A Conservation Blueprint:

An Assessment and Recommendations from the Land Trust of Santa Cruz County

Review Draft

February 2011

LAND TRUST OF SANTA CRUZ COUNTY

What we do Our goal is to protect and care for the spectacular beauty and natural resources that make Santa Cruz County special. We protect working lands, like farms and timberland, and natural lands with high conservation value – thus protecting water supplies, wildlife habitats, and open space.

How we do it We believe that a relatively small investment now can save what we love forever. We protect land through a variety of means. Sometimes we buy the land from willing landowners. Sometimes we reach preservation agreements with landowners. Always, we serve as good stewards of the land under our care. We work with a wide variety of conservation partners to accomplish our goals.

What we've done The Land Trust was founded in 1978 and has directly protected 3,200 acres of land and worked with others to protect another 10,000 acres. We have protected redwood forests, rare Sandhills habitat, wetlands at the heart of the Watsonville Sloughs, and 1,400 acres of farmland in the Pajaro Valley.

Who funds our work Our work is funded by donations from individuals, as well as foundation and government grants which multiply the impact of individual gifts. During the past three years individual donations were matched $23 to $1 by grant funding.

Our Board The Land Trust is a 501(c)(3) nonprofit under the Internal Revenue Service Code (tax ID # 94-2431856) and is governed by a Board of Trustees that includes farmers, landowners, business people, conservationists, and community volunteers.

GORDON AND BETTY MOORE FOUNDATION

The Gordon and Betty Moore Foundation, established in 2000, seeks to advance environmental conservation and cutting-edge scientific research around the world and improve the quality of life in the San Francisco Bay Area. For more information, visit www.moore.org.

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Draft: February 17, 2011

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Acknowledgments

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Foreword

Through this Conservation Blueprint we, the Land Trust of Santa Cruz County and members of the Conservation Blueprint Steering Committee, offer a practical, innovative and strategic approach to protecting our way of life in Santa Cruz County—a next-generation integrated approach to conservation. In the Blueprint we:

- Recommend conservation priorities, recognizing that financial resources are limited;
- Provide practical suggestions to address water overdraft and sustain local farming;
- Offer new ideas on protecting the health of the forests that make up two-thirds of our county; and
- Propose means of sustaining a resource-rich environment for today's residents, as well as future generations.

The Conservation Blueprint captures our best thinking, and is built upon the best thinking of many others and the successes of past and current efforts. We believe the Blueprint offers real-world solutions to the complex 21st century challenges we face. The Blueprint conservation assessment and recommendations are the result of two years of intense work, drawing on the expertise of hundreds of technical and community participants. As a team, we reviewed all the known studies of Santa Cruz County and commissioned new research to gain a comprehensive understanding of health of our environment. During the document development process we consulted over 110 experts, including scientists and planners, farmers and foresters. We held four community forums to solicit the invaluable input of our diverse community. The breadth and depth of involvement in the development of the Blueprint is testimony to the commitment and passion of the Santa Cruz County community.

Conservation Blueprint goals, strategies, and actions will guide the work at the Land Trust for the next 25 years. We expect they will also inform and guide the work of all of us who are devoted to the beauty, natural richness and way of life that make Santa Cruz County so special. The Blueprint's conservation vision and goals do not fall on the shoulders of a single organization. Collaboration—among conservation partners, nonprofit organizations, landowners, community members and other Santa Cruz County stakeholders—is integral to the Blueprint's success. Together we can sustain our rich natural legacy for future generations. We urge our fellow citizens to study this Conservation Blueprint and hope it will inspire you to take action, as it inspires us. There is still much work to be done.

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Part I. Overview and Setting

This portion of the Blueprint highlights its purpose and approaches and then provides general information about Santa Cruz County and the regional conservation challenges that provide context for the Blueprint's strategies (Part II) and topical assessments (Part III).

1. Overview

The Land Trust Conservation Blueprint is a science-based and community–informed document that recommends strategies and priorities for the next generation of land conservation and resource stewardship in Santa Cruz County. The document is intended as a strategic tool for the Land Trust. It is our hope that it will serve as a resource for conservation partners, nonprofit organizations, landowners and other community stakeholders to collaboratively advance conservation efforts.

Santa Cruz County's rich natural resources, fertile land, vast network of trails and open space, diverse habitats and natural beauty are all part of the unique legacy the community is dedicated to preserving. The people of Santa Cruz County have long appreciated the link between health and well-being, and the natural world. Further, the health of the environment is the cornerstone of the County's economic engine: agriculture and tourism. The community has worked tirelessly over the years to protect its treasured coastline, preserve majestic redwoods, and conserve productive farmland. Land conservation is the protection, careful management and stewardship of land and natural resources for the long-term in ways that benefit natural and human communities. Santa Cruz County's history has been marked by many significant conservation achievements and milestones. During the last century, over 70,000 acres of wildlands, watersheds and working lands—about one-quarter of the county's land area—have been set aside as parks and protected lands. Many landowners are thoughtful stewards of the land, utilizing best farm practices, supporting resource enhancement projects, and participating in conservation easement and Williamson Act programs. Innovative programs have been put in place and hundreds of millions of dollars invested in the protection and enhancement of our watersheds and working lands. Broad stakeholder collaboration and progressive thinking have been integral to these successes.

Santa Cruz County
Conservation Achievements

- The launch of the *redwood forest preservation movement* and establishment of California's first public redwood park in *Big Basin* at the turn of the century through the efforts of the Sempervirens Club.
- The creation of *Natural Bridges State Beach* in 1933 during the height of the Great Depression.
- The passage of *Measure J* in 1978, which ushered in a countywide comprehensive *growth management program* in response to rapid development.
- The *greenbelt movement* and *open space preservation campaigns* of the 1970 and 1980s, which resulted in the protection of Pogonip (and later, Arana Gulch and the Bombay property).
- The passage of *Measure U* - the *Orderly Growth and Agricultural Protection Initiative* in the City of Watsonville in November 2002, which established an Urban Limit Line (ULL) to manage the City's future growth and protect Pajaro Valley farmland, open space and natural resources outside the ULL over a 20 to 25 year period.

1.1 Santa Cruz County's Threatened Resources: a Call to Action

Despite the community's dedication and broad-ranging accomplishments, it is critical that conservation tactics of the last century are adapted and strengthened to meet 21st century challenges. The health of Santa Cruz County's plants, animals, habitats, and water are in decline:

- Four underground aquifers that supply 80% of the county's water needs are in overdraft with groundwater being pumped faster than it can naturally be replenished.
- Eighteen of the county's waterways are listed as impaired water bodies under the Clean Water Act.
- Thirteen rare plant species and thirteen rare animal species are listed as federally threatened or endangered, including coho salmon and steelhead.
- Ex-urban development, roads, mining, fences and other human activities have fragmented diverse habitats.
- Voluntary efforts by growers to protect water quality and riparian areas are at odds with current guidelines to ensure food safety and address water quality.
- Seventeen thousand additional housing units are projected in Santa Cruz County over the next twenty-five years.
- The Monterey Bay Region is projected to grow by 146,000 people by 2035—equivalent to creating another city the size of Salinas—generating additional development, roads and traffic that will impact Santa Cruz County's air, water, habitat, working lands and recreational resources.

Early in this 21st century, we face both old and new challenges: water shortages, climate change, the encroachment of development, the future of local farming, the survival of our forests as functioning ecosystems and productive timberlands. Community members are critical partners in implementing long-term sustainable conservation solutions. As a community of people dedicated to conservation in Santa Cruz County, we—the Land Trust, conservation partners, nonprofit organizations, landowners and all community stakeholders—must unite to address these challenges and sustain the rich natural legacy that so many have endeavored to protect. We have both the opportunity and responsibility to strategically advance our approach to conservation so that future generations can enjoy and prosper from the healthy, natural environment that so distinctly defines Santa Cruz County.

The next generation of conservation will benefit from comprehensive and integrated approaches to protecting and maintaining vital "ecosystem services" necessary for the long-term health of our land, water, wildlife and human communities. This will require trust, compromise and a shift in thinking. It will require leadership, collaboration and coordination. And, it will require that we make the investments needed to safeguard land and natural resources. As members of the Santa Cruz County community, each of us has a role to play in preserving the long-term health and viability of our county's natural resources. We urgently need to act now to:

- Further integrate conservation efforts across the regional landscape, linking public and private lands.
- Work effectively across jurisdictions, ownerships and county boundaries.
- Integrate conservation of natural areas, working lands and recreational lands into regional land use and transportation planning to create more sustainable human communities.
- Anticipate the impacts of global climate change and manage the landscape collaboratively and adaptively.
- Expand the scale and impact of voluntary conservation.
- Identify market-based conservation and voluntary stewardship incentives for conservation on private lands.

- Identify diverse conservation tools and funding sources.
- Focus precious resources on the most critical conservation projects first.
- Protect lands that achieve multiple conservation benefits for humans and wildlife.
- Build on our successes to protect the enormous public investment that has been made in our natural resources and working lands.

How you can help:

- If you are a *community leader*, consider using the Blueprint to advance your leadership role in the conservation of natural and agricultural resources. Initiate formation of a Community Task Force to look at feasibility and implementation of Blueprint goals.
- If you work for a conservation *agency or organization* whose mission includes the protection of land and natural resources, consider using the Blueprint as a tool to promote partnerships and support your mission.
- If you a *concerned citizen*, actively participate in the development of conservation policies and programs, and support your local conservation organizations.

1.2 A Vision for Santa Cruz County's Resource-Rich Legacy

Hundreds of stakeholders, including the Land Trust of Santa Cruz County, the Blueprint Steering Committee, Technical Advisors, and community members collaborated to develop ideas for a preferred future for Santa Cruz County. These ideas, along with the technical assessment findings, provide the foundation for the Blueprint's goals and critical next steps (outlined in Part II: Conservation Approach).

We envision a future in which…

- There is broad recognition that the health and sustainability of our natural resources and the health and viability of our local economy are inextricably linked
- Conservation efforts are integrated across a network of healthy, safe and well-managed public and private lands
- Rare and unique biological communities are protected and landscape linkages for wildlife maintained
- Healthy restored watersheds from upper headwaters to the ocean provide adequate clean water for fish and humans and the region's groundwater basins are brought back into balance
- There is increasing awareness that resource lands and working lands, both public and private, provide our cities and communities with essential environmental services needed to maintain our quality of life
- Education and awareness increases among landowners and homeowners that every place can play a part in maintaining healthy ecosystems
- The County's parks, open space, watersheds, and working lands are considered critical "green infrastructure" in developing future regional land use plans and a Sustainable Communities Strategy
- All residents, regardless of income or where they live, have opportunities to connect with recreational opportunities and interact with nature

- Government agencies, businesses, landowners, organizations and individuals take ownership of and implementation responsibility for this Blueprint and securing the resources necessary *to implement it*

1.3 Blueprint Purpose

The Conservation Blueprint is a science-based and community–informed document that recommends strategies and priorities for the next generation of land conservation and resource stewardship in Santa Cruz County. Over the next 25 years, the Conservation Blueprint will serve as a strategic tool for the Land Trust of Santa Cruz County to:

- Make informed conservation choices and investments;
- Enhance cooperation and coordination;
- Accelerate the pace and effectiveness of conservation; and
- Better position the County and region for state, federal and private funding for land protection and resource stewardship.

Sustainability

"Sustainability" means meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.

The Bruntland Commission
of the United Nations.
March 20, 1987

It is our hope that the Land Trust's Conservation Blueprint will serve as a resource for conservation partners, nonprofit organizations, landowners and other community stakeholders to collaboratively advance conservation efforts in Santa Cruz County.

The Blueprint draws together existing data, adopted plans, expert opinion and diverse input from conservation partners, stakeholders and the public to propose recommendations for protecting and maintaining critical biodiversity, water, agricultural and recreational resources. It describes a preferred vision for the next generation of land and resource conservation in Santa Cruz County and the Santa Cruz Mountains Region and proposes a strategic path to get there. The document identifies goals, strategies and actions to serve as a "conservation strategy", highlighting where effort and resources could best be focused in the long term to preserve rare and unique biological communities, maintain linkages for wildlife movement, protect and enhance our water resources, retain the viability of working lands, and enhance open space recreational resources. The Blueprint is an adaptive document that will be updated over time as conditions and needs change. It initiates a new era of conservation in Santa Cruz County—one focused on the protection of multiple conservation values across the landscape and the coordinated efforts needed to get there.

More specifically, the Conservation Blueprint document:

- Builds on the significant efforts and successes of many public agencies, conservation organizations and community groups to inform Santa Cruz County's conservation role in the larger region;
- Recommends a network of protected public lands, working lands and linkages that have the potential to achieve multiple conservation values and benefits for people and nature;
- Emphasizes the need for integrated conservation programs, policies and projects and the need to move beyond jurisdictional boundaries to better coordinate regulatory, policy and protection efforts;

- Highlights the importance of using a variety of existing and new voluntary conservation tools, including stewardship incentive payments to maintain vital ecosystem services; and
- Provides a basis for integrating climate change mitigation and adaptation into conservation planning and investment decisions.

1.4 Blueprint Role and Relationship to Adopted Plans and Policies

The Blueprint is not a regulatory document, nor is it meant to replace adopted plans and policies of public agencies and organizations. The document builds on the successful policies, programs and projects in Santa Cruz County and the efforts of nonprofit organizations, public agencies and individuals that have acted to protect the county's unique resources. It is the Land Trust's hope that the Conservation Blueprint will serve as an important resource that may inform conservation partnerships and investments around the region.

The Blueprint does not prescribe the use of any specific land protection tools or roles for entities. There are many different land protection tools and the use of them must be tailored to the needs of the resource and the desires of willing landowners and conservation partners. Effective implementation of the Blueprint strategies and actions will require participation, coordination and cooperation amongst numerous local, state and federal agencies, conservation organizations and private landowners.

The Blueprint is not an acquisition plan and does not identify specific properties to purchase or protect. The Blueprint also does not identify *all* lands worthy of protection or *all* worthwhile conservation projects in Santa Cruz County.

1.5 Blueprint Development Process

In May 2009, with funding from the *Gordon and Betty Moore Foundation,* the Land Trust of Santa Cruz County undertook an ambitious collaborative planning process to address the long-term viability of the region's biodiversity, water resources, working lands, and recreational areas. In order to inform the Blueprint's key findings and recommendations, the process involved an 18-month collaboration with over 110 technical experts, including the region's leading scientists, researchers, planners and technical professionals on biodiversity, water resources, working lands, recreation and regional planning. In addition, the process benefited from the insight of diverse community members and stakeholders.

More specifically, the Blueprint development process involved the following tasks:

- Designating a seven-member Steering Committee to advise the Land Trust's Blueprint team, comprised of leaders from water, resource and recreation agencies, conservation organizations, universities and the private sector.
- Collecting, synthesizing and analyzing relevant land use, conservation and resource data for the County and identifying information gaps.
- Determining conservation targets and important areas for conservation through input, modeling, analysis and refinement.
- Soliciting input on conservation goals, targets and methods from local and regional experts at a series of Technical Advisory meetings.
- Organizing additional meetings as necessary with focus groups and experts to fill in data gaps.

- Launching an interactive web portal at project inception to provide broad community access to the project.
- Hosting four countywide Community Forums (funded in part by the *Santa Cruz Community Foundation*) to engage citizens in the Blueprint development process and to hear what they value most about Santa Cruz County's environment.
- Conducting additional evaluation and analysis of current land use and future growth scenarios, land values and landscape connectivity.
- Working in coordination with the Steering Committee to draft and refine the Conservation Blueprint goals, strategies, and actions and prepare the document for public comment.
- Blueprint Organization and Strategic Components

1.6 Blueprint Organization

The Blueprint contains three parts:

Part I: Overview and Regional Setting: An overview of the planning process and document, and a description of existing conditions, trends, and challenges.

Part II: Conservation Approach: The strategic portion of the document that details specific conservation goals related to critical conservation topic areas; and describes the Land Trust's integrated approach to prioritizing conservation efforts. This section also outlines critical next steps.

Part III: Conservation Assessment: The technical portion of the document dedicated to four vital conservation topics that relate to Santa Cruz County's natural environment: Biodiversity; Water Resources; Working Lands; and Recreation and Healthy Communities. This section presents an assessment of current conditions, including challenges, opportunities and key findings.

Maps, graphics and tables provide detailed information. Graphic sidebars and shaded text boxes present supportive information, including technical terminology, contextual information and success stories. A glossary and the references, as well as appendices containing additional information including methodologies, are located at the end of the document.

The Blueprint document provides a number of **strategic components** to assist conservation partners in coordinating efforts, sharing information, targeting high value projects and advancing conservation efforts as a whole.

- Goals, strategies and actions to inform future conservation of natural lands, water resources, working lands and recreational lands in the county.
- An integrated conservation approach to identify high-value conservation areas that may offer the best opportunities to achieve broad-reaching multiple benefits related to biodiversity, water resources, working lands, and recreation and healthy communities.
- Maps to illustrate existing conditions as well as strategic Land Trust proposals and significant biodiversity, water, working lands and recreational areas.
- Links to important source documents including regional conservation plans, technical reports and organizational contacts.

- A comprehensive downloadable GIS database package.

In addition, a user-friendly web-based GIS tool known as "Explorer," available by December 2011, will facilitate use of this document's data, allowing individuals and organizations to evaluate and compare potential conservation projects. The tool will be available through the Land Trust of Santa Cruz County www.landtrustsantacruz.org and the Bay Area Open Space Council http://openspacecouncil.org/.

2. Regional Setting and Challenges

Santa Cruz County is the second smallest county in California, containing a total of 441 square miles or approximately 285,000 acres. It features diverse natural resources, varied topography and landscapes, including the forested Santa Cruz Mountains, the Mid-County coastal terraces, and the alluvial plains of South County (Figures 2-1 and 2-2).

The mountainous county includes 18 principal watersheds, all of which drain into the Monterey Bay National Marine Sanctuary. The San Lorenzo River encompasses 138 square miles and is the largest watershed lying completely within the county. The Pajaro River Watershed includes the Watsonville Sloughs, one of the largest remaining coastal wetland ecosystems in California, and critically important for migratory and wetland birds, and listed species such as the California red-legged frog and Western pond turtle. Rivers and streams that originate in the upper watersheds of the county's forested lands provide drinking water to over 90,000 residents in and around the City of Santa Cruz and coastal streams totaling 850 miles, support steelhead and coho salmon. Santa Cruz County features a high concentration of the Central California Coast's important aquatic ecosystems, including coastal streams, sloughs, wetlands, ponds, and lakes that support a diversity of wildlife. Santa Cruz County is considered a global "hot spot" for biodiversity for its abundance of native plants, including 1,200 native plant species and 17 endemic species found nowhere else in the world. The County includes diverse natural communities, from the globally rare old growth redwood forests and Santa Cruz Sandhills, to the northern maritime chaparral, and coastal prairie grasslands. The County also supports a diversity of animal species including more than 350 bird species and 11 endemic animals found nowhere else. Santa Cruz County also plays a critical role in regional landscape connectivity; specifically, providing wildlife linkages between the Santa Cruz Mountains and the Gabilan Range to the south and the Diablo Range to the east.

Santa Cruz County has an amazing network of protected lands (Inset Box), which includes public parks, trails, open space and beaches with about 45,000 acres in the State Parks system, 7,000 acres within county and city parks, over 231 miles of trails, including the California Coastal Trail and Bay Area Ridge Trail, and 12 nature centers (Figure 2-3). In annual surveys conducted for the Community Assessment Project, residents consistently and overwhelmingly identify the County's scenery, geography, and climate as the factors that contribute most to their quality of life (CAP 2010).

Approximately 78,000 acres or 27% of the County is protected in parks, public land or through conservation easements. This compares to 39% in protected status in San Mateo County and 29% in Santa Clara County respectively (Appendix D). Approximately 31,700 acres or 11 % of the County is urban or built up land and 40,000 acres or 14 % of the County is in agricultural use.

What are Protected Lands?

Lands that are held in fee title or protected via conservation easement by public agencies and non-governmental organizations including:

- Parks and open space preserves
- Conservation easements on working lands
- Lands protected via deed restrictions
- Other federal, state, county, city, and special district lands
- Other public or private lands managed for resource protection

*This does not include areas protected by policies (e.g. Timber Production Zone) or temporary conservation programs (e.g. Williamson Act, County Open Space Easements)

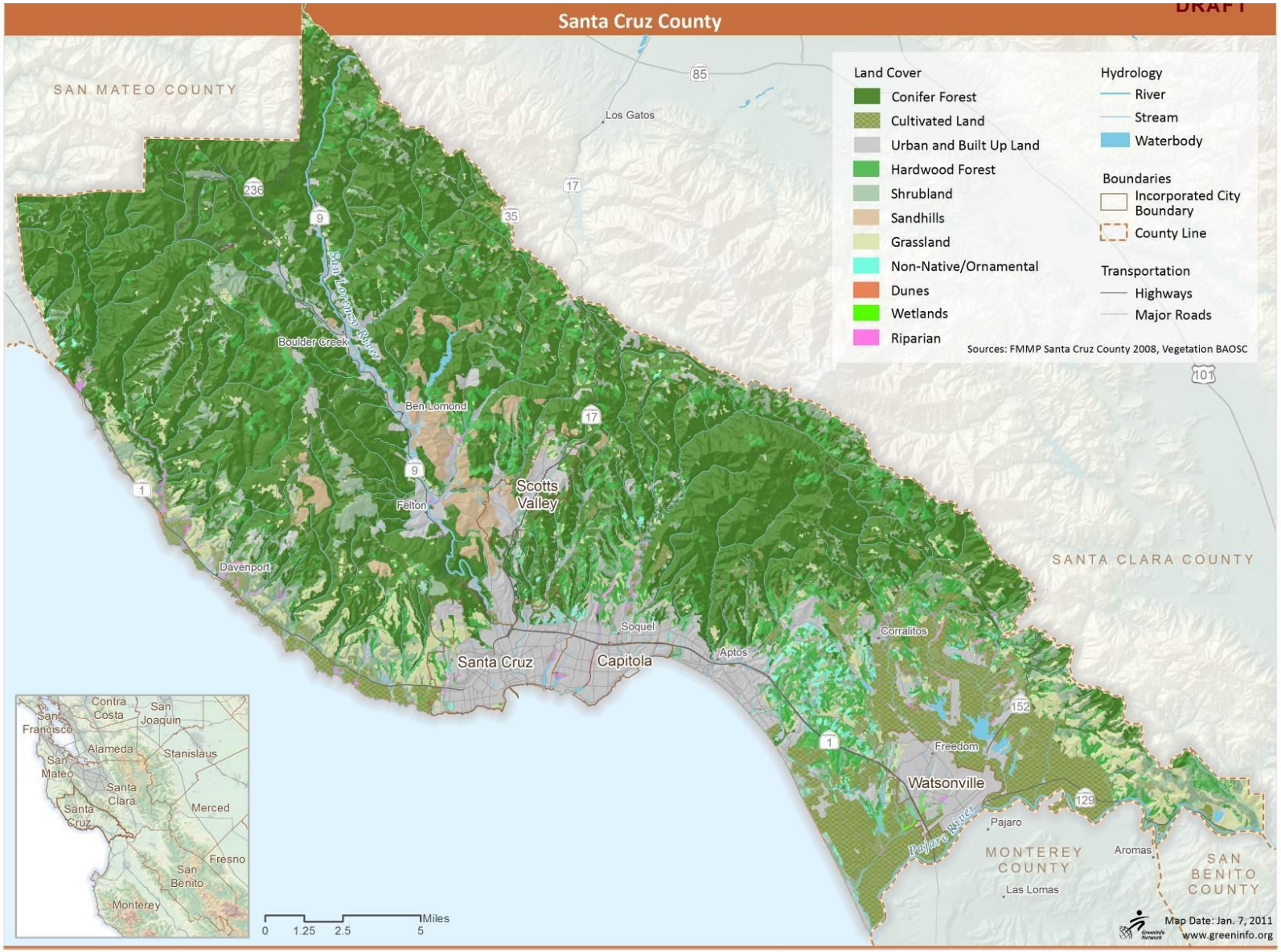

Figure 2-1: Land Cover in Santa Cruz County

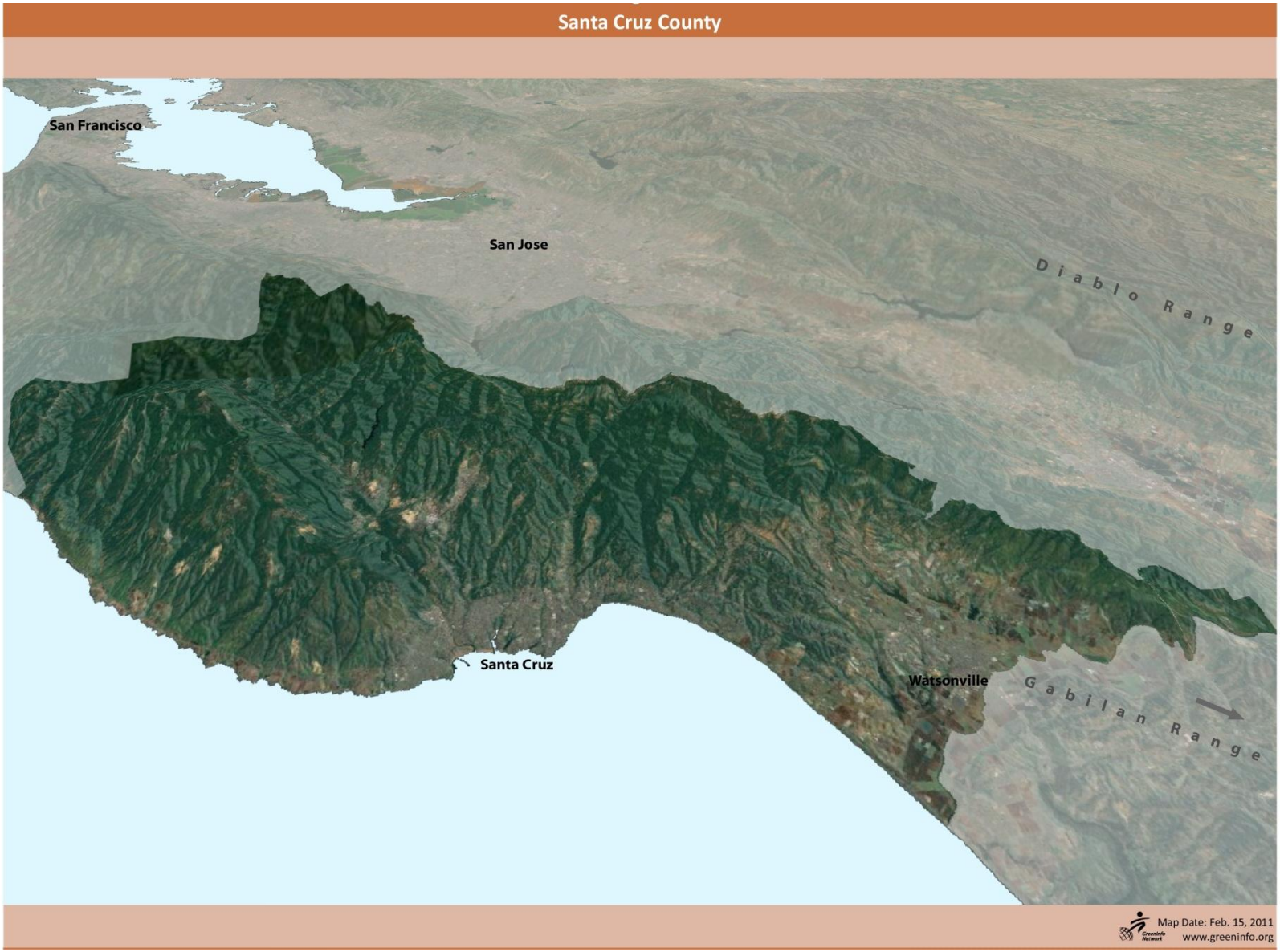

Figure 2-2: Regional View of Santa Cruz County

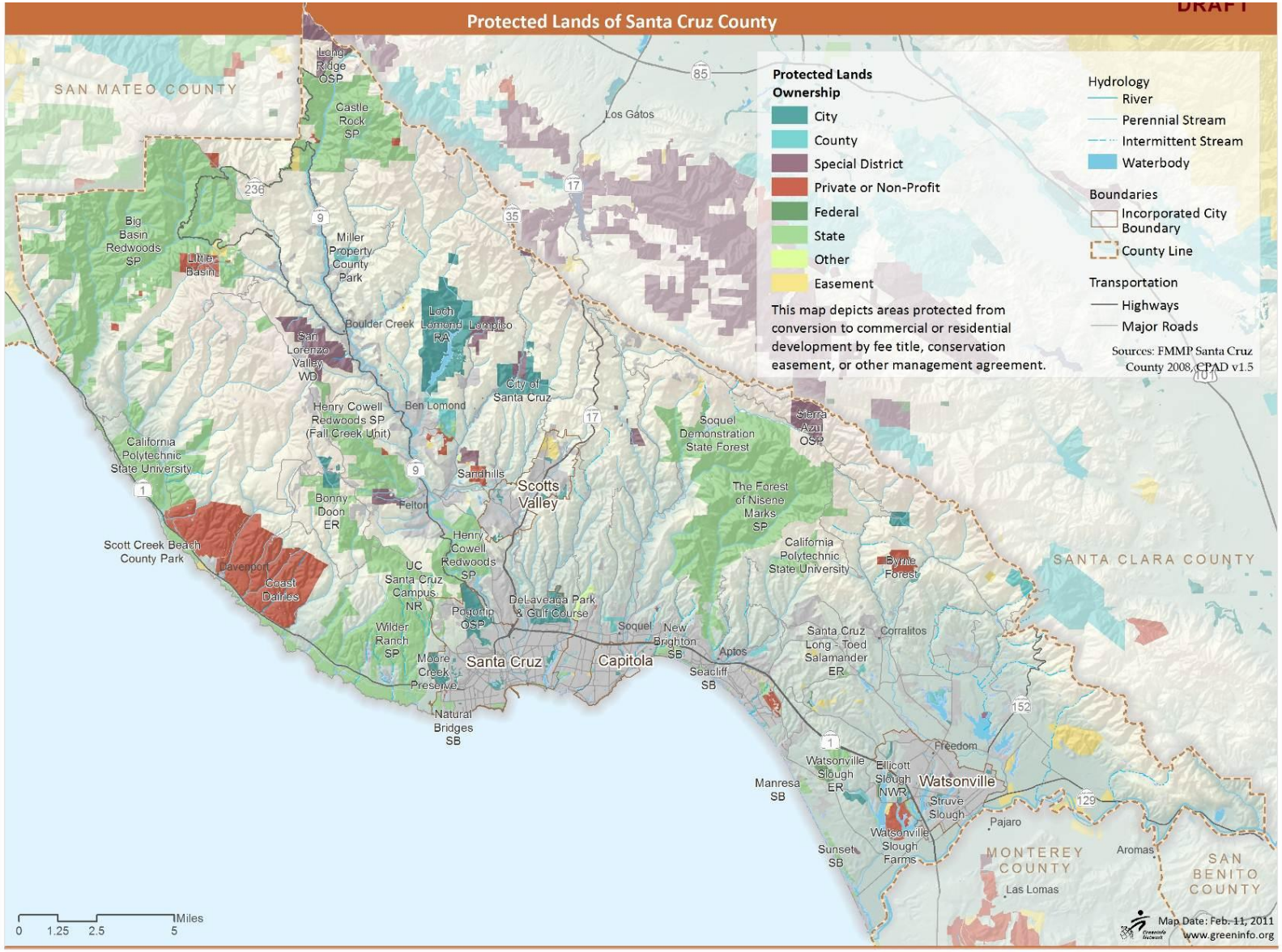

Figure 2-3: Protected Lands of Santa Cruz County

The majority of the remaining land in Santa Cruz County is in a relatively natural state, ranging from large open areas in working lands, to more parcelized rural residential areas (Department of Conservation 2010; CAP 2010) (Figure 2-4).

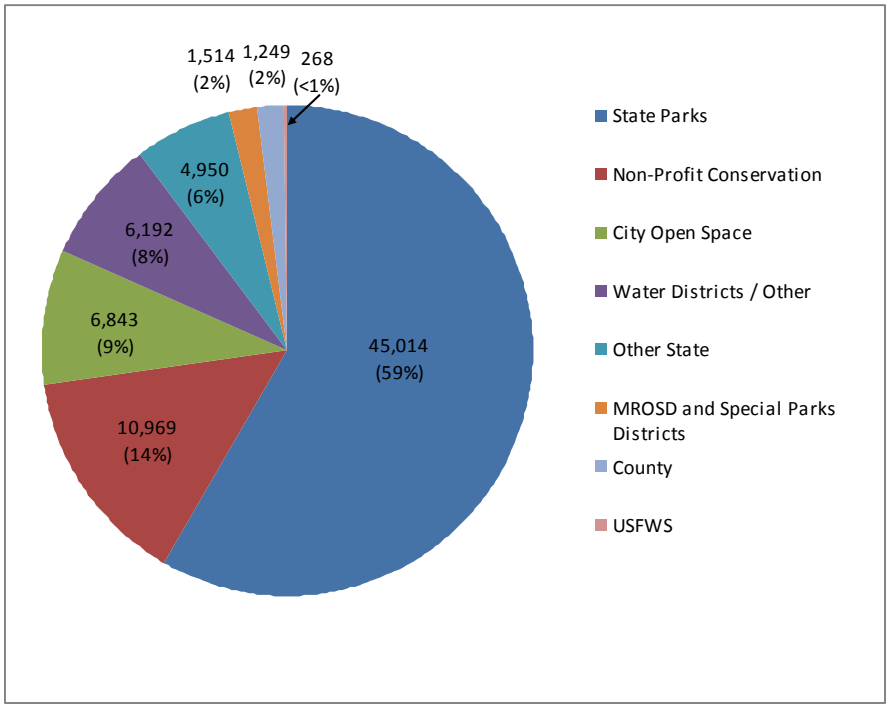

Figure 2-4: Protected Land Ownership

Agriculture is one of the top two industries in Santa Cruz County (along with tourism). The County ranks in the top third of California counties for agricultural production. Its working farmland, timberland, and rangelands generate over $491 million in annual revenues and employ 8,000 people. The County is home to some of the most productive cultivated farmland in the state. The productivity and crop values are attributable to a mild Mediterranean climate which allows for year-round farming, exceptionally fertile soil, and consumer demand for high value crops (Santa Cruz County 2009). Currently, there are 23,000 acres in cultivation in Santa Cruz County. Redwood and Redwood-Douglas fir forests cover approximately 143,000 acres across the county with 71,000 acres zoned for Timber Production. Rangeland for livestock grazing includes approximately 17,000 acres.

2.1 Conservation Challenges

2.1.1 Population Trends and Future Growth Challenges

Santa Cruz County is home to 272,000 people, with 85% of residents residing in urban areas and 15% residing in rural areas. Over the past decade, Santa Cruz County's population increased by more than 15,000 (5.9%), a growth rate that is less than half that of the State of California as a whole (CAP 2010). This is in stark contrast to the growth rate of the 1960s and 1970s, when Santa Cruz County was one of the fastest growing counties in the country, with an average *annual* population growth rate of 4.6 percent. Between 1970 and 1980, Santa Cruz County grew by over 35 percent. During this time, an estimated 85% of the development was single–family residences on individual parcels. There were enough parcels in existence at this time to almost double the population of the County if each were built upon (Santa Cruz Public Libraries 2010). This rapid growth was posing significant risk to the viability of commercial agricultural land, timber resources, fish and wildlife, marine habitats and air and water quality. This threat led to the 1978 passage of Measure J, a ballot referendum that instituted a comprehensive growth management system in the County, which included population growth limits, provision of affordable housing, and preservation of agricultural lands and natural resources.

The Association of Monterey Bay Area Governments (AMBAG) projects that between now and 2035, Santa Cruz County's annual growth rate will remain at about 1.3 %, resulting in an additional 35,500 residents (AMBAG 2010). Population growth in the Monterey Bay Region is expected to grow by sixteen percent by 2035, adding another 146,000 people—equivalent to a city the size of Salinas to the region (Table 2-1).

Table 2-1: Growth Projections for the Monterey Bay Area (AMBAG 2010)

County	2010	2020	2035
Monterey	445,309	483,733	530,362
San Benito	62,431	76,140	94,731
Santa Cruz	268,041	280,493	295,621
Total	774,781	840,366	920,713

Within several decades, the combined population of Santa Cruz County with the surrounding four counties of Santa Clara, San Mateo, Monterey, and San Benito will be close to four million people. The County is not and cannot be isolated or buffered from the impacts of future growth, including buildout of low density development, faster growth happening in adjoining counties, and projected increases in vehicle miles traveled on Highways 17, 152, 129 and Highway 1 due to a growing imbalance between the location of jobs and housing in the Monterey Bay Region. This growth will impact Santa Cruz County's air, water, habitat, working lands, and recreational facilities.

The Conservation Blueprint includes an analysis of where and how natural resources, wildlife habitat and working lands could be vulnerable to development and habitat fragmentation *within* Santa Cruz County under the current County General Plan and "Rural Density Matrix," which determines allowable densities on specific parcels based on the availability of services, environmental and site specific constraints and resource protection factors. The analysis examined the existing parcel density and distribution in the County (Figure 2-5). The analysis also evaluated development constraints included in the County General Plan and associated ordinances, including special use areas with slopes greater than 50% in urban areas, slopes greater than 30% in rural areas, fault zones, hydrologic features such as streams, lakes, ponds, floodways, flood zones, and riparian woodlands, and areas within mineral and agricultural resources (Figure 2-6). Based on these considerations, the analysis calculated the potential number of new housing units that could be constructed under the current County General Plan (Figure 2-7), considering both potential parcel splits and currently vacant parcels. Many of the parcels in the unincorporated area were split into smaller sizes than zoning and general plan policies would currently allow. The estimate of number of future units does not include the number of potential second units (that could be constructed on parcels greater than 2 acres in size) (Frank Barron 2010, pers. comm.).

The estimated range of additional housing units that could be added between now and 2035 ranges from 17,000 units from the County's most recent Housing Element Update to approximately 22,000 units based on a density analysis conducted by U.C. Davis and the Blueprint team, which accounts for the ability to develop at least one unit on each vacant parcel. It is difficult to arrive at an exact number of potential units as this would require parcel-level feasibility and site specific analysis including application of the Rural Density Matrix (Merenlender and Feirer 2010) (Frank Barron 2010, pers. comm.). Note: The analysis does not assess the *feasibility* of securing development approvals, which could include for instance, the need for setbacks and compatibility with agricultural uses.

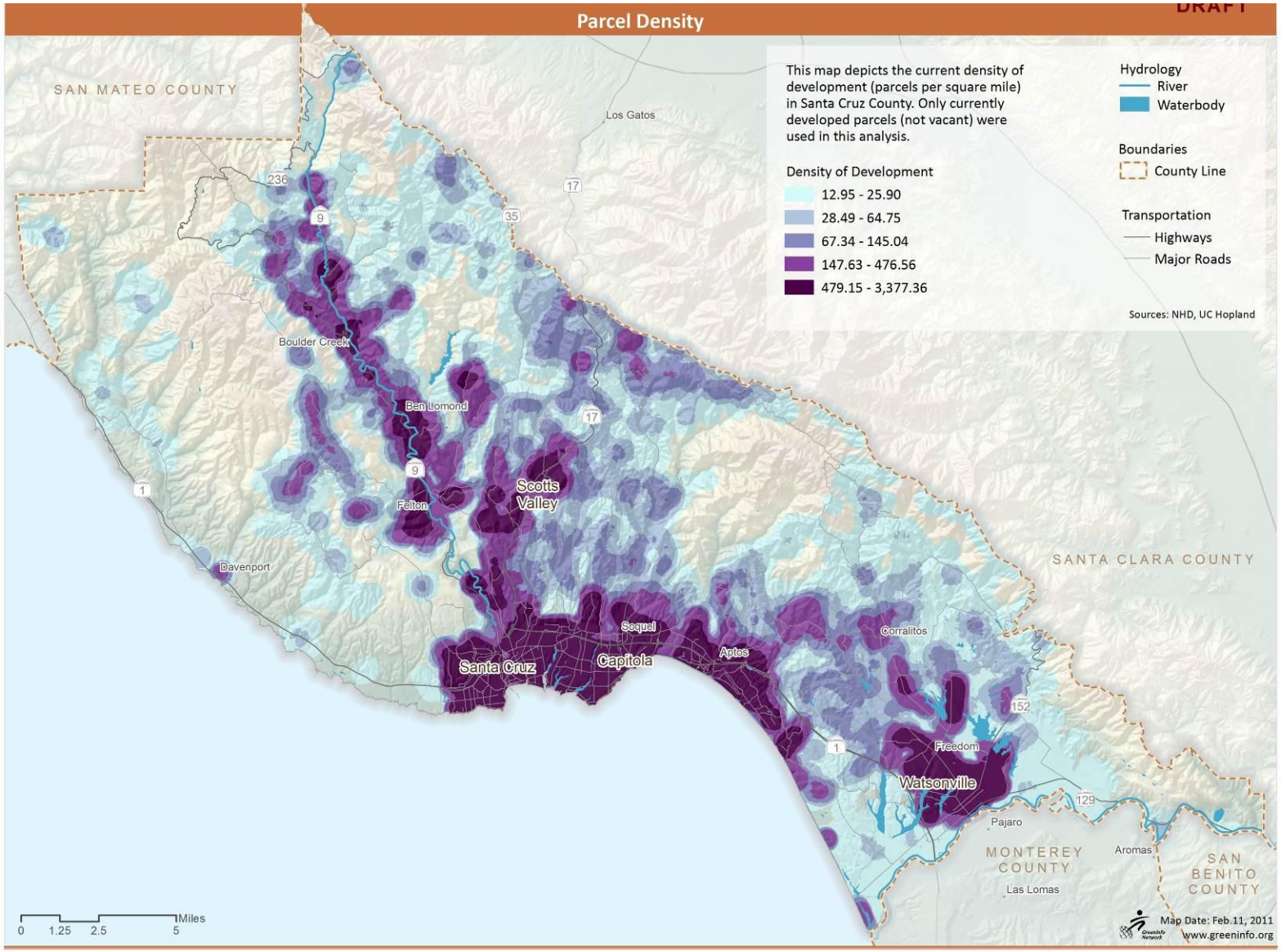

Figure 2-5: Parcel Density

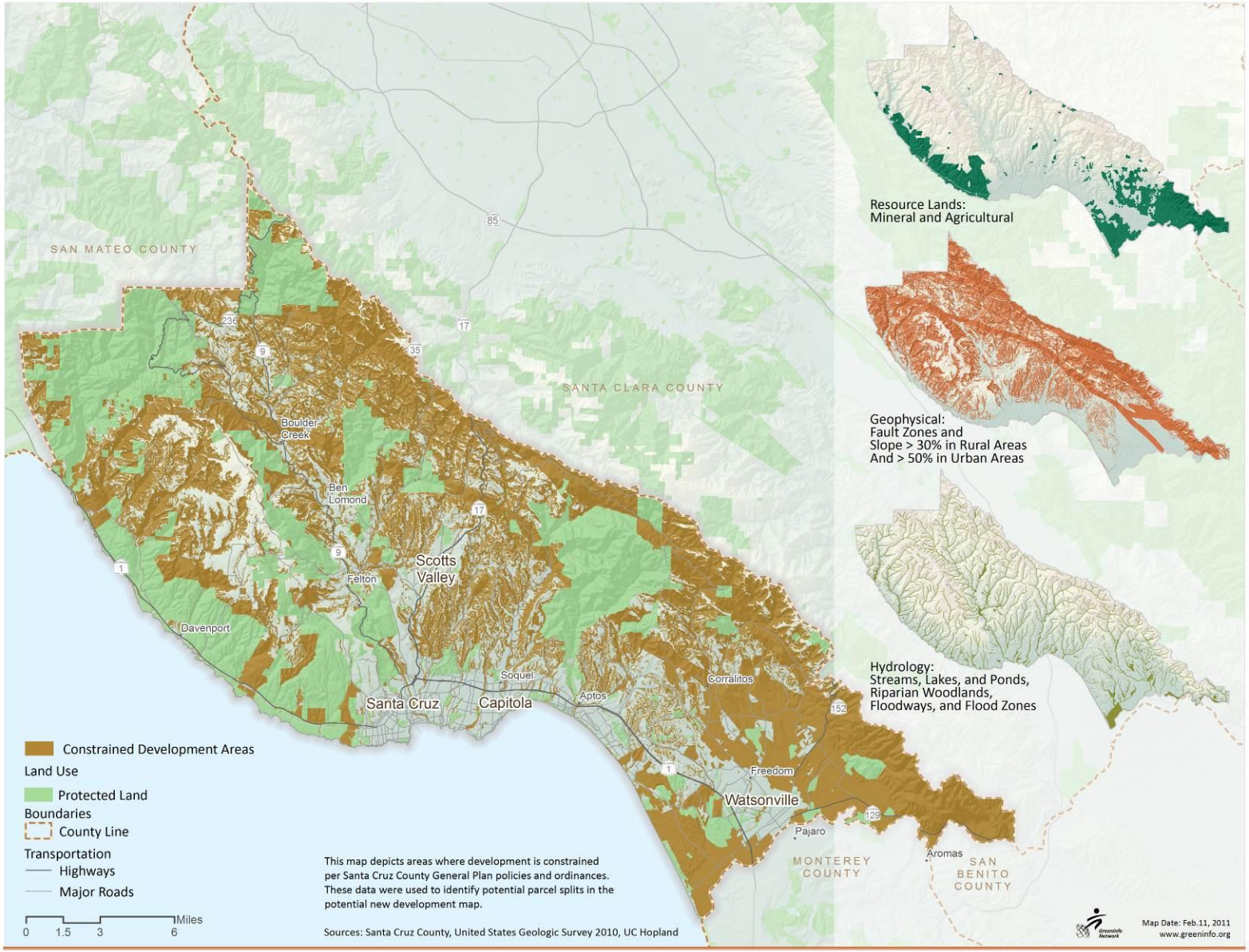

Figure 2-6: Constrained Development Areas

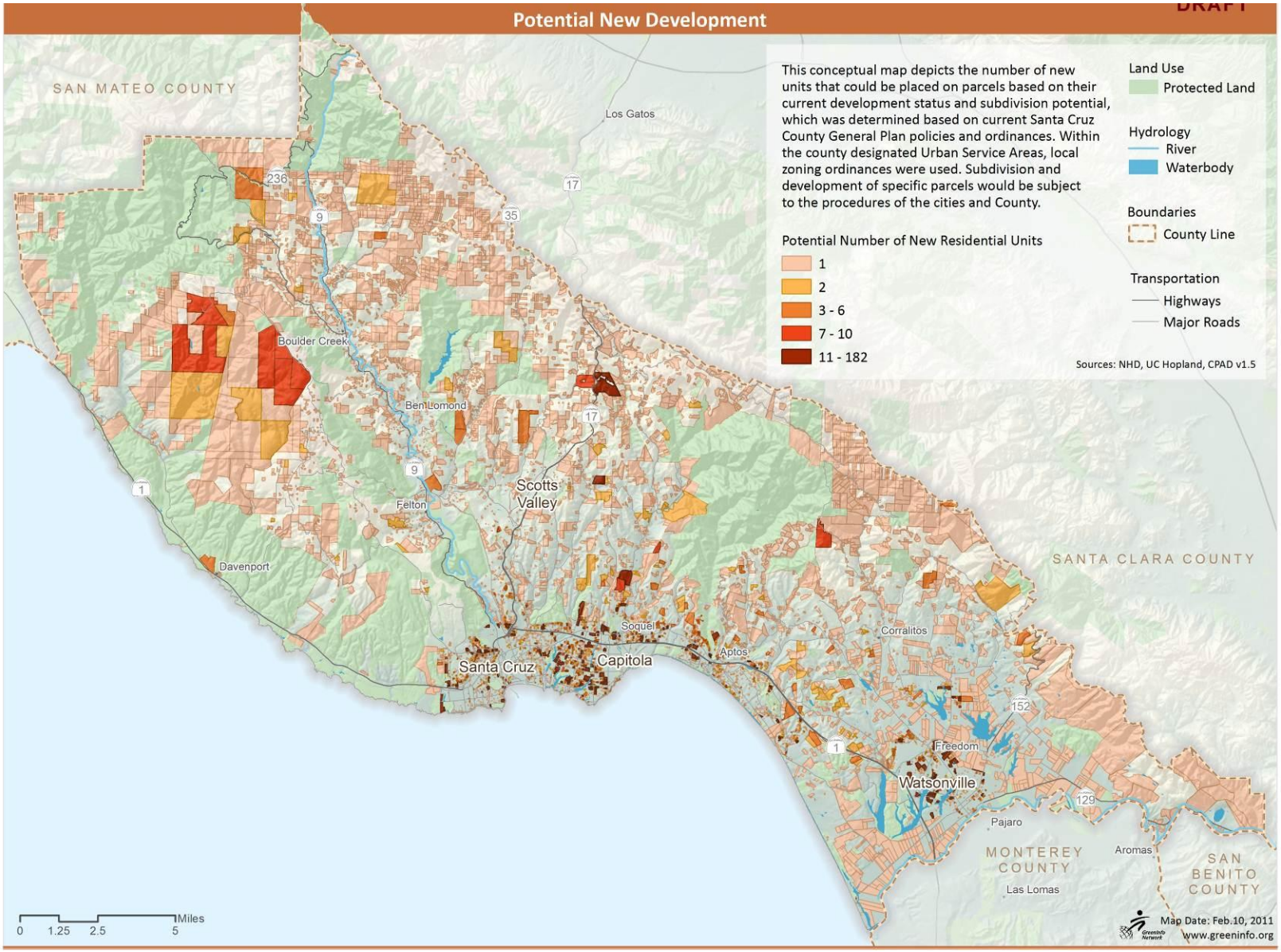

Figure 2-7: Potential New Development

2.1.2 Resource Conservation and Viability Challenges

In addition to the regional population and growth projections discussed above, Santa Cruz County's plants, animals, habitats, waters and working lands and residents face a host of other conservation-related challenges. Santa Cruz County relies almost entirely on local water supplies, which are not sufficient to meet long-term residential and agricultural demand and also accommodate the needs of fish and wildlife. Our underground aquifers are over-drafted, threatening the sustainability of our cultivated farmland. As groundwater levels diminish, seawater will intrude further inland and contaminate drinking and irrigation supplies. There are currently 18 water bodies listed as impaired on the Clean Water Act Section 303(d) list (CAP 2010). We are faced with pressing needs to protect water quality for both human consumption and for the health of Monterey Bay and the wildlife dependent on our rivers and streams (Chapter 5).

Land conversion, fragmentation, and degradation threaten the long-term viability of the county's biodiversity. Thirteen plants and thirteen animals are listed as federally threatened or endangered (Section 5.2.1). Rural development and other human activities have fragmented habitat. Remaining habitat, including that within existing protected areas, is degraded by a variety of factors that threaten viability of natural systems (Section 2). The viability of species, the integrity of natural communities, and essential ecosystem functions are challenged by ongoing threats from invasive species, fire suppression, altered stream flow and pollution from nitrogen deposition, sedimentation, herbicides and pesticides, and incompatible human uses (Section 5.2.5).

Maintaining the viability of agricultural lands uses is the biggest challenge to our working lands. Continued declines in the land base available for timber production and grazing, the availability of surface and groundwater for agricultural uses, and the complexity of regulatory permit coordination related to water quality, habitat and food safety, all threaten the viability of those industries. Increases in operational costs jeopardize the tenure of farms, forests and ranches. Sustainable management practices on working lands can provide many environmental benefits and services including ongoing stewardship of natural resources, maintenance of wildlife habitat, management of wildfire hazard and fire roads, and preventing conversion of resource lands to exurban development, but only as long as these working lands remain economically viable.

