

2 Regional Setting

This section provides background information about the environmental conditions, existing and planned development, and existing conservation plans in Santa Cruz County. The information led to selection of the conservation elements (Section 3), analysis of the pressures and stressors affecting them (Section 4), and development of the conservation strategies (Section 5).

2.1 Overview

The RCIS Area is the 285,261 acres (446 square miles) located within Santa Cruz County, which is in Central California on the Pacific Coast (Figure 1-1). It is generally bounded by the Pacific Ocean to the west, the north and east by the ridge of the Santa Cruz Mountains, and the Pajaro River to the south. The RCIS Area features varied topography, geology, soils, and hydrology that give rise to a mosaic of biologically rich communities. These include globally rare terrestrial communities such as old-growth redwood forests, Santa Cruz sandhills, karst caves, coastal prairie grasslands, and maritime chaparral; they also include coastal streams and their associated riparian corridors, ponds, sloughs, and other wetlands, and rocky seashore, dunes, and coastal bluffs. These dynamic systems were historically maintained through natural disturbance regimes, including fire and floods, which create and maintain habitat for many rare species and promote biodiversity within the landscape.

These rare communities, along with the more widespread communities which include coastal scrub, oak woodlands, and redwood forests, support rich assemblages of plants and animals. The RCIS Area is an important part of the California Floristic Province, which is a global biodiversity hotspot identified for its abundance of native and endemic plants (Myers et al. 2000). The RCIS Area supports more than 1,000 native plant species (Neubauer 2013) including 17 that are found only within the county, such as Santa Cruz wallflower (*Erysimum teretifolium*) and Scotts Valley polygonum (*Polygonum hickmanii*). The RCIS Area also supports a diversity of animal species, including endemic invertebrate species such as the Zayante band-winged grasshopper (*Trimerotropis infantilis*) and Ohlone tiger beetle (*Cicindela ohlone*), and other rare species that are endemic to the Monterey Bay Area region, such as the Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) and Santa Cruz kangaroo rat (*Dipodomys venustus venustus*). It also supports more widespread rare species such as the southern extent of the critically endangered coho salmon (*Oncorhynchus kisutch*) and marbled murrelet (*Brachyramphus marmoratus*).

Intact habitat within the RCIS Area also supports more wide-ranging terrestrial species, such as American badger (*Taxidea taxus*) and mountain lion (*Puma concolor*). These species rely on habitat permeability within the Santa Cruz Mountains, as well as habitat linkages between the Santa Cruz Mountains and both the Gabilan and Diablo Range mountains. This habitat connectivity is essential to maintaining genetic diversity within populations and can facilitate species' adaptation to climate change.

The unique and diverse biological systems are not only essential to conservation of biodiversity, but they also provide a wealth of goods and services, including crop pollination, water filtration, flood protection, carbon sequestration, climate change adaptation, recreation, and tourism (Mackenzie et al. 2011). Santa Cruz County’s natural capital provides at least \$800 million to \$2.2 billion in benefits to people and the local economy each year (Schmidt et al. 2015).

The RCIS Area’s species and biological systems occur within a landscape that features extensive existing protected lands, including primarily parks, reserves, and other protected open space areas, which cover an estimated 91,365 acres or 32% of the RCIS Area (Section 2.2.5). The RCIS Area features one conservation bank, as well as land within the service area of several additional conservation and mitigation banks (Section 2.2.6). The RCIS Area also features developed areas, working lands used for cultivation, livestock grazing, and timber production (Section 2.2.3), and lands supporting public infrastructure including transportation corridors, energy transmission facilities, and water supply infrastructure (Section 2.2.4).

The RCIS Area has been the subject of several conservation plans designed to protect and restore biological systems and promote rare species persistence while safeguarding the region’s other conservation values, including working lands and water resources, while allowing orderly development and maintenance of essential public infrastructure (Section 2.2.4).

This section provides additional details on these facets of the RCIS Area, which informed the selection of the RCIS conservation elements (Section 3) and analysis of pressures and stressors (Section 4), which was used to develop the conservation strategies (Section 5).

2.2 Land Use

This section describes the land use jurisdictions (Section 2.2.1) and designations (Section 2.2.2), the region’s working lands (Section 2.2.3), and planned major infrastructure and development projects anticipated during the next 10 years (Section 2.2.4), which the RCIS considered essential for informing the conservation strategy. It then describes existing protected lands (Section 2.2.5) including conservation and mitigation banks (Section 2.2.6).

Santa Cruz County is currently home to more than a quarter million people, and the population is expected to increase 12% between 2015 and 2040 (RTC 2018). The population and urban land uses are clustered primarily along the coast between the City of Santa Cruz and the unincorporated village of Aptos, and in Watsonville, Scotts Valley, and the San Lorenzo Valley. Agricultural land uses are concentrated primarily in the low-lying valleys including the Pajaro Valley, and on the lower coastal terraces north of the City of Santa Cruz (the North Coast).

2.2.1 Jurisdictions

Local land use jurisdiction is held by five local government entities within the RCIS Area (County of Santa Cruz 2020a). The County of Santa Cruz governs land use in 268,808 acres (94.2%) of the 285,261-acre RCIS Area located outside of the four incorporated cities, which are:

- City of Santa Cruz, which is 8,072 acres (2.8% of the RCIS Area);
- City of Watsonville, which is 4,390 acres (1.5%);
- City of Scotts Valley, which is 2,950 acres (1.0%); and
- City of Capitola, which is 1,039 acres (0.4%).

The RCIS Area also features several unincorporated towns including Aptos, Boulder Creek, Corralitos, Davenport, Felton, Freedom, Live Oak, and Soquel; land use in these areas is governed by the County of Santa Cruz.

Land use in the RCIS Area follows the current general plans of the five land use jurisdictions:

- *County of Santa Cruz 1994 General Plan and Local Coastal Program Land Use Plan* (County of Santa Cruz 1994);
- *General Plan 2030* (City of Santa Cruz 2019);
- *City of Scotts Valley General Plan 1994* (City of Scotts Valley 1994);
- *Watsonville 2005 General Plan* (City of Watsonville 1990); and
- *Capitola General Plan* (City of Capitola 2014).

Within the County of Santa Cruz, town plans address land use in accordance with the General Plan within the unincorporated community centers (County of Santa Cruz 1994). The *2040 Metropolitan Transportation Plan and Sustainable Communities Strategy* (AMBAG 2018) also discusses land use in the RCIS Area, with an emphasis on the four cities and the unincorporated towns.

Within the RCIS Area, 72,515 acres are in the designated coastal zone (Figure 2-1), which includes 64% (703 acres) of the City of Capitola, 30% (2436 acres) of City of Santa Cruz, 6% (299 acres) of the City of Watsonville (Santa Cruz County 2020a), and 26% (69,077 acres) of the unincorporated area in the County of Santa Cruz. In these areas, land use must be consistent with local coastal plans (LCPs), which identify the appropriate location, type, and scale of new or changed uses of land and water resources to guide conservation, ensure public access, and maintain consistency with the California Coastal Act of 1976. The local coastal plans provide protection for environmentally sensitive habitat areas (ESHA), which include sensitive communities and habitat for rare and endangered species.

2.2.2 Land Use Designations

The RCIS Area contains five general land uses: agricultural, commercial, public facility/institutional, residential, and open space/recreational (Table 2-1, Figure 2-1). To depict these land uses in this document, the land use (place type) data from the City of Santa Cruz (2020a), County of Santa Cruz (2020a) and the Sustainable Communities Strategy (AMBAG 2018), which synthesized data for the other cities, were aggregated into these five general land use categories which occur within the RCIS Area as follows:

- **Residential:** Over half (57%, or 163,035 acres) of the RCIS Area is designated as residential, which ranges from high-density urban residences in the heart of the City of Santa Cruz, to the very low-density rural and mountain residential areas of the unincorporated county;
- **Open Space/Recreational:** 21.3% (60,669 acres) of the RCIS Area is designated as open space or used for recreational purposes. This land is comprised primarily of large state parks such as Big Basin, Henry Cowell Redwoods, and Nisene Marks state parks, but also includes County and city parks, private conservation lands, and beaches; and
- **Agriculture:** 18% (51,444 acres) of the RCIS Area, concentrated along the north coast and in the Pajaro Valley, is zoned for farming, grazing, animal husbandry, vineyards, nurseries, Christmas tree farms, and other related agricultural uses;
- **Public Facility/Institutional:** 2.5% (6,994 acres) of the RCIS Area is designated for civic or public facilities, educational campuses, hospitals, cemeteries, airports, utilities, and wastewater treatment plants, highways, and major roads; and
- **Commercial:** 1.1% (3,119 acres) of the RCIS Area, which is concentrated in the city cores, is zoned for commercial uses include retail, service, office, industrial, and manufacturing. Vertical mixed-use areas such as a residence located above a ground-floor retail store was considered commercial for the purposes of this RCIS.

The land use designations do not depict actual current land use; rather, the general land uses designated in the general plans. Some designated *Agriculture* lands feature natural communities that have been protected from cultivation and development, and are instead managed for open space and recreation; likewise, many of the designated *Residential* parcels are not developed and are protected from development (Section 2.2.5). Within these various land use types, the land use jurisdictions have zoning designations that regulate specific uses of the land. Importantly, the area designated *Residential* includes 71,000 acres of land zoned for timber production, where residential development is limited in order to maintain productive forests (Section 2.2.3.3).

Table 2 1: General Land Use Designations within each Jurisdiction

General Land Use Designations	City of Santa Cruz		City of Capitola		City of Scotts Valley		City of Watsonville		Unincorporated Santa Cruz County		Entire RCIS Area	
	Acres ¹	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Agriculture	8.4	<0.1%		0.0%	0.5	<0.0%	2.5	<0.0%	52,234	18.3%	52,245	18.3%
Commercial	952	0.3%	205	0.1%	287	0.1%	843	0.3%	821	0.3%	3,108	1.1%
Open Space/ Recreational	2,018	0.7%	142	<0.1%	442	0.2%	527	0.2%	56,325	19.7%	59,454	20.8%
Public Facility/ Institutional	1,646	0.6%	260	0.1%	642	0.2%	1,547	0.3%	2,837	1.0%	6,931	2.4%
Residential	3,448	1.2%	432	0.2%	1,579	0.6%	1,471	0.5%	156,592	54.9%	163,521	57.3%
Total	8,072	2.8%	1,039	0.4%	2,950	1.0%	4,390	1.5%	268,808	94.2%	285,261	100.0%

¹ Acreages and percentages may not sum correctly due to rounding error

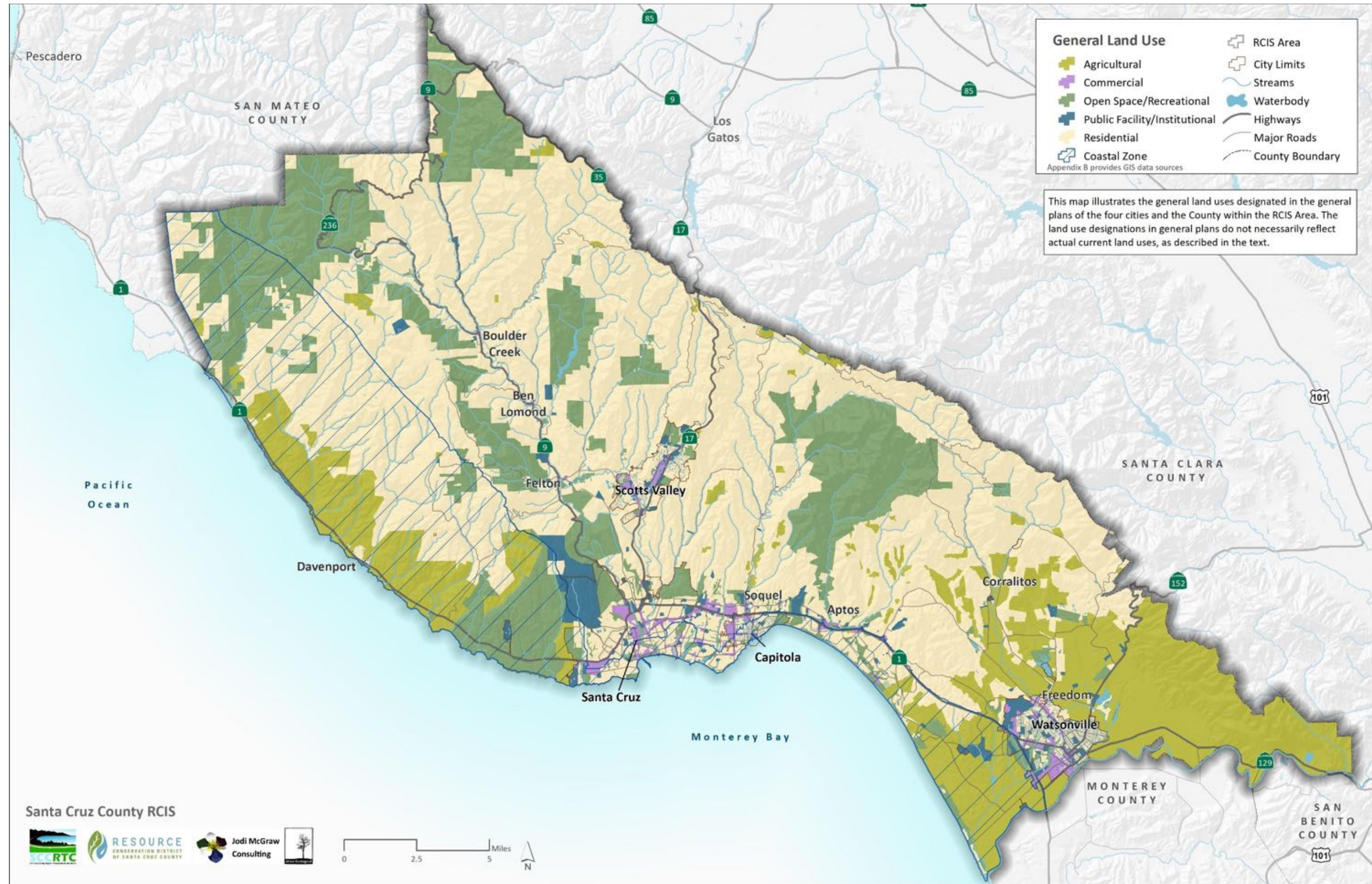


Figure 2-1: Land Use

2.2.3 Working Lands

The RCIS Area features important and iconic working landscapes, including prime farmlands in the Pajaro Valley, productive coastal farmlands on the North Coast, the scenic rangelands of the Pajaro Hills, and the redwood and Douglas-fir forests that blanket the mountains and produce timber (Figure 2-2). These lands not only have high economic value, generating \$636,032,000 in gross production value in 2020 (County of Santa Cruz Agricultural Commissioner 2020c; Table 2-2), they can also provide substantial ecological value when managed with sustainable practices. Working lands can produce (as well as rely on) ecosystem services including wildlife habitat, groundwater recharge, carbon sequestration, flood risk reduction, and biodiversity. Collaborating with landowners and land managers to protect and improve the provisioning of ecosystem services and ecological functions while sustaining working lands is a priority for conservation.

