SCCRCIS

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SANTA CLARA COUNTY REGIONAL CONSERVATION INVESTMENT STRATEGY

ICF

Open Space Authority Santa Clara Valley

Valley Transportation Authority

Coastal Conservancy

The Nature Conservancy

Conservation Strategy Group

Resources Law Group, LLP

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Contents

List of Tables

List of Figures

Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
Authority	Santa Clara Valley Open Space Authority
BAARI	Bay Area Aquatic Resource Inventory, version 2.0
Bay Area	San Francisco Bay Area
Caltrans	California Department of Transportation
CCED	California Conservation Easement Database
CDFW	California Department of Fish and Wildlife
CEHCP	California Essential Habitat Connectivity Project
CEQA	California Environmental Quality Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CLN	Conservation Lands Network
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Coastal Conservancy	California State Coastal Conservancy
Corps	U.S. Army Corps of Engineers
CPAD	California Protected Areas Database
CPUs	conservation planning units
Critical Linkages	Critical Linkages: Bay Area and Beyond
CROS	California Roadkill Observation System
CV	Climate Vulnerable
DPS	distinct population segment
FMMP	Farmland Mapping and Monitoring Program
FRAP	Fire and Resource Assessment Program
GIS	geographic information system
Greenprint	Bay Area Greenprint
Habitat Agency	Santa Clara Valley Habitat Agency
Habitat Plan	Santa Clara Valley Habitat Plan
HCP	habitat conservation plan
HCP/NCCP	Habitat Conservation Plan and Natural Community Conservation Plan
HCPs	habitat conservation plans
HUC	hydrologic unit code
I-280	Interstate 280
LTA	San Benito County Local Transportation Authority
MCA	mitigation credit agreement
MTC	Metropolitan Transportation Commission
NCCP	natural community conservation plan
NHD	National Hydrography Dataset
NWI	National Wetlands Inventory
OSP	Open Space Preserve
Pajaro Study	The Natural Conservancy's Pajaro Study 2012-2013
PEM	Palustrine Emergent
PFO	Palustrine Forested

PG&E	Pacific Gas & Electric
Program Guidelines	Regional Conservation Investment Strategies Program Guidelines
project section	San Jose to Merced Project Section
PS	Palustrine Scrub-Shrub
PV	Photovoltaic
R3	Riverine Upper Perennial
R4	Riverine Intermittent
R5	Riverine Unknown Perennial
RAMP	Regional Advance Mitigation Planning
RCIS	regional conservation investment strategy
REC	Road Ecology Center
Report	Coyote Valley Landscape Linkages Report
SCVHP	Santa Clara Valley Habitat Conservation
SCVWD	Santa Clara Valley Water District
SGCN	Species of Greatest Conservation Need
SR	California State Route
SSURGO	Soil Survey Geographic
Study	Coyote Valley Linkage Assessment Study
SWAP	State Wildlife Action plan
U.S. 101	U.S. Highway 101
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VTA	Santa Clara Valley Transportation Authority

Chapter 1
Introduction

1.1 Background

In 2016 the California State Legislature worked with the California Department of Fish and Wildlife (CDFW) to find creative ways to guide voluntary conservation actions and habitat enhancement actions for the state's most vulnerable species and their habitats. This collaboration resulted in Assembly Bill 2087, which outlines a program for informing science-based nonbinding and voluntary conservation actions and habitat enhancement actions that would advance the conservation of focal species, natural communities, and other conservation elements at a regional scale, including actions to address the impacts of climate change and other stressors and pressures that influence the resiliency of those species. Through its passage, Assembly Bill 2087 amended the California Fish and Game Code (CFGC), Division 2, Chapter 9, to add Sections 1850–1861, which create a regional conservation investment strategy program.

The program allows for CDFW or any public agency to develop a regional conservation investment strategy (RCIS) to guide voluntary conservation actions and habitat enhancement actions for a suite of species and natural communities. The RCIS must include specific information about conservation actions necessary to adequately reduce stressors and pressures on those species, including identifying conservation priorities within the region, where appropriate. An RCIS will identify areas of conservation priority for implementation of conservation actions and habitat enhancement actions by public agencies, conservation organizations, or private entities. An approved RCIS may also be used by entities requiring compensatory mitigation to facilitate selection of appropriate mitigation action and mitigation sites.

To support and guide development of RCISs, CDFW released the *Regional Conservation Investment Strategies Program Guidelines* (Program Guidelines) (California Department of Fish and Wildlife 2017), in April 2017 and revised in June 2017. The Santa Clara County RCIS was developed consistent with CFGC 1850–1861, as well as the Program Guidelines. A key component of the Program Guidelines is Section 2, *Standard Terminology*, which contains a detailed list of terms, abbreviations, and definitions applicable to RCISs. Appendix A, *Glossary*, integrates these terms and includes additional terms and abbreviations specific to this Santa Clara County RCIS.

Adoption of this RCIS by CDFW is consistent with CFGC 1850(e) and 1852(c)(7). By authorizing CDFW to approve RCISs, it is not the intent of the California State Legislature to regulate the use of land, establish land use designations, or to affect, limit, or restrict the land use authority of any public agency. Nothing in the Santa Clara County RCIS is intended to, nor should it be interpreted to conflict with state law or local ordinances. Therefore, actions carried out as a result of this RCIS will be in compliance with all applicable state and local requirements.

In addition, this Santa Clara County RCIS does not conflict with the following requirements of CFGC 1855(b)).

1. Modify in any way the standards for issuance of incidental take permits or consistency determinations pursuant to Section 2081 or 2080.1, issuance of take authorizations pursuant to Section 2835, the issuance of lake or streambed alteration agreements pursuant to Section 1602, or any other provision of this code or regulations adopted pursuant to this code.
2. Modify in any way the standards under the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code), or in any way limit a lead agency's or responsible agency's discretion, in connection with any determination of whether a proposed project may or may not result in significant environmental effects or in any way establish a presumption in connection with any determination of whether a proposed project may or may not result in significant environmental effects or whether a proposed project's impacts would be mitigated.
3. Prohibit or authorize any project or project impacts.
4. Create a presumption or guarantee that any proposed project will be approved or permitted, or that any proposed impact will be authorized, by any state or local agency.
5. Create a presumption that any proposed project will be disapproved or prohibited, or that any proposed impact will be prohibited, by any state or local agency.
6. Alter or affect, or create additional requirements for, the general plan of the city, county, or city and county, in which it is located.
7. Constitute any of the following, for the purposes of the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code):
    a. A plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.
    b. A local policy or ordinance protecting biological resources.
    c. An adopted local, regional, or state habitat conservation plan.

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 or habitat enhancement actions, 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 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. The MCA can be designed to satisfy a range of state wildlife laws, including the California Endangered Species Act, California Environmental Quality Act (CEQA), and Lake or Streambed Alteration requirements of the CFGC.

1.2 Purpose and Need for RCIS

CFGC 1852(b) states,

> The purpose of a regional conservation investment strategy shall be to inform science-based nonbinding and voluntary conservation actions and habitat enhancement actions that would advance the conservation of focal species, including the ecological processes, natural communities, and habitat connectivity upon which those focal species and other native species depend, and to provide nonbinding voluntary guidance for one or more of the following:
>
> 1. Identification of wildlife and habitat conservation priorities, including actions to address the impacts of climate change and other wildlife stressors.
> 2. Investments in resource conservation.
> 3. Infrastructure.
> 4. Identification of areas for compensatory mitigation for impacts to species and natural resources.

This Santa Clara County RCIS was selected as a pilot RCIS in part because of the substantial available scientific data to support development of a robust RCIS in a relatively short amount of time. It is also expected that a number of transportation projects will be designed and proposed for construction in the next 3 to 10 years, and that not all of these projects will have their species mitigation needs met by the *Santa Clara Valley Habitat Plan* (Habitat Plan) (ICF International 2012), a Habitat Conservation Plan and Natural Community Conservation Plan (HCP/NCCP) approved in 2013 by the U.S. Fish and Wildlife Service (USFWS) and CDFW. Certain projects may not be able to use the Habitat Plan for compensatory mitigation either because the activities are not covered by the Habitat Plan or because they are not within the Habitat Plan's permit area. Furthermore, the initial focus on transportation projects aligned with ongoing efforts by the Metropolitan Transportation Commission (MTC), the California State Coastal Conservancy (Coastal Conservancy), and The Nature Conservancy to establish a regional advance mitigation planning (RAMP) program in the San Francisco Bay Area (Bay Area). These efforts are discussed in Section 1.2.1, *Regional Advance Mitigation Planning*. Details regarding how this Santa Clara County RCIS will interact with the Habitat Plan and the approvals necessary by the Habitat Agency (the implementing entity for the Habitat Plan) for the execution of mitigation inside of the Habitat Plan's plan area are described in Chapter 4, Section 4.3.1.1, *Mitigation Credit Agreements and the Santa Clara Valley Habitat Plan*.

While mitigation for transportation projects was a key influencing factor in selecting this pilot project, this Santa Clara County RCIS can also support the mitigation needs of other types of projects occurring in the RCIS area (Section 1.3.2, *RCIS Area*), including ongoing development in the 13 cities covered by this Santa Clara County RCIS (outside the Habitat Plan's plan area), installation or replacement of large-scale utilities, and replacement of aging stormwater management facilities. The stressors and pressures associated with development and infrastructure improvements are discussed in Chapter 2, *Environmental Setting.*

Additionally, this Santa Clara County RCIS can support regional conservation investments by informing where organizations, such as land trusts, can focus acquisition, restoration, or enhancement where it will have the largest benefit for focal species and other conservation elements. This RCIS also provides information on the different organizations that are active in the RCIS area, with the intent that agencies or organizations using this RCIS will consider sharing information beyond that contained in this RCIS or partnering in implementation of conservation actions and conservation investments.

1.2.1 Regional Advance Mitigation Planning

Transportation and natural resource agencies are collaborating to develop an innovative way to advance transportation infrastructure efficiently in the Bay Area while providing more effective conservation of natural resources and working lands through a RAMP process.

RAMP is a strategic mitigation approach that allows for natural resources (e.g., species, aquatic resources, and natural communities) to be protected or restored as compensatory mitigation for estimated impacts before infrastructure projects are constructed, often years in advance. Drawing on regional examples (such as the San Diego Association of Government's TransNet's Environmental Mitigation Program), RAMP was developed by a statewide group of federal and state infrastructure and natural resource agencies interested in integrated infrastructure and conservation planning that seeks to protect biological diversity while accommodating growth. While integrated infrastructure and conservation planning often leads to avoidance and reduced impacts on natural communities and ecosystems, sometimes impacts are unavoidable and must be compensated. The goals of RAMP are improved regional mitigation and conservation planning, improved mitigation and conservation effectiveness, and improved efficiency for infrastructure projects and conservation outcomes.

RAMP enables regional and local representatives from both infrastructure and natural resource agencies to come together to jointly evaluate potential environmental impacts from infrastructure projects proposed for a region and at the same time ensure that planned mitigation for those impacts contributes to regional conservation priorities. The advance period allows strategic mitigation to be implemented and made functional before infrastructure projects' unavoidable impacts occur. Mitigating in advance for a suite of projects allows for more efficient project approvals and more certainty to cost estimates, and takes advantage of conservation opportunities before important land is lost to conversion.

RAMP is an approach that is consistent with federal and state policies encouraging landscape-scale and watershed-scale mitigation. The Federal Highway Administration's Eco-Logical Approach outlines the process and benefits of implementing transportation projects incorporating ecological principles. Federal mitigation guidance and rules emphasize landscape-scale mitigation (U.S. Department of Interior) and watershed-scale mitigation (U.S. Army Corps of Engineers [Corps] and U.S. Environmental Protection Agency [USEPA]).

RAMP is another step in the evolution to support integrated infrastructure and conservation planning and address the limitations of project-by-project mitigation. Other comprehensive, regional, and longer-term mitigation tools include habitat conservation plans (HCPs) and natural community conservation plans (NCCPs), which take a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An HCP/NCCP provides for regional or area-wide protection of plants, animals, and their habitats, while allowing development consistent with local general plans through a regulatory process with permit coverage from USFWS and/or CDFW, typically for 30 to 50 years. By contrast, RAMP focuses on integrated conservation and infrastructure planning to provide effective compensatory mitigation, but does not result in incidental take permits from USFWS or CDFW.

RAMP is expected to be implemented on a regional scale. In 2014, MTC and the Coastal Conservancy launched an effort to develop a RAMP initiative in the Bay Area. MTC and the Coastal Conservancy are sponsoring the Bay Area RAMP, with the target of including RAMP in the region's transportation plan, called Plan Bay Area 2040. Working with state and federal resource agencies and county transportation agencies, MTC and the California Department of Transportation, the initiative is integrating an assessment of predicted compensatory mitigation needs from planned transportation projects with an assessment of Bay Area conservation priorities, relying on existing conservation plans and data sources, and developing a RAMP framework for the region. A draft RAMP planning document was prepared in 2017 (O'Donoghue et al. 2017).

RAMP is intended to advance project approvals and permits more efficiently and effectively with more certainty by addressing mitigation needs in advance, grounded by regional conservation priorities. This Santa Clara County RCIS intends to facilitate this process by identifying priority areas for conservation at a finer scale (focusing on focal species and natural communities) and providing a framework for crediting conservation actions, including habitat protection and enhancement, through MCAs.

In November 2016, the voters of Santa Clara County passed Santa Clara Valley Transportation Authority's (VTA's) Measure B, a measure to fund transportation improvements. Measure B institutes a half-cent sales tax increase for 30 years, which will generate more than $6 billion for road and transit improvements. Many of these improvements will occur within the built environment of cities or on existing roads, and therefore will have no impact on threatened or endangered species or other natural resources. Of those improvement projects with species or natural resource impacts, many will be covered by and mitigated through the Habitat Plan. A subset of transportation improvement projects funded by Measure B and other funding sources will not be covered by the Habitat Plan. Projects that are not covered by the Habitat Plan because they are outside the Habitat Plan permit area, or are exempt from the provisions of the Plan could benefit from this RCIS, which identifies priority conservation actions that can be used for mitigation.

The Santa Clara County "subregional assessment" for RAMP includes a more detailed assessment of opportunities to link local planned transportation projects included in Measure B with appropriate mitigation projects. It will be designed to identify a portfolio of high-quality conservation projects that can be implemented through one or more MCAs with CDFW; in doing so, it will demonstrate the benefits of the RCIS process.

1.3 RCIS Overview

This Santa Clara County RCIS presents conservation goals and objectives for the RCIS area (Chapter 3, *Conservation Strategy*). Incorporated into those goals and objectives are conservation priorities for land acquisition, restoration, and enhancement. These conservation priorities are intended to be used in multiple ways. First, conservation organizations can use these priorities to inform the work they do, ensuring that their efforts align with the goals in this RCIS. This alignment includes the pursuit of funding for land acquisition, restoration, and enhancement. Second, the conservation priorities presented in this RCIS can also inform project permitting and regulatory processes by providing project proponents, regulatory agencies, and agencies with local land use authority information to identify priority conservation actions that can be used to meet project mitigation needs. Guidance on how this RCIS can be used to support various state and federal permits that typically require mitigation can be found in Appendix B, *Regulatory Process*.

This Santa Clara County RCIS was developed in concert with other key planning efforts that overlap in the RCIS area. Primarily, it builds on existing efforts to develop a RAMP (Section 1.2.1, *Regional Advance Mitigation Planning*) for the Bay Area with a focus on transportation projects. This RCIS was also developed to be consistent and coordinated with the Habitat Plan, addressing projects, species, and geographic locations that are not covered by that plan and including conservation actions that complement the Habitat Plan's conservation strategy. A discussion about the coordination with the Habitat Plan and the approvals necessary by the Habitat Agency for the execution of mitigation inside of the Habitat Plan's study area are described in Chapter 4, Section 4.3.1.1, *Mitigation Credit Agreements and the Santa Clara Valley Habitat Plan*.

1.3.1 RCIS Development Team

The Santa Clara County RCIS development process began in March 2016. The process was initiated by the Santa Clara Valley Open Space Authority (Authority), in collaboration with VTA, and The Nature Conservancy. ICF was the lead technical consultant on the RCIS document, working under the direction of the Authority and its consultant team, VTA, The Nature Conservancy, and the Santa Clara Valley Habitat Agency (the implementing entity for the Habitat Plan) (referred to as the Steering Committee). Funding for RCIS development was provided by the Stephen D. Bechtel, Jr. Foundation and the Coastal Conservancy.

This Santa Clara County RCIS was also developed in close coordination with other local conservation organizations and regulatory agencies, as well as representatives from the pilot East Bay RCIS (which is adjacent to the RCIS area) and the Bay Area RAMP Technical Advisory Committee. This coordination is described in more detail below.

1.3.1.1 RCIS Applicant

The Authority is the public agency proposing this strategy and will submit it to CDFW for approval. The role of the RCIS applicant is described further in Chapter 4, *Implementation*.

The Authority is an independent special district whose mission is to conserve the natural environment, support agriculture, and connect people to nature by protecting open spaces, natural areas, and working farms and ranches for future generations. The Authority was created by the California State Legislature in 1993 at the urging of community leaders who saw the importance of maintaining the ecological integrity of the region. Its jurisdiction is all of Santa Clara County with the exception of lands and communities within the boundaries of the Midpeninsula Regional Open Space District and the City of Gilroy. The cities of Milpitas, Santa Clara, Campbell, San Jose, and Morgan Hill all fall within the Authority's jurisdiction. The Authority also has the ability to acquire and hold lands outside of its jurisdiction. The Authority currently owns and/or manages over 15,000 acres of open space.

The Authority's major preservation tools include buying land, acquiring easements, contributing funds to joint conservation efforts, and careful land management. To help guide the implementation of these tools, the Authority prepared a greenprint for regional conservation (Santa Clara Valley Open Space Authority 2014). The *Santa Clara Valley Greenprint* establishes conservation goals for protecting wildlands, conserving water resources, sustaining agricultural lands, and providing recreational and educational opportunities. The Authority collaborated with the Stephen D. Bechtel, Jr. Foundation and other agencies in preparation of this RCIS to both support the intended outcomes of Assembly Bill 2087 in Santa Clara County, and to support implementation of the strategies in the

Santa Clara Valley Greenprint. Section 1.4, *Public Outreach and Involvement*, provides more details on the many partners with whom the Authority collaborated in the development of the Santa Clara County RCIS.

1.3.1.2 Steering Committee

The coordination and development of the Santa Clara County RCIS was guided by a Steering Committee. The Steering Committee, led by the Authority, was composed of staff from the Authority, Santa Clara Valley Habitat Agency, The Nature Conservancy, VTA, and the Coastal Conservancy. The Steering Committee met monthly from March 2016 through mid-2017 to provide guidance on the development of this RCIS, including the identification of the RCIS area and focal species; the development of conservation goals, objectives, and priorities; and the development of the implementation structure. The Steering Committee also coordinated outreach to stakeholders.

1.3.1.3 Technical Subcommittee

The Steering Committee formed a subgroup, the Technical Subcommittee, to analyze key technical and conservation planning issues and make recommendations to the Steering Committee. The Technical Subcommittee was composed of conservation specialists who met on an as-needed basis.

1.3.1.4 Bay Area RAMP Technical Advisory Committee

Because this Santa Clara County RCIS was developed to guide advance mitigation and facilitate MCAs (Chapter 4, *Implementation*), the Bay Area RAMP Technical Advisory Committee was involved in the RCIS planning process. The committee provided feedback to the Steering Committee and consultants on technical issues and draft elements of the strategy.

1.3.1.5 Conservation Partners and Infrastructure Agencies

The Steering Committee established a working group of Conservation Partners early in the RCIS development process. The Conservation Partners was formed through outreach to anticipated future users of this Santa Clara RCIS, including conservation organizations, resource agencies, and public infrastructure agencies. The goals of the outreach were to obtain data and input necessary to ensure that this RCIS will be effective and to increase capacity and support for its long-term implementation. Meetings with these organizations are summarized in Section 1.4, *Public Outreach and Involvement*, and a list of Conservation Partners members is provided in Appendix C, *Public Outreach*.

1.3.1.6 State Agency Sponsor

As a key state agency partner on both this Santa Clara County RCIS and the East Bay RCIS development teams, the Coastal Conservancy is also acting as the RCIS state agency sponsor for this Santa Clara County RCIS. As the Santa Clara County RCIS's state agency sponsor, the Coastal Conservancy requested approval of this RCIS through a state agency sponsor letter sent to the Director of Fish and Wildlife, as required by CFGC 1852(a). The letter summarized the purpose of this Santa Clara County RCIS from both a conservation perspective and an infrastructure planning perspective. The letter is included in Appendix D, *Letters of Support*.

1.3.2 RCIS Area

A key first step in developing this Santa Clara County RCIS was to define the RCIS area that would be covered by measures in this RCIS. To develop and define the RCIS area, the Technical Subcommittee evaluated alternative RCIS areas and provided recommendations to the Steering Committee. Alternative RCIS areas were developed considering the following types of data in and adjacent to the RCIS area.

- Important topographic or hydrologic boundaries such as watersheds (e.g., the U.S. Geological Survey's standard database of watershed boundaries).
- Areas where conservation may occur that will contribute to species recovery or sustain populations of focal species.
- Existing protected areas.
- Natural community or ecoregional boundaries.
- Jurisdictional boundaries or areas of conservation interest to the Authority, including the Authority's jurisdiction and VTA's jurisdiction.
- Boundaries of approved or in-process conservation plans or open space strategies, including the *Santa Clara Valley Greenprint*, the Pajaro Compass planning efforts, and the approved Habitat Plan.
- Locations of key projects or activities expected to use this RCIS.
- Areas of core habitat or recovery units for one or more focal species.
- Projected development based on current local general plans or capital improvement plans.

The RCIS area chosen by the Steering Committee comprises all of Santa Clara County, plus portions of three HUC-10 watersheds[1] in the upper region of the Pajaro River watershed in northern San Benito County, encompassing a total of 934,028 acres (Figure 1-1). The Steering Committee selected the strategy area because it includes most of VTA's U.S. 101 Widening Project and all of the State Route 152 Trade Corridor Project within Santa Clara and San Benito counties. By extending the strategy area into San Benito County it includes almost all of the Central California Coast Ecoregion and all of the Soap Lake Floodplain, which straddles the county boundary.

This area of San Benito County has been identified as a major conservation priority in the collaborative *Pajaro Compass* effort, and is the location of a number of planned transportation infrastructure projects that will require mitigation for impacts on listed species and their habitat, floodplain values, farmland, and connectivity. Including watersheds in the upper Pajaro River in the RCIS area would streamline conservation investment and project mitigation for South Central California Coast Steelhead (*Oncorhynchus mykiss*), a distinct population segment listed as threatened by the National Marine Fisheries Service (this species is not covered by the Habitat Plan). Including watersheds in the upper Pajaro River would also facilitate cooperative conservation partnerships and MCAs between transportation agencies and CDFW for fish and other focal species (e.g., burrowing owl) in this region.

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[1] For the purpose of this RCIS, major watersheds are identified at the level of the U.S. Geological Survey's 10-digit Hydrologic Unit Code (HUC 10).

The geographic area of this RCIS extends beyond the Habitat Plan boundaries (Section 1.5, *Relevant Plans and Policies*). Because the RCIS builds on much of the extensive data collected as part of the Habitat Plan development process, the RCIS also extends some of the benefits of the Habitat Plan to the rest of Santa Clara County and northern San Benito County.

1.3.3 Focal Species

Focal species are species whose conservation needs are addressed through this RCIS. Chapter 2, *Environmental Setting*, describes all focal species for this Santa Clara County RCIS, along with the process used to select focal species for this RCIS. Conservation priorities, including land protection, enhancement, and restoration, are described in the context of their importance for contributing to the conservation and recovery of focal species and their habitats, as well as for other conservation elements in this RCIS area (Chapter 3, *Conservation Strategy*). Many species that were not selected as focal species for this Santa Clara County RCIS (i.e., "nonfocal species"; See Chapter 2, Section 2.4, *Nonfocal Species*) have conservation needs similar to the focal species, and may also be addressed through this RCIS's conservation strategy. It is assumed that MCAs that memorialize protection and improvements for habitats that support focal and non-focal species alike, and are consistent with this RCIS's conservation goals and objectives, could result in mitigation credits for both focal and nonfocal species.

1.3.4 Strategy Term

After finding that the RCIS meets the requirements of CFGC 1852, CDFW may approve an RCIS for an initial period of up to 10 years from the date of approval. CDFW may extend the duration of an approved or amended RCIS for additional periods of up to 10 years after updating the RCIS with new scientific information and a new finding that the RCIS continues to meet the requirements of Section 1852.

1.3.5 RCIS Requirements

To approve this Santa Clara County RCIS, CDFW must determine that it meets all of the requirements in the CFGC for an RCIS. To assist CDFW with this determination, Table 1-1 lists the requirements in the order they appear in CFGC. The corresponding element in this RCIS is noted.

Table 1-1. Checklist of Required Elements in an RCIS

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1852(a)	The department may approve a regional conservation investment strategy pursuant to this chapter. A regional conservation investment strategy may be proposed by the department or any other public agency, and shall be developed in consultation with local agencies that have land use authority within the geographic area of the regional conservation investment strategy. The department may only approve a regional conservation investment strategy if one or more state agencies request approval of the regional conservation investment strategy through a letter sent to the director indicating that the proposed regional conservation investment strategy would contribute to meeting both of the following state goals: (1) Conservation. (2) Public infrastructure or forest management.	Section 1.3.1.6, *State Agency Sponsor*
1852(c)(1)	An explanation of the conservation purpose of and need for the strategy.	Section 1.2, *Purpose and Need*
1852(c)(2)	The geographic area of the strategy and rationale for the selection of the area, together with a description of the surrounding ecoregions and any adjacent protected habitat areas or linkages that provide relevant context for the development of the strategy.	Section 1.5, *Relevant Plans and Policies* Section 2.3.1, *Protected Areas* Section 2.3.2, *Ecoregions* Section 2.5.1, *Habitat Connectivity*
1852(c)(3)	The focal species[2] included in, and their current known or estimated status within, the strategy.	Section 2.3.5, *Focal Species*
1852(c)(4)	Important resource conservation elements within the RCIS area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements.	Section 2.3.1, *Protected Areas* Section 2.3.2, *Ecoregions* Section 2.3.3, *Watersheds* Section 2.3.4, *Natural Communities and Land Cover* Section 2.3.5, *Focal Species* Section 2.5, *Other Conservation Elements* Section 2.5.1, *Habitat Connectivity*

[2] Focal species are species whose conservation needs are addressed through the RCIS (Section 1.3.3, *Focal Species*).

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1852(c)(5)	A summary of historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, on the focal species, habitat, and other natural resources, as identified in the best available scientific information, including, but not limited to, the State Wildlife Action Plan.	Section 2.7, *Pressures and Stressors on Focal Species and other Conservation Elements*
1852(c)(6)	Consideration of major water, transportation and transmission infrastructure facilities, urban development areas, and city, county, and city and county general plan designations that accounts for reasonably foreseeable development of major infrastructure facilities, including, but not limited to, renewable energy and housing in the RCIS area.	Section 1.5, *Relevant Plans and Policies* Section 2.1, *Built Environment*
1852(c)(7)	Provisions ensuring that the strategy will be in compliance with all applicable state and local requirements and does not preempt the authority of local agencies to implement infrastructure and urban development in local general plans.	Section 1.3, *RCIS Overview* Section 3.8, *Consistency with HCPs and NCCPs*
1852(c)(8)	Conservation goals and measurable objectives for the focal species and important conservation elements identified in the strategy that address or respond to the identified stressors and pressures on focal species.	Section 3.2.1, *Conservation Goals and Objectives* Section 3.6., *Conservation Strategy for Focal Species* Section 3.7, *Conservation Strategy for Other Conservation Elements*
1852(c)(9)	Conservation actions, including a description of the general amounts and types of habitat that, if preserved or restored and permanently protected, could achieve the conservation goals and objectives, and a description of how the conservation actions and habitat enhancement actions were prioritized and selected in relation to the conservation goals and objectives.	Section 3.2.2, *Conservation Actions and Priorities* Section 3.6, *Conservation Strategy for Focal Species* Section 3.7, *Conservation Strategy for Other Conservation Elements*
1852(c)(10)	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 RCIS area.	Section 1.5, *Relevant Plans and Policies* Section 3.8, *Consistency with HCPs and NCCPs* Section 4.3.1.1, *Mitigation Credit Agreements and the Santa Clara Valley Habitat Plan*
1852(c)(11)	An explanation of whether and to what extent the strategy is consistent with any previously approved strategy or amended strategy, state or federal recovery plan, or other state or federal approved conservation strategy that overlaps with the RCIS area.	Section 1.5, *Relevant Plans and Policies* Section 3.8, *Consistency with HCPs and NCCPs*

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1852(c)(12)	A summary of mitigation banks and conservation banks approved by the department or the U.S. Fish and Wildlife Service that are located within the RCIS area or whose service area overlaps with the RCIS area.	Section 2.3.1.3 *Conservation and Mitigation Banks*
1852(c)(13)	A description of how the strategy's conservation goals and objectives provide for adaptation opportunities against the effects of climate change for the strategy's focal species.	Section 3.4, *Adaptations against the Effects of Climate Change*
1852(c)(14)	Incorporation and reliance on, and citation of, the best available scientific information regarding the RCIS area and the surrounding ecoregion, including a brief description of gaps in relevant scientific information, and use of standard or prevalent vegetation classifications and standard ecoregional classifications for terrestrial and aquatic data to enable and promote consistency among regional conservation investment strategies throughout California.	Section 2.3.2, *Ecoregions* Section 2.3.4, *Natural Communities and Land Cover* Section 3.3, *Conservation Gap Analysis and Conservation Targets* Section 4.2.1.1, *Updating this RCIS with Best Available Science*
1852(d)	A regional conservation investment strategy shall compile input and summary priority data in a consistent format that could be uploaded for interactive use in an Internet Web portal and that would allow stakeholders to generate queries of regional conservation values within the RCIS area.	Section 3.2.2, *Conservation Actions and Priorities*
1852(e)	In addition to considering the potential to advance the conservation of focal species, regional conservation investment strategies shall consider all of the following: (1) The conservation benefits of preserving working lands for agricultural uses. (2) Reasonably foreseeable development of infrastructure facilities. (3) Reasonably foreseeable projects in the RCIS area, including, but not limited to, housing. (4) Reasonably foreseeable development for the production of renewable energy. (5) Draft natural community conservation plans within the area of the applicable regional conservation investment strategy.	Section 1.5.1, *Existing Habitat Conservation Plans and Natural Community Conservation Plans* Section 2.1, *Built Environment* Section 2.5.2, *Working Landscapes* Section 3.8, *Consistency with HCPs and NCCPs* Section 3.7.2, *Working Landscapes*
1854(a)	The department may prepare or approve a regional conservation investment strategy, or approve an amended strategy, for an initial period of up to 10 years after finding that the strategy meets the requirements of Section 1852.	Section 1.3.4, *Strategy Term* Section 4.4, *Amending the RCIS*

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1854(c)(1)	A public agency shall publish notice of its intent to create a regional conservation investment strategy. This notice shall be filed with the Governor's Office of Planning and Research and the county clerk of each county in which the regional conservation investment strategy is found in part or in whole. If preparation of a regional conservation investment strategy was initiated before January 1, 2017, this notice shall not be required.	Not applicable, as this RCIS was initiated before January 1, 2017
1854(c)(3)(*A*)	A public agency proposing a strategy or amended strategy shall hold a public meeting to allow interested persons and entities to receive information about the draft regional conservation investment strategy or amended strategy early in the process of preparing it and to have an adequate opportunity to provide written and oral comments. The public meeting shall be held at a location within or near the strategy area.	Section 1.4, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(c)(3)(*B*)	In a draft regional conservation investment strategy or amended strategy submitted to the department for approval, the public agency shall include responses to written public comments submitted during the public comment period.	Section 1.4, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(c)(3)(*C*)	If preparation of a regional conservation investment strategy was initiated before January 1, 2017, and a public meeting regarding the strategy or amended strategy that is consistent with the requirements of this section was held before January 1, 2017, an additional public meeting shall not be required.	Section 1.4, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(c)(4)	At least 30 days before holding a public meeting to distribute information about the development of a draft regional conservation investment strategy or amended strategy, a public agency proposing a strategy shall provide notice of a regional conservation investment strategy or amended strategy public meeting as follows: (A) On the public agency's Internet Web site and any relevant LISTSERV. (B) To each city, county, and city and county within or adjacent to the regional conservation investment RCIS area. (C) To the implementing entity for each natural community conservation plan or federal regional habitat conservation plan that overlaps with the RCIS area. (D) To each public agency, organization, or individual who has filed a written request for the notice, including any agency, organization, or individual who has filed a written request to the department for notices of all regional conservation investment strategy public meetings.	Section 1.4, *Public Outreach and Involvement* Appendix C, *Public Outreach*

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1854(c)(5)	At least 60 days before submitting a final regional conservation investment strategy or amended strategy to the department for approval, the public agency proposing the investment strategy or amended strategy shall notify the board of supervisors and the city councils in each county within the geographical scope of the strategy and provide the board of supervisors and the city councils with an opportunity to submit written comments for a period of at least 30 days.	Section 1.4, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(e)	The department shall require the use of consistent metrics that incorporate both the area and quality of habitat and other natural resources in relation to a regional conservation investment strategy's conservation objectives to measure the net change resulting from the implementation of conservation actions and habitat enhancement actions.	Section 3.3, *Conservation Gap Analysis and Conservation Targets* Section 3.6, *Conservation Strategy for Focal Species* Section 3.7, *Conservation Strategy for Other Conservation Elements* Section 4.2.1.1, *Updating this RCIS with Best Available Science*
1856(b)	For a conservation action or habitat enhancement action identified in a regional conservation investment strategy to be used to create mitigation credits pursuant to this section, the regional conservation investment strategy shall include, in addition to the requirements of Section 1852, all of the following: (1) An adaptive management and monitoring strategy for conserved habitat and other conserved natural resources. (2) A process for updating the scientific information used in the strategy, and for tracking the progress of, and evaluating the effectiveness of, conservation actions and habitat enhancement actions identified in the strategy, in offsetting identified threats to focal species and in achieving the strategy's biological goals and objectives, at least once every 10 years, until all mitigation credits are used. (3) Identification of a public or private entity that will be responsible for the updates and evaluation required pursuant to paragraph (2).	Section 3.9, *Monitoring and Adaptive Management Framework* Section 4.2, *Implementation Structure* Section 4.2.1.1, *Updating this RCIS with Best Available Science*

RCIS = Regional Conservation Investment Strategy

1.4 Public Outreach and Involvement

Public outreach is required by CFGC 1854 (Table 1-1), and has been an important part of the process of developing this RCIS. The Steering Committee led the public outreach and involvement process for this RCIS to ensure that CFGC public meeting requirements are met, and to engage potential users of the RCIS throughout the RCIS development process.

The requirements for public outreach prior to the approval of an RCIS, as described in CFGC 1854, are presented in Table 1-1, and summarized here, along with a description of how the Steering Committee met these requirements.

CFGC 1854(c)(1) requires a public agency to publish notice of its intent to create an RCIS. If preparation of the RCIS was initiated before January 1, 2017, however, this notice is not required. Because development of the Santa Clara County RCIS began in March 2016, a notice of intent to create an RCIS was not published.

CFGC 1854(c)(3)(*A*) requires that the public agency preparing an RCIS (in the case of this RCIS, the Authority) hold a public meeting to allow interested persons and entities to receive information about the RCIS early in the preparation process and to have adequate opportunity to provide written and oral comments. As required in CFGC 1854(c)(4), at least 30 days before holding the public meeting, the Steering Committee provided notice of the development of the draft Santa Clara County RCIS on the Authority's website; to each city, county, and city and county within and adjacent to the RCIS area; and to the Habitat Plan's implementing agency (the Habitat Agency). No public agency, organization, or individual filed a written request for the notice, so no additional notices were sent. Consistent with this requirement, a public meeting was held on December 8, 2016 at Santa Clara Valley Open Space Authority offices in San Jose, California. Notice of this meeting was posted in the San Jose Mercury News and on the Open Space Authority's website, and was sent directly to subscribers of the agency's Board meeting packet. Interested persons were invited to provide oral and written comments to the Authority. The public meeting was held as part of a regularly-scheduled Board of Directors meeting.

Public meeting requirements differ depending on when preparation of the RCIS was initiated (CFGC 1854(c)(3)(C)). If preparation of an RCIS was initiated before January 1, 2017, and a public meeting that was consistent with the requirements of CFGC 1854 was held before January 1, 2017, an additional public meeting shall not be required. For this RCIS, which was initiated before January 1, 2017, an additional public meeting was not required, as the public meeting held on December 8, 2016, was consistent with CFGC 1854.

CFGC 1854(c)(5) requires that at least 60 days before submitting a final RCIS to CDFW for its review and approval, the RCIS applicant (i.e., the Authority) shall notify the board of supervisors and the city councils in each county within the RCIS area and provide the board of supervisors and the city councils an opportunity to submit written comments for at least 30 days. The Authority notified the board of supervisors and the city councils in each county within the RCIS area, and invited the board of supervisors and city councils to submit written comments on the Santa Clara County RCIS.

CFGC 1854(c)(3)(*B*) requires that in a draft RCIS submitted to CDFW for approval, the public agency shall include responses to written public comments submitted during the public comment period. The Steering Committee included responses to written public comments in the Final Santa Clara County RCIS submitted to CDFW in [date TBD] in Appendix C, *Public Outreach*.

Table 1-2 provides a brief description of the notices provided and meetings held during the public outreach involvement and meeting process.

In addition to outreach and engagement of conservation partners, regulatory agencies, and infrastructure agencies, the Steering Committee provided outreach and briefings for key environmental, agricultural, and business organizations, and local governments, including counties and cities in the RCIS area. As part of this process, the Steering Committee held two conservation partner meetings, with the following goals.

1. Provide conservation partners in the region with information on this RCIS and RAMP planning efforts.
2. Invite partner input regarding draft ecological values, conservation priorities, and actions.

These conservation partner meetings and other outreach efforts are summarized in Table 1-2. Participants involved in the public outreach process are listed in Appendix C, *Public Outreach*.

Table 1-2. Public Outreach and Involvement Meeting Summary

Date	Public Outreach and Involvement
August 3, 2016	Partner Meeting #1. Hosted by the Authority, the Steering Committee provided conservation partners in the region information about RAMP and the RCIS.
October 4, 2016	The Authority met with San Benito Council of Governments, San Benito County Resource Manager, and Cal Trans District 5 staff.
October 26, 2016	The Authority met with various community groups and leaders working in the northern portion of San Benito County, and involved with the Pajaro Compass.
November 7, 2016	The Authority provided notice of the RCIS public meeting on the Authority's website to each city and county within and adjacent to the RCIS area, and to the Santa Clara Valley Habitat Agency.
December 8, 2016	The Authority held a public meeting in San Jose as part of its Board of Directors meeting to discuss preparation of the RCIS. Interested persons and entities were invited to provide oral comments during the meeting, and submit written comments to the Authority. No written comments were submitted to the Authority during or in the 60 days after the public meeting.
December 22, 2016	The Authority provided information on this Santa Clara County RCIS to the Santa Clara Valley Habitat Agency Technical Advisory Committee.
January 17, 2017	The Authority provide information on this Santa Clara County RCIS at the Joint Board Meeting of the Authority and the Santa Clara Valley Water District.
February 1, 2017	The Authority met with the County of Santa Clara planning department to provide information on this Santa Clara County RCIS.
February 2, 2017	The Authority met with the Peninsula Working Group, comprised of regional environmental organizations, and hosted by the Committee for Green Foothills.
February 14, 2017	Partner Meeting #2. Held through a Webinar, the Steering Committee provided updates on this Santa Clara County RCIS development, and requested feedback on conservation opportunities in the RCIS Area.
March 1, 2017	The Authority met with the Silicon Valley Leadership Group to provide information on this Santa Clara County RCIS.
March 3, 2017	The Authority met with the Santa Clara Farm Bureau to provide information on this Santa Clara County RCIS.
July 12, 2017	The Administrative Draft Santa Clara County RCIS was submitted to CDFW.
August 11, 2017	CDFW informed the Authority that the Administrative Draft Santa Clara County RCIS was incomplete. In a letter to the Authority, CDFW provided a list of items required by CFGC 1850-1861 and the Program Guidelines that must be added to the RCIS for CDFW to deem the RCIS complete.
December 15, 2017	The 2nd Administrative Draft Santa Clara County RCIS was submitted to CDFW.
January 15, 2018	The Authority sent notices of RCIS preparation to the Santa Clara County and San Benito County Boards of Supervisors and the city councils within the RCIS area more than 60 days prior to the final RCIS being submitted to CDFW for

Date	Public Outreach and Involvement
	approval. In this notice, the Authority provided the boards of supervisors and city councils with an opportunity to submit written comments for a period of at least 30 days. Written public comments, and responses to those comments, are included in Appendix C, Public Outreach.
1-17January 15, 2018	CDFW deemed this Santa Clara County RCIS complete and posted it to the CDFW website, initiating a 30-day public review period.
February 15, 2018	Public review period closed.
March 20, 2018	Revised (Final) Santa Clara County RCIS was submitted to CDFW with public comments incorporated, where appropriate.
April 20, 2018	CDFW approved this Santa Clara County RCIS and posted it to the CDFW website.

1.5 Relevant Plans and Policies

This section identifies state or federal recovery plans, or other state or federal approved conservation strategies that overlap the RCIS area. There are no previously approved RCISs in this RCIS area. As required in CFGC 1852(c)(10), this Santa Clara County RCIS had been developed to be consistent with all existing conservation plans—including but not limited to the Habitat Plan—and to complement those plans wherever possible. Furthermore, as required by the Program Guidelines, this RCIS's conservation purpose aligns with the goals and objectives of the State Wildlife Action Plan (California Department of Fish and Wildlife 2015), and any approved regional conservation assessment encompassing the RCIS area. The conservation goals and objectives for this RCIS (Chapter 3, *Conservation Strategy*) align with many of the Statewide, Bay Delta, and Central Coast Province goals in the State Wildlife Action Plan, and, if implemented, would help to achieve them.

1.5.1 Existing Habitat Conservation Plans and Natural Community Conservation Plans

Table 1-3 provides a list of HCPs and HCP/NCCPs in the RCIS area, including the date approved, plan area size, and species covered. Regional conservation plans and strategies within and adjacent to the RCIS area are shown in Figure 1-2.

Table 1-3. Approved Habitat Conservation Plans and Natural Community Conservation Plans Overlapping the RCIS Area

HCPs and HCP/NCCPs	Year Approved	Plan Area Size (Acres)	Species Covered
Pacific Gas and Electric's San Francisco Bay Area Operations and Maintenance HCP	2017	402,440	California Freshwater Shrimp, Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, Delta Green Ground Beetle, Bay Checkerspot Butterfly, Callippe Silverspot Butterfly, Lange's Metalmark Butterfly, Mission Blue Butterfly, San Bruno Elfin Butterfly, California Tiger Salamander, California Red-Legged Frog, Alameda Whipsanke, San Francisco Garter Snake, Ridgway's Rail, Salt Marsh Harvest Mouse, San Joaquin Kit Fox, Pallid Manzanita, Sonoma Sunshine, Coyote Ceanothus, Fountain Thistle, Santa Clara Valley Dudleya, Contra Costa Wallflower, Marin Dwarf Flax, Burke's Goldfields, Contra Costa Goldfields, Sebastopol Meadowfoam, Antioch Dunes Evening Primrose, White-Rayed Pentachaeta, and Metcalf Canyon Jewelflower
Donald Von Raesfeld Power Plant Low-Effect HCP	2014	9,926	Bay Checkerspot Butterfly, Coyote Ceanothus, Santa Clara Valley Dudleya, Metcalf Canyon Jewelflower, Tiburon Paintbrush
Santa Clara Valley HCP/NCCP	2013	508,669	Bay Checkerspot Butterfly, California Tiger Salamander, California Red-Legged Frog, Foothill Yellow-Legged Frog, Western Pond Turtle, Western Burrowing Owl, Least Bell's Vireo, Tricolored Blackbird, San Joaquin Kit Fox, Tiburon Indian Paintbrush, Coyote Ceanothus, Mount Hamilton Thistle, Santa Clara Valley Dudleya, Fragrant Fritillary, Loma Prieta Hoita, Smooth Lessinga, Metcalf Canyon Jewelflower, Most Beautiful Jewelflower
Stanford University HCP	2013	8,000	California Tiger Salamander, California Red-Legged Frog, San Francisco Garter Snake
Los Esteros Low Effect HCP	2011	9,926	Bay Checkerspot Butterfly, Coyote Ceanothus, Santa Clara Valley Dudleya, Metcalf Canyon Jewelflower, Tiburon Paintbrush
PG&E Metcalf - El Patio, Metcalf - Hicks/Vasona Low Effect HCP	2007	35.9	Bay Checkerspot Butterfly
PG&E Metcalf-Evendale/Monta-Vista HCP	1998	4.19	Bay Checkerspot Butterfly
Zanker Road Resource Management HCP	1999	0.83	Salt Marsh Harvest Mouse

HCP = Habitat Conservation Plan; NCCP = Natural Community Conservation Plan

1.5.2 Existing Recovery and Other Conservation Plans

Several state or federal recovery plans overlap the RCIS area and many state and local conservation plans address the RCIS area (Table 1-4).

Table 1-4. Existing Recovery and Other Conservation Plans

Plan Type	Plan Name	Responsible Agency and Date Published	Incorporation into RCIS
Multispecies Recovery Plans	Coastal Multispecies Final Recovery Plan: California Coastal Chinook Salmon ESU, Northern California Steelhead DPS, and Central California Coast Steelhead DPS	National Marine Fisheries Service 2016	Central California Coast steelhead DPS is a focal species; recovery units used in habitat model.
	Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California	U.S. Fish and Wildlife Service 2013	Incorporated into the Summary of Baylands Conservation Strategy (Appendix I, *Summary of Bayland Conservation Strategies*).
	Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area	U.S. Fish and Wildlife Service 1998	RCIS developed in close coordination with this program for serpentine soils and focal plant species on serpentine soils.
Single Species Recovery Plans	Recovery Plan for Central California Distinct Population Segment of California Tiger Salamander	U.S. Fish and Wildlife Service 2017	Focal species; critical habitat included in prioritization.
	Recovery Plan for the South Central Coast Steelhead Trout	National Marine Fisheries Service 2013	Focal species; critical habitat included in prioritization.
	Recovery Plan for California Red-Legged Frog	U.S. Fish and Wildlife Service 2002	Focal species; critical habitat included in prioritization.
State-Wide or Regional Conservation Assessments	Regional Advanced Mitigation Program–Mitigation Assessment	Regional Advanced Mitigation Program (O'Donoghue et al. 2017)	RCIS developed in close coordination with this program.
	Audubon Important Bird Areas	Audubon 2016	
	State Wildlife Action Plan	California Department of Fish and Wildlife 2015	Included in focal species selection process.
	The Conservation Lands Network 1.0	Bay Area Open Space Council 2011	Land cover data incorporated.
	Fire Resource and Assessment Program	CalFire Fire Resource and Assessment Program (2015)	Land cover data incorporated.
	Riparian Bird Conservation Plan	Riparian Habitat Joint Venture 2004	
Regional Conservation Strategies	Final Santa Clara Valley Habitat Conservation Plan	ICF International 2012	The Habitat Plan land cover dataset is used by this RCIS (Chapter 2, *Environmental Setting*); as such, it is a component of the

Plan Type	Plan Name	Responsible Agency and Date Published	Incorporation into RCIS
			species habitat models, descriptions of natural communities and land cover types, and the basis for developing the conservation strategy (Chapter 3, *Conservation Strategy*). The RCIS goals, objectives, conservation priorities, and actions are designed to complement the Habitat Plan and are incorporated into this RCIS.
	Pajaro Compass	Pajaro Compass 2016	RCIS area expanded to address this program and expand opportunities to further the goals of the Pajaro Compass.
	Santa Clara Valley Greenprint	Santa Clara Valley Open Space Authority 2014	Used in protected land assessment, gap analysis, and conservation strategy.
	Mid-Peninsula Open Space District Conservation Vision	Mid-Peninsula Open Space District 2014	Used in protected land assessment, gap analysis, and conservation strategy.
	San Francisco Bay Subtidal Habitat Goals Report	State Coastal Conservancy 2010	Incorporated into the Summary of Baylands Conservation Strategy (Appendix I, *Summary of Bayland Conservation Strategies*)
	Baylands Ecosystem Habitat Goals	Goals Project 1999 and 2015	Goals incorporated into conservation strategy.
Critical Habitat	California Red-Legged Frog	U.S. Fish and Wildlife Service 2010	Focal species; critical habitat included in prioritization.
	South Central California Coast Steelhead	National Oceanic and Atmospheric Administration 2005	Focal species; critical habitat included in prioritization.
	Central California Coast Steelhead	National Oceanic and Atmospheric Administration 2005	Focal species; critical habitat included in prioritization.
	California Tiger Salamander (Central Coast DPS)	U.S. Fish and Wildlife Service 2005	Focal species; critical habitat included in prioritization.
Wildlife Linkage Analyses	Bay Area and Beyond: Critical Linkages	Penrod et al. 2013	Linkages included in prioritization.
	California Essential Habitat Connectivity Project	California Department of Fish and Wildlife 2010	Linkages included in prioritization.

RCIS = Regional Conservation Investment Strategy; ESU = evolutionarily significant unit; DPS = distinct population segment

1.5.3 General Plans

There are 15 cities in Contra Costa County and one in San Benito County that are inside the RCIS area. These include three cities that are permittees to the Habitat Plan (City of San Jose, City of Morgan Hill, and City of Gilroy). Both counties and all of the cities have general plans that describe the extent of each city or county's jurisdictional boundaries. Those general plan boundaries and their implications for the conservation landscape are described in Chapter 2, *Environmental Setting*.

1.6 Document Organization

This Santa Clara County RCIS and supporting information is presented in the chapters and appendices listed below.