2.1.3 Climate Change

Perhaps the greatest conservation challenge of all is global climate change. Over the next century, the region if forecasted to experience a much hotter and drier climate (Cayan et al. 2008), which will have cascading effects on the viability of Santa Cruz County's water resources, biodiversity and agricultural resources (Section 2.1.3). Changing climatic conditions are predicted to dramatically impact local water resources, by reducing stream flows and infiltration into groundwater basins, and increasing flooding, sea level rise, saltwater intrusion, and surface water temperature, which can imperil aquatic species. Rising sea levels will likely increase storm surges and lead to seasonal or permanent inundation of many coastal areas, including farms and wetlands. Hotter, drier conditions will

Climate Change Response Terms (IPCC 2007)

Mitigation: Reducing greenhouse gas emissions

Adaptation: Reducing the vulnerability of natural and human systems to climate change effects.

increase the frequency of fire, cause shifts in pollinator cycles that could disrupt native plants as well as many agricultural crops, and promote the spread of non-native species. Regulatory and policy responses to both mitigate climate change and adapt to its anticipated impacts are occurring at all levels of government and across all disciplines, including land use and transportation, energy, agriculture and natural resource conservation.

Ecosystem-based approaches that incorporate conservation and stewardship of the County's natural lands and working lands have the potential to both mitigate climate change impacts by promoting carbon sequestration and facilitating adaptation to climate change. These considerations should be critical components of local climate change response strategies and plans.

2.2 Regulatory and Policy Framework

A number of county, state and federal programs, policies and regulations have been effectively used in Santa Cruz County over the last several decades to protect biological resources, water resources and working lands. Santa Cruz County directs growth and protects natural and agricultural resources through the 1994 County General Plan, the voter-mandated growth management system (Measure J), the Local Coastal Plan (LCP) and special ordinances including the Sensitive Habitat Ordinance and Riparian Corridor and Wetland Protection Ordinance. The County has used these regulatory and policy tools to direct development to the most appropriate locations, control the pace and footprint of development, and protect the sensitive natural resources that maintain and enhance the County's environment.

The regulatory and policy tools, along with voluntary programs and efforts of conservation organizations, the RCD, NRCS, and individual landowners, have been used proactively to protect natural and agricultural resources (Chapter 7). The Conservation Blueprint builds on these important regulatory, policy and voluntary actions and makes recommendations to enhance the pace, scale and effectiveness of collaborative conservation efforts over the next generation.

Part II. Conservation Approach

Chapter 3: Conservation Goals

Chapter 4: Integrated Conservation Approach

Chapter 5: Critical Next Steps

The goals, integrated conservation approach, and critical next steps together comprise a comprehensive conservation strategy. At its core, are a series of goals for conservation of four vital components of Santa Cruz County's natural environment: biodiversity; water resources; working lands; and recreation and healthy communities. The Blueprint's integrated conservation approach provides innovative tools and models for strategically advancing conservation by targeting areas with multiple conservation benefits. Critical next steps highlight near term actions that can be taken to begin work to promote the conservation goals.

The Conservation Approach is a strategic guide for the Land Trust. It can also serve as a valuable resource for conservation partners, nonprofit organizations, landowners and other community stakeholders to collaboratively advance conservation.

3. Conservation Goals

The Conservation Blueprint goals are based on the critical synthesis presented in the assessment (Part III) of challenges and priorities that emerged as important for conservation planning in Santa Cruz County. As a whole, the goals seek to preserve rare and unique biological communities, maintain linkages for wildlife movement, protect and enhance our water resources, retain the viability of working lands, and enhance open space recreational resources.

Biodiversity

1. Secure the long-term viability of the county's rare and unique biological communities and species.
2. Conserve the broad range of representative biological systems within the county, and sustain the ecosystem services they provide.
3. Enhance connectivity within the county and ecoregion to facilitate the natural processes that sustain living systems.
4. Promote climate change resiliency and adaptation of the county's biological species and systems.

Water Resources

1. Protect water supplies to ensure long-term drinking water availability and to meet the needs of local industry, agriculture, and the natural environment.
2. Protect and enhance water quality in natural, urban, and agricultural landscapes.
3. Maintain watershed integrity and ensure resilience to climate change.

Working Lands

1. Maintain and enhance long-term economic viability of working lands.
2. Maintain and enhance the ecological integrity of natural systems within working lands without compromising their economic viability.
3. Foster integrated and cooperative conservation of natural resources and processes across all working lands, both public and private.
4. Increase public awareness about the importance of local agriculture and conservation of working lands.

Recreation and Healthy Communities

1. Connect parks, watersheds, natural areas and conserved lands across Santa Cruz County to benefit nature and create healthy, livable urban communities.
2. Ensure parks, natural areas and community facilities are adequately funded and maintained.
3. Create a regional recreation system that is responsive to demographics and use patterns and that enhances community health.
4. Integrate parks and open space networks into planning for housing, transportation, and other local infrastructure.
5. Educate, inspire and engage the public about the next generation of conservation.

4. Integrated Conservation Approach

As a means of maximizing conservation outcomes and targeting the most critical immediate conservation actions and projects, the Blueprint proposes an integrated, "whole systems" approach to accomplishing its goals. This approach is unique in that it links science, resource management and stewardship of land and water resources across a network of public and private lands. It marries technical findings described in the Conservation Assessment (Part III) with goals related to each of the primary conservation topical areas: biodiversity, water resources, working lands, and recreation and healthy communities. This information is further used to evaluate the opportunities and challenges relative to specific geographic areas within Santa Cruz County.

This chapter:

- Identifies initial priority conservation areas and describe their value in relation to biodiversity, water resources, working lands and recreation and healthy communities;
- Recommends project selection criteria for projects proposed in priority conservation areas;
- Evaluates existing conservation tools and urge exploration of enhanced tools and innovative ecosystem services models;
- Proposes critical next steps to advance Blueprint recommendations.

The integrated approach and recommendations described in this chapter are intended as a strategic tool for the Land Trust, and can serve as a resource for conservation partners, nonprofit organizations, landowners and other community stakeholders to collaboratively advance conservation efforts.

4.1 Priority Multi-Benefit Conservation Areas

Priority multi-benefit conservation areas are those areas within Santa Cruz County that are most likely to provide benefits across vital aspects of Santa Cruz County conservation— biodiversity, water resources, working lands, and recreation and healthy communities. In many instances, multi-benefit areas are also places where:

- Lands are protected and conserved;
- A strong stewardship ethic is already in place;
- There is ongoing dialogue and engagement between public agencies, landowners and conservation organizations; and
- Funding has been secured or has the strong potential to be secured to advance conservation, restoration and/or appropriate recreation.

The Integrated Conservation Values areas synthesize diverse conservation priorities in the county and links Blueprint goals for biodiversity, water resources, working lands, and recreation and healthy communities (Table 4-1, Figure 4-1). These areas were selected based upon data collected for the Blueprint, input from technical experts and subsequent threat, opportunity and connectivity analysis.

Table 4-1: Multi-Benefit Areas

Multi-Benefit Area	Acres
Upper San Lorenzo	22,500
North Coast Watersheds	42,000
Sandhills	4,100*
Upper Corralitos	12,500
Larkin Valley	9,500
Interlaken	1,500
Watsonville Sloughs/Lower Pajaro River	5,500
Pajaro Hills	14,500
Riparian and Riverine Systems	850 miles**
Total	**112,100**
Lands already Protected	**22,000**
Multi-Benefit Unprotected Acreage	**90, 000**

*Total acreage of all Sandhills communities is 6,000 acres. Sandhills are found in other designated Multi-Benefit Areas.
**River miles not included in acreage estimation.

The boundaries of these areas are approximate and do not include all areas important to protect that are discussed and highlighted in the respective chapters.

The following sections briefly highlight the attributes of each multbenefit area, which are summarized in Table 4-2.

4.1.1 Upper San Lorenzo

This approximately 23,000-acre region encompasses much of the northeastern San Lorenzo River Valley, including the headwaters of Kings, Two Bar and Bear Creeks. This area also includes upper Newell Creek and all of the watershed land that drains into Loch Lomond Reservoir, a principal water supply source for the City of Santa Cruz. This region is mostly comprised of mature redwood forest, oak woodlands, and maritime chaparral habitat, with occasional stands of old-growth redwood and sandhills habitats. The area is mostly zoned for mountain residential use and timber production. Due to relatively low development and road density, the Upper San Lorenzo area comprises one of the largest intact habitat patches connecting Santa Cruz and Santa Clara counties. This area provides excellent habitat connectivity as well as potential trail connections between Loch Lomond Recreation Area, Castle Rock State Park, Quail Hollow County Park, and Bear Creek Redwoods Open Space Preserve. Key long-term issues include habitat fragmentation from development and vineyard along Zayante, Bear Creek, and Summit roads. The San Lorenzo River and many of its tributaries are conservation priorities for steelhead and coho recovery, which will require extensive planning and restoration to address sediment and other non-point pollution sources.

Table 4-2: Characteristics of the Multi-Benefit Areas

Area	Biodiversity	Water	Agriculture	Recreation	Challenges	Opportunities
Upper San Lorenzo (22,500 acres)	• Large patch of relatively intact habitat important for wide-ranging species (e.g. puma) • Old-growth redwood • Sandhills habitat • Important watershed for steelhead and Coho recovery (San Lorenzo River)	• Newell Creek/Loch Lomond is a water supply for Santa Cruz, as is the San Lorenzo River • Perennial streams provide aquifer recharge	• Relatively large TPZ/Active THP	• Potential trail connections from Loch Lomond to Castle Rock, MROSD Preserves in Santa Clara County, and south to Quail Hollow County Park	• Expansion of rural residential development • Increased traffic on Hwy 35 and Bear Creek Rd • Habitat loss and fragmentation from vineyard expansion • Impaired water quality	• Some larger parcels • Many potential agency partners: Water Districts, State Parks, MROSD
North Coast Watersheds (42,000 acres)	• Largest intact habitat patch in Santa Cruz Mtns • Old-growth redwood • Marbled Murrelets • Swanton Floristic province • Coastal grasslands • Coho/steelhead • Maritime chaparral/endemic manzanitas • Opportunity to reintroduce SF garter snake • CA red-legged frog • Monterey Pine Forest • Climate change resiliency and refugia (cool microsites, steep elevational gradients, streams)	• San Vicente Creek is sourcewater for Davenport • Laguna and Majors Creeks provide water supply for the City of Santa Cruz • Extensive agency investments in water quality and fish habitat (San Vicente, Laguna Creeks) • Primary groundwater recharge area/year round flow • Karst outcrops in Liddell and San Vicente areas	• Largest contiguous area of TPZ /working timberland in county • Extensive rangelands (second largest rangeland area in county)	• Visually stunning coastline and intact viewshed looking interior from coast • Potential trail connections between numerous State Parks • Opportunities for public access to Coast Dairies and new connections to CA Coastal Trail	• Conversion of working timberlands to exurban development (ag viability, biodiversity impacts) • Conversion of rangelands to exurban development/loss of cattle grazing • Several large parcels that can be subdivided • Over-appropriated streams	• Adjacent to existing protected lands • Large parcels under common ownership • Successful models of conservation forestry • Potential for exploring ecosystem services pilot project • Opportunities to expand conservation grazing • Opportunities to coordinate efforts to secure water rights for agriculture or habitat needs
Sandhills (6,000	• Two communities and at	• Primary groundwater		• Some protected	• Highly parcelized	• Existing LTSCC

Table 4-2: Characteristics of the Multi-Benefit Areas

Area	Biodiversity	Water	Agriculture	Recreation	Challenges	Opportunities
acres)	least 7 species endemic to the county • Remaining patches in San Lorenzo/Scotts Valley contribute to connectivity through the region	recharge area for Santa Margarita Aquifer, a water-supply for tens of thousands of people the San Lorenzo and Scotts valleys		areas open for public recreation • Many sites provide open space/important viewsheds	• Used for residential and commercial development and quarrying	campaign • Interest of public/private funders • Increasing community awareness
Upper Corralitos (12,500 acres)	• Important watershed for steelhead • Maritime chaparral • Old-growth/late seral redwood • connectivity (spine of Santa Cruz Mtns)	• Important water supply for City of Watsonville • Groundwater recharge for Pajaro Basin	• Relatively large TPZ/active THP parcels	• Potential trail connections between Byrne Forest, Mt Madonna Co Park, MROSD, Nisene Marks	• Conversion of timberlands to exurban development	• Some larger parcels • Some existing protected land
Larkin Valley (9,500 acres)	• Primary pond and upland habitat for Santa Cruz Long-toed Salamander • California tiger salamander • Maritime chaparral • San Andreas Oak Woodland • Sandy soil insects and plants (e.g. *Chorizanthe pungens* var. *pungens*, and *C. robusta* var. *robusta*) • Monarch roosting	• High groundwater recharge • Headwaters for Harkins slough • Intact uplands maintain pond water quality		• Highway 1 viewshed	• Several large parcels with some potential to be split • Several vacant parcels can be developed • Limited opportunities to maintain linkages between SCLTS ponds	• Partner interest in SCLTS • County Sensitive Habitat Ordinance for San Andreas Oak Woodlands
Interlaken (1,500 acres)	• Riparian habitat • Lakes, ponds, and wetlands • Important nesting and roosting habitat for birds	• Groundwater recharge along numerous creeks • Opportunity to increase agricultural	• Opportunity to implement a strategic fallowing project to enhance long-term ag	• Potential for future recreational access to relatively underserved communities	• Residential development resulting in loss of habitat and farmland • Loss of remaining	• Widespread community and agency interest • IRWMP funding to study water supply,

Table 4-2: Characteristics of the Multi-Benefit Areas

Area	Biodiversity	Water	Agriculture	Recreation	Challenges	Opportunities
	• Steelhead habitat recovery potential	water storage capacity and improve flood control via stormwater diversions to College Lake	viability throughout in the basin • Prime soils and important farmland	• Asset for Watsonville's Annual Monterey Bay Birding event	riparian/wetland	flood control, and habitat • PVWMA ownership
Watsonville Sloughs and Lower Pajaro River (5,500 acres)	• Wetland and riparian habitat • Excellent breeding and overwintering habitat for birds • Only known location of CA red-legged frog breeding west of Hwy 1 • Potential habitat for SCLTS in upper watershed and linkages to Larkin Valley • Steelhead migration from lower Pajaro to upstream rearing and spawning areas	• Potential to expand Harkins Slough Managed Aquifer Recharge project • Sloughs maintain water quality (filter pollutants) for Monterey Bay • Reduce aquifer overdraft through conservation ownership and demonstration projects	• Prime soils and extensive farmland • Opportunities to demonstrate compatible farming practices near wetlands	• City of Watsonville sloughs trail system and potential connections to Pajaro Levee trails • Potential farm trails or Farm to Cafeteria program with Pajaro Unified School District	• Ongoing sedimentation degrades sloughs • Overdraft and seawater intrusion threaten long-term agricultural viability	• NRCS floodplain and wetland reserve programs • Increased flooding has resulted in willing conservation sellers • Agency interest and funding opportunities for wetland habitat protection and compatible farming • IRWMP funding for hydrologic study • Land Trust's Watsonville Slough Farms as demonstration project
Pajaro Hills (14,500 acres)	• Expansive grasslands • Southernmost distribution of redwoods in county • Sag ponds and springs • Connectivity to Gabilan Range • Large, permeable habitat patch(es)	• Large, pervious area for groundwater recharge with high residence time (limits stormwater runoff and flooding)	• Most extensive rangeland area in county with numerous working ranches • Some ranchers (Morris Beef) pioneering new markets for	• Long-term potential for recreational access and regional trails • Important viewshed for Watsonville and scenic backdrop for Pajaro Valley	• Conversion of rangeland and grassland to berries • Development could affect long-term viability of adjacent cultivated land • Potential Planned unit development (for	• Large properties, with consolidated interest • Grassland carbon market • Interested partners • Emerging grassfed beef market • Agency interest in

Table 4-2: Characteristics of the Multi-Benefit Areas

Area	Biodiversity	Water	Agriculture	Recreation	Challenges	Opportunities
	• Steelhead streams and priority watershed for steelhead restoration and enhancement (Pescadero Creek)		grassfed beef • TPZ and working forests		large ranches with multiple parcels) • Marginal economics of ranching	maintaining critical linkages between mountain ranges
Riverine and Riparian (850 acres)	• Habitat for steelhead, coho, and other native fish species • Important corridors for terrestrial species • Habitat for numerous bird species	• High recharge potential along many streambeds • Water supply and conveyance • Stormwater amelioration where floodplains are intact • Water quality benefits where riparian habitats uptake pollution before entering waterways		• Levee, streamside, and slough trails are key destinations and provide scenic access through urban areas	• Urban encroachment on riparian corridors • Non-point source pollution from urban runoff • Stormwater runoff and flooding from development • Fragmented habitat	• Agency interest in riparian protection, pilot easement conservation project with City of Santa Cruz • Agency interest and funding to restore habitat for salmonids

Figure 4-1: Multibenefit Areas

4.1.2 North Coast Watersheds

The approximately 42,000-acre includes most of the coastal watersheds between Big Basin and Wilder Ranch State Parks. As elevations drop from Ben Lomond ridge, deeply incised canyons dominated by redwood vegetation give way to maritime chaparral and then to grassland along the coast. This area is part of the largest patch of intact habitat in the Santa Cruz Mountains and is incredibly rich in biodiversity. Rare and sensitive habitats include old-growth redwoods, sandhills, coastal terrace prairie and Monterey pine forest, among others. These watersheds are critical priorities for aquatic species conservation and coho recovery, and San Vicente, Laguna, and Majors creeks supply drinking water for Davenport and the City of Santa Cruz. Due to its varied microclimates and extreme elevation gradients, this area is one of the most important refuges for biodiversity against climate change in the county.

With the exception of Bonny Doon and Davenport, most of this area is zoned for timber production. Ongoing timber harvest operations occur on several large parcels and supply a steady of volume of timber to the Big Creek Mill. This area presents a key opportunity to balance sustainable timber production and biodiversity protection through focused land conservation to prevent timberland conversion to other uses, and through stewardship incentives for habitat restoration. Securing water rights and promoting use of conservation grazing to manage and maintain grasslands may increase long-term agricultural viability on the coast. The Regional Transportation Commission's vision for trail access to Davenport along the rail corridor presents an unparalleled opportunity to implement the California Coastal Trail. In combination with recreation planning at Coast Dairies following transfer to the BLM, there will be outstanding new opportunities for public access and appreciation of this area.

4.1.3 Sandhills

The Sandhills present an opportunity to achieve multiple conservation benefits, particularly for biodiversity and water (Table 4-2). Located primarily in the San Lorenzo Valley, Scotts Valley and Bonny Doon areas, the Sandhills are an estimated 6,000 acres of Zayante soil: a coarse sand soil derived from outcroppings of ancient marine sediment. The droughty soil combines with our region's moist, maritime climate to support two endemic communities: sand chaparral, a type of maritime chaparral, and sand parkland, which features towering ponderosa pines and diverse and abundant wildflowers. These two communities support a wealth of native plants and animals including seven known endemic species (inset box) as well as numerous unique species that have yet to be described by scientists (McGraw 2004).

Sandhills Endemic Species

- Santa Cruz wallflower
- Ben Lomond spineflower
- Bonny Doon manzanita
- Ben Lomond buckwheat
- Zayante band-winged grasshopper
- Mount Hermon June beetle
- Santa Cruz kangaroo rat

In addition to their extraordinary biotic value, the Sandhills play an important role in providing water to the community. The abundant precipitation in the region (40-60 inches annually) readily percolates through the coarse Zayante soil and permeates the porous Santa Margarita sandstone, which serves as an aquifer. Wells that tap the Santa Margarita aquifer supply water to the communities of Scotts Valley and the San Lorenzo Valley. The aquifer also contributes to stream flows in the region, which support steelhead and coho salmon as well as a diverse assemblage of other riverine and riparian species.

The Sandhills also contribute to our community's recreational and educational opportunities. They feature many important trails and are

used as a classroom for outdoor education programs conducted by a variety of organizations, including Henry Cowell State Park, Santa Cruz County Parks and the Santa Cruz Natural History Museum.

Protection of Sandhills habitat can safeguard this unique ecosystem and its essential functions, which are threatened by residential and commercial uses that remove intact habitat and increase the area of impermeable surfaces (e.g. roofs, roads), thus reducing percolation into the aquifer and the groundwater necessary to support stream flows. Maintaining Sandhills habitat can also prevent pollution of the groundwater. At present, only 30% of Sandhills habitat is protected. Much of the remaining area is within relatively small parcels (<50 acres), much of which has been partially developed, necessitating approaches other than just traditional acquisition. Habitat within the Sandhills must be actively managed to address a suite of threats including invasive plants and fire suppression, in order for the rare species to persist.

4.1.4 Upper Corralitos

Conservation work in the approximately 12,400-acre Upper Corralitos area of the Santa Cruz Mountains can promote achievement of goals for biodiversity, water, and working lands. It contains a large patch of intact habitat characterized by dense redwood vegetation and steep, chaparral-covered slopes that give way to occasional grasslands along the ridge, which together connect habitat to east in the Pajaro Hills, with that further west in the upper Soquel and Aptos watersheds. The area supports much of the upper headwaters of Corralitos Creek: a tributary to the Pajaro River that is important for steelhead and also serves as a critical drinking water supply for the City of Watsonville.

Much of the land within the Upper Corralitos area is zoned for timber production and a number of landowners have prepared non-industrial timber management plans to facilitate on-going harvest operations. Watershed protection for habitat, water supply and water quality is a key conservation issue in this area, along with potential trail connections between regional parks and preserves.

4.1.5 Larkin Valley

Conservation work in the Larkin Valley region can promote biodiversity and water conservation goals. The approximately 9,500-acre area features essential breeding ponds and upland habitat for the endangered Santa Cruz long-toed salamander, which is found only in northern Monterey and southern Santa Cruz counties. The soils derived from ancient sand dunes support a mosaic of maritime chaparral and a unique type of coast live oak woodland known as San Andreas Oak Woodland, which together support a rich assemblage of native plants including several rare species.

The area is also important for water conservation. Located in the Pajaro Ground Water Basin, an area that is in overdraft, the Larkin Valley region features sandy soils that facilitate groundwater recharge It also contains the headwaters for Harkins Slough—a biodiversity hot spot and important area for water quality and flood control that was recently protected by the Land Trust of Santa Cruz County.

Land use in the region primarily consists of residential development, much of it rural. The region features many undeveloped parcels, a relatively high concentration of which can be further subdivided. Increased development will reduced water infiltration, may affect water quality in Harkins Slough, and may threaten the rare species within the maritime chaparral and San Andreas oak woodland, as well as sever important linkages between breeding ponds for the Santa Cruz long-toed salamander.

4.1.6 Interlaken

Located east of Watsonville, the nearly 1,500-acre Interlaken area features a series of lakes, including College, Kelly, Drew and Tynan, that provide habitat for a diverse assemblage of birds including riparian species and the county's highest concentration of waterbirds. Upper Casserly Creek supports steelhead and the seasonally flooded areas may provide important rearing habitat.

Key conservation issues in this area include the protection of remaining farmlands from loss to residential development, riparian habitat restoration, and water supply. The Interlaken area features primarily small and mid-sized farms and residential areas. College Lake is typically drawn down each spring for cultivation. There is widespread agency interest in managing the area for water supply storage to address water shortages in the Pajaro Valley, for flood control, and to enhance steelhead habitat. Conservation planning in this area can be integrated with recreation projects to help connect local neighborhoods to Pinto Lake County Park and a proposed trail along Salsipuedes Creek.

4.1.7 Watsonville Sloughs / Lower Pajaro River

Conservation of the Watsonville Sloughs and Lower Pajaro River can promote biodiversity and water conservation, while presenting opportunity to enhance recreation in an underserved region. The approximately 5,600-acre area encompasses the Watsonville Sloughs—a complex of six sloughs that together constitute one of the largest remaining freshwater wetland ecosystems in California and provide habitat for more than 25 rare species. They are a critical stop along the Pacific Flyway and provide essential overwintering habitat for migratory birds. Although highly modified, the lower Pajaro River supports passage by steelhead to upstream spawning and rearing habitats. The prime farmland in the lower Pajaro River Valley is among the most productive in the world, and contributes to the area's economic engine. The sloughs and river present a host of opportunities for recreation and outdoor education for the community.

A range of issues affect the viability of biodiversity and working lands in the region, including habitat loss and fragmentation, invasive species, poor water quality and circulation, groundwater overdraft, and saltwater intrusion. Effective conservation will require protection of remaining wetland habitats, restoration of their ecological and hydrologic connectivity, and support for conservation practices on adjacent farmland to reduce sedimentation and other water impacts. Coordination among the many agencies and landowners in the area will be critical to develop a shared vision to address regional flood control, recreational access, and many other issues.

4.1.8 Pajaro Hills

Located in the southeastern corner of the county, the Pajaro Hills represent an extraordinary opportunity to conserve biodiversity and promote the viability of working lands. The approximately 14,500-acre area is primarily comprised of large, working cattle ranches. The long history of grazing has helped maintain more than 4,000 acres of grasslands, which support diverse and locally significant assemblages of plants, insects, and birds. Numerous ponds interspersed within the grasslands provide habitat for the California red-legged frog and western pond turtle, while Pescadero Creek is an important stream for steelhead.

The Pajaro Hills are largely undeveloped, and the expansive area of intact habitat provides core habitat for many wide-ranging species including mountain lions. The region is also a critical habitat linkage

connecting the Santa Cruz Mountains to the Gabilan Range. Zoned primarily for agriculture, the area's main land uses are currently grazing and timber production. A few large ranches under common ownership cover most of the Pajaro Hills, although many of these properties are highly parcelized, creating potential for planned unit developments or estate homes that could fragment the landscape and degrade its biodiversity conservation values. Elimination of grazing could also convert the important grasslands to coastal scrub.

4.1.9 Riparian and Riverine Systems

Santa Cruz County's streams are critical to conservation of our biodiversity and water, and can play important roles in recreation and maintaining the viability of working lands. Located throughout the county, our more than 850 miles of coastal streams feature important native animals including steelhead, coho salmon, California red-legged frog, and western pond turtle. The riparian areas support a rich assemblage of birds and provide essential habitat linkages, particularly through urban and cultivated areas. The connectivity they provide, as well as the water and cooler microclimate, renders streams important refugia in a predicted hotter and drier climate.

Climate change will also compound the already critical importance of streams for our community's water supply. Much of our water used in Santa Cruz County comes from our streams, including Laguna, Majors, Newell, Valencia and Corralitos creeks, and the San Lorenzo River. The streams are also critical groundwater recharge areas. Maintaining stream flows and water quality is critical to our water supply.

Santa Cruz County's streams also provide a diverse array of recreational opportunities, including swimming and fishing, as well as opportunities for scenic river trails. Well-functioning watersheds and streams are critical to flood hazard abatement.

Protecting land within critical watersheds for biodiversity and water supply can greatly promote many of the conservation values of the streams. The maintenance of the county's streams and their essential and diverse conservation values is challenged by many factors, including the current impairment, diverse land ownership, and the potentially competing demands, such as drafting water for human use versus maintaining summer stream flows critical for salmonids. These challenges can be addressed through effective policies, coordinated programs and integrated land use planning.

4.2 Prioritizing Conservation Work in Multiple-Benefit Areas

The Blueprint team acknowledges that not all of the 90,000 acres within the designated multi-benefit areas are conducive to the Blueprint's conservation goals or would likely be protected or conserved over the next 25 years. Some lands would not meet the recommended selection criteria (inset box), would not contain important conservation values identified in the Blueprint, or would not be deemed at risk of loss or conversion over the next several decades. Based on Blueprint research, the Land Trust team estimates that out of the 90,000 acres categorized as "multi-benefit", approximately 50,000 acres of land, linkages and farmland would potentially be the focus of the Land Trust's coordinated voluntary conservation efforts over the next 25 years.

Multi-Benefit Conservation Project Selection Criteria

The Blueprint recommends that projects occurring in the Multi-Benefit Conservation Areas be prioritized based on the following criteria:

1. **Scale of Conservation Impact and Multiple Conservation Benefits**
    - Proximity to other conserved lands
    - Enhances linkages for wildlife between core patches of habitat
    - Achieves multiple conservation benefits, including protecting biodiversity and landscape linkages, maintaining water quality and supply by protecting waterways and riparian areas, ensuring long-term viability of working lands and providing significant recreational connection.

2. **Challenges / Threats**
    - Addresses challenge(s) and threat(s) including rural sprawl /ex-urban development, potential loss of prime farmland and other significant working lands, impacts to critical water quality and supply, fragmentation and irreversible loss of critical wildlife corridor or recreational corridor.

3. **Opportunity / Funding**
    - Uses strategic and cost-effective conservation tools to achieve *Blueprint* conservation goals
    - Involves willing landowners and multiple conservation partners
    - Leverages funding through other sources

4. **Ecosystem Integrity and Long-Term Stewardship**
    - Maintains or enhances long term ecosystem integrity and function
    - Incorporates elements to address climate change adaptation and mitigation
    - Incorporates innovative approaches to maintain healthy ecosystems such as stewardship incentives and payments for ecosystem services
    - Addresses both immediate and long-term maintenance and stewardship needs of land, natural resources, roads and other improvements

4.3 Conservation Tools

Land conservation is the protection, careful management and stewardship of land and natural resources for the long-term in ways that benefit natural and human communities. Conservation can be implemented in many ways – through policy, zoning and regulation; through outright purchase of the land; through voluntary conservation easements; through education and technical assistance; and through incentives for improved land and resource stewardship. We will need to use *all* these tools in innovative, collaborative and pro-active ways to protect, enhance and maintain the long-term integrity and resiliency of our natural systems.

The Blueprint team recommends forward-thinking and enhanced tools be added to the conventional conservation toolbox. Stewardship incentives and *payment for ecosystem services* (PES) can add to and build upon the foundation of existing policies, programs and regulation already established. Such new and enhanced tools can potentially increase the scale, impact and efficiency of conservation efforts and investments. Most importantly, conservation tools should be effective, adaptive and appropriate to the needs of the resource and the landowners and conservation partners involved.

1. ***Land Acquisition*** – Willing landowners sell their land at fair market value, reduced value (bargain sale) or donate its value to a land trust or government agency. Acquisition of fee simple secures full title to and all rights associated with the land. Land acquisition is a typical tool used where the primary goal is to allow for *permanent* protection and public use (e.g. as a park). Land acquisition is the most costly conservation tool and removes land from the tax rolls. Land acquisition also requires that the land trust or government assume responsibility for liability and ongoing maintenance.

2. ***Conservation Easements*** – Conservation easements are legal agreements between a landowner and a land trust or government agency that *permanently* limit the use of the land in order to protect its conservation values. With conservation easements, a partial interest in the property is transferred to a land trust or governmental entity by gift or purchase. Private landowners retain ownership and property remains on the tax rolls. Easements are less expensive than fee simple but require ongoing monitoring to ensure compliance with easement terms and lasting protection of conservation values. As ownership changes, the land remains subject to the easement restrictions. Conservation easements can qualify as tax-deductible charitable donations and result in property tax savings. Conservation easements are most appropriate when full title to the land is not needed to achieve conservation goals and/or when conservation of working lands and maintaining viability of working lands is a primary goal. Management agreements are often developed in concert with conservation easements to identify property-specific goals and objectives, or other performance standards. Management plans are updated periodically to address changing conditions.

3. ***Stewardship Incentives*** - Stewardship incentives can include a range of tools that reward responsible management and stewardship of land and natural resources through incentive payments, tax benefits, cost share and other means including:

    a. *USDA/NRCS Programs* – The U.S. Department of Agriculture administers numerous voluntary incentive programs to protect, restore and manage land. There are 10 USDA programs that provide financial assistance to eligible farmers and ranchers, principally through the Natural Resource Conservation Service (NRCS), to protect and improve soil, water quality, and wildlife habitat on their lands. Programs specify the length of time of a grant contract and/or require permanent or short-term conservation easements (i.e. 30

years). Grants and payments to landowners are typically awarded for specific improvements and practices. Some NRCS programs can potentially be enhanced as a *performance-based* management tool with payments for high level stewardship and resource protection in important conservation areas, including the Conservation Security Program (CSP) and the Conservation Innovation Grants program under the Environmental Quality Incentives Program (EQIP). NRCS also offers Conservation Technical Assistance (CTA) to help people to voluntarily conserve, maintain, and improve their natural resources at the local scale, including resource assessment, planning, design and implementation. CTA also develops, adapts, and transfers effective science-based tools for management and conservation of natural resources. CTA has been providing technical assistance to farmers since 1935 and is a critically important conservation tool that should be used to leverage other conservation strategies and tools.

b. *Payment for Ecosystem Services (PES)* – PES is a public-private framework that offers financial incentives to landowners in exchange for managing land in a way that protects and maintains one or more ecological values or ecosystem services. PES includes a variety of arrangements through which the beneficiaries of ecosystem services pay back the providers of those services. Payments include governmental incentive programs, mitigation banking programs and/or tax programs. A number of states and regions are developing frameworks for using PES as an important conservation and restoration tool at a watershed or regional scale. The Office of Environmental Markets was created within the U.S. Department of Agriculture in 2008 to develop uniform standards and facilitate market-based incentives for agriculture, forest, and rangeland conservation. Ecosystem markets bring buyers and sellers together to exchange payments for protecting, restoring and maintaining ecological values. Markets can include the full spectrum of regulatory and voluntary markets (i.e wetland mitigation banking, habitat/conservation banking, water quality trading, water transactions and carbon markets) (Oregon Sustainability Board 2010). To be successful, development of a PES approach should be tailored to the needs and unique circumstances of local communities. A PES approach should also demonstrate that additional conservation values are being protected above and beyond what regulation would require.

The Blueprint does not recommend the use of one specific conservation tool over another, as the appropriate conservation tool must be determined by the needs of the resource and the goals of the landowner and conservation agency. However, to accelerate the pace and effectiveness of conservation in Santa Cruz County, the Blueprint anticipates the need to expand the use of voluntary stewardship incentives in addition to conservation easements and land purchase. Figure 4-2 illustrates a recommended conservation approach for priority lands, where land acquisition as a tool is used for 10-15% of the land; conservation easements are used on 30-40% of the land; and stewardship incentives are used on 35-40% the land.

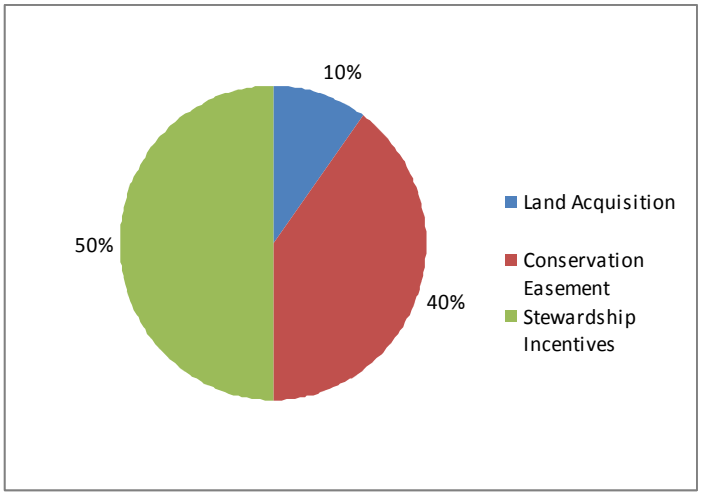

Figure 4-2: Recommended Conservation Tool Use

4.4 Ecosystem Services: Benefits and Innovative Models

Santa Cruz County's watersheds, wetlands, parks and working lands provide our local communities with substantial economic and environmental benefits or *ecosystem services*. They are benefits accrued from services naturally provided by the environment from which both human beings and all other organisms benefit (Arha et al. 2006). Ecosystem services include clean air, water supply and water quality, fish and wildlife habitat, crop pollination, soil fertility, food, flood control, public health benefits, nature-based recreational opportunities and resiliency to impacts of climate change. Ecosystem services are the links between nature and the economy. At present, these benefits are often undervalued (or not valued at all) in the marketplace and are not well-understood by policy makers and the general public (Forest Trends 2008, Delaware Valley Regional Planning Commission 2010). Innovative programs are emerging that attach an economic value to nature's benefits and provide incentive payments to protect and enhance ecologically significant lands. Payments for ecosystem services offer financial opportunities and an additional tool to landowners in exchange for managing their lands to protect and maintain one or more ecological values (Oregon Sustainability Board 2010).

There are four categories of ecosystem services (Millenium Ecosystem Assessment 225, TEEB 2010):

1. **Provisioning services (goods)** are the material outputs from ecosystems, including food, water, timber.
2. **Regulating services** are the services that ecosystems provide by acting as regulators of the quality of air and water, such as filtration of pollutants by wetlands, climate regulation through carbon storage, water cycling, and pollination.
3. **Supporting services** (habitat) underpin almost all other services. Ecosystems provide living spaces for a diversity of plants and animals. Supporting services also include soil formation, photosynthesis, and nutrient cycling.
4. **Cultural services** include the non-material benefits people obtain from contact with ecosystems, including recreation, tourism, aesthetic appreciation, and sense of place.

In a number of cases around the nation and world, the valuation and payment of ecosystem services has stimulated policies and programs that reward those responsible for protecting and maintaining those services. A well-known example is New York City's ecosystem services payments to private landowners in the watersheds of the Catskill Mountains to improve farm management practices and prevent run-off of nutrients into nearby watercourses in order to avoid building expensive new water treatment facilities. These payments to landowners cost the City between $1 billion to $1.5 billion, whereas the projected cost of new water filtration plants would have been $6 billion to $8 billion (TEEB. 2010). In Washington County, Oregon, Clean Water Services, a water resources management agency, invested in riparian restoration payments to landowners instead of constructing an engineered cooling system necessary to improve aquatic conditions. This "natural infrastructure" approach of streamside plantings cost the agency $6 million instead of the estimated cost of $60 million to $150 million for the engineered cooling towers (Oregon Sustainability Board. 2010). In southeastern Pennsylvania, a recent study estimates that the economic value of 197,000 acres of publicly-protected land and conserved farmland in five adjoining counties contributed an estimated $132.5 million in annual cost savings and economic benefits through the provision of six ecosystem services: water supply, water quality, flood mitigation, wildlife habitat, air pollution removal and carbon sequestration (Delaware Valley Regional

Planning Commission. 2010). Ecosystem service payments and markets offer an innovative and additional tool to traditional regulation, land purchase and conservation easements.

The Blueprint recommends that an economic valuation of the County's ecosystem services be completed and that pilot projects be coordinated with resource agencies, land conservation organizations, the agricultural community, and willing landowners, to explore the feasibility of incentivizing ecosystem services, and creating the infrastructure necessary to support viable ecosystem service markets. In addition to the examples above, other innovative programs and partnerships on ecosystem services that could provide models and guidance for Santa Cruz County are:

California Rangeland Conservation Coalition - a partnership of over 100 ranchers, environmentalists and government entities working together to conserve and enhance the ecological values and economic viability of California's working rangelands. The Coalition is exploring payments for ecosystem services as a means to incentivize land stewardship to benefit water, soil, air and habitat. www.carangeland.org

Ecosystem Marketplace (EM): provides information services to inform a new economy that will pay for and invest in ecosystem services. www.ecosystemmarketplace.com.

Forest Trends: an international non-profit organization that works to expand the value of forests to society; promote sustainable forest management and conservation by creating markets for ecosystem services; enhances the livelihoods of local communities living in and around forests. www.forest-trends.org.

Natural Capital Project: a partnership of Stanford University's Woods Institute for the Environment, The Nature Conservancy, World Wildlife Fund, and the University of Minnesota to create innovative approaches to measuring the economic and social value of ecosystem services and taking those values into account when making decisions. www.naturalcapitalproject.org

Willamette Partnership: a coalition of conservation, city, business, farm, and scientific leaders that have developed a common vision for ecological health and economic vitality in the Willamette Basin in Oregon. The Partnership has developed models for moving beyond compliance-based projects to incentivizing stewardship of ecosystems. www.willamettepartnership.org

4.5 Critical Next Steps

Successful implementation of the Conservation Blueprint will rely on collaboration of conservation organizations, community groups, cities, resource and recreation agencies, agricultural organizations, the County, landowners and individuals. Implementation will benefit from ongoing support for successful policies, programs and initiatives already in place. It will also thrive with effective coordination of agencies and organizations to enhance integrated approaches and local solutions to land and resource conservation. And it will rely on significant investment to protect, conserve and steward our land and resources.

This Blueprint does not task specific stakeholders with the roles and responsibilities for implementing recommended strategies and actions. Instead it emphasizes building on existing efforts and partnership networks in place, and tapping into leadership to form working groups to take the next steps – which might include enhancing regional conservation partnerships, identifying existing and new funding

sources, and developing pilot projects. It is the hope of the Land Trust that community leaders, agencies, organizations and interested community members across the county will embrace and respond to this Blueprint's Call to Action. As members of the Santa Cruz County community, each of us has a role to play in preserving the long-term health and viability of our county's natural resources.

Later chapters in the Conservation Assessment portion of this document identify strategies and actions deemed necessary to ensure the long-term health and viability of Santa Cruz County's biodiversity, water resources, working lands and recreational lands. Following are some of the most critical next steps related to each of these conservation topic areas. Although the steps are organized under the umbrella of a single topic area, many of them are interrelated. Some of the next steps support existing efforts, while others point to a need for new partnerships, policies and funding. All are designed to increase coordination and foster innovation across jurisdictions, geography, and public and private lands.

4.5.1 Biodiversity

1. Prioritize and coordinate conservation projects to protect Globally Rare and Locally Unique biological systems, such as Santa Cruz Sandhills, Maritime Chaparral, Coastal Grassland, Old Growth Redwoods, Riparian areas, streams, sloughs, ponds and other wetlands.
2. Develop best management practices for maintaining landscape permeability on public and private lands and convene a multidisciplinary working group (including CalTrans and County Public Works) to inform design of wildlife corridors to enhance connectivity in critical areas.
3. Explore ecosystem service payments and other new ways to fund long-term stewardship of natural resources on public and private conservation lands.
4. Conduct studies to fill biodiversity data daps, including developing a county-wide vegetation map that is based on a county-specific plant classification.
5. Develop curricula and expand outreach programs that increase community awareness about rare and unique systems, habitat connectivity, ecosystem services and climate change.
6. Develop and implement coordinated, regional strategies for management of widespread threats to the viability of natural systems, including invasive species and climate change.
7. Develop and implement system-specific fire management strategies that address public safety while conserving important habitat for plants and animals, particularly in fire-adapted systems such as chaparral and closed-cone conifer forests.
8. Protect and monitor potential climate *refugia* (areas that are more likely to be climatically stable or support species in the predicted hotter and drier climate), including streams, ponds, lakes, wetlands, springs and north-facing slopes.

4.5.2 Water Resources

1. Focus land conservation partnerships in watersheds that protect critical drinking water supplies and protect groundwater recharge areas.
2. Protect large blocks of interconnected public and private conservation lands to capture the widest range of hydrologic functions and processes (fog drip, recruitment of large woody debris,

water purification, flood control, groundwater recharge) to buffer against changing climate conditions.

3. Support grassroots partnerships such as the Pajaro Valley Water Community Dialogue that seeks to reduce overdraft in the Pajaro Valley through landowner engagement, outreach and collaboration.
4. Coordinate efforts to link land conservation projects with regional water supply and water quality enhancement projects through the *Integrated Regional Water Management Plans* and the *Watershed Restoration Program*.
5. Prepare comprehensive watershed assessments to identify habitat restoration and water quality enhancement priorities and work with the *Integrated Watershed Restoration Program* (IWRP) to implement projects in the Lower Pajaro River and Watsonville Sloughs, San Lorenzo River, with emphasis on Zayante and Bean creeks, and Soquel, Corralitos, San Vicente and Laguna Creeks.
6. Develop a program using easements or other landowner incentives to protect undeveloped floodplains with intact riparian vegetation for biodiversity, flood protection and water quality.
7. Encourage reduced agricultural water use and implement water-saving conservation practices through incentive programs, conservation easements and funding from conservation grant programs.
8. Support efforts by the County, Resource Conservation District and regulatory agencies to implement off stream water storage and recharge ponds.
9. Explore the feasibility and potential benefits of establishing a watershed restoration mitigation bank, where mitigation payments collected by local agencies could be used to fund land conservation and stewardship projects.

4.5.3 Working Lands

1. Prioritize multi-benefit projects that achieve diverse conservation goals and enhance viability of working lands.
2. Prioritize conservation of remaining rangeland in the north coast and Pajaro Hills to ensure long-term provision of economic and environmental benefits.
3. Promote sustainable grazing management on both privately and publicly conserved rangelands and encourage California State Parks to revisit grassland management policies and practices.
4. Develop pilot projects to assess the feasibility of “payment for ecosystem service” models to fund conservation and stewardship on working farms, ranches and timberland.
5. Consider strategic fallowing of marginal farmland that is susceptible to flooding, erosion, and other limitations.
6. Consider developing a comprehensive redwood conservation strategy and forestry partnership to achieve biodiversity and working lands conservation goals for the county’s redwood forests.
7. Explore development of a “*Grown in Santa Cruz Mountains*” marketing and Green Forest Products certification program.

4.5.4 Recreation and Healthy Communities

1. Convene a working group of public park agencies and non-profit organizations to identify local funding options and land management models for long-term stewardship and maintenance of publicly-funded parks and open space.
2. Work to include program funding for the Central Coast and Monterey Bay regions in future state bond measures to protect and enhance land, water and natural resources and provide public access opportunities.
3. Coordinate the Conservation Blueprint with the AMBAG Regional Blueprint and *Sustainable Communities Strategy* (SB 375) for the Monterey Bay Region.
4. Coordinate stewardship, restoration, maintenance, enforcement and education efforts across public and private conserved lands to address challenges such as invasive species, homeless encampments and other illegal activities.
5. Connect urban communities to parks and trails of regional and statewide significance and implement adopted regional trail connections between Santa Cruz County public lands and the Monterey Bay.
6. Partner to implement new rail and trail projects including along the 32-mile Union Pacific Rail Right-of-Way and along the San Lorenzo River Valley.
7. Address park deficiencies in economically underserved areas and seek to site parks within walking distance of every urban resident's home.
8. Utilize conserved lands for *farm to cafeteria* programs in partnership with schools and the agricultural community.
9. Coordinate and fund adult and youth citizen science programs, to monitor water quality, wildlife and other natural resource issues.
10. Enhance support for the Annual Monterey Bay Birding Festival and promote the Watsonville Sloughs as an eco-tourism destination.

Part III. Conservation Assessment

The Conservation Assessment includes a discussion of the current conditions, key issues and challenges, and the conservation goals, strategies, and actions that were developed for the Blueprint. This information was based on detailed technical analysis including consultation with over 110 experts including scientists and planners, farmers and foresters, and a broad range of community stakeholders. The four chapters highlight where conservation efforts could best be focused to preserve rare and unique biological communities, maintain linkages for wildlife movement, protect and enhance our water resources, retain the viability of working lands, and enhance open space recreational resources.

5. Biodiversity Assessment

5.1 Introduction

Santa Cruz County supports a wealth of native biodiversity. It is located in the heart of the California Floristic Province: a global biodiversity hotspot identified for its abundance of native plants, many of which are found nowhere else in the world (i.e. are endemic to the region). The county supports more than 1,200 native plant species including 17 that are found only within the county, such as Santa Cruz wallflower (*Erysimum teretifolium*) and Scotts Valley polygonum (*Polygonum hickmanii*), and 24 species that are nearly endemic to the county, such as the Santa Cruz cypress (*Hesperocyparis abramsiana* var. *abramsiana*) and Santa Cruz clover (*Trifolium buckwestiorum*; Morgan 2005). The county features 32% of the state's moss species—191 species in total (Kellman 2003).

The rich flora, topography, geology, soils, and hydrology of our county support a diversity of animal species including endemic species such as the Santa Cruz kangaroo rat (*Dipodomys venustus venustus*) and Ohlone tiger beetle (*Cicindela ohlone*). The scientific community has only begun to catalogue the plants, animals, fungi and other species in our county; new discoveries certainly lie ahead.

Santa Cruz County supports numerous biologically rich and important communities. These include the Santa Cruz Sandhills found on ancient marine deposits in the central part of the county; the sloughs and other wetlands which are concentrated in the Pajaro Valley; the coastal prairies on the ancient marine terraces along the coast and in Scotts Valley; maritime chaparral found on scattered pockets of nutrient-poor soils within reach of the summer fog; and the rock outcrops, dunes, marshes, and bluffs, that dot the coast.

The county's biodiversity value rests not only in its richness of species and diverse communities, but also its role in maintaining biodiversity within the broader Central California Coast ecoregion. Santa Cruz County contains a critical component of the Santa Cruz Mountains: a northwest-trending range that forms the backbone of the San Francisco Peninsula. Intact habitat within the mountains, which is sparsely developed compared to the adjacent low-lying valleys and coastal regions, features a diversity of plants and animals and can support wide-ranging species such as

Santa Cruz County's Biodiversity

Biodiversity *n. The variability among living organisms and the ecological complexes of which they are part. It includes genetic diversity, the richness of species, and the variability of communities and ecosystems.*

More than 1,200 native vascular plant species, including 17 endemic species and 24 species found primarily in Santa Cruz County.

191 moss species; 32% of California's mosses.

Rich and abundant wildlife, including more than 350 birds and 18 endemic animals found nowhere else.

Mosaic of natural communities including the globally rare old growth redwood forests, Santa Cruz Sandhills, northern maritime chaparral, and coastal prairie grasslands.

Coastal streams totaling 850 miles, which support steelhead and coho salmon

More than 1,500 acres of wetlands including sloughs and sag ponds that support diverse wildlife assemblages.

A patch network of more than 130,000 acres of largely intact habitat that supports wide-ranging species such as mountain lions.

Critical linkages to the Gabilan and Diablo Range Mountains that maintain genetic diversity within populations and can promote species' adaptations to climate change.

Nearly a quarter million acres of relatively intact habitat that provides essential ecosystem services include water and air filtration, carbon sequestration, and crop pollination.

the mountain lion (*Puma concolor*) and the American badger (*Taxidea taxus*). The long-term persistence of species that require large areas of intact habitat, as well as the genetic variability of all species, relies on maintaining connections between the Santa Cruz Mountains and adjacent Coast Range Mountains, including the Gabilan Mountains to the south, and the Diablo Range to the east.

Santa Cruz County's unique and diverse biological systems are not only essential to conservation of California's biodiversity, they are also the foundation of our community's well-being. They support our physical, emotional, and economic health by providing a wealth of goods and services (inset box).

In recognition of the county's unique and important biological systems, individuals, agencies, and organizations have worked to protect nearly 72,000 acres of intact habitat within a variety of state and local parks, watershed lands, and privately owned conservation lands. In addition, the county and various cities have established local land use policies designed to protect biological systems (Section 2.2).

Despite this, efforts to conserve biodiversity within Santa Cruz County are me with challenges. Important habitats have been lost, threatening the persistence of many of the county's endemic species, many of which were naturally rare. Remaining habitat is increasingly fragmented by urban and intensive agricultural land uses, which continue to convert habitat particularly in rural areas that are parcelized. Even within our existing parks and other protected areas, habitat is being degraded by factors that threaten the viability of species and communities. These include localized threats, such as pollution and non-native species, and global factors including sea-level rise and climate change (Section 5.2.4). Conservation strategies that address land conversion, fragmentation, and degradation will be essential to safeguarding the long-term viability of the county's biodiversity and the natural systems our community relies upon.

Why Biodiversity Matters

Essential Goods: Plants, animals, fungi, and other organisms supply our resource needs.

Food: Giant kelp forests produce fish; insects pollinate our crops.

Shelter: Sustainably harvested forests provide timber to produce our homes and other buildings.

Medicine: Plants, fungi, and other organisms have been used to develop a wide variety of medications and vitamins.

Ecosystem Services: Biodiversity processes support us. Redwood forests filter water and air; wetlands trap sediment and reduce flooding.

Climate Change Adaptation: Biological systems will mitigate climate change and aid our adaptation to it.