Table 2-1: Agricultural Production in Santa Cruz County in 2020 (County of Santa Cruz Agricultural Commissioner 2020c)

Product	Acres ¹	Estimated Value (\$)	% of Total Value
Berries	5,236	397,139,000	62%
Apples, Wine Grapes, and Misc. non-Berry Fruit	2,030	16,247,000	3%
Vegetables	7,722	89,462,000	14%
Nursery Crops (incl. cut flowers and potted plants)	862	119,661,000	19%
Livestock	19,244	7,166,000	1%
Timber (10,171 Board feet)	9,895	6,357,000	1%
Total	46,215	636,032,000	100%

¹ Does not include all acreages in cultivation, which total 26,414 (DOC 2016). Livestock acreages are those designated as suitable for grazing (DOC 2016); this value likely overestimates actual livestock grazing areas. The timber acres reflect the acres harvested from 2011-2019 (CalFire 2020). Additional areas are suitable for harvest.

2.2.3.1 Cultivated Land

Berries, orchards, vineyards, and vegetables are produced on an estimated 14,998 acres in the RCIS Area (Table 2-2). Legal cannabis cultivation occurs on an additional 36 acres in the RCIS Area, where operations are typically small (<1 acre) and include an estimated 1,800 sites in the RCIS Area (County of Santa Cruz 2017).

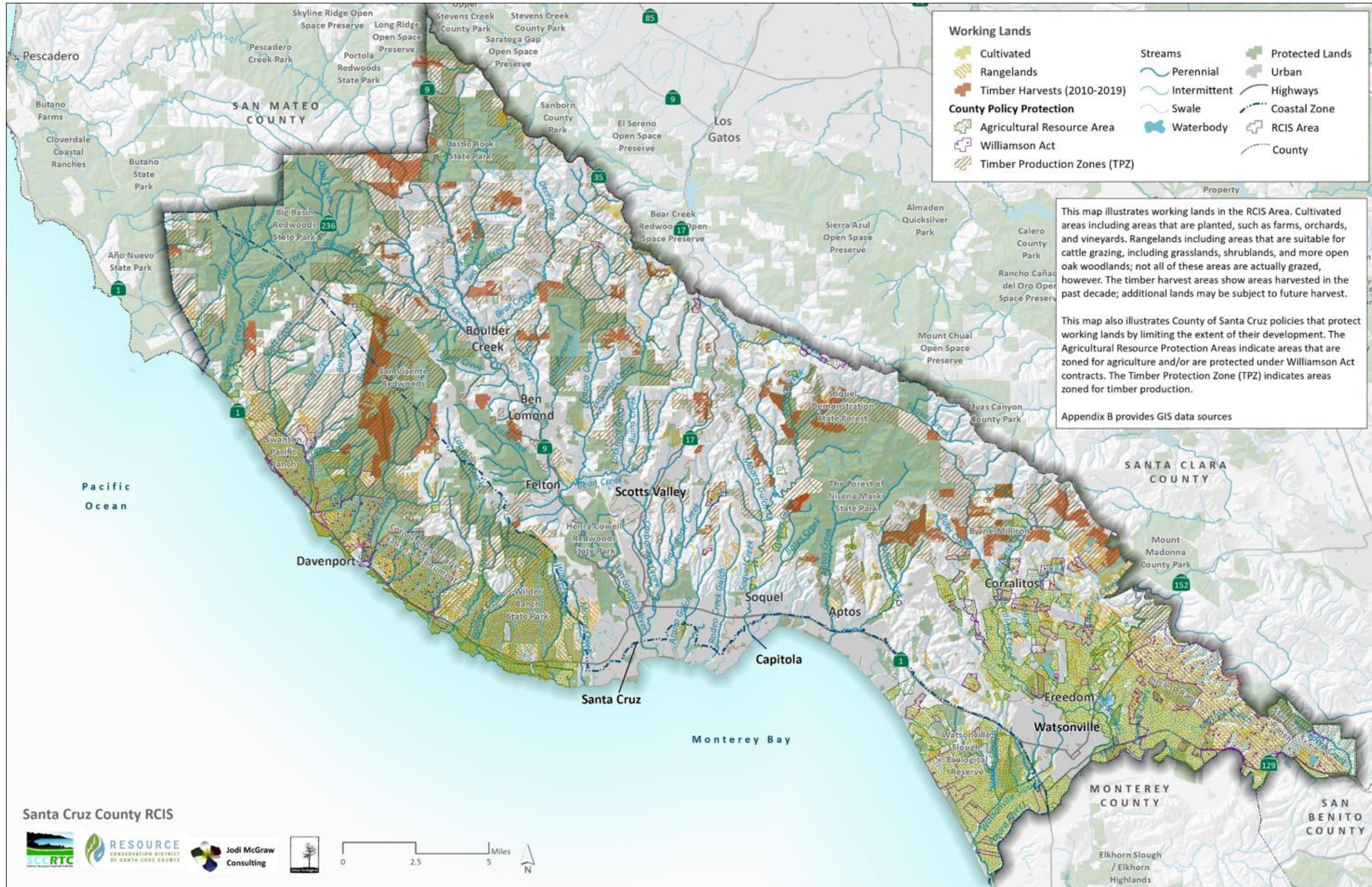


Figure 2-2: Working Lands

Agricultural crop production depends on healthy soil, pollinators, water supply, and a stable climate (Schmidt et al. 2015). Some farms provide hedgerows of trees and shrubs that provide cover, food (e.g., fruit, pollen), or other resources, and may help promote animal movement through fragmented landscapes (Davies and Pullin 2007). Depending on location and management, agricultural lands can provide critical movement corridors for wildlife between adjacent natural communities and open spaces. However, certain activities in agricultural landscapes such as tilling, pest control, use of plastics, clearing of riparian vegetation, erecting high fences, and use of bait stations, can pose significant challenges to the conservation of biological resources in these landscapes. Conservation of wildlife habitat on and adjacent to working agricultural lands is further complicated by conflicting food safety guidelines that auditors may enforce on growers in order to access markets. Local agricultural and conservation leaders have been working for over a decade to reconcile and promote the “co-management” of food safety and conservation on farms (Lowell and Stuart 2010).

2.2.3.2 Rangelands

Rangelands cover approximately 19,244 acres in the RCIS Area (DOC 2016). Grasslands and oak woodlands used as rangelands evolved under the influence of prehistoric herbivores including herds of deer, elk, and other grazing animals. In the absence of large herbivores, appropriate livestock grazing of cattle, sheep, and goats is a valuable management tool in grasslands and other non-grazing sensitive communities, that can reduce invasive plant dominance, and wildfire fuel loads and thus promote healthy populations of native plants and animals (Jackson and Bartolome 2007).

2.2.3.3 Timberlands

While the timber industry is a relatively small part of the local agricultural economy (Table 2-2), 68,306 acres within the RCIS Area are zoned for Timber Production (TPZ; County of Santa Cruz 2020c) and timber harvests have occurred on approximately 9,895 acres over the past decade (CalFire 2020). State and County of Santa Cruz (County) regulations in the RCIS Area subject timber harvest to a unique and restrictive set of regulations designed to protect environmental resources, including requiring selective harvest (rather than clear cutting) and protection of stream corridors (Mackenzie et al. 2011).

Redwood and Douglas-fir forests can be harvested to produce timber products, using techniques that can also promote biodiversity conservation by: 1) protecting and buffering remaining old-growth stands and other sensitive habitats, including streams and riparian corridors; 2) retaining important trees for native animals, and 3) promoting late-seral forest conditions characterized by fewer, more widely spaced trees (O’Hara et al. 2010, Plummer et al. 2012). Such conservation and restoration forest practices can increase the size and thus resiliency of redwood trees, and the resiliency of the entire forest to drought, fire, pests, pathogens, or other indirect effects of climate change, while limiting the impacts of the treatments on natural resources. Such forest management projects to reduce fuel loads and promote forest health can be important given the widespread practice of fire exclusion, which

can otherwise increase fuel loads and lead to catastrophic (large, intense, and severe) wildfires that may have negative effects on even fire adapted species and communities. Such projects can also help maintain native plant communities and promote landscape connectivity with the RCIS Area, while supporting jobs, and tax base and protecting ecosystem services such as reliable and safe water supply, wildlife habitat, biodiversity, and carbon sequestration (Schmidt et al. 2015).

2.2.4 Planned Infrastructure and Development Projects

Santa Cruz County's public agencies conduct infrastructure projects to provide public services to existing residents, and support emergency preparedness and emergency repair, environmental sustainability, economic development, future population growth, and to incorporate technological advancements. Projects may include improvements and maintenance of transportation, water and wastewater treatment facilities, storm drains, utilities, landfills and recycling facilities, park and other public facilities managed by each jurisdiction. Private developers can also undertake large infrastructure projects within the county including housing and commercial development and other public/private partnerships.

This RCIS evaluates foreseeable development of major planned infrastructure and development projects within the next approximately 10 years to help inform the RCIS conservation strategies, including to identify conservation priorities that are reasonably implementable.

2.2.4.1 Infrastructure

This section summarizes the major planned transportation, water, and energy infrastructure projects, and major planned commercial and residential development projects. Figure 2-3 illustrates planned transportation infrastructure projects and the locations of existing infrastructure based on available spatial data; Section E.1 describes the transportation projects in greater detail. Figure 2-3 also illustrates the boundaries of the primary water resource management agencies², which depict general areas of water infrastructure (e.g., pipelines, wells, diversions). As spatial data were not available for all existing infrastructure or planned improvements, this map is not comprehensive; nonetheless, it helps visualize the general areas within the RCIS Area where infrastructure occurs and thus may require maintenance, and where future improvements are anticipated.

There is new investment in transportation infrastructure as a result of the passage of Measure D, a local sales tax for multi-modal transportation improvements in Santa Cruz County (2016), and approval of Senate Bill 1 (2017) the California Road Repair and Accountability Act (2017). These funds are used to deliver transportation projects through the RTC's Strategic

² Small water suppliers not depicted include but are not limited to: Forest Springs, Big Basin Water Company, Mount Hermon Association, and Forest Lakes Mutual Water Company.

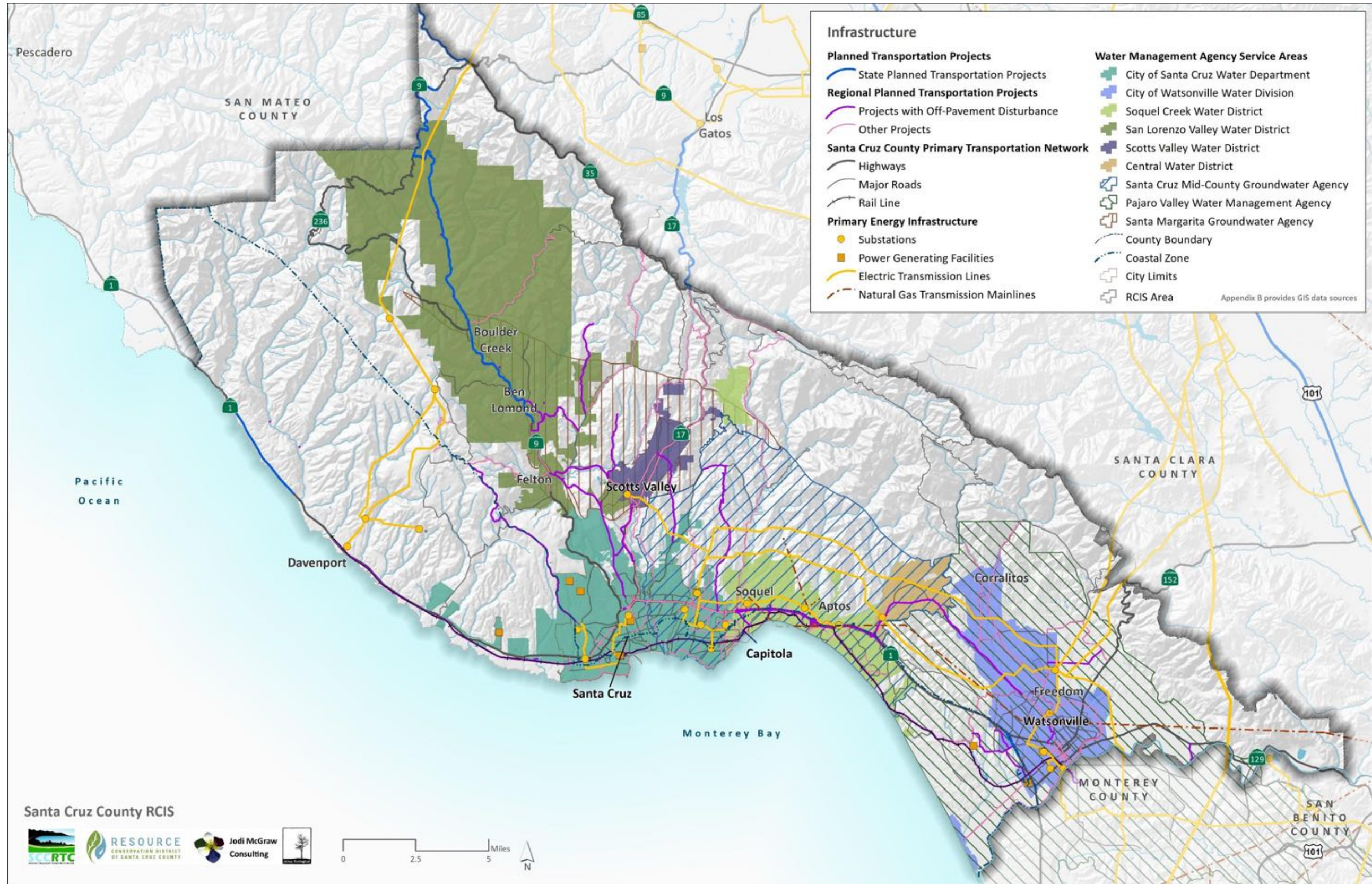


Figure 2-3: Infrastructure Areas

Implementation Plan, the State Highway Operation Protection Program (SHOPP), State Transportation Improvement Program (STIP), and other programs.

The following major transportation and water projects are included in the Capital Improvement Programs (CIPs) prepared by local jurisdictions and the Strategic Implementation Plan (SIP) for Measure D, a 2016 countywide transportation funding measure (Section E.1), and were identified as potentially requiring compensatory mitigation:

- Airport water tank installation (City of Watsonville);
- Airport runway extension (City of Watsonville);
- Stockton Avenue Bridge Rehabilitation (City of Capitola);
- Bridge Replacements (Quail Hollow, San Lorenzo Way, Green Valley, Forest Hill Drive, Rancho Rio Avenue, Either Way, Fern Drive, Larkspur, Swanton Road, Lompico Road) [County of Santa Cruz];
- Highway 1 Bridge at San Lorenzo Bridge Replacement (City of Santa Cruz);
- Watsonville Trails: Pajaro Valley Connector, Lee Road and Slough Trails (City of Watsonville);
- Monterey Bay Sanctuary Scenic Trail Network (Coastal Rail Trail);
- Highway 1 Auxiliary Lane Projects (Soquel Drive/Avenue to 41st Avenue Bay Porter to Park Avenue, State Park Drive to Freedom Boulevard);
- Santa Cruz Branch Rail Line Maintenance and Repairs;
- College Lake Integrated Resources Management Project;
- Watsonville Slough System Managed Aquifer Recharge and Recovery Projects; and
- San Lorenzo Valley Water District Capital Improvement Projects.

The 2045 RTP provides additional information about the transportation plans and programs and the Capital Improvement Programs for the respective jurisdictions include the complete list of planned infrastructure projects within each jurisdiction over the specific time period. Additional transportation and related infrastructure improvements will likely also be needed in response to storm-related damage, and other emergency repairs which cannot be individually planned but are likely to occur.

