ONE WATER PLAN

ONE WATER PLAN FOR SANTA CLARA COUNTY

An Integrated Approach to Water Resources Management

Preliminary Draft Report 2016

ONE WATER PLAN

Santa Clara Valley Water District

Executive Leadership

Chris Elias
Garth Hall
Jim Fiedler
Liang Lee
Ngoc Nguyen
Norma Camacho

Project Management Team

Afshin Rouhani
Brian Mendenhall
Sara Duckler
Tracy Hemmeter

Subject Matter Experts

Aaron Baker
Bassam Kassab
Brett Calhoun
Carole Foster
Chad Grande
Cris Tulloch
Debra Caldon
Devin Mody
Dipankar Sen
Doug Padley
Doug Titus
Ed Morales
Erin Baker
Jack Xu
James Manitakos
Janell Hillman
Jason Nishijima
Jennifer Codianne
Jennifer Watson
Jerry De La Piedra
Jim McCann
John McHugh
Jose Villarreal
Joy Lim
Kurt Hassy
Laura Young
Liang Xu
Luis Jaimes
Melissa Moore
Michael Martin
Navroop Jassal
Pat Showalter
Randy Behrens
Rechelle Blank
Ryan Heacock
Samina Shaikh
Sarah Young
Shawn Lockwood
Sue Tippets
Sunny Williams
Tony Mercado
Vanessa De La Piedra

Project Support

Colin Kortman
Eva Marie Sans
Matthew Stone
Merna Leal
Terra Alpaugh

** alphabetical by first name.*

Acknowledgements continued inside back cover

Santa Clara Valley Water District

5750 Almaden Expressway
San Jose, CA 95118-3686
408-265-2600
www.valleywater.org

The Santa Clara Valley Water District manages an integrated water resources system that includes the supply of clean, safe water, flood protection, and stewardship of streams on behalf of Santa Clara County's 1.9 million residents.

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MESSAGE FROM THE CEO

NORMA CAMACHO, INTERIM

To develop a 50-year plan that considers all water resources within the boundary of Santa Clara County is no small task. Yet more sustainable, effective, and efficient management of water requires that we consider this precious resource with multiple uses in a more integrated manner and on a broader watershed and county-wide scale. This more integrated, multi-benefit look at water resources management is our One Water Plan.

The One Water concept is not new and can be heard throughout the state in water utility discussions. What is different about our integrated water resources master plan is that it includes not only drinking water, recycled water, imported water, and groundwater, but also flood waters, stormwater, creek water and water for the environment and its inhabitants. It builds on the past and current master planning efforts that have been carried out at local, regional, and state levels. It is a more holistic water resources management approach that allows us to address challenges and realize opportunities across the landscape, jurisdictional bounds, and water systems.

The benefits of an integrated water resources management approach include more efficient use of public funds, better prioritization, and greater collaboration. Management of water resources impacts all parts of our lives, be it our water supply and quality, our interactions with land and environment, or our social economic development. Success of One Water is greatly dependent on multifaceted collaboration and partnerships among diverse interests, stakeholders, and decision makers. Achieving One Water will require open communication and collaboration with stakeholders, regulators, other public agencies, and the public at large. This endeavor will also provide the District with a better understanding of community expectations and priorities.

This plan is a long-range, countywide vision for a One Water future. We must all engage in the effort to protect, preserve, sustain, and improve water resources to develop a resilient Silicon Valley for future generations.

1 INTRODUCTION

1.1 WATER IN SANTA CLARA COUNTY
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New parklands create floodplain and quiet recreation space in urban San Jose. From the air, the hills represent the shapes of salmon swimming upstream. Photo: SCVWD

INTRODUCTION

1.1 WATER IN SANTA CLARA COUNTY

The Santa Clara Valley Water District is the primary water resources agency in Santa Clara County, California, located at the southern end of San Francisco Bay in the heart of Silicon Valley. The District is responsible for providing clean, safe water, flood protection, and stewardship of streams on behalf of the county's 1.9 million residents. The District shares its jurisdictional boundary with Santa Clara County, serving 1,300 square miles and 15 cities.

In this document, the District presents its vision for an integrated, countywide, 50-year One Water Plan, reflecting the changing context of water management in the 21st century. For Santa Clara County, the last century was a time of intense urban development and change, as well as a time when critical water-management activities were incrementally collected under one roof. In 1929, a countywide groundwater management agency was established, the earliest origins of today's Santa Clara Valley Water District. In 1958, flood protection was added to its mission to provide a more coordinated countywide approach to flood management. In the 2000s, District activities expanded into stream stewardship. Today, Santa Clara Valley Water District activities involve not only supplying water and protecting people from floods, but also maintaining healthy creek corridors and entering into partnership agreements to provide appropriate public access to county waterways.

Water Supply

Making sure Santa Clara County residents, businesses, and farmers have enough clean water for drinking, bathing, irrigation, and industry is a central responsibility of the District. Water supply is also important for the fish and wildlife in streams and water bodies managed by the District.

The County uses more water than is available locally. About 55 percent of the water used in the county originates hundreds of miles away in the

PLAN FOCUS

The One Water Plan integrates the water supply, flood protection, and stream stewardship missions of the water district at the watershed scale. Drawing from detailed existing programs and plans, One Water seeks to find the nexus between these three mission components for new opportunities in integrated water resources management. One Water does not replace the substantial existing planning in place by the District's Water Utility Enterprise and the Watersheds Division but instead looks for opportunities to further protect and enhance water resources.

The One Water Plan is long term endeavor that seeks to build up to long term improvements in water resources management and watershed conditions. One Water will operate under the current commitments, regulations, and existing restrictions and challenges that drive District operations and day-to-day work. This means that not all strategies will be practicable and not all goals and objectives can be carried out simultaneously. In the end, however, the established framework called out in this One Water Plan identifies a roadmap for integrated water resources management for the future. Not all District activities can be integrated, nor all activities managed under One Water, but all types of water will be considered in building upon past successes to manage these valuable resources as One Water.

The One Water Plan is a Santa Clara Valley Water District plan first and foremost, but includes robust opportunities for stakeholder engagement by organizations, agencies, and the general public. This engagement will aid the District in understanding community concerns and allows input and review; however, the District Board of Directors is responsible for funding the planning effort and approving related documents. One Water will be shared as a series of documents, through its website, and through publicly shared meetings, and so it has a broad audience.

Sierra Nevada and Cascades and is delivered through the Sacramento-San Joaquin Delta or the San Francisco Public Utilities Commission's Regional Water System. Most of the remainder comes from local rainfall, much of which is captured in the District's 10 local reservoirs, or infiltrates as natural groundwater recharge. Delta-conveyed and local surface water is released into creeks and percolation ponds to replenish local groundwater aquifers, or is piped directly to one of the District's three drinking water treatment plants. Water recycling and conservation are important components of the District's water supply system. To provide greater reliability, the District also "banks" water in groundwater storage outside of the county, which can be called upon during dry times.

The District manages the two major groundwater subbasins in the county – the Santa Clara and Llagas Subbasins – to maintain reliability for groundwater users, including retailers, irrigators, businesses, and residents. The District also delivers treated drinking water to retailers.

Flood Protection

Protecting homes, businesses, and transportation networks from the devastating effects of floods is another of the District's primary responsibilities. Long before the Santa Clara Valley was developed, local streams flooded naturally with great regularity. Floods cleared streams of debris, and silt flowed from the streambeds to adjacent land, replenishing the nutrients in the soil. Far from a disaster, flooding benefitted the environment. As the county's population and economy grew, however, flooding became a problem. Today, communities can suffer millions of dollars in property damages from flooding and vital roadways become impassable.

In the early days, flood protection meant straightening creeks and lining them with concrete. Over the years, however, community values, and engineering and environmental perspectives on flood management, have changed. The District has worked to keep pace with these changes and now employs numerous flood protection technologies that help keep creeks as natural and beautiful as possible. New multipurpose flood protection projects protect property while preserving habitat, improving water quality, and providing creekside trails where appropriate.

Stream Stewardship

Protecting and caring for more than 800 miles of creeks and rivers in Santa Clara County is another part of the District's work. Unique among water agencies, state legislation authorizes the District "to enhance, protect, and restore streams, riparian corridors, and natural resources in connection with carrying out the purposes set forth in [the District Act]."

The health of a creek reflects the conditions throughout the watershed, not just those along its banks. The District's environmental work protects and restores habitats and encourages the recovery of special status species. In addition, the District partners with cities and the county of Santa Clara to provide open space and recreational opportunities along creeks and at many of its reservoirs where appropriate throughout the county. It also partners with regional initiatives to restore baylands to tidal and shorebird habitats along San Francisco Bay's southern shore.

Restored Stevens Creek on Blackberry Farm, Cupertino. Photo: City of Cupertino

GENERAL PRINCIPLES

SANTA CLARA VALLEY WATER DISTRICT

Board of Directors

*The Board of the District has adopted directions to the Board Appointed Officers as to the intended results, organizational products, impacts, benefits, outcomes, recipients, and their relative worth (what good for which recipients at what costs).**

In implementing Board directions, staff will be guided by the following general principles:

1.1. An integrated and balanced approach in managing a sustainable water supply, effective natural flood protection, and healthy watersheds is essential to prepare for the future.

1.2. Effective public engagement in accomplishing the District mission is achieved through communication that involves the diverse community and key stakeholder groups in a transparent and open manner.

1.3. Collaboration with government, academic, private, non-governmental, and non-profit organizations is integral to accomplishing the District mission.

1.4. A net positive impact on the environment is important in support of the District mission and is reflected in all that we do.

1.5. Recognize that District services are critical to the economic vitality of Silicon Valley.

** Recipients refers to those receiving flood protection, water supply, or ecological benefits from District activities.*

A full explanation for the principles listed above, and Board Governance Policies; Ends, can be found at: www.valleywater.org/About/Board_of_Directors/Board_Governance_Policies/Ends.aspx

1.2 ONE WATER VISION

Water falls from the sky, flows over soil, through storm drains, and into rivers. It percolates into underground aquifers, fills reservoirs, nourishes plants, evaporates back into the atmosphere, causes floods, and irrigates crops. There is only so much water, and it's all the same water, one water.

Living in Santa Clara County, many people are not aware that their region naturally floods; or that under their roads and buildings the groundwater table rises and falls depending on rainfall, pumping from wells, or managed recharge. Most people are also not aware that the water they drink or use to water lawns or fill swimming pools may come from as far away as the Sierra Nevada or Cascade mountain ranges. Residents and businesses alike have grown used to a life where water flows unrestricted from the tap and where floods rarely threaten their property or access to homes, workplaces, shopping, or critical services. Yet in fact it has taken the construction and operation of a vast network of water delivery, storage, treatment, and flood protection facilities for this area to support today's densely developed and populous technology mecca.

> *"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

During the past near-century, water management evolved to solve problems one at a time, such as ensuring sufficient water for annual crops, or conveying excess winter flows away from valuable property. Current thinking suggests that water management issues would be best addressed on an integrated basis, where water resources are managed holistically. Fortunately, the District has also evolved over many decades and is now one of the few water management agencies in California that handles water supply, flood protection, and environmental stewardship, all in one. The One Water Plan looks at opportunities to integrate the management of flood water, stormwater, drinking water, groundwater, creek water, surface water, recycled water, and all water as One Water.

> *The District manages water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.*
>
> ONE WATER VISION STATEMENT

Additionally, multi-objective planning on a watershed scale, as proposed in the One Water Plan, is consistent with plans and direction from environmental resource agencies (see page 32, Table 3-1). This alignment can be leveraged in partnership with these agencies to focus on integrating water resources management and improving watershed health as opposed to coordinating solely on a project-by-project basis.

The District's One Water Plan was developed to plan and prioritize activities that will improve water supply reliability, flood protection, and environmental stewardship by capitalizing on the interconnected nature of all aspects of water management. Developed from District expertise and refined based on feedback from local communities and organizations, scientific experts, and land use agency representatives, this plan reflects a commitment to scientific rigor, integrated watershed-scale considerations, and stakeholder engagement. The One Water Plan incorporates knowledge from past planning efforts, builds on current related planning efforts, and coordinates with relevant District and stakeholder or partner programs to provide improved guidance for partnering with community volunteers and with other agencies.

1.3 PLAN ORGANIZATION

- ***Chapter 1*** introduces concepts underlying the planning process and provides the overall context for this planning effort, including how thinking about water resources has changed through the years. It also describes the geographic setting of Santa Clara County, including the major watersheds throughout the project area. The chapter concludes with a history of the countywide One Water Plan development process.
- ***Chapter 2*** describes the past cultural and natural history of the Santa Clara County area, its human development, and milestones in the development of the Santa Clara Valley Water District.
- ***Chapter 3*** describes present conditions in the county, with a focus on water resources infrastructure and operations, as well as current challenges.
- ***Chapter 4*** describes projected future conditions and challenges, including climate change.
- ***Chapter 5*** discusses the framework of the One Water Plan, describing the Vision, Goals, Objectives, and Strategies.
- ***Chapter 6*** discusses the attributes, metrics, and targets that were developed to measure progress toward meeting the objectives detailed in the One Water Plan. It also outlines how these will be used to prioritize and select projects and activities toward meeting the One Water objectives and goals.
- ***Chapter 7*** discusses implementation of the countywide One Water Plan, including opportunities, scheduling, and funding.

1.4 THE COUNTY SETTING

The County covers 1,300 square miles of mountains, foothills, valley, and baylands in the southern part of the San Francisco Bay Area in Northern California. The geographic centerpiece of this landscape is the Santa Clara Valley, which hosts the heart of Silicon Valley, plus more than a dozen cities, as well as many acres of working farmland, especially at the southern end of the Valley.

The Santa Clara Valley runs the entire length of Santa Clara County from San Francisco Bay south to the Pajaro River, and is bracketed by the Diablo Range on the east and the Santa Cruz Mountains on the west. The Santa Cruz Mountains extend to almost 4,000 feet in elevation, while the Diablo Range is somewhat lower at over 1,000 feet in elevation (SCV HP 2012). Roughly hourglass in shape, the Santa Clara Valley is approximately 11 miles wide at the southern end of San Francisco Bay, narrowing to about a half mile wide at an area known as the Coyote Narrows, where the two ranges nearly converge near Metcalf Road, approximately 10 miles southeast of downtown San José. Valley floor elevations increase from sea level at the baylands south to approximately 370 feet above mean sea level around Cochrane Road in the City of Morgan Hill.

The valley is generally split into two geographic regions; northern Santa Clara County is extensively urbanized and houses approximately 90 percent of the county's residents in 13 cities and towns. Southern Santa Clara County, or south county, remains predominantly rural, with the exception of two cities: Gilroy and Morgan Hill. Low-density residential developments are also scattered along the valley floor and foothill areas.

Beneath the land surface lies one of Santa Clara County's most valuable resources: groundwater. The County's two major groundwater subbasins (the Santa Clara Groundwater Subbasin to the north and the Llagas Groundwater Subbasin to the south) have vast storage capacity, estimated to be more than two times the capacity of all the District's 10 surface reservoirs combined.

For ease of description, Santa Clara County has been divided into three distinct regions: the hills, the valley floor (which includes urbanized and rural landscapes), and the baylands. These terms will be used throughout the One Water Plan.

The hills, or upper watersheds, encompass the lands in the Santa Cruz Mountains and in the Diablo Range, as well as the low foothills on either side of Santa Clara Valley, which house many of the District's 10 reservoirs.

The valley floor encompasses the built, urban zone downstream of the foothills and upstream of the baylands. This area includes lands between the cities of Palo Alto and Milpitas in the northern portion of the county and Morgan Hill and Gilroy in the south. In addition, there are many farms and undeveloped open spaces, which are more common in the south county (the rural landscapes).

The baylands are located at the northern edge of the county and encompass the former and current wetlands and coastal floodplains at the fringe of San Francisco Bay between the lines of high and low tides. The baylands include marshlands, diked and managed ponds currently or formerly used for salt production, and areas that were once inundated by tidal waters but have been filled and subsequently converted to residential, commercial, or industrial uses.

The hills, valley floor, and baylands of Santa Clara County all connect via streams that drain from the mountains to sea level in distinct watersheds. A watershed consists of the area of land where all surface water drains to a common waterway, including water from storm drain systems, as well as the underlying groundwater. Each watershed begins at a headwaters and flows down a creek before joining another stream or emptying into a lake or reservoir, a wetland, a bay, or the ocean. At times, water may also just disappear into the ground. Ridgelines tend to mark watershed divides, where water flows downhill on either side of the highest ground.

Wherever you are, you are in a watershed. Larger watersheds contain many smaller subwatersheds. For example, Calero Creek flows into (is a tributary of) Alamitos Creek, which then combines with Guadalupe Creek to form the Guadalupe River (the common waterway). Therefore, the Guadalupe River Watershed is partially made up of the Calero Creek, Alamitos Creek, and Guadalupe Creek subwatersheds. Manmade structures and urban landscapes can alter natural watershed functions through the installation of storm drain systems, the redirection of waterways, and the building of canals or ditches that transfer water from one watershed or subwatershed to another. Understanding the concept of a watershed is important because stream flow and water quality are affected by natural or human-induced conditions occurring upstream of any point in a creek.

County Watersheds

For flood protection and stream stewardship purposes, the Santa Clara Valley Water District divides the county into five major watersheds: the Coyote Creek Watershed, Guadalupe River Watershed, Lower Peninsula Watersheds, and West Valley Watersheds, all of which drain northward to San Francisco Bay, and the Pajaro River Watershed, which drains southward to Monterey Bay. Each watershed or subwatershed is slightly different in terms of its vegetation, soils, hydrology, human uses, and development. In the next phase of the One Water Plan effort, each of the following watersheds will have its own detailed plan. However, as part of this regional introduction, it is helpful to consider the variety of watersheds in Santa Clara County.

Coyote Creek Watershed

The 321-square-mile Coyote Creek Watershed flows northward into San Francisco Bay, extending from the vast natural areas of the Diablo Range down to the urbanized valley floor and baylands. This is the largest and most diverse watershed in the county, and its natural areas include rare serpentine soils and sensitive plant communities requiring special management, and several streams that are home to steelhead trout. Upper Penitencia Creek is one of Coyote Creek's main tributaries, with Cherry Flat Reservoir (owned and operated by the City of San Jose) located in its upper reach. Other tributaries include Fisher Creek, Upper Silver Creek, Lower Silver/Thompson creeks, and Lower Berryessa Creek. District-owned reservoirs in this watershed include Coyote and Anderson reservoirs, both located on the main stem of Coyote Creek east of the City of Morgan Hill.

Guadalupe River Watershed

The headwaters of the 170-square-mile Guadalupe River Watershed originate in the Santa Cruz Mountains, with major tributaries including Los Gatos Creek, Guadalupe Creek, and Alamitos Creek (of which Calero Creek is a tributary). This watershed has a history of intense mercury mining activities, which has resulted in legacy mercury contamination of reservoirs, streams, and ultimately San Francisco Bay. The Guadalupe River originates at the confluence of Guadalupe Creek and Alamitos Creek, just downstream of Coleman Road in San Jose. From there it flows north approximately 14 miles through heavily urbanized portions of San Jose, eventually discharging to San Francisco Bay via Alviso Slough. Los Gatos Creek joins the Guadalupe River in downtown San Jose. District-owned reservoirs in this watershed include Lexington Reservoir and Vasona Lake on Los Gatos Creek, Guadalupe Reservoir on Guadalupe Creek, Almaden Reservoir on Alamitos Creek, and Calero Reservoir on Calero Creek. The District operates the Almaden-Calero Canal which enables the transfer of water from Almaden Reservoir to Calero Reservoir. The San Jose Water Company owns and operates the Lake Elsman reservoir, located on Los Gatos Creek above Lexington Reservoir.

West Valley Watersheds

The West Valley Watersheds comprise an 85-square-mile area of several small watersheds, including San Tomas Aquino Creek (of which Saratoga Creek is a major tributary), Calabazas Creek, and the Sunnyvale East and Sunnyvale West channels. These watersheds are primarily characterized by channelized creeks on the valley floor and more natural streams in the hillsides, such as Saratoga Creek, which supports a native rainbow trout population. Agricultural and flood control drainage efforts in the 19th century connected all of the West Valley waterways to Guadalupe Slough at the southern end of San Francisco Bay. The District does not own or operate any reservoirs in the West Valley Watersheds area.

Pajaro River Watershed

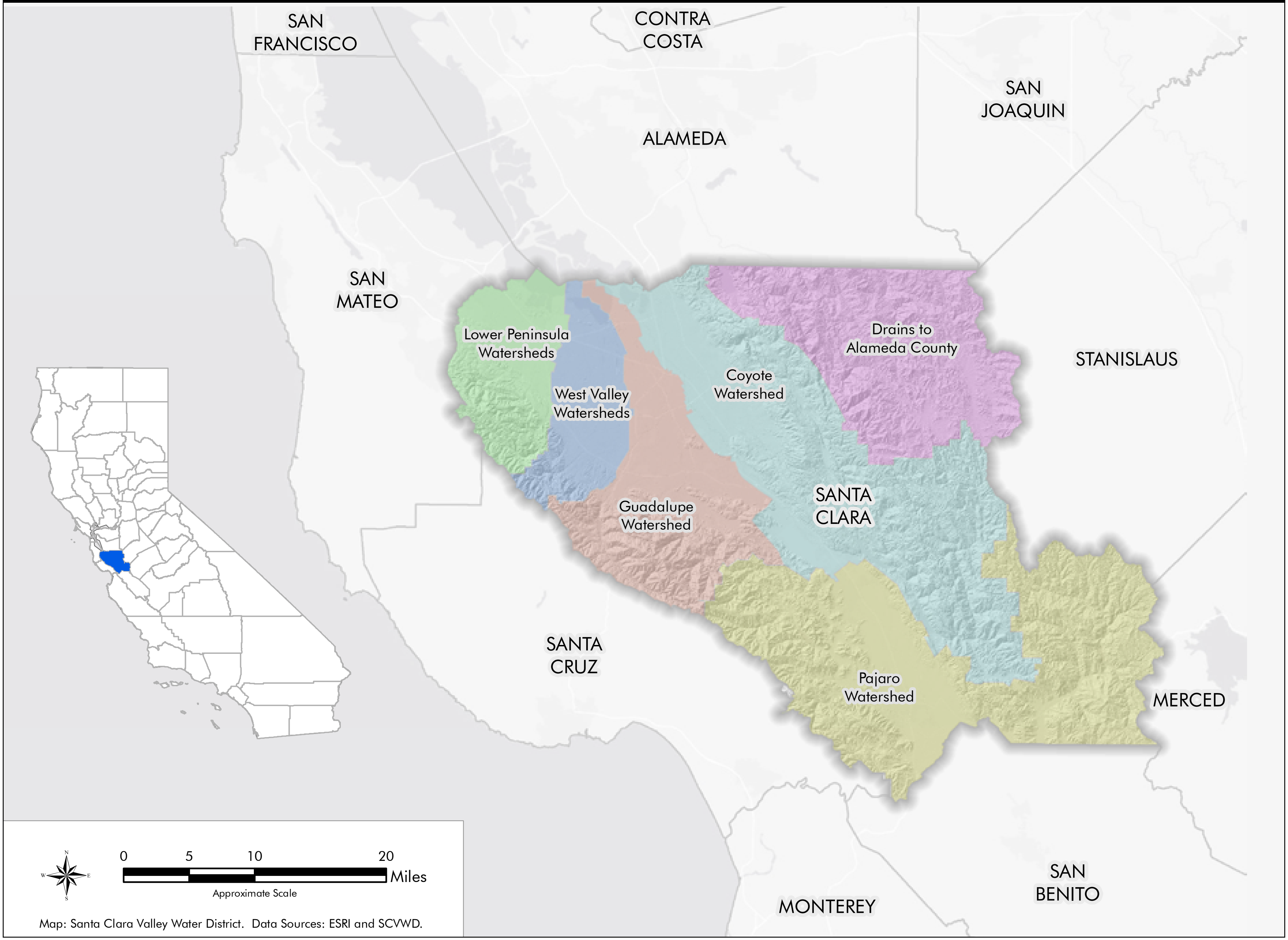
The Pajaro River Watershed originates from both the Santa Cruz Mountains and the Diablo Range and drains to Monterey Bay. This is a largely rural landscape supporting farming communities and cattle ranches, and growing crops like garlic, artichokes, red bell peppers, and mushrooms. It also includes significant open space and natural areas. The Pajaro River marks the southern boundary of Santa Clara County, as it abuts San Benito County. Within the geographical boundaries of Santa Clara County, major tributaries include Uvas Creek, Llagas Creek, and Pacheco Creek. South county businesses, residents, and farmers are primarily reliant on groundwater for their water supply, and the District actively recharges the Llagas Groundwater Subbasin by percolating local and imported water through a series of streams, channels, and percolation ponds.

The Uvas Creek and Llagas Creek subwatersheds cover a 104-square-mile region of the larger Pajaro River Watershed. Uvas Reservoir on Uvas Creek and Chesbro Reservoir on Llagas Creek are operated by the District and are important components in the recharge of groundwater. Downstream of the reservoirs, several miles of both Uvas and Llagas creeks are located on the unconfined portion of the Llagas Groundwater Subbasin, which is the "recharge zone" where the creeks generally lose water via percolation into the aquifer. The District operates a water transfer pipeline, the Uvas/Llagas Transfer Pipeline, to transport excess water from Uvas Reservoir east to Llagas Creek in order to supplement percolation in Llagas Creek and the downstream Church Avenue off-stream Recharge Ponds. The Pacheco Pass Water District owns and operates Pacheco Reservoir located on North Fork Pacheco Creek, in the Pacheco Creek Watershed.

Lower Peninsula Watersheds

The 98-square-mile area designated as the Lower Peninsula Watersheds consists of the San Francisquito Creek, Stevens Creek, Permanente Creek, Adobe Creek, Barron Creek, and Matadero Creek watersheds, which feed the tidal wetlands along the San Francisco Bay's southwest shoreline. This area encompasses a fair amount of open space and public parkland, especially at higher elevations, and several streams support steelhead trout. In addition, the tidal reaches of many of the creeks in the Lower Peninsula Watersheds support the

Figure 1-1: Santa Clara County Watersheds



Map: Santa Clara Valley Water District. Data Sources: ESRI and SCVWD.

state and federally endangered Ridgway's rail and salt marsh harvest mouse. For the most part, Los Trancos Creek and the portion of San Francisquito Creek downstream of the Los Trancos Creek confluence mark the northwestern boundary between Santa Clara and San Mateo counties. Stevens Creek Reservoir is the only District reservoir in the Lower Peninsula watersheds.

Stanford University owns Searsville Dam on San Francisquito Creek in San Mateo County, as well as Felt Lake, an off-channel reservoir on Los Trancos Creek in Santa Clara County. Permanente Diversion Channel, constructed in 1959, transfers the majority of flows from upper Permanente Creek to Stevens Creek.

Steelhead. Photo: James Hobbs

1.5 PLAN DEVELOPMENT

As described, the District is developing the One Water Plan in two phases: 1) a county-level master plan to identify countywide issues and opportunities for integrated water management, and to guide future watershed efforts; and 2) watershed level plans specific to each of the five watersheds described above.

In developing the countywide plan, the District first considered past and present conditions for six elements that aid in categorizing water resources topics (water supply, water quality, flood protection, landscape resources, ecological resources, and the baylands) and then examined future challenges such as climate change and continued development (Chapters 3-4). Plan development then focused on crafting One Water goals, objectives, strategies, and a framework for implementation (Chapters 5-7).

From the beginning in 2014, planning has been a collaborative process, with input from District staff and its Board of Directors, and from stakeholders representing the larger community of Santa Clara County, partner agencies, and regional science experts. Stakeholder engagement for the One Water Plan is ongoing, and primarily being carried out by convening a Stakeholder Work Group with local stakeholders and an Agency Planning Team with state and federal resources agency staff, and by individual outreach to interested groups. Additionally, the District maintains a website for the Plan and is using technical support from several partners for the planning effort.

Stakeholder Work Group

The Stakeholder Work Group (SWG) has been the primary vehicle for soliciting local stakeholder input and feedback on the One Water Plan, meeting approximately bi-monthly during plan development. The group is intended to represent all or most aspects of the community at large. The SWG's role is to review District products (e.g., goals, objectives, and strategies) and provide perspective from their areas of interest. SWG routinely works at a various levels of detail, reviewing materials and providing comments from big picture to wordsmithing. Stakeholder input is incorporated as much as feasible while the District Board retains authority for final approval of the One Water Plan and associated products. (See page 11 opposite for Stakeholder Work Group roster.)

Agency Planning Team

The Agency Planning Team (Agency Team) has been a group of resource and regulatory agencies providing input on the One Water Plan, meeting on a quarterly basis in general. The group helps to ensure that the Plan aligns with their strategic plans and policies; local agencies like the District play a critical role in helping these other agencies meet their goals. The Agency Team role is at a higher level than the SWG, with more input on the big picture and less on fine scale details. The Agency Team includes all regulatory agencies as well as Department of Water Resources and Natural Resources Agency staff. (See page 11 opposite for Agency Team roster.)

Science Advisory Hub

The Science Advisory Hub (SAH) has been a group of local and well-respected scientists organized by the Aquatic Science Center on the District's behalf to provide impartial feedback on the master planning process (See page 11 opposite for hub members).

Details on the One Water Plan development process, including agendas and minutes, can be found at www.valleywater.org/iwrmp

ONE WATER PLANNING PARTICIPANTS

STAKEHOLDER WORK GROUP

Newsha Ajami, Stanford Woods Institute for the Environment

Maria Angeles, City of Gilroy Public Works Department

Colin Bailey, Environmental Justice Coalition for Water

Jill Bicknell, Santa Clara Valley Urban Runoff Pollution Prevention Program

John Bourgeois, South Bay Salt Pond Restoration Project

Kelly Briggs, Department of Water Resources

Janet Burback, Santa Clara County Farm Bureau

Brenda Buxton, State Coastal Conservancy

Ann Calnan, Santa Clara Valley Transportation Authority

Rosemary Cambria, Muwekma Tribe

Leslie Chan, Santa Clara County Parks and Recreation Department

Janny Choy, Stanford Woods Institute for the Environment

Dr. Katherine Cushing, San Jose State University

Brandon Davis, Downtown Streets Team

Eric Dunlavey, City of San Jose

Anthony Eulo, Morgan Hill

Matt Freeman, Santa Clara Valley Open Space Authority

Victor Garza, La Raza Roundtable of California

Andrew Gere, San Jose Water

Kit Gordon, Sierra Club

Russ Hancock, Joint Venture Silicon Valley

Nicole Harvie, San Jose Municipal Water

Barry Hill, Santa Clara County Parks & Recreation Department

Mario Iglesias, City of Morgan Hill

Alice Kaufman, Committee for Green Foothills

Sherrie Kennedy, Santa Clara County Farm Bureau

Dhruv Khanna, Santa Clara County Farm Bureau

Shani Kleinhaus, Santa Clara Valley Audubon Society

Kirk Lenington, Midpeninsula Regional Open Space District

Alan Leventhal, San jose State University

Eileen McLaughlin, Citizens Committee to Complete the Refuge

Mike Mielke, Silicon Valley Leadership Group

Reverend Moore, II, San Jose/Silicon Valley National Association for the Advancement of Colored People

Stephanie Moreno, Guadalupe-Coyote Resource Conservation District

Bob Nunez, La Raza Roundtable of California

Jonathan Padilla, Chamber of Commerce, San Jose Silicon Valley

Ken Podgorsek, United Neighborhoods of Santa Clara County

Jeff Provenzano, City of San Jose Municipal Water System

Abby Ramsden, The Nature Conservancy

Ed Rast, United Neighborhoods of Santa Clara County

Curt Rayer, San Jose Water Company

Chris Richardson, Downtown Streets Team

Peter Schultze-Allen, Santa Clara Valley Urban Runoff Pollution Prevention Program

Bill Shoe, Santa Clara County Planning & Development Department

Risk Smelser, City of Gilroy

Jake Smith, Santa Clara Open Space Authority

Salote Soqo, Environmental Justice Coalition for Water

Edmund Sullivan, Santa Clara Valley Habitat Agency

Ian Teresi, Santa Clara County Farm Bureau

Terry Trumbull, San Jose State University

Mark Turner, Chamber of Commerce, Gilroy

Terri Wegener, California Department of Water Resources

Dan Wendell, The Nature Conservancy

SCIENCE ADVISORY HUB

Peter Baye, PhD

Andy Collison, PhD

Letitia Grenier, PhD

Peter Mangarella, PhD

Bruce Orr, PhD

Steve Rottenborn, PhD

AGENCY PLANNING TEAM

Brenda Blinn, Senior Environmental Scientist, Bay Delta Region, California Department of Fish and Wildlife

Jared Blumenfeld, Regional Administrator, Region 9, U.S. Environmental Protection Agency

Kelly Briggs, Division of Flood Management, California Department of Water Resources

Carmel Brown, Executive Policy Officer, California Department of Water Resources

Dan Castleberry, Assistant Regional Director, Pacific Southwest Region, US Fish and Wildlife Service

Mike Chotkowski, Bay Delta Regional Field Supervisor, California Department of Fish and Wildlife

Holly Costa, San Francisco District Regulatory Division Chief, North Branch, U.S. Army Corps of Engineers

Phillip Crader, Deputy Director, California State Water Resources Control Board

Adam Czekanksi, San Francisco District Deputy Commander, U.S. Army Corps of Engineers

Jane Diamond, Water Division Director, Region 9, U.S. Environmental Protection Agency

Katerina Galacatos, U.S. Army Corps of Engineers

Susan Glendening, Environmental Specialist, San Francisco Bay Regional Water Quality Control Board

Kenneth A. Harris, Jr., Executive Officer,

Central Coast Regional Water Quality Control Board

Jane Hicks, Regulatory Division Chief, San Francisco District, U.S. Army Corps of Engineers

Shin-Roei Lee, Supervising Water Resources Control Engineer, Watershed Management Division, San Francisco Bay Regional Water Quality Control Board

Keith Lichten, Chief, Watershed Management Division, San Francisco Bay Regional Water Quality Control Board

Lisa Mangione, Regulatory Division, San Francisco District, U.S. Army Corps of Engineers

Lisa McCann, Manager, Watershed Planning and Protection, Central Coast Regional Water Quality Control Board

Steve Moore, Board Member, California State Water Resources Control Board

Colonel John C. Morrow, U.S. Army Corps of Engineers

Jennifer Norris, Field Supervisor, Pacific Southwest Region, US Fish and Wildlife Service

ONE WATER PLANNING PARTICIPANTS

AGENCY PLANNING TEAM - CONTINUED

Ryan Olah, Pacific Southwest Region,
US Fish and Wildlife Service

Tami Schane, Environmental Scientist, Bay Delta Region, California Department of Fish and Wildlife

Pascale Sournoy, San Francisco Bay Conservation and Development Commission

William W. Stelle, Jr. Regional Administrator, West Coast Region, National Marine Fisheries Service, National Oceanic and Atmospheric Administration

Joseph Terry, Pacific Southwest Region, US Fish and Wildlife Service

Kristopher Tjernell, Special Assistant on Water Policy, California Natural Resources Agency

Luisa Valiela, San Francisco Bay Lead, Water Division, Region 9, U.S. Environmental Protection Agency

Lisa Van Atta, California Coastal Office,

National Marine Fisheries Service, National Oceanic and Atmospheric Administration

Terri Wegener, California Department of Water Resources

Craig Weightman, Environmental Program Manager, California Department of Fish and Wildlife

Dyan C. Whyte, Assistant Executive Officer, San Francisco Bay Regional Water Quality Control Board

Scott Wilson, Bay Delta Program Manager, California Department of Fish and Wildlife

Bruce H. Wolfe, Executive Officer, San Francisco Bay Regional Water Quality Control Board

2

PAST CONDITIONS

Valley of Heart's Delight, Santa Clara. Photo: Oregon State University

PAST CONDITIONS

This chapter describes the history of the Santa Clara Valley, from pre-European settlement to present. It begins with a brief historical ecology and then summarizes 200 years of changes to the landscape and its water resources by humans. It also introduces the general history of the Santa Clara Valley Water District.

2.1 HISTORICAL ECOLOGY

The topography and ecology of Santa Clara County are the result of thousands of years of natural processes, including tectonics, erosion, deposition, and the movement of water across the landscape. The County's underlying geology and fault zones affected the distribution of landforms and soil types, which in turn influenced vegetation, and natural communities' distribution and abundance, and thereby influenced wildlife species distribution and abundance. On a regional scale, geologic activity has also greatly affected the patterns of stream formation and the structure and function of local watersheds.

Topography in the region reflects active tectonics associated with the fault system of the San Andreas plate boundary. The Santa Clara Valley is a structural trough, or depression, created by the uplifting of the surrounding mountain ranges due to seismic activity along the San Andreas Fault on the western edge of the valley and the Hayward and Calaveras faults on the eastern edge. This trough includes San Francisco Bay to the north and the San Benito Valley to the south.

Streams flowing down from the mountain ranges deposited alluvial sediments—clays, sands, and gravels—on the valley floor over hundreds of thousands of years, resulting in relatively flat topography and creating the groundwater basins.

Atop these soils and varied topography a variety of natural flora and fauna emerged. Before European settlers disturbed the historical ecology of the Valley, it was dominated by stately oaks which dotted the landscape all the way from Palo Alto to the Pajaro River. These oaks formed savannas and woodlands that covered more than half of the valley, providing food and shelter for native wildlife.

In low-lying areas of the valley, clay soils and high groundwater levels precluded oaks from thriving. In these places, vast wetland complexes sustained rich communities of native wildlife. These complexes included seasonally flooded meadowlands, freshwater marshes, springs, ponds, and willow groves that covered thousands of acres. In the lowest portions of the valley adjacent to San Francisco Bay, intricate mosaics of tidal marsh, tidal channels, and natural salt ponds buffered storm surges and provided habitat for wildlife.

Of particular regional significance, in terms of its scale, was a valley floor wetland complex called Laguna Seca, which at one point covered over 1,000 acres. Formed by the emergence of groundwater in the valley, Laguna Seca was a natural depression with poor drainage flanked by the Santa Teresa Hills and the natural levee of Coyote Creek. Wet meadows, tule marshes, willow groves, and ponds received water from groundwater discharge and creeks that are now connected across the valley floor as part of the Fisher Creek drainage. These perennial wetlands provided a rare source of summer water for wildlife.

The valley's many creeks were ribboned with riparian habitat extending from the hills to the Bay, providing habitat and migration corridors for an array of wildlife. These corridors ranged from 1,000-foot wide willow forests on the lower Guadalupe River to even broader sycamore-alluvial woodlands on intermittent reaches of Coyote, Llagas, and other creeks.

Historically, the valley's stream network did not have continuous, channelized flow: as many streams entered the valley, they meandered across the valley floor in an S-shape and then spread out into wetlands or disappeared into porous alluvial soils. These processes contributed to aquifer recharge and the creation of wetland complexes that retained water even during the dry season. One account published in 1905 by John Snyder explains "On the approach of the dry season all the streams of the region rapidly shrink, both in volume and length, only one of them, Coyote Creek, discharging water into the bay during the entire summer. Much of its bed is dry, however, for part of the year, the water sinking soon after leaving the mountains, and appearing again about 2 miles above its mouth."

During the wet season, some of the creeks flowed into the baylands along the fringe of San Francisco Bay at the northern end of the Santa Clara Valley. These baylands once consisted of an expansive marsh plain and large tidal prism that supported an extensive network of tidal channels. Lowland areas along the bay often have fine-textured, saline, clay-rich soils.

All of the conditions described above are shown in the historical conceptual model of the valley (see pages 16-17). Historical ecology and other related information is available at: www.sfei.org/he

Figure 2-1. The historical drainage network (ca. 1800) depicted in blue and the modern drainage network in 2007 (SFEI, 2010)

HISTORICAL LANDSCAPE (CA.1850)

Historically, the Santa Clara County landscape contained a variety of habitats maintained by a natural disturbance regime that included drought, wildfires, and floods. The stream network supported diverse wildlife and hundreds of miles of riparian forest. Streams that entered the valley floor were largely intermittent (seasonal). Many had wintertime flows that spread out and sank into porous alluvial soils, recharging the aquifers and supporting wetland complexes where shallow groundwater intersected the land surface. Oak savannas and woodlands covered more than half the valley, especially the fertile, well-drained upper portions. In the lowest parts of the valley, seasonally wet meadows, freshwater marshes, and willow groves existed on clay soils. Along the Bay, the Baylands included a mosaic of tidal marsh, tidal channels, salt pannes, and other habitats that supported wildlife and buffered the valley edge from storm surges.

Courtesy of Santa Clara County, 1850

Landscape Region	Key Hydrogeomorphic Features & Processes	Key Biological Features & Processes
Hills (hillslopes and channels)	• A mix of channels with intermittent and perennial flow • Most precipitation is infiltrated, which maintains elevated riparian soil moisture and supplies water and nutrients to channels • Complex channel morphology, with frequent scour maintaining pools and recruiting large woody debris (LWD) and sediment from banks and adjacent hillslopes • Quasi-stable channel geometry	• Wildfires and soil moisture dynamics support forests in the shaded canyons and grasslands and chaparral on exposed hillslopes • Floods and soil moisture support narrow contiguous riparian corridors • Coarse sediment supply and high flows support wet season spawning and rearing habitat for salmonids • LWD, riparian shade, and discharge from springs and groundwater-supported wetlands support cool water temperatures and dry season habitat for native fish and other wildlife species
Valley Floor (fans, channels, and floodplains)	• A mix of channels with intermittent and perennial flow, with many channels terminating on alluvial fans • Frequently inundated floodplains, with water and nutrients infiltrating into the groundwater basin • Dynamic channel morphology, with frequent floods causing channel avulsions and the recruitment of LWD and sediment from banks • Quasi-stable channel geometry	• Grasslands and oak savannas are dominant on well-drained sandy soils while wet meadows, ponds, and freshwater wetland complexes occur on clay soils and are supported by flood inundation and shallow groundwater exposed in topographic depressions • The wide riparian corridor vegetation changes moving downstream as soil permeability and groundwater dynamics shift • High flows support seasonal migration of native salmonids • Riparian shade and shallow groundwater near the Baylands support cool water temperatures and perennial aquatic habitat in stream channels
Baylands (upland-marsh ecotone, marsh plain, and tidal channels)	• Fluvial water, fine sediment, and nutrients frequently delivered to the marsh plain and upland-marsh ecotone during flood events • Tidal water, fine sediment, and nutrients delivered to the marsh plain daily and the upland-marsh ecotone during storm surges • Expansive marsh plain and large tidal prism supports scoured mainstem channels and extensive tidal channel networks	• The upland-marsh ecotone is supported by flood inundation and shallow groundwater and is dominated by low gradient seasonally wet areas adjacent to tidal marsh • Habitat types include tidal marsh and salt panes, which provide a range of habitat options for variable climatic and tidal conditions • The tidal channel network provides habitat for a variety of aquatic species and mainstem channels provide salmonids access to watersheds
Groundwater Basin (shallow and deep aquifers)	• Shallow and deep aquifers recharged by stream flows coming from the hills and precipitation on the valley floor • In some locations, shallow groundwater supplies water and nutrients to freshwater wetlands, perennial channels, and to the upland-marsh ecotone • Shallow aquifer fresh-saline mixing zone is near the head of tide	• Areas with high infiltration rates are characterized by grassland, oak savanna, and sycamore alluvial woodland, and have mostly intermittent creeks • Low-lying areas with clay soils often intersect shallow groundwater and tend to support perennial ponds and freshwater marshes, willow groves, and perennial stream reaches

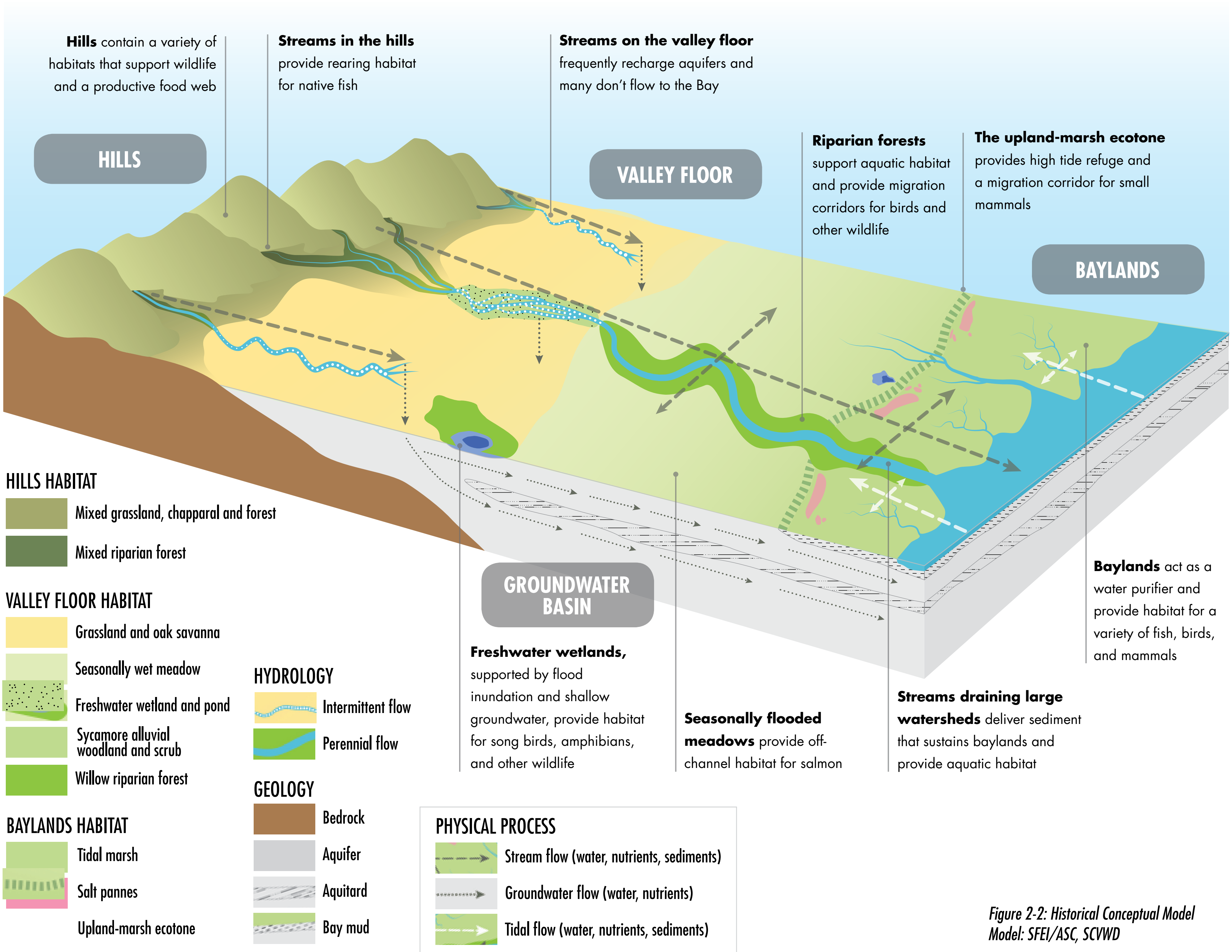


Figure 2-2: Historical Conceptual Model
Model: SFEI/ASC, SCVWD

2.2 TWO HUNDRED YEARS OF CHANGE

THE EARLIEST INHABITANTS

Humans have probably inhabited Santa Clara Valley for over 13,500 years, yet evidence dates to only 4,200 years ago due to geomorphic processes that disturb fossils and artifacts in the soil. Until about 2,500 years ago, Native American populations were seasonal—they moved in and out of the valley to take advantage of natural resources along the coast and inland.

In 1769, when Spanish explorers first visited the valley as part of the Portola expedition, the Native Americans they found living there spoke dialects of the Ohlone (Costanoan) language. Two separate groups inhabited the valley portions of the Pajaro River, although exact territorial boundaries between the tribes are unknown. These first inhabitants of the valley lived fairly lightly on the land, fishing in rivers and natural ponds and lakes, hunting, and gathering acorns, seeds, and plants. They also used controlled burns to manage vegetation and increase its productivity, which probably led to more open woodland and savannas, increasing the seed yields and making it easier to harvest acorns. But this type of land management declined in the early 19th century, with Native Americans succumbing to introduced diseases and relocation by the Spanish.

1700s
Missions and Ranchos

In 1777, the Spaniards established the first pueblo on the banks of the Guadalupe River—where the city of San Jose sits today. That same year, Father Junipero Serra founded Mission Santa Clara in Santa Clara. With the founding of the mission, livestock—mainly cattle and sheep—were brought into lower Santa Clara Valley. The wet meadows offered plenty of food and water for cattle. At the Santa Clara Mission, the Spanish planted fruit orchards and vegetable gardens, and cut down large oaks in order to plant fields of grain.

By 1834, landholding patterns in the valley had begun to change, as lands held by the missions were granted to prominent Mexican residents, and the missions' land holdings were greatly reduced. The new landowners greatly increased their heads of cattle, and the properties became known as "ranchos." The Gold Rush in 1848, and California's transition from a Mexican to an American territory heralded the end of the relatively brief Rancho era. The drought of 1862-1864 ruined cattle ranches all across the state—southern Santa Clara Valley was hit hard, and thousands of cattle starved or were killed. Ranchers who owned richer soils with natural sources of water began raising dairy cattle, sheep, and wheat.

1800s
Railroads, Farms, Orchards, Mines

New connections along the Southern Pacific Railroad opened up markets for farmers in Santa Clara Valley, and by the 1860s, large fields of wheat covered the land from San Jose to Gilroy. Wheat fell out of favor quickly, though, as it had a low profit margin compared to hay and fruit and was costly to ship. By the early 1870s, farmers, ranchers, and dairymen began drilling hundreds of groundwater wells, which provided water for irrigating crops and to water and feed dairy cattle. Willow groves were transformed into gardens and orchards. In the late 1800s and early 1900s, orchards expanded exponentially in the valley: prune, plum, and apricot trees, as well as grapes, were popular crops. For much of the 1800s and 1900s, the area was so agriculturally productive, with thousands of acres of blooming fruit trees, it became known as "The Valley of Heart's Delight."

Though farmers and communities had originally relied on surface water runoff, by 1865 free flowing artesian wells and wells pumped by windmills became a common sight in the valley. In addition to using well water, farmers dammed and diverted streams to provide water to their orchards. As agriculture expanded, much of the riparian forests and wetlands were removed and drained; in many cases, land was farmed up to the edge of the streams, many rendered shadeless due to agricultural clearing. Farmers dug ditches to drain their land, and connected creeks that once naturally soaked into wetlands, sending them directly into the Bay instead. Farmers also created informal, non-engineered levees by mounding local soil along the edge of creeks to protect their fields or homes. These actions sometimes caused flooding.

During these same years, people began to develop other resources in the valley—from the shoreline to the upper watersheds. Baylands were diked and drained by salt makers, settlers, and communities. In 1852, the Crystal Salt Works first

New Almaden quicksilver mining district attempted to capitalize on the natural salt deposits along the San Francisco Bay shoreline. Beginning in 1854, marshland was diked to create artificial ponds for salt production—levees along the bayside edges of the marshes isolated them from tidal flows while internal levees allowed stepwise evaporation as the water moved from one pond to another and concentrated the salt. By 1862, there were as many as 20 acres of ponds, and several salt companies harvesting salt. Leslie Salt Refining Company formed in 1901 and took over the smaller companies, becoming the Leslie Salt Company (later Cargill, Inc.). Ultimately, it would manage more than 20,000 acres of salt ponds in the south bay. Local communities, including Alviso, supported brine shrimp fishermen who worked the ponds.

In the upper watersheds, miners picked away at cinnabar deposits. Cinnabar was processed into mercury or "quicksilver," an important tool in the gold-mining industry. For more than half a century, and until they closed in 1927, the New Almaden and Guadalupe quicksilver mines, located in the hills south of San José, added a legacy of this metal to the entire watershed. Rivers and streams carried sediment from the mine areas down to the Bay.

1900s-1930s
Early Pollution, Flooding, Subsidence

By the turn of the 20th century, nearly 14,000 acres of orchards and vineyards were being irrigated in Santa Clara Valley. Water running off the orchards resulted in an increase of fine sediments and pesticides to creeks. As valley agriculture grew, fruit canneries sprang up on the bayshore. Waste from the canneries—along with human sewage—overwhelmed the tidal sloughs and marshes. At times, their discharges caused hypoxic conditions and fish kills in the south bay (these lasted until the mid 1970s). More farmers began raising poultry and dairy cows to supply the growing population with meat, eggs, and milk. The dairies introduced pathogens and excess nutrients from animal waste to waterways.

Former cannery in Alviso, once the third largest in the country. Photo: alpharoaming.com. Label from historysanjose.org

As more people, farms, and businesses needed more water, they sank wells into the underground aquifer at an ever-increasing rate, and for the first time, local farmers noticed a significant drop in groundwater levels. As development continued, more water was pumped from the ground than nature could replenish, and sections of the valley floor began to sink. Some of this subsidence was permanent. Subsidence increased flood risk in the valley by decreasing the slopes of creeks, reducing flow velocity, and causing sediment to settle in the bottom. This filling-in (aggradation) coupled with a reduced velocity lowered channel capacity, creating more overbank flows. Valley homes, businesses, and lives were all affected. The town of Alviso sank so low it flooded many times in the years to come, and later became the focus of major flood protection planning in the 20th century. Subsidence also caused saline water from the Bay to flow inland, contaminating shallow groundwater.

In 1920, concern over steeply declining groundwater elevations and the permanent sinking of the land surface over many miles led farmers and business leaders to push for the formation of the Santa Clara Valley Water Conservation Committee. The committee hired noted engineer Fred H. Tibbetts of Campbell to study the situation and develop a plan. Tibbetts and his partner, Stephen Keiffer, recommended an ambitious project to construct 17 large reservoirs to capture rainfall and begin the process of replenishing the underground aquifer through artificial recharge. The Santa Clara Valley Water Conservation District, a forerunner to today's Santa Clara Valley Water District, formed in 1929 as a groundwater management agency. It began building reservoirs that could release water to streams and percolation ponds to recharge the underground aquifer and halt subsidence.

In 1935, Calero, Almaden, Guadalupe, Vasona, and Stevens Creek reservoirs were completed. Coyote Reservoir was completed in 1936. Recharging of the underground aquifers began. The South Santa Clara Valley Water Conservation District was formed to build percolation facilities and manage creeks and groundwater in southern Santa Clara County. But flooding remained a serious problem: floods in 1931, 1937, and 1938, halted transportation and inundated hundreds of acres of orchards and pastures.

1940s-1960s
Post War Growth, Early Industry, Imported Water

The population in the county jumped from 30,000 in 1940 to 90,000 in 1948, then to 291,000 in 1950. This explosive post-World War II population growth, combined with a major drought from 1940 to 1946, put a severe strain on local water resources. Groundwater levels kept dropping, due to increased agriculture, industry, and residential construction, and land subsidence worsened due to overpumping. Heavy rains in 1940, 1942, and 1943 triggered devastating floods, causing power failures and leaving four dead in the Gilroy area. In response, voters passed bonds for the Santa Clara Valley Water Conservation District to construct two more large dams for water storage and percolation, forming Lexington and Anderson reservoirs. The Central Santa Clara Valley Water Conservation District was formed to manage groundwater in the Morgan Hill region.

The 1950s were a period of rapid growth for the county, with the population doubling in one decade and the valley quickly evolving from a predominantly agricultural area to an industrial and urban center. To supply this growth, the use of groundwater continued to increase, and groundwater levels continued to fall. In 1952, the first imported water was delivered to the county through the San Francisco Public Utilities Commission's (SFPUC) Hetch-Hetchy system. However, it quickly became evident that the combination of SFPUC imported supplies and local water supplies could not meet the water demands of the growing county, and by 1957, Chesbro and Uvas dams were constructed to increase surface water storage and groundwater recharge efforts in south Santa Clara County.

When the region experienced devastating floods in 1952 (see Figure 2-4, p.23), a County commission called for coordinated flood control efforts to address the piecemeal approaches by landowners and developers. Replumbing of the valley's natural waterways had given landowners and developers the false sense of security that it was safe to build even more densely across the region, and buildings were built right up to the banks of many creeks, leaving no room for natural buffers. Without buffers and floodplains to dissipate flows, the creeks overtopped their banks. The "Christmas Week" floods of 1955 left thousands homeless—the Guadalupe River alone flooded 8,300 acres, the worst flood on that river in recorded history. In 1958, the Santa Clara County Flood Control and Water Conservation District was formed to provide a uniform approach to protecting the county from flooding (as well as to supplement local water supply with water imported from outside the valley). In many developed areas, flood walls and levees were built to contain high flows, and steep, smooth channels to convey the flows away.

Post World War II industrial growth also resulted in greater use of toxic chemicals and threats from spills, leaks, and discharges to surface and groundwater. Urban development transformed the natural landscape by paving large areas with impervious surfaces such as roads, sidewalks, parking lots and rooftops, reducing natural infiltration during storms. To protect new developments, cities, landowners, and developers installed underground storm drains that captured and efficiently delivered stormwater to the creeks and the Bay.

The County's population swelled to 642,000 by 1960. When local surface water supplies could no longer meet the growing County's needs, the District turned to imported water for recharge. In 1965, the state of California began delivering water to Santa Clara County via the South Bay Aqueduct. This imported water delivery system, known as the State Water Project, transported water about 40 miles from the Sacramento-San Joaquin River Delta to the county. The District also began building water treatment plants to treat a portion of the imported water to reduce the need for groundwater pumping. In 1967, the valley's first treatment facility, the Rinconada Water Treatment Plant, began operation in Los Gatos, and the District started delivering treated water to residents in the northwestern part of the county.

In 1968, the Santa Clara Valley Water Conservation District and the Santa Clara County Flood Control and Water Conservation District merged, forming one agency to manage water supply and flood programs for most of the county. A few years, later the Santa Clara Valley Flood Control and Water District changed its name to the Santa Clara Valley Water District. By 1969, the addition of imported water to the local recharge efforts had halted more than 40 years of land subsidence.

Palo Alto airport 1958

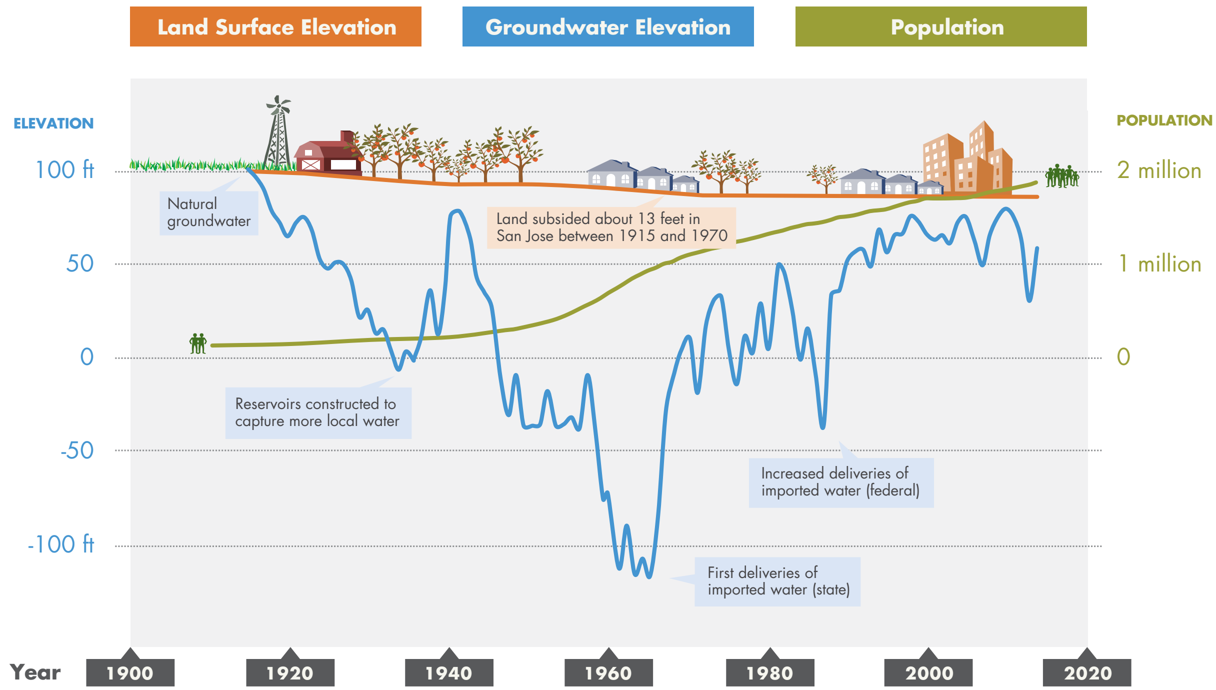


Figure 2-3: Santa Clara County Groundwater-at-a-Glance

1970s-1980s
More People, More Water

Even when the State Water Project was brought on line in the 1960s, it was apparent that additional imported water would be needed to ensure a reliable future water supply for the county. Historic droughts in 1976 and 1977 reduced deliveries from the State Water Project. To make sure each valuable drop of water was used efficiently and not wasted, the District established a water conservation education program. Conservation efforts achieved a 22 percent drop in water usage between 1976 and 1977. By the mid-1980s, groundwater pumping accounted for just half of the total water use in the county, and the rate of subsidence was reduced to about 0.01 feet per year.

During this period, the District also built more treatment facilities: the Penitencia Water Treatment Plant, located in the east foothills north of Penitencia Creek, came on line in 1974.

In 1987, following construction of the B.F. Sisk Dam and San Luis Reservoir west of Los Banos, the federal Central Valley Project began delivering imported water to Santa Clara and San Benito counties. The water arrived just as the valley entered a six-year drought. The Santa Teresa Water Treatment Plant began operating in 1989, giving the District the ability to fully utilize this additional source of imported water.

In the 1980s, addressing state and federal regulatory requirements to avoid or mitigate environmental impacts became a normal part of every construction project, with flood protection work particularly susceptible to causing impacts because of the sensitive natural habitats in and near creeks. The District hired biologists and environmental specialists to help ensure compliance with myriad environmental regulations. Water quality protection was also a major focus of the District as it was discovered that underground storage tanks were leaking and potentially contaminating groundwater.