- Plants, fungi, and bacteria bind carbon dioxide into organic matter, reducing the amount of this greenhouse gas that causes global warming.
- Intact and biologically diverse ecosystems can better absorb torrential rain, reducing the risk of flash floods and mudslides that could result from extreme weather predicted as part of climate change.

Recreation and Aesthetics: Biodiversity contributes to outdoor recreation and enhances aesthetic values, and a major main reason Santa Cruz County is a tourism destination.

Intrinsic values: For many, the species and communities have value beyond their critical role in our well-being.

5.1.1 Biodiversity Planning Goals and Objectives

The goal of the Blueprint's biodiversity component was to identify Santa Cruz County's biological conservation values and develop strategies to ensure their long-term viability. Objectives of the planning process included:

1. Harness the local knowledge by engaging a team of technical advisors with a broad range of expertise in the county's diverse biological systems to inform the **Blueprint;**
2. Build on the information and findings of prior plans conducted at a range of scales, including ecoregional plans and assessments, watershed plans, and site-level management plans;
3. Catalogue and map the county's biological conservation values and compile a database that can be updated and inform focused plans or plan updates;
4. Identify elements of an effective long-term strategy for protecting the county's diverse conservation values, including strategies for expanding the network of conservation lands;
5. Integrate the conservation plan for Santa Cruz County into the broader region, by coordinating the planning process with the nine-county San Francisco Bay Area's Upland Habitat Goals project; and
6. Identify elements of an adaptive planning approach in which new information can be integrated to update the plan, rendering it a living document.

5.1.2 Biodiversity Planning Steps and Approaches

These planning objectives were used to design the Blueprint's biodiversity planning process (inset box). Additional information about the approaches is provided in conjunction with the key findings, with more detailed methodology included in the appendices.

Biodiversity Planning Process Overview

1. **Synthesize and critically review** available information about the county's biological systems.
2. **Convene the county's experts** through a series of eight workshops to:
   a. Identify and help **fill data gaps** in our biological information;
   b. **Select the conservation targets:** the species and communities that, if conserved, would protect all biodiversity, including both the rare and unique, and the more common or widespread;
   c. **Set conservation goals for each target,** based on the existing occurrences within the county;
   d. **Identify factors affecting viability of conservation targets**, in recognition that protecting land is essential, though not sufficient, to protect biodiversity.
3. **Design a network of future conservation lands,** containing both public and private holdings, which builds on the existing protected lands to achieve the conservation goals in an efficient way.
4. **Identify a network of habitat patches and linkages essential to habitat connectivity**, to facilitate movement of plants and animals and the continuance of processes that sustain them.
5. **Evaluate impacts of climate change** to identify vulnerable systems and potential climate refugia that can promote resiliency.
6. **Develop a series of goals, strategies, and actions** to guide biodiversity conservation work in the next twenty years.

5.2 Key Findings

Santa Cruz County contains an estimated 222,000 acres (78%) of land in a relatively natural state, ranging from undeveloped parks and working lands, to relatively sparsely-developed rural residential areas (Chapter 2). These lands support a wealth of biodiversity that is essential to the community and the region (inset box).

Main Biodiversity Elements

A diverse mosaic of native vegetation, including several communities that are globally rare and support high concentrations of native plants and animals, such as the Santa Cruz Sandhills, coastal prairies, and maritime chaparral;

Coastal streams that are critical to native fish including steelhead and coho salmon, and sloughs, ponds, and other wetlands that support diverse assemblages of aquatic species, provide water for upland species, connect terrestrial habitats, and may promote adaptation to a future hotter, drier climate;

A network of large patches of intact habitat, including vast redwood forests and expansive grasslands, that are critical to the long-term viability of wide-ranging animal populations and biodiversity within the Santa Cruz Mountains and broader California Central Coast ecoregions, and provide essential ecosystem services to the community.

5.2.1 Important Biological Systems

5.2.1.1 Terrestrial Systems and Species

This area supports a mosaic of 17 general terrestrial communities, identified based on their vegetation which reflects the county's variable soils, hydrology, topography, and disturbance history, among other factors (Table 5-1, Figure 5-1). A key component of biodiversity, these communities support the more than 1,200 native plant species known to occur in the county (Morgan 2005), create diverse habitat conditions for a wealth of native animals, and provide essential ecosystem services including water filtration (especially forests and wetlands), carbon sequestration, and prevention of environmental hazards including mudslides and other erosion, and floods.

The natural vegetation types within Santa Cruz County vary greatly in their acreage, from just over 200 acres each of wetlands and Santa Cruz cypress forest, to more than 120,000 acres of redwood forest (Table 5-1). They also differ in terms of the percent that is protected. While just over 50% of the dunes and knobcone pine occur in existing protected lands, less than 20% of the coast live oak woodland and coastal mixed hardwood forests are protected (Table 5-1).

Several of the terrestrial communities are of exceptional biodiversity conservation value (Table 5-2, Figure 5-2). They were identified by experts as important targets for conservation owing to their rarity, uniqueness, and richness of native species (inset box). Most of these communities are not well-represented in the current network of protected lands and are vulnerable to loss due to future land use changes.

Biologically Highly Significant Systems

- Globally rare communities, some of which are endemic to (found only in) Santa Cruz County.
- Locally unique communities that greatly contribute to the county's biodiversity.
- Biodiversity 'hot spots' that support high concentrations of native plants and animals.

Table 5-1: Santa Cruz County Vegetation (terrestrial communities) and other land cover, showing the total acres and acres within protected land; the percent of the total county acres and acres within protected land; and the percent of each community's total acreage that is protected.

		Acres		Percent		
Structure	Vegetation Type	Total	Protected	Of County Acreage	Of Protected Acreage	Of the Type that is Protected
Herbaceous	Grasslands	15,117	4,785	5%	6%	32%
	Dunes	317	162	0%	0%	51%
	Wetlands	207	95	0%	0%	46%
Shrublands	Coastal scrub	13,147	5,029	5%	6%	38%
	Chamise	2,053	730	1%	1%	36%
	Maritime chaparral	8,115	2,151	3%	3%	27%
	Sandhills Chaparral	5,665	1,748	2%	2%	31%
Woodland	Coast live oak woodland	19,892	3,860	7%	5%	19%
	Coastal mixed hardwood	5,947	1,059	2%	1%	18%
	Riparian	1,596	646	1%	1%	40%
	Sand parkland	226	108	0%	0%	48%
Forests	Monterey pine	707	266	0%	0%	38%
	Santa Cruz cypress	209	99	0%	0%	47%
	Knobcone pine	6,142	3,158	2%	4%	51%
	Pacific Douglas fir	7,365	2,160	3%	3%	29%
	Redwood – Douglas fir	12,066	3,176	4%	4%	26%
	Redwood	123,410	42,796	43%	54%	35%
	Subtotal: Native Vegetation	222,181	72,028	78%	92%	32%
Other	Barren/Rock	560	154	0%	0%	28%
	Non-Native Plants	2,660	450	1%	1%	17%
	Water	669	471	0%	1%	70%
	Cultivated	26,985	3,393	9%	4%	13%
	Urban	32,107	2,056	11%	3%	6%
	Subtotal: Other	62,981	6,524	22%	8%	10%
	Total	**285,163**	**78,554**	**100%**	**100%**	**28%**

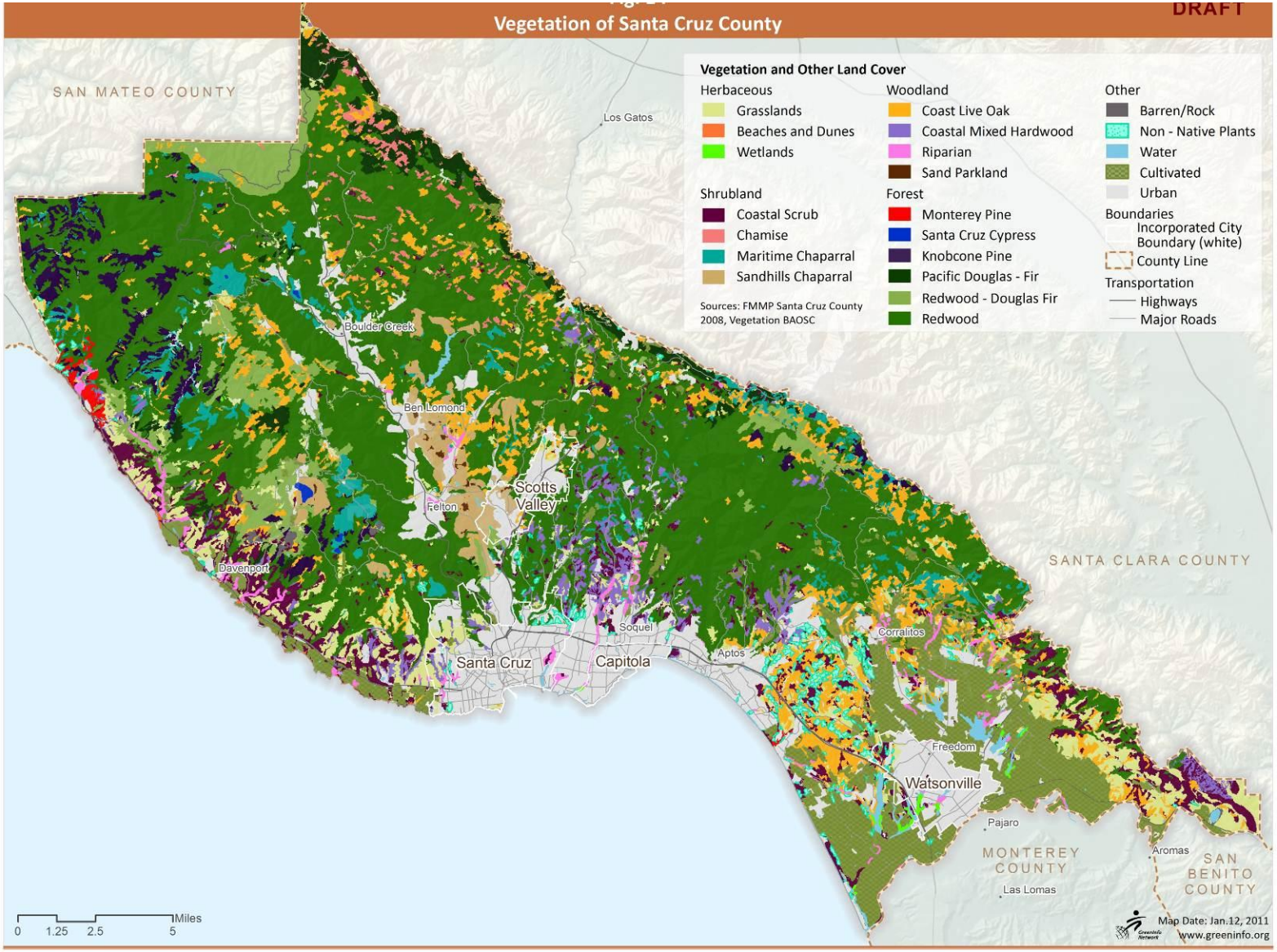

Figure 5-1: Vegetation

Table 5-2: Highly Significant Terrestrial Biological Systems in Santa Cruz County.

Name	Description	Biological Conservation Value	Occurrence and Conservation Status in Santa Cruz County
Santa Cruz Sandhills	Ecosystem endemic to outcroppings of sand soil in Santa Cruz County.	Two endemic communities, sand parkland and sandhills chaparral (a type of maritime chaparral), featuring unique assemblages of plants and animals including seven known endemic species and numerous undescribed species (McGraw 2004).	Found only in central Santa Cruz County on less than 6,000 acres, including developed areas where some species persist. Less than a third of the area (1,856 acres) is protected.
Monterey pine forest	Rare community endemic to four locations on the coast of California and Baja California	Portions of the northernmost occurrence of the globally rare community dominated by the paleoendemic Monterey pine, a Pleistocene relict now restricted to cool, foggy areas. Genetic diversity for one of the world's most important plantation trees.	Occurrence straddles San Mateo County line. Less than 40% of the approximately 700 acres in Santa Cruz County is protected.
Santa Cruz cypress forest	Rare community found only in five locations on the western Santa Cruz Mountains	Endemic community featuring the paleoendemic Santa Cruz cypress (*Hesperocyparis abramsiana* var. *abramsiana*) and maritime chaparral endemic shrubs (e.g. *Arctostaphylos silvicola* and *A. sensitiva*).	Santa Cruz County supports four of the five global populations and 209 of the 217 total acres of the community, less than half of which are currently protected.
Maritime Chaparral	Several unique communities restricted to areas with nutrient-poor soils influenced by summer fog.	Several unique chaparral communities characterized by endemic manzanitas including *Arctostaphylos andersonii, A. canescens, A. crustacea* ssp. *crinita, A. glutinosa, A. hookeri* ssp. *hookeri, A. sensitive, A. ohloneana, A. pajaroensis* and *A. silvicola.* Occur on varying substrates in reach of coastal fog including: Santa Cruz mudstone on the North Coast ("the chalks"), ancient dunes in the Larkin Valley region, uplifted marine sediment in the sandhills, and decomposed granite on ridges.	Mapped locations are approximated and are scattered throughout the hills and mountains. Just over 25% of the estimated 8,100 acres is currently protected. A county-wide classification and mapping study is recommended.
Old Growth Redwood Forest	Redwood forest that has not been previously logged.	Mature forests feature unique structure and species composition, provide breeding habitat for Marbled Murrelets, and protect streams supporting steelhead and coho salmon.	Nearly 8,000 acres in Santa Cruz County, 5,820 acres (73%) of which are currently protected.

Table 5-2: Highly Significant Terrestrial Biological Systems in Santa Cruz County.

Name	Description	Biological Conservation Value	Occurrence and Conservation Status in Santa Cruz County
Coastal Prairies and Pocket Meadows	Small, often remnant herb-dominated communities on coastal terraces or in forest openings within the mountains	• High native plant richness including numerous locally unique species, endemic, and undescribed species, including *Polygonum hickmanii, Chorizanthe robusta* var. *hartwegii,* and *Holocarpha macradenia*. • Important habitat for various insects including Ohlone tiger beetle, birds, and other animals.	Small pocket meadows dot the mountains; remnant patches of prairie occur on the coastal terraces and foothills. No system-wide mapping has been conducted. Much of the original habitat has been developed or converted to intensive agriculture.
Grasslands	Herb-dominated communities on the coastal terraces and foothills	• Support populations of many rare or locally unique animal species including American badger, Northern harrier, White-tailed Kite, Golden eagle, and Grasshopper Sparrow. • Contain remnant patches of coastal prairie native plant species.	Historically widespread along the coast but now limited to the North Coast, Pajaro Hills, and isolated patches elsewhere. Only 32% of the approximately 15,100 acres are protected.
Swanton Floristic Area	Plant species diversity 'hot spot' within the Scott Creek and Swanton Bluffs watersheds	Area of exceptionally high plant species richness which contains more than 600 plant species, including many rare, locally unique, and undescribed species (West 2010).	Precise boundary has not been delimited but less than one-third of the nearly 3,000 acres identified by local experts as most diverse is currently protected within Cal Poly's Swanton Pacific Ranch.
Sandstone Outcroppings	Areas of exposed Butano, Lompico, Vaqueros, and Zayante sandstone	• Support rich and unique native plant assemblages, including unique succulents (*Dudleya* spp.) and bryophytes. • Feature an abundance of native insects and unique bird assemblages.	Scattered locations throughout county, including China Grade and Eagle Rock (Big Basin SP), Damond Ridge and adjacent areas in Castle Rock State Park, and Circle P Ranch in the Pajaro Hills.

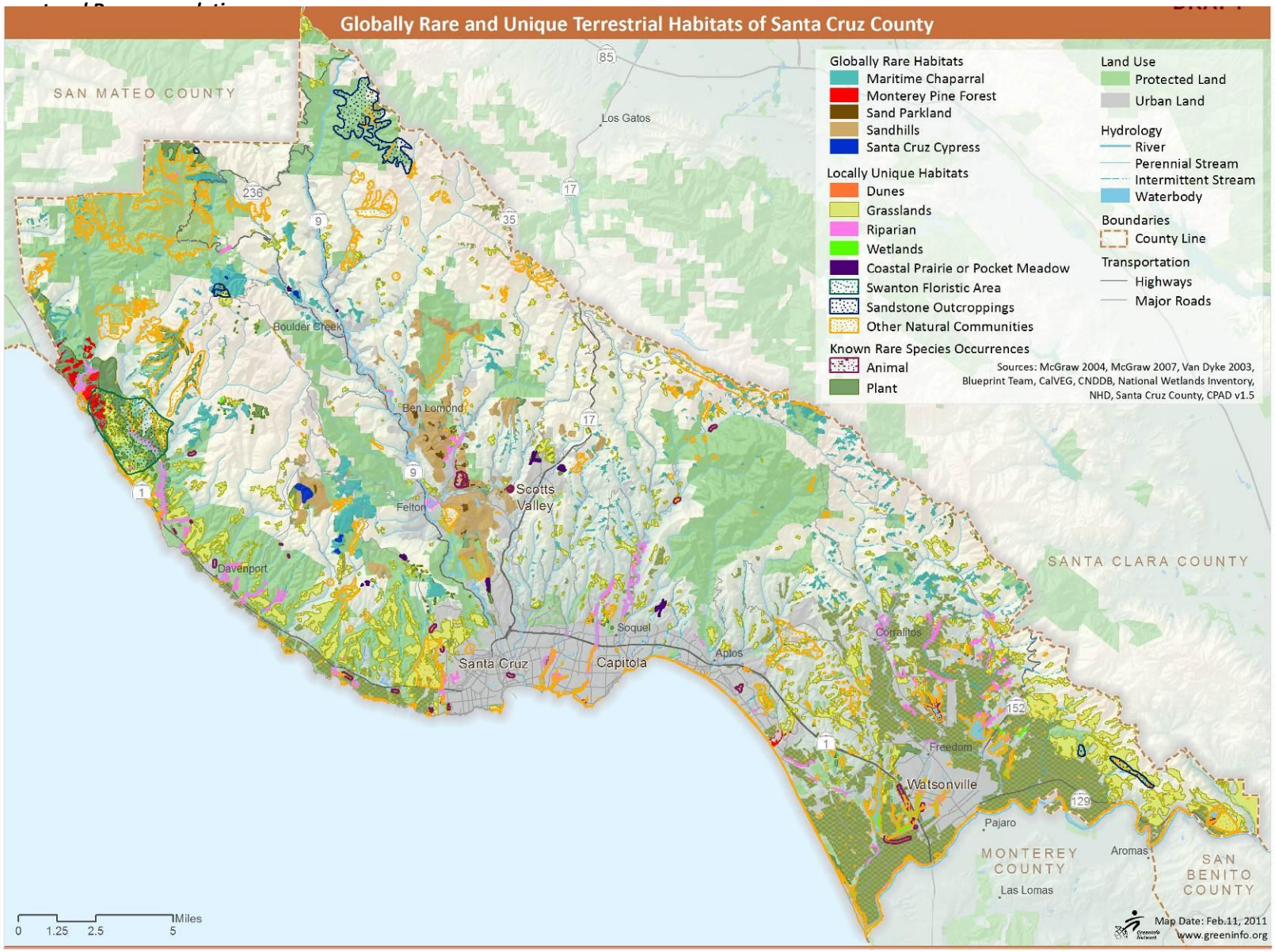

Figure 5-2: Globally Rare and Locally Unique Terrestrial Habitats

5.2.1.2 Aquatic Systems

Santa Cruz County features many of the Central California Coast's important aquatic ecosystems, including coastal streams, sloughs, wetlands, ponds, and lakes (Figure 5-3). These systems support diverse assemblages of aquatic plants and animals and sustain many terrestrial communities and species tied to the water, such as riparian woodlands that line streams and ponds, and animals that require free water.

The function and condition of aquatic systems is inextricably linked to the upland (terrestrial) habitats in which they occur. The amount and quality of the water in streams, sloughs, and ponds depends on the condition of the watershed, with intact vegetation promoting essential hydrologic functions such as rain fall infiltration and water filtration. Upland habitats exchange materials and energy with the aquatic systems and are essential for species that require both environments to complete their lifecycle, such as the Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) and other amphibians.

Naturally rare due to their tie to water within the landscape, many aquatic systems in Santa Cruz County have been converted or altered as a result of urbanization, cultivation, and other land uses that alter their hydrologic functions, structure, and habitat for native species. Streams have been channelized, dammed, or impounded, and the riparian vegetation all or partially removed, particularly in urban and heavily cultivated areas. Many of the sloughs and other wetlands have been filled or drained. It is important to note that various aquatic habitat, particularly ponds, have also been created. Many aquatic systems have been degraded by pollution, sedimentation, and other factors that affect water quality and other habitat conditions.

Due to their rarity, importance to both aquatic and terrestrial species, and their essential ecosystem services, all aquatic systems have high conservation value. Table 5-3 highlights aquatic systems that are critical to the county's biodiversity.

Of particularly importance are our coastal streams, which support threatened salmonids (steelhead and coho salmon), and other native fish, amphibians, and reptiles, and provide riparian habitat important for many species, particularly birds. Figure 5-3 illustrates the watersheds that are most critical to the conservation of riverine biodiversity. These priority watersheds were identified to the subwatershed level by a team of stream biologists and planners with extensive knowledge of the county's streams, who were convened as part of the Blueprint to rate their relative biological conservation value for steelhead and coho salmon (Appendix A). These anadromous fish utilize a variety of natural habitats along the length of a stream, are dependent upon intact riparian habitat along the stream channel, and are sensitive to changes in habitat conditions, and are therefore good indicators of conservation value. The watersheds vary greatly in their current level of protection, development, and cultivation (Figure 5-4), which can influence the viability of the streams and the species they support.

It is important to note that all streams have value for the county's biodiversity conservation, and play a critical role in our water supply, working lands, and recreation.

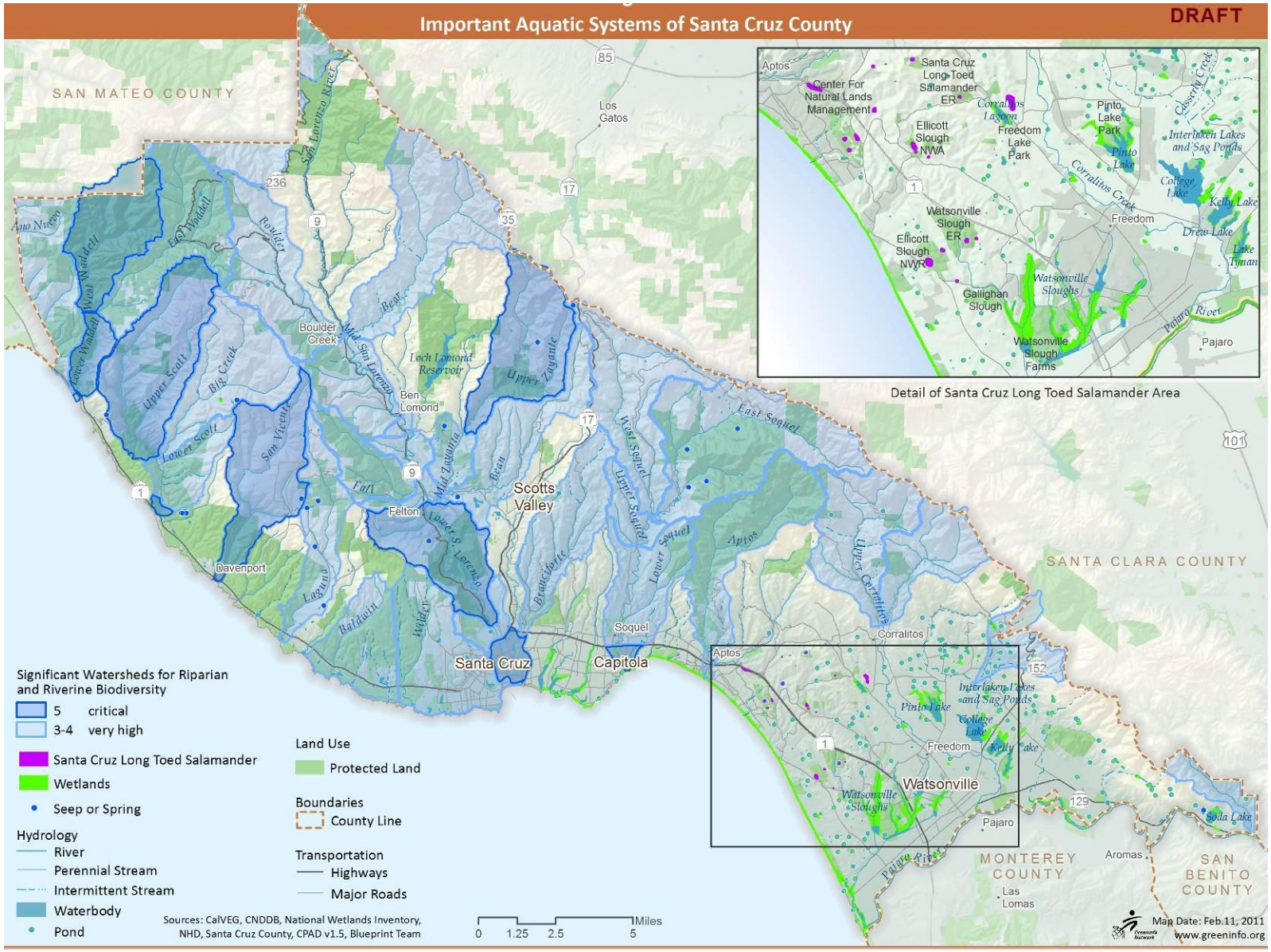

Figure 5-3: Important Aquatic Systems

Table 5-3: Highly Significant Aquatic Biological Systems in Santa Cruz County.

Name	Description	Biological Conservation Value	Occurrence and Conservation Status in Santa Cruz County
High Priority Coastal Watersheds	Perennial streams that flow to the Pacific Ocean, many of which feature lagoons and associated marshes (Appendix A)	• Support rare salmonids: coho salmon and steelhead (Central California Coast and South Central California Coast populations) • Feature other native animals including tidewater goby, Monterey roach, speckled dace, Pacific lamprey, California red-legged frog, foothill yellow-legged frog, western pond turtle, and San Francisco garter snake • Provide riparian habitat important for many species including several birds (Long-eared Owl, Yellow Warbler, and Yellow-breasted chat) • Provide water and connectivity for terrestrial animals	Experts identified 39 watersheds totaling 174,000 acres that are critical to streams of important conservation value (Appendix A), only 31% of which is protected (Figure 5-4).
Watsonville Sloughs	One of the largest remaining coastal wetlands in California	• Exceptionally important habitat for birds including migratory and wintering waterbirds, shorebirds, and riparian species. • Support aquatic species including California red-legged frog and western pond turtle	Complex of several sloughs totaling approximately 800 acres with adjacent upland habitat is essential to slough habitat condition and many aquatic species' persistence.
Interlaken Lakes and Sag Ponds	Lakes and sag ponds formed through faulting in the Pajaro Valley region	• Support diverse and abundant bird assemblages, including riparian species and the county's highest concentration of waterbirds (Santa Cruz Bird Club 2005). • Steelhead migrate through Salsipuedes Creek, which flows through College Lake.	Seven (7) lakes totaling 500 inundated acres and adjacent uplands in the Interlaken area (Pinto, College, Kelly, and Drew lakes, and Lake Tyman, and two smaller, unnamed lakes). Other than Pinto Lake, they are not protected. The majority of College Lake is seasonally drained and farmed.
Santa Cruz Long-toed Salamander Ponds	Ponds in the Larkin Valley and Rio Del Mar area	• Ponds that support breeding Santa Cruz long-toed salamanders, an endangered species endemic to coastal southern Santa Cruz and northern Monterey counties. • Ponds also provide breeding habitat for California red-legged frog, western pond turtles, and other amphibians and reptiles, as well as birds.	Seventeen (17) known ponds totaling 30 acres, 13 acres (43%) of which are currently protected. Upland habitat and corridors between ponds are essential to the species long-term persistence.

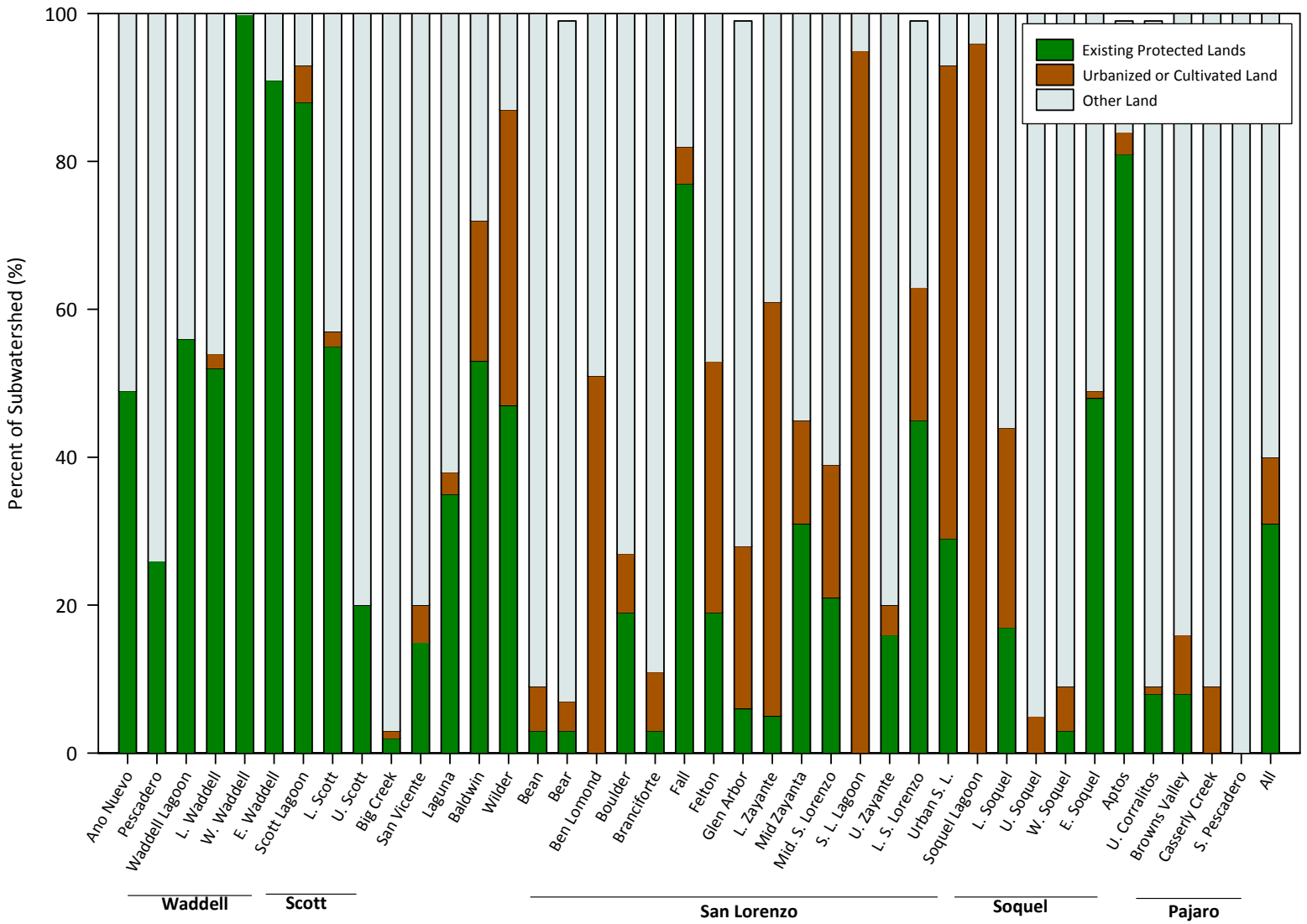

Figure 5-4: Protection status of the Priority Watersheds (Appendix A).

5.2.1.3 Rare and Endangered Species

Rare Species Hotspots

Terrestrial

- Karst caves
- Grasslands including coastal prairie and meadows
- Santa Cruz sandhills including sand parkland
- Maritime chaparral
- Dunes
- Swanton floristic area
- Riparian woodlands

Aquatic

- Coastal streams and lagoons
- Watsonville sloughs
- Interlaken lakes and sag ponds
- Other ponds and wetlands

Santa Cruz County supports 73 known rare plant species (Table 5-4). Sixteen of these species are endemic to (found only in) the county (Morgan 2005), and 13 have been listed as threatened or endangered. The county also supports 81 rare or locally unique animal species, 19 of which endemic to the county, and 13 of which are threatened or endangered (Table 5-5). Many of these rare plants and animals are found in the a few 'hot-spots' within the county (inset box).

These lists include several species that have only recently been discovered in the past few decades. For example the Ohlone tiger beetle—a species endemic to the coastal prairie grasslands of central coastal Santa Cruz County—was first collected in Soquel in 1990 (Frietag et al. 1993). In 2003, Caitlin Bean determined that the Santa Cruz kangaroo rat is endemic to the sandhills in central Santa Cruz County (Bean 2003). In 2007, biologists recommended that the Santa Cruz Mountains population of the black salamander be recognized as a unique species (Rissler and Apodaca 2007).

Many recent species discoveries have not yet been officially described by scientists. Several invertebrate species from the karst caves (Ubrick 2001) and the sandhills (McGraw 2004), as well as seven species of mosses (Kellman 2003) in Santa Cruz County are all awaiting taxonomic recognition—a process that can take time. For example, Randall Morgan discovered the Ohlone manzanita in the 1978, but it wasn't official described until 2008 (Vasey and Parker 2008).

Meanwhile, new discoveries continue to be made. In his recent examination of the county's clovers (*Trifolium* sp.), Randall Morgan identified three new species. Herpetologist Barry Sinervo is investigating whether the strictly aquatic Pacific giant salamanders recently discovered within the karst caves are a distinct species (B. Sinervo, pers. comm. 2011).

These ongoing discoveries underscore the importance of conserving the wide variety of communities and other unique systems in the county to safeguard its biodiversity.

Table 5-4: Rare and Endangered Plant Species in Santa Cruz County (adapted from Morgan 2005). Endemic species are listed in bold font

Scientific Name	Common Name	Status
Agrostis blasdalei	Blasdale's bent grass	CNPS 1B
Amsinckia lunaris	bent-flowered fiddleneck	CNPS 1B
Arctostaphylos andersonii	Santa Cruz manzanita	CNPS 1B
Arctostaphylos glutinosa	**Schreiber's manzanita**	**CNPS 1B**
Arctostaphylos hookeri	Hooker's manzanita	CNPS 1B
Arctostaphylos ohloneana	**Ohlone manzanita**	CNPS 1B
Arctostaphylos pajaroensis	Pajaro manzanita	CNPS 1B
Arctostaphylos regismontana	King's Mt. manzanita	CNPS 1B
Arctostaphylos silvicola	**Bonny Doon manzanita**	**CNPS 1B**
Arenaria paludicola	marsh sandwort	FE, SE
Artemisia pycnocephala (sandhills ecotype)	sandhills beachwort	
Campanula californica	swamp harebell	CNPS 1B
Carex saliniformis	deceiving sedge	CNPS 1B
***Carex* sp. nov.**	**campus sedge**	
Castilleja exserta ssp *latifolia*	banded owl's clover	
Chorizanthe cuspidata	San Francisco spineflower	CNPS 1B
Chorizanthe pungens var. *hartwegiana*	Ben Lomond spineflower	FE
Chorizanthe pungens var. *pungens*	Monterey spineflower	FT
Chorizanthe robusta var. *hartwegii*	Scotts Valley spineflower	FE
Chorizanthe robusta var. *robusta*	robust spineflower	FE
Clarkia prostrata	prostrate clarkia	
Clarkia purpurea ssp *purpurea*	purple godetia	
***Clarkia unguiculata* ssp. nov.**	**Laguna clarka**	
Collinsia multicolor	San Francisco collinsia	CNPS 1B
Cordylanthus maritimus ssp *palustris*	Pt. Reyes bird's-beak	CNPS 1B
Hesperocyparis abramsiana	Santa Cruz cypress	FE, SE
Dirca occidentalis	western leatherwood	CNPS 1B
***Dudleya palmeri* (local form)**	**Palmer's liveforever**	
Eriogonum nudum var. *alterans*	Watsonville buckwheat	
Eriogonum nudum* var. *decurrens	**Ben Lomond buckwheat**	**CNPS 1B**
Erysimum ammophilum	coast wallflower	CNPS 1B
Erysimum franciscanum var. *crassifolium*	coarse-leaved wallflower	
Erysimum teretifolium	**Santa Cruz wallflower**	**FE, SE**
***Eschscholzia californica* ssp.**	**sandhills poppy**	
Fritillaria affinis var. *tristulis*	checker lily	CNPS 1B
Gilia tenuiflora ssp *arenaria*	sand gilia	FE, ST
***Gnaphalium* sp. nov.**	**sandhills everlasting**	
Grindelia hirsutula var. *maritima*	San Francisco gumplant	CNPS 1B
Hemizonia parryi ssp. *congdonii*	Congdon's tarplant	CNPS 1B
Hoita strobilina	Loma Prieta hoita	CNPS 1B
Holocarpha macradenia	Santa Cruz tarplant	FT
Horkelia cuneata ssp *sericea*	Kellogg's horkelia	CNPS 1B
Horkelia marinensis	Point Reyes horkelia	CNPS 1B
Layia carnosa	beach layia	FE, SE
Lessingia germanorum	San Francisco lessingia	FE, SE

Table 5-4: Rare and Endangered Plant Species in Santa Cruz County (adapted from Morgan 2005). Endemic species are listed in bold font

Scientific Name	Common Name	Status
Linanthus grandiflorus ssp.	Dylan's linanthus	
***Linanthus parviflorus* var.**	**orange linanthus**	
Malacothamnus fasciculatus	chaparral mallow	CNPS 1B
Microseris paludosa	marsh microseris	CNPS 1B
***Minuartia californica* ssp. nov.**	**Scotts Valley sandwort**	
Pedicularis dudleyi	Dudley's lousewort	CNPS 1B
Penstemon rattanii var. *kleei*	Santa Cruz Mountains beardtongue	CNPS 1B
Pentachaeta bellidiflora	white-rayed pentachaeta	FE, SE
***Pinus ponderosa* ssp.**	**Bentham's ponderosa pine**	
Pinus radiata	Monterey pine	CNPS 1B
Plagiobothrys chorisianus var. *chorisianus*	Choris's popcorn flower	CNPS 1B
Plagiobothrys diffusus	San Francisco popcornflower	SE
Polygonum hickmanii	**Scotts Valley polygonum**	**FE, SE**
Puccinellia simplex	annual alkali grass	
Rhynchospora californica	California beaked-rush	CNPS 1B
Rosa pinetorum	pine rose	CNPS 1B
Sidalcea malachroides	maple-leafed checkerbloom	CNPS 1B
Silene verecunda ssp *verecunda*	San Francisco campion	CNPS 1B
Stebbinsoseris decipiens	Santa Cruz stebbinsoseris	CNPS 1B
Trifolium appendiculaum	beaked clover	
Trifolium buckwestiorum	Santa Cruz clover	CNPS 1B
Trifolium depauperatum var. *hydrophilum*	saline clover	CNPS 1B
***Trifolium grayi* ssp. nov. 1**	**Scotts Valley bouquet clover**	
***Trifolium grayi* ssp. nov. 2**	**San Lorenzo Valley bouquet clover**	
Trifolium grayi ssp. 3	coast bouquet clover	
Trifolium physanthum ssp.	headland clover	
Trifolium polyodon	Pacific Grove clover	CNPS 1B
Zigadenus fremontii var. *minor*	dwarf star lily	

FE= Federally endangered, FT=Federally threatened
SE= State endangered, ST=State Threatened
CNPS 1B= California Native Plant Society List of most rare and endangered plants

Table 5-5: Rare, endangered, and Locally Unique Animals in Santa Cruz County. Endemic species are listed in bold font.

Common Name	Scientific Name	Status
Invertebrates		
Antioch sphecid wasp	*Philanthus nasalis*	
California brackishwater snail	*Tryonia imitator*	
California floater clam	*Anodonta californiensis*	
Dolloff Cave spider	***Meta dolloff***	
Empire cave Neochthonius	***Neochthonius imperialis***	
Empire Cave pseudoscorpion	***Fissilicreagris imperialis***	
Undescribed aquatic cave isopod	***Calasellus* sp. nov.**	
Undescribed fulboroid roothopper	***Cixius* sp. nov.**	
Mackenzie's Cave amphipod	***Stygobromus mackenziei***	
globose dune beetle	*Coelus globosus*	
moestan blister beetle	*Lytta moesta*	
monarch butterfly	*Danaus plexippus*	
Mount Hermon June beetle	***Polyphylla barbata***	**FE**
Ohlone tiger beetle	***Cicindela ohlone***	**FE**
Opler's longhorn moth	*Adela oplerella*	
sandy beach tiger beetle	*Cicindela hirticollis gravida*	
sandhills Jerusalem cricket	***Stenopelmatus* sp. nov**	
sandhills scorpion	***Peroctinous***	
sandhills melittid bee	**Hesperapis sp. nov.**	
sandhills robberfly	***Stenopogon* sp. nov**	
Sandhills flesh-fly	***Senotaenia* sp. nov**	
sandhills metopia	***Metopia* sp. nov.**	
Santa Cruz rainbeetle	*Pleocoma conjugens conjugens*	
Santa Cruz teleman spider	***undescribed species nova***	
Strohbeen parnassium	***Parnassius clodius strohbeeni***	
unsilvered fritillary	*Speyeria adiaste adiaste*	
Zayante band-winged grasshopper	***Trimerotropis infantilis***	**FE**
Fish		
coho salmon: central California Coast ESU	*Oncorhynchus kisutch*	FE, SE
Monterey roach	*Lavinia symmetricus subditus*	SSC
Pacific lamprey	*Lampetra tridentata*	
resident stickleback	*Gasterosteus aculeatus*	
Sacramento sucker	*Catostomus occidantalis*	
speckled dace	*Rhinichthys osculus*	
steelhead: central CA coast ESU	*Oncorhynchus mykiss*	FT
steelhead: south central CA coast ESU	*Oncorhynchus mykiss*	FT
tidewater goby	*Eucyclogobius newberryi*	FE, SE
Amphibians		
black salamander	***Aneides flavipunctatus niger***	
California fairy shrimp	*Linderiella occidentalis*	
California red-legged frog	*Rana draytonii*	FT
California tiger Salamander	*Ambystoma californiense*	FT, SSC, SC
foothill yellow-legged frog	*Rana boylii*	SSC
Pacific giant salamander	*Dicamptodon ensatus*	
rough skinned newt	*Taricha granulosa*	

Table 5-5: Rare, endangered, and Locally Unique Animals in Santa Cruz County. Endemic species are listed in bold font.

Common Name	Scientific Name	Status
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	FE, SE, FP
Santa Cruz long-toed salamander	*Ambystoma macrodactylum croceum*	FE, SE, FP
Reptiles		
Western pond turtle	*Actinemys marmorata*	SSC
black legless lizard	*Anniella pulchra nigra*	SSC
Blainville's horned lizard	*Phrynosoma blainvillii*	SSC
California mountain kingsnake	*Lampropeltis zonata*	SSC
California nightsnake	*Hypsiglena torquata nuchalata*	
California whiptail	*Aspidoscelis tigris munda*	
Birds		
Double-crested Cormorant	*Phalacrocorax auritus*	WL
Osprey	*Pandion haliaetus*	WL
White-tailed Kite	*Elanus leucurus*	FP
Northern Harrier	*Circus cyaneus*	SSC
Golden Eagle	*Aquila chrysaetos*	FP
Am. Peregrine Falcon	*Falco peregrinus anatum*	SE, FP
Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT, SSC
Marbled Murrelet	*Brachyramphus marmoratus*	FT, SE
Burrowing Owl	*Athene cunicularia*	SSC
Long-eared Owl	*Asio otus*	SSC
Short-eared Owl	*Asio flammeus*	SSC
Black Swift	*Cypseloides niger*	SSC
Vaux's Swift	*Chaetura vauxi*	SSC
Olive-sided Flycatcher	*Contopus cooperi*	SSC
Loggerhead Shrike	*Lanius ludovicianus*	SSC
California Horned Lark	*Eremophila alpestris actia*	WL
Purple Martin	*Progne subis*	SSC
Yellow Warbler	*Dendroica petechia brewsteri*	SSC
Yellow breasted Chat	*Icteria virens*	SSC
Bryant's Savannah Sparrow	*Passerculus sandwichensis alaudinus*	SSC
Grasshopper Sparrow	*Ammodramus savannarum*	SSC
Tricolored Blackbird	*Agelaius tricolor*	SSC
Mammals		
American badger	*Taxidea taxus*	SSC
Monterey ornate shrew	*Sorex ornatus salarius*	SSC
pallid bat	*Antrozous pallidus*	SSC
Ringtail	*Bassariscus astutus*	FP
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*	SSC
Santa Cruz kangaroo rat	***Dipodomys venustus venustus***	
Townsend's big-eared bat	*Corynorhinus townsendii*	SSC
Western Red Bat	*Lasiurus blossevillii*	SSC

FE= Federally endangered, FT=Federally threatened
SE= State endangered, ST=State Threatened, SC= State Candidate for Listing
FP= California Fully Protected Species
SSC=California Species of Special Concern
WL= California Department of Fish and Game Watch List

5.2.2 Conservation Lands Network

A key objective of the Conservation Blueprint is to identify a network of lands that, if conserved, could safeguard the county's biological diversity (inset box). The conservation lands network is designed to protect rare and unique communities and species, as well as representative areas of the more widespread and common systems. It wound feature not only public lands, including parks or watershed lands, but also private lands including working ranches and forests where biological conservation values are conserved.

What is the Conservation Lands Network?

A network of conserved land that:

1. Collectively safeguards the county's biodiversity.
   - Protects the globally rare, locally unique, and other high conservation values systems
   - Conserves representative areas of more widespread or 'matrix' communities
   - Incorporates the most resilient areas to facilitate long-term viability.
2. Features both private and public lands that are:
   - protected from development or intensive agriculture through fee title, conservation easement, or interim protections such as cooperative agreements and land use policies
   - managed for biodiversity values and have some level of monitoring.
3. Builds on existing protected lands to create large, contiguous areas that can sustain ecological processes, support wide-ranging species, contain a wealth of native species, and resist impacts of adjacent development ('edge effects').
4. Can be updated over time to reflect changes in the landscape including new protected lands or changes in land use.

The conservation lands network was developed based upon the principles of conservation biology and systematic conservation planning (Groves 2003; Table 5-6). It was designed with the aid of Marxan, a computer program that has been utilized in conservation planning projects worldwide, including in the Bay Area Upland Habitat Goals project for the nine Bay Area counties (BAOSC *in prep*). Appendix B describes the methods used to design the network for Santa Cruz County.

The network of conservation lands that could attain the biodiversity conservation goals for Santa Cruz County contains 177,000 acres of land, including nearly 79,000 acres of private and public land that is already protected (Figure 5-5). The other 56% of land within the network is largely in private ownership, and a large proportion is within working rangelands and forests. Maintaining the conservation values of these and other lands in the network can greatly promote the biodiversity conservation goals while facilitating the Blueprint's working lands goals (Chapter 7).

Many areas that were not included in the conservation lands network that feature intact habitat have important biological conservation values, as illustrated elsewhere in this chapter. Conservation efforts in areas outside of the conservation lands network can contribute to the biodiversity conservation goals. As conservation work continues in Santa Cruz County, the network can be updated to reflect new areas protected areas and guide future work to continue to attain the objectives of the network (Table 5).

Table 5-6: Objectives of the Conservation Lands Network for Santa Cruz County (adapted from Groves 2003)

Objective	Description	Techniques Used to Design the Conservation Lands Network
Representative	Identify and protect a range of biological systems, including the full complement of species and communities, which collectively encompass the spectrum of biological variation in the region	Include a diverse range of conservation targets based on a critical review of available biological information. Targets include all of the vegetation (Table 5-1), and a suite of rare species and systems for which occurrence data are available (Appendix B).
Resilient	Include the largest and most intact areas, which are well-insulated from human impacts and where natural processes including ecological disturbances that maintain functioning systems can occur	Examine the landscape's suitability to support the conservation targets based on the degree that it is unaltered by development, which was evaluated based on parcel density and road density, and then select areas that are most suitable for inclusion in the conservation lands network.
Redundant	Include multiple occurrences of each conservation target across the landscape to ensure a high likelihood of persistence in the face of events that could eliminate occurrences (e.g. fires, floods, and disease)	Set goals for protection of the conservation targets within 16 contiguous landscape units, to capture the variability in systems across environmental gradients, as well as incorporate redundancy.
Restorative	Identify areas where restoration of system structure (e.g. species composition) and functions (e.g., natural disturbance regimes) can promote long-term viability	Consider restoration potential in evaluating the conservation value of important systems, particularly the critically rare such as Sandhills, coastal streams, and sloughs and other wetlands.
Efficient	Identify the most efficient network of lands that can attain the goals.	Build on the existing protected lands network, to most efficiently assemble large areas that are most diverse and resilient
Connected	Maintain landscape connectivity to promote species movement and other ecological processes.	Build a compact network of interconnected conservation lands and identify a patch network and critical linkages between intact habitat patches (Section 5.2.3)

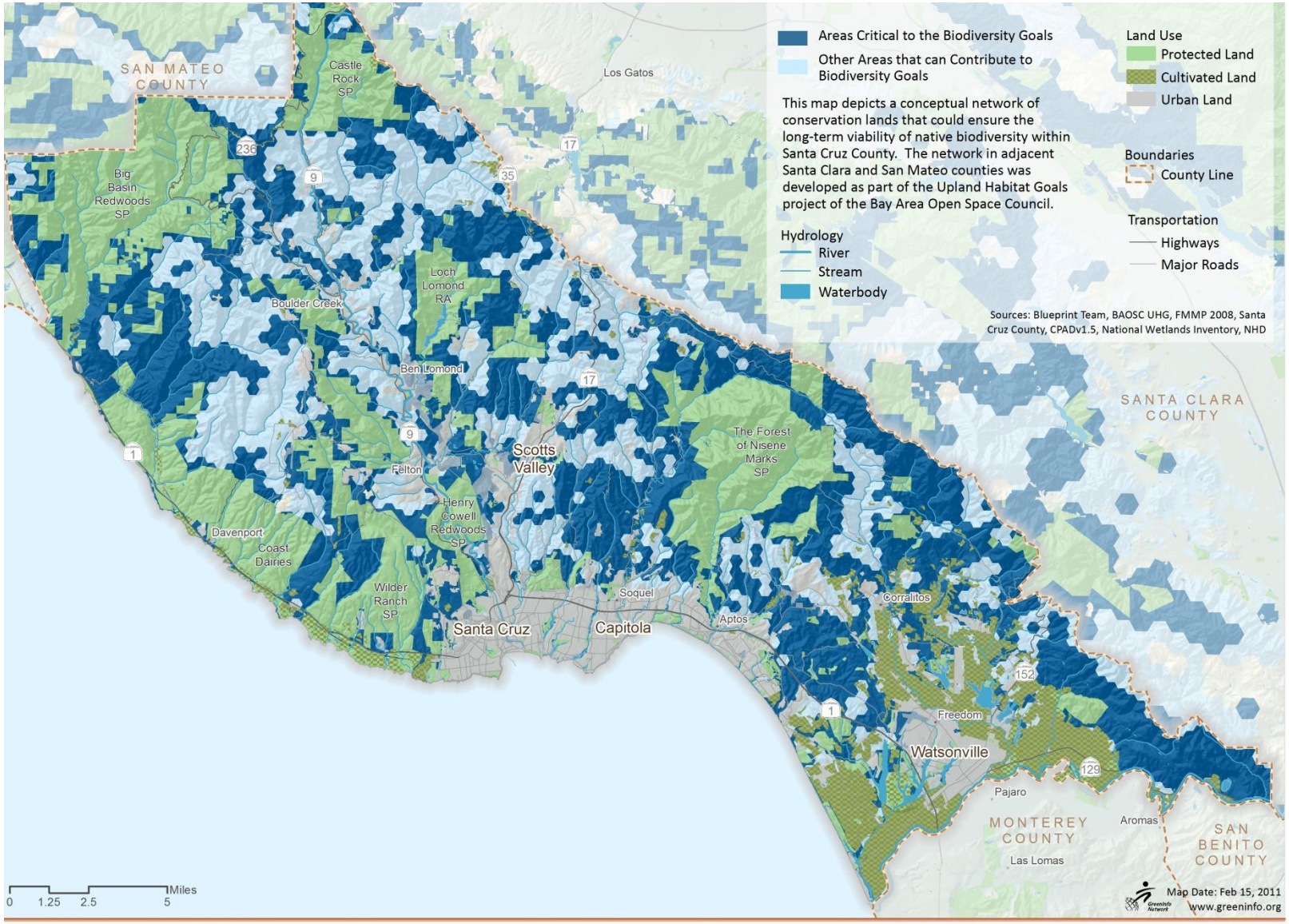

Figure 5-5: Conservation Lands Network

5.2.3 Habitat Connectivity

The long-term viability of the species and communities of Santa Cruz County relies on maintaining a network of large, interconnected patches of intact habitat. Conservation projects should maintain or enhance habitat connectivity in order to promote long-term persistence of biodiversity in Santa Cruz County (inset box). Both aquatic and terrestrial (upland) habitats within Santa Cruz County have become fragmented as a result of urbanization, cultivation, mining, and other human activities.