Large-scale energy infrastructure within the RCIS Area is limited to transmission lines, distribution lines, small-scale power generation plants, and substations operated by Pacific Gas and Electric (PG&E; Figure 2-3). The region imports electricity from Central Coast Community Energy, a community choice energy agency that procures energy for Santa Cruz, Monterey, and San Benito counties. There are no anticipated new large-scale energy development projects planned for the RCIS Area. Operations and maintenance of existing energy infrastructure,

including vegetation management, is anticipated to occur primarily in the locations of PG&E's existing facilities in the RCIS Area, and will be covered under PG&E's *Multiple Region Operation and Maintenance Habitat Conservation Plan* (Section E.3; PG&E 2020).

2.2.4.2 Development

A suite of pending residential, mixed use, commercial, and commercial cannabis (county only) applications are planned in the cities of Capitola, Santa Cruz, Scotts Valley, and Watsonville, and the County of Santa Cruz (Section E.4). These projects are concentrated in the existing developed and cultivated agricultural areas within the RCIS Area, including the unincorporated towns of Live Oak, Soquel, and Aptos (Section E.4).

2.2.5 Existing Protected Lands

The RCIS Area contains 91,343 acres that are protected from conversion to residential or commercial development and managed for open space or agriculture by fee title or conservation easement (Table 2-3, Figure 2-4; GIN 2021; USGS 2018).

These existing protected lands comprise 32% of the 285,261-acre RCIS Area (Table 2-3) and combine with intact, unprotected habitat including working lands to support rare species, sustain important natural communities, and provide essential ecosystem services (Schmidt et al. 2015). Understanding the distribution of the existing protected lands will inform the development of the conservation strategy for this RCIS.

Of the total protected land area, 84,014 acres (30% of the area or 92% of the protected lands) are protected by fee title alone, 7,329 acres (2.6% of the area or 8% of the protected lands) are protected by a conservation easement alone, while 10,232 acres (4% of the area or 11% of protected lands) are protected by both fee title and conservation easement.

The existing protected lands are owned by two federal, eight state, and 18 local government (i.e., cities, the county, and special districts) agencies, as well as six non-profit organizations with land protection missions (i.e., land trusts). Additional lands are protected by conservation easements held by these and other private, local, state, and federal agencies and organizations. California Department of Parks and Recreation (State Parks) is the largest protected landowner (45,719 acres); the Peninsula Open Space Trust (8,807 acres), City of Santa Cruz (5,919 acres) and United States Bureau of Land Management (5,776 acres) also hold considerable areas.

Gap Status Codes categorize the degree of protection for biodiversity conservation on a scale of 1-4, in which Status 1 is most protective for biodiversity, and Status 4 is least protective (Table 2-3; Figure 2-4; USGS 2018). Lands owned by non-profit entities, including local land trusts, collectively have the most land managed for biodiversity (Status 2: 11,618 acres); State Parks with special designation units, such as West Waddell Creek State Wilderness in Big Basin State

Table 2-2: Protected Lands in the RCIS Area

Ownership	Gap Status ¹ (Acres)				All	% of RCIS Area	% of Protected Lands
	Status 2	Status 3	Status 4				
Fee					84,014	29.7	92.0
Federal	268	5,776	1		6,045	2.1	6.6
State	9,718	2,741	41,318		53,777	18.9	58.9
County	142		1,114		1,256	0.4	1.4
City	1,141		5,942		7,083	2.5	7.8
Special District	1,512	177	2,055		3,744	1.3	4.1
Non-Profit	11,618		492		12,109	4.5	13.4
Easement							
Easement	128	617	6,584		7,329	2.6	8.0
<i>Easement and Fee²</i>					<i>10,232</i>		
Total	24,527	9,311	57,504		91,343²	32.0	100.0

¹ ‘GAP Status Codes’ defined by the Gap Analysis Project (USGS 2018) provide a general assessment of management intent to protect biodiversity, but do not measure effectiveness of management to protect biodiversity. GAP 3 and 4 lands may contain important habitat for native species, and promote habitat connectivity. Gap status codes were developed by the USGS and may not accurately reflect the management of all properties in the RCIS Area.

Status 1 – Managed for biodiversity with natural disturbance events allowed (none of the properties in the RCIS Area are classified as Status 1);

Status 2 – Managed for biodiversity with management that may interfere with natural processes;

Status 3 – Permanent protection, but the land is subject to multiple uses;

Status 4 – No known institutional mandates to prevent conversion of natural habitat types (Status 4 was assumed when Gap attribute was blank).

Acres and percentages may not sum correctly due to rounding error.

² Some properties are protected both in fee title and by conservation easement. To avoid duplicating their acreages, these properties are listed according to their fee owner and the additional easement acreages are not included in the protected lands total

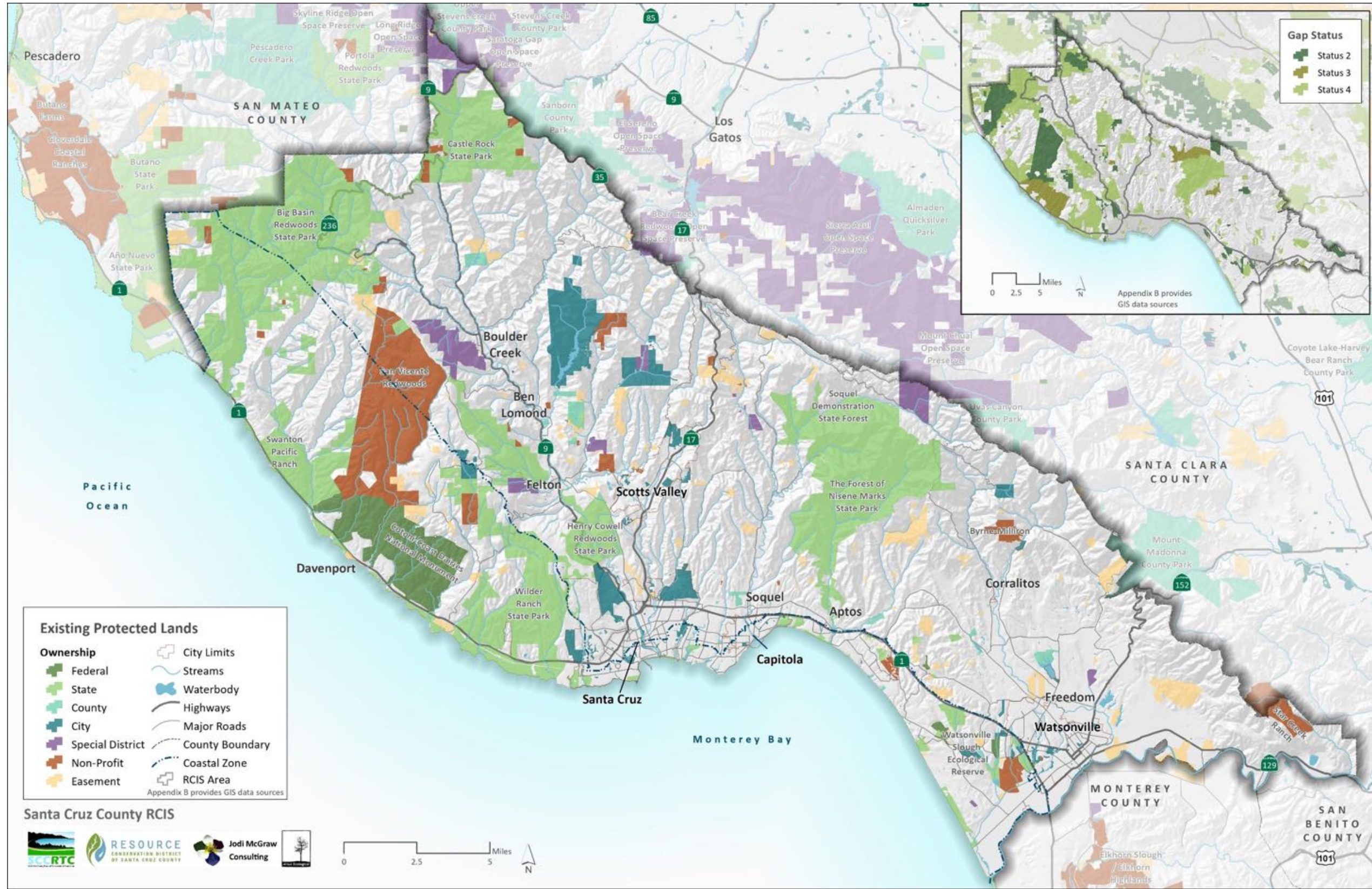


Figure 2-4: Existing Protected Lands

Park and San Lorenzo Headwaters Natural Preserve in Castle Rock State Park, also comprise a large area of Status 2 lands (9,718 acres). Gap status codes were developed by the USGS and may not accurately reflect the management of all properties in the RCIS Area.

Protected lands in Santa Cruz County adjoin those in neighboring counties, creating a network of protected parks and open space in the Santa Cruz Mountains and broader California Central Coast. Significant protected lands adjacent to the RCIS Area include state and county parks in San Mateo County to the north, Midpeninsula Regional Open Space District Preserves and Santa Clara County Parks lands to the north and east, and Elkhorn Slough/Elkhorn Highlands Natural Reserve in Monterey County to the south (Figure 2-4).

The RCIS Area also adjoins the following marine protected areas, which protect biodiversity in a total of 3,902,712 -acres of the Monterey Bay and Pacific Ocean:

- Monterey Bay National Marine Sanctuary (3,902,712 acres);
- Año Nuevo State Marine Conservation Area (7,134 acres);
- Año Nuevo ASBS State Water Quality Protection Area (13,560 acres);
- Greyhound Rock State Marine Conservation Area (7,681 acres);
- Soquel Canyon State Marine Conservation Area (14,700 acres);
- Natural Bridges State Marine Reserve (162 acres); and
- California Coastal National Monument (Includes offshore rocks, islands, exposed reefs, and pinnacles along the coastline; DOI 2020).

The RCIS Area features a relatively large percentage of existing protected land (32%); indeed, the area is outpacing the state-wide goal to conserve 30% of California’s coastal water and land by 2030 to protect biodiversity and provide nature-based solutions to address climate change, which was established by executive order (Newsom 2020). However, additional land and water protection will be essential to achieving the goals of this RCIS as the existing protected lands do not protect adequate areas of the various community and habitat types to sustain the rare species, sensitive communities, and ecosystem processes (Section 5.2).

2.2.6 Conservation and Mitigation Banks

The RCIS Area features portions of the service areas for four conservation banks and one mitigation bank (Table 2-4, Figure 2-5; CDFW 2020b, RIBITS 2020). These protected lands are all located outside of Santa Cruz County except the Zayante Sandhills Conservation Bank, which is located in Ben Lomond. The conservation and mitigation banks sell credits for California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), four endangered Sandhills species and Sandhills communities, coho salmon, steelhead (*Oncorhynchus mykiss*) and jurisdictional waters (Table 2-4). These conservation and mitigation credits can be purchased by project proponents to offset impacts to these resources caused by development, infrastructure, and other activities.

Additionally, the RCD is developing an in-lieu fee program with the US Fish and Wildlife Service to provide compensatory mitigation for impacts to California red-legged frog, Santa Cruz long-toed salamander, and tidewater goby (*Eucyclogobius newberryi*) and their habitat in Santa Cruz and Monterey Counties (RCD 2019a).

Table 2-3: Conservation and Mitigation Banks with a Service Area that includes the RCIS Area¹

Bank	Resource Covered	Location	Service Area (Acres)	% of RCIS Area
Conservation Bank				
Sparling Ranch Conservation Bank	California Tiger Salamander	San Benito and Santa Clara	4,879	1.7
	California Red-legged Frog	San Benito and Santa Clara	27,729	9.7
Ohlone West Conservation Bank	California Tiger Salamander	Alameda	909	0.3
Zayante Sand Hills Conservation Bank	Endemic Sandhill Species ² and Communities	Santa Cruz	186,962	65.5
East Austin Creek Conservation Bank ³	Coho Salmon and Steelhead	Sonoma	224,620	78.7
Mitigation Bank				
Pajaro River Mitigation Bank	Jurisdictional Waters	San Benito	56,466	19.8

¹ Other landowners in the RCIS Area, including water districts, have permanently protected and manage habitat that they use to mitigate their own projects over time. Unlike with state and/or federally authorized conservation and mitigation banks, credits for mitigation on those properties cannot be transferred to other entities.

² Mount Hermon June beetle (*Polyphylla barbata*), Zayante band-winged grasshopper (*Trimerotropis infantilis*), Ben Lomond wallflower (*Erysimum teretifolium*), Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), silverleaf manzanita (*Arctostaphylos silvicola*), and Ben Lomond buckwheat (*Eriogonum nudum* var. *decurrens*).

³ The portion of the East Austin Creek Conservation Bank Service Area that is within the RCIS Area is characterized as ‘Secondary’, which means that a higher ratio of credits may need to be purchased than if the service area were designated as ‘Primary’.

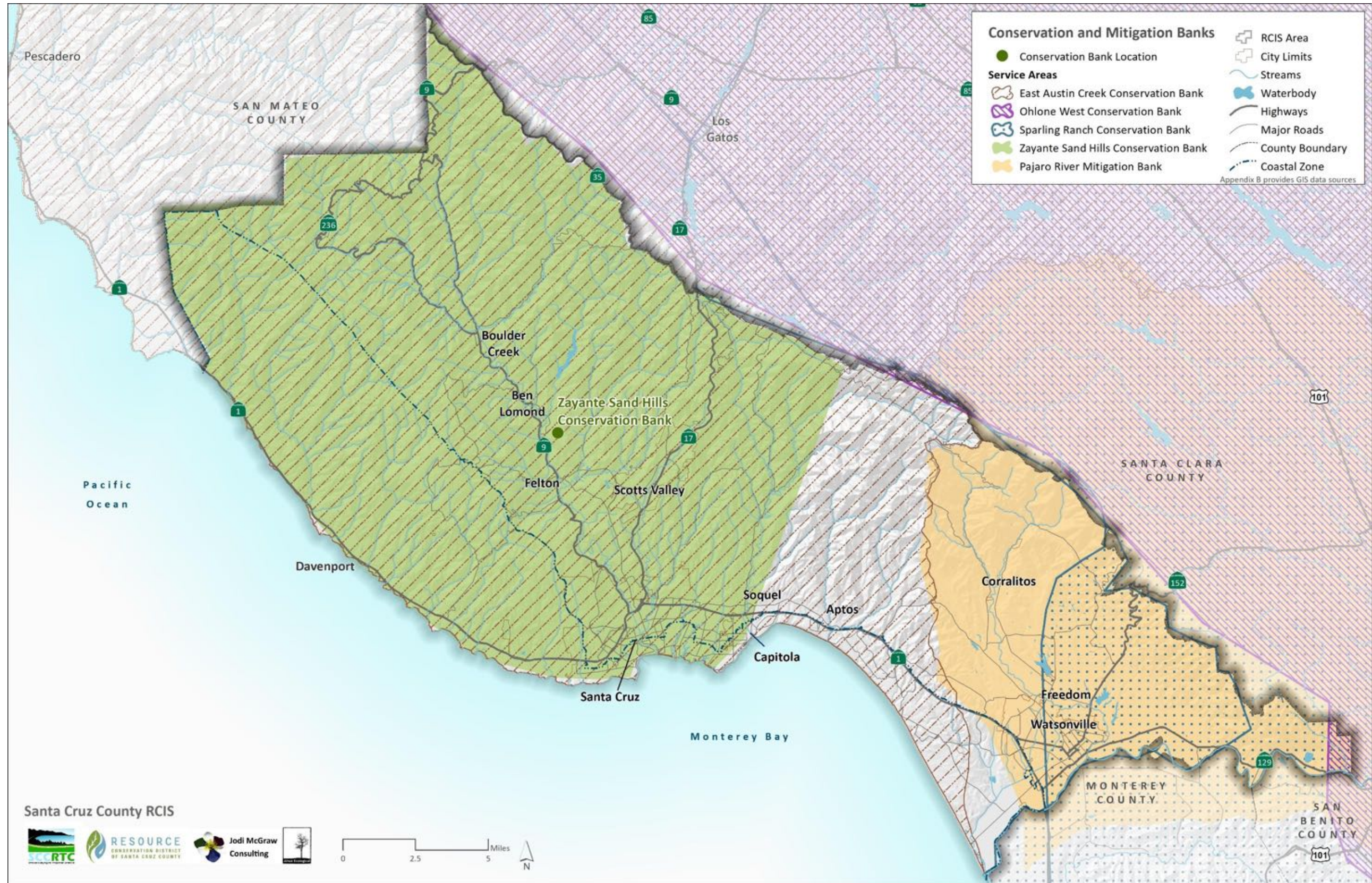


Figure 2-5: Conservation and Mitigation Banks

2.3 Existing Conservation Plans

2.3.1 Recovery Plans

Habitat within the RCIS Area is addressed in a total of twenty recovery plans, which identify goals, objectives, and recovery actions for federal and/or state listed threatened and endangered species. These include six multi-species recovery plans that collectively address four animals and ten plants whose historical or current range is within Santa Cruz County, and 14 single-species recovery plans that address twelve animals and two plants (Table 2-5).

