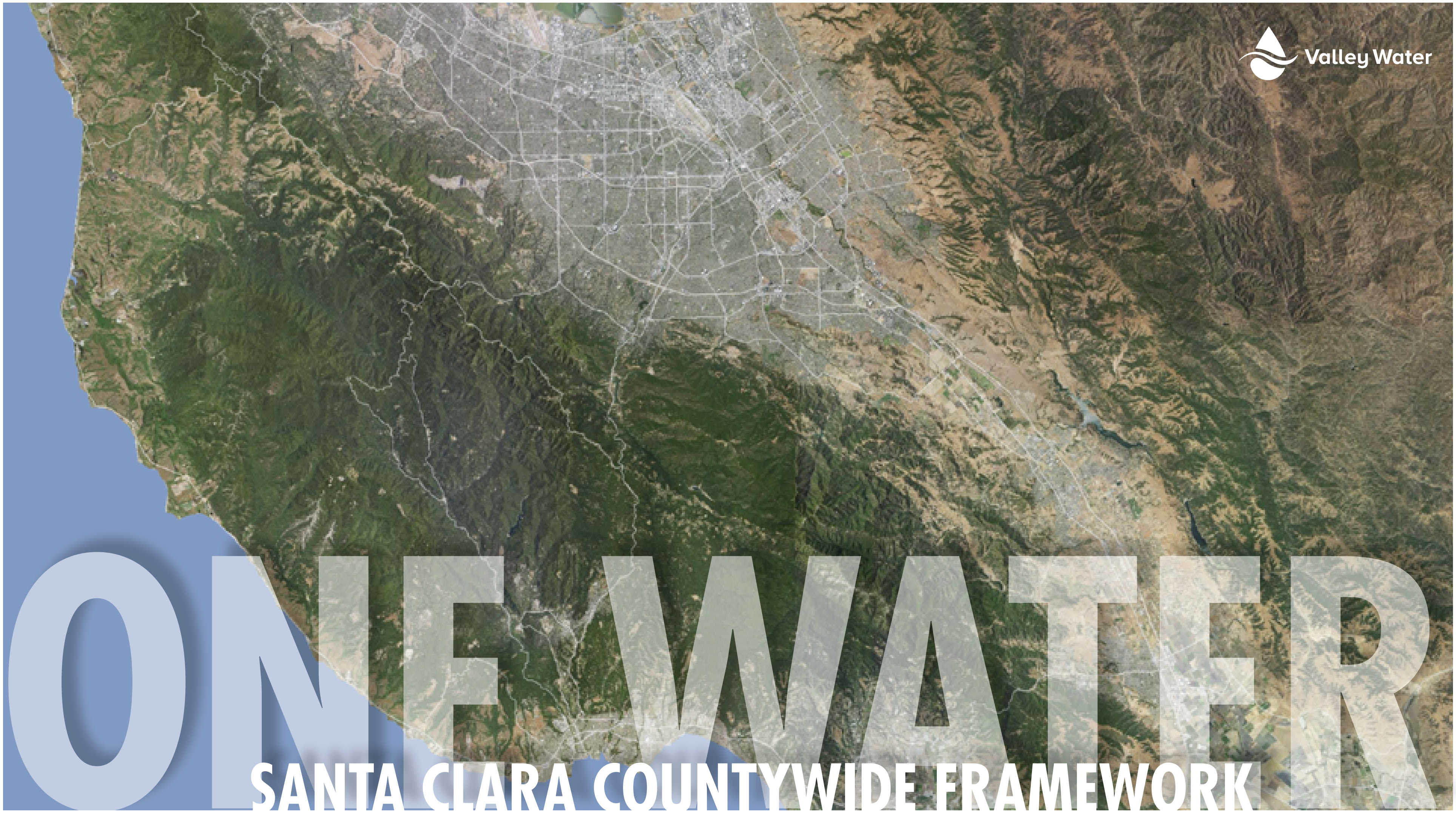

Valley Water

ONE WATER

SANTA CLARA COUNTYWIDE FRAMEWORK

An Integrated Approach to Water Resources Management

Draft Report Spring 2021

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EXECUTIVE SUMMARY

ONE WATER

Integrated Watershed Master Planning

Water is an essential resource, serving multiple critical purposes for the community. As droughts, floods, population growth, and other changing conditions all place increasing demands on California's water resources, Valley Water recognizes the importance of an integrated and equitable approach to water resources management. This approach will enable the organization to efficiently fulfill its mission and Board policies (see table below).

Valley Water's central challenges in the years ahead are to deliver reliable water supply, maintain and improve flood risk reduction, and preserve and enhance environmental stewardship with finite resources. To do this well, Valley Water needs a decision-making process that enables it to strategically allocate limited resources to those actions that achieve its mission and service to the community most efficiently. The One Water planning effort described in this report meets this need and provides an important new roadmap for integrated resource planning on a watershed scale.

Development of the One Water Countywide Framework engaged stakeholders at all levels and stages of a multi-year planning process. Stakeholders included local cities and county agencies; regional, state and federal resource management and regulatory agencies; scientists and academia; representatives of cultural and ethnic interests; as well as environmental advocacy groups, chambers of commerce, water retailers, and neighborhood and volunteer organizations.

Valley Water's One Water planning effort consists of a Countywide Framework (this report) and individual watershed plans for the Coyote, Guadalupe, Pajaro, West Valley, and Lower Peninsula watersheds, which Valley Water hopes to complete as early as 2023. The framework will guide development of the watershed plans as it sets out goals, measurable objectives, and strategies for prioritizing actions that will improve watershed health. Improvements to watershed health will be based on the extent to which watershed objective metrics measure up against achievable targets.

Valley Water Mission and Board Ends Policies	One Water Vision and Goals	One Water Objectives
To provide Silicon Valley safe, clean water for a healthy life, environment, and economy.	***To manage water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.***	All (A thru E)
E-2 Water Supply	**Goal 1**	
E-2.1 Current and future water supply is reliable.	Reliable Water Supply	Objective A: Protect, maintain, and develop local surface and ground water supplies
E-2.3 Reliable high-quality drinking water is delivered.		Objective B: Support high quality surface water in reservoirs for applicable human and aquatic life uses
E-3 Natural Flood Protection	**Goal 2**	
E-3.1 Provide natural flood protection.	Improved Flood Protection	Objective C: Reduce Flood Risk
E-3.2 Reduce potential for flood damages.		Objective C: Reduce Flood Risk
E-4 Water Resources Stewardship	**Goal 3**	
E-4.1 Protect and restore creek, bay, and other aquatic ecosystems.	Healthy and Resilient Ecosystems	Objective D: Protect, Enhance and Sustain Natural Ecosystems
E-4.3 Strive for zero net greenhouse gas emission or carbon neutrality.		Objective E: Mitigate and Adapt to Climate Change

APPROACHING MANAGEMENT CHALLENGES IN A MORE INTEGRATED WAY

The One Water approach identifies challenges to successful water resources management ranging from drought and pollution to the destruction of riparian habitats. Meeting the water resources needs of the community through management of these challenges and constraints is often considered by planning area (see table). For Valley Water, these have included ecological resources, flood protection, landscape resources, water quality, and water supply.

The One Water approach offers a decision-making process that helps address management challenges through multi-benefit projects or portfolios of coordinated activities. This approach offers a few key strengths in addition to meeting the outlined goals and objectives as it defines the process and prioritizes activities.

One strength of Valley Water's One Water approach is the opportunity to revisit how data is collected and utilized to prioritize activities. For flood risk, as an example, the new approach updates the Waterways Management Model criteria used in the past to include additional important factors that characterize the true risks of flooding for the community. Some of these factors are health and safety issues like flood depth and velocity, the varied social vulnerability of the flood prone communities, actual flood history, and business risk exposure.

Another strength of the One Water approach is a more comprehensive perspective on ecological resources. Efforts to protect threatened and endangered species have long created a management focus on specific species of flora and fauna. One Water expands from this focus to address habitats and natural communities, and to support the approach taken by the Santa Clara Valley Habitat Plan, which covers much of the county landscape. This broader area of management interest allows for improvements to overall habitat that will reduce invasive species and support threatened and endangered species, as well as other native species.

DIVERSE CHALLENGES CALL FOR COORDINATED ACTION

PLANNING AREA	CHALLENGES
Water Supply	Multi-year droughts Hydrologic variability Declining imported water reliability Increasing demand Complex operating environment Aging infrastructure Invasive species impacts
Water Quality	Impervious surfaces Urban and agricultural runoff Homeless encampments Legacy mercury Climate change impacts
Flood Protection	Continued risk of flooding Expense of future projects Aging infrastructure Changing climate Increasing development, decreasing buffer zones Impervious surfaces Erosion and sediment management for capacity Rising sea levels and permit acquisition

PLANNING AREA	CHALLENGES
Landscape Resources	Limited and costly land for trails and open space Recreational impacts on habitat and water quality Maintenance impediments and costs Planning for future flood protection
Ecological Resources	Ongoing land use changes Altered drainage network and hydrologic regime Destruction and disconnection of riparian habitats Non-native species Loss of sediment and woody debris Habitat fragmentation Ecological adaptation to climate change
Baylands	Rising sea levels Weak and aging levees Sediment deficit Mercury mobilization Under-insured businesses

A third strength of One Water's coordinated planning framework is the strong guidance on integrated water management it will provide to each of its five supporting watershed plans. These more detailed action plans will then serve as Valley Water's flood management and stewardship plans at a watershed scale.

Taken as a whole, One Water planning provides an opportunity to address multiple management challenges in parallel, and within an integrated, watershed-based framework. That framework, with its vision, goals and objectives will therefore provide the guidance for future prioritized work.

Community meeting presenting proposed interim flood protection improvements along Coyote Creek. Photo: VW

VISION

One Water's vision and goals were developed to support both Valley Water's mission and Board governance policies, which in part call for integrated water resources services for the community.

> **One Water Vision**
> *Manage Santa Clara County water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.*

The vision is supported by integrated goals and measurable objectives to optimimize Valley Water's management of water resources for Santa Clara County.

