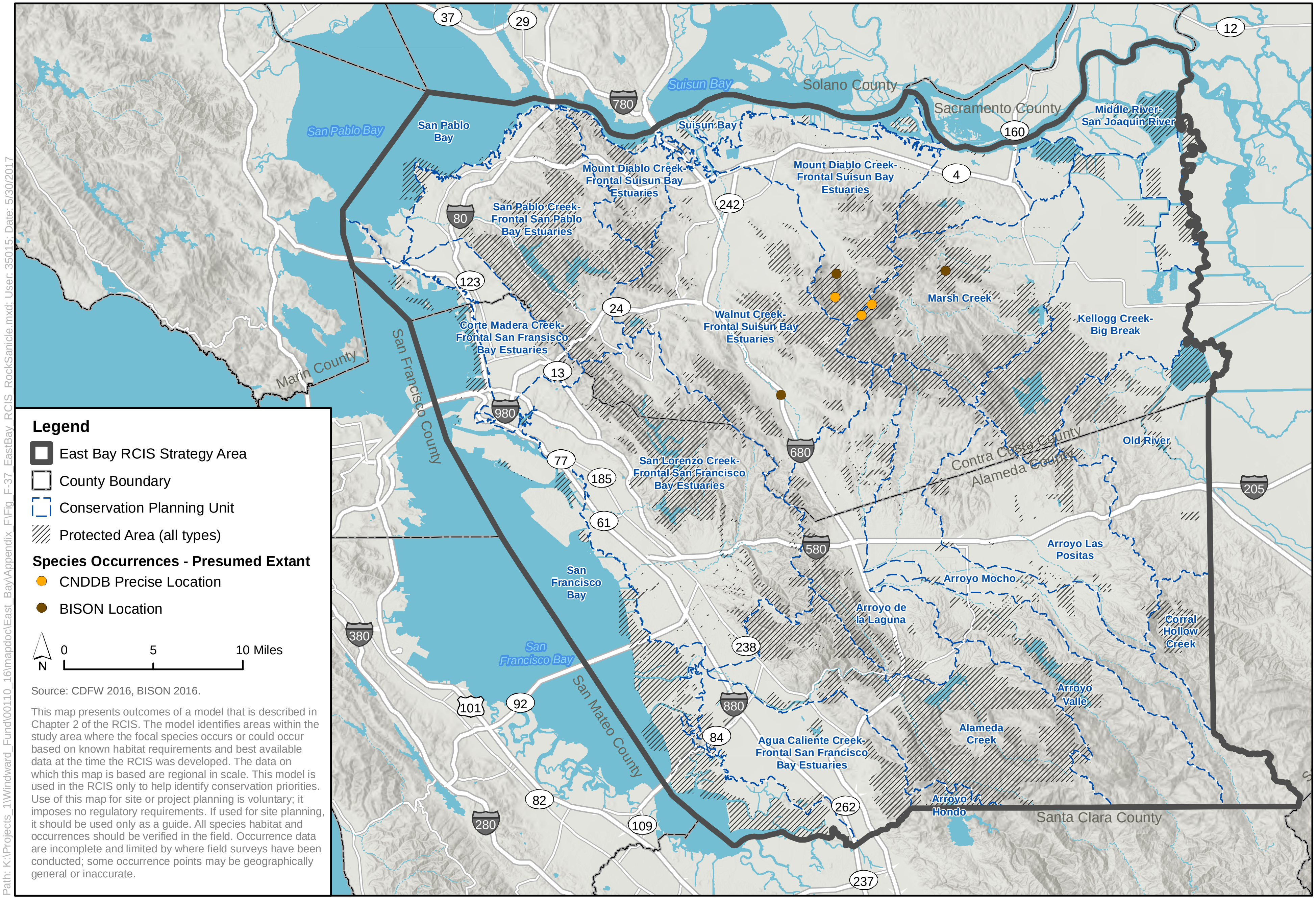
Rock sanicle is a biennial or perennial tubereous herb between 8 and 10 inches tall with small pale red-orange to yellow flowers. This species blooms from April to May, with the peak blooming period in June. The growing period for the species is February to May (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). There is no species-specific information available regarding pollinators, seed germination, seed dispersal, or seedling establishment.

Ecological Requirements

Rock sanicle occurs in mixed oak woodland, chaparral and valley and foothill grassland between 2,034 to 3,854 feet. This species grows on open, rocky scree, talus slopes, and bedrock outcrops (California Native Plant Society 2016, California Department of Fish and Wildlife, Natural Diversity Database 2016). The three CNDDB occurrences in the RCIS area occur on open, talus (igneous rock) slopes (California Department of Fish and Wildlife, Natural Diversity Database 2016). In the RCIS area, this species is commonly associated with species such as scytheleaf onion (*Allium falcifolium*), goose grass, Brewer's phacelia (*Phacelia breweri*), miner's lettuce (*Montia* spp.), violet (*Viola* spp.), large leaf sandwort (*Moehringia macrophylla*), few flowered collinsia (*Collinsia sparsiflora*), common fiddleneck (*Amsinckia intermedia*) and linanthus (*Linanthus* spp.) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model is not developed for this species because of the low number of occurrences in the RCIS area and the difficulty in mapping talus slopes at the map scale. A habitat model based on known habitat requirements mapped at a regional scale would greatly overestimate available habitat.



Legend

- East Bay RCIS Strategy Area
- County Boundary
- Conservation Planning Unit
- ▨ Protected Area (all types)

Species Occurrences - Presumed Extant

- ● CNDDB Precise Location
- ● BISON Location

Source: CDFW 2016, BISON 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

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Figure F-37
Occurrences of Rock Sanicle within the RCIS Strategy Area

F.39 Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*)

Regulatory Status

- ***State:*** California Rare Plant Rank 1B.2
- ***Federal:*** None
- ***Critical Habitat:*** N/A
- ***Recovery Planning:*** Recovery Plan for Serpentine Soil Species of the Bay Area (U.S. Fish and Wildlife Service 1998)

Distribution

General

Most beautiful jewelflower is endemic to the Bay Area and central California coast. This species occurs in Alameda, Contra Costa, Santa Clara, Monterey and San Luis Obispo Counties. Occurrences have been identified between 311 and 3,280 feet elevation. There are 96 CNDDB occurrences of most beautiful jewelflower within California (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Within the RCIS area

Of the 96 CNDDB occurrences, 19 (19.8%) are within the RCIS area. There are clusters of occurrences in the Sunol Regional Wilderness Area, Mount Diablo State Park, and the East Bay Hills (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Natural History

Most beautiful jewelflower is an annual herb that grows up to 32 inches tall lilac-lavender sepals and purple petals. This species blooms from March to October, with the peak blooming period between April and May. The growing period for the species is February to October (Baldwin et al. 2012, California Native Plant Society 2016, Calflora 2016). Most beautiful jewelflower is pollinated by insects such as bees, butterflies, beetles, and flies. *Streptanthus* flowers are self-fertile, but cannot self-pollinate due to spatial and temporal separate of stamens and stigmas. Most beautiful jewelflower is pollinated by bees, butterflies, and beetles. (Kruckeberg 1957, ICF International 2012).

Ecological Requirements

Most beautiful jewelflower occurs on serpentine chaparral, cismontane woodland, and serpentine bunchgrass grasslands on serpentine rock outcrops or grassy openings (California Native Plant Society 2016). Most beautiful jewelflower is abundant in areas with low vegetation cover and/or native grasses and forbs. Most beautiful jewelflower can occur in open grasslands dominated by nonnative annual grasses with relatively low cover. This species is strongly associated with serpentine soils but can occasionally occur on other rocky soil types (California Department of Fish and Wildlife, Natural Diversity Database 2016, Calflora 2017). Most beautiful jewelflower also grows in transitional zones between serpentine grassland and woodland or chaparral and is tolerant of moderate disturbance on serpentine roadcuts and road surfaces. Typical species associated with most beautiful jewelflower in the RCIS are include purple needlegrass, red brome, wild oats meadow barley (*Hordeum brachyantherum*), cream cups (*Platystemon californicus*), linanthus species (*Linanthus* spp.*)*, beaked cryptantha (*Cryptantha flaccida*), chia, California poppy, and small fescue (*Vulpia microstachys*) (California Department of Fish and Wildlife, Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

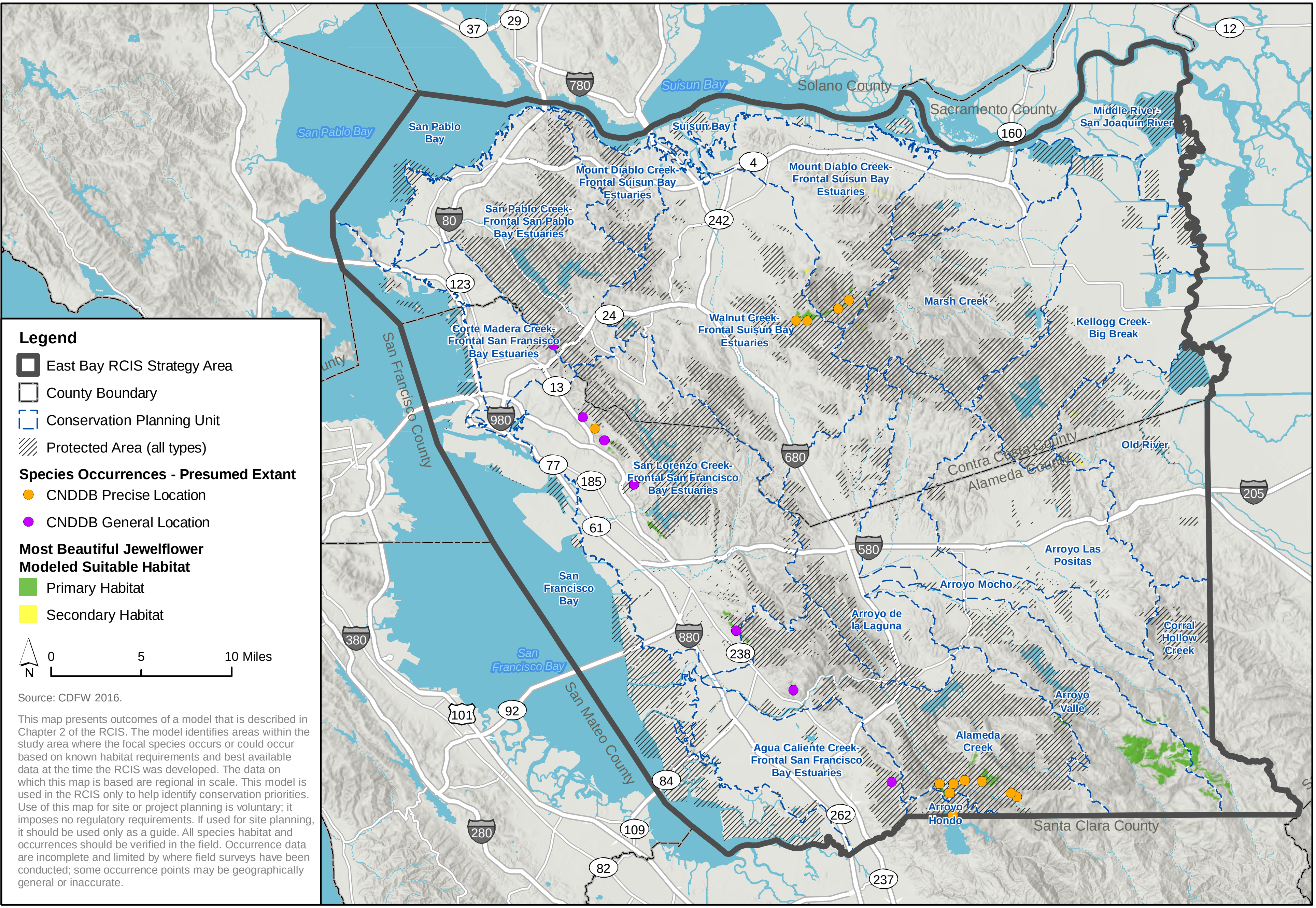
Primary habitat for most beautiful jewelflower is defined as the serpentine grassland, serpentine rock outcrop, and serpentine chaparral land cover types. Secondary habitat is defined as nonserpentine rock outcrop (barren/rock land cover type). Both primary and secondary habitat are restricted to elevations below 3,500 feet on slopes with all degrees of steepness.

Rationale

The most beautiful jewelflower habitat model is adapted from the Santa Clara Valley HCP/NCCP (ICF International 2012). Most beautiful jewelflower is almost entirely restricted to serpentinite outcrops or soils derived from serpentinite (Kruckeberg 1954). The species is found within serpentine grasslands and serpentine chaparral, primarily in grassy openings or at the boundary with oak woodlands between approximately 311 and 3,280 feet elevation. Most beautiful jewelflower is less commonly found in non-serpentine soils on rock outcrops (Mayer et al. 1994, ICF International 2012).

Model Results

Figure F-38 shows the modeled habitat for most beautiful jewelflower within the RCIS area. Primary habitat is located where serpentine soils are present in the East Bay Hills, just west of the cities of Walnut Creek and Concord and in the southeastern corner of the RCIS area. Secondary habitat is mainly located in small, scattered patches in eastern Contra Costa County.



Source: CDFW 2016.

This map presents outcomes of a model that is described in Chapter 2 of the RCIS. The model identifies areas within the study area where the focal species occurs or could occur based on known habitat requirements and best available data at the time the RCIS was developed. The data on which this map is based are regional in scale. This model is used in the RCIS only to help identify conservation priorities. Use of this map for site or project planning is voluntary; it imposes no regulatory requirements. If used for site planning, it should be used only as a guide. All species habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted; some occurrence points may be geographically general or inaccurate.