- **Chapter 1, Introduction.** Chapter 1 discusses the background, purpose of and need for this RCIS, the planning process, strategy term, RCIS area, and relevant plans in the RCIS area.
- **Chapter 2, Environmental Setting.** Chapter 2 provides a current assessment of the natural resources in the RCIS area, focal species lists, modeled species habitat, and major infrastructure in the RCIS area.
- **Chapter 3, Conservation Strategy.** Chapter 3 discusses stressors and pressures to focal species and other resources, and outlines conservation goals and objectives and conservation priorities.
- **Chapter 4, Implementation.** Chapter 4 discusses how this Santa Clara RCIS will be implemented, including coordination with other resource agencies, development of MCAs, and planning for adaptive management.
- **Chapter 5, References.** Chapter 5 is a bibliography of printed references and personal communications cited in the text.
- **Chapter 6, List of Preparers and Reviewers**
- **Appendix A, Glossary**
- **Appendix B, Regulatory Processes**
- **Appendix C, Public Outreach**
- **Appendix D, Letters of Support**
- **Appendix E, Evaluation of Species for Inclusion as Focal Species**
- **Appendix F, Associations between Land Cover and Wildlife and Plant Species**
- **Appendix G, Comparison of RCIS Species Habitat Models and Habitat Plan Habitat Models**
- **Appendix H, Focal Species Habitat Models**
- **Appendix I, Summary of Baylands Conservation Strategies**

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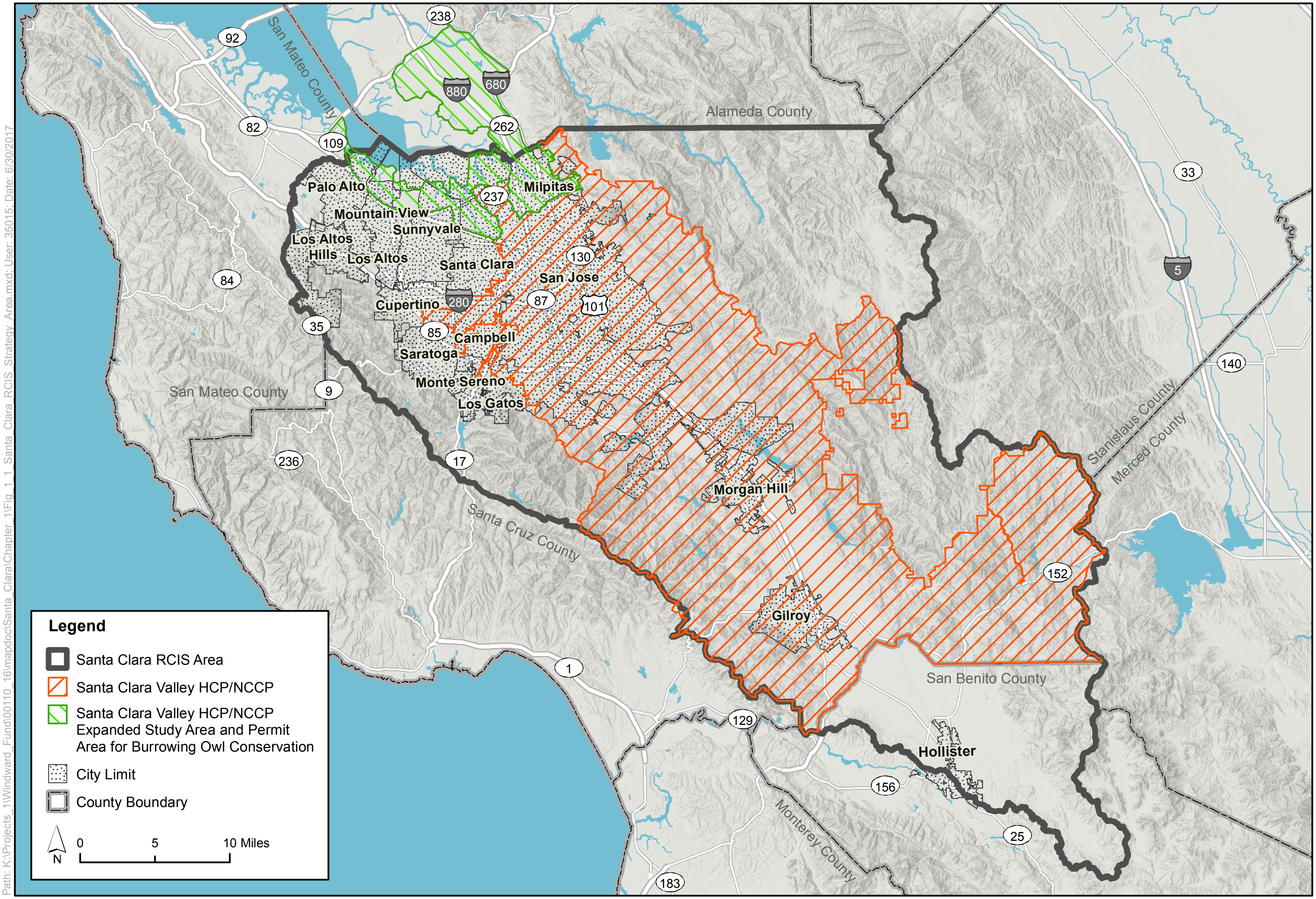

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Figure 1-1
Santa Clara RCIS Area

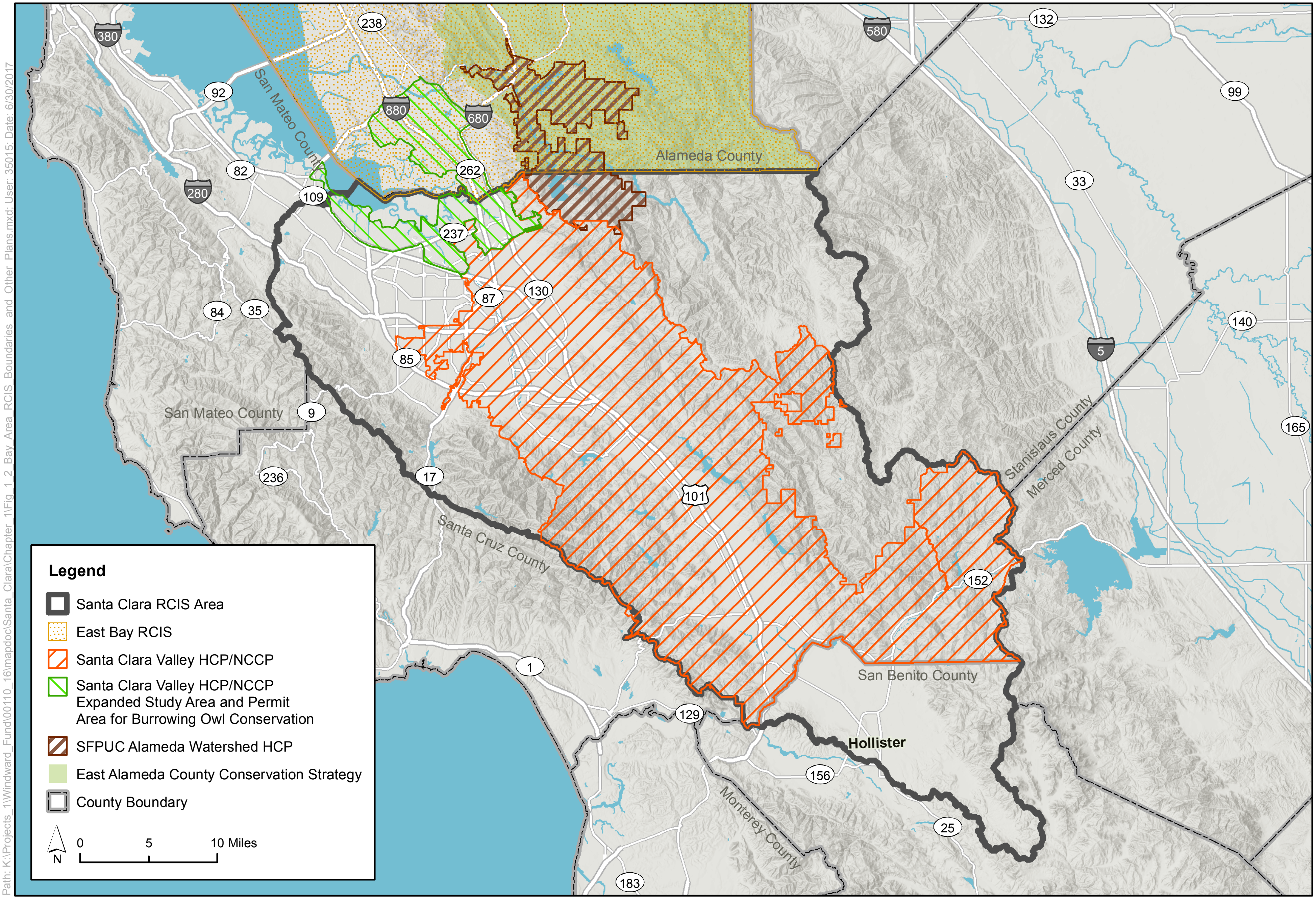

Figure 1-2
Regional Conservation Plans and Strategies within and Adjacent to the RCIS Area

Chapter 2
Environmental Setting

This chapter presents an overview of the natural resources and built environment in the regional conservation investment strategy (RCIS) area to provide context for this Santa Clara County RCIS's voluntary conservation and enhancement actions (Chapter 3, *Conservation Strategy*). This overview is comprised of the best available information on government planning bounadaries, major infrastructure, and natural resources for the RCIS area relevant to the focal species and the RCIS's conservation goals and objectives. The built environment in the RCIS area is described in the context of the following subject areas, as required in the California Fish and Game Code (CFGC) Section 1850.

- Reasonably foreseeable urban development.
- Major infrastructure, including water, transportation, and transmission infrastructure.

The environmental setting of the RCIS area is described for the following subject areas.

- Protected lands.
- Ecoregions
- Watersheds
- Natural communities, land cover types, and streams.
- Focal species

This chapter also identifies the following conservation elements that inform the conservation strategy

- Habitat connectivity
- Working landscapes
- Unique land cover types
- Serpentine soils

Finally, this chapter addresses the following stressors and pressures on conservation elements and focal species.

- Natural and agricultural land conversion
- Climate change
- Nonnative species and disease
- Loss of habitat connectivity
- Disruption of natural fire disturbance regimes
- Nitrogen deposition

2.1 Built Environment

This section describes the local government jurisdictions and plans, as well as the infrastructure in the RCIS area.

2.1.1 Local Government Planning Boundaries

CFGC 1852(c)(6) requires "consideration of . . . city and county general plan designations that accounts for reasonably foreseeable development of . . . housing in the RCIS area." This section describes urban development areas and city and county general plan designations that describe future urban development that is reasonably foreseeable.

2.1.1.1 RCIS Area Jurisdictions

The RCIS area includes all of Santa Clara County and a portion of San Benito County. Santa Clara County is 1,304 square miles (834,560 acres) and includes 15 incorporated cities. Nearly 92% of the population of Santa Clara County lives in its cities (Santa Clara County 2016). San Benito County is 1,390 square miles (889,600 acres) of which 156 square miles (99,839 acres, or 11.2% of the total county area) is part of the RCIS area. The only city in the San Benito County portion of the RCIS area is the City of Hollister.

2.1.1.2 Land Use Designations

Each city and county in the RCIS area is required by state law to develop and periodically update general plans that include land use designations that typically include uses for urban development at various densities, rural development, commercial development, institutional development, and open space. Table 2-1 and Figure 2-1 show the land use designations of the two counties and 16 cities in the RCIS area.

Table 2-1. Land Use Designations in the RCIS Area

City or Unincorporated County	Land Use Designations[1]
San Benito County (unincorporated)	Agriculture/Resource Extraction
Hollister	Agriculture/Resource Extraction, Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Santa Clara County (unincorporated)	Agriculture/Resource Extraction, Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential, Water
Campbell	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Residential
Cupertino	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Gilroy	Agricultural/Resource Extraction, Commercial, Education/Public/Semi-Public, Industrial, Parks/Open Space, Residential
Los Altos	Commercial, Education/Public, Industrial, Mixed Use, Parks/Open Space, Residential
Los Altos Hills	Education/Public/Semi-Public, Mixed Use, Parks/Open Space, Residential

City or Unincorporated County	Land Use Designations[1]
Los Gatos	Agricultural/Resource Extraction, Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Milpitas	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Monte Sereno	Commercial, Parks/Open Space, Residential
Morgan Hill	Agricultural/Resource Extraction, Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Mountain View	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Palo Alto	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
San Jose	Agricultural/Resource extraction, Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Water, Residential
Santa Clara	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential
Saratoga	Agricultural/Resource Extraction, Commercial, Education/Public/Semi-Public, Mixed Use, Parks/Open Space, Residential
Sunnyvale	Commercial, Education/Public/Semi-Public, Industrial, Mixed Use, Parks/Open Space, Residential

[1] Association of Bay Area Governments 2006, San Benito County 2015, Moore Iacofano Goltsman, Inc. 2005

In 2006, the Association of Bay Area Governments (ABAG) undertook efforts to collect land use data from all the cities and counties under its jurisdiction (Association of Bay Area Governments 2006). It aggregated the data, and grouped the many different land use designations into 14 simplified categories (Figure 2-1). The ABAG data is the most comprehensive and readily available land use dataset for the Bay Area.

The land use categories used in this Santa Clara County RCIS are listed below, along with a brief description of the type of development or other feature included under each category. These eight land use categories were aggregated from the 14 land used categories used by ABAG.[1]

- **Agriculture/Resource Extraction.** This land use category includes agriculture of all types and scales, from smaller row-crop farming operations to larger facilities such as nurseries. For a few municipalities, it also includes managed open space and areas designated as ranchlands. This category also includes almost all rangelands (for cattle grazing) that are not otherwise assigned a "Parks/Open Space" land use designation.
- **Commercial.** This land use category includes a number of different type of facilities that serve commercial or retail businesses. Examples include business centers, neighborhood commercial centers, research and development facilities, office spaces, roadside services, transit centers, hotels, and community and regional shopping centers.

[1] Land use data for the San Benito portion of the RCIS area was derived from the land use categories defined in the general plans of San Benito County and the City of Hollister. These land use types were cross-walked to be consistent with the 14 land use categories identified by ABAG.

- **Education/Public/Semi-Public.** This land use designation applies to facilities related to public and private education including school district lands, as well as schools and college campuses. It also applies to public service facilities including wastewater treatment plants, parking lots, maintenance yards, utility infrastructure, and correctional facilities.
- **Industrial.** This land use category includes light and heavy industrial uses that typically support industrial production (manufacturing), storage (warehousing), distribution, and repair.
- **Mixed Use.** In Table 2-1, the land use "Mixed Use" is associated with one or more of the following "mixed use" categories assigned by ABAG including:
    - Mixed Use
    - Mixed Use: Commercial & Industrial
    - Mixed Use: Other
    - Mixed Use: Residential & Commercial
    - Mixed Use: Residential & Industrial
    - Mixed Use: Residential & Parks/Open Space or Agriculture/Resource Extraction

  While the terminology varies by jurisdiction, the general term applies to areas that mix multiple other land uses, often including a residential component. In the RCIS area, these uses include historic preservation neighborhoods, combined industrial/commercial uses, institutional lands that also provide some amount of open space or commercial use, transit-oriented development (residential mixed with commercial near a public transit station), and medium- to high-density housing complexes.
- **Other/Unknown.** This land use category includes areas of planned development and special planning areas which did not fit into the other land use categories or areas where land use data was not available.
- **Parks/Open Space.** This land use category includes undeveloped land, excluding most rangelands (cattle grazing) across broad landscape and within residential areas. Examples include state and county parks, city parks, golf courses, fallow fields, and grassy hillsides surrounding residential development.
- **Residential.** This land use category includes residential areas of all sizes including rural residential areas, mixed residential, and low- and high-density residential areas.

2.1.2 Plan Bay Area

Plan Bay Area 2040 is a state-mandated, integrated long-range transporation and land use plan. As required by Senate Bill 375, all metropolitan regions in California must complete a Sustainable Communities Strategy as part of a Regional Transporation Plan. In the Bay Area, the Metropolitan Transporation Commission and the Association of Bay Area Governments are jointly responsible for developing and adapting the a Sustainable Communities Strategy that integrates transporation, land use, and housing to meet greenhouse gas reduction targets set by the California Air Resource Board. The region adopted its previous plan – Plan Bay Area – in July 2013 (Metropolitan Transporation Commission 2013). Plan Bay Area 2040 is a limited and focused update that builds upon the original Plan Bay Area, but with updated planning assumptions that incorporated key economic, demographic and financial trends from the previous four years (Metropolitan Transportation Commission 2017a).

Plan Bay Area 2040 provides a roadmap for accommodating projected household and employment growth in the nine-county Bay Area by 2040, as well as a transportation investment strategy for the region. Plan Bay Area 2040 is relevant to this Santa Clara County RCIS because it provides insight into geographic areas where reasonably foreseeable urban development may occur. Furthermore, Plan Bay Area links regional transportation planning and funding with regional and local population growth and future land use, and as such, also provides some insight into major infrastructure development as related to transportation (this issue is considered further in Section 2.2.2, *Transportation*). Plan Bay Area 2040 was based on local planning efforts; Santa Clara County and other San Francisco Bay Area cities and counties participated in its development. Plan Bay Area 2040 projects population growth, housing, and employment for the year 2040 under three scenarios, plus a "no project" alternative[2]. As projected for the three scenarios and no project alternative, by 2040 Santa Clara will make up a 20-52% share of total San Francisco Bay Area population growth, employment in Santa Clara will make up a 28-30% share of total San Francisco Bay Area employment growth, and there will be a housing increase of 137,000-442,000 units.

Plan Bay Area 2040 can be used to inform decision-making related to the challenges of future population growth in Santa Clara County; however, it is not intended to interfere with local land use authority and does not replace local general plans or community-specific plans. Plan Bay Area 2040 provides no regional authority over cities and counties to decide how and where land is developed or preserved. Local governments are encourage to utilize Plan Bay Area 2040 as a tool to inform land use and development decisions in the San Francisco Bay Area.

2.2 Major Infrastructure

CFGC 1852(c)(6) requires that an RCIS includes "consideration of major water, transportation and transmission infrastructure facilities . . . that accounts for reasonably foreseeable development of major infrastructure facilities, including, but not limited to, renewable energy . . . in the RCIS area." This section describes existing and reasonably foreseeable development of major infrastructure facilities in the RCIS area, including major water, transportation, transmission facilities, and renewable energy projects.

2.2.1 Water

Major water infrastructure in the RCIS area including canals, engineered channels, reservoirs, artificial marshes, artificial water features, and flood control channels are shown in Figure 2-2. Two major water districts in the RCIS area, and the major infrastructure managed by those districts, are described in Section 2.2.1.1, *Santa Clara Valley Water District*, and Section 2.2.1.2, *San Benito County Water District*.

[2] See Plan Bay Area 2040 for details about the three scenarios and the "no project" alternative, and projections for population growth, employment, and housing in Santa Clara County at: http://www.planbayarea.org/counties/focus-santa-clara-county

2.2.1.1 Santa Clara Valley Water District

The Santa Clara Valley Water District (SCVWD) manages and operates a complex and integrated water supply and flood management infrastructure network that includes dams, reservoirs, canals, pipelines, pump stations, percolation ponds, treatment plants, and recycled water facilities. With a significant portion of the water infrastructure approaching 40 to 50 years of age, SCVWD is carrying out major capital improvement projects to ensure each facility functions as intended. Some of the major capital improvement projects include the following:

- Seismic retrofit of SCVWD dams
- Dam instrumentation
- Canal rehabilitation and repair
- Flood protection and levee rehabilitation

The water district manages approximately 800 miles of creeks in Santa Clara County. To provide flood protection to the county's growing community, the district builds flood protection projects and administers an asset management program for its flood protection infrastructure. Among the major flood protections completed in recent years are 20 miles of flood protection improvements on the lower and downtown Guadalupe River projects, which protect an estimated 95,000 people who live or work along the river in cities of San Jose and Santa Clara. Flood protection and other creek-related projects include the following:

- Lower Berryessa Creek Flood Protection
- Upper Berryessa Creek Flood Risk Management
- Coyote Creek Flood Protection
- Cunningham Flood Detention Project
- Lower Llagas Creek Capacity Restoration Project
- Lower Penitencia Creek Improvements Project
- Upper Penitencia Creek Project
- San Francisquito Creek Flood Protection
- Federal Flood Insurance Program

2.2.1.2 San Benito County Water District

The San Benito County Water District manages the groundwater in the San Benito County portion of the Hollister-Gilroy basin, operates the San Benito River System and the San Felipe Distribution System, delivers imported Central Valley Project water to irrigation and municipal and industrial customers, and manages recharge through local streams. Current revenue-producing water use is about 42,500 acre feet per year. The District is governed by an elected five-member Board of Directors, and administered by the District Manager/Engineer. Current projects include the West Hills Water Treatment Plant project which is scheduled to be completed by the end of Sumemr 2017.

2.2.2 Transportation

This section describes the transportation agencies in the RCIS area. Figure 2-3 shows major transportation infrastructure within the RCIS area, including airports, transit hubs, transit priority areas, Statewide Transportation Improvement Program capital improvement projects, State highways, passenger railways, and rail stations.

2.2.2.1 Transportation Planning

Transportation planning agencies develop comprehensive strategies for transportation at the state, regional, or local level, in coordination with diverse groups of stakeholders. Major transportation planning agencies in the RCIS area include the Santa Clara Valley Transportation Authority (VTA) and the San Benito County Local Transportation Authority (LTA). These two agencies are described in the following sections.

Santa Clara Valley Transportation Authority

VTA is an independent special district that provides sustainable, accessible, community-focused transportation. VTA provides bus, light rail, and paratransit services, as well as participates as a funding partner in regional rail service including Caltrain, Capital Corridor, and the Altamont Corridor Express. As the county's congestion management agency, VTA is responsible for countywide transportation planning, including congestion management, design and construction of specific highway, pedestrian, and bicycle improvement projects, as well as promotion of transit-oriented development. VTA is planning the following major transportation projects in the RCIS area in approximately the next 10 years:

- Transit Projects
  - Capitol Expressway Light Rail Project
  - Rapid 523 Project
  - Santa Clara Pedestrian Undercrossing
- Highway Projects
  - VTA Silicon Valley Express Lanes Program
  - Interstate 280 (I-280)/Winchester Boulevard Interchange Improvements
  - I-280/Wolfe Road Interchange
  - Mathilda Avenue Improvements at SR 237 and U.S. Highway 101 (U.S. 101)
  - U.S. 101/Zanker Road Interchange
  - SR 85 to U.S. 101 Express Lanes Project

San Benito County Local Transportation Authority

LTA administers and operates public transportation services in the San Benito County. The LTA was established in October 1990 through a Joint Powers Agreement to transfer the operation, maintenance, and administration of County Express from the City of Hollister to the LTA. San Benito County Express provides transportation service to the communities of Hollister, San Juan Bautista, and Gilroy.

2.2.2.2 California High-Speed Rail Authority

The California High-Speed Rail Authority is responsible for the development of a high-speed rail system between Sacramento and San Diego, totaling approximately 800 miles with up to 24 stations. The San Jose to Merced Project Section (project section) is part of the first phase of the California High-Speed Rail System that will provide an approximately 84-mile passenger rail link between the RCIS area and the Central Valley, with an estimated travel time of one hour between San Jose and Gilroy to Merced or Fresno. The project section generally follows the Caltrain corridor and Union Pacific Rail Road corridor through San Jose, U.S. 101 through Morgan Hill and Gilroy, SR 152 through Pacheco Pass, and Henry Miller Road to Carlucci Road, approximately 8 miles east of Los Banos in Merced County (California High-Speed Rail Authority 2016). A train station for the California High-Speed Rail is planned in or near downtown Gilroy.

2.2.3 Transmission

Transmission facilities lines in the RCIS area include those supporting distribution of natural gas and electricity. Figure 2-4 shows transmission facilities in the RCIS area including transmission lines and natural gas pipelines.

2.2.3.1 Pacific Gas and Electric Company

Pacific Gas & Electric (PG&E) owns and operates all of the gas and electric transmission lines in the RCIS area. The company provides natural gas and electric service to approximately 16 million people throughout a 70,000-square-mile service area in northern and central California.

South County Power Connect

The proposed PG&E substation and transmission line project, referred to as “South County Power Connect” will increase the capacity of southern Santa Clara County’s electric system for at least 43,000 existing electric customers in Morgan Hill, Gilroy, and the surrounding communities. These upgrades will increase the redundancy of the transmission system serving the area and reduce local power outages due to transmission line disruptions. Maps of the project study area can be found at PG&E’s South County Power Connect website.[3]

2.2.4 Renewable Energy

Renewable energy projects are currently limited in the RCIS area. There are no large-scale (i.e., commercial scale) renewable energy projects planned in the RCIS area. Instead, renewable energy projects tend to be at the scale of individual residences (e.g., residential solar) or approximately 10 acres or less. The following is a list of renewable energy projects planned in Santa Clara County.

- Santa Clara County Renewables for Revenue
- Guadalupe Parkway Solar Photovoltaic (PV) Project
- Hellyer County Park Solar PV Site
- Malech Road Solar PV Site
- Holden Ranch Solar PV Site

[3] https://www.pge.com/en_US/safety/electrical-safety/safety-initiatives/south-county/details.page

- Reid Hillview Airport Solar PV Site
- San Martin Airport Solar PV Site

2.3 Natural Environment

2.3.1 Protected Areas

The RCIS area includes existing *protected areas*, which are 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. Protected areas include large parks and open space areas that are managed primarily for their ecological functions and values. Protected areas may also include semi-developed areas such as recreational parks that maintain some ecological value.

2.3.1.1 Methods

A geographic information system (GIS) dataset of protected areas was compiled for this Santa Clara County RCIS to inform the development of the conservation strategy (Chapter 3, *Conservation Strategy*). This dataset is used to identify gaps in protection (e.g., of focal species populations, habitat, movement corridors, or other natural resources), develop conservation goals and objectives, and prioritize conservation opportunities, and identify land for acquisition. This section identifies the datasets used to compile the protected areas dataset, and methods used to curate these data for this Santa Clara County RCIS.

Data from the following sources were used to compile a protected areas database for this Santa Clara County RCIS.

- California Protected Areas Database (CPAD) (California Protected Areas Database 2016).
- California Conservation Easement Database (CCED) (California Conservation Easement Database 2015).
- GIS data from the Santa Clara Valley Open Space Authority and the Midpeninsula Regional Open Space District for recently protected areas not yet included in CPAD or CCED.

The CPAD and CCED data were clipped to the RCIS area to create the protected areas GIS data layer. All protected areas in the CPAD that were owned by cities and under 100 acres were removed from the dataset. This was done to remove small city parks, golf courses, and other urban protected areas from the dataset, which often provide minimal ecological value and would likely be unimportant for the conservation strategy. In some cases, small urban parks and other protected areas protect streams and riparian areas, which provide important habitat for aquatic and terrestrial species. Where appropriate, the conservation strategy (Chapter 3, *Conservation Strategy*) identifies conservation actions and priorities to benefit steelhead, salmon, and other species in stream lengths in urban and non-urban areas, regardless of whether they pass through small urban parks not included in this Santa Clara County RCIS's protected areas dataset.

Mitigation and conservation banks located in the RCIS area and/or with service areas that overlap the RCIS area were identified from the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and U.S. Army Corps of Engineers (Corps) bank websites[4].

2.3.1.2 Types of Protected Areas

Protected areas in the RCIS area vary according to the mechanisms by which the land is protected (e.g., fee title, conservation easement, agricultural easement) and the degree to which land is protected for its ecological values (e.g., land protected primarily for the conservation of natural resources; land protected for multiple uses, including conservation and recreation; or land protected primarily for recreation.). All types of protected areas were included in the dataset. The types of protected areas in the RCIS area include the following:

- Mitigation/conservation banks.
- Land with conservation easement.
- Local or regional parks.
- State or federal wilderness areas.
- State parks.
- Agricultural easements for livestock grazing, dryland farming, or cultivated agriculture.
- Undeveloped portions of land under ownership by a public agency.
- Public golf courses (i.e., private golf courses are not included because they are private).
- Developed neighborhood parks.

There are 249,693 acres of protected area in the RCIS area, comprised of land protected in fee title only (194,557 acres), through conservation easement only (42,086 acres), or both (13,050 acres) (Figure 2-5). Collectively, these protected areas provide important habitat for focal species and public recreational opportunities. The largest landowners in the RCIS area are the State of California (approximately 70,000 acres) and Santa Clara County (approximately 70,000 acres). Publicly owned protected lands total approximately 204,000 acres within the RCIS area. The largest owners of conservation easements within the RCIS area is The Nature Conservancy (43,706 acres) and Midpeninsula Regional Open Space District (3,335 acres).

2.3.1.3 Conservation and Mitigation Banks

CFGC 1852(b)(12) requires that an RCIS provide, "a summary of mitigation banks and conservation banks approved by the department or the United States Fish and Wildlife Service that are located within the strategy area or whose service area overlaps with the strategy area." The Program Guidelines (California Department of Fish and Wildlife 2017a) further specify that the summary

[4] Up-to-date information on approved conservation and mitigation banks can be found at the following USFWS, CDFW, and Corps websites: https://www.fws.gov/sacramento/es/Conservation-Banking/Banks/In-Area/es_conse-bank-in-area.htm

https://www.wildlife.ca.gov/Conservation/Planning/Banking/Approved-Banks

http://www.spn.usace.army.mil/Missions/Regulatory/Mitigation-Banks/Approved-Banks-for-the-San-Francisco-Regulatory-Di/

include banks approved by the Corps, as well as information on the types of credits available and where information can be found on the number of available credits.

Conservation and mitigation banks are areas of preserved, restored, enhanced, or constructed habitats (for example, wetlands) that are set aside for the express purpose of providing mitigation for project impacts on wetlands, threatened and endangered species, and other sensitive resources. CFGC 1797.5 defines terms associated with mitigation banking in California. In summary, a conservation or mitigation bank is privately or publicly owned land that is managed for its natural resource values, with an emphasis on the targeted resource (species or aquatic resources, respectively). Overseeing agencies typically require that the establishment of a mitigation bank include the restoration or creation of aquatic resources. Conservation banks may include restoration or creation projects, but they are more heavily focused on the protection and management of existing occupied habitats of the target species. In exchange for permanently protecting and managing the land—and in the case of mitigation banks, restoring or creating aquatic resources—the bank operator is allowed to sell credits to project proponents who need to satisfy legal requirements for compensating environmental impacts of development projects.[5]

There are four conservation banks and one mitigation bank with available credits whose service area overlaps the RCIS area (Figure 2-6).

- The **Ohlone West Conservation Bank** occurs within Southern Alameda County and is contiguous with watershed lands owned by the San Francisco Public Utilities Commission and wilderness preserves of the East Bay Regional Park District. The Ohlone West Conservation Bank offers credits for the California tiger salamander and California red-legged frog focal species within the RCIS area.
- The **Pleasanton Ridge Conservation Bank** is located in Alameda County. The bank, which totals 654 acres, is owned by the East Bay Regional Park District and offers credits for the California red-legged frog focal species within the RCIS area.
- The **Sparling Ranch Conservation Bank** is located in southeastern Santa Clara County. The bank is owned by Southbay Conservation Resources LLC and offers credits for California tiger salamander within the RCIS area.
- The **Pajaro River Mitigation Bank** is located in San Benito County in the RCIS area, with a service area that includes the RCIS area. The bank is owned by Wildlands and offers credits for jurisdictional wetlands and waters.

2.3.1.4 Protected Areas Adjacent to the Strategy Area

There are many protected areas that are connected to, but are just outside of the RCIS area. These areas provide landscape connectivity between the RCIS area and the entire south San Francsico Bay region (Figure 2-5). The north side of the RCIS area includes portions of the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge). The Refuge extends outside of the RCIS area into adjacent Alameda County, providing connectivity for baylands natural communities to the north. Further east along the northern border the San Francisco Public Utilities Commission's Alameda Watershed is a large watershed protected for drinking water. This protected area includes annual grassland, chaparral and coastal scrub natural communities extending to the north of the RCIS area

[5] For additional information on banking see the following websites:
<www.dfg.ca.gov/hcpb/conplan/mitbank/mitbank.shtml> and <www.fws.gov/sacramento/es/cons_bank.htm>.

in Alameda County. This is the northernmost portion of several connected protected areas that extend along the Diablo Range, well into the RCIS area. On the east side of the RCIS area, Henry W. Coe State Park straddles the border of the RCIS area with Stanislaus County. Over one-third of the park lies outside of the RCIS area in adjacent Stanislaus County. Most of that area is dedicated as the Orestimba Wilderness Area. The 87,000 acre park provides landscape connectivity between the RCIS area and the more rugged interior of the Diablo Range. Along the western boundary of the RCIS area are a series of protected areas in the Santa Cruz Mountains, extending from the Forest of Nisene Marks and the Soquel Demonstration Forest north along the RCIS area boundary to Windy Hill Open Space Preserve (OSP) in San Mateo County. In between, protected areas such as the Skyline Ridge OSP, Long Ridge OSP, and Castle Rock State Park provide connectivity between redwood and coastal scrub natural communities in the RCIS area and in Santa Cruz County, adjacent to the RCIS area.

2.3.2 Ecoregions

CFGC 1852(c)(2) states that an RCIS shall include ". . . a description of the surrounding ecoregions…. that provide relevant context for the development of the strategy." Furthermore, CFGC 1852(c)(14) states that an RCIS shall include "incorporation and reliance on, and citation of, the best available scientific information regarding the RCIS area and the surrounding ecoregion, including a brief description of gaps in relevant scientific information, and use of standard or prevalent vegetation classifications and standard ecoregional classifications for terrestrial and aquatic data to enable and promote consistency among regional conservation investment strategies throughout California." This section provides a description of the ecoregions that overlap and surround the RCIS area, according to the U.S. Department of Agriculture classification (McNab et al. 2007), as required by the Program Guidelines (California Department of Fish and Wildlife 2017).

Ecoregions are areas of general similarity in ecosystems based on major terrain features such as a desert, plateau, valley, mountain range, or a combination thereof as defined by the U.S. Department of Agriculture. They provide a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions can be effective units for setting regional conservation goals, as well as developing biological criteria and water quality standards.

Ecoregions are hierarchical, and are identified based on patterns of biotic and abiotic phenomena, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. North America is divided into different ecological units from coarsest to finest (ecoregions (i.e., provinces), subregions (i.e., sections), landscapes, and land units). The RCIS areas overlaps with two ecoregions, and within each of the ecoregions there is one subregion that overlaps the RCIS area (Figure 2-7). The ecoregions and subregions that overlap the RCIS area are described in Section 2.3.2.1, *California Coastal Chaparral Forest and Shrub Province*, and Section 2.3.2.2, *California Coastal Range Open Woodland-Shrub-Coniferous Forest-Meadow Province*, based on the descriptions provided by the United State Department of Agriculture (McNab et. al. 2007).

2.3.2.1 California Coastal Chaparral Forest and Shrub Province

The California Coastal Chaparral Forest and Shrub Province overlaps with the eastern portion of the RCIS area (Figure 2-7). This province covers much of the California coast from San Francisco to Baja. The primary distinguishing characteristic of this ecoregion is its Mediterranean climate of hot, dry summers and cool, moist winters, and associated vegetative cover comprising primarily chaparral and woodlands. The landscape is composed of coastal plains and high hills. Large areas are ranchland and are grazed by domestic livestock. Relatively little land has been cultivated. The

Central California Coast Section occurs within the California Coastal Chaparral Forest and Shrub Province in the RCIS area.

Central California Coast Section

The Central California Coast Section in the RCIS area is comprised of low- to- moderate elevation ranges and valleys. Bedrock is sedimentary, granitic, and ultramafic formations. The vegetation is composed of a mixture of western hardwoods, chaparral, and California annual grassland land cover types.

2.3.2.2 California Coastal Range Open Woodland-Shrub-Coniferous Forest-Meadow Province

The California Coastal Range Open Woodland-Shrub-Coniferous Forest-Meadow Province overlaps the eastern portion of the RCIS area (Figure 2-7). This province covers much of California from San Francisco to Baja. The ecoregion has a Mediterranean climate of hot, dry summers and cool, moist winters, and most precipitation is rain. Associated vegetative cover is comprised of evergreen shrubland, with lesser areas of woodland, consisting of broadleaf species, some of which are drought-deciduous. The Central California Coast Ranges Section occurs within the California Coastal Range Open Woodland-Shrub-Coniferous Forest-Meadow Province in the RCIS area.

Central California Coast Ranges Section

The Central California Coast Ranges Section covers the eastern half of the RCIS area. The landscape is low-elevation parallel ranges. Rock formations are have marine and nonmarine sedimentary origins. The vegetation is composed of western hardwoods, annual grassland, and chaparral.

2.3.3 Watersheds

Fifteen major watersheds[6] that overlap with or occur completely within the RCIS area: San Francisco Bay, Agua Caliente Creek, Alameda Creek, Arroyo Mocho, Arroyo Valle, Arroyo Hondo, Lower Coyote Creek, Saratoga Creek, Guadalupe River, Upper Coyote Creek, Llagas Creek, Pacheco Creek, Uvas Creek, Pajaro River, and Tequisquita Slough (Figure 2-8). These watersheds catch precipitation and runoff from storm drains and carry the water north to San Francisco Bay or south to Monterey Bay. Table 2-2 summarizes the amount of and major streams within each HUC-10 watershed that overlaps with the RCIS area.

[6] For the purpose of this Santa Clara County RCIS, major watersheds are identified at the level of the U.S. Geological Survey's 10-digit Hydrologic Unit Code (HUC 10).

Table 2-2. HUC-10 Watersheds in RCIS Area

Watershed Name	Area of Entire Watershed (acres)	Area (acres) and percent of RCIS Area	Major Creeks in Watershed[1] (length in miles)
Upper Coyote Creek	124,575	124,567 (13.3%)	Coyote Creek (21.7) East Fork Coyote Creek (10.5) Middle Fork Coyote Creek (19.5) San Felipe Creek (14.5)
Guadalupe River	116,314	116,019 (12.4%)	Alamitos Creek (7.7) Canos Creek (7.3) Guadalupe Creek (9.8) Los Gatos Creek (24.8)
Pacheco Creek	107,426	107,361 (11.5%)	North Fork Pacheco Creek (16.5) Pacheco Creek (17.4) South Fork Pacheco Creek (10.3) Mississippi Creek (9.1)
Saratoga Creek	124,493	103,321 (11.1%)	Calabazas Creek (13.0) San Tomas Aquinas Creek (12.8) Saratoga Creek (18.0) Stevens Creek (21.1)
Lower Coyote Creek	95,379	95,379 (10.2%)	Coyote Creek (32.0) Berryessa Creek (9.8) Thompson Creek (14.1) Upper Penitencia Creek (11.7)
Tequisquita Slough	74,405	74,405 (8.0%)	Arroyo De Las Viboras (14.7) Arroyo Dos Picachos (9.0) Santa Anna Creek (21.7) Tequisquita Slough (7.1)
Arroyo Valle	107,152	61,503 (6.6%)	Arroyo Bayo (8.9) Arroyo Valle (10.8) Colorado Creek (10.2) San Antonio Creek (15.5)
Arroyo Hondo	63,397	60,482 (6.5%)	Arroyo Hondo (9.4) Calaveras Creek (7.9) Isabel Creek (18.7) Smith Creek (13.9)
Llagas Creek	54,113	54,113 (5.8%)	Llagas Creek (30.9) Little Llagas Creek (7.2) Santa Clara Conduit (10.1) Miller Slough (5.0)
Uvas Creek	55,487	55,323 (5.9%)	Bodfish Creek (8.0) Uvas Creek (24.3) Tar Creek (8.3) Little Uvas Creek (5.1)
Pajaro River	117,917	42,639 (4.6%)	Pajaro River (9.6) Santa Clara Conduit (6.4)

Watershed Name	Area of Entire Watershed (acres)	Area (acres) and percent of RCIS Area	Major Creeks in Watershed[1] (length in miles)
			San Ysidro Creek (5.6) Pescadero Creek (5.0)
San Francisco Bay	202,844[2]	18,392 (2.0%)	Alviso Slough (4.3) Guadalupe Slough (6.1) Coyote Creek (3.6) Adobe Creek (2.5)
Alameda Creek	86,620	15,187 (1.6%)	Alameda Creek (12.5) Valpe Creek (2.3)
Arroyo Mocho	62,158	3,970 (0.4%)	Arroyo Mocho (4.0) Tarraville Creek (0.3)
Agua Caliente Creek	40,728	761 (0.1%)	Scott Creek (2.6)
Total	**1,433,008**	**933,423 (99.9%)[3]**	**---**

[1] Includes up to four of the longest creeks in each watershed; this is not a comprehensive list of all creeks in each watershed.
[2] The amount of San Francisco Bay within Santa Clara County.
[3] The total does not equal 100% because the RCIS boundary includes trace amounts of nine additional watersheds.

2.3.4 Natural Communities and Land Cover

All RCISs are required to identify "important resource conservation elements within the RCIS area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements" (CFGC 1852 (c)(4)). This Santa Clara County RCIS uses a detailed GIS-based map of land cover types within the RCIS area to spatially characterize the distribution of natural communities and habitat.

A *land cover type* is defined as the dominant character of the land surface discernible from aerial photographs or other remotely sensed imagery, as determined by vegetation, water, or human uses. Land cover types are the most widely used units in conservation planning to analyze a variety of landscape characteristics, including natural communities, wetlands and streams, species' habitat, ecosystem function, and biological diversity. Land cover is often a function of a variety of physical and biological factors such as plant and animal associations, soil type, topography, climate, and land uses.

The land cover dataset is an important tool for developing this Santa Clara County RCIS's conservation strategy (Chapter 3, *Conservation Strategy*). Amongst its many uses, the land cover data were used to model focal species' habitat, identify gaps in conservation of habitat and other natural resources, set measurable conservation goals and objectives, and identify conservation priorities to achieve the goals and objectives.

2.3.4.1 Methods and Data Sources

The Santa Clara County RCIS land cover dataset was assembled using the following existing land cover data.

- Detailed land cover mapping conducted in 2005 and 2006, based on aerial photos from 2000, 2003, and 2004 for the Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (Habitat Plan) in Santa Clara County.[7]
- Land cover data compiled by the Conservation Lands Network (CLN)[8] (Bay Area Open Space Council 2011) for the entire 9-County San Francisco Bay Area (from 2011). The CLN land cover map is widely used throughout the Bay Area by open space and planning agencies.
- California Department of Forestry and Fire Protection's Fire and Resource Assessment Program (FRAP)[9]—a statewide map of best available land cover data spanning a period from 1990 to 2014, cross-walked into the California Wildlife Habitat Relationships system. The FRAP land cover map is widely used throughout the state of California by open space and planning agencies.
- The Bay Area Aquatic Resource Inventory, version 2.0 (BAARI) Baylands[10] and Wetlands[11] datasets—detailed base maps of the San Francisco Bay Area's aquatic features, mapped by the San Francisco Estuary Institute from 2009 to 2016, based on aerial imagery and other data sources.
- National Wetlands Inventory (NWI) Version 2.0,[12] delineating the areal extent of wetlands and surface waters.
- Inventory of agricultural resources in San Benito County from the Farmland Mapping and Monitoring Program (FMMP),[13] used to identify and classify farmland in the San Benito County portion of the RCIS area.
- Serpentine soil map units from the Soil Survey Geographic (SSURGO) databases covering eastern Santa Clara County[14] and western Santa Clara County,[15] which were used to identify and classify serpentine land cover types (Natural Resources Conservation Service 2016).

These datasets represent the best available information in the RCIS area in terms of mapping accuracy, resolution, and consistency within and outside the RCIS area.

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[7] Santa Clara Valley Habitat Conservation Plan Land Cover, 2010. ICF International.

[8] Conservation Land Network Vegetation May 2011. Bay Area Open Space Council. Available: URL: http://www.bayarealands.org/mapsdata.html. Accessed March 14, 2016.

[9] FRAP Vegetation, 2015. CALFIRE-FRAP. Available: URL: http://frap.fire.ca.gov/data/frapgisdata-sw-fveg_download. Accessed March 16, 2016.

[10] BAARI Baylands, 2015. San Francisco Estuary Institute and Aquatic Science Center. Available: URL: http://www.sfei.org/data/baari-version-20-gis-data. Accessed June 9, 2016.

[11] BAARI Wetlands, 2015. San Francisco Estuary Institute and Aquatic Science Center. Available: URL: http://www.sfei.org/data/baari-version-20-gis-data. Accessed June 9, 2016.

[12] National Wetlands Inventory Version 2, 2016. United States Fish and Wildlife Service. Available: URL: https://www.fws.gov/wetlands/Data/State-Downloads.html. Accessed July 6, 2016.

[13] San Benito County Important Farmland, 2012. California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program. Available: URL: ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/2012/

[14] Eastern Santa Clara Area, California. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database. Available online at http://sdmdataaccess.nrcs.usda.gov/. Available: URL: August 15, 2016.

[15] Santa Clara Area, California, Western Part. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database. Available online at http://sdmdataaccess.nrcs.usda.gov/. Available: URL: August 15, 2016.

The land cover dataset was assembled using a two-step approach, as described in the following two sections: first, the terrestrial land cover dataset was assembled first, after which the wetland and Bayland dataset was assembled and integrated into the terrestrial land cover dataset.

Terrestrial Land Cover

The land cover data from the Habitat Plan provided the foundation for the Santa Clara County RCIS land cover dataset, to provide consistency between the Habitat Plan and the RCIS. However, the Habitat Plan land cover data only covers the Habitat Plan's plan area, which is approximately 56% of the RCIS area. CLN and FRAP land cover data were used for the remainder of the RCIS area not covered by the Habitat Plan's land cover data. To create a unified terrestrial land cover dataset for the RCIS, the land cover classifications from CLN and FRAP were cross-walked to the Habitat Plan's classification by matching similar CLN and FRAP land cover types, based on comparable species assemblages, to the Habitat Plan's land cover types (Table 2-3a, *Crosswalk of Santa Clara County RCIS Terrestrial Land Cover Types to other State and Local Classification Systems*).

Table 2-3a. Crosswalk of Santa Clara County RCIS Terrestrial Land Cover Types to other State and Local Classification Systems

Santa Clara County RCIS Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	California Department of Forest and Fire Protection's Fire and Resources Assessment Program Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	Conservation Lands Network Land Cover Type
Grassland					
California annual grassland	42.000.00	Annual grassland	Annual Grassland; Pasture	California Annual Grassland	Coastal Terrace Prairie; Hot Grasslands; Moderate Grasslands; Nonnative / Ornamental Grass; Warm Grasslands
Serpentine grassland	41.280.00	Annual grassland, Perennial grassland	Annual Grassland	Serpentine Bunchgrass Grassland; California Annual Grassland	Hot Grasslands; Moderate Grasslands; Serpentine Grassland; Warm Grasslands
Serpentine rock outcrop	N/A[1]	N/A	Rock outcrop	Serpentine Rock Outcrop / Barren[a]	None
Barren/Rock	N/A	N/A	Barren	Barren; Rock Outcrop	Barren / Rock
Shrublands					
Northern mixed chaparral/chamise chaparral	37.000.01 37.101.00 32.120.00	Mixed chaparral / chamise-redshank/ alkali desert scrub/desert scrub	Mixed Chaparral; Chamise-Redshank-Chaparral	Northern Mixed Chaparral/ Chamise Chaparral	Chamise Chaparral; Mixed Chaparral; Mixed Montane Chaparral; Semi-Desert Scrub / Desert Scrub
Serpentine chaparral	37.000.06	Mixed chaparral	Mixed chaparral; Chamise-Redshank Chaparral	Coyote Brush Scrub; Mixed Serpentine Chaparral; Northern Coastal Scrub / Diablan Sage Scrub; Northern Mixed Chaparral / Chamise Chaparral	Chamise Chaparral; Coastal Scrub; Mixed Montane Chaparral; Semi-Desert Scrub / Desert Scrub; Serpentine Leather-Oak Chaparral; Serpentine Scrub

Santa Clara County RCIS Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	California Department of Forest and Fire Protection's Fire and Resources Assessment Program Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	Conservation Lands Network Land Cover Type
Northern coastal scrub/ Diablan sage scrub	32.000.00	Coastal scrub	Coastal Scrub/Perennial Grassland	Northern Coastal Scrub / Diablan Sage Scrub/ Coyote Brush Scrub	Coastal Scrub
Woodland					
Blue oak woodland	72.020.00	Blue oak woodland	Blue oak woodland	Blue Oak Woodland	Black Oak Forest / Woodland
Valley oak forest/ woodland	71.040.05	Valley oak woodland	Valley oak woodland	Valley Oak Woodland	Valley Oak Forest / Woodland
Coast live oak forest and woodland	71.060.00	Coastal oak woodland	Coastal oak woodland	Coast Live Oak Forest and Woodland	Coast Live Oak Forest / Woodland
Mixed oak woodland and forest	81.100.00	N/A	N/A	Mixed Oak Woodland and Forest	Canyon Live Oak Forest
Montane hardwoods	74.100.00 73.100.00	Montane hardwood-conifer	Montane Hardwood	N/A	California Bay Forest/Montane Hardwoods
Serpentine hardwoods	N/A	N/A	Coastal Oak Woodland; Montane Hardwood	Blue Oak Woodland; Coast Live Oak Forest and Woodland; Mixed Oak Woodland and Forest	Blue Oak Forest / Woodland; California Bay Forest; Coast Live Oak Forest / Woodland; Montane Hardwoods; Serpentine Hardwoods

Santa Clara County RCIS Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	California Department of Forest and Fire Protection's Fire and Resources Assessment Program Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	Conservation Lands Network Land Cover Type
Conifer Forest					
Douglas fir forest	82.200.00	Douglas fir	N/A	Mixed Evergreen Forest	Douglas Fir Forest
Serpentine conifer	N/A	N/A	N/A	Foothill Pine–Oak Woodland; Mixed Evergreen Forest; Redwood Forest	Blue Oak / Foothill Pine Woodland; Douglas Fir Forest; Serpentine Conifer
Coulter pine forest	87.090.00	Valley-foothill hardwood-conifer	N/A	N/A	Coulter Pine Forest
Knobcone pine forest	87.100.00	Closed-cone pine-cypress	N/A	Knobcone Pine Forest	Knobcone Pine Forest
Ponderosa pine woodland	87.090.00	Ponderosa pine	Blue Oak-Foothill Pine	Ponderosa Pine Woodland; Foothill Pine–Oak Woodland	Blue Oak / Foothill Pine Woodland
Redwood forest	86.100.00	Redwood	N/A	Redwood Forest	Redwood Forest
Riparian Woodland					
Central coast riparian forest	61.900.00	Valley-foothill riparian	Valley Foothill Riparian/Riverine	Willow Riparian Forest and Scrub	Central Coast Riparian Forests
Sycamore alluvial woodland	63.310.00	Valley-foothill riparian	N/A	Central California Sycamore Alluvial Woodland; Mixed Riparian Forest and Woodland	Sycamore Alluvial Woodland

Santa Clara County RCIS Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	California Department of Forest and Fire Protection's Fire and Resources Assessment Program Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	Conservation Lands Network Land Cover Type
Serpentine riparian	N/A	N/A	N/A	Central California Sycamore Alluvial Woodland; Mixed Riparian Forest and Woodland; Willow Riparian Forest and Scrub	Serpentine Riparian
Cultivated Agriculture					
Cultivated–undetermined	N/A	N/A	N/A	N/A	Cultivated
Developed agriculture	N/A	Urban-Agriculture	N/A	Agriculture developed	N/A
Grain, row-crops, hay and pasture/disked/rice	N/A	Dryland grain crops/ croplands/ irrigated grain crops/irrigated hayfield/irrigated row and field crops	Cropland; Dryland Grain Crops; Irrigated Grain Crops; Irrigated Hayfield; Irrigated Row and Field Crops; Rice	Grain, Row-crop, Hay & Pasture, Disked	N/A
Orchard	N/A	Deciduous orchard/ evergreen orchard /orchard-vineyard	Deciduous Orchard; Evergreen Orchard; Orchard-Vineyard	Orchard	N/A
Vineyard	N/A	Vineyard	Vineyard	Vineyard	N/A

Santa Clara County RCIS Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	California Department of Forest and Fire Protection's Fire and Resources Assessment Program Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	Conservation Lands Network Land Cover Type
Urban					
Urban	N/A	Urban/Residential-Park	Urban	Urban-suburban/golf courses/urban parks/landfill/ornamental woodland	Urban; Eucalyptus; Nonnative ornamental conifer/hardwood mixture/ornamental hardwood/rural residential
Rural residential	N/A	Urban	N/A	Rural-residential	Rural Residential
Ornamental woodland	N/A	Eucalyptus, Urban	N/A	Ornamental woodland	Eucalyptus; Nonnative / Ornamental Conifer; Nonnative / Ornamental Hardwood; Nonnative Ornamental Conifer-Hardwood Mixture

[a] This land cover type is often undermapped because it often occurs in areas smaller than minimum mapping unit.