VALLEY WATER MANAGES

5 *watersheds*

275 *miles of stream channel*

17 *miles of canal*

10 *reservoirs*

265 *acres of recharge ponds*

3 *drinking water treatment plants*

1 *recycled water purification center*

GOALS

To reach the long term One Water vision, Valley Water developed goals that go beyond individual management disciplines. The resulting goals address and integrate all aspects of water resources management:

RELIABLE WATER SUPPLY

This One Water reliable water supply goal aims to provide enough clean water for both people and the environment. Under this goal, Valley Water seeks to ensure that its supplies for people and the environment are reliable under uncertain conditions such as climate change, drought and changing laws. For Valley Water this means to efficiently manage the diverse supplies and substantial infrastructure already in place and continuing to aggressively implement and promote its water conservation program with the community to manage demand.

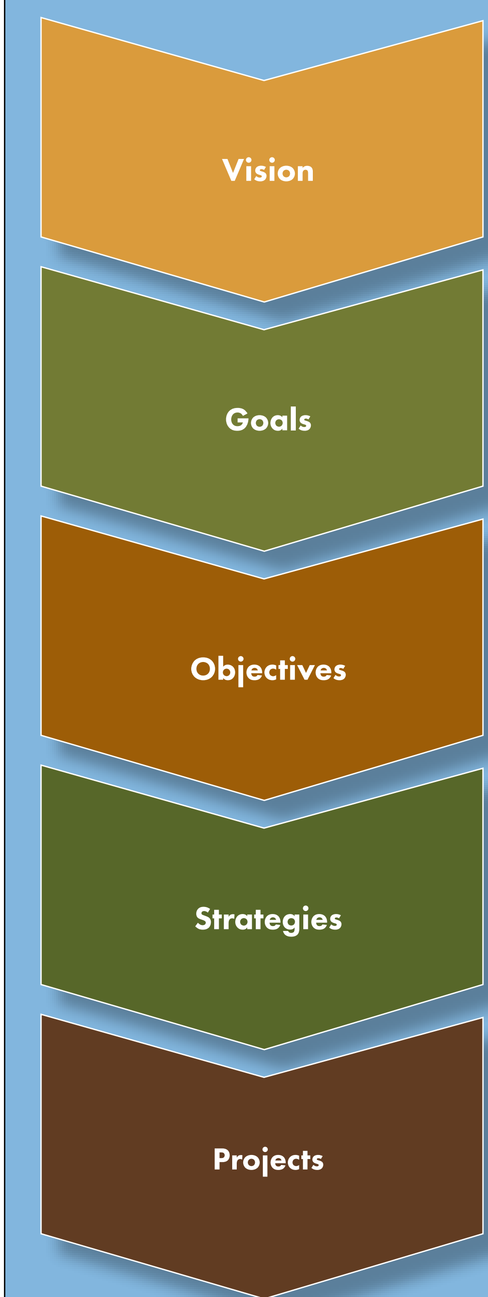
IMPROVED FLOOD PROTECTION

This One Water flood protection goal aims to reduce flood risk and protect the community from flooding by working with nature to the greatest extent possible. For Valley Water, this means enhancing stream corridors to support the conveyance of flood flows while at the same time providing benefits for natural communities and ecosystems. The goal of improving flood protection includes maintaining existing facilities, improving facilities that require additional risk reduction, and keeping the community prepared and informed of potential flood risks.

HEALTHY AND RESILIENT ECOSYSTEMS

This One Water goal underscores the importance of healthy and resilient watershed, riparian and tidal ecosystems, and the species that rely on these habitats to thrive. Making ecosystem health more relevant to every management decision is a key concept in One Water planning. For Valley Water to effectively manage ecosystems, it will be important to protect, enhance and sustain these important natural resources.

One Water Framework



OBJECTIVES

The One Water planning framework comprises five objectives, each with individual metrics and targets. Valley Water designed these objectives to meet the framework's three goals and achieve the One Water vision.

In developing the five One Water objectives, Valley Water provided meaningful opportunities for diverse Santa Clara County communities to engage in the planning process. Valley Water's commitment to community engagement is woven throughout the five One Water objectives. As such, it is not represented as an end in itself but rather as a means to gathering community support for future priorities that protect, enhance and sustain water resources.

One Water Plan Objectives:


A: Protect and Maintain Water Supplies


B: Protect and Improve Surface and Ground Water Quality


C: Reduce Flood Risk

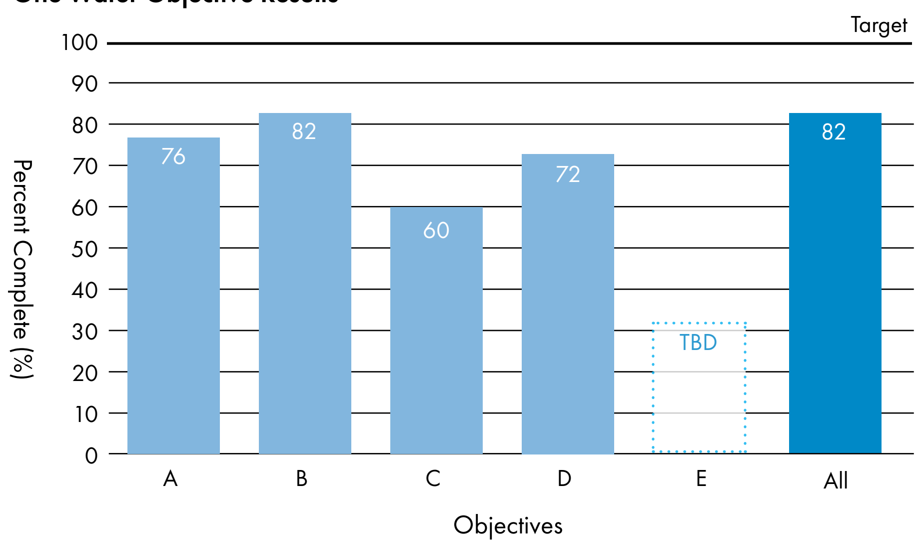

D: Protect, Enhance and Sustain Natural Ecosystems


E: Mitigate and Adapt to Climate Change

Metrics

Each of the five objectives includes specific attributes, which are the defining characteristics that describe the objective. Each attribute in turn contains a series of metrics, which are parameters that can be measured to track the status of the attributes. To assess progress, each metric will be assigned a target, which is an achievable end result to maintain or strive for within each metric.

One Water Objective Results



Draft Data for One Water Objectives (Countywide and Coyote Watershed).
A (Water Supply), B (Water Quality), C (Flood Risk Reduction), D (Habitat), E (Climate Change)

SETTING PRIORITIES AND TAKING ACTION

The One Water Framework provides overarching countywide guidance for five subsequent watershed plans in Coyote, Guadalupe, Pajaro, West Valley, and Lower Peninsula Watershed areas. The process for applying the framework includes the following steps (see diagram):

- Describe the landscape and its water resources history (Step 1).
- Establish the current baseline conditions for One Water objectives (Step 2).
- Identify which are the most challenging objectives to meet in terms of targets, and thus potential areas of improvement (Steps 3 and 4).
- Prioritize those actions that most efficiently and effectively improve conditions and meet the highest needs (Step 5).
- Select actions for programming and implementation through funding plans, grants, partnerships, and other means. Follow up with appropriate construction, maintenance, and management actions (Step 6).
- Carry out monitoring and reporting on progress of actions toward meeting targets (Step 7).

One Water watershed plans are not designed to be static, one time documents, they should be updated regularly. This important follow up should include updates of metrics and targets information supporting each One Water objective. Such updates would in turn help to demonstrate progress being made in improving watershed health, reducing flood risk, and ensuring reliable water supply.

Both the Framework and the individual plans will not only guide Valley Water but also serve as a resource for local government, NGOs, community groups, and other partner organizations.