Path: \\PDCCITRDSGIS1\Projects_1\Windward_Fund\00110_16\mapdoc\East_Bay\02_ScreencheckAgencyDraft\Appendix_F\Fig_F-33_EastBay_RCIS_MostBeautifulJewelflower.mxd; User: 35015; Date: 8/28/2018

ICF

Figure F-38
Most Beautiful Jewelflower Modeled Suitable Habitat

F.40 References

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Appendix G

Non-focal Species Summaries

Non-focal Species Summaries

This appendix briefly describes the habitat requirements of the East Bay RCIS non-focal species and explains the ecological rationale behind the association of each non-focal species with focal species so that MCA credits may be created for non-focal species. CFGC 1856(a) states that "[a] conservation action or habitat enhancement action that measurably advances the conservation objectives of an approved regional conservation investment strategy may be used to create mitigation credits that can be used to compensate for impacts to focal species and *other species*, habitat and other natural resources, as provided in this section" (emphasis added). The RCIS Program Guidelines (California Department of Fish and Wildlife 2017) provide additional guidance for what must be included in an RCIS to enable credits to be created through an MCA for species not included in an RCIS as focal species (i.e., "non-focal species"): "[t]o create credits through an MCA (mitigation credit agreement) to offset future impacts to a specific species that species must be an approved RCIS' focal species or a species whose conservation need was analyzed or otherwise provided for in the RCIS."

Many non-focal species have conservation needs similar to the focal species, which would be addressed by implementing conservation actions and habitat enhancement actions for focal species that use the same habitats. Similarly, many non-focal species will benefit from the implementation of conservation actions and habitat enhancement actions for the other conservation elements (e.g., serpentine soils, unique land cover types, and others; Chapter 3, *Conservation Strategy*, Section 3.8, *Conservation Strategy for Other Conservation Elements*). For example, non-focal species that have habitat requirements that overlap with the habitat requirements of focal species will benefit from conservation actions and habitat enhancement actions that protect, restore, and enhance habitat for focal species and other conservation elements such as habitat connectivity. The following sections briefly describe the habitat requirements of the non-focal species and explain the ecological rationale behind the association of each non-focal species with conservation actions for focal species and other conservation elements.

At the end of this appendix are two sets of tables to show how the RCIS provides for the conservation needs of non-focal species. Tables G-1a and G1-b show the general habitat associations of non-focal species, represented by this RCIS's land cover types (Chapter 2, *Environmental Setting and the Built Environment*, Section 2.2.5.5, *Natural Communities and Land Cover Types in the RCIS Area*); Tables G-2a and G-2b highlight the general similarities in habitat use and overlap between non-focal species and wildlife focal species (Table G-2a) and non-focal species and plant focal species (Table G-2b), identified by similarities in use of land cover types. Land cover is the basis for the focal species habitat models (Chapter 2, Section 2.2.6.2, *Habitat Distribution Models*) and the conservation strategy, and thus can be used as a common currency to identify general similarities in habitat affinities when analyzing how conservation goals, objectives, actions, and priorities for focal species and other conservation benefits will also benefit non-focal species.

The tables in this appendix are only intended to illustrate the general relationships between non-focal species, land cover types, and focal species to show how implementation of this RCIS's conservation actions and habitat enhancement actions could benefit non-focal species. An organism's habitat is influenced by factors other than land cover, such as microclimate, current and historic land use (e.g., livestock grazing), among others, such that not all land cover would be expected to be suitable. Also, most species do not completely overlap habitat usage with other species. As such, Tables G-1a and G-1b, and G-2a and G-2b are not intended to precisely depict non-focal species' habitat relationships or overlap in habitat use between non-focal and focal species.

Tables G-1 and G-2 are split in two parts, because the tables are too wide (i.e., have too many columns) to present in their entirety in a single table.

Delta Smelt

Delta smelt are endemic to the Bay-Delta and are most abundant from Suisun Marsh and Grizzly Bay to the Cache-Lindsey Slough Complex in the Sacramento River system (Merz et al. 2011). Adults move into freshwater habitats between January and July to spawn and larvae and juveniles move into turbid, brackish (rarely more than 12 parts per thousand [ppt]) water, primarily in Suisun Bay and Suisun Marsh, in the spring and summer (U.S. Fish and Wildlife Service 2015, Moyle et al. 2016). Rearing occurs in low salinity areas (typically less than 2 ppt) during the summer and fall (Feyrer et al. 2007, Nobriga et al. 2008). The range and ecological requirements of Delta smelt overlap with those of the three focal fish species in the East Bay RCIS area: Central California Coast steelhead, Central Valley steelhead, and Sacramento River winter-run Chinook salmon. Therefore, conservation actions for the focal fish species will benefit Delta smelt when implemented where the species co-occur. Conservation actions for focal fish species that will benefit Delta smelt include habitat acquisition, barrier removal, habitat enhancement, predator control, surveys, and research.

Longfin Smelt

Longfin smelt is found in the San Francisco Bay and the Sacramento/San Joaquin Delta (Bay-Delta), and uses a variety of habitats from nearshore waters, to estuaries and lower portions of freshwater streams (U.S. Fish and Wildlife Service 2012, Grimaldo et al. 2017, Garwood 2017), thus sharing many general ecological requirements with the other focal fish species in the RCIS area. In the Bay-Delta, most longfin smelt spend their first year in Suisun Bay and Marsh, although surveys conducted by the City of San Francisco collected some first-year longfin in coastal waters. The remainder of their life is spent in the San Francisco Bay or the Gulf of Farallones (U.S. Fish and Wildlife Service 2012). The conservation strategy for the focal fish species will protect and manage those areas where longfin smelt and the focal fish species co-occur; thus, longfin smelt will benefit from the conservation strategy. Conservation actions include habitat acquisition, predator control, surveys, and research. Given that both longfin smelt and the focal fish species are anadromous, conservation actions to improve access between the ocean and the San Francisco Bay and the Bay-Delta will improve habitat quality for longfin smelt.

Western Pond Turtle

Since western pond turtles are primarily found in natural aquatic habitats (Ernest et al. 2009) with ample basking sites (Thomson et al. 2016), they would share many of the ecological requirements of focal species that also require aquatic habitat, including Central California Coast steelhead, California tiger salamander, foothill yellow-legged frog, California red-legged frog, and tricolored blackbird. Upland habitats are also important to western pond turtles for nesting, overwintering, and overland dispersal (Holland 1994), with nesting sites as far as 400 meters (1,312 feet) or more from the aquatic habitat (Jennings and Hayes 1994, Slavens 1995). Grassland habitat suitable for burrowing owl, Swainson's hawk, golden eagle and other grassland focal species may also be suitable for western pond turtle if it is near occupied aquatic habitat. Therefore, conservation actions that protect or enhance aquatic habitat may benefit western pond turtle if the aquatic habitat includes basking sites and sufficient protected adjacent upland habitat, ideally with connectivity to other aquatic habitat. Conservation actions that protect or enhance grassland habitat may benefit western pond turtle if the actions improve grassland habitat that is within an appropriate distance of suitable aquatic habitat.

Western Snowy Plover

In the RCIS area, the western snowy plover primarily use salt pannes, salt ponds and adjacent levees for nesting, as well as tidal flats for foraging. These habitat requirements translate to the RCIS's tidal bay flat and tidal unnatural/managed pond land cover types. Driftwood, kelp, and other debris provide cover for chicks that crouch near objects to hide from predators. Invertebrates are often found near debris, so driftwood and kelp are also important for harboring western snowy plover food sources (Page et al. 2009).

The RCIS includes a conservation strategy for the baylands. The conservation strategy will protect, enhance and restore western snowy plover habitat and will partner with organizations such as the Don Edwards National Wildlife Refuge to manage the baylands habitat to benefit of the species that occur therein (Section 3.8.3, *Baylands*).

Northern Harrier

Northern harrier breeds and forages in open habitats that provide an adequate prey base of small mammals (especially voles) and birds (Davis and Niemela 2008, Evens 2015). Breeding occurs from March through August and nests are built on the ground in dense vegetation, usually near water (Davis and Niemela 2008, Evens 2015). Suitable breeding and foraging habitat types include freshwater, brackish, and saltwater marshes; wet meadows; borders of lakes, rivers, and streams; annual and perennial grasslands (including those with vernal pools); and ungrazed or lightly-grazed pastures and some croplands (Davis and Niemela 2008, Evens 2015, Slater and Rock 2005). These habitat types translate to the following East Bay RCIS land cover types: tidal vegetation, perennial freshwater marsh, seasonal wetland, California annual grassland, and cropland. Northern harriers have been documented throughout the East Bay RCIS Area (eBird 2012, California Department of Fish and Wildlife 2018, Glover 2009), and nesting has been observed along the San Francisco Bay shoreline in both Alameda and Contra Costa counties (California Department of Fish and Wildlife 2018), near Suisun Bay between Martinez and Pittsburg (Glover 2009), in the eastern portion of Contra Costa County in the south Delta (Glover 2009), and in grasslands east of San Ramon (California Department of Fish and Wildlife 2018).

Conservation actions that improve marshland or grassland habitats or increase prey abundance will benefit northern harrier. These include conservation actions for the following focal species: California tiger salamander, California red-legged frog, giant gartersnake, tricolored blackbird, golden eagle, burrowing owl, Swainson's hawk, black rail, and San Joaquin kit fox.

Bald Eagle

Bald eagles are opportunistic predators and scavengers that are closely tied to aquatic habitats (Jackman and Jenkins 2004, U.S. Fish and Wildlife Service 2007). Their diets are comprised primarily of fish, and they require large bodies of water, such as rivers, reservoirs, lakes, and estuaries, that can support resident populations of fish that are generally larger than 200 millimeters total length

(Jackman and Jenkins 2004). Bald eagles can also prey upon waterfowl, shorebirds, small mammals, turtles, and carrion (Jackman and Jenkins 2004, U.S. Fish and Wildlife Service 2007). The bald eagle breeding season in California extends from February through July, and nests are usually located in mature conifers, snags, or cliff ledges that are relatively secluded and within 1 mile of foraging habitat (i.e., a large body of water) (California Department of Fish and Game 1999, Jackman and Jenkins 2004, U.S. Fish and Wildlife Service 2007). Bald eagles are year-round residents in the Bay Area and have been observed throughout the East Bay RCIS Area (Jackman and Jenkins 2004, eBird 2012). Nesting has been documented around many of the large lakes and reservoirs in the East Bay RCIS Area including near San Pablo Reservoir (California Department of Fish and Wildlife 2018), Lake Del Valle (California Department of Fish and Wildlife 2018), Lake Chabot (East Bay Regional Parks District 2013), and San Antonio Reservoir (San Francisco Public Utilities Commission 2017). Conservation actions that result in the acquisition of land surrounding large water bodies will benefit bald eagles by protecting potential nesting and wintering habitat.

Ridgway's Rail

Ridgway's rail occur within a range of saltwater and brackish marshes, which in the RCIS area translates to the tidal bay flat and tidal vegetation land cover types. This species can inhabit salt marshes dominated by pickleweed and Pacific cordgrass (*Spartina foliosa*) in the middle marsh zone (U.S. Fish and Wildlife Service 1998, U.S. Fish and Wildlife Service 2013a). Ridgway's rails also live in tidal brackish marshes that vary significantly in vegetation structure and composition. California black rail, which is an East Bay RCIS focal species, also inhabits saltwater and brackish marsh habitat (Grinnell and Miller 1944, Manolis 1978, Spautz et al. 2005); thus, the Ridgway's rail and California black rail share similar ecological requirements. Implementation of the conservation strategy for California black rail, which would protect and enhance suitable habitat, would also benefit the Ridgway's rail.

In addition to benefitting from the conservation strategy for black rail, Ridgway's rail will also benefit from implementation of the conservation strategy for the baylands (Section 3.8.3, *Baylands*), which would protect and manage bayland habitats for native biodiversity in tidal habitats along the San Francisco Bay, including habitats used by Ridgeway's rail.

Townsend's Big-eared Bat

Townsend's big-eared bats are not habitat generalists, but rather select roost sites with specific and predictable characteristics (Sherwin et al. 2000). This species is most commonly associated with desert scrub, mixed conifer forest, and pinon-juniper or pine forest habitat (Dalquest 1947, Dalquest 1948, Graham 1966, Pearson et al. 1952, Kunz and Martin 1982, Pierson 1988, Dobkin et al. 1995, Sherwin et al. 2000, Western Bat Working Group 2017). In the RCIS area, these vegetation communities translate to the following land cover types: barren/rock, Douglas fir forest, Coulter pine forest, knobcone pine forest, ponderosa pine forest, and redwood forest. Townsend's big-eared bats are specifically associated with limestone caves, mines, lava tubes, and buildings (Dalquest 1947, Dalquest 1948, Graham 1966, Pearson et al. 1952, Kunz and Martin 1982, Pierson 1988, Dobkin et al. 1995, Sherwin et al. 2000, Western Bat Working Group 2017). The land cover types in which Townsend's big-eared bats may occur serve as upland habitat for several of the focal species in the RCIS, including California tiger salamander and California red-legged frog; therefore, the actions to protect and enhance upland habitat for these species may also protect habitat for Townsend's big-eared bat if it includes roosting features. However, to ensure the conservation of cave and cave-like roosting habitat (Western Bat Working Group 2017), the RCIS also includes a specific conservation strategy for bats which will protect, enhance, and restore roosting habitat and hibernacula for Townsend's big eared bat and other bat species in the RCIS area (Section 3.8.4, *Bats*).

Salt Marsh Harvest Mouse

Salt marsh harvest mouse occurs in tidal marsh habitat around the San Francisco Bay, which translates to the tidal bay flat and tidal vegetation land cover types in the RCIS area. This species depends on dense cover of native halophytes (salt-tolerant plants). Deep (60 to 75 centimeters) and dense pickleweed (*Salicornia pacifica*), intermixed with fat-hen (*Atriplex prostrata* [*triangularis*] or *A. patula*) and alkali heath (*Frankenia salina*), is preferred in many areas (U.S. Fish and Wildlife Service 2013b). More recent research has documented the salt marsh harvest mouse in dense stands of three-square bulrush (*Schoenoplectus americanus*) (Shellhammer 1989, U.S. Fish and Wildlife Service 2013b), as well as other kinds of dense halophytic vegetation. They will also move into adjacent grasslands during high tides. Fisler (1965) and Shellhammer et al. (1982) reported that salt marsh harvest mice will move to adjoining grasslands during the highest winter tides and will occasionally use grasslands during spring and summer, when new growth affords sufficient cover.