The floods continued, with severe flooding in 1982, 1983, and 1986, heightening public interest in flood management projects. Funding for much needed projects was obtained through voter-approved benefit assessments and water utility revenue bonds.

During this period, the South Santa Clara Valley Water Conservation District was renamed the Gavilan Water District and, upon south county voter approval, was later annexed to the Santa Clara Valley Water District.

1990s
Silicon Valley, Drought, Increasing Demand for Water

The beginning of the Internet in 1995 attracted more people and businesses to the Santa Clara Valley and led to an initial wave of startups. This was also the beginning of the "dot-com" bubble, which collapsed in April 2001 when the stock market declined dramatically. The valley weathered these changes, remaining a center of research and development, and becoming one of the largest high tech centers in the country. To ensure water supply for these innovative businesses, and in response to a prolonged drought that had begun in 1987, the District stepped up its efforts to seek new sources of water supply through recycled water projects, the storage of excess water in other regions (called water banking), and an aggressive water conservation program. In the early 1990s, local wastewater agencies added additional treatment capabilities, enabling the county to use more recycled water. Per state and county health department guidelines, appropriately treated recycled water was considered suitable for parks, schoolyards, and landscape irrigation, including residential lawns. The South Bay Water Recycling Project began in 1995 with the cities of San José, Santa Clara, and Milpitas funding construction of 100 miles of pipeline in a 30 square mile area within their jurisdictions.

In 1996, the District initiated a long-term water supply planning process, the Integrated Water Resources Plan (IWRP). Projections indicated future severe droughts could result in a significant water supply shortfall of up to 100,000 acre-feet. To address this gap, the District, with help from IWRP stakeholders, selected four main water supply components: water conservation, water recycling, water banking, and long-term water transfers.

In addition to taking action on water supply, the District also increased its efforts to protect water quality. State regulators ramped up initiatives to manage stormwater pollution, promote watershed scale management, and curb priority pollutants such as mercury and PCBs, and the District responded by helping found the Santa Clara Valley Urban Runoff Pollution Prevention Program. On the drinking water side, the District embarked on a multi-year project to upgrade all three water treatment plants to ensure continued ability to meet all state and federal water quality standards. The upgrades included changing the primary disinfectant to ozone, increasing the treatment capacity at Rinconada Water Treatment Plant, and performing seismic upgrades.

As in past years, floods continued to plague the valley. Flooding in San Jose in 1995 highlighted the need to complete flood protection projects, especially on the Guadalupe River through downtown San Jose. Floods from Coyote Creek impacted several neighborhoods in San Jose in 1997, and the flood of record occurred in Palo Alto from San Francisquito Creek in February of 1998. Floods also occurred regularly in south county, with Llagas Creek and its tributaries proving troublesome to Morgan Hill and surrounding communities. These flood events helped kick off

The District's Anderson Dam in the Coyote Creek watershed, built in the 1950s in a natural gorge east of Morgan Hill, is now undergoing a seismic upgrade. Photo: SCVWD

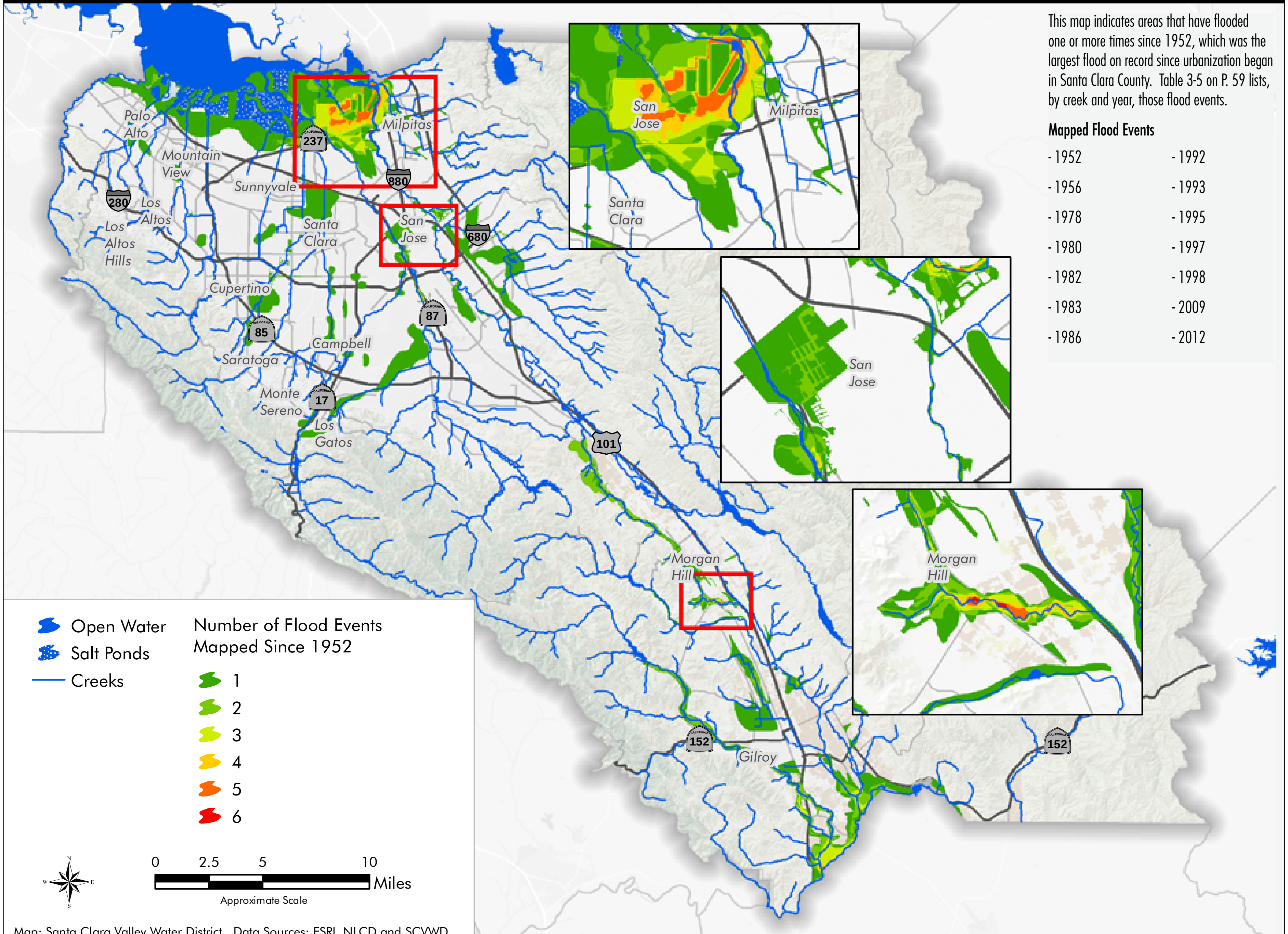
partnerships, land acquisitions, and studies to alleviate the flood problems in those (and other) neighborhoods. In conjunction with managing floods, the District also increased its efforts to protect the natural resources in its jurisdiction. In 1999, watershed stewardship was added to the District's mission. Changing community priorities, more stringent state and federal regulations, and an evolving environmental ethic led the District into the 21st century.

2000 - Present

The tech industry recovered from the dot-com bust. Companies like Apple, Google, and Facebook, which had all made their homes in the valley, become wildly successful. To ensure that these valued businesses had enough water to operate and residents enough water to drink, the District once again ramped up its efforts to conserve water, partnering with wastewater agencies to increase water recycling.

Addressing pollution from historic mining and other industrial activities also became a priority for the District, and it began working with state regulators and other partners to address mercury pollution to the Bay from the Guadalupe River Watershed. Mercury was found in Bay-caught fish at levels harmful to human health. A mercury TMDL for the watershed was completed in 2010, which resulted in a variety of remediation and cleanup activities within the county and watershed. The District also took the lead in addressing pollution from leaking gasoline

Figure 2-4: Flood Events Mapped Since 1952



This map indicates areas that have flooded one or more times since 1952, which was the largest flood on record since urbanization began in Santa Clara County. Table 3-5 on P. 59 lists, by creek and year, those flood events.

Mapped Flood Events

- 1952	- 1992
- 1956	- 1993
- 1978	- 1995
- 1980	- 1997
- 1982	- 1998
- 1983	- 2009
- 1986	- 2012

Map: Santa Clara Valley Water District. Data Sources: ESRI, NLCD and SCVWD.

RECENT WATER DISTRICT MILESTONES

2000: County voters endorse the Clean, Safe Creeks and Natural Flood Protection Plan (Measure B) and approve a special tax to ensure continuity of flood protection and stream stewardship services for 15 more years.

2001: The Governor signs Senate Bill 449, which amends the District Act by providing the District with the authority to "take an action . . . enhance, protect and restore streams, riparian corridors and natural resources in connection with carrying out the purposes set forth in the District [Act]." Those purposes are water resources management and flood protection.

2002: A new 10-year Stream Maintenance Permit reflects an era of partnership between the District and resource agencies, and allows the District timely seasonal access to creeks for improved maintenance and environmental enhancement.

2003: The District, Guadalupe-Coyote Resources Conservation District (GCRCD), and state and federal wildlife agencies enter into the Fisheries Aquatic Habitat Collaborative Effort (FAHCE) settlement agreement, which is a settlement to comprehensively address all issues in a complaint that the GCRCD filed with the State Water Resources Control Board. Their complaint challenged 15 District water rights and any related issues arising under state and federal laws concerning the impacts of the District's facilities and operations on the beneficial uses of Stevens Creek, Coyote Creek, Guadalupe River, and their respective tributaries.

2005: The 15-year, $346 million Downtown Guadalupe Flood Protection Project is completed, protecting an estimated 95,000 people from flooding and restoring critical endangered species habitat.

2006: The Santa Teresa Water Treatment Plant delivers the District's first ozonated water, providing customers with better-tasting, more healthful tap water.

2007: Assembly Bill 2435 passes, ending the county's oversight of the District's budget and other procedural holdovers from the 1968 merger. The Penitencia Water Treatment Plant begins delivering ozonated water to customers.

2008: The District is the first water agency in the state to become certified by the International Standards Organization (ISO), signifying consistency and excellence in its business and operations.

2009: The District Board calls for 15 percent mandatory conservation in response to continuing water shortage; the recession drives significant District budget reductions.

2012: Santa Clara County voters approve a special tax for the Safe, Clean Water and Natural Flood Protection program to continue funding to ensure a safe, reliable water supply, reduce toxins, hazards, and contaminants in the county's waterways, restore fish and wildlife habitat, provide open space access, and provide flood protection to homes, businesses, schools, and infrastructure.

2015: Following another year of drought, the District Board passes a resolution recommending that retail water agencies, local municipalities, and the county of Santa Clara continue to implement mandatory measures to achieve a 30 percent water use reduction target.

tanks (MTBE), and perchlorate (a chemical used in rocket fuel and explosives), which had contaminated more than 1,000 south county wells.

The District also became a major partner in efforts to restore the baylands fringing the shores of the valley. In 2003, the state and federal governments purchased a total of 16,500 acres of salt ponds in the north and south bay from Cargill Salt and began restoring the landscape. Wildlife started to colonize the improved shallow salt pond habitat and tidal marshes.

In the last decade, the District has continued to reaffirm its mission to provide Silicon Valley safe, clean water for a healthy life, environment, and economy, and to provide water supply, flood protection, and environmental stewardship for Santa Clara County. In the past, most projects and programs were planned, designed, and implemented to support one aspect of the District's mission. This One Water plan calls for more integration. By viewing and managing water as one resource, the District will be able to achieve its mission in a more integrated and sustainable manner.

3

PRESENT CONDITIONS

PRESENT CONDITIONS

Any planning process, such as the District's One Water planning process, creates an image of a desired future state then compares it to the current state and finally develops a plan for moving toward a desired future. This chapter documents the current state, or present conditions affecting water management, flood protection, and environmental stewardship in Santa Clara County, all of which informed development of the One Water Plan.

The chapter begins with an overview of current human population levels, county land uses, climate and rainfall, hydrologic challenges, and the regulatory environment that are the context for water management in Santa Clara County.

After providing this general context, the discussion of present conditions is organized into six planning elements: water supply, water quality, flood protection, landscape resources, ecological resources, and baylands. A seventh planning element, climate change, is captured in Chapter 4: Future Conditions. The District looked at these elements together to simultaneously examine the building blocks of the future and encourage the cross-disciplinary thinking of One Water planning.

3.1 OVERVIEW

Human Population and Land Use

Santa Clara County is the most populous of all nine San Francisco Bay Area counties. The County's current population of about 1.9 million is also one of the largest in the state. Nearly 92% of the county population lives in its cities. According to the Association of Bay Area Governments, Santa Clara County's population is projected to reach over 2.4 million by 2040 (ABAG, 2013).

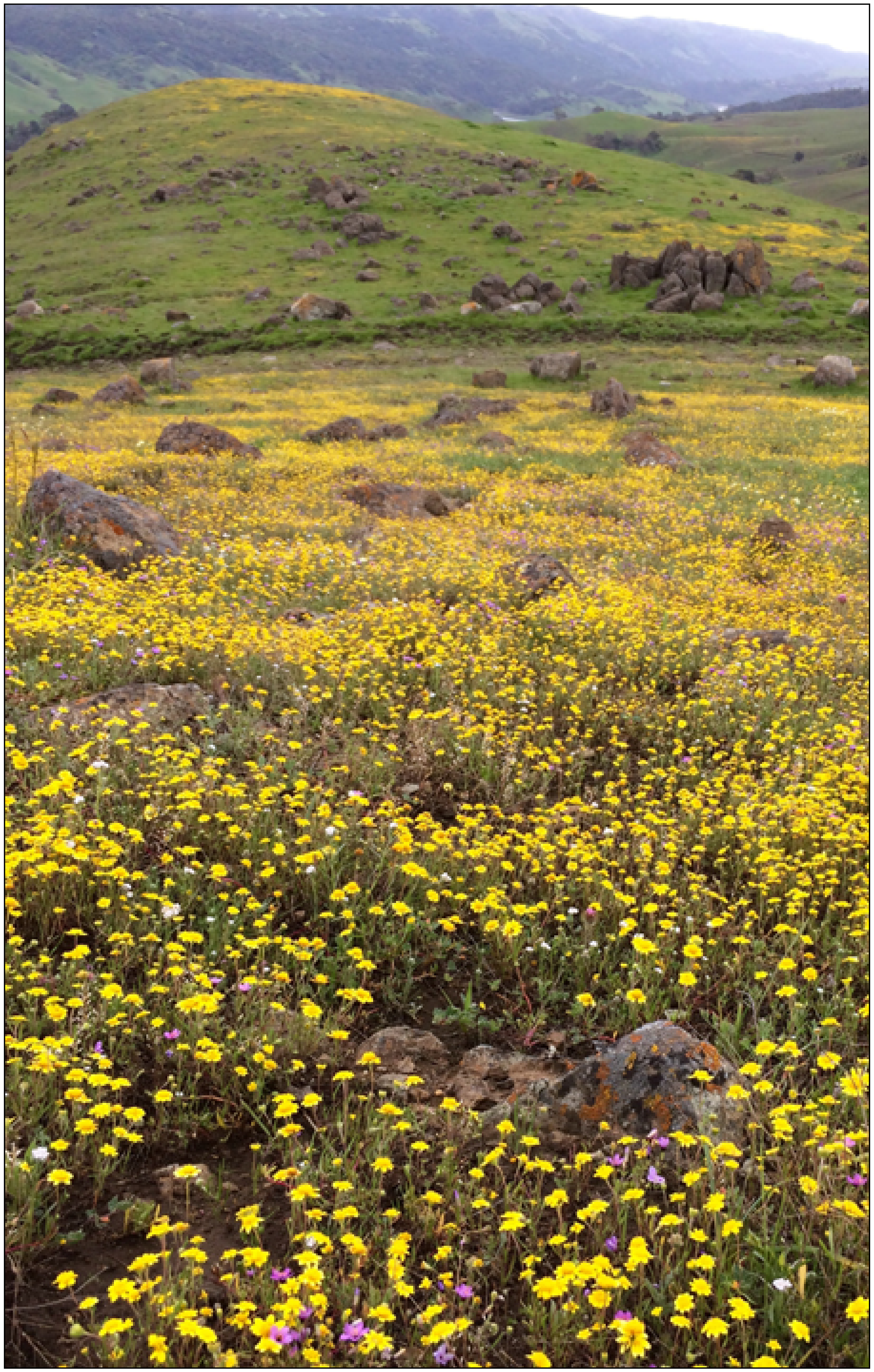
The county's economy remains one of the strongest in the nation, fueled by the high tech industry. That industry is behind the nickname "Silicon Valley," which encompasses most of the northern portion of the county, along with parts of San Mateo and Alameda counties. Agriculture, most of which now occurs in south Santa Clara County (south county), is also economically important. Currently in Santa Clara County, approximately 20,900 acres are in irrigated agriculture while 224,230 acres support grazing cattle.

Land use throughout Santa Clara County is varied (see Figure 3-1, p.28), ranging from open space reserves and ranchlands in the hills to dense urban population centers on the valley floor, complete with skyscrapers, mass transit, and major universities such as Stanford University, Santa Clara University, and San Jose State.

The baylands lie at or below sea level along San Francisco Bay in the northwestern portion of the county and consist primarily of former salt evaporation ponds, remnant or restored tidal wetlands, as well as residential, industrial, and commercial developments located on bay fill. Most of the county's salt ponds and wetlands are part of the Don Edwards San Francisco Bay National Wildlife Refuge and offer multiple opportunities for recreation such as hiking, birdwatching, and hunting. Multiple wastewater treatment facilities are located in the baylands, including the largest tertiary treatment plant in the western United States: the San José-Santa Clara Regional Wastewater Facility.

The valley floor within the northern part of the county is extensively urbanized, dominated by commercial and high-density residential uses. Industrial areas are clustered near the Bay and along major transportation corridors. The valley floor within the southern part of the county remains predominantly rural residential and agricultural, with the exception of the cities of Gilroy and Morgan Hill. Low- to moderate-density residential developments occur in the portion of the hills that rings the valley floor.

In the higher elevations of the Santa Cruz Mountains to the west of the valley, dense evergreen and hardwood forests predominate. Multiple open space reserves, regional parks, and other public lands are scattered throughout the western hills. The Diablo Range covers the eastern half of Santa



Wildflowers on Coyote Ridge.

Clara County and is dominated by rangeland and regional parks, consisting mainly of grasslands and oak woodlands. Both mountain ranges are characterized by steep- to moderate-sloping hillsides and active earthquake faults. Nine of the District's 10 reservoirs are located in the hills above the valley floor.

Climate and Precipitation

The climate and precipitation patterns of the region are key to understanding the water management challenges of Santa Clara County. The current climate, combined with regional topography and drainage patterns, influences water supply, flooding, and riparian habitat quality.

The region has a Mediterranean climate, characterized by extended periods of precipitation during the winter months and virtually no precipitation from late spring through autumn. The wet season generally extends from October through April.

Annual average rainfall varies significantly due to local topography. The Santa Cruz Mountains to the west of Santa Clara Valley receive 40 to 60 inches of rainfall per year. Santa Clara Valley lies in the rain shadow of the Santa Cruz Mountains, and precipitation falls an average of about 14 inches per year in the vicinity of downtown San José. The Diablo Range, to the east of the valley, receives 20 to 30 inches per year on its west-facing slopes.

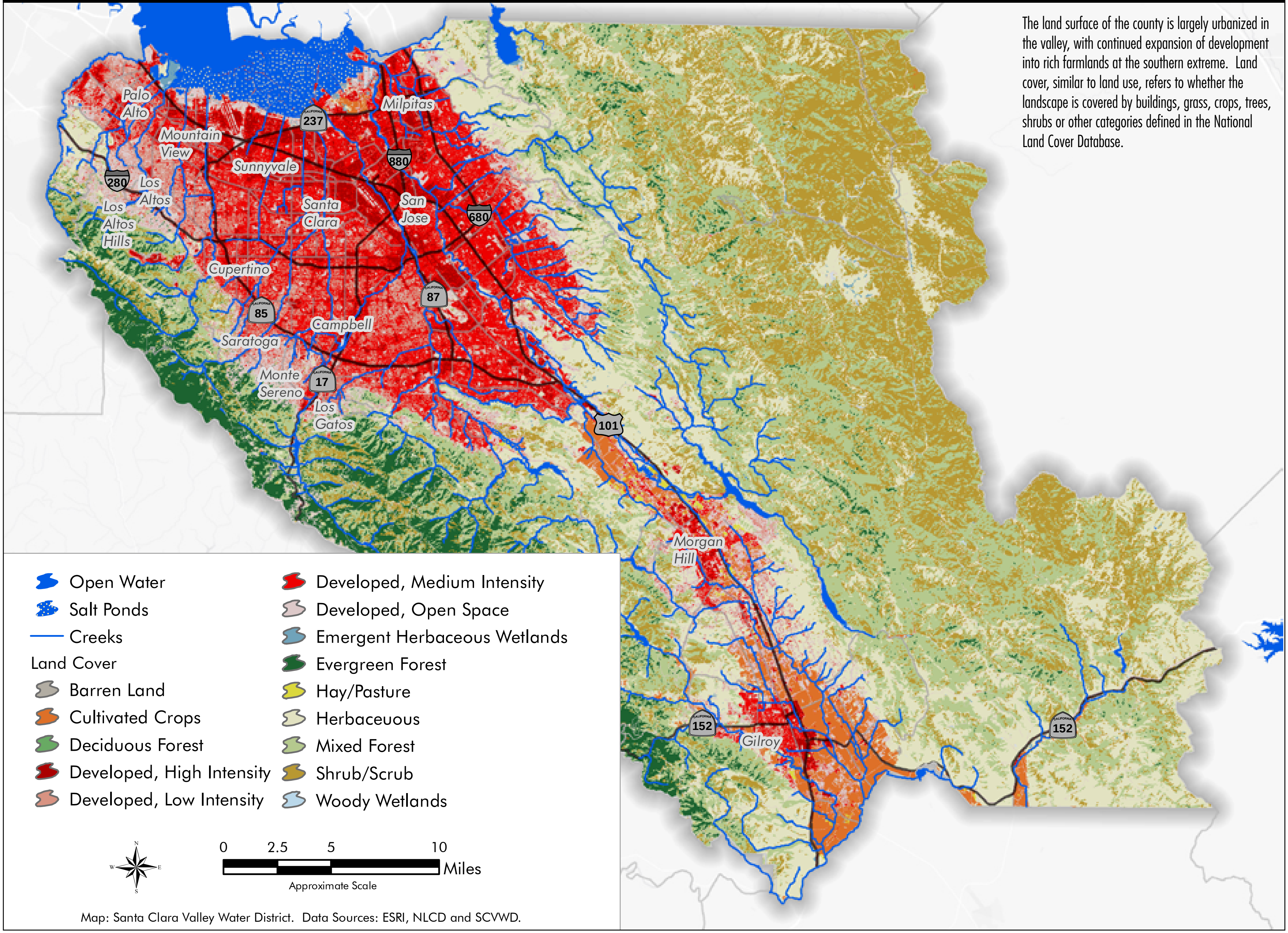
Average rainfall figures can be somewhat misleading because, in addition to seasonal variation, California experiences frequent droughts. For example, annual rainfall in San Jose between 1875 and 2015 had a wide range, from less than four to more than 32 inches. Scant amounts of snow may occur in the mountains where the headwaters for the watersheds are located, but they are not enough to create stream flow from snowmelt.

The Mediterranean climate also produces fairly mild air temperatures on the valley floor that rarely drop far below freezing. In the northern part of the county, the average summer temperatures are rarely higher than 90 degrees Fahrenheit. In south county, both summer and winter extremes are somewhat greater. Projected future conditions, including more intense storms, and more prolonged periods of drought and extreme heat days, will increase water management challenges related to the climate (see Chapter 4).

Hydrologic Changes of Management Concern

Chapter 2 on Past Conditions describes major impacts to the landscape and hydrology from urban, industrial, and agricultural land use in Santa Clara County—primarily on the valley floor. In general, impacts that continue to present challenges for Santa Clara Valley Water District management include paving and the creation of impervious surfaces, and alterations to streams and the disconnection of streams from their natural floodplains. How these impacts changed the

Figure 3-1: Land Cover



The land surface of the county is largely urbanized in the valley, with continued expansion of development into rich farmlands at the southern extreme. Land cover, similar to land use, refers to whether the landscape is covered by buildings, grass, crops, trees, shrubs or other categories defined in the National Land Cover Database.

Map: Santa Clara Valley Water District. Data Sources: ESRI, NLCD and SCVWD.

county landscape is represented in the contemporary landscape model (see pages 30-31).

A major challenge for today's water managers is the alteration of the natural hydrograph in streams. Dams and reservoirs now capture and store upstream flows on 10 creeks, thereby altering the scale and frequency of high flows to downstream areas. Additionally, the dams are operated to replenish groundwater aquifers, so where once the streams of the Santa Clara Valley rapidly shrank, both in volume and length during the dry season, there is now perennial water in most years.

The District operates reservoirs in accordance with rules that balance the beneficial uses of local waters, including water supply and the environment. Although beneficial for water supply purposes, dams block the passage of fish to upper watersheds and alter downstream habitat conditions such as water temperature. Dams also prevent the transport of coarse sediment downstream, which can lead to downstream channel erosion and incision (deepening of the streambed), as well as contribute to a lack of gravels, cobbles, and boulders essential for fish habitat. An ongoing management challenge for the District is to maintain both water supply and conditions benefiting fish spawning, rearing, and migration, while meeting the water supply needs of residents, businesses and industries that support the county's vibrant economy.

Downstream, a major challenge for water management is the disconnection of streams from their natural floodplains, and the alteration of stream channels as a result of past flood protection activities. Many lower watercourses were channelized in concrete or connected together to flow directly to the Bay, reducing overland flooding. These alterations dramatically changed the behavior and characteristics of the valley's creeks and wetlands, and present some ongoing challenges for a District endeavoring to implement more natural approaches to flood protection.

In the urbanized areas of the valley floor, another major challenge is the continued expansion of impervious surfaces. Natural and vegetated landscapes have been and continue to be replaced by paved areas unable to absorb water. Instead of infiltrating the soil naturally, rainfall in the urbanized environment is quickly transported off the landscape through a vast network of gutters, catch basins, underground pipes, and ditches. These stormdrain systems convey water directly to outfalls and creeks, which can result in unnaturally rapid changes in creek flows. This highly modified flow regime destabilizes streambeds and changes the sediment movement in creeks. The storm drain system is also a direct pathway for contaminants such as oil, pathogens, and trash to be transported to sensitive stream habitats. Impervious surfaces, and coordination with partners on stormwater impacts, remain an important ongoing management challenge for the District.

Current Regulatory Environment

Another management responsibility for the District is addressing government regulations (see Table 3-1, p. 32). Almost every aspect of District operations is governed by the numerous federal, state, regional, and local laws and regulations currently in place to protect people and the natural environment. The primary and overarching goals of all environmental laws and regulations are to 1) avoid impacts; 2) minimize impacts that cannot be avoided; and 3) mitigate for unavoidable impacts.

To identify and prevent significant potential environmental impacts, proposed District projects must be reviewed under the requirements of the California Environmental Quality Act (CEQA), and possibly the National Environmental Policy Act (NEPA) if the project has a federal nexus. District programs, projects, and activities that have the potential to affect people and/or natural resources such as wetlands, streams, water quality, habitat, and species are also likely to require permits (approvals) from regulatory agencies. For example, it is the responsibility of the District to fully comply with the regulations of the California Department of Fish and Wildlife for activities that alter lakes or streambeds; the Regional Water Quality Control Boards for impacts to waters of the state; the San Francisco Bay Conservation and Development Commission for work conducted in or near the Bay; and the U.S. Army Corps of Engineers and the appropriate Regional Board for discharge of dredged or fill material into waters of the United States, including federal jurisdictional wetlands. If any District activities have the potential to impact species listed under the federal Endangered Species Act or the California Endangered Species Act, the U.S. Fish and Wildlife Service or National Marine Fisheries Service and/or the California Department of Fish and Wildlife must be consulted.

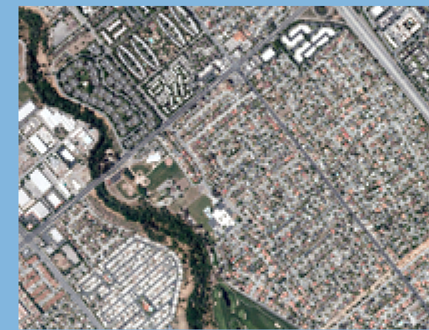
The District is committed to remaining in compliance with all environmental laws and regulations and cannot conduct work in the absence of these approvals. Acquiring all of the necessary approvals may take days, months, or even years, depending on project complexity. Regulatory considerations in this report are described as they pertain to each of the One Water planning elements.

Seven Planning Elements

The next six sections discuss the present condition in Santa Clara County of water supply, water quality, flood protection, landscape resources, ecological resources, and baylands. Within each of these planning elements, major issues, resources, infrastructure, and pertinent regulatory constraints are described, as well as ongoing management challenges. A seventh overarching topic, climate change, is covered as part of Chapter 4, Future Conditions.

CONTEMPORARY LANDSCAPE

Today, Santa Clara County is largely developed and densely populated, especially in the north. While dams on several streams have helped replenish the groundwater and prevent subsidence, they have also changed stream flow and sediment movement. Throughout the valley floor, the stream network is now fully connected by channels and storm drains that quickly move rainfall into creeks and out to the Bay. Oak savannahs and woodlands that covered the valley floor near the hills have been largely replaced by agricultural fields and residential developments. Wet meadows and freshwater marshes that dominated the valley floor were drained and converted to the valley's urban core. The dense riparian areas that lined the channels on the valley floor are largely gone as well. Baylands that once supported a wide array of tidal habitats along the shoreline have been mostly diked for industrial salt production or filled for agriculture and subsequent municipal uses. Current water and land management efforts have begun restoring portions of the ecological landscape, but more work is needed.



courtesy USDA, from NAIP, 2010

Landscape Region	Changes to Key Hydrogeomorphic Features & Processes	Changes to Key Biological Features & Processes
Hills (hillslopes and channels)	• Dams that support groundwater replenishment also change flow patterns and capture coarse sediment • Mining has increased hillslope erosion and impaired water quality (e.g., mercury)	• Land clearing/development has reduced hillslope and riparian habitat • Where dams exist, they block fish access to historical upper watershed spawning and rearing habitat and hold back spawning gravel from downstream reaches
Valley Floor (fans, channels, and floodplains)	• Many historically intermittent channels now flow year-round due to reservoir releases and urbanization (e.g. runoff from overwatering) • Channelization and levees cause most flood waters to bypass historical floodplains • Channel morphology is now highly simplified, with banks locked into place and beds intermittently cleared of LWD • Channel confinement, upstream flow/sediment impoundment, and artificial channel connections have caused many channels to incise • Widespread subsidence has flattened stream slopes, slowing flows and causing sediment deposits, and increasing flood risk	• Aquatic habitat is impaired by increased deposition of fine sediment and decreased availability of gravel in dam-controlled creeks • Decreased riparian vegetation, decreased rainwater infiltration, and impaired water quality has decreased dry season habitat for wildlife species • Some areas of grassland and oak savanna habitats remain, but wet meadow and freshwater wetland/pond habitats are almost completely gone • Remaining riparian corridors are relatively narrow • In-channel obstructions (e.g., legacy road crossings, bridge stabilization structures) block fish passage in some creeks; corrections are ongoing
Baylands (upland-marsh ecotone, marsh plain, and tidal channels)	• Levees prevent fresh water, tidal water, fine sediment, and nutrients from reaching the marsh plain and upland-marsh ecotone • Leveed channels in the tidal zone fill up with fluvial and tidal sediment, which increases flood risks	• Development has eliminated most of the upland-marsh ecotone • The Baylands, previously converted to industrial salt ponds and filled areas, are on a path toward restoration and reconnection with the Bay and reestablishment of habitat for native wildlife • Leveed channels still provide a pathway for fish into and out of the Bay but provide less overall aquatic habitat than they did historically
Groundwater Basin (shallow and deep aquifers)	• Natural recharge to the deep aquifers has decreased due to development and is currently insufficient to meet water supply needs • Excessive deep aquifer groundwater withdrawal in the early 20th century caused widespread land subsidence throughout the valley • Water from local reservoirs and imported water from the Sacramento/ San Joaquin Delta is used to recharge groundwater basins, allowing water supply needs to be met while preventing subsidence	• Shallow aquifer groundwater contamination (e.g., surface spills, underground tank leakage) may impact surface water quality where shallow groundwater re-emerges. • Historical land subsidence and sea level rise has resulted in the inland migration of the fresh-saline mixing zone in some creeks; the District proactively monitors whether this affects the near-bay shallow aquifer (though it is not used for water supply)

Figure 3-2: Contemporary Conceptual Model 2016. The Contemporary Conceptual Model, to be included in the countywide One Water Plan's final report, will describe current 2016 hydrogeomorphic and biological features and processes in Santa Clara County. The model will show how these features and processes have been changed by human development and alteration compared to the historical circa-1850 model on page 16-17. It will also describe current hills, valley floor, and baylands habitats.

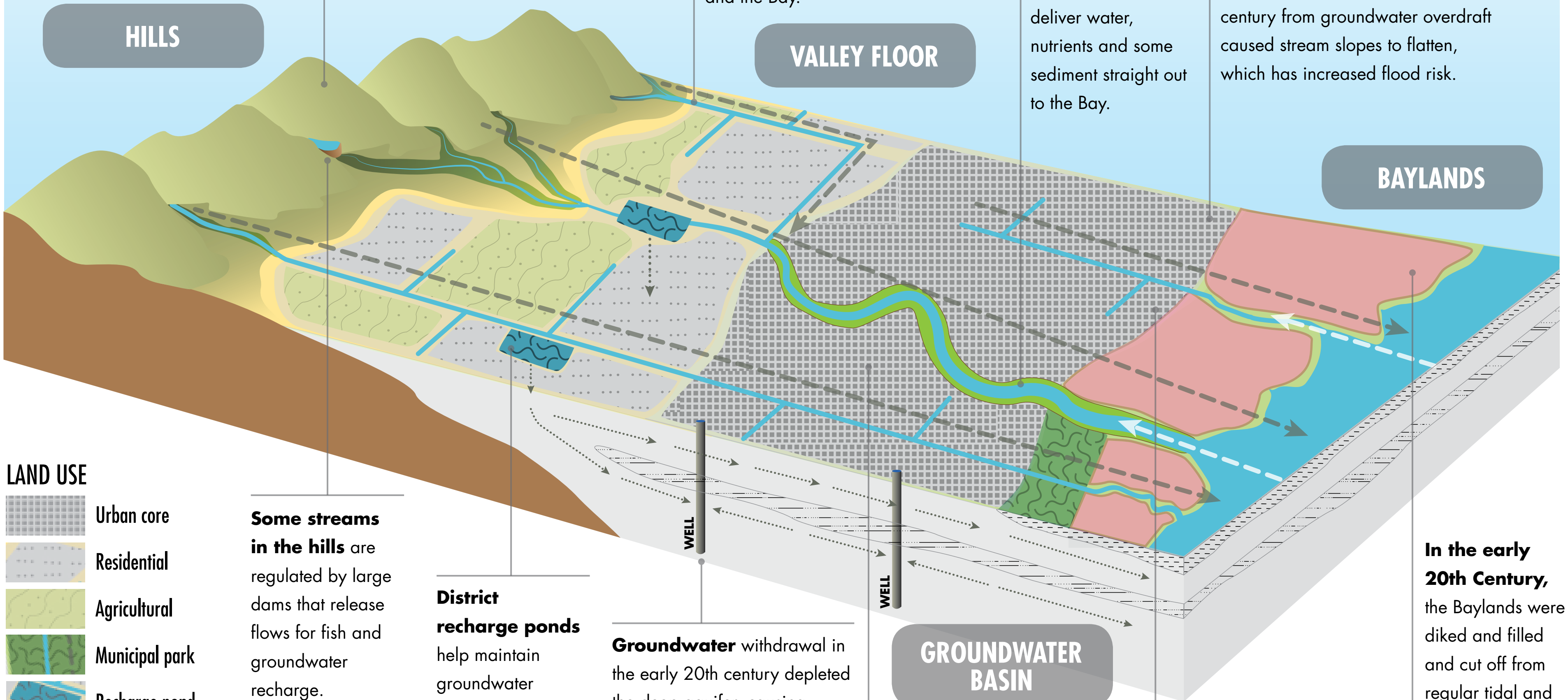
Some areas in the Santa Cruz mountains have a mining legacy that impairs instream water quality and habitat.

Large tracts of land in the hills have been permanently protected through acquisitions and easements.

Many streams on the valley floor are channelized and incised. All have permanent connections to larger channels and the Bay.

Streams draining large watersheds are leveed and deliver water, nutrients and some sediment straight out to the Bay.

Subsidence in the early 20th century from groundwater overdraft caused stream slopes to flatten, which has increased flood risk.



Some streams in the hills are regulated by large dams that release flows for fish and groundwater recharge.

District recharge ponds help maintain groundwater levels and prevent subsidence using local and imported water.

Groundwater withdrawal in the early 20th century depleted the deep aquifer, causing irreversible land subsidence. Since then, subsidence has been halted through managed groundwater replenishment.

The valley floor near the Baylands is highly urbanized and contains very few historical habitat features.

Some in-creek structures historically blocked fish migration during lower flows; many such barriers been removed or corrected in recent years.

In the early 20th Century, the Baylands were diked and filled and cut off from regular tidal and stream flows. Many of these areas are slated for restoration in the near future.

Widespread urbanization has confined creeks and increased the amount of runoff that enters creeks during storms.

LAND USE

- Urban core
- Residential
- Agricultural
- Municipal park
- Recharge pond

HILLS HABITAT

- Mixed grassland, chapparal, and forest
- Mixed riparian forest

VALLEY FLOOR HABITAT

- Grassland and oak savanna
- Willow riparian forest

GEOLOGY

- Bedrock
- Aquifer
- Aquitard
- Bay mud

BAYLANDS HABITAT

- Tidal marsh
- Diked salt ponds

PHYSICAL PROCESS

- Stream flow (water, nutrients, sediments)
- Groundwater flow (water, nutrients)
- Tidal flow (water, nutrients, sediments)

Table 3-1: Common Laws or Regulations and the Resource Agencies with Jurisdiction

Jurisdiction	Law or Regulation	Resource Agency
Federal	Clean Water Act (CWA)	U.S. Environmental Protection Agency (EPA); U.S. Army Corps of Engineers (Corps)
	Safe Drinking Water Act	U.S. Environmental Protection Agency; California State Water Resources Control Board (Division of Drinking Water)
	National Environmental Policy Act (NEPA)	Council on Environmental Quality
	Federal Endangered Species Act (ESA)	U.S. Fish and Wildlife Service (USFWS); National Marine Fisheries Service (NMFS)
	Rivers and Harbors Act	U.S. Army Corps of Engineers
	Migratory Bird Treaty Act	U.S. Fish and Wildlife Service
	Bald and Golden Eagle Protection Act	U.S. Fish and Wildlife Service
State	California Environmental Quality Act (CEQA)	All state agencies
	California Endangered Species Act (CESA)	California Department of Fish and Wildlife (CDFW)
	California Fish and Game Code	California Department of Fish and Wildlife; California Fish and Game Commission
	Porter-Cologne Water Quality Control Act	State Water Resources Control Board
	California Water Code	California Department of Water resources (DWR); State Water Resources Control Board; Regional Water Quality Control Boards
	California Code of Regulations	State Water Resources Control Board; Regional Water Quality Control Boards
	California Safe Drinking Water Act	U.S. Environmental Protection Agency; California State Water Resources Control Board (Division of Drinking Water)
	California Natural Communities Planning Act (NCCP)	California Department of Fish and Wildlife
	Sustainable Groundwater Management Act	California Department of Water Resources
	Urban Water Management Planning Act	California Department of Water Resources
	Water Conservation Act of 2009	California Department of Water Resources
Regional	San Francisco Bay Basin Water Quality Control Plan; Water Quality Control Plan for the Central Coastal Basin (Basin Plans)	San Francisco Bay Regional Water Quality Control Board; Central Coast Regional Water Quality Control Board
	Coastal Zone Management Act; McAteer-Petris Act	San Francisco Bay Conservation and Development Commission (BCDC)
Local	Local Ordinances	County of Santa Clara; various cities
	District Act	Santa Clara Valley Water District

Table 3.1 lists some of the laws, regulations, and resource agencies with regulatory jurisdiction over District activities. For more detailed information on all pertinent laws and regulations that affect District operations, see Appendix X.

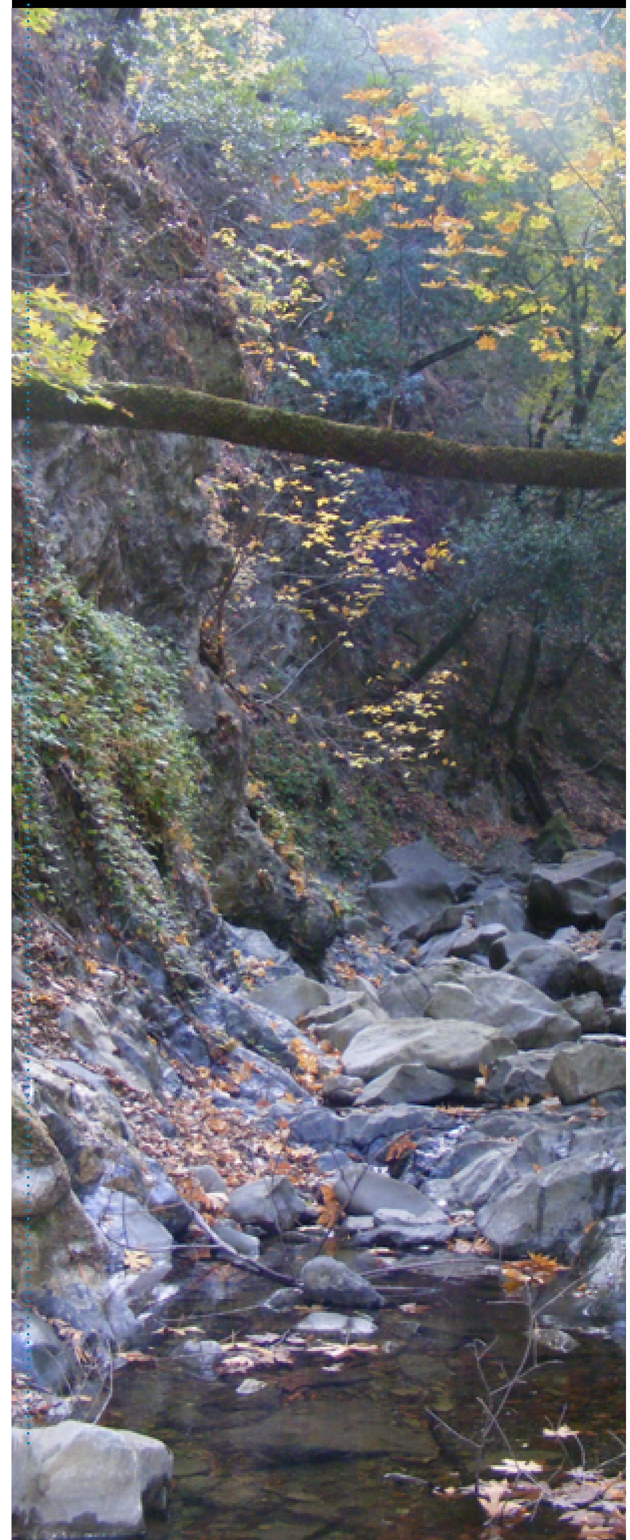
3.2 WATER SUPPLY

INTRODUCTION

Making sure Santa Clara County residents, businesses, and farmers have enough clean water for drinking, bathing, irrigation, and industry is a central responsibility of the Santa Clara Valley Water District. Water supply is also important for the fish and wildlife in streams managed by the District.

The District uses and manages a variety of local and imported water supplies. Groundwater in underground aquifers, and local surface water are the county's original sources of water supply. Much local rainfall and runoff now flows into reservoirs for storage or infiltrates to groundwater as natural recharge. Reservoir water is subsequently released into creeks and ponds to augment natural recharge and maintain groundwater levels. Some of the local surface water is processed at drinking water treatment plants. Water imported from the Sacramento-San Joaquin Delta is used for groundwater recharge or supplied to drinking water treatment plants. The treated water is sold to local water retailers who use their own distribution systems to serve customers. In addition, many private landowners, farmers, and water retailers pump groundwater. Local water supply is also augmented through water conservation; wastewater recycling and purification; deliveries to eight northern Santa Clara County agencies by the San Francisco Public Utilities Commission; and local surface water supplies managed by San Jose Water Company and Stanford University.

Providing water where and when it is needed requires a complex system of constructed and natural infrastructure. The District's countywide water supply, treatment, and distribution system includes surface water reservoirs, canals, water supply diversions, groundwater recharge ponds, controlled in-stream recharge, raw and treated water pipelines, pumping stations, and drinking water treatment plants. This complex infrastructure enables the District to store, treat, and distribute water. The District also uses a strategy called "conjunctive use" to make the best use of water



resources. In broad terms, conjunctive use means the coordinated management of both surface water and groundwater supplies to maximize the availability and reliability of supplies for meeting various management objectives. For example, in wetter times, excess surface water supplies are recharged into groundwater for use during dry times.

With demand for water increasing at the same time as experts predict increased frequency and severity of droughts, the District remains committed to balancing water supply development, conservation, and recycling as part of its water supply operations and long term planning. The One Water Plan will coordinate with existing District plans and programs in support of an integrated approach to water resources management.

WATER USE AND DELIVERY

County water supplies are used for residential, commercial, institutional, industrial, landscape irrigation, and agricultural purposes. Average county water use is about 360,000 acre-feet-per-year (AFY), which includes about 330,000 AFY for municipal and industrial use and 30,000 AFY for agricultural use.

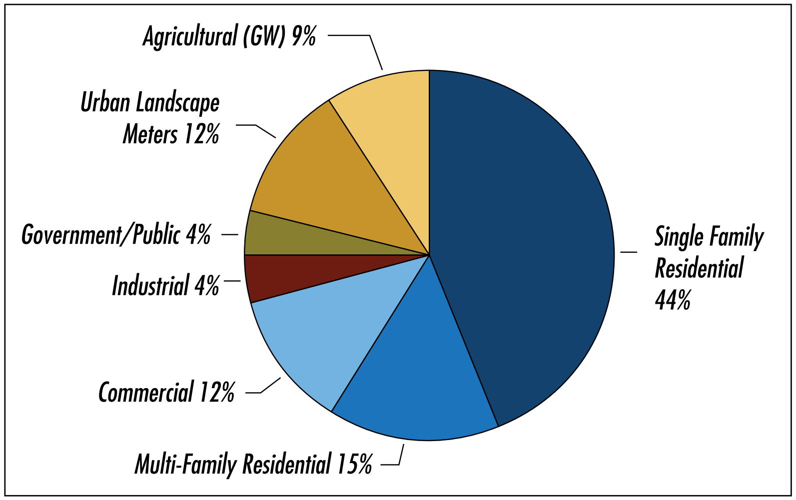


Figure 3-3: Percent Water Use Per Sector 2013

The residential sector uses the most water in the county (59 percent), followed by the commercial (12 percent) and urban landscape (12 percent) sectors. Agriculture, industrial, and institutional (government/public) sectors use approximately 17 percent of the total (see Figure 3-3). The County's use of water would be about 15 percent higher if not for water savings resulting from District and water retailer conservation programs.

The District delivers water, both treated and untreated, to users through a complex system of facilities (see Figure 3-6, p.40). Facilities include three drinking water treatment plants owned and operated by the District. The Penitencia plant serves Milpitas and parts of San Jose and can produce up to 40 million gallons per day (MGD) of treated water using primarily imported water supplies. The Santa Teresa plant mostly serves San Jose and can produce up to 100 MGD of treated water using imported and local surface water supplies. The Rinconada plant serves the western portion of northern Santa Clara County and can produce up to 80 MGD treated water using both imported and local surface water supplies. By meeting demands that would otherwise be met by groundwater, this treated water provides in-lieu recharge.

Thirteen major water retailers purchase water wholesale from the District and/or San Francisco Public Utilities Commission, and/or pump groundwater managed by the District and deliver it to consumers. Retailers include the cities of Milpitas, San Jose, Santa Clara, Sunnyvale, Mountain View, Palo Alto, Morgan Hill, and Gilroy, as well as the following entities: Stanford University, Purissima Hills Water District, California Water Service Company, San Jose Water Company, and Great Oaks Water Company. In addition, some users are independent groundwater pumpers or use raw surface water for irrigation.

WATER SUPPLY

This section provides more detailed information on each of the county's water supply sources, including local surface water, groundwater, imported water, and recycled water.

Surface Water

The District owns and operates 10 dams and surface water reservoirs, with an average yield of about 80,000 AFY (see Figure 3-4, p.36 and Table 3-2, p.35). These reservoirs capture and store local rainfall, releasing that water to streams for in-channel groundwater percolation, and then diverting some of the water to off-channel percolation ponds (recharge ponds) where the water is allowed more time to percolate into groundwater aquifers.

Some of the reservoirs (Anderson, Coyote, Almaden, and Calero) can also be used to supply drinking water treatment plants. In addition, Anderson and Calero are connected to the imported water system and can store imported supplies. The District's reservoirs are all sized for annual operations except Anderson, which is large enough to carry supplies over from one year to the next. Concerns over seismic stability currently limit the operation and capacity of five of the District's 10 reservoirs. The District is now designing improvements that will remove the operating restrictions from Anderson, Almaden, Calero, and Guadalupe reservoirs. The District leases all the reservoirs to Santa Clara County Parks, providing various opportunities to local communities and visitors for fishing, boating, and lakeside recreation.

On average, San Jose Water Company (Lake Elsman and Saratoga Creek diversion) and Stanford University (Searsville dam and reservoir) augment District supplies by providing local surface water supplies of about 11,000 AFY. Other reservoirs in the county not owned by the District include Calaveras Reservoir, Cherry Flat Reservoir, and Pacheco Reservoir.

Table 3-2: Reservoir Capacities, Restrictions, and Water Supply Impacts

Reservoir/ Dam	Year Completed	Reservoir Use	Reservoir Capacity (ACRE-FEET)	Restricted Capacity (ACRE-FEET)(1)	Reason for Restriction
Almaden	1935	Recharge and Treated	1,586	1,472	Seismic stability concern
Calero	1935	Recharge and Treated	9,934	4,585	Seismic stability concern
Guadalupe	1935	Recharge	3,415	2,218	Seismic stability concern
Stevens Creek	1935	Recharge	3,138	No restriction	N/A
Vasona	1935	Recharge	495	No restriction	N/A
Coyote	1936	Recharge and Treated	23,244	12,382 (Permanent restriction)	Active fault movement (Calaveras fault) under dam
Anderson	1950	Recharge and Treated	90,373	61,810	Seismic stability concern
Lexington	1952	Recharge	19,044	No restriction	N/A
Chesbro	1955	Recharge	7,945	No restriction	N/A
Uvas	1957	Recharge	9,835	No restriction	N/A
TOTALS			**169,000**	**122,924**	

Note: (1) Restricted capacity per Department of Safety of Dams interim operating restrictions.

Reservoirs do not only serve as storage units for surface water. Reservoir operations also help the District provide other benefits, including flood control, recreation, and habitat enhancement. The District stores water from local, wet season precipitation and/or imported water in its reservoirs for release throughout the year for downstream percolation into groundwater aquifers. Reservoir operations must take into account the need for adequate reservoir capacity to reduce the risk of downstream flooding. The amount of water stored in a reservoir and the rate at which water should be released is determined by calculated operating strategies or "rules."

How the District operates its reservoirs also affects the quantity and quality of water available to habitat and aquatic life downstream. Many of the streams in the county, including several below District reservoirs, are habitat for special status species, including steelhead trout listed as threatened under the federal Endangered Species Act. The District strives to operate its reservoirs to maintain downstream habitat and fisheries in good condition, as required under federal and state laws and regulations.

The District operates six diversion facilities and Uvas and Chesbro reservoirs under existing Lake or Streambed Alteration Agreements (LSAA) with the California Department of Fish and Wildlife (CDFW). The LSAAs for the diversions identify flow, water quality and monitoring requirements that must be met to operate the diversions without adversely affecting existing fish or wildlife resources in the creeks. Central California Coast steelhead, Central Valley Chinook salmon and the Western pond turtle are among the species identified as resources requiring protection through these LSAAs.

The LSAAs for the two reservoirs replaced a 1956 Memorandum of Agreement between CDFW and the District. The LSAAs include storage-based reservoir operating rules intended to support the various life stages of steelhead trout and water supply objectives.

In addition, reservoir re-operations rules for the Coyote Creek, Guadalupe River, and Stevens Creek dams are being developed to fulfill agreements made as a result of the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) to address District water rights.

Groundwater

The District manages the Santa Clara and Llagas Groundwater Subbasins within Santa Clara County (see Figure 3-5, p.38). The Santa Clara Subbasin is part of the Santa Clara Valley Basin and is further divided into two management areas: the Santa Clara Plain management area in northern Santa Clara County and the Coyote Valley management area from south of the Coyote Narrows. The Llagas Subbasin is part of the Gilroy-Hollister Groundwater Basin.

A groundwater basin, or aquifer, is essentially an underground storage "reservoir." The water supplied to groundwater basins may originate from several sources, such as:

- local precipitation that naturally percolates through soils and streambeds
- water captured and stored within surface reservoirs and released for downstream percolation (i.e., recharge)
- imported water released into streams or recharge ponds

Natural recharge, which includes infiltration of precipitation, is insufficient to meet demands on

Figure 3-4: District Operated Reservoirs

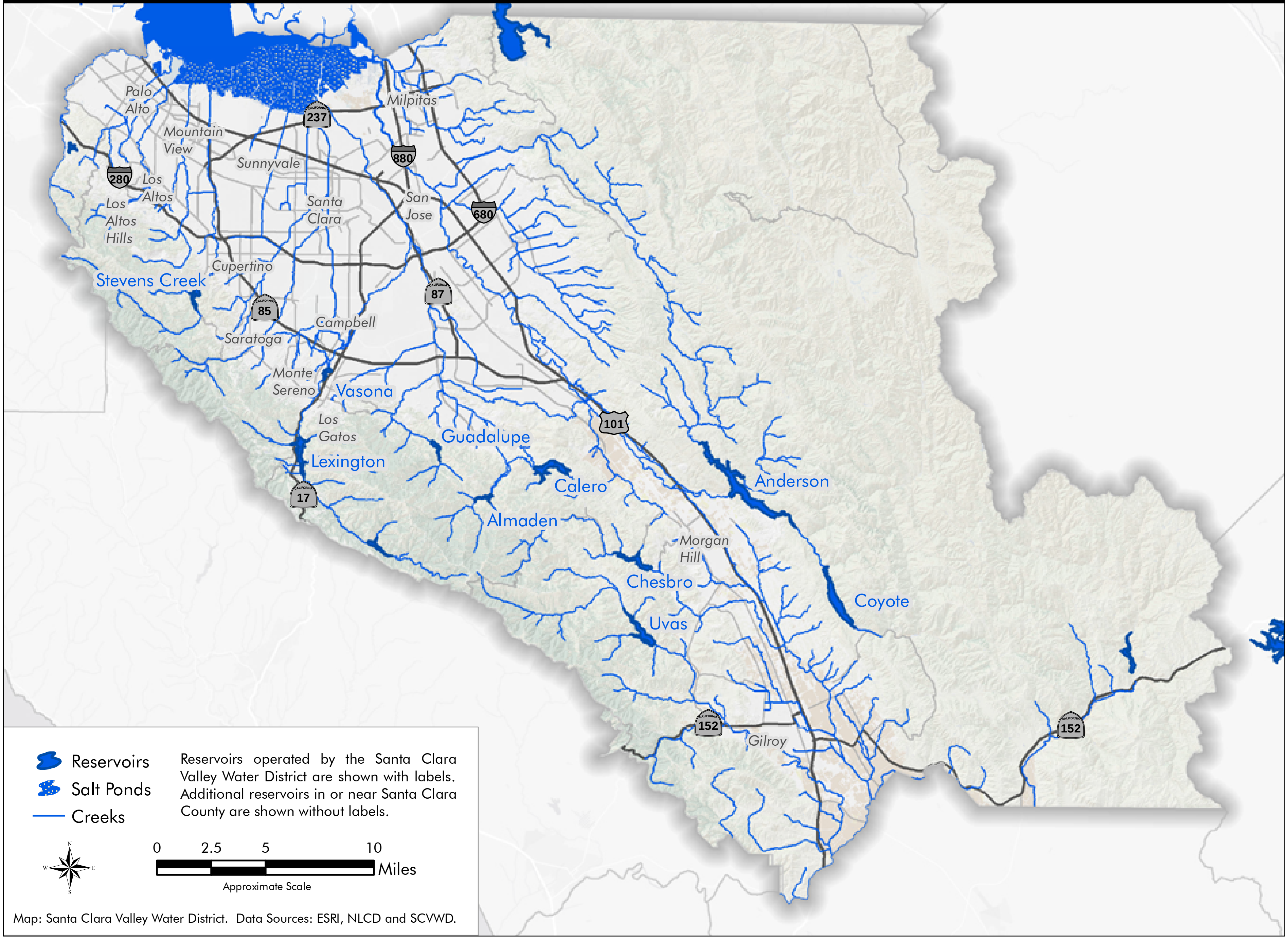


Table 3-3: Average Natural and Managed Recharge

Groundwater Management Area	Natural Recharge (AFY)	Managed Recharge (AFY)	Total (AFY)
Santa Clara Plain	30,000	64,000	94,000
Coyote Valley	2,500	12,000	14,500
Llagas	21,500	24,000	45,500
Total	**54,000**	**100,000**	**154,000**

the groundwater subbasins. Since groundwater pumping exceeds natural recharge, the District conducts managed recharge. The District uses both runoff captured in local reservoirs, and imported water to recharge groundwater through nearly 300 acres of recharge ponds and 90 miles of local creeks.

In-lieu recharge is provided by treated water deliveries, recycled water, and water conservation because they offset demands on the groundwater subbasins.

The District manages groundwater to maintain groundwater levels above subsidence thresholds and to maintain reserves for dry years. Too much pumping in a single year or long-term overdraft (pumping more than is recharged on average) can lead to decreased groundwater storage and levels and resumed threat of land subsidence. It is important to preserve or enhance natural recharge, the District's ability to conduct managed recharge, and in-lieu recharge activities, all of which may become more difficult with climate change and future regulatory restrictions.

Imported Water

About 40 percent of the county's water supply comes from hundreds of miles away, first as snow or rain in the Sierra Nevada and Cascade ranges of northern and eastern California, then as water in rivers that flow into the Sacramento-San Joaquin Delta. Often called "imported water," it is brought into the county via California's State Water Project and the federal Central Valley Project water conveyance systems. The state and federal water projects include complex networks of reservoirs, aqueducts, pipelines, diversions, power plants, and pumping plants that move water from areas of California where water is more abundant to higher use areas where water is scarcer.

The Central Valley Project delivers about 110,000 AFY to the county on average. These supplies are conveyed through San Luis Reservoir in Merced County. The District operates the Pacheco Pumping Plant, which draws water from San Luis Reservoir and transports it to Santa Clara and San Benito counties via the Pacheco Conduit pipeline. At Casa de Fruita on Highway 152, a bifurcation valve is operated to direct water both to San Benito County via the San Benito Conduit and to Santa Clara County via the Santa Clara Conduit, which terminates at Coyote Pumping Plant near the base of Anderson Reservoir. These supplies are pumped into Anderson Reservoir; released to Coyote Creek for groundwater recharge; and/or delivered to the Rinconada and Santa Teresa water treatment plants, irrigation customers, or Calero Reservoir via the Cross-Valley Pipeline.

The State Water Project delivers about 60,000 AFY to the county on average. These supplies come from the Delta via the South Bay Aqueduct, which terminates at the South Bay Aqueduct Terminal Tank adjacent to the Penitencia Water Treatment Plant in the Coyote Watershed. State Water Project supplies are released for recharge in the Penitencia Creek Recharge System, used at

REGULATORY AND POLICY FRAMEWORK

California has a limited supply of fresh water, especially in time of drought, and diverse entities, including the District, hold various rights to a certain amount of that supply. The District is subject to a myriad of regulations governing its water rights and operations, state codes setting standards for construction and maintenance of water supply infrastructure, and various legislative directives to sustain groundwater and report on water supply data.

The District reports to the State Water Resources Control Board on its water rights on an annual basis. The District updates its Urban Water Management Plan in compliance with California Water Code every five years. As the groundwater management agency for the county, the District is updating its Groundwater Management Plan to meet the requirements of the recent Sustainable Groundwater Management Act. The District already complies with groundwater level monitoring requirements and submits its data to the California Department of Water Resources (DWR) on an annual basis. District water supply operations in creeks and recharge ponds are regulated under various resource agency requirements, and reservoir operating rules are determined by the California Department of Fish and Wildlife, California Division of Safety of Dams, and the Federal Energy Regulatory Commission.