WATERSHED PLANS SCHEDULE

2021
COYOTE

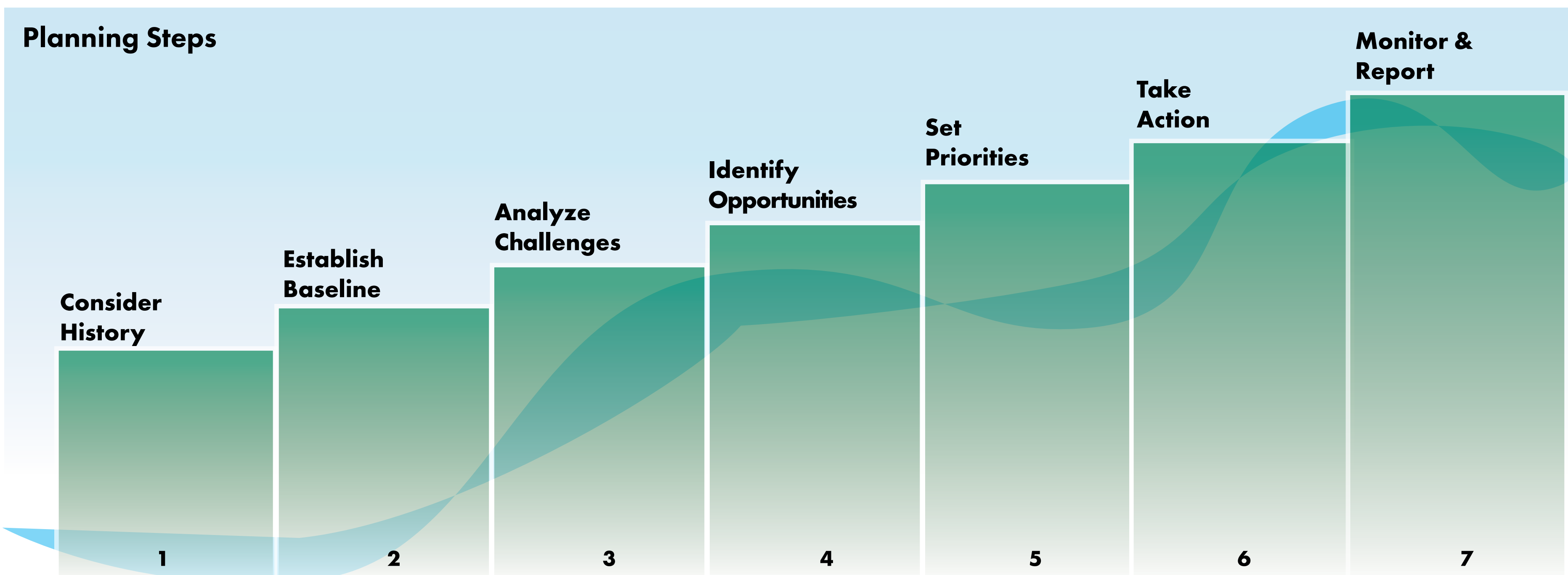
2022
GUADALUPE

2022
PAJARO

2023
WEST VALLEY

2023
LOWER PENINSULA

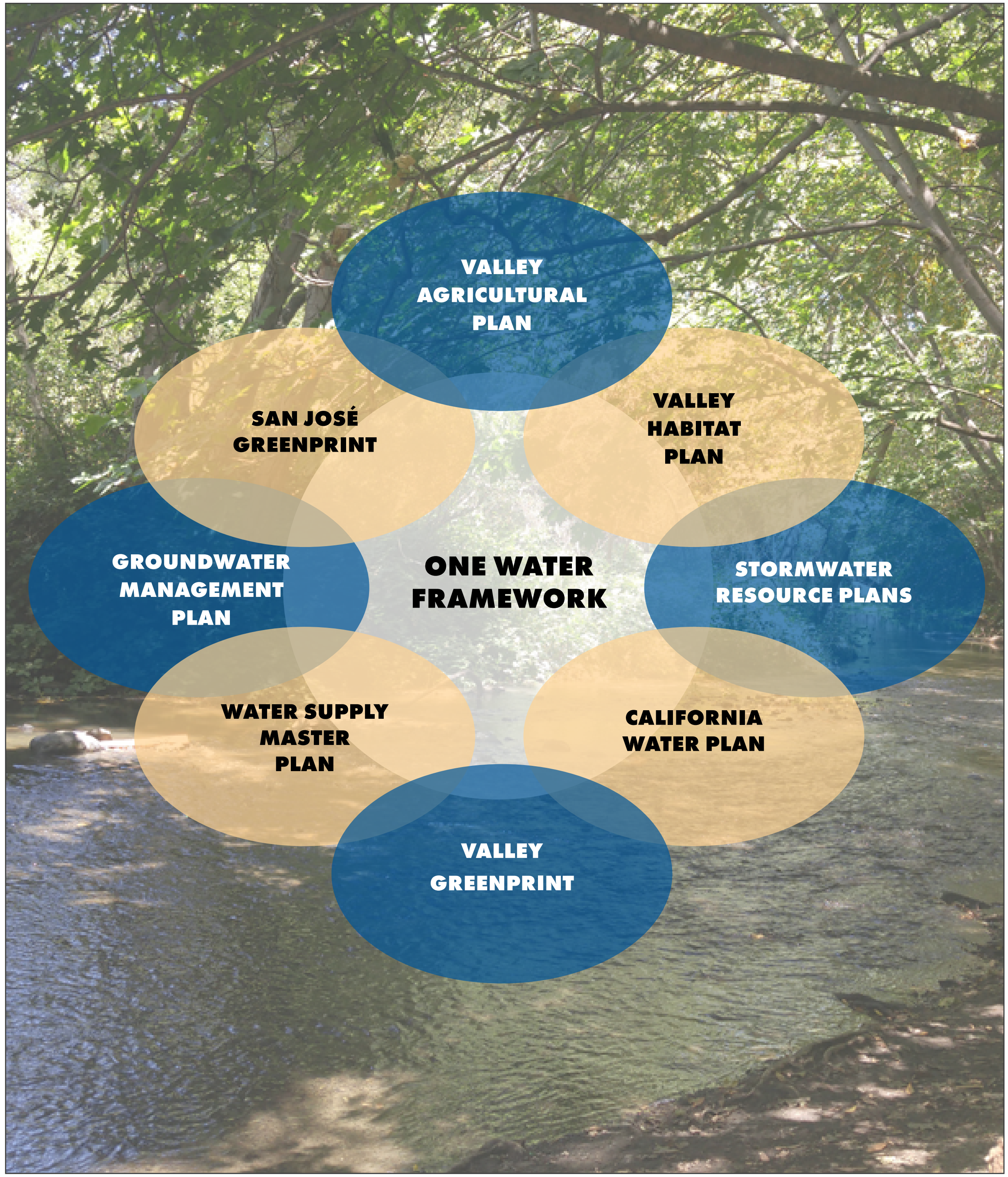
Beyond the individual watershed plans, the Framework itself provides a list of potential projects, programs, policies and partnerships which are appropriate at a countywide scale. These may be addressed countywide or implemented piece-by-piece at a watershed-scale.



PLANNING THROUGH PARTNERSHIPS

The One Water Framework can be most successful through robust participation of Valley Water staff, as well as partner agencies and organizations. Close coordination with existing plans and programs allows One Water to build on successful endeavors and incorporate relevant expertise, and it also allows for One Water and its vision to become integrated into corresponding planning and implementation efforts.

Long range planning at the local, regional, and state level covers many of the same topics as One Water and gives Valley Water a path to addressing larger regional and statewide challenges at the local level, including climate resilience, reliable water supply, and stormwater resource management. As Valley Water rolls out the One Water Framework and subsequent watershed plans, it will strive to gain support for improved water resources management and watershed conditions.



WEAVING COMMUNITY AND EQUITY INTO WATERSHED PLANNING

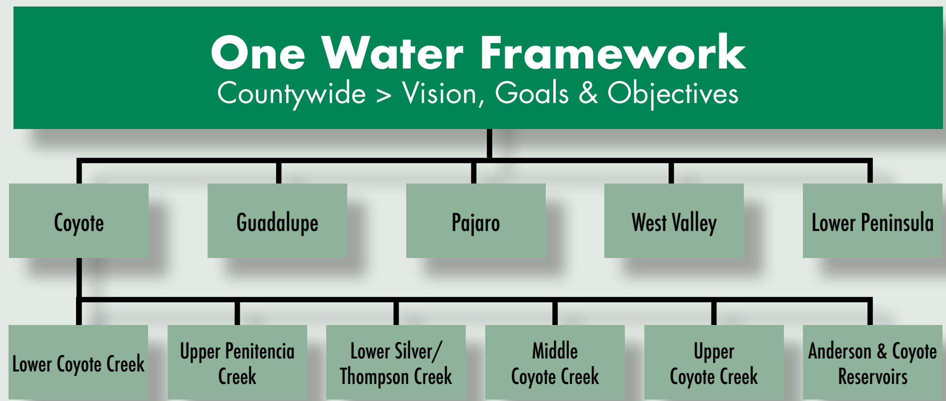
Valley Water has remained committed to providing meaningful opportunities for community engagement in watershed planning throughout the development of the One Water Countywide Framework. This commitment will be further reflected and refined as watershed plans seek to address both one water objectives but also make them locally relevant to the people living in each watershed. By engaging stakeholders throughout the community, Valley Water can build on their strengths and expertise to create a plan that speaks to all of our water resource needs.

Equitable access to clean water and management of our shared water resources will be an ongoing challenge that One Water can help address. As new challenges such as climate change and income inequity mount in the years ahead, Valley Water will continue to deliver clean water, reduced flood risk, and resilient healthy landscapes to all the people of Santa Clara County.

What's included in the One Water Framework?

- Overviews of past and present conditions including detailed maps of water supply infrastructure, flood control channels, descriptions of sensitive habitats and species, and discussion of management impacts on local communities, agriculture, groundwater, trails, conservation efforts, and other current topics.
- Framework goals, objectives and metrics spelled out.
- Examples of integrated projects already occurring on a countywide scale including the restoration of the South Bay salt ponds, the Shoreline Study for coastal flood protection levee on the bayshore, a plan to capture more stormwater as a resource, efforts to clean up homeless encampments, near-water recreation and hazardous tree abatement programs, and more.
- Clear guidance for more detailed watershed plans. By way of example, appropriate One Water actions may include projects such as expanded riparian habitat, offstream flood detention, and improved fish habitat and passage.
- Reference appendices on special status plant, animal and fish species, as well how One Water relates to other Valley Water and partner plans, regulations, and policies.
  LINK TBD

Watershed-Based Planning Structure



Executive Summary: One Water, Santa Clara Countywide Framework, Valley Water (184 pages)

Version 6, February 2021

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1 INTRODUCTION

New parklands create floodplain and quiet recreation space in urban San José. From the air, the hills represent the shapes of salmon swimming upstream. Photo: Valley Water

INTRODUCTION

1.1 WHY ONE WATER?

Valley Water, formerly known as the Santa Clara Valley Water District, is the primary water resources agency in California's Santa Clara County. Located at the southern edge of San Francisco Bay and encompassing the economic engine that is Silicon Valley, Valley Water is responsible for providing clean, safe water, flood protection, and stewardship of aquatic habitats on behalf of the county's 1.9 million residents. Valley Water's publicly elected Board of Directors has developed governance policies, broadly defining the water resource outcomes desired by the community over time. These outcomes include making sure Santa Clara County's residents, businesses, and farmers have a reliable and dependable source of clean water for drinking, bathing, landscaping, farming, recreation, and industry. They also include reducing the risk of flood damage to homes, businesses, schools, and other developed lands and transportation networks. And finally, they include protecting, restoring, and enhancing streams, riparian corridors, wetlands, tidal marsh and other natural aquatic resources, and encouraging the recovery and health of native species.