RCIS = regional conservation investment strategy; HCP/NCCP = Habitat Conservation Plan/Natural Community Conservation Plan; N/A = The corresponding classification system does not have a similar land cover type that can be cross-walked to the RCIS type

Terrestrial land cover data covereage from the Habitat Plan were used in its entirety. CLN land cover data were applied to areas outside of the Habitat Plan boundary. FRAP land cover data were used in the San Benito County portion of the RCIS area where there is no coverage by the Habitat Plan or CLN data. The FRAP dataset identified a large extent of the RCIS area in San Benito County as California annual grassland. Aerial images, however, indicated that some of this California annual grassland had been furrowed or tilled. Areas classified as Farmland of Local Importance from the FMMP dataset were used in San Benito County portion of the RCIS area to identify and classify land cultivated as dry cropland that had been generally classified as California annual grassland in the FRAP dataset. The Farmland of Local Importance dataset was selected from other FMMP datasets to refine the land cover mapping in San Benito County because the Farmland of Local Importanct dataset provided the clearest distinction of the underlying agricultural land cover. The minimum mapping unit ranged from 0.2 acres to 10 acres, depending on the land cover type and data source. Figure 2-9 depicts the source of land cover data used to map land cover in the RCIS area.

There were several idiosyncrasies when adapting the land cover types from different sources for this Santa Clara County RCIS. Serpentine rock outcrop and barren/rock were included in the grassland natural community for consistency with the Habitat Plan. In the CLN dataset, underlying vegetation types on parcels less than 10 acres are classified as rural residential. For the RCIS dataset, where CLN data were used, the rural residential classifications were removed and the original CLN vegetation types were restored. Rural residential was retained as a land cover type where it is included in the other data sources.

In addition, the SSURGO database was reviewed to identify soils in the RCIS area with a potential serpentine component (includes serpentine, ultrabasic, and alluvium derived from serpentine). These areas were overlaid onto the existing nonserpentine land cover types, and land cover types were reclassified into serpentine land cover types where the extent of serpentine soils in each GIS mapping unit was greater than or equal to 30% (Figure 2-10). This approach is consistent with the Habitat Plan's mapping of serpentine soils, which generally corresponds to a cut-off of 30% or greater of the soil map unit being serpentine. See Section 2.5.4, *Serpentine Soils*, for more details on serpentine soils in the RCIS area.

Wetland and Baylands Land Cover

Data from the following five sources were used to develop a wetland and baylands land cover layer that was integrated into the terrestrial land cover data.

- BAARI Wetlands
- BAARI Baylands
- Habitat Plan land cover
- NWI Version 2.0
- SSURGO

BAARI Wetlands data were used as the primary building block for the wetland and baylands land cover layer, due to its currency (published in 2015) and high-quality mapping standards. BAARI wetland types were cross-walked into the RCIS land cover types (Table 2-3b, *Crosswalk of Santa Clara County RCIS Wetland and Bayland Land Cover Types to other State and Local Classification Systems*). Types including seeps or springs were overlaid with select SSURGO map units representing potential serpentine soils to identify serpentine seeps and springs. This cross-walked and modified BARRI data served as the foundation of the wetland land cover layer.

Additional datasets were needed to provide wetland data where not covered by the BAARI data (BAARI only covers watersheds within Santa Clara County). Wetland types were then cross-walked from the Habitat Plan's land cover dataset and added only in areas not already covered by BAARI Wetlands. Select riverine types from the NWI Version 2 data, which were already represented by a separate stream dataset represented as lines (Stream Layer, below), were removed to avoid duplication with the separate linear stream dataset. The remaining types were added in areas not already covered by BAARI wetlands or the Habitat Plan's land cover dataset. Types removed included select linear shaped palustrine and riverine features primarily mapped in the higher elevations in the RCIS area. The types removed were:

- Palustrine Emergent (PEM)
- Palustrine Forested (PFO)
- Palustrine Scrub-Shrub (PS)
- Riverine Intermittent (R4)
- Riverine Upper Perennial (R3)
- Riverine Unknown Perennial (R5)

BAARI Baylands were added to the dataset to provide coverage in the baylands portion of the RCIS area. All BAARI Bayland types were added and cross-walked to RCIS land cover types. Overlapping wetlands from the above datasets were overwritten. The minimum mapping unit varies across the source datasets, the smallest being less than 0.025 acre for small features such as seeps and springs (BAARI wetlands) and 25 meters (82 feet) for minimum mapping length of nontidal unnatural channels. This compilation of wetlands and baylands was then integrated into the terrestrial land cover dataset and overwrote overlapping terrestrial land cover. Table 2-4 summarizes the amount of each wetland and baylands land cover type in each watershed within the RCIS area.

Table 2-3b. Crosswalk of Santa Clara County RCIS Wetland and Bayland Land Cover Types to other State and Local Classification Systems

Santa Clara County RCIS Land Cover Type	BAARI Baylands Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	BAARI Wetlands Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	National Wetland Inventory Land Cover Types[2]
Baylands						
Shallow bay	Shallow Bay	N/A[1]	Marine	Lacustrine	N/A	E1UBL, E2SBNh, E2SBNx, E2SMh, E2USNh
Tidal bay flat	Tidal Bay Flat	N/A	Estuarine	Lacustrine	N/A	N/A
Tidal unnatural	Lagoon Perennial Open Water Unnatural; Tidal Ditch; Tidal Engineered Channel	N/A	Estuarine	Riverine	N/A	N/A
Tidal vegetation	Lagoon Perennial Vegetation Unnatural; Tidal Marsh Flat; Tidal Panne; Tidal Vegetation	52.112.00	Estuarine/Fresh water emergent wetland/non-forested wetland/Saline emergent wetland	Playa open water unnatural/ playa unvegetated flat unnatural/ Playa vegetated unnatural	N/A	E2EM1N, E2EM1Nh
Wetland and Pond						
Perennial freshwater marsh	N/A	52.100.01	Freshwater emergent wetland	Depressional vegetated natural; Depressional Vegetation Unnatural; Lacustrine Vegetated unnatural	Coastal Valley and Freshwater Marsh	L2EM2Fh

Santa Clara County RCIS Land Cover Type	BAARI Baylands Land Cover Type	California Department of Fish and Wildlife Vegetation Code	California Wildlife Habitat Relationships Habitat Type	BAARI Wetlands Land Cover Type	Santa Clara County HCP/ NCCP Land Cover Type	National Wetland Inventory Land Cover Types[2]
Seasonal wetland	N/A	44.000.00	wet meadow	Playa Open Water Unnatural; Playa Unvegetated Flat Unnatural; Playa Vegetated Unnatural	Seasonal Wetland	N/A
Seep or spring (nonserpentine)	N/A	N/A	N/A	Seep or Spring Natural; Seeps or Spring Unnatural	N/A	N/A
Seep or spring (serpentine)	N/A	N/A	N/A	Seep or Spring Natural; Seeps or Spring Unnatural	Serpentine seep	N/A
Pond	N/A	N/A	Lacustrine	Depressional Open Water natural; Depressional Open Water Unnatural	Pond	PABF, PABFh, PABFx, PABH, PABHh, PABHx, PUBF, PUBFh, PUBFx, PUBH, PUBHh, PUBHx, PUBK, PUBKx, PUSA, PUSAh, PUSAx, PUSC, PUSCh, PUSCx, PUSKx
Reservoir	N/A	N/A	Water	Lacustrine Open Water Unnatural; Lacustrine Open Water Natural	Reservoir	L1UBHh, L1UBHx, L1UBKx, L2UBHh, L2UBK1 L2UBKx

1 N/A = The corresponding classification system does not have a similar land cover type that can be cross-walked to the RCIS type

2 The National Wetlands and Deepwater Map Code Diagram is attached to this table that describes the National Wetland Inventory codes (https://www.fws.gov/wetlands/documents/NWI_Wetlands_and_Deepwater_Map_Code_Diagram.pdf).

Table 2-4. Wetland and Aquatic Land Cover Types within each Watershed (acres)

	Wetlands and Ponds						Baylands				
Watershed	**Perennial Freshwater Marsh**	**Seasonal Wetland**	**Seep/ Spring Nonserpentine**	**Seep/Spring Serpentine**	**Pond**	**Reservoir**	**Shallow Bay**	**Tidal Bay Flat**	**Tidal Unnatural**	**Tidal Vegetation**	***Total***
San Francisco Bay	313.0	402.8	_	_	556.1	_	627.2	2530.2	8,052.4	2,695.0	***15,177.1***
Agua Caliente Creek	_	_	_	_	2.7	_	_	_	_	_	***2.7***
Alameda Creek	0.7	_	_	_	15.0	1.6	_	_	_	_	***17.3***
Arroyo Mocho		_	_	_	6.9	_	_	_	_	_	***6.9***
Arroyo Valle	32.2		12.2		161.9	1.9	_	_	_	_	***208.4***
Arroyo Hondo	83.9	0.9	46.9		113.1	1,357.6	_	_	_	_	***1,602.6***
Lower Coyote Creek	154.5	85.5	21.1	13.3	382.2	165.3	_	_	_	_	***822.1***
Saratoga Creek	106.1	15.3	1.6	_	171.6	169.4	1.9	0.2	15.3	64.2	***545.9***
Guadalupe River	117.0	9.5	4.3	10.8	447.9	1,100.4	_	_	0.1	46.9	***1,737.3***
Upper Coyote Creek	171.5	35.4	31.8	1.9	185.5	1,178.0	_	_	_	_	***2,204.3***
Llagas Creek	77.9	15.8	_	6.6	214.4	206.2	_	_	_	_	***521.1***
Pacheco Creek	4.2	15.4	_	6.6	317.0	258.3	_	_	_	_	***601.7***
Uvas Creek	30.5	7.2	_	_	153.3	263.0	_	_	_	_	***454.1***
Pajaro River	38.4	1.6	_	_	188.4	175.9	_	_	_	_	***404.5***
Tequisquita Slough	_	0.9	_	0.3	134.0	19.0	_	_	_	_	***154.3***

Stream Layer

High Resolution Flowlines from the National Hydrography Dataset (NHD) (U.S. Geological Survey 2016) were used to represent streams in the RCIS area. All records that fell within the RCIS area were used. The NHD was used because the dataset includes stream attributes necessary to model aquatic species' habitat (e.g., identification of perennial, ephemeral, and intermittent stream status). The NHD was also selected to provide continuity in the stream layer data across the entire RCIS area. Figure 2-11 shows the streams in the RCIS area.

2.3.4.2 Natural Communities and Land Cover Types in the RCIS Area

Natural communities are an assemblage of species that co-occur in the same habitat or area and interact through trophic and spatial relationships. Communities are typically characterized by reference to one or more dominant species (Lincoln et al. 1998). Natural communities are defined by the vegetative communities, as identified by land cover types for this Santa Clara County RCIS. The RCIS area includes seven natural communities (Table 2-5).

In addition to the natural communities and respective land cover types, the RCIS area also includes two categories of nonnatural land cover types.

- Cultivated agriculture
- Urban

Table 2-5 presents the amounts of natural communities and land cover types in the RCIS area. Figure 2-12 depicts the natural communities in the RCIS area, and Figure 2-13 depicts the land cover types in the RCIS area. The natural communities and the land cover types associated with each community, as well as cultivated agriculture and urban land cover types, are described below. These descriptions are based on the discriptions of land cover from CLN (Bay Area Open Space Council 2011) and the Habitat Plan (ICF International 2012).

Table 2-5. Extent of Natural Communities* and Land Cover Types in the RCIS Area

Santa Clara County RCIS Land Cover Type	Acres in RCIS Area	Percent of RCIS Area
Grassland	**197,779**	**22**
California annual grassland	181,269	19
Serpentine grassland**	14,425	1.5
Serpentine rock outcrops**	268***	< 0.1
Barren/ Rock	1,878	0.2
Shrublands	**120,957**	**13**
Northern mixed chaparral/chamise chaparral	99,620	11
Serpentine chaparral**	6,077	0.5
Northern coastal scrub/ Diablan sage scrub**	15,261	2
Woodland	**250,303**	**27**
Blue oak woodland	38,024	4
Valley oak forest and woodland**	15,905	2
Coast live oak forest and woodland	74,067	8
Mixed oak woodland and forest	98,180	11

Santa Clara County RCIS Land Cover Type	Acres in RCIS Area	Percent of RCIS Area
Montane hardwood**	20,420	2
Serpentine hardwood**	3,707	0.4
Conifer Forest	**69,816**	**7**
Redwood forest**	14,996	2
Douglas fir forest**	15,567	2
Serpentine conifer**	754	< 0.1
Coulter pine forest**	198	< 0.1
Knobcone pine forest**	709	< 0.1
Ponderosa pine woodland	37,592	4
Riparian Woodland	**7,990**	**0.9**
Central coast riparian forest**	3,787	0.4
Sycamore alluvial woodland**	4,087	0.5
Serpentine riparian**	117	< 0.1
Baylands	**13,747**	**1.5**
Shallow bay	629	0.1
Tidal bay flat**	2,531	0.3
Tidal unnatural	8,068	0.8
Tidal vegetation**	2,806	0.3
Wetland and Pond	**10,711**	**1**
Perennial freshwater marsh**	1,130	<0.1
Seasonal wetland**	591	< 0.1
Seep/Spring (nonserpentine)**	120***	< 0.1
Seep/Spring (serpentine)**	40***	< 0.1
Pond**	3,048	0.3
Reservoir	5,495	0.6
Cultivated Agriculture*	**60,367**	**6**
Cultivated–undetermined	1,582	0.2
Developed agriculture	1,928	0.2
Grain, row-crops, disked	51,268	5
Orchard	3,971	0.4
Vineyard	1,626	0.2
Urban*	**202,349**	**22**
Urban	189,732	20
Rural residential	12,401	2
Ornamental woodland	216	< 0.1
GRAND TOTAL	934,028	100

* Cultivated agriculture and urban are considered nonnatural communities.
** Identified as a rare/unique land cover type in the RCIS area (Section 2.5.3, *Unique Land Cover Types*).
*** This land cover type is likely undermapped because it occurs in areas smaller than the minimum mapping unit.
RCIS = regional conservation investment strategy

Grassland

The grassland natural community (Figure 2-12) consists of herbaceous vegetation dominated by grasses and forbs. Grasslands are the dominant land cover type outside of urban areas in the RCIS area and are found in upland topographic locations, generally irrespective of landscape position, slope, and aspect. Areas devoid of vegetation, but located within grasslands are also included in this natural community as individual land cover types (Figure 2-14).

Grassland in the RCIS area is classified into four land cover types.

- California annual grassland
- Serpentine grassland
- Serpentine rock outcrop
- Barren/rock

California Annual Grassland

The California annual grassland land cover type (Figure 2-14) is an herbaceous plant community dominated by nonnative annual grasses (Holland 1986, Sawyer and Keeler-Wolf 1995). California annual grassland is defined as areas where grasses and forbs occur as extensive stands without an overstory. The dominant grasses generally consist of introduced annual grasses, including, foxtail chess (*Bromus madritensis*), harding grass (*Phalaris aquatica*), hare barley (*Hordeum murinum* ssp. *leporinum*), nit grass (*Gastridium phleoides*), oats (*Avena barbata* and *A. fatua*), rattail sixweeks grass (*Festuca myuros*), ripgut grass (*Bromus diandrus*), rye grass (*Festuca perennis*), silver hair grass (*Aira caryophyllea*), small fescus (*Festuca microstachys*), soft chess (*Bromus hordeaceus*), barbed goat grass (*Aegilops triuncialis*) and water beard grass (*Polypogon viridis*). The associated herbaceous cover includes native and nonnative forbs. Common herbaceous species in the RCIS area include black mustard (*Brassica nigra*), California poppy (*Eschscholzia californica*), clover species (*Trifolium* spp.), common fiddleneck (*Amsinckia menziesii*), common yarrow (*Achillea millefolium*), filaree species (*Erodium* spp.), four-spot (*Clarkia purpurea* ssp. *quadrivulnera*), Ithuriel's spear (*Triteleia laxa*), knapweed species (*Centaurea* spp.), lupine species (*Lupinus* spp.), purple owl's-clover (*Castilleja exserta*), and soap plant (*Chlorogalum pomeridianum*).

Native, nonserpentine grasslands are patchily distributed within the larger California annual grassland land cover type. These native grasslands include an abundance of nonnative annual grasses, interspersed with perennial grasses and forbs. Thus, native grassland cannot be distinguished from California annual grassland at the mapping scale used for this Santa Clara County RCIS. Consequently, native grass patches are included in the California annual grassland land cover type.

California annual grassland occupies an estimated 181,269 acres (19%) of the RCIS area. This land cover type is generally found most prominently at the southern portion of the RCIS area.

Serpentine Grassland

The serpentine grassland land cover type (Figure 2-14) is grassland that occurs on serpentine soils. Many serpentine species are partially or completely confined to growing on this substrate (Safford et al. 2005). Native bunchgrasses in serpentine habitat are generally similar to those in nonserpentine habitats, although serpentine populations may be more tolerant of heavy metals present in the soil and may have lower growth rates compared to nonserpentine populations (Huntsinger et al. 1996).

Serpentine grassland is considered a sensitive biotic community by the CDFW. Serpentine grassland is a mosaic of perennial bunchgrass stands, perennial and annual grasses, and herbaceous wildflower species (McCarten 1987). The flora is composed primarily of native species (although nonnative species such as soft chess can also be common), and is generally more diverse than the flora of grasslands on nonserpentine substrates (McNaughton 1968). Plants typical of this habitat fluctuate in their affinity to serpentine soils, from those that are strong indicators to those that also occur in nonserpentine grasslands. Generalist grassland species include grasses such as ryegrass, purple needlegrass (*Stipa pluchra*), Torrey's melicgrass (*Melica toeeryana*), big squirreltail (*Elymus multisetus*), California melic (*Melica californica*), California oat grass (*Danthonia californica*), and forbs such as dwarf plantain (*Plantago erecta*) and common muilla (*Muilla maritima*). Wildflowers that often form patches of color within the grassland matrix include California goldfields (*Lasthenia californica* ssp. *californica*), California poppy, hayfield tarweed (*Hemizonia congesta*), purple owl's-clover (*Castilleja exserta*), rosin weed (*Calycadenia truncata*), common yarrow, tidy-tips (*Layia platyglossa*) and lomatium species (*Lomatium* spp.). Species strongly associated with serpentine soils, and thus indicators for serpentine grassland, include, jeweled onion (*Allium serra*), Franciscan wallflower (*Erysimum franciscanum*), serpentine leptosiphon (*Leptosiphon ambiguus*), most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*), , and smooth lessingia (*Lessingia micradenia* var. *glabrata*) (Evens and San 2004, Hobbs and Mooney 1985, Holland 1986, Hooper and Vitousek 1998, McCarten 1987).

Serpentine grassland occupies approximately 14,425 acres (1.5%) of the RCIS area, and is mainly located in the area of Coyote Ridge in San Jose and Morgan Hill, to the immediate east and west of U.S. 101.

Serpentine Rock Outcrop

The serpentine rock outcrop land cover type (Figure 2-14) is exposures of serpentinite bedrock that typically lack soil and contain sparse cover of nonnative plant species. Serpentine rock outcrops provide important habitat for some species like Santa Clara Valley dudleya (*Dudelya setchellii*), and tend to be more native-dominated, including annual plantain provides habitat for bay checkerspot butterfly (*Euphydryas editha* bayensis).This land cover type is found strictly in areas of serpentine soils or geology.

Serpentine rock outcrops occupies approximately 268 acres (<0.1 %) of the RCIS area and is found in the same locations as serpentine grassland.

Barren/Rock

The barren/rock land cover type (Figure 2-14) includes nonagricultural areas that are devoid of vegetation. Barren areas are historically and recently disturbed land in urban areas. Land uses in barren areas can include aggregate facilities and mine tailings. Rock areas are nonserpentine rock outcrops, which are exposures of bedrock that typically lack soil and have sparse vegetation. Within the RCIS area, several types of rock outcrops are present and are derived from sedimentary, volcanic, and metamorphic sources. These rock outcrops can support native species and provide important habitat for species in the RCIS area.

The barren/rock land cover type occupies approximately 1,878 acres (0.2 %) of the RCIS area and is primarily found as barren or rocky patches within California annual grassland, although this land cover type can also be present in chaparral and oak woodlands.

Shrublands

The shrublands natural community (Figure 2-12) is composed of two distinct vegetation communities, chaparral and scrub land cover types. Chaparral occurs on rocky, porous, nutrient-deficient soils on steep slopes up to 6562 feet in elevation (Keeley 2002). These communities are dominated by densely packed and nearly impenetrable drought-adapted evergreen woody shrubs with small, thick, leathery sclerophyllous leaves (Hanes 1988, Keeley 2002). In comparison, the scrubland cover types generally consist of low "soft" shrubs in open to dense shrublands, interspersed with grassy openings or little to no herbaceous layer.

Shrublands in the RCIS area is classified into three land cover types (Figure 2-15).

- Northern mixed chaparral/chamise chaparral
- Serpentine chaparral
- Northern coastal scrub/Diablan sage scrub

Northern Mixed Chaparral/Chamise Chaparral

The northern mixed chaparral land cover type (Figure 2-15) includes a variety of shrubs with thick, stiff, sclerophyll leaves where no one species is clearly dominant. At maturity, this community can be dense and nearly impenetrable. Stand structure is dependent on age since last burn, precipitation, aspect, and soil type. Dominant species include chamise (*Adenostoma fasciculatum*), birchleaf mountain mahongany (*Cercocarpus betuloides*), silktassle (*Garrya* spp.), coyote bush (*Baccharis pilularis*), hollyleaf cherry (*Prunus ilicifolia*) and several species of ceanothus (*Ceanothus cuneatus C. leucodermis,*), manzanita (*Arctocstaphylos glandulosa, A. glauca,* redberry (*Rhamnus ilicifolia*, *R. crocea*) and oak (*Quercus chrysolepis, Q. dumosa, Q. berberidifolia, Q. wizlizenii*) (Mayer and Laudenslayer 1998, Holland 1986). Chamise chaparral supports pure or nearly pure stands of chamise. Due to the density of the vegetation, there is usually little or no understory. This community generally occurs below 3,000 feet elevation on mountain ranges in northern California. This land cover type is often found on dry, rocky, steep slopes with little soil (U.S. Geological Survey 2012).

Northern mixed chaparral/chamise chaparral occupies approximately 99,620 acres (11%) of the RCIS area and is found on the immediate western and eastern borders of Santa Clara County.

Serpentine Chaparral

The serpentine chaparral land cover type (Figure 2-15) is also dominated by shrubs with thick, stiff, sclerophyll leaves, but tends to be of shorter stature and more open than the northern mixed chaparral/chamise chaparral land cover type (Hanes 1988, California Partners in Flight). In addition, species composition is restricted to those shrubs that are adapted shallow, stony, infertile soils derived from serpentine. Serpentine chaparral usually occurs below 5,000 feet elevation. Dominant species include chamise, toyon (*Heteromeles arbutifolia*), California juniper (*Juniperus californica*), foothill pine (*Pinus sabiniana*), yerba santa (*Eriodictyon californicum*), leather oak (*Quercus durata*), and multiple species of ceanothus including Coyote ceanothus (*C. ferrisae*) (Holland 1986).

Serpentine chaparral occupies approximately 6,077 acres (0.5%) of the RCIS area and is scattered throughout the RCIS area on the east and west side of the Santa Clara Valley.

Northern Coastal Scrub/Diablan Sage Scrub

The northern coastal scrub/Diablan sage scrubland cover type (Figure 2-15) is composed primarily of evergreen shrubs with an herbaceous understory in openings. This land cover type is usually found at elevations below approximately 1,640 feet (Holland and Keil 1995). The northern coastal scrub/Diablan sage scrubland cover type is typically dominated by California sagebrush (*Artemisia californica*) and black sage (*Salvia mellifera*), with associated species including coyote brush, California buckwheat (*Eriogonum fasciculatum*), poison oak (*Toxicodendron diversilobum*), and sticky monkey flower (*Mimulus aurantiacus*) (Holland 1986). Northern coastal scrub/Diablan sage scrub occurs on both serpentine and nonserpentine substrate. The dominant woody plants in this land cover type are nearly the same among different soil types.

Northern coastal scrub/Diablan sage scrub occupies approximately 15,261 acres (2%) of the RCIS area and is located in small, scattered patches dispersed throughout the northern mixed chaparral/chamise chaparral land cover type.

Woodland

The woodland natural community (Figure 2-12) is an upland vegetation community dominated by hardwood tree species, characterized by a prevalence of various species of oaks (*Quercus* sp.). The composition of this natural community can range from open savannas with grassy understories to dense woodlands with persistent leaf litter that precludes much herbaceous understory or shrubby understories. The canopy can vary from pure stands of oak trees to stands intermixed with other broadleaf and coniferous trees.

Woodland in the RCIS area is classified into six land cover types (Figure 2-16).

- Blue oak woodland
- Coast live oak forest and woodland
- Valley oak forest/woodland
- Mixed oak woodland and forest
- Montane hardwood
- Serpentine hardwood

Blue Oak Woodland

The blue oak woodland land cover type (Figure 2-16) is dominated by blue oak (*Quercus douglasii*), a highly drought-tolerant species adapted to growth on thin soils in the dry foothills. Blue oaks grow slowly in these soils and may take decades to reach maturity, forming open savanna-like woodlands. They generally occur on sites that are drier and have lower levels of nitrogen, phosphorus, and organic matter than those where valley oak (*Quercus lobata*), or coast live oak (*Quercus agrifolia*) are found (Griffin 1973, Baker et al. 1981). Although blue oaks can become established on south-facing slopes during wetter years or where mesic conditions are present, they are generally found on north-facing slopes throughout their range (Griffin 1971). However, in the Central California Coast Ranges, blue oak woodland is more common on south-facing slopes (Miles and Goudey 1997).

California buckeye (*Aesculus californica*) and foothill pine are associate tree species in this community.

The understory varies from shrubby to open, with a composition similar to that of the adjacent California annual grassland. Understory species include California annual grasses, California coffeeberry, holly-leafed cherry, and poison oak. Blue oak woodland is considered a sensitive natural community by CDFW (California Department of Fish and Game 2001) when blue oak, valley oak, and coast live oak are present.

Blue oak woodland occupies approximately 38,024 acres (4%) of the RCIS area and is located mainly on the east side of the RCIS area adjacent to other woodland types.

Valley Oak Forest and Woodland

The valley oak forest and woodland land cover type (Figure 2-16) is characterized by a fairly open canopy of mature valley oaks with a grassy understory, generally on valley bottoms and north-facing slopes (Griffin 1971, Holland 1986, Sawyer and Keeler-Wolf 1995). Valley oak forest and woodland often forms a mosaic with annual grasslands, and are also found adjacent to other land cover types, including mixed oak woodland, blue oak woodland, and riparian woodland types. Valley oak forest and woodland is generally denser on valley bottoms, where the tree roots can penetrate to the groundwater, and less dense on ridges where trees need wider spacing to develop larger root systems (Griffin 1973). Although valley oak forest and woodland is typically found in alluvial soils in California, it occurs in nonalluvial sites on broad ridgetops and mid-slope benches.

Trees in the valley oak forest and woodland land cover type are typically mature and well spaced. They are usually the only trees present in this open-canopy woodland, have no shrub layer, and the understory is dominated by California annual grassland. As with most oak communities, regeneration typically is episodic, occurring periodically in "mast years," when acorn production is high and some acorns germinate by avoiding acorn predators such as acorn woodpeckers and California ground squirrels. Beardless wild rye (*Elymus triticoides*), California rose (*Rosa californica*), mugwort (*Artemisia douglasiana*), and poison oak are common native species in riparian portions of valley oak woodland.

Valley oak forest and woodland occupies approximately 15,905 acres (2%) of the RCIS area, mainly on the east side of the valley floor and occurs adjacent to other woodland types.

Coast Live Oak Forest and Woodland

The coast live oak forest and woodland land cover type (Figure 2-16) mostly includes stands of coast live oak, although California bay (*Umbellularia californica*) is often a major component, and other interior live oaks and scattered deciduous trees are often present. Across the Central Coast Ranges, stands occur at lower elevations (200 to 3,250 feet) on north and northeast aspects. Slopes are generally steep (36% on average), and parent material is primarily sedimentary sandstone and shale, with loam soils (Allen-Diaz et al. 1999).

Grasses and herbs are common in this land cover type. Other species found in this cover type include bush monkey flower, California coffee berry, California sagebrush, and spiny redberry (*Rhamnus crocea*) (Allen-Diaz et al. 1999). In addition, bugle hedge nettle (*Stachys ajugoides*), California blackberry (*Rubus ursinus*), California wood fern (*Dryopteris arguta*), and poison oak are often present.

Coast live oak forest and woodland occupies approximately 74,067 acres (8%) of the RCIS area around the valley floor and occurs adjacent to other woodland types.

Mixed Oak Woodland and Forest

The mixed oak woodland and forest land cover type (Figure 2-16) contains coast live oak, valley oak, and blue oak trees where no species is clearly dominant, or where different types of oak woodlands are present in a small-scale mosaic and each type occurs in patches too small to map. This habitat includes a mixture of interior live oak (*Quercus wislizeni*) and deciduous oaks. Evergreen broadleaved trees such California bay, Pacific madrone (*Arbutus menziesii*), tan oak (*Notholithocarpus densiflorus*), conifers such as Douglas fir (*Pseudotsuga menziesii*), Coulter pine (*Pinus coulteri*), and foothill pine, and deciduous species such as California buckeye and bigleaf maple (*Acer macrophyllum*) frequently occur in this land cover type.

Mixed oak woodland and forest is a dominant woodland land cover type in the RCIS area and occupies approximately 98,180 acres (11%). It is found primarily on the eastern side of the Santa Clara Valley, but is also present on the lower foothills of the Santa Cruz Mountains.

Montane Hardwood

The montane hardwood land cover type (Figure 2-16) is dominated by broadleaved trees, often with taller conifers interspersed, forming a closed forest. Montane hardwood forests occur on a wide range of slopes with soils that are rocky, alluvial, coarse textured, poorly developed, and well drained. Tree height tends to be uniform, expect where conifers are present. Typically montane hardwood species include white alder (*Alnus rhombifolia*), coast live oak, big leaf maple, California bay, Pacific madrone, Douglas fir, tanoak, and occasionally valley oak and blue oak. Associated conifers species may include foothill pine, ponderosa pine (*Pinus ponderosa*), Coulter pine black oak (*Quercus kelloggii*), and knobcone pine (*Pinus attenuata*). The scattered understory vegetation can consists of manzanita, mountain mahogany, and poison oak, as well as patches of forbs and grasses (Holland 1986, Mayer and Laudenslayer 1998).

Montane hardwood occupies approximately 20,420 acres (2%) of the RCIS area and is most dense in the Sierra Azul Open Space Preserve on the west side of the Santa Clara Valley, but is scattered throughout the Santa Cruz Mountains and in the northeastern corner of the RCIS area.

Serpentine Hardwood

The serpentine hardwood land cover type (Figure 2-16) is composed of species associated with the montane hardwood land cover type on serpentine soils. Leather oak, which is often a serpentine endemic, often grows as a component of the serpentine chaparral community but is classified as serpentine hardwood when intermixed with other hardwood species. Serpentine tolerant hardwood species include California buckeye, California bay, western redbud (*Cercis occidentalis*), and canyon live oak (*Quercus chrysolepis*) (Frazell et al. 2009).

Serpentine hardwood occupies approximately 3,707 acres (0.4%) of the RCIS area and occurs mainly in the Santa Cruz Mountain and in the vicinity of Coyote Ridge.

Conifer Forest

The conifer forest natural community (Figure 2-12) is an upland vegetation community dominated by cone-bearing, needle-leaved or scale-leaved evergreen trees. The canopy can range from open to continuous with one or two tiers. Shrub layers are sparse to continuous, and herbaceous cover can be sparse to abundant. Landforms associated with conifer forest include slopes, ridges, headlands, maritime terraces, rocky ridges, and sand dunes.

Conifer forest in the RCIS area is classified into six land cover types (Figure 2-17).

- Redwood forest
- Douglas fir forest
- Serpentine conifer
- Coulter pine forest
- Knobcone pine woodland
- Ponderosa pine woodland

Redwood Forest

The redwood forest land cover type (Figure 2-17) is dominated by an overstory of redwood with a variety of associated tree, shrub, and forb species in the understory. Most redwood forests have been logged since the second half of the nineteenth century, and most of the existing trees are stump sprouts. However, in many areas, particularly along creeks, dense cover of redwood trees has been maintained. Areas that were burned following logging now support chaparral or oak-dominated communities.

Redwood forests occur in areas that receive substantial rainfall, generally more than 35 inches per year. Common plants associated with these forests include trees such as California bay, madrone, and tan oak; the shrub layer includes species such as black huckleberry (*Vaccinium ovatum*), California hazelnut (*Corylus cornuta* var. *californica*), and thimbleberry (*Rubus parviflorus*). In riparian areas, California bay and bigleaf maple are common, California nutmeg (*Torreya californica*) may occur, and ferns such as sword fern (*Polystichum munitum*) often form a dense layer.

Redwood forest occupies approximately 14,996 acres (2%) of the RCIS area. This land cover type is uncommon in the RCIS area, only occurring in the Santa Cruz Mountains along the Santa Cruz-Santa Clara County boundary. Redwood forest occurs along creeks and valleys, generally on north-facing slopes. Stands of redwoods are found along Uvas (Uvas Canyon County Park), Llagas, and Arthur Creeks.

Douglas Fir Forest

The Douglas fir forest land cover type (Figure 2-17) is typically comprised of closed canopy stands in the Santa Cruz Mountains portion of the RCIS area. In this land cover type, Douglas fir is nearly always associated with redwoods and tanoaks, and supports an understory similar to the redwood forest land cover type. In the Santa Cruz Mountains, Douglas fir grows on north facing slopes (with moister sites) with well-drained, deep soils composed of weathered marine sandstones and shales (University of California 2017). Other associated hardwoods include California bay, Pacific madrone, and big leaf maple.

Douglas fir forest occupies approximately 15,567 acres (2%) of the RCIS area. Douglas fir forest is generally intermixed with the redwood forest land cover type in the RCIS area.

Serpentine Conifer

The serpentine conifer land cover type (Figure 2-17) is comprised of coniferous forest in arid landscapes on serpentine soils. Serpentine coniferous forest consists of dense to open mono-dominant stands of conifer trees that are strongly associated with serpentine soils but also occur on other soil types. Knobcone pine forms dense single-aged stands, usually on serpentine or other shallow rocky soils, on hilltops that receive moisture from clouds or fog. California juniper, Coulter pine, ponderosa pine, and foothill pine are widespread on nonserpentine soils but can occur on isolated stands of dry rock serpentine outcrops (Alexander et al. 2006, Frazell et al. 2009). This land cover types supports a shrubby understory comprised of species similar to those representative of the serpentine chaparral land cover type. Serpentine conifer usually occurs in areas with more xeric exposure, but integrates with the serpentine chaparral land cover type in flatter, more mesic areas. Dominant species in the serpentine conifer land cover type include chamise, manzanita species, buckbrush, leather oak, and grey pine (Holland 1986).

Serpentine conifer occupies approximately 754 acres (<0.1%) of the RCIS area in small patches in the Santa Cruz Mountains between Los Gatos and Gilroy, in Anderson Lake County Park, Coyote Lake County Park, and Mount Hamilton.

Coulter Pine Forest

The Coulter pine forest land cover type (Figure 2-17) is typically dominant in closed canopy stands. Other tree species that are commonly associated with Coulter pine woodlands include Douglas fir, black oak, canyon live oak, coast live oak, interior live oak, foothill pine, and ponderosa pine. The shrub layer can range from sparse to dense and the ground layer is typically sparse. Topographically, Coulter pine woodlands occur in uplands on all aspects. The soils tend to be shallow and well drained (Sawyer and Keeler-Wolf 1995).

Coulter pine woodland occupies approximately 198 acres (<0.1%) of the RCIS area and occurs in one small patch on Mount Hamilton.

Knobcone Pine Woodland

The knobcone pine woodland land cover type (Figure 2-17) consists of dense stands of knobcone pines (*Pinus attenuata*) that regenerate following fire. This land cover type is uncommon in the RCIS area, occurring only in the Santa Cruz Mountains on ridgetop sites, often on serpentine-derived soils. It is thought that the water-retaining properties of serpentinite, combined with the pine's ability to intercept marine fog, allow knobcone pine to persist in these locations (Vogl 1973).

Knobcone pine is an obligate fire-climax species—fire is required to melt the resin that seals the cones, releasing the seed. Fire also creates the bare mineral soil required for the seeds to germinate. Stands of knobcone pine are therefore even-aged, dating back to the last stand-replacing fire. Knobcone pine is fast growing, with a relatively short lifespan of 75 to 100 years, although approximately half the trees may die by 60 years of age (Vogl 1973). Knobcone pine woodland is replaced by chaparral at lower elevations and by conifers (e.g., redwood or Douglas fir) at higher elevations, and it may occur in a mosaic with chaparral, conifer, and oak dominated woodlands. Although knobcone pine usually occurs as dense, mono-dominant stands, it can also be associated with chaparral species such as manzanitas bush chinquapin (*Chrysolepis chrysophylla* var*. minor*) and bush poppy (*Dendromecon rigida*), that form a sparse to dense understory layer.

Knobcone pine woodland occupies approximately 709 acres (<0.1%) of the RCIS area and is located in the Santa Cruz Mountains west of Morgan Hill along the Santa Cruz-Santa Clara County boundary.

Ponderosa Pine Woodland

The ponderosa pine woodland land cover type (Figure 2-17) is dominated by an overstory of ponderosa pine with oaks trees in the understory. On ridges, ponderosa pine trees are often large and well-spaced, forming very open stands over annual grassland. Regeneration is often common and many age classes are present. Associated tree species include black oak, coast live oak, and Pacific madrone. Few shrubs are present, although bigberry manzanita is common in some areas. Ponderosa pine is uncommon in the Coast Ranges; these stands are likely relicts of a wider distribution in the past when the climate was cooler.

Ponderosa pine woodland occupies approximately 37,592 acres (4%) of the RCIS area. This land cover occurs primarily on three high elevation ridges in Henry W. Coe State Park—Pine Ridge, Middle Ridge, and Blue Ridge—and extends downslope into north-facing canyons and valleys.

Riparian Woodland

The riparian woodland natural community (Figure 2-12) is dominated by woody vegetation associated with riverine water sources. Riparian woodlands are dominated by trees and contain an understory of shrubs and forbs. From the foothills to the valley floor, riparian woodland land cover types thrive along stream banks and floodplains in the RCIS area.

Riparian woodland in the RCIS area is classified into three land cover types (Figure 2-18).

- Central coast riparian forest
- Sycamore alluvial woodland
- Serpentine riparian

Streams in the RCIS area are represented by the stream layer dataset (Section 2.3.4.1, *Methods and Data Sources*). Although not included in the land cover dataset, streams are described within this section on the riparian woodland natural community, as streams are a fundamental ecosystem component of the riparian woodland natural community

Central Coast Riparian Forest

The central coast riparian forest land cover type (Figure 2-18) is found in and along the margins of the active channel on intermittent and perennial streams. Generally, no single species dominates the canopy, and composition varies with elevation, aspect, hydrology, and channel type. The major canopy species throughout the RCIS area are California bay, California sycamore (*Platanus racemosa*), coast live oak, arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and valley oak. Associated trees and shrubs include bigleaf maple, California buckeye, Fremont cottonwood (*Populus fremontii* ssp. *fremontii*), white alder, and other species of willow. Nonnative invasive species that may be present include giant reed (*Arundo donax*) and Himalayan blackberry (*Rubus armeniacus*).

Central coast riparian forest occupies approximately 3,787 acres (0.4%) of the RCIS area, and is found in association with streams throughout the RCIS area.

Sycamore Alluvial Woodland

The sycamore alluvial woodland land cover type (Figure 2-18) is generally present on broad floodplains and terraces along low gradient streams with deep alluvium. Areas mapped as sycamore alluvial woodland are generally open canopy woodlands dominated by California sycamore, often with white alder and willows. Other associated species include bigleaf maple, valley oak, coast live oak, and California bay.

The understory is disturbed by winter flows, and herbaceous vegetation is typically sparse or patchy. Typically, plants such as blackberry (*Rubus* spp.), California buckeye, common chickweed (*Stellaria media*), coyote brush, goose grass (*Galium aparine*), Italian thistle (*Carduus pycnocephalus* ssp. *pycnocephalus*), mule fat, poison oak, and willows populate the stream banks.

Sycamore alluvial woodland occupies 4,087 acres (0.5%) of the RCIS area and all stands of this land cover type are found throughout the RCIS area along streams and creeks.

Serpentine Riparian

The serpentine riparian land cover type (Figure 2-18) is composed of species associated with the Central Coast riparian forest land cover types on serpentine rocks.

Serpentine riparian occupies approximately 117 acres (<0.1%) of the RCIS area, and occurs in very small patches in the Santa Cruz Mountains and the west side of the Diablo Range.

Streams

Streams in the RCIS area include perennial, intermittent, and ephemeral watercourses characterized by a defined bed and bank. Perennial streams support flowing water year-round in normal rainfall years. These streams are often marked on U.S. Geological Survey (USGS) quadrangle maps with a blue line, known as blue-line streams. Intermittent (seasonal) streams carry water through most or all of the dry season (May-October) in a normal rainfall year. More specifically, in the wet season, intermittent streamflow occurs when the water table is raised, or rejuvenated, following early season rains that fill shallow subsurface aquifers. Ephemeral streams carry water only during or immediately following a rainfall event. The principal watercourses in the Pajaro River Basin, in which the RCIS area occurs, have some perennial reaches due to a combination of high groundwater levels (primarily in headwater reaches of tributaries and in the Pajaro River), agriculture runoff, and releases from dams in the valley floor reaches.

Streams are associated with riparian plants described in the riparian woodland community. The riparian plant composition and the width of the riparian corridor varies depending on channel slope, magnitude and frequency of channel and overbank flows, and the frequency and duration of flooding flows that inundate the broader floodplain.

There are approximately 2,528 miles of streams in the RCIS area, including 449 miles of perennial streams, 561 miles of intermittent streams, and 1, 518 miles of ephemeral streams (Figure 2-11).

Wetland and Pond

The wetland and pond natural community (Figure 2-12) includes open water and aquatic habitats subject to seasonal or perennial flooding or ponding, and may have hydrophytic herbaceous vegetation. Wetlands and ponds generally differ in their surface area to volume ratio, water level fluctuations, and vegetation cover. Wetlands typically support emergent vegetation, while ponds do not.

The wetland and pond natural community includes six land cover types (Figure 2-19).

- Perennial freshwater marsh
- Seasonal wetland
- Spring/seep (nonserpentine)
- Spring/seep (serpentine)
- Pond
- Reservoir

Perennial Freshwater Marsh

The perennial freshwater marsh land cover type (Figure 2-19) is dominated by emergent herbaceous plants (e.g., reeds, sedges, grasses) with either intermittently flooded or perennially saturated soils. Perennial freshwater marshes are found throughout the coastal drainages of California wherever flowing water slows down and accumulates, even on a temporary or seasonal basis. A perennial freshwater marsh usually features shallow water that is often clogged with dense masses of vegetation, resulting in deep peaty soils. Plant species common to perennial freshwater marsh predominantly consist of cattails (*Typha* spp.), bulrushes (*Schoenoplectus* and *Bolboschoenus* spp.), sedges (*Carex* spp.), and rushes (*Juncus* spp.). Dominant species in perennial freshwater marsh in the RCIS area include beard grass (*Polypogon* sp.), tall cyperus (*Cyperus eragrostis*), willow weed (*Persicaria lapathifolia*), yellow cress (*Rorippa* spp.), and false loosestrife (*Ludwigia* spp.) are common associates. Dominant species in nontidal perennial freshwater marsh are narrow-leaved cattail (*Typha angustifolia*), broadfruit bur-reed (*Sparganium eurycarpum*) and perennial pepperweed (*Lepidium latifolium*) (Jones & Stokes 2002).

Perennial freshwater marsh occupies approximately 1,130 acres (<0.1%) throughout the RCIS area, though it is less abundant in the Santa Cruz Mountains.

Seasonal Wetland

The seasonal wetland land cover type (Figure 2-19) is freshwater wetland habitat that supports ponded or saturated soil conditions during winter and spring, and is dry through the summer and fall until the first substantial rainfall. Seasonal wetlands consist of relatively low-growing vegetation similar to perennial freshwater marsh, such as rushes, sedges, and grasses (Bay Area Open Space Council 2011). The vegetation may also consist of wetland generalists, such as hyssop loosestrife (*Lythrum hyssopifolia*), cocklebur (*Xanthium* spp.), and Italian ryegrass that typically occur in frequently disturbed sites, such as along streams. Common species in seasonal wetlands within the RCIS area include yellow cress and smartweed (*Persicaria* spp.).

Seasonal wetlands occupy approximately 591 acres (<0.1%) of the RCIS area and occur throughout the RCIS area, with the exception that in the Santa Cruz Mountains, this land cover type is restricted to the eastern foothills.

Spring/Seep (nonserpentine)

The seeps/springs land cover type (Figure 2-19) is otherwise dry areas where water penetrates the root zone or ground surface and creates small wetlands that supports wetland vegetation. They usually form on hillside or along the base of hills or alluvial fans. They lack well-defined channels and are almost entirely dependent on groundwater (slope wetlands) (San Francisco Estuary Institute 2011). These provide a source of drinking water for wildlife in the area.

Seeps/Springs occupy approximately 120 acres (<0.1%) of the RCIS area and are mapped in areas east of the Santa Cruz Mountains.

Spring/Seep (serpentine)

The serpentine spring/seep land cover type (Figure 2-19) is similar to nonserpentine seeps, except that it occurs on serpentine soils. Serpentine seeps/springs typically occur within a matrix of serpentine grassland. They are similar to nonserpentine seeps except that they support species adapted to serpentine soils such as Mount Hamilton thistle (*Cirsium fontinale* var. *campylon*), two-tooth sedge (*Carex serratodens*), iris-leaved rush (*Juncus xiphioides*) seep monkeyflower (*Mimulus guttaus*), Italian wildrye (*Festuca perennis*), rabbitfoot grass (*Polypogon monspeliensis*), and hoary coffeeberry (*Frangula californica* ssp. *tomentella*) (Alexander et al. 2006).

Seeps/Springs (serpentine) occupy approximately 40 acres (0.3%) of the RCIS area and are located where serpentine soils are present.

Pond

The pond land cove type (Figure 2-19) is small perennial or seasonal water bodies with little or no vegetation. If vegetation is present, it is typically submerged, floating, or growing along the margins. Ponds may occur naturally or may be created or expanded for livestock use (stock ponds). Pond vegetation is influenced by surrounding land use, livestock and wildlife activity, and site soil and hydrology. Plants often associated with ponds include floating plants such as duckweed (*Lemna* spp.) or rooted plants such as cattails, bulrushes, sedges, rushes, watercress, and water-primrose. Stock ponds are often surrounded by grazing land with grazing livestock. Immediately adjacent to a stock pond, soil may be exposed due to the continued presence of livestock or wildlife (e.g., feral pigs). As a result, many stock ponds in the RCIS area are devoid of vegetation. Stock ponds, removed from grazing pressures or excessive wildlife activity, may be surrounded by wetland vegetation including willows, cattails, reeds, bulrushes, sedges, and tules (*Schoenoplectus* [*Scirpus*] *californicus*) if the appropriate soil and hydrology is also present.

Ponds occupy an approximately 3,048 acres (0.3%) of the RCIS area and occur throughout the RCIS area.

Reservoir

The reservoir land cover type (Figure 2-19) is large, open water bodies that are highly managed for water storage, water supply, flood protection, or recreational uses. Plants often associated with reservoirs include those plants common to deep water systems. Algae are the predominant photosynthetic organisms found in the open waters of reservoirs. Depending on reservoir temperature, water level, and other environmental conditions, algal blooms may occur, resulting in thick algal mats on the surface of the reservoir. Where reservoir edges are shallow, plant species similar to those found in ponds may be present. If a reservoir has steeper edges, water depth and fluctuations in reservoir height may prevent the establishment of vegetation. Upland and riparian trees that were not removed during the construction of the reservoir, or that were planted afterwards, may be present around the perimeter of the reservoir.

Reservoirs occupy an approximately 5,495 acres (0.6%) of the RCIS area and occur throughout the RCIS area.

Baylands

The baylands natural community (Figure 2-12) consists of tidal wetland and tidally influenced aquatic and terrestrial areas below the topographical contour that corresponds to the maximum possible extent of the tides. This natural community is subject to tidal fluctuations in water height that may be natural or muted by man-made structures such as tidal gates or culverts (San Francisco Estuary Institute 2011). The baylands natural community is located immediately adjacent to the San Francisco Bay in the northern portion of the RCIS area. A summary of conservation strategies for the baylands is included in Appendix I, *Summary of Bayland Conservation Strategies*.

Baylands in the RCIS area is comprised of four land cover types (Figure 2-20).

- Shallow bay
- Tidal bay flat
- Tidal vegetation
- Tidal unnatural

Shallow Bay

The shallow bay land cover type (Figure 2-20) is open water areas within San Francisco Bay (including other estuarine channels) entirely between 18 feet below mean lower low water (Goals Project 1999) Shallow bay habitat are areas of continuous open water that are submerged during even the lowest tide; as a result these areas are too deep to support the types of vegetation found in tidal marsh habitats. The sediment of shallow bay is primarily mud. Eelgrass (*Zostera* marina) can grow underwater along the fringes of shallow bay (generally at an average of 6.5 feet) where enough light is available. However wave action and desiccation stress prevent eelgrass from growing in very shallow areas.

Shallow bay is important for many invertebrates, fish, and waterbirds. The rich environment is an especially productive feeding area for many fish, including northern anchovy, sturgeon, and jacksmelt. The eelgrass beds are a particularly productive part of the shallow bay and also provide refuge for organism to escape from predators. Shallow bay habitat also serves as an important migratory corridor for anadromous fish such as Chinook salmon, steelhead, green sturgeon, and lamprey. Harbor seals and sea lions also utilize this habitat (Goals Project 1999; San Francisco Estuary Institute 2011).

Shallow bay occupies approximately 629 acres (0.1) of the RCIS area.

Tidal Vegetation

The tidal vegetation land cover type (Figure 2-20) contains halophytic (i.e., plants that grow in high salinity water) wetland vegetation below the high tide line, subject to the ebb and flow of daily tides. Tidal vegetation colonizes microhabitats within the tidal marsh dependent upon tidal elevations and drainage patters. Tidal vegetation in the lowest, wettest portion of the marsh, where inundation/saturation is nearly permanent, typically includes California cordgrass (*Spartina foliosa*), pickleweed (*Salicornia* spp.), saltmarsh bulrush, and tules (*Schoenoplectus* spp.). Tidal vegetation is typically most expansive in the middle marsh. In these broad, nearly flat areas, dense woody pickleweed vegetation dominants the landscape mixed with scattered patches of salt marsh dodder (*Cuscuta salina*), jaumea (*Jaumea carnosa*) alkali-heath (*Frankenia salina*), and saltgrass (*Distichlis spicata*). Often referred to as tidal plains, the middle marsh typically floods during higher tides but is not continually inundated/saturated. Higher marsh occurs in drier areas of the marsh above the mean high water level along elevated or better-drained sediment deposits. These areas can be dominated by marsh gumplant, nonnative grasses, marsh baccahris, and coyote brush, and can integrate with the coastal freshwater community (U.S. Fish and Wildlife Service 2013, San Francisco Estuary Institute 2011).

Tidal vegetation occupies approximately 2,806 acres (0.3%) of the RCIS area.