Habitat Connectivity Essentials

Habitat connectivity is the connectedness of habitat patches for a given species.

In fragmented or patchy landscapes, habitat connectivity can:

- Include corridors, stepping stones, or a permeable (easy to move through) matrix.
- Support species with large home ranges such as mountain lions, for which remaining habitat patches are too small to support persisting populations.
- Allow species to migrate seasonally, as part of their life history (e.g. steelhead and coho salmon) or in response to changes in habitat suitability, or to disperse to establish a new territory.
- Promote recolonization of habitat patches after a disturbance (e.g. fire).
- Promote exchange of genetic material to facilitate long-term population viability.
- Enable species movement in response to climate change.

5.2.3.1 Aquatic Habitat Connectivity

Santa Cruz County's streams have been fragmented by factors that degrade habitat, including stream channelization, loss of riparian vegetation, sedimentation, and pollution. Stream habitat connectivity is also severed by physical barriers including dams, impassible road culverts, debris, and other unnatural factors that block the channel or otherwise render it impassible. The most recent county-wide synthesis of passage barriers located 28 areas where streams are partially or completely blocked as a result of anthropogenic factors (County of Santa Cruz 2010). Many of these barriers prevent anadromous fish including steelhead and coho from accessing suitable habitat upstream, thus limiting their populations. Identifying and removing fish passage barriers has been a key focus of work by the County in coordination with the Resource Conservation District of Santa Cruz County.

5.2.3.2 Terrestrial Habitat Connectivity

The connectedness of vegetation within the landscape, or landscape connectivity, is a key factor influencing terrestrial habitat connectivity (Lindenmeyer and Fischer 2006). In Santa Cruz County, landscape connectivity has been reduced by a number of factors including:

1. **Habitat conversion**: Development, cultivated agriculture, and mining on more than 59,000 acres (21%) of the county have fragmented remaining habitat, particularly within the coastal areas and valleys, but also along mountain streams (e.g. San Lorenzo River) and ridgelines (e.g. Summit Road) where rural development is concentrated.
2. **Rural Residential Development:** Development within the hills, mountains, and other rural areas can fragment habitat for many species wary of humans and the attendant features of their habitations, including dogs.

3. **Roads:** The estimated 3,049 miles of roads in the county can act as barriers to movement of many species. Of particularly concern are the divided highways, Highway 17 and portions of Highway 1, which feature physical barriers and also have the greatest traffic volume. Other state highways including highways 9, 129, and 152, as well as major arterial roads such as Soquel San Jose Road and Bear Creek Road, likely inhibit movement of many species including mountain lions: the territories or which are bounded by major roads and highways in Santa Cruz County (C. Wilmers, unpublished data).
4. **Fences:** Fences designed to restrict animal movement such as those made of 'hog wire', can prevent animals from moving between habitat patches and confine their movement to road corridors where mortality is greatest. Such fences have proliferated in recent years, particularly in agricultural areas as a result of food safety concerns.

The long-term viability of the species and communities of Santa Cruz County requires maintaining a network of large, interconnected patches of intact habitat. To identify the patch network, the Blueprint team collaborated with Conservation Biologist Dr. Adina Merenlender on an analysis of the Santa Cruz Mountains bioregion, 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 (Appendix C; Merenlender and Feirer 2011). The patch network reflects the general naturalness of the landscape, rather than the suitability of the habitat for any one species. The Blueprint team compared the resulting patch network with mountain lion movement data collected by Dr. Chris Wilmers, University of California Santa Cruz, as part of collaboration with the California Department of Fish and Game. 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.

Habitat Connectivity Analysis Objectives

1. Map remaining patches of intact habitat (areas without public roads on parcels > 10 acres).
2. Identify potential corridors and other landscape linkages to connect the patches.
3. Evaluate the patch network based on available mountain lion habitat use and movement data.

The connectivity analyses identified several large patches of intact habitat and revealed several important potential corridors connecting them within Santa Cruz County, and also areas critical to connecting the County to adjacent regions (Figure 5-6).

5.2.3.2.1 Large Patches of Intact Habitat

While the low-lying valleys and much of the coastal region are highly developed, the Santa Cruz Mountains contain many large patches of intact habitat. In Santa Cruz County, remaining patches primarily consist of large State Parks and other public lands, privately-held forests used for timber harvest, and rangelands used for cattle grazing. The six largest patches that are all or partly within the county include (Figure 5-6):

1. **North Coast**: The more than 70,000-acre primarily forested area split nearly evenly between Santa Cruz and San Mateo counties, that includes Big Basin State Park and private forestlands within the Scott Watershed;

2. **Pajaro Hills**: A more than 24,000-acre area of grasslands, shrublands, and forests in the southern tip of the Santa Cruz Mountains that straddles the Santa Clara County line and features approximately 10,000 acres in Santa Cruz County located in the hills above the Pajaro Valley;
3. **Aptos Forests:** A roughly 14,500-acre forested area north of Aptos that includes Nisene Marks and the Soquel Demonstration forest and private forests;
4. **Upper San Lorenzo:** A nearly 12,000-acre forested area in the county's northern tip, that includes Castle Rock State Park and adjoining private forests;
5. **Loch Lomond Forests:** A nearly 10,000-acre forested area surrounding the City of Santa Cruz Water Department's Loch Lomond reservoir that also includes adjacent private forests; and
6. **Upper Corralitos Forests:** A nearly 6,000-acre forested area north of Corralitos that primarily features privately-owned forest land.

Conservation of these areas is essential to maintaining large patches of intact habitat, which are important for wide-ranging species, support a disproportionate richness of species, and are more resistant to habitat degradation caused by edge effects. Presently, just 44% of the total land in these patches is protected. In the Pajaro hills and Upper Corralitos patches, just 8% and 11% of the land is permanently protected.

It is important to note that these are not the only important patches within the network. Other important areas include the southern portion of Ben Lomond Mountain features a complex of 10 patches totaling 22,500 acres (Figure 5-6). Additional habitat patches contribute to local and regional connectivity, and also contain important elements of the county's biodiversity, including biologically significant systems such as wetlands, riparian corridors and streams, and other important habitats.

5.2.3.2.2 Internal Connectivity

Despite their large size, individually these patches may not be able to sustain populations of many wide-ranging species, particularly in the face of a changing climate. Instead long-term persistence of species and thus the maintenance of biodiversity will rely on connectivity between them. Together, these patches can serve as 'stepping stones' for movement through the Santa Cruz Mountains (Figure 5-6).

Creating or maintaining connectivity between the patches will ultimately require site-specific evaluation of several factors including the nature of the barrier (e.g. road and/or development), topography (steepness of slopes, presence of canyons), and potential to modify existing infrastructure to facilitate movement, such as making road culverts wildlife friendly. The patch network developed for this project included a series of potential corridors connecting the patches. Further analysis is needed to evaluate the suitability of the potential corridors. Table 5-7 outlines some initial considerations and recommendations for connections between the six main patches (Figure 5-6).

In some cases, the patches are separate from each other by a single road along which there is no development for at least a portion of the patch border. This is the case for Loch Lomond Forest and Northern Forest, which are separated by Bear Creek Road, and Northern Forest and Northwestern Forest, which are separated by Highway 236. Mountain lion movement data reveals several areas where mountain lions have previously crossed these roads to move between habitat patches. These data and the potential corridors should be combined with on-the-ground field examination as part of site-specific planning to identify the best corridors for maintaining connectivity between these patches.

Table 5-7: Linkage design considerations for the six largest patches of habitat within Santa Cruz County.

Linkage	Interpatch Distance (approx.)	Barrier(s)	Linkage Design Considerations and Recommendations
1. North Coast ↔ Upper San Lorenzo	0.25 miles (road corridor only)	Highways 9 and 236: Winding, two-lane, undivided roads. with only sparse development along the stretches separating the habitat patches	• Protect undeveloped habitat on either side of road(s) in areas that are suitable for crossing (e.g. are not excessively steep). • Consider upgrading culverts located in areas used to cross in order to make them wildlife-friendly.
2. Upper San Lorenzo ↔ Loch Lomond Forest	0.25 miles (road corridor only)	Bear Creek Road: A two lane, undivided road lined with many residences and vineyards, but with some undeveloped segments	Same as #1
3. North Coast ↔ Loch Lomond Forest	2.2 miles (with smaller patches in between)	• Empire Grade: A two-lane, undivided arterial. • Highway 9: A two-lane, undivided road primarily lined with residential development, dense in some places, but with few areas of intact habitat • San Lorenzo River, which is also lined by development	• Same as #1 • Maintain riparian vegetation along San Lorenzo River to facilitate latitudinal movement. • Evaluate fencing highway sections to guide wildlife to passable culverts or other crossings, if present. • Maintain habitat permeability between Boulder Creek and Ben Lomond.
4. Loch Lomond Forest ↔ Aptos Forest	6 miles (with smaller patches in between)	• Highway 17: A four-lane road with a median barrier, which is flanked by moderate-density rural residential development • Soquel-San Jose and Upper Zayante roads, and Glenwood Drive: Windy, two-lane roads with low to moderate density residential development	• Same as #1 • Evaluate installation of wildlife friendly crossing structures • Evaluate fencing sections of the highway to guide wildlife to passable culverts or other crossings • Maintain or enhance habitat permeability between Scotts Valley and the Summit
5. Aptos Forest ↔ Upper Corralitos	1 mile (with a smaller patch in between)	• Eureka Canyon Road: A narrow, two-lane road patchily lined primarily with residential development • Buzzards Lagoon Road: A one lane, partially dirt road partially lined with sparse, residential development.	• Same as #1 • Maintain low traffic volume on Buzzards Lagoon Road including through Nisene Marks State Park • Maintain current low-intensity land use (sparse rural development and timber harvest) and thus permeability.
6. Upper Corralitos ↔ Pajaro Hills	2 miles (with a smaller patch in between)	• Highway 152: A windy, two-lane road with patches of sparse residential development between the patches • Mt. Madonna Road: A narrow, two-lane road lined with sparse, residential development	• Same as #1 • Evaluate fencing highway sections to guide wildlife to passable culverts or other crossings, if present • Maintain current low-intensity land use (sparse rural development) and thus permeability.

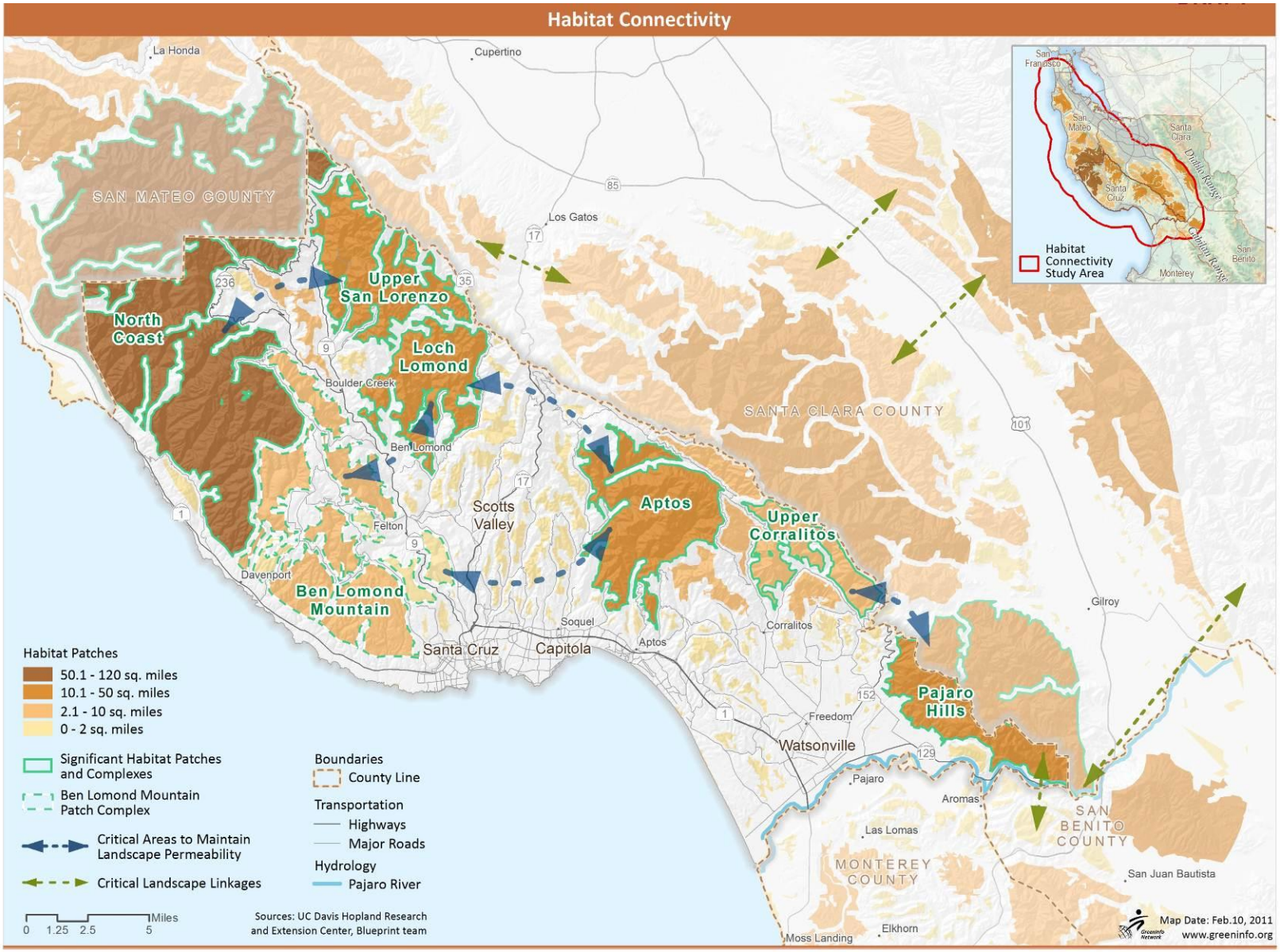

Figure 5-6: Habitat Patches and Landscape Linkages

The other patches are separately by broader swaths of development (Figure 5-6). Specifically, Loch Lomond Forest is separately from Aptos Forest by a relatively broad swath of rural residential development flanking Highway 17: a major highway that bisects the county. Its high traffic volume and concrete median divider result in high rates of mortality for animals that attempt to cross the highway, including mountain lions (C. Wilmers, pers. comm. 2010). Though two lions monitored as part of the Bay Area Puma Project have recently been observed crossing Highway 17, these successful crossings are not thought to be common and instead, the mountain lions territories are typically on one side or the other of the highway suggesting it presents a hard barrier (C. Wilmers, pers. comm. 2010). Given this, effective corridors linking habitat on either side of Highway 17 will likely need to incorporate infrastructure that enables wildlife to cross the highway, such as specialized overpasses or underpasses, including culverts.

When compared with Highway 17, Highway 9 represents 'soft barrier' (C. Wilmers, pers. comm. 2010). The two-lane highway ascending the San Lorenzo Valley lacks a median divider. While it influences mountain lion territories, it is more frequently crossed (C. Wilmers, unpublished data). Fencing areas where animals are less likely cross the road successfully, such as blind curves, may help connect patches of intact or relatively permeable habitat on either side of Highway 9. This could help connect the North Coast Forests to the Loch Lomond Forests, by way of a relatively large patch of habitat between Empire Grade Road and Highways 9 and 236, which features intact forests managed in part by the San Lorenzo Valley Water District for watershed values.

A similar 'stepping stone' approach to corridor design may be needed to ensure connectivity between Aptos Forest and Upper Corralitos Forest and then to Pajaro Hills beyond, as each of these patches has intervening smaller patches (Figure 5-6).

Mountain Lions Help Maintain Biodiversity

Mountain lions play an important role in maintaining the diversity of plants and animals in Santa Cruz County by controlling populations of black-tail deer (*Odocoileus hemionus columbianus*): a common herbivore found throughout the Santa Cruz Mountains. In other areas where mountain lions have been eliminated, such as Zion Canyon in Utah, unnaturally large populations of deer have reduced the diversity and cover of native plants. In riparian areas, heavy deer browsing causes stream bank erosion, which degraded fish habitat (Terborgh et al. 2001, Ripple and Beschta 2006)

5.2.3.2.3 Critical Landscape Linkages

As part of a broader assessment of regional connectivity, the large habitat patches of Santa Cruz County can serve as 'stepping stones' that connect the habitat in northern Santa Cruz Mountains (San Mateo County) to that further south and east (Figure 5-6 inset map). Indeed, Santa Cruz County plays a critical role in regional landscape connectivity; specifically, maintaining linkages between the Santa Cruz Mountains and the Gabilan Range to the south and the Diablo Range to the east. These linkages between the Coast Range Mountains have been identified as essential to maintaining biodiversity within the Central California Coast Ecoregion in several regional and statewide assessments (Penrod et al. 2001, Thorne et al. 2002, Spencer et al. 2010).

Analysis conducted as part of the Conservation Blueprint as well as linkage designs developed concurrently as part of the Bay Area Critical Linkages Project of the Bay Area Open Space Council, reveal that the least cost path (i.e., the best path to connect habit patches) connecting the Santa Cruz Mountains to the Gabilan Range is through the southeastern portion of Santa Cruz County (Figure 6).

The linkage emanates from the Pajaro Hills habitat patch and crosses the Pajaro River and Highway 129, which follows the river, into the northern foothills of the Gabilan Range just east of the town of Aromas.

Santa Cruz County also plays an important role in maintaining the linkage between the Santa Cruz Mountains and the Diablo Range from which it is otherwise separated by the southern Santa Clara Valley (Figure 5-6). The Pajaro Hills feature expansive intact habitat adjacent to the Pajaro River, which has been identified as a linkage between the southern tip of the Santa Cruz Mountains and Diablo Range Mountains south of Mount Hamilton (Figure 5-6). In addition, the Upper Corralitos patch is adjacent to expansive areas of intact habitat on the northeastern slope of the Santa Cruz Mountains, which extends down to the Santa Clara Valley floor near the City of Morgan Hill. This habitat is separated from the vast intact landscape within the Diablo Range south of Mount Hamilton by urban development in the Santa Clara Valley, including Highway 101, an eight or ten lane highway. Creating an effective corridor between the Santa Cruz Mountains and the Diablo Mountains in this region, known as the Coyote Hills, will require a wildlife-friendly crossing structure as well as protecting remaining habitat on either side of the valley.

General Climate Change Impacts on Biodiversity

Terrestrial Systems

- Plants and animal distributions shift into regions with currently cooler climatic envelopes.
- Plant and animal species become more or less abundant within their current range.
- Vegetation structure changes.
  - Forests transition to shrublands
  - Shrublands transition to grasslands
  - potentially new plant communities emerge as a result of novel climates.
- Fire frequency increases, promoting fire-adapted species and eliminating fire-sensitive species.
- Pest and pathogen outbreaks increase due to drought-stressed plants and increased fire.
- Non-native species invade and spread.

Aquatic Systems

- Reduced stream flow due to evaporation and lowering of groundwater.
- Increased variability of stream flow:
  - flooding due to more severe precipitation could alter channel conditions and habitat, and export nutrients and other materials
  - drought could cause perennial streams to dry up seasonally.
- Reduced depth and hydroperiod (period of inundation) in sloughs, ponds, and wetlands.
- Increased water temperature, reduced dissolved oxygen, and increased productivity.
- Changes in community composition due to shifts in species distributions and interactions.
- Changes in abundance in response to physical changes and species interactions.
- Invasion and spread of non-native species.

5.2.4 Global Change

5.2.4.1 Climate Change

By the end of the century, the average annual temperature in California is predicted to increase by up to 8.1 ^{o}F (Cayan et al. 2008). Though the change in California's precipitation is expected to be less than 10% (Cayan et al. 2008), the increase in temperature will promote water loss due to evaporation and transpiration, creating a climatic water deficit for plants (Flint and Flint, unpublished data). Moreover, a continuation of the trend of 33% reduction in the frequency of California summer fog (Johnstone and Dawson 2010) could exacerbate the drought stress caused by the predicted hotter and likely drier conditions.

The hotter, drier climate will affect natural biological systems through a variety of mechanisms (inset box). The effects on individual species or communities can be difficult to predict as they will be influenced by a host of cascading indirect effects mediated by complex species interactions. What are

the consequences for a rare plant that is solely or primarily pollinated by a butterfly species that emigrates in response to a warming climate? While some studies suggest that species that presently co-occur will shift their distributions together in response to climate change such that communities will move together (Breshears et al. 2008), other studies suggest that the unique combinations of temperature and precipitation not currently found in the region (D. Ackerly, unpublished data), will result in novel communities, or new assemblages of species (Stralberg et al. 2009).

The vulnerability of species and communities to climate change depends on their exposure, sensitivity, and capacity to adjust to change (Hanson and Hoffman 2011). Though a comprehensive and detailed viability analysis of the biological systems in Santa Cruz County was beyond the scope of the Blueprint[1], Table 5-8 identifies types and examples of species and systems that could be most vulnerable based on five considerations (Hanson and Hoffman 2011).

Of particular concern are the potential effects of climate change on fog frequency. Numerous species within Santa Cruz County are adapted to the coastal fog, which moderates summer high temperatures, creates humidity, and provides water for plant uptake during the otherwise long summer drought. Three systems, which collectively contain a high proportion of the county's biodiversity, rely on summer fog.

- **Coast Redwood forest:** Coast redwoods (*Sequoia sempervirens*) intercept fog, using it directly and increasing soil moisture used by other species (Dawson 1998). By adding water to the catchment basin, redwoods contribute to summer stream flows and are also critical to maintaining cool stream temperatures, which are critical for rearing coho salmon.
- **Martitime chaparral:** Several endemic species of manzanita including Ohlone manzanita (*Arctosphylos ohloneana*), silverleaf manzanita (*A. silvicola*), and Santa Cruz manzanita (*A. andersonii*), are found only within reach of the summer fog. The maritime chaparral communities they dominate also support other plants and diverse animal assemblages.
- **Coastal Prairie:** Floristically rich coastal prairie grasslands occur within reach of the coastal fog, which some species utilize for moisture in the summer (Corbin et al. 2005).

The predictions for future summer fog frequency on California's coast are unclear. While a 33% reduction in the frequency of California summer fog has been observed over the past century (Johnstone and Dawson 2010), the predicted increase in temperature differential between coastal and inland areas, which is a major driver of fog, may increase the frequency of summer fog thus mitigating the effects of global change on temperatures in Santa Cruz County. Monitoring will be needed to inform future conservation and management.

More frequent fire predicted to accompany the hotter, drier climate will likely alter dramatically the structure and species composition of the natural communities within Santa Cruz County (Fried et al. 2004). Across the Central Coast Ecoregion, the extent of shrublands and conifer forests are predicted to decline while the area of grassland increases (Lenihan et. al. 2008). These predictions suggest that maritime chaparral, sandhills, and coastal scrub as well as coast redwood and Pacific Douglas fir forests could decline while grasslands spread in Santa Cruz County. More research is needed to understand the implications of these regional changes for the species and communities of Santa Cruz County.

[1] NatureServe provides a vulnerability analysis tool: http://www.natureserve.org/prodServices/climatechange/ccvi.jsp

Table 5-8: Species and biological systems that could be most vulnerable to the impacts of climate change (adapted from based Hansen and Hoffman 2011)

Criteria	Terrestrial	Aquatic
Specialized habitat or microhabitat	• Santa Cruz Sandhills endemic species (e.g. Zayante band-winged grasshopper) • Karst cave and cavern endemic species • Coastal dune, wetland, and rock outcrop species including many shorebirds • Coastal prairie grassland species • Marbled Murrelet and other redwood forest-obligate species • Pine Siskin and other Monterey pine species	• Marsh and other wetland species, including many plants, amphibians, reptiles, and birds (resident and migrants) • Pond species including Santa Cruz long-toed salamander and California red-legged frog • Tidewater goby and other lagoon species • California brackishwater snail
Narrow environmental tolerances that are likely to be exceeded	• Monterey pine and coast redwood, which require cool, foggy areas • Maritime chaparral endemic species (e.g. *Arctostaphylos ohloneana*), which require fog • Black oak and foothill pine, which as at the edge of their elevational range	• Coho salmon • Species at the southern end of their range including Pacific giant salamander and rough skinned newt
Dependence on specific environmental triggers or cues that are likely to be disrupted	• Breeding birds • Migratory species (butterflies, birds, and bats)	• Fish sensitive to the timing of lagoon closures and openings due to precipitation (e.g. steelhead and coho) • Breeding amphibians, which require specific pond hydroperiods
Dependence on interspecific interactions that are likely to be disrupted	• Insect-pollinated plants, especially those with specialist pollinators • Insectivorous bats, especially specialist (e.g. pallid bats feed largely on Jerusalem crickets)	• Increased stream biological productivity due to higher temperatures could alter competitive relationships in stream assemblages
Poor ability to colonize new, more suitable locations	• Many plants • Limited mobility animals including flightless insects	• Pond invertebrates, amphibians, and reptiles that cannot disperse through upland habitats, particularly developed areas

5.2.4.2 Sea Level Rise Effects on Biodiversity

The sea level has risen by 8 inches in the past century, and is anticipated to rise by more than 4.5 feet (55 inches) by the end of this century (Heberger et al. 2009). The resulting inundation and attendant erosion and flooding could eliminate coastal habitats, including:

- **rock outcroppings** used for roosting and nesting by coastal seabirds, such as Double-crested Cormorants, Brown Pelicans, and Pigeon Guillemots, and as haul-out sites for marine mammals including harbor seals;
- **coastal wetlands** including salt marsh and brackish marsh, which support a diverse assemblage of shorebirds including Black-necked Stilt and American Avocet;
- **bluffs** utilized by nesting birds including Black Swifts, unique plant assemblages featuring succulents (*Dudleya* spp.); and
- **dunes** utilized by many plant and animal species including nesting Western Snowy Plovers, Monterey spineflower, and globose dune beetles.

While new habitats could be created adjacent to the areas that will be inundated, this will not be possible where the adjacent land is already developed or is armored (e.g. by sea walls or levees). A state-wide analysis found that only 40% of the area in Santa Cruz County is suitable for wetland migration: the formation of new wetlands (Figure 5-7; Heberger et al. 2009). Protecting this land will be essential to mitigating loss due to sea level rise.

5.2.4.3 Climate Change Resiliency

Biodiversity can promote human adaptation to climate change. In turn, there are several way we can enhance the ability of natural systems to persist, or retain the same basic structure and functions, in the face of climate change (inset box).

Climate Change Resilience Strategies

Protect land featuring a diverse range of geophysical conditions including topographical conditions, soils, slope-aspects, elevations, and localized climates.

Protect heterogeneous habitats including a range of successional stages (i.e., time since last fire or other disturbance).

Protect climate change refugia: areas that may buffer species against climate change (Table 7).

Protect buffers around key habitat areas where migration is feasible.

Ensure long-term viability through redundancy: protect areas of each community, habitat, or refuge across the landscape.

Preserve landscape connectivity by maintaining permeability and protecting critical linkages.

Monitor climate change and its impacts and adapt conservation strategies to address changing circumstances.

One key approach is to conserve areas that can buffer species from the impacts of a hotter and drier climate change (Table 5-9). These climate change refugia include areas that are wetter and cooler at present. These areas are generally scattered throughout the county (Figure 5-8). Wet areas will also be critical to human adaptation to climate change. Protecting intact habitat where wetlands can migrate is another way to add resiliency.

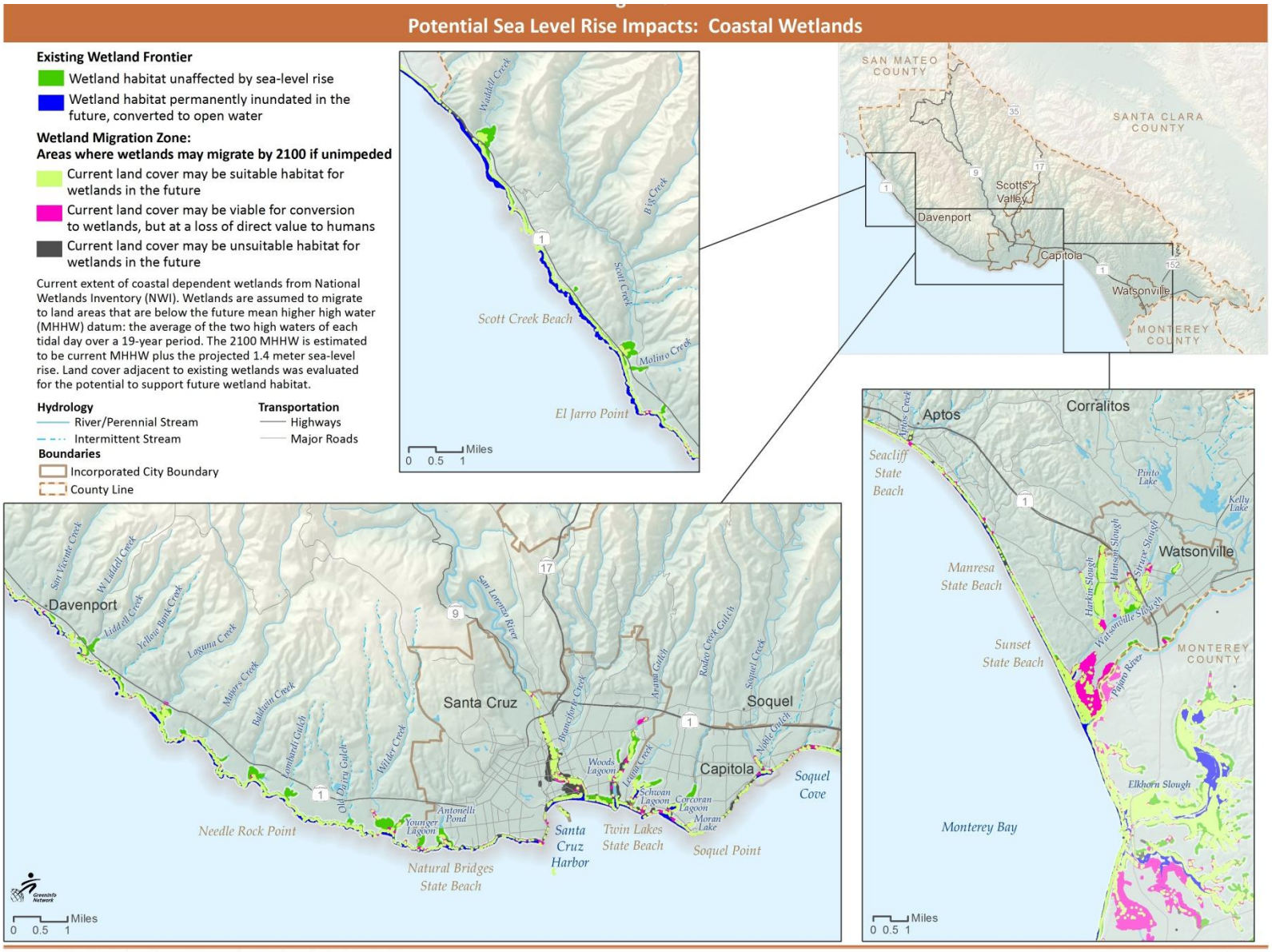

Figure 5-7: Wetland Loss and Potential Wetland Mitigation Areas

Table 5-9: Potential Climate Change Refugia in Santa Cruz County.

Refugia	Contribution to Climate Resiliency	Occurrence in Santa Cruz County
Coastal Areas	The ocean buffers temperature increases; fog can further ameliorate climate change	• Approx. 40 miles of coastline; most of the county is within 15 miles of the coast • Long, coastal valleys convey cooler air inland
Streams and Riparian Areas	• Source of perennial water for animals • Feature cooler microclimates due to evaporation and transpiration • Create corridors that can facilitate animal movement in response to climate change	• 850 miles of streams, 550 miles of which are perennial. • The stream network is pervasive and collectively connects much of the county. • Some streams, particularly in the Pajaro Valley, are highly degraded
Ponds, lakes, sloughs, and reservoirs	• Source of water for animals • Feature cooler microclimates due to evaporation and transpiration	• At least 90 water bodies totaling more than 1,500 acres • Most features are in the Pajaro Valley
Seeps and Springs	Source of perennial water	20 mapped seeps and springs (USGS), though likely many more occur in the landscape
North-facing slopes	Cooler microclimate due to reduced solar insolation and typically greater vegetation cover and thus evapotranspiration	More than 36,000 acres of north-facing slopes (aspects of 340 to 20 degrees), scattered throughout county. Variable, mountainous topography results in north-facing slopes being well-distributed within the county.
Steep elevation gradients	• Reduce the distance species need to move along an elevation gradient • Precipitation and winter minimum temperature increase with elevation, though so does summer maximum temperature in Santa Cruz County	• Elevation ranges from sea level to approximately 3,400 feet • Steep terrain occurs within contiguous habitat patches on Ben Lomond Mountain (which receives high precipitation) and near Mt. Umunhum and Loma Prieta (Figure 5-8)

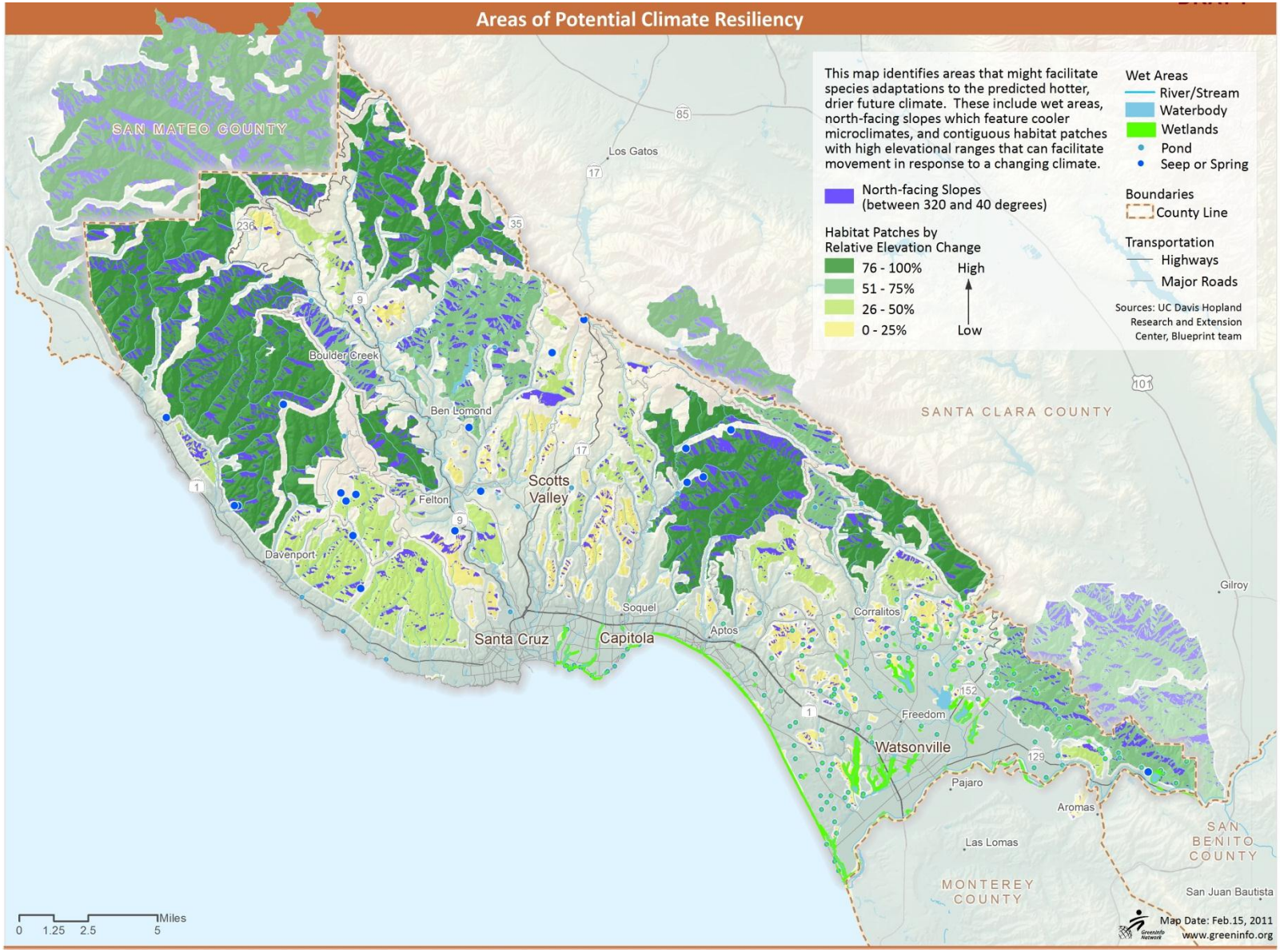

Figure 5-8: Potential Climate Change Refugia

5.2.5 Biodiversity Viability Challenges

Efforts to safeguard the biodiversity of Santa Cruz County will need to address myriad threats to the viability of populations, the integrity of communities, and essential ecosystem functions that are present even within protected areas. Stewardship of parks, open spaces, and conserved working lands must address factors that can impede the conservation goals (Table 5-10). Coordination of stewardship programs among landowners can enhance effectiveness.

Table 5-10: Factors that can threaten long-term ecological viability of species and communities even within areas that are protected from development.

Type	Viability Threat	Impacts
Biological Invasions	Invasive plants	Invasive plants outcompete native plants, degrade habitat for native animals, alter disturbance regimes (e.g. fire frequency), and alter nutrient cycling (e.g. nitrogen availability).
	Non-native animals	Non-native animals outcomplete, predate upon, and hybridize with native animals, negatively impact native plants through herbivory, and promote non-native plant invasions through disturbance (e.g. feral pig diggings).
	Emergent diseases	New diseases impact native plants (e.g. sudden oak death), amphibians (Chytrid fungus or "*Bd*", Ranaviruses, etc.) and birds (West nile virus and Avian flu).
Altered Fire Regimes	Fire Suppression	Fire suppression eliminates fire-adapted and early successional species and can ultimately converts vegetation (e.g. chaparral transitions to forest)
	Inappropriate Fire Frequency or Seasonality	Increased fire frequency and inappropriate fire seasonality can eliminate even fire-adapted species and communities.
Altered hydrologic regimes	Stream Flow (including flood control)	Flood management can eliminate early-successional riverine and riparian species prevent transport of sediment and pollution, and alter habitat conditions and displace some native species (e.g. reduced flow increases water temperature and decreases oxygen)
	Pond/slough hydroperiod	Reducing the period of inundation can eliminate aquatic species that require sufficient time to complete their lifecycle.
Pollution	Nitrogen deposition	Deposition of nitrogen from pollution in the atmosphere fertilizes vegetation, can promote the invasion and spread of non-native plants, and alters the competitive balance between native plant species, thus displacing poor competitors including many endemic species.
	Sedimentation	Sediment degrades spawning habitat for salmonids and other fish, and reduces the size of ponds and their period of inundation.
	Pathogens	Pathogens from cultivated land, livestock operations, septic tanks, and other sources pollute streams, sloughs, and other aquatic systems.
	Fertilizers	Agricultural run-off increases productivity in aquatic systems, degrading stream, pond, slough, wetland, and other habitat

Table 5-10: Factors that can threaten long-term ecological viability of species and communities even within areas that are protected from development.

Type	Viability Threat	Impacts
Pollution (continued)	Biocides	Herbicide and pesticides can impact native plants and insects, and biomagnify within food webs to acutely impact top predators.
	Genetic Erosion	Non-local genetic material introduced into natural systems from hatcheries, nurseries, and other sources can disrupt locally adaptive genetic complexes and evolutionary processes (e.g. speciation).
Incompatible Human Uses	Grazing	Inappropriate intensity or seasonality of grazing, and cattle activity in sensitive communities (e.g. riparian areas) can displace native plants and degrade habitat for native animals. Cessation of grazing in grasslands can cause succession to other communities, in the absence of other disturbances (e.g. fire).
	Forest management	Certain harvest activities and roads displace native plants and animals, can cause erosion and stream sedimentation, and can promote non-native species.
	Water use	Stream diversions can directly impact native animals and degrade habitat by reducing flows and increasing stream temperature. Dams displace native plants and animals and can present barriers to aquatic species migration.
	Mining	Mining displaces native plants and animals, can pollute air and water, and can promote non-native species.
	Recreation	Trails can displace native plants and animals, cause erosion, and promote non-native plants. Hunting and fishing cause mortality that can reduce native animal populations.
	Other Stream Habitat Modifications	Streambed alterations, channelization, dredging, flood-control structures, water diversion structures, culverts, dams, fords, bridges, and other modifications can degrade habitat and impede migration.
Global Change	Hotter, drier climate	Climate change can displace species directly, and alter competition, predation, disease, and other species interactions and ecological processes, thus affecting native species.
	Increase in Atmospheric CO_2	Increased atmospheric carbon dioxide can fertilize plants, promote the invasion and spread of non-native species, and alter competitive balances between native plants, thus displacing poor competitors including many native plants.
	Sea Level Rise	Sea level rise can inundate wetlands, rocks, cliffs, and dunes, displacing coastal plants and animals and increasing erosion and flooding of coastal systems.

5.3 Goals, Strategies, and Actions

Based on the key findings for biodiversity, a series of goals, strategies, and actions identify next steps for conservation agencies and organizations to protect the unique and representative ecological systems and the services they provide, maintain landscape permeability and regional connectivity to facilitate the processes that sustain them, and promote resiliency and adaptation to a changing climate in order to ensure long-term maintenance of biodiversity.

The four distinct goals for biodiversity conservation can be achieved through four general strategies, each of which can be adapted to each goal's unique circumstances that were revealed through the Blueprint's analyses (inset boxes). For each strategy a series of actions identify the specific steps or critical approaches to successful strategy implementation (Table 5-11). In many cases, strategies and actions can promote attainment of multiple goals. For example, enhancing connectivity can promote adaptation of species to climate change.

Biodiversity Goals

1. Secure the long-term viability of the county's **rare and unique biological communities and species**.
2. Conserve the broad range of **representative biological systems** within the county, and sustain the ecosystem services they provide.
3. Enhance **connectivity** within the county and ecoregion to facilitate the natural processes that sustain living systems.
4. Promote **climate change resiliency and adaptation** of the county's biological species and systems.

Biodiversity Strategies

A. **Protect habitat** essential to attaining the goals, focusing on areas that achieve multiple conservation benefits.

B. **Conduct stewardship** on private and public conservation lands to restore impaired areas and prevent future habitat degradation.

C. **Promote community awareness** of Santa Cruz County's rich biological systems and their ecosystem services.

D. **Adapt and develop new strategies** based on the latest scientific information to enhance long-term effectiveness of biodiversity conservation projects.

Goal 1: Secure the long-term viability of the county's rare and unique biological communities and species (Tables 5-2 and 5-3).

Strategy 1.A: Protect habitat essential to attaining the long-term viability of the county's rare and unique systems, focusing on areas that achieve multiple conservation benefits.

Actions

1.A.1 **Protect areas critical to the conservation of the county's rare and unique biological systems**, including large habitat areas that are intact or restorable, expand, buffer, or connect existing protected areas; are not compatible with other land uses; require active, long-term management; and/or are threatened by habitat conversion.

1.A.2 **Develop voluntary landowner agreements**, including long-term management agreements, to protect the county's rare and unique biological systems within private lands including working lands.

Table 5-11: Summary of strategies and actions to attain the four biodiversity conservation goals. Action details are provided in the text.

Goal	Strategies			
	Habitat Protection	**Stewardship**	**Community Education**	**Adapt and Develop Strategies**
1. Secure the long-term viability of the county's **rare and unique biological communities** and species	▪ Protect areas critical to the conservation of the county's rare and unique biological systems ▪ Develop voluntary landowner agreements ▪ Explore creation of a riparian easement program ▪ Enhance the effectiveness of policies	▪ Develop and implement restoration plans ▪ Develop and support collaborative working groups ▪ Support and expand volunteer stewardship programs ▪ Develop new ways to fund long-term stewardship of public and private conservation lands	▪ Support and expand public interpretation programs ▪ Develop, support, and expand landowner outreach programs ▪ Support and expand school outdoor education programs ▪ Support and expand volunteer programs	▪ Conduct studies to fill data gaps ▪ Maintain and regularly update a database of biological information
2. Conserve the broad range of **representative biological systems** within the county, and sustain the ecosystem services they provide	▪ Conserve the county's widespread species and communities within the network of public and private conservation lands ▪ Maintain the viability and sustainability of working landscapes including forests and rangelands ▪ Support policies and programs that protect water supply watersheds	▪ Support and expand stewardship programs ▪ Develop and implement system-specific fire management strategies	▪ Develop and conduct ecosystems services education programs	▪ Develop a comprehensive redwood forest conservation strategy ▪ Develop and seek county adoption of an oak woodlands management plan
3. Enhance **connectivity** within the county and ecoregion to facilitate the natural processes that sustain living systems	▪ Protect large, interconnected intact habitat patches ▪ Support and enhance policies that maintain landscape permeability	▪ Restore and enhance critical linkages ▪ Develop best management practices for maintaining permeability on public and private land	▪ Develop and implement programs to increase awareness of the importance of a permeable landscape	▪ Explore policies or programs to address factors that fragment habitat and impede wildlife
4. Promote **climate change resiliency and adaptation** of the county's biological species and systems	▪ Protect representative areas of the county's diverse, local climates ▪ Protect potential climate refugia ▪ Enhance landscape permeability and habitat connectivity	▪ Integrate climate considerations in management and restoration plans	▪ Incorporate climate change impacts into outreach programs	▪ Develop focused conservation strategies for systems vulnerable to climate change ▪ Monitor climate change and its impacts

1.A.3 **Explore creation of a riparian easement program** to promote protection of habitat along critical coastal streams.

1.A.4 **Enhance the effectiveness of policies** operating at the local, state, and federal level to protect biological resources, including by:

- Identifying ways to more effectively mitigate development impacts, by protecting larger habitat areas that can be managed for long-term viability. This may include establishing conservation and mitigation banks where large, intact habitat areas are managed to mitigate the impacts of development and other activities on smaller, disjunct areas.
- Buffering sensitive aquatic systems including streams, ponds, and sloughs from the impacts of adjacent land use and maintain their connectivity through upland habitat.

Strategy 1.B: Conduct stewardship on private and public conservation lands supporting the county's rare and unique biological systems, to restore impaired areas and prevent future habitat degradation.

Actions

1.B.1 **Develop and implement restoration plans** to enhance the composition, structure, and function of rare and unique biological communities that are important for the long-term viability of rare species and provide ecosystem services. Restoration plans may include:

- Watershed plans to restore and enhance habitat for anadromous fish and other aquatic species, by addressing altered hydrological regimes (e.g., insufficient flows), removing unnatural migration barriers, and improving in-stream habitat quality by addressing sedimentation, pollution, removal of large-woody debris, and other factors that degrade habitat.
- Restoration and management plans for sloughs, ponds, and important wetlands, to restore hydrologic function and connectivity, enhance native structure and species composition, and improve upland habitat that is essential to long-term viability.
- Restoration and management plans for sensitive terrestrial systems such as Sandhills, coastal prairie, maritime chaparral, and Santa Cruz Cypress forests.

1.B.2 **Develop and support collaborative working groups** comprised of land owners and managers to identify and implement coordinated, regional strategies for management of widespread threats to the viability of natural systems (Table 5-10). Working groups could be modeled after the Santa Cruz Weed Management Area, which addresses invasive plants.

1.B.3 **Support and expand volunteer stewardship programs** that help meet management needs of conservation areas and connect the community with the land, such as the California Native Plant Society's Habitat Restoration Team and Watsonville Wetlands Watch stewardship program.

1.B.4 **Develop new ways to fund stewardship of public and private conservation lands**, which is essential to addressing factors that degrade habitat and thereby attain the conservation goals of the Blueprint.

Strategy 1.C: Promote community awareness of Santa Cruz County's rare and unique biological systems *and their ecosystem services.*

Actions

1.C.1 **Support and expand public interpretation programs** that highlight the unique systems within the county, increase community enjoyment of public parks, and promote support for habitat protection, restoration, and management programs.

1.C.2 **Develop, support, and expand outreach programs for landowners** whose properties feature rare and unique systems, to inspire and inform their effective stewardship. Outreach materials can provide system-specific guidance for appropriate landscaping, fire clearance, soil erosion control, and management of potential pollutants, to maintain or enhance habitat conditions.

1.C.3 **Support and expand school programs that use as classrooms our county's rare systems**, such as the Museum of Natural History's Sandhills Education Program, the San Lorenzo Valley High School's Watershed Academy, the Fitz Wetlands Educational Resource Center at Pajaro Valley High School, O'Neil Sea Odyssey, Watershed Cruzn', and others.

1.C.4 **Support and expand volunteer programs** including docent groups and stewardship teams, that enhance public appreciation and enjoyment of the county's rich biological systems by involving them in interpretation, restoration, and stewardship.

Strategy 1.D: Adapt and develop new strategies to promote the conservation of the county's rare and unique biological systems based on the latest scientific information to enhance long-term effectiveness of biodiversity conservation projects.

1.D.1 **Conduct studies to fill data gaps** critical to effective conservation of the county's rare and unique systems, and update the conservation strategies to reflect new information. Specific studies that could enhance conservation work include:

- Develop a county-wide vegetation map based on the *California Manual of Vegetation* (Sawyer et al. 2010) and a floristic analysis of the county's systems, including maritime chaparral.
- Conduct rare species surveys, to better understand of their distribution and relative abundance within the county and promote their conservation and management.

1.D.2 **Maintain and regularly update a database of biological information** for the region to facilitate long-term implementation and adaptation of the Blueprint.

Goal 2: Conserve the full range of representative biological systems within the county, and sustain the ecosystem services they provide.

Strategy 2.A: Protect habitat essential to conserving the full range of representative biological systems, focusing on areas that achieve multiple conservation benefits.

Actions

2.A.1 **Conserve the county's widespread species and communities within the network of public and private conservation lands** (Section 5.2.2).

2.A.2 **Maintain large patches of habitat by supporting the viability and sustainability of working landscapes including forests and rangelands**, working with willing landowners on conservation and stewardship agreements, and expanding programs that address threats to the viability of sustainable forestry and ranching in the county (Chapter X).

2.A.3 **Support policies and programs that protect water supply watersheds** including the intact native vegetation that safeguards our critical coastal streams.

Strategy 2.B: Conduct stewardship on private and public conservation lands to restore impaired areas and prevent future habitat degradation.

Actions

2.B.1 **Support and expand stewardship programs** that maintain and enhance habitat within the county's rural private lands (also promotes Strategy 1.B).