Managing the county's water resources to meet these desired outcomes requires a means to prioritize actions. At times, priorities may lead to single purpose actions; at others, there may be opportunities for actions that may have multiple benefits. And there may be future trends that bring additional constraints and challenges. For example, a growing regional population may increase demand for water supply, while a changing climate may point to more extremes in water availability. Such extremes could increase water scarcity, flood risk, and temperature stress on natural ecosystems.

Valley Water faces the challenge of delivering reliable water supply, maintained and improved flood risk reduction, and preserved and enhanced environmental stewardship with finite resources. To do this well, Valley Water needs a decision-making process to strategically allocate limited resources to actions that achieve its mission and service to the community. One Water will lay the foundation for this process.

NATIONAL CONTEXT

The US Water Alliance's One Water Council, a diverse group of water leaders nationwide, completed a roadmap in 2016. According to the roadmap, the hallmarks of One Water, all central to Valley Water's planning effort, are:

1. The mindset that all water has value—from the water resources in our ecosystems to our drinking water, wastewater, and stormwater.
2. A focus on achieving multiple benefits, meaning that our water-related investments should provide economic, environmental, and societal returns.
3. Approaching decisions with a systems mindset that encompasses the full water cycle and larger infrastructure systems.
4. Utilizing watershed-scale thinking and action that respects and responds to the natural ecosystem, geology, and hydrology of an area.
5. Relying heavily on partnerships and inclusion, recognizing that real progress will only be made when all stakeholders have a seat at the table.

The One Water approach recognizes that water must be managed in ways that respect and respond to the natural flows and ecology of watersheds. It embraces watersheds as the context in which communities reconcile their water demands with the imperative of sustaining the resource for future generations. Watershed-level management brings together regional partners from within and beyond the water sector in joint planning and collaborative action to protect the shared natural resource that is essential for health, agriculture, industry, aquatic species, forests, wildlife, recreation, and life itself.

The One Water vision is to manage Santa Clara County water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.

One Water Components

1. ***Vision:*** Based on the Board's required outcomes, develop an integrated long-term One Water vision and goals that articulate agency direction.
2. ***Objectives:*** Develop objectives that define focal areas for action needed to achieve the integrated goals.
3. ***Metrics:*** For each objective, develop metrics that enable evaluation of the agency's status in meeting its objectives and goals and clearly demonstrate progress over time.
4. ***Actions:*** Follow a systematic, needs-based approach for prioritizing actions to meet long-term level of service targets.
5. ***Watershed Plans:*** Assemble watershed plans that integrate water utility, flood risk reduction, and stream stewardship objectives on a geographic basis enabling coordinated prioritization and action.

One Water is a decision-making process to strategically allocate limited resources to actions that achieve Valley Water's mission and service to the community.

Table 1-1: How One Water Reflects Established Valley Water Directives

Valley Water Mission and Board Ends Policies	One Water Vision and Goals	One Water Objectives
To provide Silicon Valley safe, clean water for a healthy life, environment, and economy.	***To manage water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.***	All (A thru E)
E-2 Water Supply	**Goal 1**	
E-2.1 Current and future water supply is reliable.	Reliable Water Supply	Objective A: Protect, maintain, and develop local surface and ground water supplies
E-2.3 Reliable high-quality drinking water is delivered.		Objective B: Support high quality surface water in reservoirs for applicable human and aquatic life uses
E-3 Natural Flood Protection	**Goal 2**	
E-3.1 Provide natural flood protection.	Improved Flood Protection	Objective C: Reduce Flood Risk
E-3.2 Reduce potential for flood damages.		Objective C: Reduce Flood Risk
E-4 Water Resources Stewardship	**Goal 3**	
E-4.1 Protect and restore creek, bay, and other aquatic ecosystems.	Healthy and Resilient Ecosystems	Objective D: Protect, Enhance and Sustain Natural Ecosystems
E-4.3 Strive for zero net greenhouse gas emission or carbon neutrality.		Objective E: Mitigate and Adapt to Climate Change

1.2 VALLEY WATER MISSION AS PART OF ONE WATER

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 Valley Water. Water supply is also important for fish and wildlife in streams and water bodies managed by Valley Water.

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 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 remain- der comes from local rainfall, much of which is captured in Valley Water'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 Valley Water's three drinking water treatment plants. Water recycling and conservation are important components of Valley Water's water supply system. To provide greater reliability, Valley Water also "banks" water in groundwater storage outside of the county, which can be called upon during dry times.

Valley Water 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. Valley Water also delivers treated drinking water to retailers.

Flood Protection

Protecting people, homes, businesses, and transportation networks from the devastating effects of floods is another of Valley Water'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 benefited the environment. As the county's population and economy grew, however, flooding became a problem. Today, communities can suffer millions of dollars in property damage from flooding and vital roadways can 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. Valley Water has worked to keep pace with these changes and now employs numerous flood protection techniques 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.

Environmental Stewardship

Unique among water agencies, state legislation authorizes Valley Water "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. Valley Water's environmental work protects and restores habitats and encourages the recovery of special status species.

In addition, Valley Water partners with cities and the County of Santa Clara to provide open space and recreational opportunities, and address water quality impairments, 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

1.3 FRAMEWORK DEVELOPMENT

Valley Water is undertaking One Water planning in two phases: 1) Countywide framework to develop goals and objectives as guidance for watershed-based planning; and 2) watershed level plans specific to each of the five watersheds described above.

From the beginning in 2014, planning has been a collaborative process, with input from Valley Water staff and its Board of Directors, and from stakeholders representing the larger community of Santa Clara County, partner agencies, and regional science experts (see pp. 9-10).

Stakeholder engagement for the One Water planning process 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, Valley Water maintains a website for One Water planning and is using technical support from several partners for the effort.

1.4 FRAMEWORK ORGANIZATION

Chapter 1 introduces the purpose and need for this plan. It also provides a background description of the geographic setting of Santa Clara County, including the county's major watersheds. The chapter concludes with a history of the One Water planning process.

Chapter 2 provides the environmental and human development setting for the plan. It describes the past cultural and natural history of the county, its historical human development, and milestones in the development of Valley Water. The chapter then describes the current condition, the water, flood protection, and stewardship infrastructure present, and current challenges. Finally, the chapter discusses projected future conditions and challenges, including climate change.

Chapter 3 develops the One Water framework in detail. It describes the path from the Valley Water Mission and Board Ends policies developed by the Board of Directors to the One Water vision and integrated watershed planning goals. It then discusses how those goals were separated into coherent and direct objectives, which form the heart of the One Water framework

Chapter 4 delves deeper into the heart of the prioritization process. It defines objectives and describes how progress in achieving them can be measured through attributes and metrics. This chapter is foundational to the watershed plans to be developed for each major county watershed. It describes how plan development and prioritization occurs and the foundational role of "watershed health" in prioritization.

Chapter 5 discusses implementation of the One Water framework and includes the projects, programs and policies that are best addressed at the countywide scale.

VALLEY WATER MANAGES

5
watersheds

275
miles of stream channel

17
miles of canal

10
reservoirs

265
acres of recharge ponds

3
drinking water treatment plants

1
recycled water purification center

1.5 THE COUNTY SETTING

Santa Clara 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. 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 Valley Water'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 Framework.

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 host many of Valley Water'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 extent 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, Valley Water 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 planning 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.

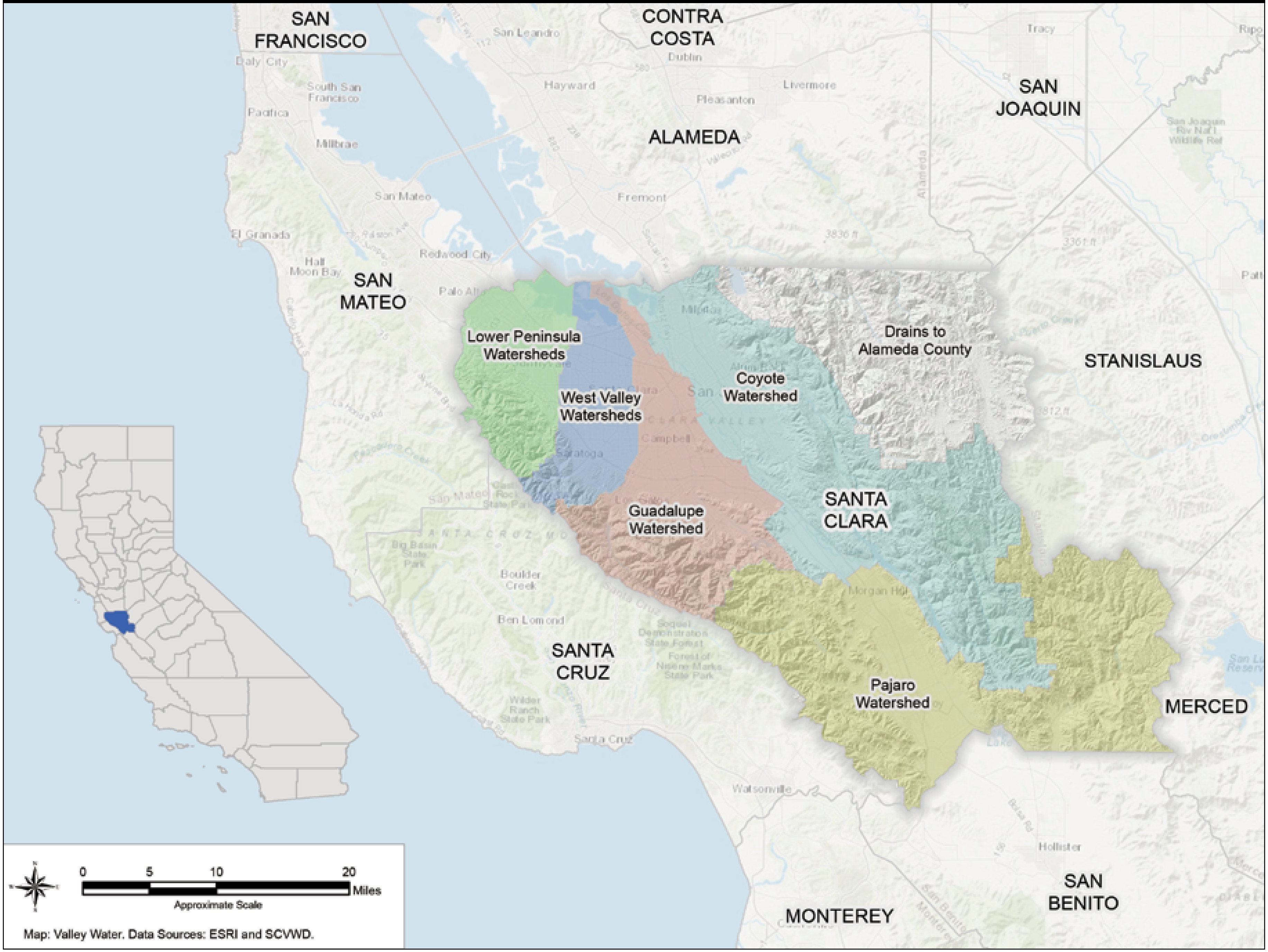
Coyote Creek Watershed

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 José) located in its upper reach. Other tributaries include Fisher Creek, Upper Silver Creek, Lower Silver/Thompson creeks, and Lower Berryessa Creek. Valley Water-owned reservoirs in this watershed include Coyote and Anderson reservoirs, both located on the main stem of Coyote Creek east of the 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