Table 2-4: Recovery Plans in the RCIS Area

Plan Name	Citation	Relevant Species Addressed
Multi-species Recovery Plans		
Final Coastal Multispecies Recovery Plan	NMFS 2016b	Central California Coast steelhead
Recovery Plan for Marsh Sandwort (<i>Arenaria paludicola</i>) and Gambel's Watercress (<i>Rorippa gambelii</i>)	USFWS 1998b, 2019a	marsh sandwort ¹
Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan	USFWS 1998c, 2019b	Monterey spineflower
Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula	USFWS 2003b	marsh sandwort ²
Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California	USFWS 1998d	Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, Ben Lomond wallflower, Scotts Valley spineflower, Scotts Valley polygonum, Ohlone tiger beetle
Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area	USFWS 1998f	white-rayed pentachaeta ³
Single-Species Recovery Plans		
Recovery Strategy for California Coho Salmon	CDFW 2004	Coho salmon
Final Recovery Plan for Central California Coast coho salmon Evolutionarily Significant Unit	NMFS 2012	Central California Coast coho salmon

Plan Name	Citation	Relevant Species Addressed
South-Central California Coast Steelhead Recovery Plan	NMFS 2013	South-Central California Coast steelhead
Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (<i>Ambystoma californiense</i>)	USFWS 2017a	California tiger salamander
Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (<i>Charadrius alexandrinus nivosus</i>)	USFWS 2007a	Western snowy plover
Recovery Plan for the Tidewater Goby (<i>Eucyclogobius newberryi</i>)	USFWS 2005b	tidewater goby
Recovery Plan for <i>Chorizanthe robusta</i> var. <i>robusta</i> (Robust Spineflower)	USFWS 2004a	robust spineflower
Draft Revised Recovery Plan for the Santa Cruz Long-toed Salamander (<i>Ambystoma macrodactylum croceum</i>)	USFWS 2004b	Santa Cruz long-toed salamander
Final Revised Recovery Plan for the Southern Sea Otter (<i>Enhydra lutris nereis</i>)	USFWS 2003a	southern sea otter
Recovery Plan for the California Red-legged Frog (<i>Rana aurora draytonii</i>)	USFWS 2002a	California red-legged frog
Draft Recovery Plan for the Least Bell's Vireo (<i>Vireo bellii pusillus</i>)	USFWS 1998a	least bell's vireo ⁴
Recovery Plan for the Santa Cruz Cypress (<i>Cupressus [Hesperocyparis] abramsiana</i>)	USFWS 1998e	Santa Cruz cypress
Recovery Plan for the Threatened Marbled Murrelet (<i>Brachyramphus marmoratus</i>) in Washington, Oregon, and California	USFWS 1997	marbled murrelet
California Least Tern Recovery Plan	USFWS 1985a	California least tern ⁵
Recovery Plan for the San Francisco Garter Snake (<i>Thamnophis sirtalis tetrataenia</i>)	USFWS 1985b	San Francisco garter snake

¹ Marsh sandwort is not currently found in Santa Cruz County, though the region is mentioned as hopeful for relocation in recovery plan; Gambel's watercress is not present currently or historically in Santa Cruz County.

- ² This recovery plan focuses on San Francisco lessingia and Raven's manzanita, but also discusses species located in Santa Cruz County that share habitats with the listed species and have suffered substantial declines on the northern San Francisco Peninsula and adjacent coast.
- ³ White-rayed pentachaeta is not currently found in Santa Cruz County, though the region is mentioned as a potential relocation area in the species' recovery plan.
- ⁴ Least Bell's Vireo does not typically occur in Santa Cruz County, though the region is within the species' historic breeding range.
- ⁵ California least tern does not typically occur in Santa Cruz County, though the region is within the species' historic breeding range.

2.3.2 Habitat Conservation Plans

Portions of the RCIS Area are addressed in six programmatic Habitat Conservation Plans (HCPs; Table 2-6). These plans developed to comply with Section 10 of the federal Endangered Species Act cover multiple activities occurring in different areas over a longer-period of time. An additional 30 HCPs in the RCIS Area address single projects in relatively small areas (Table 2-6) and often address just one or two covered species. Section 5.4 summarizes how the RCIS conservation strategy is consistent with the recovery plans and approved HCPs.

The existing programmatic HCP permit areas range between 1,693 and 564,781 acres, with the latter including area outside of the RCIS Area (Table 2-6). In addition, 22 project-specific HCPs have been developed to address activities in a single location in the RCIS Area. Collectively, the HCPs within the RCIS Area cover seven plant species and 12 animal species (Table 2-6).

The RCIS Area is not addressed in any Natural Community Conservation Plans (NCCPs) developed pursuant to the Natural Community Conservation Planning Act (Fish and Game Code sections 2800-2835), which identify and provide for the regional protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. However, the RCIS Area is contiguous with the Santa Clara Valley Habitat Plan, a regional HCP and NCCP that covers the southeastern portion of adjacent Santa Clara County (ICF 2012).

Table 2-5: Habitat Conservation Plans in the RCIS Area

Habitat Conservation Plan	Reference	Plan Area (Acres)	Species Addressed that occur within the RCIS Area
Programmatic Habitat Conservation Plans			
Draft City of Santa Cruz Anadromous Salmonid Habitat Conservation Plan	City of Santa Cruz <i>in prep.</i>	TBD	steelhead and coho salmon

Habitat Conservation Plan	Reference	Plan Area (Acres)	Species Addressed that occur within the RCIS Area
City of Santa Cruz Operations and Maintenance Habitat Conservation Plan	City of Santa Cruz 2021		Ben Lomond spineflower, robust spineflower, Santa Cruz tarplant, San Francisco popcornflower, Ohlone tiger beetle, Mount Hermon June beetle, tidewater goby, Pacific lamprey, California red-legged frog, Southwestern pond turtle
Pacific Gas and Electric Company Multiple Region Operation and Maintenance Habitat Conservation Plan	PG&E 2020	564,781	California tiger salamander, California red-legged Frog, marbled murrelet, Mount Hermon June beetle, Ohlone tiger beetle, Santa Cruz long-toed salamander, Zayante band-winged grasshopper, Monterey spineflower, robust spineflower
Interim Programmatic Habitat Conservation Plan for Mount Hermon June Beetle, Ben Lomond Spineflower	USFWS et al. 2011	1,693	Mount Hermon June beetle, Ben Lomond spineflower
PGE Vegetation Management Habitat Conservation Plan	PG&E 2018	10.2	Santa Cruz long-toed salamander, California red-legged frog, Monterey spineflower
Project-Specific Habitat Conservation Plans (Listed in order of acreage)			
Quail Hollow Quarry	Graniterock 1998	219	Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond wallflower, Ben Lomond spineflower
Seascape Uplands	Reid 1994	192	Santa Cruz long-toed salamander
Wilder Quarry (Granite Rock)	1998 ¹	125	California red-legged Frog

Habitat Conservation Plan	Reference	Plan Area (Acres)	Species Addressed that occur within the RCIS Area
Santa Cruz Gardens Unit 12	Arnold and Lyons 2008	58.5	Santa Cruz tarplant, Ohlone tiger beetle
Tucker Pond	Reid and Biosearch 2006	55	Santa Cruz long-toed salamander, California red-legged frog
UCSC Ranch View Terrace	Jones and Stokes 2005	38.8	California red-legged frog, Ohlone tiger beetle
Hanson Aggregates Felton Plant	HRG 1999	35	Mount Hermon June beetle, Zayante band-winged grasshopper
Bean Creek Estates	Arnold et. Al 2008	18.1	Mount Hermon June beetle, Ben Lomond spineflower, Santa Cruz wallflower
City of Santa Cruz Graham Hill Water Treatment Plant	EMS and Arnold 2013	12.71	Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower
Bonny Doon Quarries	1999 ¹	4.9	California red-legged Frog
Salvation Army	McGraw 2009a	4.5	Mount Hermon June beetle, Ben Lomond spineflower
PG&E Gas Pipeline	PG&E 2017	2.9	Mount Hermon June beetle
Lone Pine Lane (Sisk)	2008 ¹	1.24	Mount Hermon June beetle
Collado Drive	2008 ¹	1.093	Mount Hermon June beetle
Busch Residence	2008 ¹	0.999	Mount Hermon June beetle
Carter-224 Hidden Glen Drive	Arnold 2008	0.52	Mount Hermon June beetle
Tinkess Parcel	McGraw 2008a	0.44	Mount Hermon June beetle
San Lorenzo Valley Water District Probation Tank Replacement Project	McGraw 2017a	0.43	Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, Ben Lomond wallflower
Blake Lane	McGraw 2017b	0.42	Mount Hermon June beetle

Habitat Conservation Plan	Reference	Plan Area (Acres)	Species Addressed that occur within the RCIS Area
Mayer Property	Arnold 2002	0.35	Mount Hermon June beetle, Ben Lomond spineflower
Mansfield Property	Arnold 2009b	0.3	Mount Hermon June beetle
County of Santa Cruz Juvenile Hall	McGraw 2019	0.27	Mount Hermon June beetle
Scotts Valley Multi-Agency Regional Intertie Project	Arnold and Bandel 2014	0.23	Mount Hermon June beetle, Zayante band-winged grasshopper, California red-legged frog
Clements Property	McGraw 2017c	0.2	Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower
Sunde Residence	McGraw 2007b	0.19	Mount Hermon June beetle
County of Santa Cruz Juvenile Hall	McGraw 2016	0.19	Mount Hermon June beetle
Sohl Residence	Arnold 2014	0.063	Mount Hermon June beetle
Menchine Residence	Arnold 2009a	0.046	Mount Hermon June beetle
Mañana Woods Booster Pump Station Project	McGraw 2008b	0.045	Mount Hermon June beetle
Walters Property	McGraw 2012	0.02	Mount Hermon June beetle
West Residence	McGraw 2009b	0.015	Mount Hermon June beetle

¹ These HCPs are listed on the Ventura Fish and Wildlife Office website; however, the HCPs could not be located.

2.3.3 Other Conservation Plans

The RCIS Area is also addressed in several other conservation strategies and assessments encompassing a wide range of biodiversity conservation values and their management; some of these plans also address areas outside of the RCIS Area. These plans address the following aspects of the RCIS Area, as detailed in Table 2-7:

- **Conservation Plans:** land protection, restoration, and management goals and priorities for the state (California State Wildlife Action Plan), 10-County Bay Area (Conservation Lands Network), and the County (Conservation Blueprint for Santa Cruz County);

- **Habitat management plans:** habitat management in areas important for rare species and biodiversity;
- **Water quality and management plans and watershed assessment and enhancement plans:** water quality and groundwater management, as well as biodiversity and rare species conservation for aquatic systems and their watersheds;
- **Fisheries:** conservation of rare salmonids and other fish species; and
- **Other Plans and Programs:** other plans that address conservation including ecosystem services, and the nexus with wildfire protection and transportation infrastructure.

Table 2-6: Other Conservation Plans in the RCIS Area¹

Conservation Plan	Citation	Conservation Values Addressed
Conservation Plans		
Conservation Lands Network (incl. Bay Area Critical Linkages Project 2013)	BAOSC 2019	Rare species, sensitive communities, connectivity, old growth forests, watersheds, aquatic systems, climate change resiliency, etc.
California State Wildlife Action Plan	CDFW 2015	Species of Greatest Conservation need, multi-species Ecosystem approach, climate change vulnerability, prioritizing strategic conservation targets, planning at level of geographic provinces, anadromous fishes, alleviate pressures and stresses
Conservation Blueprint for Santa Cruz County	Mackenzie et al. 2011	Rare species, sensitive communities, connectivity, old growth forests, watersheds, aquatic systems
Habitat Management Plans		
The Sandhills Conservation and Management Plan	McGraw 2004	Sandhills communities and endemic species
Monterey Bay National Marine Sanctuary Final Management Plan	NOAA 2008	Marine and coastal areas
Water Quality and Management Plans		

Conservation Plan	Citation	Conservation Values Addressed
Water Quality Control Plan for the Central Coastal Basin (Basin Plan)	CCRWQCB 2019	Steelhead and coho salmon; designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater; amendments for water quality programs to address Total Maximum Daily Loads (TMDL) including sediment, nutrients, toxins, and pathogens
Integrated Regional Water Management Plan	County of Santa Cruz 2019a	Coho salmon and steelhead; aquatic habitat, coastal dunes, water supply, water quality, climate change, Total Maximum Daily Loads (TMDL), sea level rise, flooding
Santa Cruz Mid-County Groundwater Basin Groundwater Sustainability Plan	SCMCGA 2019	Sustainable groundwater management including groundwater overdraft, sea water intrusion, and protection of sensitive species that are dependent on groundwater
Pajaro Valley Basin Management Plan ²	PVWMA 2014, PVWMA 2021	Sustainable groundwater management including groundwater overdraft, sea water intrusion, and protection of sensitive species that are dependent on groundwater
Santa Margarita Groundwater Sustainability Plan	SMGA 2021	Sustainable groundwater management including groundwater overdraft, sea water intrusion, and protection of sensitive species that are dependent on groundwater
Watershed Restoration Program and Enhancement Plans		
Integrated Watershed Restoration Program Priority Project List	IWRP 2019	Steelhead, coho salmon, tidewater goby, California red-legged frog, Santa Cruz long-toed salamander, southwestern pond turtle; coordinated watershed restoration; water quality enhancement