The conservation strategy for California black rail, which will protect and enhance suitable habitat, will also benefit the salt marsh harvest mouse. California black rail, an RCIS focal species, also inhabits saltwater and brackish marsh habitat (Grinnell and Miller 1944, Manolis 1978, Spautz et al. 2005); thus, the salt marsh harvest mouse and California black rail share similar ecological requirements. In addition to benefitting from the conservation strategy for California black rail, salt marsh harvest mouse will benefit from implementation of the conservation strategy for the baylands (Section 3.8.3, *Baylands*), which encompasses tidal marsh habitat around the San Francisco Bay in the RCIS area. Implementation of the conservation strategy for the baylands would protect and manage tidal marsh habitat and transitional zones in the RCIS area for rare, threatened and endangered species, including the salt marsh harvest mouse. The conservation strategy emphasizes the importance of partnering with organizations, such as the Don Edwards National Wildlife Refuge, and private landowners to manage the baylands to benefit of the species that occur therein.

American Badger

American badger is found in open, arid landscapes with vegetation that can range from forest to grassland (Zeiner et al. 1988). Quinn (2007) found in a study at the Fort Ord National Monument in Monterey, California, that the top three habitat preferences within the American badger's home range were annual grassland, coastal sage scrub, and urban. The land cover types in the RCIS area that serve as habitat for the American badger include California annual grassland, serpentine grassland, and northern coastal scrub/Diablan sage scrub. Given the extensive distribution of grassland in the RCIS area (Section 2.2.5.5, *Natural Communities and Land Cover Types in the RCIS Area*), American badgers share ecological requirements with 20 focal species that also require grassland and shrubland habitat. Therefore, actions that protect or enhance grassland, shrubland, or other arid habitats will benefit the American badger. American badgers also require habitat with friable soils to dig burrows (Zeiner et al. 1988, California Department of Fish and Game 1995), as do some of the burrowing focal species such as California tiger salamander, western burrowing owl, and San Joaquin kit fox, and prey on ground squirrels and other small mammals (Zeiner et al. 1988, California Department of Fish and Game 1995). Actions to protect, enhance and restore grassland habitat with ground squirrel burrows containing friable soils necessary for American badger denning will protect prey populations for the American badger.

Hoover's Button Celery

Hoover's button celery is an annual or perennial native herb that occurs in vernal pools and other ephemeral wetland habitats (Baldwin et al. 2012, California Native Plant Society 2018, Calflora 2018). Vernal pools are a land cover type under the wetland and pond natural community in the RCIS. Given that the California tiger salamander and the vernal pool branchiopods also require vernal pool habitat, these species share ecological requirements with Hoover's button celery; thus, the conservation strategy to protect, enhance and restore habitat for these focal species will also benefit Hoover's button celery.

Associations between Non-focal Species and Land Cover Types

Table G-1a. Associations between Non-focal Species and Land Cover Types[1]

	Natural Community	Grassland				Shrublands			Woodland								Conifer Forest					
Common Name ***Scientific Name***	**Land Cover Type**	**California annual grassland**	**Serpentine Grassland**	**Alkali Grassland**	**Barren/Rock**	**Northern mixed chaparral/chamise chaparral**	**Serpentine chaparral**	**Northern coastal scrub/Diablan sage scrub**	**Blue oak woodland**	**Cismontane juniper woodland**	**Valley oak forest and woodland**	**Coast live oak forest and woodland**	**Mixed oak woodland and forest**	**Foothill-pine oak woodland**	**Montane hardwoods**	**Serpentine hardwoods**	**Sargent cypress woodland**	**Serpentine conifer**	**Coulter pine forest**	**Knobcone pine forest**	**Ponderosa pine woodland**	**Redwood forest**
Fish																						
Delta smelt *Hypomesus transpacificus*																						
Longfin smelt *Spirinchus thaleichthys*																						
Reptile																						
Western pond turtle *Emys marmorata*		X	X	X																		

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[1] This table shows the general relationships between species and land cover types. Most species select habitat based on characteristics at a finer scale than the land cover types presented here. In such cases, this table does not capture the full extent of a species' habitat relationships.

	Natural Community	Grassland				Shrublands			Woodland								Conifer Forest					
Common Name ***Scientific Name***	**Land Cover Type**	**California annual grassland**	**Serpentine Grassland**	**Alkali Grassland**	**Barren/Rock**	**Northern mixed chaparral/chamise chaparral**	**Serpentine chaparral**	**Northern coastal scrub/Diablan sage scrub**	**Blue oak woodland**	**Cismontane juniper woodland**	**Valley oak forest and woodland**	**Coast live oak forest and woodland**	**Mixed oak woodland and forest**	**Foothill-pine oak woodland**	**Montane hardwoods**	**Serpentine hardwoods**	**Sargent cypress woodland**	**Serpentine conifer**	**Coulter pine forest**	**Knobcone pine forest**	**Ponderosa pine woodland**	**Redwood forest**
Birds																						
Western snowy plover *Charadrius alexandrinus nivosus*																						
Northern harrier *Circus cyaneus*		X	X	X																		
Bald eagle *Haliaeetus leucocephalus*																					X	
Ridgway's rail *Rallus obsoletus obsoletus*																						
Mammals																						
Townsend's big-eared bat *Corynorhinus townsendii townsendii*					X													X	X	X	X	

	Natural Community	Grassland				Shrublands			Woodland								Conifer Forest					
Common Name ***Scientific Name***	**Land Cover Type**	**California annual grassland**	**Serpentine Grassland**	**Alkali Grassland**	**Barren/Rock**	**Northern mixed chaparral/chamise chaparral**	**Serpentine chaparral**	**Northern coastal scrub/Diablan sage scrub**	**Blue oak woodland**	**Cismontane juniper woodland**	**Valley oak forest and woodland**	**Coast live oak forest and woodland**	**Mixed oak woodland and forest**	**Foothill-pine oak woodland**	**Montane hardwoods**	**Serpentine hardwoods**	**Sargent cypress woodland**	**Serpentine conifer**	**Coulter pine forest**	**Knobcone pine forest**	**Ponderosa pine woodland**	**Redwood forest**
Salt marsh harvest mouse *Reithrodontomys raviventris*																						
American badger *Taxidea taxus*		X	X	X				X														
Plants																						
Hoover's button-celery *Eryngium aristulatum* var. *hooveri*																						

Table G-2b. Associations between Non-focal Species and Land Cover Types

	Riparian Woodland			Baylands					Wetland and Pond										Cultivated Agriculture				Urban		
Common Name ***Scientific Name***	**Mixed riparian forest and scrub**	**Sycamore alluvial woodland**	**Serpentine riparian**	**Deep bay**	**Shallow bay**	**Tidal bay flat**	**Tidal unnatural/managed pond**	**Tidal vegetation**	**Alkali wetland**	**Aquatic-undefined**	**Aquatic-unnatural**	**Perennial freshwater marsh**	**Seasonal wetland**	**Spring/seep (nonserpentine)**	**Spring/seep (serpentine)**	**Pond**	**Reservoir**	**Vernal Pool**	**Cultivated-undetermined**	**Cropland**	**Orchard**	**Vineyard**	**Urban**	**Rural residential**	**Ornamental woodland**
Fish																									
Delta smelt *Hypomesus transpacificus*				X	X	X	X	X																	
Longfin smelt *Spirinchus thaleichthys*				X	X	X	X	X																	
Reptiles																									
Western pond turtle *Emys marmorata*	X	X	X									X				X	X								
Birds																									
Western snowy plover *Charadrius alexandrinus nivosus*						X	X																		
Northern harrier *Circus cyaneus*								X				X	X							X					
Bald eagle *Haliaeetus leucocephalus*	X				X	X	X	X									X								
Ridgway's rail *Rallus obsoletus obsoletus*						X		X																	

	Riparian Woodland			Baylands					Wetland and Pond										Cultivated Agriculture				Urban		
Common Name ***Scientific Name***	**Mixed riparian forest and scrub**	**Sycamore alluvial woodland**	**Serpentine riparian**	**Deep bay**	**Shallow bay**	**Tidal bay flat**	**Tidal unnatural/managed pond**	**Tidal vegetation**	**Alkali wetland**	**Aquatic-undefined**	**Aquatic-unnatural**	**Perennial freshwater marsh**	**Seasonal wetland**	**Spring/seep (nonserpentine)**	**Spring/seep (serpentine)**	**Pond**	**Reservoir**	**Vernal Pool**	**Cultivated-undetermined**	**Cropland**	**Orchard**	**Vineyard**	**Urban**	**Rural residential**	**Ornamental woodland**
Mammals																									
Townsend’s big-eared bat *Corynorhinus townsendii townsendii*																									
Salt marsh harvest mouse *Reithrodontomys raviventris*						X		X																	
American badger *Taxidea taxus*																									
Plants																									
Hoover’s button-celery *Eryngium aristulatum* var. *hooveri*													X	X				X							

Associations between Non-focal Species and Wildlife Focal Species

Table G-2a. Associations between Non-focal Species and Wildlife Focal Species[2]

Common Name ***Scientific Name***	**Wildlife Focal Species**	**Longhorn fairy shrimp**	**Vernal pool fairy shrimp**	**Vernal pool tadpole shrimp**	**Callippe silverspot butterfly**	**Central California Coast steelhead**	**Central Valley steelhead**	**Winter-run Chinook salmon**	**California tiger salamander**	**Foothill yellow-legged frog**	**California red-legged frog**	**Northern California legless lizard**	**Alameda whipsnake**	**Giant garter snake**	**Tricolored blackbird**	**Golden eagle**	**Burrowing owl**	**Swainson's hawk**	**California black rail**	**San Joaquin kit fox**	**Mountain lion**
Fish																					
Delta smelt *Hypomesus transpacificus*						X	X	X													
Longfin smelt *Spirinchus thaleichthys*						X	X	X													
Reptiles																					
Western pond turtle *Emys marmorata*									X	X	X	X			X	X	X	X		X	
Birds																					
Western snowy plover *Charadrius alexandrinus nivosus*																					
Northern harrier *Circus cyaneus*		X	X	X	X				X		X	X		X	X	X	X	X	X	X	X
Bald eagle *Haliaeetus leucocephalus*																					

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[2] This table shows general similarities in habitat use between non-focal species and focal species. Most species do not completely overlap habitat usage with other species. Furthermore, most species select habitat at finer scales than generalized here. As such, these tables does not precisely depict the overlap in habitat use between focal species and non-focal species.

Common Name ***Scientific Name***	**Wildlife Focal Species**	**Longhorn fairy shrimp**	**Vernal pool fairy shrimp**	**Vernal pool tadpole shrimp**	**Callippe silverspot butterfly**	**Central California Coast steelhead**	**Central Valley steelhead**	**Winter-run Chinook salmon**	**California tiger salamander**	**Foothill yellow-legged frog**	**California red-legged frog**	**Northern California legless lizard**	**Alameda whipsnake**	**Giant garter snake**	**Tricolored blackbird**	**Golden eagle**	**Burrowing owl**	**Swainson's hawk**	**California black rail**	**San Joaquin kit fox**	**Mountain lion**
Ridgway's rail *Rallus obsoletus obsoletus*																			X		
Mammals																					
Townsend's big-eared bat *Corynorhinus townsendii townsendii*												X									
Salt marsh harvest mouse *Reithrodontomys raviventris*																			X		
American badger *Taxidea taxus*		X	X	X	X				X		X	X	X		X	X	X	X		X	
Plant																					
Hoover's button-celery *Eryngium aristulatum* var. *hooveri*		X	X	X					X												

Table G-2b. Associations between Non-focal Species and Plant Focal Species[3]

Common Name ***Scientific Name***	**Plant Focal Species**	**Pallid manzanita**	**Brittlescale**	**Big tarplant**	**Fragrant fritillary**	**Round leaved-filaree**	**Mount Diablo fairly lantern**	**Congdon's tarplant**	**Palmate bracted bird's-beak**	**Presidio clarkia**	**Livermore tarplant**	**Recurved larkspur**	**San Joaquin spearscale**	**Brewer's western flax**	**Loma Prieta hoita**	**Contra Costa goldfields**	**Mason's lilaeopsis**	**Showy madia**	**Rock sanicle**	**Most beautiful jewelflower**
Fish																				
Delta smelt *Hypomesus transpacificus*																	X			
Longfin smelt *Spirinchus thaleichthys*																	X			
Reptile																				
Western pond turtle *Emys marmorata*																				
Birds																				
Western snowy plover *Charadrius alexandrinus nivosus*																				
Northern harrier *Circus cyaneus*																				
Bald eagle *Haliaeetus leucocephalus*																				
Ridgway's rail *Rallus obsoletus obsoletus*																	X			

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[3] This table shows general similarities in habitat use between non-focal species and focal species. Most species do not completely overlap habitat usage with other species. Furthermore, most species select habitat at finer scales than generalized here. As such, these tables does not precisely depict the overlap in habitat use between focal species and non-focal species.