PERTINENT PLANS, POLICIES, PERMITS

2012 SCVWD Water Supply and Infrastructure Master Plan

2012 SCVWD Groundwater Management Plan

2010 SCVWD Urban Water Management Plan

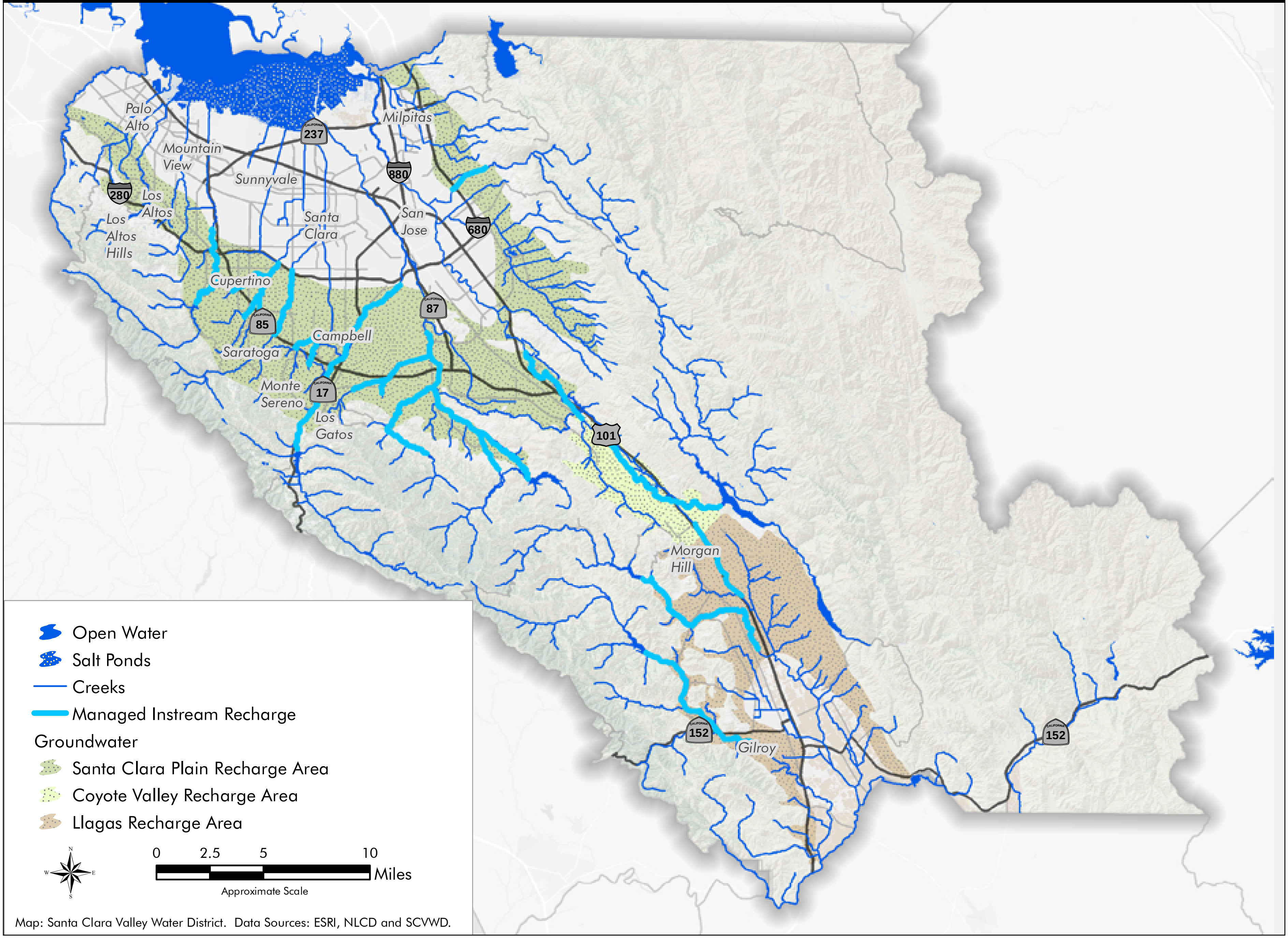
Fisheries Habitat Restoration Plan (in progress to support Water Rights Change Petitions)

Lake and Streambed Alternation Agreements

South Bay Water Recycling Strategic and Master Plan

South County Recycled Water Master Plan

Figure 3-5: Groundwater & Instream Recharge



Map: Santa Clara Valley Water District. Data Sources: ESRI, NLCD and SCVWD.

the Penitencia Water Treatment Plant, or delivered to the Rinconada Water Treatment Plant and recharge facilities via the Central Pipeline (see Figure 3-6, p.40).

The District is allocated a certain amount of Delta water exports each year depending on hydrologic and storage conditions. Water that is not needed by the District in a given year is allowed to continue south in the California Aqueduct to Kern County where it is percolated into the Semitropic Groundwater Basin and "banked" for future use. The District has 350,000 AF of storage capacity in the Semitropic Groundwater Storage Bank. The District does not retrieve its stored water directly from the groundwater basin at Semitropic. In dry years, the District "takes" its water through the South Bay Aqueduct, while the Semitropic Water Storage District receives less water for its use or delivery into the California Aqueduct for downstream users.

An additional 15 percent (about 55,000 AFY) of Santa Clara County's water supply is provided by the San Francisco Public Utilities Commission's Regional Water System. These drinking water deliveries go directly to the cities of Milpitas, San Jose, Santa Clara, Sunnyvale, Mountain View, and Palo Alto, and to Stanford University and the Purissima Hills Water District.

Recycled Water

A small but growing source of water for Santa Clara County is recycled water. Using recycled water helps augment drinking water and groundwater supplies through in-lieu recharge; provides a dependable, drought-proof, locally-controlled water supply; and reduces reliance on imported water. Recycled water is currently 5 percent of the regional water supply in Santa Clara County and is distributed for non-potable uses such as landscape and agricultural irrigation, industrial cooling, and dual-plumbed facilities. In 2014, the county used about 22,000 AF of recycled water for irrigation, industry, and agriculture, up from about 15,000 in 2010 and about 7,000 in 2000.

The District has a goal of expanding recycled water production and distribution so that it supplies at least 10 percent of countywide water demands, or 50,000 AFY, by 2035. This will require expanding the use of recycled water for indirect potable reuse (primarily using purified recycled water for groundwater recharge) and eventually for direct potable reuse (augmenting raw water supplies with purified water).

In northern Santa Clara County, the City of San José operates the South Bay Water Recycling (SBWR) system and distributes recycled water generated by the San José/Santa Clara Regional Wastewater Facility. The SBWR system delivers an average of 10 million gallons per day (MGD) of recycled water through 143 miles of pipe to the cities of San José, Santa Clara, and Milpitas. Some of this water is being supplied to the District's adjacent Silicon Valley Advanced Water Purification Center, which in turn purifies the water with advanced technologies (microfiltration and reverse osmosis) and blends it with tertiary treated water to create high quality recycled water that can be used by a wider variety of customers. The purification center is demonstrating the effectiveness of the treatment technologies and setting the stage for the District to begin an indirect potable reuse program. In the northern part of the county, Sunnyvale and Palo Alto also produce recycled water.

In southern Santa Clara County, the South County Regional Wastewater Authority (SCRWA) manages wastewater treatment for the cities of Gilroy and Morgan Hill. In partnership with the District, SCRWA operates the south county Regional Wastewater Treatment Plant in Gilroy. SCRWA recycled water is currently used for landscape irrigation, agricultural irrigation, and energy plant cooling water (industrial uses).

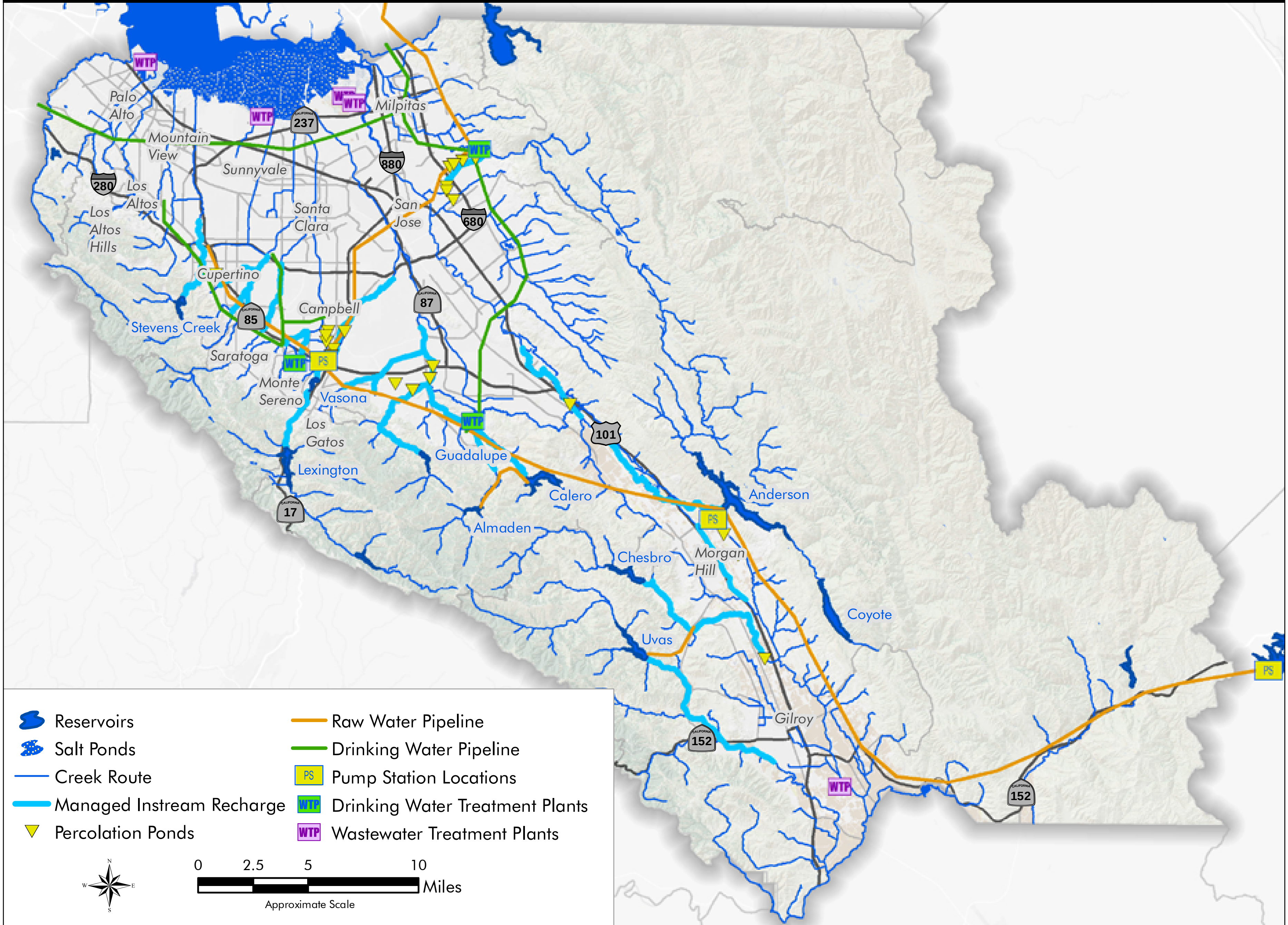
Purification plant

The District's 2012 Water Supply and Infrastructure Master Plan (Water Master Plan) includes developing 20,200 AFY of potable reuse capacity. The current plan is that water would be purified at an expanded purification center, piped to the District's Los Gatos Recharge System, and used for groundwater recharge. The District is currently evaluating options for developing an expedited and expanded potable reuse program.

Water Conservation

Water conservation is another critical part of the District's water supply program, especially with recent state mandates and emergency drought regulations. As a result of water conservation investments made by the District and its retailer customers since 1992, water use in the county has remained relatively flat despite a 25 percent increase in population. The District plans to continue expanding water conservations savings. About 60,000 AF of water were saved in 2014. The District's goal is to achieve about 99,000 AFY of savings by 2030.

Figure 3-6: **Water Supply Distribution**



Map: Santa Clara Valley Water District. Data Sources: ESRI, NLCD and SCVWD.

KEY CHALLENGES

Reliance on imported water: The District relies on the State Water Project and federal Central Valley Project water delivery systems for an average of 40 percent of its water supply. Threats to the Delta, such as sea level rise from climate change, levee failures, and declining fish populations, could undermine water supply availability and reliability for Santa Clara County. The District is participating in statewide planning to improve water supply reliability and protect the Delta environment.

Increasing demand: Changes in planned and forecasted water use and demand can upset the water supply balance. Shifts in land use, groundwater pumping, and new development can lead to increases in water use and result in water shortages if new supplies and extra water conservation measures are not implemented. In addition, the effects on water demand from projected temperature increases and precipitation pattern changes from climate change are unclear.

Complex Operating Environment: The District's water supply operations are becoming increasing complex. Operations need to address a large number of variables and uncertainties: multiple sources of water, different hydrologic conditions, changing availability of both supplies and facilities to meet a range of uses, regulatory constraints, and institutional issues such as interim operating restrictions placed on dams for seismic concerns. In addition, the California Department of Fish and Wildlife and the National Marine Fisheries Service provide direction on making adjustments to reservoir releases to best manage available supplies for both water supply and fishery management purposes. Operations will become even more complex with climate change.

Aging infrastructure: Some of the District's infrastructure was constructed more than 80 years ago and needs repair, rehabilitation, or replacement. This infrastructure provides the foundation of the District's water supply system. Necessary capital improvement projects include dam seismic retrofits, pipeline maintenance, and treatment plant upgrades. Without these investments, the District cannot ensure the future reliability of the county's water supply. The District developed an asset management program to track the current conditions of its assets (including pipelines, treatment plants, percolation facilities, equipment, and stream channels) and to help implement management strategies to determine when assets need to be maintained, repaired, or replaced in order to maintain current water supply operations.

Invasive species impacts: Zebra mussels and quagga mussels are species of freshwater bivalves native to Europe, which are known to cause devastating impacts to water supply infrastructure and ecosystems. The mussels multiply quickly and form dense colonies, which can attach to infrastructure, and clog pipelines, water intakes, valves, pumps, and treatment plants. Mussels can be transported between waterways via water transfers or by attaching to boats or other watercraft. Zebra mussels are present in adjacent San Benito County. The District monitors for mussels in its reservoirs, lakes, and pipelines. Santa Clara County Parks manages recreation (boating and fishing) on District reservoirs and is responsible for the invasive mussel boat inspection program. To date, mussels have not been detected in District facilities or those feeding into District facilities.

Invasive quagga mussels of various sizes. Photo: USFWS

Monitoring mercury in fish in Guadalupe River.
Photo: James Hobbs

3.3 WATER QUALITY

INTRODUCTION

Pollution, from both human and natural sources, undermines the quality of the water necessary for human and environmental use in Santa Clara County. While discharges of wastewater from industry or sewage treatment plants are now carefully treated and regulated to minimize their impacts on receiving waters, indirect sources of pollution—such as fertilizer and pesticide applications, grazing, leaking septic systems, and urban runoff—still threaten waterways, reservoirs, groundwater, and San Francisco Bay. As rain falls, flows across the land and through streams, or percolates into the ground, it can erode sediment or pick up pollutants at any point along the way.

In a well-functioning watershed, natural processes work to sustain good water quality—water in which native fish and other biota thrive and that humans can safely use. Water quality can be naturally maintained through the interaction of water with riparian vegetation, topography, and soils. For instance, wetlands remove harmful pollutants from water by trapping metals and organic materials: soil microbes degrade organic waste, rendering it less harmful. Vegetation and root biomass trap sediment and the attached nutrients, diminishing the eroding action of wind and water along creek beds. Stream vegetation and rocks enhance "stream roughness," which mixes and slows down the water, again decreasing erosion and oxygenating the water. Soils can filter some contaminants as water infiltrates into the subsurface, and residence time in the subsurface can allow for natural degradation to occur. Clay layers can prevent the downward migration of contaminants to water supply aquifers. Not all natural processes in the county's watersheds are still functional, however. Mining, ranching, agriculture, urbanization, and the construction of water management infrastructure have all altered the natural dynamics of many streams, decreasing the amount of riparian vegetation and increasing erosion and pollution. Restoring some natural functions is still possible — one aim of the One Water Plan.

Protecting water quality is a central responsibility of the Santa Clara Valley Water District. The District is responsible for complying with various federal and state water quality laws and regulations and for reducing threats from contamination to District water supplies, groundwater basins, and local receiving waters such as county streams and San Francisco Bay. The State of California protects myriad "beneficial" uses of water for the public trust, ranging from municipal, domestic, and agricultural supply to navigation, recreation, and fish and wildlife habitat. Water quality regulations are complex, but on the most basic level, the ones most pertinent to District activities derive from protections for these beneficial uses, state lists of water bodies impaired by particular or multiple pollutants, and limits on the total load of a particular pollutant from all sources these water bodies can receive.

District water quality management is presently divided into three areas: source water (in reservoirs for eventual treatment for human use or groundwater recharge), surface water (creek and urban runoff), and groundwater. Although existing water quality conditions and the regulatory framework for each of these three areas of water quality management may be distinct, there are overlapping management strategies and key issues. Some pollutants are particular to different areas of water management, while others affect water quality across the board. While the District's overall water quality goal remains to protect the beneficial uses of water, new thinking about the relationships between water quality, natural flood protection, water supply, and watershed restoration informs the One Water Plan.

WATER QUALITY PROTECTION

Source Water Quality

To protect source water quality, the District works with the county of Santa Clara and landowners to manage the quality of the water entering its 10 reservoirs. Four of the reservoirs supply the District's drinking water treatment plants and are subject to state drinking water standards. Primary threats include animal waste, erosion, septic systems, algae, and fuel.

The U.S. Environmental Protection Agency and the State Water Board's Division of Drinking Water require public water systems to regularly

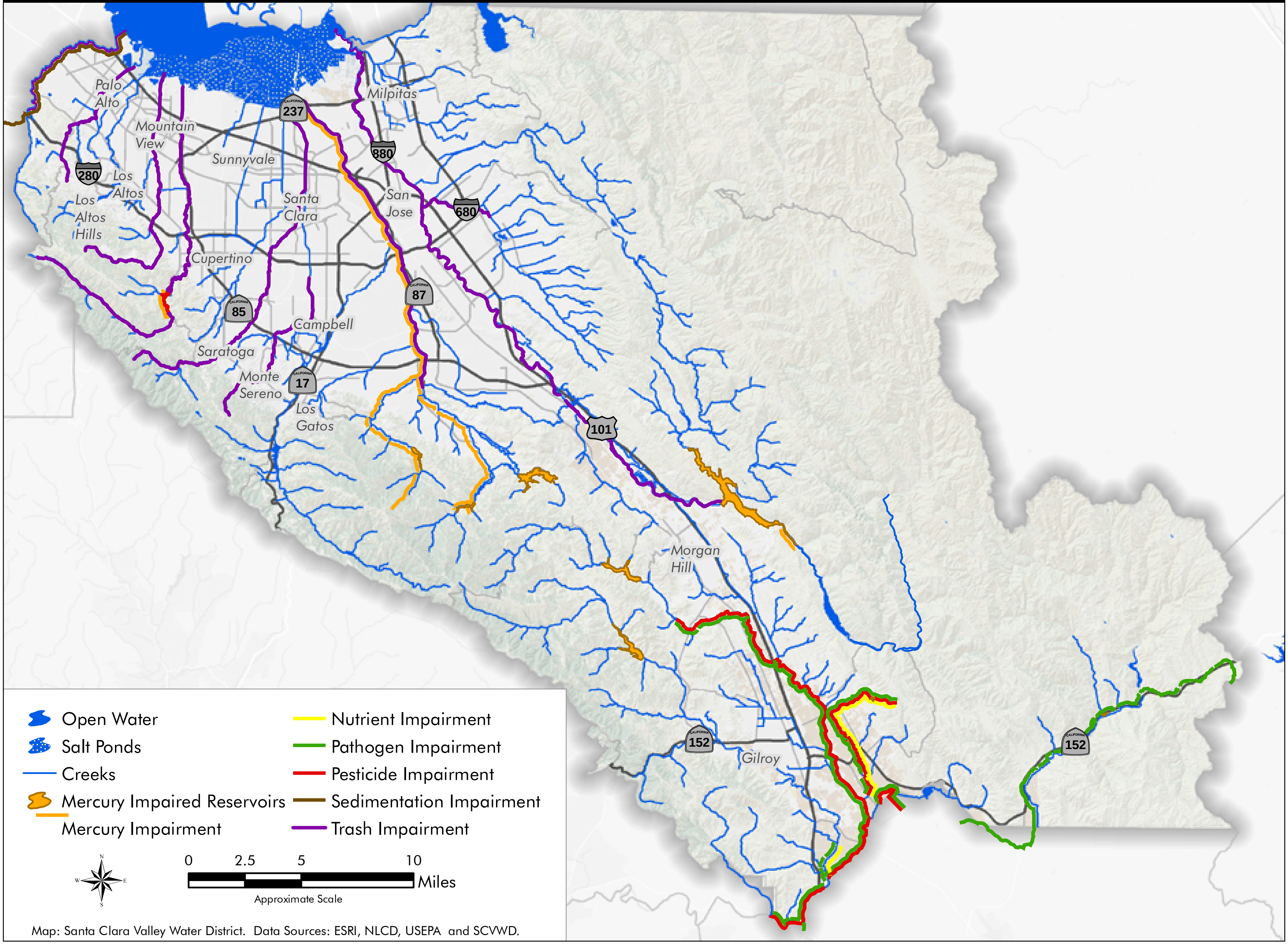
GENERAL REGULATORY FRAMEWORK

The primary laws protecting water quality are the federal Clean Water Act, California Porter Cologne Water Quality Act, and the federal and state Safe Drinking Water Acts. The Clean Water Act is the main federal law governing surface water pollution and is administered by the U.S. Environmental Protection Agency in coordination with state agencies. The federal Safe Drinking Water Act sets limits on contaminants that can cause adverse public health effects and requires regular monitoring of public water systems.

The California State Water Resources Control Board (State Water Board) administers water rights, water pollution control, and water quality functions for the State. The State Water Board provides policy guidance and delegates authority to nine regional boards that regulate surface water and groundwater quality within their respective regions, including planning, permitting, and enforcement activities. Santa Clara County falls under the jurisdiction of two regional boards: the San Francisco Bay Regional Water Quality Control Board covers watersheds draining to San Francisco Bay, including Stevens Creek, Coyote Creek, and the Guadalupe River; the Central Coast Regional Water Quality Control Board covers watersheds draining to Monterey Bay, including the Pajaro River Watershed.

California's Porter-Cologne Water Quality Control Act is designed to protect water quality and beneficial uses of the state's water. The Act requires each regional board to develop and adopt water quality control plans (Basin Plans) within their respective regions, as well as programs and strategies to achieve objectives. District activities must adhere to Basin Plans. For more details see Appendix X.

Figure 3-7: 303d Impaired Water Bodies



monitor for contaminants. In addition, the federal and state Safe Drinking Water Acts require public water systems to take actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater. The District is committed to protecting from contamination the local and imported water supply sources that feed the District's three drinking water treatment plants.

To assess the quality of the District's reservoirs that are used to directly supply water to the District's water treatment plants, and to identify potential contaminating sources, the District conducts water quality monitoring at San Luis, Anderson, and Calero reservoirs, as well as at the reservoirs and streams that feed into them. Although Almaden Reservoir does not directly supply drinking water to the District's water treatment plants, it is considered a secondary drinking water reservoir because excess water from Almaden Reservoir is transferred to Calero Reservoir via the Almaden-Calero Canal. Since Coyote Reservoir flows into Anderson Reservoir, it is also considered a secondary drinking water reservoir. Therefore, Almaden Reservoir, Coyote Reservoir, and the tributaries that flow into them are also monitored by the District to identify contaminating sources.

The District supplements the programs described above by monitoring other chemical and physical properties of the source water that impact treatment. Turbidity and algal content can impact treatment, disinfectant demand, and filter run times. Algae and hydrogen sulfide can impart undesirable tastes and odors requiring additional treatment. Low oxygen content can lead to an increase in sulfide, iron, and manganese concentrations that may also require additional treatment. Organic carbon and bromide content play a role in the amount of disinfection by-products that occur in the finished water.

In order to aid in the selection of the most easily treated source water, or to choose a particular portal (intake) depth from which to draw the water, several physical and chemical parameters are regularly monitored. This information is used to determine when reservoir mixing and stratification occur, as well as which water depth is of the best quality.

Agricultural chemicals and sediment can impact water quality in adjacent streams. Here in the Pajaro River watershed, a well-vegetated riparian corridor and managed wetland offer a natural buffer and filter for contaminants. Photo: SCVWD

District operations are impacted by water quality issues in the Sacramento-San Joaquin Delta and the state and federal water projects that supply water to Santa Clara County. For example, during drought conditions, less freshwater inflow to the Delta and San Francisco Bay results in salty water from the Bay moving farther upstream into the Delta. High salinity water contains high levels of bromide, which contribute to treatment byproducts (bromates and trihalomethanes [THMs]) that are potentially carcinogenic.

Surface Water Quality

Surface waters in the region consist of streams, rivers, lakes, non-tidal wetlands, baylands, and coastal waters. In the urban reaches of streams, impacts from excess sediment, pesticides, fertilizers, trash, and animal and human waste are more significant (see Figure 3-7, p.44).

Regulators have listed several county creeks that drain to San Francisco Bay as impaired for trash, including the Guadalupe River and Coyote, San Francisquito, Permanente, Silver, San Tomas Aquino, Saratoga, Matadero, and Stevens creeks.

Many creeks in urban areas are also polluted by homeless encampments. The District has a memo-

REGULATORY FRAMEWORK: 303(D) LISTS AND TMDLS

The federal Clean Water Act Section 303(d) requires that states make a list of waters that are not attaining water quality standards for contaminating factors such as nitrates, bacteria, trash, mercury, and others. Once a water body is placed on the 303(d) list, the appropriate Regional Water Quality Control Board will evaluate the nature of the impairment and may begin developing a Total Maximum Daily Load (TMDL) for a specific contaminant. A TMDL evaluates the condition of surface waters and sets limits on the amount of a specific contaminant from all sources and watersheds that the water body can be exposed to without adversely affecting the beneficial uses of those waters. TMDLs assess pollution sources and amounts (or "loads") entering a water body, define the total load allowable, and describe the implementation plan to be undertaken by responsible parties (i.e., dischargers). In Santa Clara County, a number of TMDLs have been issued to address contaminants such as mercury, pesticides, fertilizers, fecal bacteria, and sediment, among others.

randum of agreement to work cooperatively with the City of San José to conduct camp cleanups in cooperation with the San José Police Department and the City's Environmental Services and Housing Departments. Through the Good Neighbor Program's Illegal Encampment Cleanup Project, District staff and agency partners remove active encampment sites throughout the county.

In the more rural areas of the county, such as the Pajaro River Watershed, surface water quality is impacted by agricultural activities, which may add pesticides and herbicides, high levels of bacteria indicative of pathogens, and fine-grained sediment to local waterways. Many contaminants can surpass safe levels in surface waters, especially after large storms.

In upper watersheds and historic mining areas, contaminants can include mercury, selenium, and sediment. Runoff and releases from reservoirs in from these areas may carry contaminants downstream.

Finally, many streams in the county still support the federally threatened steelhead trout (Onchorhynchus mykiss), presenting additional water quality challenges for the District in terms of maintaining appropriate habitat conditions for this species. Stream flow, water temperature, sedimentation, and post-storm low dissolved oxygen and turbidity all affect steelhead.

Regional Stormwater

Stormwater runoff from urban impervious surfaces and roadways or agricultural fields can overwhelm drainage systems and pollute streams, bays, and the ocean. Section 402 of the federal Clean Water Act prohibits the discharge of any pollutant to waters of the United States from a point source, unless that discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Point sources include stormwater discharges from discrete conveyances such as pipes, storm drains, or man-made ditches and channels. Each regional board is responsible for addressing region-wide water quality concerns by adopting, monitoring compliance with, and enforcing NPDES permits.

The Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) is an association of 13 cities and towns, the county of Santa Clara, and the Santa Clara Valley Water District. The SCVURPPP was created to manage the county's first NPDES stormwater discharge permit issued in 1990 from the San Francisco Regional Water Quality Control Board for watersheds draining to San Francisco Bay. This permit was one of several NPDES permits issued to the various counties, municipalities, and special districts within the San Francisco Bay Area.

In 2009, the San Francisco Bay Regional Water Quality Control Board consolidated the various NPDES permits throughout the region and issued one Municipal Regional Stormwater NPDES Permit (MRP) to 76 counties, municipalities, and special districts (including the Santa Clara Valley Water District). The 76 agencies are co-permittees to this regional permit, which was updated in 2015. Similar to the original countywide NPDES permits, the MRP specifies actions to reduce the discharge of pollutants into storm water and includes requirements for achieving water quality standards, and objectives in areas such as water quality monitoring, trash reduction, illicit discharge elimination, public information and outreach, and toxic substance controls.

The District has conducted numerous creek monitoring and assessment efforts to supplement the data collected through the urban runoff program. These include a multi-year dissolved oxygen study in Coyote Creek; a microbial source tracking study in the Pajaro River Watershed; and trash monitoring at two trash booms on Lower Silver Creek.

The portion of southern Santa Clara County within the Pajaro River watershed is not associated with SCVURPPP. Some south county municipalities, including the cities of Gilroy and Morgan Hill, have their own NPDES permit under the Central Coast Regional Water Quality Control Board. The SCVURPPP and the District participate in south county water pollution prevention programs by providing assistance and training materials, but do not currently fund south county programs.

Total Maximum Daily Loads (TMDLs)

District activities are subject to a number of regulatory restrictions on contaminant loads in the form of TMDLs (see sidebar).

The Guadalupe River watershed is known for its historic and long-productive mercury mines. Mining in the hills above San José occurred from the late 1840s through the early 1970s and released a significant amount of mercury into the watershed and ultimately San Francisco Bay. Today, mercury presents a human health challenge as it methylates up the aquatic food chain to fish caught in the Bay and some reservoirs. As a result, the state has

Table 3-4: TMDLs in Santa Clara County

TMDL	Water Bodies	Region
Chlorpyrifos and Diazinon	Pajaro River, Llagas Creek	Central Coast
Diazinon and Pesticides	Urban Creeks	San Francisco Bay
Fecal Coliform	Pajaro River, Llagas Creek, Carnadero/ Uvas Creek, Furlong Creek, Pacheco Creek	Central Coast
Mercury	San Francisco Bay	San Francisco Bay
Mercury	Guadalupe River Watershed	San Francisco Bay
Nitrogen and Orthophosphate	Pajaro River, Llagas Creek, Carnadero Creek, Uvas Creek, Furlong Creek, Pacheco Creek	Central Coast
Polychlorinated biphenyls (PCBs)	San Francisco Bay	San Francisco Bay
Sediment	Llagas Creek	Central Coast

issued a human health hazard and "no fish consumption" advisory for fish from this watershed. To more directly manage this source of mercury contamination, regulators worked with the District and other stakeholders on a TMDL program specific to the Guadalupe watershed.

District reservoirs and lakes listed under the Guadalupe River Watershed Mercury TMDL (Guadalupe TMDL) as impaired for mercury include Calero, Almaden, and Guadalupe reservoirs, and Lake Almaden. Reservoirs and lakes store water for long periods of time, which can lead to stagnant, low, or no dissolved oxygen conditions at the bottom layer (hypolimnion) of the water column. Inorganic mercury (mercury in its elemental form) enters the reservoir via runoff from the lands draining historic mercury mines in the upper watershed, as well as from atmospheric deposition and imported water deliveries into Calero Reservoir (water transfers from Almaden Reservoir via the Almaden-Calero Canal may also transport mercury-laden water to Calero Reservoir). The low oxygen conditions in reservoirs can spur the growth of certain anaerobic bacteria that in turn, through metabolic processes, convert elemental mercury to methylmercury (mercury with carbon and hydrogen atoms attached to it). Methlymercury is more easily absorbed by living tissue than elementary mercury and bioaccumulates exponentially up the food chain from plankton to fish to humans, birds, and other wildlife. Methylation can also occur in riparian wetlands and baylands outside of reservoirs.

The District, as the owner and operator of the dams and reservoirs concerned, is considered a responsible party under the Guadalupe TMDL. To comply with the TMDL, the District conducts activities such as removing inorganic mercury from the watershed and reducing the potential for methylmercury production in District lakes and reservoirs by operating water circulators and oxygenation systems to reduce the low oxygen conditions in the hypolimnion.

The State Water Resources Control Board is in the process of developing the Statewide Mercury Control Program for Reservoirs, which will be a program (or possibly a TMDL) to address the impacts to additional water bodies found to be impaired for mercury pollution. Anderson, Chesbro, Uvas, Stevens Creek, San Luis, and Del Valle reservoirs will likely be regulated under the statewide program or TMDL.

In the San Francisquito Watershed, upstream erosion from human activities and natural shifts in the San Andreas Fault system exacerbate sediment loads to San Francisquito Creek, with adverse impacts to fish populations, resulting in a sediment TMDL that directs efforts to alleviate this situation.

In the portion of southern Santa Clara County found within the Pajaro River Watershed, the Central Coast Regional Water Quality Control Board has issued various TMDLs to regulate fecal coliform bacteria, nitrates, chlorpyrifos and diazinon,

Agricultural well taps groundwater in southern Santa Clara Valley. Photo: SCVWD and sediment. The District is not currently considered a responsible party in these TMDLs. However, the District and the county of Santa Clara have provided some support for south county TMDLs, such as conducting studies and trainings.

While the District is not considered a discharger or other responsible party in the majority of the county's TMDLs, the TMDLs do indicate water quality concerns the District may still wish to address.

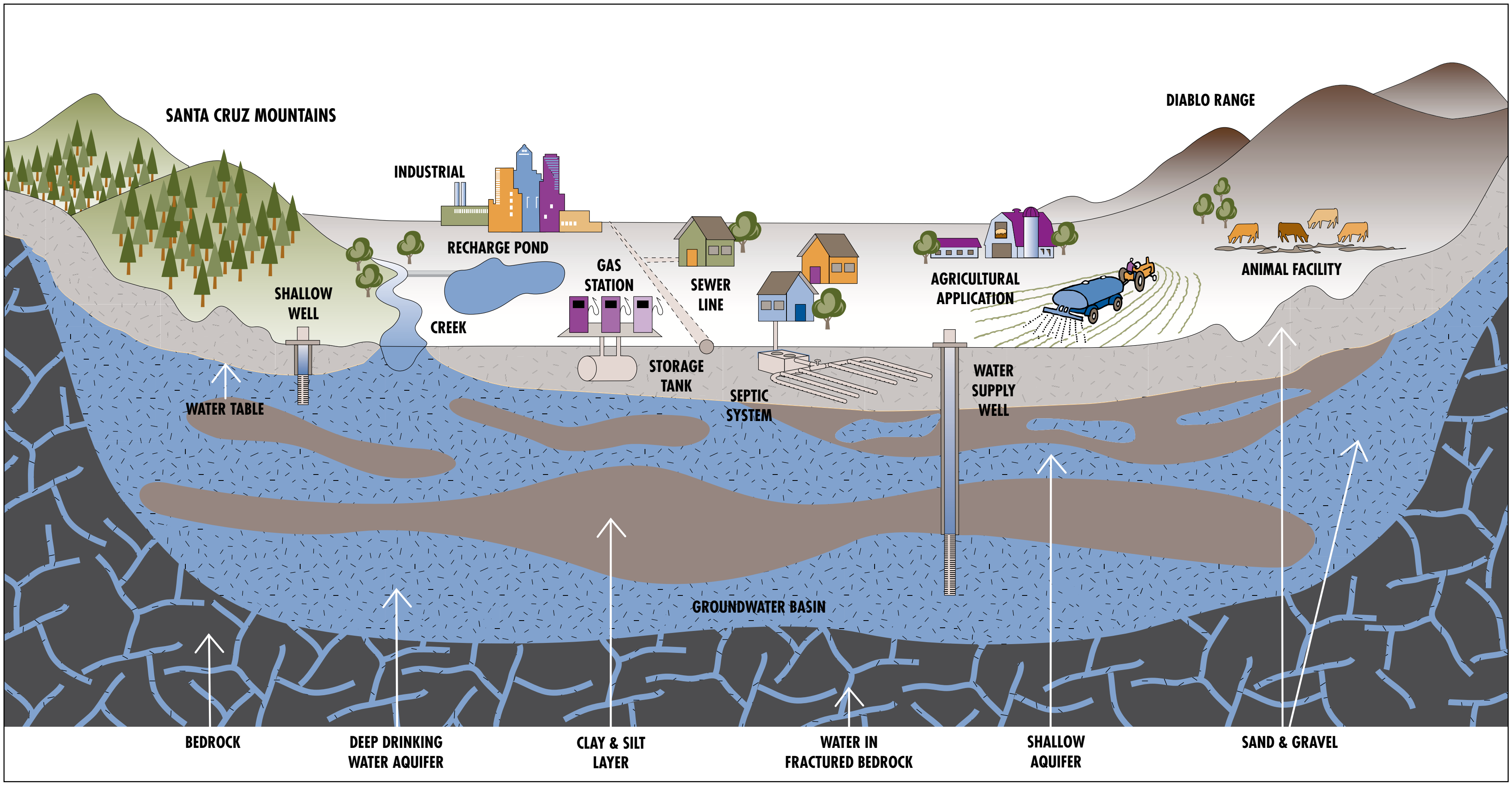
Groundwater Quality

To protect groundwater quality, the District works with a variety of partners and collaborators. Groundwater quality is threatened by industrial releases, leaking underground storage tanks, the application of fertilizers and pesticides, animal waste, and other land use activities.

The federal and state Safe Drinking Water Acts include provisions for groundwater quality protection. The District conducts ongoing groundwater quality monitoring to assess subbasin conditions in order to protect groundwater from the threat of contamination and to minimize land subsidence, which could lead to saltwater intrusion. The District's efforts include regional, ambient water quality monitoring, as well as focused monitoring near recycled wastewater irrigation sites and areas where saltwater intrusion has been observed historically.

The District monitors groundwater quality at wells throughout Santa Clara County and also evaluates data collected by local public water suppliers to assess regional groundwater quality and identify potential threats so they can be appropriately addressed. The District also monitors the quality of local and imported water used for groundwater re-

Figure 3-8: The Groundwater Table



charge. Public water suppliers, such as cities and water companies, also regularly test the quality of their groundwater supplies to make sure they meet state and federal drinking water standards. For eligible private domestic well owners, the District offers basic water quality testing, and recommends that all owners test their wells at least annually.

Recycled water generally has higher concentrations of salts, nutrients, disinfection by-products, and emerging contaminants than local groundwater, treated raw water, or purified water. Therefore, the District and its partners regularly measure groundwater quality in areas where recycled water is used for irrigation to assess changes in groundwater quality in order to minimize risks to groundwater. As the District moves towards indirect potable reuse of purified recycled water via groundwater percolation or injection, additional water quality monitoring and public outreach efforts are being undertaken to ensure the water supply is safe and publicly accepted.

Groundwater quality monitoring results in the Santa Clara Subbasin demonstrate that the groundwater is generally of excellent quality for municipal, irrigation, and domestic supply. Some shallow aquifers adjacent to the San Francisco Bay have been affected by saltwater intrusion, and high total dissolved solids is noted in some wells close to the Bay. The Llagas Subbasin generally produces water of good quality for municipal, irrigation, and domestic uses. Compared to the Santa Clara Subbasin, there are typically more detections of parameters above drinking water standards in the Llagas Subbasin, primarily from nitrate and perchlorate. Nitrate is an ongoing concern in the Llagas Subbasin due to historic and ongoing sources, including synthetic fertilizers, septic systems, and animal waste. Cleanup of perchlorate contamination in the Llagas Subbasin due to releases from a former rocket fuel manufacturing facility is ongoing under a state abatement order. By July 2011, there were only eight domestic wells with perchlorate above the drinking water standards compared to 188 wells in 2004.

Groundwater recharge pond in Santa Clara County.

The District continues to advocate for the timely restoration of groundwater quality.

Reports: www.valleywater.org/services/groundwaterquality.aspx.

KEY CHALLENGES

Impervious surfaces: Parking lots, roadways, and rooftops, are so extensive in Santa Clara County as to have a significant impact on stream function and water quality. Underground storm drain systems drain impervious surfaces and are direct pathways for contaminants such as oil, pathogens, and trash to be transported from roadways and parking lots to sensitive stream habitats. The District supports projects that reduce impervious surface areas and increase absorption of rainwater and runoff within cities and developed areas through low impact development (LID). LID uses green infrastructure such as grassy swales instead of storm drains to slow down stormwater and filter pollutants before they reach receiving waters.

Urban and agricultural runoff: The waterways of Santa Clara County and ultimately San Francisco Bay are significantly impacted by urban, agricultural, and industrial runoff. The threat is ubiquitous and growing, despite the urban runoff prevention programs described earlier and programs to curb agricultural runoff in southern Santa Clara County and other rural areas. Pollution prevention requires ongoing, extensive, diverse, and continuous public outreach for the many sources of pollutants, and about emerging new contaminants as data on impacts become available.

Homeless encampments: Encampments are a source of pathogens, trash, and other pollutants. Impacts to riparian habitat, fish and wildlife, and water quality occur due to use of illegal trails, poaching, human presence disturbing wildlife, trash, unsanitary conditions, localized herbaceous vegetation matting or clearing, soil grading or ground surface leveling, wildfires, and excavation for fire pits. Many communities in Santa Clara County and throughout the Bay Area face the challenge of managing homelessness. Municipalities and NGOs continue to organize various initiatives to encourage homeless people to live in housing, and work on projects such as the cleanup of streets and streams. For many years, the District has actively participated in the effort to clean up areas along waterways to reduce the accumulation of trash and its associated impacts on stream flows and flood flow conveyance, water quality, and the environment. While cleanups have been successful in removing substantial amounts of trash, they do not address the core issue of homelessness in Santa Clara County. As a result, homeless individuals or families that are temporarily displaced during a cleanup effort either resettle at the same location or relocate their camp to another site, often also along a waterway. Moving forward, the District is committed to working with municipalities and the county of Santa Clara on a countywide effort to reduce homelessness.

Legacy mercury: Sources of mercury still exist in the upper watershed. The actions taken to date dramatically reduce methylmercury production, but they do not eliminate the process.

Climate change impacts: Increased temperatures could lead to greater impairment of stream habitat quality and increase the occurrence of algae and low dissolved oxygen in creeks and reservoirs. More wildfires could increase sedimentation in creeks and reservoirs. Sea level rise could change salinity in lower reaches of creeks and possibly even impact imported water supplies.

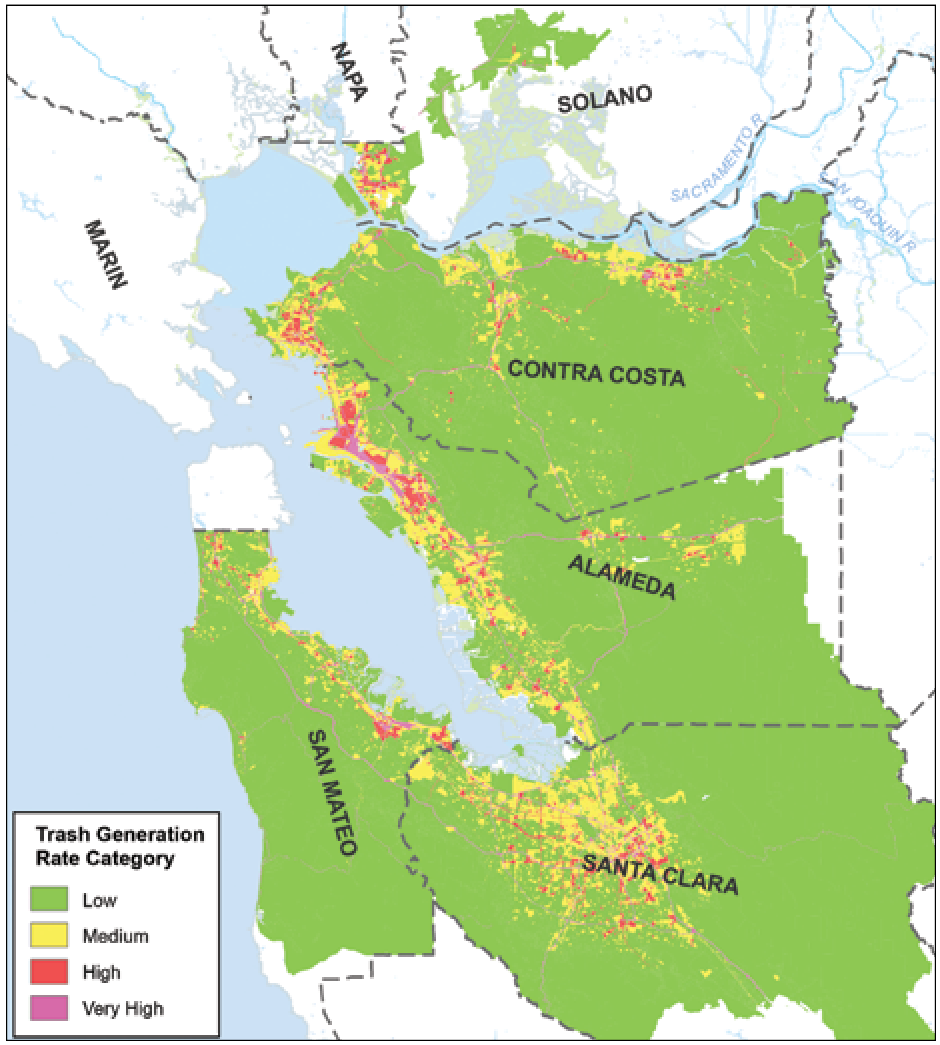


Figure 3-9: Bay Area trash generation areas. Map: BASMAA

3.4 FLOOD PROTECTION

INTRODUCTION

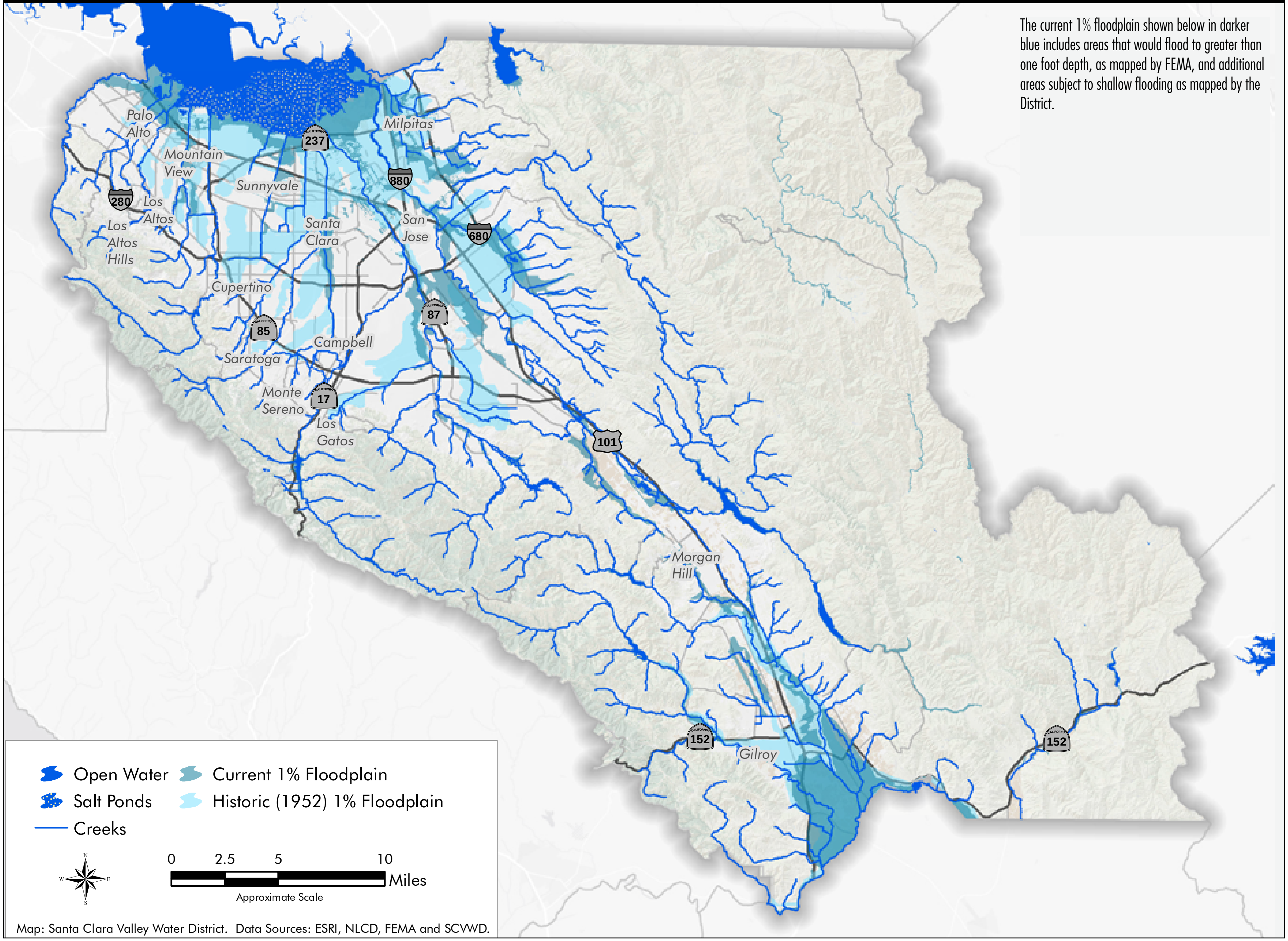
Flood protection involves keeping the water away from the people and keeping the people away from the water during large storm events. For the Santa Clara Valley Water District and its federal and local partners, this task involves managing flood events and floodplains, as well as maintaining streams for flow capacity.

Flood protection begins with understanding local conditions. Various characteristics of Santa Clara County's physical and hydrologic landscape contribute to its flooding problems. The steep-sided mountain ranges bordering the valley catch storms coming in from the Pacific and quickly send the rainfall to short, steep streams that abruptly transition to a flat valley floor. Floods can occur within a few hours of intense storms with little warning time. Once the water reaches the valley floor, flows can overtop banks, leading to shallow but widespread flooding. At the same time, rainwater may begin to pool in flat areas and on neighborhood streets, or carry clogging debris into street drains, overwhelming urban drainage systems. In certain areas, multiple creeks flow close to one another or join together, especially in the northeastern and southern portions of the county. Some neighborhoods are subject to overbank flooding from more than one creek.

The valley's continued development has reduced the amount of land able to absorb rainfall and has increased the need for speedy drainage, especially in urbanized areas. Yet even as flood protection efforts have expanded, flooding has never been totally eliminated in the valley (see Table 3-5, p. 59). Significant flooding has occurred on one or more of the valley's streams more than 20 times in the last 100 years. These floods typically produced shallow, moving water dangerous for people and cars, and filled homes, streets and structures with water and mud, requiring costly cleanups.

As the primary agency with authority to provide flood protection in the county, the District works with local municipalities and federal agencies to

Figure 3-10: Current & Historical Floodplains



THE ONE PERCENT FLOOD

For guidance on flood risk, the District has historically looked to published FEMA maps of one percent flooding, unpublished maps showing shallow one percent flooding, and records of historic flooding. The District is currently using modern modeling to verify or update those areas mapped as subject to flooding.

A one percent flood is a shorthand expression for a flood that has a 1-in-100 chance of being exceeded in any given year. This may also be expressed as the 100-year flood. This does not mean this level of flooding only happens once every 100 years. It means that over many, many years, a one percent flood would occur on average once every 100 years. However, it could also occur two years in a row, or there could be 150 years between such events. Global warming, with its potential for extreme weather events, now makes such predictions more uncertain.

manage flood risk. A first step is to try to predict when and where flooding may occur using historic records, topographic surveys, and various flood risk maps and models. Another step is to change the way water flows through creeks and channels so as to minimize or prevent flooding. Most major creeks in the now-urbanized Santa Clara Valley have already been changed in some way to improve their conveyance capacity. To maintain capacity, ensure access, and meet fire suppression requirements, the District undertakes routine maintenance activities along and within creeks.

To provide more flood protection the District employs both hardscape and softscape solutions, ranging from building earthen levees or concrete walls to enhancing floodplains. In recent years, the District has embraced the concept of natural flood protection, and now seeks to construct or enhance projects that can achieve multiple objectives — projects that not only reduce flooding but also improve wildlife habitat, water quality, and recreational opportunities for the community. Such multi-objective projects also reflect the District's One Water approach to water resources management.

PROTECTING PEOPLE AND PROPERTY

Flood managers must consider impacts to people and property when planning or evaluating flood protection measures. Impacts of flooding can include risks to human health and safety, physical damage to structures, huge cleanup costs, and economic disruptions due to direct damages and transportation impacts (for example, flooded highways or commuter railways).

Safety

The risk of losing lives or damaging homes, businesses, or personal property can be difficult to assess. Assessment usually begins with the Federal Emergency Management Agency's (FEMA) one percent flood maps, and expands via computer modeling. Although models can estimate the economic risks of flooding, based on predicted flood depths and amount of development in the floodplain, understanding risks to health and safety is less exact. During a flood, the depth and velocity of floodwaters, as well as the amount of warning time, interplay in creating or reducing risks to people. After a flood, a number of factors can have significant impacts on public health, such as flood-induced contamination, mold, wastewater management, and drinking water safety.

One important consideration for flood managers is to protect critical facilities. Even people who don't live or work in a floodplain can be affected if a critical facility, or the roadway leading to it, is flooded (see Figure 3-12, p.55). Critical facilities include fire and police stations, hospitals, utilities, transportation networks, senior and assisted living centers, storage units for important records, drinking water or wastewater treatment plants, and facilities housing telecommunications hardware,

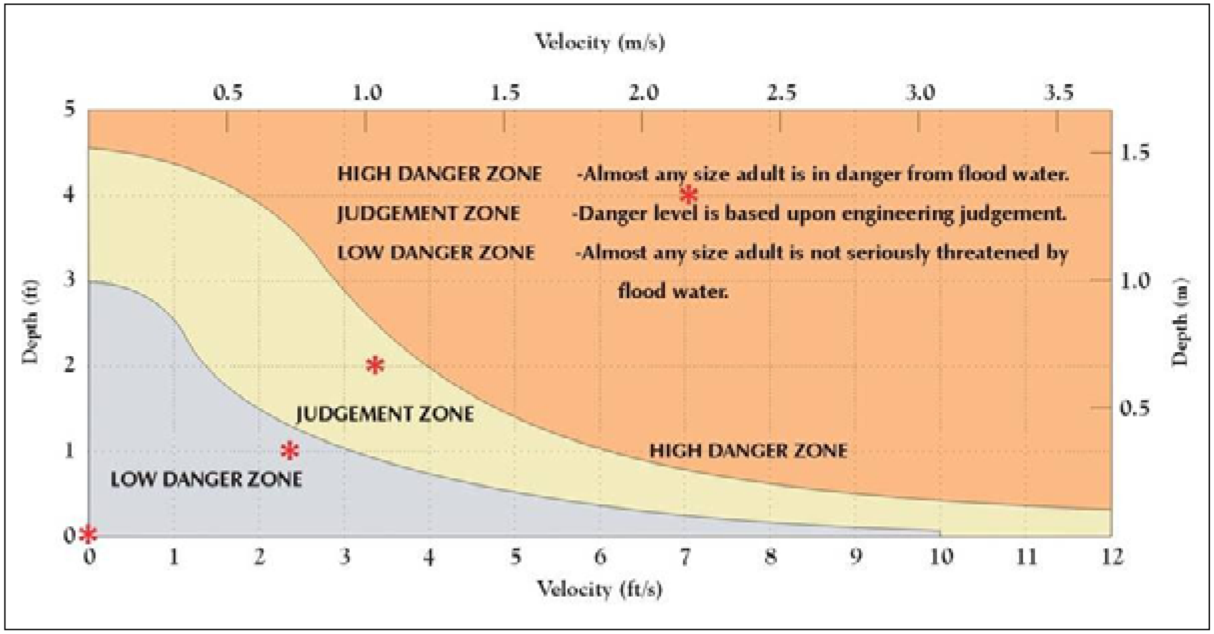


Figure 3-11: U.S. Bureau of Reclamation diagram showing how the danger to adult individuals during a flood event increases as a combination of flood depth and flood velocity.

servers, or other infrastructure. These facilities can be damaged or isolated by flooding and render them out of service for long periods.

Whether the risk is to people, property, or facilities, the District's primary tools for assessing flood risk focus on floodwater depth, velocity, and warning time. Planned flood studies will soon provide calculated velocities in floodplains for the first time, helping the community better prepare for emergency response and evacuation. The District also hopes to provide more warning time before powerful incoming storms. To this end, the District is working with state and regional partners to install advanced weather-forecasting technology.

Managing Floods — Capital Projects

Floodwater management includes actions to modify the natural flow of floodwaters, either by confining high flows to the creek corridor or by detaining high flows in reservoirs or detention basins (see Figure 3-13, p.56). Historically this approach often involved putting water in a pipe, ditch, culvert, or behind or between walls; current thinking includes restoring some elements of a more natural floodway to creeks and waterways. This work is typical of the District's capital improvement program — constructing infrastructure to keep the water away from people. This program seek to reduce the number of homes, schools, and businesses subject to flooding by reducing the chances that water will overtop creek and channel banks and flood developed areas.

As described in the regulatory section on page 58, the District has primary authority for floodwater management in Santa Clara County, but collaborates with its federal partner, the U.S. Army Corps of Engineers (the Corps) on a number of flood protection projects. Partnerships with not only federal but also state and local agencies can make multi-objective projects combining flood protection, riparian restoration, and recreation a reality that counties and cities alone can rarely afford.

In an example of the natural flood protection approach, the District designed the Guadalupe River Project through downtown San Jose to protect more than 7,000 properties from a one percent risk of flooding, while also improving the river's ecology, hydrology, fisheries, and habitat. In partnership with the Corps, the District widened and planted extensively in the floodplain and upland areas to decrease erosion and increase habitat space. Upriver, the District is working to stabilize the channel and expand habitat for steelhead trout and other native fish. Photos: SCVWD

Natural Flood Protection

Increasingly, water managers have recognized that large, heavily engineered river modification projects lack the resilience of natural river systems. The use of concrete eliminated creek corridor habitats and associated ecosystem services. In response, the District now embraces a multi-objective approach it calls natural flood protection. Natural flood protection aims to balance property protection with natural resource preservation, community benefits, and the costs of building and maintaining projects over the long term. The District has targeted all new flood protection projects to follow the natural flood protection approach.

Managing Floodplains — The "Nonstructural" Approach

Floodplain management relies on land use decisions and regulations that manage activities or development within the floodplain to accommodate floodwater without significant disruption to public health, safety, or property. Such actions keep people away from the water.

Other activities also reduce flood risks, including education and outreach, flood warning programs, and ordinances or codes to manage development in floodplains. Local land use agencies play a critical role in these "nonstructural" activities to keep people and property safe in flood prone areas.