Tidal Bay Flat

The tidal bay flat land cover type (Figure 2-20) occurs within intertidal areas with less than 10% vegetation cover (other than eelgrass). Tidal bay flats have areas of soft sediment that lie between the elevations of the lowest tides to the mean lower low water tidal datum, as dictated by the current tidal epoch. Tidal bay flats form when mud and other fine-grained sediments are deposited by tides or rivers on gently sloping beds. Tidal bay flats are extremely productive, supporting diatoms, worms and shellfish, fish, algae, eelgrass, shorebirds, and harbor seals. Mudflats are the most common type of Tidal Bay Flat (San Francisco Estuary Institute 2011, San Francisco Bay Conservation and Development Commission 2015).

Tidal bay flat occupies approximately 2,531 acres (0.3%) of the RCIS area.

Tidal Unnatural

The tidal unnatural land cover type (Figure 2-20) is a man-made or modified tidal channel that conveys tidal water and runoff within tidal wetlands and other baylands. These can include tidal ditches, as well as flood control channels and canals. (San Francisco Estuary Institute 2011).

Tidal unnatural occupies approximately 8,068 acres (0.8%) of the RCIS area.

Cultivated Agriculture

The cultivated agriculture community (Figure 2-12) consists of cultivated row crops, vineyards, orchards, and other crops that require soil tillage. In the RCIS area, cultivated agriculture is located in the vicinity of Morgan Hill, Gilroy, and Hollister around U.S. 101 and SR 25.

Cultivated agriculture is classified into five land cover types (Figure 2-21).

- Grain, row-crop, disked
- Orchard
- Vineyard
- Developed agriculture
- Cultivated-undetermined

Grain, Row-Crop, Disked

The grain, row-crop, disked land cover type (Figure 2-21) consists of tilled land not supporting orchard or vineyard, and includes hay and pasture and a small amount of rice. Row-crops are those areas tilled and cultivated for agricultural crops such as corn, lettuce, peppers, and pumpkins. Irrigated or dry crop is usually harvested in rows as edible or useful herbaceous products such as cereals or vegetables for stock or human use. Agricultural crop fields are also occasionally planted for both animal forage and to improve nitrogen levels, as with legumes such as alfalfa or sweet clovers. This land cover type includes ruderal areas and areas that have been left fallow for several growing seasons. Ruderal sites may be dominated by weeds such as black mustard or thistles.

Hay is also produced in Santa Clara Valley for grain. Common vegetation includes fast-growing forage grasses, such as oats (*Avena* spp.) and Italian rye grass, as well as irrigated legumes such as alfalfa (*Medicago sativa*), sweetclover (*Melilotus* spp.), and clover (*Trifolium* spp.). In some areas, nonnative weedy vegetation, such as thistles, mustards, and a variety of other weedy forbs are also common.

Grain, row-crop, disked is the dominant cultivated agriculture land cover type, occupying approximately 51,268 acres (5%) of the RCIS area.

Orchard

The orchard land cover type (Figure 2-21) is those areas planted in fruit-bearing trees. Orchards are usually evergreen or deciduous small trees producing fruit or nut crops, usually planted in rows with or without irrigation channels, such as apples, cherries, walnuts, peaches, and olives. Orchard is distinguished on the basis of its tree cover, canopy characteristics, and distinctive production rows.

Orchards occupy approximately 3,971 acres (0.4%) of the RCIS area.

Vineyard

The vineyard land cover type (Figure 2-21) is characterized by row production pattern and open canopy. Vines or shrubs may dominant the woody component of plantations on agricultural or horticultural lands uses in the production of food or fiber such as vineyards devoted to grapes or kiwi fruit and shrubby nut or fruit crops such as blueberries or raspberries.

Vineyards occupy approximately 1,626 acres (0.2%) of the RCIS area, primarily in the southern portion of the RCIS area.

Developed Agriculture

The developed agriculture land cover type (Figure 2-21) is characterized by the presence of large agricultural buildings such as greenhouses, shadehouses, nurseries, corrals, or dairies. These intensive uses occur within agricultural areas, rather than urban settings.

Developed agriculture occupies approximately 1,928 acres (0.2%) of the RCIS area.

Cultivated-undetermined

The cultivated undetermined land cover type (Figure 2-21) is those areas where the land cover data and aerial imagery was too vague to categorize into a specific land cover type in the cultivated agriculture community.

Cultivated-undetermined occupies approximately 1,582 acres (0.2%) of the RCIS area.

Urban

The urban community (Figure 2-12) consists of areas where native vegetation has been replaced with residential, commercial, industrial, transportation, or with structures, paved and impermeable surfaces, horticultural plantings, turf, and lawn. Vegetation found in the urban land cover types is typically cultivated vegetation associated with landscaped residences, nonnative planted street trees (i.e., elm, ash, liquidambar, pine, palm), and parklands.

Urban in the RCIS area is classified into three land cover types (Figure 2-13).

- Urban
- Rural residential
- Ornamental woodland

Urban

The urban land cover comprises areas dominated by residential, commercial, industrial, transportation, recreational structures, or other developed land use elements such as highways, city parks, and cemeteries. Vegetation found in the urban land cover type is similar to that of the rural residential land cover type, with the exception that these areas are more expansive and include large areas of turf and lawn.

The urban center in the RCIS area is located adjacent to the San Francisco Bay in the northern portion of Santa Clara County. Urban occupies approximately 189,732 acres (20%) of the RCIS area.

Rural Residential

The rural residential land cover type (Figure 2-13) includes areas that have structures, paved and impermeable surfaces, horticultural plantings, and lawns smaller than 10 acres (irrigated lawns larger than 10 acres were mapped as urban parks). Rural residential areas of less than 10 acres that were adjacent to or surrounded by agriculture and/or natural land cover types were mapped as the adjacent land cover type. Vegetation found in the rural residential land cover type is usually in the form of landscaped residences, planted street trees (i.e., elm, ash, liquidambar, pine, palm), and parklands.

Rural residential occupies approximately 12,401 acres (2%) of the RCIS area adjacent to the grain, row-crop, disked land cover type between the cities of Morgan Hill and Gilroy.

Ornamental Woodland

The ornamental woodland land cover type (Figure 2-13) is those areas where ornamental and other introduced species of trees, including *Eucalyptus* (usually species *globulus*) and Monterey pine (*Pinus radiata*) species, have been planted or naturalized and dominate, forming an open-to-dense canopy. Ornamental woodland was included as a separate land cover type because some stands could provide suitable nesting habitat for raptors.

Ornamental woodlands occupies approximately 216 acres (<01%) in small patches mainly around Saratoga, Los Gatos, and Gilroy and isolated locations in the Mount Diablo Range.

2.3.5 Focal Species

Focal species are species whose conservation needs are addressed through this Santa Clara County RCIS. Discussions in this RCIS about conservation priorities, including land protection, enhancement, and restoration (Chapter 3, *Conservation Strategy*) are described within the context of the conservation needs for focal species. Therefore, selecting the species that are addressed in this RCIS was one of the first and most important decisions to determine the scope of the RCIS planning process.

2.3.5.1 Focal Species Selection Process

The focal species selection process consisted of the following three-step screening criteria process.

- Step 1. Identify potential focal species.
- Step 2. Apply screening criteria.
- Step 3. Finalize focal species list.

Each step is described in more detail below.

Step 1. Identify Potential Focal Species

The first step in developing the list of species was to compile a comprehensive list of declining and vulnerable species that occur or may occur in the RCIS areas or species that are not declining or vulnerable but provide additional conservation benefits. This list was compiled by reviewing a variety of publicly available sources. The list included those taxa identified as species of greatest conservation need in the State Wildlife Action plan (SWAP) and species that have documented occurrences in the RCIS area as reported in the California Natural Diversity Database (CNDDB) (Appendix E, *Evaluation of Species for Inclusion as Focal Species*).

Other sources that were considered when identifying potential species to be addressed in this Santa Clara County RCIS, include:

- The Habitat Plan.
- California Native Plant Society (CNPS) *Inventory of Rare and Endangered Vascular Plants of California* (California Native Plant Society 2016).
- CDFW lists of special animals and special plants (California Department of Fish and Wildlife, Natural Diversity Database 2016 a and 2016b).
- A list of federally listed endangered and threatened species obtained from the USFWS for the RCIS area.
- Personal communication with local species experts occurring throughout the stakeholder and public outreach process, including wildlife agency staff and representatives of local environmental groups.

Step 2. Apply Screening Criteria

Once the potential focal species were identified, the following criteria were applied to each species to determine if it should be further considered for inclusion as a focal species in this Santa Clara

County RCIS. To be addressed, the species must meet the following occurrence and data criteria, and meet at least one of the status, rarity, or conservation benefit criteria.

- **Occurrence.** The species is known or likely to occur in the RCIS area. Occurrence data were based on credible evidence. Some species may not be present in the RCIS area at the time the RCA or 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 within the RCIS area are available to propose viable conservation actions.
- **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 RCIS approval. This includes species covered by the Habitat Plan.
- **Rarity.** The species is recognized by Nature Serve 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 the CNPS as Rare, Threatened, or Endangered in California and elsewhere (1B) or Rare, Threatened or Endangered in California, but more common elsewhere (2B).
- **Provides Other Conservation Benefit.** If a species does not meet the above criteria but provides some other conservation benefit, it was considered for inclusion as a focal species. Species providing other conservation benefit are not necessarily declining or vulnerable, but are those 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, defined as follows:
    - **Area-dependent species.** The species requires large, contiguous blocks of habitat and may therefore inform the placement of protected areas on the landscape.
    - **Umbrella species.** Conservation of an umbrella species would indirectly conserve multiple other species dependent on the same ecological conditions.
    - **Indicator species.** The species' abundance in a given area is believed to indicate the presence of certain environmental or ecological conditions suitable for a group of other species. This may include species that are particularly sensitive to climate change.
    - **Keystone species.** The species' impacts on a community or ecosystem are much larger than would be expected from the species' abundance.

Step 3: Finalize Focal Species Lists

As in all planning efforts, resources, time and budget to prepare this Santa Clara County RCIS were limited. Because a large number of species met the criteria, this list was pared to a more manageable number of species to limit the scope of the RCIS to be consistent with the available resources and schedule. The following additional factors were considered in order to further refine the focal species list and give priority to species that would benefit most from the RCIS and add conservation value to the conservation strategy.

- **Prioritize species that are anticipated to have mitigation needs for public infrastructure projects in the next 10 years**. All things being equal, threatened and endangered species anticipated to need mitigation as the result of public infrastructure projects in the next 10 years were prioritized for inclusion as focal species. The California State Legislature's stated purpose of the pilot RCIS program is to "identify regional conservation and conservation investments and aid the development of critical infrastructure through an open public process and using a science-based approach while also encouraging investments in conservation through advanced mitigation" (Assembly Bill 2087, Section 1). The 10-year horizon was selected because CDFW may approve an RCIS for an initial period of up to 10 years. The RCIS may be amended during or after this period to include additional focal speci**es.**[16]

- **Prioritize species in the RCIS area not completely addressed by the Habitat Plan over species completely addressed by the Habitat Plan.** Some species[17] that meet the criteria are covered by the Habitat Plan and have a range in the RCIS area that overlaps entirely within the Habitat Plan's plan area. Those species' conservation and mitigation needs will be fully addressed by the Habitat Plan. Such species were not included as focal species for this Santa Clara County RCIS because including those species provides little additional conservation benefit. All conservation efforts for those species, including any mitigation needs, would be accomplished through Habitat Plan and its implementing entity, the Santa Clara Valley Habitat Agency.
- **Prioritize species in the RCIS area that occur on unprotected lands and that may be impacted by development over species where the only known occurrences are on protected lands.** For a few of the species that meet the selection criteria, the only documented occurrences are on protected land (e.g., San Francisco collinisia (*Collinsia multicolor*), legenere (*Legenere limosa*), vernal pool fairy shrimp (*Branchinecta lynchi*)). Because these species of plants and wildlife have only been documented on federal, state, or regional parkland in the RCIS area stressors and pressures on those species are expected to be low compared to other species.
- **Prioritize species in the RCIS area that are not addressed by other regional conservation strategies.** There are many overlapping conservation or other planning strategies in the Bay Area that address one or more species. For example, species that occur only in the bayland portion of the strategy (e.g., Ridgway's rail, salt marsh harvest mouse) were not included as focal species. Instead, this Santa Clara County RCIS summarizes the conservation strategies provided by the conservation planning strategies and programs that address the baylands (Goals Project 2015). Species not addressed by any other regional strategies were prioritized over species that are already addressed by other regional conservation planning efforts.

Species that meet the screening criteria, whose needs are not completely addressed by the Habitat Plan or other regional conservation strategy, that do not occur only on protected land, and that are likely to need mitigation for transportation infrastructure projects within the next 10 years were included as focal species. This Santa Clara County RCIS includes 18 focal species, 10 wildlife species and eight plant species.

The screening criteria and evaluation process for each species evaluated for potential inclusion in this Santa Clara County RCIS as a focal species are presented in Appendix D, *Letters of Support*. Tables 2-6 and 2-7 show the focal wildlife and focal plant species selected for the RCIS, respectively.

[16] The list of potential focal species developed after applying the criteria in Step 2 but excluded in Step 3 are excellent candidates for a future addition to this Santa Clara County RCIS.

[17] These species include bay checkerspot butterfly, least Bell's vireo, Tiburon Indian paintbrush, coyote ceanothus, Metcalf Canyon jewelflower, and Santa Clara Valley dudleya

Table 2-6. Santa Clara County RCIS Focal Wildlife Species

Scientific Name	Common Name	Status[a]			Covered by SCVHP[b]
		Federal	State	Global	
Fish					
Oncorhynchus mykiss	Central California Coast steelhead	T	–	G5T2Q	–
Oncorhynchus mykiss	South Central California Coast steelhead	T	SSC	G5T2T3Q	–
Amphibians					
Ambystoma californiense	California tiger salamander (Central CA Distinct Population Segment)	T	T	G2G3	X
Rana boylii	Foothill yellow-legged frog	–	SC	G3	X
Rana draytonii	California red-legged frog	T	SSC	G2G3	X
Birds					
Agelaius tricolor	Tricolored blackbird	–	SC	G5T1T2	X
Athene cunicularia	Burrowing owl	–	SSC	G4	X
Buteo swainsoni	Swainson's hawk	–	T	G5	–
Mammals					
Vulpes macrotis mutica	San Joaquin kit fox	E	T	G4T2	X
Puma concolor	Mountain lion	–	–	–	–

a **Status**

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
C = listed as a candidate species, which is a species for which the U.S. Fish and Wildlife Service has on file sufficient information to warrant a listing.
= 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.
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
SC = listed as a candidate species. A candidate species is one that the California Fish and Game Commission has formally declared a candidate species..
= no listing.

Global Conservation Status (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.
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 for global conservation.

b **Covered by the Santa Clara Valley Habitat Conservation and Natural Community Conservation Plan (SCVHP)** (ICF International 2012. Available: http://scv-habitatagency.org/178/Santa-Clara-Valley-Habitat-Plan)

X Covered by SCVHP
– Not covered by the SCVHP

Table 2-7. Santa Clara County RCIS Focal Plant Species

Scientific Name	Common Name	Status[a]				Covered by SCVHP[b]
		Federal	State	Global	CRPR	
Centromadia parryi subsp. *congdonii*	Congdon's spikeweed	–	–	G3T2	1B.2	–
Cirsium fontinale var. *campylon*	Mount Hamilton thistle	–	–	G2T2	1B.2	X
Eriastrum tracyi	Tracy's eriastrum	–	R	G3Q	1B.2	–
Fritillaria liliacea	Fragrant fritillary	–	–	G2	1B.2	X
Hoita strobilina	Loma Prieta hoita	–	–	G2	1B.1	X
Lessingia micradenia var. *glabrata*	Smooth lessingia	–	–	G2T2	1B.2	X
Sanicula saxatilis	Rock sanicle	–	R	G2	1B.2	–
Streptanthus albidus subsp. peramoenus	Most beautiful jewelflower	–	–	G2T2	1B.2	X

a **Status**

Federal

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

= no listing.

State

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.

Rules for assigning T-ranks follow the same principles outlined 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 to 80% of occurrences threatened/moderate degree of immediacy of threat)

b **Covered by the Santa Clara Valley Habitat Conservation and Natural Community Conservation Plan (SCVHP)** (ICF International 2012. Available: http://scv-habitatagency.org/178/Santa-Clara-Valley-Habitat-Plan)

X Covered by SCVHP

– Not covered by the SCVHP

2.3.5.2 Habitat Distribution Models

Habitat distribution models were developed for most focal plant and wildlife species to predict where they could occur, based on known habitat requirements and previously documented occurrences. Habitat distribution models were used to aid the development of the conservation strategy, including the biological goal and objectives and conservation priorities for focal species. Habitat distribution models for the focal species are described in detail in the respective focal species profiles in Section 2.3.5.3, *Focal Species Profiles*. Methods used for all the models are described below.

Habitat distribution models were developed for six of the eight focal plant species and nine of the 10 focal wildlife species. For rock sanicle (*Sanicula saxatilis*) and Tracy's eriastrum (*Eriastrum tracyi*), there are too few known occurrences within the RCIS area to model suitable habitat with confidence. A habitat distribution model was not developed for mountain lion because this species has such a broad distribution in the RCIS area that modeling suitable habitat would not be informative. Instead, mountain lion suitable habitat and movement patterns were used to inform the model of landscape linkages with the RCIS area.

Model Structure and Development Methods

The habitat distribution models were designed to estimate the extent and location of key habitat characteristics of each species and to be repeatable and scientifically defensible, while remaining as simple as possible. The models are spatially explicit, GIS-based "expert opinion models" based on identification of suitable land cover types in the RCIS area and location of known species occurrences. Land cover types are the basic unit of evaluation for habitat modeling and developing conservation strategies for the focal species. Land cover types were identified as suitable habitat based on the known or presumed habitat requirements and use patterns of each species. When supported by appropriate data, the models also incorporate physical parameters, including the elevation limits of known occurrences or soil type. In some cases, perimeter zones that were used to designate habitat are defined by a certain distance from a suitable land cover type. For example, one model parameter for Mount Hamilton thistle is serpentine soils within 25 feet of streams where the upland habitat is influenced by flooding or groundwater.

Habitats for wildlife were designated according to type of habitat use, such as breeding, foraging, aestivation, and movement habitat. Primary and secondary habitats for plants were designated according to the associated land cover types that characterize the locations of known occurrences, with occurrences more likely to occur in primary habitat than secondary habitat. Determination of suitable land cover types and additional physical parameters were based on available data from peer-reviewed scientific literature. When data were inconclusive or contradictory, conservative values were used in estimating suitable habitat. Overall, the habitat distribution models likely overestimate the actual extent of suitable habitat for most focal species because some important habitat features cannot be spatially mapped at the scale of the RCIS area, or such mapping was beyond the scope of this Santa Clara County RCIS, and because species do not occupy all of their suitable habitat.

This RCIS's habitat models were developed to be generally consistent with the habitat models developed for the Habitat Plan's covered species. This RCIS's habitat models differ in land cover types used to represent habitat where there are differences between the land cover data (and names of land cover types) used by this RCIS and the Habitat Plan (see Table 2-3a, *Crosswalk of Santa Clara*

County RCIS Terrestrial Land Cover Types to other State and Local Classification Systems, and Table 2-3b, *Crosswalk of Santa Clara County RCIS Wetland and Bayland Land Cover Types to other State and Local Classification Systems*, for a comparison of land cover types used by this RCIS and the Habitat Plan). Other differences generally reflect minor refinements in this RCIS's habitat models. A comparison of the Habitat Plan model parameters and the Santa Clara County RCIS model parameters for species that are included both in this RCIS and the Habitat Plan is included in Appendix G, *Comparison of RCIS Species Habitat Models and Habitat Plan Habitat Models*.

Focal Species Locations

The data used to identify locations of occurrence of focal species, and to inform the development of the focal species' habitat models come primarily from the CNDDB (California Natural Diversity Database 2016), with some additional data from the USGS's Biodiversity Information Serving Our Nation (BISON) database (U.S. Geological Survey 2016). These occurrence records are also displayed in each species' habitat distribution map. In addition, occurrence data specific to the the Habitat Plan (i.e., from a source other than CNDDB) was reviewed to identify suitable land cover types for the focal species' habitat models, but were not included on the habitat distribution maps. These data include the following.

- Plant occurrence records from 2004 SCVWD surveys of their facilities (J. Hillman pers. comm., as cited in the Habitat Plan).
- Rare plant and special-status wildlife survey data from field work conducted in 2005 and 2006 east of San Jose on approximately 8,000 acre property owned (at the time) by United Technologies Corporation and now owned by the Santa Clara Valley Open Space Authority (as cited in the Habitat Plan).
- Plant occurrence records from the CNPS (K. Bryant pers. comm., 2006–2007 data, as cited in the Habitat Plan).

For CNDDB records, only occurrences presumed extant were used. Data that are reported to the CNDDB are done so with varied precision. Some occurrences are very well documented with explicit locations (e.g., GPS coordinates) while other are reported with more general location information. Precise occurrences are those that have sufficient information to be located on a standard USGS 7.5 minute quadrangle map, either at specific location or with an accuracy of 80 meter. General occurrences are those that have been documented in very general terms and include nonspecific records (such as the boundary of a park where an occurrence is known to occur) or records with an accuracy of 0.1, 0.2, 0.4, 0.6, 0.8, or 1.0 mile. Precise occurrences were assumed to be extant unless they were on sites that have obviously been converted to other land uses and were used to verify habitat distribution models.

In addition, BISON data were filtered to use specific observations documented between 1977 and 2016, rather than records from literature and other sources that have not been field verified. This filter was used to exclude nonspecific, historic records from unauthenticated sources.

Occurrences that fell outside of a model's predicted habitat distribution were evaluated to determine whether they indicated flaws in the model or were an anomalous or erroneous location point. Erroneous points were deleted; anomalous points (e.g., those that occur in unsuitable habitat, or beyond the expected range of the species), were retained but were not used to adjust the model results. Aerial photographs were examined to assess the significance of extreme outliers.

CNDDB Data Limitations

CNDDB records represent the best available statewide data but, are limited in their use for conservation planning. CNDDB data document presence only; the absence of an occurrence data point does not indicate that the species is not present. CNDDB records rely on field biologist to voluntarily submit information on the results of surveys and monitoring. As a result, the database is biased geographically towards areas where surveys have been conducted or survey efforts are greater (many areas have not been surveyed at all and this is not reflected in the database). The database may also be biased toward species that receive more survey effort. For example, there have been more surveys for California red-legged frog than other special-status amphibians because California red-legged frog is a listed species. Conspicuous diurnal species such as raptors receive greater survey effort than nocturnal species such as bats. Plants typically receive less survey effort than wildlife.

Model Uses and Limitations

The habitat distribution models are intended to be used only for planning purposes at the scale of the RCIS area. The use of these models by project proponents is voluntary. The models impose no regulatory requirements. If used for site planning, the models should be only used 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 also be geographically general or inaccurate.

The precision of the habitat distribution models is limited by several factors, including minimum mapping units of the underlying land cover datasets. Areas of suitable habitat smaller than the mapping thresholds were not mapped and could therefore not be incorporated into the models. This constraint limited the degree of resolution of some habitat features potentially important to some species. This presented challenges for focal plant species, which are often associated with unmapped microhabitats such as swales, ditches, or rock outcrops smaller than the minimum mapping unit.

The habitat distribution models were limited to distinguishing habitat uses based on key life history requirements such as breeding, foraging, or dispersal that are tied to land cover types. The land cover data do not allow further distinctions of habitat quality on a regional scale. To account for these limitations, conservative estimates of habitat parameters were used. This approach tends to overestimate the actual extent of suitable or required habitat for this species, but is consistent with current conservation planning practices when data are limited (Noss et al. 1997).

2.3.5.3 Focal Species Profiles

The following species profiles summarize the regulatory status, distribution in the RCIS area, and habitat requirements for the focal species. The information provided in the species profiles are intended to be sufficient to develop effective and practical conservation goals, objectives, and actions for this Santa Clara County RCIS. The profiles are not intended to provide a comprehensive summary of the biology and ecology of each focal species. A summary of the historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, on the focal species, is provided separately in Section 2.7, *Pressures and Stressrs on Focal Species and other Conservation Elements*.

Central California Coast Steelhead (*Oncorhynchus mykiss*)

Regulatory Status

- **State:** None
- **Federal:** Threatened
- **Critical Habitat:** Final critical habitat for the Central California Coast steelhead distinct population segment[18] (DPS) designated by National Marine Fisheries Service 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 the 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 Central California Coast steelhead approved in 2016 as part of the California Coast Multispecies Plan, including California Coastal Chinook Salmon, Northern California steelhead, and Central California Coast steelhead (National Marine Fisheries Service 2016a).

Distribution

General

The Central California Coast steelhead DPS comprises winter-run steelhead populations that spawn and rear from the Russian River in Sonoma County south to Aptos Creek in Santa Cruz County, and includes tributaries to the San Francisco/San Pablo Bay system, and stretches south to Aptos Creek in Santa Cruz County (National Marine Fisheries Service 2016a). Due to significant impacts from urban infrastructure and agricultural development, the range and habitat of this species is severely limited and degraded (Moyle 2002, Leidy et al. 2005, National Marine Fisheries Service 2016b).

Within the RCIS Area

Central California Coast DPS steelhead occur in Guadalupe River, Stevens Creek, and Coyote Creek stream system upstream to Anderson Dam and Reservoir, near the City of Morgan Hill (Leidy et al. 2005, National Marine Fisheries Service 2016a) (Figure H-1, Appendix H, *Focal Species Habitat Models*).

Life 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.

[18] A distinct population segment is "a subdivision of a vertebrate species that is treated as a species for purposes of listing under the Endangered Species Act (ESA). Based on FWS and NMFS "Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act" (61 FR 4722; February 7, 1996), two elements are considered in determining whether there is a distinct population segment: (1) discreteness of the population segment in relation to the remainder of the species to which it belongs; and (2) the significance of the population segment to the species to which it belongs" (National Marine Fisheries Service 2016).

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 mature 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) describes two different habitat types used by Central California Coast steelhead and resident trout. The 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

Habitat for the species was based on critical habitat designations and streams with known populations or occurrences of steelhead, and expert knowledge of habitat conditions in the RCIS area (Smith, J. personal comment).

Modeled habitat identifies 13 different types of streams with excellent to no suitability for steelhead or other fish species. The best habitat in the RCIS area are stream segements where in most years conditions of stream flow, water temperature, and feeding potential are sufficient to potentially support steelhead spawning and also rearing by juvenile steelhead. Other areas (usually farther downstream of the cool steelhead zone) have conditions are more variable among years or marginal in terms of stream flow and/or water temperature for rearing steelhead (J. Smith, pers. comm, March 3, 2017).Each type of habitat is described in detail below.

Estuarine

Lowermost reaches of streams where conditions are saline and tidal (such as on Guadalupe Slough, lower Guadalupe River and Lower Coyote Creek).

Cold Steelhead and Cold Steelhead-Extent Unknown

A small portion of this habitat is on undammed tributaries, such as Tar, Bodfish, Little Arthur creeks (tributaries to Uvas Creek), Cedar Creek (tributary to Pacheco Creek) and Arroyo Aguague (tributary to Upper Penitencia Creek). However, most of the remaining steelhead habitat in the RCIS area is downstream of reservoirs on Los Gatos, Guadalupe, Alamitos, Arroyo Calero, Coyote, Upper Penitencia, Chesbro, Uvas, and Pacheco creeks. The mapped stream segments in this category normally provide an appropriate mix of: 1) relatively cool water (rarely above 22-24 degrees C); 2) high stream flow to provide fast-water feeding habitat for steelhead; 3) relatively clean, coarse substrate for insect production; and 4) sufficient sun and water clarity to provide for algal growth (as a base of the food chain) and to allow steelhead to feed on drifting insects in fast water (Smith 1982, Smith and Li 1983). Much of the stream habitat in this category (downstream of reservoirs) is warmer than typical trout habitat, but the high summer stream flows allow steelhead to sufficiently feed on drifting insects to cope with the metabolic costs of the warmer water (Smith and Li 1983). Steelhead downstream of reservoirs in summer are found almost exclusively in fast-water habitat in riffles, runs and heads of pools and often reach smolt size in one summer (Smith 1982, Smith and Li 1983). A variety of native fish species are usually present in this habitat and downstream of reservoirs, includes Pacific lamprey.

Cold Trout and Cold Trout-Extent Unknown

These are perennial habitats upstream of reservoirs where conditions are suitably cool enough to support resident rainbow trout (*Oncorhynchus mykiss*), often with California roach (*Lavinia symmetricus*), Sacramento sucker (*Catostomus occidentalis*) and riffle sculpin (*Cottus gulosus*) present. Prior to reservoir construction, most of these habitats supported steelhead and possibly some salmon (*Oncorhynchus spp*.). Pacific lamprey (*Lampetra tridentata*) is another anadromous species of concern that is presumed absent from this habitat upstream of the reservoirs. However, lampreys are able to ascend the spillway at Uvas Reservoir (Smith 1982) to utilize upper Uvas Creek. Resident trout are also present above natural and smaller man-made barriers on Smith, Bodfish, Little Arthur, and Upper Penitencia creeks.

Warm Potential Trout/Steelhead

These habitats are usually further downstream of reservoirs than the cold steelhead reach and are often deficient in one or more of the 4 factors listed above. Higher water temperatures increase steelhead food demands, often sufficiently to starve the fish. Variable year-to-year stream flows, or reduced stream flows due to percolation, reduce the fast water steelhead feeding habitat needed to meet the metabolic demands of high temperature. Insect production is low due to poor substrate, turbidity, or low stream flow. Feeding is reduced by heavy shading or high turbidity. Management for increased stream flows or reduced water temperatures downstream of reservoirs in this zone may make the habitat more regularly suitable for steelhead. Usually, warm-water native fish (see below) tend to dominate in this habitat type, with any juvenile steelhead scarce and/or strongly restricted to suitable fast-water feeding habitat.

Warm Native

These habitats are dominated by native warm-water fishes, often including Sacramento sucker, hitch or roach, Sacramento pikeminnow (*Ptychocheilus grandis*), threespine stickleback (*Gasterosteus aculeatus*), and prickly sculpin (*Cottus asper*). Most of the mapped reaches contain at least 3-4 of the above species as the minnow-sucker association of Smith (1982). North Fork Pacheco Creek (above the reservoir) and Upper Silver Creek (tributary to Coyote Creek) contain roach associations, dominated by California roach, with relatively scarce stickleback (Upper Silver Creek) or Sacramento Sucker and prickly sculpin (North Fork Pacheco Creek). The third potential native warm-water fish community is the Sacramento perch (Archoplites interruptus)/Sacramento blackfish (*Orthodon microlepidotus*) community (Smith 1982). This low-gradient stream association is absent from the RCIS area, and from the rest of California, because of the scarcity of Sacramento perch and the dominance of even high quality downstream habitats by introduced fishes, including sunfishes (*Lepomis spp*.) and common carp (*Cyprinus carpio*). Foothill yellow-legged frogs (*Rana* *boylei*) and California red-legged frogs (*R. draytonii*) can occur in relatively undisturbed reaches of the warm native, cold steelhead and cold trout zones.

Mixed Native – Salmon

Chinook salmon (*O. tshawytscha*) presently spawn in Coyote Creek, the Guadalupe River, and its tributaries. Some of the reaches they use are mapped as "cold steelhead" or "warm potential trout/steelhead," indicating the higher quality year-round habitat that steelhead are potentially able to use for rearing. However, since Chinook spawn in early winter and juveniles migrate to the ocean in their first spring, Chinook are able to use habitats that turn very warm or have low water quality in summer. Most of these habitats also have a fish community composed of a mixture of native species (Sacramento sucker and hitch) and introduced species (carp and red shiner (*Cyprinella lutrensis*)).

Mixed Native – Salmon

These warm-water habitats contain a mixture of native and introduced species. This includes lower portions of Coyote and Llagas creeks and Guadalupe River, and the Pajaro River and most pond and reservoir habitats. Native tule perch (*Hysterocarpus traski*) have apparently been reintroduced to Coyote Creek via the pipeline from San Luis Reservoir; they are present in the on-channel Ogier Ponds.

Managed Reservoir

These artificial habitats provide warm-water lake conditions, a habitat type originally rare in the RCIS Area. These habitats are primarily occupied by sport fishes other warm-water introduced species such as green sunfish (*Lepomis cyanellus*), redear sunfish (*Lepomis microlophus*), pumpkinseed sunfish (*Lepomis gibbosus*), crappie (*Pomoxis spp*.), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), bullhead (*Ameiurus spp*.), white catfish (*Ameiurus catus*), and channel catfish (*Ictalurus punctatus*). Forage for the predatory fishes has usually included introduced threadfin shad (*Dorosoma petenense*), inland silverside (*Menidia beryllina*), golden shiner (*Notemigonus crysoleucas*), and crayfish. Some native fishes, including Sacramento sucker and Sacramento blackfish, can be abundant in the new habitats, but most native species do poorly when facing competition and predation from the introduced fishes.

Fish Scarce

These habitats are normally dry during summer and fall. However, they may serve as migration routes for steelhead and other fishes and/or as reproductive habitat for rapidly developing amphibians such as tree frogs (*Hyla regilla*) or western toads (*Bufo boreas*).

No Data

Fish species present are unknown, but may have fisheries values.

No Data/Probably No Value

Fish species present are unknown, but because of location or habitat conditions the reach is unlikely to have habitat value for fish. A majority of the no data or no data / probably no value stream reaches are seasonal streams, extreme headwaters, or highly modified urban channels.

Model Results

Figure H-1, Appendix H, *Focal Species Habitat Models*, displays the results of the modeled habitat for the Central California Coast DPS steelhead within the RCIS area. The majority of suitable "cold steelhead" habitat is located along the western edge of the RCIS area in the Santa Cruz Mountains.

South Central California Coast Steelhead (*Oncorhynchus mykiss*)

Regulatory Status

- **State:** N/A
- **Federal:** Threatened
- **Critical Habitat:** Final critical habitat for the South Central California Coast steelhead DPS designated by National Marine Fisheries Service 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 the Corps in 33 CFR 329.11) or the bankfull elevation where the ordinary high-water line has not been defined.
- **Recovery Planning:** South Central California Coast Steelhead Recovery Plan approved in 2013 (National Marine Fisheries Service 2013).

Distribution

General

Historically, the South Central California Coast steelhead ranged from creeks in the Aptos Hills south to San Luis Obispo. Due to significant impacts from urban infrastructure and agricultural development, the range and habitat of this species is severely limited and degraded (National Marine Fisheries Service 2013).

Within the RCIS Area

The South Central California Coast DPS steelhead has potential to occur in the RCIS area, particularly in the Pajaro River system, including Pescadero Creek, Uvas and Bodfish Creeks near SR 152, Little Arthur Creek near Mount Madonna, Tar Creek near Gilroy, Pacheco Creek, and Tequisquita Slough (National Marine Fisheries Service 2013) (Figure H-1, Appendix H, *Focal Species Habitat Models*).

Life History

Only winter steelhead are found in the South Central California Coast steelhead distinct population segment. Migration and spawn timing are similar to Central California steelhead. Life history traits for South Central Coast California steelhead are similar to those described for Central California Coast steelhead. Steelhead along the Central California Coast enter freshwater to spawn when winter rains have been sufficient to raise streamflows and breach the sandbars that form at the mouths of many streams during the summer. Increased streamflow during runoff events also appears to provide cues that stimulate migration and allow better conditions for fish to pass obstructions and shallow areas on their way upstream (Moyle 2002). 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 (Shapovalov and Taft 1954).

Ecological Requirements

The South Central California Coast steelhead have similar habitat requirements to the Central Coast DPS. Smith (1999) describes two different habitat types used by Central Coast steelhead and resident trout. The primary habitat consists of shaded pools of small, cool, low-flow upstream reaches typical of the original steelhead habitat in the region. Steelhead require 2 years of rearing to be large enough to smolt and emigrate.

In addition, they can 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 increased 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 temperature of 73°F to 77°F, steelhead/rainbow trout move into higher velocity microhabitats in riffles, the head of pools, and runs where sufficient food can be obtained. These habitats are created by summer releases from an upstream reservoir; growth rates can be high and steelhead can smolt as yearlings (Smith and Li 1983 and Smith 2007).

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

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 into the substrate or other cover. Backwater habitat, small tributaries, or other low velocity areas may also be important winter habitat.

Upper lethal temperature for Pacific salmonids is in the range of 75°F–77°F (24°C–25°C) 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 higher temperatures if food is abundant (Moyle 2002, Smith and Li 1983). Temperature also influences the smoltification process. In some studies, steelhead have exhibited decreased migratory behavior and decreased seawater survival at temperature in excess of 55°F (13°C) (Zaugg and Wagner 1973, Adams et al. 1975).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

The model parameters for South Central California Coast Steelhead DPS and descriptions of stream habitat types are the same as the model parameters for Central California Coast Steelhead DPS (see *South Central California Coast Steelhead [Oncorhynchus mykiss], Model Parameters* above).

Model Results

Figure H-1, Appendix H, *Focal Species Habitat Models*, displays the results of the modeled habitat for the South Central California Coast DPS steelhead within the RCIS area. The majority of suitable cold steelhead habitat is located along the western edge of the RCIS area in the Santa Cruz Mountains.

California Tiger Salamander (*Ambystoma californiense*).

Regulatory Status

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

Distribution

General

California tiger salamander 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 a total of 1,148 CNDDB occurrences of California tiger salamander within its range (California Natural Diversity Database 2016).

Within the RCIS Area

California tiger salamander are found in aquatic and upland habitats in scattered locations throughout the RCIS area on both sides of Highway 101 along Coyote Valley, on both sides of Highway 152 and in San Benito County. This species is not present in the immediate northeastern and northwestern corners of the RCIS area. the 1,148 CNDDB occurrences, 168 (14%) are located within the RCIS area (Figure H-2, Appendix H, *Focal Species Habitat Models*).

Life History

California tiger salamander uses aquatic and terrestrial habitats at different stages in their life cycle. Adults emerge from underground burrows to breed, but only for brief periods during the year. Adult California tiger salamander 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 the pond bottom (Stebbins 1972, Shaffer and Fisher 1991, Barry and Shaffer 1994, Jennings and Hayes 1994). After breeding, adults leave the breeding ponds and return to their refugia (e.g., small mammal burrows). After approximately two weeks, the salamander eggs begin to hatch into larvae. Once larvae reach a minimum body size they metamorphose into terrestrial juvenile salamanders. The amount of time that salamanders spend 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 are larger at time of metamorphosis. At a minimum, salamanders require ten weeks living in ponded water to complete metamorphosis but in general development is completed in 3– 6 months (Petranka 1998). If a pond dries prior to metamorphosis, the 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 treefrogs (*Pseudacris regilla*), California red-legged frogs, western toads (*Bufo boreas*) and spadefoot toads (*Spea* spp.) (Zeiner et al. 1988, U.S. Fish and Wildlife Service 2000). Adults eat earthworms, snails, insects, fish, and small mammals (Stebbins 1972).

Ecological Requirements

California tiger salamanders breed and lay their 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 2017). Streams are rarely used for reproduction, but California tiger salamanders have been reported in ditches with seasonal wetland habitat and in slow-flowing swales and creeks (Alvarez et al. 2013).

California tiger salamanders are particularly sensitive to the duration of ponding in aquatic breeding sites. Because tiger salamanders have a 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 non-native predators from establishing (U.S. Fish and Wildlife Service 2017). The U.S. Fish and Wildlife Service (2017) states that, to remain viable, populations of California tiger salamanders 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). The U.S. Fish and Wildlife Service determined the minimum preserve size based on the 1.3 mile maximum dispersal distance (i.e., a preserve with a radius of 1.3 miles is 3,398 acres). The U.S. Fish and Wildlife Service also explains that four ponds provides the necessary amount of redundancy to ensure long-term habitat availability (U.S. Fish and Wildlife Service 2017).

The suitability of California tiger salamander habitat is proportional to the abundance of upland refuge sites are near aquatic breeding sites. California tiger salamanders primarily use California ground squirrel burrows as refuge sites (Loredo et al. 1996, Trenham 2001); Botta's pocket gopher burrows are also frequently used (Barry and Shaffer 1994, Jennings and Hayes 1994), as well as man-made structures. California tiger salamanders also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990). The presence and abundance of tiger salamanders in many areas are limited by the number of small-mammal burrows available; salamanders are typically absent from areas that appear suitable other than their lack of burrows. Loredo et al. (1996) emphasized the importance of California ground squirrel burrows as refugia for California tiger salamanders, and suggested that a commensal relationship existed between the California tiger salamander and California ground squirrel in which tiger salamanders benefit from the burrowing activities of 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. Also, tiger salamanders apparently do not avoid burrows occupied by ground squirrels (Loredo et al. 1996).

The proximity of refuge sites to aquatic breeding sites also affects the suitability of salamander habitat. California tiger salamanders are known to travel distances up to 1.4 miles from breeding sites (Trenham et al. 2001, Searcy and Shaffer 2008, Orloff 2011) and tend to live between approximately 100 yards and 0.6 mile (or more) from their breeding sites (Ford et al. 2013). 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 adult and subadult tiger salamanders 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 corner of the Antioch HCP/NCCP inventory area, Orloff (2011) recorded the majority of captured salamanders 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 salamanders 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. Also, habitat complexes that include upland refugia relatively close to breeding sites are considered more suitable because predation risk and physiological stress in California tiger salamanders probably increases with migration distance. Orloff (2011) also noted that California tiger salamanders also appear to have fidelity to specific areas of upland habitat.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

California tiger salamanders require two major habitat components: aquatic breeding sites and upland refugia sites typically created by small mammals. Model parameters were developed for both. Modeled potential breeding habitat within the RCIS area includes all wetland and pond types, (excluding seeps and reservoirs) that occur within grassland, woodland, riparian woodland, conifer forest, cultivated agriculture, and shrubland land cover types up to 3,940 feet elevation. Modeled potential upland habitat extends 1.3 miles around all areas designated as breeding habitat, excluding baylands and urban land cover types. In addition to the potential breeding and upland habitat, occupied habitat was designated using all CNDDB records with an extant record, indicating that the species is present at the location. This occupied habitat buffer is similar to the methodology used to display occupied habitat by buffering 1.3 miles from known extant occurrences in the draft recovery plan for the species (U.S. Fish and Wildlife Service 2017).

Model Results

Figure H-2, Appendix H, *Focal Species Habitat Models*, displays 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 nonurban 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.

Foothill Yellow-legged Frog (*Rana boylii*)

Regulatory Status

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

Distribution

General:

Foothill yellow-legged frog is found in low velocity permanent and ephemeral streams throughout Northern California, west of the Cascades and Sierra Nevada mountain ranges and south to Kern County at elevations from sea level to 4,500 feet (Stebbins 2003). It is estimated that the species currently occupies only 45% of its historical range in California. 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) (Jennings and Hayes 1994). There are 879 CNDDB occurrences within its range (California Natural Diversity Database 2016).

Within the RCIS Area

Foothill yellow-legged frog is found in the foothill areas of eastern Santa Clara County and the Santa Cruz Mountains in western Santa Clara County, generally upstream of reservoirs. Of the 879 CNDDB occurrences, 20 (3%) are located within the RCIS area (Figure H-3, Appendix H, *Focal Species Habitat Models*).

Life History

The foothill yellow-legged frog is a medium sized frog 1.5 to 3.2 inches longer from snout to vent with yellow undersides of the rear legs and lower abdomen (Stebbins and McGinnis 2012). They occur in perennial rocky stream and rivers with sunny banks and deep shaded pools, and tend to remain in streams and rivers year-round. Masses of eggs are attached ot gravel or rocks in moving water near stream margins (Zeiner et al. 1988). Foothill yellow-legged frogs in California generally breed between March and early June (Storer 1925, Grinnell et al. 1930, Wright and Wright 1949, Jennings and Hayes 1994). 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 attain adult size in two years (Storer 1925). In a study on the Eel River along the northern coast of California, foothill yellow-legged frog 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 for foothill yellow-legged frogs. Significant seasonal movements fo migrations from breeding areas have not been reported. Normal home ranges are less than 33 feet in the longest dimension (Zeiner et al. 1988).

Ecological Requirements

Foothill yellow-legged frogs require shallow, flowing water in small to moderate-sized streams with at least some cobble-sized substrate (Hayes and Jennings 1988, Jennings 1988; Bourque 2008). 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). This species has been found in streams without cobble (Fitch 1938, Zweifel 1955), but it is not clear whether these habitats are regularly used (Hayes and Jennings 1988, Jennings and Hayes 1994). Foothill yellow-legged frogs are usually absent from habitats where introduced aquatic predators, such as various fishes and bullfrogs, are present (Hayes and Jennings 1988, Kupferberg 1996). 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).

Adult foothill yellow-legged frogs feed primarily on aquatic and terrestrial insects (Fitch 1936); tadpoles preferentially graze on algae (Jennings and Hayes 1994). Postmetamorphs eat aquatic and terrestrial insects (Storer 1925, Fitch 1936).

A diversity of overstory habitat types are suitable for foothill yellow-legged frog, including hardwood forest, conifer forest, chaparral, riparian, and wet meadows. Frogs favor habitat with more than 20% shading, but are excluded from areas with too much cover (greater than 90%), likely due to a lack of basking sites (Hayes and Jennings 1988, Jennings 1988). Foothill yellow-legged frogs prefer low to moderate stream gradients, particularly for breeding (Smith pers.comm., in Hayes et al. 2016), but during the non-breeding season juvenile and adult frogs may migrate to higher gradient streams.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters were developed to capture habitat associations and the hydrodynamic features that create the most suitable in-stream conditions for foothill yellow-legged frog. Modeled habitat included a 165-foot buffer around rivers and streams associated with the following communities: conifer forests, woodlands, riparian woodlands, and shrublands. Sections of these aquatic features with low (0 to 11%) gradient slopes were identified as potential breeding or foraging habitat. Areas were excluded when found adjacent to urban, rural residential or landfills. The 0 to 11% slope used to designate potential breeding or foraging habitat was determined by comparing slope percentages for areas known to be used for breeding in a recent study of the species within the RCIS area.

Although foothill yellow-legged frog typically uses streams with slopes of lower gradient (e.,g < 6.5%) (Kupferberg 1996, Ibis Environmental Inc. 2003), it was necessary to use slopes up to 11% in GIS to capture stream reaches with known occurrences of foothill yellow-legged frog. All other stream reaches found within the same watershed as modeled breeding/foraging habitat was included as low-use or dispersal habitat.

Model Results

Figure H-3, Appendix H, *Focal Species Habitat Models*, displays modeled habitat for foothill yellow-legged frog within the RCIS area. The model identifies breeding/foraging habitat and low-use habitat. Breeding/foraging habitat are those 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. Secondary habitat captures segments of the rivers and streams that would most likely be used for movement between suitable breeding habitats in the same watersheds. The known occurrences are shown within the modeled habitat. Due to 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.

California red-legged Frog (*Rana draytonii*)

Regulatory Status

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

Distribution

General

The California red-legged frog is found along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County. There are a total of 1,404 CNDDB occurrences within the species' range (California Natural Diversity Database 2016).

Within the RCIS Area

California red-legged frog occurs throughout the RCIS area, with its critical habitat encompassing most of the eastern half of the RCIS area. Scattered occurrences are located throughout the open space on the east and west side of the Santa Clara Valley, but are clustered in the vicinity of Henry W. Coe State Park, Anderson Lake, and in the vicinity of Mount Hamilton. Of the 1,404 known occurrences, 155 (11%) occur in the RCIS area, with the majority of occurrences within the critical habitat (Figure H-4, Appendix H, *Focal Species Habitat Models*).

Life History

The California red-legged frog is a medium sized frog 1.75 to 5.25. inches long, from snout to vent, with reddish undersides of hind legs and lower belly. This species is found near ponds in a variety of habitats, mostly commonly in lowlands and foothills near woods adjacent to streams. California red-legged frogs breed 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). Males usually attain sexual maturity at 2 years of age and females at 3 years of age.

Ecological Requirements

California red-legged frog utilizes a variety of habitats, including various aquatic systems and riparian and upland habitats (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. 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. Stock ponds are frequently used by California red-legged frogs if the ponds are managed to provide suitable hydroperiod, pond structure, vegetative cover, and control of nonnative predators.

California red-legged frogs consume 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., *Hyla 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, California red-legged frogs often disperse from their breeding habitat to forage and seek summer habitat if water is not available (U.S. Fish and Wildlife Service 2002). This habitat may include shelter under boulders, rocks, logs, industrial debris, agricultural drains, watering troughs, abandoned sheds, or hayricks. The frogs will also use small mammal burrows, incised streamed channels, or areas with moist leaf litter (Jennings and Hayes 1994, U.S. Fish and Wildlife Service 1996, U.S. Fish and Wildlife Service 2002). However, this summer movement behavior has not been observed in all California red-legged frog populations studied. California red-legged frogs 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). 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. Generally speaking, red-legged frogs will use the extent of a riparian corridor no matter how narrow or wide it is. The primary features driving the use of this habitat are cool moist soil under shrubs or other vegetation where frogs can find refuge for short periods before returning to the water. On rainy nights, red-legged frogs may roam away from aquatic sites as much as one mile. Red-legged frogs often move away from the water after their first winter, causing sites where red-legged frogs were easily observed in the summer months to appear devoid of this species. Additionally, red-legged frogs sometimes disperse in response to receding water, which often occurs during the driest time of the year (U.S. Fish and Wildlife Service 2005b).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for California red-legged frog were developed to capture breeding, refugia, and dispersal habitat for the species. Breeding habitat includes all wetland and ponds (excluding reservoirs) within conifer forest, cultivated agriculture, grassland, woodland, riparian woodland, and shrubland land cover types. To capture refugia habitat, a 300-foot buffer was applied to all breeding habitat. Dispersal habitat includes all suitable land cover types found 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 shrubland communities.

Model Results

Figure H-4, Appendix H, *Focal Species Habitat Models*, displays modeled breeding, refugia and dispersal habitat for California red-legged frog within the RCIS area. The model output identifies breeding habitat and bases refugia and dispersal habitat on the dispersal distances from aquatic habitat that 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 nonurban portions of the RCIS area. The known occurrences and designated critical habitat areas are shown within the modeled habitat. Site-specific conditions should be surveyed to determine whether habitats on the site would support California red-legged frog.

Tricolored Blackbird (*Agelaius tricolor*)

Regulatory Status

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

Distribution

General

The tricolored blackbird is nearly endemic to California, with more than 99% of the global population occurring in the stategy area, and other populations in Oregon, Washington, Nevada, and western coastal Baja California (Meese et al. 2014). In California, tricolored blackbird occurs the Central Valley and surrounding foothills, and in coastal areas from Sonoma County to San Diego County. This species locally breeds in northeastern California. In winter, it is widespread along the

Central Coast and San Francisco Bay area. There are a total of 907 CNDDB occurrences for this species within its range.

Within the RCIS Area

The majority of the RCIS area provides both breeding and/or foraging habitat for the tricolored blackbird. Six precise occurrences have been documented in the RCIS area, most of which are in the southern portion of the RCIS area in Santa Clara and San Benito counties. In 2014, a colony of approximately 600 individuals was observed at the Calero Reservoir. In 2016, a colony of approximately 40 individuals were observed nesting in cattails on the northern, western and southern banks of Tooth Lake on the Canada de los Osos Ecological Reserve. In Santa Clara County, tricolored blackbird colonies have also been observed within the last 5 years at the Los Alamitos Percolation Ponds, Coyote Ranch Park, Coyote Ranch Park, Del Puerto Canyon Road, Halls Valley, and Lake Cunningham Park. There have also been several documented occurrences of tricolored blackbird colonies in the vicinity of San Felipe Lake, Tres Pinos, and Hollister. The most recent colony was documented in 2016, where approximately 5,000 individuals were observed in the vicinity of Santa Ana Valley Road in Hollister, nesting in wheat and mustard (California Natural Diversity Database 2016, Information Center for the Environment 2017). Of the 907 known occurrences, 16 (2%) occur in the RCIS area (California Natural Diversity Database 2016) (Figure H-5, Appendix H, *Focal Species Habitat Models*).