Common Name ***Scientific Name***	**Plant Focal Species**	**Pallid manzanita**	**Brittlescale**	**Big tarplant**	**Fragrant fritillary**	**Round leaved-filaree**	**Mount Diablo fairly lantern**	**Congdon's tarplant**	**Palmate bracted bird's-beak**	**Presidio clarkia**	**Livermore tarplant**	**Recurved larkspur**	**San Joaquin spearscale**	**Brewer's western flax**	**Loma Prieta hoita**	**Contra Costa goldfields**	**Mason's lilaeopsis**	**Showy madia**	**Rock sanicle**	**Most beautiful jewelflower**
Mammals																				
Townsend's big-eared bat *Corynorhinus townsendii townsendii*		X					X								X					
Salt marsh harvest mouse *Reithrodontomys raviventris*																	X			
American badger *Taxidea taxus*																				
Plant																				
Hoover's button-celery *Eryngium aristulatum* var. *hooveri*			X					X	X		X		X			X				

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Appendix H
Summary of Baylands Conservation Strategies

Table H-1 Baylands Conservation Strategies: Species

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
Salt marsh harvest mouse *(Reithrodontomys raviventris)*				
The goals that follow are based on the following documents: Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (https://www.fws.gov/sacramento/es/recovery-planning/tidal-marsh/Documents/TMRP_Volume1_RP.pdf) pp 355 Baylands Ecosystem Habitat Goals Science Update 2015 (http://baylandsgoals.org/wp-content/uploads/2015/10/Baylands_Complete_Report.pdf) pp 135, pp 148, pp 154, pp 158 pp 209, pp 223				
• **1.0**: Acquire existing, historic, and restorable tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species. • **2.0**: Manage, restore, and monitor tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species. • **3.0**: Conduct range-wide species status surveys/monitoring and status reviews for listed species and species of concern covered in this recovery plan. • **4.0**: Conduct research necessary for the recovery of listed species and the long-term conservation of species of concern.	• **1.2.2.** Acquire/protect currently unprotected high marsh and ecotonal habitat and lands restorable to high marsh and ecotonal habitat for *Chloropyron molle* ssp. *molle*, *Cirsium hydrophilum* var. *hydrophilum*, California clapper rail, and salt marsh harvest mouse by purchase of fee title or conservation easement. **(Priority 1)** • **2.1.5.2** Minimize or avoid over-management of estuarine salinity variation. **(Priority 2)** • **2.1.8.2.1** Identify lands adjacent to the Bay Trail and other public access areas where human-related disturbance encourages predation that causes a threat to the California clapper rail and salt marsh harvest mouse. **(Priority 2)** • **2.1.9.2** Manage cattle grazing to minimize impacts to salt marsh harvest mouse, Suisun shrew, and the birds of the high tidal marsh, such as saltmarsh common yellowthroat. **(Priority 3)** • **2.2.1** Create an interdisciplinary review panel or similar group to coordinate and review the design of	• **4.2.7.1** Conduct a population viability analysis to determine desirable population sizes for long-term persistence of extant South Bay salt marsh harvest mouse populations. **(Priority 2)** • **4.2.7.2** Study use of adjacent habitat, including brackish marsh, by the salt marsh harvest mouse. **(Priority 1)** • **4.2.7.3** Study the impact of *Spartina alterniflora* and its hybrids, and *Lepidium latifolium* on the salt marsh harvest mouse. **(Priority 2)** • **4.2.7.4** Study predation impacts to the salt marsh harvest mouse. **(Priority 2)** • **4.3.1** Conduct a salt marsh harvest mouse population genetic analysis to determine: ○ the genetic effective population size ○ the genetic relationships among presumed populations ○ the magnitude of gene exchange between marshes and	Table III-3: Summary of California Clapper Rail and Salt Marsh Harvest Mouse Recovery Criteria – highlights needs by specific habitat complex	**Noted in objective/action**

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	tidal marsh restoration projects throughout San Francisco Bay. **(Priority 2)** • **2.2.3.1** Protect, manage, and monitor large populations and occupied marsh complexes as interim reserves selected to represent the full range of both subspecies of salt marsh harvest mouse. **(Priority 1)** • **2.2.3.3** Transition from diked wetlands to restored or enhanced tidal marsh habitat, where feasible. **(Priority 3)** • **3.1.2.6** Monitor for salt marsh harvest mouse. **(Priority 2)** • Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Where tidal marsh cannot be restored, improve water management to enhance diked wetlands through realigning levees and drainage ditches and connecting historic sloughs. • Enhance and restore the natural transition zone, focusing on tidal marsh transitions, incorporating protective buffers wherever possible, particularly around the base of alluvial fans to provide sediment to the terrestrial side of marshes. • Realign railways to allow for migration of the baylands with sea-level rise. • Increase the populations of threatened and endangered species through methods such as farming best practices to meet specific conservation objectives to buffer future impacts.	subpopulations within marshes the extent of inbreeding occurring within populations **(Priority 1)**		

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Reduce the runoff of agricultural contaminants and nutrients from agricultural activities to improve water quality in the adjacent wetlands • Restore a tidal marsh corridor along the eastern edge of the Richmond Landfill to reconnect Wildcat Marsh and San Pablo Marsh. • Restore tidal marsh throughout most of the segment prior to 2030, providing a continuous corridor of tidal marsh along the shore across a gradient of salt to brackish marsh • Protect existing muted tidal wetland for the salt marsh harvest mouse as insurance against fully tidal wetland being lost as a result of sea-level rise.			
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 162, pp 164				
Subregional Habitat Recommendations: • Contra Costa North • Contra Costa West • Coyote Creek Area • Mowry Slough Area	**Contra Costa North** • Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Where tidal marsh cannot be restored, improve water management to enhance diked wetlands. • Ensure natural transitions between marshes and adjacent uplands, and protect and expand adjacent buffers where possible. • Restore riparian vegetation along small and large streams. **Contra Costa West** • Protect and enhance existing tidal marshes, beaches, lagoons, and uplands.	*	*	**Contra Costa North** Railroads and roadways, major pipelines, sewer lines, Concord Naval Weapons Station, adjacent heavy industry (e.g., Pacific Gas and Electric Company's Pittsburg power plant), and on-site contaminants. **Contra Costa West** Union Pacific railroad tracks, Richmond landfill, flood control

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Restore a tidal marsh corridor along the eastern edge of the Richmond landfill to reconnect Wildcat Marsh and San Pablo Marsh. • Protect and restore tidal marsh south of the Point Pinole Regional Shoreline at the Bruener property, and connect to Giant Marsh. • Restore vernal pools in the adjacent uplands. • Control rampant spread of pepper grass in rare high marsh plant associations, and prevent reemergence of invasive non-native Chilean cordgrass at Point Pinole. **Coyote Creek Area** • Restore tidal marsh throughout most of the segment, providing a continuous corridor of tidal marsh along the bayshore. The type of tidal marsh created (salt or brackish) will be dependent on the amount and proximity to local freshwater outflows. Restoration should emphasize reestablishing a natural transition between tidal marsh and adjacent wetlands and upland habitats, as well as transitions between salt and brackish tidal marsh. • Modify and manage a large complex of salt ponds for shorebirds and waterfowl. • Restore or enhance vernal pools in the adjacent undeveloped uplands.			considerations, and on-site contaminants. **Coyote Creek Area** Pacific Gas and Electric Company transmission lines and other utility corridors, flood protection considerations, historical land subsidence, freshwater outflow from wastewater treatment facilities, operation and maintenance of salt ponds in absence of salt production, and smooth cordgrass. **Mowry Slough Area** Union Pacific railroad tracks; Pacific Gas and Electric Company transmission lines, Hetch Hetchy Aqueduct, and other utility corridors; flood control considerations; operation and maintenance of salt ponds in absence of salt production; and current use of levees and salt pans by

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Reestablish native riparian vegetation and otherwise improve the riparian corridor along Coyote Creek. • Manage discharges from the San Jose treatment plant to limit adverse environmental impacts, especially to tidal salt marsh habitat. Consider using recycled water to augment flows in Coyote Creek or for other habitat enhancements. **Mowry Slough Area** • Enlarge the Dumbarton, Mowry, and Calaveras Point tidal marshes, and provide a corridor of tidal marsh along the bayshore. • Modify and manage for shorebirds and waterfowl a complex of salt ponds adjacent to and including the crystallizer complex between Mowry Slough and Newark Slough. • Protect and enhance the tidal marsh/upland transition at the upper end of Mowry Slough and in the area of the Pintail duck club. Similar habitat can be protected and restored at the upper ends of Newark, Plummer, and Albrae sloughs. • Protect the area of harbor seal haul-out along lower Mowry Slough. • Consider, among other possible alternatives, using treated wastewater from the San Jose wastewater treatment plant to dispose of bittern.			nesting snowy plovers.
The goals that follow are based on the Comprehensive Conservation Planning (https://www.fws.gov/uploadedFiles/DESFBFinalCCP_sm.pdf) pp 180				

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
• **1.0:** Protect and contribute to the recovery of endangered, threatened, and other special status species on the Refuge by conservation and management of the habitats on which these species depend.	• **1.1:** Conduct standardized monitoring efforts and research projects in coordination with other regional efforts for salt marsh harvest mouse and California clapper rail within five years. Improve high tide refugia for these species.	*	*	*
The goals that follow are based on the South Bay Salt Pond Restoration Project Final EIS/R, 2 Description of Alternatives: (http://www.southbayrestoration.org/pdf_files/SBSP_EIR_Final/2_Alternatives%20Final%20EIS_R.pdf) pp 2-19				
• Restoration of tidal habitat benefits special-status and native species	• Contribute to the recovery of the South Bay subspecies of the salt marsh harvest mouse	• Likely decades for high-quality tidal marsh development • Monitoring not expected to begin for 5-10 years after pickleweed establishment in 300 acres or more	• Meet recovery plan criteria for salt marsh harvest mouse habitat within the South Bay Salt Pond Restoration Project Area • 75% of viable habitat areas within each large marsh complex with a capture efficiency level of 5.0 or better in five consecutive years	*
Ridgeway's rail (California clapper rail) (*Rallus obsoletus*)				
The goals that follow are based on the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (https://www.fws.gov/sacramento/es/recovery-planning/tidal-marsh/Documents/TMRP_Volume1_RP.pdf) pp 335				
• **1.0**: Acquire existing, historic, and restorable tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species.	• **1.2.1.1** Acquire/protect currently unprotected tidal marsh habitat. **(Priority 2)** • **1.2.1.2** Investigate opportunities to acquire/protect lands restorable to tidal marsh. **(**Priority **2)**	• **4.2.6.1** Conduct a population viability analysis of the California clapper rail. **(Priority 1)** • **4.2.6.2** Study effects of recent non-native *Spartina* treatment on	• Table III-3: Summary of California Clapper Rail and Salt Marsh Harvest Mouse	**Noted in objective/action**

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
• **2.0**: Manage, restore, and monitor tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species. • **3.0**: Conduct range-wide species status surveys/monitoring and status reviews for listed species and species of concern covered in this recovery plan. • **4.0**: Conduct research necessary for the recovery of listed species and the long-term conservation of species of concern.	• **1.2.2.** Acquire/protect currently unprotected high marsh and ecotonal habitat and lands restorable to high marsh and ecotonal habitat for Chloropyron molle ssp. molle, Cirsium hydrophilum var. hydrophilum, California clapper rail, and salt marsh harvest mouse by purchase of fee title or conservation easement. **(Priority 1)** • **2.1.6.1.1.3** Monitor the success of control at sites where non-native Spartina is managed and the ability of treated sites to support California clapper rails. **(Priority 1)** • **2.1.8.2.1** Identify lands adjacent to the Bay Trail and other public access areas where human-related disturbance encourages predation that causes a threat to the California clapper rail and salt marsh harvest mouse. **(Priority 2)** • **2.1.8.2.3** Implement and enforce pet restrictions. **(Priority 2)** • **2.1.8.2.4** Avoid relocation of nuisance animals in California clapper rail habitat. **(Priority 2)** • **2.2.1** Create an interdisciplinary review panel or similar group to coordinate and review the design of tidal marsh restoration projects throughout San Francisco Bay. **(Priority 2)** • **3.1.1.1** Review existing species survey guidance to determine its adequacy. **(Priority 3)** • **3.1.1.2** If necessary, revise existing guidance or develop new standardized,	California clapper rail movement within the ecosystem. **(Priority 1)** • **4.2.6.3** Conduct diet analyses on California clapper rail as a tool to understanding habitat use. **(Priority 2)** • **4.4.3** Study the impacts of large-volume, human-caused, freshwater discharges into tidal marshes. **(Priority 2)** • **4.4.4** Investigate the effects of salinity fluctuation and altered tidal datum on species covered in this recovery plan. **(Priority 2)** • **4.4.5** Study the time lag between habitat restoration and recolonization by species covered in this recovery plan. **(Priority 2)** • **4.4.6** Conduct research on the physical processes (geomorphic and hydrologic) that maintain the structure and function of suitable habitats for tidal marsh species. **(Priority 2)** • **4.4.7** Study the effects of global climate change and resulting sea level rise on tidal marsh ecosystems. **(Priority 1)** • **4.4.8** Conduct research on management conflicts between tidal marsh species. **(Priority 2)** • **4.5.2.1** Conduct research into mercury exposure pathways for California clapper rails and potential means to interrupt those pathways. **(Priority 2)**	Recovery Criteria – highlights needs by specific habitat complex	

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	scientifically based, and species-specific survey guidance. **(Priority 3)** • **3.1.2.5.1** Develop certification/training programs for California clapper rail surveyors and survey coordinators. **(Priority 3)** • **3.1.2.5.2** Conduct annual California clapper rail call counts during breeding season. **(Priority 2)** • **3.1.2.5.3** Monitor adult California clapper rail survival and mortality of adults, chicks, and eggs due to predation. **(Priority 2)** • **3.1.2.5.4** Develop and maintain a database to track results from annual California clapper rail monitoring results. **(Priority 2)** • **3.1.2.5.5** Examine the methodology used for call count surveys in • Action 3.1.2.5.2 above, by cross validating surveys (using double observer methods) with movement studies recommended in Action 4.2.6.2. **(Priority 3)**	• **4.5.2.2** Conduct other necessary research on bioaccumulation and effects, including reproductive success and development, of toxic estuarine contaminants on tidal marsh species. **(Priority 2)** • **4.5.2.3** Apply results of research in Action 4.5.2.2 to re-evaluate suitability of delisting criterion E/5 for the California clapper rail and revise, if appropriate. **(Priority 3)** • **4.5.2.4** Apply results of research in Actions 4.2.4.2.1 and 4.2.4.2.2 to sediment and water quality standards to protect sensitive wildlife of the San Francisco Bay Estuary. **(Priority 3)** • **4.5.2.5** Conduct studies to establish contaminant levels in biosentinels that are "acceptable" or "not acceptable", then measure compounds in these biosentinels directly or via a non-invasive surrogate, such as feathers, if possible. **(Priority 1)** • **4.7** Establish research protocols, where necessary, and as determined by the RIT, described below. **(Priority 3).** For example, establish protocols for handling sick, injured, oiled, and dead California clapper rails or salvaged eggs. • **4.8** Conduct additional research identified as necessary by the Recovery Implementation Team		