Figure 3-12: Critical Facilities & Flood Risk

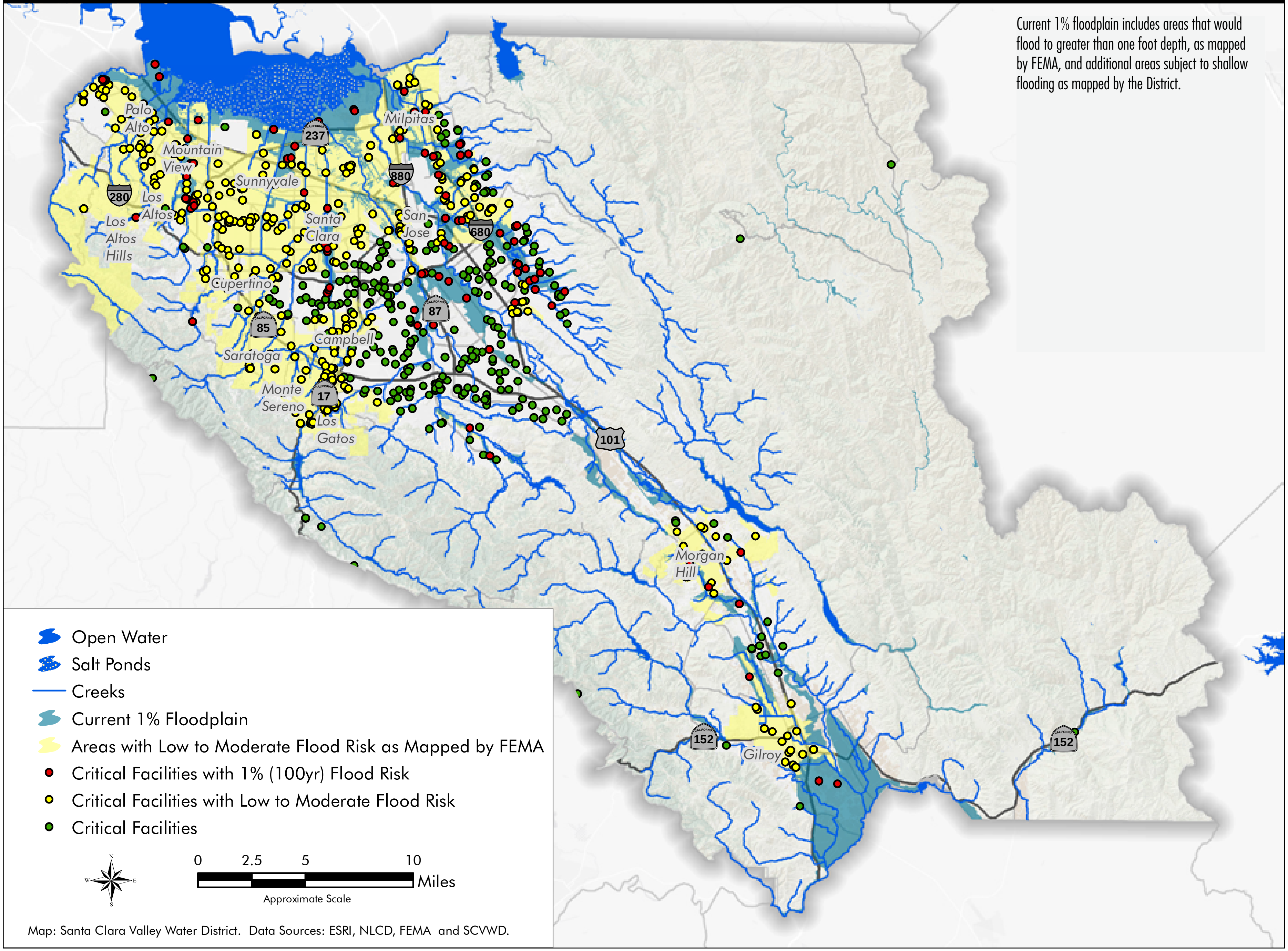
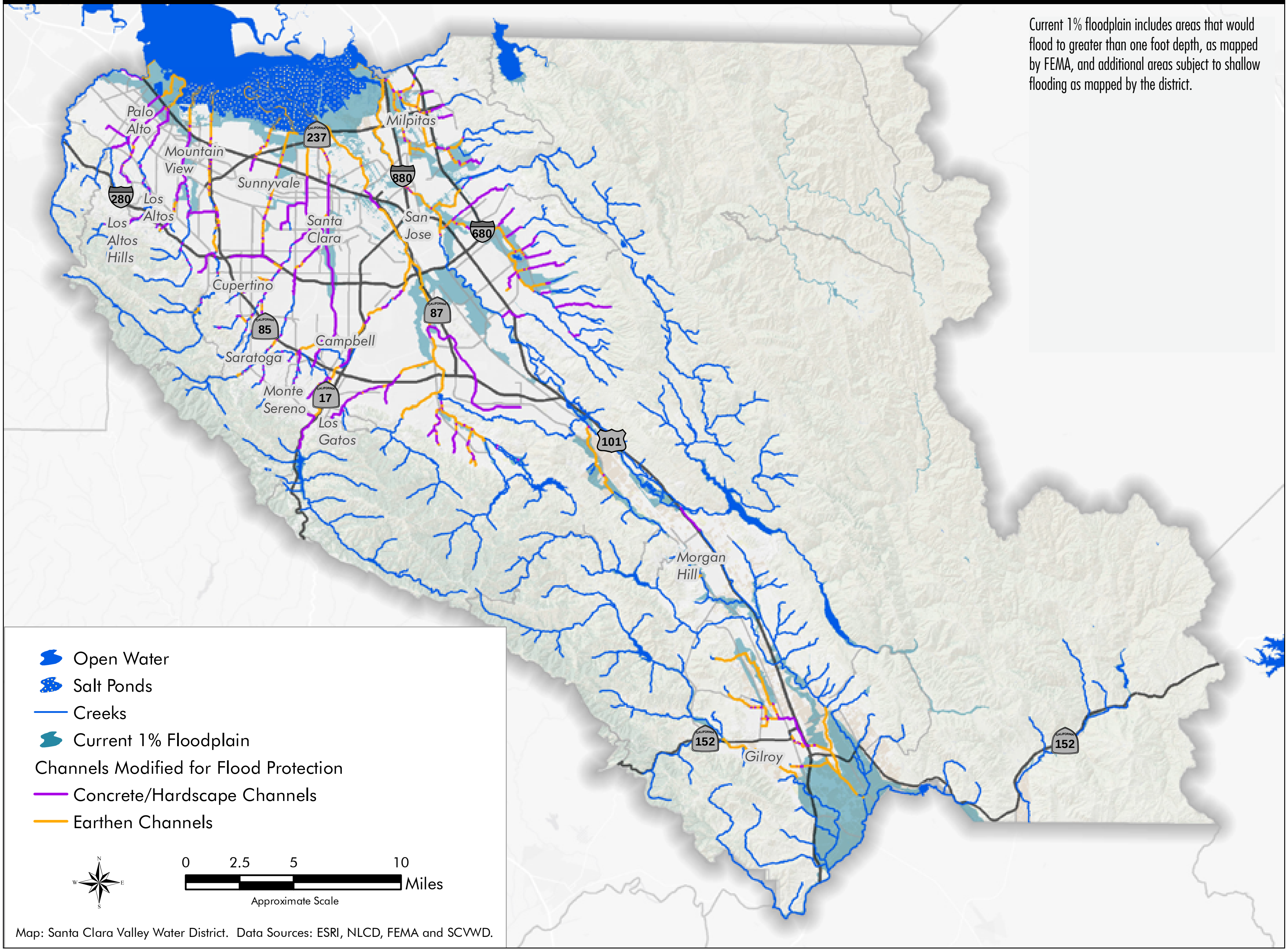


Figure 3-13: Major Flood Control Infrastructure



As described in the regulatory section, floodplain management is primarily the responsibility of cities, towns, and the county of Santa Clara. These local land use agencies work in partnership with FEMA, which provides guidance and incentives for wise floodplain management.

Maintenance

Santa Clara County includes about 800 miles of creek channels; countywide, most creeks include reaches with remnant natural features, but on the valley floor most reaches have been altered or hardened in some way to reduce flooding. To make sure streams function smoothly, the District undertakes routine maintenance activities along approximately 275 miles of creeks and related facilities through its ongoing, long-term Stream Maintenance Program, whose primary purpose is flood protection. The District does not own or manage the entire length of all of the creeks within the county. Typically, the District manages creeks that are on land it owns (fee title) or property that it has access to (through an easement). Any maintenance or construction work in and near creeks, or in wetland areas, triggers review and approvals (e.g., permits and agreements) from numerous federal, state, and local regulatory agencies.

Maintenance Guidelines and Facility Inspections

District staff inspect channels annually to identify bank erosion, levee erosion, levee damage from animals, in-channel blockages, sediment deposition, excessive bed scour, and in-channel vegetation growth that may impede flow conveyance.

To identify and prioritize when maintenance is needed to provide for flood protection, District staff use Maintenance Guidelines developed for its creeks and flood management facilities. The guidelines include descriptions of general stream functions and characteristics, high flow capacity objectives, estimates of flood stage-discharge relationships for creek reaches, and an overview of recommended routine activities to restore or maintain function. These activities include vegetation management for stream capacity and access, sediment removal, bank stabilization, road access improvement, management of animal conflicts (such as rodent burrows in levees), and other minor maintenance.

Controlling Erosion and Sedimentation

Development has changed much of the valley's landscape from vegetated soil, which absorbs rainfall, to impervious surfaces and storm drains, which move rainwater very quickly toward creeks. These changes both increase the amount of rainfall that reaches creeks (less absorption) and speed this increased amount of water to creeks (pipes are faster than trickling water through grassy hills). Finally, storm drain outfalls concentrate this increased flow to a few locations that discharge into the creek. Compared to natural overland flow, these point sources can act like a fire hose, leading to erosion of creek beds and banks and general "unraveling" of both natural and man-made creek structures.

Creek erosion undercuts trees and threatens nearby roads, fences, and other creekside structures including flood protection measures such as levees. Erosion also impacts the creek bottom (incision), where it can expose underground utilities such as water mains and sewer lines, subjecting them to destructive creek flows.

Eroded sediment, meanwhile, will be carried downstream and deposited in the flatter reaches of creeks. Channel sedimentation reduces flood conveyance capacity and increases the risk of flooding. Overtopping of banks can also deposit an enormous amount of sediment onto urban and suburban surfaces. During high flow or flood events, water so filled with sediment it may be chocolate brown in color, can settle into low areas and remain there for hours or days. These sediment-laden spillovers can leave a big cleanup job in streets and parks. They can also be devastating when muddy water enters homes, schools, shops, or other structures.

Reducing negative impacts from erosion and sedimentation is both a flood management and a maintenance issue for the District. Both the occurrences (erosion and sedimentation) and the fix (bank repair, sediment removal) can be harmful for ecological resources. The maintenance work is costly and time-consuming. Under the One Water approach, it may be more cost-effective to address the erosion potential rather than focus solely on repair. Methods may include revegetating the banks and near-bank areas, reconfiguring outfalls to redirect high storm inflows, or participating in stormwater management programs in partnership with the cities, the county, or developers.

REGULATORY AND POLICY FRAMEWORK

Flooding can pose a risk to life and property. To protect the public, federal agencies may oversee and partially fund large-scale flood protection projects. They also help cities and counties create ordinances and policies that reduce flood risk at the local level based on local conditions.

The primary federal agencies concerned with flood protection are the U.S. Army Corps of Engineers (Corps) and the Federal Emergency Management Agency (FEMA). The Corps brings national economic and design standards to bear on the planning and design of each project. Once a project is constructed, the Corps maintains a strong vested interest, and inspects against strict maintenance standards. FEMA is tasked with reducing flood damages.

FEMA does not regulate District activities. However, FEMA works with the District to certify that District-constructed flood risk reduction projects meet rigorous standards for providing a one percent level of protection. FEMA relies on local municipalities and the county of Santa Clara to enforce floodplain management ordinances. FEMA's National Flood Insurance Program (NFIP) requires each land use agency to adopt and enforce a floodplain management ordinance.

In an effort to encourage communities to establish sound floodplain management programs that go beyond the National Floodplain Insurance Program minimum requirements and incorporate such activities as education, technical support, flood data management, and flood warning programs, FEMA created the Community Rating System (CRS). The CRS program can qualify communities for reduced flood insurance rates based on floodplain management activities that reduce flood risks. The District has long supported local participation in the CRS program, and annually documents its own significant CRS-creditable activities, which can be shared as credit with each local community.

District maintenance or construction work in and near creeks, or in wetland areas, triggers regulatory review and requires permits from numerous federal, state, and regional agencies. In addition to obtaining permits from the Corps, California Regional Water Quality Control Boards, the California Department of Fish and Wildlife, and the San Francisco Bay Conservation and Development Commission, the District must also often consult with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service before conducting work in protected species' habitats.

The District's Stream Maintenance Program is the regulatory mechanism by which the District is authorized to conduct routine flood protection work in channels and streams within its jurisdiction. Program permit conditions detail the measures required by the regulatory agencies to avoid, minimize, or mitigate for environmental impacts associated with maintenance work. Due to the nature of working in stream channels, impacts cannot always be avoided. Mitigation may be in the form of revegetation efforts, invasive plant removal, improvement of stream habitats, or land acquisition for conservation purposes.

Removing sediment from Thompson Creek, San Jose, to maintain stream capacity and condition. Photo: SCVWD

Table 3-5: Recorded Flood Events on Santa Clara County Creeks by Watershed

Year	Lower Peninsula	West Valley	Guadalupe	Coyote	Uvas/Llagas
1952	Many creeks	Many creeks	Many creeks	Many creeks	Many creeks
1955	Many creeks	Many creeks	Many creeks	Many creeks	Many creeks
1967	Permanente, Heney	Smith	Los Gatos	Berryessa, Sierra, Crosley, Calera, Los Coches	Little Llagas, West Branch Llagas, Carnadero
1978		Calabazas	Ross, Santa Teresa, Calero	South Babb, Flint, Fisher	Little Llagas, Corrallitos, Lions, West Branch Llagas, Llagas
1980	Adobe, Matadero, San Fransquito, Stevens	Calabazas, San Tomas Aquino	Wildcat, Guadalupe, Ross, Golf, Greystone, Santa Teresa	Berryessa, Silver, Coyote, Lower Penitencia, Upper Penitencia, North Babb, South Babb, Fisher	Little Llagas, Uvas, Edmunson, Jones
1982	San Francisquito, Adobe		Guadalupe	Fisher, South Babb, Coyote, Upper Penitencia, Lower Penitencia	Tennant, Corrallitos, West Little Llagas, East Little Llagas, Edmundson, Llagas, West Branch Llagas, Uvas
1983	Matadero, Barron, Adobe, Permanente, Purissima	Calabazas, Sunnyvale East, Sunnyvale West	Guadalupe	South Babb, Berryessa, Coyote, Upper Silver, Fisher, Los Coches, Upper Penitencia, Lower Penitencia, Sierra, Crosley, Sweigert	Llagas, West Little Llagas, East Little Llagas, Corrallitos, Tennant, San Martin, Church, Rucker, Skillet, San Ysidro, West Branch Llagas, Uvas
1986	Stevens	Calabazas, San Tomas Aquino	Guadalupe, Ross, Guadalupe Creek, Los Gatos	Upper Penitencia, Sierra	Jones, Llagas, Uvas, Tennant, Corrallitos
1992				Upper Silver	
1995	Adobe, Hale, San Francisquito, Barron, Permanente		Guadalupe, Ross, Canoas, Calero	Upper Penitencia, Fisher	West Little LLagas, Rucker, Skillet, Burchell, Uvas, Day, West Branch Llagas, West Little Llagas, East Little Llagas
1997				Coyote	West Little Llagas, Tennant-Corrallitos, Llagas, East Little Llagas, Corrallitos, San Martin, Llagas, Dexter, Uvas-Carnadero
1998	San Francisquito, Adobe, Hale, Permanente	Calbazas, Sunnyvale East, San Tomas Aquino, Smith	Guadalupe, Ross	Berryessa, Calera, Coyote, Los Coches, Upper Penitencia	West Little Llagas, Tennant, Corrallitos, East Little Llagas, West Branch Llagas, Uvas
2009					West Little Llagas
2012	San Francisquito				

KEY CHALLENGES

Continued risk of flooding: Despite decades of effort to provide flood protection, about 40,000 acres of developed land remain subject to flooding from a one percent flood event in Santa Clara County. A stable funding source for flood protection projects has been established through 2029, and several large, multi-year, capital construction projects are anticipated to be complete by then. This will reduce the area subject to flooding but not eliminate it.

Expense of future projects: Capital projects are less affordable than in the past. In previous years, the District focused on constructing projects with the aim of protecting properties in the one percent floodplain, thereby eliminating FEMA flood insurance requirements for the protected neighborhoods. High-priority projects, where the cost of building flood protection was justified by significant reduction in flood damages, were constructed first. Today, different tactics are needed, including stronger flood risk management. This will involve more detailed scientific studies, and closer working relationships between the District and the cities.

Aging infrastructure: Rehabilitation of flood protection infrastructure projects with a typical design life of 50 years will soon become a priority. In Santa Clara County, nearly all of the capital projects are more than 20 years old, and half are more than 40 years old. Rehabilitating capital projects, while very costly, may create opportunities to replace old concrete or barren channels with a more environmentally friendly landscape. New and strategic partnerships could provide financial opportunities, ecological or geomorphic improvements, and increased community support.

Changing climate: Climate change will affect the level of flood risk. Flood protection projects are designed based on statistical analysis of past events, and built to provide protection to a certain level—often the one percent flood. With climate change, the future is likely to be very different from the past, with most models projecting more intense, but possibly less frequent, rainstorms. Combined with projected sea-level rise, this calls for a new approach in planning for future flood protection measures. Previously-built projects may not provide protection if hydrologic conditions no longer match design assumptions.

Increasing development, decreasing buffer zones: The community's past, and in some cases current, emphasis has been to maximize development of homes and businesses right up to the natural banks of creeks. When flood protection needs were considered, little room was available other than to build floodwalls or levees. The current challenge is narrow creek corridors—hemmed in by the previous approach of straightening, hardening, and walling off of creeks. Continued development will most likely increase the size of impervious areas in the watershed, which may increase erosion and decrease flood protection. To create a sustainable, high-functioning creek corridor, more land is required than for a simple, concrete, or bare-earth conveyance channel. However, land acquisition in Silicon Valley and neighboring communities is extremely costly.

Impervious surfaces: Urban growth brings with it more acres of impervious surfaces in the form of parking lots, roads, and other hardscape. The One Water approach supports projects that reduce impervious surface areas and increase absorption of rainwater and runoff within cities and developed areas. Developing more local support and funding for green infrastructure may become more important for flood protection than ever before with climate change.

Risk by watershed: Flood problems are not cookie-cutter issues, and neither are solutions. In the past, the District has relied heavily on published studies by the Corps and FEMA to define flood flows and floodplains, but more localized studies could provide more specific guidance on economic impacts and public health and safety issues. The District is planning to conduct its own studies to produce a more comprehensive assessment of risks than ever before, on a watershed-by-watershed basis.

3.5 LANDSCAPE RESOURCES

INTRODUCTION

Urbanization has vastly increased the acreage covered by buildings, roads, and other paved surfaces — all of which prevent water from sinking into the earth. In contrast, land left in its natural state or lightly developed for recreational or agricultural uses provides area for rainfall or floodwaters to absorb into the soil and underlying groundwater aquifers. District interest in protecting open landscapes throughout Santa Clara County derives from these benefits to water resources management. Open landscapes support several of the District's primary objectives: reliable local water supply by preserving natural infiltration in the recharge areas; flood protection by preserving natural infiltration and natural floodplains; water quality protection; and ecological stewardship by fostering natural habitats. Open landscapes and green spaces, with recreational trails along creeks and through watersheds, also improve quality of life for communities throughout Santa Clara County (see Figure 3-15, p. 64).

Much of the county can be classified as open space or agricultural landscape. The northern portion of the valley is highly urbanized, and District efforts to protect landscape resources are focused on balancing trail and open space access with flood protection and stream maintenance, primarily along creek corridors. In the more agricultural and less-developed southern Santa Clara County, District activities also include supplying water to farms and promoting responsible farming and grazing — supporting another kind of valuable open space. In the hills above its reservoirs, the District partners with open space districts and Santa Clara County Parks to support and promote low impact land uses in order to protect water quality in the upper watersheds. Some of the District's partners include the State Coastal Conservancy, The Nature Conservancy, Santa Clara County Parks, the Santa Clara Valley Open Space Authority, and the Mid-Peninsula Regional Open Space District.

Overall, the District maintains a strong interest in working with open space managers, parkland owners, and farmers and ranchers to ensure that undeveloped landscapes continue to help sustain the county's water resources. As part of a multi-objective, One Water approach, the District has increasingly tried to incorporate open space elements into capital flood protection and other projects to maximize both flood mitigation and riparian habitat.

MULTI-PURPOSE LANDSCAPES

Landscapes For Flood Protection

As the primary agency carrying out flood protection in Santa Clara County, the District works to maintain adequate flow capacity within creek channels. However, maintaining an open, undeveloped floodplain in less restricted landscapes can also provide flood protection. To this end, since 1999, the District has purchased or partnered to acquire approximately 2,000 acres of floodplain, which it maintains as open space. This has been more difficult to accomplish in the more urbanized parts of the valley. However, allowing creeks room to flow naturally is something the District strives to support.

In recent years, the District has also looked to open landscapes such as parks and sports fields to double as flood detention basins in the rare instances where flood waters overtop creek banks. This allows for beneficial uses by the community during the majority of times when the area is not needed for flood protection. For example, Lake Cunningham Regional Park in the Coyote Creek Watershed doubles as a flood basin when Lower Silver Creek overflows its banks.

Many flood protection projects include purchasing properties near creeks, which not only removes at-risk homes from floodplains, but also allows for a wider, more natural creek system. Since the mid-1990s, the District has purchased a total of 90 developed properties in the City of San Jose alone, in support of flood protection on the Guadalupe River and Coyote Creek. The District is currently in the process of purchasing dozens more properties near Morgan Hill to incorporate into a flood protection and restoration project.

Open landscapes that can absorb or filter agricultural and urban runoff caused by flood and storm events also contribute to District pollution prevention activities (see Chapter 3.3: Water Quality)

Landscapes For Groundwater Recharge

Natural groundwater recharge comprises about 15 percent of the District's water supply sources and contributes to the reliability and sustainability of the county's water supply. The preservation and expansion of pervious surfaces in areas with suitable soils for percolation will help maintain or enhance natural recharge. These areas could provide multiple benefits when combined with landscapes for flood protection or stream stewardship.

Landscapes For Trails And Recreation

The District views open land and trails as valuable public resources—opportunities for citizens to engage with the county's waterways and natural resources. Since trail development is outside the District's usual purview, it partners with other local agencies that plan, design, construct, maintain, and patrol trails for public use. District lands along creeks, reservoirs, and pipeline corridors are potential components of an underlying structure for a countywide network of trails (see Figure 3-14).

Guadalupe River Park Trail. Photo: SCVWD

Using cooperative interagency agreements, the District shares its land and resources, allowing partners like the City of San José, the Santa Clara Valley Open Space Authority, and Santa Clara County Parks to bring their green space visions to reality. Though the costs and maintenance responsibilities for trails fall to these other agencies, the District actively funds some efforts through a robust grant program. Between 2003 and 2015, the District granted $4.9 million to other agencies and communities for public access to trails and open space; these grants assisted more than 51 projects, and built access to more than 70 miles of trails.

Landscapes for Preservation, Restoration, or Mitigation

Some undeveloped areas are protected as habitat for fish and wildlife species, forests and woodlands, sensitive plant communities, and tidal marshes. District lands or waterways may include or be adjacent to such areas. These protected lands contribute to the District's capacity to absorb rainfall and runoff, and sustain riparian habitats.

The District also purchases or restores open space to protect or create habitat to meet regulatory obligations when mitigation is required to compensate for a project's environmental impacts. In 2012, for example, the District purchased open space referred to as the Coyote Ridge Preserve to meet mitigation requirements for impacts associated with the District's Stream Maintenance Program and other projects. Mitigation property may also be purchased through mitigation "banks", such as those available under the 2013 Santa Clara Valley Habitat Plan (see Appendix B, Coordination).

Above and beyond regulatory requirements, the District purchases open lands adjacent to waterways (or encourages other agencies to do so) to create, restore, improve, rehabilitate, or revitalize habitat. One example is the flood protection

Figure 3-14: Countywide Trails Master Plan

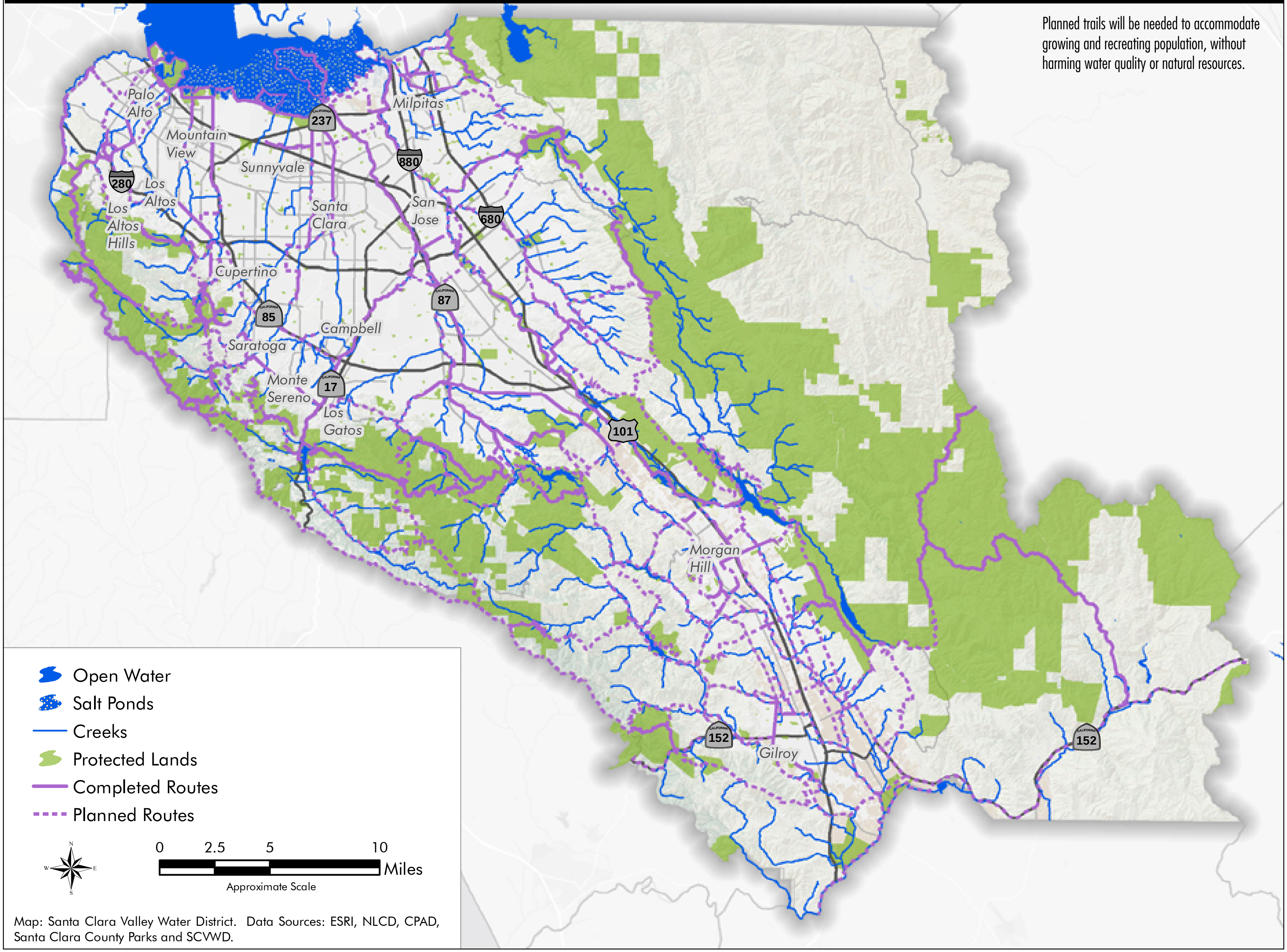
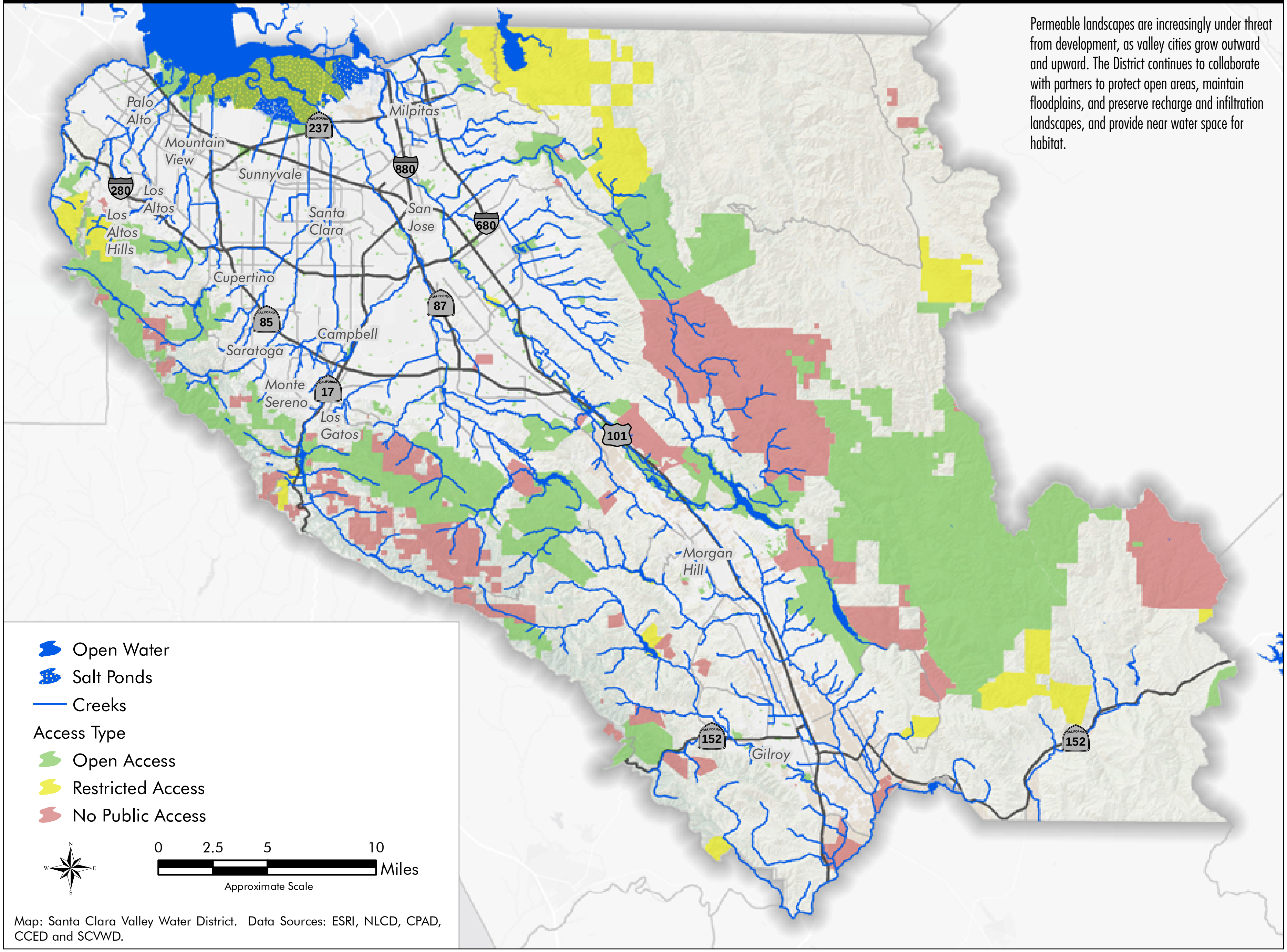


Figure 3-15: Open Space/Protected Areas



Permeable landscapes are increasingly under threat from development, as valley cities grow outward and upward. The District continues to collaborate with partners to protect open areas, maintain floodplains, and preserve recharge and infiltration landscapes, and provide near water space for habitat.

Irrigation lines water crops in southern Santa Clara Valley. Photo: SCVWD

REGULATORY AND POLICY FRAMEWORK

Protecting open landscapes for water infiltration, water quality, and flood protection is often something the District does in partnership with other landowners, as well as with municipalities responsible for zoning and land use management. In general, such broader issues require more policy and planning outreach with city and county neighbors, and less regulatory response other than the kinds described below and in other sections of this chapter.

District landscape management and protection activities can involve both on- and off-site mitigation for impacts to habitats or special status species under state or federal environmental laws and regulations. The need for mitigation sites can, in turn, involve the District in acquisition, preservation, or restoration of disturbed landscapes or more pristine open spaces. Regulators can also require monitoring of mitigation efforts to ensure that objectives are reached. Beyond mitigation, FEMA-defined floodplains are an important federal tool for planning open space and floodplain management and acquisitions.

PERTINENT LOCAL AND DISTRICT POLICIES AND PLANS

County and city general plans

Strategic Plan for the county of Santa Clara Parks & Recreation System

Countywide Trail Master Plan

Santa Clara Valley Open Space Authority Valley Greenprint

Clean, Safe Creeks and Natural Flood Protection Program

Safe, Clean Water & Natural Flood Protection Plan

Santa Clara Valley Habitat Plan

SCVWD Fisheries Aquatic Habitat Collaborative Effort

Guidelines and Standards for Land Use near Streams

Various Joint Use Agreements, Joint Trail Agreements, and Memorandums of Understanding

project along Lower Coyote Creek, where additional land was acquired as a buffer to the creek channel and improved through further revegetation and habitat enhancement.

Working Landscapes

Responsible farming and grazing practices are vital to the District's long-term vision. Farmlands not only provide a local food source but preserve rural space from urban development, facilitating movement of native species between bordering habitat fragments, and provide undeveloped space adjacent to streams. Rangelands, where cattle graze, make up the largest agricultural zones of the county and also provide important habitat in the surrounding hills. Farmland and rangeland provide pervious surfaces capable of absorbing rain and runoff, allowing for natural groundwater recharge. In addition, well-managed farms and rangeland can reduce the amount of nutrient and sediment pollution flowing into creeks. Many farmers and ranchers are actively involved in managing their working lands in ways that mirror some District objectives, and are thus valuable partners.

Valley farmers use about 30,000 AFY of groundwater and 600 AFY of recycled water, serving an agricultural economy generating more than $250 million annually. Farmers in the valley grow diverse crops, including the garlic that makes the City of Gilroy famous. Red bell peppers have ranked as one of the top three grossing crops in the county for 10 years, and more recently, nursery crops and mushrooms are taking hold as anchors of local agriculture. See map in Chapter 3.1 for land cover including hay/pasture and cultivated crops.

District efforts to sustain permeable working landscapes also extend to providing alternate water sources and, in partnership with local resource conservation districts, to encouraging greater irrigation efficiencies. The District, in partnership with the South County Regional Wastewater Authority, is actively working to expand recycled water availability to farmers in south county. The District also partners with the Loma Prieta Resource Conservation District to offer irrigation efficiency testing and management assistance to growers.

KEY CHALLENGES

Limited and costly land: The highly developed and desirable nature of the Santa Clara Valley increases land costs for open space, recharge, flood protection, habitat and recreation. The District faces significant logistical, monetary, and maintenance challenges in supporting the expansion of landscapes for all these purposes in the county.

Impacts on habitat and water quality: Protecting open spaces near waterways can reduce human impacts on habitat and water quality, but only if managed with careful attention to impacts from any resulting public access to these landscapes. Trails, for example, can have negative impacts unless properly planned, designed, built, and maintained. If water runs off trail surfaces into a stream, it can pick up pollutants or cause erosion. Building new trails or expanding existing ones also increases the presence of humans in natural environments, creek zones, watershed lands, and wildlife habitats. Direct physical effects include legal and illegal hunting, littering, harvesting of plants and plant parts, mineral and rock collection, harassment of wildlife by trail users and their pets, and off-trail recreational and commercial activities. Indirect physical effects include light, noise, odors, and human-caused wildfires. Balancing public access with District protection and maintenance of waterways, flood plains, and water resources remains an ongoing challenge.

Maintenance impediments and costs: Often what appears to be open space along waterways to the public, including District maintenance roads, seems like an ideal location for recreational amenities such as trails. However public access to these lands is not always possible as unimpeded District access for maintenance responsibilities such as sediment and vegetation removal must be preserved. For this reason the District generally prefers to limit recreational improvements on creekside maintenance roads to one side of the channel. Still, the District often incurs increased maintenance costs as a result of its efforts to support the public's use of District-owned property.

Planning for future flood protection: Trails can get in the way of flood protection improvements, some of which take decades to plan and construct. Moving trails is costly and funding for relocation is rarely part of trail development grants. The District encourages trail proponents to avoid extensive trail improvements in areas where flood protection improvements have not been completed.

3.6 ECOLOGICAL RESOURCES

INTRODUCTION

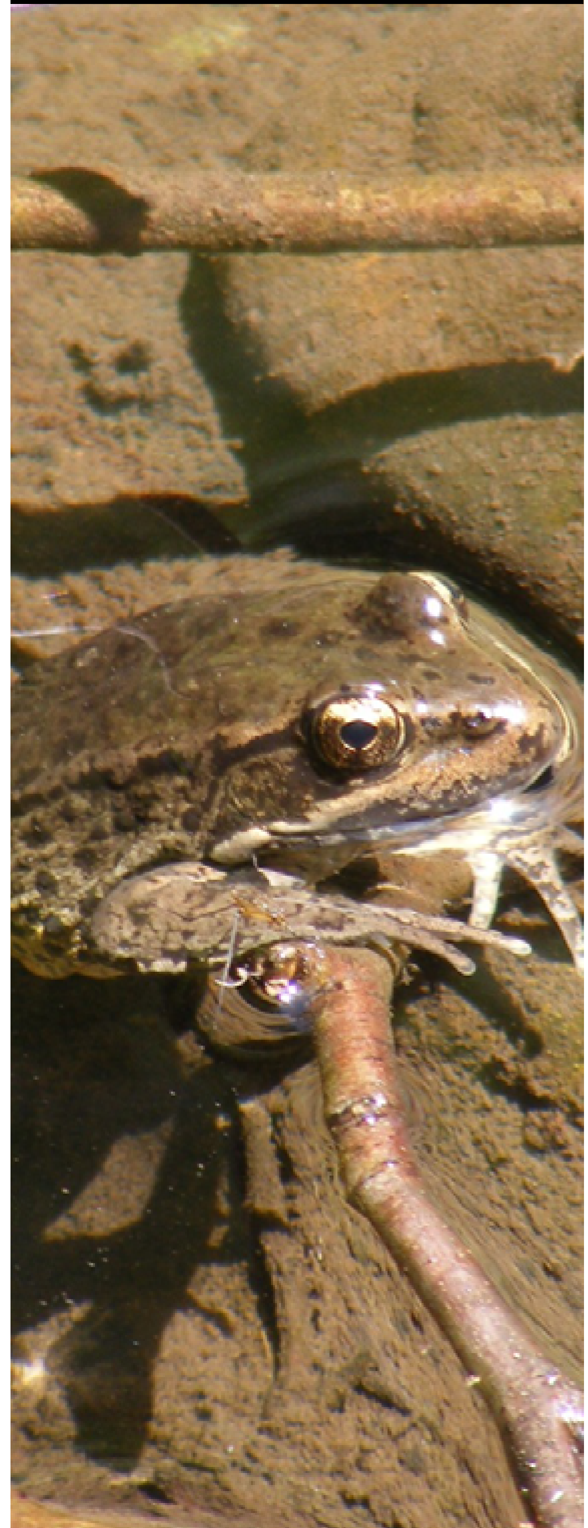
Santa Clara County is a highly urbanized region with nearly two million human inhabitants. Despite this level of development and the pressures it can have on the natural landscape, seven natural communities, 37 types of land cover (vegetation groups), over 400 species of vertebrates, and numerous fish species coexist. In addition, a variety of special status species of wildlife, fish, and plants persist in the county. The balance between the urban and natural settings requires careful consideration and management, and falls under the watchful eye of federal and state regulatory agencies.

To prevent the further decline of habitats and species in the face of population growth, broad protection and active management of natural resources must be a priority. The Santa Clara Valley Water District has played, and will continue to play a key role in this endeavor as it manages water resources for the region and its inhabitants. This is made possible by the District's enacting legislation with the state that allows for watershed stewardship in addition to water supply and flood protection mandates.

Some of the District's general goals include:

- Preserve creeks, Bay, and ecosystems through environmental stewardship
- Improve watersheds, streams, and natural resources as they pertain to ecological resources
- Promote the protection of creeks, Bay, and other aquatic ecosystems from threats of pollution and degradation
- Restore the salmonid fishery on identified salmonid streams by creating suitable accessible spawning and rearing habitats
- Engage the community in the protection of water quality and streams stewardship

District goals and activities also reflect the intent of the 2012 Santa Clara Valley Habitat Plan, a



major collaboration among diverse open space and resource managers working on habitat and species protection of which the District was a part.

Working with partners, and with a special concern for the more than 800 miles of creeks and rivers in the county needing protection and care, the District intends to strengthen its stewardship of the county's natural environments, particularly as they relate to water resources. The District owns relatively little land across the county, however, so partnerships with other agencies, organizations, and landowners remain key to reaching these stewardship goals and carrying out the One Water Plan.

COUNTYWIDE LANDSCAPE

Santa Clara County's ecological resources occur in three distinct regions: the hills (or upper watershed), the valley floor (which includes urbanized and rural landscapes), and the baylands. Though highly altered by humans today, these regions still reflect the natural landscapes, ecosystems, stream corridors, and plant and wildlife communities that characterized the region before human settlement. Since different environments are needed for reproduction, foraging, and shelter during different periods of a species' lifecycle, the county's fish and wildlife need access to a complex variety of well-connected habitat types and corridors across the hills, valley floor, and baylands zones. Connecting habitats across watersheds is one of the challenges considered in the countywide One Water Plan.

Hills

(hillslopes, canyons, and channels)

The hills include the lands in the Santa Cruz Mountains and the Diablo Range, as well as the low foothills on either side of Santa Clara Valley that surround many of the District's 10 reservoirs.

The Diablo Range, located on the east side of Santa Clara Valley, is characterized by gently sloping but strongly dissected alluvial foothills, with rugged topography and heights in excess of 1,000 feet in elevation (SCVHP, 2012). Rock outcrops with cliff faces are infrequent along the ridges but more frequent along the incised creeks. Outcrops of mafic and ultramafic soils and associated serpentine geology are locally present in the Diablo Range foothills. Vegetation within the Diablo Range is highly variable and dependent on substrate, elevation, and aspect; average rainfall at the upper elevations can be 20 to 30 inches per year. Fog drip from trees on ridgelines may provide significant water during the dry season. South and west facing slopes tend to be drier and have more drought tolerant vegetation such as mixed chaparral, coastal sage scrub, and grassland with scattered oaks, while north and east facing slopes are wetter and have more woodland vegetation (such as mixed oak). Plants and animals in the hills are somewhat different than in the rural and urbanized regions (see below).

Some of the most sensitive habitat types in the hills occur on serpentine soils, which are typically very nutrient-poor and high in heavy metals. This combination is toxic to most plant species other than those native species adapted to tolerate serpentine soils. As a result, serpentine soils support highly specialized flora (see Vegetation below). Large blocks of serpentine soils and associated serpentine geology occur in the Diablo Range foothills. Lesser amounts of serpentine soils and geology occur on the west side of the valley and in scattered areas on the valley floor (such as Tulare Hill).

Across the Valley on the west side, the Santa Cruz Mountains rise to almost 4,000 feet in elevation. Typical of the Coast Ranges, they extend northwesterly and are characterized by steep, rugged slopes and abrupt, deeply incised drainages (SCVHP, 2012). Vegetation in the Santa Cruz Mountains is adapted to moderate moisture levels; sections of the mountains can receive 40 to 60 inches of rain per year. Typical vegetation consists of oak and coniferous woodlands, with some chaparral and coastal scrub present on thinner soils.

These hill and mountain landscapes are no longer pristine. Individual residences and ranches are dispersed throughout the hills of both mountain ranges. The Diablo Range, with its drier conditions, was historically used for cattle ranching while small communities and lumber camps dotted the wetter Santa Cruz Mountains. As these landscapes have been lightly developed, the wildlife resources may not have been as severely affected as those in lower elevation landscapes. Large mammals are present and can move relatively freely across the upper watersheds. Bird and reptile communities may be relatively intact throughout the range, and amphibians can use springs and natural wetlands for reproduction. However, the hills are not free from human influence, and impacts to these resources continue today.

Valley Floor

(alluvial fans, channels, and floodplains)

The valley floor encompasses the alluvial fans and outwash plains of Santa Clara Valley, and includes both urbanized and rural landscapes. Some areas on the valley floor, while predominantly rural, still contain remnant native grassland and a mosaic of wetlands and riparian habitats. Riparian forest and scrub habitats include Central California sycamore alluvial woodland, a sensitive natural community. Wetlands include coastal and valley freshwater marsh, and seasonal wetlands.

The urbanized zone was built on the plains of the valley floor. These areas are dominated by residential, commercial, and industrial developments. The creeks and rivers in these urban landscapes have been channelized, and are contained within levees for the most part. These creek corridors have been confined to the smallest amount of land possible to pass winter storm flows. In places, channels—or ditches—were dug to drain natural wetlands, and these form parts of today's creek network. Vegetation along the creeks is distributed in patches, and the lateral extent of creek (riparian) vegetation is compromised by the developed landscape. In some areas, the urban forest, composed of non-native species, may act as additional wildlife habitat. Wildlife in the valley's more urban zones are dominated by a few native species that interact well with humans as well as those species introduced to the landscape.

The valley floor's more rural landscapes have been mostly developed for agricultural production. Many are being overtaken by large lot suburban development. Much of the agricultural land is planted in orchards, vineyards, and row crops; land for grazing dairy cattle and various other livestock is not as prevalent. Individual agricultural parcels are relatively small and interspersed with residential areas. Wildlife are limited in the rural landscapes and freely use creeks as habitat corridors to move from habitat patch to habitat patch.

Baylands

(upland-marsh ecotone, marshplain, and tidal channels)

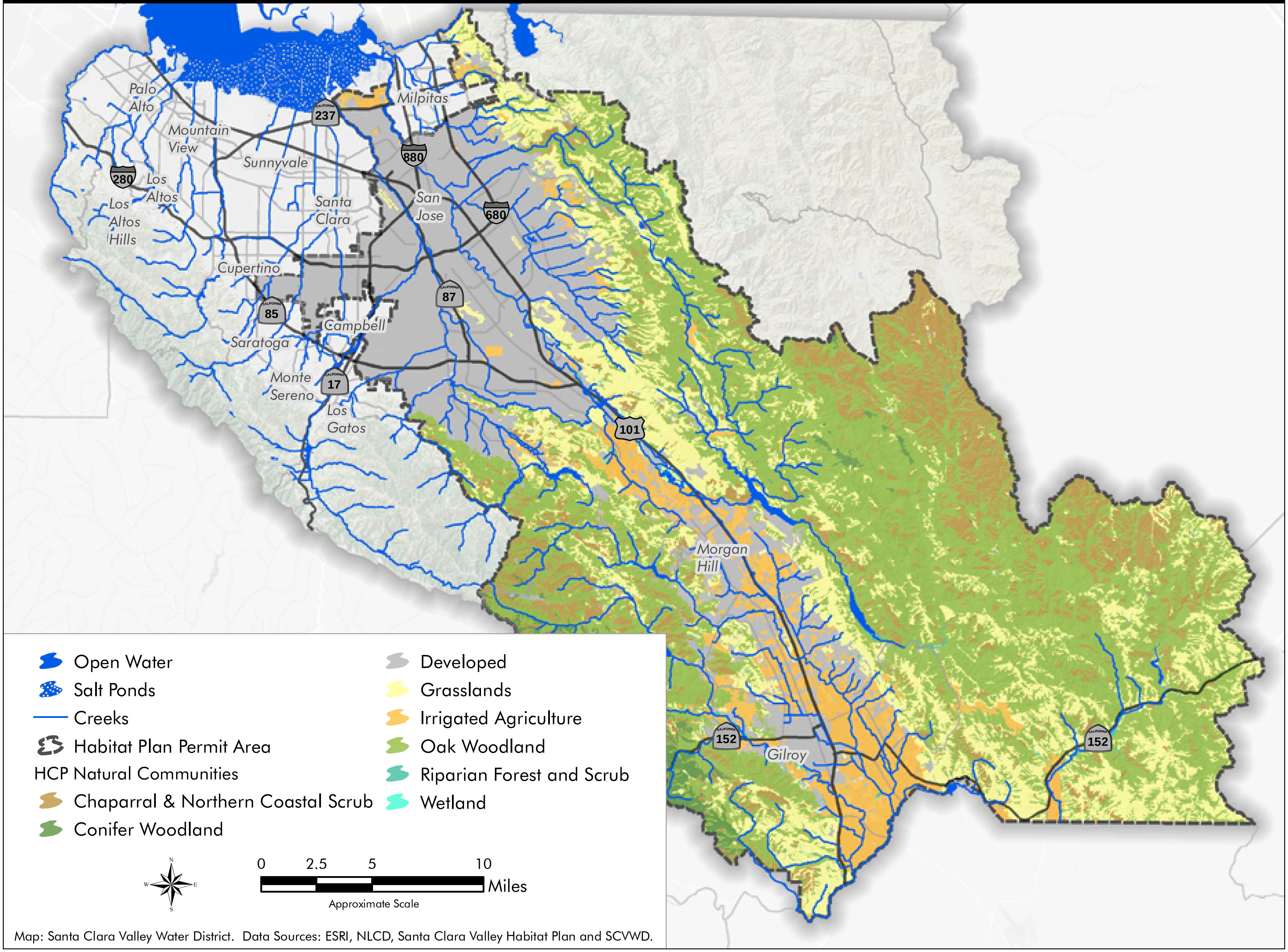
The northern portion of the county drains to San Francisco Bay. Though highly altered by human influence, the baylands are still characterized by valuable and functional tidal estuarine systems. South San Francisco Bay's remnant tidal marshes, once extensive, provide valuable habitat for migratory and resident birds, fish, and other wildlife species. The baylands are distinct from other portions of the watersheds for several reasons. The substrate tends to be fine-grained soils with relatively high salt content. The flat terrain is poorly drained and supports unique species of wildlife. Many baylands areas were used for commercial purposes, leaving only small strands of open habitat along sloughs, modified stream channels, and low-lying lands undeveloped or diked for salt production. Resident wildlife populations are at low levels due to limited habitat. Seasonally, wildlife populations expand with the influx of migrant birds in the spring and fall. Many special status plant species that historically occurred in tidal and high marsh areas of the baylands have been extirpated due to habitat modification and pressures from development. A major wetland restoration project along the South Bay shore, in which the District is a partner, is reducing pressures for special status marsh species (see p. 86).

See also Chapter 1: The County Setting; Chapter 2: Historical Ecology & Model; and Chapter 3.1 Overview & Contemporary Model, and 3.7 Baylands.

Natural Communities

Natural communities are an assemblage of species that co-occur in the same habitat or area and interact through functional ecological relationships. Communities are typically characterized by one or more dominant plant species, which form land cover types. As detailed in the Santa Clara Valley Habitat Plan (2012), seven natural commu-

Figure 3-16: Habitat Conservation Plan - Natural Communities



Map: Santa Clara Valley Water District. Data Sources: ESRI, NLCD, Santa Clara Valley Habitat Plan and SCVWD.

nities are described, including 37 more specific land cover types. For the purpose of describing these natural communities in terms of vegetation and wildlife on a countywide basis, common wildlife species associated with each community are also included. Areas outside of the Valley Habitat Plan fall into several land cover types as illustrated in the land cover map in Chapter 3.1. Aquatic species are described separately under the Fish section below. The following major natural communities are found in Santa Clara County.

Grassland

The grassland natural community consists of herbaceous vegetation dominated by grasses and forbs (herbaceous flowering plants that are not grasses), which grow throughout the county in many different habitats. Native grasslands are more common in the low foothills and upper watershed areas while California annual (non-native) grassland is typically found on the valley floor.

Native grasslands, seeps, and rock outcrops are habitat for several special status plant species. Grasslands in the county can be classified into the following land cover types:

- California annual (non-native) grassland
- Non-serpentine native grassland
- Serpentine bunchgrass grassland
- Serpentine rock outcrop/barrens
- Serpentine seep
- Rock outcrop (non-serpentine)

Common wildlife species in the grassland natural community include: Northern Pacific rattlesnake, valley garter snake, western meadowlark, California ground squirrel, Botta's pocket gopher, California vole, and coyote. Burrows and cracks in grasslands provide subterranean habitat for amphibians, and grasslands also serve as foraging habitat for raptors such as American kestrels and red-tailed hawks.

California quail. Photo: Rick Lewis

Chaparral and Northern Coastal Scrub

Chaparral scrub communities in California flourish on rocky, porous, nutrient-deficient soils on steep slopes. Within the county, the highest elevation for chaparral scrub communities is 4,360 feet at Mt. Hamilton. These communities are dominated by drought-adapted, evergreen, woody shrubs. Special status plant species also thrive in these natural communities, typically in the chaparral that grows on serpentine soils. Chaparral can be classified into several land cover types in the county:

- Northern mixed chaparral/chamise chaparral
- Mixed serpentine chaparral

A related land cover type is northern coastal scrub, generally characterized by low stature shrubs with soft leaves, interspersed with grassy openings and an herb-rich vegetation community. Northern coastal scrub in the county can be further divided into the following types, scattered throughout the Santa Cruz Mountains and the Diablo Range:

- Northern coastal scrub/Diablan coastal scrub
- Coyote brush scrub

Wildlife species of the chaparral and northern coastal scrub natural communities include: Western fence lizard, Pacific gopher snake, California quail, wrentit, spotted towhee, brush rabbit, and black-tailed deer.

Oak Woodland

The most common land covers in the county are dominated by upland hardwood trees such as oaks. Special status plant species are sometimes interspersed in oak woodland communities. The oak woodland natural community, dominated by at least 10 percent cover of hardwood tree species such as oak, has the following oak-dominated land cover types in the watersheds:

- Valley oak woodland
- Mixed oak woodland and forest
- Coast live oak woodland and forest
- Blue oak woodland
- Foothill pine-oak woodland

Common wildlife species in the oak woodland natural community include: Southern alligator lizard, oak titmouse, acorn woodpecker, American deer mouse, and black-tailed deer. Oak woodlands also provide upland habitat for amphibian species including California toad.

Riparian Forest and Scrub

Riparian forest, woodland, and scrub communities surround riverine watercourses and are abundant along stream banks and floodplains. The type of woody vegetation dominating these communities depends on the consistency of water sources, some of which are intermittent, some permanent.

Acorn woodpecker. Photo: Rick Lewis

Riparian woodland is dominated by trees and contains an understory of shrubs and forbs. Riparian scrub is dominated by young willow trees and shrubs, typically representing an early successional stage of riparian woodland. Special status plants sometimes live in riparian vegetation communities. Riparian vegetation in the watersheds can be classified into the following land cover types:

- Willow riparian forests, woodlands, and scrub
- Central California sycamore alluvial woodland
- Mixed riparian woodland and forest
- Riverine

California newt. Photo: Rick Lewis

Wildlife species in the riparian forest and scrub community include: California slender salamander, California newt, coast garter snake, red-shouldered hawk, mallard, Wilson's warbler, and common gray fox.

Conifer Woodland

Conifer woodlands in Santa Clara County include redwood forest and knobcone pine woodland, found in the Santa Cruz Mountains on the west side of the county, and ponderosa pine woodland, at higher elevations on the east side of the county in the Diablo Range. While some special status plant species may occasionally be seen in conifer woodland (such as ladyslipper orchid, fragrant fritillary, or Loma Prieta hoita), these species are likely rare or extirpated in the county. Conifer woodland vegetation in the county can be classified into the following land cover types:

- Redwood forest
- Ponderosa pine woodland
- Knobcone pine woodland

Common wildlife species in the conifer woodland community include: arboreal salamander, California newt, red-sided garter snake, Steller's jay, Cooper's hawk, Western gray squirrel, and striped skunk.

Wetlands

Wetlands include areas subject to seasonal or perennial flooding or ponding, or that have saturated soil conditions. Wetlands support predominantly hydrophytic (water-loving) herbaceous plant species. Plants growing in wetlands can tolerate lengthy periods of inundation and low levels of soil oxygen; the presence of flood-tolerant species is often a good wetland indicator even if the ground appears dry for most of the year. Wetlands in the baylands are primarily composed of salt and brackish marsh species and interspersed mudflats. These wetlands form a gradient based on hydrology and salinity, with species in the low marsh adapted to inundation from daily tidal prism, and in the high marsh to frequent inundation. Endangered plants in tidal areas of the county were typically located in the high marsh and have almost all been extirpated, succumbing to intense human development pressure and competition from exotic species. Freshwater marshes and other herbaceous wetlands are found in the hills and valley floor and may contain special status plant species. Wetland habitat can be classified into the following land cover types in the county:

- Coastal and valley freshwater marsh
- Seasonal wetland
- Tidal wetlands and salt marsh

Common wildlife species of the wetlands community include: Sierran treefrog, California toad, killdeer, mallard, and red-winged blackbird; wetlands provide foraging habitat for species like the white-tailed kite and northern raccoon. Wildlife commonly found in tidal wetlands include: garter snake (*Thamnophis sp.*), mallard, pie-billed grebe, marsh wren, song sparrow, and California vole.

Open Water

Beyond its terrestrial and wetland habitats, the county encompasses a variety of open water and aquatic habitats such as lakes, reservoirs, water treatment ponds, sloughs, and ponds (including percolation, stock ponds, and salt ponds) that do not support emergent vegetation.

Common wildlife in the open water natural community include: garter snake, mallard, gadwall, and American coot.

Vegetation

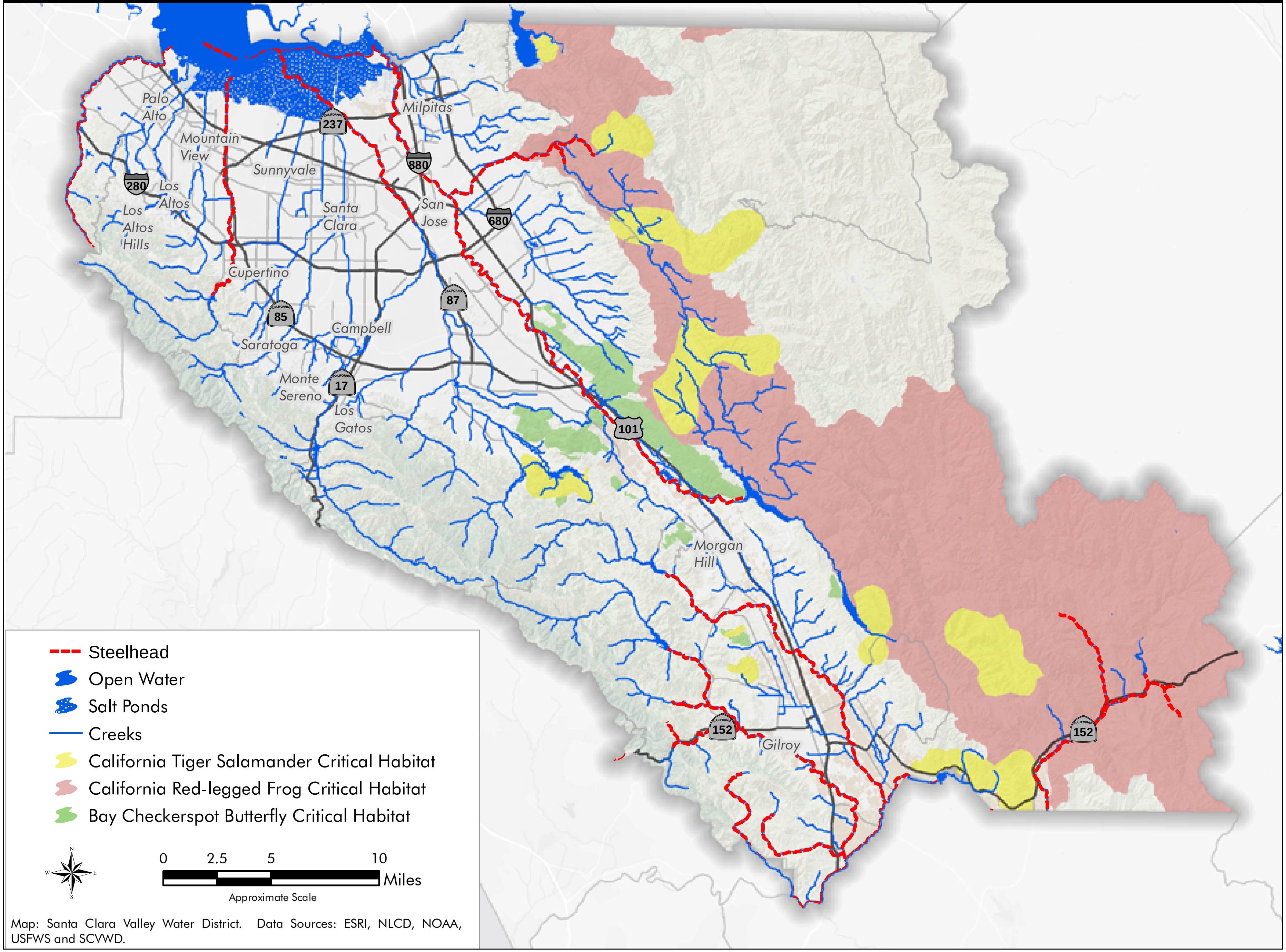
Special Status Plant Species

A table of special status plant species known to occur in the county or for which suitable habitat is present is listed in Appendix A-4. Most of the special status plants in the county are clustered into two major geographic regions: the baylands and the low, rural foothills adjacent Coyote Valley. The baylands, with their tidal marsh and high marsh habitats, historically supported a suite of special status marsh plants, many of which have been extirpated from the county due to intense urbanization, habitat loss and fragmentation, altered hydrologic regime, and pressure from invasive species, as discussed earlier.

Sensitive Natural Communities

The conservation of special status native plants and wildlife is integral to maintaining biological diversity, as is conserving and protecting the habitats in which they live. Sensitive natural communities are vegetation communities of limited distribution statewide or within a county or region that is vulnerable to impacts from human development or other projects. These communities may or may not contain special status species or their habitat. Impacts to sensitive natural commu-

Figure 3-17: Sensitive Species Critical Habitat



nities are regulated by the California Department of Fish and Wildlife. See: www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf

The following natural communities are considered by CDFW to be sensitive (2010; www.dfg.ca.gov/biogeodata/vegcamp/natural_communities.asp):

- Non-serpentine native grassland
- Serpentine bunchgrass grassland
- Serpentine rock outcrop
- Serpentine seep
- Mixed serpentine chaparral
- Northern coastal scrub/Diablan sage scrub (with coyote ceanothus component)
- Valley oak woodland
- Blue oak woodland
- Central California sycamore alluvial woodland
- Coastal and valley freshwater marsh
- Seasonal wetland

These sensitive natural communities can be clustered into three generalized categories in the county: communities restricted to or adjacent to serpentine soils, located predominantly in the low foothills of the upper watershed; woodland-dominated communities, located in the rural landscape (sycamore alluvial woodland) and hills; and wetland plant communities, found throughout the county on the valley floor, in the baylands, and in ponds and drainages in the mountains and foothills.

REGULATORY AND POLICY FRAMEWORK

Many species and habitats protected by federal and state laws or regulations occur in and around creeks, reservoirs, and other areas under District purview (see Figure 3-17, p. 73). As such, District maintenance or construction work in these areas often triggers regulatory review and requires permits. Sometimes these activities also require any habitat lost to be replaced with something equivalent or better nearby.

FEDERAL PROTECTIONS

Several wildlife and plant species that occur within Santa Clara County are listed as endangered or threatened under the federal Endangered Species Act, which is administered by two federal agencies; the National Marine Fisheries Service for marine mammals, marine fishes, and anadromous fishes (e.g., steelhead), and the U.S. Fish and Wildlife Service for all other species. The federal Endangered Species Act prohibits "take" of any species listed as endangered or threatened. Simply stated, take is defined as killing or injuring an endangered or threatened species, or adversely impacting its habitat. If an action is likely to adversely affect a listed species or its habitat, the project proponent must consult with these agencies for "take" authorization.

Coyote ceanothus. Photo: Janell Hillman

Some areas within Santa Clara County are designated by the National Marine Fisheries Service or U.S. Fish and Wildlife Service as "critical habitat" for certain species listed as threatened or endangered under the federal Endangered Species Act. For projects with a federal nexus, these regulatory agencies must be consulted to ensure that a project's actions will not destroy or adversely modify critical habitat. Critical habitat is designated for the following species within the county: California red-legged frog, California tiger salamander, Bay checkerspot butterfly, Alameda whipsnake , Central California Coast Steelhead Evolutionary Significant Unit (ESU), and South Central California Coast Steelhead ESU.