Conservation Plan	Citation	Conservation Values Addressed
Aptos Creek Watershed Assessment and Enhancement plan	Conrad and Dvorsky 2003	Steelhead and coho salmon; fisheries habitat enhancement, riparian restoration, water quality improvement
Arana Gulch Watershed Enhancement Plan	Strelow Consulting 2002	Steelhead and coho salmon; erosion, and fish barriers
Lower Pajaro River Enhancement Plan	Fall Creek Engineering et. Al 2002	Steelhead; riparian restoration, erosion, nutrients, and toxins (DDT)
San Lorenzo River Salmonid Enhancement Plan	Alley et al. 2004	Steelhead and coho salmon; fisheries decline, habitat improvement
San Vicente Creek Watershed Plan for Salmonid Recovery	RCD 2014	Steelhead and coho salmon; fish passage barriers, riparian habitat.
The Soquel Creek Watershed Assessment and Enhancement Project Plan	RCD 2003	Steelhead and coho salmon; fish passage; water quality improvement; instream flow, riparian habitat enhancement;
Scotts Creek ³ Watershed Assessment	Scotts Creek Watershed Council 2003	Steelhead and coho salmon; fish passage; water quality improvement; instream flow, riparian habitat enhancement;
Watsonville Sloughs Watershed Conservation and Enhancement Plan	Swanson Hydrology 2003	tidewater goby, California red-legged frog; riparian habitat and freshwater marsh habitat enhancement; water quality improvement.
Pinto Lake Implementation Strategies	RCD 2013	Riparian and wetland restoration, restoring water quality in Pinto Lake to prevent cyanobacteria blooms
Rapid Assessment Methods within the San Lorenzo Watershed	Central Coast Wetlands Group and County of Santa Cruz 2021	Document riparian conditions to develop riparian protection and enhancement projects
Fisheries/Aquatic Conservation Programs and Reports		
Strategic Plan for Recovery of the Santa Cruz long-toed salamander and California red-legged frog in the Larkin Valley area	RCD 2019b	Santa Cruz long-toed salamander and California red-legged frog

Conservation Plan	Citation	Conservation Values Addressed
Comparative Lagoon Ecological Assessment Project (CLEAP) Report	2ndNature 2006	Steelhead, coho salmon, tidewater goby
Priority Action Coho Team: Strategic Partnering to Accelerate Central California Coast Coho Salmon Recovery	PACT 2019	Coho salmon
Species in the Spotlight: Coho, Central California Coast Coho - Year Action Plan	NMFS 2016a	Coho salmon
Juvenile Steelhead & Stream Habitat (JSSH) Monitoring Program	Beck et al. 2019	Steelhead
San Lorenzo River Riparian Conservation Program	City of Santa Cruz et al. 2018	Riparian and riverine communities, steelhead, and coho salmon
Other		
Healthy Lands and Healthy Economies: Nature’s Value in Santa Cruz County	Schmidt et al. 2015	Valuation of ecosystem services and natural capital
Early Mitigation for Transportation Improvements in Santa Cruz County	County of Santa Cruz Early Mitigation Partnership 2018	Collaboration goals for effective mitigation of sensitive species affected by transportation projects in Santa Cruz County
Santa Cruz, San Mateo Community Wildfire Protection Plan	CalFire et al. 2018	Wildfire management plan that addresses Santa Cruz long-toed salamander, California red-legged frog, marbled murrelet, San Francisco garter snake; endemic sandhills species and communities, maritime chaparral, riparian, oak woodlands

¹ This table does not include conservation and management plans for individual properties, which are too numerous to list but play an important role in conservation in the RCIS Area.

² Department of Water Resources approved the PVWMA Basin Management Plan as functional equivalent to a Groundwater Sustainability Plan (GSP) on July 17, 2019. The PVWMA released a Groundwater Sustainability Updated in December 2021 (PVWMA 2021)

³ The RCIS uses “Scott Creek” rather than “Scotts Creek” except where referring to the title of a document, such as here.

2.4 Natural Environment

This section describes the natural environment within the RCIS Area in terms of its ecoregions, climate, disturbance regimes, natural communities, and habitat connectivity.

2.4.1 Ecoregions

The RCIS Area occurs within the California Coastal Chaparral Forest and Shrub Province (Code: 261), as designated by the United States Department of Agriculture (USDA) in their mapping of Ecological Regions (McNab et al. 2007; Figure 2-6). The province covers much of the California coast from San Francisco to Baja California, and features coastal plains and high hills with a Mediterranean-like climate. Precipitation occurs as rainfall primarily between October and April, with an annual dry season extending from the late spring into the fall. Within the province, mean daily temperatures average 50 to 63 °F; coastal areas experiencing cooler summer daytime temperatures modified by morning fog and sea breezes, while inland and higher elevations experience higher temperatures (McNab et al. 2007). Much of the vegetation in this province is tolerant of drought and adapted to fire.

The Central California Coast Section (Code: 261A) of the province, in which the RCIS Area is located, features low to moderate elevation parallel ranges and valleys and underlain by sedimentary, granitic, and ultramafic geologic formations. The vegetation is a mixture of western hardwoods, coastal prairie-scrub, coastal sagebrush, redwood forest, chaparral-mountain shrub, and annual grasslands cover types (McNab et al. 2007).

Within the Central California Coast Section, the RCIS Area includes three subsections (Figure 2-6):

- The Santa Cruz Mountains Subsection (Code: 261Af) is the predominant subsection, covering 74% of the RCIS Area, and includes the mountainous terrain;
- The Watsonville Plain-Salinas Valley Subsection (Code: 261Ah) includes the lower elevation areas from the City of Santa Cruz south to the Pajaro Valley, and covers 22% of the RCIS Area; and
- The Leeward Hills Subsection (Code: 261Ag) occurs in the southeastern tip of the RCIS Area, where it covers only 0.3% of the land therein.

2.4.2 Climate

The RCIS Area generally features a Mediterranean-like climate with mild, wet winters and hot, dry summers. The variable topography in the region creates variable microclimates. The Santa Cruz Mountains rise dramatically from the coast, reaching more than 3,000 feet in elevation in the span of just a few miles. These high peaks have cooler winter temperatures and receive substantially more rainfall. Average annual rainfall ranges from about 22 inches on the coast near Watsonville to more than 60 inches along the ridge of Ben Lomond Mountain (Mackenzie



Figure 2-6: Ecological Regions

et al. 2011) The microclimates in the RCIS Area combine with variation in geology, soils, hydrology, and land use history, among other factors, to support a diverse mosaic of natural communities (Section 2.4.5).

Precipitation drives stream flows, which vary seasonally, with about 85 percent of the annual rainfall occurring between December and May. The highest flows typically occur between December and March when winter storms are at their peak and when soils are saturated. Peak flows drop off considerably after the winter rains cease, although many streams maintain smaller but steady flows in the dry months due to the slow release of stored subsurface water (Mackenzie et al. 2011). Area exhibits high interannual variability, which can have important implications for its ecological systems. Between 1868, when records began to be collected, and 2005, average rainfall in the City of Santa Cruz was 28.5 inches but ranged between 10.2 inches in 1924 to 61.3 inches in 1941 (Griggs and Haddad 2011). Dry periods extend for three or more years (i.e., droughts) occur periodically and can have important implications for terrestrial as well as aquatic systems and species.

2.4.3 Disturbance Regimes

The ecosystems and communities within the RCIS Area are shaped by a variety of ecological disturbances: relatively discrete, natural events that disrupt the structure of an ecosystem, community, or population, and cause changes in resource availability or the physical environment (Pickett and White 1985). Fires, floods, and soil disturbances (e.g., landslides, animal diggings, and earthquakes) remove established plants and animals, and free up resources such as light, nutrients, and space; in doing so, they create opportunities for early successional species, and promote diversity within the landscape by increasing spatial heterogeneity (Sousa 1984).

Disturbances occur at various temporal and spatial scales, ranging from a tree fall that happens in minutes and creates a small canopy gap, to large wildfires, such as the 2020 CZU Lightning Complex Fire that burned 86,533 acres including 56,529 acres in Santa Cruz County over a five-week period. Varying types of disturbance overlap in the landscape, and occur with differing frequency, intensity, and severity, among other aspects of the disturbance regime.

Prior to human arrival, the landscape was likely burned infrequently by large fires ignited by lightning strikes (Sugihara et al. 2018). With the arrival of humans about 12,000 years ago, indigenous burning altered the frequency, size, extent, and seasonality of fire, which likely differed among community types (Kimmerer and Lake 2001, Anderson 2018). Fire management by indigenous communities combined with lightning may have led to higher levels of biodiversity (Anderson 2018). Incorporating indigenous knowledge and practices into fire management may increase the effectiveness of fire as tools for restoring and plant communities in the RCIS Area.

Native species in the RCIS Area have evolved in response to these disturbance regimes, and many disturbance-adapted species require some aspect of disturbance to complete their life

history. For Santa Cruz cypress (*Hesperocyparis abramsiana* var. *abramsiana*), fire opens the serotinous cones and releases its seeds, and also creates bare mineral soil and open canopy conditions that promote seedling establishment (USFWS 1998e, McGraw 2011). In the absence of fire, mature trees die and their populations of viable seed may diminish, creating a ‘senescence risk’ that could threaten to extirpate populations as can occur due to fire exclusion (Ne’eman et al. 1999, McGraw 2011).

Disturbance regimes can be altered by land use modifications and climate change, among other anthropogenic factors, which can interact in complex ways to alter the effects of disturbance for natural systems within the landscape (Newman 2019). Drivers of global change will produce new spatial patterns, altered disturbance regimes, and novel trajectories of change (Turner 2010). Atmospheric rivers promoted by global warming create intense rainfall events and more intense and severe floods; meanwhile, climate-change-induced droughts can render vegetation susceptible to mortality by pests or pathogens, promoting the intensity, severity, and/or frequency of fire. Since the turn of the century, 14 wildfires totaling 77,730 acres have burned 69,529 acres, or 24% of the RCIS Area (Figure 2-7). For comparison, wildfires totaling 5,172 acres were recorded between 1954 and 2000 (Calfire 2021). Increased frequency of fire has the potential to alter plant community structure and species composition, and could cause type conversion, even in natural communities dominated by plants and animals adapted to fire (Section 4.10.1.5).

While these anthropogenically modified disturbances can be particularly harmful for species that do not require disturbance to persist and instead can be harmed by disturbance, even disturbance-adapted species can be negatively impacted by disturbances that are outside of the natural disturbance regime, such as fires that occur in the wrong season, burn at significantly higher temperatures due to high fuel loads or occur too infrequently. These types of anthropogenically modified disturbances can promote the invasion and spread of exotic plants, which can outcompete disturbance-adapted species, many of which are poor competitors, and alter ecosystems including disturbance regimes (Hobbs and Huenneke 1992, D’Antonio et al. 1999).

Because of the important and complex roles of disturbance, biodiversity conservation within the RCIS Area will require managing disturbance and addressing its complex interactions with anthropogenic factors, to safeguard functioning ecosystems, maintain natural community structure and species composition, and promote persistence of species (Newman 2019).

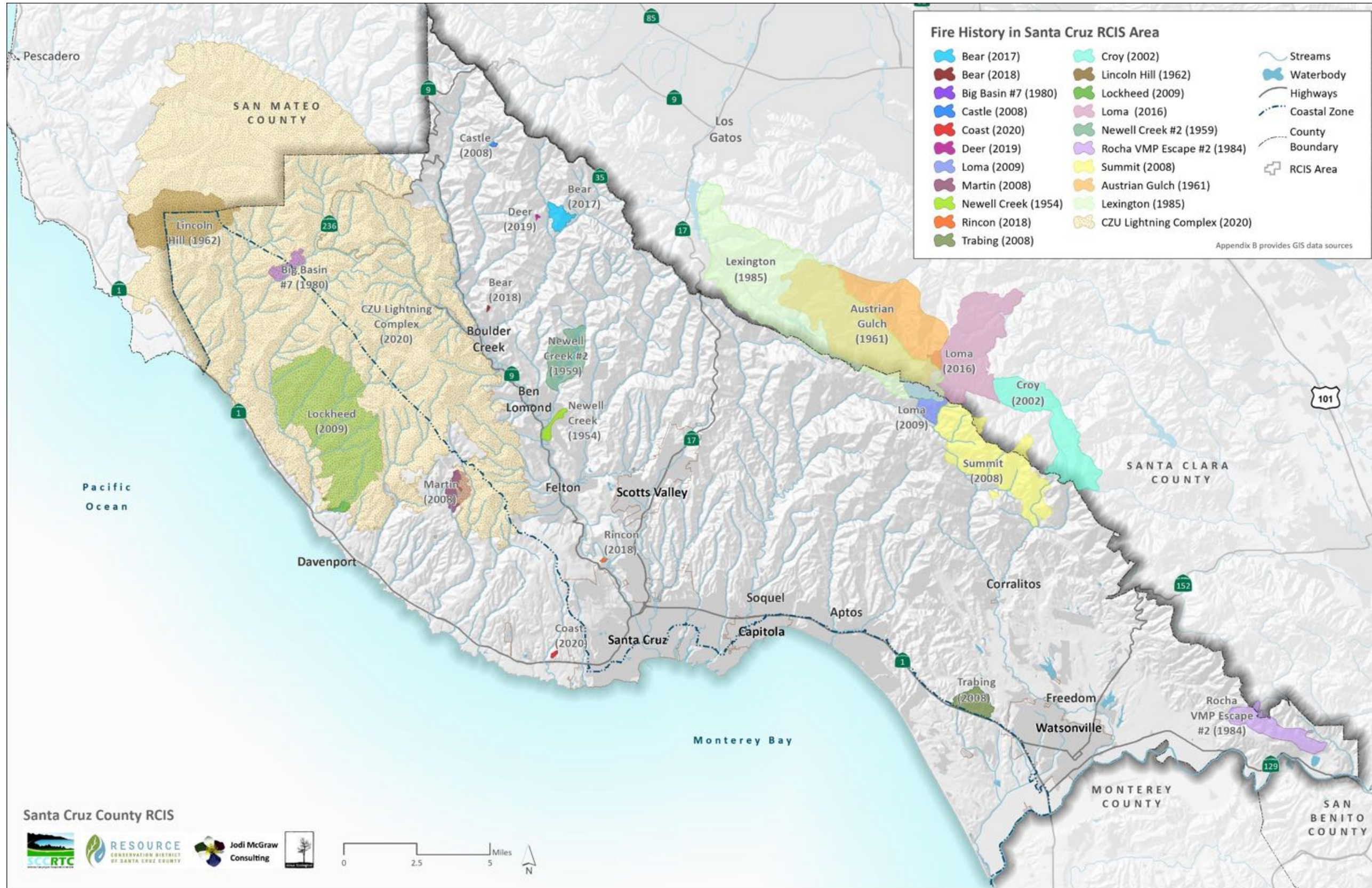


Figure 2-7: Fire History

2.4.4 Watersheds

The RCIS encompasses 65 smaller drainage basins or subwatersheds (Figure 2-8), each having unique characteristics based on variations in size, aspect, elevational gradient, precipitation, geology, and soils. For planning purposes, the RCIS Area was divided into four watershed regions that are similar to the HUC 10 Watersheds (USDA and NRCS 2013), but were created by grouping the 65 sub-watersheds mapped within the RCIS Area (Figures 2-8; Mackenzie et al. 2011). The following briefly characterizes each of these larger watershed areas:

- **North Coast:** Along the northern coast between Big Basin and Wilder Ranch state parks are coastal watersheds that drain directly into the Pacific Ocean. As elevations drop from Ben Lomond Ridge, deeply incised canyons dominated by redwood vegetation give way to maritime chaparral and then coastal scrub and grassland along the coast. This North Coast, which totals 78,235 acres (27.4% of the RCIS Area) features 239 miles of perennial and intermittent streams that have been identified as priorities for conservation of coho salmon and steelhead, the Swanton Botanic Province, which is an area of diverse plant life (West 2010), and karst formations that provide caves important for endemic invertebrates as well as the water supply system.
- **San Lorenzo:** The San Lorenzo River Watershed is the largest watershed lying completely within the RCIS Area and encompasses 86,789 acres (30.4% of the RCIS Area) and features 302 miles of perennial and intermittent streams. It includes critical sub-watersheds for the protection of fish and other aquatic wildlife such as Zayante Creek and the San Lorenzo River Lagoon, which is important for the tidewater goby, and steelhead. Upper Newell Creek watershed drains into Loch Lomond Reservoir, a principal water supply source for the City of Santa Cruz (Mackenzie et al. 2011).
- **Mid-County:** South of the San Lorenzo River Watershed and North of Pajaro River Watershed are several watersheds that drain into Monterey Bay including Arana Gulch, Rodeo Gulch, and several small creeks that drain the coastal terraces near San Andreas Fault. This Mid-County area totals 58,496 acres (20.5% of the RCIS Area) and features 159 miles of perennial and intermittent streams including two major streams, Soquel and Aptos creeks, which are important for steelhead and represent the southernmost range of coho salmon. The upper watersheds in this region is dominated by redwood forest, while the lower foothills support expansive oak woodlands.
- **Pajaro:** The lower Pajaro River Watershed includes 61,742 acres (21.6%) within the RCIS Area, which is about 15% of the Pajaro River Watershed that also includes portions of San Benito, Monterey, and Santa Clara counties. The valleys within this watershed are largely cultivated or developed, but are innervated by important streams for steelhead and other aquatic species, which include 184 miles of perennial and intermittent streams; this watershed also features sloughs, lakes, and wetlands that dot the landscape. The watershed is ringed by the Southern Santa Cruz Mountains which support extensive grasslands important for raptors, and intact habitat that has been identified as essential for maintaining habitat connectivity between the Santa Cruz Mountains and the Gabilan Range to the south.