2.B.2 **Develop and implement system-specific fire management strategies** that address public safety and can conserve important habitat for plants and animals, particularly in fire-adapted systems such as chaparral and closed-cone pine forests (i.e., Santa Cruz cypress, Monterey pine, and knobcone pine forests).

Strategy 2.C: Promote community awareness of Santa Cruz County's representative biological systems and their ecosystem services.

Action

2.C. 1 **Develop and conduct ecosystems services education programs** that increase community awareness about the important ecosystem services provided by intact habitat throughout the county, including provision of clean drinking water, crop pollination, flood abatement, and carbon sequestration.

Strategy 2.D: Adapt and develop new strategies based on the latest scientific information to enhance long-term effectiveness of biodiversity conservation projects.

Actions

2.D.1 **Develop a comprehensive redwood forest conservation strategy** by convening a multidisciplinary working group, comprised of landowners, agencies, organizations, and resource experts to identify ways to achieve biodiversity and working lands conservation goals for the county's redwood forests. Goals of the strategy could include:

- Protecting redwood forests that buffer existing protected forest, feature old growth or larger second growth stands, are in water supply watersheds, occur in the headwaters of important coastal streams, or fit other criteria.

- Identifying management strategies for redwood forests to enhance the diversity of forest ages/successional stages, including to promote late-seral forests that support old-growth dependent species, protect important coastal streams, and safeguard water supply watersheds.
- Maintaining and enhancing the sustainability of timber harvests to promote biodiversity, water, and working lands goals.

2.D.2 **Develop and seek county adoption of an oak woodlands management plan** to protect the county's diverse and important oak woodlands including through participation in the California Oak Woodlands Conservation Program. Objectives of the plan could include:

- Conserving the rare and unique black oak forest, San Andreas oak woodland, and coast live oak savanna, as well the more widespread Shreve oak woodlands.
- Protecting oak woodlands and forests that contain additional conservation targets or values, buffer existing protected lands, are in water supply watersheds, occur in the headwaters of important coastal streams, or fit other conservation values.
- Providing best management practices and other guidelines for management of oak woodlands to address factors that can degrade habitat such as sudden oak death.

Goal 3: Enhance connectivity within the county and broader ecoregion to facilitate the natural processes that sustain living systems.

Strategy 3.A: Protect habitat essential to attaining the goals, focusing on areas that achieve multiple conservation benefits.

Actions

3.A.1 **Protect large, interconnected intact habitat patches** within a network of public and private conservation lands to facilitate migration, dispersal, gene flow, and other natural processes through the landscape (Table 5-7, Figure 5-6).

3.A.2 **Support and enhance policies that maintain landscape permeability** by conserving timber resources, clustering development, protecting riparian corridors, and limiting intensive land use in water supply watersheds and in sensitive habitat areas.

Strategy 3.B: Conduct stewardship on private and public conservation lands to maintain and enhance landscape permeability.

Actions

3.B.1 **Restore and enhance critical linkages** by convening a multidisciplinary working group including biologists, agencies including and transportation organizations (e.g. CalTrans and County Public Works), landowners, and other stakeholders, to design corridors including wildlife friendly crossings to restore or enhance connectivity in areas that are critical to wildlife movement. Corridors that could be targeted include:

- The linkage between the Santa Cruz Mountains and the Gabilan Mountains, as designed by the *Bay Area Critical Linkages* project and through the Blueprint analysis.

- Connectivity across Highway 17 near Lexington Reservoir and/or elsewhere that it is feasible.
- Linkages between large blocks of intact habitat (Table 5-7).

3.B.2 **Develop best management practices for maintaining landscape permeability on public and private lands** to maintain or enhance connectivity. The voluntary guidelines could identify common barriers, such as fences, as ways to avoid or limit their impacts to wildlife movement.

Strategy 3.C: Promote community awareness of Santa Cruz County's role in regional connectivity and the importance of a permeable landscape for long-term biodiversity conservation.

Action

3.C.1 **Develop and implement programs to increase awareness of the importance of a permeable landscape** to maintaining biodiversity and ecosystem services, and provide guidance to landowners for how to maintain or enhance wildlife movement through the landscape.

Strategy 3.D: Adapt and develop new strategies based on the new scientific information to enhance long-term effectiveness of biodiversity conservation projects.

Action

3.D.1 **Explore policies or programs to address factors that fragment habitat and impede wildlife** movement. Potential programs could address:

- Recent food safety regulations, which have increased fencing and clearing of natural lands adjacent to agricultural lands.
- The importance of maintaining riparian corridors and other habitat remnants that connect core habitat areas through urban and cultivated areas.
- The importance of maintaining wildlife connectivity as development continues within rural areas.

Goal 4: Promote climate change resiliency and adaptation of the county's biological species and systems.

Strategy 4.A: Protect habitat essential to facilitating species adaptation to a changing climate, including potential climate refugia and large, interconnected habitat patches that achieve multiple conservation benefits.

Actions

4.A.1 **Protect representative areas of the county's diverse local climates** within the network of public and private conservation lands, including areas of varying proximity to the coast, elevation, and a range of other geophysical conditions including topography, slope-aspects, and soils.

4.A.2 **Protect potential climate refugia,** areas that are more likely to be climatically stable or support species in the predicted hotter and drier climate, including streams, ponds, lakes, wetlands, springs, and north-facing slopes (Table 5-9, Figure 5-8).

4.A.3 **Enhance landscape permeability and habitat connectivity** through a variety of strategies (Goal 3), to promote species dispersal in response to a changing climate.

Strategy 4.B: Conduct stewardship on private and public conservation lands to facilitate adaptation to and mitigation of climate change and prevent future habitat degradation.

Action

4.B.1 **Integrate climate considerations in management and restoration plans**, such as vulnerability analyses, long-term monitoring, and adaptive management to promote long-term effectiveness.

Strategy 4.C: Promote community awareness of Santa Cruz County's rich biological systems and their vulnerability to climate change, as well as their role in mitigating climate change.

Action

4.C.1 **Incorporate climate change impacts into outreach programs** or develop novel programs to increase community awareness about the effects of climate change on biodiversity and the role of biodiversity in facilitating human adaptations to a changing climate, and providing guidance for how to mitigate climate change impacts

Strategy 4.D Adapt and develop new strategies to address climate change impacts on biodiversity based on the new scientific information.

Actions

4.D.1 **Develop focused conservation strategies for systems vulnerable to climate change** as part of an analysis to refine the list of biological systems that are vulnerable to climate change (Table 5-8). Strategies should emphasize habitat protection that has the potential to benefit multiple species and communities.

4.D.2 **Monitor climate change and its impacts** to track indicators of climate change and its effects on important biological systems, particularly climate-vulnerable systems.

6. Water Resources

Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land. -Luna Leopold

The County's water resources are vital to every aspect of our lives. Rivers and streams that originate in the upper watersheds of the county's forests provide water to over 90,000 residents in and around the City of Santa Cruz. Three groundwater basins serve as the primary water source for all of the central and southern portions of the county. The Pajaro Valley's remarkable agricultural productivity and diversity of crops is dependent upon the availability of this high quality groundwater. Rivers, streams, ponds, wetlands, and associated riparian habitats provide essential habitat for plants, fish, and other animals. In addition to water supplies and habitat, ecologically intact watersheds provide a host of ecosystem services including water quality protection, stormwater and flood control, nutrient cycling, and recreational opportunities.

Numerous federal, state, and local agencies are responsible for maintaining water supplies and water quality. While there are huge challenges ahead, the major water purveyors in the county, along with many local partner agencies and organizations, have established policies and programs to protect water resources and maintain their beneficial uses for people and the environment. The Conservation Blueprint aims to complement the efforts of these organizations by identifying the most important opportunities for landscape conservation to help protect water supplies, ensure water quality, and maintain essential watershed-scale processes. Land conservation can complement policies to protect water resources and will reduce the extent that new water supply pipelines and treatment facilities are needed.

Santa Cruz County Water Resources At a Glance

- Our water supplies originate almost entirely within the county—we're dependent on local streams and groundwater to satisfy the demand of 256,000 residents, provide for industry and agriculture, and meet the habitat needs for threatened salmon and many other species.
- There are approximately 850 miles of streams and waterways in the county.
- Approximately 32 streams or water bodies are considered to be water quality impaired.
- All of the county's watersheds drain into the Monterey Bay National Marine Sanctuary.
- Eighty percent of the water consumed in the County comes from groundwater.
- Agriculture uses 60% of the County's water (nearly 52,000 acre-feet per year), with residential and commercial use accounting for the remaining 40%.
- The county's three main groundwater basins are all in a state of overdraft.

6.1 Water Resources Overview

Santa Cruz County is located within the rugged and geologically dynamic Santa Cruz Mountains. The county is generally bounded in the north and east by Castle Rock Ridge, which extends south from the San Francisco Peninsula and gradually drops to Chittenden Gap. Ben Lomond Mountain rises between Castle Rock Ridge and the Pacific, and serves as a major watershed divide. Mountains in the county rise dramatically from the coast, reaching more than 3,000 feet in elevation in the span of just a few miles. High peaks and cooler winter temperatures-- especially at higher elevations-- combine to effectively capture winter rains. 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. These rains drive stream flows in the Santa Cruz Mountains, 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.

The mountainous topography of the county encompasses 18 principal watersheds (Figure 6-1). These can generally be characterized as North Coast streams that drain the western slope of Ben Lomond Mountain, the San Lorenzo River and its tributaries, and the Pajaro River and its tributaries. These watersheds are in turn comprised of 58 smaller drainage basins or subwatersheds, each having unique characteristics based on variations in size, aspect, elevational gradient, precipitation, geology, and soils. With the exception of the Pajaro River and a small reach of Pescadero Creek that originates in San Mateo County, these streams originate within Santa Cruz County and they all drain to Monterey Bay. Together, the two rivers and numerous streams that traverse the County total over 850 miles in length.

The San Lorenzo River encompasses 138 square miles and is the largest watershed lying completely within the county. From its headwaters at Saratoga Gap near the intersection of Highways 9 and 35, the San Lorenzo River flows 25 miles to its lagoon near downtown Santa Cruz. Nine major tributaries and numerous smaller streams feed into the river. The communities of Boulder Creek, Brookdale, Ben Lomond, Felton, Scotts Valley, and Santa Cruz are all located within this watershed.

The Pajaro River Watershed covers over 1,300 square miles of land in Santa Cruz, San Benito, Monterey, and Santa Clara Counties. About 200 square miles, or 15 percent, falls within Santa Cruz County. Referred to as the “Lower Pajaro”, the portion of the river within the Santa Cruz County originates at Chittenden Gap and flows nearly 30 miles to its mouth at Sunset Beach west of Watsonville. Principal tributaries to the Pajaro include Corralitos and Salsipuedes Creeks. The Watsonville Sloughs, with a watershed area of 14 square miles, are also located within the Pajaro River Watershed. One of the largest remaining coastal wetland ecosystems in California, the Watsonville Sloughs are critically important for migratory and wetland birds, along with other rare species including California red-legged frog and western pond turtle (Section 5.2.1). Seven principal lakes and many fault-induced sag ponds and depressions are located throughout the Pajaro Valley in the Interlaken area. Many of these water bodies provide exceptional habitat for wildlife (Section 5.2.1) and represent opportunities for water supply and flood control projects.

The San Lorenzo and Pajaro Rivers flow into the Monterey Bay National Marine Sanctuary: one of the most biologically diverse and productive ecosystems in the world. Its abundance and diversity of marine species, scenic beauty, recreational opportunities, and the value to commercial fisheries make it a national treasure. Located off the north coast of Santa Cruz County, Greyhound Rock and Año Nuevo State marine conservation areas were established to protect a wide variety of marine life and habitats, including rocky intertidal, sandy beach, estuary, offshore rocks and islands, shale reef, bull kelp, and giant kelp forest (CDFG 2008).

6.2 Water Resource Issues and Challenges

Strong water resource policies, programs, and partnerships in the county have established an excellent foundation for the protection of water resources; however, there are many critical issues affecting long-term water supply, water quality, and watershed function. These issues are complex and interrelated, as illustrated in Figures 6-2 and 6-3.

Figure 6-1: Water Resources

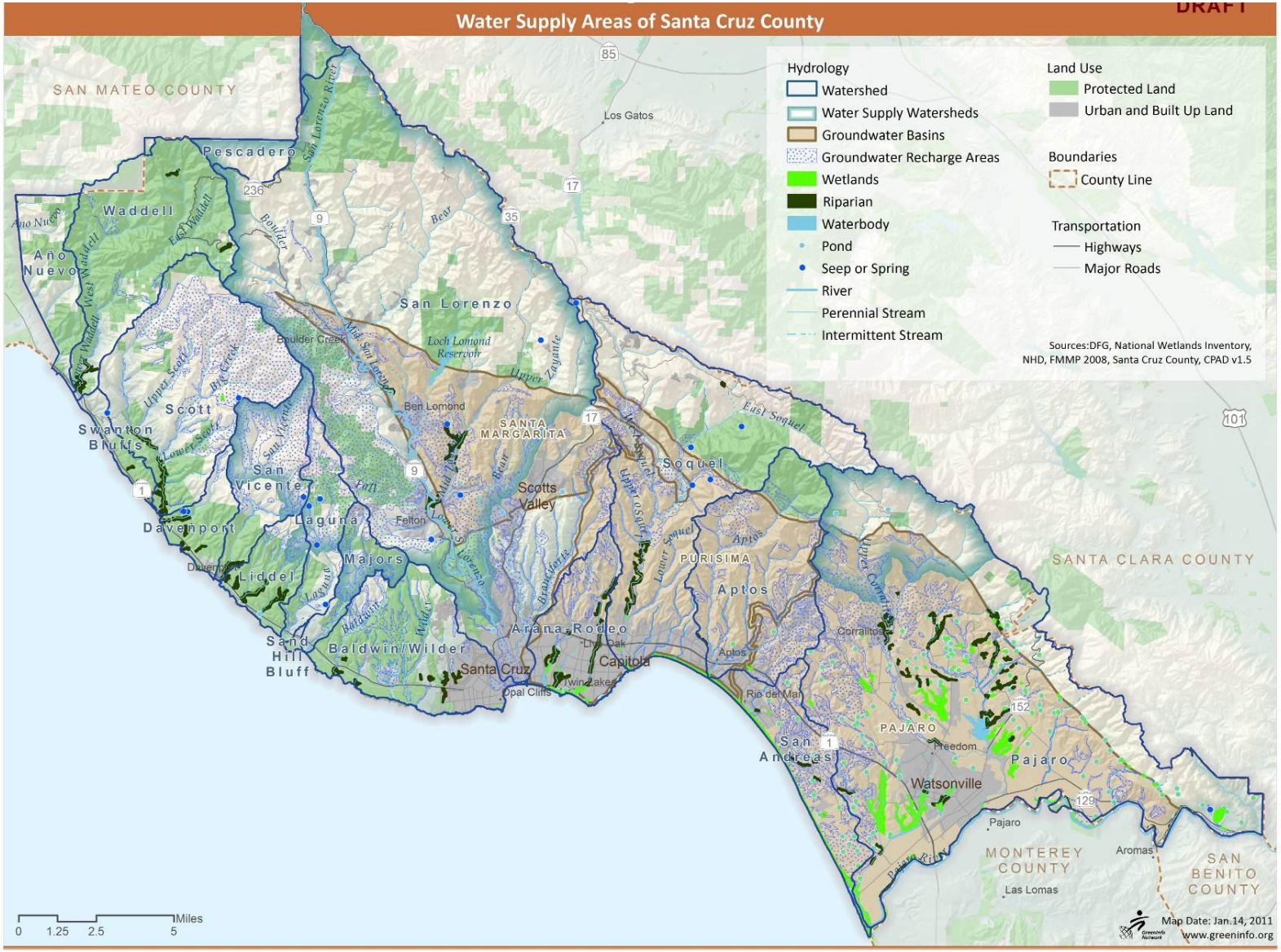

Figure 6-2: Water Supplies

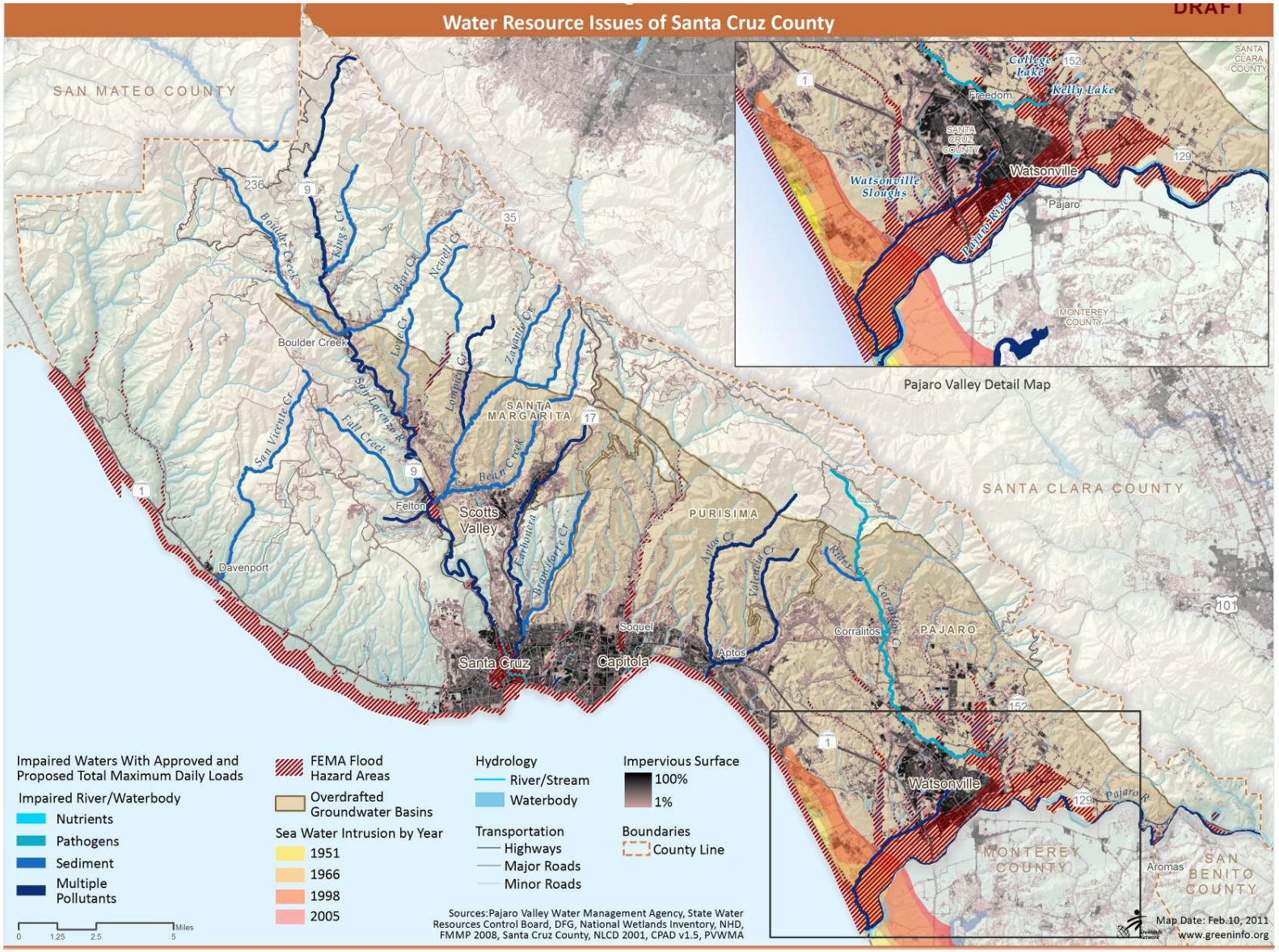

Figure 6-3: Water Resource Issues

6.2.1 Water Supply

Santa Cruz County relies mostly on local water supplies to meet demand for residential, commercial, and agricultural water needs. While some major purveyors depend solely on groundwater for their potable supply, the City of Santa Cruz and San Lorenzo Valley Water Districts get a large portion of their water supply from local streams (Table 6-1). Loch Lomond Reservoir was constructed within Newell Creek, a tributary of the San Lorenzo River, by the City of Santa Cruz in 1960 to store drinking water for residents of the City. The City of Santa Cruz is the largest user of surface water in the county, deriving approximately 96% of their supply from the San Lorenzo River Watershed and north coast stream diversions located on Majors and Laguna creeks and Liddell Spring.

Stream flows in the San Lorenzo River Watershed and along the north coast are often insufficient during droughts and in the late summer season to meet demand for drinking water and to support fisheries. As demand grows over the next 25 years, water shortages for the City of Santa Cruz are projected to become the norm, even during years of normal or average rainfall (NSCIRWMP 2005). Implementation of the Coho Recovery Plan may further strain water availability in order to provide increased stream flows sufficient to recover the threatened fish population. To provide reliable water supplies during drought periods and to protect groundwater aquifers, the City of Santa Cruz and Soquel Creek Water District are evaluating a potential 2.5 million gallon per day desalination facility.

Overall, approximately 80-85 percent of the water consumed in the county comes from underground aquifers. Each of the three major groundwater basins in the county is in a state of overdraft, as more water is pumped per year than is naturally replenished. Overdraft can cause many serious problems including seawater intrusion, ground subsidence, permanent loss of groundwater storage capacity, reduced stream flow, loss of riparian habitat, and other serious water quality impairments (Fisher 2010). In Scotts Valley, extensive development has occurred in areas where groundwater recharge took place above the Santa Margarita groundwater basin; coverage by impervious surfaces has reduced groundwater recharge by at least 50 percent (B. Hecht, pers. comm., 3/5/2010). In response to overdraft, the Scotts Valley Water District has developed recycled water and is exploring development of new groundwater wells to in deeper formations to alleviate pressure on the Santa Margarita Basin.

In the Pajaro Valley, groundwater use is estimated at 55,000 to 60,000 acre-feet per year (Fisher 2010a), with agricultural production accounting for approximately 80-85 percent of this amount. Sustainable yield—the amount of water that can be pumped from an aquifer over the long term without causing unacceptable harm—is estimated at 30,000 to 50,000 acre-feet per year (Fisher 2010a). Overdraft in the Pajaro Valley has been occurring since at least the 1950's, but has been worsened by the widespread conversion from pasture and orchards to water-intensive berries (J. Ricker, pers. comm. 2/3/11). By the year 2040, water use is projected to increase by an additional 4,000 acre-feet to meet projected residential demand (AMBAG 2010), further exacerbating groundwater overdraft.

Because of costs and technical challenges, in 2010 the Pajaro Valley Water Management Agency (PVWMA) amended the Basin Management Plan to eliminate a planned water supply pipeline connecting to the Central Valley Project. There are currently no existing or planned connections to other regional water delivery systems. Potential options to import water will be expensive and will take years to implement if they prove feasible.

Table 6-1: Water Use in Santa Cruz County, 2008-2009

Water Supplier	Connections	Population	Water Use acre-feet/yr	Ground Water	Surface Water	Recycled Water
Santa Cruz City Water Dept.	24,300	95,000	11,054	4%	96%	
Watsonville City Water Dept.	15,000	63,700	7,960	89%	11%	
Soquel Creek Water District	15,000	49,000	4,795	100%		
San Lorenzo Valley (SLVWD)	6,085	19,000	2,026	66%	34%	
SLVWD-Felton	1,300	4,000	450		100%	
Scotts Valley Water District	3,600	11,300	1,640	90%		10%
Central Water District	800	2,700	583	100%		
Lompico Creek Water District	500	1,300	83	30%	70%	
Big Basin Water Company	580	1,500	240	15%	85%	
Mount Hermon Association	530	1,400	250	100%		
Forest Lakes Mutual Water Company	330	900	140	100%		
Smaller Water Systems (5-199 connections)*	3,000	8,000	1,800	95%	5%	
Individual Users*	8,000	20,000	5,000	95%	5%	
Pajaro Agriculture (Santa Cruz County only)**			27,200	90%	1%	5%
Mid- & North-County Agriculture*			2,400	75%	25%	
Total	**79,025**	**277,800**	**65,621**	**78%**	**20%**	**2%**

Source: Santa Cruz County Water Resources Program, May 2010

* Values are estimates

** Agricultural water use on the Monterey County side of the Pajaro basin was 22,500 acre-feet in 2008

6.2.2 Seawater Intrusion

A key symptom of overdraft is seawater intrusion (Figure 6-3). In the Pajaro Valley, seawater intrusion has been expanding inland from the coast at an average rate of 100-250 feet per year (PVWMA 2010). The PVWMA has detected seawater with chloride concentrations of greater than 500 mg/L in wells one mile inland, and concentrations of more than 200 mg/L in some wells over two miles inland. Sixty percent of the basin now has groundwater levels below sea level, with the west side of the basin closest to the ocean suffering the greatest impact (Fisher 2010).

> "Once you have an aquifer intruded by seawater, it's very expensive and difficult to change. It can be impossible for a grower to deal with that. An intrusion problem that took 50 years to create could take many times that to solve." (Andy Fisher, Register Pajaronian 2010)

As salt levels increase, groundwater wells will be rendered unsuitable for drinking water and agricultural use. Even small salt concentrations can render wells unusable, requiring years of natural recharge in combination with significantly reduced groundwater extraction to restore groundwater conditions to normal (Fisher, 2010).

6.2.3 Non-point Source Pollution

Virtually every stream in the county suffers to a degree from degraded water quality, and many have been listed as impaired under Section 303(D) of the Clean Water Act (Table 6-2). Thirty-two water bodies are currently listed or proposed for development of Total Maximum Daily Loads—a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards as established by the State Water Resources Control Board. Primary pollutants of concern include sediment, nutrients, and pathogens.

Major sediment sources include erosion stemming from poorly drained road networks, undersized or failing stream crossings, landslides, grading for residential development, and timber harvest and agricultural activities. Road construction, development and urbanization near streams and in steeper areas has resulted in the alteration of natural runoff timing and stream flow volumes, which has contributed to localized flooding events and increased delivery of sediment to local streams. In the San Lorenzo River Watershed, excessive sedimentation from roads is considered the primary cause of the estimated 70-90% reduction in salmon and steelhead populations that has occurred since the 1960's (NSCIRWMP 2005). Build-out of future residential development is expected to account for nearly 17,000 additional units, with almost a third of that housing located in rural areas (County of Santa Cruz 2004). Grading for future residential development along with associated access roads, driveways, and other improvements will likely exacerbate existing sediment and non-point pollution problems.

> "Urban runoff is a significant source of bacteria, nitrate and sediment. Most urban development in the San Lorenzo Valley is residential with homes very close to and positioned well above the stream system, such that contaminants can move rapidly from neighborhood areas into the channels. Homes overlying sandy soils contribute a disproportionate volume of nutrients which enter the streams through the sandy aquifers. In residential areas, source control to reduce runoff has particular value as a way of reducing contaminants." (Balance, 2007)

Santa Cruz County has over 22,000 septic systems, 13,000 of which are in the San Lorenzo River Watershed, which has the highest density of septic systems of any comparable area in the State. The majority of septic systems in the watershed are over 25 years old and are located on parcels that could not fully meet today's standards for installation of a new septic system which are designed to ensure their effectiveness, due to small lot size, close proximity to a stream, high groundwater, steep slope, or clay soil. (County of Santa Cruz 2010) As of 2007, monitoring results in both the San Lorenzo and the north coast watersheds showed an increasing trend in bacteria levels over the previous five-year period, most likely attributable to increased development (Balance 2007). Elevated nitrate concentrations in these waters are indicative of the widespread use of septic systems to treat and dispose of household wastewater, and are also attributed to runoff from confined animal facilities. Nitrate levels tend to be higher in Boulder Creek, the sandy soil areas to the east of the San Lorenzo River, and in Valencia Creek (Balance 2007 and J. Ricker, pers. comm., 2/3/11).

Table 6-2: Impaired Water Bodies in Santa Cruz County Subject to Existing or Proposed TMDL Requirements (CA Water Resources Control Board 2010)

Water Body	Length / Area	Unit	Pollutant	Expected TMDL Completion Date	USEPA TMDL Approved Date	Comments Included on TMDL List
Aptos Creek	8	Miles	Pathogens	01/01/11		Impaired from below Bridge Creek to the mouth (approximately 5 miles).
Aptos Creek	8	Miles	Sedimentation/Siltation	01/01/21		
Arana Gulch	5	Miles	Chlorpyrifos, E. coli, Fecal Coliform	01/01/21		
Beach Road Ditch	1	Miles	Low Dissolved Oxygen, Nitrate, Turbidity, pH	01/01/21		
Bean Creek	9	Miles	Sedimentation/Siltation		02/19/04	
Bear Creek	6	Miles	Sedimentation/Siltation		02/19/04	
Boulder Creek	8	Miles	Sedimentation/Siltation		02/19/04	
Branciforte Creek	6	Miles	Chlorpyrifos, Enterococcus, E. coli	01/01/21		
Branciforte Creek	6	Miles	Fecal Coliform	01/01/11		
Branciforte Creek	6	Miles	Sedimentation/Siltation		02/19/04	
Carbonera Creek	10	Miles	Nutrients, Sedimentation/Siltation		01/14/03	
Carbonera Creek	10	Miles	Pathogens	01/01/11		
Corcoran Lagoon	12	Acres	Total Coliform, pH	01/01/21		
Corralitos Creek	13	Miles	Escherichia coli (E. coli), Fecal Coliform	01/01/11		
Corralitos Creek	13	Miles	Turbidity, pH	01/01/21		Impaired from the Salsipuedes Creek to Browns Valley Road..
Fall Creek	5	Miles	Sedimentation/Siltation		02/19/04	

Table 6-2: Impaired Water Bodies in Santa Cruz County Subject to Existing or Proposed TMDL Requirements (CA Water Resources Control Board 2010)

Water Body	Length / Area	Unit	Pollutant	Expected TMDL Completion Date	USEPA TMDL Approved Date	Comments Included on TMDL List
Hanson Slough	1	Miles	Pathogens		07/19/07	
Harkins Slough	7	Miles	Chlorophyll-a, Low Dissolved Oxygen	01/01/21		
Harkins Slough	7	Miles	Pathogens		07/19/07	
Kings Creek	4	Miles	Sedimentation/Siltation		02/19/04	
Lockhart Gulch	3	Miles	Low Dissolved Oxygen, pH	01/01/21		
Lompico Creek	4	Miles	Nutrients		01/14/03	
Lompico Creek	4	Miles	Pathogens	01/01/11		
Lompico Creek	4	Miles	Sedimentation/Siltation		02/19/04	
Love Creek	4	Miles	Sedimentation/Siltation	01/01/21		
Moore Creek	2	Miles	Electrical Conductivity, pH, low Dissolved Oxygen, E. coli	01/01/21		
Newell Creek (Lower)	2	Miles	pH	01/01/21		
Newell Creek (Upper)	4	Miles	Sedimentation/Siltation	01/01/21		
Pajaro River	32	Miles	Boron, Chlordane, Chloride, Chlorpyrifos, Dieldrin, Low Dissolved Oxygen, PCBs, sodium, Tubidity, pH	01/01/21		Impaired below Main Street in Watsonville to the mouth.
Pajaro River	32	Miles	DDD (Dichlorodiphenyldichloroethane)	01/01/13		
Pajaro River	32	Miles	E. coli, Fecal Coliform	01/01/11		Impaired reach includes the entire Pajaro River.
Pajaro River	32	Miles	Nitrate, Nutrients		10/13/06	
Pajaro River	32	Miles	Sedimentation/Siltation		05/03/07	
Pinto Lake	115	Acres	Chlorophyll-a, Cyanobacteria hepatotoxic microcystins, Low Disolved Oxygen, Scum/Foam	01/01/13		

Table 6-2: Impaired Water Bodies in Santa Cruz County Subject to Existing or Proposed TMDL Requirements (CA Water Resources Control Board 2010)

Water Body	Length / Area	Unit	Pollutant	Expected TMDL Completion Date	USEPA TMDL Approved Date	Comments Included on TMDL List
Salsipuedes Creek	3	Miles	Escherichia coli (E. coli), Fecal Coliform	01/01/11		
Salsipuedes Creek	3	Miles	Low Dissolved Oxygen, pH, Turbidity	01/01/21		
San Lorenzo River	27	Miles	Chlordane, Chlorpyrifos, PCBs	01/01/21		Impaired from lagoon to Zayante Creek (approximately 7 miles).
San Lorenzo River	27	Miles	Nutrients		01/14/03	
San Lorenzo River	27	Miles	Pathogens	01/01/11		
San Lorenzo River	27	Miles	Sedimentation/Siltation		02/19/04	
San Lorenzo River Lagoon	66	Acres	Pathogens	01/01/11		
San Vicente Creek	9	Miles	Sedimentation/Siltation	01/01/19		
Schwan Lake	23	Acres	Escherichia coli (E. coli), Fecal Coliform, Nutrients, Total Coliform	01/01/21		
Soda Lake	2627	Acres	Ammonia (Unionized)	01/01/21		
Soquel Creek	18	Miles	Enterococcus, E. coli, Fecal Coliform	01/01/11		
Soquel Creek	18	Miles	Turbidity	01/01/21		
Soquel Lagoon	1	Acres	Pathogens	01/01/11		
Soquel Lagoon	1	Acres	Sedimentation/Siltation	01/01/21		
Struve Slough	3	Miles	Low Dissolved Oxygen, pH	01/01/21		
Struve Slough	3	Miles	Pathogens		07/19/07	
Valencia Creek	6	Miles	Pathogens, Sedimentation/Siltation	01/01/11		
Watsonville Slough	6	Miles	Low Dissolved Oxygen, Pesticides, Turbidity	01/01/21		
Watsonville Slough	6	Miles	Pathogens		07/19/07	
Zayante Creek	9	Miles	Chlorpyrifos, Fecal Coliform	01/01/21		
Zayante Creek	9	Miles	Sedimentation/Siltation		02/19/04	

Water qualify of the Pajaro River is severely impaired, with widespread sedimentation impacts resulting from some agricultural practices.. As noted in Lower Pajaro River Enhancement Plan (2002), pressure to maximize economic returns has resulted in some areas with little setback of agricultural fields from waterways and drainages, and double and triple cropping practices, which leaves bare soils during the wet winter months. Widespread conversion of crops over the past two decades (for example, from apple orchards to strawberries) in combination with plastic sheeting and hoop houses has increased winter stormwater runoff. In many cases this has overwhelmed the local drainage network of culverts and ditches and has resulted in localized flooding, loss of soils, sedimentation and undercutting of creek channels with loss of riparian vegetation (R. Casale, pers. comm., 12/19/09). Pesticides, herbicides, and chemical fertilizers also occur in some south county streams and in the Watsonville Sloughs (SWRCB 2010).

6.2.4 Water Quality Impacts to Monterey Bay

There is a direct connection between water quality in the county's lakes, rivers, and streams with the health of Monterey Bay. Polluted urban and agricultural runoff degrades Bay water quality during winter storm events, and can result in serious impacts to the near-shore environment and marine habitats. High nutrient loadings have been identified in Monterey Bay and may be attributed to nitrate runoff associated with agricultural fertilizer use. High nitrate levels can result in harmful algal blooms with severe impacts to marine species. The deaths of at least 21 southern sea otters were linked to microcystin, a toxin also known as blue-green algae, which thrives in warm, stagnant, nutrient-rich water. High concentrations of microcystin were found in the Salinas, Pajaro and San Lorenzo Rivers, and in ocean water at the Santa Cruz wharf (Sanctuary Integrated Monitoring Network 2010).

6.2.5 Flooding and Stormwater Runoff

Nearly 20,000 acres within the county lie within FEMA-designated flood hazard areas (Figure 6-3). Flooding and seasonally high water can impact natural resources throughout the watershed from streambank erosion, sedimentation, and other water quality impacts. Areas mapped at greatest risk of flooding include the lower reaches of Waddell and Scott creeks on the north coast; the lower and middle reaches of the San Lorenzo River; lower Soquel Creek; and nearly 10,000 acres in the Pajaro River Watershed, including the Interlaken region and the Watsonville Sloughs. The City of Watsonville lies almost entirely within the floodplain and is at risk of flooding during major storm events. The 1982 and 1995 floods resulted in severe property damage, lost agricultural revenue, and loss of life. The 1995 flood caused one death and $67 million in damage to agricultural fields and $28 million in property damage to the Town of Pajaro (APV 2011).

The U.S. Army Corps of Engineers (USACE) has been working with the City of Watsonville and the Counties of Santa Cruz and Monterey since 1966 to address flood control along eleven miles of the lower Pajaro River from Murphy Crossing Road to the river mouth, and along five miles of Corralitos and Salsipuedes Creeks. Since that time, 19 alternatives for flood control have been evaluated. The current USACE preferred alternative would establish a 100-foot levee setback to achieve 100 year flood protection for the City of Watsonville, and 50 year flood protection for the agricultural areas downstream of the Highway 1 bridge. Local stakeholders have widely mixed opinions about the merits of this alternative, and there are competing interests for the project to address riparian habitat, fish passage, agricultural protection, and recreational access. Action Pajaro Valley (www.actionpajarovalley.org) has been working with agency partners and the office of Sam Farr to

solicit stakeholder input to help develop a comprehensive flood protection plan that meets local community needs. Recommendations from a 2001 community planning process advocated a hybrid flood control design alternative that would include (MIG 2001):

- Some floodwalls and levee raising in the current levee footprint
- Some setback of levees
- Limited dredging and channel excavation in select areas
- Bridge modifications to eliminate constriction and backup of design flood flows
- Limited agricultural land acquisition or easements
- Planned levee overtopping, localized bypassing, and floodplain area drainage improvements
- Vegetation management

The current USACE proposal does not recommend many of these elements for funding because they are considered too expensive and do not have a high enough benefit-to-cost ratio for federal participation (APV 2011). Given the wide range of issues in the Lower Pajaro Watershed, including climate change, sea water intrusion, need for aquatic habitat values, there may be a benefit in developing a longer-term vision that addresses opportunities for water storage and flood management upstream in Santa Clara and San Benito counties along with these considerations. Action Pajaro Valley hosts a comprehensive website that describes flood control and other issues in the Pajaro River: www.pajarowatershed.org.

6.2.6 Climate Change

In addition to the many potential impacts to biological resources outlined in Section 5.2.4, climate change is predicted to have dramatic impacts on local water supplies and water quality. While scenarios vary, climate change is expected to result in (Ricker 2010):

- Increased storm intensity, causing more flooding, faster surface runoff, and less infiltration into groundwater basins
- Reduced groundwater recharge due to faster runoff, resulting in diminished groundwater supplies for residential and agricultural use and diminished stream base flows
- Increased demand by 10-20% for water supplies in response to higher temperatures or shorter wet seasons
- Reduced stream baseflows, which will reduce surface supplies and impact aquatic habitat

Rising sea levels will likely increase storm surges and may lead to seasonal or permanent inundation of many areas between the mouth of the Pajaro River and the Highway 1 bridge, including much of the Watsonville Sloughs (Hayes 2010). In addition to direct loss of farmland and freshwater wetlands, sea level rise will likely increase the rate of seawater intrusion into the aquifer (Section 6.2.6).

6.3 Opportunities for Water Resources Conservation

Protection of water resources is an incredibly broad topic, and requires a variety of integrated approaches. These include focused conservation planning in sourcewater areas and other sensitive

watershed locations; widespread participation and engagement in local and regional planning processes by those in the conservation community; regulatory approaches and policies; and voluntary conservation programs including land acquisition, easements, and stewardship incentives. Given the variety of agencies and efforts dedicated to water protection, the emphasis of this discussion is primarily on local and regional programs (rather than state and federal efforts), and on programs that operate primarily in the rural and agricultural areas of the county.

6.3.1 Sourcewater Protection

Protecting the source of principal water supply streams and groundwater recharge areas is one of the most important nationwide priorities for focused land conservation efforts (TPL 2004, Herbert 2007). Because many of the public water purveyors in the county rely on water sources that are located beyond their jurisdictional boundaries (Table 6-1), Santa Cruz County plays a critical role in protecting critical water resources through its General Plan policies. The Santa Cruz County Environmental Health Services Water Resources Program is responsible for coordinating with the local water purveyors and other agencies to address protection of water sources through long-range water supply planning, water quality protection, and watershed management. Environmental Health staff also oversee approximately 130 small water systems in the county serving roughly 2,500 households, and over 8,000 private wells in the county that serve between 1 and 4 households.

Sourcewater Protection Can Reduce Treatment Costs

The development of watershed lands and groundwater aquifer recharge areas contaminates drinking water supplies, resulting in increasing water treatment costs. These costs can be prevented with a greater emphasis on source protection.

A nationwide study of 27 water suppliers conducted by the Trust for Public Land and the American Water Works Association(2004) found that the more forest cover in a watershed, the lower the treatment costs:

• Approximately 50 to 55 percent of the variation in treatment costs can be explained by the percent of forest cover in the source area.

• For every 10 percent increase in forest cover in the source area, treatment and chemical costs decreased approximately 20 percent, up to about 60 percent forest cover.

The County General Plan (Chapter 5: Conservation and Open Space) outlines a number of policies and programs related to sourcewater protection. Key policies address maintenance of adequate stream flows, water quality of surface streams, wastewater management, groundwater protection, and water conservation. The General Plan has designated the following areas as most critical for water supply and quality (Figure 6-2):

Water Supply Watersheds

These areas encompass all of the lands that contribute surface runoff to an existing or proposed reservoir or intake used for water supply, including everything upstream of that point. Areas proposed for future reservoirs were not included in the Blueprint's designation of Water Supply Watersheds because their construction is no longer deemed feasible (J. Ricker, pers. comm.). Nearly 100,000 acres are designated as Water Supply Watersheds, where future subdivisions are generally restricted to minimum parcel sizes of at least 10 acres outside of the Coastal Zone and 20 acres inside the Coastal Zone. In designated water supply watersheds, new residential can only occur on lots greater than one acre in size.

Primary Groundwater Recharge Areas

These are locations where, due to the presence of sandy soils, surface water more readily infiltrates into the aquifers. The county has designated nearly 54,000 acres as Primary Groundwater Recharge zones, which cannot be subdivided into parcels smaller than 10 acres. The intent is to ensure that these areas remain largely free from development and impervious surface that could impede recharge, and also to reduce impacts to groundwater quality from septic systems and other pollutants.

Water Quality Constraint Areas

These include areas on the north coast located within one mile upstream of intakes used for public water supplies, where minimum parcel sizes are set at 2.5 acres, including:

- City of Santa Cruz intakes on Reggiardo, Laguna and Majors Creek, and Liddell Spring
- Bonnymede Mutual intake on Reggiardo Creek
- Davenport water system intakes on Mill and San Vicente Creeks.

Critical Water Supply Streams

Rivers and streams that provide critical drinking water sources include Laguna, Majors, Liddell, San Vicente, Mill, and Reggardio Creeks on the North Coast; the San Lorenzo River and its tributaries north of the City of Santa Cruz; and Corralitos and Browns Valley Creeks and their tributaries upstream of the City of Watsonville's water diversion points.

Surface Water Protection Zones

Starting in 2002, local water purveyors were required under the Safe Drinking Water Act to conduct periodic assessments of their drinking water sources. These assessments include a delineation of the immediate water source areas and the potential contaminating activities in proximity to those sources that could impair drinking water supplies. Together with critical water supply watersheds and groundwater recharge areas, these are some of the most important public drinking water sources in the county and represent critical opportunities for voluntary land protection to complement the county's policies. Land conservation in these areas both protects the source of these essential water supplies and can reduce the number of future stream diversions and amount of potential groundwater extraction.

Land conservation in these areas—especially in locations immediately upstream or upgradient of water diversions—can provide incentives to landowners to exceed resource protection ordinances and standards. The City of Santa Cruz, for example, is working on a pilot riparian conservation easement program in partnership with the Land Trust of Santa Cruz County. The intent of Phase I of the program is to protect riparian habitat along a key reach of the San Lorenzo River and to ensure water quality protection in the vicinity of the City's groundwater wells.

6.3.2 Water Rights

Landowners in many unincorporated areas of the county may have riparian or appropriative rights to divert water from surface streams. Streams that are over-appropriated through legal or unpermitted diversions can have insufficient flows necessary to sustain fish and other species. County staff monitors stream diversions and applications for water rights. When a stream is determined to be fully

appropriated, no new permits may be filed with the State and the applications for water rights will be denied. The San Lorenzo River is fully appropriated in the summer months and is subject to these restrictions. Soquel Creek has been fully adjudicated by the State, resulting in the apportionment of water that each right holder may take (Santa Cruz County Water Resources Program 2011). In these areas and along the north coast and on Corralitos Creek where in-stream flows are often insufficient during low rainfall years, there may be opportunities to secure water rights for conservation purposes. This approach, which will require careful strategic planning, landowner outreach, and conservation incentives, can have many benefits. For example, water rights can be purchased and dedicated under Section 1707 of the state water code to maintain flows for critical streams for steelhead and coho, for example. In less sensitive areas, water rights can be secured to facilitate recharge projects or used to establish off-stream ponds or reservoirs to supply irrigation water for agricultural operations during the dry summer months.

6.4 Local Water Resource Agencies and Programs

Working with federal, state, and other local agencies, the County's major water purveyors are responsible for providing sustainable water resources (Table 6-3). They have been largely successful at developing and implementing a broad array of projects and programs to address many of the key water resource challenges facing Santa Cruz County.

6.4.1 Integrated Regional Water Management Plans

Integrated Regional Water Management Plans (IRWMPs) provide an important framework for regional water resource protection. Development of these plans is required in response to the State of California's Integrated Regional Water Management planning initiative to promote informed, locally-driven, and consensus-based approaches to water resources management. Approved IRWMPs are necessary for regions to be eligible to receive certain funding through the State Department of Water Resources proposition-funded grant programs. Through the two local IRWMPs approved in 2006, over $37.5 million in Proposition 50 funding was secured for local water resource projects, including Watsonville's recycled water treatment plant and coastal distribution system.

In December 2010, additional IRWMP Proposition 84 funding was tentatively awarded for two projects located in areas that have emerged as important Blueprint conservation priorities:

- The **Watsonville Sloughs** Hydrologic Study will develop the baseline data necessary to prepare water supply, flood management, and wetland restoration strategies in this critical area.

Integrated Regional Water Management Plans (IRWMPs)

IRWMPs are intended to address the major water-related objectives and conflicts within a region. They outline a variety of strategies and alternatives to manage water supply and demand; identify key environmental stewardship actions to provide long-term, reliable, and high-quality water supplies; and identify disadvantaged communities in the region and address their water-related needs.

Santa Cruz County falls within two IRWMP planning areas. The Santa Cruz IRWMP covers the northern two-thirds of the county and Watsonville Sloughs. http://www.santacruzirwmp.org/

The Pajaro River Watershed IRWMP covers the rest of the county that lies within the Pajaro River Watershed. http://pvwma.dst.ca.us/project_planning/projects_irwmp.shtm)

Table 6-3: Sample Water Resource Agency Programs and Initiatives for Water Resources Conservation

Agency	Project
Santa Cruz County	• Lead role in developing the 2011 Integrated Regional Water Management Plan update to address regional water supply and water quality issues • Recently expanded water quality monitoring programs, outreach and public information • Maintains strong stormwater pollution prevention and many other programs
City of Santa Cruz	• Recently approved creek and riparian habitat protection ordinance • Initiated pilot riparian conservation easement program with the Land Trust of Santa Cruz County • Exploring desalination plant with Soquel Creek Water District to address water shortages during drought periods • Developing comprehensive Habitat Conservation Plan to address resource impacts from water diversions
City of Watsonville	• Exploring solar and other alternative energy sources to reduce greenhouse gas emissions associated with water pumping and delivery • Audits energy use associated with water production • Developed recycled water facility • Supports green business programs to encourage water conservation • Extensive outreach and education about local water resources through their nature center and Watsonville Sloughs trails
Soquel Creek Water District	• Comprehensive Integrated Resource Plan in place • Exploring conjunctive use (interagency water sharing and transfers) arrangements with the City of Santa Cruz • Exploring desalination facility with the City of Santa Cruz • Developed groundwater management plan for the Soquel-Aptos area with the Central Coast Water District
Scotts Valley Water District	• Expanding use of recycled water facility for municipal golf course and landscaping • Exploring conjunctive use (interagency water sharing and transfers) arrangements with the City of Santa Cruz
San Lorenzo Valley Water District	• Completing comprehensive watershed management plan for its land holdings • Implements effective sourcewater protection program through fee purchase of forested watershed lands and sensitive sandhills habitat • Audits energy use associated with water production
Pajaro Valley Water Management Agency	• Updating the Basin Management Plan to address long-term water supply issues and to develop solutions to overdraft in Pajaro Valley • Exploring College Lake for water supply, flood control, and habitat restoration • Operates the coastal recycled water distribution facility and the Harkins Slough Managed Aquifer Recharge (MAR) project • Working with Recharge Initiative Project to identify new MAR sites

- The **College Lakes** Integrated Watershed Management Plan will explore options for increased water supply, flood control, and habitat improvements for aquatic species.

In addition, a Prop 50 IRWM grant funded Action Pajaro Valley (www.actionpajarovalley.org) to establish the Pajaro River Watershed Information Center, a comprehensive website with detailed information about the watershed including flood protection, water supply, water quality, and many other issues (www.pajarowatershed.org).

Because of the high level of engagement by local agencies and their commitment to developing comprehensive solutions for water and environmental resource protection, the IRWM planning process provides important opportunities for conservation organizations to coordinate efforts and direct resources toward priority projects that are of regional significance. Moving forward, our hope is that key Blueprint recommendations and supporting data for biodiversity and other conservation values will be used to inform IRWMP priorities and can help direct funding to locations where multiple environmental benefits can be achieved through land conservation projects.

6.4.2 Other Water Resource Organizations, Partnerships, and Programs

There are a number of very successful interagency programs and partnerships in the county that demonstrate the value of collaborative and voluntary approaches to water resource conservation and management. Their continuation and expansion are critical to address and resolve the many water resource issues that occur in the county.

6.4.3 Resource Conservation District of Santa Cruz County (RCD)

Drawing on federal, state, and local grant funds and through a longstanding partnership with the USDA Natural Resources Conservation Service (NRCS), the RCD provides project design support, permitting, cost-share funding, technical assistance and education and outreach services to interested landowners and conservation project partners. The RCD and NRCS are non-regulatory agencies and focus on voluntary participation to protect and restore natural resources. Virtually all of the RCD's programs and projects emphasize water resource protection, and the RCD is a key implementation partner on the Santa Cruz Integrated Regional Water Management Plan (IRWMP) and Santa Cruz Integrated Watershed Restoration Program (IWRP) efforts.

Current RCD projects include:

- Agricultural water quality management and research projects to reduce nutrient and sediment delivery
- Livestock management and use of BMPs to reduce water quality impacts
- Implementation of erosion control projects to reduce sedimentation from rural roads
- Habitat restoration to eradicate non-native species from riparian habitats
- Permitting assistance through their countywide *Partners in Restoration Permit Coordination*

Riparian Areas

"The riparian zone is the area where streams interact with the land, and it is a stream's best defense for keeping non-point source pollutants out of its waters. The riparian zone protects water quality by processing nutrients, filtering contaminants from surface runoff, absorbing and gradually releasing floodwaters, maintaining fish and wildlife habitats, recharging groundwater, and maintaining stream flows." (TPL 2001)

Program, which streamlines the permitting processes associated with habitat restoration and work in regulated water bodies.

- Watershed education through numerous workshops, brochures, and publication of *Watershed Cruzin': An Activity Guide to Santa Cruz County Watersheds*, a resource aimed at teachers to help them prepare watershed-based curricula and field-based activities for their students.
- Implementation of numerous multiple benefit conservation projects that link water supply, water quality and habitat through the Integrated Watershed Restoration Program of Santa Cruz County.

6.4.4 Integrated Watershed Restoration Program of Santa Cruz County

Local conservation organizations have been very active in preparing watershed assessments and enhancement plans. By 2003, many technical assessments and watershed studies were completed in the county, covering major portions of the watersheds for the San Lorenzo River, Scott Creek, Arana Gulch, Soquel Creek, Aptos Creek, the Lower Pajaro River, and the Watsonville Sloughs.