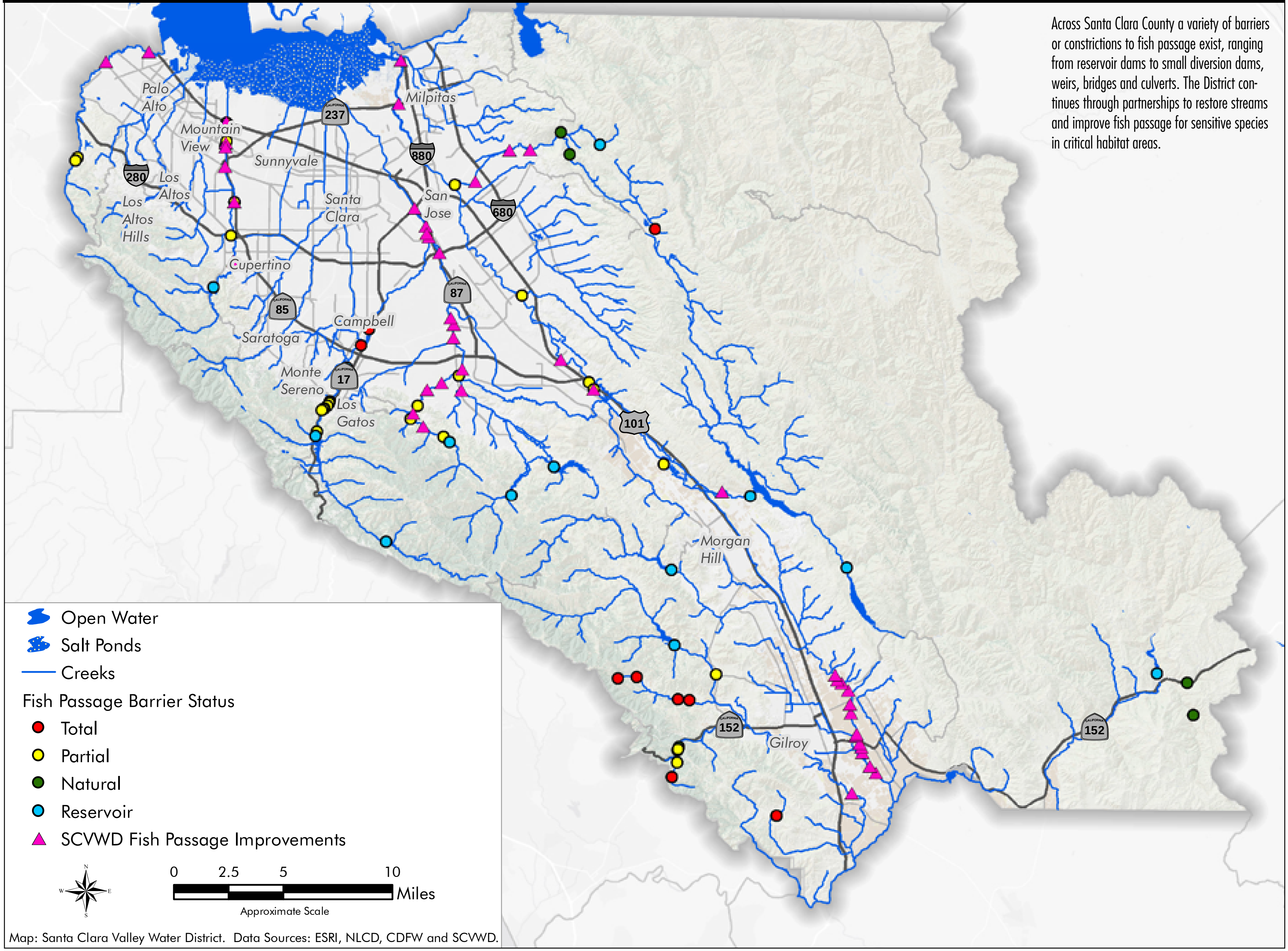
STATE PROTECTIONS

The California Endangered Species Act is administered by the California Department of Fish and Wildlife and protects animal species listed as endangered, threatened, or candidate species for listing. California Fish and Wildlife has additional protections for certain species not listed under the federal and state Endangered Species Acts, including California Species of Special Concern and Fully Protected species. California Environmental Quality Act (CEQA) analysis for a project should take into consideration Species of Special Concern, as well as plants listed as rare and endangered by the California Native Plant Society. Species designated as Fully Protected under California Fish and Wildlife Code may not be taken or possessed at any time, and no permits may be issued for their take, with few exceptions.

Special status species is being used as a universal term for species that are considered sufficiently rare that they require special consideration and/or protection under applicable local, state, and federal regulations and should be, or are, listed as rare, threatened, or endangered by the federal and/or state government.

Figure 3-18: Fish Passage Impediments

Across Santa Clara County a variety of barriers or constrictions to fish passage exist, ranging from reservoir dams to small diversion dams, weirs, bridges and culverts. The District continues through partnerships to restore streams and improve fish passage for sensitive species in critical habitat areas.



Map: Santa Clara Valley Water District. Data Sources: ESRI, NLCD, CDFW and SCVWD.

Wildlife

With an increase in human population, resident wildlife populations in Santa Clara County have been greatly reduced. Many species occur at low levels in marginal habitats and compete with humans for space, cover, food, and water. Species that can tolerate humans often do better than those that do not. Domestic cats and dogs reduce wildlife populations in both the District's urbanized and rural landscapes on the valley floor.

Hundreds of species of vertebrates (amphibians, reptiles, birds, and mammals) occur in Santa Clara County either seasonally or year-round. There are also a large number of invertebrates living in Santa Clara County watersheds. Non-native wildlife make up a portion of the species in these groups as do special status wildlife species. Some common native wildlife species are noted under the under natural community types above. A list of special status wildlife species is included in Appendix A-1.

Special Status Wildlife Species

Several special status wildlife species are known to occur in Santa Clara County. The baylands region of Santa Clara County is home to a number of special status species. These include the federally and state endangered and state fully protected salt marsh harvest mouse and Ridgway's rail. In the valley floor and hills regions of the county, special status wildlife species are also often associated with water. Riparian, wetlands, and open water natural communities support various special status wildlife species including the California tiger salamander (federally and state threatened), California red-legged frog (federally threatened and state species of special concern), and western pond turtle (state species of special concern). Grasslands and oak woodlands serve as upland habitats for California tiger salamanders and California red-legged frogs, species that require aquatic and terrestrial habitats with adequate connectivity. A couple special status wildlife species that rely mainly on upland habitats are the federally threatened Bay checkerspot butterfly, which feeds on a variety of plants associated with serpentine grasslands, and the state species of special concern western burrowing owl, which utilizes open habitats such as grasslands. Western burrowing owls may also use levees and higher ground in the baylands.

Through the One Water Plan, the District seeks to improve and connect habitats and take a countywide, landscape-scale view of what has been a species-by-species, stream-by-stream approach to stewardship.

Fish

Human impacts on the landscape — and particularly the rivers and streams of Santa Clara County — have created many hardships for native fish and huge challenges for resource managers trying to sustain remaining fish populations. Dams and reservoirs, diversions, hardscaping (concrete and other impervious surfaces), pollution, and introduced species have all negatively affected native fish populations in the county (see Figure 3-17, p. 73). Climate change — with a predicted increase in the number and duration of droughts — will exacerbate these problems.

Due to the diverse landscapes and geological complexities of California, along with its semi-arid climate, the diversity of endemic fish is limited to 66 freshwater, estuarine, and anadromous fish (not including subspecies) (Moyle, 2002). More specifically, Santa Clara County falls within the Sacramento-San Joaquin Province, one of six icthyological (or fish study) areas in the state. While the province includes 40 endemic species of fish, the county is known to have historically supported up to 17 different endemic species (see Appendix A-2).

The introduction, naturalization, and straying of various fish species into county watersheds has increased species richness; however, this may be detrimental to native fish populations. The development of reservoirs, impoundments, and diversions has increased available habitat for non-native warm water species, and imported water has been a vector for introduction of species from outside the watershed. Other potential vectors of introduction include sport fish management, sport fishing, biological controls, aquaculture, and pets (Moyle, 2002).

District biologists have observed 33 non-endemic fish in the watersheds during field surveys, and a reduction of endemic species from a total of 17 to 13. The presence of non-endemic species is only an estimate as new species have the potential of being discovered or introduced at any time. Endemic and non-endemic estuarine fish are present within the brackish and estuary areas of Santa Clara County. Many estuarine and marine fish found in San Francisco Bay were not included in the list as they are transient and often not seen in areas managed by the District. The list provided gives insight into the current fish assemblages based upon observation, but yearly and seasonal changes can contribute to variations within the assemblage in Santa Clara County at any given time.

Special Status Fish Species

Several special status fish species are known to occur in Santa Clara County (see Protection Status in Appendix A-3).

Most of these fish are anadromous, migrating from the Bay up into the watersheds to spawn. These include steelhead trout and Pacific lamprey. These fish often rear their young or grow larger in the shallow waters adjacent to the baylands. They also need streams with good water quality, healthy riparian vegetation shading the water, woody debris in the channels, and deep pools, where they can survive in drought conditions. Dams and diversions have made many of the county's streams impassable to anadromous fish. Some of these fish are trying to return to their natal streams; others are strays from hatcheries.

Other fish species of special status within the county or in adjacent San Francisco Bay include green sturgeon, longfin smelt, and Monterey roach.

REPRESENTATIVE BIOLOGICAL RESOURCES

The District intersects with countless biological resources during the course of its day-to-day work. The following descriptions of four species are representative of the variety of ways in which sensitive species may not only constrain District activities or require mitigation but also provide opportunities for stewardship.

California red-legged frog — District stream maintenance activities, such as pesticide spraying or erosion control, are subject to restrictions protecting the California red legged frog. Santa Clara County is one of 28 counties statewide in which the federal government has designated 4.1 million acres as critical habitat for the threatened California red-legged frog. Threats to frog habitats include fragmentation, degradation, and invasion by non-native species. Introduced American bullfrogs, for example, eat the tadpoles of red-legged frogs, as well as juveniles and even large adults. Crayfish, catfish, sunfish, and mosquito fish all prey upon or compete with red-legged frogs at various life stages. Their habitat may also be affected by changes to water flows and by pollutants.

California red-legged frogs are a moderate-to-large frog (1.7-5.5 inches) with brown, grey, olive, or reddish colored backs spotted with black flecks and blotches. The lower abdomen and the undersides of its hind legs are normally red. California red-legged frogs breed in natural and man-made marshes, cattle ponds, and in backwaters within streams and creeks typically lacking predatory fish. For successful reproduction, they require water that is eight inches deep continuously from March through July.

Steelhead trout — District reservoir operations and stream maintenance activities, among other activities, can be restricted by laws protecting threatened steelhead trout in Santa Clara and surrounding counties. Federal designations recognize two distinct stocks of steelhead representing the genetic diversity and life history adaptations for fish that have evolved uniquely in Santa Clara County. Today, steelhead are found in the San Francisquito Creek, Coyote Creek, Stevens Creek, Guadalupe River, and Pajaro River watersheds.

These fish can grow to weigh as much as 35 pounds, though they are generally smaller on the central California coast. Steelhead are dark olive, with silvery white undersides, heavily speckled bodies, and a pinkish stripe running along their sides (the "rainbow" in rainbow trout). A steelhead trout is the same species as a rainbow trout. However, a steelhead is an anadromous form of the resident rainbow trout because it migrates to the ocean as a juvenile and returns to fresh water as an adult to spawn.

During spawning, female steelhead dig nests (or "redds") where there is suitable gravel, water depth, and velocity, and deposit eggs, which hatch in three to four weeks. Unlike other salmonid fish, steelhead do not necessarily die after they spawn, but can live to spawn as many as four times. Juvenile fish typically spend one to two years rearing in freshwater before migrating to estuarine areas as smolts and then swimming into the ocean to feed and mature. Young steelhead feed mostly on zooplankton while adults will eat aquatic and terrestrial insects, mollusks, crustaceans, fish eggs, minnows, and other small fishes. Steelhead can remain at sea for up to three years before returning to fresh water to spawn. District reservoir operations often involve ensuring that streams below dams have cold enough water and dissolved oxygen to support steelhead.

Photos: CDFW & USFWS

Bay checkerspot butterfly — The federally threatened Bay checkerspot butterfly was historically widely distributed to the east, west, and south San Francisco Bay but is now restricted to a few remaining patches of suitable habitat contained within the western and south edges of the Bay, including Coyote Ridge above Anderson Reservoir. The Coyote Ridge area contains the largest critical habitat unit of the 12 units within the county for the Bay checkerspot butterfly.

The larvae of this beautiful, black and orange-patterned butterfly depend on two plants adapted to seasonally dry conditions on serpentine-derived soils. The primary larval host plant is dwarf plantain. In many years, the plantain dries up and the larvae transfer to a second host plant, exerted Indian paintbrush or purple owl's clover, which remain edible later in the season. District mitigation and habitat conservation activities around various special status plants and species associated with unique serpentine soils, including the Bay checkerspot butterfly, are extensive and include the creation of new habitats.

California sycamore — Santa Clara Valley includes many natural communities designated as "sensitive" by the state of California and of consequent concern in District watershed stewardship. In its efforts to restore habitats and floodplains through the One Water Plan, the District has a particular interest in sycamore alluvial woodland, a sensitive community dominated by a tree with a massive trunk and distinctive, smooth, pale, mottled bark called the California (aka "western") sycamore. Although found elsewhere, including along stream banks, this deciduous tree thrives at the base of the valley in deep alluvial gravel, where it can tap into the high groundwater table. By doing so, it survives droughts; the sycamore also tolerates flooding.

The sycamore is native to California and Baja California, growing along streams and rivers in canyons, seeps, and springs in the Central Valley and canyons of the Coast Ranges. A mature tree can reach 40-90 feet, with trunks five feet in diameter. It has an open crown, with thick, spreading branches. In the 1800s, some sailors sighted course by huge sycamores along the California coast. Its leaves are huge and lobed—the largest leaves of any native tree in North America—with their lower surface pale and covered with fine hairs. Its dangling fruits, which hang in clusters, are small, spiky, golden pods that open up to reveal many tiny seeds embedded in soft tufts of silky hairs. In winter, the pods break open like dandelion heads, and disperse in the wind. Songbirds sometimes use the silky tufts to line their nests. The sycamore is a food plant for the Western tiger swallowtail and other butterflies, and its fruits are eaten by many small birds.

Mistletoe is often found in sycamores, brought by birds that shelter in the tree. Mammals, including American beaver and western gray squirrel, eat its twigs and bark. Native Americans used its inner bark for food and medicines, and its bark can be boiled for coffee. It is also planted as a landscape and street tree because it provides excellent shade, yet allows sun to come through in the winter.

KEY CHALLENGES

Ongoing land use changes: Urbanization, agriculture, and grazing all alter natural habitats for fish, wildlife, and plant communities. Human land uses break up the natural connectivity of stream habitats throughout a watershed; displace and disturb native species; and introduce new predators, invasive species, and polluted urban and agricultural runoff, among other impacts. They also contribute to altered flow regimes, polluted urban runoff into creeks, the draining of wetlands and ponds, and creating impervious surfaces inhospitable to plants, fish, and wildlife.

Altered drainage network and hydrologic regime: For many species of native fish, the completion of their life cycles relies on the availability of a mosaic of habitat types created and maintained by a variable flow regime. The flow regime of a river or stream—how water flows through it, in what seasons, and at what volume—is essential to sustaining its ecological integrity. Humans have substantially altered that regime for the streams in Santa Clara County, in particular by building dams, channelizing streams, and putting in culverts, all of which increase natural drainage networks. This increase—along with a decrease in sinuosity—has changed the physical characteristics of the county's streams. Redistribution of water also redistributes fish species, both native and non-native.

Destruction and disconnection of riparian habitats: Many species require riparian, floodplain, and wetland habitats along with adjacent uplands to flourish and find refuge. In the baylands and valley floor regions, both urban and rural, riparian habitat has been destroyed to make room for agriculture or when flood control channels were put in. Streams have also been disconnected from their floodplains and adjacent uplands. This disconnection disrupts important natural stream functions that provide fish and wildlife habitat. As floodplains have been destroyed so has the capacity for floodwaters to slowly infiltrate the ground.

Bolsa fish ladder on Uvas Creek in the Pajaro River watershed at the Union Pacific Railroad crossing. Photo: SCVWD

Non-native species: The health of many native species is compromised by the presence of non-native species in their habitats. Non-native species introduced both intentionally and unintentionally by humans can spread diseases, outcompete and displace native species, prey upon native species, hybridize with natives, or degrade habitats used by native species. Many disturbed aquatic habitats are subject to intense invasion by exotic plants such as pepperweed, giant reed, Atlantic cordgrass, stinkwort, and annual grasses. Riparian areas, in particular, are often heavily invaded by the giant reed, or Arundo donax. California's creeks and rivers, meanwhile, harbor 51 documented alien freshwater fish, some of which have been introduced to new watersheds in the Santa Clara Valley via water transfer facilities such as aqueducts or pipelines. In situations when interactions are dominated by non-native fish, issues can occur that reduce the population size, distribution, and overall success of native fish and their habitats. Problematic invaders for aquatic ecosystems aren't limited to weeds and fish. Introduced microbes can cause wildlife and domestic animal diseases such as avian cholera, parvo, feline immunodeficiency virus, West Nile virus, and Lyme disease. Invasive invertebrates such as quagga mussels, zebra mussels, Asian clams, Chinese mitten crabs, and common snails can displace natives, disrupt food chains, and in some cases obstruct water delivery infrastructure. Other competitors for shrinking food and habitats include terrestrial and semi-aquatic non-natives such as American bullfrog and signal crayfish. Non-native mammals that prey on native species or reduce habitat quality include domestic dogs and cats, red fox, Virginia opossum, house mice, Norway rats, and wild boars. Keeping invaders from overwhelming creeks, reservoirs, and baylands habitats is an ongoing challenge for the District.

Loss of sediment and woody debris: Streams that have been dammed no longer carry the sediment and woody debris they did historically. In streams, aquatic habitat is derived from the movement of water and sediment within the channel and floodplain. Important habitat for fish — such as riffles and pools — forms when sediment and woody debris are transported, moved around, and deposited downstream. Reservoirs with dams, as well as artificial instream impoundments, capture sediment and wood that would be moving downstream, leading to downstream channel incision and bed coarsening. Dams also change water temperatures and other important physical conditions for fish.

Habitat fragmentation: Due to human development, many habitats for fish and wildlife in Santa Clara Valley are patchy and fragmented, rather than connected as they once were, often by streams. Creeks do not exist separate from their surrounding landscapes: connectivity to their floodplains and adjacent uplands is important for wildlife. Connectivity along a stream can be interrupted by constrictions, changes in channel types, patchy bank vegetation, and barriers or obstacles. When habitats are missing or confined by floodwalls, fences, bridges, and other barriers, wildlife are also sometimes forced to cross busy roads, putting them at additional risk. Barriers also prevent wildlife from moving out of harm's way during high flow events.

Ecological adaptation: Ecological communities along stream systems within a watershed are constantly changing. Many California plants and animals are adapted to changing conditions and can reestablish after a disturbance. Their resilience is, in part, controlled by the size and complexity of the community within a watershed and by the presence or absence of various stressors. If one portion of the watershed endures a significant change to its plant and animal communities, other portions may provide immigrants or new recruits for rebuilding natural communities over time. A community that lacks biological resilience may have difficulty adapting and may be subject to invasion, replacement of species, or loss of species.

Climate change: Temperature and hydrologic effects associated with climate change are likely to exacerbate ecological issues and degraded conditions within California stream systems. In Santa Clara County, higher temperatures and changes in flow could decrease water quality. Changes in temperature and precipitation could result in changes in habitat types, and, therefore, changes in the characteristics of species in a given area. Sea level rise and other climactic disruptions could transform bayside ecosystems.

District biologists net, weigh, measure, and radio tag Chinook salmon in the Guadalupe River near Trimble Avenue. These hatchery strays were used as surrogates to assess fish passage through the District's downtown Guadalupe Flood Control Project.
Photo: David Salsbery, SCVWD

3.7 BAYLANDS

INTRODUCTION

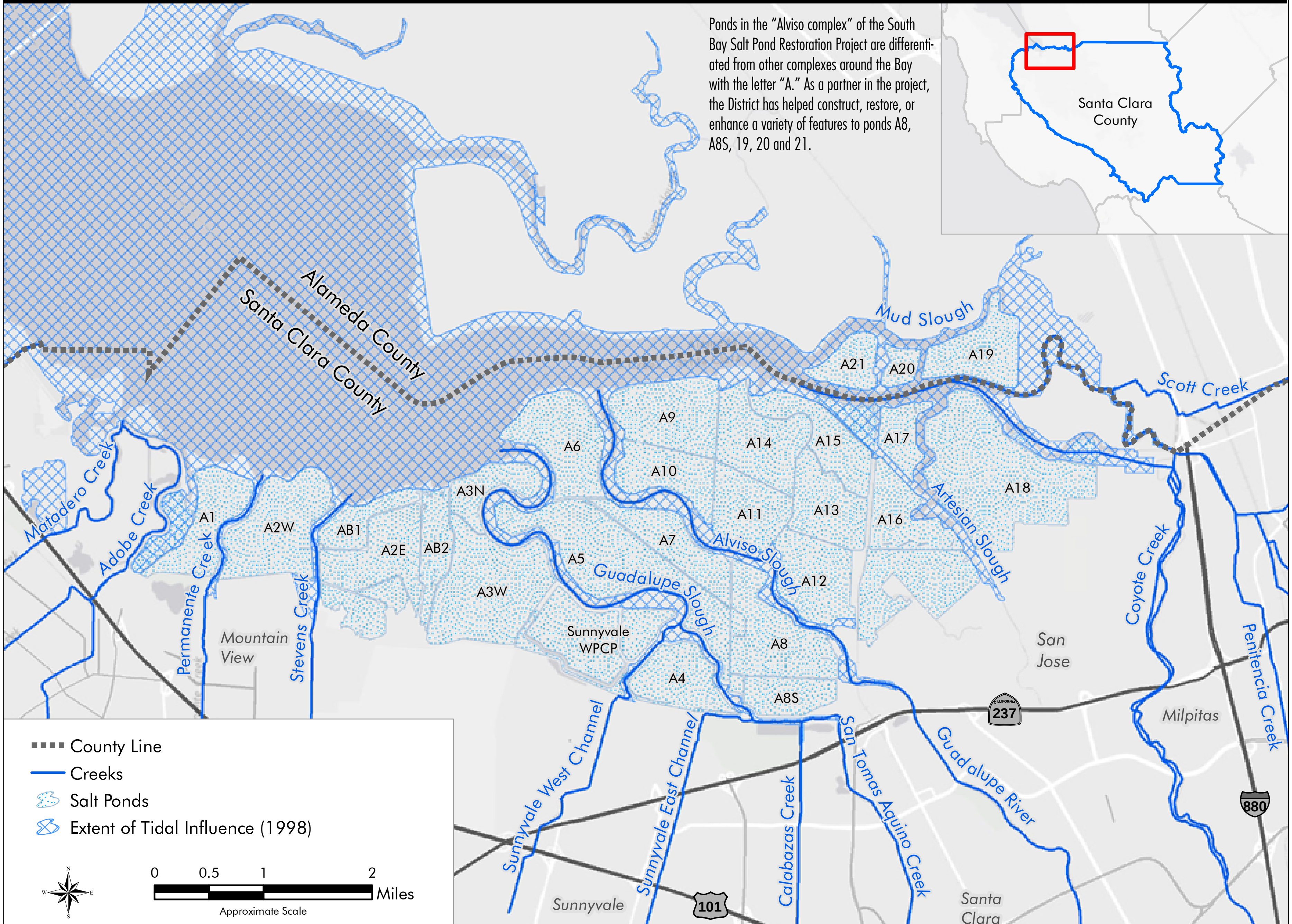
Some Santa Clara County creeks drain into San Francisco Bay through concrete channels and urbanized shorelines, others through former wetlands and coastal floodplains now being restored to ecological health. The "baylands" lie at or below sea level and were once awash in the ebb and flow of daily tides (see Figure 3-19, p. 82). Over the last two centuries, levees were built around thousands of acres of baylands, putting them to work as salt production ponds or new land for development. Though many former bayland areas on the Santa Clara County shore are no longer influenced by natural processes and tides, others are part of a regional approach in landscape-scale restoration of habitats including seasonal wetlands, mudflats, lagoons, low-lying grasslands, and associated uplands.

The Santa Clara Valley Water District is one of nine partners working on major restoration and flood control projects along the 17 miles of shoreline that comprise some of Santa Clara County's northern boundary with San Francisco Bay. Bayland habitats now being returned to the tides as part of habitat restoration efforts also provide an invaluable buffer from storm surges and flooding for Silicon Valley's shoreline.

Major landmarks in the baylands zone of the county include Moffett Field, Shoreline Amphitheater, and the Don Edwards National Wildlife Refuge, which includes a complex of former salt production ponds around the town of Alviso. This nearshore and baylands area also encompasses the mouths of Coyote Creek and the Guadalupe River, as well as numerous other smaller creek mouths and storm drain channels that provide freshwater to the very shallow South Bay.

On the Bay side of Highways 101, 880, and 237 between Palo Alto and Milpitas, huge developments include office parks, former landfills, employment centers, and suburban communities. The headquarters and offices of of many Silicon Valley giants, stand on these former baylands.

Figure 3-19: Baylands



Map: Santa Clara Valley Water District. Data Sources: ESRI, SFEI and SCVWD.

Monitoring baylands near Alviso Slough. Photo: Maureen Downing Kunz

The District conducts work in areas of the baylands within its jurisdiction to manage drainage, flooding, runoff, and contamination from local watersheds into the Bay. The District also coordinates with other major agencies to protect the shoreline from flooding due to high tides, sea level rise, and storm events, and to carry out tidal restoration.

The Land-Water Interface

The hydrology and geomorphology of the baylands and stream mouths along the Santa Clara County shoreline have unique conditions different from upper watersheds. These conditions largely result from the influence of ocean tides on the South Bay shore.

The natural shape of the Bay funnels tides through the Golden Gate and magnifies tidal fluctuations in the Bay's southern extreme. Daily tidal fluctuations are higher in the South Bay than any other part of the Bay; the difference between low and high tides can be up to 11 feet during an extreme tide, and about seven feet during more normal conditions.

As freshwater flows down from local watersheds and meets tidal waters coming in from the Bay, the tidal-fluvial interface produces a distinct set of physical and ecological attributes characterized by a change in salinity gradient. The salinity gradient from seawater (35 parts per thousand, or ppt, of salt to water) to brackish (~10-15 ppt) to freshwater (<5 ppt) has immense importance to the biological functioning of tidal areas and channels, including controlling aquatic and benthic species composition and richness. The salinity gradient also impacts plant community composition along the bayshore and tributaries. In the San Francisco Bay Area, plant species common at the interface include salt and freshwater marsh plants such as tule, common reed, cattail, pickleweed, and salt grass. The location of the salinity gradient changes based on the annual and daily tide cycle and the amount of freshwater flows.

The interface between tidal and stream flow also creates a unique set of hydrologic patterns in the baylands, which in turn influence sediment dynamics, channel morphology, vegetation, and salinity conditions. Sediment is transported landward by flood tides and bayward by ebb tides and river flows, such that a reach of high turbidity and sediment deposition can occur where flows meet and slow. The sediment deposited in this bi-directional flow zone is typically fine sand and silt, with particles decreasing in size in the bayward direction and arranged in unique patterns. As sediment has become such a valuable resource for wetland creation and sea level rise adaptation, identifying the location of this transition zone is important for flood protection and habitat enhancement planning.

It is typical to have freshwater from land be the main source of sediment to boundary marshes along a bay. In the South Bay, this is not the case. Instead, the murky water of the South Bay is the prime source of sediment for the marshlands.

Along Santa Clara County's shore, 13 freshwater streams and channels currently cross the baylands

REGULATORY AND POLICY FRAMEWORK

Shorelines and wetlands have long been a focus of government agencies planning to ensure public and navigational access to state waters, and to protect the water quality of San Francisco Bay.

The primary regulatory and government agencies that the District works with in the baylands are the U.S. Army Corps of Engineers and the Federal Emergency Management Agency (FEMA) on flood protection issues, and the California State Coastal Conservancy on baylands restoration projects.

The District is not regulated by FEMA but uses FEMA mapping of the one percent floodplain resulting from coastal flooding of Bay waters, in addition to one percent flooding from adjacent creeks to understand and communicate flood risks. FEMA-mapped areas are subject to development standards as implemented by the cities via floodplain management ordinances.

District maintenance or construction work at creek mouths or in wetland areas often triggers regulatory review and requires permits from agencies such as the U.S. Army Corps of Engineers, the California Department of Fish and Wildlife, the U.S. Fish & Wildlife Service, and the National Marine Fisheries Service. The District also obtains permits from the San Francisco Bay Conservation and Development Commission for any alterations within 100 feet of the shoreline and from the San Francisco Bay Regional Water Quality Control Board for activities impacting water quality and wetlands (see also Chapter 3.3: Water Quality, and Chapter 3.6: Ecological Resources).

or are influenced by baylands or by the tides (see Figure 3-19, p. 82). But they didn't always connect with the tides. For example, on the west side of the valley, San Francisquito Creek was one of the few creeks to historically maintain a natural channel all the way to the Bay. Most others never flowed all the way to the Bay, or only did so during very wet winters. Instead, they dissipated into wet meadows in the valley. Over time, these creeks have been straightened, rerouted, or channelized in their lower reaches to convey water directly into the Bay.

BAYLANDS INFRASTRUCTURE

Land Use

Transportation corridors have long dominated the bayshore, and were often built near the upstream extent of tidal influence where creeks were relatively easy to cross and the tidal land was usually dry. Railroads, highways, fuel lines, and sewer lines are located along the bayshore, in essentially the more stable ground adjacent the baylands. These infrastructure features often create flow constrictions and channel bed grade controls, and present challenges for flood protection and sea level rise adaptation. Many former baylands areas on the Bay side of these transportation corridors have now been developed into major office parks.

Other land uses in former baylands and the nearshore zone include municipal landfills, industrial sites, golf courses, recreational fields, and wastewater treatment plants, including the Bay's largest—the San José/Santa Clara Regional Wastewater Facility, and the District's Silicon Valley Advanced Water Purification Center near Alviso.

Interspersed among all these municipal and industrial developments are the remaining open spaces and more natural features of the baylands: wildlife refuges, wetland restoration projects, and managed ponds. A number of recreational trails traverse levees and berms.

Levees And Flood Protection

As large populations of people now live and work in areas inside the original tidal zone, and as a result of historical land subsidence, flooding is a potential problem during storms and extreme high tide events.

Most of the bayfront levees protecting people and property come in two types: outboard levees (bayfront and slough/creek levees adjacent to tidal waters) and inboard levees (levees adjacent to the former salt production ponds, and not subject to tidal action).

Most historic salt pond levees were constructed with bay mud, scooped and piled in-place. Others were constructed from imported soil, riprap, broken concrete, and other predominantly inorganic debris. The levees were built to contain Bay water for commercial salt evaporation, not engineered or compacted to engineering standards for flood protection. The levees continue to settle, erode, and deform over time.

When the state and federal governments purchased the salt ponds for wildlife refuges in 2003, they inherited miles of levees with little budget to maintain them. All these former salt pond levees need on-going maintenance. The District has partnered in various interim cooperative agreements to support maintenance activities.

Flood protection in the South Bay is doubly important to protect areas that have experienced long term subsidence. As a result of groundwater pumping in the early 1900s, the baylands subsided by two to eight feet between 1912 and 1967. Although the District has halted subsidence through an extensive, ongoing managed groundwater recharge program, this older subsidence is irreversible. Some South Bay communities like Alviso now sit below sea level. With sea levels rising due to climate change, the potential for Bay water to overtop the levees and flood these areas is increasing.

The District has helped restore a complex of former salt ponds near Alviso including 330 acres of tidal marsh and channels at Pond A6; 240 acres of shallow ponds and bird islands at Ponds A16 and 17; and 1,400 acres of marsh and shallow water habitat for pelicans, cormorants, and ducks at Pond A8. The project also includes 2.2 miles of new Bay Trail between Mountain View's Stevens Creek and Sunnyvale. From the fluvial-flood management perspective, the opening of the Alviso ponds has also increased the conveyance and storage capacity of the lower river and slough, helped scour out the channel, and provided increased flood storage in the ponds themselves. This additional capacity will also provide some protection from coastal flooding and sea level rise.

SOUTH BAY SALT POND RESTORATION PROJECT PARTNERS

Alameda County Flood Control and Water Conservation District (until 2014)

East Bay Regional Parks District (since 2013)

California Department of Fish and Wildlife

California State Coastal Conservancy

Santa Clara Valley Water District

Resources Legacy Foundation (Packard, Hewlett and Moore)

U.S. Fish and Wildlife Service

U.S. Geological Survey

SHORELINE PROJECT PARTNERS

California Department of Fish and Wildlife

California State Coastal Conservancy

Cities of Mountain View, Palo Alto, San Jose, Santa Clara and Sunnyvale

National Aeronautics and Space Administration

San Francisquito Creek Joint Powers Authority

Santa Clara Valley Water District

U.S. Army Corps of Engineers

U.S. Fish and Wildlife Service

Finally, levee failure is a risk in earthquake-prone California. With an up to 25-foot thick layer of Bay mud, levee fill, and alluvium overlay in some zones of the shoreline, soils could not only settle further but shift in an earthquake event. The former salt ponds, for example, overlap with several local faults and lie, at their closest, approximately 1.8 miles from the Hayward Fault and eight miles from the San Andreas Fault. In the event of an earthquake, the Alviso pond complex has a moderate to high susceptibility to liquefaction (when the Bay mud moves like a liquid). New levees would be constructed to withstand earthquake damage.

SOUTH BAY FLOOD PLANNING AND RESTORATION

The District is a partner in two closely aligned projects that propose to restore portions of the marshlands and provide flood protection. As a partner in both, the District is working toward two of its core objectives: flood protection and watershed stewardship. The larger and longer endeavor is the South Bay Salt Pond Restoration Project to restore 65 former salt ponds to a mosaic of tidal habitats and managed shallows. The restoration project hinges, in some part, on ensuring little or no additional flood risk to shoreline properties from the restoration work. As such, the District is playing a critical role as the local flood control partner through its second major baylands area partnership—with the U.S. Army Corps of Engineers—in the South San Francisco Bay Shoreline Study. In addition, work in recent years in the Alviso Ponds area has restored habitat and provided additional recreational access.

Salt Pond Restoration Project

The South Bay Salt Pond Restoration Project is the largest tidal wetland restoration project on the West Coast. When complete, the restoration will convert 15,100 acres of commercial salt ponds at the south end of San Francisco Bay to a mix of tidal marsh, mudflat, and other wetland habitats. The property was purchased by state and federal agencies and private foundations from Cargill Salt in 2003. The acquisition of the South Bay salt ponds provides an opportunity for regional wetlands restoration, improving the physical, chemical, and biological health of San Francisco Bay. The goals of the project are to:

- Restore and enhance a mix of wetland habitats
- Provide wildlife-oriented public access and recreation
- Provide for flood management in the South Bay

Shoreline Study

In conjunction with the salt pond restoration project described above, the District is one of three partners in the South San Francisco Bay Shoreline Study led by the U.S. Army Corps of Engineers. This first phase of this effort proposes to construct flood-protection levees along the South Bay shore that take into account protection provided by other natural means (such as the restoration project described above). The project would protect, among other significant shoreline assets, homes and businesses in the Alviso area and the San Jose Santa Clara Regional Wastewater Facility, which serves 1.4 million residents and 17,000 businesses. The project would also recreate some of the transitional upland habitat lost due to the creation of ponds and other development, and include further measures to accommodate sea level rise.

These two nested projects showcase how a flood protection agency with a broad mission can provide leadership and innovation in both landscape scale ecosystem restoration and flood management.

REPRESENTATIVE BIOLOGICAL RESOURCES IN THE BAYLANDS

Ridgway's rails, formerly known as California clapper rails, are one of the most endangered species in the Alviso area—they rely on tidal saltmarsh for habitat. In the summer of 2015, just eight years after Pond A21 was breached to let in tidal flows, biologists discovered a breeding pair of rails in the new tidal marsh. The Ridgway's rail is a rather large, chicken-like bird (sometimes called the "marsh hen") with a long, slightly decurved bill for probing in marsh vegetation and mudflats at low tide for small crustaceans or other invertebrates. It is a federally endangered species and declined when the Bay's formerly extensive saltmarshes were filled in for development, diked off for farmland, or converted to salt production ponds. They were also hunted during the Gold Rush and sold at markets; introduced predators like Norway rats and feral cats have also taken a toll.

Willets are one of the most common large shorebirds seen along the South Bay's edges, pecking and probing in the mud for small crustaceans and mollusks. Their distinguishing white and black underwing pattern is revealed when they take flight. These birds nest in wet Sierra Nevada meadows in Modoc, Lassen, and Plumas counties. They arrive in coastal estuaries in the fall and stay for the winter. During high tides, when mudflats are submerged, willets and other shorebirds need safe areas where they can roost and rest. Shorebirds are a target for the South Bay Salt Pond Restoration Project: ponds such as A16 have been specifically designed for willets and many other shorebirds, with shallow channels and mounds for feeding and resting, as well as varying salinity levels to attract a diversity of bird species. The mounds offer them a place where they can rest without fear of predators or human disturbance. A complex system of water control structures works with the tides to bring water in and out of the site and keeps the water depth at 12 inches or less, maximizing habitat and water quality.

Pickleweed is one of the first plants to colonize the new tidal marshes converted from salt ponds. This salt-loving succulent resembling a cluster of tiny pickles grows along the edges of San Francisco Bay: *Salicornia depressa* is an annual form that grows more upright, turns pink-red in the fall, and is likely to show up in the early stages of a restoration project. *Sarcocornia pacifica*, a perennial, is a low-to-the-ground, creeping form. Pickleweed can tolerate being immersed in saltwater and grows in very salty soils. The endangered salt marsh harvest mouse hide in pickleweed's thick cover, which serves as a place to nest. It is a host plant for several butterfly species and black rails. Although pickleweed colonization is a sign of restoration success, it is not the end point in tidal marsh restoration. Over time, marshes will mature and develop natural variations that allow for a complex and diverse array of plant species — including pickleweed.

Bird photos: Rick Lewis

Willets with their distinctive wing stripes.

KEY CHALLENGES

Rising sea levels: Many models project sea level rise in San Francisco Bay of up to 55 inches by the end of the century. The rate of increase is projected to accelerate dramatically mid-century. Most sea level rise projections do not take into account exacerbating factors such as astronomical tides, changes in atmospheric pressure, wind stress, floods, or El Niño. The effects of tidal fluctuations combined with sea level rise can lead to extreme high water events. A recent study projects a 1 in 6 chance that sea level could increase four feet by 2060, when the combination of sea level rise, storm surges, and tides are taken into account. The frequency and duration of sea level extremes is expected to increase as sea level rises, with the potential to exceed coastal and San Francisco Bay-Delta flood defenses designed for historical conditions. For the baylands, these impacts could result in more stress on salt pond and other levees, increased flooding from more intense storms, direct flooding from the Bay, habitat alteration, and degraded water quality in creek mouths and sloughs.

Weak and aging levees: Salt pond levees were typically constructed with Bay mud dredged from adjacent borrow ditches or pond areas. Soils were not compacted during construction and, as a result, some levees have settled and changed shape. Both outboard and inboard levees from the salt ponds and current restoration sites have been providing psuedo-flood protection for Santa Clara County's shore for a century. With sea level rising, and extreme storm events on the near horizon, the District remains concerned about levee strength and stablility.

Sediment deficit: Geologists have recently noted that sediment loosened from hydraulic gold-mining operations of the mid-1800s in the Sierra foothills has now worked its way through the San Francisco Bay Estuary system, and is not being replaced. Since the main natural source of sediment to South Bay wetlands is muddy bay water, this increases the challenge for restoring the salt ponds to wetlands. Sediment is also trapped behind dams in District watersheds. With sea level rising, balancing a diminishing sediment supply with the need for more sediment to elevate wetlands, protect shorelines, and strengthen levees is an ongoing challenge within the baylands zone. Recent monitoring of the restored Alviso pond suggests that sediment builds up faster in the South Bay than in other Bay regions, but much more needs to be done to augment the supply of sediment to shorelines as water levels rise. Baylands managers have already begun using fill from construction sites and dredged material to improve resilience.

Mercury mobilization: The New Almaden Mine located in the hills of the Guadalupe Watershed, was the largest mercury mine in North America. It operated for over a century. Legacy pollution from the now-closed mine was carried downstream by the Guadalupe River to the Alviso shoreline area. Pond A8 is still a mercury hotspot. Mercury runoff from the Guadalupe watershed filters through shoreline sloughs, baylands, and restored salt ponds before entering the Bay. Biological processes and conditions that occur in wetlands may promote mercury methylation (see Chapter 3.3, Water Quality). In its methylated form, mercury is much more bioavailable in the food chain, and gains concentration exponentially as it is passed from water and sediments to clams, fish, and fish-eating birds. The District is working with its restoration partners around the Alviso ponds to monitor restoration impacts and mercury levels in both birds and fish.

Under-insured businesses: FEMA requires all structures in the 100-year flood zone that are covered by a federally-insured mortgage to carry flood insurance. Most residences are financed by traditional mortgages from federally insured banks. In the bayshore area, the structures subject to flooding are typically businesses, not residences. Businesses are not always financed through traditional mortgages or self-insured, and thus may not have adequate flood insurance.

USGS and other scientists are studying changes in the baylands post restoration.

4

FUTURE CONDITIONS

New Water Trail landing at Alviso. Photo: Galli Basson

FUTURE CONDITIONS

4.1 INTRODUCTION

California's changing climate, shrinking snowpack, and prolonged drought make fresh water management more complex and more important than ever before.

Evidence of climate change is already being observed in California. In the last century, the California coast has seen almost eight inches of sea level rise. The average April 1 snowpack in the Sierra Nevada region has decreased in the last half century. As a result of the changing climate, wildfires are becoming more frequent, longer, and widespread. Historic precipitation data for California's central coast region shows a trend toward decreasing rainfall during the November to January period and a trend toward increasing rainfall during the February to April period. Temperature projections for the Bay Area show a shift in the timing of spring and summer heat extremes to begin earlier and extend later into September, as well as an increase in the frequency and intensity of heat waves. Future changes may include more intense precipitation events and more frequent and severe droughts. Climate change adds an additional layer of complexity and uncertainty to planning.

The One Water Plan recognizes that climate change affects all aspects of water management, and that to be successful, adaptation planning needs to be integrated and comprehensive. For example, potential increases in flood waters are both a threat (to flood protection and habitat) and an opportunity (for water supply). In the One Water framework, integrated projects will leverage opportunities while managing threats and achieving multiple benefits.

4.2 CURRENT VS. FUTURE CONDITIONS

Water management requires advanced planning. As a water resource agency for nearly 90 years, the District is accustomed to managing resources within a changing and sometimes unpredictable environment with variable rainfall and periods of drought and flood. Until recently, District planners have been able to rely on historic ranges of weather and climate. However, uncertainties about changing climate conditions and new extremes make projections about future conditions more difficult. Flexibility — and an emphasis on adaptable processes and infrastructure — will be key to managing water resources successfully under climate change.

In general, studies suggest the following kinds of changes to the climate in the southwestern United States, which includes Santa Clara County, in the century ahead.

Rising Sea Level

Many models project sea level rise in San Francisco Bay of up to 55 inches by the end of the century. The rate of increase is projected to accelerate dramatically mid-century. Most sea level rise projections do not take into account exacerbating factors such as astronomical tides, changes in atmospheric pressure, wind stress, floods, or the El Niño/Southern Oscillation. The combined effects of these fluctuations and sea level rise can lead to extreme high water events.

Table 4-1: Projected Temperature Santa Clara Valley

	San Jose Temp	San Jose Increase	Gilroy Temp	Gilroy Increase
Historical Average	61.2 °F		56.8 °F	
Low-Emissions Scenario	64.5 °F	+3.3 °F	60.4 °F	+3.6 °F
High-Emissions Scenario	66.9 °F	+5.7 °F	62.8 °F	+6.0 °F

Shifting Precipitation Patterns

Many climate models suggest a drying tendency and a decline in the frequency of precipitation events but not a clear change in the intensity of precipitation events. While Santa Clara County's year-to-year rainfall amounts may not differ significantly from past patterns, the county could experience increasingly frequent and heavier rain events at different times than it did historically. For the District, such changes in precipitation patterns can negatively affect water supply availability and operations and have significant impacts on natural ecosystems. Increased storms can also increase flood risk and damage creek systems and habitat.

Heat, Temperature Change, and Drought

Cal-adapt models project that San Jose will have more days of extreme heat, and more frequent and more intense heat waves under a moderate-high emissions scenario. Statewide, the number of days per year with temperatures above the climatological 90th percentile recorded between 1961 and 1990 is projected to increase. Longer, hotter periods have significant implications for public health, fire risk, air quality, agricultural production, and natural ecosystems in the District. Droughts may also increase in frequency, intensity, or duration as a result of higher temperatures, extreme temperatures, heat waves, and reduced or changed precipitation. Studies suggest that longer-term droughts will intensify in large areas of the Southwest.

Extreme Weather Effects

As changes in average temperature, precipitation, and sea level are likely to occur gradually until 2040-2060, the most immediate problem for the District may be preparing for more extreme events. Even small incremental changes to average global temperatures or sea level can turn a "normal" weather or flood event into a more extreme one. Extreme weather events coinciding with sea level rise is a significant concern for the San Francisco Bay Area. Much of the shoreline of this highly urbanized metropolitan area is below or barely above sea level, including 17 miles of shoreline in Santa Clara County. A major storm surge, coupled with high tides and elevated sea levels, increases the risk to human and natural communities, infrastructure, and private property. Aging earthen levees and thousands of acres of wetlands and salt ponds in the early stages of restoration may provide a critical buffer zone.

Table 4-2: Climate Change Effects on District Resources

Climate Change	Potential Effects	Affected Key District Resource Areas
Increased temperatures	Increased risk to human health and natural systems and sensitive species Increased risk of wildfire Increased drought Changes in habitat Changes in patterns in natural systems such as blooming and nesting Decreased soil moisture	Water supply and demand Water quality Ecological resources Landscape resources
Changes in precipitation patterns	Changes to natural systems Changes in habitat Changes in patterns in natural systems such as blooming and nesting Challenges to water supply operations	Water supply and demand Water quality Ecological resources Landscape resources
Decreased precipitation	Increased drought Impact on natural systems Increased water supply demand	Water supply and demand Water quality Ecological resources Landscape resources
Increased precipitation (includes extreme storm events)	Increased flood risk Impact on natural systems Sedimentation and water quality Erosion and stream bank/bed scouring	Water supply and demand Water quality Ecological resources Landscape resources Bayfront
Sea level rise	Increased flooding Changes in habitat	Landscape resources Bayfront

Super Storms and Atmospheric Rivers

It is unlikely that a super storm like Sandy, which hit New York City's coast in 2012, would cause the same scale of damage in the San Francisco Bay Area, mainly because geography and climate conditions are different. But lessons from Sandy do underscore the vulnerability of drinking water and wastewater treatment systems to extreme or catastrophic events, and the Santa Clara County shoreline is no exception. The Bay Area stands in the path of an important class of Pacific storms referred to as "atmospheric rivers" (ARs). While not specifically a result of climate change, ARs are the only type of extreme precipitation significant enough to be modeled by global climate models. Some models project that future ARs will be more frequent, more intense, contain more water vapor, and last longer than they have historically. In terms of atmospheric rivers, the worst case modeled may be an ArkStorm with 1 in 1,000 year precipitation levels. U.S. Geological Survey models suggest such a storm could last 23 days and dump as much as 10 feet of water on California, overwhelming the flood protection system in many areas including the Bay Area.

Wildfires

Northern California is already experiencing more wildfires than in the past, and faces a more than 50 percent increase in the occurrence of large wildfires by mid-century, and a more than 90 percent increase by the end of the century. The increased risk will stem from a combination of dry, hot conditions, past forest management practices, seasonal shifts in vegetation growth, and climate change. Wildfires can pose risks to District facilities, by adding debris and sediment to waterways.

4.3 IMPACTS ON DISTRICT ACTIVITIES

In general, the District anticipates that climate change may impact its activities in the following ways:

Less Reliable Water Supply

- Reduced snowpack
- Increased occurrence and magnitude of droughts
- Reduced water quality in the Delta
- Reduced Delta exports – thereby reducing the reliability of imported water

Increased Demand for Water

- Increased evapotranspiration rates
- Soil moisture deficits in non-irrigated agriculture, landscapes, and natural areas
- Increased urban and agricultural irrigation needs

Changes in Flood Risk

- Increased stress on levees in the Bay due to sea level rise
- Increased flood risk due to changes in storm patterns and intensities
- Increased bayfront and tidal flooding from sea level rise and storms

Watershed Stewardship

- Decreased water quality due to impacts such as higher temperatures and changes in flow
- Changes in habitat types and, therefore, changes in characteristic species in a given area
- Transformation of bayside ecosystems due to sea level rise and other climatic disruptions

More specifically, Table 4-2 correlates climate changes discussed above with the effects on the various key resource areas addressed in this One Water Plan.

4.4 BEYOND CLIMATE CHANGE: OTHER FUTURE CHALLENGES

Climate change and the prospect of prolonged drought are not the only challenges the Santa Clara Valley Water District anticipates facing in the future. Other challenges may include, continued urbanization and population growth, and shrinking federal budgets for major infrastructure upgrades. Addressing many of the key issues described in the preceding sections, through integrated solutions, offers the opportunity to achieve multiple benefits in support of the District's various goals and objectives.

Prolonged drought and extreme heat may create more demand for recycled water that has undergone ultraviolet or other treatment in facilities like this one.

5 FRAMEWORK

FRAMEWORK

5.1 VISION

The One Water Plan provides an overarching vision, integrated goals, and targeted objectives for exploring opportunities to further the integrated management of water resources in Santa Clara County.

The vision, goals, and objectives make up a planning framework the District can apply to countywide activities and policy considerations. This framework will also guide more detailed planning on watershed and subwatershed scales.

One Water planning builds on mandates spelled out in the District's authorizing legislation. It also reflects new thinking about how to integrate the multiple aspects of the District's mission: to provide Silicon Valley safe, clean water for a healthy life, environment, and economy. In addition, it underscores the commitment of the Santa Clara Valley Water District's Board of Directors to long-term planning. Board policy states that an integrated and balanced approach in managing a sustainable water supply, effective natural flood protection, and healthy watersheds is essential to prepare for the future.

Local communities support this commitment. This One Water framework is the product of several years of working with more than 80 stakeholders. This work led to five goals and 10 objectives that reflect the overarching vision for the One Water Plan:

Vision: The District manages water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.

5.2 INTEGRATED GOALS

The intensive One Water planning process, involving both staff recommendations and stakeholder input, produced an integrated set of goals for water resources management for the District and its partners in Santa Clara County. The resulting five goals and 10 objectives were carefully crafted to provide concise planning guidance. They were also carefully designed as a countywide planning umbrella for as yet unspecified projects and opportunities for integrated water management on many scales.

The five goals are integrated in that each is multi-faceted and can support multiple objectives. They differ in this way from other District goals, which historically focused on a single concept such as water supply, flood protection, or watershed stewardship. They are more similar to District Board Governance Policies under Ends Policy 1 - Guiding principles (see page 5).

Through its efforts to achieve these integrated, multi-purpose goals, the District intends more holistic management of county water resources. These goals and objectives lead to strategies and real world actions — in the form of supporting partnerships and policies and implementable projects and programs — that move District more fully into an era of managing the community's single most critical resource as One Water.

The following goals are described in terms of overall intent, rationale for inclusion, and resulting conditions assuming implementation levels are substantial.

1. VALUED AND RESPECTED RAIN

Goal: Manage rainwater to improve flood protection, water supply, and ecosystem health

This goal recognizes the value of rain, and the District's goal of improving its ability to capture rainwater and put it to the best use. Over the past 70 to 100 years, the prevailing directive for the management of storm, flood, or creek flows was to move water downstream as quickly as possible. The idea was to get the water out of the way to prevent flooding and make room first for agriculture, and later, for urban development. Under this One Water goal, capturing rainwater, infiltrating it in desirable locations, and reducing runoff into streams, recognizes that rain is more of a resource than a hindrance. The water captured diversifies or augments the District's water supply portfolio, and helps supply both human and environmental needs as appropriate.

This goal also acknowledges a respect for rain, because flooding can be dangerous. It is in everyone's best interest to prepare for, manage, and mitigate risks associated with flooding. Managing rainwater to reduce outflow from storm drains and other inputs to streams can help attenuate flood peaks and keep houses, businesses, and schools out of harm's way. In addition, managing rainwater can mean partnering with municipalities, private landowners, and NGOs to help plan landscapes to better accommodate flooding. One Water planning also calls on the District to apply natural flood protection principles so that the county can realize additional benefits from valuing and respecting rain, such as habitat protection and improved water quality.

2. HEALTHFUL AND RELIABLE WATER

Goal: Enhance the quantity and quality of water to support beneficial uses

This goal for healthful and reliable water concerns having enough clean water for both people and the environment. "Healthful" reflects the District's intention to provide water clean enough for human consumption and healthy enough to support endangered fish and important riparian habitats in its creeks. To meet this goal, water must also meet regulatory standards governing contaminants such as mercury, sediment, pesticides, trash, and bacteria.

"Reliable" relates to both the quality and quantity of the water available to the county and managed by the District. Under this goal, the District's supplies for various beneficial resources will be reliable under a variety of hydrologic conditions and regulatory, environmental, and economic uncertainties. For the District, this means continuing to efficiently manage the diverse supplies and substantial infrastructure already in place and continuing to aggressively implement and promote its water conservation program to manage demand. The more integrated One Water approach will help identify more opportunities to leverage the nexus with watershed stewardship and flood protection to achieve both water quality and quantity goals and protect multiple beneficial uses through better integration of projects.

Kids help plant and restore the banks of Adobe Creek in Edith Park, Los Altos Hills.

3. ECOLOGICALLY SUSTAINABLE STREAMS AND WATERSHEDS

Goal: Protect, enhance and sustain healthy and resilient stream ecosystems

This goal underscores the importance of healthy and resilient stream ecosystems, and the habitats and species that rely on streams to thrive, as an integral part of water resources management throughout the county. Making ecosystem health more relevant to every management decision is a key concept in One Water planning.

In working to achieve this goal, "protecting" a stream or a watershed could mean avoiding or minimizing disruption to its ecosystem, or preserving remnant natural areas for the future. The District might, for example, work to preserve a threatened and sensitive area along a riparian corridor.

The term "enhancing" describes any effort to improve the condition of a habitat, vegetative community, or ecosystem. Enhancement in the One Water context encompasses activities such as rehabilitation or revitalization of existing systems, and sometimes restoration.

Within this goal, the term "sustaining" refers to maintaining the functions and diversity of a stream ecosystem to the greatest extent possible, with consideration for addressing threats such as development and climate change.

The term "resilience," in this goal, reinforces the idea of sustainability (see page 96). A resilient system is one that can recover from disturbance. In this context, the District might undertake a project that connects more habitats along an intermittently developed stream corridor. The connectivity would help species to move among habitats in response to warmer temperatures or loss of host vegetation.

The One Water approach views all of these aims and actions — whether they eventually lead the District into preserving critical habitat or removing a minor creek constriction or providing an alternate habitat downstream for a sensitive species — as pathways to healthier watersheds.

4. RESILIENT BAYLANDS

Goal: Protect, enhance, and sustain healthy and resilient baylands ecosystems and infrastructure

This goal mirrors Goal 3 for streams but applies to the unique area near or below sea level along Santa Clara County's shore called the baylands. Four of the county's five major watersheds drain directly into San Francisco Bay and through the baylands. The creeks, rivers, and channels of these four watersheds bring ecologically important fresh water and sediment to the bayshore, with a particular influence at creek mouths and sloughs where drainage from watersheds meets and mixes with ocean tides.

This goal recognizes two unique things about the baylands: first, that they host a regionally significant tidal marsh ecosystem; and second, that they provide buffer zones for other shoreline and flood protection infrastructure of concern to the District.

From a One Water perspective, it is clear that baylands systems, as well as their more developed environs, may be threatened by the interplay of rising sea levels, projected increases in the intensity of storm surges, and local subsidence due to historic groundwater pumping.

This goal recognizes that managing and responding to these threats requires an integrated One Water approach. It also reflects the District's continued commitment to address multiple objectives in the bayland zone through two existing partnerships: one working with the Army Corps to erect a significant new flood protection levee along several miles of the county shore, and the other working with resource agencies to restore thousands of acres of wetlands. A balance of both soft (marsh) and hard (levee) approaches to flood protection is called for here, and offers a nexus with environmental stewardship.

5. COMMUNITY COLLABORATION

Goal: Work in partnership with an engaged community to champion wise decisions on water resources

With this goal, the District acknowledges that changing the way the county views and values water resources requires partnerships and support from the communities it serves. An engaged community can be a wise champion for greater integration and efficiencies, and the goal expresses the District's continued commitment to involving stakeholders in its decision-making processes.

A robust stakeholder engagement process helped the District develop the One Water Plan, but the engagement doesn't stop with publication of this plan. This goal reaffirms the District's commitment to ongoing communication with the community, and to continued partnerships in championing all water as one water.

DEFINITION OF RESILIENCE

Scientists define a resilient ecosystem or habitat as one that can withstand disturbance without changing self-organized processes and structure (Hodgson 2015). If applied to the Silicon Valley, a resilient landscape would have the ability to sustain native biodiversity, ecological functions, and critical physical processes over time in the face of climate change, urbanization, and other stressors (Beller et al 2015). The term can also be applied more broadly to social systems (such as emergency preparedness) as the capacity of individuals, communities, and systems to survive, adapt, and grow in the face of stress or shocks.

5.3 OBJECTIVES

The One Water Plan's 10 objectives represent intermediary steps to reaching goals. Their purpose is to bring the five higher-level goals into sharper focus as tangible concepts.

For each objective, the District developed three to six key attributes representing critical measures or components of that objective. As the One Water Plan is applied and implemented, the District will track progress in meeting each objective by evaluating various metrics and targets associated with these attributes (see Chapter 6). More specific targets will be included in the forthcoming watershed-based plans. The combination of the objective statements plus their related attributes, metrics, and targets make for SMART (specific, measurable, achievable, realistic, time based) objectives.

A. Reliable Water Supply

Objective: Reliable current and future water supply for urban, rural, agricultural, and environmental needs

This One Water objective is to maintain a reliable water supply that draws on a diverse mix of water sources — groundwater, local rainwater, imported water, and recycled water — to supply diverse needs. The objective also acknowledges an ongoing emphasis on expanding local supply, especially recycled water and water conservation, as a means of meeting future demands. District efforts to manage demand, develop recycled water supplies, and secure and optimize its flexible and interconnected water supplies and infrastructure are the District's strategy for maintaining a reliable current and future supply.

B. Sustainable Groundwater

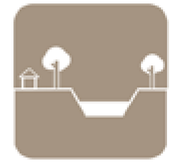
Objective: Sustainable groundwater subbasins

This One Water objective is to manage groundwater subbasins to ensure water supply reliability for all uses, avoid permanent land subsidence, and minimize water quality degradation, including from saltwater intrusion. Meeting the objective requires the continued implementation of comprehensive conjunctive use programs and the exploration of expanded programs as needed. This objective requires the ongoing coordinated use of multiple supply sources, including conserved or recycled water, to offset demands on groundwater. It also requires storage of supply in groundwater subbasins for use during water shortages. Sustainable groundwater management supports urban, rural, agricultural, and environmental water supply needs.

C. High Quality Water

Objective: High quality surface water and groundwater

This One Water objective is to maintain high quality water in its reservoirs, creeks, groundwater subbasins, and the Bay. The county needs high quality surface water and groundwater to safeguard public and ecological health and to support myriad beneficial uses. Maintaining high water quality involves the District in water quality protection at many scales, ranging from meeting or surpassing regulatory standards for drinking water to preventing pollution and protecting source water (including groundwater). Meeting this objective, in conjunction with objectives for stream health, will require the District to continue working with others to improve other water quality parameters such as temperature, dissolved oxygen, turbidity, and food supply for fish (benthic macro-invertebrates).



D. Reduced Flood Risk

Objective: Reliable and effective flood risk reduction using an integrated approach

This One Water objective is to practice, encourage, and support flood and floodplain management that integrates risk reduction with enhancement of natural creek corridors and floodplain functions.

By promoting managed flooding and natural flood protection, the District can also meet multiple objectives. One Water projects would be developed to not only enhance natural riparian functions, but also to increase infiltration, diversify habitats, manage woody debris, provide life-cycle cues to sensitive species, and move gravel and fine sediment through the system.

E. Expanded Floodplains

Objective: Expanded and protected buffer lands adjacent to water bodies

This One Water objective is to expand buffer lands adjacent to creeks, reservoirs, the Bay, and other water bodies. These buffers would allow for natural creek meanders and periodic overtopping of floodwaters into safe areas. Expanding buffers would also support natural processes, create water-to-land habitat transitions, and provide recreational opportunities along waterways where appropriate.

Expanding landscapes to buffer waterways and water bodies could also offer the District more flexibility in meeting multiple objectives. As high energy flows or floods spill over banks, for example, they reduce erosion, filter through vegetation, and deposit sediment on buffering floodplains rather than in channels where it can impede flow. Buffers will be increasingly critical in future, as the District works to help creeks, communities, and shorelines adapt to climate change, extreme storms or heat, sea level rise, and increased urbanization. Buffers increase the District's ability to meet a variety of One Water objectives.

F. Supportive Stream Flows

Objective: Stream flows that support natural processes

This One Water objective is to work toward more natural stream flows in terms of the magnitude, timing, and duration so that they support natural processes. Many habitats, plant communities, and species along creeks are adapted to an historic, if intermittent and changeable, natural hydrograph and climate. The One Water approach is designed to help the District balance multiple objectives, including supporting biologically healthy streams as well as water supply and flood protection objectives. This balancing will need to be consistent with the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) program and other operating agreements and requirements.

G. Resilient Habitats

Objective: Resilient habitats and resources for native species

Resilience is an important concept for One Water integrated planning and can be applied to water-related habitats and systems in the hills, the valley floor, and the baylands (see sidebar).