Figure 1-1: Santa Clara County Watersheds



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 José. From there it flows north approximately 14 miles through heavily urbanized portions of San José, eventually discharging to San Francisco Bay via Alviso Slough. Los Gatos Creek joins the Guadalupe River in downtown San José. Valley Water-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. Valley Water operates the Almaden-Calero Canal which enables the transfer of water from Almaden Reservoir to Calero Reservoir. The San José Water Company owns and operates the Lake Elsman reservoir, located on Los Gatos Creek above Lexington Reservoir.

Steelhead. Photo: James Hobbs

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. Valley Water 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 Valley Water 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 Valley Water 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. Valley Water 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 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 Valley Water 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.

1.6 ADDITIONAL PERSPECTIVES ON ONE WATER

Stakeholder Work Group

Initial stakeholder outreach for One Water was conducted through a centralized, diverse Stakeholder Work Group (SWG). The group met approximately bimonthly during plan development. The group was intended to represent all or most aspects of the community at large.

The SWG's role was (and will continue to be throughout the development of individual watershed plans) to review Valley Water products (e.g., goals, objectives, and strategies) and provide perspective from stakeholder areas of interest. SWG routinely worked at various levels of detail, reviewing materials and providing comments. Stakeholder input has been and will be incorporated as much as is feasible, while Valley Water Board retains authority for final approval of the One Water Framework and associated products.

Agency Planning Team

The Agency Planning Team (Agency Team) has been a group of resource and regulatory agencies providing input on the One Water Framework, 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 Valley Water 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 p.10 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 Valley Water's behalf to provide impartial feedback on the master planning process (See page opposite for hub members).

Details on One Water planning process, including agendas and minutes, can be found at www.onewaterplan.wordpress.com

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 José State University

Brandon Davis, Downtown Streets Team

Eric Dunlavey, City of San José

Anthony Eulo, Morgan Hill

Matt Freeman, Santa Clara Valley Open Space Authority

Victor Garza, La Raza Roundtable of California

Andrew Gere, San José Water

Kit Gordon, Sierra Club

Russ Hancock, Joint Venture Silicon Valley

Nicole Harvie, San José 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 José State University

Eileen McLaughlin, Citizens Committee to Complete the Refuge

Mike Mielke, Silicon Valley Leadership Group

Reverend Moore, II, San José/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 José Silicon Valley

Ken Podgorsek, United Neighborhoods of Santa Clara County

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Curt Rayer, San José Water Company

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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 José 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

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

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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

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Ryan Olah, Pacific Southwest Region, U.S. Fish and Wildlife Service

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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

** All positions current as of August 2016.*

2 SETTING

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

2.1 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 Valley Water.

2.1.1 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 14-15). Historical ecology and other related information is available at: www.sfei.org/he

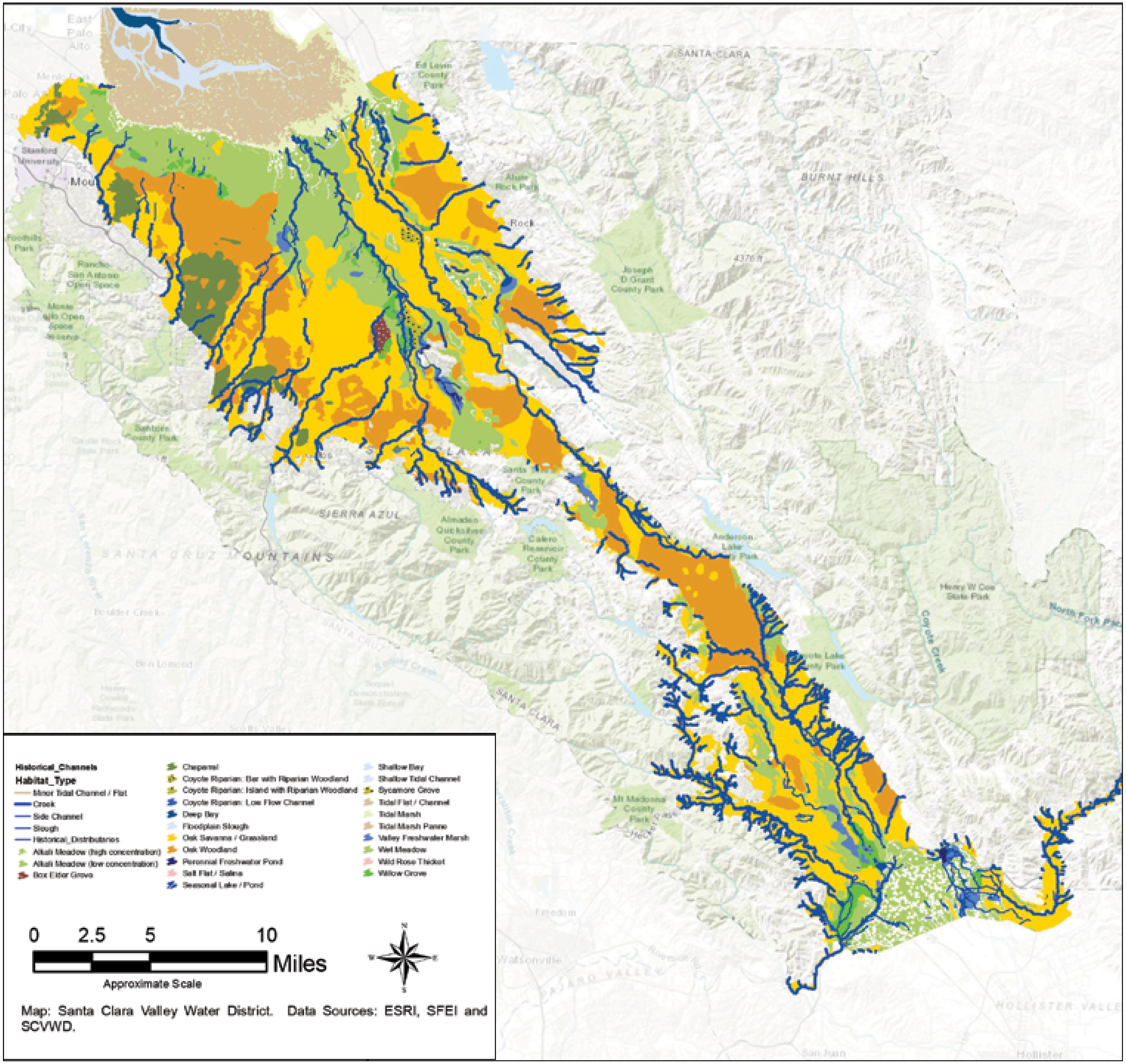


Figure 2-1. Historical drainage network (ca 1800) and habitat types (SFEI).