Integrated Watershed Restoration Program Objectives

1. Coordinate agencies on the **identification, funding, and implementation** of watershed restoration projects.
2. Target proposals to **critical projects** supported by the resource agencies.
3. Facilitate higher quality **designs** at lower cost.
4. Simplify the **permit process** for watershed restoration projects.
5. Effect **institutional change** to improve watershed restoration efforts.
6. Develop a countywide **outreach and education** program.
7. Develop a countywide watershed restoration **monitoring** program geared toward future project identification needs.
8. Develop additional **assessments and plans** as needed.
9. Serve as a watershed restoration **information hub** for Santa Cruz County.

Source: IWRP Website, http://iwrp.rcdsantacruz.org/

To facilitate implementation of these plans, the Resource Conservation District, Coastal Conservancy, California Department of Fish and Game, Coastal Watershed Council, and the City and County of Santa Cruz developed the Integrated Watershed Restoration Program (IWRP), which is administered by the RCD. The aim of the IWRP is to support local watershed partners in developing projects and to coordinate with agencies that provide technical assistance, permits, and funding to overcome the many obstacles and challenges that stand between a good plan and its successful implementation, such as: competition between partners for limited funding, confusing and time-consuming permitting processes, lack of coordination and differing priorities among resource/funding agencies.

In 2003, the Coastal Conservancy granted the RCD of Santa Cruz $4.5 million to develop an integrated approach to conservation that included development of the first countywide permit coordination program (PIR); a rural roads evaluation and improvement program; an education program (Watershed Cruzin'); and funds to complete the design and permit phase of 55 high priority restoration projects in the county. In addition to the program areas and funding, IWRP established a Technical Advisory Committee comprised of representatives from the Santa Cruz County Planning and Environmental Health Department, the Department of Fish and Game, the Central Coast Regional Water Quality Control Board, the Coastal Commission, the State Coastal Conservancy, the National Marine Fisheries Service, U.S. Fish and Wildlife Service, the Army Corps of Engineers, and the Natural Resources Conservation Service. The TAC meets

regularly to identify and prioritize new projects, provide feedback on project alternatives and designs, review projects that have been completed, and to discuss both programmatic and project specific lessons learned. Since 2003, the IWRP partners have implemented upwards of 80 conservation projects and secured nearly $12 million in implementation funds from a wide variety of public and private sources including Prop 50 IRWM funds. The IWRP's success in Santa Cruz County led the State Coastal Conservancy to award additional funds in the end of 2008 to help build similar programs in San Mateo and Monterey counties through their respective RCDs.

The IWRP provides an outstanding foundation to use watershed-based approaches to identify and address conservation issues. Comprehensive watershed plans are critical tools to identify issues that impair watershed function and to establish resource protection priorities. Watershed planning processes tend to be non-regulatory in nature and foster participation by a wide range of stakeholders. Early stakeholder involvement in the planning process can be key to buy-in and widespread participation during implementation.

The Blueprint integrates feedback from project partners to identify locations that would benefit from new or updated watershed assessments. Priorities for watershed planning include:

- San Vicente and Laguna creeks , to address coho recovery, erosion, and water supply
- Zayante and Bean creeks (fisheries, erosion, large-woody debris)
- Corralitos and Salsipuedes creeks (fisheries, erosion, agricultural water quality, water supply)
- Watsonville Sloughs (hydrologic study to facilitate restoration planning)
- Larkin Valley (pond management and connectivity for Santa Cruz long-toed salamander recovery)
- Lower Pajaro River (flood control, climate change, fish passage, recreational access)

6.4.5 Water Quality Monitoring Programs

Water quality monitoring measures the health and status of our waters. Many agencies and organizations in Santa Cruz County gather and share data to evaluate water quality. This information is used to establish priorities for regulatory programs like TMDLs, or to set priorities and attract funding for watershed restoration work. Santa Cruz County has implemented a comprehensive monitoring program that evaluates water quality at popular recreational destinations and in streams where listed species are present. The program includes weekly monitoring of approximately 14 beaches and 15 freshwater sites and monthly or bi-monthly monitoring of an estimated 35 freshwater sites and 12 beaches.

Water Quality Monitoring Resources and Interactive Websites

Coastal Watershed Council
http://www.coastal-watershed.org/data-portal/

Santa Cruz County Water Quality GIS
http://waterqualitygis.co.santa-cruz.ca.us/

California Environmental Data Exchange Network
http://www.ceden.us/AdvancedQueryTool

Sanctuary Integrated Monitoring Network
http://www.sanctuarysimon.org/monterey/sections/waterQuality/overview.php?sec=wq

The Central Coast Ambient Monitoring Program
http://www.ccamp.org/

Sanctuary Citizen Watershed Monitoring Network
http://montereybay.noaa.gov/monitoringnetwork/

Central Coast Long-term Environmental Assessment Network (CLEAN)
http://www.cclean.org/

Many other organizations including the Central Coast Regional Water Quality Control Board, Monterey Bay National Marine Sanctuary, Save Our Shores, Surfrider Foundation, Central Coast Wetlands Group, and the Coastal Watershed Council have established their own water quality monitoring programs. Efforts like the Watershed Council's *First Flush* event are vital to identify point sources of pollution and to hone in on areas where non-point source pollution occurs. Many of these programs rely on volunteers and students to collect and analyze the data, which provides them with an important sense of ownership in maintaining the health of local waters. Increasingly, results of local water quality data are being published on-line using interactive websites that allow users to seek or provide information about particular water bodies or specific pollutants.

6.4.6 Pajaro Valley Groundwater Protection Efforts

Addressing overdraft and seawater intrusion in the Pajaro Valley is a major priority of the Pajaro Valley Water Management Agency (PVWMA). In 2011-12, the PVWMA will update the Basin Management Plan, which serves as the guiding document to set the agency's direction and strategic priorities for water supply and protection programs. Among many other strategies, the plan will evaluate opportunities to maximize natural recharge and to locate new Managed Aquifer Recharge (MAR) projects. The aim of MAR projects is to capture surplus winter rains or surface waters that are prevented from naturally recharging due to underlying hardpan or impervious rock layers, and conveying them back into the aquifer in managed percolation ponds.

Pajaro Valley Water Community Dialogue: Preliminary Ideas to Address Overdraft in the Pajaro Valley

- Expanded use of the PVWMA recycled water facility including nighttime usage
- Winter water storage at College and Pinto lakes
- Installation of a regional network of irrigation monitoring sensors
- Collection of Beach Road tile drain water for treatment and reuse
- Identification of locations for managed aquifer recharge projects
- Identification of strategic locations for land fallowing (steep slopes, habitat)
- NRCS / RCD support in securing grant funding and incentives for conservation practices

Source: Pajaro Community Dialogue on Water Public Workshop, December 2010

This effort will build on the work of the *Recharge Initiative*, a program led by Dr. Andy Fisher of the UCSC Department of Earth and Planetary Sciences. The goal of the program is to protect, enhance, and improve the availability and reliability of ground water resources. Recharge Initiative staff and colleagues are currently working to identify locations within the Pajaro Valley where MAR projects could be sited. They estimate that a widely distributed network of MAR projects could address the overdraft problem by as much as 20 percent (Fisher 2010). Their research indicates that there are added water quality benefits of managed recharge, including filtering of nitrogen and other pollutants that occurs as water infiltrates into the soil.

Recognizing that agricultural water use in the Pajaro Valley is not sustainable at current levels (Section 6.2.1) and concerned that the PVWMA and other agencies may not be able to solve the problem without resorting to burdensome regulations and/or adjudication, leaders from the local agricultural industry in 2010 initiated a voluntary, community-based planning process—the Pajaro Valley Water Community Dialogue—to identify local solutions to the overdraft problem. The dialogue includes widespread participation and involvement by landowners and growers who represent over 70-80

percent of the cultivated land in the Pajaro Valley, along with representatives from many agencies and conservation organizations.

The group is discussing a wide range of solutions, including land fallowing and changes in crop types and rotation cycles in an effort to reduce overall water use by as much as twenty percent. Subcommittees are meeting to evaluate specific topics including: recharge efforts; irrigation and management practices to conserve water; "big project" ideas related to development of new water supplies; and communication and outreach to broaden support for and encourage participation in the process. Resolving the overdraft issue and getting to a state of sustainable yield in the Pajaro Valley will require extraordinary collaboration and cooperation among agencies and landowners, conservation program funding, and time to phase in changes without causing unintended social or economic impacts. Elements of the solution could include:

- Support landowner and agency engagement in the Pajaro Valley Water Community Dialogue
- Incorporate findings from the Recharge Initiative and other community recharge mapping efforts into the Basin Management Plan, and secure funding for permanent protection of these areas through conservation easements or other tools
- Reduce water use through strategic land fallowing in marginal areas, which include steep slopes, areas subject to seasonal flooding or inundation, and lands on the west side of the basin that are experiencing seawater intrusion
- Use longer crop rotation cycles and more frequent rotation with less water-intensive crops
- Explore opportunities to link flood control and recharge efforts
- Utilize Farm Bill funding administered by the NRCS to provide grower incentives to upgrade irrigation technology and improve farm management practices
- Demonstrate agricultural water saving projects on conservation lands and explore use of the Land Trust's Watsonville Slough Farms property as a MAR project site to accommodate excess water the PVWMA is permitted to use for recharge purposes

6.4.7 Watershed-Based Conservation and Ecosystem Services

Recognizing the value functioning ecosystems have for water supplies, payment and incentive programs are being developed to support conservation projects that promote or sustain them. New markets and funding sources for land conservation can complement regulatory approaches to water protection. Table 6-4 summarizes the range of ecosystem services that are provided by watersheds, and lists examples of conservation priorities. Payments for these watershed services could include outright purchase or easements to secure critical water sources; temporary leases or land management agreements to achieve specific land management or water protection objectives; or use of tradable rights under cap and trade programs.

Nutrient trading is emerging as a market-based approach for protecting and improving water quality. It is intended to work alongside programs such as the Total Maximum Daily Load (TMDL) process established under the Clean Water Act to help polluters meet or exceed local standards for water quality protection. Like TMDLs, nutrient trading involves setting a goal for the total amount of nutrients that can enter a target water body. This can be a mandatory cap on the total quantity of nutrient, or a

Table 6-4: Ecosystem Services Provided by Ecologically Functional Watersheds

Watershed Function	Ecosystem Service or Benefit	Conservation Priorities in Santa Cruz County
Water Supply Provision	Watersheds capture rainfall and deliver it to streams and groundwater basins. Functional watersheds maximize water supplies and can reduce drinking water treatment costs.	• Water supply watersheds • Primary groundwater recharge areas, including sandhills • Headwaters of Soquel, Aptos, Arana, and Rodeo Gulch Creeks to recharge the Purisima basin • Intact redwood forest • Seeps and springs • College Lake-- potential for expanded water supply •
Water Quality Protection	Drinking and irrigation water is filtered and purified by roots, soil, and bacteria that pull out chemicals and pollutants	• Riparian areas, wetlands, and sloughs • Groundwater recharge areas • Erodible soils • Steep slopes with landslide-prone geologic formations
Stormwater and Flood Control	Watersheds with intact riparian areas, undeveloped floodplains, and wetlands moderate the timing and volume of stream flows to reduce impacts from stormwater runoff, erosion, and sedimentation.	• Floodplains and areas identified as FEMA flood hazards • Streams and riparian areas • Sources of large logs, downed trees, and other large woody debris that stabilize stream channels • Wetlands and sloughs
Stream Flow	Watersheds act like sponges to capture, store, and release water to streams and groundwater basins. Intact vegetation and deep soils increase store and release water later into the dry season, ameliorating summer drought.	• Streams in water supply watersheds • Priority watersheds for aquatic species conservation • Headwater streams and riparian areas upstream of flood-prone areas • Primary groundwater recharge areas to support summer baseflows
Soil Health, Fertility, and Nutrient Cycling	Soil formation and nutrient recycling occur throughout watersheds. These processes are essential to maintain the productivity of natural and agricultural systems. Carbon sequestration is considered a prime means of addressing greenhouse gas emissions.	• Carefully managed redwood forests and grasslands • Old-growth and older redwood forests • Organic farmland and cultivated areas managed for soil sustainability
Biodiversity Maintenance	Native terrestrial and aquatic habitat is arrayed throughout intact watersheds. Urbanized watersheds fragment and degrade habitat quality.	• Areas identified as critical for biodiversity (Section 5) • Highly significant terrestrial and aquatic habitats • Large, intact habitat patches that allow for connectivity and regional linkages
Recreation, Aesthetics	Forested mountains, rolling grasslands, and clean rivers, lakes, and beaches are characteristic of intact watersheds. These areas improve quality of life through scenery and opportunities for outdoor recreation and education. This in turn helps drive our tourism-based economy.	• Public access points and vistas along rivers, streams, sloughs, and lagoons • Redwood forests and old-growth groves suitable for parks or public access • New connections to regional trails such as the California Coastal Trail / Monterey Bay Sanctuary Scenic Trail • New trails from Watsonville to the Sloughs and Pajaro River
Climate Change Resilience	Watersheds with steep elevational gradients, north-facing slopes, diverse microclimates , and other elements of biogeographic diversity are considered to be more resilient to climate change. Preserving watersheds in natural condition is key to maintaining their many services and benefits over time.	• Water supply watersheds • Streams and riparian habitat • Springs and seeps • North-facing slopes • Steep elevational gradients

percentage reduction goal that's pursued through voluntary participation. The total amount of allowable pollution is then allocated among the sources that will participate in the trading program.

Sources with low-cost pollution reduction options have an incentive to reduce nutrient loadings beyond what is required of them and to sell the excess credits to sources with higher control costs. Through a series of trades, pollution reduction efforts get re-allocated to the sources that have the lowest-cost opportunities to reduce pollution (Nutrient Net 2010).

6.5 Summary of Key Findings

1. Santa Cruz County relies almost entirely on local water supplies, which are not sufficient to meet long-term residential and agricultural demand while also accommodating the needs of fisheries and other environmental values.
2. The County's current General Plan policies will limit future development to low-densities in critical water supply areas, but only voluntary land conservation can provide permanent protection and restoration to maintain critical water supply watersheds and primary groundwater recharge areas. Land protection and stewardship projects in water supply watersheds will reduce sediment and other non-point source pollution, and will benefit recovery of steelhead trout, coho salmon, and other aquatic species.
3. Local water agencies are working closely together to develop new water supplies, facilitate water transfers and exchanges, manage groundwater resources, and provide incentives for water conservation. The Integrated Regional Water Management Plans for Northern Santa Cruz County and the Pajaro River Watershed provide a critical foundation for interagency coordination and collaboration. Greater participation in these planning efforts by land conservation organizations, along with integration of Conservation Blueprint data and recommendations, will lead to new partnerships and programs where land conservation can enhance major water supply and water quality improvement projects.
4. Overdraft in the Pajaro Valley threatens the long-term viability of the local agricultural economy. As groundwater levels diminish, seawater will intrude further inland and contaminate drinking and irrigation supplies. A wide variety of strategies will be necessary to address overdraft, including changes in crop type and rotation cycles, focused conservation in recharge areas, and grassroots planning efforts like the Pajaro Valley Water Community Dialogue to encourage local growers' engagement in these solutions.
5. The Integrated Watershed Restoration Program provides an excellent foundation to comprehensively identify and address priority water and environmental issues. With an emphasis on multi-benefit ecosystem projects, the collaborative program has streamlined implementation of many watershed protection projects. Priority areas for new or updated watershed planning areas include San Vicente, Laguna, Bean, Zayante, Corralitos, and Salsipuedes creeks among others.
6. Stream corridors with intact floodplains and riparian habitats are critical conservation priorities. These areas provide multiple environmental benefits and present opportunities to link biodiversity, water quality protection, groundwater recharge, and flood control efforts.
7. Climate change threatens to dramatically impact local water resources. We will need to aggressively conserve water supply areas to ameliorate the effects of the hotter, drier climate, and maintain watershed integrity through careful stewardship and management.

6.6 Goals, Strategies, and Actions

The following Goals, Strategies and Actions were developed to address the many water resource issues, challenges, and opportunities. They are recommended next steps that conservation agencies and organizations can take and tools that can be used to support and sustain water supplies, ensure water quality, and maintain watershed integrity and hydrologic function.

Water Resource Conservation Goals

1. Protect water supplies to ensure long-term drinking water availability and to meet the needs of local industry, agriculture, and the natural environment.
2. Protect and enhance water quality in natural, urban, and agricultural landscapes.
3. Maintain watershed integrity and ensure resilience to climate change.

Goal 1: Protect water supplies to ensure long-term drinking water availability and to meet the needs of local industry, agriculture, and the natural environment.

Strategy 1A: Protect Surface and Groundwater Supplies

Actions

1.A.1 **Protect Critical Water Supply Streams**: Focus land conservation efforts in watersheds where drinking water streams originate. The protection and stewardship of water supply streams in these watersheds will also benefit conservation of critical fish and wildlife habitat (Chapter 5).

1.A.2 **Protect Natural Groundwater Recharge Areas**: Protect primary groundwater recharge areas to allow for maximum natural percolation into groundwater basins. Because they experience severe overdraft, recharge areas within the Santa Margarita and Pajaro Groundwater Basins are especially important to protect from expansion of development or impervious surfaces.

1.A.3 **Secure Locations for Managed Aquifer Recharge Projects**: Conduct research to identify and prioritize sites for installation of Managed Aquifer Recharge projects where surface runoff is collected and conveyed into the aquifer. Support partnerships among land conservation organizations, willing landowners, and water management agencies to secure new MAR sites through conservation easements, licenses, or other agreements. Due to its close proximity and intended use as a demonstration farm, the Land Trust's Watsonville Slough Farms property may lend itself to a new MAR project to accommodate excess water the PVWMA is permitted to use for recharge purposes. This project should be evaluated for consideration in the PVWMA Basin Management Plan update

1.A.4 **Support Groundwater Research Projects**: Key research topics include:

- Updating the County's groundwater recharge maps to identify additional critical locations where recharge takes place
- Further assessment of surface-groundwater interactions in the coastal zone
- Baseline research to evaluate stream reaches that are considered "losing streams", where streams experience diminished baseflows, lose flow to recharge, or channels go completely dry.

- Focus on practical research and demonstration projects that emphasize education and outreach to restore and protect hydrologic function.

1.A.5 **Protect Riparian Areas:** Protect streams and associated floodplains and riparian habitats to maximize recharge potential, water quality protection, and flood attenuation that occurs in these areas. Coordinate efforts between land conservation organizations and local agencies to establish a Riparian Conservation Easement Program that complements existing riparian protection ordinances through landowner incentives and education.

1.A.6 **Explore Off-Stream Water Supplies:** In coordination with the County, the Resource Conservation District, the State Water Resources Control Board, and other regulatory agencies, explore opportunities to develop ponds or other off-stream supplies for agricultural operations on the North Coast. The Resource Conservation District's off-stream pond enhancement project at Molino Creek could serve as an important case study to demonstrate a project that captures excess winter runoff for irrigation use in the summer, while benefiting wildlife habitat.

1.A.7 **Secure Water Rights:** Explore feasibility of acquiring and banking water rights to enhance habitat and as a hedge against future drought periods.

1.A.8 **Promote Effective Policies:** Support implementation of local, state, and federal policies designed to protect and restore water supplies.

Strategy 1B: Expand Water Conservation Efforts

Actions

1.B.1 **Support Community-Based Efforts to Reduce Overdraft**: Support local groups and efforts such as the Pajaro Valley Community Dialogue on Water that seek to reduce overdraft in the Pajaro Valley through landowner engagement, outreach, and collaboration (Section 6.4.6).

1.B.2 **Explore New Projects**: Explore feasibility of pursuing new programs and projects that have emerged from recent discussions about overdraft in the Pajaro Valley (Section 6.4.6).

1.B.3 **Utilize Grant Programs:** Promote use of Farm Bill programs such as WHIP and EQIP grants, and NRCS and RCD cost-share programs to increase water conservation projects on agricultural lands. These programs can greatly reduce landowner costs to develop water-saving improvements like sprinkler pipe gaskets, variable speed pumps, drip irrigation systems, irrigation monitoring systems and soil moisture sensors, and other infrastructure (Table 6-3).

1.B.4 **Explore Agency Water Rate Programs**: Consider tiered water rate structures that encourage conservation, rebates for installing water-saving technology and infrastructure, and/or credits for developing managed groundwater recharge or similar projects.

1.B.5 **Pursue Land Conservation Incentives**: Support incentive programs associated with donated conservation easements and/or direct funding from conservation grant programs to encourage landowners to reduce agricultural water use. Tax breaks or direct funding for easements could be used to offset landowner costs associated with retiring marginal

lands, changing crop types, employing longer crop rotation cycles, or investing in irrigation technology and other water-saving infrastructure improvements.

1.B.6 **Promote Interagency Coordination:** Ensure coordination among the Natural Resource Conservation Service, Resource Conservation District, Land Trust of Santa Cruz County, and other partners to promote water conservation and stewardship programs. Provide outreach materials to help landowners understand relevant Farm Bill and other conservation grant funding programs, potential financial benefits associated with easement programs, and other available incentives.

1.B.7 **Utilize Demonstration Projects**: Explore the feasibility of using protected lands to demonstrate successful water conservation projects and techniques.

Goal 2: Protect and enhance water quality in natural, urban, timberland and other agricultural landscapes.

Strategy 2A: Protect significant water resource areas

Actions

2.A.1 **Land Conservation:** Work with willing sellers to acquire fee title or conservation easements, or enter into long-term management agreements, to protect lakes, riparian areas, wetlands, and other water resources, especially where there are opportunities to protect areas critical for biodiversity (Chapter 5). Strive to protect natural buffer areas adjacent to water resources to capture and filter pollutants before they enter these waters.

2.A.2 **Coordinated Management:** Seek funding to implement and prepare comprehensive management plans for critical water resources, including wetland complexes, riparian corridors, and areas located immediately upstream or upgradient of intakes used for public water supplies. Work with water purveyors to explore the benefits of conservation easements or other tools to help protect designated *Surface Water Protection Zones*.

2.A.3 **IRWMP and IRWP**: Support priority water quality enhancement and restoration projects identified in the Integrated Regional Water Management Plans and Integrated Watershed Management Program. Focus conservation efforts on multi-benefited projects that link habitat restoration with flood control and recharge.

2.A.4 **New Tools:** Explore feasibility of establishing a development-funded wetlands mitigation bank and program to prepare wetland management plans. Support efforts to establish a Joint Venture public/private partnership program for Santa Cruz County.

2.A.5 **Support Existing Policies and Programs**: Support existing water resource policies and programs that establish protections for riparian corridors and wetlands, limit development in sensitive water resource areas, and address protection of surface and groundwater quality.

2.A.6 **Green Infrastructure:** Support programs and policies that reduce impacts from urban stormwater runoff through on-site retention or percolation designs, restoration of urban streams, and erosion control measures.

Strategy 2B: Promote Management and Stewardship Practices to Improve Water Quality on Agricultural and Rural Lands

Actions

2.B.1 **Landowner Education and Outreach**: Support efforts by the Natural Resources Conservation Service, Resource Conservation District, Agriculture Water Quality Alliance, and other groups that provide training materials and educational resources to landowners and growers in the use of conservation practices that reduce non-point source pollution and agricultural runoff.

2.B.2 **Grants and Incentives:** Support use of grants and other incentives to encourage use of conservation practices that protect water quality such as winter cover cropping, irrigation water management, furrow alignment, filter strips, sediment detention basins, tailwater recovery systems, grassed waterways, and proper road alignment and drainage facilities.

2.B.3 **Coordination:** Support efforts like the Pajaro Community Dialogue on Water (Section 6.4.6) and the Agriculture Water Quality Alliance, a partnership of agricultural industry groups, resource conservation agencies, researchers and environmental groups, in their mission to protect water quality on the Central Coast through voluntary collaboration with managers of agricultural and rural lands.

Strategy 2C: Monitor water quality.

Actions

2.C.1 **Expand Monitoring Programs**: Support agency and local non-profit programs to monitor surface water quality in order to evaluate effectiveness in controlling point and non-point pollution sources. Opportunities include:

- Coordinate efforts to develop and maintain a county-wide GIS inventory of roads, stream crossings, and their condition to prioritize sediment sources.
- Utilize conservation properties to establish baseline conditions and long-term monitoring sites to gage the success of water quality improvement practices.

2.C.2 **Citizen Science**: Seek opportunities to increase the role of students, farmers and citizen scientists in collecting local water quality data. Build on the efforts of the County Water Resources Program, Coastal Watershed Council and the Central Coast Ambient Water Monitoring Program to facilitate access to water quality information.

Goal 3: Maintain Watershed Integrity and Ensure Resilience to Climate Change

Strategy 3A: Protect Watershed Integrity

Actions

3.A.1 **Watershed Planning**: Prepare comprehensive plans for watersheds that have not been assessed to prioritize projects necessary to ensure long-term availability of high-quality

water supplies for human and natural systems (Biodiversity Goal 4). Priorities for new or expanded watershed plans include the lower Pajaro River and Watsonville Sloughs, and Soquel, Corralitos, San Vicente, Laguna, and Zayante and Bean Creeks. Review and update as needed existing plans for other watersheds.

3.A.2 **Land Conservation**: Protect large blocks of interconnected public and private conservation lands to capture a wide range of hydrologic functions and processes (fog drip, recruitment of large woody debris, water purification, flood control, groundwater recharge) to buffer against climate change.

3.A.3 **Stream, Floodplain and Wetland Restoration**: Protect and restore streams, riparian corridors, floodplains, and wetlands to mitigate against anticipated increases in seasonal flooding and inundation under conservative climate projections. Expand use of NRCS Floodplain Easement and Wetland Reserve Programs to help secure funding for these sites.

3.A.4 **Policies**: Support policies and programs that protect water supply watersheds, floodplains, riparian and wetland areas, and critical coastal streams.

3.A.5 **Funding:** Evaluate feasibility of developing "payment for ecosystem service" models to fund conservation and stewardship projects that address water resources. Explore the feasibility and potential benefits of establishing a watershed restoration project mitigation bank, where mitigation payments collected by local agencies could be used to fund land conservation and stewardship projects. Develop stable, permanent funding mechanisms to support ongoing watershed restoration, protection and management efforts.

3.A.6 **Coordination:** Support coordinated efforts between conservation organizations and resource agencies to link land conservation projects with fisheries restoration and water quality enhancement projects through the *Integrated Watershed Restoration Program.* Support efforts to fund Watershed Coordinators to coordinate projects and to serve as a technical resource for landowners.

Strategy 3B: Community Involvement and Education

Actions

3.B.1 **Community Involvement in Watershed Management**: Support local community and school involvement in watershed planning and management efforts to promote greater awareness of the link between water quality, water supply, watershed health, and resource conservation.

3.B.2 **Watershed Education**: Support watershed education programs such as the RCD's *Watershed Cruzin'* , the San Lorenzo Valley Water District's watershed grant program, and similar efforts to promote understanding of local watersheds and water resource issues. Support efforts by County, RCD, and others to educate the community about their watersheds and the health of their waters (e.g. Drains to Bay, and watershed boundary signs along major roads)

3.B.3 **Interagency Coordination**: Encourage continued participation of conservation organizations, public agencies, landowners and other stakeholders in ongoing coordinated water resources management efforts such as Pajaro Valley Community Dialogue on Water, the Pajaro Watershed Council, and other local watershed planning efforts.

3.B.4 **Working Group**: Establish a working group of key conservation organizations and public agencies to implement Conservation Blueprint recommendations and strategies by identifying roles and opportunities to pursue collaborative projects.

3.B.5 **Water Conservation**: Support education and incentives offered by water purveyors to encourage homeowner water conservation and use of water-saving technology.

7. Working Lands

Santa Cruz County features some of the Central Coast's most important and iconic working landscapes, including the prime farmlands of the Pajaro Valley, productive coastal farmlands of the North Coast, the scenic rangelands of the Pajaro Hills and the ubiquitous redwood and Douglas fir forests, that are the bedrock of the local economy. For the purposes of the Blueprint, *working lands* are defined as farmland, rangeland and timberland managed for commodity purposes. However, it is important to recognize that our conservation lands are also working lands in the sense that they too are producing economic benefits for our local economy and maintaining important ecological services (Figure 7-1).

Santa Cruz County Agriculture At a Glance

- Agriculture generates over $491 million in revenues and employs 8,000 people
- Strawberries are the number one grossing crop valued at $172,600,000. Other important crops are raspberries, cut flowers, tree and vine fruit, livestock and timber
- 15 % of fruits and vegetables are organically grown, with more than 113 organic growers on 3,341 acres
- 17,717 acres of grassland are suitable for grazing
- 71,000 acres are zoned Timber Production (TPZ)

(Santa Cruz County 2010; CAP 2010; DOC 2010; CalFire 2008)

The Conservation Blueprint's Working Lands Goals, Strategies and Actions address the importance of enhancing the long-term economic viability of agriculture, by minimizing the loss and conversion of significant working lands, enhancing the health of the land and water resources that support agriculture, integrating conservation efforts across public and private lands, and increasing public awareness of the importance of local agriculture to the County and of protecting and conserving working landscapes. The Conservation Blueprint focuses on the conservation challenges and opportunities related to agricultural viability in Santa Cruz County, with an emphasis on timberland, rangeland and cultivated farmland.

7.1 Overview of Working Lands

While Santa Cruz is the second smallest county in California, it has the highest percentage of productive agricultural land (relative to its size), and ranks 20th in the state in agricultural production. The total land devoted to agriculture in the county is approximately 40,000 or 14% of the county. Though the acreage of farmland has declined over the last decade, the total production value has increased to $491 million, due in large part to berry production (CAP 2010). Agricultural production also affects local jobs and support services that raises the value of agriculture's contribution to the economy at closer to $1.7 billion (Dave Moeller. pers. comm.).

7.2 Timberland

Forest resources are among the most valuable natural resources of California and Santa Cruz County is considered the birthplace of California's timber industry. Redwood and Redwood-Douglas fir forests cover approximately 143,000 acres in Santa Cruz County. While the timber industry is a small part of the local agricultural economy, a significant amount of the landscape, 71,000 acres, is zoned for Timber Production (TPZ) (Figure 7-2). Over the last decade, timber harvests have occurred on approximately 31,200 acres: 10,600 acres as part of non-industrial timber management plans (NTMPs) and 20,600 acres as part of timber harvest plans (THPs) (CalFire 2008). Timber harvest activity in the county must be

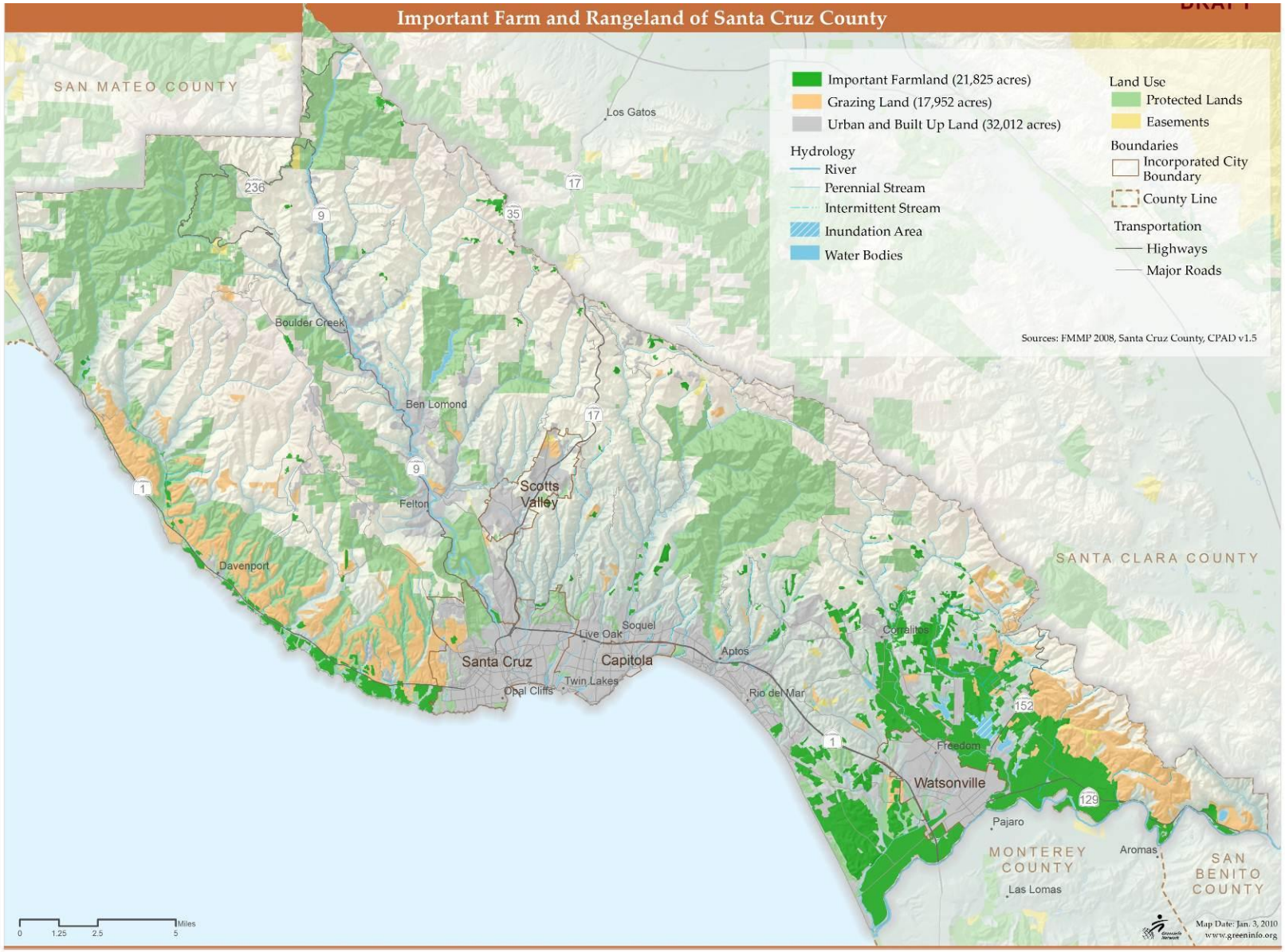

Figure 7-1: Important Farmland and Rangeland

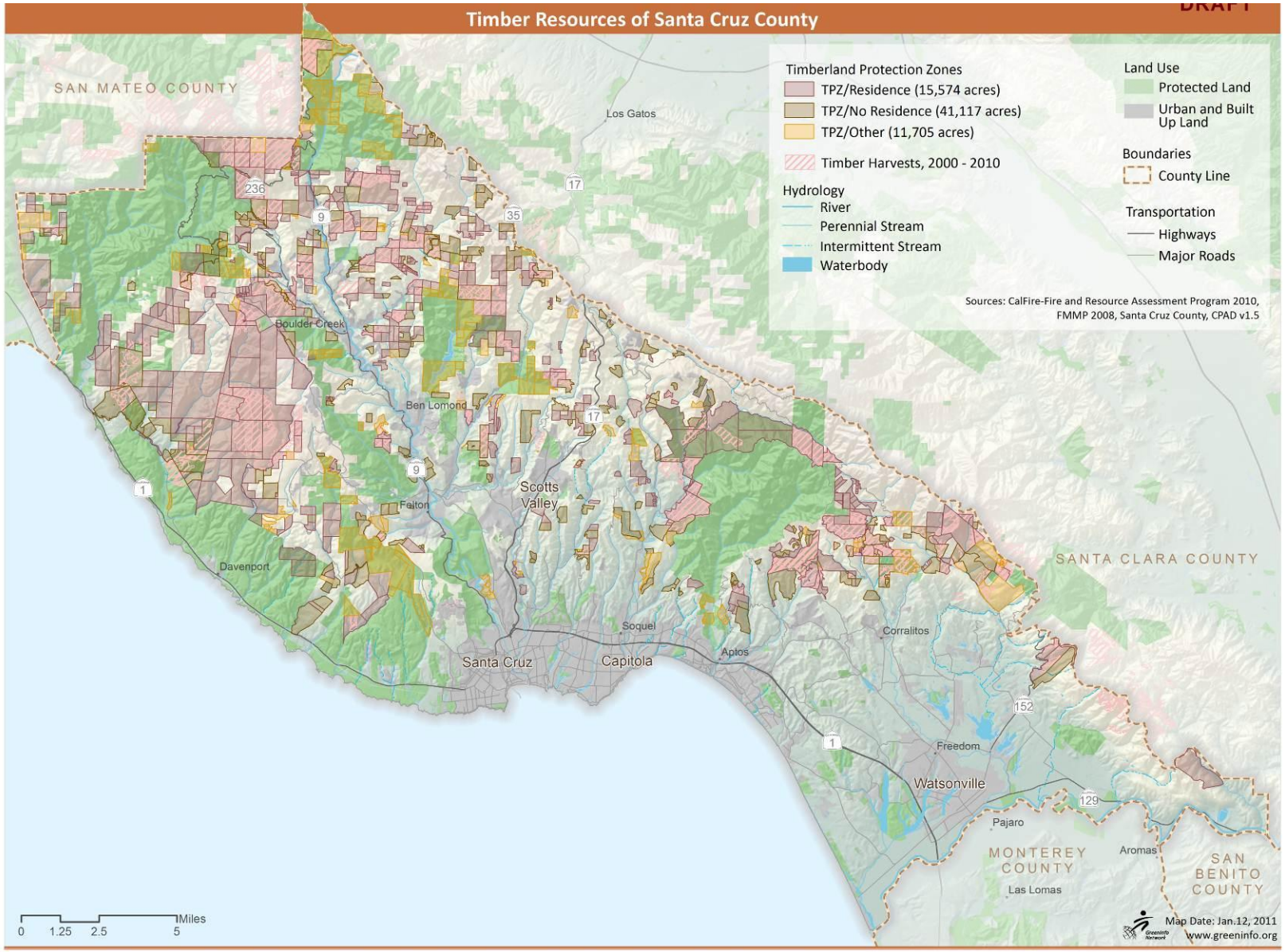

Figure 7-2: Timber Resources

done selectively, as clear-cutting is not allowed and is subject to a unique and restrictive set of State and County regulations. Timber values have declined in Santa Cruz County from a high of $14 million in 2000 to $3.5 million in 2009 (CAP 2010).

In addition to private timberlands, timber harvest occurs on public lands and conservation lands. In 1990, the 2,681-acre Soquel Demonstration Forest (SDSF) was added to the Department of Forestry's demonstration state forest system. It can serve as a laboratory for evaluating how forest ecosystems respond to a variety of management techniques. It is financed through selective harvests intended to emphasize protection of watershed, fisheries, old-growth trees, and recreational opportunities (Evarts et al. 2001.) An example of a non-profit conservation organization that conducts selective timber harvest on conserved lands is the Land Trust of Santa Cruz County, which practices conservation forestry on the Byrne-Milliron Forest (Inset Box).

Success Stories - Sustainable Forestry at Byrne-Milliron Forest Land Trust of Santa Cruz County

Since 1984, the Land Trust of Santa Cruz County has owned the 322 acre Byrne-Milliron Forest. As a condition of the purchase, the Land Trust was required to manage the Byrne property for educational and recreational uses, and as a sustainable working forest. In contrast to the clear cutting that happened on the property over a century ago, the Land Trust does sustainable harvesting of trees on the property and manages to reduce tree density and provide age diversity. Over the last 25 years, sustainable harvests have generated $1.5 million for ongoing stewardship of the forest and other conservation lands in Santa Cruz County.

In response to growing consumer demand and environmental awareness, Santa Cruz County has led the state in marketing environmentally certified redwood lumber. Big Creek Lumber Company, a local family-owned timber grower, miller, and retailer, which owns and operates 10,000 acres in the Santa Cruz Mountains, was the first producer of redwood timber with sustainable forestry certification in 1996.Big Creek specializes in managing the forest from the soil to the market and operates one of the few lumber mills in the Central Coast and Bay Area regions. Their mill in Davenport on the north coast of Santa Cruz County processes logs from Big Creek lands as well as another 50,000 acres of private lands (Noss 2000). There are now at least 25,000 sustainably-certified acres in the Santa Cruz Mountains, representing about 10% of the region's working forestlands. In addition to production of forests products, the county's working forests provide significant watershed and habitat functions including streams and important habitat for fish and other wildlife (Evarts et al. 2001).

Environmental Sustainability

Environmental Sustainability is management of natural resources in such a way as to ensure that opportunities and resources for future generations are not diminished (Noss 2000).

7.2.1 Rangeland

Rangelands in Santa Cruz County are working landscapes for the grazing of livestock that also play an important role in protecting our water resources, biodiversity, native plant communities, wildlife habitat, and provide important scenic and open space benefits. Rangelands cover approximately 18,000 acres in the county (Table 7-1). An additional 4,000 acres of rangeland are in parks or are under

Table 7-1: Important farmland and rangeland in Santa Cruz County (Dept. of Conservation 2010)

Type	Acres
Prime Farmland	14,356
Farmland of Statewide Significance	2,706
Unique Farmland	4,249
Farmland of Local Importance	516
Total Important Farmland	21,827
Rangeland Suitable for Grazing	17,717
Total Acres of Agricultural Land	39,544

conservation easement. The 2009 Santa Cruz County Crop Report states that 5,191 acres or 30% of total rangeland was in production with a crop value of $82,000.

Rangelands face numerous challenges including the economic viability of grazing operations, decreased availability of lands to graze, the distance ranchers must travel and transportation costs they must absorb to process cattle, inconsistent vegetation and stewardship practices and conversion to low-density residential development and more intensive agricultural uses. Due to the relative scarcity of rangelands in Santa Cruz County and the biological importance of grassland ecosystems, the Blueprint team set a protection goal of 90% for grassland habitats (Chapter 5). Protecting these landscapes is important to the county's agricultural viability and maintaining grazing as an appropriate management tool is essential to protecting grassland-dependent species and vital ecosystem services.

Grazing Management

Grazing Management is the use of grazing animals to achieve desired ecological, social, and economic outcomes. It is the least costly and in some ways most flexible tool for managing vegetation on California grasslands. Properly managed, grazing can coexist with other goals of open space preservation, including water quality management, control of invasive plant species, and maintenance of endangered habitat. Grazing can also be an important strategy for conserving large landscapes across public and private lands.

One means to support conservation of rangelands and maintenance of grazing is public support for local niche markets for grass-fed beef. However, support services and infrastructure for meat processing require USDA approval and USDA-certified facilities in Hollister, Gilroy and Santa Cruz have all closed. Today, the industry has moved toward highly centralized processing facilities in the Central Valley and the closest USDA-certified facility is over 250 miles away, at the Orland plant (Ablamsky 2008). The lack of support services for the region's livestock industry must be addressed for the long-term viability and conservation of rangelands.

7.2.2 Cultivated Farmland

Santa Cruz County is home to some of the most productive farmland in California. The high crop values are attributable to the county's mild Mediterranean climate that allows for year-round farming,

exceptionally fertile soil and consumer demand for high value crops (*Santa Cruz County. 2009*). Currently, there are 22,000 acres in cultivated farming in Santa Cruz County (Table 7-1). Seventeen crop types net more than one million dollars each annually, including strawberries, raspberries, cut flowers, apples, brussels sprouts, lettuce, broccoli and wine grapes. The berries, flowers, and other products that are farmed in the fertile Pajaro Valley in southern Santa Cruz County provide the foundation for the county's agricultural economy (APV 2002). Other productive farmland includes the coastal terraces of the North Coast where brussels sprouts and strawberries are grown.

Cultivated farming faces numerous challenges in the near future, including water supply and food safety. Agriculture is the biggest user of water in Santa Cruz County, using 60 percent of the county's water. Lack of adequate water supply and conflict with urban water uses for the available supply could significantly diminish the Pajaro Valley's future agricultural potential. The efforts of agricultural producers on the Central Coast, particularly growers of leafy greens, to protect water quality and riparian habitat are being compromised by current food safety guidelines, or interpretation thereof (RCD Monterey County 2009).

Success Stories
Land Trust Conserves Prime Pajaro Valley Farmland

The Land Trust of Santa Cruz County's dedication to conserving the rich farmland of the Pajaro Valley was rewarded in 2008, when the Trust successfully partnered with leading members of the agricultural community to protect 1,000 acres of prime farmland. These important farmlands and their rich heritage are now protected forever because of the generosity and commitment of several long-time Pajaro Valley landowners. These important conservation easements were established through landowner donations and/or funding from the California Department of Conservation's Farmland Protection Program and the U.S. Department of Agriculture's Natural Resources Conservation Service.

Land Trust of Santa Cruz County. www.landtrustsantacruz.org

7.3 Land Use Regulation, Policies and Programs

A number of county, state and federal programs, policies and regulations have been used in Santa Cruz County to protect working lands and slow their conversion to urban and exurban uses. Table 7-2 shows the agricultural acreage that has been converted to urban use over the last decade.

Table 7-2: Agricultural land converted to urban use in Santa Cruz County (Dept. of Conservation 2010)

	Acres of Land Converted				
Type of Land	**2000-2002**	**2002-2004**	**2004-2006**	**2006-2008**	**Total**
Prime Farmland	217	94	74	46	**431**
Statewide Importance	40	43	24	4	**111**
Unique Farmland	23	25	26	7	**81**
Local Importance	3	2	4	0	**9**
Grazing	53	16	9	13	**91**
Total	**336**	**180**	**137**	**70**	**723**

7.3.1 Measure J

Measure J is Santa Cruz County's comprehensive growth management system and land use planning tool enacted by voters in 1978 to address population growth limits, provision of affordable housing, preservation of agricultural lands and natural resources, and limits on growth in rural areas. The County incorporated Measure J into its County General Plan as its growth management program to define when and where development should and should not occur, control the pace of development and protect agriculture and natural resources.

Success Stories: Measure J

During the 1970s, Santa Cruz County was one of the fastest growing counties in the state, with an average annual population growth rate of 4.6 percent. Between 1970 and 1980, Santa Cruz County's population grew by over 35 percent. In 1978, voters in Santa Cruz County responded to this threat by approving an ordinance that is arguably the most extensive county growth management program in California. Measure J included a series of six key policies designed to address rapid population growth and development (Schiffrin 1984):

(1) Preserve Agricultural Land
(2) Distinguish "Urban" and "Rural" areas
(3) Urban Area Protection
(4) Annual Population Growth Limit
(5) Housing for Persons with Average Incomes
(6) Resource Protection

7.3.2 Santa Cruz County General Plan

The County implements a series of measures to protect natural and agricultural resources through the 1994 County General Plan and Local Coastal Plan (LCP) Land Use policies[2], the voter-mandated growth management system referenced above, and programs that address specific land use and resource conservation issues. There are many areas of the county in which the General Plan constrains development, including areas with slopes greater than 50% in urban areas, slopes greater than 30% in rural areas, fault zones, hydrologic features such as primary groundwater recharge areas, water supply watersheds, streams, lakes, ponds, floodways, flood zones, and riparian woodlands, and areas within mineral and agricultural resources. For areas outside the Urban Services Line, a "Rural Density Matrix" determines allowable density of development on specific parcels based on the availability of services, environmental and site specific constraints and resource protection factors (Chapter 2). The County uses these policies to define where development should occur, limit development density, and to protect the natural resources that maintain and enhance the county's unique environment (Santa Cruz County 1994).

7.3.3 Timber Production Zone (TPZ) and Timber Harvest Plans (THPs)

In 1973, the Z'Berg-Nejedly Forest Practice Act (FPA) was enacted by the California Legislature, to restore the state's timberlands to maximum sustained timber production while "giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment and aesthetic enjoyment." The California Department of Forestry and Fire Protection (CalFire) regulates timber harvest through the Forest Practice Act (FPA) and Forest Practice Rules (FPR).

Santa Cruz County is one of several counties that have additional rules and regulations for the timber harvest plans and timber operations, including the prohibition against clear-cutting. The County General Plan objectives for timber production are "to encourage the orderly economic production of forest

[2] As required by the California Coastal Act of 1976, the County prepared and adopted a Local Coastal Program Land Use Plan for the regulation of development and protection of coastal resources within the designated coastal zone of the county. The LCP is incorporated into the 1994 General Plan and includes land use, resources and constraints, and shoreline access maps.

products on a sustained yield basis under high environmental standards, to protect the scenic and ecological values of forested areas, and to allow orderly timber production consistent with the least possible environmental impacts." County staff review proposed timber harvests for conformance with the Santa Cruz County rules as included in the FPR, with an emphasis on the protection of water quality and biotic resources (Santa Cruz County 1994*).* While the County has review authority over Timber Harvest Plans (THP), Cal Fire has the ultimate responsibility for approval and enforcement *(*CalFire 2010*).* In 1999, the County Board of Supervisors prohibited commercial logging over significant areas of the county by setting a parcel size of 5 acres as the minimum area to qualify for Timber Production (TP) zoning (Figure 7-3). In 2007, the County Board of Supervisors changed the minimum parcel size eligible for TP zoning to a minimum of 40 acres in size.

To protect TPZ lands, the General Plan includes land division restrictions for timber resource lands, with minimum average areas per parcel of 160 acres, or 40 gross acres if development is clustered inside the Coastal Zone and 40 acres, or 10 acres, if clustered outside the designated Coastal Zone (Santa Cruz County 1992). Through implementation of the FPA and TPZ and County zoning, the potential for development of timber lands is lessened. Working timberlands can contribute to maintaining land stewardship and resource management benefits.

7.3.4 Williamson Act

The California Land Conservation Act of 1965, known as the "Williamson Act," has been one of the State's most important agricultural land protection tools. The Williamson Act preserves agricultural and open space lands through property tax incentives provided in response to voluntary restrictive covenants. Private landowners voluntarily restrict their land to agricultural and open space uses in 10 or 20 year contracts with local government. In exchange, the property is assessed for its use as agriculture, rather than for its potential development value. The State reimburses counties for the difference between these two property tax assessments, a payment called "subvention." The State of California has budgeted millions dollars in subvention payments to local governments to implement the Williamson Act. However, as California has struggled in recent years to balance its budget and control its debt, financial support for the Williamson Act has effectively been eliminated. Statewide, the amount of land enrolled in the Williamson Act program is declining. The program still exists, but as counties are forced to absorb the property tax losses, many are moving to phase out Williamson Act contracts. As of 2010, Santa Cruz County had 19,758 acres enrolled in the Williamson Act (Santa Cruz County Assessor's Office 2010). Along with TPZ and County General Plan policies, Williamson Act contracts provide temporary protection to working lands from conversion to rural-residential development and other intensive land uses (Figure 7-3).

Figure 7-3: Working Lands Policy Protection

7.4 Working Lands Issues and Challenges

7.4.1 The Challenge of Agricultural Viability

The policies, programs and incentives Santa Cruz County has effectively utilized over the last several decades, have played a significant role in preventing the loss and conversion of working forests, rangelands and farmland that has otherwise occurred in many areas of the state. However, to ensure the economic viability and environmental sustainability of our working lands in the future, conservation organizations will increasingly need to consider the role of market factors, resource constraints, and regulation that are challenging the long-term economic health of working farms, forests and rangeland.

Economically Viable: Agriculture is profitable and long-lasting.

Environmentally Sustainable: Production, processing, transport, and consumption of agricultural products in such a way that conserves natural resources and protects human and ecosystem health.

To develop the Conservation Blueprint, the team met with a diverse cross-section of agricultural leaders and experts to better understand the challenges facing the agricultural community and discuss potential conservation tools that could enhance working lands viability and sustainability. Table 7-3 outlines the challenges identified by the county's *agricultural leaders and experts*.

Table 7-3: Challenges to the viability of our working lands.