This One Water objective is to strengthen the resilience of natural environments and resources so they can better withstand the stresses and disturbances brought about by urbanization, drought, climate change, and sea level rise. Meeting this objective might involve building more connections between habitats throughout the county. Habitat connectivity, often best achieved along creek corridors, can help sustain native and migratory terrestrial and aquatic species. From an integrated One Water perspective, resilient habitats may occupy the same spaces as areas used for other important water management functions, such as groundwater recharge or flood and water quality protection.

H. Climate Change Adaptation

Objective: Adapt to and prepare for climate change

This One Water objective is to prepare for and adapt to global warming and climate change effects that include temperature increases, precipitation changes, weather extremes, and sea level rise. These effects may increase water supply risks and uncertainty, increase the severity or duration of droughts, flooding, wildfire, and create added stress on native species and riparian and wetland ecosystems. Managing whole watersheds, with an eye for One Water integration, will be critical in creating the kind of flexibility in water resources management necessary to be adaptive and create resilience in the face of uncertainties and mitigate for unforeseen impacts.

I. Emergency Preparedness

Objective: Anticipate and prepare for emergencies

This One Water objective is to anticipate and prepare for water resource emergencies, including flooding, drought, earthquake, fire, other natural and man-made hazards, such as the contamination of drinking water supply, failure of infrastructure, and attack or accident. Such efforts involve the District planning hazard mitigation strategies and helping residents and communities respond to emergencies, updating infrastructure to provide back ups and fall backs, and proactively planning for potential emergency funding.

J. Community Engagement

Objective: Active and ongoing community and tribal engagement

This One Water objective engages the diverse communities that represent Santa Clara County through meaningful participation opportunities that result in informing District Board decision-making processes. The effectiveness of this effort will derive from the quality, duration, and extent of community participation in wise decision making. It will also help guide the allocation of public resources to protecting, enhancing, and sustaining water resources.

5.4 STRATEGIES

To support the One Water vision, goals, and objectives, District staff and stakeholders developed a list of potential strategies. A strategy is a particular course of action.

These strategies should be considered potential strategies that may or may not all be incorporated in the One Water implementation program at a countywide or watershed-specific level. As the plan is applied and implemented, the District may find that it is able to achieve One Water objectives with fewer strategies. In addition, it should be noted that the District already implements many of the strategies. A list of potential strategies is provided in Table 5-1 opposite.

In general, the District has divided strategies into four categories.

The first category is strategies that increase understanding of water resources. Such strategies would improve data sharing, educate the public on water resources issues, and continue to engage the community in making wise water use decisions.

The second category is strategies that develop science-based policies and priorities, and that support science based decision making.

The third category is strategies that develop partnerships and mutual objectives. These strategies recognize that given its limited land jurisdiction and organizational scope, the District needs to partner with other agencies and organizations (local, regional, state, federal, scientific, NGO) to meet its goals and objectives. The District cannot achieve One Water on its own.

The fourth category is strategies that take action to meet an objective. Such strategies would result in a protected resource or constructed improvement.

Table 5-1: Potential Strategies to Address One Water Goals and Objectives

#	Strategy	Supports Objective(s)
Increase understanding of water resources		
1	Develop and disseminate adequate data and tools for integrated water resource management	A- J
2	Develop and disseminate educational programs (for schools, colleges, and communities) about integrated water resource management; climate change impacts, risks, vulnerabilities, and resiliency strategies; and water use in different sectors	A- J
3	Emphasize two-way transparent and open communication with community and key stakeholder groups	J
4	Leverage near-water trails and other recreational and public spaces for education and stewardship, e.g. with interpretive panels	E, J
Develop science-based policy and priorities		
5	Prevent encroachment on District right-of-way	A,C,D,E,G
6	Monitor indicator attributes for long-term success of identified target species	G
7	Develop and substantiate ecosystem services in benefit:cost analyses	A,B,D,E,F,G
8	Ensure that project designs are based on best available science regarding sea level rise and anticipated changes in precipitation patterns	A,B,D,H
9	Actively engage land-use agencies to develop and implement policies that protect and conserve water resources	A- J
10	Assess potential post-disaster opportunities (fire, flood, other) and develop emergency recovery plans for rebuilding smart	A- J
11	Identify and enforce codes that would prevent hazards to public health and safety along waterways	C- J
Develop partnerships that support mutual objectives		
12	Work with land-use agencies to create resilient water-related wildlife habitat in coordination with new development	G
13	Pursue public-private partnerships with appropriate recognition and incentives for voluntary actions consistent with District objectives	A- J
14	Collaborate with agencies and organizations (federal, state, regional, local, private) to create programs and secure funding for integrated water resources management that are implemented within reasonable time frames	A,B,C,D,E, G,H, I

Table 5-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Develop partnerships that support mutual objectives		
15	Actively participate in general planning especially during policy development	A,D,E,G,H,I,J
16	Collaborate with agencies, organizations, and land owners (though appropriate incentives consistent with District objectives) to expand the use of onsite stormwater capture, low impact development, green infrastructure, and other infiltration strategies while protecting groundwater quality and improving soil health	A,B,C,D,F, G,H,J
17	Partner with land-use agencies and land owners (though appropriate incentives consistent with District objectives) to preserve natural recharge and headwater areas (water supply and base flow enhancement)	A,B,C,D,E, F,G,H
18	Work with stormwater programs to expand best management practices and pollution prevention programs	A, B, C
19	Partner with local agencies and organizations (e.g., parks, open space, and resource conservation districts) and with private landowners (e.g. agricultural, golf course, grazing interests) to expand near-water open space	A,B,C,D,E, G,H
20	Continue partnerships with land-use agencies and retailers to develop and implement water use ordinances that address demand management and reuse	A
21	Coordinate with neighboring groundwater management agencies on groundwater management	B
22	Encourage and promote sustainable open space and land use practices (e.g., grazing, timber harvesting, agriculture, ranching, and forest management) to reduce erosion, improve soil health, protect water quality, and improve habitat connectivity	A, B, C, F, G
23	Coordinate with larger regional, state, and federal efforts on climate change adaptation	A-I
24	Increase wildfire education and prevention	C, H,I
25	Coordinate prevention, response, and recovery plans for floods, earthquakes, droughts, fire, and catastrophic events with local, county, state, and federal government agencies	A, H, I
26	Facilitate post-disaster land acquisition policy discussions	I
27	Partner with local universities and colleges on joint research and other projects related to water; engage faculty and students to add extra staffing for water outreach programs; develop education and internship opportunities	A-J

Multi-Objective Projects: Managing Stormwater and Trash

Crews vacuum stormdrain to remove contaminants, and volunteers remove trash from creek Green infrastructure in nearby Palo Alto showcases how urban land use changes can benefit water quality and reduce street flooding. Photos: SCVURPPP and City of San Jose

Table 5-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Develop partnerships that support mutual objectives		
28	Collaborate with neighborhoods, nonprofits, local governments, private property owners, and growers on water management projects	A-J
29	Support appropriate resource-sensitive recreational activities and opportunities on reservoirs, streams, and other publically-owned water bodies	E,J
Take action to meet the objective		
30	Create creek corridors that are qualitatively appropriate to location, e.g. width, height, vegetation, groundwater connections, hydrology	A, B, G
31	Support resilient native wildlife communities/adaptability of habitat	G, H
32	Improve connectivity for movement of mammals, birds, and fish, including continuous riparian corridors and connections from hills to bay, when managing water for beneficial uses or flood protection	G
33	Manage to support a diversity of complex habitats, communities, and habitat resources (by providing or installing refugia, microtopography, complex vegetative structure, coarse woody debris in channels, other physical heterogeneities)	G
34	Manage and promote functional vegetation communities when managing water for beneficial uses or flood protection	G
35	Prevent introduction/establishment of new invasive species and pathogens and remove existing invasive species in and around aquatic environments	A, C, G
36	Plant native plant species where appropriate and consider infiltration and absorption for plant health	G
37	Structural Flood Risk Reduction Strategies • Build setback levees • For all new flood protection capital projects/planning studies, assess at least one alternative that provides dynamic geomorphic flexibility, functional floodplains, riparian habitat, and infiltration of floodwaters • Manage for invasive species (e.g., *Arundo donax*) that impede flood flows • Acquire flood easements over open space and agricultural lands to reduce downstream flow quantities • Daylight creeks to increase ecological use (get them out of pipes) • Maintain creeks and flood infrastructure for the least environmental impact, lowest life cycle costs, and minimum risks	D,E,G

Multi-Objective Project: Restoring Creeks, Preventing Erosion and Improving Water Quality

The transformation of a stretch of Stevens Creek at Blackberry Farm near Cupertino, from parking lot in 2008 to thriving riparian corridor today. Photos: City of Cupertino

Table 5-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Take action to meet the objective		
38	Nonstructural Flood Risk Reduction Strategies • Develop and deploy interactive flood warning system based on real-time weather data • Prepare for emergency response • Support and encourage all cities and county to engage in and maximize points with FEMA's Community Rating System (CRS) for flood awareness, education, preparation, and risk reduction [See CRS for details of programs] • Advocate for regulations and policies about building on/using known floodplains • Implement near-water uses that support wider floodplains and room around and within water bodies for flowage or recreation. This could include purchase, easements, or site design guidelines • Provide technical advice/expertise to land use regulators and landowners (public and private) on their implementation of creek corridor ordinances, policies, and practices	D,G
39	Look for opportunities to purchase or encumber riparian land	A, B, C, D, E, G, H
40	Protect and manage property around reservoirs and other water bodies to improve and sustain water quality and minimize invasive species while allowing resource-sensitive recreational use	C, E, J
41	Move development back from water's edge (creek, tidal, and reservoir) when opportunities arise ("retreat" to prepare for sea level rise and to open riparian corridor)	A, B, C, D, E, G, H
42	Continue to protect, maintain, and develop local surface water supplies	A,B
43	Continue to protect, maintain, and develop imported water supplies	A, B, H
44	Continue to protect, maintain, and develop non-potable recycled water, indirect potable reuse, and direct potable reuse	A, B, H
45	Continue to increase water conservation savings and expand demand management measures	A, B, H
46	Continue to manage groundwater in conjunction with other supplies (local surface, imported, recycled, conserved)	A, B, C, H
47	Complete local reservoir seismic retrofits to remove operating restrictions	A, B, H
48	Continue to maintain existing water utility infrastructure	A, B, C, I

Greening and softening hardscape so that storm runoff can percolate into the ground has the potential to transform how water moves across the urban landscape countywide. Porous asphalt and permeable pavers at Creekside Park in Los Gatos, and a green roof in San Jose are all examples supported by the Santa Clara Valley Urban Runoff Pollution Prevention Program, of which the District is a partner. Photos: SCVURPPP

Table 5-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Take action to meet the objective		
49	Expand off-stream groundwater recharge capacity and conveyance	A, B, F, H
50	Increase managed/artificial recharge	A, B, C, H
51	Develop watershed-based stormwater management, such as watershed-based implementation of structural measures associated with LID and green infrastructure	A, B, C, D, F, H
52	Ensure that indirect potable reuse projects protect groundwater quality	C
53	Remove, remediate, or manage mercury in waterways	C
54	Prevent trash in waterways	C
55	Create habitat refuges to adapt to climate change or extreme events, e.g. thermal and drought refuges, flood refuges (both riverine and tidal) for high-velocity flows and sea level rise	G, H
56	Protect and restore bayland and riparian habitats that buffer storm impacts and protect water quality	D, G, H
57	Prepare plans to be adaptive to and provide resilience against floods, droughts, and catastrophic events	A, D, H, I
58	Expand water storage capacity in and outside of the county	A, I
59	Maintain reliable, accessible supply of emergency supplies (e.g. sandbags, pipe repair materials, water)	I
60	Expand education efforts on groundwater and potable reuse	A, B, H, J
61	Get input from tribes, disadvantaged, and underrepresented communities on water management decisions	A- J
62	Use social media to reach and interactively engage people; e.g., reporting water-saving success stories, violations, and inefficient vs. efficient resource uses	A, J
63	Freshwater flows support estuary function and integrate with habitat restoration in support of baylands and estuary health	F, G, H

Multi-Objective Projects: Restoring Habitat and Reducing Mercury Methylation

The District helped install a set of adjustable gates between Pond A8 and Alviso Slough as a partner in the South Bay Salt Pond Restoration Project. The 40-foot wide concrete gates can be opened or closed to tidal inflows and Guadalupe watershed outflows to provide the best possible aquatic habitat conditions in each season for steelhead, shorebirds, waterfowl and other baylands visitors. Conditions that are precursors to methylmercury problems, such as warm temperatures or algal blooms, have also been successfully prevented with the added management tool of the gates. Improvements to the ponds and slough, meanwhile, have increased flood retention capacity and the shoreline buffer zone. Photos: SCVWD

COUNTYWIDE OPPORTUNITIES

The next step in a framework that includes a vision, goals, objectives and strategies is to analyze opportunities for countywide implementation. Within the District and for its partner agencies and organizations, the One Water approach inspires thinking about integration and collaboration. One Water planning seeks additional opportunities for integrated approaches to water resources management by identifying where there is nexus among the various purposes of the District, and leveraging those opportunities to achieve multiple objectives in an effective and efficient manner. In analyzing opportunities for countywide One Water projects, one key will be to look for connections across multiple disciplines. Opportunities should also be considered broadly from a perspective of how they take place or are implemented across the geographic bounds of Santa Clara County, or a watershed or subwatershed, expanding the view from project level to landscape level.

Chapter 6 will explain how progress toward meeting the One Water objectives may be measured and tracked, by assessing objectives through their key attributes and metrics.

Chapter 7 will discuss countywide opportunities, the process for their prioritization, and how assessments of progress toward achieving One Water objectives will feed into that analysis. Recommendations for project and program implementation are described in Chapter 7 as the 'Implementation Plan.'

Hacienda Avenue, Campbell, before (top) and after (bottom) green infrastructure improvements, including bioretention basins along sidewalks which provide stormwater management benefits.   Photos: SCVURPPP

CHAPTER

6
MEETING THE OBJECTIVES

6.1 SETTING TARGETS & MEASURING PROGRESS
6.2 PRIORITIZING PROJECTS

MEETING THE OBJECTIVES

INTRODUCTION

The One Water Plan includes a process for assessing how, and to what degree, objectives are being met over the implementation horizon, including short-term milestones on the way to long-term targets. The plan's 10 objectives serve as important guidance as the District and its partners continue work towards realizing a One Water vision. The District developed these objectives through a stakeholder process with advice from a Science Advisory Hub, as described in Chapters 1 and 5. This chapter describes how key attributes, metrics, and targets will be used to track progress toward meeting One Water objectives through time.

6.1 SETTING TARGETS AND MEASURING PROGRESS

The District will assess progress in meeting objectives by tracking established attributes through specific metrics and targets. The District reviewed existing District objectives and measures, reviewed literature, held discussions with the Science Advisory Hub, and worked with resource agency staff to select the most useful, feasible, and relevant attributes, metrics, and targets.

Attributes are important characteristics that together help describe an objective. For the objective high quality surface water and groundwater, for example, one attribute of several might be surface water in streams supports healthy aquatic ecosystems. A useful attribute is one that can be measured in a scientifically defensible way. Through the planning process, and with the help of science advisors, the District has developed a small number of attributes for each objective (typically between 3 and 5 - see Table 6-1). Each attribute represents a critical component or indicator of that objective.

Metrics are parameters that can be measured to track the status of attributes. Each attribute will be measured and tracked via one or more metrics. If the attribute is buffer areas bordering water, for example, a metric might be the abundance, width and condition of a buffer area, as measured by a standardized and repeatable survey. Factors considered in selecting One Water metrics included the ability to quantify realistic, optimistic targets that would indicate success; the cost and feasibility of collecting scientifically-defensible data; the existence of programs already collecting that data; and the potential usefulness of the metric to other agencies and the public.

Targets are an optimistic but achievable endpoint, quantified where possible to indicate success. For example, targets related to the objective of flood risk reduction would be specific levels of flood protection tied to specific land uses. For example, long-range targets might be a 500-year level of protection for all critical facilities, and a 100-year level of protection for all residential areas. When a collection of key attributes reach their established metric-targets, the objective may be considered met. The One Water Plan takes the long view, planning 30 to 50 years into the future, and recognizing that attaining success may take decades.

Where applicable, shorter-term milestones will be established, designating smaller steps along the way toward long-range targets. Tracking each objective, via its key attributes, toward a target endpoint over time can reveal positive or negative trends.

Tables 6-2 (A – J) provide an overview of the attributes that describe each objective, and the metrics that will be used to guide its evaluation, linked to each attribute. Targets are under development.

The status of each of each objective will be assessed based on the progress of its component attributes, as measured through its specific metrics. For each metric, the District will determine the percent of the target achieved to date. Within each attribute, the metric scores would be averaged to determine that attribute's score. Each objective will then be scored by averaging the attribute scores.

The stage of this process showing component attribute scores averaged to determine an objective score is illustrated in Figure 6-1.

Status Chart

Figure 6-2, below, shows how the status of the 10 One Water objectives might be displayed in the One Water tracking process. Since the status of each objective is shown as percent achievement against its consolidated target, all objectives are to be represented on the same 0 – 100 scale. Normalizing to a single scale (0 – 100) also allows objectives to be compared or combined to allow for different views of the watershed status. The unshaded area above the colored bars indicates the amount of progress yet to be made before reaching the established targets.

Of course, this visual analysis can be expanded or rolled-up for any level of detail, between the metrics that add up to the attributes, the attributes that add up to the objectives, and the objectives that add up to the overall status assessment.

Any objective, attribute or metric can be weighted for its relative importance by adjusting the width of its bar. In this example, all objectives are weighted equally, as shown by the equal widths of the 10 status bars. Weighting would change the value of the overall status assessment, and could be visually represented by changing the "real estate" devoted to any one item. In this One Water Plan Countywide Report, objectives are all equally weighted, providing a starting point from which future changes may easily be incorporated.

6.2 PRIORITIZING PROJECTS, PROGRAMS AND STRATEGIES

In addition to visually displaying progress toward meeting the objectives as the status chart is updated through time, it can also be useful in pointing to areas that might need more attention. For example, in the hypothetical status chart shown in Figure 6-2 ('hypothetical' because measures have not yet been evaluated for the Countywide Report), objectives B and C are shown as performing very close to their targets, indicating that current approaches are on track. Objectives E and I, on the other hand, appear as shorter bars on the chart, indicating that more attention is needed in these areas. As project ideas are developed and ranked, more weight may be placed on projects, programs and strategies that would lift performance in under-performing areas.

Chapter Seven describes how the objectives, attributes and metrics will be used to rate and prioritize potential projects or programs.

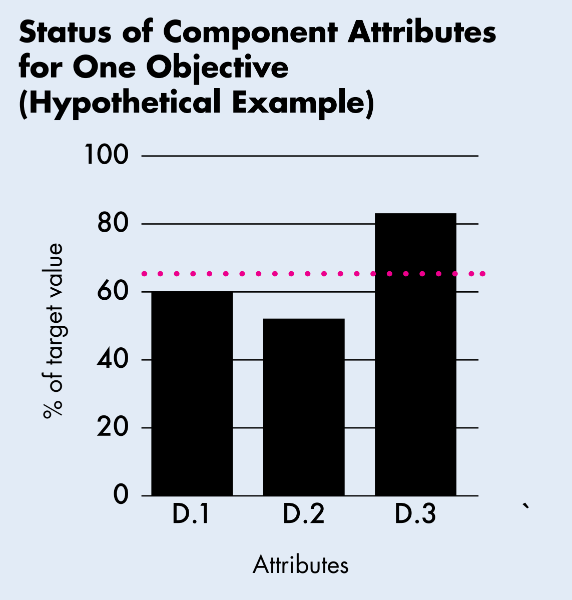


Figure 6-1: Each objective is assessed according to the progress of its component attributes. Attributes are, in turn, measured through specific metrics (not shown). This example is hypothetical. Values have not yet been assessed.

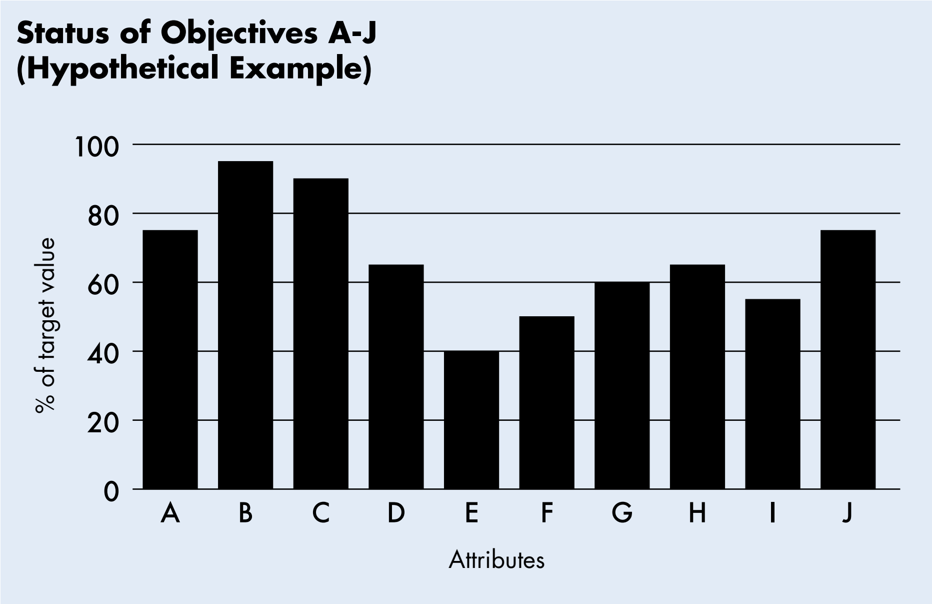


Figure 6-2: Percent of target by key attributes per objective. This example is hypothetical. Values have not yet been assessed.

Table 6-1: Key Attributes

One Water Objective	Key Attribute (for tracking & assessing)
A. Reliable current and future water supply for urban, rural, agricultural, and environmental needs	Protect, maintain and develop local surface water supplies (E-2.1.2.) Protect, maintain and develop imported water supplies (E-2.1.3.) Protect, maintain and develop recycled water supplies (E-2.1.4.) Demand management (incl. water use efficiency, water conservation) (E-2.1.5.)
B. Sustainable groundwater subbasins	Sufficient groundwater supplies to optimize water supply reliability Groundwater levels maintained to minimize subsidence Groundwater is protected from existing and potential contamination, including saltwater intrusion (repeated C.3)
C. High quality surface water and groundwater	Surface water in reservoirs supports human use Surface water in streams supports healthy aquatic ecosystems Groundwater is protected from existing and potential contamination, including saltwater intrusion (repeated B.3)
D. Reliable and effective flood risk reduction using an integrated approach	People and structures are at a low risk of flooding from high flows overtopping banks (creek and tidal) Flood protection infrastructure that is geomorphically and ecologically resilient, appropriate to its landscape, and provides multiple benefits to the community where feasible Community aware of flood risks and taking measures to improve safety and reduce damage Creek maintenance costs for flood
E. Expanded and protected buffer lands adjacent to water bodies	Buffer and landscape context: areas bordering channels, wetlands, lakes, the bay and reservoirs throughout the county provide protection from stress and disturbance
F. Stream flows support natural processes	Stream flows that support a healthy aquatic habitat and appropriate geomorphic
G. Resilient habitats and resources for native species	Buffer and landscape context (connectivity and habitat patch size; CRAM A1) Hydrology that supports natural processes (CRAM A2) Physical structure (complexity at a variety of scales; CRAM A3) Biotic structure (appropriate diversity; CRAM A4)
H. Adapt to and prepare for climate change	Bay shoreline and tidal zone are resilient to increased mean sea level and coastal storm magnitude and frequency Water supply resources are adaptable, resilient, and reliable in the face of changing climate with its associated risks and vulnerabilities Creeks and flood protection facilities are resilient to changes in flood frequency and channel-forming flows Creeks and riparian habitat are resilient to changes in flood frequency, air temperature, precipitation patterns, baseflow conditions and drought frequency and duration
I. Anticipate and prepare for emergencies	Prevent emergencies to avoid, prevent or stop a threatened or actual act of terrorism Protect against acts of terrorism and manmade or natural disasters Respond appropriately to emergencies Recover from emergencies - rebuilding after an emergency Mitigate for emergencies to lessen the impact of disasters
J. Effective community and tribal engagement	Inclusive and effective community involvement in water-resource planning and policy development Public investments in maintaining healthy natural resources Community actions to reduce flood and drought risks and protect waterways Other organizations (NGO, public, and private) incorporate One Water goals and objectives in their policies and programs

Table 6-2: Objectives, Attributes and Metrics

OBJECTIVE		ATTRIBUTES		METRICS	
A: Reliable current and future water supply for urban, rural, agricultural, and environmental needs	**A.1**	**Protect, maintain, and develop local surface water supplies (E-2.1.2.)** Ensure sufficient reservoir capacities to meet annual Santa Clara County water needs	**A.1.1**	Operational capacity at District reservoirs (OM 2.1.2.c,d,e,f,g)	Target would be linked to CEO Outcome Measures and water supply management plan
	A.2	**Protect, maintain, and develop imported water supplies (E-2.1.3.)** Ensure imported water meets water supply needs of Santa Clara County	**A.2.1**	Long-term average annual imported water supplies	
	A.3	**Protect, maintain, and develop recycled water supplies (E-2.1.4.)** Expand the use of recycled water to help meet Santa Clara County water demands	**A.3.1**	Recycled water production (OM 2.1.4.a)	
	A.4	**Demand management (including water use efficiency, water conservation) (E-2.1.5.)** Support water conservation activities	**A.4.1**	Annual water conservation savings (OM 2.1.5.a)	
OBJECTIVE		**ATTRIBUTES**		**METRICS**	
B: Sustainable groundwater subbasins	**B.1**	**Sufficient groundwater supplies to optimize water supply reliability** Maintain end-of-year groundwater storage throughout Santa Clara County	**B.1.1**	End of year groundwater storage (OM 2.1.1.a,b,c)	Target would be linked to CEO Outcome Measures
	B.2	**Groundwater levels maintained to minimize subsidence** Ensure groundwater levels are above subsidence thresholds	**B.2.1**	Groundwater levels at subsidence index wells (OM 2.1.1.d)	
	B.3	**Groundwater is protected from existing and potential contamination, including saltwater intrusion** Protect or promote groundwater quality to support beneficial uses **Note: repeated in water quality (C.3.1)*	**B.3.1**	Water supply wells meet primary drinking water standards (OM 2.1.1.e) **Note: repeated in water quality (C.3.1)*	
			B.3.2	Concentrations of nitrate, chloride, and total dissolved solids (TDS) in index wells (OM 2.1.1.g) **Note: repeated in water quality (C.3.2)*	

Table 6-2: Objectives, Attributes and Metrics - continued

OBJECTIVE	ATTRIBUTES	METRICS	
C: High quality surface water and groundwater 	**C.1 Surface water in reservoirs supports human use** Maintain quality (chemical, biological, and physical) of surface waters to meet standards for human use once treated	**C.1.1** Chemical water quality (i.e. dissolved metals, total metals, mercury, nutrients and nitrates, DO, pH, perchlorate, gasoline additives – BTEX, bromide, total organic carbon) Target would be linked to regulatory standards and CEO Outcome Measures **C.1.2** Biological water quality (i.e. pathogens-cryptosporidium and giardia, total coliform, E. Coli, enterococci, and invasive mussels) **C.1.3** Physical properties of water quality (i.e. temperature, conductivity, suspended sediment -turbidity) **C.1.4** Emerging contaminants levels in surface waters (current CECs: pharmaceuticals, caffeine, and hormones)	Target would be linked to regulatory standards and CEO Outcome Measures
	C.2 Surface water in streams supports healthy aquatic ecosystems Maintain quality (chemical, biological, and physical) of stream waters to be suitable for aquatic species	**C.2.1** Chemical water quality (i.e. mercury, nutrient, DO, pH) **C.2.2** Biological water quality (i.e. pathogens and source - Microbial Source Tracking, BMI – assemblage, HABs – harmful algal blooms) **C.2.3** Physical properties of water quality (i.e. temperature, sediment, trash) **C.2.4** Integrated chemical/biological/physical water quality indicators (i.e. BMI community metric scores, toxicity) **C.2.5** Emerging contaminants levels in surface waters (HABs, current CECs: pyretheroids) **C.2.6** Fish tissue concentration of methyl mercury that meets Total Maximum Daily Load (TMDL) objectives (OM 4.1.1.c) **C.2.7** Robust outreach and education program in compliance with MRP 2.0 (C.7) requirements **Note: repeated in community engagement (J.3.3)*	
	C.3 Groundwater is protected from existing and potential contamination, including saltwater intrusion (repeated B.3) Protect or promote groundwater quality to support beneficial uses **Note: repeated in groundwater (B.3)*	**C.3.1** Water supply wells meet primary drinking water standards (OM 2.1.1.e) **Note: repeated in groundwater (B.3.1)* **C.3.2** Concentrations of nitrate, chloride and total dissolved solids in index wells (OM 2.1.1.g) **Note: repeated in groundwater (B.3.2)*	

Table 6-2: Objectives, Attributes and Metrics - continued

OBJECTIVE	ATTRIBUTES	METRICS	
D: Reliable and effective flood risk reduction using an integrated approach 	**D.1 People and structures are at a low risk of flooding from high flows overtopping banks (creek and tidal)** Protection from flooding and future sea level rise; plans are in place to restore damaged areas	**D.1.1** Number of parcels subject to creek or tidal flooding **D.1.2** Residential population at risk to Health & Safety from 1% flood event *D.1.2.1: Acres of developed land at depth of 2' or greater* *D.1.2.2: Acres of developed land at velocity of 1 fps or greater* **D.1.3** Maintain FEMA-compliant plans to prepare for and recover from floods *Recovery Plan, Local Hazard Mitigation Plan, Training and Exercise Plans, Infrastructure Reliability Plan, Climate Adaptation Plan, Emergency Action Plans* **Note: linked to multiple emergency preparedness attributes (I.1-I.5)*	Target development in progress
	D.2 Flood protection infrastructure that is geomorphically and ecologically resilient, appropriate to its landscape, and provides multiple benefits to the community where feasible Continuous stream corridors connected or reconnected to Baylands with wide buffers	**D.2.1** Stream corridor continuity (CRAM metric A1M1) Assesses spatial association with other areas of aquatic resources. Referred to as stream corridor continuity for riverine wetlands **D.2.2** Abundance, width and conditions of buffer area (CRAM metric A1M2) Adjoining area in a natural or semi-natural state and currently not dedicated to anthropogenic uses that would hurt its ability to entrap contaminants, discourage forays into the area by people and non-native predators, or otherwise protect the area from stress and disturbance. This includes three submetrics (A) percent with buffer, (B) average buffer width, and (C) buffer conditions. **D.2.3** Number of streams connected or reconnected directly to baylands **D.2.4** Channel maintenance costs	
	D.3 Community aware of flood risks and taking measures to improve safety and reduce damage Community participation in flood management and educational activities	**D.3.1** Community Rating System (CRS) participation and rating of communities in Santa Clara Co. (OM 3.2.2.b,c)	

OBJECTIVE	ATTRIBUTES	METRICS	
E: Expanded and protected buffer lands adjacent to water bodies 	**E.1 Buffer and landscape context: areas bordering channels, wetlands, lakes, the bay and reservoirs throughout the county provide protection from stress and disturbance** CRAM provides specific metric assessment directions for riverine, depressional and estuarine areas	Metrics likely to be linked to California Rapid Assessment Method for wetlands (CRAM)	Target development in progress

Table 6-2: Objectives, Attributes and Metrics - continued

OBJECTIVE	ATTRIBUTES		METRICS	
F: Stream flows support natural processes 	**F.1**	**Stream flows that support a healthy aquatic habitat and appropriate geomorphic processes**	Metrics likely to be linked to California Rapid Assessment Method for wetlands (CRAM) and conditions specified by state water license requirements and Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) conditions	Target development in progress

OBJECTIVE	ATTRIBUTES		METRICS	
G: Resilient habitats and resources for native species 	**G.1**	**Buffer and landscape context (connectivity and habitat patch size; CRAM A1)** Connectivity between habitat patches and to appropriate surrounding areas for movement of native wildlife and to promote natural recruitment of native vegetation	Metrics likely to be linked to California Rapid Assessment Method for wetlands (CRAM) and additional metrics specific to fish and wildlife	Target development in progress
	G.2	**Hydrology that supports natural processes (CRAM A2)** Using the CRAM hydrology attribute, this measures the extent of departure of observed conditions from the "least-disturbed" state (i.e. reference condition)		
	G.3	**Physical structure (complexity at a variety of scales; CRAM A3)** Suitable habitat for aquatic, wetland, and riparian species		
	G.4	**Biotic structure (appropriate diversity; CRAM A4)** Plant community composition that supports wildlife		
	G.5	**Appropriate resources for fish and wildlife**		

Table 6-2: Objectives, Attributes and Metrics - continued

OBJECTIVE		ATTRIBUTES		METRICS	
H: Adapt to and prepare for climate change	**H.1**	**Bay shoreline and tidal zone are resilient to increased mean sea level and coastal storm magnitude and frequency** Protect bayside and inland structures and ecosystems from the effects of sea level rise		Metrics under development by District Climate Team	Target development in progress
	H.2	**Water supply resources are adaptable, resilient and reliable in the face of a changing climate with its associated risks and vulnerabilities** Strategies to prepare for changes in available water resources and demand			
	H.3	**Creeks and flood protection facilities are resilient to changes in flood frequency and channel-forming flows** Natural and developed lands can respond to flooding in a safe and economically efficient manner			
	H.4	**Creeks and riparian habitat are resilient to changes in flood frequency, precipitation patterns, air temperature, baseflow conditions and drought frequency and duration** Stewardship of ecosystems and species in response to a changing climate			

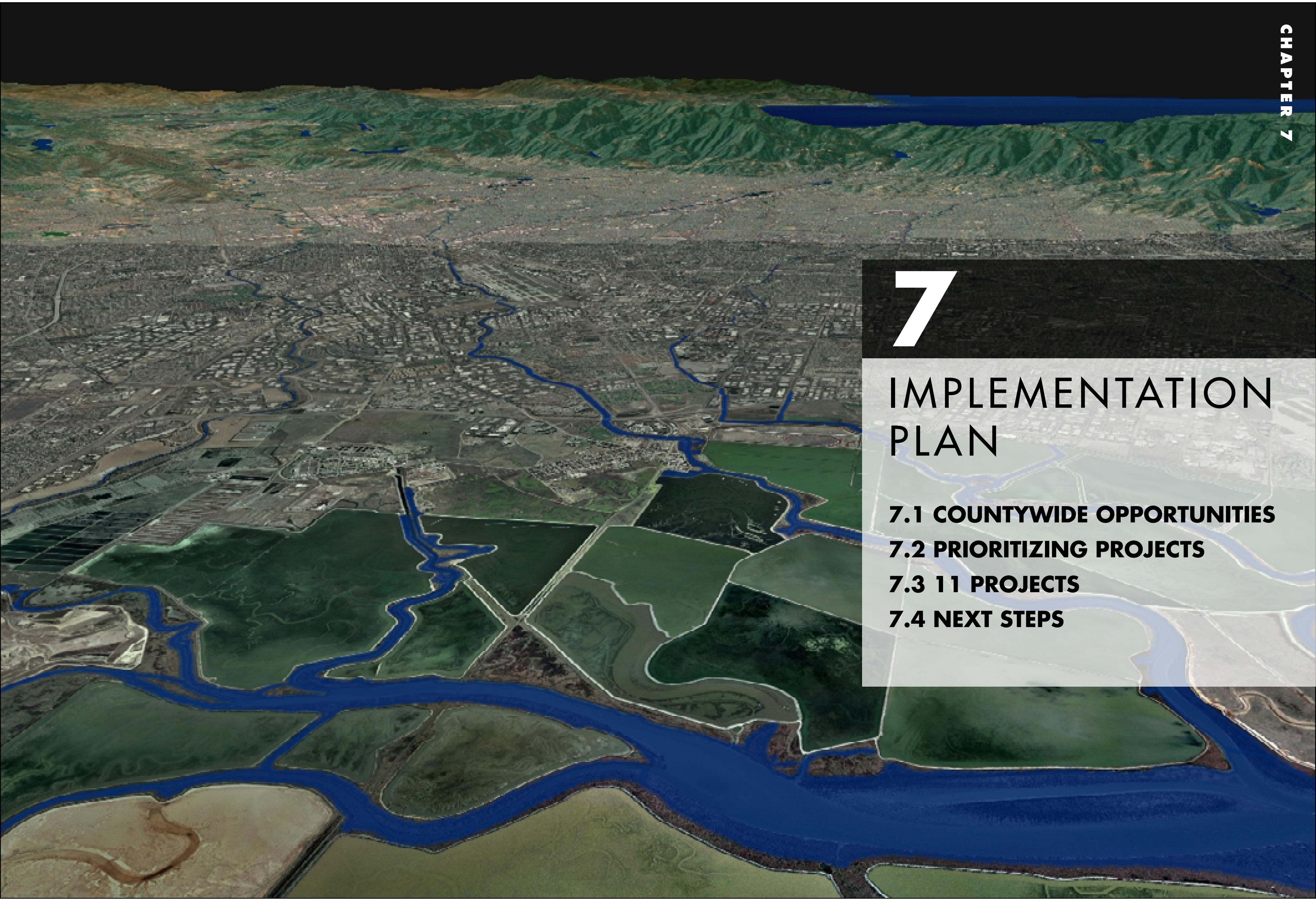
OBJECTIVE		ATTRIBUTES		METRICS	
I: Anticipate and prepare for emergencies	**I.1**	**Prevent emergencies to avoid, prevent or stop a threatened or actual act of terrorism** Ensuring we are optimally prepared to prevent an imminent terrorist attack	**I.1.1**	Maintain FEMA-compliant plans for emergency prevention: (THIRA, IRP, CAP)	Target development in progress, would be related to developing and maintaining compliant plans
	I.2	**Protect against acts of terrorism and manmade or natural disasters** Capabilities necessary to secure against natural or man-made disasters	**I.2.1** **I.2.2** **I.2.3**	Maintain FEMA-compliant plans to protect against disasters: (THIRA, Security Command Center) Number of annual training exercises (OM 2.1.6.a) Percent of employees that receive required FEMA/CAL-EMA NIMS/SEMS training (OM 2.1.6.b)	
	I.3	**Respond appropriately to emergencies** The ability to protect property and the environment after an incident has occurred	**I.3.1**	Maintain FEMA-compliant plans to improve response coordination: (THIRA, EOC, DOC, ICP, EOP, DRP, EAP, Training and Exercise Plan)	
	I.4	**Recover from emergencies - rebuilding after an emergency** Assist communities to recover from disaster	**I.4.1**	Maintain FEMA-compliant plans to restore or rehabilitate disaster-struck areas: (THIRA, Recovery Plans)	
	I.5	**Mitigate for emergencies to lessen the impact of disasters** Reduce the loss of property by lessening potential impacts prior to disasters	**I.5.1**	Maintain FEMA-compliant plans that reduce impacts of potential disaster: (THIRA, Continuity Plan, Continuity Exercises Plan)	

Table 6-2: Objectives, Attributes and Metrics - continued

OBJECTIVE	ATTRIBUTES	METRICS	
J: Effective community and tribal engagement	**J.1 Inclusive and effective community involvement in water resource planning and policy development** Opportunities for all communities to engage with the District	**J.1.1** Number of Board-level policy and programmatic discussions open for public input (including Board Committees, Board Sub-Committees, and Board Ad Hoc Committees) **J.1.2** Number and geographic diversity of District offsite meetings and events **J.1.3** Opportunities and invitations for local tribal leaders to engage with District staff	Target development in progress
	J.2 Public investments in maintaining healthy natural resources Measuring the public's willingness to invest time and money in support of natural resources	**J.2.1** Number of volunteer days in which people participate in waterway stewardship events (e.g., Adopt-A-Creek, National River Cleanup Day, Coastal Cleanup, and District-funded grant programs) **J.2.2** Percent of ballot measures passed by the community that fund natural resource protection or management aligned with One Water objectives	
	J.3 Community actions to reduce flood and drought risks and protect waterways Instilling a sense of resource ownership	**J.3.1** Annual water conservation savings (OM 2.1.5.a) **Note: repeated in water supply (A.4.1)* **J.3.2** Countywide Score on the Community Rating System's Program (CRS) for Public Information (PPI) **J.3.3** Robust outreach and education program in compliance with MRP 2.0 (C.7) requirements **Note: repeated in water quality (C.2.7)*	
	J.4 Other organizations (NGO, public, and private) incorporate One Water goals and objectives in their policies and programs Long-term influence of the One Water Plan	**J.4.1** Number of new partnerships/programs/projects with external organizations resulting from One Water Plan (i.e., storm drain master plans, land acquisitions, and restoration) **J.4.2** General Plans with One Water goals or objectives adopted, endorsed, or cited (this is a long-term goal)	

CHAPTER 7

7 IMPLEMENTATION PLAN



Santa Clara County looking south from San Francisco Bay, with Monterey Bay in the distance: Photo: Amber Manfree

IMPLEMENTATION

INTRODUCTION

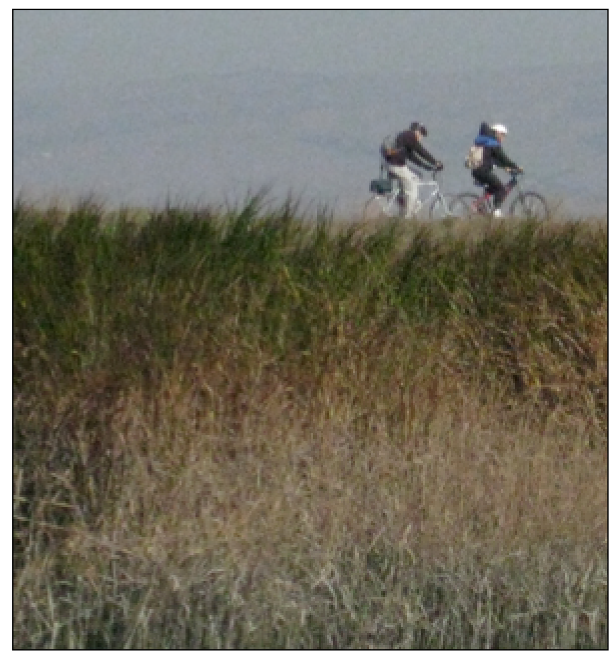
As described in Chapter 1, the One Water Plan integrates the water supply, flood protection, and stream stewardship missions of the water District at the watershed scale. Drawing from detailed existing programs and plans, One Water seeks to find the nexus between these three mission components for new opportunities in integrated water resources management. One Water does not replace the substantial existing planning in place by the District's Water Utility Enterprise and the Watersheds Division but instead looks for opportunities to further protect and enhance water resources.

The One Water Plan is long term endeavor that seeks to build up to long-term improvements in water resources management and watershed conditions. One Water will operate under the current commitments, regulations, and existing restrictions and challenges that drive District operations and day-to-day work. This means that not all strategies will be practicable and not all goals and objectives can be carried out simultaneously. In the end, however, the framework called out in this One Water Plan identifies a roadmap for integrated water resources management for the future. Not all District activities can be integrated, nor all activities managed under One Water, but all types of water will be considered in building upon past successes to manage these valuable resources as One Water.

Chapter 7 of the Countywide Report acts as the first "Implementation Plan" for the One Water Plan. The chapter is critical as it relates current and future opportunities to the One Water Framework laid out in Chapter 5, and the means to how related objectives are measured in Chapter 6. The Implementation Plan demonstrates a list of opportunities and provides recommendations to the District Board for activities that meet the intent of the One Water Plan while adhering to the District Act, mission, and Board governance policies. Subsequent watershed-specific master plans under One Water will each include their own Implementation Plans, allowing for reference back to integrated master planning as the District makes hard decisions on how to spend limited resources.

As previewed in Chapter 6, a first step in implementing the One Water Plan is to evaluate, prioritize, and fund a group of programs, projects, or recommended policies and guidelines, otherwise known as "opportunities," that support One Water objectives. Opportunities are first examined at a countywide scale.

As One Water planning progresses, the geographic scale will move from countywide to watershed specific. At that time, implementation opportunities for each of the five watersheds will be evaluated, selected, and refined for inclusion in each watershed plan. This inclusion of prioritized opportunities sets this master planning effort apart from past long-term planning efforts in the watersheds. Upon completion of all five watershed-specific plans, the comprehensive One Water Plan will be further reviewed for priorities, with the long-term plan being to revisit One Water every five years for updates.



7.1 COUNTYWIDE OPPORTUNITIES

The One Water Plan will be implemented through specific studies, actions, projects, programs, recommended policies and guidelines, and partnerships. The District developed a list of opportunities for these kinds of implementation activities through the One Water planning process. Stakeholders and District staff were encouraged to propose ideas that would improve the condition of the county with respect to One Water goals and objectives.

For the Countywide Plan, these opportunities were selected because they reflect One Water strategies, meet One Water objectives, have a countywide scope applicable to more than one watershed, and are not included in other master plans. In some cases, taking action to establish a countywide program may lead to smaller scale actions in future watershed-specific plans.

In general, the types of activities considered at a countywide scale include:

- Work taking place in multiple watersheds
- Work taking place in the baylands (an area that covers multiple watersheds)
- Operations-type work that can be applied to areas countywide or in more than one major watershed drainage
- Proposed policies that could be applied countywide
- Climate change adaptation-related activities
- Work to prepare for emergencies and hazard mitigation
- Community engagement efforts

Photo: Rick Lewis

7.2 PRIORITIZING PROJECTS

The most promising of these ideas and opportunities, and additional opportunities identified in the future, are being evaluated and ranked for implementation using the following prioritization process. While all opportunities are viewed as having merit, required Board approval and potential resource constraints necessitate the creation of a prioritized list. Steps to prioritize opportunities include:

Step 1: Assemble a master list of countywide opportunities, including studies, action-based projects, policy developments, and partnerships.

Step 2: Screen opportunities for further consideration, based on countywide applicability and general feasibility.

Step 3: Assess and rate each opportunity with respect to how well it would achieve the objectives, emphasizing those that would help achieve multiple objectives, by comparing program benefits to key attributes.

Step 4: Evaluate the highest-rated opportunities for implementation based on feasibility and funding.

The District will use the attributes and metrics developed to track progress in meeting One Water objectives to evaluate and prioritize countywide implementation opportunities.

Each opportunity on the countywide list that passes basic screening criteria (Step 2) will be assessed for its potential to move key attributes in a positive direction (Step 3). Though these first actions in support of the One Water Plan will be ranked through a simplified process, the process will be refined as more details for the metrics are developed. In the meantime, qualitative scores will be assigned for each opportunity compared to its influence on each attribute:

- Substantially improves = 3
- Somewhat improves = 2
- Slightly improves = 1
- Not related = 0
- Negatively influences = -1

This rating system does not establish weights or priorities among or between the 10 One Water objectives or their key attributes. Although objectives may have different numbers of attributes, scores are normalized, for a maximum rating of 100 (see Chapter 6 for more details on attributes, metrics, and weighting). This system does not provide fine-grained guidance at this time to differentiate between scores. In the future, specific metrics will provide a more quantitative method for evaluating the likely benefit of projects to address key attributes, and thus meet objectives.

As metrics and targets are more fully developed and vetted, they will be incorporated directly into this rating system for use in prioritizing opportunities at a watershed scale. Proposed activities can then be rated directly against established metrics. Those activities that provide the most benefit for agreed-upon metrics will be prioritized for implementation, then considered in terms of feasibility and funding, as described in Chapter 6.

Table 7-1: Countywide Opportunities

No.	Projects	Related Objective(s)	Type of Project*	District Role**	Related Plans and Programs										
					Capital Improvement Plan	District-wide Asset Management Program	FAHCE /Three Creeks	Groundwater Management Plan	Reservoir & Raw Water Operations Planning	Safe, Clean Water & Natural Flood Protection program	Santa Clara Valley Habitat Plan	South Bay Water Recycling Strategic Master Plan	Stream Maintenance Program	Water Quality Plans and Programs	Water Supply & Infrastructure Master Plan
1	Protect land to meet the objectives of the One Water Plan	A, B, C, D, E, G, H, I, and J	P, A	P (limited) C, T	●			●	●	●	●			●	●
2	Recommend policy for near-water recreation opportunities on District fee property and guidelines for best management practices on non- District property	C, E, G, and J	P, E&O	C, T	●	●			●	●				●	
3	Develop and implement Stormwater Resource Plan	A, B, C, D, F, H, and J	P&D, E&O, P	C	●			●	●					●	●
4	Recommend guidelines for water quality and other beneficial uses to guide District regarding homeless encampments near waterways	C, D, G, and J	P	C						●					
5	Develop a systemic, watershed- (and sediment-shed) based approach to sediment and vegetation management in creeks, reservoirs, and Bay	A, C, D, E, F, G, and H	P&D	P, C		●	●		●	●			●		
6	Develop reference creek channel types for select reaches within select creeks	C, D, E, F, G, and H	P&D	P, C	●		●						●		

*Type of Project: (A) = Acquisition ; (C) = Construction; (E&O) = Education and Outreach; (P) = Policy; and (P&D) = Plan & Design

** District Role: (A) = Advocate; (L)= Lead; (P)= Partner; and (T) = Technical Advisor

Table 7-1: Countywide Opportunities - continued

No.	Projects	Related Objective(s)	Type of Project*	District Role**	Related Plans and Programs										
					Capital Improvement Plan	District-wide Asset Management Program	FAHCE/Three Creeks	Groundwater Management Plan	Reservoir & Raw Water Operations Planning	Safe, Clean Water & Natural Flood Protection program	Santa Clara Valley Habitat Plan	South Bay Water Recycling Strategic Master Plan	Stream Maintenance Program	Water Quality Plans and Programs	Water Supply & Infrastructure Master Plan
7	Continue to partner on South Bay Salt Pond Restoration Project	C, D, E, G, H, and J	C	C	●					●					
8	Continue coordinated effort on the Shoreline Study	D, E, G, H, and I	C	P, C	●					●					
9	Update the "Guidelines and Standards for Land Use near Streams (2007)"	A, B, C, D, E, F, G, H, and J	P	C			●	●	●					●	●
10	Expand invasive plant removal program	D, F, G, H, I, and J	P & D, C E & O	P, C, T						●			●		
11	Develop hazard tree abatement program	G, H, I and J	P, P & D	P						●	●		●		

*Type of Project: (A) = Acquisition ; (C) = Construction; (E&O) = Education and Outreach; (P) = Policy; and (P&D) = Plan & Design

** District Role: (A) = Advocate; (L)= Lead; (P)= Partner; and (T) = Technical Advisor

7.3 11 PROJECTS

Countywide Opportunities evaluated by staff with stakeholder input have been captured in Table 7-1 on the preceding page.

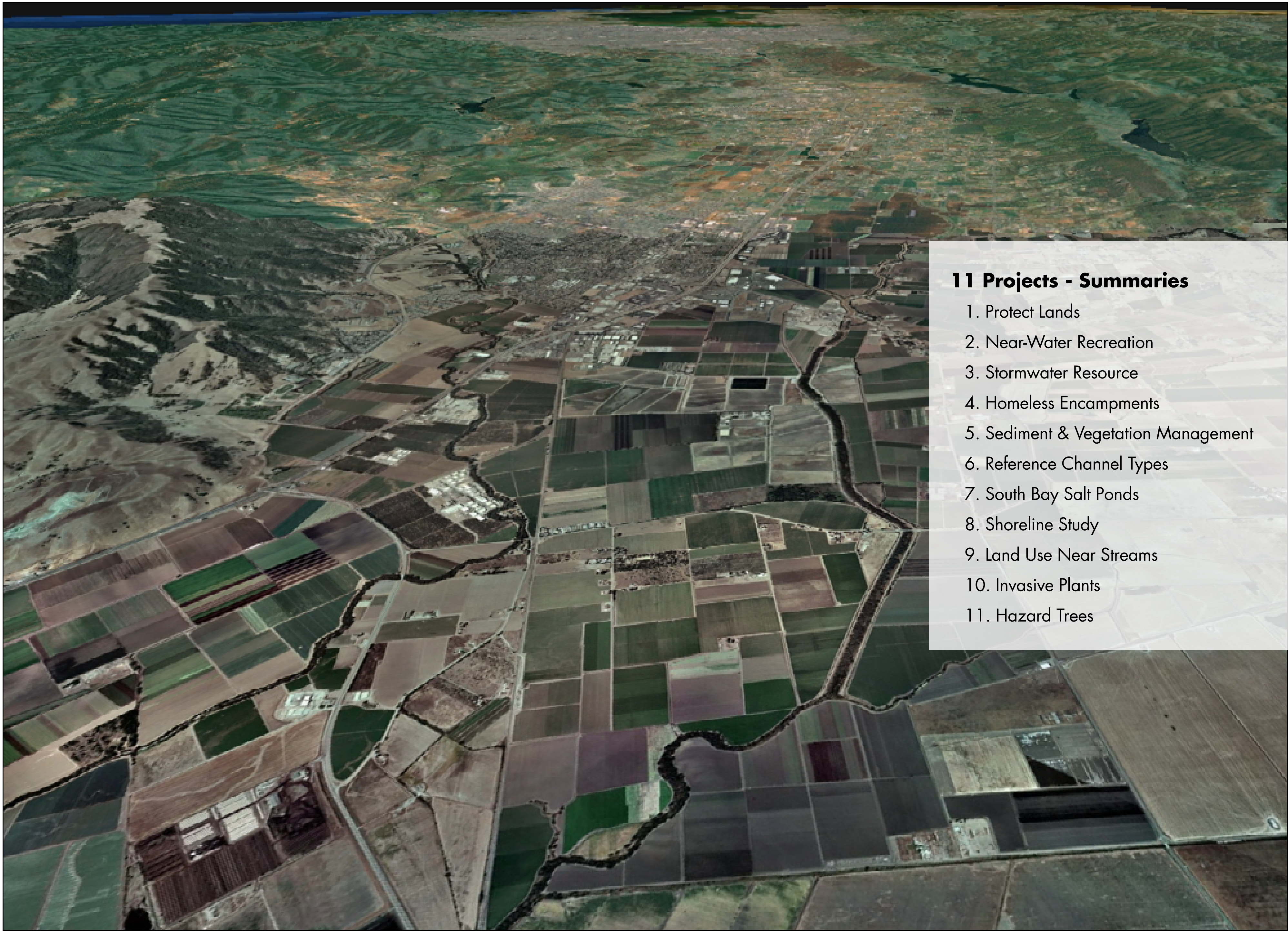
Table 7-1 summarizes the opportunities, the objectives they support, the type of project, District role, and existing plans and programs that require coordination.

Table 7-2 recommends a draft ranking of project opportunities based on Steps 1-3 as outlined in section 7.2 on page 117. Step 4 of the prioritization process will be completed as the preliminary draft report is finalized and will be presented to the Board for further consideration and possible funding through current or future budgets. Final recommendations may include timing considerations that relate to sequencing related activities.

On the following pages, each potential countywide opportunity is explored in more depth in two-page summaries. These include a brief project description and reference to related One Water goals, objectives, and strategies. They also include the geographic focus, the District's likely role in such a project, potential or current partners, benefits, project components, potential funding sources, and proposed budget and timing.

Table 7-2: Ranked Countywide Opportunities

Project No.	Title	Total Score
7	Continue to partner on South Bay Salt Ponds Restoration Project	45
1	Protect land to meet the objectives of the One Water Plan	45
3	Develop and implement a Stormwater Resource Plan	42
8	Continue coordinated effort on the Shoreline Study	33
9	Update the "Guidelines and Standards for Land Use Near Streams (2007)"	29
4	Recommend guidelines for water quality and other beneficial uses to guide District regarding homeless encampments near waterways	21
5	Develop a systematic, watershed- (and sediment-shed) based approach to sediment and vegetation management in creeks, reservoirs and Bay	20
6	Develop reference creek channel types for select reaches within select creeks	19
2	Recommend policy for near-water recreation opportunities on District fee property and guidelines for best management practices on non-District property	16
10	Expand invasive plant removal program	14
11	Develop hazardous tree abatement program	8

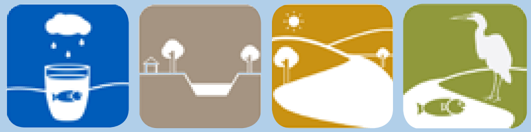


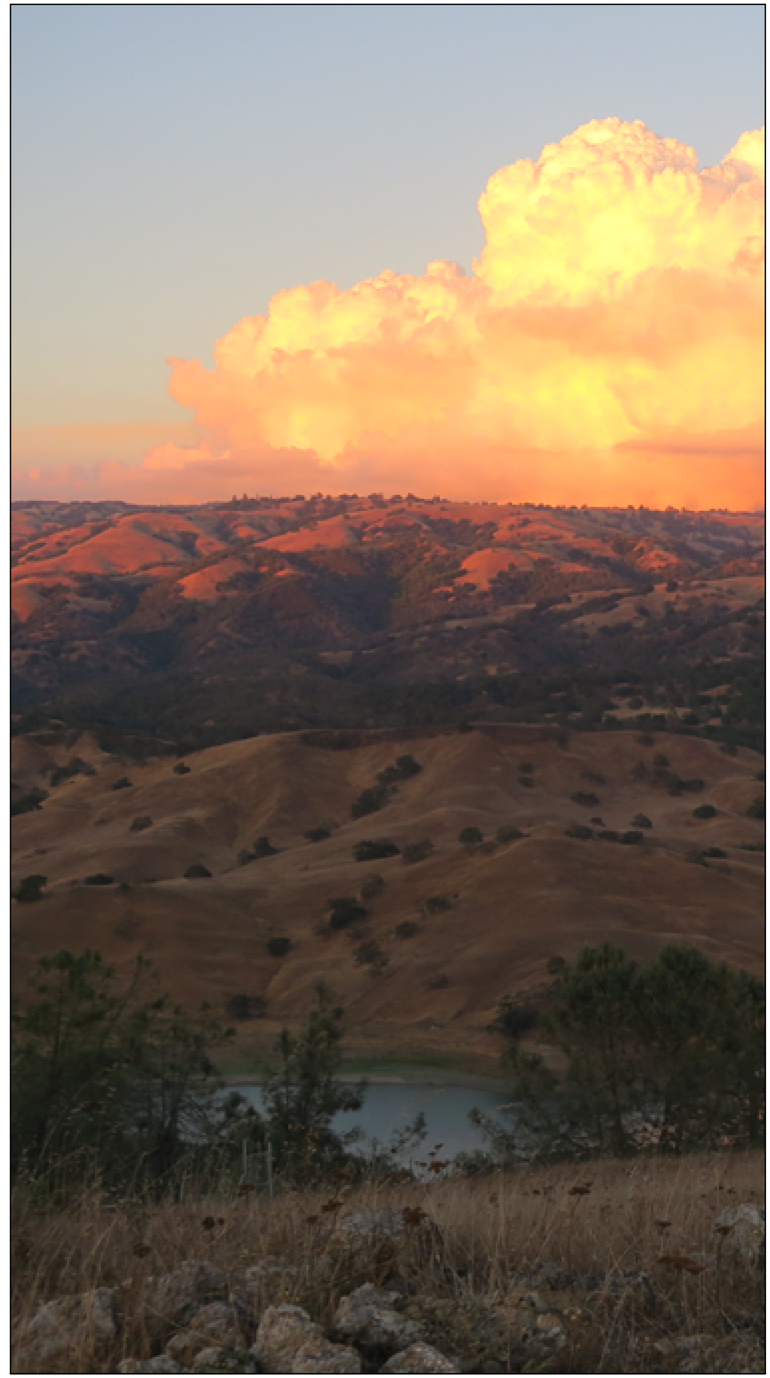
11 Projects - Summaries

1. Protect Lands
2. Near-Water Recreation
3. Stormwater Resource
4. Homeless Encampments
5. Sediment & Vegetation Management
6. Reference Channel Types
7. South Bay Salt Ponds
8. Shoreline Study
9. Land Use Near Streams
10. Invasive Plants
11. Hazard Trees

Looking north from Santa Clara County. Photo: Amber Manfree

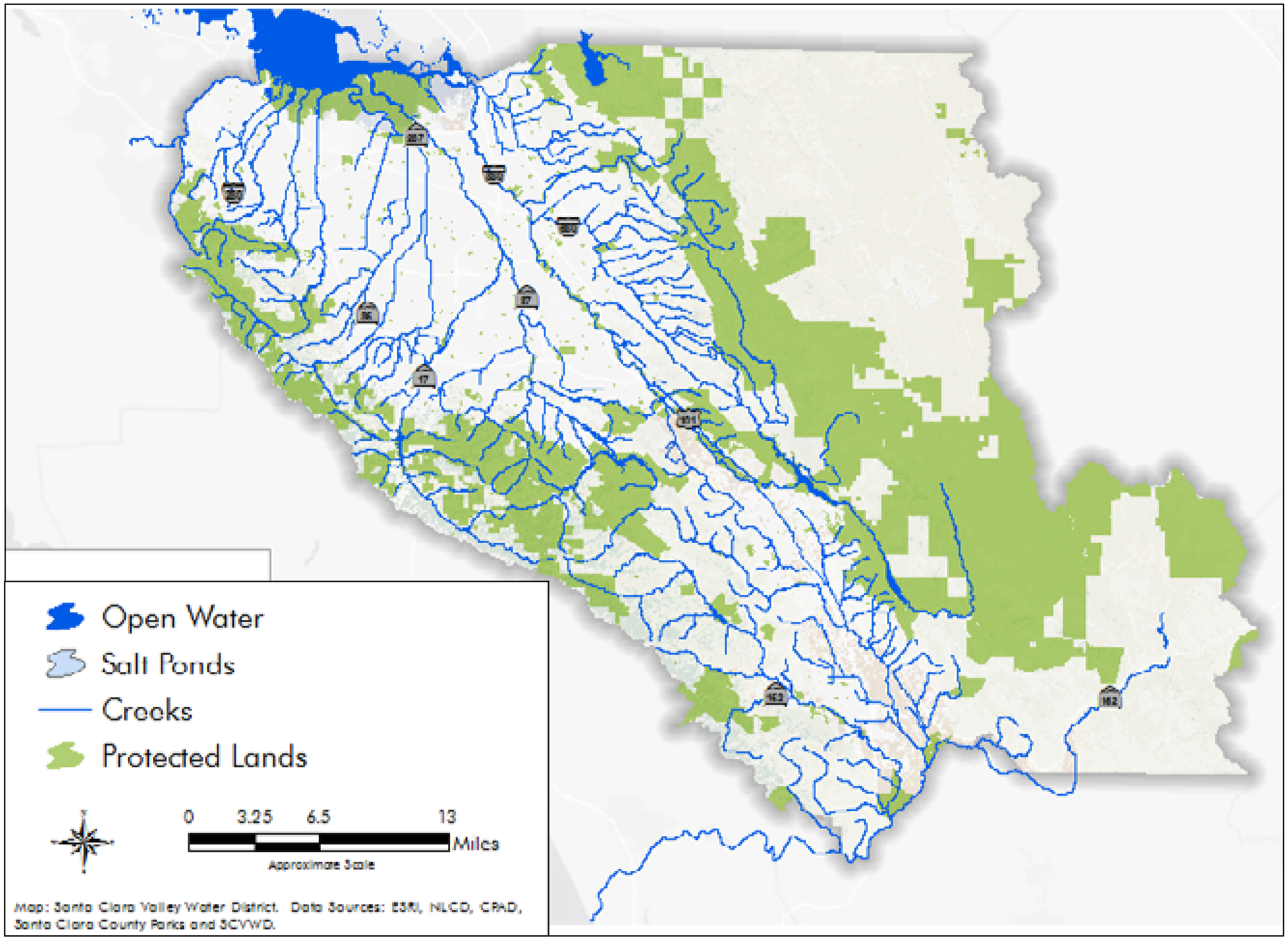
OPPORTUNITY 1: Protect Land to Meet the Objectives of the One Water Plan

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	C, D, E, G 
Secondary Objectives	A, B, F, H, I, J
District Role	P, C, T
Potential or Current Partners	County, Open Space Districts, SFPUC, TNC, VHA



PROJECT 1 SUPPORTS

Goals	• Valued and Respected Rain • Healthful and Reliable Water • Ecologically Sustainable Streams and Watersheds
Objectives	• High Quality Surface Water and Groundwater • Reliable and Effective Flood Risk Reduction Using an Integrated Approach • Expanded and Protected Buffer Lands Adjacent to Water Bodies • Resilient Habitats and Resources for Native Species
Strategy	• Actively engage land-use agencies to develop and implement policies that protect and conserve water resources
Attributes	• Protect, maintain and develop local surface water supplies • People and structures at low risk of flooding from high flows overtopping banks (creek and tidal) • Riparian areas bordering channels, wetlands, lakes, and resevoirs throughout the county that provide "desired" functions and services over the short- and long-term



Project 1 Overview

This opportunity is focused on acquiring available land as determined appropriate, for comprehensive water resources management and flood protection for all beneficial uses. This opportunity has several related components, namely updating District Board policies for land acquisition; developing a prioritization method to identify high-priority potential opportunities; analyzing buffer width requirements for various purposes (e.g., flood risk reduction, natural recharge and infiltration, and water resources-related habitat suitability); and acquiring or protecting land as it becomes available. Actions under this opportunity will also update the District's post-disaster land acquisition policy; the update will ensure that acquisition priorities are in place before any natural or man–made disaster.