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
		that address changing conditions and are supportive of highest priority recovery tasks. **(Priority 2)** • **4.9** Apply the results of all studies to conservation and recovery efforts. **(Priority 2)**		
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp164, pp 166, pp168, pp 170				
Subregional Habitat Recommendations: • Suisun Marsh West • Contra Costa North • Mountain View • Coyote Creek • Mowry Slough • Coyote Hills • Baumberg • Hayward	**Suisun Marsh West** • Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough. • Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it along Cordelia Slough probably would facilitate water management on duck clubs in the area. • Provide natural transitions to adjacent uplands, with protective buffers wherever possible. • Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay. **Contra Costa North** • Restore large areas of tidal marsh in diked and muted tidal marsh areas.	*	*	**Suisan Marsh West** Southern Pacific railroad tracks, industrial areas in southwest portion, flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Contra Costa North** Railroads and roadways, major pipelines, sewer lines, Concord Naval Weapons Station, adjacent heavy industry (e.g., Pacific Gas and Electric Company’s Pittsburg power plant), and on-site contaminants. **Mountain View** Pacific Gas and Electric Company

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Where tidal marsh cannot be restored, improve water management to enhance diked wetlands. • Ensure natural transitions between marshes and adjacent uplands, and protect and expand adjacent buffers where possible. • Restore riparian vegetation along small and large streams. **Mountain View** • Restore large areas of tidal marsh and provide a continuous corridor of tidal marsh along the bayshore. • Provide more and wider buffers to tidal marshes, and improve management to reduce human intrusion and predators. • Modify and manage two or three complexes of salt ponds, including the pond adjacent to the Dumbarton Bridge, for shorebirds, waterfowl, and post-breeding least terns. • Enhance the seasonal wetlands and burrowing owl habitat in the Sunnyvale baylands. • Reestablish native vegetation and otherwise enhance the riparian corridor along San Francisquito Creek, Guadalupe River, and other tributary streams. **Coyote Creek** • Restore tidal marsh throughout most of the segment, providing a continuous corridor of tidal marsh along the bayshore. The type of tidal marsh			transmission lines and other utility corridors, flood protection considerations, historical land subsidence, freshwater outflow from wastewater treatment facilities, operation and maintenance of salt ponds in absence of salt production, and smooth cordgrass. **Coyote Creek** Pacific Gas and Electric Company transmission lines and other utility corridors, flood protection considerations, historical land subsidence, freshwater outflow from wastewater treatment facilities, operation and maintenance of salt ponds in absence of salt production, and smooth cordgrass. **Mowry Slough** Union Pacific railroad tracks; Pacific Gas and Electric Company

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	created (salt or brackish) will be dependent on the amount and proximity to local freshwater outflows. Restoration should emphasize reestablishing a natural transition between tidal marsh and adjacent wetlands and upland habitats, as well as transitions between salt and brackish tidal marsh. • Modify and manage a large complex of salt ponds for shorebirds and waterfowl. • Restore or enhance vernal pools in the adjacent undeveloped uplands. • Reestablish native riparian vegetation and otherwise improve the riparian corridor along Coyote Creek. • Manage discharges from the San Jose treatment plant to limit adverse environmental impacts, especially to tidal salt marsh habitat. Consider using recycled water to augment flows in Coyote Creek or for other habitat enhancements. **Mowry Slough** • Enlarge the Dumbarton, Mowry, and Calaveras Point tidal marshes, and provide a corridor of tidal marsh along the bayshore. • Modify and manage for shorebirds and waterfowl a complex of salt ponds adjacent to and including the crystallizer complex between Mowry Slough and Newark Slough. • Protect and enhance the tidal marsh/upland transition at the upper			transmission lines, Hetch Hetchy Aqueduct, and other utility corridors; flood control considerations; operation and maintenance of salt ponds in absence of salt production; and current use of levees and salt pans by nesting snowy plovers. **Coyote Hills** Smooth cordgrass, flood protection considerations, predator corridor along Alameda Flood Control Channel, operation and maintenance of salt ponds in absence of salt production, and current use of levees and salt pans by nesting snowy plovers. **Baumberg** Smooth cordgrass, flood protection considerations, East Bay Dischargers Authority waste water pipeline, Pacific Gas and Electric Company

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	end of Mowry Slough and in the area of the Pintail duck club. Similar habitat can be protected and restored at the upper ends of Newark, Plummer, and Albrae sloughs. • Protect the area of harbor seal haul-out along lower Mowry Slough. • Consider, among other possible alternatives, using treated wastewater from the San Jose wastewater treatment plant to dispose of bittern. **Coyote Hills** • Maintain and manage a complex of salt ponds for shorebirds and waterfowl in the southern part of the segment and restore the remaining area to tidal marsh. Restoration should emphasize natural transition of tidal marsh/uplands at Coyote Hills and a continuous corridor of tidal marsh around Dumbarton Point. • On the eastern side of Coyote Hills, enhance and expand muted tidal areas with improved water management. • Protect and enhance existing willow groves and seasonal wetlands. • Consider reintroducing coyotes into Coyote Hills to restore natural predator/prey relationships and to control the introduced red fox. • Consider removing the flood control levees in the lower reaches of the Alameda Creek Flood Control Channel as part of restoration planning for this area.			transmission lines and other utility corridors, major predator access corridor on Old Alameda Creek, operation and maintenance of salt ponds in absence of salt production, and public access and recreation. **Hayward** East Bay Dischargers Authority pipeline, extensive stands of smooth cordgrass, Pacific Gas and Electric Company transmission lines and other utility corridors, Southern Pacific railroad tracks, and flood control levees for adjacent areas.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Control smooth cordgrass before restoring large diked areas to tidal marsh. **Baumberg** • Modify and manage for shorebirds and waterfowl two complexes of salt ponds — one in the Turk Island area and one in the Baumberg Tract area (including the southern Oliver Brothers ponds). • Restore the remaining areas to tidal marsh, ensuring a continuous corridor of tidal marsh along the bayshore, and incorporate shallow pans in the marsh designs. • Enhance the Alameda Flood Control ponds in the Turk Island area as either tidal or muted tidal marsh. • Maintain and enhance the existing willow grove and managed diked wetlands on the eastern side of the active salt ponds in the Turk Island area. **Hayward** • Restore sandy berms and barrier beaches along the shoreline. • Restore natural salt pond or backshore pans in the diked marshes adjacent to the West Winton Avenue landfill area and in the old oxidation pond to the south. • Establish or maintain a complex of managed salt ponds to the north of Highway 92, including shallow pans. • Protect the wetlands adjacent to the Hayward Area Recreation District			

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	Marsh and enhance tidal influence to the entire marsh system. • Control smooth cordgrass. • Reintroduce California seablite and associated flora in suitably restored habitat.			
The goals that follow are based on the Comprehensive Conservation Planning (https://www.fws.gov/uploadedFiles/DESFBFinalCCP_sm.pdf) pp 180				
• **1.0:** Protect and contribute to the recovery of endangered, threatened, and other special status species on the Refuge by conservation and management of the habitats on which these species depend.	• **1.1:** Conduct standardized monitoring efforts and research projects in coordination with other regional efforts for salt marsh harvest mouse and California clapper rail within five years. Improve high tide refugia for these species. • **1.4:** Improve ecological function of tidal and managed marsh, especially at La Riviere Marsh, Mayhews Landing, and New Chicago Marsh units in order to enhance tidal marsh habitat.	*	*	*
California black rail *(Laterallus jamaicensis* ssp. *coturniculus)*				
The goals that follow are based on the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (https://www.fws.gov/sacramento/es/recovery-planning/tidal-marsh/Documents/TMRP_Volume1_RP.pdf) pp 355; Appendix C				
• **2.0**: Manage, restore, and monitor tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species. • **3.0**: Conduct range-wide species status surveys/monitoring and status reviews for listed species and species of concern covered in this recovery plan.	• **2.1.8.2.3** Implement and enforce pet restrictions. **(Priority 2)** • **3.1.2.9** Continue to conduct surveys/monitoring of California black rail. **(Priority 3)**	• **4.2.10** Conduct biological and ecological studies on the California black rail. **(Priority 3)** • **4.4.8** Conduct research on management conflicts between tidal marsh species. **(Priority 2)**		**Noted in objective/action**

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
• **4.0**: Conduct research necessary for the recovery of listed species and the long-term conservation of species of concern.				
The goals that follow are based on the following documents: • Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 134, pp 136				
Subregional Habitat Recommendations: • Suisun Marsh East • Contra Costa North	**Suisun Marsh East** • Restore tidal marsh at sites adjacent to Honker Bay, along the eastern side of Montezuma Slough, in the Nurse Slough area, and near Denverton Creek. • Provide a tidal marsh corridor along the base of Potrero Hills between Nurse Slough and the marshes to the west. • Provide natural transitions to adjacent uplands (with protective buffers wherever possible) for all existing and restored tidal marshes. • Protect and enhance existing vernal pools and other seasonal wetlands adjacent to Montezuma Slough, in the Nurse Slough area, and north of Potrero Hills. • Enhance managed marshes in the Grizzly Island area to improve and diversify managed wetlands. **Contra Costa North** • Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Where tidal marsh cannot be restored, improve water management to enhance diked wetlands.	*	*	**Suisun Marsh East** Flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Contra Costa North** Railroads and roadways, major pipelines, sewer lines, Concord Naval Weapons Station, adjacent heavy industry (e.g., Pacific Gas and Electric Company's Pittsburg power plant), and on-site contaminants.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Ensure natural transitions between marshes and adjacent uplands, and protect and expand adjacent buffers where possible. • Restore riparian vegetation along small and large streams.			
The goals that follow are based on the South Bay Salt Pond Restoration Project Final EIS/R, 2 Description of Alternatives: (http://www.southbayrestoration.org/pdf_files/SBSP_EIR_Final/2_Alternatives%20Final%20EIS_R.pdf) pp 2-19				
• Restoration of tidal habitat benefits special-status and native species	• Contribute to the recovery of the South Bay subspecies of the salt marsh harvest mouse	• Likely decades for high-quality tidal marsh development • Monitoring not expected to begin for 5-10 years after pickleweed establishment in 300 acres or more	• Meet recovery plan criteria for salt marsh harvest mouse habitat within the SBSP Restoration Project Area • 75% of viable habitat areas within each large marsh complex with a capture efficiency level of 5.0 or better in five consecutive years	*
Salt marsh wandering shrew *(Sorex vagrans halicoetes)*				
The goals that follow are based on the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (https://www.fws.gov/sacramento/es/recovery-planning/tidal-marsh/Documents/TMRP_Volume1_RP.pdf) pp 355; Appendix C				
*	• **3.1.2.7** Conduct surveys/monitoring of salt marsh wandering shrew and Suisun shrew. **(Priority 3)**	• **4.2.8** If sufficient numbers of the species are identified under Action 3.1.2.7, conduct biological and ecological studies on the salt marsh wandering shrew and the Suisun shrew. **(Priority 3)** • **4.3.2** If sufficient numbers of the species are identified under Action	*	**Noted in objective/action**

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
		3.1.2.7, conduct research to assess genetic diversity within and among populations of salt marsh wandering shrew and Suisun shrew. **(Priority 3)**		
California least tern *(Sterna antillarum browni)*				
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 152				
Subregional Habitat Recommendations: • Oakland Area	Oakland Area • Enhance and expand tidal and diked habitats at all potential areas throughout the segment, for example, on Alameda Island, on Bay Farm Island, and in the vicinity of the Oakland Airport. • Protect and enhance the eelgrass bed near Bay Farm Island. • Enhance and protect suitable habitat (e.g., barren or sparsely vegetated areas protected from predators) for snowy plover and least tern at Alameda Naval Air Station, Oakland Airport, Bay Farm Island, and other locations. • Restore beach dune and marsh in the sanctuary on the southern end of Alameda Island. • Increase habitat in and around San Leandro Bay for harbor seals and develop extensive and connected segments of tidal marsh for small mammals. • Restore pockets of low-lying sand beaches in sheltered sites to support			Possible Constraints: **Oakland Area** Large urban population, extensive fill along the shoreline, railroad tracks and spurs, major highways, exotic predators (e.g., rats and red fox), smooth cordgrass, and on-site contaminants.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	reintroduced colonies of California seablite. • Enhance Lake Merritt by improving tidal action and restoring tidal marsh along the lakeshore and the channel that connects the Lake to the Oakland Inner Harbor. • Enhance riparian corridors along streams throughout the segment and reconnect tributary streams to the Bay.			
The goals that follow are based on the Comprehensive Conservation Planning (https://www.fws.gov/uploadedFiles/DESFBFinalCCP_sm.pdf) pp 180				
• **1.0:** Protect and contribute to the recovery of endangered, threatened, and other special status species on the Refuge by conservation and management of the habitats on which these species depend.	• **1.3:** Provide appropriate habitat for at least one California least tern colony within the pond complexes to support an average of one fledged chick per nest over a 15-year period, with at least ten nests established annually following habitat creation.	*	*	*
The goals that follow are based on the South Bay Salt Pond Restoration Project Final EIS/R, 2 Description of Alternatives: (http://www.southbayrestoration.org/pdf_files/SBSP_EIR_Final/2_Alternatives%20Final%20EIS_R.pdf) pp 2-23				
• Maintain numbers of post-breeding California least terns in the Project Area at multiyear average levels including natural variation in numbers; avoid negative effect of SBSP Restoration Project on Bayarea least tern breeding bird numbers (multi-year average levels with natural variation)	*	*	*	*
The objectives that follow are based on the Baylands Ecosystem Habitat Goals Science Update 2015 (http://baylandsgoals.org/wp-content/uploads/2015/10/Baylands_Complete_Report.pdf) pp 181				
*	• Enhance and protect suitable habitat (e.g., barren or sparsely vegetated areas protected from predators) for	*	*	*