Working Forests	Rangeland and Grazing	Cultivated Farmland
• Acquisition of important timberlands by conservation organizations and park agencies is decreasing the land base available for working forest production, taking land off the tax rolls and reducing local skilled labor. • Continued declines in the land base for timber harvesting could have implications for viability of the local lumber mill and timber industry and for ongoing stewardship of land, maintenance of roads and prevention of wildfires. • Some conservation tools such as easements may restrict flexibility of agricultural production and agricultural viability, as economic and regulatory conditions change.	• Increased operational costs and markets that do not cover those costs • Decreasing availability of land for grazing, including lack of grazing opportunity on public lands • Loss of local animal processing facilities • Decreasing opportunities for next generation ranchers to practice conservation grazing and range management. • Urban encroachment • Impact of climate change on grassland ecosystems	• Long-term tenure of farmland • Reliable water supply • Groundwater overdraft and saltwater intrusion • Water quality regulatory compliance (e.g. Regional Water Quality Control Board Ag Waiver) • Risk of flooding • Food safety guidelines • Maintaining long-term soil fertility • Climate change: temperature, soil, water supply, flooding, saltwater intrusion

7.4.2 Regulation, Permit Coordination and Agricultural Viability

Environmental regulation is an important mechanism for protecting natural resources, endangered species and fish and wildlife habitat. Whether on timberland, rangeland, or cultivated farmland, owners of working lands must comply with numerous important regulatory requirements both in their production and conservation activities. However, working landowners cite increasing challenges to their ongoing viability related to regulatory coordination, particularly having to obtain multiple permits from state and federal agencies and experiencing long processing times and high fees. Delays in obtaining permits can increase project costs and jeopardize public and private grants. Perhaps one of the most troubling trends is that conservation–minded owners of working lands are discouraged from pursuing voluntary conservation projects because of the uncertainty, cost and time associated with the permit process. In some cases, these challenges are having unintended consequences of discouraging restoration projects that would otherwise offer benefits to the public and to ecosystem health (AIN and CRA 2010.*)*

Success Stories:
Santa Cruz Resource Conservation District

The ***Integrated Watershed Restoration Program*** (IWRP) is a countywide multi-jurisdictional task force overseen by the Santa Cruz RCD and State Coastal Conservancy, formed to integrate watershed restoration efforts, improve coordination and efficiency, and leverage funds for restoration activities within Santa Cruz County. It includes active participation of the County and all state and federal resource agencies.

The Santa Cruz Countywide Partners in Restoration Permit Coordination Program, operated by the RCD and NRCS, facilitates implementation of many of the recommendations outlined in the regional watershed plans. Based on a model of coordinated, multi-agency regulatory review, permit coordination ensures the integrity of agency mandates, but makes permitting more accessible to farmers and ranchers than does the traditional approval process.

(Source: Resource Conservation District of Santa Cruz County; Sustainable Conservation. 2010)

A recent survey by the California Rangeland Trust found that two-thirds of those who sought to undertake voluntary conservation projects on private lands either downsized or cancelled their projects as a result of permitting problems (Ochwar et al. 2008). In Santa Cruz County, the Resource Conservation District has developed several programs to promote coordination of regulatory permits through agency and non-profit partnerships that ensure protection of important natural resources *and* provide certainty for agricultural producers (Inset Box).

7.4.3 Climate Change and Working Lands

Agriculture is highly vulnerable to climate change and may face unprecedented losses in the coming decades. Current climate change scenarios predict that water supplies will become increasingly constrained, and the prevalence of invasive plants, disease and pests will increase.
In addition, climate change is expected to exacerbate the impacts of groundwater and surface water depletion, sea level rise and saltwater intrusion, plant stress, and shifts in pollinator life cycles. These predicted impacts will have unknown affects on the viability of Santa Cruz county's timberlands, rangelands and cultivated farmlands. In the last several years, conservation organizations including the Conservation Fund, The Nature Conservancy, Pacific Forest Trust, the California Rangeland Conservation

Coalition and the Marin Agricultural Land Trust have modeled new public-private partnerships to develop pilot carbon sequestration projects on working forests and rangelands in California. These and other models offer potential options for agricultural landowners and working lands to remain economically viable while mitigating and adapting to climate change.

Success Stories:
The Garcia River Forest, The Conservation Fund

In 2004, the Conservation Fund led a partnership with the State Coastal Conservancy, The Nature Conservancy and Wildlife Conservation Board to purchase 24,000 acres of redwood and Douglas fir forests along the Garcia River. The property had been intensively harvested for many years and its roads and streams in poor condition. The Conservation Fund's goal was to protect the forest from conversion to vineyards and second home development, rebuild timber inventories to support the local economy, upgrade roads and restore stream conditions for rare and threatened species. Today, the forest is being managed sustainably as a working forest. Keeping the land in production is generating revenue to support ongoing forest and stream restoration work and preserve jobs within the community. In 2008, the Garcia Forest became one of the first forests to register as a forest carbon project with the Climate Action Reserve (www.climateactionsreserve.org) and now provides verifiable carbon credits to companies and public agencies seeking to offset greenhouse gas emissions or bank the credits for regulated markets.

(The Conservation Fund 2010 www.conservationfund.org/west/california/garcia)

7.4.4 Potential Future Land Use Challenges

In the coming decades, there are potential land use challenges within Santa Cruz County and in the greater San Francisco and Monterey Bay regions that could affect working lands. These include:

- Potential for development of additional primary and secondary residences in rural Santa Cruz County.
- Population increases and future housing demand tied to regional job growth.
- Expiration of existing urban growth boundaries within Santa Cruz County.
- Potential amendments to and interpretation of Santa Cruz County general plan policies that could be detrimental to long-term agricultural viability.

7.5 Working Lands Conservation and Ecosystem Services

Recent studies have shown that working lands can and do provide valuable economic benefits and ecosystem services to surrounding communities. Conserving productive working lands can produce the following economic benefits: (1) a viable local agricultural industry and local jobs (2) protection of rural and environmental amenities (3) local and national food security, and (4) orderly and fiscally sound development of urban and rural lands (Arha et al. 2006). *Ecosystem services* are the benefits accrued

from services naturally provided by the environment from which human beings and all other organisms benefit. These natural services include wildlife habitat, water and air purification, pollination, flood control, scenic values, carbon storage and mitigation of global climate change (Arha et al. 2006).

Incentivizing landowners to manage their land for ecosystem services recognizes the value of these services and can have economic benefits for both landowners and the public, and can result in greater effectiveness of conservation efforts across Santa Cruz County. Table 7-4 presents some of the many ecosystem services provided by working lands and their attendant economic and public benefits. Use of existing programs, new stewardship incentives and on-the-ground pilot projects should be explored to inform our understanding about which management practices can enhance specific ecosystem services in important conservation areas of the county.

On May 22, 2008 Congress enacted the Food, Conservation, and Energy Act of 2008, also known as the 2008 Farm Bill, into law. The Farm Bill governs Federal farm, food, and conservation policy and is renewed every five years. As part of the 2008 Farm Bill, the U.S. Department of Agriculture also created a new office within USDA called the *Office of Environmental Markets (OEM) (*www.fs.fed.us/ecosystemservices/OEM*)*, to catalyze the development of markets for ecosystem services produced by land management activities. The 2008 Farm Bill represents the single greatest source of federal funding for ecosystem services-related conservation on private conservation lands. USDA programs under the Farm Bill provide 86 percent of the total federal funding potentially available for water quality, conservation, and watershed restoration projects (Arha et al. 2006).

Table 7-4: Ecosystem Services Provided by Working Lands Adapted from Arha et al. 2006)

Ecosystem Service	Economic Advantage to Landowners	Public Benefit
Water Supply and Quality	Reliable water source and agricultural viability	Clean water, clean beaches, domestic water supply
Pollination	Improved crop yields	Habitat diversity, biodiversity
Soil Fertility	Increased yield and decreased fertilizers	Healthy ecosystems, local food
Carbon Sequestration and Reduction in Greenhouse Gas Emissions (forests, grassland, soil)	Stable soils, increased yield, soil fertility, retention of water; potential income from voluntary and regulated carbon markets	Mitigation and adaptation to climate change, clean air
Flood Mitigation	Protects against crop and soil loss	Downstream flood protection
Habitat	Pollination, decreased pesticide, fertilizers	Scenic values, cultural heritage, greenbelts and long-term biodiversity protection

While most Farm Bill programs administered through the National Resources Conservation Service (NRCS) help farmers, ranchers and private non-industrial forest landowners implement specific water and land conservation *practices* (Table 7-5), there are NRCS programs that could be adapted to *performance-based* environmental management with payments for high level stewardship and resource protection in important conservation areas. These include the Conservation Security Program (CSP) and the Conservation Innovation Grants program under the Environmental Quality Incentives Program

Table 7-5: Major USDA Conservation Programs (Arha et al. 2006, Weldon 2009)

PROGRAM	AGENCY*	DESCRIPTION
Conservation Technical Assistance (TA)		
Conservation Operations	NRCS	Provides T.A. for resource assessment, planning, implementation and maintenance of conservation systems.
Working Land Conservation: Farm and Ranch Management		
Environmental Quality Incentives Program (EQIP)	NRCS	Provides T.A. and cost-share for a range of activities that improve soil, air, water and wildlife habitat. Includes creation of pollinator habitat, removal of invasive species and opens eligibility to forest landowners.
Conservation Security Program (CSP)	NRCS	Provide T.A. and financial assistance to demonstrated land stewards for ongoing and new conservation efforts on working lands that address one or more resources of concern, such as soil, water, or wildlife habitat.
Wildlife Habitat Incentives Program (WHIP)	NRCS	Provides cost-share up to 75% to improve and restore habitat on working farms, ranches and non-industrial private forest lands.
Conservation Reserve Program (CRP)	FSA	Provides cost share to landowners who establish buffers to intercept sediment and nutrients; and who convert fields to natural cover for periods of 10-15 years. Participants receive annual rent payments and 50% cost-share to restore natural cover. Continuous CRP landowners can receive up to 90% cost-share and higher rental payments.
Farm and Ranch Lands Protection Program (FPPP)	NRCS	Provides matching funds to help purchase development rights to keep productive farms, forests, and ranchlands in agricultural use. NRCS partners with conservation organizations and land trusts to acquire conservation easements and will provide 50% of the fair market value of the easement. Land Trusts must provide a cash match of 25% of purchase price of the easement.
Grassland Reserve Program (GRP)	NRCS	Voluntary conservation program that protects grazing lands with significant ecological value through long-term contracts or easements. Allows normal haying and grazing activities but not cropping, and requires restoration and maintenance of native grass and shrub species . NRCS will provide 50% of the purchase price for easements.
Land Retirement and Restoration		
Conservation Reserve Enhancement Program (CREP)	FSA	Provides significant incentives to landowners to address high priority conservation issues such as water quality, wildlife habitat, usually in priority watersheds. Incentives include cost-share, rental payments, easements and tax credits. Allows landowners to take marginal land out of production and address soil and water resource concerns while earning potentially greater income than from farming those lands.
Wetlands Reserve Program (WRP)	NRCS	Provides funds to protect and restore wetlands on working lands through conservation easements. Landowners can receive full compensation for a WRP easement on the wetland portion of the site, while providing compensation from other NRCS programs for the remainder of the site.

*NRCS is the USDA Natural Resource Conservation Service
FSA is the USDA Farm Services Agency

(EQIP), which targets resource conservation goals in a place-based prioritization system (Casey and Boody 2006). Two other important programs administered by NRCS that benefit working lands viability and resource sustainability are the Agricultural Water Enhancement Program (AWEP), a voluntary conservation initiative of the EQIP that provides support for projects that conserve and improve water quality, use irrigation water efficiently, mitigate the effects of drought and climate change and take other actions that benefit water resources; and the Cooperative Conservation Partnership Initiative (CCPI), a voluntary conservation initiative that leverages financial and technical assistance with partners' resources to assist producers in implementing conservation practices on agricultural and nonindustrial private forest lands, including soil erosion practices, management of grazing lands, improving forestlands, reducing on-farm energy usage and other conservation measures.

7.6 Working Lands Key Conservation Findings

The following key findings about Working Lands viability were developed based on meetings with the Blueprint's Agriculture and Working Lands Technical Advisory group and representatives of the agricultural community.

7.6.1 Summary of Key Findings

1. **Cooperative conservation efforts** of agencies and organizations should be integrated across all working lands, public and private.

2. **Regulatory coordination** of permits and coordination between regulatory and voluntary conservation efforts is critical to maximizing the benefits of land conservation and resource protection efforts.

3. **Working forests, rangeland, and farmland** should be factored into an interconnected natural and human landscape contributing to the maintenance of healthy communities and ecosystems.

4. **Diverse and creative conservation tools** should be employed to improve the pace, effectiveness and scale of agricultural conservation, including working lands conservation easements, affirmative easements, purchase and lease-back, rental agreements, long-term management agreements, and payment for ecosystem services (PES).

5. **Stewardship incentives**, including payment for ecosystem services (PES) programs and conservation markets should be explored to quantify the economic benefits and values provided by Santa Cruz County's working farms, ranches and timberland and incentivize their protection. Landowners should be encouraged to manage and steward their properties to achieve multiple conservation benefits and maintain ecosystem services in exchange for payment, tax incentives, and technical assistance.

6. **Integrated approaches to working lands conservation** should include projects that address multiple conservation values and issues (e.g. water supply, groundwater recharge, riparian function, climate change) as they can leverage partnerships and funding, build public support, and enhance natural resource health, all necessary to long-term agricultural viability.

7. **Funding** for agricultural conservation programs, such as the Williamson Act, is unreliable and long-term and dedicated sources of funding must be developed for agricultural conservation, stewardship and restoration.

8. **Land tenure** issues should be considered in prioritizing agricultural conservation projects.

9. **Sustainable water use and agricultural practices** are central to long-term agricultural viability and protection of farmland from future conversion.

10. **Grazing on public and private rangelands** is important to maintain grasslands and the economic viability of the local livestock industry.

11. **Working timberlands should be integrated into a regional conservation network** of public and private conserved lands to maintain ecosystem function and habitat connectivity in the Santa Cruz Mountains. Conservation partners should coordinate protection efforts to ensure that sustainable forestry is considered a viable conservation tool and strategy.

12. **Awareness of the multiple benefits of working lands** by the public and key policy-makers must be increased.

7.6.2 Significant Working Lands Criteria

Figures 7-11 and 7-22 illustrate the significant farmland, rangelands and timberland of Santa Cruz County, including the Pajaro Valley, Pajaro Hills, North County forests, rangelands and farmlands . These working lands cover approximately 112,000 acres of the county. To prioritize these working lands for conservation, the Blueprint developed the following criteria to assist conservation organizations, agencies and funders to evaluate site-specific cooperative projects for agricultural conservation and agricultural viability (inset box).

Working Lands Conservation Criteria

1. *Threat of conversion and/or loss of land tenure*: important farmland category proximate to urban development - urban/agricultural buffers (contribution to defining urban / rural interface and greenbelt).
2. *Size and Adjacency to Other Working Lands:* large blocks of contiguous farmland, rangeland and timberland and farmland adjacent to existing commercial agriculture zones to support viability.
3. *Multiple Conservation Benefits:* Floodplain protection, groundwater recharge, riparian corridor, biodiversity, wildlife habitat (Section 4.1)
4. *Resources can be managed sustainably* (i.e. water sufficiency)
5. *Potential to leverage other public and private investment* (i.e. Landowner participation in voluntary stewardship programs (NRCS).
6. *Potential for locating important agricultural infrastructure*

7.7 Goals, Strategies, and Actions

The following Goals, Strategies and Actions were developed in response to the Blueprint's key findings regarding agriculture and working lands. They are recommended next steps that conservation agencies and organizations should take and tools that should be implemented to support and sustain agriculture and ensure the long-term viability of our working forests, rangelands and farmland and the ecosystem services they provide.

Agriculture and Working Lands Conservation Goals

1. Maintain and enhance the long-term economic viability of working lands.
2. Maintain and enhance the ecological integrity of natural systems within working lands without compromising their economic viability.
3. Foster integrated and cooperative conservation of natural resources and processes across all working lands, both public and private.
4. Increase public awareness about the importance of local agriculture and conservation of working lands.

The conservation approach targets four distinct **goals**, which can be achieved through **strategies** adapted to the goal's unique circumstances and discussed in the narrative. In many cases, the strategies and actions can promote attainment of multiple agricultural goals but also highlight recommendations unique to timberland, rangeland and cultivated land. **Actions** identify the specific steps or critical approaches to implementing successful strategies for working lands.

Goal 1: Maintain and enhance long-term economic viability of working lands.

Strategy 1.A: Minimize loss of additional significant working lands to residential or non-agricultural commercial development through regulation, policy and funding.

Actions

1.A.1 **Growth Management Policy and Programs**: Conserve prime farmland by maintaining voter-approved growth management policies and ordinances.

1.A.2 **Conservation Easements:** Use conservation easements with willing sellers and increase use of affirmative conservation easements (land must stay in farming), where appropriate, to retain working lands in agricultural use and address farm and ranch succession.

1.A.3 **Funding:** Restore funding for Williamson Act subvention payments and develop other voluntary funding incentives and tools for long-term conservation and stewardship of working lands.

Strategy 1.B: Conserve Rangelands. Conserve as much of Santa Cruz County's remaining grasslands as possible.

Action

1.B.1 **Rangeland Conservation:** Prioritize conservation of remaining large areas of grassland in the North Coast and Pajaro Hills to ensure long-term provision of economic and environmental benefits including opportunities for new grazing leases, groundwater

recharge, flood control, reducing erosion, storing carbon, and facilitating wildlife movement.

Strategy 1.C: Retain, enhance, and restore grazing practices on publicly and privately conserved lands.

Actions

1.C.1 **Stewardship Practices:** Prepare and implement comprehensive rangeland management plans to promote stewardship and resource management on both privately and publicly conserved grasslands. Encourage California State Parks to revisit grassland management policies and practices, and to consider use of grazing leases to manage and restore grasslands.

1.C.2 **Education and Training:** Increase opportunities for education and job training in range management on privately and publicly-conserved grazing lands.

1.C.3 **Agricultural Support Facilities:** Coordinate efforts to amend USDA policies to allow for use of mobile livestock animal processing units and explore the feasibility of locating processing units on conserved lands, such as the Land Trust's Watsonville Slough Farms property.

Strategy 1.D: Support ongoing efforts to develop off-stream ponds to assist in providing a reliable supply of water.

Actions

1.D.1 **Off-stream water storage and recharge ponds:** Support efforts by the County, Resource Conservation District and regulatory agencies to implement off-stream water storage and recharge ponds.

1.D.2 **Watershed Assessment:** Support efforts in preparing a watershed assessment and water supply analysis as a component of the Santa Cruz Integrated Regional Water Management Plan (IRWMP) to identify opportunities to reestablish irrigated crops on the North Coast.

Strategy 1.E: Enhance partnerships and coordinate efforts to promote agricultural education and hands-on training opportunities for the next generation of foresters, ranchers, and farmers.

Action

1.E.1 **Agricultural Training:** Support use of conservation properties, such as Watsonville Sloughs, Byrne Forest, Soquel Demonstration Forest and Swanton Pacific Ranch, to implement new training opportunities; partner with the Farm Bureau and programs such as AgriCulture to expand education and training to youth; and expand student involvement in agricultural curricula and farm to cafeteria programs.

Goal 2: Maintain and enhance the ecological integrity of natural systems within working lands, including streams, riparian corridors, floodplains, wetlands, and important upland habitats without compromising their economic viability.

Strategy 2.A: Prioritize multi-benefit conservation projects including those that achieve maintenance of working lands, protection of surface waters and groundwater water recharge areas, flood prevention, riparian corridor protection, biodiversity, wildlife habitat, and establish urban and agricultural buffer zones.

Actions

2.A.1 **Financial Partnerships:** Enhance partnerships to secure funding for agricultural conservation projects that achieve multiple resource conservation objectives such as maximizing carbon sequestration, protecting soil fertility, preventing nitrogen pollution and protecting riparian corridors and wildlife habitat. Potential state and federal sources of funding include the NRCS and Department of Conservation Farmland Conservancy Program; Farm, Ranch and Watershed Account).

2.A.2 **Diverse Conservation Tools:** Use diverse conservation tools that maintain agricultural viability and provide incentives for resource protection within multi-benefit areas, including but not limited to conservation easements, stewardship incentives, and management agreements.

2.A.3 **Multi-Benefit Conservation Working Group:** Create a working group of key conservation organizations, public agencies and other interested parties to identify grant programs and funding opportunities and implement multi-benefit conservation projects.

Strategy 2.B: Promote use of stewardship incentive programs to protect and enhance ecological values on agricultural lands.

Actions

2.B.1 **Best Stewardship Practices:** Support and enhance efforts to work with willing landowners to implement best stewardship practices on cultivated farmland, rangeland and timberland that sustain soil fertility, water supply, water quality and wildlife habitat.

2.B.2 **Adaptive Management Practices:** Work with willing landowners to pilot innovative and adaptive management practices on fee-owned conservation lands and promote sustainable management practices on conservation easement lands and working lands, including cover cropping, crop rotation, fallowing and retiring marginal lands.

2.B.3 **Retire Marginal Land:** Consider strategic fallowing of marginal farmland that is susceptible to flooding, erosion, and other limitations.

2.B.4 **Create easements on flood-prone lands:** Utilize funding through NRCS Floodplain Easement and Wetland Reserve Programs to conserve flood-prone areas.

2.B.5 **State and Federal Stewardship Incentive Programs:** Increase use of existing state and federal conservation incentive programs for agricultural conservation and stewardship projects.

2.B.6 **Safe Harbor Agreements*:*** Support use of *Safe Harbor Agreements* to provide regulatory certainty to farmers, ranchers and timberland owners that protect and/or restore wildlife habitat and wildlife corridors for rare, threatened, endangered, or other listed species.

Safe Harbor Agreements

The "*Safe Harbor*" policy under the Endangered Species Act provides incentives for private and non-Federal property owners to restore, enhance, and maintain habitats for listed species. A Safe Harbor Agreement provides assurances that additional land, water, and/or natural resource use restrictions will not be imposed as a result of their voluntary conservation actions.

2.B.7 **Conservation Tools:** Use diverse conservation tools, including conservation easements, stewardship payments and other incentives to maintain agricultural uses on timberland, rangeland and cultivated lands.

2.B.8 **Landowner Outreach:** Coordinate outreach to landowners about conservation grant funding programs, potential financial benefits associated with easement programs, and other available incentives.

2.B.9 **Rangelands and Water Recharge:** Study the characteristics of water flow and percolation on South County rangelands and the relationship with Pajaro groundwater basin recharge. Explore the potential for establishing a water credits system to be used to conserve rangeland and maintain groundwater recharge benefits.

2.B.10 **Forestry Grants**: Seek grant funding from USDA-Forest Service's *Sustainable Urban and Community Forestry Program* for protecting natural resources; improving the public's health, well-being, and economic vitality; and enhancing ecological processes.

2.B.11 **Working Group:** Form a working group with representatives from the agricultural community, landowners, conservation organizations, public agencies and other interested parties to evaluate the feasibility of identifying conservation incentives.

Strategy 2.C Explore new markets and funding strategies to maintain ecosystem services on working lands.

Actions

2.C.1 **Ecosystem Services Payment Programs:** Assess the feasibility of stewardship incentive payments and conservation markets to encourage maintenance of ecosystem services on working farms, ranches and timberland. Conduct an ecosystem services valuation to establish the financial value of services such as nutrient cycling, pollination, clean water, erosion control, flood control, biodiversity, soil fertility, pollination, carbon storage and recreation and tourism.

2.C.2 **Ecosystem Service Pilot Projects:** Work with willing landowners to develop ecosystem service pilot projects on significant working lands within important watersheds.

2.C.3 **Carbon pilot projects:** Work with willing landowners to develop carbon-sequestration pilot projects on agricultural soils, grasslands, forests, and wetlands through tax credits and stewardship conservation payments.

Goal 3: Foster integrated and cooperative conservation of natural resources and processes across all working lands, both public and private.

Strategy 3.A: Integrate working timberlands into a regional conservation network to maintain the viability of the local timber industry and protect biodiversity, habitat connectivity and watershed integrity.

Actions

3.A.1 **Coordinated Vision for Working Forests:** Coordinate with conservation organizations, the County, regulatory agencies and landowners to develop a shared vision and tools for integrating working forests into regional biodiversity conservation strategies.

3.A.2 **Conservation Forestry Partnership.** Consider a conservation forestry partnership in Santa Cruz, San Mateo and Santa Clara Counties that incorporates the unique conditions of the Santa Cruz Mountains into a comprehensive conservation plan and identifies, protects and restores the most significant habitat, encourages viability of long-term sustainable timber management, and provides improved regulatory incentives and efficiencies. Partners could include willing forest landowners, the County, State Parks, land conservation agencies, conservation organizations, and regulatory agencies.

Strategy 3.B: Integrate public and private rangelands into a regional conservation network to maintain agricultural viability and protect biodiversity and wildlife connectivity.

Action

3.B.1 **Rangeland Conservation Partnership:** Coordinate with the California Rangeland Conservation Coalition to identify opportunities to promote rangeland management, training and partnerships in Santa Cruz, Santa Clara, and San Mateo Counties.

Strategy 3.C: Support and build upon strategic partnerships for cultivated farmland amongst conservation organizations, resource conservation agencies, the Farm Bureau, municipalities, regulatory agencies and the agricultural community to ensure Santa Cruz County's cultivated farmland sector remains economically and ecologically viable.

Actions

3.C.1 **Groundwater Recharge Coordination**: Support strategic partnerships modeled on the *Pajaro Valley Water Community Dialogue*, to further identify critical groundwater recharge areas, address water scarcity, sea level rise and saltwater intrusion in the Lower Pajaro River.

3.C.2 **IRWMP and Conservation Coordination**: Use the Santa Cruz and Pajaro Integrated Regional Water Management Plans (IRWMPs) as vehicles to develop a comprehensive conservation plan for the lower Pajaro River, including addressing climate change mitigation and adaptation.

3.C.3 **Food Policy and Sustainable Community Initiatives:** Participate in emerging state and regional food security and *Sustainable Communities Strategy* policy initiatives developed by California Department of Food and Agriculture, Department of Conservation, Strategic Growth Council, American Farmland Trust, Sustainable Agricultural Education (SAGE) and local agencies to develop practical solutions to address working lands viability.

3.C.4 **Riparian Easement Program:** Establish a coordinated riparian conservation easement program for willing landowners that addresses food safety, biodiversity, and water resource conservation objectives while maintaining the economic viability of neighboring farms.

Goal 4: Increase public awareness about the importance of local agriculture and conservation of working lands

Strategy 4.A: Promote awareness and consumption of local agricultural products that support the viability of Santa Cruz farms, ranches and forests.

Actions

4.A.1 **Locally Produced Products:** Promote local working land products grown on public and private conservation lands.

4.A.2 **Local Procurement Policy**: Promote a local procurement policy for the County and cities to require that local agricultural food and fiber products, or a reasonable percentage of it, be procured from local growers and suppliers.

4.A.3 **USDA Certified Infrastructure:** Support efforts to create USDA certified infrastructure required for safely and humanely raising, producing and selling locally raised livestock.

4.A.4 **Agricultural Viability Summit:** Partner with the agricultural community, U.C. Cooperative Extension, landowners, growers, public agencies and conservation organizations to host an agricultural viability summit to address challenges and opportunities for agricultural viability for the current and next generation.

4.A.5 **Green Certification Program:** Explore development of a "*Grown in Santa Cruz Mountains*" marketing and Green Forest Products certification program to promote local businesses utilizing best stewardship practices.

4.A.6 **Niche Agricultural Markets:** Support specialized or **"**niche" markets for agricultural products as a component of conservation easements, including exploring opportunities and requirements for reintroducing dairy operations and supporting local milk and other locally-produced dairy products on conservation easement lands.

8. Recreation and Healthy Communities

Santa Cruz County is known for its spectacular scenery and outstanding access to redwood forests, beaches, and state and community parks. Just over a quarter of the county is in some form of conservation status (See Appendix D which describes how Santa Cruz County compares to others in the Bay Area). In addition to the many environmental benefits these protected natural areas provide, local parks provide tremendous benefits to the community: healthier lifestyles associated with outdoor recreation; places for kids to experience nature in a world increasingly focused on media and technology; and opportunities for nature study through environmental education programs.

Santa Cruz County's spectacular setting and accessible open spaces attract new residents and small business owners seeking a high quality of life, and they provide a major draw for tourists. Santa Cruz County's parks and beaches are a major destination and the overall value of the tourist economy is estimated at over $649 million annually (CAPP 2010).

Recreation and Healthy Communities Conservation Goals

1. Connect parks, watersheds, natural areas and conserved lands across Santa Cruz County to benefit nature and create healthy, livable urban communities.
2. Educate, inspire and engage the public about the next generation of conservation.
3. Ensure parks, natural areas and community facilities are adequately funded and maintained.
4. Create a regional recreation system that is responsive to demographics and use patterns (age, ethnicity, culture) and that enhances community health.
5. Integrate parks and protected open space networks into planning for housing, transportation, and other local infrastructure.

The Conservation Blueprint is not intended to serve as a parks or trails master plan. Rather, its aim is to broadly identify the most important opportunities to enhance connections between people and the land, and to foster their appreciation and understanding of nature. Some landowners in the community have expressed concern about trails being sited on or near their property. The Blueprint does not identify any property-specific trails and supports potential future trails only on public lands or where landowner permission has been secured.

8.1 Overview of Protected Lands and Key Recreational Resources

Santa Cruz County has benefited from years of dedicated land conservation and stewardship. Nearly 77,000 acres are in conservation status (Table 8-1, Figure 8-1). Of these areas, nearly 65,000 acres are available for public recreation and enjoyment, with over 231 miles of unpaved trails providing access to state, county, and local parks (CAPP 2010).

Table 8-1: Protected Lands in Santa Cruz County

Organization	Acres	Recreational Status
California Department of Parks and Recreation	45,548	Extensive trails, camping, and interpretive programs at 12 State parks and beaches; 10.8 million visitors to Santa Cruz and San Mateo parks in 2008
Trust for Public Land (Coast Dairies)	6,544	Pending transfer to BLM; extensive planning for resource management, trails, and public facilities expected
City of Santa Cruz	5,869	Highly accessible greenbelt surrounds city and provides regional connections to State Parks and the University; planning Monterey Bay National Marine Sanctuary visitor center at wharf; Loch Lomond Recreation Area
Cal Poly (Swanton Pacific Ranch et al.)	3,808	University research and education focus on natural resources management; public access during U-Pick days but lacks formal trail system
Land Trust of Santa Cruz County	2,824	Trails at Antonelli Pond, Byrne Forest, and planned for Watsonville Slough Farms
CalFire	2,734	Soquel Demonstration Forest very popular cycling destination; emphasis on watershed research; potential visitor center on Old San Jose Rd
Water Districts and Public Utility Watershed Lands (SLVWD et al)	2,084	Informal access to San Lorenzo Valley Water District lands above Boulder Creek; planned trail system in Olympia Quarry
California Department of Fish and Game	1,526	Public access to Bonny Doon Ecological Reserve
Midpeninsula Regional Open Space District	1,507	Extensive trails; visitor parking and major improvements planned at Bear Creek Redwoods and Sierra Azul Open Space Preserves
Santa Cruz County	1,249	Very popular regional parks located throughout county, after school and summer science camps
Sempervirens Fund	903	Limited access
City of Watsonville	757	Many smaller parks and open spaces; Parks Master Plan recently approved; very popular sloughs trails with 1.5 miles planned
University of California / Other State Lands	690	UC Campus Reserve trail system
Conservation Set-Asides / Miscellaneous	300	Limited Access
U.S. Fish and Wildlife Service	268	Limited Access
City of Scotts Valley	176	Neighborhood parks; planning underway at Glenwood Preserve for public access
Center for Natural Lands Management / Other Non-Profits	164	Limited access
City of Capitola	41	Neighborhood parks and playgrounds
Other Special Park Districts (Boulder Creek et al)	7	Neighborhood parks and playgrounds
Total	**76,999**	

Source: Adapted from BPAD 2010

Figure 8-1: Regional Recreational Resources

8.2 Recreation and Healthy Communities Issues and Challenges

In November 2009 the Conservation Blueprint planning team held a workshop with leaders from the parks, recreation, and outdoor education communities. The purpose of the workshop was to identify key challenges confronting parks providers and outdoor environmental educators working in and around Santa Cruz County, and to explore opportunities and potential solutions to meet these challenges moving forward. The workshop included a discussion of local and regional trails and opportunities to enhance connections with local communities.

The following key findings emerged from this workshop:

- Current funding for stewardship of natural resources within parks and protected areas is inadequate
- Local agencies have had to close facilities, cut educational programs, and are struggling to handle basic operations and maintenance needs (the State Parks Santa Cruz District operating and maintenance budget totals approximately $14.5 million, and the County Parks totals nearly $2.4 million)
- Increased demand for recreational services is anticipated to result from the projected regional population increases of 35,500 within the county and 146,000 for the Monterey Bay Area region by 2035 (AMBAG 2010)
- New funding sources will be needed to acquire, develop and manage parks, trails and natural areas
- The region's changing demographics will require new amenities and services to meet the needs of different age groups and ethnicities
- Agencies will have to maintain and build on partnerships to take advantage of others' strengths and to avoid duplicating services
- Providing safe and convenient access between schools, neighborhoods, parks and protected open spaces is a priority in all communities
- The Regional Transportation Commission's purchase of the Union Pacific rail line between Davenport and Watsonville presents an outstanding opportunity to implement the Coastal Trail

Local parks providers have had to cut their programs to the bone in response to the 2008 recession and the State's budget deficit. They are all struggling to keep facilities open to the public and in most cases have had to pare back education programs and support staff. Since the workshop, the Proposition 21 State Parks funding measure failed to pass and the proposed 2011 State budget called for $4 million in additional budget cuts, further jeopardizing the agency's programs and ability to partner with other parks providers.

8.3 Healthy Communities

8.3.1 Green Infrastructure

A primary goal of the Conservation Blueprint is to foster greater connections between parks, watersheds, natural areas and conserved lands across Santa Cruz County to benefit nature, increase viability of working lands, and create healthy, livable urban communities. Protected natural areas, public parks, greenbelts, and working lands provide substantial economic, environmental and

Green Infrastructure

Green Infrastructure is an interconnected network of natural lands and working lands that maintain ecological processes, sustain air and water resources, and confer multiple conservation benefits that contribute to the health and quality of life for communities and people (McMahon and Benedict 2001)

public health benefits to surrounding communities but these benefits are often undervalued in policy and investment decisions (Delaware Valley RPC 2010). Just as roads, schools, water treatment plants, sewer systems, hospitals, and other aspects of the built environment (*grey infrastructure*) provide for the critical needs of communities, a connected network of important natural lands, waters and working landscapes (green infrastructure) is integral to a community's health, livability, and economic vitality (McMahon and Benedict 2001). *Green infrastructure* strategies seek to value the different ecological, social, and economic functions provided by natural systems and open spaces in order to guide more efficient and sustainable land use and development patterns. Green infrastructure can best be used as a framework for well-planned growth when it pre-identifies both ecologically significant lands and suitable development areas (McMahon and Benedict 2001).The Conservation Blueprint does just that by identifying important natural habitat and working lands in the county that achieve multiple public benefits including urban greening, habitat protection and water resources protection.

The passage of the Global Warming Solutions Act of 2006 (AB 32) and the Sustainable Communities Strategy (SB375) in 2008 offer opportunities to integrate the Conservation Blueprint and green infrastructure approaches into development of regional "Sustainable Communities Strategies." By coordinating the recreational lands, natural lands and working lands identified by the Blueprint with the County General Plan, AMBAG Blueprint and Sustainable Communities Strategy, it can help the region meet its SB 375 targets.

SB 375 – Sustainable Communities Strategy

In September, 2008, Governor Arnold Schwarzenegger signed into law SB 375 (Steinberg), the nation's first legislation to link transportation and land use planning with global warming. SB 375 adds a sustainable communities strategy that links climate policy with regional transportation plans (RTP) and regional distribution of housing. The Sustainable Communities Strategy provides an opportunity to coordinate land use and transportation planning with parks, recreation and conservation of natural and working lands. NRDC. 2009)

8.3.2 Connecting with Local Communities

The Blueprint recommends enhancing the County's recreational system by working to improve and increase connections between local neighborhoods and communities with parks and trails of regional and statewide significance. The City of Watsonville Parks and Recreation Facilities Master Plan identifies potential trail connections within city limits as well as connections from the city to the Monterey Bay Sanctuary Scenic Trail to the west. These potential trails cross multiple jurisdictions, including state, federal and privately owned and conserved lands, and is emblematic of a local and regional recreation partnership (City of Watsonville, 2009). Incorporating bike-friendly access and safe routes to schools into efforts by local, regional and state agencies, including regional transportation plans, is another means of enhancing connections, such as key bikeways and levee trails identified in the San Lorenzo Urban River Plan (City of Santa Cruz 2003).

Not all communities and residents have the same access to parks, protected natural areas, and trails. It is important to identify areas of the County that are economically underserved and seek to address the physical, social and economic barriers to park equity. The Trust for Public Land, a national land conservation organization, has developed a park equity analysis for the San Francisco Bay Area that links spatial information about park locations and investment with census data by race and income to map underserved areas (www.tpl.org). Living in an underserved area more than one-quarter of a mile from safe and well-equipped parks or natural areas is considered to be a major contributing factor to the alarming rates of obesity and chronic disease seen around the country that result from physical inactivity (TPL 2005).

It is unclear how communities in the county, especially in unincorporated areas, would score in terms of park equity and access. Most of the unincorporated Town Plans are out of date. Santa Cruz County has been very successful at completing local park plans and improvements, but there is not a current adopted plan or vision to guide the parks system. A master plan for parks or trails similar to those adopted by Santa Clara and San Mateo counties could be used to identify strategic priorities for new parks in underserved areas, or to identify regional trail connections between communities and nearby protected areas.

Transit & Trails
www.transitandtrails.org

In 2010, the Bay Area Open Space Council developed an on-line mapping tool to help encourage use of public transportation to Bay Area parks and trailheads. An interactive map identifies hundreds of trailheads and campgrounds and links directly to MTC's 511 Transit Trip Planner and Google Transit. Users enter a start location, choose a destination, and then can print a detailed trip itinerary with a map, transit times, fares and walking directions to and from the transit stops. This tool can help identify the closest parks and amenities to underserved communities and, by promoting use of public transit and car-free outdoor adventures, reduce traffic and greenhouse gas emissions.

Source: www.openspacecouncil.org

Other studies have documented that lack of transportation options (e.g. not having an automobile) hinders families from visiting local, regional and state parks. In 2010, the Bay Area Open Space Council, a coalition of 60 land conservation organizations and parks agencies in the San Francisco Bay Area, launched an innovative project called the "Transit and Trails Project (TNT)." TNT seeks to use 21st century technologies to link people to their local parks and open space via transit (Inset Box).

8.3.3 Education and Engagement

Environmental education and interpretation is the key to engaging the next generation of land stewards. Santa Cruz County is home to twelve nature centers and many successful outdoor education programs for youth and adults, sponsored by public agencies and non-profit conservation organizations, often in partnership. Building on and supporting these partnerships is critical to increasing public awareness and support for conservation and stewardship programs.

In times of deep budget cuts to parks and recreation programs and a decline in funding for non-profit organizations, educational programs are often the first to be cut. The Conservation Blueprint calls for supporting our existing, successful environmental education programs across the county by sharing strategies and funding approaches that can build capacity and address critical resource needs. Building partnerships among land management agencies, land trusts, conservation organizations and funders for citizen science programs that monitor water quality, wildlife, and climate-related impacts will be a

growing management need and opportunity. Another opportunity to build capacity for environmental education is to work with conservation organizations and willing landowners to develop and enhance environmental programs and outings on working lands and other privately conserved lands as a component of voluntary conservation agreements (e.g. conservation easements).

8.4 Recreational Access

With sufficient funding and partnerships, there are outstanding opportunities to establish new connections between protected areas and local communities. Trails are the key means by which people are able to experience and enjoy publicly accessible natural areas. Trails can enhance appreciation and support for the protection and stewardship of natural areas; they can serve as an important transportation alternative to the automobile and provide safe travel routes for pedestrians and cyclists; and they can offer an economic boost to communities.

The California Coastal Trail

A continuous 1,200 mile trail stretching along the California coastline from Mexico to Oregon, designed to foster appreciation and stewardship of the scenic and natural resources of the coast through hiking and other complimentary modes of non-motorized transportation.

Priorities in Santa Cruz County:

- Develop new trails and public access on Coast Dairies property
- Pursue recreational access and improvements along former Union Pacific Branch Rail Line between Watsonville and Davenport
- Improve signage and access for pedestrians and cyclists in urban areas
- Integrate planning with the Monterey Sanctuary Scenic Trail project

Source: http://www.coastwalk.org

8.4.1 Regional Connections

The extensive network of protected lands in the Santa Cruz Mountains and along the coast provide many opportunities to complete trail projects that are of national, statewide, or regional significance:

California Coastal Trail

In 1972, Proposition 20 provided that "A continuous hiking, bicycle, and equestrian trails system shall be established along or near the coast." The Coastal Act of 1976 required local jurisdictions to identify an alignment for the California Coastal Trail in their Local Coastal Programs. Since that time implementation of a continuous 1,300-mile trail spanning the length of California has been a major strategic emphasis of the Coastal Conservancy and partners including the Coastal Commission, State Parks, and Coastwalk, a statewide non-profit organization.

As 2003 assessment found that 40 percent of the trail had been completed statewide. In Santa Cruz County, seven miles along the 43-mile long coastline, located primarily along West Cliff and East Cliff Drives, had been adequately established and signed to meet trail design standards. To complete the trail, the assessment identified the need for improvements along Highway 1 and other roads (4 miles); land purchase or other agreements to facilitate construction on private lands (20 miles); and construction on existing public lands (10 miles) at an estimated total cost of $18 million (SCC 2003).

Monterey Bay Sanctuary Scenic Trail

The Monterey Bay Sanctuary Scenic Trail would link existing and new trail segments into a continuous coastal trail around Monterey Bay, from Natural Bridges State Beach in Santa Cruz County to Point Piños Lighthouse in Monterey County. It would follow the same general alignment as the Coastal Trail, and is intended to feature the Monterey Bay National Marine Sanctuary, the coastal environment, and local communities through engaging interpretive signage and scenic vistas. The trail is expected to achieve many benefits including enhanced public appreciation and support for protection of the Sanctuary, a transportation alternative to the automobile, and economic benefits from increased tourism and retail activity (NOAA 2010). Key partners include the Monterey Bay National Marine Sanctuary, Coastal Conservancy, Association of Monterey Bay Area Governments, the Santa Cruz County Regional Transportation Commission, and the Transportation Agency for Monterey County.

Santa Cruz Branch Rail Line

On May 6, 2010, the Santa Cruz County Regional Transportation Commission (SCCRTC) unanimously agreed to acquire the 32-mile Union Pacific rail line, which extends from Davenport to Watsonville. Under an agreement with the SCCRTC, Sierra Northern Railway will continue freight service and will provide future recreational rail service from Davenport to Santa Cruz. As improvements are made, sections of this rail corridor will serve as the primary alignment of the California Coastal and Monterey Bay Sanctuary Scenic Trail. The SCCRTC's vision includes pedestrian and bicycle access with spurs to transit and commercial hubs and to other existing and proposed trails, including those in the Watsonville Sloughs (SCCRTC 2010). The relatively flat grade of the trail lends itself in many places to wheelchair access and would provide numerous opportunities for environmental interpretation along its length.

Bay Area Ridge Trail

The Bay Area Ridge Trail is a planned 550-mile ridgeline trail that encircles the San Francisco Bay Area through nine counties (www.ridgetrail.org). When completed, it will link more than 75 public parks and open space preserves and will provide access from many local communities to the Bay Area's most prominent ridges and peaks. The Bay Area Ridge Trail Council has worked with local agencies to plan and implement the trail; 330 miles of the Ridge Trail are currently open to hikers, cyclists, and equestrians. There are a number of opportunities to enhance connections to the Ridge Trail from Santa Cruz County:

- The Midpeninsula Regional Open Space District is preparing master plans for Sierra Azul and Bear Creek Redwood Open Space Preserves. These plans call for new visitor parking areas or improvements along Summit Road and Highland Way, along with other trail upgrades and visitor amenities. When trail improvements are completed in Sierra Azul Open Space Preserve, there will be nearly continuous trail access from Los Gatos to Aptos via the Soquel Demonstration State Forest and the Forest of Nisene Marks State Park.
- The Santa Clara County Parks Department manages three parks—Sanborn, Uvas, and Mt. Madonna—that are located along the Santa Cruz County line. The agency's 1995 Trails Master Plan identified five potential connections or access points into Santa Cruz County. As the agency prepares master plans for these parks, there will be opportunities to involve stakeholders from Santa Cruz County to explore new connections from local parks and communities to segments of the Ridge Trail that run through these parks. Visitor access

improvements at Mt. Madonna County Park, and potential parkland acquisitions associated with the Santa Clara County Habitat Conservation Plan, could facilitate future trail connections into the county.

8.4.2 Other Potential Recreational Connections

At the Conservation Blueprint workshop on Recreation and Community Health, parks providers and land managers participated in a discussion to share agency perspectives on potential future trail connections within the county. Many of these ideas reflect the long-term vision for parks and regional trails outlined in various State Parks General Plans, the 1995 Santa Clara County Trails Master Plan, and the Midpeninsula Regional Open Space District's 1998 Regional Open Space Study (Table 8-2). These conceptual trail corridors would require land acquisition, easements, or other landowner agreements and permissions to secure rights for their use. Alignments would typically be located on public lands or along public rights-of-way where there is sufficient space to make improvements for paths. To facilitate trail connections across private lands, organizations like the Bay Area Ridge Trail Council help secure funding for trail easements and often work with willing landowners to understand and make use of California's recreation use and trail immunity statutes (Civil Code Section 846). Enacted by the legislature in 1963 to encourage private landowners to allow the general public to use their lands for recreation, Section 846 provides those owners with immunity from potential liability to recreational users except under certain conditions.

Other trail planning considerations from the technical workshop included:

Promote trails on conserved forests and farms. Members of the public are very interested to learn more about the county's agricultural heritage and to experience timber and food production in working lands settings. The Land Trust's Byrne Forest and the Soquel Demonstration State Forest provide opportunities to interpret conservation forestry practices. While potential food safety considerations require careful planning and trail layout, there may be an opportunity to establish a farm trails program in Santa Cruz County. In the meantime, signage and interpretive walks can be expanded at Watsonville Slough Farms to allow visitors to learn about organic farming and the conservation practices that are necessary to protect adjacent sensitive habitats.

Integrate public access with watershed protection. The Soquel Demonstration State Forest and the San Lorenzo Valley Water District are preparing plans for the management of sensitive watershed lands. These agencies recognize the benefits of watershed-based education and are working to plan or improve trails that are carefully aligned to protect watershed and habitat resources. These plans will foster appreciation of watershed resources and engage residents in their stewardship.

Expand Watsonville's trails system. The City of Watsonville's seven-mile system of Slough Trails is an important community asset by providing safe routes between neighborhoods, scenic views, and interpretive opportunities. In 2009 the City adopted a new *Parks and Recreation Facilities Master Plan*, which proposed an additional 1.4 miles to the Slough Trail system, along with 14 miles of new trails within city limits and nearly 20 miles outside of the City. These potential trails would establish connections to existing levee trails, to the Watsonville Sloughs, and to the proposed Monterey Bay Sanctuary Scenic Trail. Implementation of these trails would require numerous partnerships with other agencies and non-profits including Watsonville Wetlands Watch and the Land Trust of Santa Cruz County.

Table 8-2: Conceptual Long-term Trail Connections in Santa Cruz County

Potential Connection	Amenities and Features
Big Basin to Henry Cowell Redwoods State Park (Fall Creek Unit)	Ridgetop trail along Ben Lomond Mountain could provide views of the coast and Castle Rock Ridge; connection to Town of Boulder Creek via San Lorenzo Valley Water District watershed lands
Henry Cowell (Fall Creek) to the Coast	Potential connections could traverse a wide variety of habitats including redwood, sandhills, maritime chaparral, grassland and/or riparian forests along San Vicente Creek; and terminate at the Coast Dairies property where trail and public access improvements are anticipated under future BLM management
Castle Rock State Park to Loch Lomond	Trail could follow King's Creek from its headwaters to Miller Creek County Park and old-growth redwood groves, then to trails in Loch Lomond's redwood forest
Loch Lomond to Bear Creek Redwoods Open Space Preserve	Ridgetop trail with views of the San Lorenzo River Valley could connect to new public staging area and extensive trails planned by MROSD; from here, existing trails connect to the Bay Area Ridge Trail and beyond
Loch Lomond to Henry Cowell Redwoods State Park	Trail could extend south to Quail Hollow County Park and then to Henry Cowell; views of San Lorenzo Valley and coast; habitat variety
Henry Cowell Redwoods State Park to Santa Cruz	Safe route for pedestrians and cyclists between Felton and Santa Cruz; access to San Lorenzo River
Forest of Nisene Marks State Park to Sierra Azul Open Space Preserve	Could provide access from Coastal Trail in Aptos to Bay Area Ridge Trail and Town of Los Gatos
Sunset State Beach to Watsonville Sloughs to Pinto Lake	Network of paths and trails along sloughs and the Pajaro River and Salsipuedes Creek levees

8.5 Funding and Partnerships

The most critical challenge facing agencies that operate local, regional and state parks is ensuring that their facilities are safe and adequately funded and maintained. Over the past 10 years, the majority of funding for parks and conservation in Santa Cruz County has come from voter-approved park, resource and water bonds, with 83% of conservation-related funding coming from Propositions 12, 40, 84 and 50. Bonds have been an important source of funding for land acquisition and capital improvements in the county, such as constructing recreational facilities and restoration improvements, and repairing trails. Bond expenditures are restricted however, and cannot be used to fund ongoing maintenance and operation of parks and open space lands. As state and local parks budgets have shrunk, the ability of agencies to protect and manage sensitive natural resources and repair and maintain park facilities has drastically declined. Without a secure source of funding for on-going operations and maintenance, most park managers believe there is no way to sustain the park system and maintain public support.

In the short term, conservation organizations must work to ensure that any future state bond measures continue to include funding for protecting and enhancing land, water, natural resources and recreational opportunities in the Central Coast and Monterey Bay regions (inset box). Park agencies and non-profit organizations also need to coordinate efforts to identify sustainable funding sources and innovative land management models for long-term stewardship and maintenance of parks and protected lands.

Recreation and Healthy Communities Conservation Criteria

1. Provides links between important parks, protected open spaces, bicycle and trail connections administered by state, county, cities and non-profit organizations
2. Implements key state, county and local adopted trail connections and with adjacent counties
3. Provides multiple conservation and community benefits
4. Contributes to improving access to and equity of parks, trails and community amenities and environmental education in underserved communities.

8.6 Goals, Strategies, and Actions

The following Goals, Strategies and Actions were developed in response to the Blueprint's key findings regarding recreation, parks and healthy communities. They are recommended next steps that recreation agencies and conservation organizations should take and tools that should be implemented to connect parks and conserved lands across the County, ensure parks are adequately funded and maintained, create a recreational system that is responsive to current and future demographics, integrate parks and open space thoughtfully and strategically into planning for the built environment, and increase public awareness about the role of parks and protected open space in creating healthy communities.

The conservation approach targets five distinct **goals**, which can be achieved through **strategies** adapted to the goal's unique circumstances and discussed in the narrative. In many cases, the strategies and actions can promote attainment of multiple goals for recreation and healthy communities. **Actions** identify the specific steps or critical approaches to implementing successful strategies for recreation and healthy communities.

Goal 1:Connect parks, watersheds, natural areas and conserved lands across Santa Cruz County to benefit nature and create healthy, livable urban communities.

Strategy 1A: Link recreation, open space and conserved lands in and around urban areas to connect parks, trails, conserved farmland, community gardens and schools.

Actions

1.A.1 **Connections to Parks and Trails.** Connect local neighborhoods and communities to parks and trails of regional and statewide significance, such as those identified in the General Plans and Park Master Plans of Santa Cruz County and the cities of Watsonville, Capitola, Santa Cruz and Scotts Valley.