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

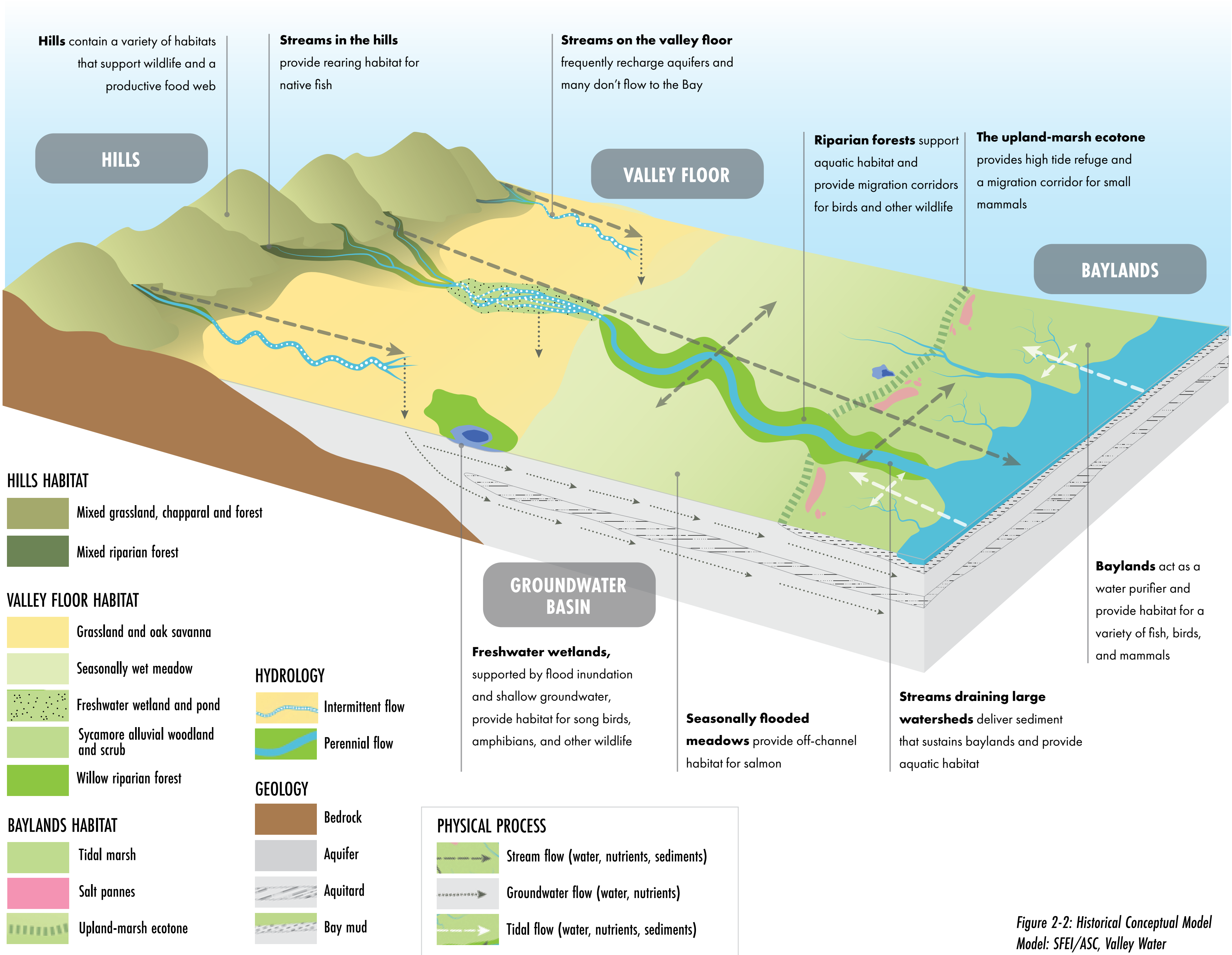


Figure 2-2: Historical Conceptual Model
Model: SFEI/ASC, Valley Water

2.1.2 TWO HUNDRED YEARS OF CHANGE

THE EARLIEST INHABITANTS

Humans have probably inhabited the 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 San José 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 the 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 José 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 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 was 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

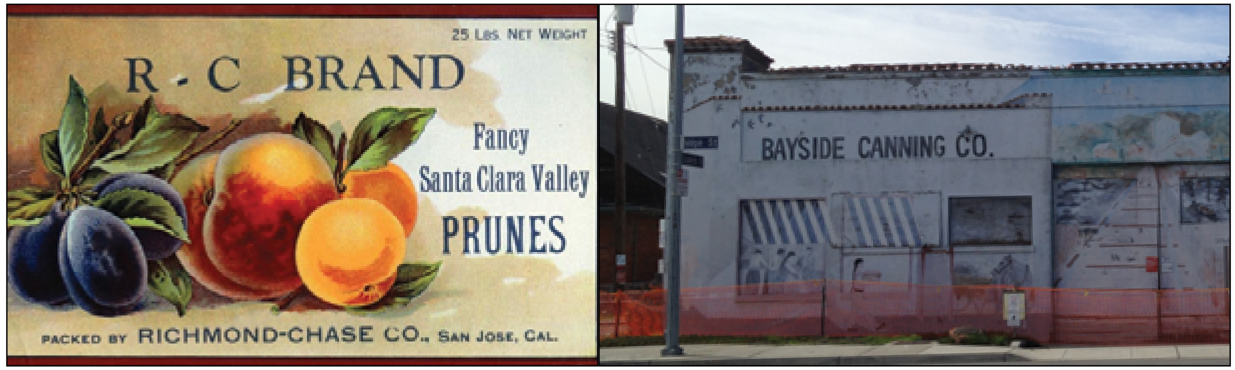
New Almaden quicksilver mining district in the south bay. Local communities, including Alviso, supported brine shrimp fishermen who worked the ponds.

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. The New Almaden and Guadalupe quicksilver mines, located in the hills south of San José, and active until the 1970s, 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, Imported Water

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.

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 through tidal creeks, impacting shallow groundwater.



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

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 Valley Water, 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. However, flooding remained a serious problem: floods in 1931, 1937, and 1938 halted transportation and inundated hundreds of acres of orchards and pastures. In 1939, the first imported water was delivered to the county through the San Francisco Public Utilities Commission's (SFPUC) Hetch-Hetchy system.

1940s – 1960s
Post War Growth, Early Industry

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. 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.21), 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, Valley Water turned to imported water for recharge. In 1965, the state of California began delivering water to Santa Clara County via the South Bay Aqueduct, which is part of the State Water Project; this transported water about 40 miles from the Sacramento-San Joaquin River Delta to Santa Clara County. Valley Water 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 Valley Water started delivering treated water to residents in the northwestern part of the county via local water retailers.

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

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 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.

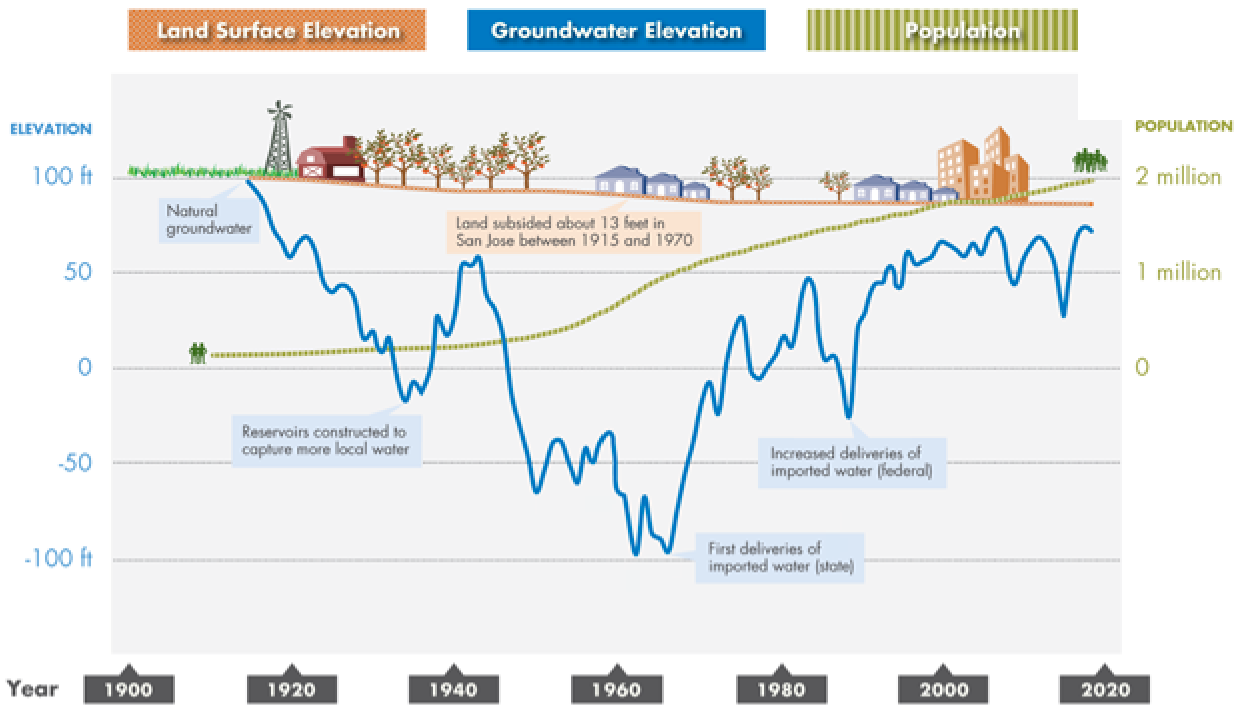


Figure 2-3: Santa Clara County Groundwater-at-a-Glance

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. According to 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 José in 1995 highlighted the need to complete flood protection projects, especially on the Guadalupe River through downtown San José. Floods from Coyote Creek impacted several neighborhoods in San José 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 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 Total Maximum Daily Load (TMDL) for the watershed was completed in 2010, which resulted in a variety of remediation and cleanup activities within the county and watershed.