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	the snowy plover and least tern at Alameda Naval Air Station, Oakland Airport, Bay Farm Island, and other locations.			
Delta smelt *(Hypomesus transpacificus)*				
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 132, pp 134				
Subregional Habitat Recommendations: • Suisun Marsh East • Suisun Marsh West	**Suisun Marsh East** • Restore tidal marsh at sites adjacent to Honker Bay, along the eastern side of Montezuma Slough, in the Nurse Slough area, and near Denverton Creek. • Provide a tidal marsh corridor along the base of Potrero Hills between Nurse Slough and the marshes to the west. • Provide natural transitions to adjacent uplands (with protective buffers wherever possible) for all existing and restored tidal marshes. • Protect and enhance existing vernal pools and other seasonal wetlands adjacent to Montezuma Slough, in the Nurse Slough area, and north of Potrero Hills. • Enhance managed marshes in the Grizzly Island area to improve and diversify managed wetlands. **Suisun Marsh West** • Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough.	*	*	**Suisun Marsh East** Flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Suisan Marsh West** Southern Pacific railroad tracks, industrial areas in southwest portion, flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it along Cordelia Slough probably would facilitate water management on duck clubs in the area. • Provide natural transitions to adjacent uplands, with protective buffers wherever possible. • Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay.			
California central coast steelhead/South-central California coast steelhead *(Oncorhynchus [=salmo] mykiss)* *Note: steelhead are not specified to species				
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 134, pp 154, pp160, pp 162, pp 168				
Subregional Habitat Recommendations: • Suisun Marsh West • Berkeley Area • Mountain View Area • Coyote Creek Area • Baumberg Area	**Suisun Marsh West** • Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough. • Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it along Cordelia Slough probably would facilitate water management on duck clubs in the area. • Provide natural transitions to adjacent uplands, with protective buffers wherever possible.	*	*	**Suisan Marsh West** Southern Pacific railroad tracks, industrial areas in southwest portion, flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Berkeley** Large urban population seeking access to the

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay. **Berkeley** • Restore, enhance, and protect a diversity of habitats, including tidal marsh, shorebird roosting sites, and seasonal wetlands. • Restore and enhance the tidal marsh between the Hoffman Marsh and the Richmond Marina by removing fills that fragment the area. • Restore riparian vegetation along Codornices Creek. Also enhance wetland/upland transitions in this area. • Protect gull, tern, and egret nesting habitat at Brooks Island, Red Rock, and Castro Rocks. **Mountain View** • Restore large areas of tidal marsh and provide a continuous corridor of tidal marsh along the bayshore. • Provide more and wider buffers to tidal marshes, and improve management to reduce human intrusion and predators. • Modify and manage two or three complexes of salt ponds, including the pond adjacent to the Dumbarton Bridge, for shorebirds, waterfowl, and post-breeding least terns.			shoreline, extensive shoreline development, highways, and on-site contaminants. **Mountain View** Pacific Gas and Electric Company transmission lines and other utility corridors, flood protection considerations, historical land subsidence, freshwater outflow from wastewater treatment facilities, operation and maintenance of salt ponds in absence of salt production, and smooth cordgrass. **Coyote Creek** Pacific Gas and Electric Company transmission lines and other utility corridors, flood protection considerations, historical land subsidence, freshwater outflow from wastewater treatment facilities, operation and

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Enhance the seasonal wetlands and burrowing owl habitat in the Sunnyvale baylands. • Reestablish native vegetation and otherwise enhance the riparian corridor along San Francisquito Creek, Guadalupe River, and other tributary streams. **Coyote Creek** • Restore tidal marsh throughout most of the segment, providing a continuous corridor of tidal marsh along the bayshore. The type of tidal marsh created (salt or brackish) will be dependent on the amount and proximity to local freshwater outflows. Restoration should emphasize reestablishing a natural transition between tidal marsh and adjacent wetlands and upland habitats, as well as transitions between salt and brackish tidal marsh. • Modify and manage a large complex of salt ponds for shorebirds and waterfowl. • Restore or enhance vernal pools in the adjacent undeveloped uplands. • Reestablish native riparian vegetation and otherwise improve the riparian corridor along Coyote Creek. • Manage discharges from the San Jose treatment plant to limit adverse environmental impacts, especially to tidal salt marsh habitat. Consider using recycled water to augment flows in			maintenance of salt ponds in absence of salt production, and smooth cordgrass. **Baumberg** Smooth cordgrass, flood protection considerations, East Bay Dischargers Authority waste water pipeline, Pacific Gas and Electric Company transmission lines and other utility corridors, major predator access corridor on Old Alameda Creek, operation and maintenance of salt ponds in absence of salt production, and public access and recreation.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	Coyote Creek or for other habitat enhancements. **Baumberg** - Modify and manage for shorebirds and waterfowl two complexes of salt ponds — one in the Turk Island area and one in the Baumberg Tract area (including the southern Oliver Brothers ponds). - Restore the remaining areas to tidal marsh, ensuring a continuous corridor of tidal marsh along the bayshore, and incorporate shallow pans in the marsh designs. - Enhance the Alameda Flood Control ponds in the Turk Island area as either tidal or muted tidal marsh. - Maintain and enhance the existing willow grove and managed diked wetlands on the eastern side of the active salt ponds in the Turk Island area.			
The goals that follow are based on the South Bay Salt Pond Restoration Project Final EIS/R, 2 Description of Alternatives: (http://www.southbayrestoration.org/pdf_files/SBSP_EIR_Final/2_Alternatives%20Final%20EIS_R.pdf) pp 2-24				
- Enhance numbers of salmonids and juvenile in rearing and foraging habitats relative to NEPA/CEQA baseline numbers	*	*	- Counts of upstream-migrating salmonids to monitor spawning populations in South Bay streams	*
Fall-run Chinook salmon *(Oncorhynchus tshawytscha)*				
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 132, pp 134				

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
Subregional Habitat Recommendations: • Suisun Marsh East • Suisun Marsh West	**Suisun Marsh East** • Restore tidal marsh at sites adjacent to Honker Bay, along the eastern side of Montezuma Slough, in the Nurse Slough area, and near Denverton Creek. • Provide a tidal marsh corridor along the base of Potrero Hills between Nurse Slough and the marshes to the west. • Provide natural transitions to adjacent uplands (with protective buffers wherever possible) for all existing and restored tidal marshes. • Protect and enhance existing vernal pools and other seasonal wetlands adjacent to Montezuma Slough, in the Nurse Slough area, and north of Potrero Hills. • Enhance managed marshes in the Grizzly Island area to improve and diversify managed wetlands. **Suisun Marsh West** • Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough. • Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it along Cordelia Slough probably would facilitate water management on duck clubs in the area.	*	*	**Suisun Marsh East** Flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Suisan Marsh West** Southern Pacific railroad tracks, industrial areas in southwest portion, flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Provide natural transitions to adjacent uplands, with protective buffers wherever possible. • Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay.			
The goals that follow are based on the South Bay Salt Pond Restoration Project Final EIS/R, 2 Description of Alternatives: (http://www.southbayrestoration.org/pdf_files/SBSP_EIR_Final/2_Alternatives%20Final%20EIS_R.pdf) pp 2-24				
• Enhance numbers of salmonids and juvenile in rearing and foraging habitats relative to NEPA/CEQA baseline numbers	*		• Counts of upstream-migrating salmonids to monitor spawning populations in South Bay streams	*

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
Suisun thistle *(Cirsium hydrophilum var. hydrophilum)*				
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 134				
Subregional Habitat Recommendations: • Suisun Marsh West	**Suisun Marsh West** • Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough. • Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it along Cordelia Slough probably would facilitate water management on duck clubs in the area. • Provide natural transitions to adjacent uplands, with protective buffers wherever possible. • Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay.	*	*	**Suisan Marsh West** Southern Pacific railroad tracks, industrial areas in southwest portion, flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts.
The goals that follow are based on the following documents: • Comprehensive Conservation Planning (https://www.fws.gov/uploadedFiles/DESFBFinalCCP_sm.pdf) pp 184				
• **2.0:** Conserve, restore, enhance, create, and acquire habitats to support the diversity and abundance of migratory birds and other native flora and fauna that depend on the South San Francisco Bay Ecosystem.	• **2.1:** Within ten years of Plan approval, conduct baseline surveys for population density, presence/absence, and abundance and/or cover of priority native plants, fish, and wildlife to determine species diversity that will inform habitat enhancement actions.	*	*	*

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
Soft bird's-beak *(Chloropyron molle ssp. molle)*				
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 132, pp 134, pp 136, pp 146				
Subregional Habitat Recommendations: • Suisun Marsh East • Suisun Marsh West • Contra Costa North • Contra Costa West	**Suisun Marsh East** • Restore tidal marsh at sites adjacent to Honker Bay, along the eastern side of Montezuma Slough, in the Nurse Slough area, and near Denverton Creek. • Provide a tidal marsh corridor along the base of Potrero Hills between Nurse Slough and the marshes to the west. • Provide natural transitions to adjacent uplands (with protective buffers wherever possible) for all existing and restored tidal marshes. • Protect and enhance existing vernal pools and other seasonal wetlands adjacent to Montezuma Slough, in the Nurse Slough area, and north of Potrero Hills. • Enhance managed marshes in the Grizzly Island area to improve and diversify managed wetlands. **Suisun Marsh West** • Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough. • Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it	*	*	**Suisun Marsh East** Flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Suisan Marsh West** Southern Pacific railroad tracks, industrial areas in southwest portion, flood control considerations, levee maintenance, sedimentation of tidal creeks, water salinity management, and water quality impacts. **Contra Costa North** Railroads and roadways, major pipelines, sewer lines, Concord Naval Weapons Station, adjacent heavy industry (e.g., Pacific Gas and Electric Company’s Pittsburg power plant), and on-site contaminants. **Contra Costa West**

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	along Cordelia Slough probably would facilitate water management on duck clubs in the area. • Provide natural transitions to adjacent uplands, with protective buffers wherever possible. • Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay. **Contra Costa North** • Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Where tidal marsh cannot be restored, improve water management to enhance diked wetlands. • Ensure natural transitions between marshes and adjacent uplands, and protect and expand adjacent buffers where possible. • Restore riparian vegetation along small and large streams. **Contra Costa West** • Protect and enhance existing tidal marshes, beaches, lagoons, and uplands. • Restore a tidal marsh corridor along the eastern edge of the Richmond landfill to reconnect Wildcat Marsh and San Pablo Marsh. • Protect and restore tidal marsh south of the Point Pinole Regional Shoreline at the Bruener property, and connect to Giant Marsh.			Union Pacific railroad tracks, Richmond landfill, flood control considerations, and on-site contaminants.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Restore vernal pools in the adjacent uplands. • Control rampant spread of pepper grass in rare high marsh plant associations, and prevent reemergence of invasive non-native Chilean cordgrass at Point Pinole.			
The goals that follow are based on the Comprehensive Conservation Planning (https://www.fws.gov/uploadedFiles/DESFBFinalCCP_sm.pdf) Pp 184				
• **2.0:** Conserve, restore, enhance, create, and acquire habitats to support the diversity and abundance of migratory birds and other native flora and fauna that depend on the South San Francisco Bay Ecosystem.	• **2.1:** Within ten years of Plan approval, conduct baseline surveys for population density, presence/absence, and abundance and/or cover of priority native plants, fish, and wildlife to determine species diversity that will inform habitat enhancement actions.	*	*	*
California seablite *(Suaeda californica)*				
The goals that follow are based on the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (https://www.fws.gov/sacramento/es/recovery-planning/tidal-marsh/Documents/TMRP_Volume1_RP.pdf) pp 355				
• **2.0**: Manage, restore, and monitor tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species.	• **2.2.7.2.4.**1 Implement *California Seablite Reintroduction Plan, San Francisco Bay, California*. **(Priority 2)** • **2.2.7.2.4.2** Assess reintroduction success, review reports, and adapt *California Seablite Reintroduction Plan, San Francisco Bay, California*, as necessary. **(Priority 2)**	*	*	**Noted in objective/action**
The goals that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 152, pp 170				
Subregional Habitat Recommendations: • Oakland • Hayward	**Oakland** • Enhance and expand tidal and diked habitats at all potential areas throughout the segment, for example, on Alameda Island, on Bay Farm	*	*	**Oakland** Large urban population, extensive fill along the shoreline, railroad tracks and spurs,

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	Island, and in the vicinity of the Oakland Airport. • Protect and enhance the eelgrass bed near Bay Farm Island. • Enhance and protect suitable habitat (e.g., barren or sparsely vegetated areas protected from predators) for snowy plover and least tern at Alameda Naval Air Station, Oakland Airport, Bay Farm Island, and other locations. • Restore beach dune and marsh in the sanctuary on the southern end of Alameda Island. • Increase habitat in and around San Leandro Bay for harbor seals and develop extensive and connected segments of tidal marsh for small mammals. • Restore pockets of low-lying sand beaches in sheltered sites to support reintroduced colonies of California seablite. • Enhance Lake Merritt by improving tidal action and restoring tidal marsh along the lakeshore and the channel that connects the Lake to the Oakland Inner Harbor. • Enhance riparian corridors along streams throughout the segment and reconnect tributary streams to the Bay. **Hayward Area** • Restore sandy berms and barrier beaches along the shoreline.			major highways, exotic predators (e.g., rats and red fox), smooth cordgrass, and on-site contaminants. **Hayward** East Bay Dischargers Authority pipeline, extensive stands of smooth cordgrass, Pacific Gas and Electric Company transmission lines and other utility corridors, Southern Pacific railroad tracks, and flood control levees for adjacent areas.

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Restore natural salt pond or backshore pans in the diked marshes adjacent to the West Winton Avenue landfill area and in the old oxidation pond to the south. • Establish or maintain a complex of managed salt ponds to the north of Highway 92, including shallow pans. • Protect the wetlands adjacent to the Hayward Area Recreation District Marsh and enhance tidal influence to the entire marsh system. • Control smooth cordgrass. • Reintroduce California seablite and associated flora in suitably restored habitat.			
The goals that follow are based on the Comprehensive Conservation Planning (https://www.fws.gov/uploadedFiles/DESFBFinalCCP_sm.pdf) pp. 184				
• **2.0:** Conserve, restore, enhance, create, and acquire habitats to support the diversity and abundance of migratory birds and other native flora and fauna that depend on the South San Francisco Bay Ecosystem.	• **2.1:** Within ten years of Plan approval, conduct baseline surveys for population density, presence/absence, and abundance and/or cover of priority native plants, fish, and wildlife to determine species diversity that will inform habitat enhancement actions.	*	*	*
The goals that follow are based on the Baylands Ecosystem Habitat Goals Science Update 2015 (http://baylandsgoals.org/wp-content/uploads/2015/10/Baylands_Complete_Report.pdf) pp 148, pp 180				
	• Identify, conserve, and manage selected refugia for native bayland plants. Focus on unique or core populations of uncommon plants, especially in low marshes. • Consider relocating rare plants to more appropriate areas as flooding and salinity conditions change.	*	*	*

Goals	Objectives	Research Needs/Data Gaps	Restoration Priorities	Other Conservation Needs or Priorities
	• Increase the populations of threatened and endangered species through methods such as farming best practices to meet specific conservation objectives to buffer future impacts. • Continue to control invasive Spartina along Sears Point, Sonoma Baylands, and Tolay Creek and Tubbs Island. Restore pockets of low-lying sand beaches in sheltered sites to support reintroduced colonies of California seablite.			