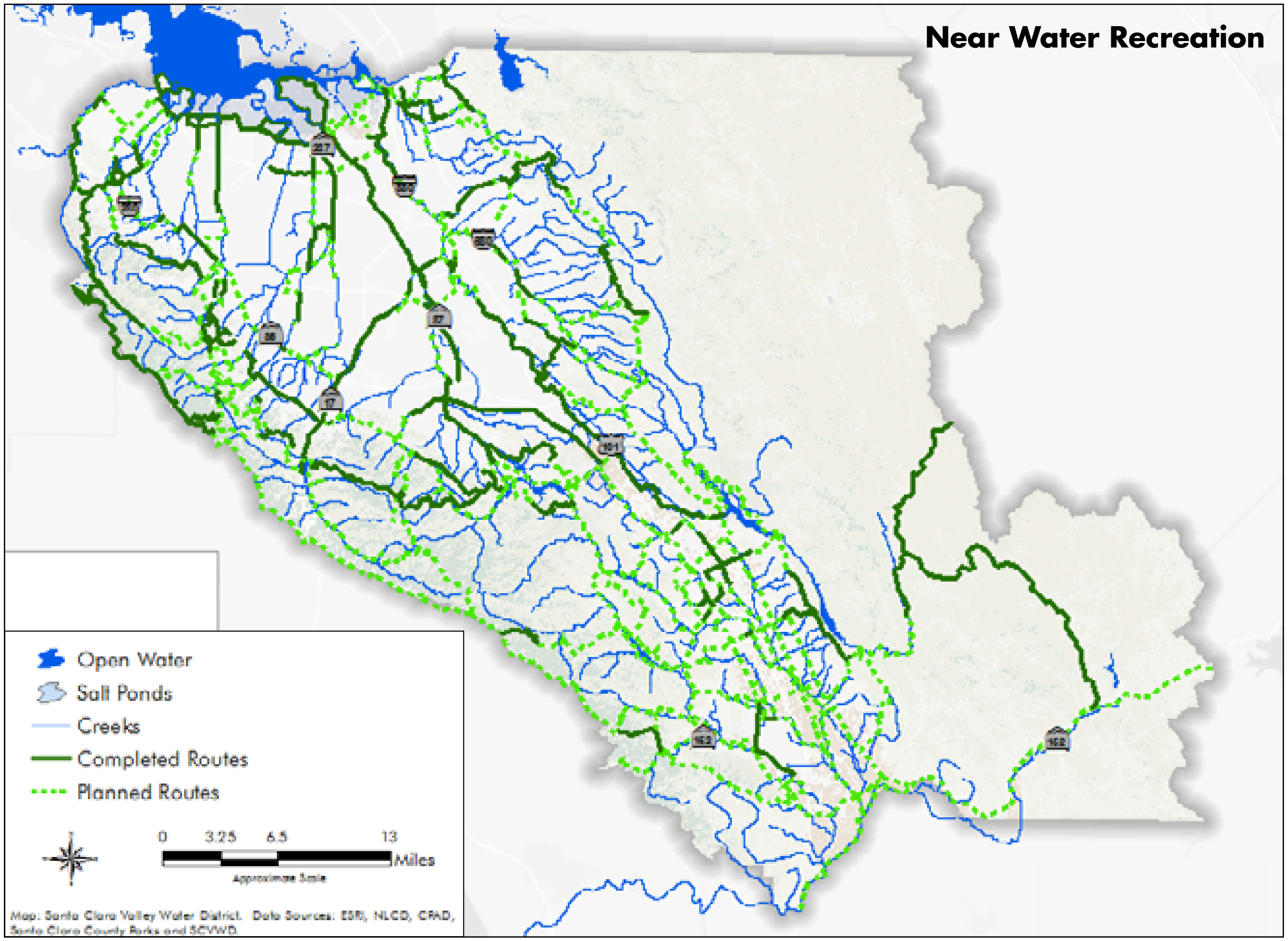
Benefits	Proactive approach to watershed protection
Project Components	Identify general geographic areas of property need based on objectives Identify specific properties and their ownership, land use, and adjacent land use Prioritize and recommend properties for protection or acquisition if and when they become available
Potential Funding	Safe Clean Water D7 Funds
Budget and Projected Timeline	TBD, due to opportunistic nature of the project

OPPORTUNITY 2: Recommend Policy for Near-Water Recreation Opportunities on District Fee Property and Guidelines for Best Management Practices on Non-District Property

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	C, E, G 
Secondary Objectives	D, J
District Role	C, T
Potential or Current Partners	Municipalities, open space districts

PROJECT 2 SUPPORTS

Goals	• Healthful and Reliable Water • Ecologically Sustainable Streams and Watersheds
Objectives	• High Quality Surface Water and Groundwater • Expanded and Protected Buffer Lands Adjacent to Water Bodies • Resilient Habitats and Resources for Native Species
Strategy	• Prevent encroachment on District right-of-way • Support appropriate resource-sensitive recreational activities and opportunities on reservoirs, streams, and other publicly-owned water bodies • Protect and manage property around reserviors and other water bodies to improve and sustain water quality and minimize invasive species while allowing resource-sensitive recreational use • Leverage near-water trails and other recreational and public spaces for education and stewardship, e.g. with interpretive panels
Attributes	• Surface waters – including reservoir, creek and bay waters – support healthy aquatic ecosystems and human health (i.e., beneficial uses) • Near-water recreation



Project 2 Overview

The goal of this objective is to create a District Board Policy for near-water or on-the-water recreation within or adjacent to District Facilities. The intent of such a policy is to provide guidance for the community and the District as to how natural, educational, and recreational experiences may proceed without damaging habitat, undermining bank stability, threatening water quality, or impeding water supply operations and watershed maintenance activities. Such a policy could include buffer requirements for recreational amenities on District right-of-ways near streams, reservoirs, and the Bay.

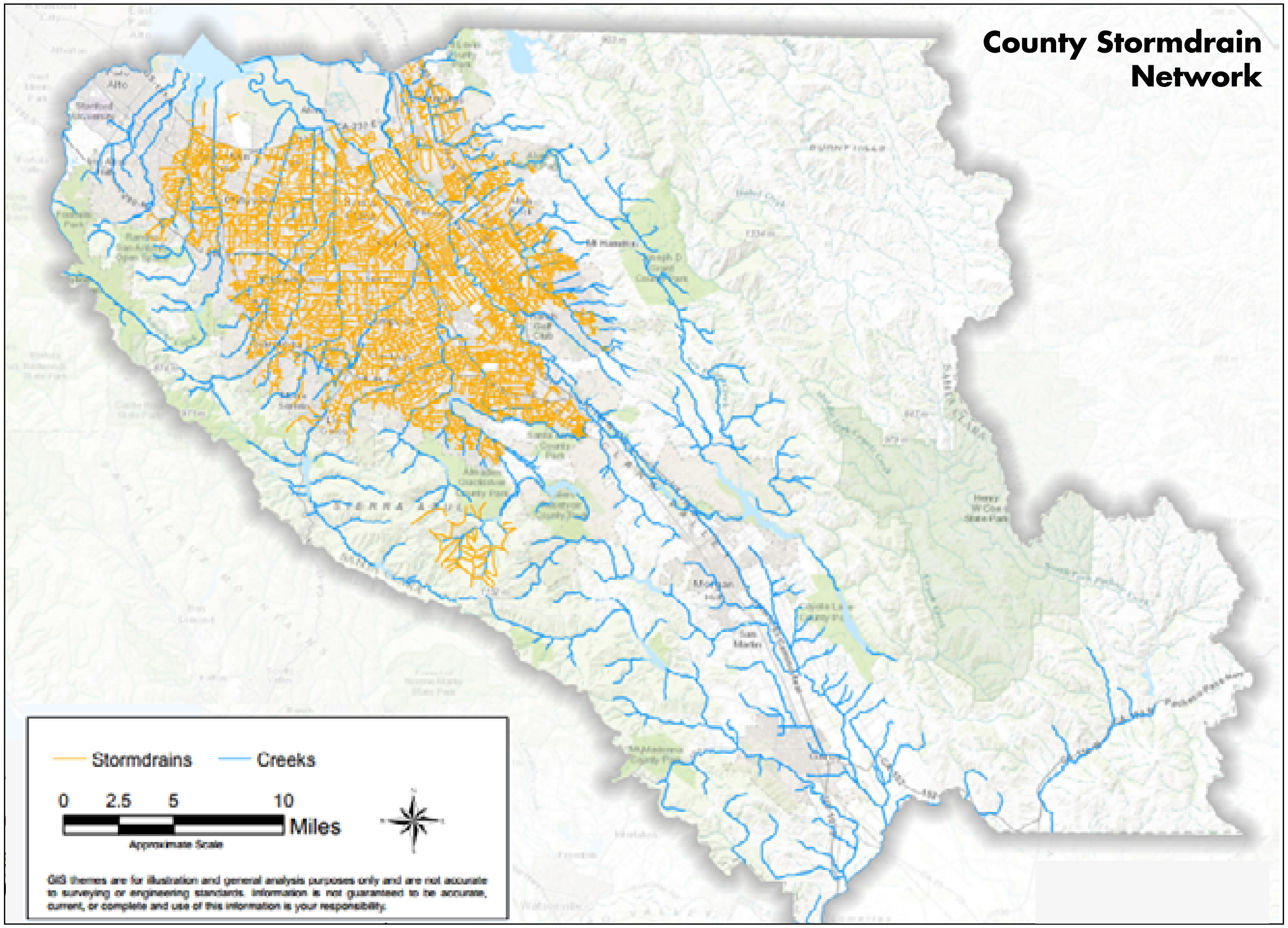
Benefits	Clarification of Board policy Clearer expectations for partner agencies and public
Project Components	Identify existing policies at District and partner agencies Identify constraints and opportunities for near-water and on-the-water recreation Develop policy recommendations Discuss any approved policies with partner agencies and organizations to formulate an implementation approach
Potential Funding	TBD
Budget and Projected Timeline	TBD

OPPORTUNITY 3: Develop and Implement a Stormwater Resource Plan

Geographic Area	Countywide
Project Focus	All Watersheds
Primary Objectives	A, C, D 
Secondary Objectives	B, F, H, J
District Role	C
Potential or Current Partners	Municipalities, open space districts

PROJECT 3 SUPPORTS

Goals	• Healthful and Reliable Water • Ecologically Sustainable Streams and Watersheds
Objectives	• Reliable Current and Future Water Supply for Urban, Rural, Agricultural, and Environmental Needs • High Quality Surface Water and Groundwater • Reliable and Effective Flood Risk Reduction Using an Integrated Approach
Strategy	• Work with stormwater programs to expand best management practices and pollution prevention programs • Develop and disseminate adequate data and tools for integrated water resource management • Develop watershed-based stormwater management, such as watershed-based implementation of structural measures associated with LID and green infrastructure
Attributes	• Protect, maintain and develop local surface water supplies and imported water supplies • Surface waters — including reservoir, creek, and bay waters — support healthy aquatic ecosystems and human health (i.e., Beneficial Uses) • People and structures at low risk of flooding from high flows overtopping banks (creek and tidal)



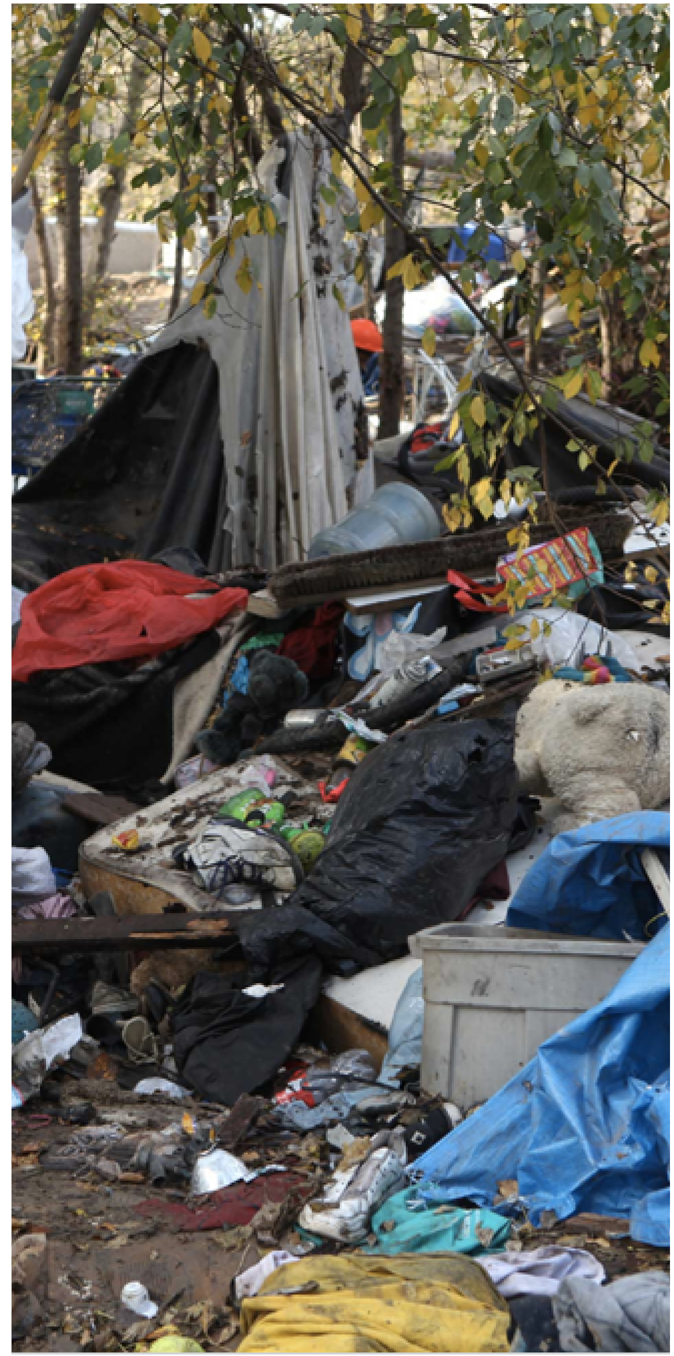
Project 3 Overview

This opportunity is to participate in creating a Stormwater Resource Plan (SWRP) for Santa Clara Basin within Santa Clara County. The objective of the plan is to manage stormwater on a broad scale in partnership with Santa Clara County and the 13 cities in northern Santa Clara County. This SWRP would include developing approaches to meet RWQCB Municipal Regional Permit requirements, as well as satisfy the requirement to have SWRP apply for related California Prop 1 funding. The planning process would also evaluate opportunities to improve water supply reliability. The SWRP would include green infrastructure and low impact development considerations, including analysis of potential rainwater capture and reuse sites and other on-site management techniques. The District could also partner with Morgan Hill and Gilroy on additional stormwater resource planning in the future.

Benefits	Stormwater management to reduce sedimentation and bank erosion Stormwater management to reduce flood risk Stormwater management to improve water quality Stormwater capture to augment water supply
Project Components	Identify existing and pending stormwater regulations and requirements for District and partners Identify components of a SWRP Identify and prioritize sites for stormwater retention/LID/green infrastructure Implement stormwater improvements
Potential Funding	SCW Priority B, Proposition 1 grant
Budget and Projected Timeline	TBD

OPPORTUNITY 4: Recommend Guidelines for Water Quality and Other Beneficial Uses to Guide District Regarding Homeless Encampments near Waterways

Geographic Area	Countywide	
Project Focus	Near water bodies	
Primary Objectives	C, D, J	
Secondary Objectives	G	
District Role	C	
Potential or Current Partners	Municipalities, NGOs	



PROJECT 4 SUPPORTS

Goals

- Healthful and Reliable Water
- Ecologically Sustainable Streams and Watersheds
- Community Collaboration Objectives

Objectives

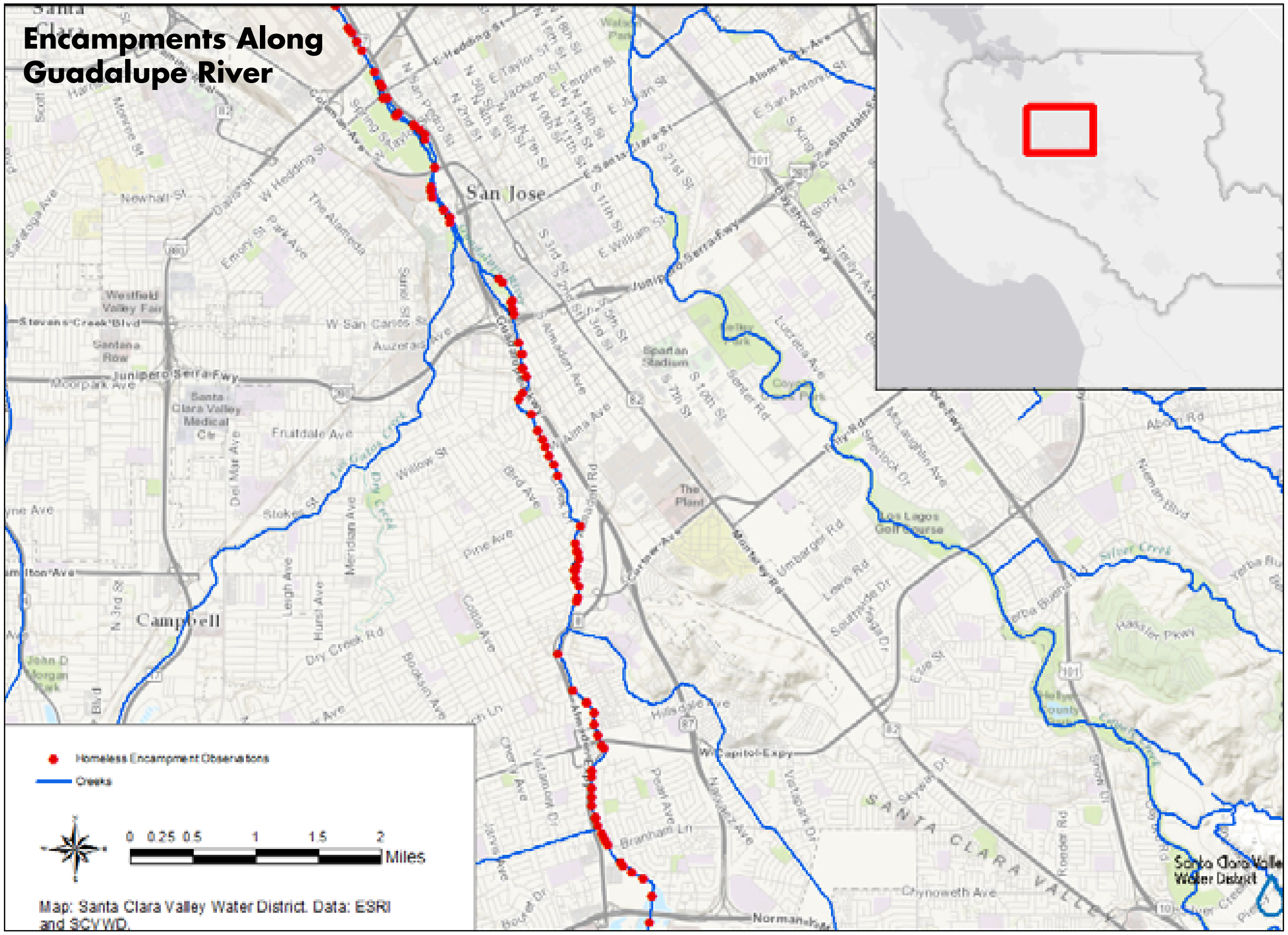
- High Quality Surface Water and Groundwater
- Reliable and Effective Flood Risk Reduction Using an Integrated Approach
- Active and Ongoing Community and Tribal Engagement Strategy

Strategy

- Develop and disseminate educational programs (for schools, colleges, and communities) about integrated water resource mangement; climate change impacts, risks, vulnerabilities, and resiliency strategies; and water use in different sectors
- Prevent encroachment on District right-of-way
- Pursue public-private partnerships with appropriate recognition and incentives for voluntary actions consistent with District objectives

Attributes

- Surface waters – including reservoir, creek, and bay waters – support healthy aquatic ecosystems and human health (i.e., beneficial uses)
- People and structures at low risk of flooding from high flows overtopping banks (creek and tidal)
- Inclusive and effective involvement in water-resource decision-making processes



Project 4 Overview

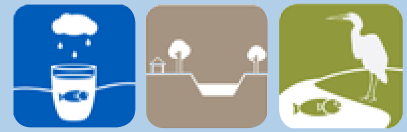
This opportunity is to create guidelines and recommend Board policy for District involvement in managing homeless encampment impacts on waterways and coordinating with other partners to reduce these impacts. Homeless encampments occur countywide and can degrade water quality, inhibit flood protection (by placing debris on the floodplain or within the flood channel), and harm ecological resources and sensitive habitats. Implementing such a policy will aid in restoring these areas to a more natural state with improved watershed health.

Benefits	Clarification of Board policy Clearer expectations of District's role in addressing the larger societal challenge
Project Components	Identify existing policies at District and partner agencies Identify constraints and opportunities concerning encampments Develop policy recommendations Discuss any approved policies with partner agencies and organizations to formulate an implementation approach
Potential Funding	SCW Priority B
Budget and Projected Timeline	TBD

OPPORTUNITY 5: Develop a Systematic, Watershed- (and Sediment-shed) based Approach to Sediment and Vegetation Management in and around Creeks, Reservoirs, and the Bay

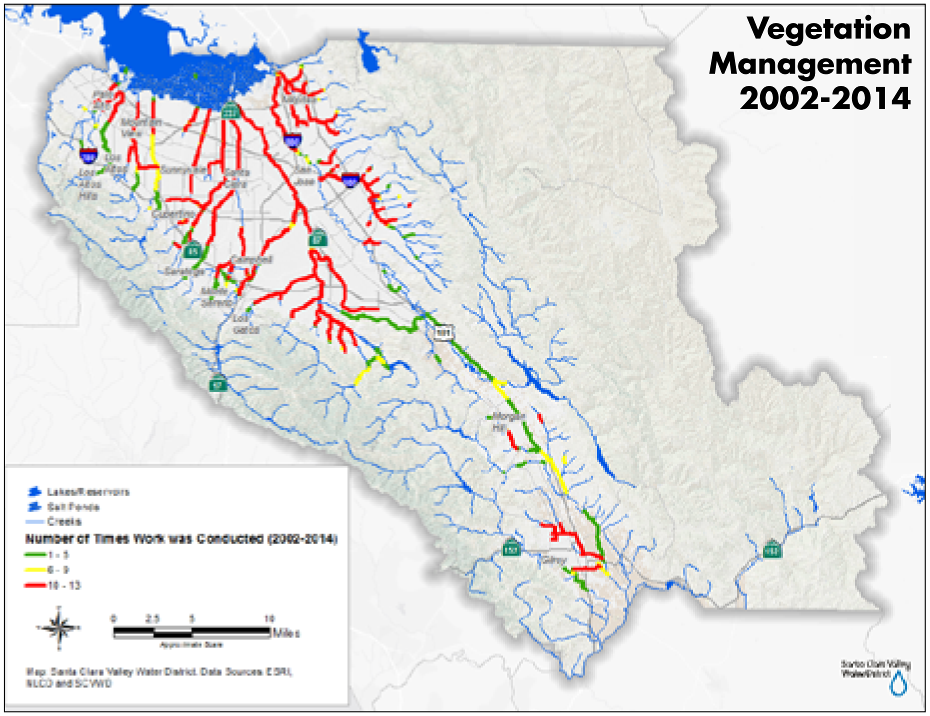
Project 5 Overview

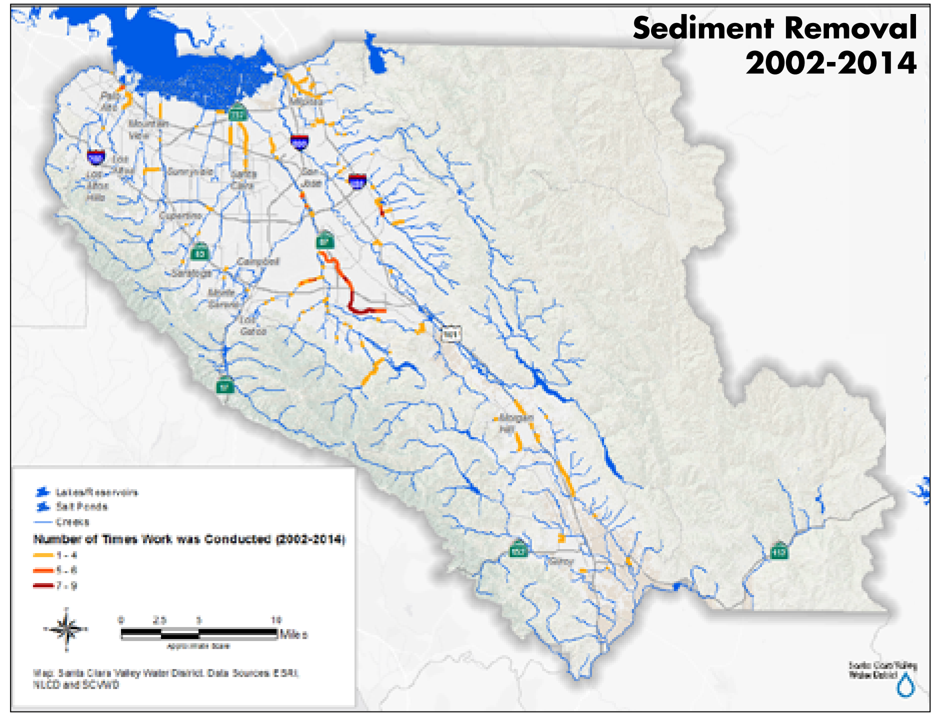
This opportunity is to develop a programmatic approach to sediment and vegetation management beyond existing Stream Maintenance Program operations. Such an approach will aid in identifying recurring maintenance work that may be better addressed as a larger activity (e.g., capital project) to mitigate for erosion and unwanted deposition. The approach will also undertake analysis to understand the appropriate movement of sediment through the system, and how to facilitate through-movement.

Geographic Area	Countywide	
Project Focus	All Watersheds	
Primary Objectives	C, D, G	
Secondary Objectives	A, B, E, F, H	
District Role	P, C	
Potential or Current Partners		

PROJECT 5 SUPPORTS

Goals	• Ecologically Sustainable Streams and Watersheds • Resilient Baylands
Objectives	• High Quality Surface Water and Groundwater • Reliable and Effective Flood Risk Reduction Using an Integrated Approach • Resilient Habitats and Resources for Native Species
Strategy	• Develop and disseminate adequate data and tools for integrated water resource management • Create creek corridors that are qualitatively appropriate to location; e.g., width, height, vegetation, groundwater connections, hydrology
Attributes	• Surface waters — including reservoir, creek, and bay waters — support healthy aquatic ecosystems and human health (i.e., beneficial uses) • People and structures at low risk of flooding from high flows overtopping banks (creek and tidal) • Diverse, healthy, riverine habitats supported by physical processes that sustain desired functions/ benefits over the long-term





Benefits	A comprehensive countywide effort will streamline current practices and allow for the use of consistent methodologies in planning of sediment and vegetation management. Decreased frequency of maintenance Potential for streamlined permitting processes Identification of core constraints
Project Components	Identify current District sediment and vegetation management operations and guidelines Identify related constraints and opportunities Conduct necessary studies to provide sufficient information Identify approaches to maintaining a stable watershed (and sediment-shed) Implement activities
Potential Funding	SCW
Budget and Projected Timeline	TBD

OPPORTUNITY 6: Develop Reference Creek Channel Types for Select Reaches within Select Creeks

Geographic Area	Countywide
Project Focus	Near creeks
Primary Objectives	D, E, F, G 
Secondary Objectives	C, H
District Role	P, C
Potential or Current Partners	TBD

PROJECT 6 SUPPORTS

Goals

- Ecologically Sustainable Streams and Watersheds

Objectives

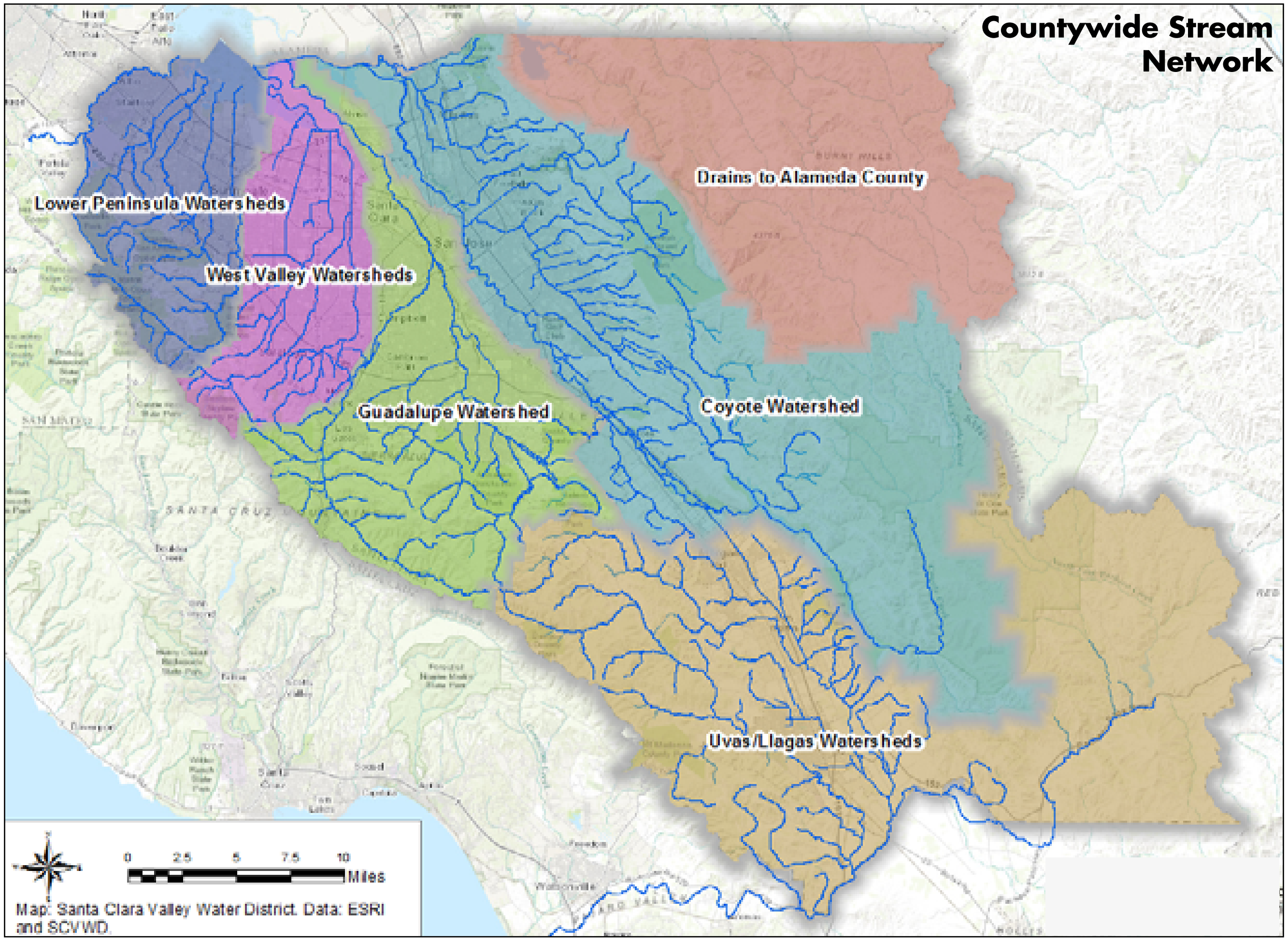
- Reliable and Effective Flood Risk Reduction Using an Integrated Approach
- Expanded and Protected Buffer Lands Adjacent to Water Bodies
- Resilient Habitats and Resources for Native Species
- Adapt to and Prepare for Climate Change Strategy

Strategy

- Actively engage land-use agencies to develop and implement policies that protect and conserve water resources
- Develop and disseminate adequate data tools for integrated water resource management
- Manage to support a diversity of complex habitats, communities, and habitat resources (by providing or installing refugia, microtopography, complex vegetative structure, coarse woody debris in channels, other physical heterogeneities)

Attributes

- Surface waters —including reservoir, creek, and bay waters — support healthy aquatic ecosystems and human health (i.e., Beneficial Uses)
- People and structures at low risk of flooding from high flows overtopping banks (creek and tidal)
- Stream flows that support natural processes
- Creeks and riparian habitat are resilient to changes in flood frequency, air temperature, baseflow conditions, and drought frequency duration



Project 6 Overview

This opportunity is to develop descriptions of local creek channel types as a reference for future work. A review of historical and current conditions in creeks could help describe a range of natural and altered channel morphologies. This information could then be incorporated into planning studies for future work such as flood protection or stream stewardship activities.

Benefits	Additional guidance for management of particular types of creek channels with regards to operations, maintenance, and further in-channel work
Project Components	Identify typical landscape categories for District operations Map creek channel types as necessary Develop reference channel types for specific needs Incorporate information into District capital planning process
Potential Funding	SCW
Budget and Projected Timeline	TBD

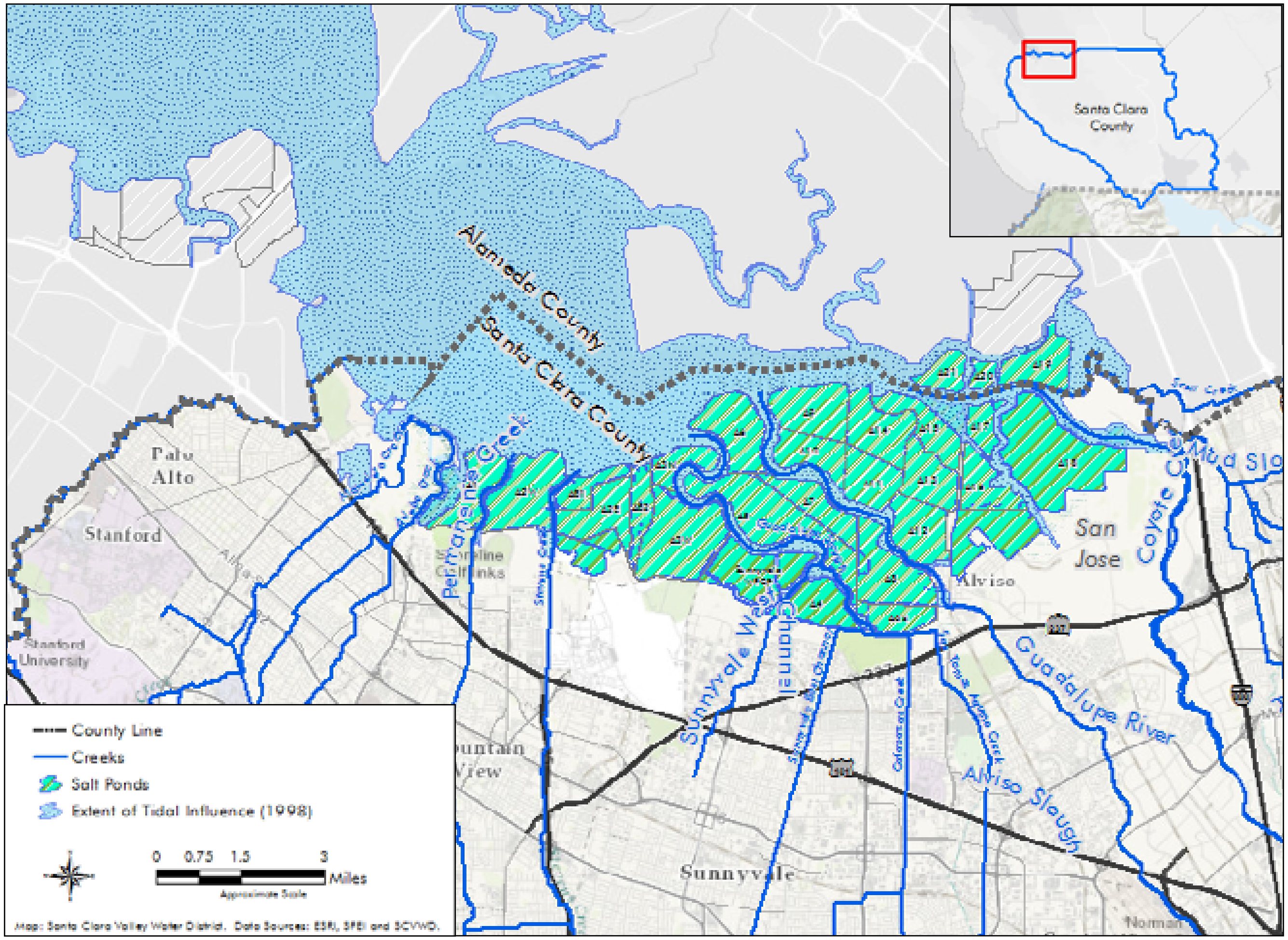
OPPORTUNITY 7: Continue to Partner on South Bay Salt Ponds Restoration Project

Geographic Area	Baylands
Project Focus	Baylands and lower watersheds
Primary Objectives	E, G, H
Secondary Objectives	C, D, J
District Role	C
Potential or Current Partners	Cities of San Jose, Sunnyvale, Mountain View, and Palo Alto, East Bay Regional Parks District, Mid Peninsula Open Space Authority, California Department of Fish and Wildlife, California State Coastal Conservancy, Resources Legacy Foundation (Packard, Hewlett, and Moore), U.S. Fish and Wildlife Service, and U.S. Geological Survey

PROJECT 7 SUPPORTS

Goals	• Resilient Baylands • Ecologically Sustainable Streams and Watersheds
Objectives	• Reliable and Effective Flood Risk Reduction Using an Integrated Approach • Resilient Habitats and Resources for Native Species • Adapt to and Prepare for Climate Change
Strategy	• Protect and restore bayland and riparian habitats that buffer storm impacts and protect water quality • Freshwater flows support estuary function and integrate with habitat restoration in support of baylands and estuary health
Attributes	• Diverse, healthy wetlands supported by physical processes that sustain desired functions/benefits over the long-term • Surface waters — including reservoir, creek, and bay waters — support healthy aquatic ecosystems and human health (i.e., beneficial uses) • Bay shoreline and tidal zone are resilient to increased mean sea level and coastal storm magnitude and frequency

Salt ponds near Alviso Slough (bottom). Photo: Marc Holmes, The Bay Institute



Project 7 Overview

This opportunity is to continue participation in the South Bay Salt Ponds Restoration Project with multiple partners. As a project that spans the South Bay, it involves planning to improve tidal habitat for multiple jurisdictions and provides adaption to climate change with water quality and recreational benefits. Current efforts include planning for flood risk management elements on the land side of the former salt ponds and supporting scientific investigations for monitoring legacy mercury impacts on wildlife to answer permitting questions so the full-scale restoration of the former salt ponds (A5 – A11) can go forward.

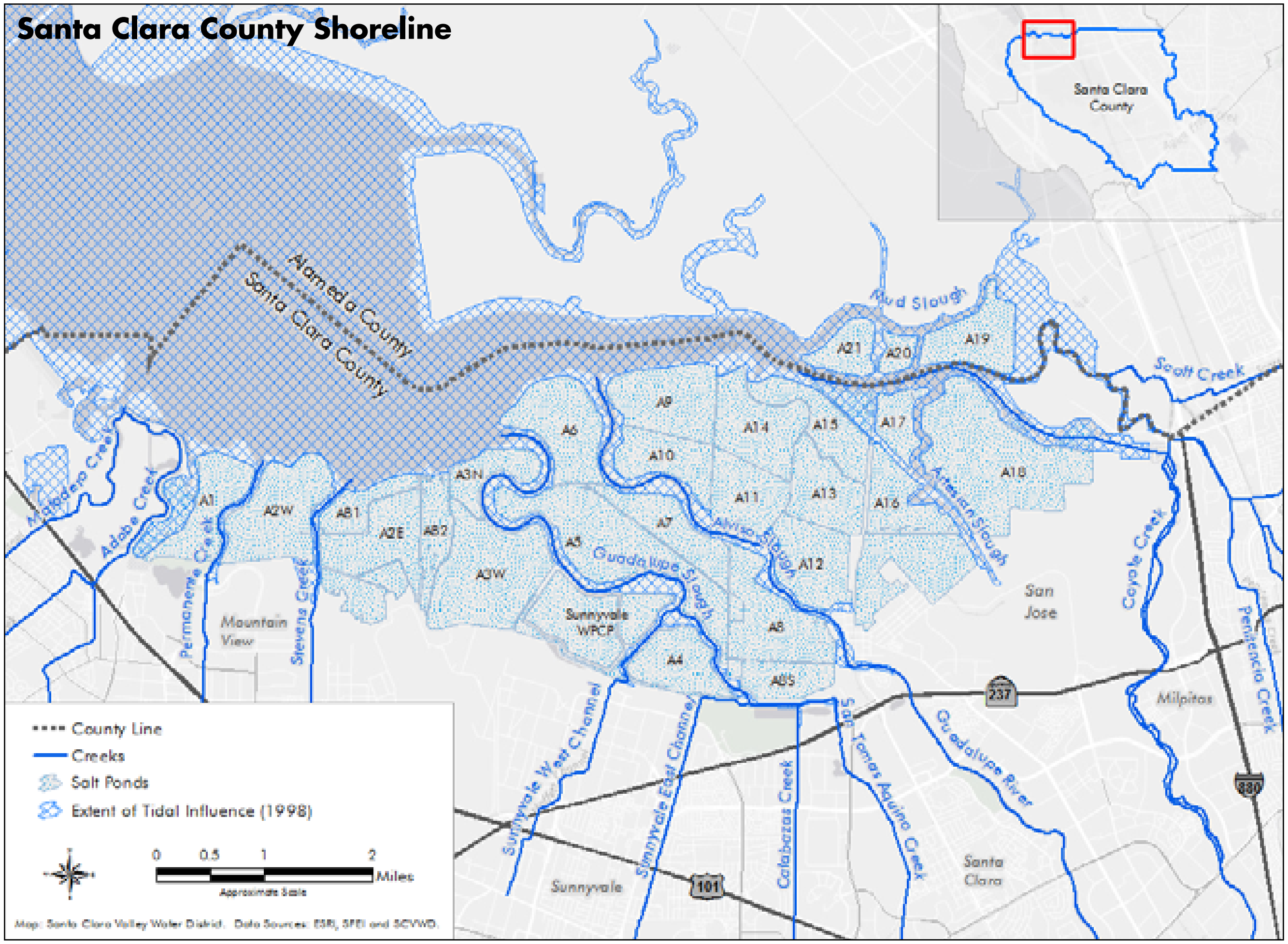
Benefits	Regional tidal restoration effort with additional benefits for water quality, flood protection, and climate change adaptation
Project Components	Define District role Provide relevant expertise and data Identify implementation activities Assist in carrying out implementation as it relates to District missions
Potential Funding	Safe, Clean Water Ballot Measure, San Francisco Restoration Authority's Measure AA funds, and the US Army Corps of Engineers
Budget and Projected Timeline	The SBSP is a 50-year project. In the next decade the Shoreline Project will be constructed adjacent to San Jose. In the next five years, mercury issues will be resolved so that full-scale restoration of Pond A5-8 can go forward.

OPPORTUNITY 8: Continue Coordinated Effort on the Shoreline Study

Geographic Area	Baylands
Project Focus	Baylands and lower watersheds
Primary Objectives	D, G, H 
Secondary Objectives	E, I, J
District Role	P, C
Potential or Current Partners	California Coastal Conservancy, City of Mountain View, City of Palo Alto, City of San Jose, City of Sunnyvale, Mid Peninsula Open Space Authority, NASA Moffett Field, San Francisquito Creek Joint Powers Authority, US Army Corps of Engineers, and US Fish and Wildlife Service

PROJECT 8 SUPPORTS

Goals	• Ecologically Sustainable Streams and Watersheds • Resilient Baylands
Objectives	• Reliable and Effective Flood Risk Reduction Using an Integrated Approach • Resilient Habitats and Resources for Native Species • Adapt to and Prepare for Climate Change
Strategy	• Protect and restore bayland and riparian habitats that buffer storm impacts and protect water quality • Freshwater and tidal flows support estuary function and integrate with habitat restoration in support of baylands and estuary health
Attributes	• Bay shoreline and tidal zone are resilient to increased mean sea level and coastal storm magnitude and frequency • Diverse, healthy wetlands supported by physical processes that sustain desired functions/benefits over the long-term • Surface waters — including reservoir, creek, and bay waters — support healthy aquatic ecosystems and human health (i.e., beneficial uses)



Project 8 Overview

This opportunity is to continue participation in a long-term coastal flood protection study along the South Bay shoreline with multiple partners, jurisdictions, and benefits called the Shoreline Study. For the District, the study addresses flood protection in the baylands and shoreline zone between San Francisquito Creek and Coyote Creek. It involves planning to provide coastal flood protection for critical facilities and businesses, and with consideration for the protection of important ecological resources. The project includes a proposed 18-mile-long levee along the Santa Clara County shoreline.

The Shoreline Study is divided into 11 separate Economic Impact Areas (EIA). EIAs 1-10 are located between San Francisquito Creek and Guadalupe River, where the proposed coastal levee length is about 14.5 miles (in the preliminary feasibility planning study phase). EIA 11 is located between Guadalupe River and Coyote Creek, where the proposed coastal levee length is about 3.5 miles (in the design phase). The full-scale tidal restoration component of the project is being coordinated with the continued partnership on the South Bay Salt Ponds Restoration Project.

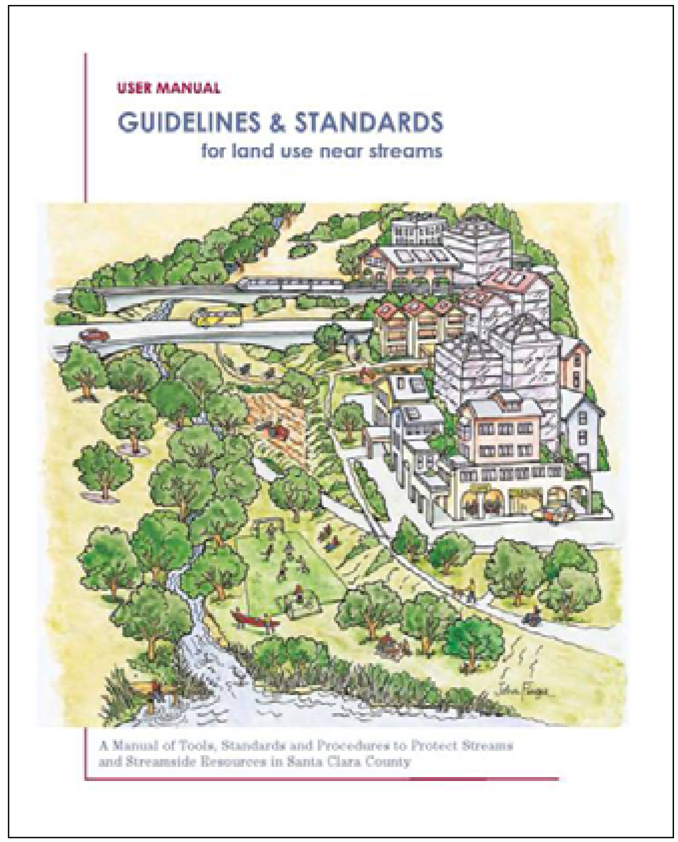
Benefits	Protection of the South Bay shoreline from flooding and sea level rise with additional benefits for tidal restoration and climate adaptation
Project Components	Define District role Provide relevant expertise and data Identify implementation activities Assist in carrying out implementation as it relates to District mission
Potential Funding	Safe Clean Water Ballot Measure, San Francisco Bay Restoration Authority Measure AA funds, US Army Corps of Engineers, and adjacent cities
Budget and Projected Timeline	Estimated cost EIA 1-10 ~ $800 M Estimated cost EIA 11 ~ $175 M

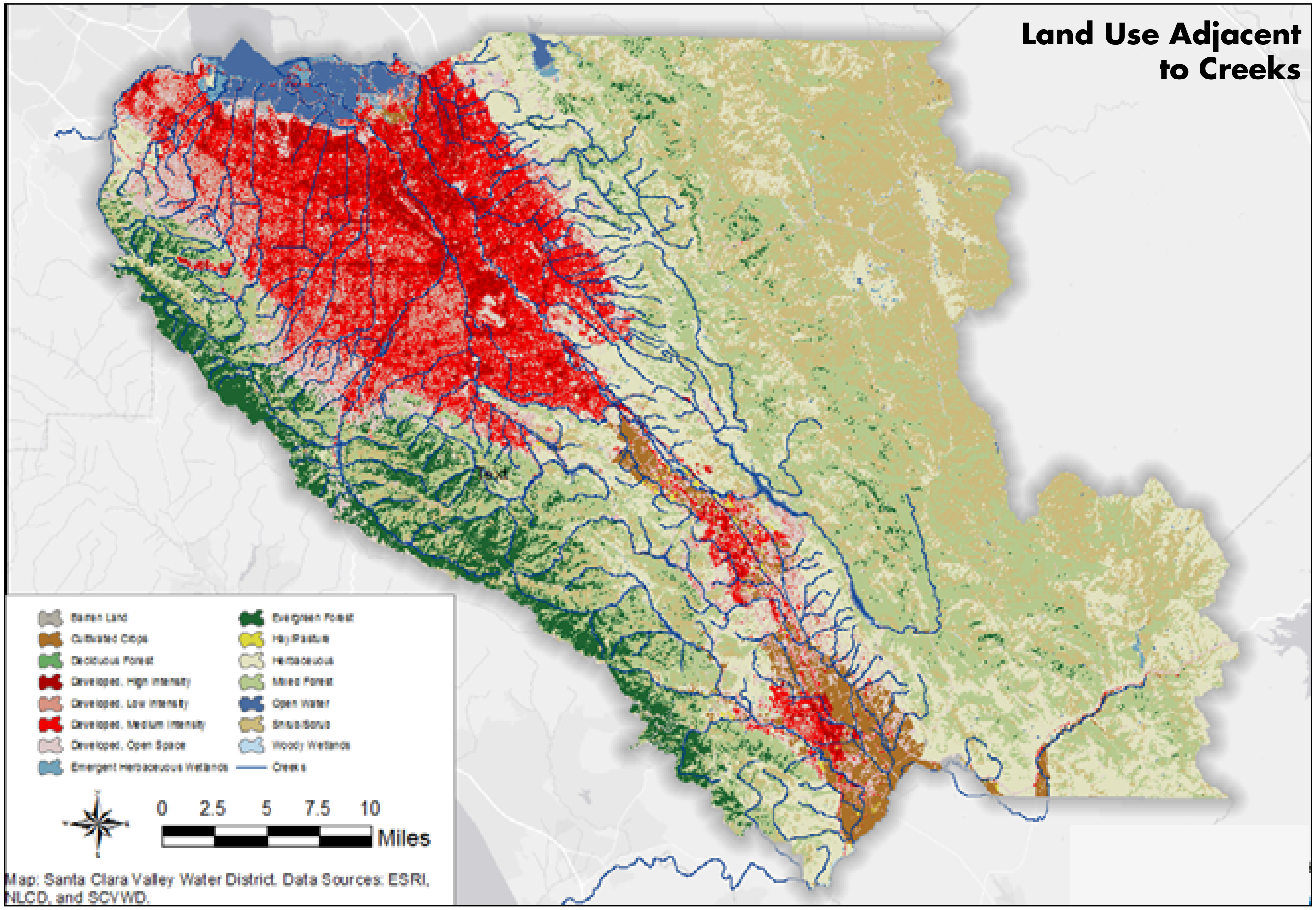
OPPORTUNITY 9: Update the Guidelines and Standards for Land Use Near Streams (2007)

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	C, D, E, G, J 
Secondary Objectives	A, B, F, H
District Role	P
Potential or Current Partners	Municipalities, private property owners, community stakeholders

PROJECT 9 SUPPORTS

Goals	• Ecologically Sustainable Streams and Watersheds
Objectives	• High Quality Surface Water and Groundwater • Reliable and Effective Flood Risk Reduction Using an Integrated Approach • Expanded and Protected Buffer Lands Adjacent to Water Bodies • Resilient Habitats and Resources for Native Species • Active and Ongoing Community and Tribal Engagement
Strategy	• Work with stormwater programs to expand best management practices and pollution prevention programs • Develop and disseminate adequate data and tools for integrated water resource management
Attributes	• Protect, maintain, and develop local surface water supplies and imported water supplies • Surface waters — including reservoir, creek, and bay waters — support healthy aquatic ecosystems and human health (i.e., Beneficial Uses) • People and structures at low risk of flooding from high flows overtopping banks (creek and tidal)





Project 9 Overview

This opportunity is to update the "Guidelines and Standards for Land Use Near Streams (Guidelines) (2007)" developed by the Water Resources Protection Collaborative in an effort led by the District. The Guidelines were adopted by the county's municipalities to be used in the planning, design, and approval of public, and private projects located near streams. They are also available to the public at large. This update would incorporate lessons learned during implementation of the Guidelines over the past nine years; reference, where appropriate, the newly developed Santa Clara Valley Habitat Plan; address current issues of concern; and reformat the document to be more user friendly to all intended audiences including municipality staff, the development community, private land owners, and the general public. The SCVWD Water Resources Protection Manual, which was developed as tool for implementing the Water Resources Protection Ordinance, would also be updated for consistency with the Guidelines as appropriate.

Benefits	Reaffirm Collaborative members' commitment to protecting and enhancing/restoring stream corridors Creation of a user friendly document to assist all users in protecting and enhancing/restoring stream corridors Updated guidance to District staff
Project Components	Convene original Water Resources Collaborative member agencies and stakeholders groups Review implementation of Guidelines by adopting agencies Review opportunities to strengthen protection of and restoration/ enhancement of stream corridors Reformat the Guidelines to be more user friendly to all intended audiences Update the District Water Resource Protection Manual Seek adoption by the governing body of each municipality in the county of the updated Guidelines document Seek adoption by Board of Directors of the updated Water Resources Protection Manual
Potential Funding	TBD
Budget and Projected Timeline	TBD

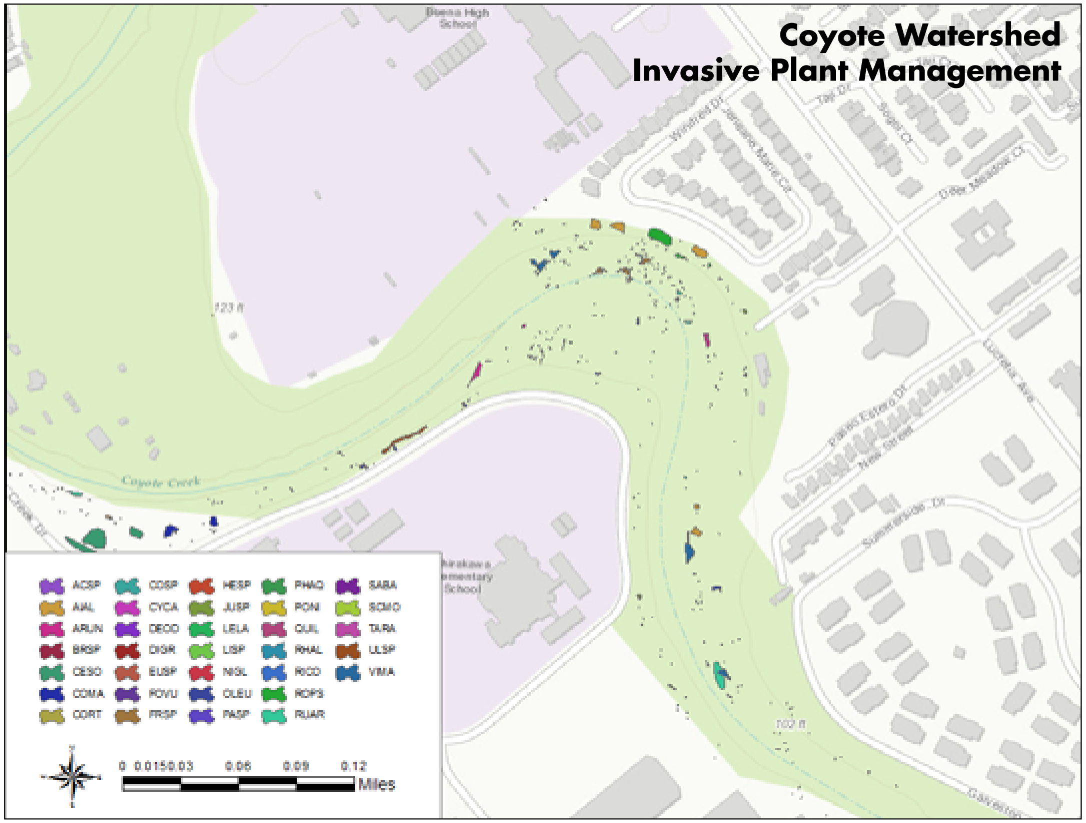
OPPORTUNITY 10: Expand Invasive Plant Removal Program

Geographic Area	Countywide
Project Focus	Near reservoirs, streams, and the Bay
Primary Objectives	F, G
Secondary Objectives	D, H, I, J
District Role	C, L, T
Potential or Current Partners	County, Municipalities, and Open Space Districts

PROJECT 10 SUPPORTS

Goals	• Ecologically Sustainable Streams and Watersheds
Objectives	• Stream Flows Support Natural Processes • Resilient Habitats and Resources for Native Species
Strategy	• Prevent introduction/establishment of new invasive species and pathogens and remove existing invasive species in and around aquatic environments • Manage and promote functional vegetation communitites when managing water for beneficial uses or flood protection
Attributes	• Diverse, healthy riverine habitats supported by physical processes that sustain desired functions/benefits over the long-term

Perennial pepperweed. Photo: Peter Baye



Project 10 Overview

This opportunity is to create a comprehensive program to remove invasive plants along creeksides, near reservoirs, and around baylands. The activity may require District Board policy revisions and technical analysis to establish prioritization and techniques. Establishing a program at the countywide scale will allow the District to build on existing efforts, add consistent protocols, guide partner agencies and organizations, and implement removal and management programs at smaller scales.