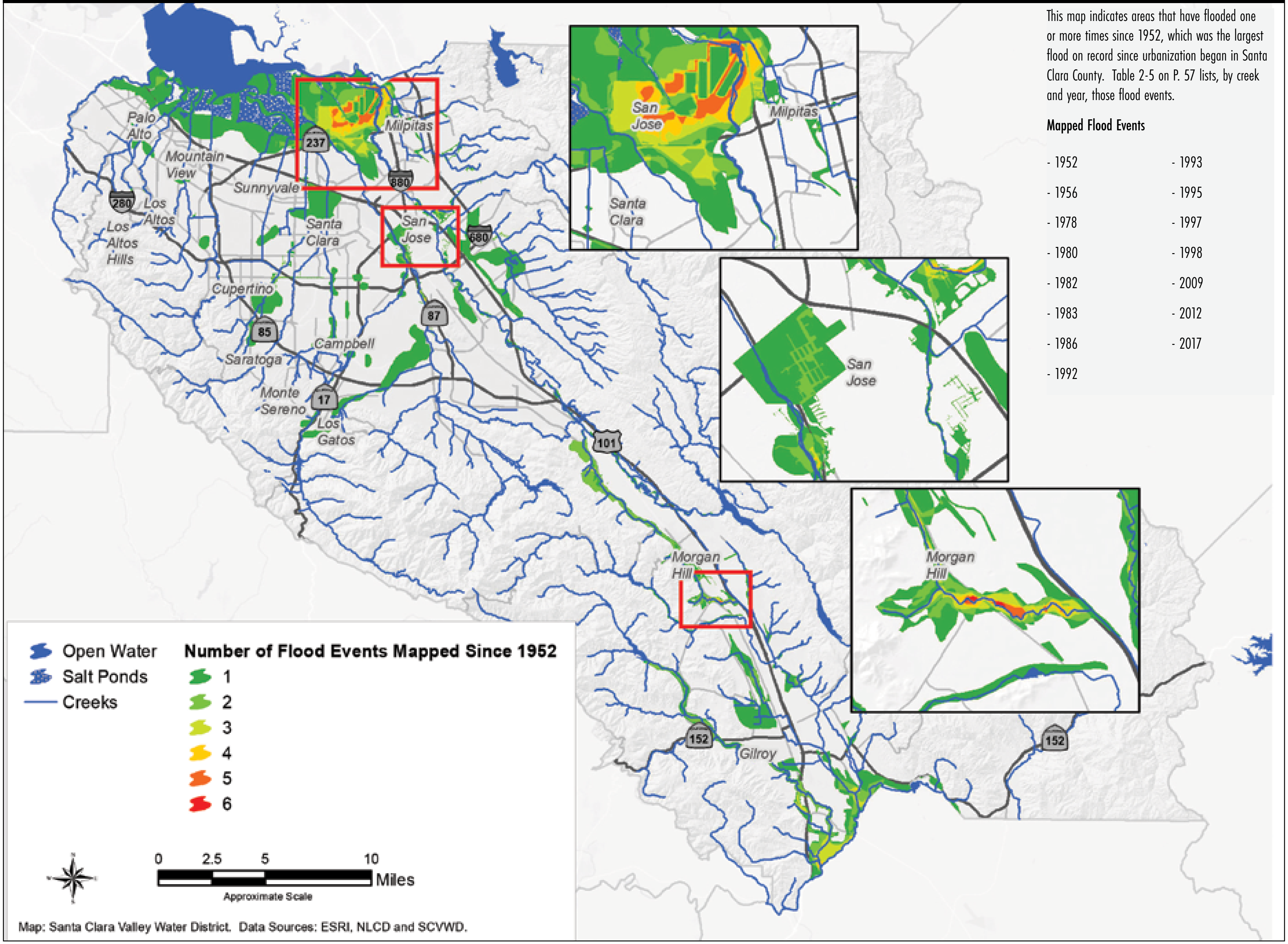
The District also took the lead in addressing pollution from leaking gasoline tanks (MTBE), and perchlorate (a chemical used in rocket fuel and explosives), which had contaminated more than 1,000 south county wells.

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 Santa Clara Valley Water District (renamed Valley Water in 2019) 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 Valley Water mission. This One Water plan calls for more integration. By viewing and managing water as one resource, Valley Water will be able to achieve its mission in a more integrated and sustainable manner.

Valley Water'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: Valley Water

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 2-5 on P. 57 lists, by creek and year, those flood events.

Mapped Flood Events

- 1952
- 1956
- 1978
- 1980
- 1982
- 1983
- 1986
- 1992
- 1993
- 1995
- 1997
- 1998
- 2009
- 2012
- 2017

RECENT VALLEY WATER 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 Santa Clara Valley Water District Act by providing the Santa Clara Valley Water 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 Santa Clara Valley Water District and resource agencies, and allows Santa Clara Valley Water District timely seasonal access to creeks for improved maintenance and environmental enhancement.

2003: Santa Clara Valley Water 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 Santa Clara Valley Water District's water rights and any related issues arising under state and federal laws concerning the impacts of Santa Clara Valley Water 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 Santa Clara Valley Water 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 Santa Clara Valley Water District's budget and other procedural holdovers from the 1968 merger. The Penitencia Water Treatment Plant begins delivering ozonated water to customers.

2008: Santa Clara Valley Water 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: Santa Clara Valley Water 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.

2014: Silicon Valley Advanced Water Purification Center opens in north San José, producing eight million gallons per day of highly purified water.

2015: Following another year of drought, Santa Clara Valley Water 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.

2019: Santa Clara Valley Water District renamed Valley Water. The agency continues post drought water conservation efforts (20 percent savings relative to 2013 demand). The State's Conservation as a California Way of Life legislation provides a road map of new and planned mandates to conserve water.

Guadalupe River Park Trail, San José

2.2 PRESENT CONDITIONS

2.2 PRESENT CONDITIONS

Any planning process, such as Valley Water'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 Framework.

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 2.3: Future Conditions. Valley Water looked at these elements together to simultaneously examine the building blocks of the future and encourage the cross-disciplinary thinking of One Water planning.

2.2.1 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 percent 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. Approximately 20,900 acres in the county are in irrigated agriculture while 224,230 acres support grazing cattle.

Land use throughout Santa Clara County is varied (see Figure 2-5, p.26), 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 José State University.

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. Three 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 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 Valley Water's 10 reservoirs are located in the hills above the valley floor.

Wildflowers on Coyote Ridge.

Climate and Precipitation

The climate and precipitation patterns of the region are key to understanding the water management challenges of the 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 José 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 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

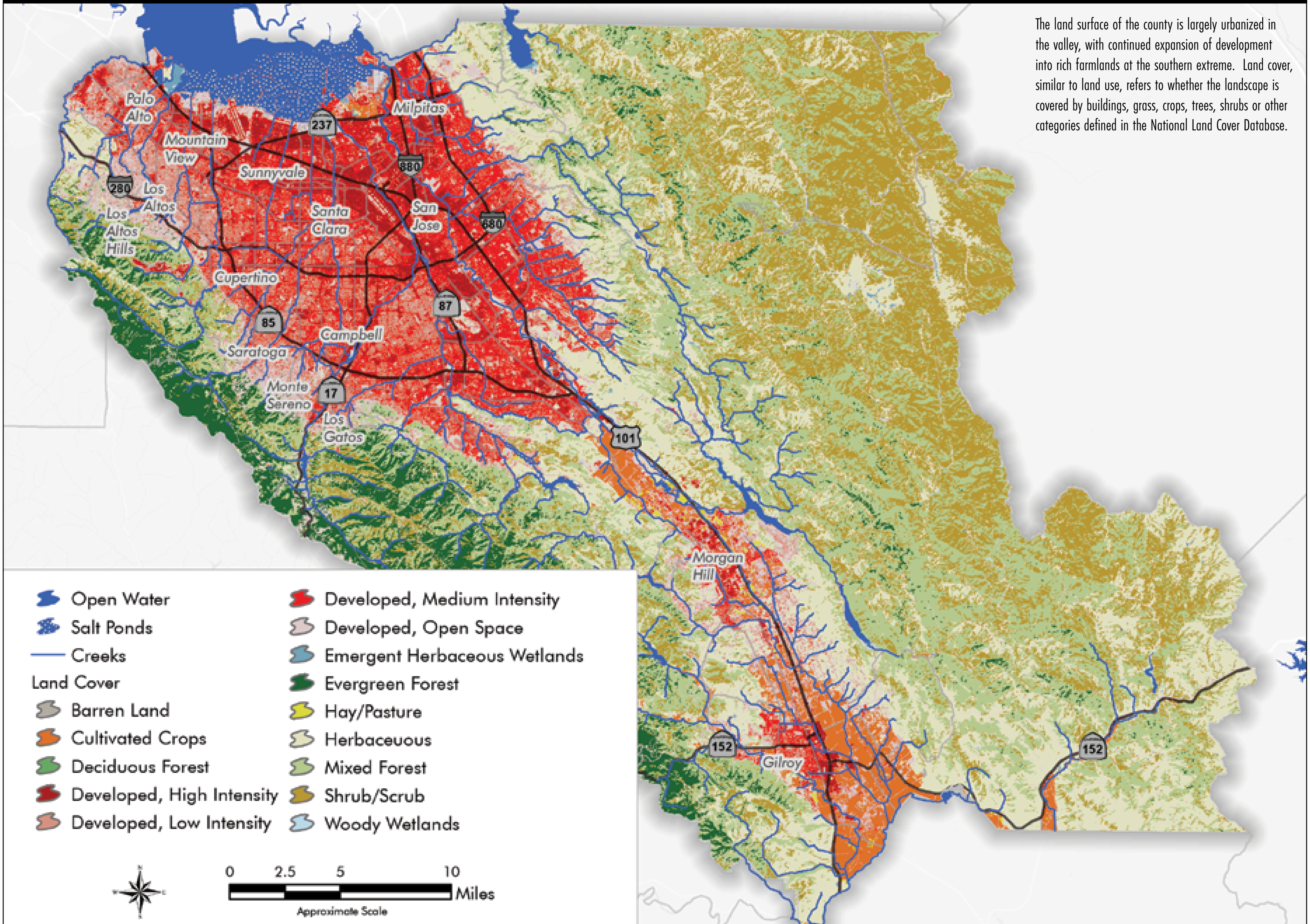
Chapter 2.1 Past Conditions describes major impacts to the landscape and hydrology from urban, industrial, and agricultural land use in Santa Clara County—primarily on the valley floor. In general, impacts that continue to present challenges for Valley Water management include paving and the creation of impervious surfaces, and alterations to streams and the disconnection of streams from their natural floodplains. How these activities changed the county landscape is represented in the contemporary landscape model (see pages 28-29).

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.

Valley Water 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 may alter downstream habitat conditions such as fish passage and 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 Valley Water is

Figure 2-5: 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.

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 Valley Water 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 Valley Water.

Current Regulatory Environment

Another management responsibility for Valley Water is addressing government regulations (see Table 2-1, p. 30). Almost every aspect of Valley Water 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 Valley Water 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. Valley Water 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 Valley Water 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 Valley Water 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.

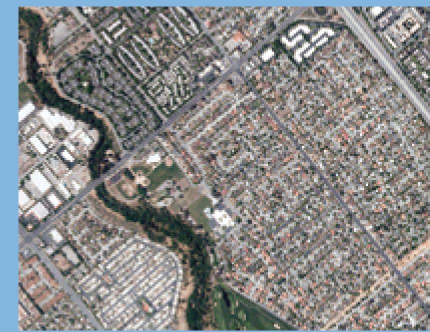
Valley Water is committed to remaining in compliance with all environmental laws and regulations and cannot conduct work in the absence of these approvals. Acquiring all of the necessary approvals may take days, months, or even years, depending on project complexity. Regulatory considerations in this 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 of water supply, water quality, flood protection, landscape resources (agriculture, trails and recreation, open space), ecological resources, and baylands in the county. 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 2.3 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 caused widespread land subsidence throughout the northern valley until the mid-1960's • 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; Valley Water proactively monitors whether this affects the near-bay shallow aquifer (though it is not used for water supply)

Figure 2-6: Contemporary conceptual model as of 2016, showing hydrogeomorphic and biological features and processes in Santa Clara County. The model shows how these features and processes have been changed by human development and alteration compared to the historical circa-1850 model on page 14-15. It will also describe current hills, valley floor, and baylands habitats.