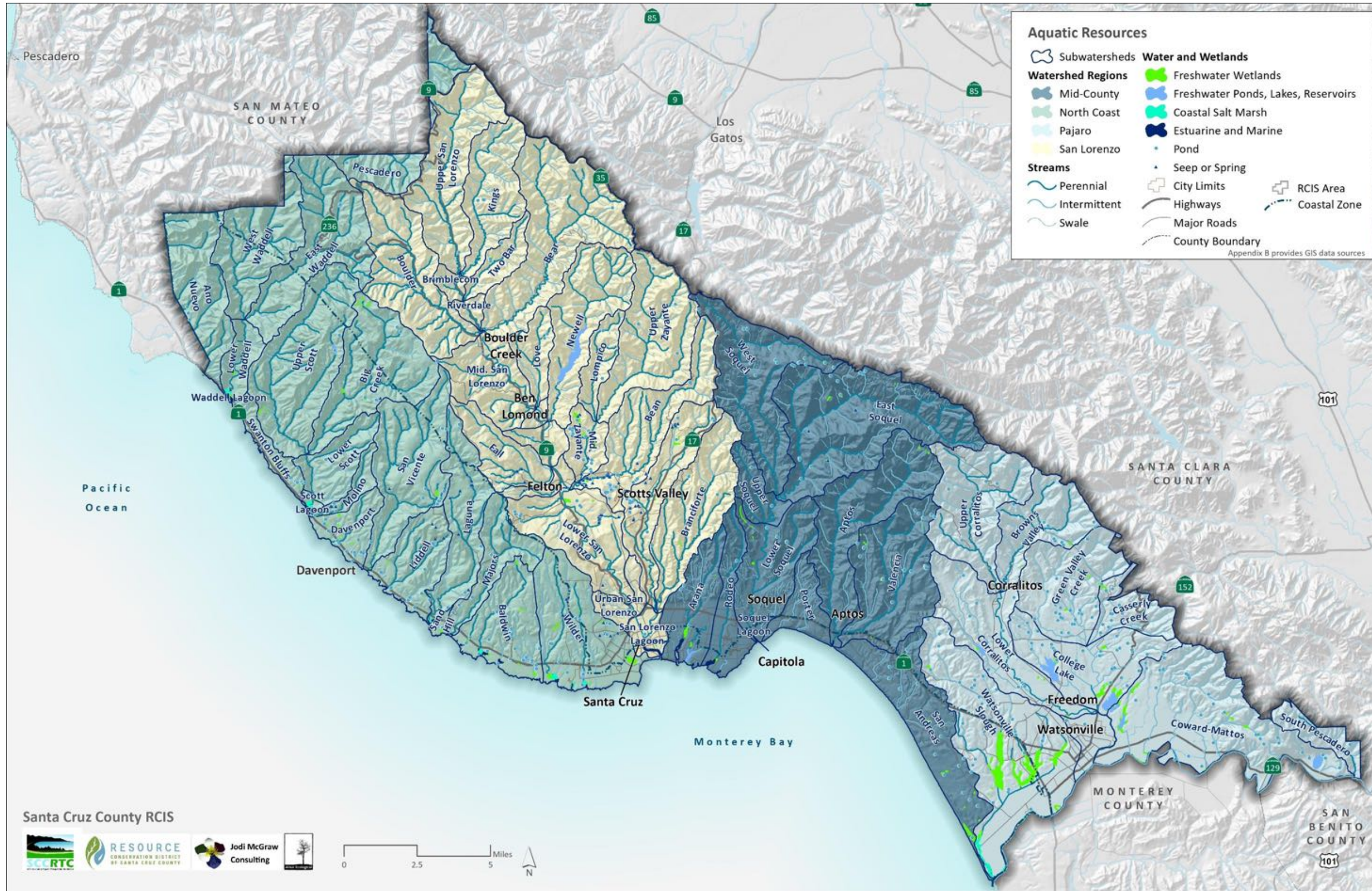


Figure 2-8: Aquatic Resources

2.4.5 Natural Communities and Other Land Cover

The RCIS Area supports a mosaic of natural communities, which reflect the RCIS Area's variable soils, hydrology, topography, and disturbance history, among other factors. They include aquatic systems such as streams, lakes, ponds, sloughs, and estuaries (Figure 2-8), and terrestrial systems including grasslands, shrublands, woodlands, and forests, as well as wetlands (Figure 2-9). These natural systems occur amidst other land cover types, including urban and cultivated lands (Table 2-8, Figure 2-9).

This RCIS used the best available information to map the natural communities. Available GIS data were incorporated in a stepwise fashion and decision rules were developed to control which layers were given priority in areas of overlap so that more accurate and/or more biologically relevant information was reflected in the final map and table (Table B-2). Crosswalks were used to compile the various sources into the common classification for the RCIS, and relate those types to the California natural communities list (CDFW 2020c), the California Wildlife Habitat Relationships (CWHR) classification system (CDFW 2018), and the CDFW list of sensitive natural communities (CDFW 2009, 2020c).

The Santa Cruz Mountains Stewardship Network is developing a fine-scale vegetation map for the Santa Cruz Mountains bioregion, including all of Santa Cruz County. The Vegetation Map and Landscape Database Project will combine high-quality lidar data, high-resolution optical imagery, fieldwork, and local expert input to create detailed maps and datasets of fine-scaled vegetation consistent with the Manual of California Vegetation (Sawyer et al. 2009, CNPS 2021). Other project products include vegetation lifeform mapping, multiclass impervious/permeable surface mapping, detailed lidar-derived topographic/terrain models, and a countywide 5m fire fuels model. The fine-scale vegetation map, which is slated to be completed in Fall 2022/Winter 2023, is anticipated to be an invaluable tool in implementation of this RCIS, by helping users locate areas for conservation actions. Any updates to this RCIS are anticipated to integrate the data or future high-resolution data.

The following sections briefly describe the aquatic and terrestrial natural communities in the RCIS Area.

Table 2-7: Natural Communities and Other Land Cover

Natural Community or Other Land Cover	CDFW Natural Communities ¹	California Wildlife Habitat Relationship (CWHR) Type ²	Sensitive Communities ³	Area (acres)	% of RCIS Area	% Protected ⁴
Grasslands				14,715	5.2%	32
Grasslands	California Annual and Perennial Grassland	Annual Grass, Perennial Grass, Wet Meadow	Yes (partial)	14,715	5.2%	32
Shrubland				22,725	8.0%	37
Coastal Scrub	California Coastal Scrub Macrogroup	Coastal Scrub	Yes (partial)	12,689	4.5%	42
Chamise Chaparral	California Chaparral Macrogroup	Mixed Chaparral	No	2,002	0.7%	37
Maritime Chaparral	California Chaparral Macrogroup	Mixed Chaparral	Yes	8,033	2.8%	31
Hardwood Woodland/Forest				28,793	10.1%	28
Coast Live Oak	Coast Live Oak Woodland Alliance and Shreve Oak Forest Provisional Alliance	Coastal Oak Woodland	Yes (partial)	19,056	6.7%	29
Coastal Mixed Hardwood	California Forest and Woodland Macrogroup	Coastal Oak Woodland	Yes (partial)	6,326	2.2%	27
Riparian Woodland	Southwestern North American riparian flooded and swamp forest macrogroup	Valley Foothill Riparian, Montane Riparian	Yes	3,412	1.2%	30
Conifer Woodland/Forest				154,917	54.3%	41
Knobcone Pine	Knobcone pine forest alliance	Closed-Cone Pine- Cypress	Yes	6,463	2.3%	57
Sandhills	Silverleaf Manzanita Chaparral Alliance, Ponderosa pine forest Alliance	Mixed Chaparral	Yes	5,630	2.0%	35
Sand Parkland	Ponderosa Pine Forest Alliance	Ponderosa Pine	Yes	255	0.09%	70

Natural Community or Other Land Cover	CDFW Natural Communities ¹	California Wildlife Habitat Relationship (CWHR) Type ²	Sensitive Communities ³	Area (acres)	% of RCIS Area	% Protected ⁴
Monterey Pine	Bishop pine – Monterey pine forest alliance	Closed-Cone Pine-Cypress	Yes	694	0.24%	38
Santa Cruz Cypress	Santa Cruz cypress groves alliance		Yes	209	0.07%	50
Pacific Douglas-Fir	Douglas fir forest alliance	Douglas Fir	No	6,883	2.4%	38
Redwood – Douglas-Fir	Redwood forest alliance	Redwood	Yes (partial)	11,993	4.2%	49
Redwood	Redwood forest alliance	Redwood	Yes (partial)	122,791	43.1%	39
Aquatic Systems and Wetlands				1,902	0.67%	54
Perennial Streams		Riverine	Yes	567 miles ⁵		36
Intermittent Streams		Riverine	Yes	317 miles ⁵		32
Swales (Ephemeral Streams)		Riverine	Yes	684 miles ⁵		37
Freshwater Wetlands	Arid West freshwater emergent marsh	Freshwater Emergent Wetland	Yes	793	0.28%	64
Coastal Salt Marsh	Temperate Pacific tidal salt and brackish meadow	Estuarine, Saline Emergent Wetland	Yes	125	0.04%	57
Freshwater Ponds, Lakes, Reservoirs ⁶	NA	Lacustrine	Yes	829	0.29%	49
Estuarine and Marine	NA	Estuarine and Marine	Yes	155	0.05%	30
Other				62,209	21.8%	10
Barren/Rock	NA	NA	No	512	0.18%	43
Non-Native/Ornamental	Eucalyptus, tree-of-heaven, black locust groves, semi-natural alliance	Urban	No ⁷	2,590	0.9%	19
Beach, Dunes, and Rocky Shore	Vancouverian Coastal Dune and Bluff Macrogroup	Barren (for Dunes)	Yes	588	0.2%	56
Cultivated	NA	Numerous types ⁸	No	26,415	9.3%	13

Natural Community or Other Land Cover	CDFW Natural Communities ¹	California Wildlife Habitat Relationship (CWHR) Type ²	Sensitive Communities ³	Area (acres)	% of RCIS Area	% Protected ⁴
Urban ⁹	NA	Urban	No	32,105	11.3%	5
Total				285,261	100.0%	32

¹ CDFW Natural Communities List complies with the National Vegetation Classification Standard (NVCS). NVCS is a hierarchical classification consisting of eight levels including three CDFW natural community levels: macrogroup, group, and alliance (CDFW 2020c).

² Defined using California Wildlife Habitat Relationships (CWHR) classification system (CDFW 2018).

³ “Yes” indicates natural communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects (CDFW 2009, 2020c). “Yes (partial)” identifies natural community and other landcover categories for which a subset of the mapped area is sensitive. For example, native perennial grasslands are sensitive communities while California annual grasslands are not. “No” indicates land cover types that do not qualify as ‘sensitive communities’. Additional areas, such as eucalyptus groves that are a type of non-native/ornamental land cover, can be sensitive habitat under various location and state designations if they support rare species such as monarch butterfly.

⁴ The percentage of the vegetation or land cover type that is within an existing protected land, which was calculated using the gap analysis described in Section 5.2. Note that all acreages and percentages may not sum correctly due to rounding error

⁵ Stream miles are not included in calculations of the percentage of RCIS Area or the percentage of the RCIS Area that is protected.

⁶ The area (acreage) of water is underestimated, as most streams are mapped as linear features so their wetted area is largely not reflected as ‘water’. Lakes, ponds, and reservoirs mapped within the vegetation and other land cover dataset total 829 acres; however, this does not include smaller ponds including those mapped as points (Figure 2-8), which are not reflected in this area. In general, the mapping of aquatic systems (as well as other plant communities and land cover) in the RCIS is regional scale and not intended to delineate jurisdictional waters, wetlands, or other habitat features.

⁷ Eucalyptus and other non-native trees do not constitute sensitive natural communities as defined by CDFW (2009, 2020c); however, these trees can constitute a ‘sensitive habitat’ under the Coastal Act when they support overwintering Monarch butterflies, provide bird rookeries, and/or support nesting raptor species.

⁸ Cultivated lands include: pasture, dryland grain crops, irrigated hayfield, irrigated row and field crop, cropland, deciduous orchard, evergreen orchard, vineyard.

⁹ Urban denotes areas that are developed or otherwise built up as mapped in the Farmland Mapping and Monitoring Program (DOC 2016). In compiling the vegetation map, areas mapped as featuring sandhills, riparian woodland, or other sensitive habitat were retained and ‘override’ areas mapped as urban/built up, to reflect their conservation value (Table B-2).