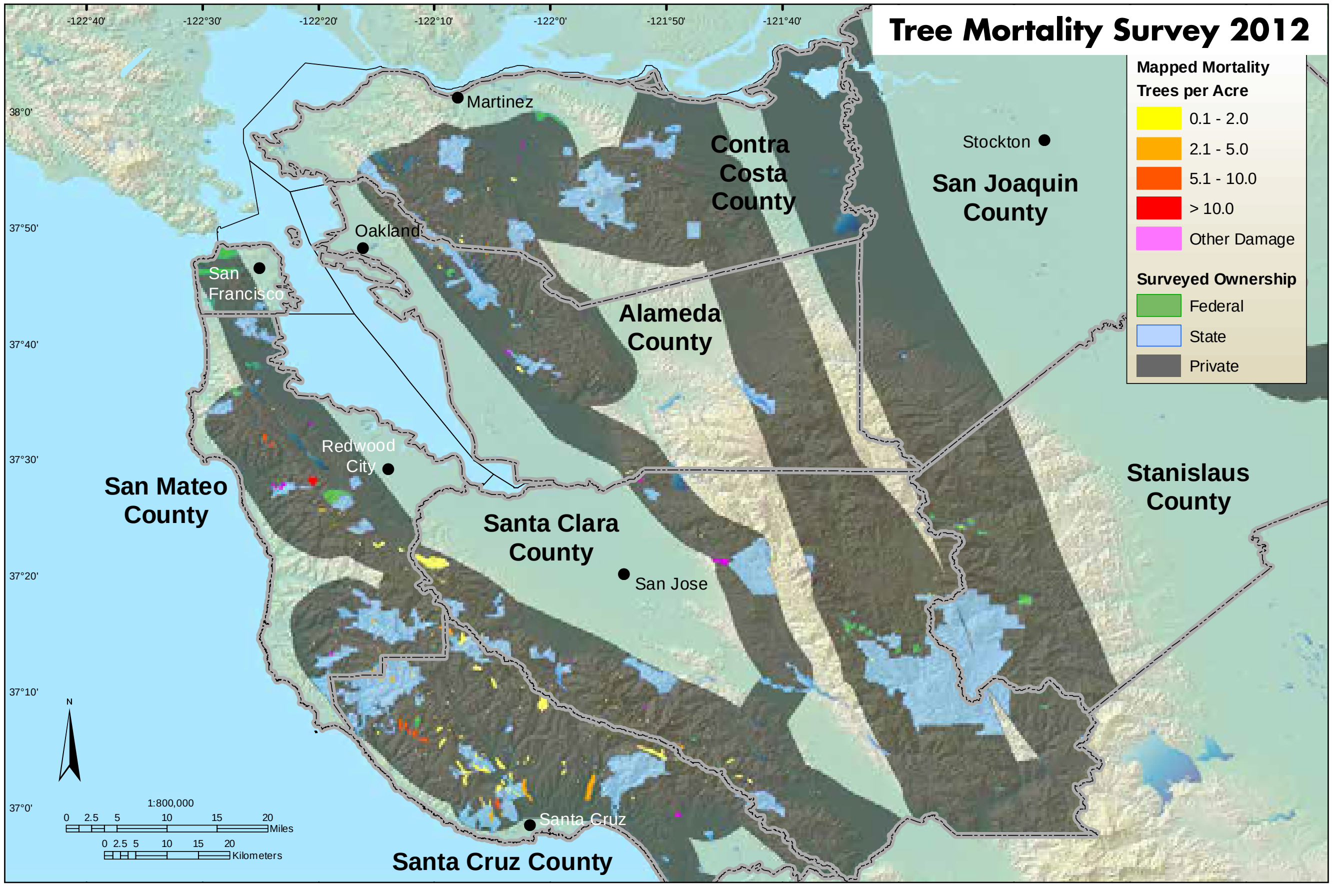
Benefits	Comprehensive, countywide consistent planning and methodologies for the identification and removal of invasive plants More resources to sustain native plant communities Decreased maintenance frequency and costs, with resulting habitat improvements Uniform permitting and help identifying invasives on a countywide scale among partner agencies and organizations Improved relationships with landowners for corridor connectivity between SMP lands
Project Components	Map invasive plant species in areas not already completed by SMP Develop an approach for invasive plant removal Develop a prioritization framework for invasive removal Develop plans for planting natives in place of invasives where appropriate
Potential Funding	SCW D2
Budget and Projected Timeline	TBD

OPPORTUNITY 11: Develop a Hazard Tree Abatement Program

Geographic Area	Countywide
Project Focus	District fee and easement
Primary Objectives	H, I 
Secondary Objectives	G, J
District Role	P
Potential or Current Partners	County, Municipalities, Open Space Districts

PROJECT 11 SUPPORTS

Goals	• Ecologically Sustainable Streams and Watersheds
Objectives	• Anticipate and Prepare for Emergencies • Adapt to and Prepare for Climate Change Strategy
Strategy	• Manage and promote functional vegetation communities when managing water for beneficial uses or flood protection • Prevent introduction/establishment of new invasive species and pathogens and remove existing invasive species • Prepare plans to be adaptive to, and provide resilience against, floods, droughts, and catastrophic events



Project 11 Overview

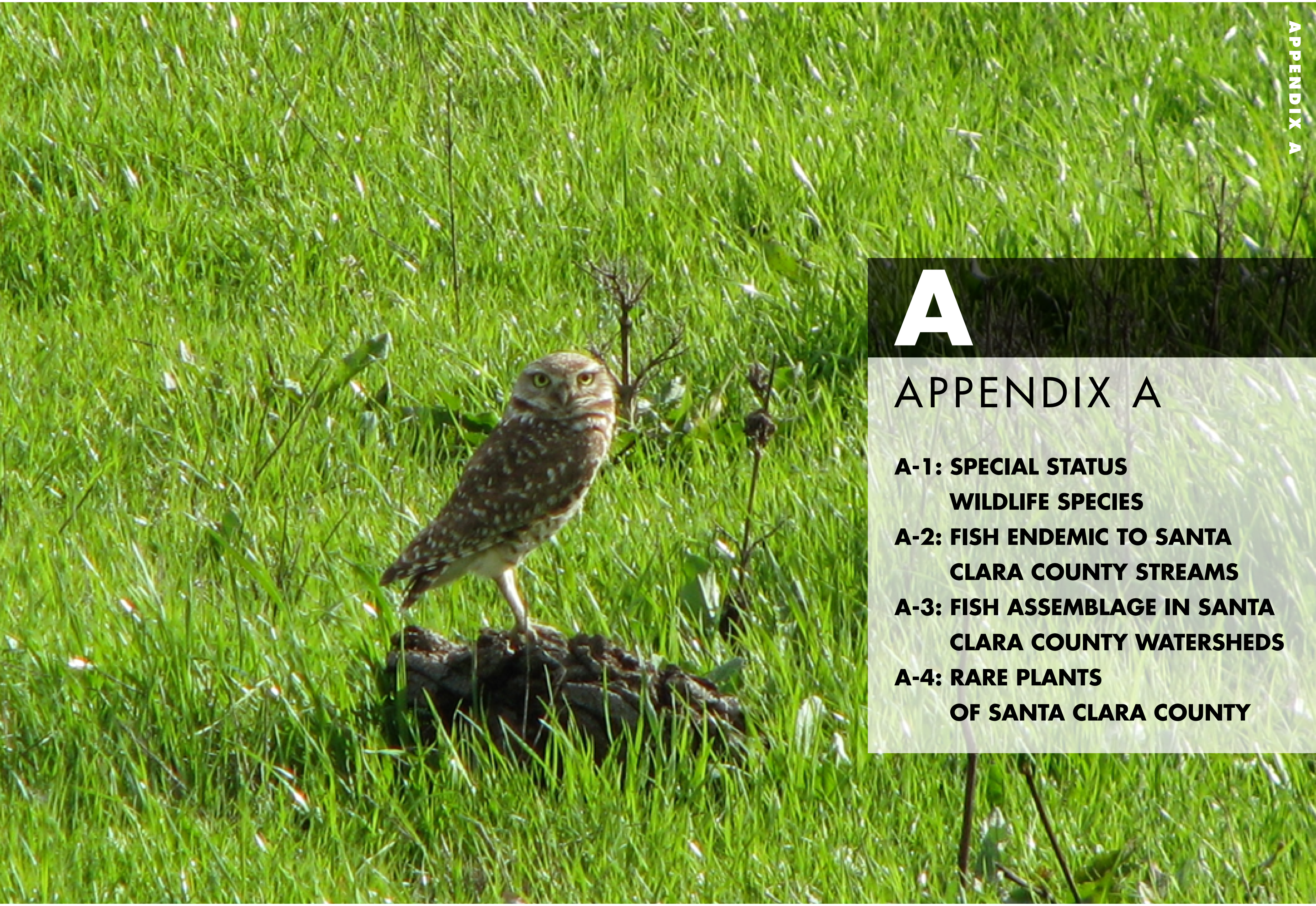
This opportunity is to establish a Hazard Tree Abatement Program for District-owned properties at a countywide scale. Abatement activities include not only the removal, but also the pruning and bracing, of hazardous trees. This will allow the District to develop a prioritized, efficient, and effective way to conduct the work, including receiving authorization from permitting agencies.

Benefits	Established program to allow for permitted activities Reduce risks associated with falling/fallen trees Reduce fire danger associated with dead trees Improve habitat for native species
Project Components	Map hazardous trees Develop criteria for prioritized action Identify permitting agency concerns, including any required mitigation Develop plan to remove trees and mitigate where necessary with consideration for integrated water resources management at a watershed scale
Potential Funding	
Budget and Projected Timeline	TBD

7.4 Next Steps

This 2016 One Water Plan is another step in the District's effort to implement integrated water resources master planning. Building on substantial existing planning through the District's Water Utility Enterprise and watersheds division, this document represents a District-wide effort to plan more efficiently and effectively for the future. Through partnerships, both existing and new, the District is a technical resource, a collaborator, and a leader for the management of water resources across Santa Clara County.

Costa's hummingbird. Photo: Rick Lewis



A

APPENDIX A

Burrowing owl. Photo: Nina Merrill, SCVWD

APPENDIX A-1: Special-Status Wildlife Species

Species	Scientific Name	Status[3]
Monarch Butterfly	*Danaus plexippus*	Federally Proposed Threatened
Bay Checkerspot Butterfly	*Euphydryas editha bayensis*	Federally threatened
California Tiger Salamander	*Ambystoma californiense*	State threatened; Federally threatened
California Red-legged Frog	*Rana draytonii*	Federally threatened; CDFW-SSC
Foothill Yellow-legged Frog	*Rana boylii*	CDFW-SSC
Western Pond Turtle	*Actinemys marmorata*	CDFW-SSC
Coast Horned Lizard	*Phrynosoma blainvillii*	CDFW-SSC
Northern California Legless Lizard	*Anniella pulchra*	CDFW-SSC
Alameda Whipsnake	*Masticophis lateralis euryxanthus*	State threatened; Federally threatened
San Joaquin Coachwhip	*Masticophis flagellum ruddocki*	CDFW-SSC
Redhead (Nesting)	*Aythya americana*	CDFW-SSC
Double-crested Cormorant (Nesting Colony)	*Phalacrocorax auritis*	CDFW-WL
California Condor	*Gymnogyps californianus*	State endangered: Federally endangered; CDFW-FP
Western Least Bittern (Nesting)	*Ixobrychus exilis hesperis*	CDFW-SSC; USFWS-BCC
Osprey (Nesting)	*Pandion haliaetus*	CDFW-WL
White-tailed Kite (Nesting)	*Elanus leucurus*	CDFW-FP
Bald Eagle	*Haliaeetus leucocephalus*	State endangered; CDFW-FP; USFWS-BCC
Northern Harrier (Nesting)	*Circus cyaneus*	CDFW-SSC
Sharp-shinned Hawk (Nesting)	*Accipiter striatus*	CDFW-WL
Cooper's Hawk (Nesting)	*Accipiter cooperii*	CDFW-WL
Swainson's Hawk	*Buteo swainsoni*	State threatened; USFWS-BCC
Ferruginous Hawk (Wintering)	*Buteo regalis*	CDFW-WL; USFWS-BCC
Golden Eagle (Nesting + Wintering)	*Aquila chrysaetos*	CDFW-FP; CDFW-WL
Merlin (Wintering)	*Falco columbaris*	CDFW-WL
Prairie falcon (Nesting)	*Falco mexicanus*	CDFW-WL; USFWS-BCC

APPENDIX A-1: Special-Status Wildlife Species - *continued*

Species	Scientific Name	Status[3]
American Peregrine Falcon (Nesting)	*Falco peregrines anatum*	CDFW-FP; USFWS-BCC
California Black Rail	*Laterallus jamaicensis coturniculus*	State threatened; CDFW-FP; USFWS-BCC
Ridgway's Rail	*Rallus obsoletus*	State endangered; Federally endangered; CDFW-FP
Western Snowy Plover	*Charadrius nivosus alexandrines*	Federally threatened; CDFW-SSC; USFWS-BCC
Black Oystercatcher (Nesting)	*Haematopus bachami*	USFWS-BCC
Caspian Tern (Nesting Colony)	*Hydroprogne caspia*	CDFW-WL; USFWS-BCC
California Least Tern	*Sternula antillarum browni*	State endangered; Federally endangered; CDFW-FP
Black Skimmer (Nesting Colony)	*Rynchops niger*	CDFW-SSC; USFWS-BCC
California Gull (Nesting Colony)	*Leocophaeus atricillia*	CDFW-WL
Marbled Murrelet	*Brachyamphus marmoratus*	State Endangered; Federally Threatened
Burrowing Owl (Nesting + Wintering)	*Athene cunicularia*	CDFW-SSC; USFWS-BCC
Short-eared Owl (Nesting)	*Asio flammeus*	CDFW-SSC
Long-eared Owl (Nesting)	*Asio otus*	CDFW-SSC
Vaux's Swift (Nesting)	*Chaetura vauxi*	CDFW-SSC
Costa's hummingbird (Nesting)	*Calypte costae*	USFWS-BCC
Allen's Hummingbird (Nesting)	*Selaphorus sasin*	USFWS-BCC
Lewis's Woodpecker (Nesting)	*Melanerpes lewis*	USFWS-BCC
Nuttall's Woodpecker (Nesting)	*Picoides nutalli*	USFWS-BCC
Olive-sided Flycatcher (Nesting)	*Contupus cooperi*	CDFW-SSC; USFWS-BCC
Loggerhead Shrike (Nesting)	*Lanus ludovicanius*	CDFW-SSC; USFWS-BCC

APPENDIX A-1: Special-Status Wildlife Species - *continued*

Species	Scientific Name	Status[3]
Least Bell's Vireo	*Vireo bellii pusillus*	State endangered; Federally endangered
Yellow-billed Magpie (Nesting and Communal Roosts)	*Pica nutalli*	USFWS-BCC
California Horned Lark (Nesting)	*Eremophila alepestris actia*	CDFW-WL
Purple Martin (Nesting)	*Progne subis*	CDFW-SSC
Oak titmouse (Nesting)	*Baeolophus inornatus*	USFWS-BCC
Saltmarsh Common Yellowthroat (Nesting)	*Geothlypis trichas sinuosa*	CDFW-SSC; USFWS-BCC
Yellow-breasted Chat (Nesting)	*Icteria virens*	CDFW-SSC
Yellow Warbler (Nesting)	*Setophaga petechia*	CDFW-SSC; USFWS-BCC
Grasshopper Sparrow (Nesting)	*Ammodramus savannarum*	CDWF-SSC
Bell's Sage Sparrow (Nesting)	*Artemisiospiza belli belli*	CDFW-WL; USFWS-BCC
Byrannt's Savannah Sparrow (Nesting)	*Passerculus sandwichnensis alaudinus*	CDFW-SSC
Alameda Song Sparrow (Nesting)	*Melospiza melodia pusillula*	CDFW-SSC; USFWS-BCC
Black-chinned Sparrow (Nesting)	*Spizella atrogularis*	USFWS-BCC
Tricolored Blackbird	*Agelaius tricolor*	State Candidate; USFWS-BCC
Lawrence's Goldfinch (Nesting)	*Spinus lawrencei*	USFWS-BCC
Saltmarsh Wandering Shrew	*Sorex vagrans halicoetes*	CDFW-SSC
Salinas Ornate Shrew	*Sorex ornatus salaries*	CDFW-WL
Townsend's Big-eared Bat	*Corynorhinus townsendii*	State Candidate
Pallid Bat	*Antrozous pallidus*	CDFW-SSC
Western Red Bat	*Lasiurus blossevillii*	CDFW-SSC
Hoary Bat	*Lasiurus cinereus*	CDFW-WL
Santa Cruz Kangaroo Rat	*Dipodomys venustus venustus*	CDFW-SSC
Berkeley Kangaroo Rat	*Dipodomy heermanii berkelyeyensis*	CDFW-WL

APPENDIX A-1: Special-Status Wildlife Species - *continued*

Species	Scientific Name	Status[3]
Salt Marsh Harvest Mouse	*Reithrodontomys raviventris*	State Endangered; Federally endangered; CDFW-FP
San Francisco Dusky-footed Woodrat	*Neotoma fuscipes annectens*	CDFW-SSC
American Badger	*Taxidea taxus*	CDFW-WL
San Joaquin Kit Fox	*Vulpes macrotis mutica*	State threatened; Federally endangered

APPENDIX A-2: Fish Endemic To Santa Clara County Streams Draining Into San Francisco Bay

Common Name	Scientific Name
Pacific Lamprey	*Entosphenus tridentatus*
Sacramento Sucker	*Catostomus occidentalis*
Sacramento Blackfish	*Orthodon microlepidotus*
Hitch	*Lavinia exilicauda*
Sacramento Splittail	*Pogonichthys macrolepidotus*
Sacramento Pikeminnow	*Ptychocheilus grandis*
Thicktailed Chub	*Gila crassicauda*
California Roach	*Lavinia symmetricus*
Speckled Dace	*Rhinichthys osculus*
Rainbow Trout	*Oncorhynchus mykiss*
Three-Spined Stickleback	*Gasterosteus aculeatus*
Tule Perch	*Hysterocarpus traski*
Prickly Sculpin	*Cottus asper*
Western Brook Lamprey	*Lampetra richardsoni*
Sacramento Perch	*Archoplites interruptus*
Riffle Sculpin	*Cottus gulosus*
Pacific Staghorn Sculpin	*Leptocottus armatus*

Source: Leidy (2007) including Snyder (1905), Hubbs (1925), Follett (1974) and current published literature Moyle (2002).

APPENDIX A-3: Fish Assemblage of All Watersheds Within Santa Clara County

Common Name	Scientific Name	Endemic	Protection Status
Pacific Lamprey	*Entosphenus tridentatus*	YES	-
White Sturgeon	*Acipenser transmontanus*		-
Threadfin Shad	*Dorosoma petenense*		-
American Shad	*Alosa sapidissima*		-
Fathead Minnow	*Pimephales promelas*		-
Hitch	*Lavinia excilicauda*	YES	-
California Roach	*Lavinia symmetricus*	YES	WL*
Speckled Dace	*Rhinichthys osculus*	YES	-
Sacramento Blackfish	*Orthodon microlepidotus*	YES	-
Splittail	*Pogonichthys macrolepidotus*	YES	-
Goldfish	*Carassius auratus*		-
Common Carp	*Cyprinus carpio*		-
Golden Shiner	*Notemigonus crysolecus*		-
Red Shiner	*Cyprinella lutrensis*		-
Sacramento Sucker	*Catostomus occidentalis*	YES	-
Black Bullhead	*Ameiurus melas*		-
Brown Bullhead	*Ameiurus nebulosus*		-
Yellow Bullhead	*Ameiurus natalis*		-
White Catfish	*Ameiurus catus*		-
Channel Catfish	*Ictalurus punctatus*		-
Wakasagi	*Hypomesus nipponensis*		-
Eulachon	*Thaleichthys pacificus*		-
Rainbow Trout**	*Oncorhynchus mykiss*	YES	TH(F)
Chinook Salmon	*Oncorhynchus tshawytscha*		-
Chum Salmon	*Oncorhynchus keta*		-
Pink Salmon	*Oncorhynchus gorbuscha*		-
Inland Silverside	*Menidia beryllina*		-
Rainwater Killifish	*Lucania parva*		-
Mosquito Fish	*Gambusia affinis*		-
Three-Spined Stickleback	*Gasterosteus aculeatus*	YES	-
Prickly Sculpin	*Cottus asper*	YES	-

APPENDIX A-3: Fish Assemblage of All Watersheds Within Santa Clara County *- continued*

Common Name	Scientific Name	Endemic	Protection Status
Riffle Sculpin	*Cottus gulosus*	YES	-
Pacific Staghorn Sculpin	*Leptocottus armatus*		-
Largemouth Bass	*Micropterus salmoides*		-
Red-eye Bass	*Micropterus coosae*		-
Smallmouth Bass	*Micropterus dolomieu*		-
Striped Bass	*Morone saxatilis*		-
Green Sunfish	*Lepomis cyanellus*		-
Redear Sunfish	*Lepomis microlophus*		-
Pumpkinseed	*Leopmis gibbosus*		-
Bluegill	*Lepomis macrochirus*		-
White Crappie	*Pomoxis annularis*		-
Black Crappie	*Poxomis nigromaculatus*		-
Sacramento Perch	*Archoplites interruptus*	YES	-
Tule Perch	*Hysterocarpus traski*	YES	-
Bigscale Logperch	*Percina macrolepida*		-
Yellowfin Goby	*Acanthogoius flavimanus*		-

Source: Data Collected by District Biological Staff and Cited in Other Literature

WL: CDFW Watch List

TH(F): Federally Threatened

* The subspecies of California Roach, Lavinia symmetricus subditus or Monterey Roach, is designated on CDFW Watch List due to habitat loss.

**Rainbow trout includes all O. mykiss DPS of steelhead (SCC and CCC)

APPENDIX A-4: Rare Plants of Santa Clara County

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Acanthomintha lanceolata	Santa Clara thorn-mint	Lamiaceae	4.2	None	None	1200	80	Mar-Jun	Chaparral (often serpentinite), cismontane woodland, coastal scrub
Allium peninsulare var. franciscanum	Franciscan onion	Alliaceae	1B.2	None	None	300	52	Apr-Jun	Clay, volcanic, often serpentinite; cismontane woodland, valley and foothill grassland
Allium sharsmithiae	Sharsmith's onion	Alliaceae	1B.3	None	None	1200	400	Mar-May	Serpentinite, rocky; chaparral, cismontane woodland
Amsinckia lunaris	bent-flowered fiddleneck	Boraginaceae	1B.2	None	None	500	3	Mar-Jun	Coastal bluff scrub, cismontane woodland, valley and foothill grassland
Androsace elongata ssp. acuta	California androsace	Primulaceae	4.2	None	None	1200	150	Mar-Jun	Chaparral, cismontane woodland, coastal scrub, meadows and seeps, pinjon and juniper woodland, valley and foothill grassland
Arctostaphylos andersonii	Anderson's manzanita	Ericaceae	1B.2	None	None	760	60	Nov-May	Openings, edges; broadleafed upland forest, chaparral, north coast coniferous forest
Arctostaphylos regismontana	Kings Mountain manzanita	Ericaceae	1B.2	None	None	730	305	Jan-Apr	Granitic or sandstone; broadleafed upland forest, chaparral, north coast coniferous forest
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	1B.2	None	None	60	1	Mar-Jun	Alkaline; playas, valley and foothill grassland (adobe clay), vernal pools
Azolla microphylla	Mexican mosquito fern	Azollaceae	4.2	None	None	100	30	Aug	Marshes and swamps (ponds, slow water)
Balsamorhiza macrolepis	big-scale balsamroot	Asteraceae	1B.2	None	None	1555	90	Mar-Jun	Sometimes serpentinite; chaparral, cismontane woodland, valley and foothill grassland
Boechera rubicundula	Mt. Day rockcress	Brassicaceae	1B.1	None	None	1200	1200	Apr-May	Rocky slopes; chaparral
Calandrinia breweri	Brewer's calandrinia	Montiaceae	4.2	None	None	1220	10	Jan-Jun	Sandy or loamy, disturbed sites and burns; chaparral, coastal scrub
California macrophylla	round-leaved filaree	Geraniaceae	1B.2	None	None	1200	15	Mar-May	Clay; cismontane woodland, valley and foothill grassland
Calochortus umbellatus	Oakland star-tulip	Liliaceae	4.2	None	None	700	100	Mar-May	Often serpentinite; broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland
Calyptridium parryi var. hesseae	Santa Cruz Mountains pussypaws	Montiaceae	1B.1	None	None	1530	305	May-Aug	Sandy or gravelly, openings; chaparral, cismontane woodland

APPENDIX A-4: Rare Plants of Santa Clara County - *continued*

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Calystegia collina ssp. venusta	South Coast Range morning-glory	Convolvulaceae	4.3	None	None	1490	425	Apr-Jun	Serpentinite or sedimentary; chaparral, cismontane woodland, valley and foothill grassland
Campanula exigua	chaparral harebell	Campanulaceae	1B.2	None	None	1250	275	May-Jun	Chaparral (rocky, usually serpentinite)
Campanula sharsmithiae	Sharsmith's harebell	Campanulaceae	1B.2	None	None	855	490	Apr-Jun	Chaparral (serpentintite, rocky)
Castilleja affinis var. neglecta	Tiburon paintbrush	Orobanchaceae	1B.2	CT	FE	400	60	Apr-Jun	Valley and foothill grassland (serpentinite)
Castilleja rubicundula var. rubicundula	pink creamsacs	Orobanchaceae	1B.2	None	None	910	20	Apr-Jun	Serpentinite; chaparral (openings), cismontane woodland, meadows and seeps, valley and foothill grassland
Ceanothus ferrisiae	Coyote ceanothus	Rhamnaceae	1B.1	None	FE	460	120	Jan-May	Serpentintite; chaparral, coastal scrub, valley and foothill grassland
Centromadia parryi ssp. congdonii	Congdon's tarplant	Asteraceae	1B.1	None	None	230	0	May-Nov	Valley and foothill grassland (alkaline)
Chloropyron maritimum ssp. palustre	Point Reyes bird's-beak	Orobanchaceae	1B.2	None	None	10	0	Jun-Oct	Marshes and swamps (coastal salt)
Chorizanthe robusta var. robusta	robust spineflower	Polygonaceae	1B.1	None	FE	300	3	Apr-Sept	Sandy or gravelly; chaparral (maritime), cismontane woodland (openings), coastal dunes, coastal scrub
Cirsium fontinale var. campylon	Mt. Hamilton fountain thistle	Asteraceae	1B.2	None	None	890	100	Feb-Oct	Serpentinite seeps; chaparral, cismontane woodland, valley and foothill grassland
Cirsium praeteriens	lost thistle	Asteraceae	1A	None	None	100	0	Jun-July	Unknown
Clarkia breweri	Brewer's clarkia	Onagraceae	4.2	None	None	1115	215	Apr-Jun	Often serpentinite; chaparral, cismontane woodland, coastal scrub
Clarkia concinna ssp. automixa	Santa Clara red ribbons	Onagraceae	4.3	None	None	1500	90	Apr-Jul	Chaparral, cismontane woodland
Collinsia multicolor	San Francisco collinsia	Plantaginaceae	1B.2	None	None	250	30	Feb-May	Sometimes serpentinite; closed cone coniferous forest, coastal scrub
Cypripedium fasciculatum	clustered lady's-slipper	Orchidaceae	4.2	None	None	2435	100	Mar-Aug	Usually serpentinite seeps and streambanks; lower montane coniferous forest, north coast coniferous forest
Delphinium californicum ssp. interius	Hospital Canyon larkspur	Ranunculaceae	1B.2	None	None	1095	195	Apr-Jun	Chaparral (openings), cismontane woodland (mesic), coastal scrub

APPENDIX A-4: Rare Plants of Santa Clara County - *continued*

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Dirca occidentalis	western leatherwood	Thymelaeaceae	1B.2	None	None	425	25	Jan-Apr	mesic; broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland
Dudleya abramsii ssp. setchellii	Santa Clara Valley dudleya	Crassulaceae	1B.1	None	FE	455	60	Apr-Oct	Serpentinite, rocky; chaparral, cismontane woodland, valley and foothill grassland
Eriastrum tracyi	Tracy's eriastrum	Polemoniaceae	3.2	CR	None	1780	315	May-Jul	Chaparral, cismontane woodland
Eriogonum argillosum	clay buckwheat	Polygonaceae	4.3	None	None	800	150	Mar-JUn	Cismontane woodland (serpentinite or clay)
Eriogonum nudum var. decurrens	Ben Lomond buckwheat	Polygonaceae	1B.1	None	None	800	50	Jun-Oct	Sandy; chaparral, cismontane woodland, lower montane coniferous forest (maritime ponderosa pine sandhills)
Eriogonum umbellatum var. bahiiforme	bay buckwheat	Polygonaceae	4.2	None	None	2200	700	Jul-Sept	Rocky, often serpentinite; cismontane woodland, lower montane coniferous forest
Eriophyllum jepsonii	Jepson's woolly sunflower	Asteraceae	4.3	None	None	1025	200	Apr-Jun	Sometimes serpentinite; chaparral, cismontane woodland, coastal scrub
Eryngium aristulatum var. hooveri	Hoover's button-celery	Apiaceae	1B.1	None	None	45	3	Jun-Aug	Vernal pools; mesic alkaline grassland
Erysimum franciscanum	San Francisco wallflower	Brassicaceae	4.2	None	None	550	0	Mar-Jun	Often serpentinite or granitic, sometimes roadsides; chaparral, coastal dunes, coastal scrub, valley and foothill grassland
Extriplex joaquinana	San Joaquin spearscale	Chenopodiaceae	1B.2	None	None	835	1	Apr-Oct	Alkaline; chenopod scrub, meadows and seeps, playas, valley and foothill grassland
Fritillaria agrestis	stinkbells	Liliaceae	4.2	None	None	1555	10	Mar-Jun	Clay, sometimes serpentinite; chaparral, cismontane woodland, pinyon and juniper woodland, valley and foothill grassland
Fritillaria falcata	talus fritillary	Liliaceae	1B.2	None	None	1525	300	Mar-May	Serpentinite, often talus; chaparral, cismontane woodland, lower montane coniferous forest
Fritillaria liliacea	fragrant fritillary	Liliaceae	1B.2	None	None	410	3	Mar-May	Serpentintite, often talus, chaparral, cismontane woodland, lower montane coniferous forest

APPENDIX A-4: Rare Plants of Santa Clara County - *continued*

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Galium andrewsii ssp. gatense	phlox-leaf serpentine bedstraw	Rubiaceae	4.2	None	None	1450	150	Apr-Jul	Serpentintite, rocky; chaparral, cismontane woodland, lower coniferous forest
Helianthus exilis	serpentine sunflower	Asteraceae	4.2	None	None	1525	150	Jun-Nov	Serpentinite seeps; chaparral, cismontane woodland
Hoita strobilina	Loma Prieta hoita	Fabaceae	1B.1	None	None	860	30	May-Oct	Usually serpentinite, mesic; chaparral, cismontane woodland, riparian woodland
Iris longipetala	coast iris	Iridaceae	4.2	None	None	600	0	Mar-May	Mesic; coastal prairie, lower montane coniferous forest, meadows and seeps
Isocoma menziesii var. diabolica	Satan's goldenbush	Asteraceae	4.2	None	None	400	15	Aug-Oct	Cismontane woodland
Lasthenia conjugens	Contra Costa goldfields	Asteraceae	1B.1	None	FE	470	0	Mar-Jun	Mesic; cismontane woodland, playas (alkaline), valley and foothill grassland, vernal pools
Legenere limosa	legenere	Campanulaceae	1B.1	None	None	880	1	Apr-Jun	vernal pools
Leptosiphon acicularis	bristly leptosiphon	Polemoniaceae	4.2	None	None	1500	55	Apr-Jul	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland
Leptosiphon ambiguus	serpentine leptosiphon	Polemoniaceae	4.2	None	None	1130	120	Mar-Jun	Usually serpentintite; cismontane woodland, coastal scrub, valley and foothill grassland
Leptosiphon grandiflorus	large-flowered leptosiphon	Polemoniaceae	4.2	None	None	1220	5	Apr-Aug	Usually sandy; coastal bluff scrub, closed-cone coniferous forest, cismontane woodland, coastal dunes, coastal prairie, coastal scrub, valley and foothill grassland
Leptosyne hamiltonii	Mt. Hamilton coreopsis	Asteraceae	1B.2	None	None	1300	550	Mar-May	Cismontane woodland (rocky)
Lessingia hololeuca	woolly-headed lessingia	Asteraceae	3	None	None	305	15	Jun-Oct	Clay, serpentinite; broadleafed upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland
Lessingia micradenia var. glabrataL	smooth lessingia	Asteraceae	1B.2	None	None	420	120	May-Nov	Serpentinite, often roadsides; chaparral, cismontane woodland
Lessingia tenuis	spring lessingia	Asteraceae	4.3	None	None	2150	300	May-Jul	Openings; chaparral, cismontane woodland, lower montane coniferous forest

APPENDIX A-4: Rare Plants of Santa Clara County - *continued*

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Lomatium observatorium	Mt. Hamilton lomatium	Apiaceae	1B.2	None	None	1330	1219	Mar-May	Cismontane woodland
Madia radiata	showy golden madia	Asteraceae	1B.1	None	None	1215	25	Mar-May	Cismontane woodland, valley and foothill grassland
Malacothamnus aboriginum	Indian Valley bush-mallow	Malvaceae	1B.2	None	None	1700	150	Apr-Oct	Rocky granitic, often in burned areas; chaparral, cismontane woodland
Malacothamnus arcuatus	arcuate bush-mallow	Malvaceae	1B.2	None	None	355	15	Apr-Sept	Chaparral, cismontane woodland
Malacothamnus davidsonii	Davidson's bush-mallow	Malvaceae	1B.2	None	None	855	185	Jun-Jan	Chaparral, cismontane woodland, coastal scrub, riparian woodland
Malacothamnus hallii	Hall's bush-mallow	Malvaceae	1B.2	None	None	760	10	May-Oct	Chaparral, coastal scrub
Malacothrix phaeocarpa	dusky-fruited malacothrix	Asteraceae	4.3	None	None	1400	100	Apr-Jun	Openings, burned or disturbed areas; closed-cone coniferous forest, chaparral
Meconella oregana	Oregon meconella	Papaveraceae	1B.1	None	None	620	250	Mar-Apr	Coastal prairie, coastal scrub
Micropus amphibolus	Mt. Diablo cottonweed	Asteraceae	3.2	None	None	825	45	Mar-May	Rocky; broadleafed upland forest, chaparral, cismontane woodland, valley and foothill grassland
Microseris sylvatica	sylvan microseris	Asteraceae	4.2	None	None	1500	45	Mar-Jun	Chaparral, cismontane woodland, Great Basin scrbu, pinyon and juniper woodland, valley and foothill grassland (serpentinite)
Mielichhoferia elongata	elongate copper moss	Mielichhoferiaceae	4.3	None	None	1960	0	Life form: moss	Metamorphic rock, usually acidic, vernally mesic, often roadsides, sometimes carbonate
Monardella antonina ssp. antonina	San Antonio Hills monardella	Lamiaceae	3	None	None	1000	320	Jun-Aug	Chaparral, cismontane woodland
Monolopia gracilens	woodland woolythreads	Asteraceae	1B.2	None	None	1200	100	Feb-Jul	Serpentine; broadleafed upland forest (openings), chaparral (openings), cismontane woodland, north coast coniferous forest (openings), valley and foothill grassland
Navarretia cotulifolia	cotula navarretia	Polemoniaceae	4.2	None	None	1830	4	May-Jun	Adobe; chaparral, cismontane woodland, valley and foothill grassland
Navarretia prostrata	prostrate vernal pool navarretia	Polemoniaceae	1B.1	None	None	1210	3	Apr-Jul	Mesic; coastal scrbu, meadows and seeps, valley and foothill grassland (alkaline), vernal pools

APPENDIX A-4: Rare Plants of Santa Clara County - *continued*

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Penstemon rattanii var. kleei	Santa Cruz Mountains beardtongue	Plantaginaceae	1B.2	None	None	1100	400	May-Jun	Chaparral, lower montane coniferous forest, north coast coniferous forest
Pentachaeta exilis ssp. aeolica	San Benito pentachaeta	Asteraceae	1B.2	None	None	855	480	Mar-May	Cismontane woodland, valley and foothill grassland
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	Apiaceae	4.2	None	None	610	0	Jun-Oct	Vernally mesic; broadleafed upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools
Phacelia phacelioides	Mt. Diablo phacelia	Boraginaceae	1B.2	None	None	1370	500	Apr-May	Rocky; chaparral, cismontane woodland
Piperia candida	white-flowered rein orchid	Orchidaceae	1B.2	None	None	1310	30	Mar-Sept	Sometimes serpentinite; broadleafed upland forest, lower montane coniferous forest, north coast coniferous forest
Piperia leptopetala	narrow-petaled rein orchid	Orchidaceae	4.3	None	None	2225	380	May-Jul	Cismontante woodland, lower montane coniferous forest, upper montane coniferous forest
Piperia michaelii	Michael's rein orchid	Orchidaceae	4.2	None	None	915	3	Apr-Aug	Coastal bluff scrub, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest
Plagiobothrys chorisianus var. chorisianus	Choris' popcornflower	Boraginaceae	1B.2	None	None	160	15	Mar-Jun	Mesic; chaparral, coastal prairie, coastal scrub
Plagiobothrys chorisianus var. hickmanii	Hickman's popcornflower	Boraginaceae	4.2	None	None	185	15	Apr-Jun	Closed-cone coniferous forest, chaparral, coastal scrub, marshes and swamps, vernal pools
Plagiobothrys glaber	hairless popcornflower	Boraginaceae	1A	None	None	180	15	Mar-May	Meadows and seeps (alkaline), marshes and swamps (coastal salt)
Plagiobothrys uncinatus	hooked popcornflower	Boraginaceae	1B.2	None	None	760	300	Apr-May	Chaparral (sandy), cismontane woodland, valley and foothill grassland
Plagiobothrys verrucosus	warty popcornflower	Boraginaceae	2B.1	None	None	760	610	Apr-May	Shale; chaparral
Psilocarphus brevissimus var. multiflorus	Delta woolly-marbles	Asteraceae	4.2	None	None	500	10	May-Jun	Vernal pools
Puccinellia simplex	California alkali grass	Poaceae	1B.2	None	None	930	2	Mar-May	Alkaline, vernally mesic; sinks, flats and lake margins; chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools

APPENDIX A-4: Rare Plants of Santa Clara County - *continued*

Scientific Name	Common Name	Family	Rare Plant Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	Bloom Period	Habitat
Sanicula saxatilis	rock sanicle	Apiaceae	1B.2	CR	None	1175	620	Apr-May	Rocky; broadleafed upland forest, chaparral, valley and foothill grassland
Senecio aphanactis	chaparral ragwort	Asteraceae	2B.2	None	None	800	15	Jan-May	Sometimes alkaline; chaparral, cismontane woodland, coastal scrub
Sidalcea malachroides	maple-leaved checker-bloom	Malvaceae	4.2	None	None	730	0	Mar-Aug	Often in disturbed areas; broadleafed upland forest, coastal prairie, coastal scrbu, north coast coniferous forest, riparian woodland
Streptanthus albidus ssp. albidus	Metcalf Canyon jewelflower	Brassicaceae	1B.1	None	FE	800	45	Apr-Jul	Valley and foothill grassland (serpentinite)
Streptanthus albidus ssp. peramoenus	most beautiful jewelflower	Brassicaceae	1B.2	None	None	1000	95	Mar-Oct	Serpentinite; chaparral, cismontane woodland, valley and foothill grassland
Streptanthus callistus	Mt. Hamilton jewelflower	Brassicaceae	1B.3	None	None	790	600	Apr-May	Chaparral, cismontane woodland
Stuckenia filiformis ssp. alpina	slender-leaved pondweed	Potamogetonaceae	2B.2	None	None	2150	300	May-Jul	marshes and swamps (assorted shallow freshwater)
Suaeda californica	California seablite	Chenopodiaceae	1B.1	None	FE	15	0	Jul-Oct	Marshes and swamps (coastal salt)
Trifolium amoenum	two-fork clover	Fabaceae	1B.1	None	FE	415	5	Apr-Jun	Coastal bluff scrub, valley and foothill grassland (sometimes serpentinite)
Trifolium hydrophilum	saline clover	Fabaceae	1B.2	None	None	300	0	Apr-Jun	Marshes and swamps, valley and foothill grassland (mesic, alkaline), vernal pools
Tropidocarpum capparideum	caper-fruited tropidocarpum	Brassicaceae	1B.1	None	None	455	1	Mar-Apr	Valley and foothill grassland (alkaline hills)

Source: CNPS, Rare Plant Program. 2016. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society, Sacramento, CA. Website http://www.rareplants.cnps.org [accessed 11 April 2016].

B

APPENDIX B

COORDINATION WITH PLANS, PROGRAMS, NEIGHBORS

APPENDIX B:

COORDINATION AND INTEGRATION WITH OTHER PLANS, PROGRAMS, AND NEIGHBORING COUNTIES

INTRODUCTION

The District develops, updates, and follows a number of plans and programs to support its mission. Some programs are in response to regulatory requirements, and some are an organized approach to long-standing practices and obligations. This section describes some of the major plans and programs that the District manages or supports via active partnership. Each of these plans will inform, or become a critical component of, the One Water Plan. They are very briefly summarized here. Most also maintain on-line materials, including full program descriptions and maps. Check embedded links for more information.

HABITAT AND FISHERIES PLANS

The Santa Clara Valley Habitat Plan

The Santa Clara Valley Habitat Plan was developed to protect, enhance, and restore natural resources in Santa Clara County at an ecosystem scale and to contribute to the recovery of endangered species, while allowing for reasonable future development and maintenance activities. The plan incorporates two, 50-year, multi-jurisdictional federal and state endangered species permits, a Habitat Conservation Plan (HCP), and a Natural Communities Conservation Plan (NCCP), issued in July 2013 by the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife. The Santa Clara Valley Habitat Plan document and the associated HCP/NCCP permits are commonly called the Valley Habitat Plan or VHP. The VHP provides a coordinated process for permitting and mitigating impacts to 18 species, which are either listed as endangered or threatened under the federal and state Endangered Species Acts, or with the potential to be listed during the 50-year permit term. Three cities (San Jose, Gilroy, and Morgan Hill), the County, and the Valley Transportation Authority are local partners along with the District. All are required to comply with the VHP conditions in order to receive permit coverage.

Conditions detailed in the VHP require that impacts to the covered species and their habitats must be mitigated by incorporating avoidance and minimization measures into projects and activities and/or paying development impact fees imposed to cover the costs of VHP implementation. A portion of development fees is dedicated to supporting the creation and management of a Habitat Plan Reserve System (Reserve System) in which land is protected and/or restored to benefit covered species and natural communities. Additional VHP mitigation may include creation or restoration of habitat such as riparian woodland and scrub, wetlands, and ponds. The VHP specifies riparian setback requirements, ranging from 35 to 250 feet, depending on reach-specific conditions and parcel size. The Santa Clara Valley Habitat Agency, a Joint Powers Authority, was created to implement the requirements of the VHP and manage the Reserve System.

Benefits of the VHP to the District include the potential to expedite the environmental permitting process for project or maintenance activities occurring within the VHP area, long-term certainty about expected costs for mitigation and monitoring requirements, and the availability of mitigation through the local Reserve System.

The Santa Clara Valley Habitat Plan supports the goals and objectives of the One Water Plan by protecting floodplains through riparian setback requirements and creating and/or protecting endangered species habitat through the Reserve System and restoration requirements.

Fisheries And Aquatic Habitat Collaborative Effort (FAHCE)

The District has long-standing water rights issued by the State Water Resources Control Board within the Coyote Creek, Guadalupe River, and Stevens Creek (Three Creeks) watersheds to divert water from local creeks for storage in reservoirs and groundwater recharge ponds. In 1996, a complaint was filed with the State Board by the

Guadalupe Coyote Resource Conservation District (GCRCD). It stated that the District was violating its water rights by not operating its reservoirs in the Three Creeks watersheds adequately to maintain downstream habitat and fisheries in good condition, as required under the California Constitution, Water Code, common law public trust doctrine, and Fish and Game Code.

To settle the complaint, the District convened settlement negotiations, referred to as the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE). The negotiations led to the FAHCE Settlement Agreement, which was initialed in 2003 by the District, GCRCD, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and numerous non-governmental organizations with an interest in fisheries. The overall management objectives of the FAHCE Settlement Agreement focus on maintaining healthy populations of the federally threatened Central California Coast steelhead trout and the federal species of concern and state species of special concern Central Valley fall/late fall-run Chinook salmon. A key provision of the FAHCE Settlement Agreement is the implementation of a Fish Habitat Restoration Plan, which includes measures to provide suitable spawning and rearing habitat, adequate and appropriate flows through reservoir releases, and adequate passage for adult and juvenile migration within the Three Creeks watersheds. The FAHCE Settlement Agreement requires the parties to carry out certain conditions precedent, including completing an environmental review, amending the District's water rights to be consistent with the FAHCE Settlement Agreement, dismissal of the water rights complaint, and obtaining state and federal regulatory approvals of the FAHCE restoration measures described in the FAHCE Settlment Agreement. The District is not obligated to undertake the FAHCE restoration measures until the conditions precedent in the FAHCE Settlement Agreement are met.

The parties who initialed the FAHCE Settlement Agreement are obligated to support the District's water rights change petition to amend the District's water rights to be consistent with the FAHCE Settlement Agreement if the record continues to demonstrate that the FAHCE Settlement Agreement measures are the best alternative to protect and maintain the beneficial uses of the of the Three Creeks (i.e. Stevens Creek, Coyote Creek, Guadalupe River, and their respective tributaries) and otherwise comply with applicable laws.

The One Water approach is designed to help the District balance multiple objectives, including supporting biologically healthy streams as well as water supply and flood protection objectives. This balancing will need to be consistent with the District's obligations under the FAHCE Settlement Agreement, terms and conditions of its water right licenses, and other obligations and requirements the District must adhere to. Implementation of the FAHCE restoration program will benefit the District and One Water Plan because it will provide suitable spawning and rearing habitat, adequate and appropriate flows through reservoir releases, and adequate passage for adult and juvenile migration within the Three Creeks watersheds.

CONSTRUCTION, OPERATIONS, AND MAINTENANCE PLANS

Capital Improvement Plan

The District maintains a rolling Capital Improvement Plan (CIP) which looks ahead five years on major construction investments, and is updated and adopted by the Board of Directors annually. The CIP is a projection of the District's capital funding for planned infrastructure projects. Annual updates incorporate input from local municipalities and progress on individual projects with respect to schedules and budgets. The program includes water supply, flood protection, water resources stewardship, buildings and grounds, and information technology projects. The current CIP includes 66 projects totaling over $3.45 billion (this accounts for the total estimated project planning and construction costs, which extend beyond the next five years), with approximately 20 percent of this amount, $704 million, anticipated to be funded by outside sources, reimbursements, and partnerships.

The One Water Plan will review the CIP and its projects as it analyzes countywide opportunities and watershed-specific opportunities, considering existing projects as well as new when prioritizing activities.

Safe, Clean Water and Natural Flood Protection Program

In November 2012, the voters of Santa Clara County overwhelmingly supported Measure B, the Safe, Clean Water and Natural Flood Protection Program. Developed with input from more than 16,000 residents and stakeholders, this 15-year program supported by a parcel tax funds projects and programs within the following five top community priorities:

- Ensure a safe, reliable water supply
- Reduce toxins, hazards, and contaminants in our waterways
- Protect our water supply and local dams from the impacts of earthquakes and natural disasters
- Restore fish, bird, and wildlife habitat; and provide open space access
- Provide flood protection to homes, businesses, schools, and highways

Within each priority area, between two and eight specific projects or programs are described and explicitly funded in support of the priority. To ensure accountability to the voters, the ballot measure also created an Independent Monitoring Committee, appointed by the Santa Clara Valley Water District Board of Directors.

Asset Management Program

An Asset Inventory has been developed to track key assets the District owns, operates, and maintains within the District's three business areas: Water Utility, Administration, and Watersheds. The District's Asset Management Program provides guidance to manage its assets for the best long-term use of public resources. District assets are identified and analyzed to determine the current condition of each asset, when an asset will need to be repaired or replaced, as well as how much the maintenance or replacement of an asset will cost. Typical water utility assets include water treatment plants, pipelines and tunnels, canals and ditches, dams, pumping plants, and groundwater percolation ponds. Typical administration assets include buildings, computer hardware and software, and vehicles.Typical watershed assets include creeks (owned or maintained by agreement), weirs, outfalls, and fish passage facilities.

One major goal of the Asset Management Program is to develop accurate long-term financial planning for District operations, maintenance, planning, and engineering. Another goal is to optimize asset renewal strategies to minimize lifecycle costs while providing required levels of service at an acceptable level of risk.

Going forward, improved coordination between the Asset Management Program and other District programs would ensure that all new assets are added into the Asset Inventory. In addition, the One Water Plan process could help to address future levels of service needs.

By reducing unplanned asset failures or service outages, minimizing the operating and capital costs of owning assets, and enabling accurate long-term financial planning, the Asset Management Program supports the One Water Plan goals and objectives, ensuring the District's ability to sustain reliable water supply, flood protection, and environmental stewardship services to residents and businesses in Santa Clara County.

Stream Maintenance Program

The Stream Maintenance Program (SMP) is the regulatory mechanism by which the District is authorized by state and federal resource protection agencies to conduct routine flood protection work. The program follows an integrated maintenance approach to minimize impacts to the riparian environment. The two primary goals of the program are to 1) maintain the flow conveyance capacity of District channels and facilities, and 2) maintain the structural and functional integrity of District facilities. The District initially developed the program in 2001, with a major update in 2014, as a long-term program to improve the management and maintenance of channels for flood protection and to streamline the environmental permitting process. Five categories of "routine maintenance" are covered in the SMP: vegetation management, sediment removal, bank stabilization, management of animal conflicts, and minor maintenance (such as graffiti removal and fence repair). To identify and prioritize when maintenance is needed to provide for flood protection, maintenance guidelines are developed for each facility to detail the maintenance activities required to provide adequate flow conveyance capacity while complying with environmental regulations. The SMP includes best management practices to avoid or reduce environmental impacts to the maximum extent possible. The SMP has an ongoing compensatory mitigation program to address unavoidable environmental impacts incurred during routine stream maintenance activities. The District developed an Invasive Plant Management Program (IPMP) to mitigate for some SMP activities, with a goal of preserving and improving habitat within Santa Clara County streams and riparian corridors by removing invasive plants. Other mitigation efforts may include improving instream habitat for salmonids and acquiring land for habitat preservation.

The Stream Maintenance Program supports the goals and objectives of the One Water Plan in several ways, including: reducing flood risk by streamlining the permitting process using an integrated maintenance approach; minimizing impacts on habitats and resources for native species through the use of maintenance guidelines to ensure that stream maintenance activities are conducted only when they are determined to be necessary and appropriate to maintain flow conveyance and the structural integrity of stream banks, or to improve watersheds, streams, and natural resources; and conducting mitigation activities such as managing invasive plants, native revegetation efforts, and improving instream habitats for salmonids and other special status species.

Local Hazard Mitigation Plan

The Federal Disaster Mitigation Act of 2000 (DMA 2000) requires that cities, counties, and special districts have a Local Hazard Mitigation Plan (LHMP) to be eligible to receive Federal Emergency Management Agency (FEMA) hazard mitigation funding. The LHMP is to comply with Title 44 of the Code of Federal Regulations, Section 201.6, and must indentify hazards and vulnerabilities, assess risks, and rate associated mitigation strategies that would reduce or eliminate the long-term risk to human life, property, the environment, and economy from hazards. The process to develop an LHMP must include community outreach and the alignment of risk reduction with other organizational and community objectives. In order to ensure that LHMP mitigation strategies align with community and organizational objectives it is important for the LHMP planning process to be performed in coordination with other organizational planning efforts.

WATER SUPPLY MANAGEMENT PLANS AND PROGRAMS

The county's primary water resources agency, largely responsible for maintaining a reliable supply of water, the District manages 10 local reservoirs, three drinking water treatment plants, a complex system of creeks, channels, groundwater subbasins, groundwater recharge facilities, imported water facilities, raw and treated water conveyance pipelines, out-of-county groundwater banking, and a new recycled water purification facility. The District supplies treated water to and and manages groundwater for local water retail agencies, which in turn provide it to their customers in Santa Clara County. The District also provides groundwater management and untreated surface deliveries for thousands of individual users throughout the county. The One Water Plan provides a platform for integrating water supply projects and programs with other water management projects and programs where these is a nexus with flood protection and/or stream stewardship. This section describes the major plans and programs that comprise the Water Supply Management program, and some of the challenges those plans and programs are intended to address.

Reservoir and Raw Water Operations and Planning

The District stores water from local, wet season precipitation and/or imported water in its reservoirs for release throughout the year for downstream percolation into groundwater aquifers. The storage of stormwater in reservoirs also helps attenuate storm flows downstream. Reservoir operations, based largely on water supply needs, also take into account environmental needs for instream habitat, downstream flood protection, and recreation. The amount of water stored in a reservoir and the timing and rate at which water should be released is determined by pre-determined operating strategies or "rules.".

Managing the District's water supply portfolio to provide a reliable source of water requires complex analyses that incorporate the multiple sources of water under various hydrologic conditions and availability and utilizing available facilities to meet a range of uses, while accommodating regulatory constraints and institutional issues. For example, the Department of Safety of Dams interim operating restrictions placed on Anderson, Coyote, Almaden, Calero, and Guadalupe reservoirs have resulted in loss of storage capacity, water supply yield, and system operational flexibility.

In addition, staff works in collaboration with the California Department of Fish and Game and the National Marine Fisheries Service to evaluate and make adjustments to releases to best manage available supplies for both water supply and fishery management purposes.

Operational decisions are made through annual operations planning activities, which include evaluating transfer opportunities, allocating imported water deliveries, meeting treated water demands, satisfying groundwater recharge needs, setting local and imported water carryover storage targets, and scheduling facility maintenance. In addition, the planning process must consider the potential for both single and multiple dry year scenarios following the current year.

In order to meet the supply needs of the county efficiently, the district analyzes different possible futures (or scenarios), each with different combinations of risk factors and timing issues. Hydrologic uncertainties influence the projections of both local and imported water supplies and the anticipated reliability of those supplies. The water supply outlook is usually prepared by evaluating projections of wet, median, dry, and critically dry conditions, corresponding to 25 percent, 50 percent, 90 percent, and 99 percent exceedence probability scenarios. Water supply conditions are monitored and evaluated on an ongoing basis along with changing demands, and operations are then adjusted appropriately.

After modeling surface water operations for each of the probability scenarios, groundwater models are used to project end-of-year groundwater storage for the current year. In a conjunctive use system such as the District's, projected groundwater storage serves as an early warning sign and a good indicator of potential shortages.

Groundwater Management Plan

Per the Santa Clara Valley Water District Act, the District's objectives and authority related to groundwater management are to recharge groundwater basins; conserve, manage, and store water for beneficial and useful purposes; increase water supply; protect groundwater from contamination; prevent waste and diminution of the District's water supply; and do any and every lawful act necessary to ensure sufficient water is available for present and future beneficial uses within Santa Clara County. The District conveys both imported water (from the Delta) and local runoff to reservoirs and/or areas where it percolates down to underground aquifers for future use and to prevent land subsidence. This effort requires the coordinated management of surface and groundwater supplies.

The District's 2012 Groundwater Management Plan identified two important basin management objectives: 1) manage groundwater supplies to optimize water supply reliability and minimize land subsidence; and 2) protect groundwater from existing and potential contamination, including salt water intrusion. The District is updating its Groundwater Management Plan to meet the requirements of the Sustainable Groundwater Management Act, including more analysis of surface water-groundwater interactions. The analysis will help inform One Water Plan priorities.

Urban Water Management Plan

The District, as an urban water supplier, is required to submit an Urban Water Management Plan (UWMP) to the California Department of Water Resources every five years. The UWMP provides detailed information on the County's water supply sources, water use projections, demand management measures, water shortage contingency planning, water recycling, water quality, threats to water supply reliability, and an examination of the water supply outlook for normal, dry, and multiple dry years over a 20-year planning horizon. This is the foundation for other important plans, primarily the Water Supply and Infrastructure Master Plan described below. Any changes to water supply and demand projections resulting from One Water Plan implementation will be reflected in future UWMP updates.

Water Supply and Infrastructure Master Plan

This 2012 plan presents a strategy for meeting Santa Clara County's water supply needs through the year 2035. The main objective of the Water Supply and Insfrastructure Master Plan (Water Master Plan) is for water supplies to meet at least 100 percent of average annual water demand during non-drought years and at least 90 percent of average annual water demand during droughts. Baseline water supplies are expected to increase from the current average of about 370,000 acre-feet per year (AFY) to an average of 423,000 AFY in 2035, due to anticipated removal of operating restrictions on existing reservoirs, increased usage of non-potable recycled water, development of potable reuse, and increased water conservation savings. The Water Master Plan identifies and rationalizes a number of new capital water supply and infrastructure projects that will require significant capital investments, and proposes strategies for implementing those activities. Five phases of implementation are identified, from 2012 through 2031 and beyond. The plan identifies additional stormwater capture and reuse opportunities to be explored through efforts like the One Water Plan. The projects and programs in the Water Master Plan support the objectives of the One Water Plan, and implementation will be coordinated with One Water Plan implementation.

The District is scheduled to update the Water Master Plan in 2017. The projects and programs proposed by One Water Plan will be considered in the Water Master Plan update process.

South Bay Water Recycling Strategic and Master Plan

The City of San José, in collaboration with the District, prepared the South Bay Water Recycling Strategic and Master Plan (2014) to analyze the potential benefits and feasibility of recycled water system improvement and expansion options. Proposed near-term (2015-2020) reliability improvement projects include a mixture of projects to extend the useful life of existing assets, replace aging equipment and infrastructure, increase operational flexibility, and add new storage facilities, pump stations, and transmission mains. Long-term (2020 and beyond) recycled water expansion options include plans to expand the South Bay distribution system, including piping extensions, new pump stations, and new storage tanks to increase the recycled water market by approximately 70 percent, or an additional 10,000 AFY. The 2014 plan also identifies and evaluates potable reuse options.

South County Recycled Water Master Plan

This plan (updated in 2016) identifies additional recycled water projects to expand the use of tertiary treated recycled water in southern Santa Clara County to increase the reliability of long-term water supplies, lessen the demand on groundwater, and provide the South County Regional WasteWater Authority with additional discharge alternatives. Several improvement projects have been constructed since the development of the original plan in 2004, including expansion of over 7,000 feet of pipeline, construction of a new storage reservoir and pump station, and increased tertiary filtration capacity at the treatment plant. Projects currently in progress include over 30,000 feet of new pipe, additional turnouts, and a booster pump station expansion. The South County Recycled Water Program supports water supply reliability and agricultural and recreational land uses, consistent with objectives of the One Water Plan.

California WaterFix and EcoRestore

Today, an average of 40 percent of Santa Clara County's water supplies are conveyed through the Sacramento-San Joaquin Delta (Delta) and imported into this county ("imported" water) via canals of the State Water Project or the federal Central Valley Project. The District is concerned with the future reliability of imported water supplies because of the instability of existing Delta levees, underlying seismic risks, climate change, ongoing regulatory uncertainty, and the Delta's environmental health. To address these concerns, the District has been participating in statewide efforts to achieve the co-equal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The "California WaterFix" includes conveyance facilities (mainly intakes and tunnels) to improve water supply reliability, and California EcoRestore proposes restoration of at least 30,000 acres of Delta habitat. The District is currently evaluating the benefits and costs associated with California WaterFix.

Water Quality Plans and Programs

A multitude of water quality laws and regulations exist to reduce threats from contamination of surface water, groundwater, imported water, stormwater, and recycled water. The District participates in and complies with a number of plans and programs toward this purpose, most of them driven by state or federal regulatory agencies. Chapter 5 provides an overview of the District's approach to water quality issues, and Appendix X provides a summary of these programs and requirements.

District efforts to improve water quality in Santa Clara County implement several One Water Plan goals and objectives by addressing contaminants of concern in streams and reservoirs to protect drinking water sources; by complying with regulations such as Total Maximum Daily Loads and the Municipal Regional Stormwater Permit to reduce contaminants in local waterways; by conducting numerous water quality monitoring efforts; and by implementing trash and homeless encampment cleanup programs.

More details on all these plans, programs and activities can be found in embedded links and in the online supporting materials for the One Water Plan.

COORDINATION WITH NEIGHBORING COUNTIES

Santa Clara Valley Water District engagement with the county's neighbors occurs across multiple fronts that span water supply, flood protection, and watershed stewardship. The District also coordinates with non-neighboring counties around the Bay Area and the State of California for integrated regional planning, water supply operations, and flood risk coordination. Additional coordination with neighboring counties will be necessary at the watershed-specific level where there are shared resources.

Collaborative Activity	Partner(s)	Neighboring County
Flood protection along San Francisquito Creek from the Bay to HWY 101	San Francisquito Joint Powers Authority	San Mateo
Water supply via the San Felipe Division	San Benito County Water District; United States Bureau of Reclamation	San Benito
Water supply via South Bay Aqueduct	Alameda County Water District; Zone 7 Water Agency; California Department of Water Resources	Alameda
Groundwater management	Alameda County Water District, San Benito County Water District; San Mateo County	Alameda; San Benito; San Mateo
Soap Lake floodplain preservation	Pajaro River Watershed Flood Prevention Authority	San Benito and Santa Cruz
Integrated regional water management	SF Bay Integrated Regional Water Management Coordinating Committee; Pajaro River Watershed Regional Water Management Group	Alameda, San Benito, Santa Cruz, and San Mateo
South Bay Salt Pond Restoration	California State Coastal Conservancy	Alameda and San Mateo

One Water Plan acknowledgements - continued

Non-District One Water Team

**Center for Collaborative Policy,
California State University, Sacramento**
Ana Cortez
Ariel Ambruster
David Ceppos
Marcelle Dupraw
Stephanie Horii

**San Francisco Estuary Institute/
Aquatic Science Center**
Josh Collins
Robin Grossinger
Scott Dusterhoff

One Water Plan Production Team
Technical Editor: Ariel Rubissow Okamoto
Assistant Editor: Lisa Owens Viani
Design: Darren Campeau

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Managing water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values

Santa Clara Valley Water District