Note:
* Information not provided in given documents

Table H-2 Baylands Conservation Strategies: Priority Locations

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
San Pablo Bay, Suisun Bay, and from Lower Wildcat Creek to the Don Edwards National Wildlife Refuge			
The objectives that follow are based on the following documents: • Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (https://www.fws.gov/sacramento/es/recovery-planning/tidal-marsh/Documents/TMRP_Volume1_RP.pdf); pp 355; • Baylands Ecosystem Habitat Goals Project (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 122, pp 127, pp 131, pp 135, pp 143, pp 149, pp 153, pp 158, pp 171, pp 176, pp 181, pp 186, pp 194, pp 209, pp 213, pp 217			
• **1.2.1.1** Acquire/protect currently unprotected tidal marsh habitat. **(Priority 2)** • **1.2.1.2** Investigate opportunities to acquire/protect lands restorable to tidal marsh. **(Priority 2)** • **1.2.2.** Acquire/protect currently unprotected high marsh and ecotonal habitat and lands restorable to high marsh and ecotonal habitat for *Chloropyron molle* ssp. *molle*, *Cirsium hydrophilum* var. *hydrophilum*, California clapper rail, and salt marsh harvest mouse by purchase of fee title or conservation easement. **(Priority 1)** • **2.1.5.2** Minimize or avoid over-management of estuarine salinity variation. **(Priority 2)** • **2.1.6.1.1.3** Monitor the success of control at sites where non-native Spartina is managed and the ability of treated sites to support California clapper rails. **(Priority 1)** • **2.1.8.2.1** Identify lands adjacent to the Bay Trail and other public access areas where human-related disturbance encourages predation that causes a threat to the California clapper rail and salt marsh harvest mouse. **(Priority 2)** • **2.1.8.2.3** Implement and enforce pet restrictions. **(Priority 2)**	• **4.2.6.1** Conduct a population viability analysis of the California clapper rail. **(Priority 1)** • **4.2.6.2** Study effects of recent non-native *Spartina* treatment on California clapper rail movement within the ecosystem. **(Priority 1)** • **4.2.6.3** Conduct diet analyses on California clapper rail as a tool to understanding habitat use. **(Priority 2)** • **4.2.7.1** Conduct a population viability analysis to determine desirable population sizes for long-term persistence of extant South Bay salt marsh harvest mouse populations. **(Priority 2)** • **4.2.7.2** Study use of adjacent habitat, including brackish marsh, by the salt marsh harvest mouse. **(Priority 1)** • **4.2.7.3** Study the impact of *Spartina alterniflora* and its hybrids, and *Lepidium latifolium* on the salt marsh harvest mouse. **(Priority 2)** • **4.2.7.4** Study predation impacts to the salt marsh harvest mouse. **(Priority 2)**	• Restore large tracts of tidal marsh in the Hill Slough and upper Suisun Slough areas (including Goat Island), on Morrow Island south of the confluence of Goodyear and Suisun Sloughs, and at Southampton Bay. Connect these large areas of restored tidal marsh via a tidal marsh corridor along Cordelia Slough or other appropriate corridor location. • Consider relocating rare plants to more appropriate areas as flooding and salinity conditions change. • Continue to control invasive Spartina along Sears Point, Sonoma Baylands, and Tolay Creek and Tubbs Island. • Contain perennial pepperweed and eliminate populations in proximity to marsh–upland transition zones and in high-elevation marsh. In particular, exclude pepperweed from mature brackish tidal marshes that are	• Conserve low-intensity agricultural lands adjacent to tidal areas for future marsh and transition zone migration. Prioritize the areas near Nurse Slough, Hill Slough, and the head of Cordelia Slough that have naturally gentle slopes ideal for landward marsh migration. • Identify, conserve, and manage selected refugia for native bayland plants. Focus on unique or core populations of uncommon plants, especially in low marshes. • Increase the populations of threatened and endangered species through methods such

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
• **2.1.8.2.4** Avoid relocation of nuisance animals in California clapper rail habitat. **(Priority 2)** • **2.1.9.2** Manage cattle grazing to minimize impacts to salt marsh harvest mouse, Suisun shrew, and the birds of the high tidal marsh, such as saltmarsh common yellowthroat. **(Priority 3)** • **2.2.1** Create an interdisciplinary review panel or similar group to coordinate and review the design of tidal marsh restoration projects throughout San Francisco Bay. **(Priority 2)** • **2.2.3.1** Protect, manage, and monitor large populations and occupied marsh complexes as interim reserves selected to represent the full range of both subspecies of salt marsh harvest mouse. **(Priority 1)** • **2.2.3.3** Transition from diked wetlands to restored or enhanced tidal marsh habitat, where feasible. **(Priority 3)** • **2.1.8.2.3 Implement and enforce pet restrictions. (Priority 2)** • **3.1.1.1** Review existing species survey guidance to determine its adequacy. **(Priority 3)** • **3.1.1.2** If necessary, revise existing guidance or develop new standardized, scientifically based, and species-specific survey guidance. **(Priority 3)** • **3.1.2.5.1** Develop certification/training programs for California clapper rail surveyors and survey coordinators. **(Priority3)** • **3.1.2.5.2** Conduct annual California clapper rail call counts during breeding season. **(Priority 2)** • **3.1.2.5.3** Monitor adult California clapper rail survival and mortality of adults, chicks, and eggs due to predation. **(Priority 2)**	• **4.2.8** If sufficient numbers of the species are identified under Action 3.1.2.7, conduct biological and ecological studies on the salt marsh wandering shrew and the Suisun shrew. **(Priority 3)** • **4.2.10** Conduct biological and ecological studies on the California black rail. **(Priority 3)** • **4.3.1** Conduct a salt marsh harvest mouse population genetic analysis to determine: • the genetic effective population size • the genetic relationships among presumed populations • the magnitude of gene exchange between marshes and subpopulations within marshes • the extent of inbreeding occurring within populations **(Priority 1)** • **4.3.2** If sufficient numbers of the species are identified under Action 3.1.2.7, conduct research to assess genetic diversity within and among populations of salt marsh wandering shrew and Suisun shrew. **(Priority 3)** • **4.4.3** Study the impacts of large-volume, human-caused, freshwater discharges into tidal marshes. **(Priority 2)** • **4.4.4** Investigate the effects of salinity fluctuation and altered tidal datum on species covered in this recovery plan. **(Priority 2)** • **4.4.5** Study the time lag between habitat restoration and recolonization by species covered in this recovery plan. **(Priority 2)**	not yet heavily infested and from restoration areas soon to be opened to tidal influence. Use methods that do not jeopardize seed banks of desirable plant species by avoiding persistent soil-active herbicide. Prevent the spread of invasive species coincident with marsh migration. • Enhance and restore the natural transition zone, focusing on tidal marsh transitions, incorporating protective buffers wherever possible and thus creating shoreline migration space. • Protect and restore tidal marsh on both sides of the Petaluma River, particularly on the eastern side, between Highway 37 and False Bay (Dustman Road), which is already vulnerable to flooding. • Protect, restore, and manage agricultural lands and other open space to reestablish a transition zone and buffers adjacent to tidal marsh and to provide space for landward migration. Create transition zone habitats on gentle slopes in front of flood-risk-management levees. • Enhance the stream–marsh transition zone between San Antonio Creek and tidal habitats, one of the few places where such restoration can take place.	as farming best practices to meet specific conservation objectives to buffer future impacts. • Elevate Highway 37 to a causeway, and remove, realign, or elevate other barriers (such as the SMART rail) to achieve unimpeded tidal and other hydrological connectivity. • Optimize managed marshes (duck clubs) to ensure continued support for a diverse suite of waterbirds, prevent subsidence, protect water quality, store carbon, and accumulate peat in the face of increasing salinities, sea-level rise, and other changes. • Realign railways to allow for migration of the baylands with sea-level rise. • Reduce the runoff of agricultural contaminants and nutrients from agricultural activities to improve water quality

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
• **3.1.2.5.4** Develop and maintain a database to track results from annual California clapper rail monitoring results. **(Priority2)** • **3.1.2.5.5** Examine the methodology used for call count surveys in Action 3.1.2.5.2 above, by cross validating surveys (using double observer methods) with movement studies recommended in Action 4.2.6.2. **(Priority 3)** • **3.1.2.6** Monitor for salt marsh harvest mouse. **(Priority 2)** • **3.1.2.7** Conduct surveys/monitoring of salt marsh wandering shrew and Suisun shrew**. (Priority 3)** • **3.1.2.9** Continue to conduct surveys/monitoring of California black rail. **(Priority 3)**	• **4.4.6** Conduct research on the physical processes (geomorphic and hydrologic) that maintain the structure and function of suitable habitats for tidal marsh species. **(Priority 2)** • **4.4.7** Study the effects of global climate change and resulting sea level rise on tidal marsh ecosystems. **(Priority 1)** • **4.4.8** Conduct research on management conflicts between tidal marsh species. **(Priority 2)** • **4.5.2.1** Conduct research into mercury exposure pathways for California clapper rails and potential means to interrupt those pathways. **(Priority 2)** • **4.5.2.2** Conduct other necessary research on bioaccumulation and effects, including reproductive success and development, of toxic estuarine contaminants on tidal marsh species. **(Priority 2)** • **4.5.2.3** Apply results of research in **Action 4.5.2.2** to re-evaluate suitability of delisting criterion E/5 for the California clapper rail and revise, if appropriate. **(Priority 3)** • **4.5.2.4** Apply results of research in **Actions 4.2.4.2.1** and **4.2.4.2.2** to sediment and water quality standards to protect sensitive wildlife of the San Francisco Bay Estuary. **(Priority 3)** • **4.5.2.5** Conduct studies to establish contaminant levels in biosentinels that are "acceptable" or "not acceptable", then measure compounds in these biosentinels directly or via a non-invasive surrogate, such as feathers, if possible. **(Priority 1)**	• Preserve salmonid habitat in all creeks, and remove barriers to fish passage in areas of known populations. • Restore a continuous tidal marsh corridor along Suisun Slough, providing connected marsh from Grizzly Bay to the slough's upstream extent and Hill Slough • Enhance and restore a natural transition zone. Draft plans for a future connection to the Jepson Prairie, focusing on tidal marsh transitions, incorporating protective buffers wherever possible, and thus creating shoreline migration space. • Enhance and restore the natural transition zone, focusing on tidal marsh transitions, incorporating protective buffers wherever possible, particularly around the base of alluvial fans to provide sediment to the terrestrial side of marshes. • Restore a tidal marsh corridor along the eastern edge of the Richmond Landfill to reconnect Wildcat Marsh and San Pablo Marsh. • Restore tidal marsh throughout most of the segment prior to 2030, providing a continuous corridor of tidal marsh along the shore across a gradient of salt to brackish marsh	in the adjacent wetlands • Consider ways to increase sediment supply to the tidal baylands. For example, dredged sediments can be placed directly on adjacent mudflats to be reworked by wave and tidal action in order to increase local suspended-sediment concentrations and marsh-accretion rates. Improve sediment supply to the restored marshes north of Highway 37, and consider methods of increasing their trapping efficiency to increase accretion rates. Consider the beneficial reuse of dredged material to elevate restored ponds such as at Cullinan Ranch. • Optimize the management of ponds for a diverse suite of waterbirds and consider relocating, reconfiguring, or enhancing ponds to accommodate sea-level

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
	• **4.7** Establish research protocols, where necessary, and as determined by the RIT. **(Priority 3).** For example, establish protocols for handling sick, injured, oiled, and dead California clapper rails or salvaged eggs. • **4.8** Conduct additional research identified as necessary by the Recovery Implementation Team that address changing conditions and are supportive of highest priority recovery tasks. **(Priority 2)** • **4.9** Apply the results of all studies to conservation and recovery efforts. **(Priority 2)** • Conduct pilot projects to assess the effectiveness of artificial floating islands for nesting and high-tide refugia for Ridgway's rail • If small pilot projects prove successful at achieving the three purposes discussed above, expand small-scale projects or implement 10 mid-scale living shoreline and living breakwater projects in San Francisco Bay by 2020. • Pending the results of evaluations of pilot-scale studies, incorporate living shoreline components and naturalized habitat into the design of new and replacement shoreline protection structures.	• Protect existing muted tidal wetland for the salt marsh harvest mouse as insurance against fully tidal wetland being lost as a result of sea-level rise • Enhance existing shoreline tidal marsh ecosystems and their function by reconnecting drainages that run parallel to the bay shore from Cullinan and the top of the centennial strip marsh, and by providing connectivity between strip-marsh units (Sonoma Creek and west units). • Enhance seasonal wetlands at the Mare Island dredged-material-disposal ponds to improve shorebird habitats. • Restore an extensive transition zone and connected high marsh along the undeveloped area between the bay and Highway 101. • Restore the large areas of public lands along lower Novato Creek to a combination of tidal, seasonal, and riparian wetlands to create a mosaic of habitat types, including a large transition zone and critical habitat at the fluvial–tidal interface. • Protect and restore agricultural lands and other open space to reestablish transition zones and buffers adjacent to tidal marsh and provide space for landward	rise. Revisit the acreage of ponds needed based on changes in the overall acreage of different habitat types (e.g., mudflats along Napa River).