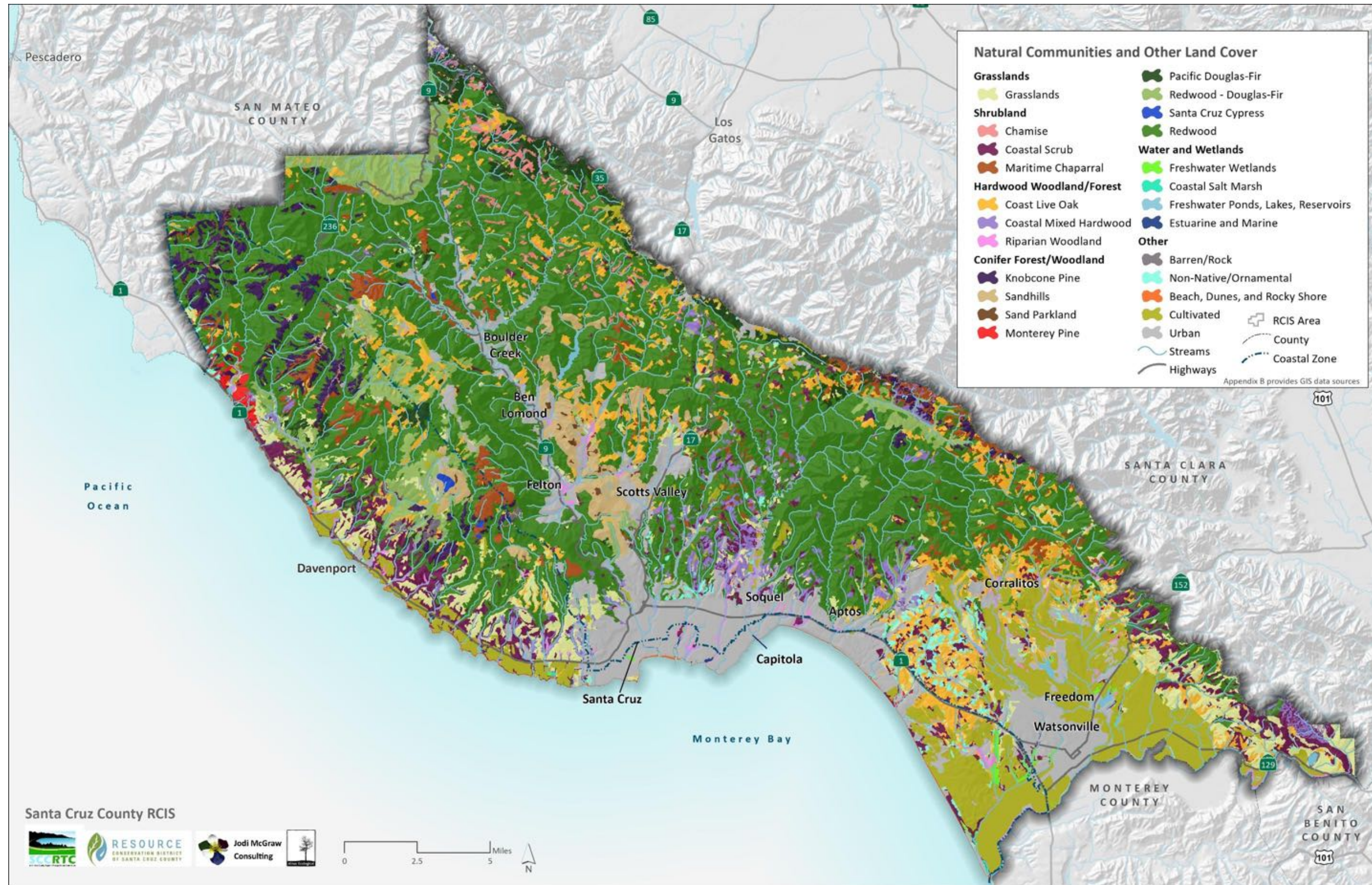


Figure 2-9: Natural Communities and other Land Cover Types

2.4.5.1 Aquatic Systems

The RCIS Area features a high concentration of the Central Coast's important aquatic ecosystems including streams, sloughs, wetlands, ponds, and lakes. The RCIS Area features 587 miles of perennial, 323 miles of intermittent streams, and an additional 686 miles of swales that collectively support diverse assemblages of aquatic invertebrates, fish, and amphibians, including steelhead and coho salmon. The region's streams originate in, and flow to the ocean within, the RCIS Area, except for the Pajaro River, which originates in Santa Clara and San Benito counties but flows into the Monterey Bay within the RCIS Area, and a small reach in the Pescadero Creek headwaters that originates in the RCIS Area but drains into San Mateo County. The remaining streams all drain into the Monterey Bay National Marine Sanctuary, where they can have important implications for water quality and habitat conditions in the near-shore environment (Figure 2-8). Where they meet the ocean, several of the streams feature estuaries (i.e., lagoons) that are important for steelhead, tidewater goby, and a host of other riverine and marine species. Streams and lakes in the RCIS Area support over 3,500 acres of riparian woodlands, which are important for maintaining aquatic habitat, support diverse assemblages of native animals, including neotropical migratory birds, and provide essential corridors for wildlife movement, particularly in urban or cultivated areas.

Santa Cruz County's streams and riparian areas have been impacted by factors that degrade habitat, including residential development, stream channelization, loss of riparian vegetation, excessive sedimentation, and pollution (Mackenzie et al. 2011). In addition to these stressors, substantial declines in fish populations in Santa Cruz County have resulted from the reduction of habitat quantity and quality related to streamflow reductions from direct diversion and groundwater withdrawal. Instream flow requirements for fish and other aquatic species varies by season, stream, and reach within stream. Impacts to streamflow from consumptive use are more pronounced during the dry season in summer and early fall. During this time, surface diversions and groundwater pumping can reduce water quality, dry streambeds, adversely affect spawning and migration, and disconnect aquatic habitat (County of Santa Cruz 2020b).

Located at the interface between the riverine and marine communities, the bar-built estuaries in the RCIS Area create over 100 acres of habitat that evolve over the course of year as the estuary transforms from a tidal dominant system during open bar conditions to a more freshwater dominated system when the bar is closed. Depending on the season and salinity, estuaries can provide habitat for migratory and wetland birds, rearing steelhead, spawning tidewater goby, California red-legged frog, and Southwestern pond turtle. Estuaries are highly sensitive to changes in sea-level rise, ocean energy and precipitation patterns as well as pollutants from their upstream watersheds.

The RCIS Area features numerous lakes, ponds, and reservoirs totaling more than 800 acres³ which provide habitat for aquatic species including pond-breeding reptiles and amphibians, support riparian vegetation important for many species including neotropical migratory birds, provide a source of free water for terrestrial species, including bats, and provide floodwater detention.

The RCIS Area also features abundant wetlands, including freshwater emergent wetlands associated with the streams, ponds, and reservoirs, as well as brackish and saltwater wetlands near the coast. The RCIS wetlands include the Watsonville Sloughs, which are one of the largest remaining coastal wetland ecosystems in California, and critically important for migratory and wetland birds, and special-status species such as the California red-legged frog and Southwestern pond turtle (Mackenzie et al. 2011). These wetlands attenuate floodwaters and improve water quality, providing important ecosystem services (Schmidt et al. 2015).

Santa Cruz County waters provide drinking water for residents and visitors, critical habitat to numerous threatened and endangered species and opportunities for recreational and commercial activities. Nearly all of Santa Cruz County's water supply (all but 0.1%) is locally derived, which is unique given much of the State's reliance on federal and state water projects: in Santa Cruz County, 21% of the water supply is from surface water, 76% is from groundwater, and the remaining 3% is recycled water (County of Santa Cruz 2019b). However, like many other areas of California, the County faces water resource challenges including impaired water quality, inadequate water supply, over-drafted groundwater basins, depleted streams, and degraded riparian habitat (County of Santa Cruz 2019b). Depletion of groundwater can have implications for groundwater dependent ecosystems in the RCIS Area, including springs, ponds, lakes, streams, wetlands, karst caves, and deep-rooted plant communities, including riparian woodlands. Efforts are underway as part of the Sustainable Groundwater Management Act (and building on previous efforts) to manage groundwater in the Santa Margarita, Santa Cruz Mid-County, and Pajaro Valley basins (SCMCGA 2019, County of Santa Cruz 2019a, SMGA 2021, PVWMA 2021).

2.4.5.2 Terrestrial Systems

The RCIS Area features a mosaic of terrestrial plant communities, which reflect variation in geology, soils, microclimate, hydrology, and land use history; in some cases, the history of disturbance including fire can influence the current community type (Section 2.4.3). Table 2-9 provides a brief description of the mapped communities focused on characterizing their dominant species, factors influencing their distribution, and successional relationships to other communities. It also characterizes the communities according to their relationship with fire, based on the response of the dominant plant species to fire, which can have important implications for the maintenance of biodiversity within the communities.

³ Lakes, ponds, and reservoirs mapped within the vegetation and other land cover dataset total 829 acres; however, this does not include smaller ponds including those mapped as points in Figure 2-7, which add to this area.

Table 2-8: Brief description of the Natural Plant Communities in the RCIS Area

Community and Extent in RCIS Area	Fire Relationship ¹	Brief Description
Grasslands 14,715 ac. (5.2%)	Fire adapted	<ul style="list-style-type: none"> • Upland, herbaceous communities dominated by grasses • Includes coastal prairie grasslands, which feature diverse assemblages of native grasses and forbs in areas within reach of coastal fog, including marine terraces featuring claypan soils • Also includes California annual grasslands dominated by exotic annual grasses but with scattered native herbs and grasses. • Some grasslands are anthropogenic clearings in shrublands and forests, rather than edaphic (soils based)
Shrubland 22,725 ac. (8.0%)		Shrub-dominated communities that generally occur on inimical (thinner, nutrient poor) soils compared to forests
Coastal Scrub 12,689 ac. (4.5%)	Fire adapted	<ul style="list-style-type: none"> • Shrubland dominated by soft-wooded, evergreen, relatively short (1-2 m tall) shrubs • Dominant species include coyote brush (<i>Baccharis pilularis</i> ssp. <i>consanguinea</i>) and California sagebrush (<i>Artemisia californica</i>) • Primarily occurs on slopes near the ocean, but can occur on dry slopes inland • Successional (i.e., later successional sere) with some grasslands, which can be converted to coastal scrub in the absence of grazing, fire, or other disturbance
Chamise Chaparral 2,002 ac. (0.70%)	Fire adapted	<ul style="list-style-type: none"> • Shrubland dominated by sclerophyllous (thick leaved), hard-wooded shrubs that are generally taller (2-4 m) than in coastal scrub • Occurs in inland portions of the RCIS Area, away from reach of the coastal fog, which supports maritime chaparral • Dominated by chamise (<i>Adenostoma fasciculatum</i>), and other fairly widespread chaparral shrubs such as black sage brittleleaf manzanita (<i>Arctostaphylos crustacea</i> ssp. <i>crustacea</i>) and yerba santa (<i>Eriodictyon californicum</i>)

Community and Extent in RCIS Area	Fire Relationship ¹	Brief Description
Maritime Chaparral 8,033 ac. (2.8%)	Fire dependent	<ul style="list-style-type: none"> • Shrubland dominated by tall, sclerophyllous, hard-wooded shrubs within reach of the coastal fog • Often occurs on nutrient poor (oligotrophic) soils (e.g., decomposed granite or sand) • Supports a diverse assemblage of native shrubs including several rare manzanita species such as Ohlone manzanita (<i>Arctostaphylos ohloneana</i>) and Shreiber’s manzanita (<i>A. glutinosa</i>), and Santa Cruz manzanita (<i>A. andersonii</i>), as well as more widespread species such as crinite (<i>A. crustacea</i> ssp. <i>crinita</i>) and sensitive manzanita (<i>A. nummularia</i>) • Communities dominated by silverleaf manzanita are included within the ‘Sandhills’ mapping unit, though they are a form of maritime chaparral • Communities featuring scattered closed-cone pines (knobcone pine and Santa Cruz cypress) are classified based on the trees; however, these communities are ecologically similar and intergrade with maritime chaparral (and Sandhills)
Hardwood Woodland/Forest 28,793 ac.(10.1%)		Tree-dominated communities supporting hardwoods (dicotyledonous trees), as opposed to conifers, in the canopy which is either dense (forest) or moderate (woodland), and features shade-tolerant herbs, vines, and shrubs in the understory
Coast Live Oak 19,056 ac.(6.7%)	Fire adapted	<ul style="list-style-type: none"> • Mesic woodlands/forests on generally deep soils on coastal slopes dominated by coast live oak (<i>Quercus agrifolia</i>) • Can occur as an oak savanna where it intergrades with coastal grasslands • Inland and mid-to-high elevation stands within the RCIS Area are dominated by Shreve oak (<i>Quercus parvula</i> var. <i>shrevei</i>), which has been historically mapped as coastal live oak (or interior live oak, <i>Q. wislizenii</i>)
Coastal Mixed Hardwood 6,326 ac.(2.2%)	Fire adapted	<ul style="list-style-type: none"> • Community with a mix of hardwoods including coast live oak, Shreve oak, California bay (<i>Umbellularia californica</i>), Pacific madrone (<i>Arbutus menziesii</i>) tanoak (<i>Notholithocarpus densiflorus</i>), bigleaf maple (<i>Acer macrophyllum</i>), and black oak (<i>Q. kelloggii</i>) at higher elevations further inland

Community and Extent in RCIS Area	Fire Relationship ¹	Brief Description
Riparian Woodland 3,412 ac. (1.2%)	Fire adapted	<ul style="list-style-type: none"> • Features scattered coast redwood (<i>Sequoia sempervirens</i>) and Pacific Douglas-fir (<i>Pseudotsuga menziesii</i>), which may become more common in the absence of fire • Woodlands dominated by deciduous trees that occur in moist areas adjacent to streams or ponds and lakes • Dominant species include willows (<i>Salix</i> spp.), cottonwoods (<i>Populus</i> spp.) alders (<i>Alnus</i> spp.), box elder (<i>Acer negundo</i>), big leaf maple, and California sycamore (<i>Platanus racemosa</i>).
Conifer Woodland/Forest 154,917 (54.3%)		
Knobcone Pine 6,463 ac. (2.3%)	Fire dependent	<p>Tree-dominated communities supporting conifers (gymnosperms)</p> <ul style="list-style-type: none"> • Areas featuring knobcone pine (<i>Pinus attenuata</i>) but that lack Santa Cruz cypress or ponderosa pine • Often occurs in close association with maritime chaparral on xeric and oligotrophic (i.e., sandy and/or thin) soils; accordingly, the understory is comprised of maritime chaparral shrubs
Sandhills 5,630 ac.(2.0%)	Fire dependent	<ul style="list-style-type: none"> • Areas on Zayante sand soil in central Santa Cruz County that primarily support maritime chaparral dominated by silverleaf manzanita (<i>Arctostaphylos silvicola</i>) and associated shrubs including buckbrush (<i>Ceanothus cuneatus</i> var. <i>cuneatus</i>) • More well-developed soils, moister microhabitat areas, and/or later successional areas support woodlands/forests dominated by ponderosa pine (<i>Pinus ponderosa</i>) and coast live oak, often with scattered shrubs in the understory. • Sandhills communities include sand parkland; however, this diverse and rare community type was mapped and treated separately
Sand Parkland 255 ac. (0.09%)	Fire dependent	<ul style="list-style-type: none"> • Sandhills community characterized by scattered ponderosa pines and coast live oak, very limited or no shrubs, and a diverse assemblage of native forbs that includes

Community and Extent in RCIS Area	Fire Relationship ¹	Brief Description
		<p>several endemic species and a suite of coastal disjunct species (i.e., species primarily found in coastal beaches, dunes, and bluffs)</p> <ul style="list-style-type: none"> Occurs primarily (though not exclusively) on ridges in sandhills
<p>Monterey Pine 693 ac. (0.24%)</p>	<p>Fire dependent</p>	<ul style="list-style-type: none"> Forests dominated by Monterey pine (<i>Pinus radiata</i>), which generally feature coastal scrub shrubs and herbs in the understory Includes 639 acres of stands in the Año Nuevo region, where the species is native, as well as 5 acres near La Selva Beach where it was planted (and may be invasive)
<p>Santa Cruz Cypress 209 ac. (0.07%)</p>	<p>Fire dependent</p>	<ul style="list-style-type: none"> Areas featuring Santa Cruz cypress (<i>Hesperocyparis abramsiana</i>), which occurs in just five small stands on the western Santa Cruz Mountains on sandy soils. Canopy also features knobcone pine; understory is comprised of shrubs found in maritime chaparral
<p>Pacific Douglas-Fir² 6,883 ac.(2.4%)</p>	<p>Fire adapted</p>	<ul style="list-style-type: none"> Conifer forests dominated by Pacific Douglas-fir and featuring coast redwood as an associate Other associates include hardwoods such as Pacific madrone, tanoak, California bay, and Shreve oak
<p>Redwood – Douglas-Fir² 11,993 ac. (4.2%)</p>	<p>Fire adapted</p>	<ul style="list-style-type: none"> Conifer forests featuring a mix of Pacific Douglas-fir and coast redwood, with Pacific Douglas-fir usually dominant Hardwood associates include primarily tanoak and Pacific madrone
<p>Redwood² 122,791 ac.(43.0%)</p>	<p>Fire adapted</p>	<ul style="list-style-type: none"> Conifer forests dominated by coast redwood but also featuring Pacific Douglas-fir Hardwoods include primarily tanoak but also Pacific madrone, Shreve oak, and California bay
<p>Wetland 825 ac. (0.29%)</p>		<p>Plant communities transitional between aquatic and terrestrial systems, where the water table is usually at or near the soil surface</p>

Community and Extent in RCIS Area	Fire Relationship ¹	Brief Description
Freshwater Wetlands 793 ac. (0.28%)	Fire adapted	<ul style="list-style-type: none"> Wetlands associated with freshwater Dominated by cattails (<i>Typha</i> spp.), bulrushes (<i>Bolboschoenus</i> spp., <i>Scirpus</i> spp., and <i>Schoenoplectus</i> spp.), rushes (<i>Juncus</i> spp.) and sedges (<i>Carex</i> spp.), among others
Coastal Salt Marsh 125 ac. (0.04%)	Fire sensitive	<ul style="list-style-type: none"> Wetlands supported by brackish or saltwater Dominated by pickleweed (<i>Salicornia</i> spp.) and saltgrass (<i>Distichlis spicata</i>)
Other		
Non-Native/Ornamental 2,590 ac. (0.9%)	Varies	<ul style="list-style-type: none"> Areas dominated by non-native species including primarily trees such as Monterey cypress (<i>Hesperocyparis macrocarpa</i>) and gum (<i>Eucalyptus</i> spp.)
Beach, Dunes, and Rocky Shore 588 ac. (0.2%)	Fire sensitive	<ul style="list-style-type: none"> Areas along the coastal strand including beaches, dunes, rocky shore, and coastal cliffs and bluffs.