Life History

Tricolored blackbirds are closely related to red-winged blackbirds, but the two species differ substantially in their breeding ecology. Red-winged blackbird pairs defend individual territories, while tricolored blackbirds are 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). As many as 20,000 or 30,000 tricolored blackbird nests have been recorded in cattail marshes of 9 acres)or less (Neff 1937, DeHaven et al. 1975a), and individual nests may be built less than 1.5 feet apart (Neff 1937). 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).

During the breeding season, tricolored blackbirds exhibit itinerant breeding, commonly moving to different breeding sites each season (Hamilton 1998). 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).

Ecological Requirements

Tricolored blackbirds have three basic requirements for selecting their 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 blackbird nested primarily in freshwater marshes dominated by cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.), with colony sites occurring to a lesser extent in were in willows (*Salix* spp.), blackberries (*Rubus* sp.), thistles (*Cirsium* and *Centaurea* spp.), or nettles (*Urtica* sp.) (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 Santa Clara County, tricolored blackbirds occur sporadically, favoring smaller marsh and wetland sites, often supported by artificial stock ponds or water retention impoundments (California Department of Fish and Wildlife 2017b). Colony size in Santa Clara County is much smaller than is found in the Central Valley, often 10's to 100's of pairs rather than 1000's.

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 the 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). Tricolored blackbirds are not common in Santa Clara County during the winter.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for tricolored blackbird were developed to capture habitat associated with breeding and foraging for the species. Breeding habitat includes all wetland and pond and riparian land cover types within 1,640 feet of suitable foraging habitat. Foraging habitat includes cultivated agriculture, grassland, riparian woodland, and woodland land cover types within 3 miles of wetland and ponds.

Model Results

Figure H-5, Appendix H, *Focal Species Habitat Models*, displays modeled breeding and foraging habitat for tricolored blackbird within the RCIS area. Suitable habitat is modeled throughout the undeveloped lands in the RCIS area. The known occurrences are shown within the modeled habitat. The habitat model likely overestimates potential breeding habitat, as not all areas mapped as wetland and pond provides suitable breeding habitat. Similarly, including all riparian areas as modeled breeding habitat likely overestimates suitable breeding habitat, as breeding habitat will be limited to small ponds and wetlands that occur in slow water portions of these riparian corridors. Site-specific conditions should be assessed to determine whether habitats on the site could support tricolored blackbird.

Burrowing Owl (*Athene cunicularia*)

Regulatory Status

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

Distribution

General

The western burrowing owl is found throughout nonmountainous western North America, from the Great Plains grasslands in southern portions of the western Canadian provinces south through the U.S. into Mexico (Poulin et al. 2011). In California, the burrowing owl's range extends throughout lowland areas 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). There are a total of 1,924 CNDDB occurrences within its range (California Natural Diversity Database 2016).

Within the RCIS Area

While overwintering habitat is distributed extensively throughout the RCIS area, breeding pairs occur primarily in the City of San Jose, at the San Jose International Airport, and Alviso, near the baylands, and in the San Benito County portion of the RCIS area. Of the 1,924 known occurrences, 67 (3.5%) occur in the RCIS area (California Natural Diversity Database 2016), with the majority of the occurrences in Santa Clara County (Figure H-6, Appendix H, *Focal Species Habitat Models*).

Life History

Burrowing owls are small owls, betwen 7.5 and 9.8 inches long. This species is mostly a resident in California, but some northern California invidividuals may migrate as far as Central American during the winter. Burrowing owls are found at elevations as high as 5300 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, western burrowing owls breed once per year in an extended reproductive period, during which most adults mate monogamously. Both sexes reach sexual maturity at 1 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 the incubation and brooding and is believed to remain continually in the burrow while the male does all the hunting. The young begin emerging from the nest burrow when about 2 weeks old, and they remain closely associated with the nest burrow or nearby satellite burrows for several weeks (Thomsen 1971). The 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 adult (post-breeding dispersal) and juvenile (natal dispersal) burrowing owls 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 (i.e., high gene flow) 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 their range, burrowing owls require 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 Natural Diversity Database 2016), and urban vacant lots, as well as the margins of airports, golf courses, and roads (Gervais et al. 2008). In Santa Clara County, burrowing owls primarily occupy higly developed parcels, such as the Moffeet Federal Airfield and Shoreline Park. This species burrows underground and depends on burrowing mammals, primarily ground squirrel (*Spermophilus beecheyi*), for burrow construction (California Natural Diversity Database 2016). Structures such as culverts, piles of concrete rubble, and pipes are also used as nest sites. Artifical nest boxes are also frequently used by burrowing owls (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). Burrowing owls at Moffett used many of the same or nearby (within eyesight) burrows year after year.

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 for burrowing owl (Gervais and Anthony 2003). Burrowing owls tend to forage close to their nest during the breeding season but have been recorded hunting up to 1.7 miles away (Gervais et al. 2003). The home range size of burrowing owls is undetermined, but appears to be based on the 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 and in agriculture areas in California, and owls did not show preference for cover types. 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 the burrow, 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

Model parameters for burrowing owl were developed to capture breeding and overwintering habitat (i.e., areas where burrowing owl may breed and overwinter) and overwintering habitat (i.e., areas assumed suitable for overwintering only). Breeding/overwintering habitat included grassland, cultivated agriculture (except orchard and vineyard), woodland, and ornamental woodland and rural residential land cover types. Woodland land cover types were included where they occurred within 985 feet of grassland habitat. Breeding/overwintering habitat was restricted to suitable land cover types occurring on less than 5% slope. Overwintering habitat included the same land cover types as breeding/overwintering habitat, but was restricted to suitable land cover types occurring on slopes greater than 5% but less than 25%.

Model Results

Figure H-6, Appendix H, *Focal Species Habitat Models*, displays modeled habitat for burrowing owl within the RCIS area. Suitable habitat is spread widely throughout the valley floor and along the edge of the foothills that border the valley on both sides. The majority of the known occurrences are shown within the modeled habitat. Small patches of suitable habitat found within and in close proximity to urban areas are not readily visible in Appendix H, *Focal Species Habitat Models*, due to the scale of the map. These areas are typically small vacant lots on the margins of other suitable land cover types. All 10 of the occurrences in San Benito County are in breeding/overwintering habitat. Site-specific conditions will dictate whether burrowing owls could be present and should be assessed to determine whether the habitat on the site could support burrowing owl.

Swainson's Hawk (*Buteo swainsoni*)

Regulatory Status

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

Distribution

General

In California, Swainson's hawk is uncommon and only occurs during the breeding season in desert, shrubsteppe, grassland, and agricultural habitats in the Central Valley and Great Basin bioregions (Woodbridge 1998).

Within the RCIS Area

Swainson's hawk is extremely uncommon in the RCIS area, with the majority of occurrences being of migrating birds. Swainson's hawk were first documented nesting in Santa Clara County (in Coyote

Valley) in 2013 for the first time since 1894 (Phillips et al. 2014) and have nested successfully in the same area in Coyote Valley each year since 2013, except in 2017 when the nest was knocked out of the nest tree by high wind (Phillips, pers. comm. 2017). This successful breeding indicates that there is suitable nesting habitat for Swainson's hawk in the RCIS area (Figure H-7, Appendix H, *Focal Species Habitat Models*).

Life 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). 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. The young remain in the nest until they fledge in 38 to 42 days after hatching (England et al. 1997).

Ecological Requirements

Breeding

Swainson's hawk is 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. In California, Swainson's hawk 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 hawk 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 hawk 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 hawk 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 the 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 back on the breeding grounds, Swainson's hawks again 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 the nestlings' nutritional demands during rapid growth and the adults' high energetic costs of breeding.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for Swainson's hawk were developed to capture foraging and nesting habitat in the RCIS area. Nesting habitat included riparian woodland land cover types. Foraging habitat included grassland land cover types, and cultivated agriculture land cover types except for orchard, vineyard, and developed agriculture. Modeled habitat was restricted to the Upper Santa Clara Valley level IV ecoregion (Griffith et al. 2016), which is the only part of the RCIS area where Swainson's hawk has been documented to successfully nest since 1894 (Phillips et al. 2014). In California, Swainson's hawks primarily nest in flatter, valley landscapes, which is captured well by the Upper Santa Clara Valley ecoregion.

Model Results

Figure H-7, Appendix H, *Focal Species Habitat Models*, displays modeled habitat for Swainson's hawk within the RCIS area. Swainson's hawk modeled habitat is restricted to the Upper Santa Clara Valley, including Coyote Valley, where Swainson's hawk has recently successfully nested. Modeled nesting habitat is restricted to the riparian corridors. The nesting habitat model does not capture single or small patches of trees, which is potentially suitable nesting habitat when it occurs amongst suitable foraging habitat. Suitable foraging habitat occurs throughout the Upper Santa Clara Valley. The known nesting location is shown within the modeled habitat. Site-specific conditions should be surveyed to determine whether habitats on the site provide suitable nesting and/or foraging habitat for Swainson's hawk.

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 Service1998a).

Distribution

General

San Joaquin kit foxes occur 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 1998a). There are 979 known occurrences throughout its range (California 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 1998a).

Within the RCIS Area

San Joaquin kit fox is rare in the RCIS area, with occurrences generally clustered around the southeastern corner of the RCIS area. Of the 979 known San Joaquin kit fox occurrences, 9 (1%) are located within the RCIS area. All occurrences in the RCIS area are general occurrences, with the last documented occurrences in 2002 near Henry W. Coe State Park (California Natural Diversity Database 2016) (Figure H-8, Appendix H, Focal Species Habitat Models).

Genetic studies have shown that individuals from the San Luis Reservoir population, east of the RCIS area, interbreed with individuals from Alameda and Contra Costa Counties (Schwartz et al. 2000, in U.S. Fish and Wildlife Service 2006). It is assumed that the Pacheco Creek and Tequisquita Slough watersheds in the southeastern part of the strategy provides movement habitat between these two areas (U.S. Fish and Wildlife Service 2006). In the recovery plan for this species, USFWS restricts the range in Santa Clara County to the Pajaro River watershed (U.S. Fish and Wildlife Service 1998a).

Life History

The San Joaquin kit fox is small fox, about the size of a house cat with long ears. This speices favors shrublands and grasslands in dry arid climates with burrows for denning. The diet of kit foxes varies, with season and geographic locality based on local availability of potential prey. In the northern portion of their range, kit foxes most commonly prey on California ground squirrels, cottontails (*Sylvilagus audubonі*), black-tail jackrabbits (*Lepus californicus*), pocket mice (*Perognathus* spp.), and kangaroo rats (*Dipodomys* spp.) (Hall 1983, Orloff et al. 1986, U.S. Fish and Wildlife Service et al. 1998). Secondary prey taken opportunistically may include ground-nesting birds, reptiles, and insects (Laughlin 1970).

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.

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 kit foxes generally do not overlap (White and Ralls 1993).

Ecological Requirments

San Joaquin kit foxes occur 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). They 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, kit foxes may occupy soils with a high clay content where they can modify burrow dug by other animals, such as California ground squirrels (*Spermophilus beecheyi*), kangaroo rats, and badgers (Orloff et al. 1986, Cypher et al. 2012).

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, kit foxes now occur primarily in foothill grasslands (Swick 1973, Hall 1983, U.S. Fish and Wildlife Service 1998a), valley oak savanna, and alkali grasslands (Bell 1994). 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 1998a).

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 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 oat (*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.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for San Joaquin kit fox were developed to capture movement/foraging habitat and low-use habitat. Movement and foraging habitat includes grassland and shrubland/woodland habitat adjacent to grassland habitat. Low-use habitat includes croplands, pastures, and shrubland/woodland habitat immediately adjacent (within 1 mile) to movement and foraging habitat. All areas within 656 feet of highways were excluded from the model as habitat. The model was further refined by only including habitat in those watersheds currently thought to have potential to support kit fox movement and dispersal.

Model Results

Figure H-8, Appendix H, *Focal Species Habitat Models*, displays modeled potential habitat for San Joaquin kit fox within the RCIS area. The model output identifies movement/foraging habitat and low-use habitat. Suitable habitat is modeled throughout the undeveloped lands in the southeastern portion of the RCIS area in the lands around Henry W. Coe State Park.

Mountain Lion (*Puma concolor*)

Regulatory Status

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

Distribution

General

Mountain lion ranges 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, coniferous forest, and riparian 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.

Life History

The mountain lion, aslo known as cougar, puma, panther, and catamount, is the largest wildcat in North America. Mountain lions are reddish-brown to tawny to gray, with a black tip on their long tail. Adults masles average approximately 140 pounds but may weigh 180 pounds and measures 7 to 8 feet long from nose to tip of tail. Adult males stand 30 inches tall at the shoulder and adult females are about 25 percent smaller than males. They are solitary mammals that are very territorial and avoid other invidiuals except during courtship (Link et al. 2005). Mountain lions primarly prey on deer, but will also eat smaller animals such as coyote, porcupines, and raccoons. Allen et al. 2015 found that in a study in Mendecino County that black-tailed deer (*Odocoileus hemionus*) made up 98.6 percent of mountain lion biomass. 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 2017c), however Allen et al. (2015) found that mountain lions hunting during diurnal hours as opportunities arise, especially during summer when young ungulates are avalaible (Allen et al. 2015). Mountain lions become sexually mature at 24 months of age, however they 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. Male mountain lions can live 10 to 12 years in the wild and females normally live longer. Female progency will establish a terriotiry adjacent to their mother, while males will disperse far distances from their natal area (Link et al. 2005).

Ecological Requirements

Mountain lions inhabit a wide range of habitats in search for food and shelter. More than half of California is mountain lion habitat. Mountain lions are found wherever deer are present, generally in foothills and mountains, while valleys and deserts are considered unsuitable. They can also be found in areas with rural human development. Mountain lions prefer habitat with steep canyons, rock outcroppins and boulders, or with enough brush to aid their ambush hunting style (Link et al. 2005). Female mountain lions 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, they require large areas of habitat. 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 sqaure miles, dependingon time of year, terrain, and avalibility of prey. Females home ranges are about that half of males (Link et al. 2005). Beier (1993) found that mountain lions can survivies 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 populations persistence increases. Thus corridors for movement are important in areas where habitat loss will occur. 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 was not developed for this Santa Clara County RCIS. Because this species ranges widely throughout a broad variety of habitats in the mountains and foothills, a habitat model would not provide much value towards developing a conservation strategy for this species. Rather, data from publications relevant to the RCIS area (see Section 2.5.1, *Habitat Connectivity*) are used to identify functional connections between habitats for mountain lion (Chapter 3, *Conservation Strategy*).

Congdon's Spikeweed (*Centromadia parryi* subsp. *congdonii*)

Regulatory Status

- **State:** California Native Plant Society List 1B.2
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** N/A

Distribution

General

Congdon's spikeweed is distributed along the inner and outer South Coast Ranges between Solano and San Luis Obispo counties. Populations are clustered in the East and South San Francisco Bay, Salinas Valley and Los Osos Valley. There are a total of 93 CNDDB occurrences of Congdon's spikeweed within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, occurrences of Congdon's spikeweed are clustered around the southern edge of the baylands north of SR 237 and west of Interstate 880. Of the 93 known Congdon's spikeweed occurrences, 7 (9.5%) are located within the RCIS area (Figure H-9, Appendix H, *Focal Species Habitat Models*).

Life History

Congdon's spikeweed is an annual herb up to 28 inches tall will 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 (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). 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 spikeweed occurs in California annual grassland and disturbed sites such as agriculture fields or golf courses on lower slopes, flats, swales, and floodplains below 800 feet elevation (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 econtone. This species typically occurs in colonies and is more common in areas that have a lower density of competing non-native annual grasses. Occurrences in the RCIS area are associated with species such as Italian ryegrass (*Festuca* perennis), saltgrass (*Distichlis spicata*), pickleweed (*Salicornia* pacifica), bird's foot trefoil (*Lotcus corniculatus*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), swamp grass (*Crypsis schoenoides*), rabbit's foot grass, alkali heath, alkali mallow (*Malvella leprosa*), and other non-native grasses.

Hybridization with the subspecies *Centromadia parryi* ssp. *rudis* was reported on for the North Livermore Road population (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Figure H-9, Appendix H, *Focal Species Habitat Models*, displays modeled habitat for Congdon's spikeweed in the RCIS area. Although land cover types that may provide habitat suitable for Congdon's spikeweed occur throughout the RCIS area, modeled habitat was limited to potentially suitable habitat adjacent to the existing occurrences in the RCIS area, all located north of California SR 237 and west of Interstate 880 (California Natural Diversity Database 2016), to avoid greatly overestimating habitat for this species. Areas south and east of these highways are too developed and urbanized to support habitat for this species.

Congdon's spikeweed is generally associated with seasonally wet areas; however, in this portion of the RCIS area, this habitat is associated with ruderal or disturbed areas, including unmapped drainages and areas with minor topographic swales. Such areas were identified in aerial photographs and mapped as potential habitat for this species.

Mount Hamilton Thistle (*Cirsium fontinale* var. *campylon*)

Regulatory Status

- **State:** California Native Plant Society List 1B.2
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area (U.S. Fish and Wildlife Service1998b)

Distribution

General

Mount Hamilton thistle is a narrowly distributed perennial thistle, limited to the Mount Hamilton and Diablo Ranges of the South Coast Ranges. This species is endemic to Santa Clara, Stanislaus, and Alameda Counties in the San Francisco Bay Area. There are a total of 41 occurrence of Mount Hamilton thistle within its range (ICF International 2012), 41 of which are listed within CNDDB (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, Mount Hamilton thistle is located between San Jose and Morgan Hill along U.S. 101 in the Santa Teresa Hills, Coyote Ridge, and Silver Creek Hills. Outlying occurrences are also located in the Santa Cruz Mountains and in the northeastern corner of the RCIS area near its border with Stanislaus County. Of the 41 Mount Hamilton thistle occurrences, 35 (73%) are located within the RCIS area (Figure H-10, Appendix H, *Focal Species Habitat Models*).

Life History

Mount Hamilton thistle is a perennial herb between 24 and 79 inches, with a single stem and white flower heads that are strongly nodding. This species blooms from April to October, with the peak blooming period between May and July. The growing period for the species is year round (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). Little research has been conducted on pollination, but it can be assumed that Mount Hamilton thistle hosts a variety of pollinators, including bees, wasps, beetles, flies and butterflies, similar to other *Cirsium* spp.. Seeds dispersal is primarily concentrated within wetland habitat, while secondary dispersal due to hydrochory can move seeds to adjacent upland areas or into downstream wetlands during flood events occupied habitat. This species has large seed rain, high viability, germinability and probable lack of seed dormancy which ensure successful regeneration as long as suitable habitat existis (Hillman and Parker 2011).

Ecological Requirements

Mount Hamilton thistle is a strict serpentine endemic, occurring almost exclusively on serpentine and ultramafic soils. Mount Hamilton thistle occurs in perennial and intermittent drainages associated with seeps and springs, and adjacent transitional zones that are influenced by runoff or groundwater. The surrounding upland habitat is often serpentine grassland and/or serpentine rock outcrops, although sometimes the occurrence are in foothill pine woodland or coast live oak woodland and forest. This species ranges is elevation from 320 feet to 2,900 feet. Most locations support dense, isolated colonies of 100 to 5,000 individual plants, although more than 18,000 plants were observed in one location in the RCIS area in 1992 (U.S. Fish and Wildlife Service 1998b). Extant CNDDB occurrences in the RCIS area are associated with species such as seep monkeyflower (*Mimulus guttatus*), iris-leaved rush (*Juncus xiphiodies*), hoary coffeeberry(*Rhamnus tomentella*), Agrostis species (*Agrostis* spp.), barley species (*Hordeum* spp.), dallisgrass (*Paspalum dilatatum*), two-tooth sedge, shortspike hedgenettle (*Stachys pycnantha*), common verbena (*Verbena lasiostachys*), coast clover (*Trifolium wormskioldii*), rabbit's foot grass, other other rush (*Juncus* spp.) and sedge species (*Carex* spp.) (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Modeled habitat for Mount Hamilton thistle includes two categories: potential and occupied. Potential habitat includes the serpentine seep/spring land cover type and serpentine grassland and serpentine chaparral land cover types where they occur within 25 feet of perennial, intermittent, and ephemeral streams. Many occurrences of Mount Hamilton thistle occur in small, localized spring-fed drainages not identified in the land cover data as springs or seeps, and were therefore not captured in modeled potential habitat. To capture occurrences and surrounding habitat that were not included within modeled potential habitat, occupied habitat was modeled to include all precise location CNDDB polygons and the area within a 25-foot buffer of the occurrence. The 25-foot buffer was not applied to those occurrences identified by CNDDB as having an 80-meter accuracy, as the buffer would likely capture unsuitable habitat. Occurrences whose locations were identified as general by CNDDB were not used to model occupied habitat. Potential habitat that overlapped with occupied habitat was re-categorized as occupied habitat. Therefore, occupied habitat includes all known CNDDB occurrences recorded as a precise location. Potential habitat includes potentially suitable habitat that does that does not overlap a known occurrence of Mount Hamilton thistle.

Model Results

Figure H-10, Appendix H, *Focal Species Habitat Models*, shows the modeled occupied and potential habitat for Mount Hamilton thistle within the RCIS area. Occupied habitat includes all known CNDDB precise occurrences in the RCIS area, whereas the occupancy of potential habitat is unknown (note that in Appendix H, *Focal Species Habitat Models*, in some cases the occurrence symbol obscures the underlying modeled habitat). In the RCIS area, potential habitat is limited to small linear patches where serpentine soils and streams intersect. These habitat patches are abundant in the vicinity of San Jose, Morgan Hill, and Gilroy where serpentine soils and Mount Hamilton thistle occurrences are present. Occurrences that do not fall within potential or occupied habitat are likely fed by unmapped springs on slopes or ridges.

Tracy's Eriastrum (*Eriastrum tracyi*)

Regulatory Status

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

Distribution

General

Tracy's eriastrum is distributed in northern and southern California in Colusa, Lake, Fresno, Tehama, Glenn, Kern, Shasta, Stanislaus, Tehama, Trinity, and Tulare counties (California Natural Diversity Database 2016). In the San Francisco Bay Area, populations of Tracy's eriastrium are known only from Santa Clara County. There are a total of 119 occurrence of Tracy's eriastrum within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, Tracy's eriastrum is located in the Mount Hamilton Range near San Antonio Valley. Of the 119 CNDDB occurrences, 4 (3%) are located within the RCIS area (Figure H-11, Appendix H, *Focal Species Habitat Models*).

Life History

Tracy's eriastrum is an annual herb up to 9 inches tall with small white to purple flowers. This species blooms from May to July, with the peak blooming period between June. The growing period for the species is March to July (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

Tracy's eriastrum occurs in chaparral, cismontane woodland, and valley and foothill grasslands between 1033 to 5839 feet. This species is associated with gravelly shale or clay soils and is often found in open areas (California Native Plant Society 2016). Occurrences in the RCIS area are noted as occurring on the edge of an old dirt road along the top of a ridge under chamise (*Adenstoma fasciculatum*) shrubs, on a talus slope and on eroding scree. In the RCIS area, this species is most commonly associated with chamise chapparal, with associated species such as Abram's eriastrum (*Eriastrum abramsii*), coastal sage scrub oak (*Quercus dumosa*), ceanothus (*Ceanothus* spp), yerba santa (*Eriodictyon* spp.), non-native grasses (*Avena* spp., *Bromus* spp.) (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model was not developed for this species 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 and land cover type-relationships mapped at a regional scale would result in a model that greatly overestimates available habitat.

Rock Sanicle (*Sanicula saxatilis*)

Regulatory Status

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

Distribution

General

Rock sanicle is endemic to the San Francisco Bay area in Contra Costa and Santa Clara counties. There are a total of 7 CNDDB occurrences of rock sanicle within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, populations are located in the vicinity of Mount Hamilton. Of the 7 CNDDB occurrences, 4 (57%) are located within the RCIS area (Figure H-11, Appendix H, *Focal Species Habitat Models*).

Life History

Rock sanicle is a biennial or perennial tubereous herb between 8 and 10 inches tall with small pale red-orange to yellow flowers that has a small tuber 0.8 to 1.4 inches wide. This species blooms from April to May, with the peak blooming period between June. The growing period for the species is Feburary 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 2034 to 3854 feet. This species grows on open, rocky scree, talus slopes, and bedrock outcrops (California Native Plant Society 2016, California Natural Diversity Database 2016). All of the four occurrences in the RCIS area occur on open, talus (igneous rock) slopes. Three of these rocky slopes are identified as occurring below chaparral and one is surrounded by by foothill pine and blue oak woodland. In the RCIS area, this species is commonly associated with species such as scytheleaf onion (*Allium falcifolium*), goose grass, ceanothus, Brewer's phacelia (*Phacelia brewerii*), miner's lettuce (*Montia* spp.), violet (*Viola* spp.), large leaf sandwort (*Moehringia macrophylla)*, few flowered collinsia (*Collinsia sparsiflora),* common fiddleneck (*Amsinkia intermedia*) and linanthus (*Linanthus* spp.) (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

A habitat distribution model was 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 scale of the land cover mapping. A habitat model based on known habitat requirements and land cover type-relationships mapped at a regional scale would result in a model that greatly overestimates available habitat.

Fragrant Fritillary (*Fritillaria liliacea*)

Regulatory Status

- **State:** California Native Plant Society List 1B.2
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** N/A

Distribution

General

Fragrant fritillary is endemic to the San Francisco Bay area and central coastal California (California 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 from 0 to 1345 feet. There are a total of 81 CNDDB occurrences of fragrant fritillary within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, most populations of fragrant fritillary are located on Coyote Ridge with other occurrences scattered throughout parks and open space between San Jose and Morgan Hill. Of the 81 CNDDB occurrences, 14 (17%) are located within the RCIS area (Figure H-12, Appendix H, *Focal Species Habitat Models*).

Life History

Fragrant fritillary is an 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 (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). 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, as they are adapted to germinating on the ground. Pollination and dispersal may occur incidentally by birds and mammals present in occupied habitat.

Ecological Requirements

Fragrant fritillary occurs in cismontane woodland, coastal prairie, coastal scrub, and valley and foothill grassland, occurring in both upland and seasonally saturated areas below 1,312 feet (California Native Plant Society 2016). This species has a weak affinity for serpentine soils and also grows on clay and other soil types (California Natural Diversity Database 2016, Calflora 2016). This species has also been observed growing in California annual grassland habitat. Some species commonly associated with fragrant fritillary include purple needlegrass (*Stipa pulchra*), blue dicks (*Dichelostemma capitatum*), soap plant, common muilla, shining pepperweed (*Lepidium nitidum)*, purple clarkia (*Clarkia purpurea*), California buttercups (*Ranunculus californicus*), California poppy and coyote brush (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters were developed for both primary and secondary habitat. Fragrant fritillary is often found on serpentine soils in grassland, but also occurs on other soils types in grassland, oak woodland, and coastal scrub habitat in the RCIS area. Primary habitat within the RCIS area is defined as serpentine grassland between 0 and 1,500 feet in elevation on slopes with all degrees of steepness. Secondary habitat is defined as California annual grassland, northern coastal scrub/Diablan sage scrub and blue oak woodland, valley oak forest/woodland, coast live oak forest woodland, and mixed oak woodland and forest between 0 and 1,500 feet in elevation on slopes with all degrees of steepness. The southern extent of modeled habitat in the RCIS area was limited to north of SR 152, as there are no known occurrences of this species south of SR 152 in the RCIS area.

Model Results

Figure H-12, Appendix H, *Focal Species Habitat Models*, shows the modeled habitat for fragrant fritillary within the RCIS area. Primary habitat is clustered around Coyote Ridge where serpentine soils are present. Secondary habitat is found on the east and west sides of the valley floor. Secondary habitat is most prevalent in the southern portion of in Santa Clara County.

Loma Prieta Hoita (*Hoita strobilina*)

Regulatory Status

- **State:** California Native Plant Society List 1B.1
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** N/A

Distribution

General

Loma Prieta hoita is endemic to the San Francisco Bay area. This species occurs in Alameda, Contra Costa, and Santa Clara counties. There are a total of 29 CNDDB occurrences of Loma Prieta hoita within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, most populations of Loma Prieta hoita are located on the west side of the RCIS area in the Santa Cruz Mountains, with other scattered locations on Coyote Ridge. Of the 29 CNDDB occurrences, 26 (90%) are located within the RCIS area Figure (H-13, Appendix H, *Focal Species Habitat Models*).

Life History

Loma Prieta hoita is an 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 (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). 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 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, Califoria bay, big leaf maple, toyon, California coffeeberry (*Frangula californica*), California blackberry (*Rubus ursinus*), Torrey's melica (*Melica torreyana*), sticky monkeyflower (*Mimulus auranticus*) poison oak and coyote brush (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Loma Prieta hoita is strongly associated with serpentine soils in the understory of woodland and chaparral. Because serpentine land cover types are limited to SSURGO map units with 30% or more of the unit comprised as serpentine (e.g., serpentine hardwood, serpentine chaparral, serpentine riparian, etc.; Section 2.3.4.1, *Methods and Data Sources*), some suitable serpentine habitats were not captured by serpentine land cover types. To capture more occurrences in the model, suitable land cover types that occurred on SSURGO map units containing lower quantities of serpentine soil (i.e., 1 to 29%) were used to account for this species' strong affinity to serpentine soils.

Primary habitat was limited to the following land cover types between 100 and 2,000 feet elevation: coast live oak forest and woodland, mixed oak woodland and forest, and montane hardwood land cover types where they occurred on SSURGO map units with a serpentine soil component, and serpentine hardwood land cover types. Secondary habitat was limited to the following land cover types between 100 and 2,000 feet elevation: northern mixed chaparral/chamise chaparral, and mixed riparian forest and scrubland where they occurred on SSURGO map units with a serpentine soil component, and serpentine chaparral, and serpentine riparian cover types between 100 and 2,000 feet elevation.

Model Results

Figure H-13, Appendix H, *Focal Species Habitat Models*, shows the modeled habitat for Loma Prieta hoita within the RCIS area. Primary habitat is clustered around the eastern Santa Cruz Mountains and the southeastern corner of Santa Clara County. Secondary habitat is located in the Santa Cruz Mountains to the west of the primary habitat near the Santa Cruz county border.

Smooth Lessingia (*Lessingia micradenia* var. *glabrata*)

Regulatory Status

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

Distribution

General

Smooth lessingia is endemic to the San Francisco Bay area. This species occurs only in Santa Clara County between 393 and 1,377 feet elevation. There are a total of 41 CNDDB occurrences of smooth lessingia within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, smooth lessingia occurs on the eastern slopes of the Santa Cruz Mountains and the hills adjacent to the Santa Clara Valley. All off the CNDDB occurrences are located within the RCIS area (Figure H-14, Appendix H, *Focal Species Habitat Models*).

Life History

Smooth lessignia is an annual herb that grows up to 24 inches tall with basal leaves less than 2.5 inches long, linear leaves along the stem 1 inch long, and three to five purple flowers per head. This species blooms from April to November, with the peak blooming period between September and November. The growing period for the species is March to November (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). 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. Germination of *Lessingia* seeds in the laboratory is apparently quite easy, however factors such as local climate, soil, and herbivory may profoundly influence germination rate, seedling establishment, and suriviorship ini nature (U.S. Fish and Wildlife Service 1998b). Pollination and dispersal may occur incidentally by birds and mammals present in occupied habitat.

Ecological Requirements

Smooth lessingia occurs in serpentine grasslands and serpentine rock outcrops. This species is a broad endemic of thin, gravelly serpentine outcrops and roadcuts and can also occur in chaparral and cismontane woodlands in open areas containing serpentine soils (California Natural Diversity Database 2016, Calflora 2017). This species occurs at elevations between 300 and 1,600 feet. Smooth lessingia generally grows as expansive stands where vegetation cover is low and native diversity is high. This species is tolerant of disturbance and sometimes occurs on roadcuts or at roadside, but is limited by nonnative plant invasion. In the RCIS area, associated plant species include California sagebrush big berry manzanita (*Arctostaphylos glauca*), toyon, common yarrow, dwarf plantain, golden yarrow (*Eriphyllum confertflorum*), hayfield tarweed, junegrass species (*Koeleria* spp.), miner's lettuce (*Claytonia perfoliata*), purple needlegrass, serpentine linanthus (*Leptoshiphon ambiguus),* serpentine sunflower (*Helianthus bolanderi*), California gilia (*Gilia achilleifolia)* and non-native grasses (*Avena* spp., *Bromus* spp., *Brachypodium distachyon*) (Calfiornia Natural Diversity Database 2017).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Smooth lessingia is restricted to serpentine rock outcrops, serpentine roadcuts, and sparsely-vegetated serpentine grasslands. Habitat for smooth lessingia was thus defined as serpentine grassland and serpentine rock outcrops between 0 and 2,000 feet in elevation on slopes with all degrees of steepness.

Model Results

Figure H-14, Appendix H, *Focal Species Habitat Models*, shows the modeled habitat for smooth lessingia within the RCIS area. The habitat is concentrated on Coyote Ridge north of Anderson Reservoir and scattered areas of serpentine soils in the Santa Cruz Mountains. Note that in some cases in Appendix H, *Focal Species Habitat Models*, the modeled habitat is smaller than the size of the occurrence symbol.

Most Beautiful Jewelflower (*Streptanthus albidus* subsp. *peramoenus*)

Regulatory Status

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

Distribution

General

Most beautiful jewelflower is endemic to the San Francisco Bay area and central California coast. This species occurs in Alameda, Contra Costa, Santa Clara, Monterey, and San Luis Obispo counties.

There are a total of 96 CNDDB occurrences of most beautiful jewelflower within its range (California Natural Diversity Database 2016).

Within the RCIS Area

In the RCIS area, most beautiful jewelflower occurs on the eastern slopes of the Santa Cruz Mountains and the hills adjacent to Santa Clara Valley, as well as some outlying occurrences west of Gilroy and along the northern border of Santa Clara County. Of the 96 CNDDB occurrences, 44 (46%) are located within the RCIS area. Most of the occurrences in the RCIS area occur on Santa Clara County Park lands and other protected lands, including open spaces and water district property (Figure H-15, Appendix H, *Focal Species Habitat Models*).

Life History

Most beautiful jewelflower is an annual herb that grows up to 32 inches tall lilac-lavender sepals and puple 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 (California Native Plant Society 2016, Calflora 2016, Baldwin et al. 2012). 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 (Kruckeberg 1957, ICF International 2012). 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

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 beautifulj 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 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. Occurrences have been identified between 311 and 3,280 feet elevation. Some species associated with most beautifulj jewelflower in the RCIS are include purple needlegrass, red brome, oat grass (*Avena* spp.) meadow barley (*Hordeum brachyantherum*), cream cups (*Platystemon californicus*), linanthus species (*Linanthus* spp.*)*, beaked cryptantha (*Cryptantha flaccida*), Chia sage (*Salvia columbariae*), California poppy and small fescue (*Vulpia microstachys*) (California Natural Diversity Database 2016).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Primary habitat is defined as serpentine grassland, serpentine rock outcrop, and serpentine chaparral from 0 to 3,500 feet elevation on slopes with all degrees of steepness. Secondary habitat is defined as nonserpentine rock outcrop (barren/rock land cover type) from 0 to 3,500 feet elevation on slopes with all degrees of steepness.

Model Results

Figure H-15, Appendix H, *Focal Species Habitat Models*, shows the modeled habitat for most beautiful jewelflower within the RCIS area. Primary habitat is clustered around Coyote Ridge and small scattered patches in the Santa Cruz Mountains. Secondary habitat is located in northern Santa Clara County and on the east and west sides of the urban development adjacent to the San Francisco Bay.

2.4 Nonfocal Species

The Program Guidelines state that "To 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 species that were not selected as focal species for this Santa Clara County RCIS (i.e., "nonfocal species") (Section 2.3.5.1, *Focal Species Selection Process*) have conservation needs similar to the focal species, and may also be addressed through the conservation strategy for other conservation elements (e.g., serpentine soils, unique land cover types, and others; Section 3.7, *Conservation Strategy for Other Conservation Elements*). For example, nonfocal 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. Land Cover is the basis for the focal species habitat models (Section 2.3.5.2, *Habitat Distribution Models*) and the conservation strategy (Chapter 3, *Conservation Strategy*), and thus can be used as a common currency when considering how conservation goals, objectives, actions, and priorities for focal species will also benefit nonfocal species. To ensure that mitigation credit agreements may be created through this RCIS for nonfocal species, Tables F-1a and F-1b and F-2a and F-2b in Appendix F, *Associations between Land Cover and Wildlife/Plant Species* show the habitat relationships between nonfocal species and this RCIS's land cover types. As such, this RCIS contemplates the conservation needs of the focal species, and nonfocal species with similar habitat needs. It is assumed that MCAs that memorialize protection and habitat improvements for land cover types that support focal and non-focal species alike, could result in mitigation credits for both focal and nonfocal species.

2.5 Other Conservation Elements

CFGC 1852(c)(4) states that an RCIS will include, "important resource conservation elements within the strategy area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements." This section identifies important conservation elements other than focal species and natural communities that occur within the RCIS area. Other conservation elements were identified based on guidance from the Steering Committee, as well as from existing literature and data relevant to the RCIS area, as described in each section that follows.

2.5.1 Habitat Connectivity

Loss of habitat connectivity is one of the leading threats to biodiversity in the RCIS area. Movement is essential to wildlife survival in order to find mates, seasonal habitat, shelter, and food. In fragmented habitats, wildlife are regularly struck by vehicles or get stuck in fences as they attempt to cross roads and other barriers to reach suitable habitat. As development in the RCIS area continues, and climate change alters habitat conditions, the ability of wildlife to move across the landscape will become increasingly threatened without concerted efforts to maintain and increase permeability across the landscape. Movement is essential to gene flow, which is necessary to maintain genetic diversity, and increase the likelihood of long-term persistence of plant and animal populations and entire species. Without the ability to move across the landscape, populations become more susceptible to reduced genetic diversity (and associated deleterious effects), localized loss of habitat, disease, and ultimately extirpation.

There is a wealth of information about connectivity in the region, from high-level, statewide modeling (*California Essential Habitat Connectivity Project* [Spencer et al. 2010]), to regional linkage modeling (*Critical Linkages: Bay Area and Beyond* [Penrod et al. 2013]), to localized assessments of key points of connectivity (*Santa Clara Valley Habitat Plan* [ICF International 2012], *Coyote Valley Linkage Assessment Study* [Diamond and Snyder 2016] and the *Coyote Valley Landscape Linkages Report* [Santa Clara Valley Open Space Authority and Conservation Biologiy Insititue 2017]*).* Each of these information sources are discussed below and shown in Figures 2-22a and 2-22b.

2.5.1.1 California Essential Habitat Connectivity Project

The California Department of Transportation (Caltrans) and CDFW completed the California Essential Habitat Connectivity Project (CEHCP) (Spencer et al. 2010) to identify natural landscape blocks and least cost habitat linkages between those blocks, as a means to better understanding the relative connectedness of the landscape at a regional level. This analysis is intended to inform infrastructure planning and conservation investments statewide, as a means to work toward improving connectivity for ecosystems and organisms. The Santa Clara County RCIS area is located within the Central Coast Ecoregion described in the CEHCP. The methods used in the CEHCP were similar to those used in other regional linkage assessments. Large landscape blocks were identified, which include a combination of protected areas and other areas with intact natural communities at low risk of conversion to non-natural communities over time. The analysis then determined which natural landscape blocks to connect and modeled least cost path corridors in order to create Essential Connectivity Areas. The analysis connected natural landscape blocks by modeling least-cost-path corridorts to identify essential connectivity areas (Figure 2-22a).

In the south San Francisco Bay Area, the CEHCP generally identified natural landscape blocks in the Santa Cruz Mountains and in the Diablo Range. Essential connectivity areas are located throughout the Santa Cruz Mountains, where gaps in protected lands exist. The CEHCP also identified a combination of natural landscape blocks and essential connectivity areas along the western edge of the Santa Clara County RCIS area, south to the Pajaro River. Nearly all of the Diablo Range is shown as a natural landscape block, even though only a portion of the range is protected. The area across the Santa Clara Valley floor, south of the City of San Jose and north of the City of Gilroy is identified as an essential connectivity area linking the Santa Cruz Mountains to the Diablo Range. In the south of the RCIS area, the Pajaro River corridor is identified as a potential riparian connection.

Since the CEHCP was completed, several additional connectivity studies have beenconducted in the RCIS area. These studies provide local, fine-scale information on connectivity, practical solutions, and invaluable data that can be used to inform infrastructure and conservation planning in the RCIS area, in addition to the information provided in the CEHCP. Those studies are described below.

2.5.1.2 Critical Linkages: Bay Area and Beyond

Critical Linkages: Bay Area and Beyond (Critical Linkages) (Penrod et al. 2013) used very similar methodology to the CEHCP, except that Critical Linkages analyzes connectivitity at a finer scale (i.e., the San Francisco Bay Area) than the CEHCP (i.e., throughout Califonrnia), resulting in a more detailed analysis of connectivity on a local scale than the CEHCP. One result of the different level of analysis, for example, is that Critical Linkages identifies more, smaller-scale landscape blocks and linkages in the Santa Clara RCIS area: the CEHCP identifies the Diablo Range as one natural landscape block, whereas Critical Linkages identifies several finer-scale landscape blocks within the Diablo Range (Figure 2-22a). In addition, the Gabilan Range was identified in Critical Linkages as an important landscape block in the south Bay Area, with connections between the Santa Cruz Mountains, the Diablo Range, and the Gabilan Range identified using least cost path models (Figure 2-22b). This highlights the importance of the Gabilan Range to the overall connectivity of the region, as well as the connections between the Santa Cruz Mountains and the Diablo Range in the southern end of the Santa Clara Valley (i.e., south of Coyote Valley).

This Santa Clara County RCIS primarily uses *Critical Linkages: Bay Area and Beyond* (Critical Linkages) rather than the CEHCP to characterize linkages between landscapes and habitats within and adjacent to the RCIS area, because Critical Linkages analyzes landscape connectivity at a finer scale. The conservation goals and objectives for landscape connectivity (Chapter 3, *Conservation Strategy*, Section 3.7.1, *Habitat Connectivity and Landscape Linkage*) refer to the Critical Linkages, as well as information from targeted studies on animal movement across Coyote Valley and the Pajaro region in recent years (those studies are described below).

Critical Linkages represents the best available data on landscape linkages that are vital to connectivity in the 9-county San Francisco Bay Area. These linkages were designed through an extensive scientific and stakeholder-driven process from 2012 to 2013. Critical linkages identifies 14 landscape-level connections crucial to maintaining connectivity amongst wildlife populations within and adjacent to the 9-county San Francisco Bay Area. Critical Linkages assessed and modeled movement routes for six of the RCIS focal species, including mountain lion, burrowing owl, California tiger salamander, California red-legged frog, foothill yellow-legged frog, and steelhead across the San Francisco Bay Area and surrounding counties based on suitable habitat between large blocks of land under existing protections (Penrod et al. 2013). Critical Linkages identified six linkages in the RCIS area (Figure 2-22b).

- Diablo Range–Gabilan Range
- Diablo Range–Inner Coast Range
- East Bay Hills–Diablo Range
- Mount Diablo–Diablo Range
- Santa Cruz Mountains–Diablo Range
- Santa Cruz Mountains–Gabilan Range

These landscape linkages are discussed in more detail in Chapter 3, *Conservation Strategy*, as they relate to focal species and conservation priorities focused on wildlife connectivity and landscape permeability. The Conservation Lands Network website[19] provides more information on Critical

[19] http://www.bayarealands.org/

Linkages: Bay Area and Beyond, and the Conservation Lands Network. The Conservation Lands Network Explorer[20] is an online mapping decision support tool that allows users to assess the biodiversity and conservation values of an area of interest (Penrod et al. 2013).

2.5.1.3 Santa Clara Valley Habitat Plan Landscape Linkages

Landscape linkages from the Habitat Plan are also included on Figure 2-22b, as indicated by arrows; these linkages are defined as habitat that allows for the movement of organisims from one area of suitable habitat to another (ICF International 2012). These linkages were used to identify areas of land necessary for wildlife movement in Santa Clara County and to habitat in adjacent counties. A literature review identified all known or potential linkages in the Habitat Plan's study area from the following sources. Linkages were also inferred from land cover data, occurrence data, and habitat distribution models.

- Statewide assessment of landscape linkages needs developed by expert opinions of wildlife biologists (California Wilderness Coalition 2002).
- Ecoregional planning process conducted for the central coast region (The Nature Conservancy 2006).
- A study of movement needs of mountain lions estimated by least-cost path analysis of regional land cover data (Thorne et al. 2002).
- A local workshop on landscape linkages in the Sierra Azul region held on October 11, 2006 (Coastal Training Program, Elkhorn Slough National Estuarine Research Reserve 2006).
- Wildlife movement data from the study area for American badgers (Diamond 2006), Tule elk (Coletto 2006), bobcat, and other species.
- Locations of existing culverts, bridges, and other overpasses suitable for wildlife along U.S. 101 between Metcalf Road in San José and the Coyote Creek bridge crossing near Morgan Hill (California Department of Fish and Game 2006).
- Locations of median barriers and existing culverts, bridges, and other overpasses suitable for wildlife along SR 152 between the SR 156 interchange and the Santa Clara/Merced County line (data collected by Jones & Stokes in February 2007).
- Coyote Valley Specific Plan Draft Environmental Impact Report (City of San José 2007).

Details on each landscape linkages can be found in Chapter 5 of the Habitat Plan. The numbers shown on the landscape linkages in Figure 2-22b are the same as those used in the Habitat Plan for consistency.

2.5.1.4 Localized Linkage Assessments

The *Coyote Valley Linkage Assessment Study* (Study) and the *Coyote Valley Landscape Linkages Report* (Report) also provide data on habitat connectivity and wildlife movement in Coyote Valley in the RCIS area (Diamond and Snyder 2016, Santa Clara Valley Open Space Authority and Conservation Biologiy Insititue 2017). These documents evaluate wildlife pathways in habitats across the valley floor. The Study was among the first to publish wildlife movement data across the valley floor where wildlife can travel from the Santa Cruz Mountain foothills on the west side of the valley to Coyote

[20] http://www.bayarealands.org/explorer/

Ridge and the Diablo Range on the east side. This study also includes recommendations for improvements to wildlife movements at known barriers on the valley floor (Diamond and Snyder 2016).

The Report presents a landscape linkage design across Coyote Valley that identifies important wildlife pathways and opportunities for restoration and barrier modification, including modification of existing barriers and proposed new wildlife crossings. It is intended to build upon and refine the linkages that were identified in Critical Linkages for Coyote Valley. The Report stresses the importance of maintaining Fisher Creek as a wildlife pathway because it is currently the only culvert that allows wildlife to pass underneath Monterey Road. The Report also highlights several other important landscape features for wildlife connectivity, such as the Laguna Seca wetlands and Tulare Hill (Santa Clara Valley Open Space Authority and Conservation Biology Institute 2017).

The Natural Conservancy's Pajaro Study 2012-2013 (Pajaro Study) (Diamond and Snyder 2013) identifies the Soap Lake Floodplain (i.e., upper Pajaro River floodplain) as a primary connection between the Diablo and Santa Cruz mountain ranges in the San Benito portion of the RCIS area. This region contains a variety of habitats, including riparian systems, agriculture lands, and ranchlands that are critical to wildlife movement through the area. The Pajaro Study found that all of these habitat types (i.e., both vegetated and unvegetated) support wildlife movement and connectivity across the Soap Lake Floodplain. Multiple habitats over large landscapes in the floodplain are necessary to allow animals to take different routes during flooding events, and to provide landscape resiliency to future climate change, which may affect some routes through the floodplain (Dimaond and Snyder 2013).

Figure 2-22b shows several linkage features that were identified in the documents described above, including culverts, overpasses, underpasses, and other crossings. These linkages features are identified as conservation priorities in the RCIS (Chapter 3, *Conservation Strategy*, Section 3.7.1.2, *Conservation Priorities*). Note, however, thatother linkage features may be present in the RCIS area in areas that have not yet been identified.

2.5.2 Working Landscapes

CFGC 1852 (e)(1) requires that an RCIS consider "the conservation benefits of working lands for agricultural uses." To support this analysis, the following section describes the extent of farmland and rangeland in the RCIS area. This information is based on the latest annual report of agricultural production in Santa Clara and San Benito Counties compiled by each counties' Agricultural Commissioner (Santa Clara County 2015, San Benito County 2015).

2.5.2.1 Farmland

In 2015, 23 different agricultural commodities grown in Santa Clara County exceeded $1,000,000 in crop value. Santa Clara County's top three crops for over 10 years continue to be nursery crops (valued at $65,974,000), mushrooms ($64,533,000) and bell peppers ($19,247,000). Other important crops in Santa Clara County include corn, tomatoes, spinach, and grapes. Over the last 30 years the land being farmed has declined from a peak of 40,000 acres in the late 1980s to the current level of about 20,000 acres. This excludes rangeland but includes 4,000 acres per year of dry farmed grain hay.

About 75% of the total land area in San Benito County is farmland of which 91% is grazing land and 4% is prime farmland, as mapped by FMMP (Farmland Mapping and Monitoring Program 2012).

Prime farmland is defined by FMMP as farmland that has the best combination of chemical and physical features to sustain long-term high yield crops. Most of San Benito's County's prime farmland, as well as most of the county's farmland of statewide importance (i.e., farmland that is of slightly lower quality than prime farmland, due to steep slopes or soil moisture), and farmland of local importance (i.e., land cultivated as dry cropland), is located within the portion of San Benito County in the RCIS area (California Department of Conservation 2012).

San Benito County's leading industry is production agriculture. The industry produces a variety of commodities and specialty vegetables. San Benito County is among the top five producing counties in California of spinach, peppers, lettuces, and salad mix products. In 2015, the overall value of the county's agricultural increased nearly 11% from 2014 for a record high of $360,593,000.

2.5.2.2 Rangeland

The grasslands and oak woodland natural communities in the RCIS area evolved under the influence of prehistoric herbivores—including large herds of deer, elk, antelope, and other grazing animals—and without competition from nonnative annuals, which currently dominate much of the region. In the absence of these large native herbivores, appropriate livestock grazing of cattle, sheep, and goats is a valuable range management tool, used to manage infestations of invasive plants, promote populations of native plants and animals, and reduce wildfire fuel loads. Additionally, the grasslands and oak woodlands provide important habitat for many of the focal species in this Santa Clara County RCIS (Jodi McGraw Consulting 2015).

Livestock grazing is the most widespread land management practice in the world, affecting 70% of the land surface of the western United States (Krausman et al. 2009). Grazing reduces the amount of accumulated plant litter, thereby favoring native plant establishment and growth and enhancing the overall composition of native plant communities in the reserve. Nonnative annual grasses and herbs tend to rapidly monopolize landscapes and can inhibit the germination of seeds and growth of native species through the capture of water and mineral resources and the physical and chemical effects of accumulated plant litter (Jodi McGraw Consulting 2015). Grazing intensity and type and class of stock can vary depending on the management objectives in a particular location. For example, in some cases fairly aggressive grazing practices can be used in an attempt to eradicate invasive pest plants, provided enough residual dry matter is retained to protect soil health and prevent the risk of erosion. Generally moderate grazing can also improve conditions for covered species by reducing dense ground cover, which can impede movement and decrease populations of burrowing rodents (Ford et al. 2013).