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
		migration, including oak woodlands and mixed evergreen forest along the entire ridge and hillslopes. Transition zone habitats can be created on gentle slopes in front of flood-risk-management levees. • Design and restore complete tidal wetland systems, even at a small scale, that include tidal marshes, beaches, lagoons, and broad transition zones. Develop techniques for implementing active revegetation, high-tide-refuge islands, and subtidal habitat restoration. • Tidal restoration should stress wide platforms for high salt marsh and local native terrestrial transition zone (wet meadow) vegetation tolerant of infrequent tidal flooding, rather than an expanded intertidal marsh plain that is subject to drowning as the sea-level rise accelerates. • Preserve, enhance, and create diverse pocket habitats that are linked in a subregional habitat corridor that encompasses sand beaches, eelgrass, oyster beds, macroalgal beds, mudflats, rocky intertidal areas, and tidal marsh • Maintain and enhance tidal marsh and marsh connectivity along the shoreline	

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
		• Restore and enhance tidal marsh along the bayfront to provide a continuous corridor of tidal marsh for the entire length of the segment, particularly around Dumbarton Point • Create transition zone habitat where feasible at the edges of existing marshes at Coyote Hills, on gentle slopes in front of flood-risk-management levees, and other suitable locations • Restore large tidal marshes along the eastern side of Montezuma Slough, in the Nurse Slough area, near Denverton Creek, and at sites adjacent to Honker Bay. • Provide a tidal marsh corridor along the base of Potrero Hills between Nurse Slough and the marshes to the west. • Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Enhance cover for wildlife in existing tidal wetlands through active revegetation and by constructing high-tide-refuge islands within the marsh plains. Conduct pilot projects to assess the effectiveness of artificial floating islands for Ridgway’s rail nesting and high-tide refugia.	

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
		• Enhance and protect suitable habitat (e.g., barren or sparsely vegetated areas protected from predators) for the snowy plover and least tern at Alameda Naval Air Station, Oakland Airport, Bay Farm Island, and other locations. • Restore and enhance riparian vegetation along streams that flow into the marsh.	
San Pablo Bay, Suisun Bay, and from Lower Wildcat Creek to the Don Edwards National Wildlife Refuge			
The objectives that follow are based on the San Francisco Bay Subtidal Habitat Goals Report (http://www.sfbaysubtidal.org/PDFS/Full%20Report.pdf) pp 70, pp 80, pp 91, pp 112, pp 137, pp 138, pp 158, pp 159			
• Promote sand beach creation, restoration, and replenishment projects that use clean, maintenance-dredged sand where possible and in areas where sand is deposited, such as at the river delta interface • Consider incorporating living shoreline techniques to retain sand, either from natural deposition or from sand replenishment • Encourage removal of artificial structures that have negative impacts on soft bottom habitat function • Where appropriate, remove shoreline stabilization structures and riprap from the bay that are no longer providing protection or may be contributing to coastal erosion • Provisionally the targets would be to increase native oyster populations within 10 acres of subtidal area within 5 years, within 400 acres of subtidal area within 10 years, and within 8,000 acres of subtidal area within a 50-year time frame	• Promote pilot projects to remove artificial structures and creosote pilings at targeted sites in combination with a living shoreline restoration design that will use natural bioengineering techniques (such as native oyster reefs, stone sills, and eelgrass plantings) to replace lost habitat structure • Implement a program of adaptive management with phased restoration. Periodic reviews will determine whether the knowledge is adequate to support proceeding to the next phase. Provisionally the targets would be to increase native eelgrass habitat by 25 acres within 5 years, 100 acres within 10 years, and up to 8,000 acres within 50 years, at 35 locations.	• Select sites that have the greatest opportunities for integrating subtidal habitat with other restored or important habitats for pilot subtidal restoration projects near locations identified by the San Francisco Baylands Ecosystem Habitat Goals Project • Support and promote integration of subtidal habitat design and subtidal enhancement, restoration, and monitoring into tidal wetland restoration projects around the bay • Design habitat restoration projects to account for long-term changes including sea level rise and loss of sediment, by increasing resiliency of existing habitat types and facilitating upslope habitat migration.	*

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
- Incorporate native oyster restoration into other regional restoration and shoreline protection projects and initiatives - Incorporate native eelgrass restoration into other regional restoration and shoreline protection projects and initiatives. - Protect San Francisco Bay *Fucus* beds through no net loss to existing beds - Protect San Francisco Bay *Gracilaria* beds through no net loss to existing beds		- Consider incorporating living shoreline techniques to retain sand, either from natural deposition or from sand replenishment. - Promote sand beach creation, restoration, and replenishment projects that use clean, maintenance-dredged sand where possible and in areas where sand is deposited, such as at the river delta interface - Determine storage and stockpile locations for dredged sand for later beneficial reuse. Develop restoration projects that are in close proximity to dredging projects. - Select sites that have the greatest opportunities for integrating subtidal habitat with other restored or important habitats for pilot subtidal restoration projects near locations identified by the San Francisco Baylands Ecosystem Habitat Goals Project. - Support and promote integration of subtidal habitat design and subtidal enhancement, restoration, and monitoring into tidal wetland restoration projects around the bay Design habitat restoration projects to account for long-term changes including sea level rise and loss of sediment, by increasing resiliency	

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
		of existing habitat types and facilitating upslope habitat migration.	
Mowry Slough			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 162, pp 164			
• Enlarge the Dumbarton, Mowry, and Calaveras Point tidal marshes, and provide a corridor of tidal marsh along the bayshore. • Modify and manage for shorebirds and waterfowl a complex of salt ponds adjacent to and including the crystallizer complex between Mowry Slough and Newark Slough. • Protect the area of harbor seal haul-out along lower Mowry Slough.	*	• Protect and enhance the tidal marsh/upland transition at the upper end of Mowry Slough and in the area of the Pintail duck club. Similar habitat can be protected and restored at the upper ends of Newark, Plummer, and Albrae sloughs.	• Union Pacific railroad tracks • Pacific Gas and Electric Company transmission lines • Hetch Hetchy Aqueduct, and other utility corridors; flood control considerations; operation and maintenance of salt ponds in absence of salt production; and current use of levees and salt pans by nesting snowy plovers.
Suisun Marsh West			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp 164, pp 166, pp 168, pp 170			
• Restore large areas of tidal marsh in the Hill Slough and upper Suisun Slough areas, and on Morrow Island south of the confluence of Goodyear Slough and Suisun Slough. • Connect these large areas of restored tidal marsh with a tidal marsh corridor. The location of this corridor is highly flexible, but establishing it along Cordelia Slough probably would facilitate water management on duck clubs in the area.	*	• In Suisun Marsh, restore a functionally connected band of tidal marsh along the transition zone, providing space for landward marsh migration from the easternmost to the westernmost extent of the marsh. Blend the restored tidal marsh gradually with the adjacent	• Southern Pacific railroad tracks • Industrial areas in southwest portion • Flood control considerations • Levee maintenance, sedimentation of tidal creeks

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
• Provide natural transitions to adjacent uplands, with protective buffers wherever possible. • Enhance managed marsh areas that are not restored to tidal marsh to improve waterfowl habitat. • Protect and restore tidal marsh at Southampton Bay.		grasslands to maximize plant diversity in the transition zone. • Restore tidal marsh in Suisun Marsh west of the railroad in conjunction with enlarging the small openings beneath the railroad tracks to accommodate current water flows and future sea-level rise. • Along the southern edge of Suisun Marsh, restore a broad band of tidal marsh and open water habitat, in part to improve fish habitat and productivity.	• Water salinity management • Water quality impacts.
Suisun Marsh East			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp 164, pp 166, pp 168, pp 170			
• Restore tidal marsh at sites adjacent to Honker Bay, along the eastern side of Montezuma Slough, in the Nurse Slough area, and near Denverton Creek. • Provide a tidal marsh corridor along the base of Potrero Hills between Nurse Slough and the marshes to the west. • Provide natural transitions to adjacent uplands (with protective buffers wherever possible) for all existing and restored tidal marshes. • Protect and enhance existing vernal pools and other seasonal wetlands adjacent to Montezuma Slough, in the Nurse Slough area, and north of Potrero Hills. • Enhance managed marshes in the Grizzly Island area to improve and diversify managed wetlands.	*	*	• Flood control considerations • Levee maintenance • Sedimentation of tidal creeks • Water salinity management • Water quality impacts.

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
Contra Costa North			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp 164, pp 166, pp 168, pp 170			
• Restore large areas of tidal marsh in diked and muted tidal marsh areas. • Where tidal marsh cannot be restored, improve water management to enhance diked wetlands. • Ensure natural transitions between marshes and adjacent uplands, and protect and expand adjacent buffers where possible. • Restore riparian vegetation along small and large streams.			• Railroads and roadways, major pipelines, sewer lines, Concord Naval Weapons Station, adjacent heavy industry (e.g., Pacific Gas and Electric Company's Pittsburg power plant), and on-site contaminants.
Contra Costa West			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 132, pp 134, pp 136, pp 146			
• Protect and enhance existing tidal marshes, beaches, lagoons, and uplands. • Restore a tidal marsh corridor along the eastern edge of the Richmond landfill to reconnect Wildcat Marsh and San Pablo Marsh. • Protect and restore tidal marsh south of the Point Pinole Regional Shoreline at the Bruener property, and connect to Giant Marsh. • Restore vernal pools in the adjacent uplands. • Control rampant spread of pepper grass in rare high marsh plant associations, and prevent reemergence of invasive non-native Chilean cordgrass at Point Pinole.	*	*	• Union Pacific railroad tracks • Richmond landfill • Flood control considerations • On-site contaminants

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
Coyote Hills			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp 164, pp 166, pp 168, pp 170			
• Maintain and manage a complex of salt ponds for shorebirds and waterfowl in the southern part of the segment and restore the remaining area to tidal marsh. Restoration should emphasize natural transition of tidal marsh/uplands at Coyote Hills and a continuous corridor of tidal marsh around Dumbarton Point. • On the eastern side of Coyote Hills, enhance and expand muted tidal areas with improved water management. • Protect and enhance existing willow groves and seasonal wetlands. • Consider reintroducing coyotes into Coyote Hills to restore natural predator/prey relationships and to control the introduced red fox. • Consider removing the flood control levees in the lower reaches of the Alameda Creek Flood Control Channel as part of restoration planning for this area. • Control smooth cordgrass before restoring large diked areas to tidal marsh.	*	*	• Smooth cordgrass • Flood protection consideration • Predator corridor along Alameda Flood Control Channel • Operation and maintenance of salt ponds in absence of salt production, and current use of levees and salt pans by nesting snowy plovers.
Baumberg			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp 164, pp166, pp 168, pp 170			
• Modify and manage for shorebirds and waterfowl two complexes of salt ponds — one in the Turk Island area and one in the Baumberg Tract area (including the southern Oliver Brothers ponds). • Restore the remaining areas to tidal marsh, ensuring a continuous corridor of tidal marsh	*	*	• Smooth cordgrass • Flood protection consideration • East Bay Dischargers Authority waste water pipeline

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
along the bayshore, and incorporate shallow pans in the marsh designs. • Enhance the Alameda Flood Control ponds in the Turk Island area as either tidal or muted tidal marsh. • Maintain and enhance the existing willow groves and managed diked wetlands on the eastern side of the active salt ponds in the Turk Island area.			• Pacific Gas and Electric Company transmission lines and other utility corridors, major predator access corridor on Old Alameda Creek • Operation and maintenance of salt ponds in absence of salt production, and public access and recreation.
Hayward			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 136, pp 146, pp 160, pp 162, pp164, pp 166, pp 168, pp 170			
• Restore sandy berms and barrier beaches along the shoreline. • Restore natural salt pond or backshore pans in the diked marshes adjacent to the West Winton Avenue landfill area and in the old oxidation pond to the south. • Establish or maintain a complex of managed salt ponds to the north of Highway 92, including shallow pans. • Protect the wetlands adjacent to the Hayward Area Recreation District Marsh and enhance tidal influence to the entire marsh system. • Control smooth cordgrass. • Reintroduce California seablite and associated flora in suitably restored habitat.	*	*	• East Bay Dischargers Authority pipeline • Extensive stands of smooth cordgrass • Pacific Gas and Electric Company transmission lines and other utility corridors • Southern Pacific railroad tracks • Flood control levees for adjacent areas.

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
Oakland			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 152			
• Enhance and expand tidal and diked habitats at all potential areas throughout the segment, for example, on Alameda Island, on Bay Farm Island, and in the vicinity of the Oakland Airport. • Protect and enhance the eelgrass bed near Bay Farm Island. • Enhance and protect suitable habitat (e.g., barren or sparsely vegetated areas protected from predators) for snowy plover and least tern at Alameda Naval Air Station, Oakland Airport, Bay Farm Island, and other locations. • Restore beach dune and marsh in the sanctuary on the southern end of Alameda Island. • Increase habitat in and around San Leandro Bay for harbor seals and develop extensive and connected segments of tidal marsh for small mammals. • Restore pockets of low-lying sand beaches in sheltered sites to support reintroduced colonies of California seablite. • Enhance Lake Merritt by improving tidal action and restoring tidal marsh along the lakeshore and the channel that connects the Lake to the Oakland Inner Harbor. • Enhance riparian corridors along streams throughout the segment and reconnect tributary streams to the Bay.	*	*	• Large urban population, extensive fill along the shoreline • Railroad tracks and spurs • Major highways • Exotic predators (e.g., rats and red fox) • Smooth cordgrass • On-site contaminants.

Objectives	Research Needs/Data Gaps	Restoration Priorities	Other conservation needs or priorities
Berkeley			
The objectives that follow are based on the Baylands Ecosystem Habitat Goals (http://baylandsgoals.org/wp-content/uploads/2015/10/1999sfbaygoals031799.pdf) pp 134, pp 154, pp 160, pp 162, pp 168			
• Restore, enhance, and protect a diversity of habitats, including tidal marsh, shorebird roosting sites, and seasonal wetlands. • Restore and enhance the tidal marsh between the Hoffman Marsh and the Richmond Marina by removing fills that fragment the area. • Restore riparian vegetation along Codornices Creek. Also enhance wetland/upland transitions in this area. • Protect gull, tern, and egret nesting habitat at Brooks Island, Red Rock, and Castro Rocks.	*	*	• Large urban population seeking access to the shoreline • Extensive shoreline development • Highways • On-site contaminants.