¹ Fire Relationship characterized based on the general response of the dominant species to fire

- **Fire dependent:** Dominated by plant species that cannot persist without recurring fire.
- **Fire sensitive:** Dominated by plant species that are killed by, and do not regenerate well following, fire, which is not an important component of the natural disturbance regime.
- **Fire adapted:** Dominated by species adapted to fire within the natural range of variation of the disturbance regime (i.e., type, seasonality, intensity, and frequency). Includes all communities not characterized as fire dependent or fire sensitive.

² The redwood and Douglas-fir forests collectively feature 10,306 acres of old-growth and older-second-growth forests

The terrestrial systems vary in areal extent from just 209 acres of Santa Cruz Cypress, which is found almost exclusively in Santa Cruz County, to nearly 123,000 acres of redwood forests (Table 2-9), of which 10,306 acres are characterized as old-growth or older-second-growth forests (SRL 2008, Singer 2012a). These terrestrial natural communities are a key component of the rich biodiversity in the area, as they support more than 1,000 native plant species known to occur in Santa Cruz County (Neubauer 2013) and create diverse habitat conditions for a wealth of native animals. The diversity reflects not only the diversity of land facets in the RCIS Area, but also its location its central location along the California Coast, where it features a mix of species found in the cooler, moister northern portions of the state, as well as those found in the hotter and drier southern region. Many of the natural communities provide essential ecosystem services including water filtration (especially forests and wetlands), carbon sequestration, and prevention of environmental hazards such as erosion including devastating floods and mudslides (Mackenzie et al. 2011).

2.4.6 Habitat Connectivity

Habitat connectivity is essential to the persistence of biodiversity and the maintenance of ecosystem processes. Specifically, it is critical to:

- Supporting species with large home ranges such as mountain lions, for which habitat within each range or portions thereof is insufficient to support persisting populations;
- Allowing individuals to migrate seasonally, in response to changes in habitat suitability, or to disperse to establish a new territory;
- Facilitating recolonization of habitat patches after a disturbance (e.g., fire);
- Promoting exchange of genetic material to facilitate population viability; and
- Enabling migration in response to climate change.

Maintaining connectivity between the Santa Cruz Mountains and adjacent mountain ranges has been identified as especially critical for several species, including mountain lion. This highly territorial species with a large home range (100-150 square miles for males) occurs at low density (Beier 1993, Morrison and Boyce 2009). Juveniles, which must disperse from their natal territories, can benefit from access to habitat in adjacent mountain ranges. Without immigration, the Santa Cruz Mountains population could decline below levels needed to maintain genetic diversity or a persisting population (Thorne et al. 2002, Gustafson et al. 2018). It will also be essential to maintain the permeability of habitat *within* the RCIS Area, including between patches of remaining intact habitat. Notably, traffic and attendant development through the Highway 17 corridor create a partial barrier to east-west movement through the RCIS Area and may impede gene flow (Wilmers et al. 2013).

Within the region's streams, habitat connectivity is essential for migration of aquatic species, including anadromous fish such as coho salmon, steelhead, and Pacific lamprey which rely on aquatic habitat connectivity for seasonal movement, to locate optimal spawning and rearing

habitat and both winter and summer refugia. Likewise, pond-breeding amphibians and reptiles, such as Santa Cruz long-toed salamander, California red-legged frog, and southwestern pond turtle, among others, rely on connectivity to move from ponds to upland habitat used for foraging, aestivation, and dispersal. Indeed, most animals require connected, permeable habitat featuring adequate plant cover and other natural features to complete their life history. Urban development, agriculture, and transportation infrastructure have impeded animal movement through the landscape.

Riparian corridors can facilitate animal movement through the landscape, and can be critical to animal movement through cultivated and urbanized areas (Hilty and Merenlender 2004). Anthropogenic factors including stream channelization, road crossings, loss of riparian vegetation; surface water diversions and groundwater extraction; encroachment from various land-uses and development; and dams and reservoirs have created barriers to in-stream migration. Meanwhile, riparian vegetation clearing as part of development and for compliance with food safety auditor requirements has reduced the width and fragmented riparian corridors in some areas, potentially constraining their ability to facilitate animal movement.

Landscape permeability and connectivity will be imperative for species to adapt to climate change (Heller and Zavaleta 2009). As the climate warms, species will require a permeable landscape to migrate within the RCIS Area as well as between the RCIS Area and adjacent areas, to stay within their climate envelope (i.e., adapted climatic tolerance), including by moving along latitudinal and elevational gradients, or to access climate refugia such as wet areas and cooler microclimates (Morelli et al. 2016).

Conservation actions should maintain or enhance habitat connectivity, as interconnected protected areas will be effective at maintaining biodiversity, especially in the face of climate change (Hilty et al. 2020).

Two major studies illuminate the priority areas to maintain or enhance connectivity in the RCIS Area.

1. **Santa Cruz Mountains Bioregion Habitat Connectivity Study (Merenlender and Feirer 2011):** To identify a patch network within Santa Cruz County, the Conservation Blueprint team collaborated with Conservation Biologist Dr. Adina Merenlender on an analysis which was designed to identify remaining patches of intact habitat and evaluate areas where corridors might be most effectively located in order to connect them (Merenlender and Feirer 2011). The patch network reflects the general naturalness of the landscape, rather than the suitability of habitat for any one species. However, the resulting patch network was compared with mountain lion movement data. A wide-ranging, territorial species that utilizes a wide variety of habitats, mountain lions represent an appropriate species for evaluating habitat connectivity in the Santa Cruz Mountains (Mackenzie et al. 2011).
2. **Bay Area Critical Linkages Study (Penrod et al. 2013):** This study identified landscape linkages to connect protected habitat located within natural landscape blocks in the Bay

Area and adjacent areas. It also identified important aquatic linkages for species such as steelhead. The linkages were developed based on analyses conducted for species include: mountain lion, California red-legged frog, foothill yellow-legged frog, and steelhead (Penrod et al. 2013).

These two complementary studies, which were conducted at different spatial scales using different methods, collectively identify key areas for maintaining habitat permeability and connectivity within the RCIS Area, and connecting the RCIS Area to important habitat beyond its borders (Table 2-10, Figure 2-10).

The Santa Cruz Mountains Bioregion Habitat Connectivity Study identified six large patches (and one patch complex) of intact habitat within the RCIS Area, as well as six Critical Areas to Maintain Landscape Permeability, which connect these large habitat patches within the RCIS Area (Table 2-10, Figure 2-10). The Critical Landscape Linkages identified through the study also highlight connections to adjacent habitat outside the RCIS Area; specifically, linkages to the Diablo Range through Coyote Valley and the Upper Pajaro River, and a linkage to the Gabilan Range through the Aromas Hills Area (Figure 2-10).

Broadly, the Bay Area Critical Linkages project identified two linkage designs to connect intact blocks of habitat in the Santa Cruz Mountains to large landscape blocks in the two adjacent mountain ranges:

- **Santa Cruz Mountains–Diablo Range:** This linkage extends from the Stevens Creek watershed southeast along the eastern slope of the Santa Cruz Mountains. The linkage connects the Santa Cruz Mountains to the Diablo Range across U.S. 101 through the Coyote Valley and across the Pajaro River corridor.
- **Santa Cruz Mountains–Gabilan Range:** This linkage extends from the Pajaro Hills through the Chittenden Gap in the western Santa Cruz Mountains south to Pinnacles National Park in the Gabilan Range.

The Bay Area Critical Linkages Project also identified Key Riparian Corridors based on streams that are important for anadromous fish. Recognizing streams provide important corridors for numerous species as well as essential breeding habitat for many birds, amphibians, and reptiles, Riparian Buffer Zones were created within 1 km of these streams to facilitate movement of species along stream corridors (Penrod et al. 2013; Figure 2-10). Identifying and removing fish passage barriers with an emphasis on those in the key riparian corridors to allow anadromous fish, including steelhead and coho salmon, to access suitable upstream habitat that is important to complete their life history. The County of Santa Cruz has assembled a local fish passage database that classifies instream barriers and can help inform and prioritize efforts to enhance connectivity within streams (Section 5.3.2).

Table 2-9: Significant Habitat Patches and Patch Complexes within the RCIS Area (Mackenzie et al. 2011)

Significant Habitat Patch or Complex	Patch Size within RCIS Area (acres)	Total Patch Size (acres)	Connected Patch or Complex
North Coast – forested area split evenly between San Mateo and Santa Cruz counties, includes Big Basin State Park and private forests in Scott Creek Watershed	33,797	70,400	Upper San Lorenzo
Upper San Lorenzo – forested area including Castle Rock State Park and adjoining private forests	11,873	11,904	North Coast
Ben Lomond Mountain – a complex of ten patches that are closely located	22,319	22,464	Loch Lomond, Aptos
Loch Lomond – forested area surrounding the Santa Cruz City Water Department’s Loch Lomond reservoir	9,647	9,664	Ben Lomond Mtn., Aptos
Aptos – forested area including Nisene Marks State Park and Soquel Demonstration Forest	14,478	14,528	Loch Lomond, Ben Lomond Mtn, Upper Corralitos
Upper Corralitos – mostly privately owned forested land north of Corralitos	5,594	5,824	Aptos, Pajaro Hills
Pajaro Hills – grasslands, shrublands, and forests that straddles the Santa Clara County line in the hills above the Pajaro Valley	7,967	24,192	Upper Corralitos
Total	105,676	158,976	

Restoration of riparian and other vegetation in the Riparian Buffer Zones can facilitate aquatic species dispersal to upland habitats, for species such as California red-legged frog that utilize both aquatic and upland habitats. Riparian areas also provide cover (i.e., shrubs and trees) used by many species to move through open habitat, and are critical to animal movement through cultivated and urbanized areas as noted above (Hilty and Merenlender 2004).

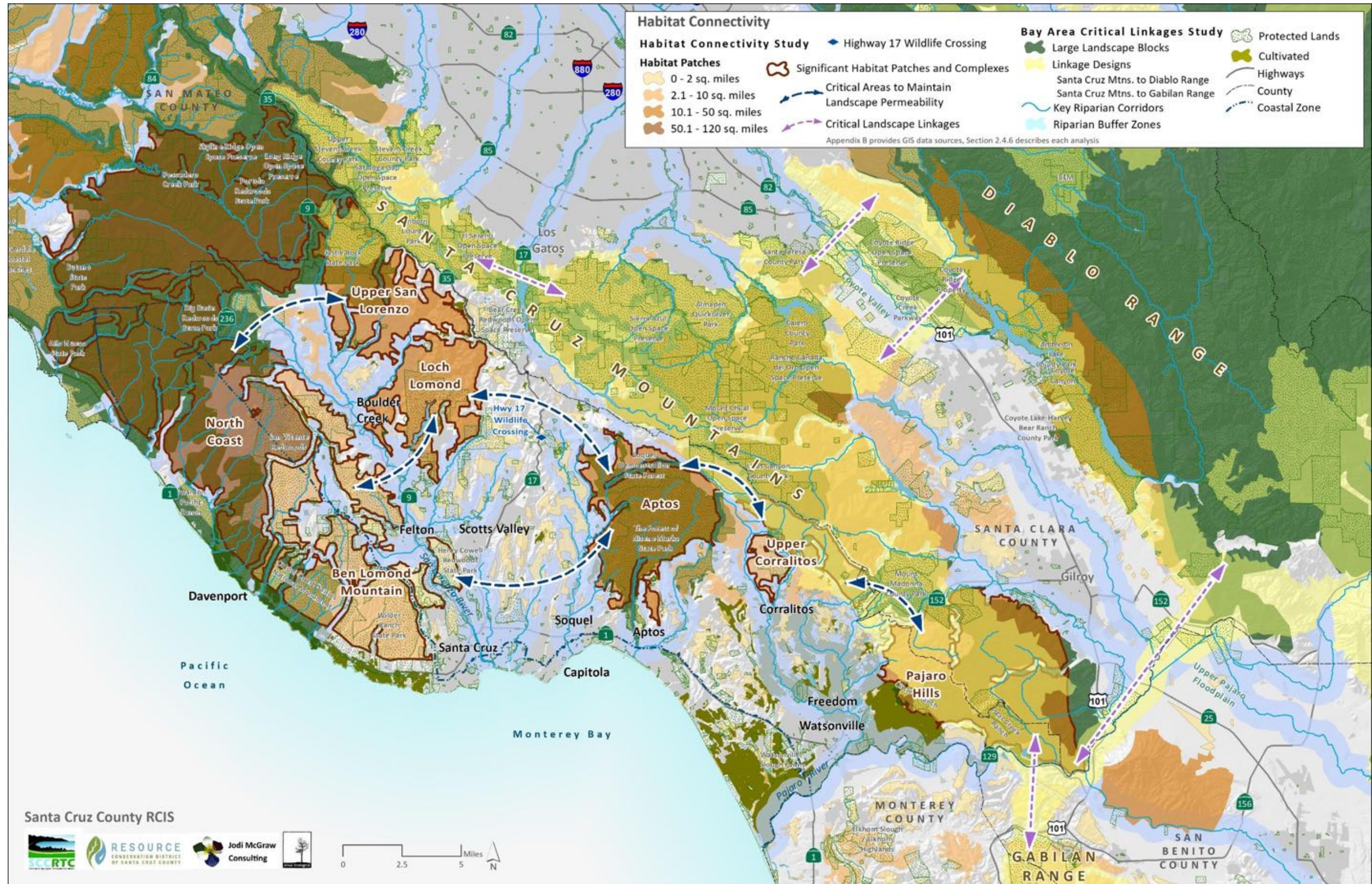


Figure 2-10: Habitat Connectivity