In San Benito County there are 508,000 acres of rangeland, of which 60,516 acres are located in the RCIS area, and in 2015 there were 65,000 cattle in the county. Ranchland comprises a significant portion of the unincorporated portion of Santa Clara County (approximately 49% of the entire County). Rangeland is generally located in the hills east and west of developed areas of the north and south valleys in Santa Clara County in the RCIS area (Figure 2-23).

2.5.3 Unique Land Cover Types

Unique land cover types are locally rare land cover types that support some native vegetation and one or more focal plant or wildlife species. Many acres of these unique land cover types have been historically developed and are currently under threat from invasive exotic species, human disturbance, or disease. There are a total of 22 unique land cover types in the RCIS area (Table 2-5, unique land cover types identified with an asterisk).

Each unique land cover type was identified from the list of land cover types that occur in the RCIS area (Section 2.3.4, *Natural Communities and Land Cover*). The following criteria define them, however, these criteria are not mutually exclusive; in most cases multiple criteria apply to each unique land cover type.

- CDFW sensitive biotic community (California Department of Fish and Wildlife 2010, California Natural Diversity Database 2016)
- Locally rare vegetation type comprising 2% (Table 2-5) or less of the total land area of the RCIS area
- Associated with serpentine soils or rock (California Native Plant Society 2016)
- Provides irreplaceable habitat for focal species (e.g., critical to survival and recovery)[21]

Each land cover type was evaluated against these criteria, using the sources indicated in this section, to determine whether or not the land cover type qualifies as unique to the RCIS area.

2.5.4 Serpentine Soils

Serpentine soils are soils that are derived from weathered ultramafic rock such as serpentinite, dunite, and peridotite, and are characterized by low plant growth and productivity, and generally have lower amounts of vegetation cover, as well as lower cover of nonnative species, than California annual grasslands (McNaughton 1968, Holland 1986). The unique growing conditions are due in large part to the high content of heavy metals in the soil such as chromium, nickel, and cobalt, which are toxic to most plants, a very low ratio of calcium to magnesium, unusually high levels of iron, and limiting levels of key nutrients for plant growth such as nitrogen, phosphorous, potassium, and calcium (Kruckeberg 1984). Serpentine soils support highly specialized plant species and natural communities. Numerous focal plant species (i.e., Mount Hamilton thistle, Loma Prieta hoita, smooth lessingia, most beautiful jewelflowerm and fragrant fritillary), and plant and wildlife species that aren't included in this Santa Clara County RCIS are associated with serpentine soils (Tables F-1 and F-2, Appendix F, *Natural Community Conservation Crosswalk for Non-focal Species*). The conservation strategy developed for these focal plant species (Section 3.6, *Conservation Strategy for Focal Species*), and serpentine soils (Section 3.7.3, *Serpentine Soils*) are designed to provide for the conservation needs of focal species and other serpentine associated species. The conservation strategy for serpentine soils will protect and enhance habitat for those species that occur on serpentine soils, but are not included as focal species in this RCIS (Section 3.5.3, *Serpentine Soils*).

Serpentine soils in the RCIS area were identified during development of the land cover dataset (Section 2.3.4.1, *Methods and Data Sources*). Table 2-8 provides a list of the serpentine soils series found in the RCIS area, and the amounts of serpentine soils therein. Although serpentine soils are limited in their distribution in the RCIS area (Figure 2-10), they support most of the focal plant species and several unique natural communities.

[21] Multiple sources, dependent on the species (Section 2.3.5, *Focal Species*), were used to determine whether or not the land cover type provides irreplaceable habitat for focal species.

Table 2-8. Serpentine Soils, by Series, in the RCIS Area

Serpentine Soil Series (SSURGO database, NRCS 2016)	Soil Series Amount (acres)	Percent in the RCIS Area
Climara	2,744	9%
Gilroy	1,077	4%
Henneke	2,989	10%
Hentine	809	3%
Lithic Xerorthents	739	2%
Maxwell	759	3%
Montara	14,562	49%
Rock outcrop	1,422	5%
Santerhill	4,789	16%
Grand Total	**29,889**	**100%**

Source: Natural Resource Conservation Service 2016, SSURGO database

2.6 Gaps in Scientific Information

The conservation strategy presented in Chapter 3, *Conservation Strategy*, is based on the best available scientific information. However, there are many gaps in that information, even in the RCIS area, which has been heavily studied. This section includes a discussion about information gaps that, if filled, could change the objectives, actions, and priorities in the RCIS area. Gaps can be created from a lack of information or by shortcomings in how information is disseminated.

2.6.1 Regional Gaps

Information gaps at the regional level are not unique to the RCIS area. These gaps hold true for nearly all of California.

2.6.1.1 Focal Species Occurrence Data

The California Natural Diversity Database (California Natural Diversity Database 2016) was the primary source of species occurrence data, along with a few other sources. While the data are considered high quality, because of the verification process used by CDFW, there are two inherent gaps. First, only positive data are presented (i.e., where an occurrence is found). While positive occurrence data are very useful, there is no way to know where surveys have been conducted for each species with negative survey results (i.e., where an occurrence was not detected). Knowing where species do not occur, in habitat that may appear suitable, is also important. Because that information is not available, the species habitat models typically over-predict where species may occur. With negative survey data, those models could be refined by removing areas that had been surveyed where no species were found. Second, the CNDDB does not include data for large areas of potentially suitable habitat, in part because a large amount of California, including the RCIS area, has never been surveyed. Specifically, the northeastern portion of Santa Clara County and the northern portion of San Benito County have not been extensively surveyed, or had data reported to the CNDDB. Both of these areas are predominantly private land, and access for survey efforts may be limited. Oftentimes, surveys are driven by environmental compliance for projects. So for example, many CNDDB occurrences fall along gas and electric rights-of-way or roadways; places where infrastructure projects typically happen. As a result, conservation and mitigation projects often focus on limited areas with suitable occurrence data, potentially at the expense of other important areas that are occupied by target species, but have not been surveyed.

2.6.1.2 Knowing-Doing Gap

The knowing-doing gap is the phenomenon of information gained through scientific research not finding its way into the hands of land management practitioners. There are two areas addressed repeatedly in this RCIS where that happens: invasive plant management and grazing management. Matzek et al. (2014) found that the majority of resource managers rarely had access to scientific, peer-reviewed literature and only found it moderately useful when they did. Instead, they frequently relied on their own experience over research-based conclusions. Additionally, when resource managers conducted research of their own, the methods rarely followed standard scientific protocols and the information was typically not disseminated to their colleagues. The same pattern can be seen in grazing management. Similar to invasive plant science, rangeland science has produced an immense amount of research on the effectiveness of grazing as a conservation management tool in the past decade. The science on grazing methods, invasive plant management using grazing, and the potential to impact water resources is ever changing. Getting that information into the hands of resource managers and ranchers is important to closing the knowing-doing gap. These gaps likely apply to other resource areas as well, but invasive plant management and grazing management are the most prevalent examples. Improving the access to, and application of, scientific research on invasive plant and grazing management by land management practitioners could improve land management practices for the benefit of native biodiversity and ecosystem processes in the RCIS area.

2.6.1.3 Wildlife Movement

There has been more study of wildlife movement in the RCIS area than most places in the country. Over the last decade, researchers have monitored animal movements across Coyote Valley, in the Santa Cruz Mountains, and throughout the Pajaro Watershed (Section 2.5.1, *Habitat Connectivity*). There is a gap in wildlife movement data in the eastern portion of the RCIS area. Specifically, information is lacking about how animals move across SR 152, an assumed barrier to north-south movement. There are only a few locations where animals are likely to cross, so aligning land acquisition with those crossing locations make sense. Knowing more about owhich crossings are most important, however, would allow conservation organizations to focus land acquisition and management in the most critical locations.

2.6.2 Natural Community and Species

There are many gaps in what is known about natural communities and species, both across their range and inside of the RCIS area. This summary is not exhaustive, but identifies key issues in the RCIS area that, if better understood, would influence how the conservation strategies were implemented.

2.6.2.1 Pond Functionality and Longevity

Several focal species rely on freshwater wetland habitat for at least part of their life cycle (i.e., California tiger salamander, California red-legged frog, tricolored blackbird). In the RCIS area, most of the freshwater wetlands are human-made stock ponds. Stock ponds are widely distributed across the RCIS area, especially east of the Santa Clara Valley in the Diablo Range, where ranching has been a dominant land use for centuries. Like other wetlands, ponding duration and timing are important factors that affect habitat quality for a species. Under most climate change scenarios, the RCIS area will get hotter and drier. That means that ponds, which primarily rely on surface runoff, will receive less water and dry up sooner in a typical year. At the very least, rainfall patterns, both the timing and amount, are likely to change, meaning that the ponds that are functioning well for species today, may not function in the same way tomorrow. Shorter ponding durations may reduce reproductive success of species such as California tiger salamander and California red-legged frog if ponding durations become too short to successfully complete reproduction and emergence from aquatic habitats. Understanding existing and future ponding durations under different climate change scenarios can inform land management and pond restoration and creation efforts in ways that may buffer aquatic species from the effects of climate change. For example, new ponds may need to be supported by well water or other sources of reliably available water, or designed to increase water storage capacity or retention while providing suitable habitat features. Vegetation may also need to be managed differently to maintain open water habitats in warmer, drier conditions.

Little is known about pond functionality and longevity for many of the ponds in the RCIS area that provide habitat for California tiger salamander, California red-legged frog, and other native species. A systematic survey of the pond resources in the RCIS area, with an emphasis on their ability to provide habitat functionality for native species, would greatly inform how to prioritize land acquisitions, and restoration and enhancement actions on private and public lands. Grazing on public lands is widespread, but the use of grazing as a management tool is still variable, particularly to manage pond vegetation. In the RCIS area, Santa Clara County Parks, the Santa Clara Valley Open Space Authority, and The Nature Conservancy allow grazing on most of their lands. Yet, California State Parks does not allow grazing on the Henry W. Coe State Park. Without grazing, ponds often fall into disrepair, fill with sediment, and fail. This reduces the habitat quality for focal and nonfocal species over time. A better understanding of the conditions of ponds in the RCIS area could inform the use of grazing to manage habitat features in ponds.

2.6.2.2 Rare Plant Distribution

The gaps in survey effort for species is discussed above in Section 2.6.1.1, *Focal Species Occurrence Data*, but the lack of survey data for rare plant species is an issue throughout the state. Plant species are under-surveyed for two reasons: 1) lack of access to private lands, and 2) plants are not state or federally listed as threatened or endangered at the same rate as wildlife, and therefore regulatory triggers are not in place to require surveys as frequently. Further, often when botanical surveys are done in areas, protocols which involve multiple surveys across the full range of blooming periods are not completed. So even if surveys occur, some species could be missed if they are not flowering at that time. The lack of survey data for many rare plant species consequently limits planning efforts. For example, the few occurrence data for rock sanicle, Tracy's eriastrum, and Congdon's spikeweed limit the identification of priority conservation areas in this RCIS. More surveys on private lands and standardized survey efforts would help fill this data gap and allow for more informed conservation priorities for focal and nonfocal plant species.

2.6.2.3 California Ground Squirrel Distribution

Many native species in California, and in particular in the RCIS area, rely on California ground squirrels as an important element of their life history. California tiger salamanders and burrowing owls rely on ground squirrels, and other fossorial mammals, to provide underground refugia and nest sites, respectively. Many species of raptors and mammals rely on ground squirrels as a food source. If the distribution of ground squirrels in the RCIS area was better understood, it would allow for the refinement of species habitat models and ultimately could influence where conservation priorities are located. Gaining this knowledge would require a systematic survey effort across the study area that was repeated at regular (e.g., 5-10 year) intervals.

2.6.2.4 California Tiger Salamander Hybridization

California tiger salamanders hybridize with invasive barred tiger salamanders in the RCIS area, resulting in a reduction in the numbers of fully native California tiger salamanders. The larger, more aggressive hybrid animals routinely outcompete the native species, furthering the decline of an already rare species. Work is ongoing to understand the prevalence of hybridization in the RCIS area, and throughout the species' range, but there is still a large gap in knowledge. Fully understanding the distribution of hybrids is the first step. The level of hybridization, and extent of introgression of non-native tiger salamander genes into California tiger salamanders varies, and some level of hybridization can likely be tolerated in the native population without significantly altering ecological function (Searcy et al. 2016). While the ideal scenario is to preserve native populations, it may not be feasible for populations of California tiger salamander that have already hybridized with barred tiger salamander. Experimental evidence suggests that hybrids with relatively lower levels of barred tiger salamander genes are ecologically equivalent to fully native California tiger salamanders, and should be protected alongside native California tiger salamanders (Searcy et al. 2016). More research is needed to identify the threshold of nonnative genetic introgression below which hybrids should be retained, and above-which hybrids should be removed. Understanding that balance, so that management and monitoring can be designed to respond, is imperative.

2.7 Pressures and Stressors on Focal Species and other Conservation Elements

Section 1852(c)(5) of CFGC requires that an RCIS include a summary of historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, on the focal species, habitat, and other natural resources, as identified in the best available scientific information, including, but not limited to, the SWAP. The SWAP (California Department of Fish and Wildlife 2015) defines *pressures* as an anthropogenic (human-induced) or natural driver that could result in changing the ecological conditions of the target. Pressures can be positive or negative depending on intensity, timing, and duration. SWAP defines *stress* as a degraded ecological condition of a target that resulted directly or indirectly from negative impacts of pressures.

Understanding the pressures and stressors experienced by the focal species and their habitats within the RCIS area is one of the critical steps necessary to define conservation actions to counteract them. This Santa Clara County RCIS identifies 10 general categories of pressures on focal species, their habitat, and other natural resources in the RCIS area. Within these 10 categories, 19 of the 22 pressures identified in the SWAP are addressed. The 10 categories include:

- Housing and urban areas
- Livestock, farming, and ranching

- Climate change and its influence on sea-level rise, drought, and wildfire
- Nonnative species and disease
- Loss of habitat connectivity (also known as habitat fragmentation)
- Disruption of natural fire disturbance regime
- Dams and water management/use
- Mining and quarrying
- Airborne pollutants
- Tourism and recreation

Three pressures from the SWAP were not addressed because, while they are important in the Bay Delta and Central California Province, they are not a significant stressors on ecosystems in the strategy area. Those pressures are renewable energy, shipping lanes, and wood and pulp plantations.

Each of these pressures and stressors is summarized and discussed in detail in relation to the focal species and other conservation elements discussed in this chapter, with discussion relying heavily on the SWAP. A matrix showing the association between pressures and stressors and each focal species is included in Table 2-9. The focal species and other conservation elements discussed in the following sections can be referenced in Section 2.3.5, *Focal Species* and Section 2.5, *Other Conservation Elements*, respectively.

Table 2-9. Pressures and Stressors on each Focal Species

Pressures and Stressors	Housing and Urban Areas	Livestock, Farming, and Ranching	Climate Change	Nonnative species and disease	Loss of Habitat Connectivity	Disruption of Natural Fire Disturbance Regime	Dams and Water Management/ Use	Mining and Quarrying	Airborne Pollutants	Tourism and Recreation
Focal Species										
Central California Coast Steelhead	X	X	X	X	X	X	X	X	--	X
South Central California Coast Steelhead	X	X	X	X	X	X	X	X	--	X
California Tiger Salamander	X	X	X	X	X	X	X	X	X	X
Foothill Yellow-legged Frog	X	X	X	X	X	X	X	X	X	X
California Red-legged Frog	X	X	X	X	X	X	X	X	X	X
Tricolored Blackbird	X	X	X	X	X	X	X	--	--	--
Burrowing Owl	X	X	X	X	X	X	--	--	--	--
Swainson's Hawk	X	X	X	X	X	X	--	--	--	--
San Joaquin Kit Fox	X	X	X	X	X	X	--	--	--	--
Mountain Lion	X	X	X	X	X	--	--	--	--	--
Congdon's Spikeweed	X	X	X	X	X	X	--	--	--	--
Mount Hamilton Thistle	X	X	X	X	X	X	X	--	X	--
Tracy's Eriastrum	X	X	X	X	X	X	--	--	--	--
Rock Sanicle	X	X	X	X	X	X	--	--	--	--
Fragrant Fritillary	X	X	X	X	X	X	--	--	X	--
Loma Prieta Hoita	X	X	X	X	X	X	--	--	X	--
Smooth Lessingia	X	X	X	X	X	X	--	--	X	--
Most Beautiful Jewelflower	X	X	X	X	X	X	--	--	X	--

2.7.1 Housing and Urban Areas

Economic and population growth is a driver of development, leading to an increased demand for housing, commercial development, services, transportation, and other infrastructure, which in turn puts increasing pressure on the state's land, water, and other natural resources. The primary cause of habitat loss and degradation in the RCIS area is the increasing human population and its high demand for a limited supply of land, water, and other natural resources. Natural habitats in the RCIS area have been converted to a variety of different land uses, including high-density urban, rural residential, weedy pastureland, dryland farming, irrigated cropland, and orchards and vineyards. Wildlife species differ in their tolerances of each of these land uses, with many unable to adapt to the more intensive land uses. Beyond direct habitat loss, converting land to more intensive land uses creates additional pressures, including invasive species, human disturbance, wildfire suppression, and insect control, that further degrade ecosystem health and wildlife viability.

Growth and development, including urban, commercial, and industrial development, can apply major stresses on focal species and habitat within the RCIS area. Housing and urban areas include the following pressures that could impact focal species in the RCIS area.

- Land coversion
- Commercial and industrial areas (including industrial effluents)
- Garbage and solid waste
- Household sewage and urban waste water
- Roads and railroads (also reference wildlife connectivity section)
- Utility and service lines

Urban development in the RCIS area has resulted in the loss, degradation, and fragmentation of natural habitats (both terrestrial and aquatic), and agricultural land in the RCIS area. For example, historically, much of the western Santa Clara Valley was comprised of wet meadows, freshwater marsh and ponds, oak woodland and savanna and chaparral (Beller et al. 2010). With approximately 190,000 acres of the RCIS area developed, urbanization has caused irrevocable loss of historic open space and species habitat within the RCIS area in the past two decades, particularly on the Valley floor. Over 200,000 acres of agricultural land have been lost in the Bay Area since 1984, with Santa Clara County losing 45% of its agricultural land.

Future development in the RCIS area will further stress focal species and other conservation elements. By 2040, the San Francisco Bay Area is projected to add 2.4 million people, increasing total regional population from 7.2 million to 9.6 million, an increase of 30% or roughly 1% per year (Metropolitan Transportation Commission 2017a, 2017b). Santa Clara County has a population of 1.9 million people and is the largest county in the Bay Area. The population in Santa Clara County is expected to increase by 1% yearly through 2020 (California Department of Transportation 2016). Greenbelt Alliance's At Risk analysis shows more than 63,400 acres of farmland and rangeland currently at risk of development, particularly in the south end of Santa Clara County (Greenbelt Alliance 2012). Of the remaining farmland, more than half is at risk of development over the next thirty years (San Francisco Bay Area Planning and Urban Research Association 2013). Continued loss of habitat, through permanent or temporary conversion to other purposes, is a key pressure, primarily in the western portion of the RCIS area, and most heavily in the urban center of San Jose and Silicon Valley, south through the Upper Santa Clara Valley to Hollister. Focal species have different tolerances to land conversion, with many of them unable to adapt to more-developed land uses.

Beyond direct habitat loss, converting land to more intensive human-related uses indirectly affects focal species and other conservation elements by, among other pressures, fragmenting habitats and creating waste and pollutants from point and nonpoint sources. Habitat fragmentation can isolate populations, making dispersal to patches of habitats across an inhospitable landscape challenging. Habitat fragmentation also has additional consequences, including the introduction and spread of invasive species and noise and light pollution.

Continued population growth increases the demand for transportation and utility facilities for urban and regional areas. Caltrans estimates that the capacity of existing rail, air, and highway transportation systems will need to be increased to accommodate a growing population in the Bay Area (Caltrans 2015). The California Transportation Plan calls for an increase in intermodal transportation systems, including increased freeway reliability, express and high occupancy vehicle lanes, and increased connectivity between transportation types and across modes of transportation (Caltrans 2015). The majority of these connections will occur along existing transportation corridors and increase mobility between existing modes of transportation including intercity bus and rail (Caltrans 2015). The focus on improvements to existing corridors and connections between travel modes should minimize new habitat fragmentation from new state highways. However, new local roadways and other infrastructure have the potential to create additional habitat fragmentation (see Section 2.7.5, *Loss of Habitat Connectivity* for more details).

In addition to habitat fragmentation, roads and traffic can result in direct mortality. In most cases, an animal that has been hit by a vehicle dies immediately or shortly after a collision. Many different wildlife species have been observed as roadkill, sometimes in massive numbers. According to Caltrans and California Highway Patrol statistics, there are about 1,000 reported accidents each year on state highways involving deer, other wildlife, and livestock (Shilling 2015, as cited in (California Department of Fish and Wildlife 2015).

Garbage and solid waste from housing and urban development may directly affect wildlife by entangling or poisoning individuals. Runoff from residential and commercial areas, landscaped yards, roads and parking lots, and domesticated animal feces include pollutants and pathogens. Particulates, pollutants, and pathogens deposited from the air can degrade aquatic and terrestrial ecosystems and marine habitats. Discharges from power plants, sewage plants, and other industrial facilities are high in pollutants and pathogens. Effects on Focal Species and Habitats

Growth and development fragment habitats into small patches, isolating individuals with limited dispersal ability, and altering the remaining fragments. These smaller fragments often become dominated by species more tolerant of habitat disturbance, while less-tolerant species decline. Populations of less-mobile species often decline in smaller habitat patches d habitat quality, extreme weather events, or normal population fluctuations. Natural recovery following such declines is difficult for mobility-limited species. Such fragmentation also disrupts or alters important ecosystem functions, such as predator-prey relationships, competitive interactions, seed dispersal, plant pollination, and nutrient cycling (Bennett 1999; Environmental Law Institute 2003, as cited in the California Departement of Fish and Wildlife 2015). See Section 2.7.5, *Loss of Habitat Connectivity* for a description of how fragmentation caused by housing, urban areas, and development affects focal species and habitats.

All of the focal species are impacted by housing and urban development (Table 2-9). For example, California tiger salamander, California red-legged frog, and burrowing owl populations have experienced dramatic declines in the RCIS area due to widespread habitat loss and habitat fragmentation, resulting the conversion of grassland habitat to the urban uses described above (Gervais et al. 2008). In addition, burrowing owl has also lost suitable agricultural lands to development. Equally important for this species is the loss of fossorial rodents, such as ground squirrels, caused in part, by rodent control efforts. Occurrences of the focal plant and fish species are also directly impacted by habitat conversion and habitat fragmentation. Habitat loss can result in the elimination of individuals or populations of these species from the area that is converted, and these species can also be affected by proximity to converted lands from runoff and pollution associated with urban development and associated infracturcture and trampling (in the case of rangelands).

2.7.1.1 Effects on Other Conservation Elements

All of the other conservation elements in the RCIS area could be affected by housing, urban areas, and future development within the RCIS area. The major impact of new development is the conversion from undeveloped to developed land cover, which reduces biodiversity, eliminates natural habitat, including the removal of unique land cover types and vegetation communities that occur on serpentine soils. Habitat conversion may further isolate areas of remaining natural habitat, increasing the edge (i.e., boundary) and the distance between habitats, limiting habitat connectivity and landscape linkages. For example, urban development and habitat fragmentation may disconnect streams and their tributaries, change hydrologic regimes, and limit or obstruct natural interactions between wetland systems. Fragmentation and resulting land management activities like fire suppression modify the natural disturbance regime necessary to sustain the unique land cover types in the RCIS area. Additionally, urban development can convert farmland and rangeland to habitat with large amounts of impervious surfaces (e.g., concrete or asphalt) which have little or no value for the focal species in the RCIS area.

2.7.2 Livestock, Farming, and Ranching

As described in the SWAP (California Department of Fish and Wildlife 2015), agriculture is essential major component of California's economy. Conversions of native habitat to agriculture across the state have been significant. Although agricultural lands no longer support native vegetation, they can provide important habitat for wildlife species, such crops like alfalfa that provides foraging habitat for Swainson's hawk. Livestock grazing is prevalent in the RCIS area. The effects of grazing on wildlife vary from beneficial to detrimental, depending upon how grazing is managed, including the timing (i.e., seasonality) and duration of grazing, and the type and number of livestock. These effects also depend on the relative sensitivities of individual wildlife species, because not all species respond the same way to grazing. Intensive grazing can be unsustainable in grasslands and other natural communities, by, destroying native vegetation and degrading streams. Well-managed livestock grazing, however, can benefit sensitive plant and animal species, particularly by controlling annual grasses and invasive plants in grasslands and other natural communities where these have become established. Livestock grazing is essential to conserving and managing focal species' habitats in the RCIS area.

Livestock, farming, and ranching include the following pressures that could impact focal species in the RCIS area.

- Agriculture effluents
- Land conversion

2.7.2.1 Effects on Focal Species and Habitats

All of the focal species are impacted by livestock, farming and ranching (Table 2-9). Runoff of agricultural chemicals and sediment, consumption of over-subscribed water resources, and conversion and fragmentation of habitat all affect the RCIS area's focal species and native biodversity. Agricultural practices can have a range of direct and indirect consequences to focal species and native biodiversity, positive or negative, based on timing, duration, and intensity. In addition, different cropping systems (e.g., organic versus conventional farming, or highly diversified fields versus large monocultures) can have different levels of impacts to natural ecosystems across the landscape.

Many agricultural practices in the RCIS area are compatible with the focal species, and in some cases, provides habitat. For example, field crops can provide foraging habitat for raptors, such as Swainson's hawk, and stock ponds can provide foraging and aquatic habitat for California red-legged frog, California tiger salamander, and tricolored blackbird. Agriculture can negatively affect those species, however, through chemical treatments, removal of nesting habitat, or direct mortality from harvesting and maintenance activities.

Agricultural runoff with fertilizers and pesticides can pollute aquatic habitat. Rain and irrigation runoff carry silt and agricultural chemicals, degrading surface water quality and reaching groundwater. Herbicides and pesticides can have toxic effects on aquatic plants and animals (e.g., California tiger salamander and focal fish species), and chemical contaminants can alter the ecological composition and chemistry of aquatic systems. For example, fertilizer runoff can increase growth of aquatic plants and algae, resulting in lowered oxygen levels when the excessive plant matter decomposes. Silt and sediment also degrade aquatic environments by increasing turbidity and shading out aquatic vegetation. Silt and sedimate can also scour or smother stream-bottom sediments that are important spawning sites and invertebrate habitats.

Land conversion from one type of agriculture to another, including conversion of field and row crops or grazing lands to orchards or vineyards can affect focal species and native wildlife that use the existing crop. For example, conversion of field crops to orchards and vineyards dramatically reduces the quality of foraging habitat for Swainson's hawk and tricolored blackbird (California Department of Fish and Wildlife 2015)...Effects on Other Conservation Elements

Other conservation elements may be impacted by livestock, farming, and ranching. Livestock grazing can affect riparian areas because cattle congregate in these habitats forwater. Livestock consume and trample riparian plants, which decreases shade and can increase water temperatures, reducing habitat for focal fish species and other native species that depend on cool water.

Livestock grazing can also affect water quality, flows in streams, channel morphology, hydrology, riparian zone soils, in-stream and streambank vegetation, and aquatic and riparian wildlife. Livestock can trample stream channels, causing stream banks to collaspse and soils to erode. Livestock can also cause erosion in heavily grazed area by reducing plant cover. Eroded soils can wash into waterways, with sediment shading aquatic plants, filling pools important pool habitats, and scouring or smothering stream-bottom sediments that are important spawning sites and invertebrate habitats (California Department of Fish and Wildlife 2015)... Climate Change

Climate change is a major challenge to the conservation of natural resources in California and the RCIS area. Climatic changes are already occurring in the state and have resulted in observed changes in natural systems. For example, small mammal distributions were found to shift upwards along an elevational gradient in Yosemite National Park, consistent with an increase in minimum changes in temperature over the last century (Moritz et al. 2008). Projected changes in climate, including extreme events such as fire, drought, flood, extreme temperatures, and storm events, are likely to have significant impacts on habitats, species, and human communities in the near future. Sea-level rise, drought, and flooding are discussed in the context of climate change.

2.7.2.2 Sea-Level Rise

The San Francisco Bay, which includes more than 1,000 miles of shoreline, is vulnerable to a range of natural hazards, including storms, extreme high tides, and rising sea levels resulting from global climate change. Sea level along the California coast has increased by about 6 inches over the last 100 years (California Energy Commission 2006), while the longest-running tide gauge in the nation, located in San Francisco Bay, indicates 0.08 inches of rise per year, or approximately 7.9 inches over the last 100 years (Largier et al. 2010). According to the National Research Council's 2012 sea level rise projections for North-central California, 4.7 to 24 inches of sea level rise is expected by 2050 and 16.5 to 65.8 inches is expected by 2100 (Hutto et al 2015). A conservative estimate for the RCIS area is between 7.1 and 11.4 inches by 2050 (National Oceanic and Atmospheric Administration 2017). The number of acres vulnerable to flooding is expected to increase by 20 to 30% by 2100 in most parts of the San Francisco Bay Area, with some areas projected for increases over 40% (Maizlish et al. 2017).

With projected sea-level rise in the RCIS area, approximately 11,755 acres of land in Santa Clara will be vulnerable to flooding as compared to 4,453.9 acres with no sea-level rise by 2050 (Cal-adapt 2017). The RCIS area has a relatively low level of vulnerability to sea-level rise and flooding as compared to other part of the San Francisco Bay Area (Cal-adapt 2017), given that only a small portion of the San Francisco Bay occurs in the northern corner of the RCIS area.

Sea-level rise will have the most significant impact on tidal vegetation and other land cover types in the baylands natural community within the RCIS area. Marshes around San Francisco Bay are particularly vulnerable to the anticipated increase in sea-level rise and reductions in available sediment. Ultimately, the concern is that future change will cause marshes and mudflats to drown, leaving only narrow, fragmented habitat patches along the shoreline. Remaining patches would be squeezed up against levees and seawalls with development behind them, exacerbating flooding. With remaining patches limited to fragments adjacent to developed areas, deleterious edge impacts could be amplified (e.g., spread of invasive species and predators). Sea level rise will also affect the location, extent, and composition of nontidal brackish marsh habitats along the tidal-terrestrial transition zone where it exists at or below current sea level because of increasing water elevation, increasing saltwater intrusion, and the tidal hydrologic regime. Nontidal brackish perennial emergent wetland locations that exist at the water’s edge will become more deeply immersed, or in the case of overtopped levees, deeply flooded by seawater. Plants such as saltgrass (*Distichlis spicata*) will disappear and be replaced by obligate wetland species such as bulrush (*Scirpus* spp.) Where nontidal freshwater marsh occurs in flooded depressions in upland areas adjacent to the baylands, those freshwater habitats will be inundated at least daily by tidal action and ultimately be lost (National Oceanic and Atmospheric Administration 2017).

Urbanization in the northern portion of the RCIS area near the San Francisco Bay has resulted in the loss of and major alterations to tidal marsh habitat. The tidal-terrestrial transition zone, which occupies the gradient between the intertidal zone and terrestrial habitat (i.e., the transition between pickleweed-dominated salt marsh to salt pans and saltgrass) is one of the most heavily impacted San

Francisco Bay ecosystems and is now limited to a narrow strips of land along the boundary of artificial levees (Beller et al. 2013).

Sea-level rise and changes in timing and volume of flow are projected to increase salinity intrusion into freshwater aquifers and the RCIS area. Similarly, changes in runoff and flows could result in increases in stream temperatures throughout the RCIS area (California Department of Fish and Wildlife 2016a). Estuarine inflows are projected to increase an average of about 20% from October through February and decrease by about 20% from March through September. Higher winter inflows could result in higher watershed runoff present in estuaries in winter, but reduced inflows in the spring and summer have the largest projected impact on estuarine waters reducing the amount of watershed runoff by a maximum of 8% by late June (California Department of Fish and Wildlife 2015).

Hotter, drier summers, combined with lower river flows, will further stress water resources available to both people, wildlife, and vegetation. This is likely to translate into less water for wildlife, especially fish and wetland species. Lower river flows will allow saltwater intrusion into the rivers and the increasing salinity and disrupting the complex food web of aquatic systems. As freshwater aquatic systems within the RCIS area become stressed from sea-level rise, the ecological functioning of upland habitats is also likely to be disrupted as individual species respond differently to climatic changes. Some species will likely adapt in place, others will probably move to better climates, and the rest will experience different rates of population or health declines.

2.7.2.3 Drought

Drought is a natural part of a Mediterranean climate system to which species and natural communities have adapted. However, a prolonged drought could cause serious impacts on focal species within the RCIS area. A drought is defined as two or more successive water years with 75% or less of the median inflow (i.e., precipitation) (ICF International 2012).

On average, the precipitation total across California show little change in annual precipitation. The Mediterranean climate in expected to continue, with various climate models predicting slightly wetter winters while others projects slightly drier winters with a 10 to 20% total decrease in annual precipitation. By 2090, precipitation is the RCIS area may decrease slightly, however temperatures may also increase by approximately 5 degrees Fahrenheit, however even modest changes in temperature and precipitation could have significant impacts on the focal species and their habitat in the RCIS area with projected increases in urbanization and population (National Oceanic and Atmospheric Administration 2017).

Some of California’s native species are more vulnerable than others to extended or frequent severe drought and may be at risk of extirpation. Small population size, short life expectancy relative to the drought duration, and inability to adequately cope with extreme events are reasons some taxa, including several of the Santa Clara County RCIS focal species, are more vulnerable than others. The impacts of drought on some types of animals are more obvious than others. Many adult amphibians (e.g., focal species California tiger salamander and California red-legged frog) can survive periods of no water, but most require water for the egg and larval/tadpole life stages (California Department of Fish and Wildlife 2015). Other, more terrestrial species, are only able to successfully breed when food, such as vegetation or prey species that feed on vegetation, is available for the young (California Department of Fish and Wildlife 2015). Severe, extended absence of precipitation can lead to population declines through lack of recruitment of young amphibians (e.g., toads, frogs, or salamanders).

Whether drought causes a species to decline towards extinction depends on a number of factors, including how widely distributed the species is relative to extreme drought conditions, the degree to which microhabitats remain available to serve as refugia, and the ability for animals to relocate to less impacted areas. With adequate behavioral or genetic diversity and enough time, some animals can adapt to or evolve with changing conditions.

2.7.2.4 Wildfire

Climate change is expected to contribute to significant changes in fire regimes, including shifts in the timing, frequency, and intensity of wildfire events. Fire is a natural component of many ecosystems and natural community types, including grasslands, chaparral/northern coastal scrub, oak woodlands, and conifer woodlands. For each of these natural communities, fire frequency and intensity influence community regeneration, composition, and extent. For example, more frequent, intense fires caused by high fuel loads and increased encroachment by woody species into grasslands could negatively affect community composition by favoring early successional species. Forest and grasslands systems throughout the Santa Clara County RCIS have been stressed by the outbreak of wildfires. Additionally, frequent, intense fires could cause *type conversion*, increasing the extent of certain natural communities, such as grassland, at the expense of others, such as chaparral or oak woodlands.

CAL FIRE has rated the fire probability in undeveloped portions of the RCIS area as moderate to high. Recent fire history[22] for large fires (>100 acres) indicates that there have been 37 large fires since 1951. Large fires ranged from 101 acres to 5,813 acres. Of these, none were over 10,000 acres (i.e., catastrophic fires).[23] There were four fires that occurred either partly within the RCIS area or immediately adjacent (e.g., in State Parks lands) that were over 10,000 acres. These fires burned a total of 112,242 acres, or 38% of the land cover types prone to wildfire (also referred to as "burnable land cover"). Wildfire frequency, size, and intensity are expected to increase throughout the RCIS area. Wildfire risk may increase 4 to 6 times the current conditions (California Department of Fish and Wildlife 2015). The number of escaped fires is projected to increase by 51%, while total area burned by contained fires is projected to increase 41% despite enhancement of fire suppression efforts (California Department of Fish and Wildlife 2015). The probability of large fires (>100 acres) is expected to increase by the end of the 21st century, and area burned is projected to increase from 10 to 50% by the 2070–2099 time period (PRBO Conservation Science 2011).

2.7.2.5 Effects on Focal Species and Habitats

All of the focal species are, or will likely be, affected by climate change (Table 2-9). Climate change may alter habitats in the RCIS area as temperatures and precipitation levels change, which could lead to the reduction in population sizes or extirpation of focal species that rely on those habitats, or require focal species in the strategy to migrate to other areas. Many of the focal species in the RCIS area are of special conservation concern because of their risk of extinction, and are particularly vulnerable to climate change (California Department of Fish and Wildlife 2015). Species that are

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[22] Calculations were based on data from 1956 to 2014.

[23] Catastrophic fires occurred as follows: 32,866 acres in 1961(Bollinger Ridge), 13,128 acres in 1985 (Lexington), 18,500 acres in 2003 (Annie), and 47,748 acres in 2007 (Lick).

particularly vulnerable often occur within a limited geographic range, exist in small populations, have specialized habitat requirements, and have low dispersal ability which make it difficult for them to migrate to more suitable areas as habitats shift with climate change. Aquatic species are particularly at risk (e.g., California tiger salamander or Central California Coast steelhead), because they could be extirpated by loss of aquatic breeding habitat during extended periods of drought. By identifying species most at risk from the effects of climate change, conservation and management efforts can be targeted to reduce and mitigate these impacts, such as by protecting and restoring existing habitat and linkages between habitats and climate change refuges, or through assisted migration.

The State Wildlife Action Plan (California Department of Fish and Wildlife 2015) identifies four of the focal wildlife species as climate vulnerable: both steelhead runs (Central California Coast steelhead and South Central California Coast steelhead), California tiger salamander, foothill yellow-legged frog, and Swainson's hawk (Table 2-9). Both DPSs of steelhead have been identified as extremely likely to become extinct in the wild before 2100 due to a decrease in cool, flowing water and an increase in alien fish over time (Moyle et al. 2012). Amphibians are particularly vulnerable to climate change, due to their reliance on aquatic and/or moist habitats. California tiger salamander is one of several species with an intermediate-to-high risk of extinction due to climate change because of significant losses in the suitability of occupied and potential habitat by 2050 (Wright et al. 2013). Foothill yellow-legged frog and California red-legged frog are also vulnerable to effects from climate change, though to a lesser extent, (likely due to their dispersal ability and distribution of available future habitat (Wright et al. 2013). In the climate risk analysis for California's at-risk birds (Gardali, et al. 2012), Swainson's hawk is listed as a species with moderate vulnerability to climate change because their use of very specific habitats and their long-distance migratory patterns (i.e., the timing of their migration needs to be matched with suitable climate conditions). The California Department of Fish and Wildlife has also identified the following focal plant species as highly (i.e., significant decline) or moderately (i.e., declining) vulnerable to climate change by 2050: fragrant fritillary, most beautiful jewelflower, smooth lessingia, and Mount Hamilton thistle.[24] Climate vulnerability in plant species was found to be significantly related to anthropogenic barriers to dispersal, and also increased by land use change from human response to climate change (e.g., solar power stations, wind farms, geothermal wells, or biofuel production sites) and narrow temperature tolerance (Anacker and Leidholm 2012).

Focal species in the RCIS area could respond to climate change in a number of ways. First, the timing of seasonal events, such as migration, flowering, and egg laying, may shift earlier or later. Such shifts may affect the timing and synchrony of events that must occur together, such as butterfly emergence and nectar availability. Second, range and distribution of focal species may shift (Walther et al. 2002). This is of particular concern for narrowly distributed focal species that already have restricted ranges due to urban development or altitudinal gradients. Historically, some focal species could shift their ranges across the landscape. Today, urban and rural development prevents the movement of many species across the landscape. Species or natural communities that occur only at high elevation (e.g., ponderosa pine woodland in the RCIS area) or within narrow environmental gradients (e.g., Mount Hamilton thistle) are particularly vulnerable to changing climate because they likely have nowhere to move if their habitat becomes less suitable (e.g., Thorne et al. 2016).

Increases in disturbance events, and/or the intensity of disturbance events, such as fire or drought may also occur. This could increase the distribution of disturbance-dependent land cover types, such

[24] Loma prieta hoita, Tracy's eriastrum, and rock sanicle were not included in the climate vulnerability analysis.

as California annual grassland, within the RCIS area (Rogers and Westfall 2007). An increase in the frequency and intensity of disturbance could increase the likelihood that these events will harm or kill individual focal species, many of which are already quite rare. Events that occur with unpredictable or random frequency (called stochastic events) such as those described in this section can have an inordinately negative effect on the focal species.

2.7.2.6 Effects on Other Conservation Elements

Climate change will also affect the vegetation communities that occur on serpentine soils and other unique land cover types in the RCIS area. Similar to the discussion in Section 2.7.3.4, *Effects on Focal Species and Habitats*, the serpentine soils and unique land cover types in the RCIS area are particularly at risk from climate change because of their narrowly distribution in the RCIS area. Urban and rural development have put increased pressure of the ranges of these land cover types, and this pressure will only increase in the context of climate change. Given that serpentine land cover types are restricted to areas containing serpentine soils, conservation of large patches of serpentine habitat is important to provide those areas with climate resiliency. In addition, some unique land cover types may be severely reduced in range and distribution or even extirpated with prolonged, extreme climate driven event such as a severe drought or increased fire frequency. In a climate change vulnerability assessment of California's terrestrial vegetation (Thorne et al. 2016), coastal salt marsh and freshwater marsh are unique land cover types located within the RCIS area with high vulnerability to climate change.[25] In addition, several other unique land cover types such as California forest and woodland, coastal scrub, and California rock outcrop vegetation, are identified as have a mid-high to moderate level of climate vulnerability.

2.7.3 Nonnative Species and Disease

Nonnative plants can be found in many different habitats and tend to dominate brackish aquatic habitats. Invasive spartina and perennial pepperweed is a major concern in salt marshes, and opposite leaf Russian thistle appears to be increasing in some areas. Coastal habitats face alien species such as gorse, ice plant, and pampas grass. Introduced plants also invade aquatic habitats. These aquatic invaders include Brazilian waterweed, egeria, Eurasian water milfoil, hydrilla, water hyacinth, water pennywort, and parrot feather. In grasslands, some of the more challenging plant invaders include eucalyptus, fountain grass, gorse, medusahead, tree of heaven, and yellow star thistle. In riparian and wetland areas, invading plants include edible fig, giant reed (or arundo), Himalayan blackberry, pampas grass, Russian olive, tamarisk (or salt cedar), pennyroyal, peppergrass, and tree of heaven (California Department of Fish and Wildlife 2015). Oak woodlands are invaded by plants such as Scotch broom and French broom. In other timbered areas, invasive grasses can form dense stands that inhibit the germination of such coastal forest species as redwoods. Cape ivy chokes out native vegetation with densely growing vines. Found most commonly in shady coastal lowlands, cape ivy also invades oak woodlands, riparian forests, coastal scrub, and Monterey pine forests (Bunn et al. 2005).

Nonnative animals are also a concern within the RCIS area. These animals have invaded both terrestrial and aquatic environments. Nonnative terrestrial animal species include brown-headed cowbirds, European starlings, domestic dogs and cats, introduced red foxes, Norway rats, and wild

[25] Vulnerability was determined by using a vegetation map from 2015 and examining how climate conditions will change at over time.

pigs. Cowbirds can lower the reproductive success of other native birds by laying their eggs in other birds' nests, causing the targeted host birds to raise the cowbird nestlings at the expense of their own. Native raccoons, whose populations appear to have greatly increased near housing developments and recreation facilities, pressure some native reptile species—notably western pond turtles—because of egg predation.

Introduced feral pigs are a major problem in many habitat types across the RCIS area. Wild pigs root in the soil, creating excessive soil disturbance and destroying native plant communities. In oak woodlands, feral pigs can inhibit the germination and growth of young oaks by eating acorns and oak seedlings and removing leaf litter, causing soils to dry out (Bunn et al. 2005). In salt marsh habitats, the introduced red fox increases predation rates for sensitive coastal shorebirds such as Ridgway's rail. Populations of native avian predators, such as California gulls and corvids (i.e., raven, crows, and jays) have increased and are now having negative consequences in salt marshes in San Francisco Bay.

Many nonnative fish species have become established in California, dominating many of the rivers and streams in the RCIS area. These include species such as striped bass, white catfish, channel catfish, American shad, black crappie, largemouth bass, and bluegill. Many fish were historically introduced (via stocking) by federal and state resource agencies to provide sport fishing or forage fish to feed sport fish. Many introduced nonnative fish and amphibians out-compete native fish for food or space, prey on native fish (especially in early life stages), change the structure of aquatic habitats (increasing turbidity, for example, by their behaviors), and may spread diseases (Moyle 2002).

2.7.3.1 Effects on Focal Species and Habitats

Nonnative species are ubiquitous in the RCIS area, and all of the focal species are affected by nonnative species and disease to some extent (Table 2-9). Invasive plant and animal species put significant pressure on focal species within the RCIS area. Invasive species often reduce habitat quality for the focal wildlife and plant species, often due to the density and monotypic habitat that is formed. Some invasive wildlife species depredate focal wildlife species; for example, nonnative bass and bullfrog consume California red-legged frogs and California tiger salamanders and, as such, the presence of bullfrogs and bass limits the opportunity for success of these focal species. Rooting disturbance from feral pigs allows nonnative invasive plants to establish in grassland and aquatic communities (Sweitzer and Van Vuren 2002) making them unsuitable for the focal wildlife and plant species in the RCIS area.

2.7.3.2 Effects on Other Conservation Elements

Invasive plants and animal species affect the unique land cover types and serpentine soils in the RCIS area. Invasive plant and animal species outcompete and displace native plant communities. For example, the replacement of native grasses and herbs by fast-growing nonnative annual grasses and herbs in serpentine grasslands has a profound effect upon ecosystem functions. Exotic annual grasses grow faster, deplete the soil of nutrients, and reduce light availability. Similar effects from invasive plant species on other serpentine land cover types can occur. Feral pigs can degrade unique land cover types from excessive use and rooting, which can lead to loss of emergent vegetation, erosion, and flooding. The presence of bullfrogs and bass can also indicate that the seasonal hydroperiod of a unique aquatic land cover type is no longer function, as these species occur in perennial aquatic habitats.

2.7.4 Loss of Habitat Connectivity

Growth and development can fragment habitats into small patches, which cannot support as many species as larger patches. These smaller fragments often become dominated by species more tolerant of habitat disturbance, while less-tolerant species decline. Populations of less mobile species often decline in smaller habitat patches because of reductions in habitat quality, extreme weather events, or normal population fluctuations. Natural recovery following such declines is difficult for mobility-limited species that may not be able to recolonize otherwise suitable habitat. Such fragmentation also disrupts or alters important ecosystem functions, such as predator-prey relationships, competitive interactions, seed dispersal, plant pollination, and nutrient cycling (California Department of Fish and Wildlife 2015).

Growth and development, along with associated linear structures like roads, canals, and power lines, impede or prevent movement of a variety of animals. As growth patterns include residential projects located far from existing urban centers, there is a greater need for supporting infrastructure. This is generally less significant than habitat loss but makes it more difficult for those species that need to move large distances in search of food, shelter, and breeding or rearing habitat and to escape competitors and predators. Animals restricted to the ground, like mammals, reptiles, and amphibians, face such obstacles as roads, canals, and new gaps in habitats. Attempts to cross these obstacles can be deadly, depending on the species and the nature of the gap (four-lane highways with concrete median barriers compared to narrow, rural two-lane roads, for example).

Wildlife-vehicle collisions are a large and growing concern among public transportation departments, conservation organizations and agencies, and the driving public. Wildlife-vehicle collisions are a safety concern for drivers and a conservation concern for most animal species. Recently, Loss et al. (2014) estimated that between 89 and 340 million birds may die per year in the US from collisions with vehicles. Many public transportation departments are trying different methods of reducing wildlife-vehicle collisions, including fencing roadways and providing crossing structures across the right-of-way to allow safe animal passage.

The California Roadkill Observation System (CROS), a site created by UC Davis's Road Ecology Center (REC), records the locations of roadkill observations on major highways and freeways and includes records of carcasses cleaned up by the California Department of Transportation between 1987 and 2007. Using data from the CROS, the REC identifies stretches of California highways that are likely to be hotspots (i.e., stretches of highway that are statistically different from other stretches) for wildlife-vehicle collisions. The CROS accounts for both observed animal carcasses and traffic incidents, which can range from wildlife sightings on the roadway to a wildlife-vehicle collisions. In the RCIS area, U.S. 101 and SR 17 were analyzed by the REC, however only a portion of the RCIS area is included in analysis (Santa Clara County south of Morgan Hill). There is only one hotspot identified at the western edge of the RCIS area along SR 17 near Los Gatos,[26] which is the longest, densest stretch with higher levels of wildlife-vehicle collisions. The remainder of U.S. 101 and SR 17 in the RCIS area have low incidences of wildlife-vehicle collision, with slightly higher rates in small, scattered locations along U.S. 101 in Central San Jose and near Morgan Hill. Most of the observations in the RCIS area are of medium (e.g., American badger, bobcat, coyote, raccoon) and large animals (e.g., wild pig, mountain lion, mule deer).

[26] Data from the CROS used in the analysis was collected between 2009 and 2015.

2.7.4.1 Effects on Focal Species and Habitats

Loss of connectivity would affect all of the focal species in the RCIS area (Table 2-9). Loss of connectivity between open space patches that provide habitat for focal species reduces their genetic pool due to the loss of the ability of populations to disperse and intermix. A diverse genetic pool is important for populations to adapt to changing environmental conditions, for disease resistance, and to minimize physiological and behavior problems (Falk et al. 2001). Barriers to movement could also extirpate local, smaller populations of focal species in the RCIS area. For example, breeding populations of Central California Coast steelhead and South Central California Coast steelhead in the RCIS area could be extirpated if these species are prevented from reaching their spawning territory. Habitat connectivity is also important for the focal plant species to be able to migrate in response to climate change. The loss of habitat connectivity would also restrict the focal plant and wildlife species from colonizing new areas of suitable habitat in the RCIS area.

2.7.4.2 Effects on Other Conservation Elements

Loss of connectivity would further isolate populations in the increasingly fragmented landscape of the RCIS area. Similar to 2.8.4.1, *Effects on Focal Species and Habitats*, the loss of connectivity between areas containing serpentine soils and unique land cover types could reduce biodiversity and limit the ability of existing populations to adapt to changing conditions. Loss of connectivity between unique land cover types and serpentine soils could result in permanent habitat conversion and habitat loss throughout the RCIS area.

2.7.5 Disruption of Natural Fire Disturbance Regime

Periodic fire is an important influence on natural communities and focal species in the RCIS area, especially the grassland and shrubland natural communities. Historically and prehistorically, fires from both lightning strikes and human ignition kept woody vegetation from invading grassland (where the soil conditions are appropriate) and converting it to coastal scrub or oak woodland. Grassland was likely the dominant vegetation community, especially near prehistoric and historic settlements and travel routes, and in association with brush clearing for “rangeland improvements” to increase livestock forage (Reiner 2007; Tyler et al. 2007). The prehistoric burning apparently resulted in spatially patchy grasslands in a mosaic with woody vegetation (Keeley 2002). The grasslands were kept open by fire, drought, and possibly some influence of native grazers, such as tule elk and pronghorn. However, prior to Native American occupancy and their frequent burning, Ford and Hayes (2007) speculate that many of the grasslands within the range of coyote brush would have been brushlands. Today, in the absence of frequent extensive fire and moderate or higher intensity livestock grazing, the grasslands within the range of coyote brush have succeeded or will succeed in the future to northern coastal scrub and eventually mixed woodland, except on the hottest south-facing slopes and shallow soils (ICF International 2012). Similarly, chapparal and northern coastal scrub/Diablan sage scrub land cover types are dependant on periodic fires to maintain natural processes such as succession and regeneration. Periodic fires help increase native species diversity and reduce nonnative species (ICF International 2012). EasementFire suppression can also allow woodland to encroach on and convert chaparral land cover types.