1.A.2 **Rail to Trail Projects.** Build on efforts of the Santa Cruz County Regional Transportation Commission and other partners to implement rail and trail projects including the 32-mile Union Pacific Rail Right-of-Way; explore feasibility of rail project along the San Lorenzo River Valley.

1.A.3 **Farm Leases.** Support partnerships between public agencies, non-profit organizations, educational institutions and the agricultural community to allow farming of public lands near urban areas through competitive lease arrangements.

1.A.4 **Farm to Cafeteria Programs.** Utilize conserved lands for *farm to cafeteria* programs in partnerships with schools and the agricultural community.

Strategy 1.B: Implement regionally-significant parks and trails in Santa Cruz County.

Actions

1.B.1 **Significant Recreation Projects.** Partner to implement locally and regionally significant recreational projects identified in adopted plans of State Parks, San Mateo County Parks, Santa Clara County Parks, California Coastal Conservancy, Santa Clara County Habitat Conservation Plan, Midpeninsula Regional Open Space District, and local agencies.

1.B.2 **Bay Area Ridge Trail.** Explore feasibility of extending the Bay Area Ridge Trail to include Santa Cruz County and the Monterey Bay Area, and implement adopted regional trail connections between Santa Cruz County public lands and the Monterey Bay.

1.B.3 **Coastal Trail Access.** Coordinate efforts between the County, Coastal Commission, Regional Transportation Commission, Association of Monterey Bay Governments (AMBAG), State Coastal Conservancy and conservation organizations to develop a connected system of hostels/huts along the Coastal Trail route, consistent with protecting natural resources.

Strategy 1.C: Promote compatible public access on public watershed lands.

Actions

1.C.1 **Low Impact Recreation in Watersheds.** Support collaborations between cities, the County, and water districts to promote watershed-based learning and appropriate low-impact recreational uses on public watershed lands and Soquel Demonstration State Forest.

Strategy 1.D: Work with willing landowners to increase use of conserved lands near urban areas for community education, outings and stewardship programs.

Actions

1.D.1 **Organized Outings on Conserved Lands.** Work with willing landowners to create organized recreational and educational programs and outings as a component of voluntary conservation agreements (e.g. conservation easements).

1.D.2 **Farm Trails Program.** Enhance public awareness and participation in the Farm Trails program on participating private agricultural lands.

1.D.3 **Recreational Immunity Awareness.** Increase awareness of willing landowners about liability protections for public recreational use under the *Recreational Immunity Liability Statute.*

Goal 2: Educate, inspire and engage the public about the next generation of conservation.

Strategy 2.A: Support existing and successful environmental education programs across the county and share strategies, programs and funding approaches responsive to emerging trends and community needs.

Actions

2.A.1 **Funding for Environmental Education Programs.** Seek funding to promote and expand successful environmental education programs among park and resource conservation agencies, outdoor education organizations and school districts.

2.A.2 **Citizen Science Programs.** Build support among agencies, organizations and individuals for coordinating and funding adult and youth citizen science programs, to monitor water quality, wildlife and other natural resource issues.

2.A.3 **Nature-Based Learning Websites.** Support nature-based learning websites to increase awareness of environmental education and its practitioners.

Strategy 2.B: Support and build on partnerships between conservation, recreation and environmental education organizations to enhance public understanding and appreciation of nature.

Actions

2.B.1 **Monterey Bay National Marine Sanctuary Visitor Center.** Support partnerships between conservation, recreation and environmental education organizations, the City of Santa Cruz and NOAA for the new Monterey Bay National Marine Sanctuary Visitor Center as an important new nature-based tourism destination

2.B.2 **Watsonville Sloughs Eco-Tourism.** Enhance public and private support for the Annual Monterey Bay Birding Festival and promote the Watsonville Sloughs as an eco-tourism destination.

Goal 3: Ensure parks, natural areas and community facilities are adequately funded and maintained

Strategy 3.A: Pursue new sources of funding and partnerships to acquire, develop, restore and maintain parks, trails, natural areas, recreational facilities and environmental educational programs.

Actions

3.A.1 **Working Group.** Convene a working group to identify funding recommendations that address critical gaps in stewardship and maintenance of publicly-funded parks and open space and to re-open closed facilities.

3.A.2 **Central Coast Funding.** Work to include program funding for the Central Coast / Monterey Bay Region in future state bond measures to protect and enhance land, water and natural resources and provide public access opportunities.

3.A.3 **Grant Applications.** Continue to develop coordinated grant applications for state and federal funding for parks, public access, resource enhancement, and education projects.

Strategy 3.B: Protect, restore and adaptively manage Santa Cruz County's unique natural habitats, waterways and coastal areas through partnerships between the county, cities, state and federal agencies and non-profit organizations.

Actions

3.B.1 **Professional Collaboration.** Establish a recreational and resource professional collaborative to improve ongoing coordination and increase efficiency between public agencies and organizations, and share successful approaches and solutions to protecting and managing natural resources within parks and preserves.

3.B.2 **Coordinated Stewardship and Maintenance.** Coordinate stewardship, restoration, maintenance, enforcement, and education efforts across public and private conserved lands to address challenges such as invasive species, homeless encampments, and other illegal activities.

3.B.3 **Coordinated Resource Management and Research.** Coordinate resource management and research efforts of state, county, and city parks, ecological preserves, water districts and universities to address climate change mitigation and adaptation.

Goal 4: Create a regional recreation system that is responsive to demographics and use patterns (age, ethnicity, culture) and enhances community health

Strategy 4.A: Increase park access from local communities and address park deficiencies in economically underserved areas.

Actions

4.A.1 **Parks within Walking Distance.** Seek to site parks within walking distance of every urban resident's home.

4.A.2 **Safe Bikeways.** Incorporate bike-friendly access and safe routes to schools into efforts by local, regional and state agencies, including redevelopment projects and regional transportation plans. Assist in implementing key bikeways and levee trails such as those included in the Watsonville Parks and Recreation Master Plan and San Lorenzo River Lower River Plan.

4.A.3 **Communication Tools.** Develop new communication tools to coordinate park and recreation information, including a regional website, that enhances public use of and

awareness about all parks, trails, campgrounds, bikeways, dog parks and other special use areas within Santa Cruz County.

4.A.4 **Transit to Trails Web Tool.** Support and expand the Bay Area Open Space Council's *Transit to Trails* website to include Santa Cruz County, and connect communities with local parks and trails via transit and bikeways.

Goal 5: Integrate parks and protected open space networks into planning for housing, transportation, and other local infrastructure.

Strategy 5.A: Coordinate land use, transportation and open space planning to provide integrated and well-planned development and conservation projects that maintain healthy natural and urban communities.

Actions

5.A.1 **Sustainable Communities Strategy**. Integrate the Conservation Blueprint into the *Sustainable Communities Strategy* (SB 375) for the Monterey Bay Region with state and regional entities, such as Strategic Growth Council, Regional Transportation Commission, County, cities and Association of Monterey Bay Governments (AMBAG). Coordinate reduction in greenhouse gas emissions through land use and transportation planning with open space, recreation and conservation planning.

5.A.2 **Multi-Benefit Projects.** Prioritize recreation and open space projects in local communities that achieve multiple public benefits including urban greening, habitat protection and water resources protection.

5.A.3 **Green Infrastructure.** Integrate natural habitat protection (green infrastructure) as a component of urban and municipal facilities (grey infrastructure) planning efforts.

5.A.4 **Greenways.** Implement compatible recreational uses and greenways along riparian corridors.

5.A.5 **Grant Applications.** Support coordinated grant applications among public agencies and non-profit organizations for urban greening, sustainable communities and land conservation projects.

Glossary

abiotic: The non-biological elements of a system, such as geology, soil type, topography and physical factors.

adaptive management: a systematic process for continuously improving management policies and practices by learning from the outcomes of previously employed policies and practices.

biodiversity: The variability among living organisms and the ecological complexes of which they are part. It includes genetic diversity, the richness of species, and the variability of communities and ecosystems.

biomagnification: The increasing concentration of a substance, such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain. As a result of biomagnification, organisms at the top of the food chain generally suffer greater harm from a persistent toxin or pollutant than those at lower levels.

carbon sequestration: the removal and storage of carbon from the atmosphere in carbon sinks (such as oceans, forests or soils) through physical or biological processes, such as photosynthesis; the process of increasing the carbon content of a reservoir other than the atmosphere.

climate refugia: Areas that are more likely to be climatically stable or support species in the face of climate change. For the predicted hotter and drier climate, climate refugia include streams, ponds, lakes, wetlands, springs, and north-facing slopes.

climate resilient: Areas or species that are able to withstand stresses to a greater degree (are more resistant) or are able to recover from climate-related stresses more rapidly (are more resilient) than other species or areas.

community (biological): The plants, animals, and other organisms (e.g. fungi and bacteria) that co-occur within a given area.

conservation easements: legal agreements between a landowner and a land trust or government agency that permanently limit the use of the land in order to protect its conservation values.

corridor: An area that links two habitat areas that are otherwise separated by non-habitat.

cultivated agriculture: area of landscape actively managed for the production of food, feed, and fiber.

disturbance regime: the range of ecological disturbances that are characteristic of an area or community. For example, the fire regime of a community relates to the type, frequency, and severity of fire and the conditions that it creates.

disturbance: an event that removes established plants and animals from an area, such as a fire, flood, or extreme drought event.

ecological integrity: the ability of an ecosystem to maintain essential ecological processes, functions, and structures and to adapt to spatial and temporal changes.

economically viable agriculture: agriculture that is profitable and sustainable (long-lasting).

ecosystem approach: a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use.

ecosystem services: the direct and indirect benefits accrued from services naturally provided by the environment from which both human beings and all other organisms benefit.

ecosystem service markets (conservation markets): mechanisms that create a market for ecosystem services in order to improve the efficiency of how the service is used.

endangered: threatened with extinction. Federally endangered species have been listed by the United States Government under the federal Endangered Species Act. State-listed endangered species have similarly been listed under the California Endangered Species Act.

endemic: native to an area, and found only within that area. For example, a species that is endemic to Santa Cruz County naturally occurs only within Santa Cruz County.

extinct: having no living representative. Extinct species have died out.

extirpated: locally extinct. A species that has been extirpated from Santa Cruz County no longer occurs within the county.

fragmentation: human activity that results in creating small, isolated areas poorly suited to maintaining ecological functions and supporting populations of species.

grazing management (conservation grazing) - the use of grazing animals to achieve desired ecological, social, and economic outcomes.

habitat connectivity: quality of a landscape that enables individuals, populations, and ecological processes to move between and through patches of habitat.

habitat patch: area of contiguous land featuring relatively intact vegetation that is not fragmented by public roads but may feature private ranch and forest roads that are infrequently driven.

hydrologic regime: the range of water-related conditions and processes of an area. For example, in streams this can include the flow rate, the frequency of flooding, and the severity of flooding, among other factors.

intrinsic: the value of someone or something in and for itself, irrespective of its utility for people.

linkage: An area that enhances the movement of animals or the continuity of ecological processes through the landscape

mitigation: an anthropogenic intervention to reduce negative or unsustainable uses of ecosystems or to enhance sustainable practices.

morphology: aspects of an organisms form. Examples include the shape of a plant's leaves, or the size of a foxes ears.

non-industrial timber management plans (NTMP): a long-term timber management plan for an area of less than 5,000 acres in which the landowner is granted a perpetual permit to harvest in exchange for an agreement to manage the forest through uneven-aged management and long-term sustained yield practices.

payment for ecosystem services (PES): financial incentives to landowners in exchange for managing land in a way that protects and maintains one or more ecological values or ecosystem services; a variety of arrangements through which the beneficiaries of ecosystem services pay back the providers of those services.

permeability: Degree to which the landscape is unfragmented and intact, thus facilitating movement of wildlife and ecological processes such as plant dispersal and gene flow.

protected lands: lands that are held in fee title or protected via conservation easement by public agencies and non-governmental organizations.

resiliency: the ability of a species or system to return to its original condition following a disturbance or other event.

safe harbor agreement: assurances that additional land, water, and/or natural resource use restrictions will not be imposed (under the Endangered Species Act) as a result of voluntary conservation actions.

safe harbor policy: incentives under the Endangered Species Act for private and non-Federal property owners to restore, enhance, and maintain habitats for listed species.

soil fertility: the potential of the soil to supply nutrient elements in the quantity, form, and proportion required to support optimum plant growth

stewardship: careful protection and management of land and water that maintains the long-term productivity of the natural systems.

sustainability: meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.

sustainable use: human use of an ecosystem so that it may yield a continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.

system: Ecological communities and their associated processes and functions.

targets: Elements of biodiversity such as species, communities, or ecological systems that are the focus of planning.

timber harvest plan (THP): an environmental review document prepared by a licensed registered professional forester and submitted by a landowner to the California Department of Forestry and Fire Protection (CAL FIRE) outlining what timber resources will be harvested, how they will be harvested, and the steps that will be taken to prevent damage to the environment.

timber production zone (TPZ): an area which has been zone for and is devoted to and used for growing and harvesting timber.

Viability (ecological): The ability of a species or system to withstand or recover from most natural or anthropogenic disturbances and thus to persist for many generations or over long time periods.

working lands/landscape: lands managed by humans for the production of commodities (food, fiber, and other materials), including farmland, rangeland and timberlands.

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Appendices

The appendices provide additional, detailed information related to the Blueprint's Biodiversity Assessment (Appendices A-C), and a table illustrating the acreage of land that is protected and build up in the Bay Area counties.

Appendix A: Important Streams for Riverine Biodiversity Conservation

Santa Cruz County's streams are critical to local and regional biodiversity conservation. The coastal streams support steelhead (*Oncorhynchus mykiss;* Central California Coast and South Central California Coast Distinct Population Segments) and coho salmon (*Oncorhynchus kisutch*): two salmonid species that have been listed as threatened under the federal Endangered Species Act. The streams also feature other native fish, amphibians, and reptiles, including several species of conservation concern such as the California red-legged frog (*Rana draytonii*) and western pond turtle (*Actinemys marmorata*). The riparian habitat that lines the streams supports many native plants and animals, including several sensitive bird species such as Long-eared Owl and Yellow-breasted Chat (Section 5.2.1).

A.1 Overview

Recognizing that all streams have value for the county's biodiversity conservation, as well as play a critical role in our water supply, working lands and recreation, the Blueprint team convened a team of stream biologists and planners with extensive knowledge of the county's streams, in order to evaluate and rate their biological conservation value for aquatic biodiversity, with an emphasis on their value for steelhead and coho salmon. These anadromous fish utilize a variety of natural habitats along the length of a stream, are dependent upon intact riparian habitat along the stream channel, and are sensitive to changes in habitat conditions; therefore, they represent good indicators of conservation value.

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A.2 Planning Units

In keeping with the primary goal of the Blueprint*,* which is to inform land conservation activities (i.e. land protection, management, and stewardship), watersheds were used as the planning unit, rather than the individual creeks and rivers. Because the various tributaries of the larger streams, including the San Lorenzo, Soquel, and Aptos creeks, vary in their conservation value, the team rated subwatersheds, the boundaries of which were initially determined based on the County of Santa Cruz's watershed GIS layer. Recognizing that they feature uniquely important conservation values, the lagoons of four streams were distinguished from the remainder of the lower watershed within the Waddell, Scott, San Lorenzo, and Soquel watersheds. This approach resulted in analysis of 65 subwatersheds in Santa Cruz County.

A.3 Planning Criteria

During the workshop, the stream experts identified and then began to apply a series of criteria to evaluate each stream's conservation value (Table A-1). Due to the level of effort required, tabulation of the criteria was ultimately completed by the experts following the meeting.

Table A-1: Criteria used to evaluate the conservation value of Santa Cruz County streams.

Criterion	Description
Coho Present	Indication of whether *Oncorhynchus kisutch* have been observed in the watershed since 2000
Coho Potential	Relative potential for watershed to support *Oncorhynchus kisutch*
Steelhead Smolt Density	Relative density of steelhead smolts (as compared to other Santa Cruz County streams)
Steelhead YOY Density	Relative density of steelhead young of the year (as compared to other Santa Cruz County streams)
Upstream of Important Habitat	Indication of whether the subwatershed is upstream of important habitat
Downstream of Important Habitat	Indication of whether the subwatershed is downstream of important habitat
Older *O. mykiss*	Indication of whether older *O. mykiss* are present in the watershed, regardless of whether thought to be steelhead vs. resident rainbow trout
Monterey Roach	Indication of whether *Lavinia symmetricus subditus* are known to occur in the watershed
Sacramento Sucker	Indication of whether *Catostomus occidantalis* are known to occur in the watershed
Pacific lamprey	Indication of whether *Lampetra tridentata* are known to occur in the watershed
Speckled Dace	Indication of whether *Rhinichthys osculus* are known to occur in the watershed
riffle sculpin	Indication of whether riffle sculpin are known to occur in the watershed
Tidewater goby	Indication of whether *Eucyclogobius newberryi* are known to occur in the watershed
California red-legged frog	Indication of whether *Rana draytonii* are known to occur in the watershed
Foothill yellow-legged frog	Indication of whether *Rana boylii* are known to occur in the watershed
San Francisco garter snake	Indication of whether *Thamnophis sirtalis tetrataenia* are known to occur in the watershed
Western pond turtle	Indication of whether *Actinemys marmorata* are known to occur in the watershed

A.4 Overall Conservation Value

During the meeting, the experts rated the overall conservation value of each of the 65 subwatersheds on a scale of 0-5, in which five was used for the most critical subwatersheds, and 0 was used for subwatersheds that do not support anadromous fish. The scores were determined by consensus following a discussion of each stream's main systems and species and current status as well as its potential conservation value following feasible restoration activities. This qualitative, expert opinion-based approach was chosen because lack of comprehensive information about the watersheds precluded calculation of a quantitative score based on the criteria identified.

A.5 Planning Outcomes

Table A-2 identifies the criteria and conservation rating for each of the 65 subwatersheds in Santa Cruz County. Additional information about the subwatersheds is available in the complete stream matrix, which can be requested from the Land Trust of Santa Cruz County.

The Blueprint team selected streams with a conservation value of three or more as having the highest importance for conservation of biodiversity in our coastal streams (Section 5.2.1). It is important to note, however, that watersheds that rated lower in this evaluation may have very important biodiversity value including for other types of aquatic systems and species, such as the Watsonville Sloughs. Moreover, streams that might not support anadromous fish and other aquatic species of concern may have other important conservation values, including supporting riparian woodlands important for birds, providing connectivity between patches of intact habitat, contributing to our water supply, and/or providing important recreation opportunities.

Table A-2: Characteristics of important coastal streams by subwatershed

					Coho		Steelhead			Important Habitat			Other Species Present							
Watershed	Subwatershed	Acres	% Protected	Conservation Value	Present	Potential	Smolt Density	Young of the Year Density	Spawning Quality	Up-stream	Downstream	Older *O. mykiss*	Roach	Sucker	Lamprey	Dace	Sculpin	Tidewater Goby	CRLF	Other[1]
Ano Nuevo	Ano Nuevo	5,378	49.4	3														Y		SFGS
Aptos	Aptos	7,960	81.3	4	N	L	M	M	M	N	N		N	N	?	N	N	Y		
Aptos	Valencia	7,627	8.7	2					L											
Arana-Rodeo	Arana	3,918	13.0	1	N	N	L	L	L	N	N	Y	N	N	N	N	N			
Arana-Rodeo	Rodeo	2,904	0.8	2						Y								Y		
Baldwin/Wilder	Baldwin	4,772	52.9	4		L	H	H	M									Y	Y	
Baldwin/Wilder	Wilder	7,221	47.1	4		L			M									Y	Y	WPT
Davenport	Davenport	2,055	77.7	1		L			L			Y								
Davenport	Molino	979	30.2	1		L						Y							Y	
Laguna	Laguna	4,986	34.6	4	Y	L	H		M	Y								Y	Y	WPT
Liddel	Liddel	3,826	73.6	1		N	L	L	L										Y	
Majors	Majors	3,189	50.9	1		N	L	L	L			Y							Y	
Pajaro	Browns Valley	4,633	7.6	4		N	M	M	M			Y	N	N	N	N	Y			
Pajaro	Casserly Creek	2,888	0	3		N	M		M		Y?								Y	
Pajaro	College Lake	6,046	4.6	2		N	?				Y									
Pajaro	Coward-Mattos	12,581	5.6	1		N														
Pajaro	Green Valley Creek	6,414	4.8	1		N														
Pajaro	Lower Corralitos	6,423	1.7	2					M		Y									
Pajaro	Salsipuedes	1,362	0.4	2					L	Y?	Y			Y						
Pajaro	South Pescadero	1,686	0	4		N	L-M		M					Y	?				Y	
Pajaro	Upper Corralitos	7,106	8.4	4		N	M-H	M-H	M					Y	Y	N	Y		Y	
Pajaro	Watson. Slough	13,168	9.5	0		N	N	N	N									?		
Pescadero	Pescadero	3,221	26.1	3																
San Andreas	San Andreas	7,011	10.9	0																
San Lorenzo	Bean	6,168	2.8	4	Y	L-M?	L-H	L-H	L	Y			Y	Y	Y	Y	N			
San Lorenzo	Bear	10,399	3.4	3		M?	M	M-H	L	Y				Y	Y		N			
San Lorenzo	Ben Lomond	344	0	3		L	L-H	L-M	L	Y	Y	N	Y	Y	Y	Y	N			

Table A-2: Characteristics of important coastal streams by subwatershed

					Coho		Steelhead			Important Habitat			Other Species Present							
Watershed	Subwatershed	Acres	% Protected	Conservation Value	Present	Potential	Smolt Density	Young of the Year Density	Spawning Quality	Up-stream	Downstream	Older *O. mykiss*	Roach	Sucker	Lamprey	Dace	Sculpin	Tidewater Goby	CRLF	Other[1]
San Lorenzo	Boulder	7,293	19.4	3		N	L-M	M	L	Y			Y	Y	Y	Y	N			
San Lorenzo	Branciforte	6,235	3.1	4		M?	L-M	L-M	L	Y		Y		Y	Y	N	N			
San Lorenzo	Brimblecom	613	0	2		L	L	L	L	Y	N		N	Y	N	Y	N			
San Lorenzo	Carbonera	4,780	5.7	2		L	L-M	L	L	Y		Y	Y	Y		Y	N			
San Lorenzo	Fall	3,149	77	3		L	M-H	M	L	Y		Y	N	N	N	N	N			
San Lorenzo	Felton	805	19.2	3		L	L-M	L-M	L	Y	Y	N	Y	Y	Y	Y	N			
San Lorenzo	Glen Arbor	1,170	6.1	3		L	L-M	L-M	L	Y	Y		Y	Y	Y	Y	N			
San Lorenzo	Kings	4,929	37.6	2		L	L-M	L	L	Y	N		Y	Y		Y	N			
San Lorenzo	Lompico	1,791	25.6	2		N	L	L-H	M	Y	N		N	N	N	N	N			
San Lorenzo	Love	1,913	3.3	1		N			L	Y	N									
San Lorenzo	Lower S. Lorenzo	5,830	44.8	5		L	H	M-H	L	Y	Y		Y	Y	Y	Y	N			
San Lorenzo	Lower Zayante	56	4.6	3		L	L-M	M-H	L	Y	Y		Y	Y	Y	Y	N			WPT
San Lorenzo	Mid Zayanta	1,738	31.1	4		M	M	M-H	M	Y	Y		Y	Y	Y		N		Y	
San Lorenzo	Mid. San Lorenzo	4,259	20.3	3		L	L-H	L-M	L	Y	N		Y	Y	Y	Y	N			
San Lorenzo	Newell	6,346	45.8	2		N	L-M	L-M	L	Y			Y	Y	Y	N	N			WPT
San Lorenzo	Riverdale	525	0	2		L	L	L	L	Y			N	Y	N	Y	N			
San Lorenzo	San Lorenzo Lagoon	1,103	0	5		M	pot. H	pot. H	N		Y		Y	Y			N	Y		
San Lorenzo	Two Bar	1,676	1.6	1		N	L	L	L	Y										
San Lorenzo	Upper S. Lorenzo	7,439	46	2		L	L		M											
San Lorenzo	Upper Zayante	7,197	15.7	5		M	M-H	M-H	M	Y		Y		Y	Y	N	N		Y	
San Lorenzo	Urban S. Lorenzo	1,249	28.7	3		N	L		L	Y										
San Vicente	San Vicente	7,217	15.1	5	Y	M	M	M	M										Y	
Sand Hill Bluff	Sand Hill	189	12.5	0																
Scott	Big Creek	7,227	2.1	3	Y	L	M	M	L	Y									Y	
Scott	Lower Scott	2,831	17.2	3	Y	L	L	L	L	Y									Y	
Scott	Scott Lagoon	183	88.0	5			H		L		Y							Y	Y	
Scott	Upper Scott	8,853	19.9	5	Y	H	M	M	M	Y									Y	

Table A-2: Characteristics of important coastal streams by subwatershed

					Coho		Steelhead			Important Habitat			Other Species Present							
Watershed	Subwatershed	Acres	% Protected	Conservation Value	Present	Potential	Smolt Density	Young of the Year Density	Spawning Quality	Up-stream	Downstream	Older *O. mykiss*	Roach	Sucker	Lamprey	Dace	Sculpin	Tidewater Goby	CRLF	Other[1]
Soquel	East Soquel	12,184	48.4	4	Y	M	M-H	L-H	M	Y		Y	Y	Y	Y	N	N		Y	FYLF, WPT
Soquel	Lower Soquel	4,925	17.2	3		L	L-M	L-M	L	Y	Y		Y	Y	Y	N	N			FYLF, WPT
Soquel	Porter	2,067	3.3	1																
Soquel	Soquel Lagoon	400	0	5		N	H	H	N		Y		Y	Y	N	N	N	Y		WPT
Soquel	Upper Soquel	1,772	0	4		L	M	M	M	Y	Y		Y	Y	Y	N	N		N	FYLF, WPT
Soquel	West Soquel	7,959	2.6	4		L-M	L-M	L-M	L	Y		Y	N	Y	N	N	N			
Swanton Bluffs	Swanton Bluffs	1,552	58.6	0																
Waddell	East Waddell	7,557	90.5	3	Y	L	M	M	M	Y									Y	
Waddell	Lower Waddell	1,609	52.1	5	Y	L-M	M		L	Y	Y								Y	WPT
Waddell	Waddell Lagoon	43	55.6	5	N	L	H		L										Y	SFGS, WPT
Waddell	West Waddell	6,133	99.7	5	Y	M-H	M	M	M	Y		Y						e	Y	SFGS, WPT

Y=present, N=absent, L=low, M=medium, H=high, E=extirpated, pot.= potential, and blank cells indicate no information available.

[1] Conservation Value: Relative value based on expert opinion on a scale of 0-5, with 5=critical, 4-extremely high, 3= high, 2=moderate, 1=low, 0=none (only 3-5 shown)

[2] Other Species: SFgs = San Francisco garter snake; wpt = western pond turtle; fylf = foothill yellow-legged frog

Appendix B: Conservation Lands Network Design

A key objective of the Conservation Blueprint is to identify a network of lands that, if conserved, could safeguard the county's biological diversity (inset box). The conservation lands network features not only public lands, including parks or watershed lands, but also private lands including working ranches and forests where biological conservation values are conserved.

What is the Conservation Lands Network?

A network of conserved land that:

1. Collectively safeguards the county's biodiversity.
   - Protects the globally rare, locally unique, and other high conservation values systems
   - Conserves representative areas of more widespread or 'matrix' communities
   - Incorporates the most resilient areas to facilitate long-term viability.
5. Features both private and public lands that are:
   - protected from development or intensive agriculture through fee title, conservation easement, or interim protections such as cooperative agreements and land use policies
   - managed for biodiversity values and have some level of monitoring.
6. Builds on existing protected lands to create large, contiguous areas that can sustain ecological processes, support wide-ranging species, contain a wealth of native species, and resist impacts of adjacent development ('edge effects').
7. Can be updated over time to reflect changes in the landscape including new protected lands or changes in land use.

The conservation lands network was with the aid of Marxan, a computer program that has been utilized in conservation planning projects worldwide (REFs), including in the Bay Area Upland Habitat Goals (UHG) project which developed a conservation lands network for the nine Bay Area counties (REF). In utilizing Marxan, the Blueprint team followed the good practices manual, which discusses effective methods for the use of Marxan in conservation planning processes (Ardron et al. 2008), and built on successful approaches used in UHG (Bay Area Open Space Council *in prep.*). The following provides a brief overview of the planning process and outlines the following key components of the model used to design a CLN for Santa Cruz County:

1. Conservation Targets and Goals
2. Suitability
3. Model parameters
4. Solution

The reader is referred to the Marxan good practices handbook and the UHG project for more exhaustive information about the project.

B.1. Overview

The Conservation Blueprint designed a network of conservation lands within the aid of Marxan: software developed based on the principals of systematic conservation planning and conservation biology (Margules and Pressey 2000), which generates spatial reserve systems that efficiently achieve biodiversity conservation goals and objectives. It is the most widely used conservation planning tool in the world, with numerous plans employing Marxan published in the peer-reviewed literature.

Table B-1: Objectives of the conservation lands network for Santa Cruz County (adapted from Groves 2003)

Objective	Description	Techniques Used to Design the Conservation Lands Network
Representative	Identify and protect a range of biological systems, including the full complement of species and communities, which collectively encompass the spectrum of biological variation in the region	Include a diverse range of conservation targets based on a critical review of available biological information. Targets include all of the vegetation (Table 5-1), and a suite of rare species and systems for which occurrence data are available (Appendix B).
Resilient	Include the largest and most intact areas, which are well-insulated from human impacts and where natural processes including ecological disturbances that maintain functioning systems can occur	Examine the landscape's suitability to support the conservation targets based on the degree that it is unaltered by human development, which was evaluated based on parcel density and road density, and then select areas that are most suitable for inclusion in the conservation lands network.
Redundant	Include multiple occurrences of each conservation target across the landscape to ensure a high likelihood of persistence in the face of events that could eliminate occurrences (e.g. fires, floods, and disease)	Set goals for protection of the conservation targets within 16 contiguous landscape units, to capture the variability in systems across environmental gradients, as well as incorporate redundancy.
Restorative	Identify areas where restoration of system structure (e.g. species composition) and functions (e.g., natural disturbance regimes) can promote long-term viability	Consider restoration potential in evaluating the conservation value of important systems, particularly the critically rare such as Sandhills, coastal streams, and sloughs and other wetlands.
Efficient	Identify the most efficient network of lands that can attain the goals.	Build on the existing protected lands network, to most efficiently assemble large areas that are most diverse and resilient
Connected	Maintain landscape connectivity to promote species movement and other ecological processes.	Build a compact network of interconnected conservation lands and identify a patch network and critical linkages between intact habitat patches (Section 5.2.3)

B.2. Conservation Targets and Goals

The conservation targets for the Blueprint are the biological systems, species, communities, and important areas, that would safeguard all biodiversity within the county is protected to a level that would allow each target to maintain viability and evolve. The Blueprint team used a coarse filter-fine filter approach to identifying conservation targets and setting goals for their representation in the network (Groves 2003):

1. Coarse filter: protect representative areas of each vegetation type to safeguard the majority of biodiversity elements, particularly common species;

2. Fine filter: conserve species that may not be adequately protected by the coarse filter, including rare species, abiotic elements such as rock outcroppings, and known hot spots (areas featuring a high concentration of biodiversity).

The following sections outline the process used to identify and map the coarse filter (vegetation) and fine filter targets, and set conservation goals for their occurrence within the conservation lands network.

B.2.1. Vegetation Targets

A key element of the Blueprint approach to protecting biodiversity in Santa Cruz County is to conserve representative areas of each vegetation type.

B.2.1.1. Vegetation Map Assembly

The coarse filter targets were vegetation types within Santa Cruz County, which was compiled from several sources using a series of steps (Table B-2).

1. **Compile Vegetation Layers**: CALVEG existing vegetation (USFS 2000) was used for 99% of the county, while the Nature Conservancy's composite vegetation map used for the Central Coast Ecoregional Assessment (TNC 2006) was used in the southeast corner of the county where CALVEG did not feature any data.
2. **Manual Corrections:** Inaccuracies encountered in these layers were corrected based on expert knowledge and high resolution aerial image analysis. For example, areas where CALVEG had incorrectly mapped as "Ponderosa Pine forest" were changed to "Redwood forest" and areas of "Monterey Cypress Forest" were changed to "Knobcone Pine".
3. **Consolidation of Types**: Several of the CALVEG mapped vegetation types were merged, based on review with a team of vegetation experts in the county, who indicated that the multiple types did not reflect biologically meaningful differences in the vegetation that would influence biodiversity. Examples include merging "Coyote Brush" and "California Sagebrush" as the experts indicated they were not well-differentiated in CALVEG.
4. **Enhancements:** The CALVEG -based map was then enhanced using additional county-specific information to increase the accuracy and precision of the vegetation layer (Table B-2).

These steps to assemble a vegetation map greatly increased its ability to be used as a coarse filter for conservation planning. However, future planning efforts in the county would benefit from a site-specific mapping study to create a hierarchical map of the vegetation following the classification in the *California Manual of Vegetation* (Sawyer et al. 2008). Of particular importance is to classify and map the maritime chaparral communities within the county, which were not accurately mapped and could not be differentiated as part of this project.

Table B-2: Vegetation data used to create a map of coarse filter conservation targets.

Layer	Source	Description	How Used
CALVEG Existing Vegetation	USFS 2000	Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) for the existing vegetation on the central coast, developed in 2000 based on remote sensing with accuracy assessments.	Of the 31 types identified in "regional dominance type 1", we merged types that were not well distinguished, corrected obvious inaccuracies, and replaced information through a series of enhancements.
Composite Vegetation	TNC 2006	TNC's Central Coast Ecoregional Assessment Vegetation Map, based on Gap Veg and CDF Hardwoods	For the approximately 1% of area not covered by CALVEG in the SE Corner of the County
Santa Cruz Cypress	McGraw 2007	Precise GPS-mapping for Butano Ridge, Eagle Rock, and Majors Creek populations (McGraw 2007) combined with coarser mapping for Bonny Doon and Bracken Brae (USFWS 1998).	Data in CALVEG replaced with the Santa Cruz cypress data, which more accurately depicted vegetation.
Sandhills	McGraw 2005	72 sites totaling 5,781 acres mapped based on field reconnaissance and aerial image analysis updated based on McGraw 2004	Data in CALVEG replaced with Sandhills data, which more accurately depicted vegetation.
Sand Parkland	McGraw 2004	44 sites totaling 227 acres mapped based on field reconnaissance and aerial image analysis	Data in CALVEG and Sandhills replaced with Sand Parkland data, which more accurately depicted vegetation.
Maritime Chaparral (Sandhills)	McGraw 2005	30 sites totaling 3244 acres mapped as maritime chaparral during field reconnaissance and aerial image analysis for Sandhills mapping (McGraw 2004)	Data in CALVEG replaced with Maritime Chaparral data.
Maritime Chaparral	M. Vasey, pers. comm. 2010	Area within county where chaparral is likely to be maritime chaparral (i.e. influenced by fog)	Converted CALVEG 'montane chaparral' and 'chamise chaparral' to maritime chaparral.
Urban and Built Up	FMMP 2008	Areas occupied by structures with a building density of at least 1 unit to 1.5 acres.	Data in CALVEG replaced to more accurately depict developed areas. Sandhills and Sand Parkland were overlaid after this layer, to incorporate Sandhills areas that met the definition of urban and built up.
Cultivated	FMMP 2008	Areas of farmland, mapped with a minimum mapping unit of 10 acres.	Used to replace CALVEG to more accurate depict areas of cultivation

B.2.1.2. Selecting Targets and Goals

Working with Technical Advisors, we assigned each of the 17 natural vegetation types to one of five vegetation rarity categories and then set goals for their representation within the conservation lands network, expressed as a percent of remaining vegetation within the county (Inset Box, Table B-3). The natural vegetation types within Santa Cruz County vary greatly in their areal extent (i.e. acres covered), from just over 200 acres each of wetland vegetation and Santa Cruz cypress forest, to more than 120,000 acres of redwood forest. By virtue of their rarity, the globally rare and the locally unique/highly significant types support a proportionately greater amount of the county's biodiversity. Their rarity also renders them more vulnerable to the impacts of development and other changes. For this reason, the goal for their future protection was set at 90%; that is, one goal of the Blueprint is to protect 90% of the remaining area (i.e. acres) supporting these systems. In recognition of their important role in maintaining biodiversity locally, the locally uncommon types were assigned a protection goal of 75%. Because the locally common and locally widespread vegetation types support a wealth of native species and, by virtue of their widespread nature, are critical to maintaining were set at 50% and 33%, respectively (Table B-3).

Vegetation Rarity Categories

Globally rare: Entire global occurrences is (primarily) within Santa Cruz County.

Locally Unique or Highly Significant: More widespread outside of the Santa Cruz Mountains, but rare within the region and uncommon in the county (<1,000 acres); or highly biologically significant in terms of supporting a disproportionate richness of rare species.

Locally Uncommon: More widespread within the Santa Cruz Mountains but not common in the county.

Locally Common: Fairly common within the county and Santa Cruz Mountains.

Locally Widespread: Widespread within the county and Santa Cruz Mountains.

B.2.2. Fine Filter Conservation Targets

The Blueprint team incorporated information about rare species and communities that represent important conservation targets and, owing to their rarity, might not be adequately conserved in a network designed solely based on coarse filter vegetation types (Table B-4). Information was synthesized through two main steps:

1. **Collate Existing Spatial Information:** Through extensive outreach to agencies, partner organizations, and local experts, among others, the Blueprint team synthesized available, relevant spatial data for rare species and communities.
2. **Live Mapping with Experts:** The Blueprint team convened experts during two live GIS mapping sessions, one for native plant and insect diversity and another for bird diversity, to review the sufficiency of existing information and to map additional areas that were not already identified.

Spatial data for rare species, habitats, and communities that were obtained through these steps were incorporated as fine filter targets (Table B-4). Because of their rarity and recognizing that the mapped occurrences represent only a subset of the actual occurrences, a goal of 90% was set for inclusion of these targets within the conservation lands network developed by Marxan. These goals were met and in most cases, exceeded, for the vast majority of the fine filter targets. The only exceptions were where

Table B-3: Santa Cruz County vegetation types in five protection categories, showing the acreage total, needed to achieve protection goals, in existing protected lands, added in the conservation lands network (CLN), and together, showing the percent of the protection goal acreage that is currently achieved and that which would be achieved within the CLN.

Category (Protection Goal)	Vegetation Type	Acres					Percent of Goal that is Attained within	
		Total	Goal	Existing Protected Lands	Added by CLN	Total CLN	Existing Protected Lands	Total CLN
Globally Rare (90%)	Maritime chaparral	8,116	7,304	2,154	5,088	7,242	29%	99%
	Monterey pine	707	637	266	424	690	42%	108%
	Sand parkland	226	204	112	108	220	55%	108%
	Sandhills	5,665	5,099	1,678	3,731	5,409	33%	106%
	Santa Cruz cypress	209	189	97	113	209	51%	111%
Locally Rare or Highly Significant (90%)	Dunes	353	295	174	164	338	59%	115%
	Grasslands	15,120	13,608	4,790	9,144	13,934	35%	102%
	Riparian	1,615	1,442	648	896	1,544	45%	107%
	Wetland (vegetation only)	207	186	95	98	193	51%	104%
Locally Uncommon (75%)	Coastal scrub	13,155	10,324	5,038	6,575	11,613	49%	112%
	Chamise	2,053	1,540	728	826	1,554	47%	101%
	Knobcone pine	6,142	4,607	3,158	2,470	5,627	69%	122%
Locally Common (50%)	Coast live oak[1]	19,912	11,717	3,848	10,724	14,572	33%	124%
	Coastal Mixed Hardwood	5,946	3,098	1,062	3,330	4,392	34%	142%
	Pacific Douglas fir	7,368	3,683	2,158	3,214	5,372	59%	146%
	Redwood – Douglas fir	12,068	6,034	3,143	4,383	7,526	52%	125%
Locally Abundant (33%)	Redwood	123,419	41,348	42,776	41,045	83,822	103%	203%
Other (No Protection Goal)	Barren/Rock	563	0	154	162	316		
	Water	671	0	474	179	653		
	Non-Native	2,663	0	456	1,566	2,022		
	Cultivated	27,023	0	1,106	2,807	3,913		
	Urban	32,149	0	229	2,012	2,241		
	Total	**285,350**	**111,313**	**78,554**	**98,452**	**177,005**		

[1] Coast live oak woodlands within the Larkin Valley region are known as San Andreas Oak woodlands, are also considered Globally Rare.

Table B-4: Data used to map fine filter conservation targets.

Layer	Source	Description	How Used
Rare Species and Communities	California Natural Diversity Database 2010	Point and polygon data for rare species and sensitive communities in Santa Cruz County	Removed inaccurate records and presumed extirpated records as well as linear features (which greatly influence Marxan); these were added after the analysis.
Santa Cruz Long-toed Salamander Ponds	USFWS 2009	Locations of Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) breeding ponds	Included all mapped ponds as fine filter targets
Hooker's manzanita	Van Dyke 2003	42 mapped occurrences totaling 54 acres of central maritime chaparral featuring *Arctostaphylos hookeri* var. *hookeri* in the Larkin Valley region	All patches included as fine filter targets
Old Growth Redwoods	Save-the-Redwoods League 2010	Polygons delimiting the 28 patches totaling ~5,400 acres of old growth redwood or large second growth redwood that is indistinguishable (originally mapped by Steve Singer)	All forest patches as fine filter targets.
National Wetlands Inventory	USFWS 2003	Map of wetlands in the southern approximately one-third of the county (i.e. east-side Santa Cruz, and Larkin Valley to Pajaro Valley)	All wetlands included as fine filter targets.
Lakes and Ponds	County of Santa Cruz 2010	77 lakes and ponds totaling 1,500 acres, 56 of which were mapped by the county and 21added by the Blueprint team	All lakes and ponds included as fine filter targets.
Native Plant and Insect Hotspots	Blueprint Experts 2010	70 patches totaling 9.400 acres and 6 additional point occurrences for areas identified by a team of experts as supporting high concentrations or native plants and insects.	All patches included as fine filter targets
Bird Diversity	Blueprint Experts 2010	Eight locations (points) identified by members of the Santa Cruz Bird Club as important for native bird diversity	All locations included as fine filter targets
Important Bird Areas	TNC 2002	32 areas totaling 922 acres that were identified by David Suddjian as supporting bird populations	All patches included as fine filter targets
Marbled Murrelet	TNC 2002	4 areas mapped as supporting nesting Marbled Murrelet (originally mapped by Steve Singer)	All points included as fine filter targets
Marine Habitats	Marine Map 2010	Pinniped haulouts, bird rookeries, breeding bird colonies, snowy plover breeding areas, estuaries, and coastal marsh	All occurrences in the study area (i.e. not in ocean) were included as fine filter targets

the target was represented by a point (mostly from the CNDDB 2010) and occurred in urban or cultivated areas.

B.3. Landscape Units

Many of the conservation targets vary across Santa Cruz County in terms of their species composition and condition (vegetation or other important areas) or genetic diversity (species). In order to ensure that the Conservation Lands Network captured this variability, and to feature multiple occurrences of targets across the landscape to facilitate their persistence in the face of events that could eliminate occurrences (e.g. fires, floods, and disease), the county was divided into 16 landscape units, within which Marxan sought to achieve the conservation goals. For example, to achieve the goal to protect 75% of the remaining coast live oak woodland, Marxan sought to include 75% of the coast live oak woodland in each of the 16 landscape units within which it occurs. Similarly, the goal to protect 75% of the chamise chaparral was achieved within each of the four landscape units in which it was mapped. Achieving conservation goals *within* each landscape unit is one reason why the CLN exceeds the county-wide conservation goals for many systems (Table B-3).

The landscape units were created based primarily on the subwatershed boundaries, which generally divide the county into a series of wedges from northwest to southeast. The watershed boundaries were adjusted to create relatively similar sized landscape units, by merging adjacent, smaller watersheds (e.g. Scott and Swanton Bluff) and subdividing large watersheds (e.g. San Lorenzo). The boundaries were also adjusted to create greater land use homogeneity within each landscape unit, by, for example separating urban and intensively cultivated areas in the Pajaro Valley from adjacent relatively intact areas in the Pajaro Hills.

B.4. Planning Units

The county was divided into 4,083, 30-hectare, adjoining hexagonal planning units. These are the pieces of the landscape that Marxan selects from to assemble the conservation lands network. The size reflects the resolution of the data as well as the intention of the model to inform site level planning (e.g. for parcels of land).

B.5. Suitability and Cost

The cost layer is used to reflect the feasibility of successfully implementing conservation efforts in a given area and across the entire network. It causes Marxan to seek to attain goals in the areas that are most resilient and will promote long-term viability and where work is more practical, and to also create an efficient and thus cost-effective conservation lands network.
Two factors were used to represent suitability in the cost layer for Santa Cruz County:

1. **Parcel density:** the density of parcels influences development density, and thus both the ability of the landscape to support viable biological systems, as well as the monetary costs for conservation efforts in the area; and
2. **Road density:** the density of roads directly reflects habitat fragmentation, and is also an indicator of the ecological integrity of the area.

These suitability factors were calculated for each planning unit, normalized on a scale of 0-1000, and then the two values were averaged to create the relative suitability score for each planning unit. In

order that the suitability index would not only steer the model toward areas of low road density and parcelization to meet the goals but also guide creation of a cost-efficient work, a minimum value of 100 was set for all planning units, so there would be a 'cost' of adding even the most low parcel and road density planning unit to the network.

B.6. Model Parameters and Settings

In addition to the previously described inputs, model parameters and settings influence the areas selected by Marxan for inclusion in the CLN.

B.6.1. Lock In Existing Protected Lands

In order to have the network build on the more than 78,000 acres of existing protected lands in the county, any planning unit with at least 10% protected land were built into to the solution, and Marxan designed the remaining portion of the network around these "locked-in" planning units. Planning units adjacent to protected lands in adjacent counties (San Mateo, Santa Cruz, and Monterey) were similarly 'locked in' in order to facilitate design of a more regional conservation network.

B.6.2. Boundary Length Modifier

The boundary length modifier (BLM) sets the maximum boundary to internal area ratio of the CLN. The parameter ranges between 0 and 1, with a BLM of 1 causing the model to aggregate the sites selected entirely, and values closer to zero putting decreasing restriction on the total boundary length, thus allowing Marxan to select areas based more on their individual contributions to the conservation goals.

As recommended in the good practices manual, the Blueprint team ran Marxan with multiple BLM values to evaluate the benefit of a more compact network against the cost of a more expansive and thus less efficient network. We ultimately set the BLM at 0.05, reflecting the importance of the model efficiently attaining the conservation goals.

B.6.3. Penalty Factor

The penalty factor establishes the cost of the model *not* meeting the goals and can be varied among the targets to reflect their relative priority. For the Blueprint*,* a single penalty factor of 800 was set for all targets to reflect the relatively high importance for attaining all conservation target goals.

B.7. Analysis and Solution

The previously described inputs and settings are used by Marxan's simulated annealing algorithm to find a good solution through a series of 1 million iterations—computations designed to find the global optimum for the network. The software was run 20 times, with each run identifying a solution, or group of planning units that collectively meets the goals most efficiently. Because the software does not use a strict optimization approach, each run selects a slightly different set of planning units. The number of times a planning unit is selected across the different runs is an indicator of how important it is to meeting the goals. As a result, the final CLN includes planning units chosen in the best (i.e., most efficient) solution, as well as any planning units that were chosen in at least 18 of the 20 runs but were not in the best solution. The CLN is illustrated in Section 5.2.2.

Appendix C: Habitat Connectivity Analyses

Santa Cruz County features large areas of natural habitat surrounded by a diffuse area of non-habitat ('matrix') featuring varying development intensity. Maintaining connectivity between patches of intact habitat will promote long-term viability of the species and communities.

As part of the Blueprint, the planning team collaborated with Conservation Biologist Dr. Adina Merenlender to analyze terrestrial landscape connectivity in the Santa Cruz Mountains. The purpose of the study was to identify remaining patches of intact habitat and evaluate areas where conservation projects designed to maintain and enhance connectivity should be directed to be most effective.

Habitat patches were defined as contiguous areas of intact vegetation on parcels of at least 10 acres that are located away from roads, other than private ranch roads, fire roads, or other infrequently travelled roads that are thought to be permeable. The road buffer distance was proportional to the traffic volume, and so was greatest for Highway 17 and portions of Highway 1, and lowest for small streets.

The most effective corridors connecting adjacent patches were identified based on the distance and the permeability of the habitat between them. Permeability, or the ease with which an animal might move through a landscape, depends on the aspects of the habitat and varies for each species. However, in this analysis permeability was evaluated generally based on the naturalness of the landscape gauged based on three factors: 1) distance to roads, with the permeability inversely proportional to the traffic volume, 2) parcel size, which reflects land use intensity and is also inversely related to permeability, and 3) median patch size, or the median area of patches within 1.5 miles of an area. These factors were incorporated into the GIS-based model FunConn v. 1.9), which was used to estimate a continuous surface of travel cost between patches in the network and then identify lease cost pathways (potential corridors) between the habitat patches (Merenlender and Feirer 2011).

The Blueprint team then compared the resulting network of habitat patches and potential corridors identified by the model with mountain lion movement data collected by Dr. Chris Wilmers, University of California Santa Cruz. Mountain lions are wide-ranging, territorial species, with home ranges of between 20 and 60 square miles for females and up to 100 square miles for males. They utilize a wide variety of habitats occupied by deer, their preferred prey, and as such, they represent an appropriate species for which to evaluate habitat connectivity in the Santa Cruz Mountains.

Time-stamped location data for eight female and five male lions collectively tracked between October 2004 and October 2010 in northern and central Santa Cruz County and the northern slope of the Santa Cruz Mountains in Santa Clara County were examined in conjunction with the patch and corridor network to visually assess the extent to which the patches and corridors were utilized (relative to habitat outside). We note that caution must be used in 'truthing' the network based solely limited data for one species.

The Blueprint team also evaluated the draft linkage designs developed concurrently as part of the Bay Area Critical Linkages Project of the Bay Area Open Space Council. These linkages largely supported results of the Blueprint's habitat connectivity analysis in identifying the best path to connect habit patches within the Santa Cruz Mountains Region.

Together, these three analyses were used to identify critical linkages, significant habitat patches, and areas within which permeability should be maintained or enhanced to protect connectivity in the Santa Cruz Mountains. These landscape-scale results should be further evaluated based on site-specific assessments to inform the design of specific habitat connectivity projects, which could include development of wildlife friendly crossings (e.g. culverts or overpasses) and land conservation and stewardship projects for areas within the linkages.

Appendix D: Developed and Protected Land in the Bay Area

Acres and percent of built up and protected land in Santa Cruz County compared to eight other Bay Area Counties.

County	Total Acres*	Acres Urban & Built up**	Percent Built Up	Protected Acres***	Percent Protected
Alameda	472,000	145,000	31%	117,000	25%
Contra Costa	461,000	147,000	32%	128,000	28%
Marin	334,000	42,000	13%	197,000	59%
Napa	484,000	22,000	5%	141,000	29%
San Mateo	287,000	71,000	25%	113,000	39%
Santa Clara	827,000	187,000	23%	240,000	29%
Solano	532,000	59,000	12%	62,000	17%
Sonoma	1,009,000	73,000	7%	172,000	17%
Total Bay Area (Excluding San Francisco)	*4,406,000*	*746,000*	*17%*	*1,170,000*	*27%*
Santa Cruz	286,000	31,000	11%	77,000****	27%

Numbers rounded to nearest thousand.

* State Department of Conservation (excludes water acreage)

**State Department of Conservation

*** Bay Area Open Space Council Bay Area Protected Areas Database

**** Community Assessment Project