2.7.5.1 Effects on Focal Species and Habitats

Fire-suppression policies pose a great threat to most of the focal species in the RCIS area to some extent (Table 2-9). With buildup of fuel over many years, the risk of catastrophic fire is greatly increased (U.S. Fish and Wildlife Service 2002). Such a fire can kill the focal wildlife species, which might otherwise be able to escape. In addition, invasive plant species can be managed with prescribed burns, which can be intentionally ignited to mimic natural fire disturbance; however, lack of prescribed burns can severely impact important habitat for the focal plant and wildlife species when other invasive plant species management techniques are not effective. Fire suppression also limits that natural processes that some fire adapted plants require to progate, such as pallid manzanita, which requires fire for natural seed germination.

2.7.5.2 Effects on Other Conservation Elements

Fire is a natural component of many ecosystem, natural communities, and unique land cover types in the RCIS area. Many of the plants in the chaparral and northern coastal scrub communities have evolved to be dependent on periodic fire for regeneration (Holland 1986; Hanes 1988; Schoenherr 1992). In fact, communities dominated entirely by chamise cannot sustain themselves in the absence of fire (U.S. Fish and Wildlife Service 2002). Some species of chaparral have peeling bark or volatile oils that promote fire (Schoenherr 1992). Many of the dominant shrubs, such as manzanita and ceanothus, have adapted to fire by resprouting from basal burls or woody root crowns following a fire event. Other species have seeds that require fire to initiate growth (U.S. Fish and Wildlife Service 2002; Rundel and Gustavson 2005). Regrowth is triggered by removal of the overstory, typically by fire. Chemicals in smoke and charred wood also stimulate germination in a wide variety of native forbs that lie dormant as seeds in the soil for decades before a fire.

Ford and Hayes (2007) described the dynamic successional relationship between California grasslands and northern coastal scrub. Frequent fire, rodent herbivory, livestock grazing and trampling, and drought tend to maintain grassland and limit succession from grassland to northern coastal scrub as well as the succession from scrub to mixed oak woodland. The succession from grassland to scrub can be as rapid as >5% per year after suppression of fires and livestock grazing, and the succession from scrub to woodland can occur within 50 years after that. Returning such sites to grassland would typically require management that included manual clearing and herbicides or repeated burning at times of maximum herbaceous understory and dry weather, followed by at least moderate intensity summer seasonal or yearlong livestock grazing (ICF International 2012).

Oak woodland is also a fire-adapted ecosystem, and fire has likely played a large role in maintaining this community type in the RCIS area. Fire creates the vegetation structure and composition typical of oak woodlands, and this natural community has experienced frequent, low-severity fires that maintain woodland or savanna conditions. In the absence of fire, the low or open understory that characterizes the land cover type is lost. Ultimately, closed-canopy oak forests are replaced by shade-tolerant species because oaks cannot regenerate and compete in a shaded understory. Soil drought may also play a role in maintaining open-tree canopy in dry woodland habitat (ICF International 2012).

2.7.6 Dams and Water Management/Water Use

Water resources are managed to meet water and power supply needs and to accommodate urban communities and agricultural production in the RCIS area. Water management pressures in the RCIS area include water diversions, dams, flood control structures (e.g., levees and bank protection), groundwater pumping, stream and river crossings (e.g., culverts, bridges), and dredging. Rivers and streams suffer from the historic and ongoing conversion of tributary waterways into constructed stormwater infrastructure. Stormwater conveyances are managed to convey urban runoff and floodwater and can alter the hydrologic processes that are important to ecosystem function, such as sediment deposition, water filtration, support of riparian vegetation and wildlife movement corridors. Dams are located on many streams in the RCIS area. Dams reduce the amount of water remaining in streams that is needed by fish at critical times, and they alter the flow regimes in ways that are detrimental to aquatic life. Less water in the rivers also means less water for managed wetlands. Focal fish species and other aquatic species are blocked from moving upstream or downstream by dams and other water diversions.

2.7.6.1 Effects on Focal Species and Habitats

Dams and water management/water use primarily affect aquatic species in the RCIS area (Table 2-9). Dams and water management practices can reduce the amount of water available for focal fish and terrestrial wildlife, obstruct fish passage, and result in numerous other habitat alterations. Diversion of water for irrigation can contribute to altered hydrologic regimes, and nutrient laden runoff can degrade aquatic habitat. Agricultural water consumption, over the last century, has increased due to ther production of water-intensive crops like strawberries, lettuce, and grapes has increased the need for water. Water is supplied to agriculture by diversion of surface water, by groundwater pumping, and through import from other regions via the State Water Project. As groundwater levels are depleted, saltwater intrusion increases and flows are also reduced in streams and rivers. Diminished flows reduce aquatic systems' capacity to discharge incoming contaminants and sediment and can inhibit migration by focal fish species. Additionally, groundwater depletion and drought have increased salinity in inland lakes and freshwater/brackish lagoons, which affects habitat conditions for western pond turtle and other species (California Department of Fish and Wildlife 2015).

2.7.6.2 Effects on Other Conservation Elements

Bridges, levees, and bank-protection structures are present on rivers and streams in the RCIS area. These structures prevent flood flows from entering historic floodplains and eliminate or alter the character of floodplain habitats, such as shaded riverine habitat, and floodplain ecosystem processes. Constrained flood-level flows increase scouring and incision of river channels and reduce or halt the formation of riparian habitat, channel meanders, and river oxbow channels (California Department of Fish and Wildlife 2015)..

2.7.7 Mining and Quarrying

Historic mercury mining operations are the primary mining and quarrying-related stressor in the RCIS area. These mines continue to affect water quality and native fauna and flora in many of the RCIS area streams and estuaries in the Baylands (National Marine Fisheries Service 2016a).

2.7.7.1 Effects on Focal Species and Habitats

Historic mercury mines in the RCIS area primarily affect aquatic species (Table 2-9). Historic mercury mining operations in the RCIS area have resulted in high levels of mercury in stream systems, affecting water quality and focal fish and amphibians and other native species. In some streams, such as the Guadalupe watershed, mercury may be the greatest factor affecting salmonids and the native fish assemblage (National Marine Fisheries Service 2016a).

2.7.7.2 Effects on Other Conservation Elements

As described above, historic mercury mines primarily affect stream systems in the RCIS area. High concentrations of mercury in sediments affects water quality, and native biodiversity in affected streams (National Marine Fisheries Service 2016a).

2.7.8 Airborne Pollutants

Particulates, pollutants, and pathogens deposited from the air can degrade aquatic and terrestrial ecosystems and esturarine habitats. Discharges from power plants, sewage plants, and other industrial facilities are high in pollutants and pathogens.Nitrogen deposition from air pollution is ongoing and increasing the RCIS area (Weiss 1999; California Energy Commission 2006). Nitrogen deposition is predicted to continue to increase as population growth occurs in the RCIS area, which results in an increase in air pollutant emissions from passenger and commercial vehicles and other industrial and nonindustrial sources (although it could possibly decrease if future automobile technologies address this issue). Emissions from these sources are known to increase airborne nitrogen, of which a certain amount is converted into forms that can fall to earth as depositional nitrogen. Serpentine soils are inherently nutrient poor and are particularly limited in available nitrogen. Most serpentine-endemic plant species have evolved to tolerate this condition, while competitive invasive species cannot do so (ICF International 2012). This nutrient deficiency is believed to be the primary mechanism by which serpentine soils retain a high degree of native diversity (Harrison 1999).

2.7.8.1 Effects on Focal Species and Habitats

Nitrogen deposition has been shown to greatly increase available nitrogen in the soils and in turn to potentially increase the success of plant invasions into serpentine areas (Weiss 1999). The nonnative species overtake native serpentine species, including many of the serpentine-endemic focal plant species (e.g., most beautiful jewelflower or fragrant fritillary) in the RCIS area. Nonnative plants may also compete with native plants for water, nutrients, light, and safe sites for germination, crowding out covered plants (ICF International 2012). The same study also found that Sserpentine areas that are grazed do not suffer the same plant invasions, most likely because due to the fact that cattle preferentially selectively graze the invasive grasses and leave the native species and, in doing so, also because the cattle effectively remove nitrogen from the site (Weiss 1999).

2.7.8.2 Effects on Other Conservation Elements

California grasslands are believed to be among the most sensitive to nitrogen deposition (Fenn et al. 2010). Indirect impacts of continued nitrogen deposition on the unique land cover types and serpentine soils in the RCIS area are anticipated to result from future urban development and rural development. Serpentine land cover types are general the focus of conservation actions to offset the effects of nitrogen deposition because they have a high ratio of focal plant species, however of the other unique land cover types in the RCIS area have been identified as sensitive or potentially sensitive to nitrogen deposition (Weiss 2006): Northern mixed chaparral/chamise chaparral, serpentine chaparral, mixed oak woodland and forest, and redwood forest, are known to be sensitive to nitrogen deposition. According to this report, California annual grassland, valley oak forest and woodland, blue oak woodland, coast live oak forest and woodland, perennial freshwater marsh, seasonal wetland, and ponds may also be sensitive to nitrogen deposition (ICF International 2012).

2.7.9 Tourism and Recreation

Outdoor recreation and exposure to nature is important to foster an appreciation of nature; however, recreation in sensitive habitats could result in habitat degradation. Tourism and recreation on public lands can have its greatest affect on focal and other native species where desities of recreationists are high, such as in public parks in the RCIS area. Increased human use within natural areas could affect focal and other native species through, among other ways, the spread of invasive species and diseases, collection and harassment of individuals, increased frequency of wildfire ignition, and trash dumping.

2.7.9.1 Effects on Focal Species and Habitats

Tourism and recreation may affect some focal species (Table 2-9), though the actual extent of effects will be specific to those species present near recreation. For example, focal fish species may be caught by people fishing. Recreationists may trample California tiger salamander migrating to aquatic habitat, as well has trample vegetation in otherwise suitable habitat. Recreation in public parks, however, is generally managed to minimize human-wildlife interactions and effects to sensitive species and habitats

2.7.9.2 Effects on Other Conservation Elements

Large numbers of outdoor recreationists in sensitive areas can directly damage natural systems by reducing vegetative cover, compacting soil, increasing soil destabilization and erosion, disturbing breeding and foraging areas, contaminating natural lands and waterways through inappropriate disposal of trash and human waste, and by introducing nonnative species. Natural areas may be indirectly affected by increased development of recreational access points and supporting infrastructure such as roads, construction and use of visitor facilities and campgrounds. Visitor litter in parks and public lands can encourage increased corvid populations (jay, crow, and raven), which contributes to greater competition with and predation upon other native wildlife.

Concentrated recreational use in highly sensitive areas, such as streams and riparian zones by hikers, picnickers, mountain bikers, and equestrians can damage these systems, reducing vegetative cover and disturbing sensitive natural communities. Concentrated fishing, especially in populated area can lead to localized depletion of fisheries. Illegal trampling, and collecting, can deplete floral and faunal populations, reduce biodiversity, and alter trophic and community structures in frequently visited natural habitats.

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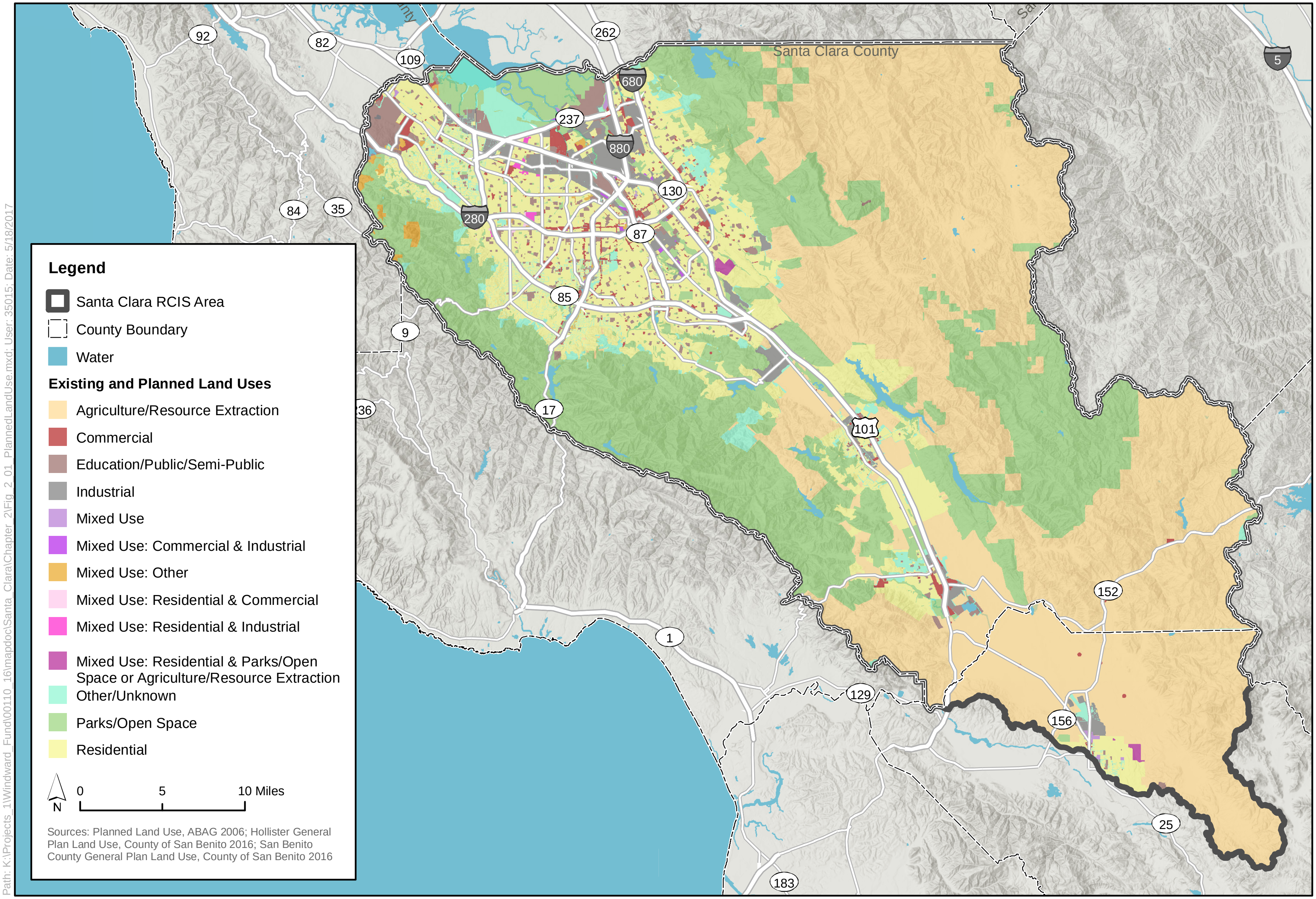

Figure 2-1
Existing and Planned Land Uses in the RCIS Area

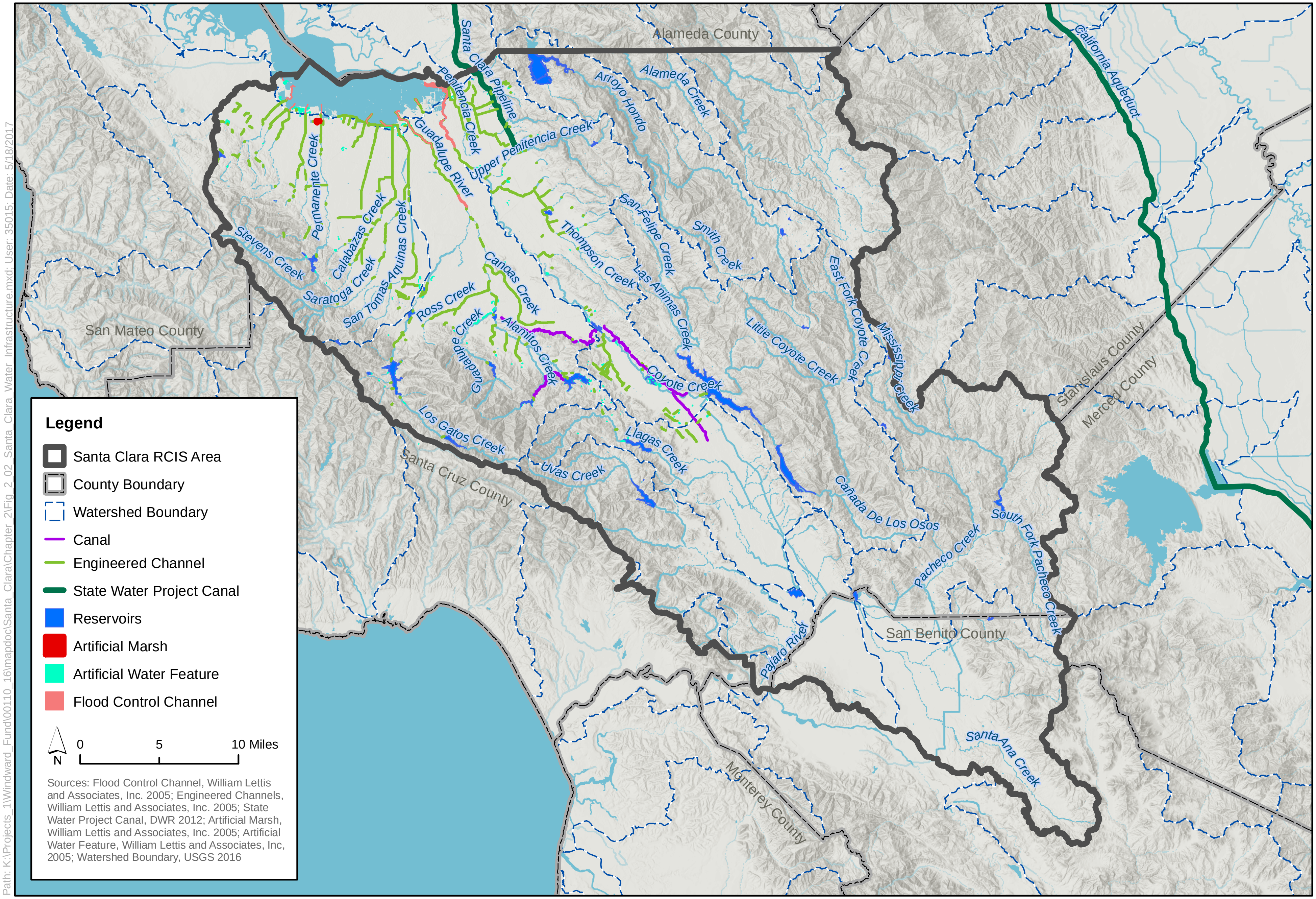

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Figure 2-2
Water Infrastructure within the Santa Clara RCIS Area

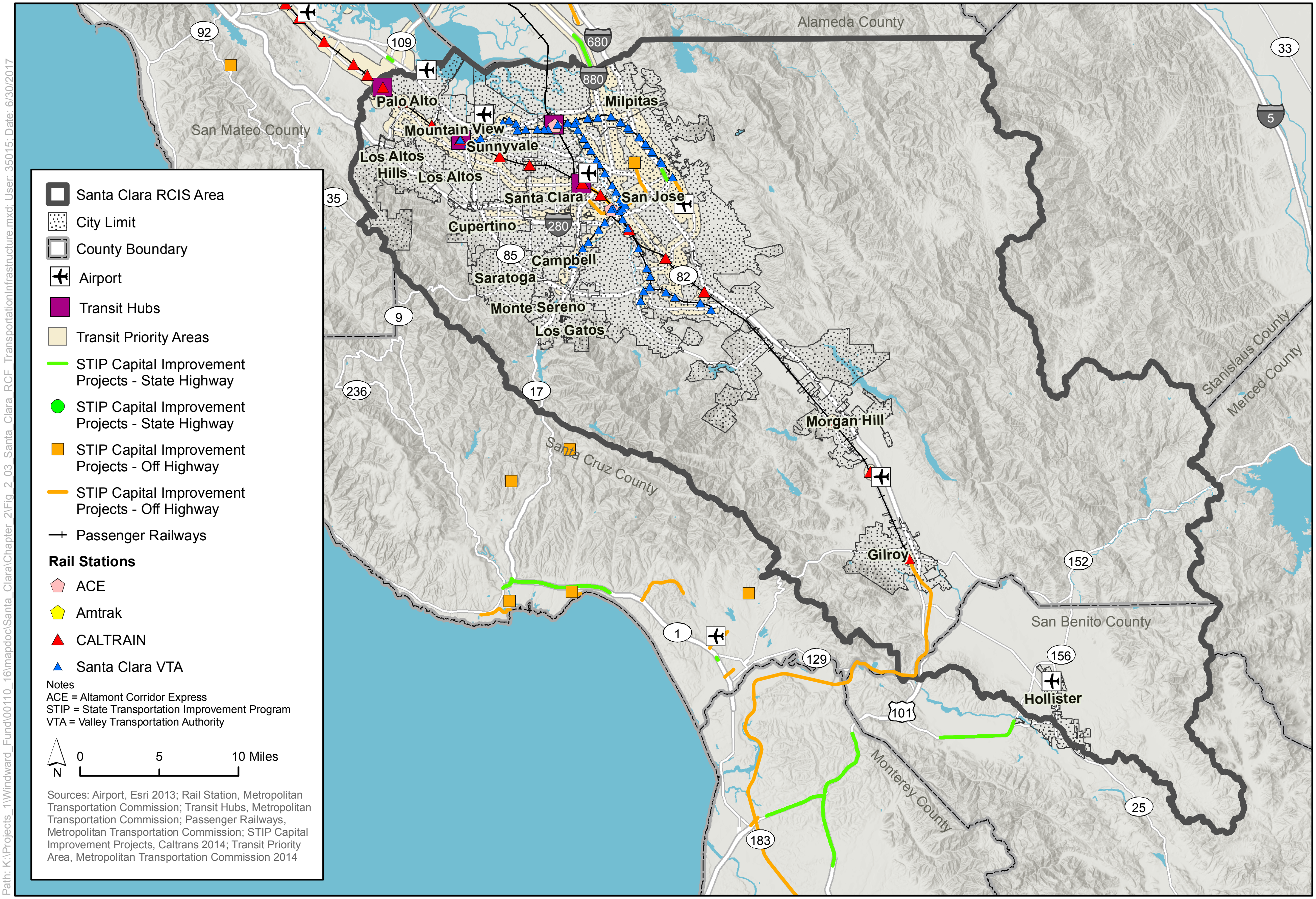

Figure 2-3
Major Transportation Infrastructure within the Santa Clara RCIS Area

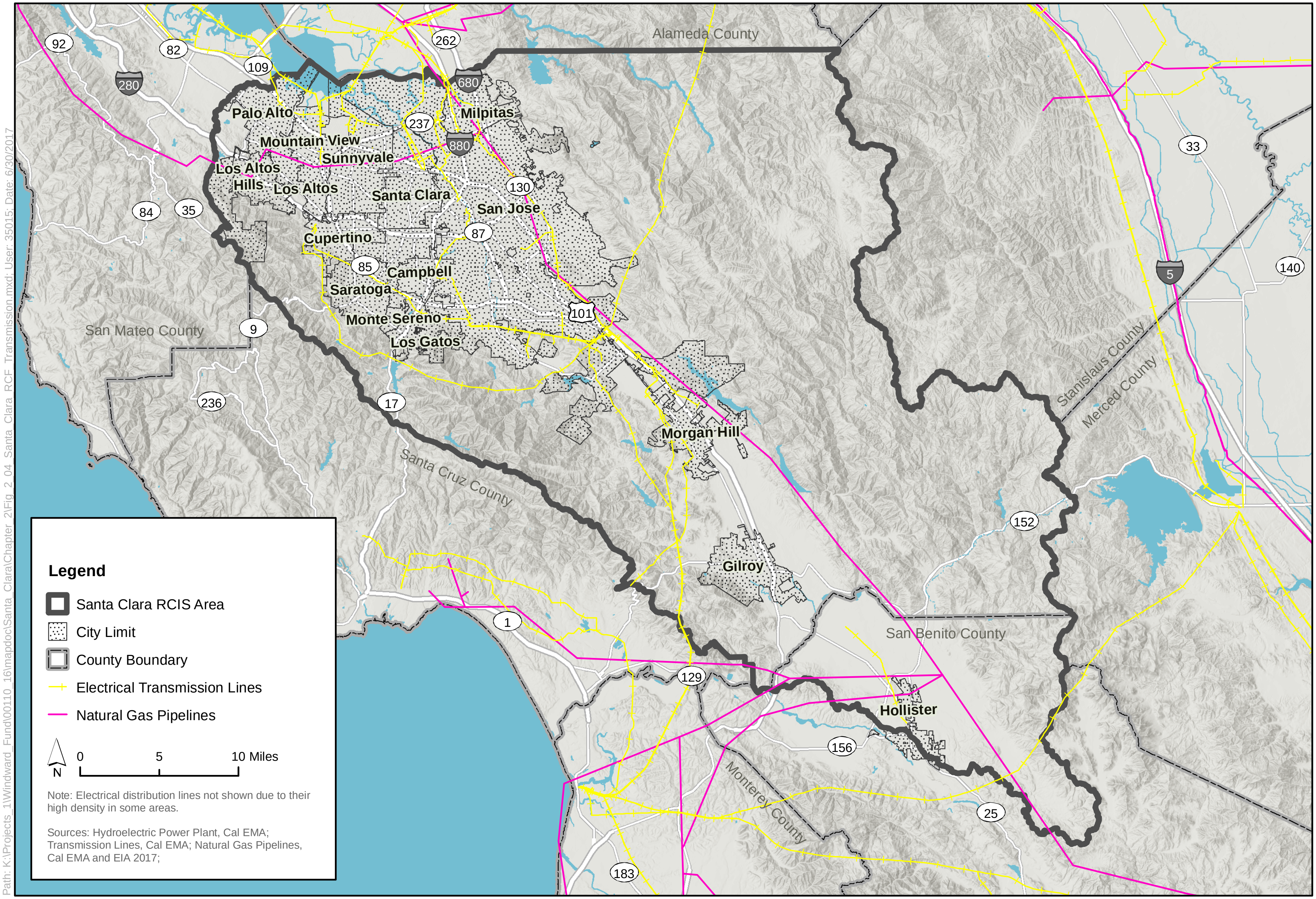

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Figure 2-4
Major Electrical Transmission Facilities within the Santa Clara RCIS Area

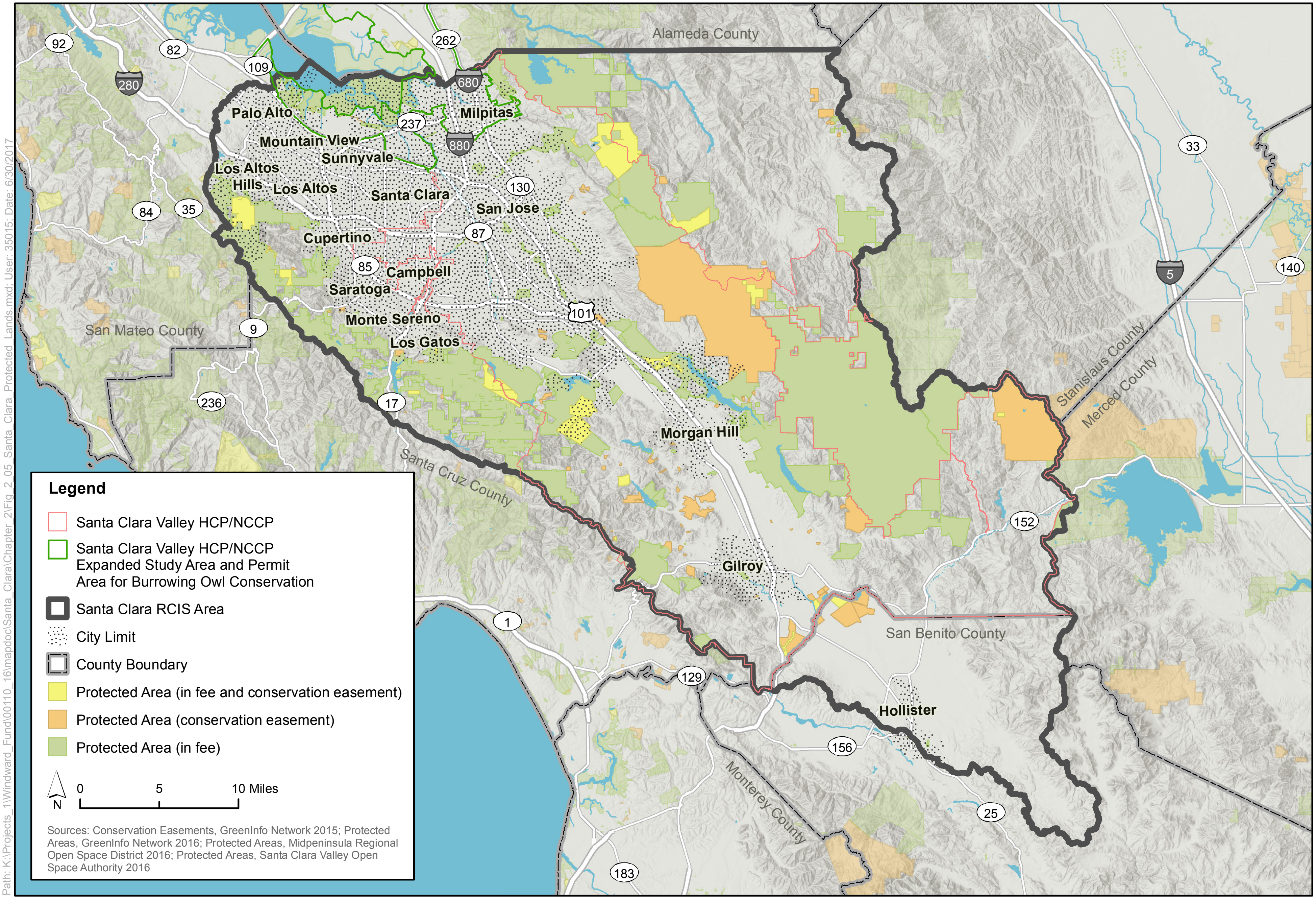

Figure 2-5
Santa Clara RCIS Protected Areas

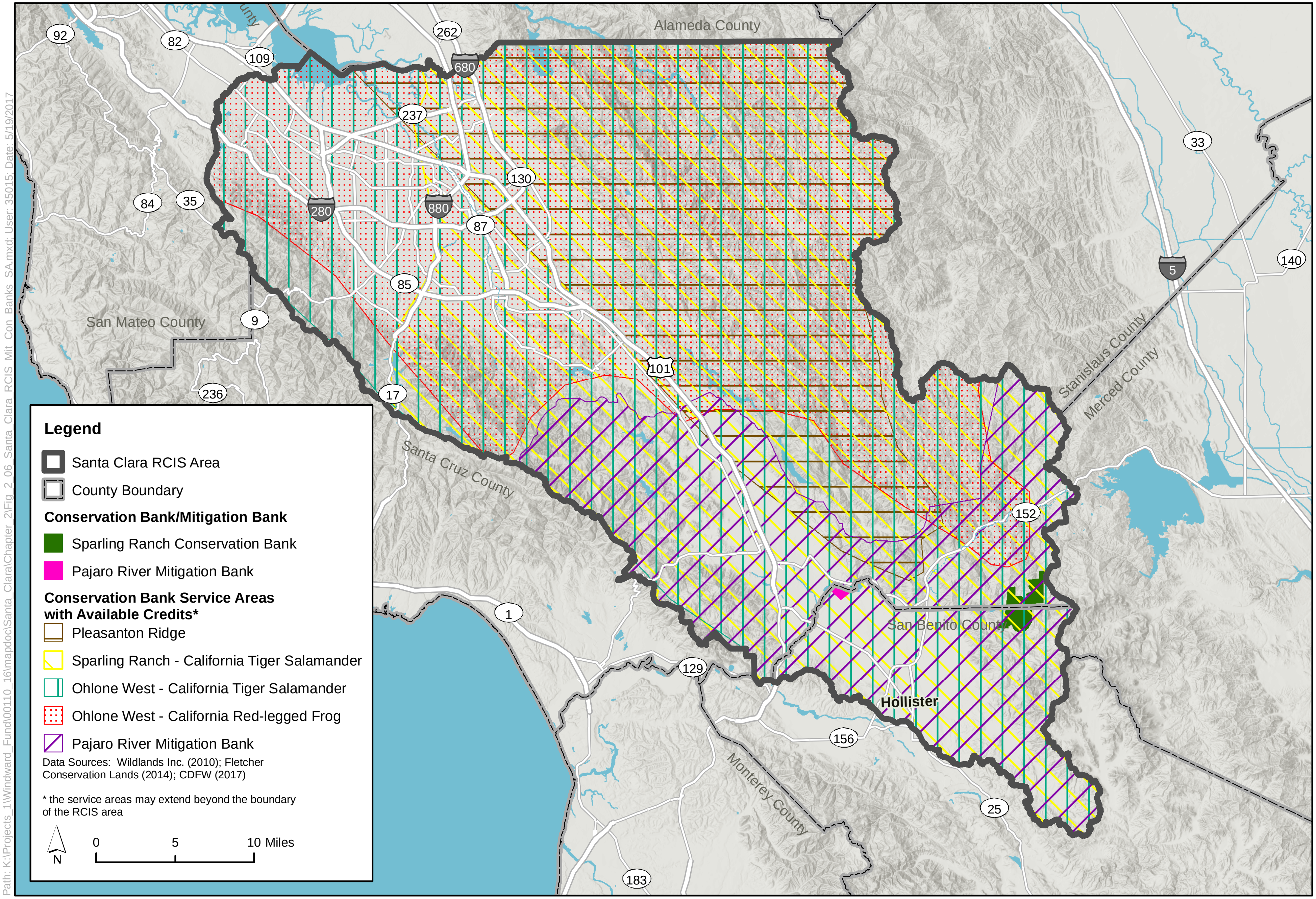

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Figure 2-6
Mitigation and Conservation Bank Service Areas with Available Credits Overlapping the RCIS Area

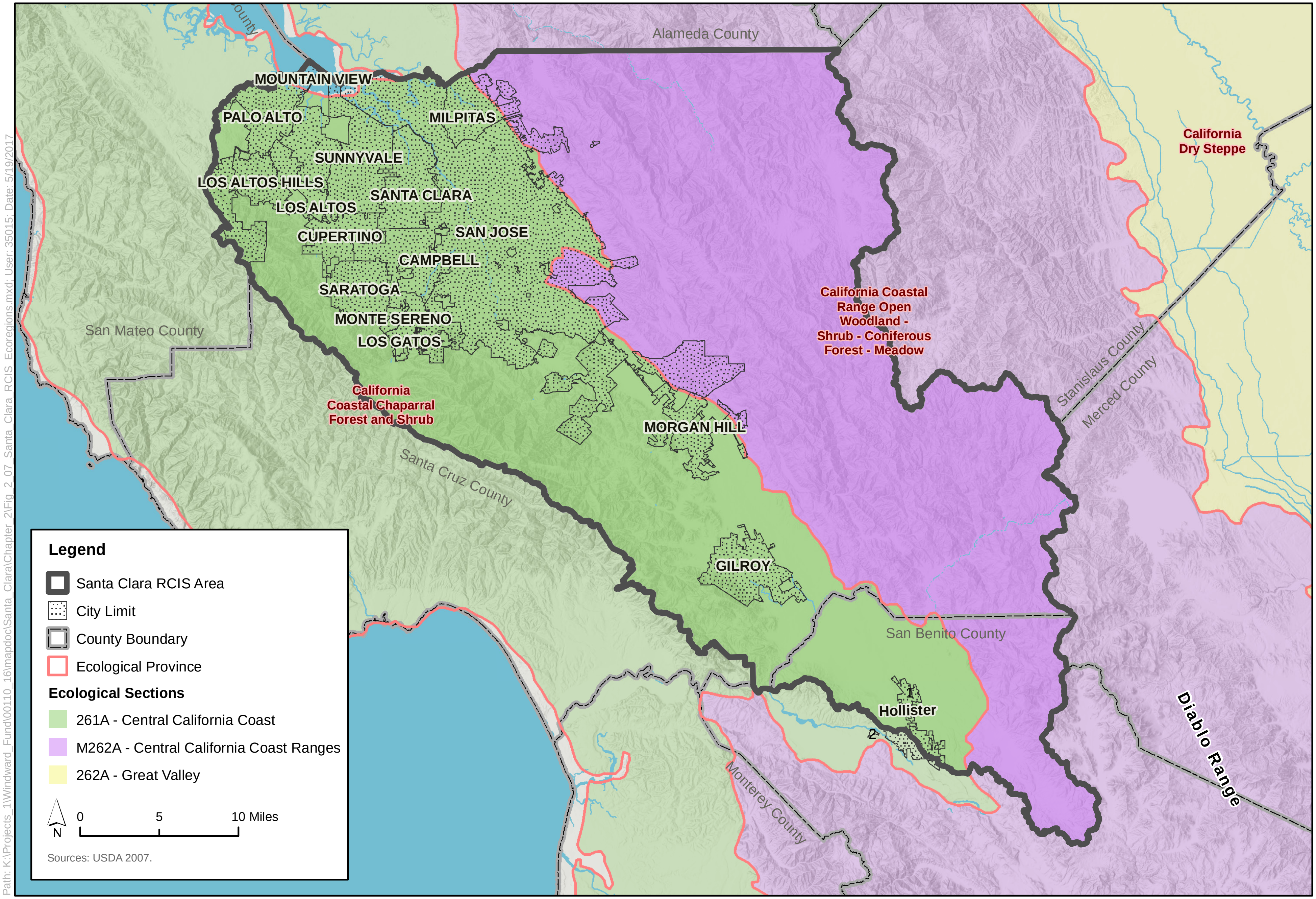

Figure 2-7
Ecoregions of the Santa Clara RCIS Area

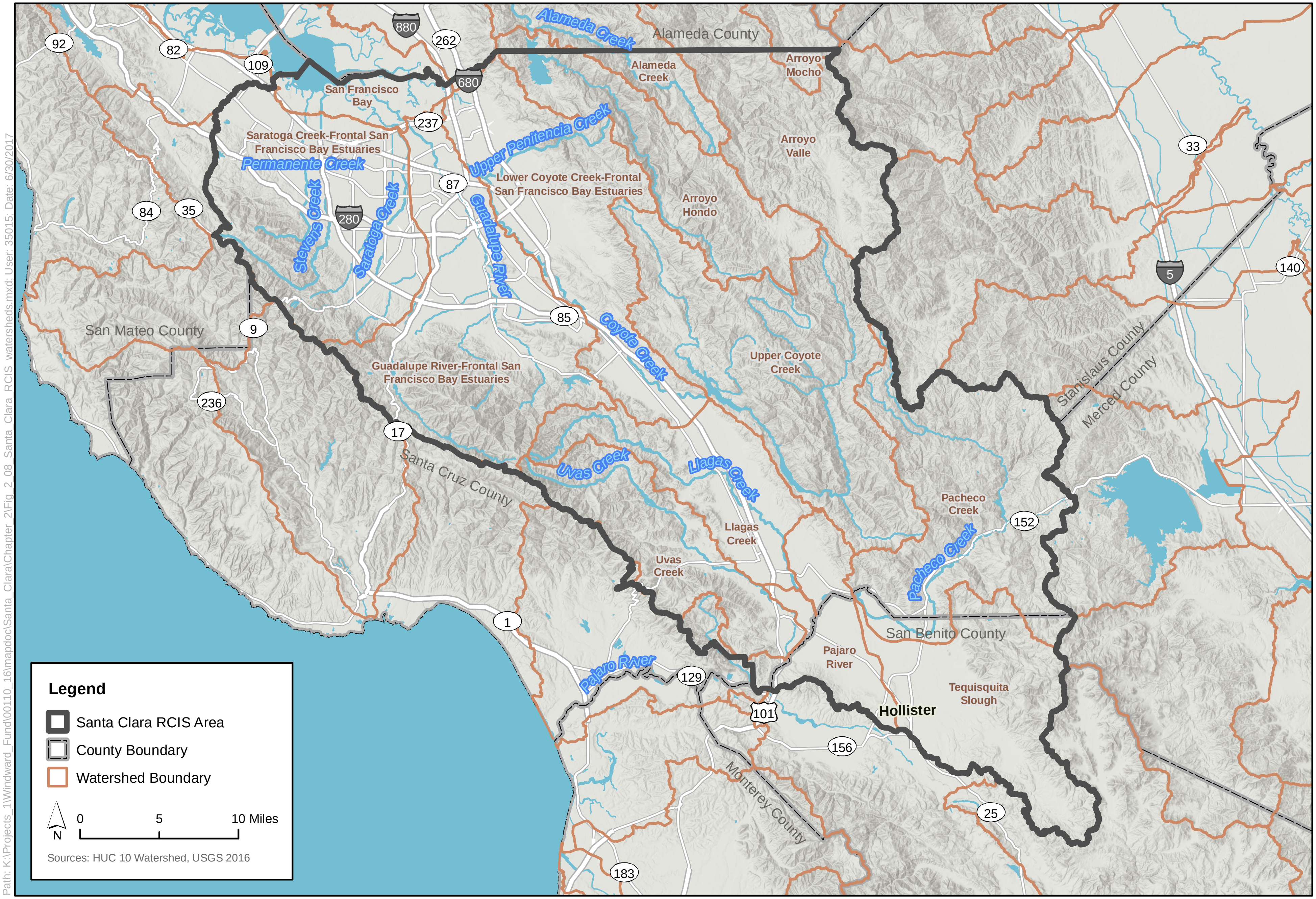

Figure 2-8
Major Watersheds of the RCIS Area

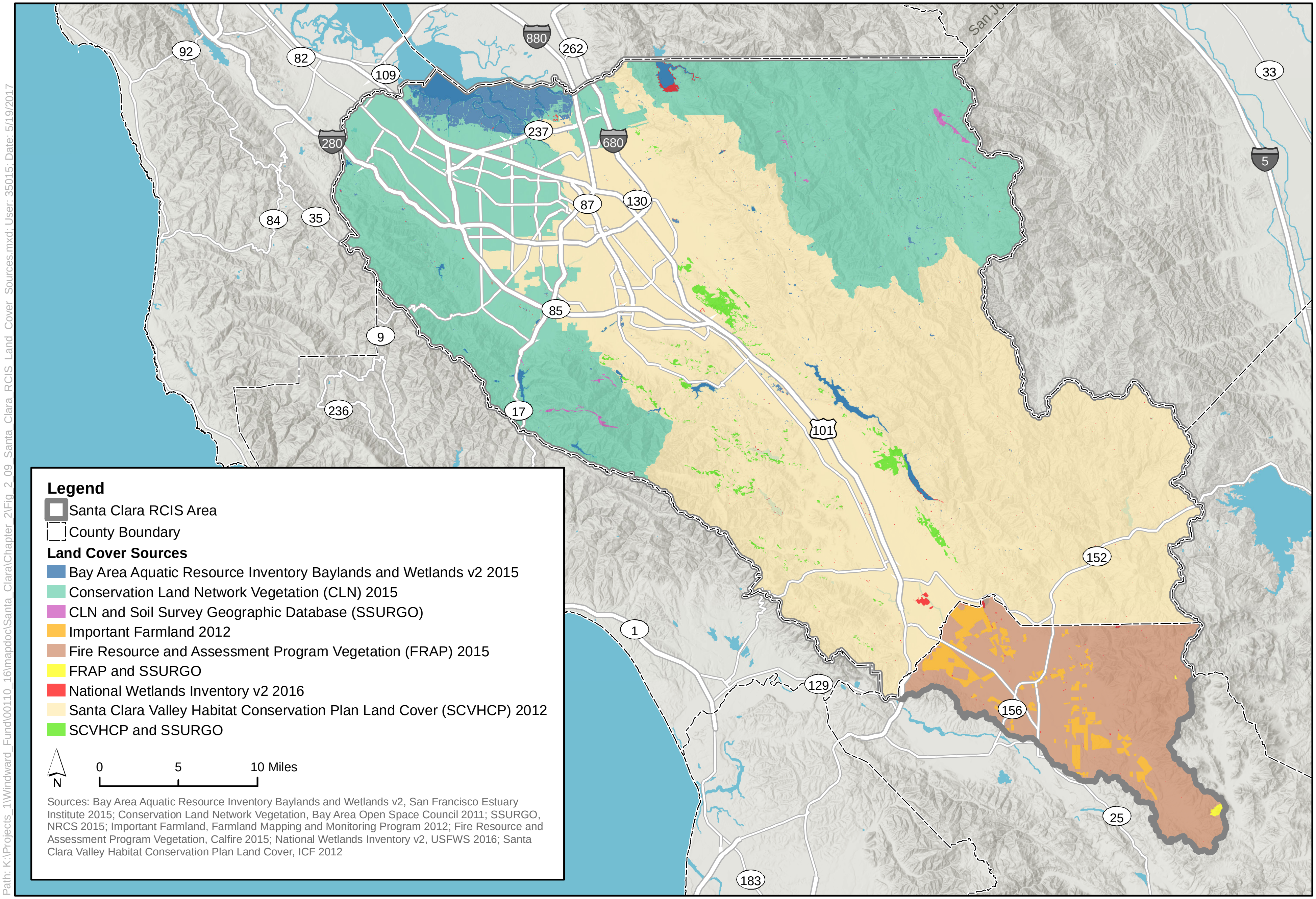

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Figure 2-9
Santa Clara RCIS Land Cover Data Sources

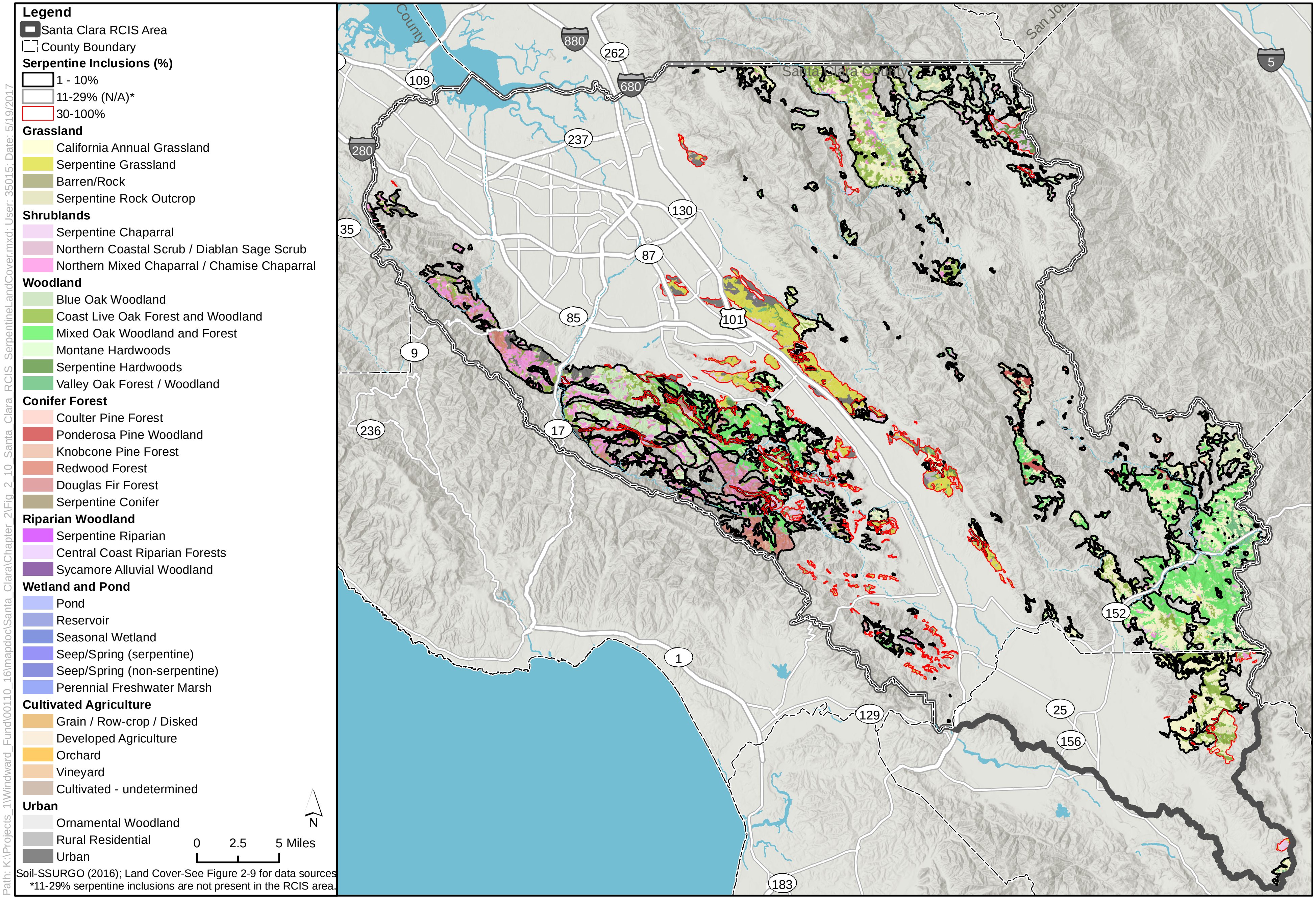

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Figure 2-10
Distribution of Serpentine/Ultramafic Soils and Land Cover in the RCIS Area

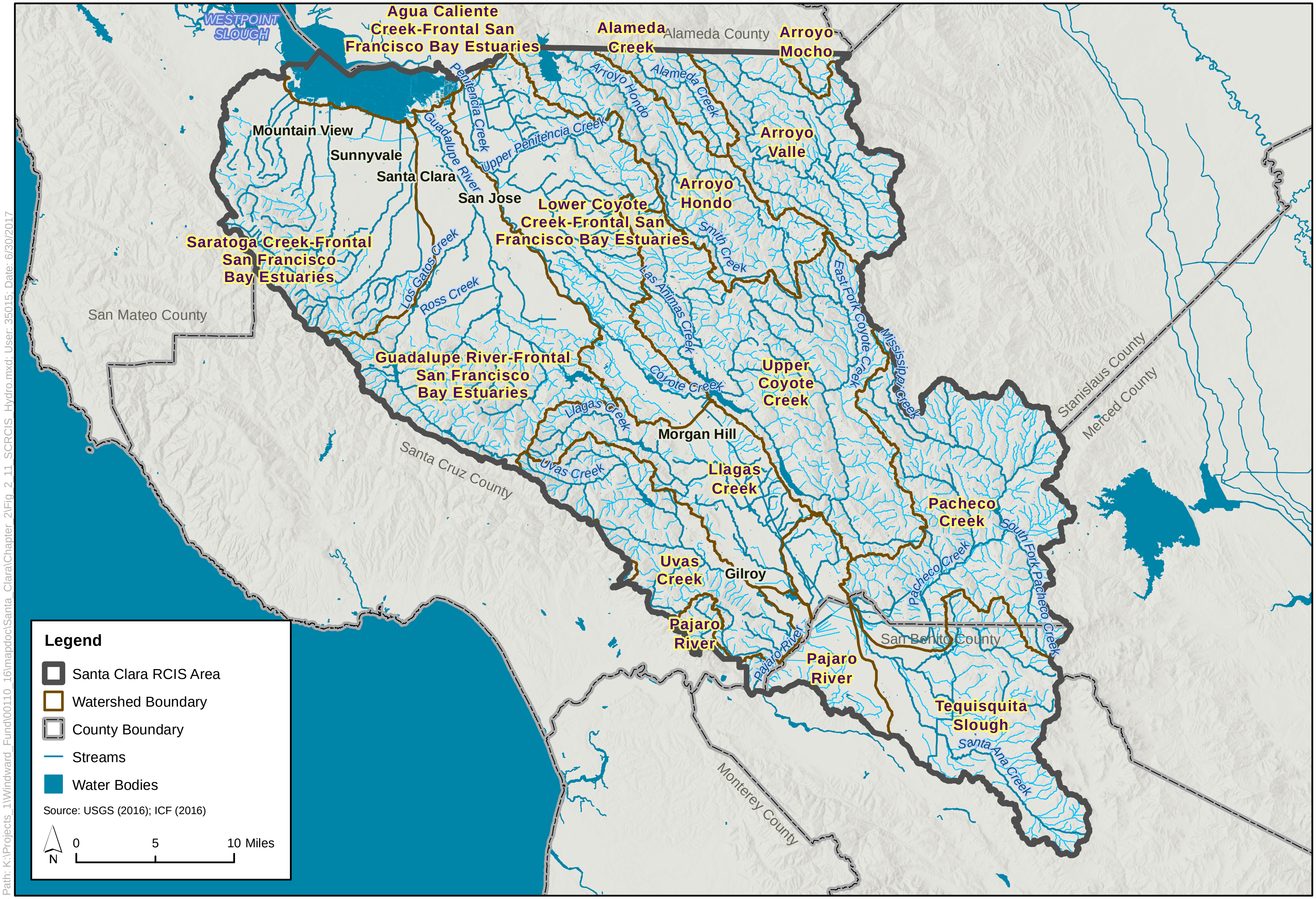

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Figure 2-11
Streams and Water Bodies in the RCIS Area

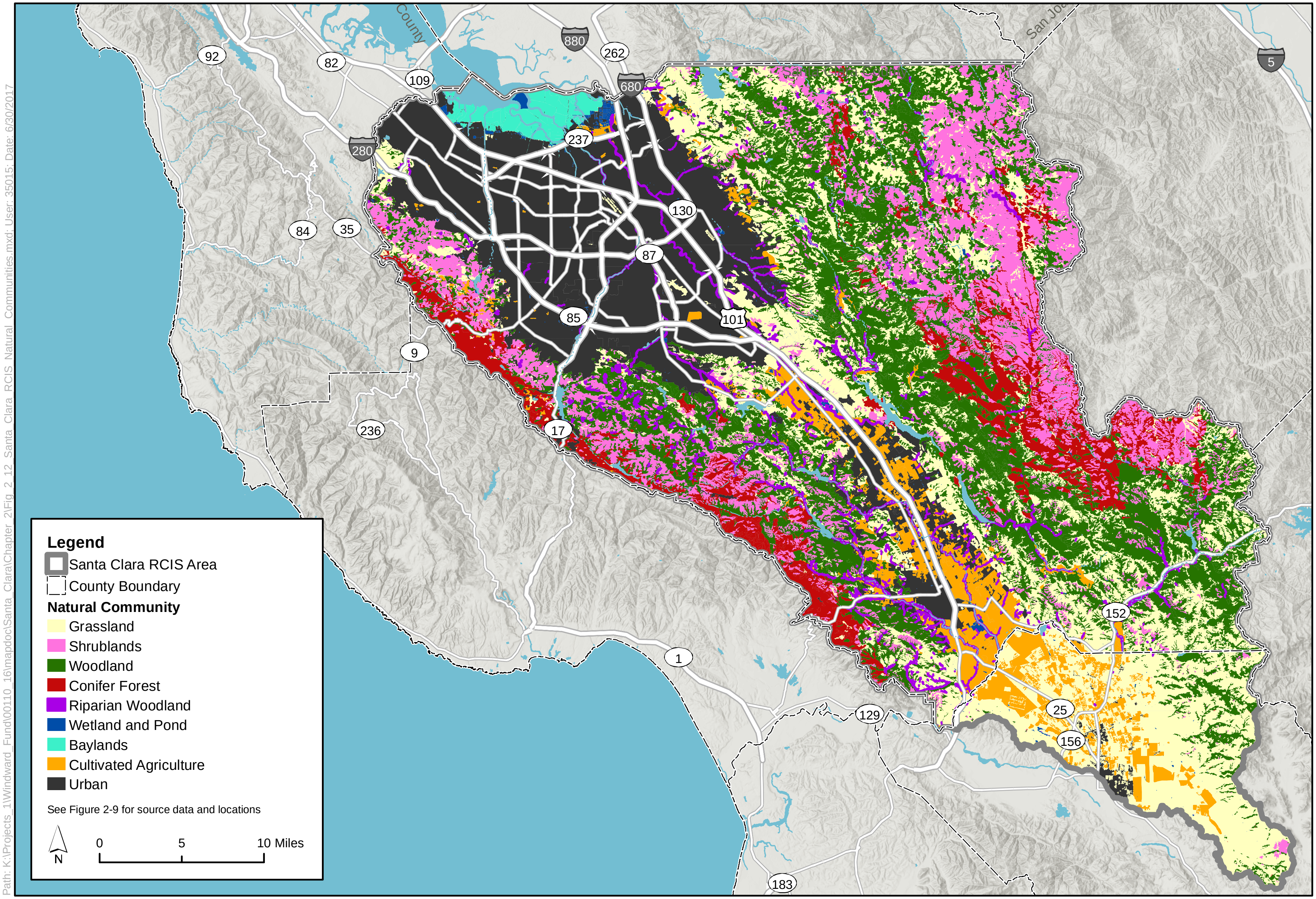

Figure 2-12
Santa Clara RCIS Natural Communities

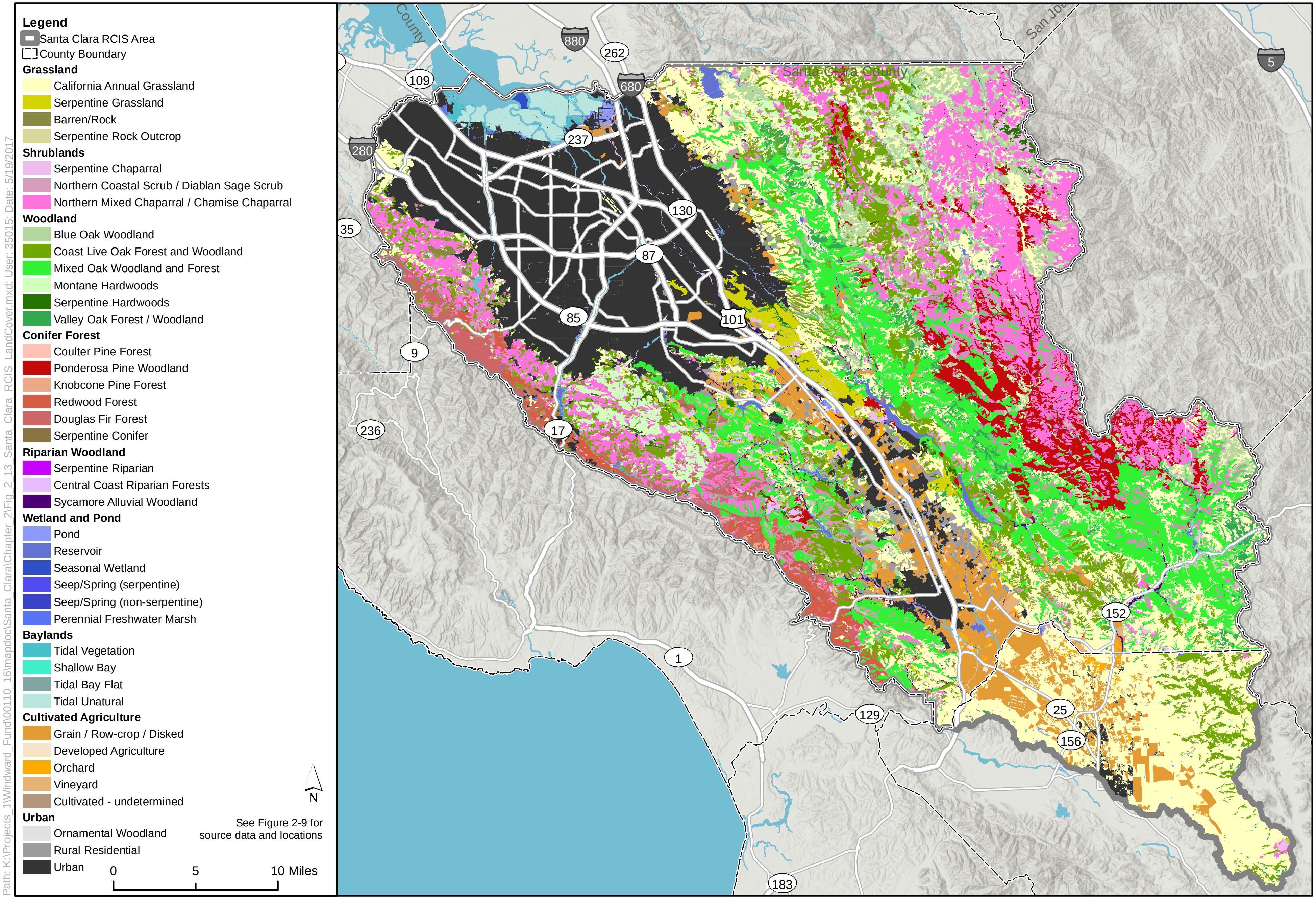

Figure 2-13
Santa Clara RCIS Land Cover

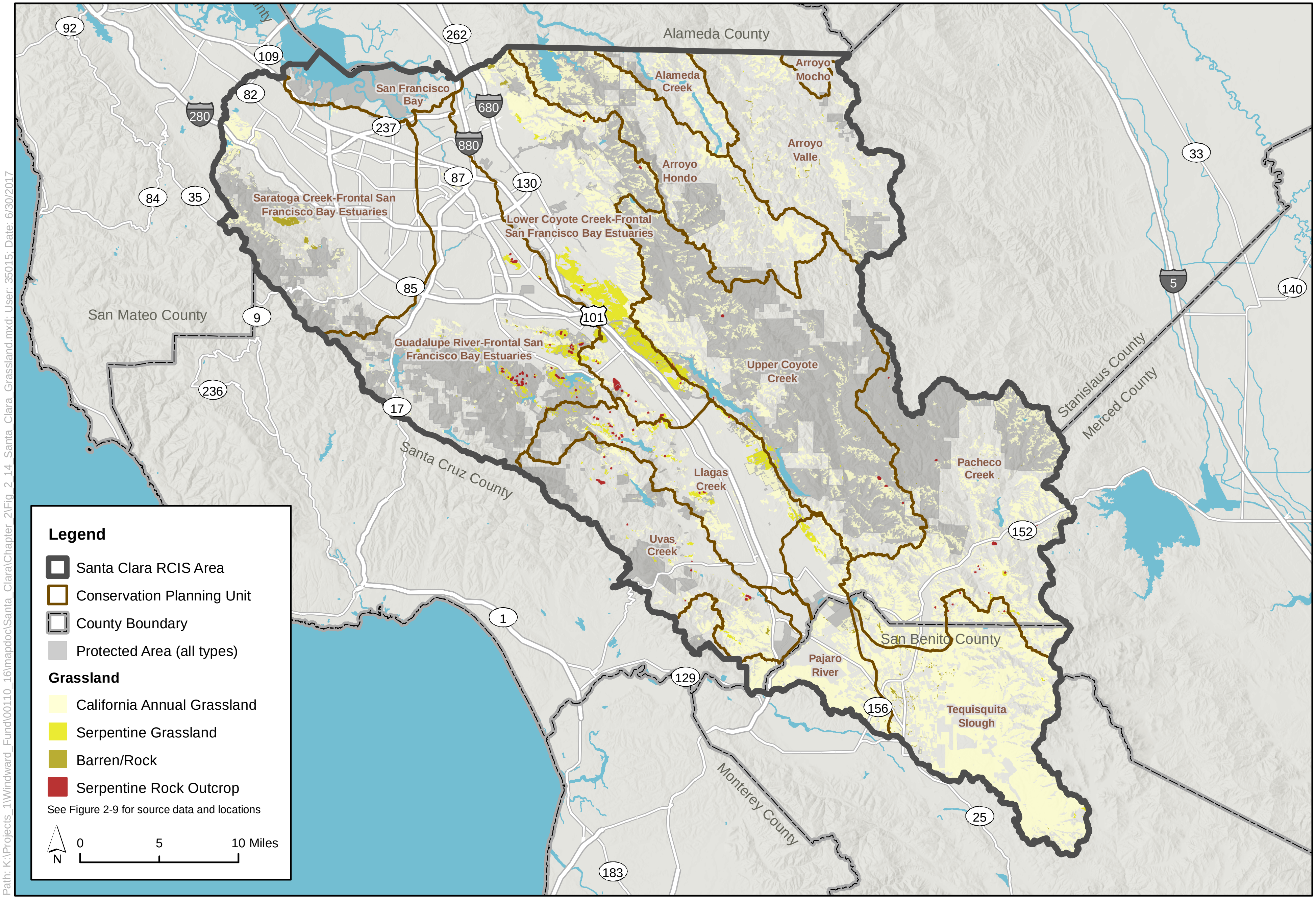

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Figure 2-14
Grassland Land Cover in the RCIS Area

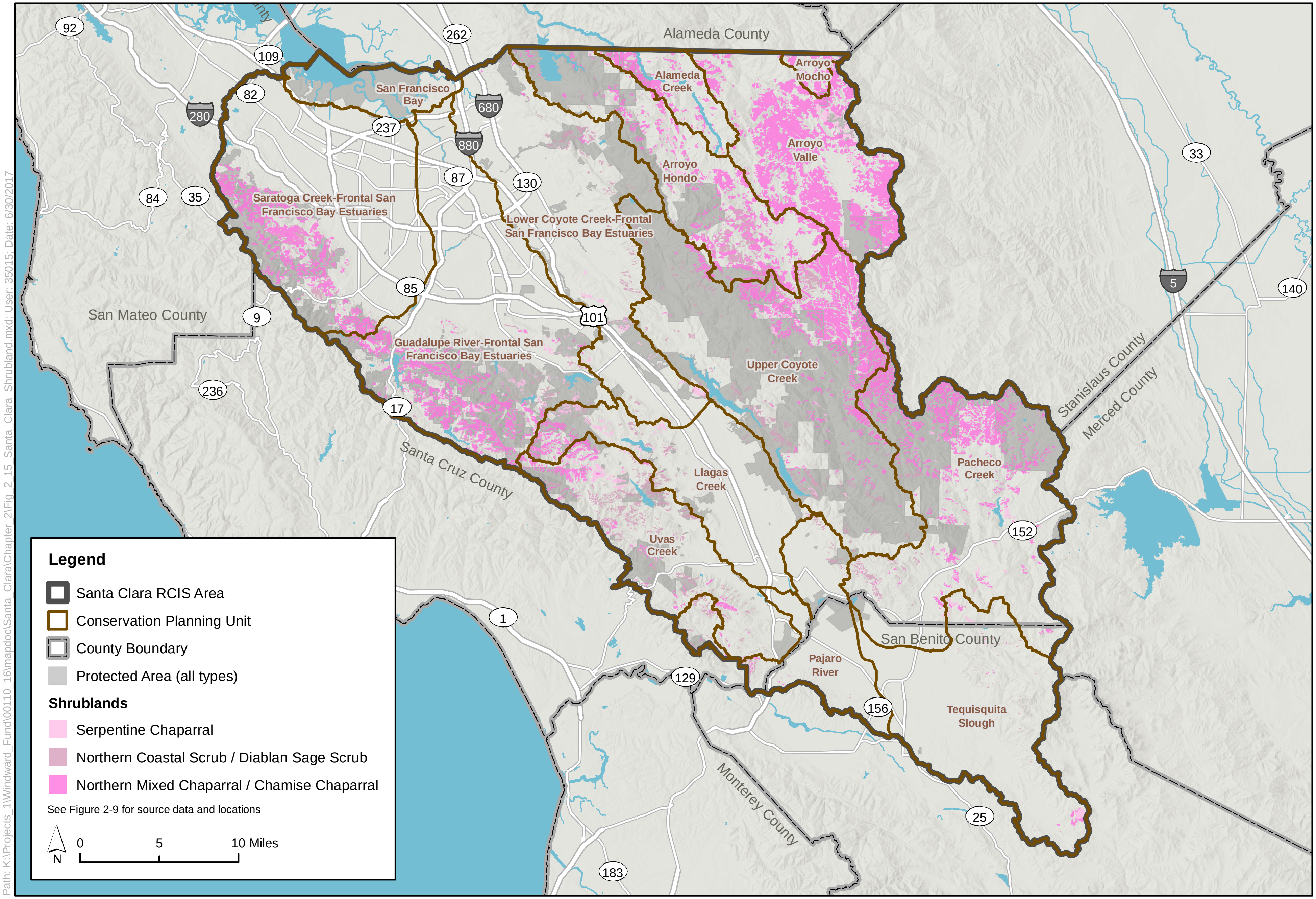

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Figure 2-15
Shrubland Land Cover in the RCIS Area

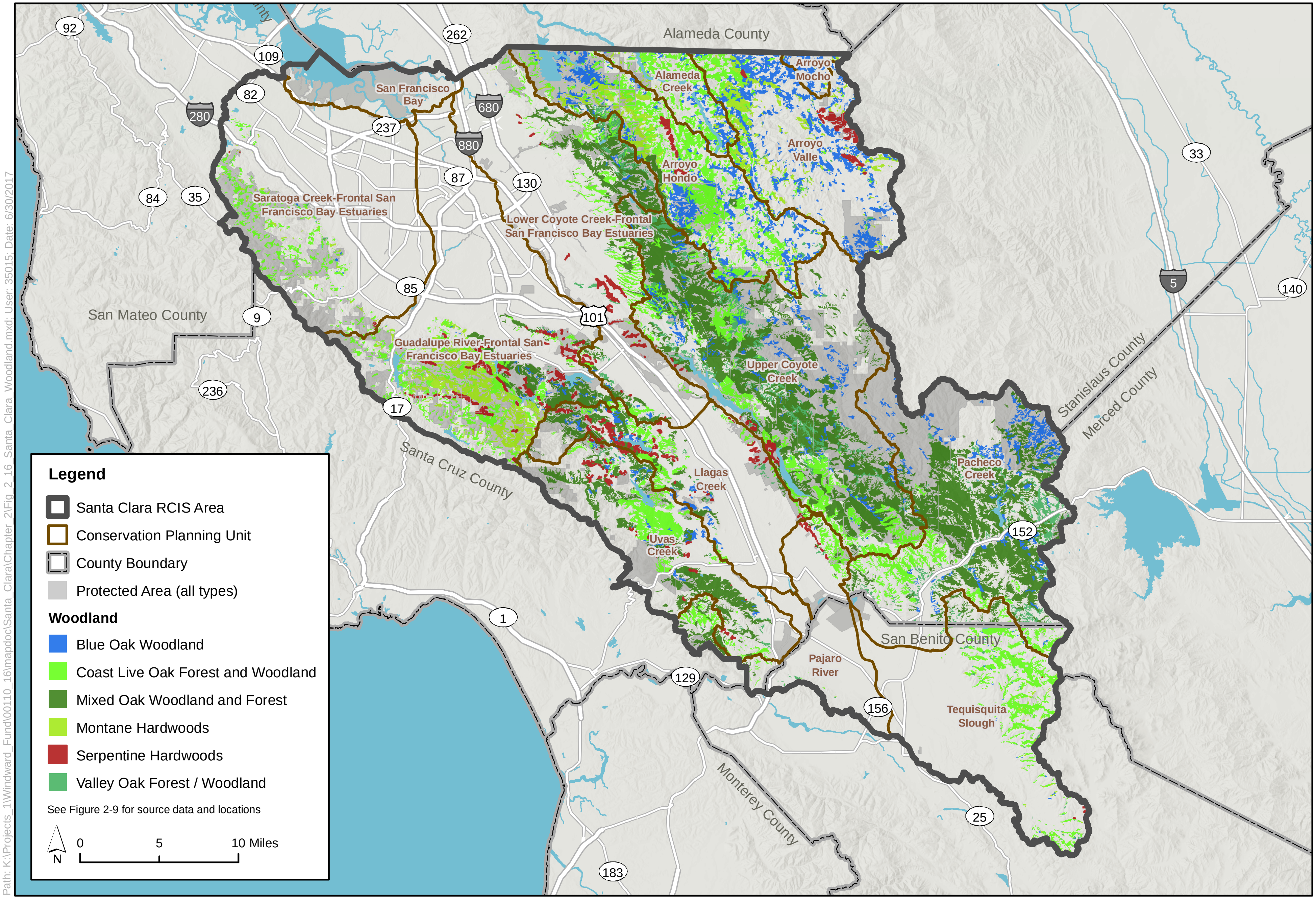

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Figure 2-16
Woodland Land Cover in the RCIS Area

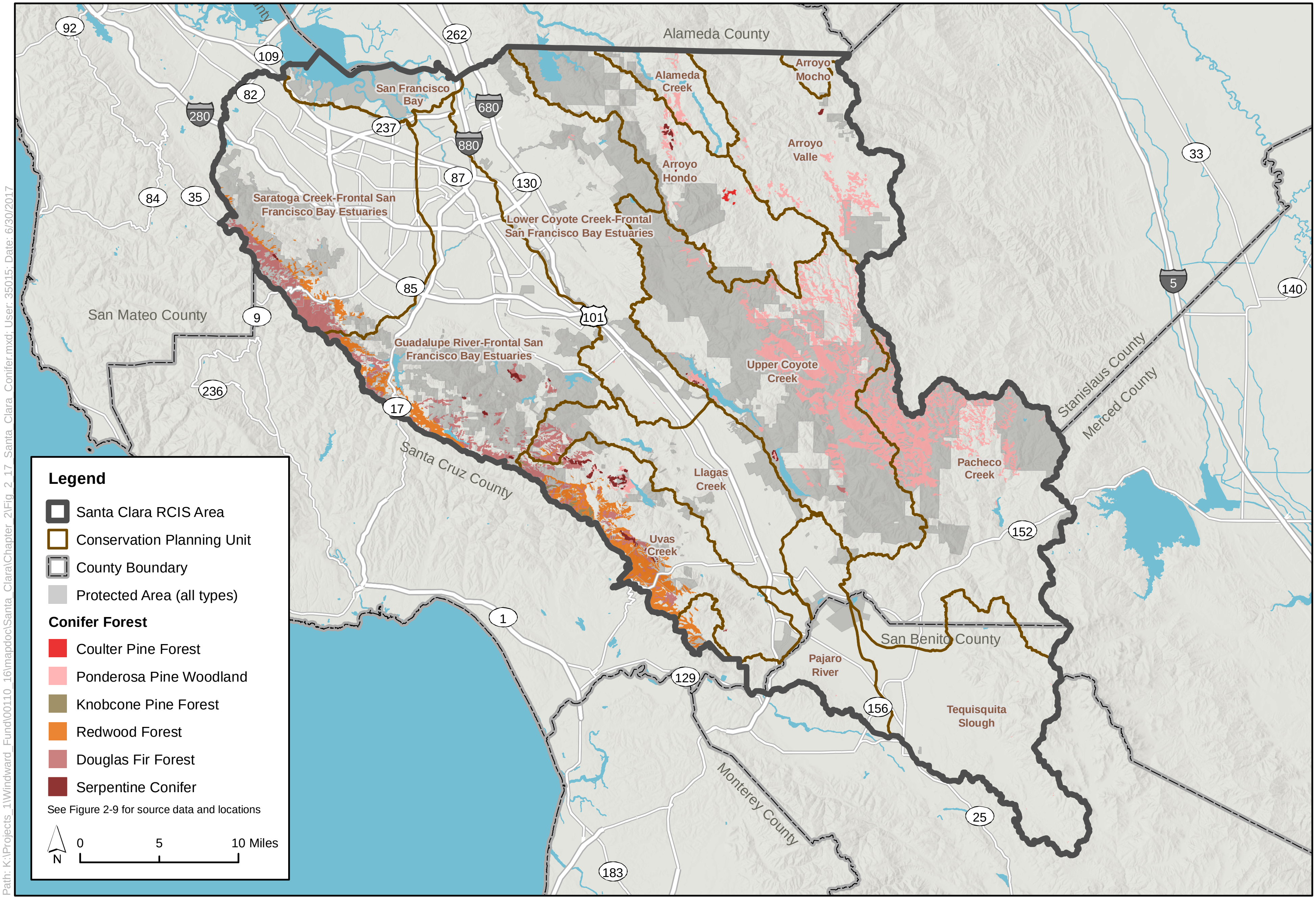

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Figure 2-17
Conifer Forest Land Cover in the RCIS Area

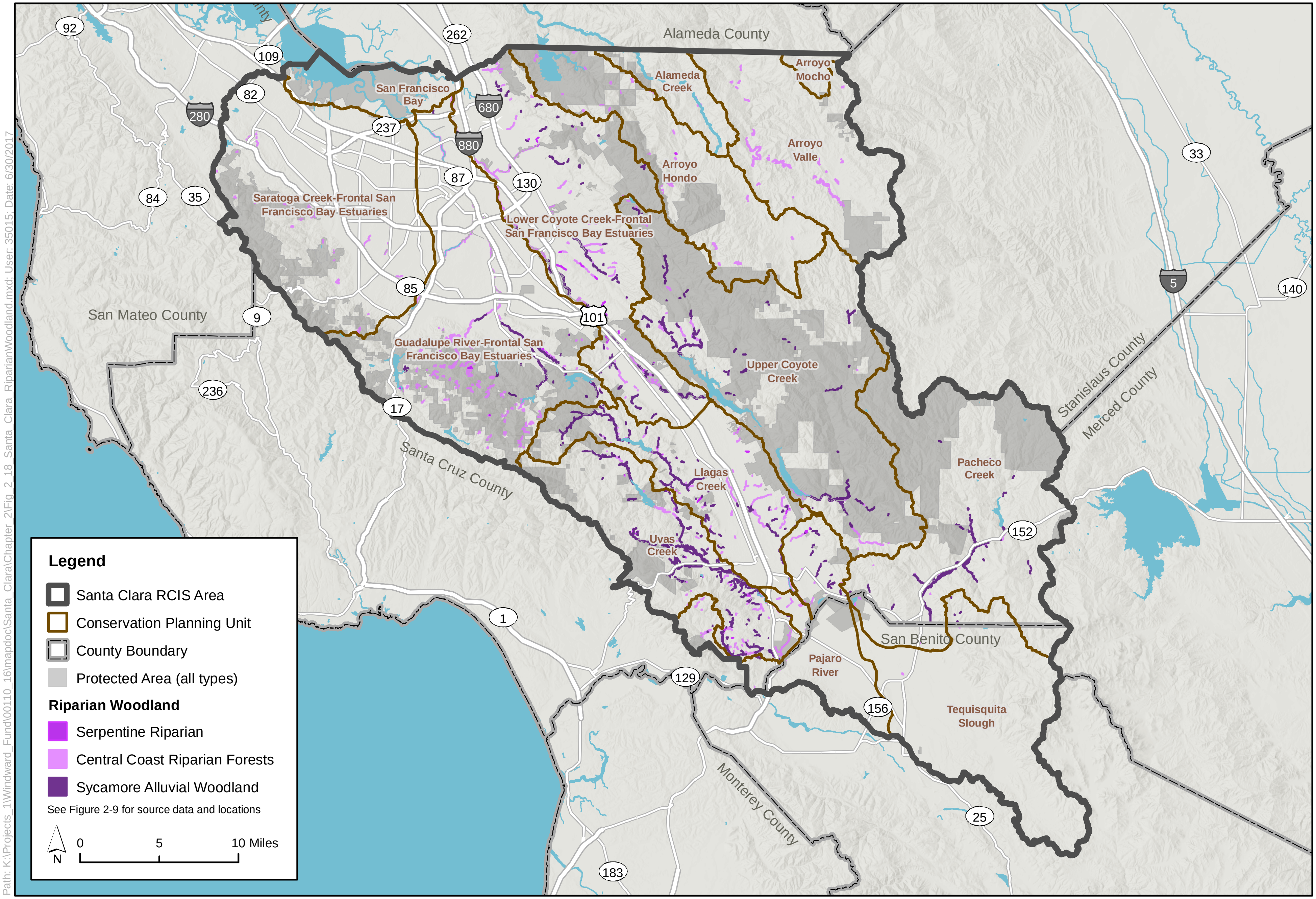

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Figure 2-18
Riparian Woodland Land Cover in the RCIS Area

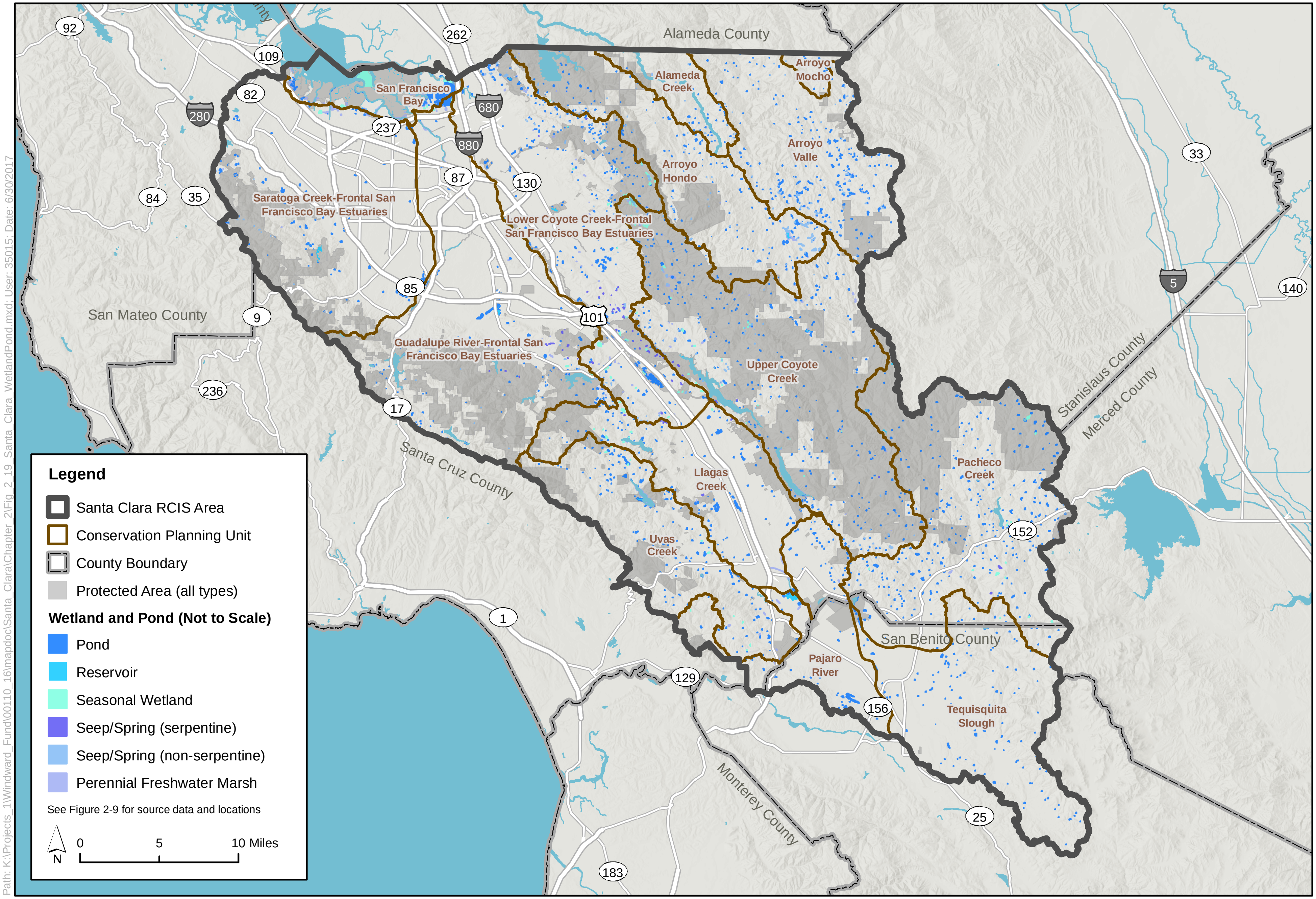

Figure 2-19
Wetland and Pond Land Cover in the RCIS Area

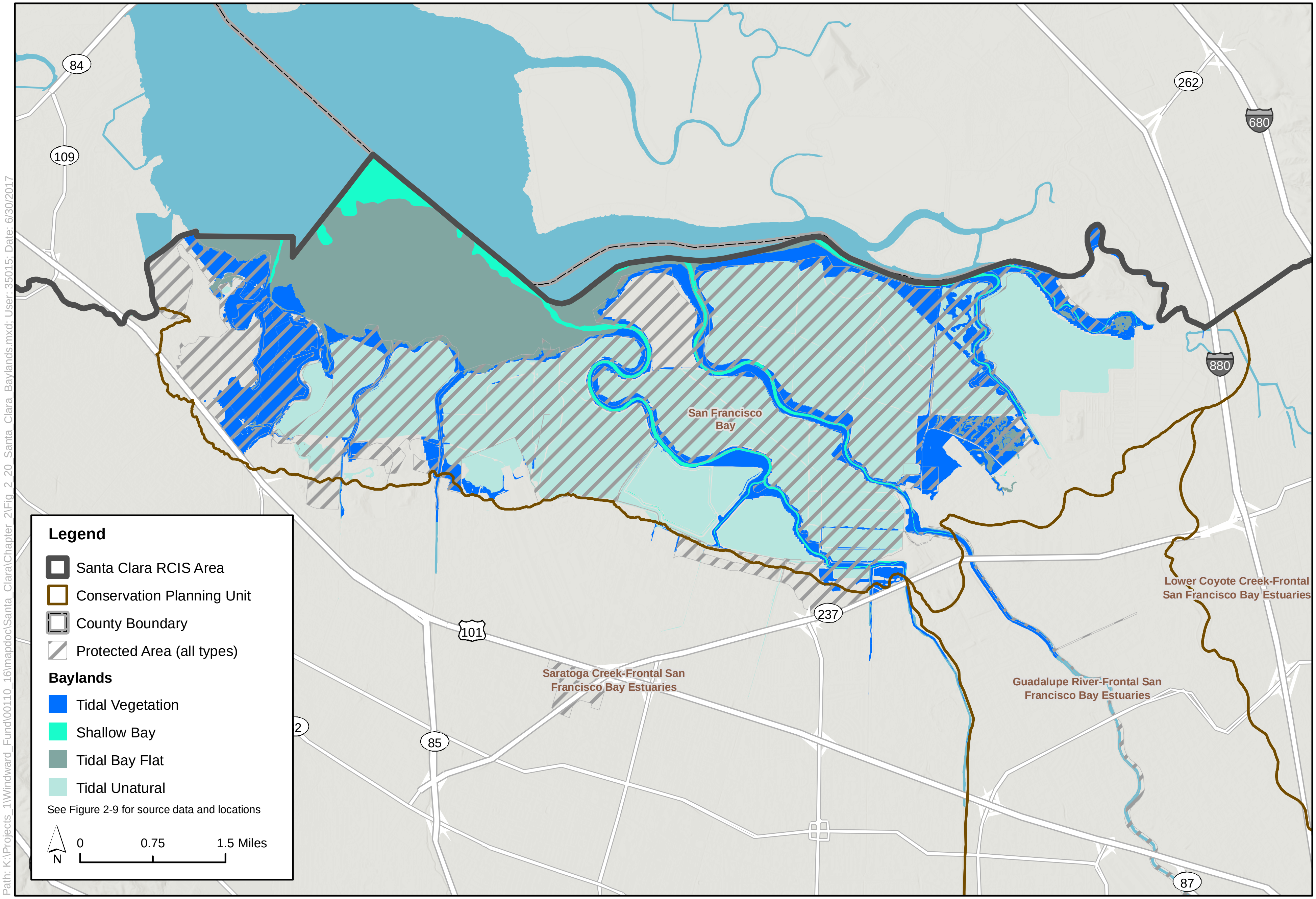

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Figure 2-20
Bayland Land Cover in the RCIS Area

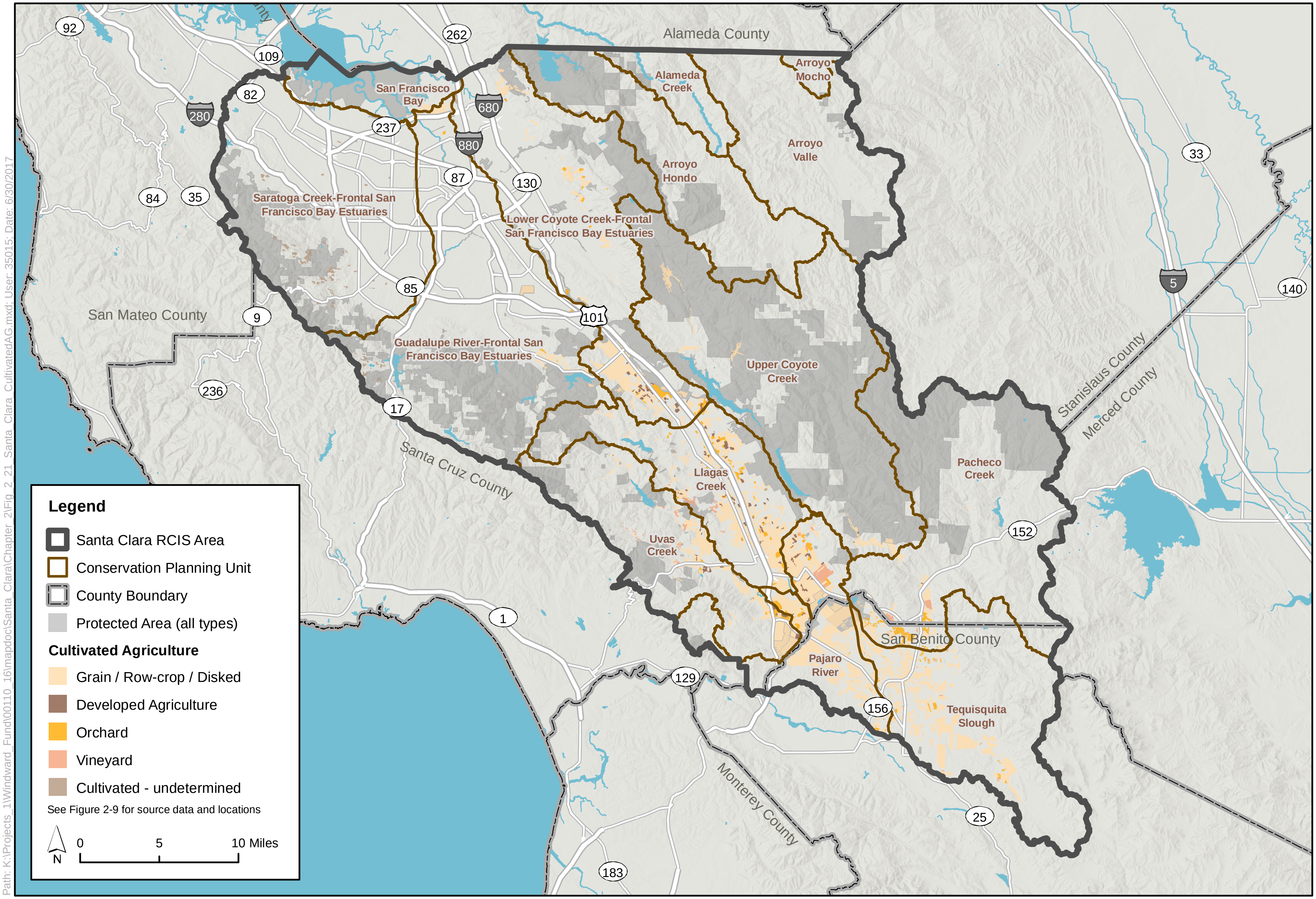

Figure 2-21
Cultivated Agricultural Land Cover in the RCIS Area

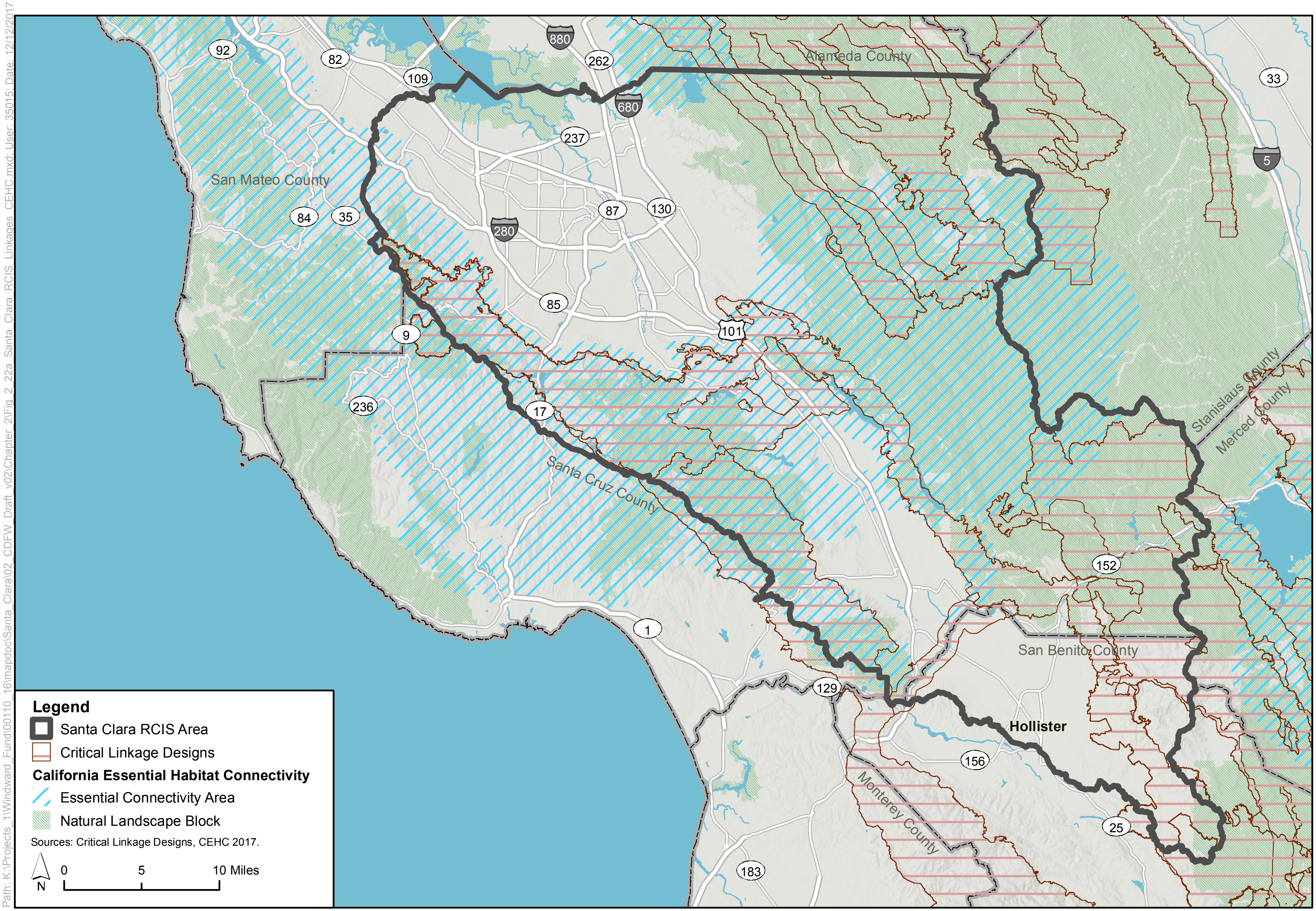

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Figure 2-22a
California Essential Habitat Connectivity Linkages in the RCIS Area

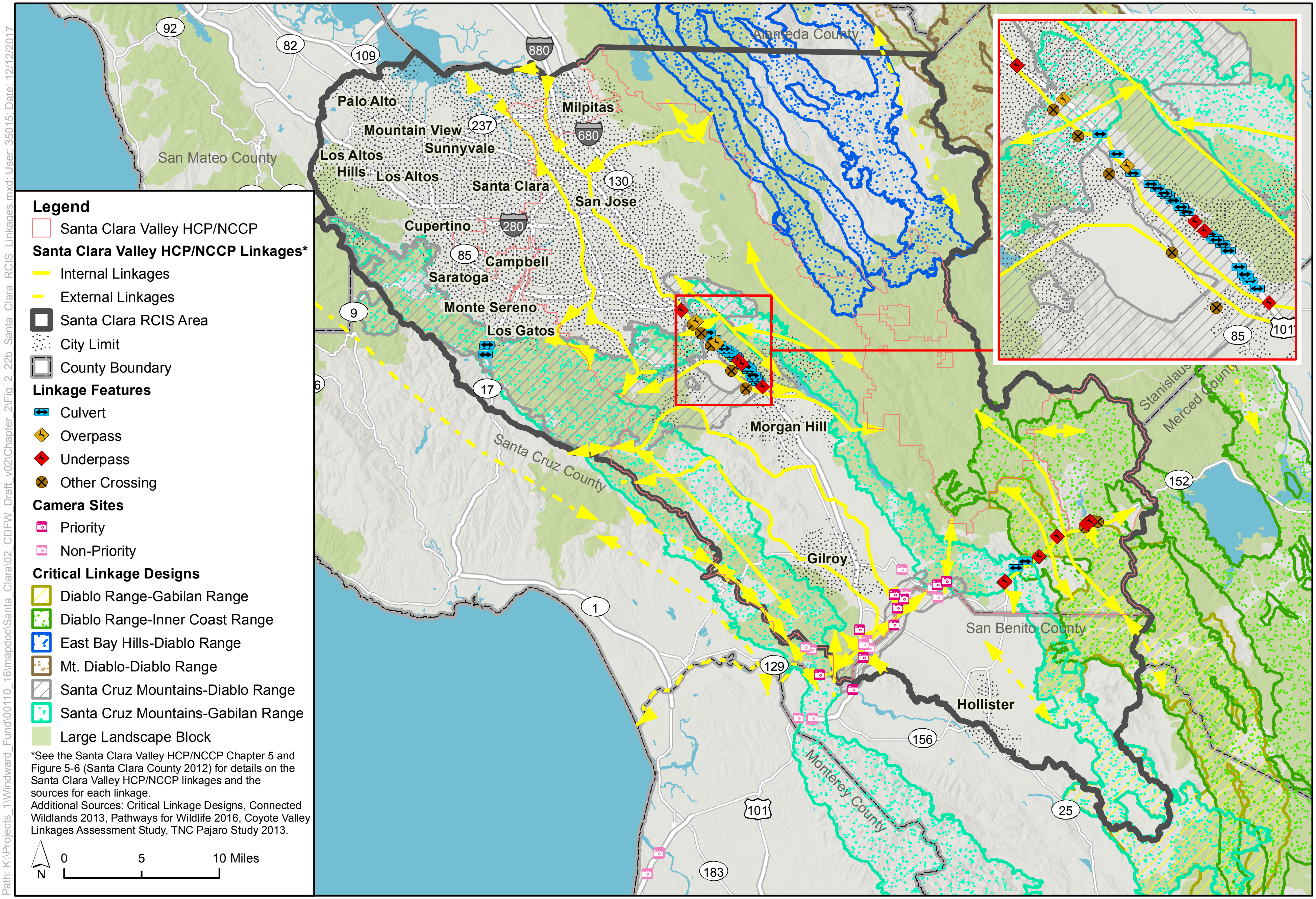

Figure 2-22b
Linkages within the RCIS Area

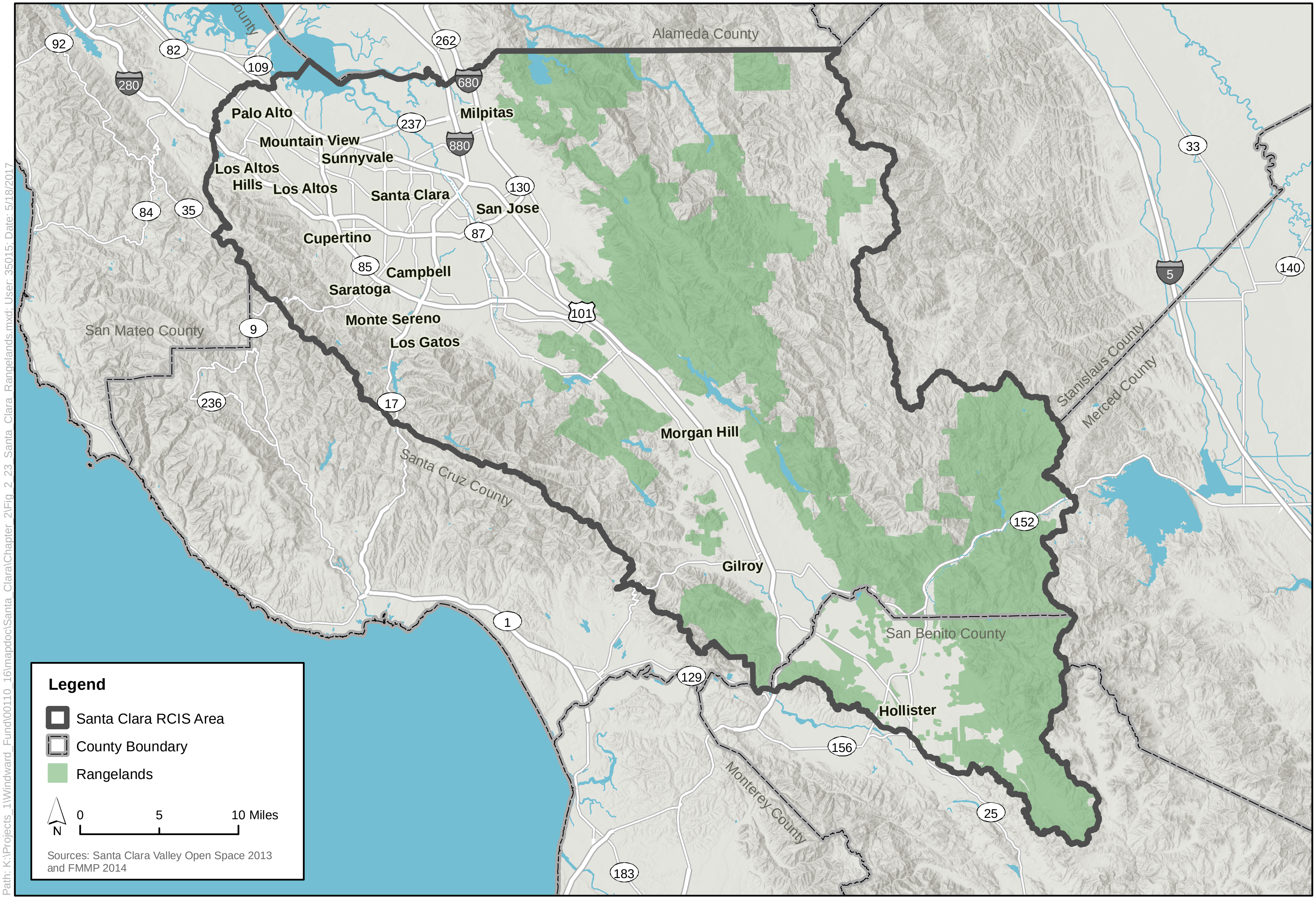

Figure 2-23
Rangeland in the RCIS Area