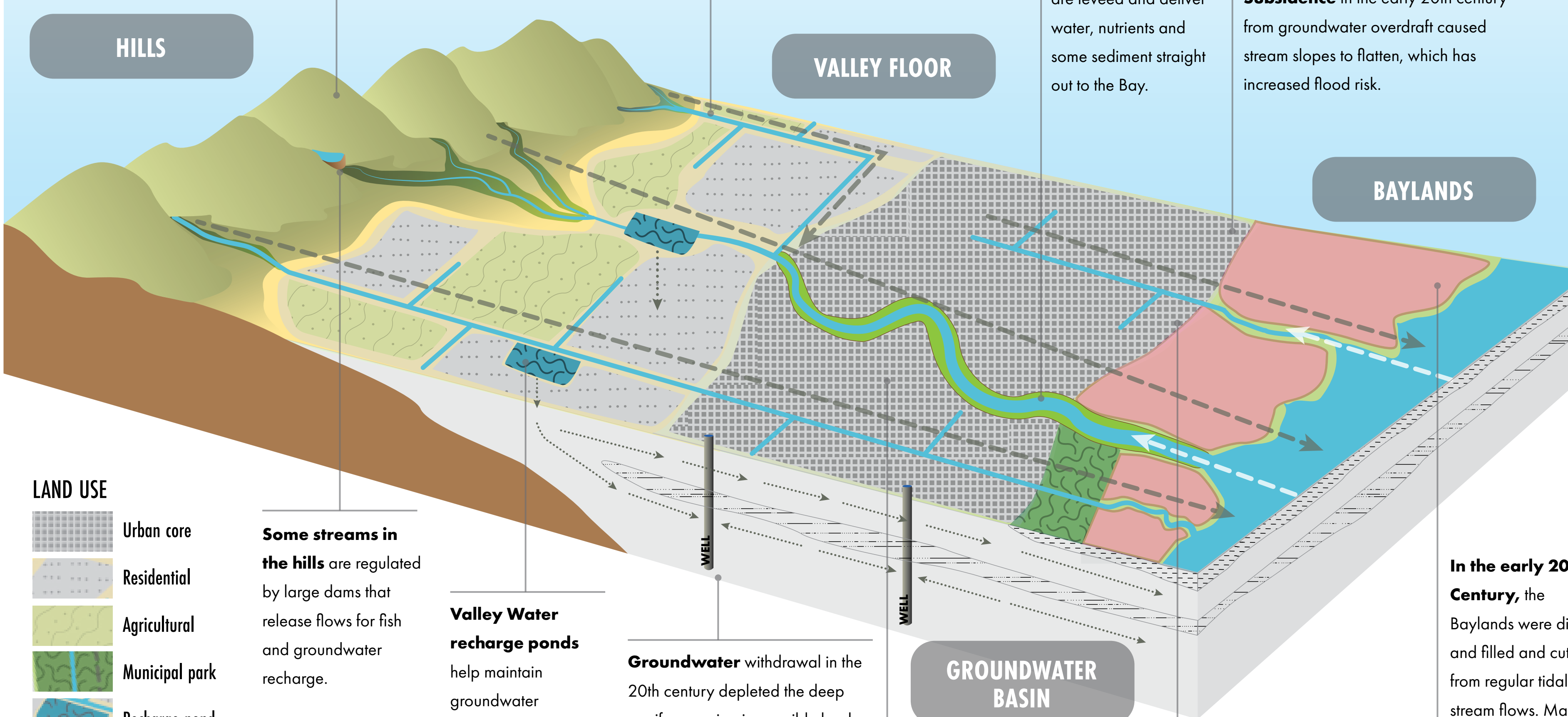
Some areas in the Santa Cruz mountains have a mining legacy that impairs instream water quality and habitat.

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.

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

Groundwater withdrawal in the 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 2-1: Common Laws or Regulations and the Resource Agencies with Jurisdiction

Jurisdiction	Law or Regulation	Resource Agency
Federal	Clean Water Act	U.S. Environmental Protection Agency; U.S. Army Corps of Engineers
	Safe Drinking Water Act	U.S. Environmental Protection Agency; California State Water Resources Control Board (Division of Drinking Water)
	National Environmental Policy Act	Council on Environmental Quality
	Federal Endangered Species Act	U.S. Fish and Wildlife Service; National Marine Fisheries Service
	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	All state agencies
	California Endangered Species Act	California Department of Fish and Wildlife
	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; Regional Water Quality Control Boards
	California Water Code	California Department of Water resources; 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	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
Local	Local Ordinances	County of Santa Clara; various cities
	District Act	Valley Water

Table 2-1 lists some of the laws, regulations, and resource agencies with regulatory jurisdiction over Valley Water activities.

2.2.2 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 Valley Water. Water supply is also important for the fish and wildlife in streams managed by Valley Water.

Valley Water 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 reuse; deliveries to eight northern Santa Clara County agencies by the San Francisco Public Utilities Commission; and local surface water supplies managed by San José Water Company and Stanford University.

Providing water where and when it is needed requires a complex system of constructed and natural infrastructure. Valley Water'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 Valley Water to store, treat, and distribute water. Valley Water 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.

Prolonged droughts will continue to challenge water supply reliability, and growth and climate change will increase the challenge of meeting future needs. Valley Water remains committed to balancing water supply development, conservation, and recycling as part of its water supply operations and long term planning. The One Water Framework will coordinate with existing Valley Water plans and programs in support of an integrated approach to water resources management.

WATER USE AND DELIVERY

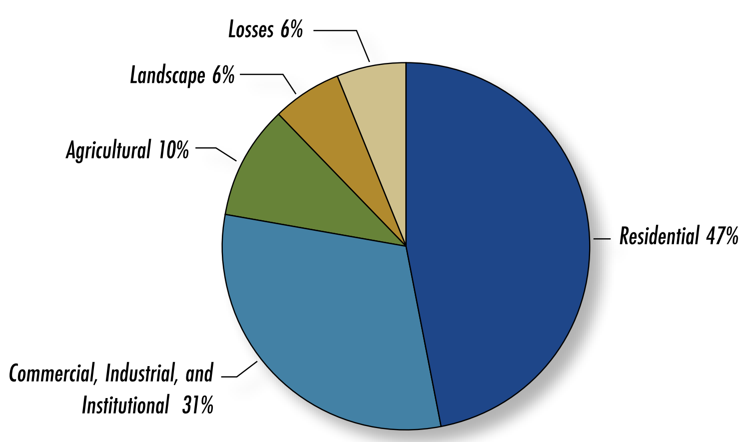
County water supplies are used for residential, commercial, institutional, industrial, landscape irrigation, and agricultural purposes. Average county water use is about 350,000 acre-feet-per-year (AFY), which includes about 320,000 AFY for municipal and industrial use and 30,000 AFY for agricultural use.

The residential sector uses the most water in the county (47 percent), followed by commercial/industrial/institutional use (31 percent). The agricultural sector uses approximately 10 percent of the total (see Figure 2-7). The county's use of water would be about 15 percent higher if not for water savings resulting from Valley Water and water retailer conservation programs.

Valley Water delivers water, both treated and untreated, to users through a complex system of facilities (see Figure 2-10, p.38). Facilities include three drinking water treatment plants owned and operated by Valley Water. The Penitencia plant serves Milpitas and parts of San José 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 José 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 100 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 Valley Water and/or the San Francisco Public Utilities Commission, and/or pump groundwater managed by Valley Water and deliver it to consumers. Retailers include the cities of Milpitas, San José, 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 José Water Company, and Great Oaks Water Company. In addition, some users are independent groundwater pumpers or use raw surface water for irrigation.

Figure 2-7: Percent Water Use Per Sector 2018



WATER SUPPLY SOURCES

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

Valley Water owns and operates 10 dams and surface water reservoirs, with an average yield of about 80,000 AFY (see Table 2-2, p.33 and Figure 2-8, p.34). 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. Valley Water'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 Valley Water's 10 reservoirs. Valley Water is now designing improvements that will remove the operating restrictions from Anderson, Almaden, Calero, and Guadalupe reservoirs. Valley Water 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 José Water Company (Lake Elsman and Saratoga Creek diversion) and Stanford University (Searsville dam and reservoir) augment Valley Water supplies by providing local surface water supplies of about 11,000 AFY. Other reservoirs in the county not owned by Valley Water include Calaveras Reservoir, Cherry Flat Reservoir, and Pacheco Reservoir.

Reservoirs do not only serve as storage units for surface water. Reservoir operations provide secondary benefits such as flood protection, recreation, and habitat enhancement. Valley Water stores water from local, wet season precipitation and/or imported water in its reservoirs for release throughout the year for downstream percolation

Table 2-2: 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	9,738	4,414	Seismic stability concern
Guadalupe	1935	Recharge	3,415	2,218	Seismic stability concern
Stevens Creek	1935	Recharge	3,056	No restriction	N/A
Vasona	1935	Recharge	495	No restriction	N/A
Coyote	1936	Recharge and Treated	22,541	11,843 (Permanent restriction)	Active fault movement (Calaveras fault) under dam
Anderson	1950	Recharge and Treated	89,278	51,766	Seismic stability concern
Lexington	1952	Recharge	19,044	No restriction	N/A
Chesbro	1955	Recharge	7,967	No restriction	N/A
Uvas	1957	Recharge	9,688	No restriction	N/A
TOTALS			**166,808**	**111,963**	

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

into groundwater aquifers or for deliveries to water treatment plants. 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 Valley Water 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 Valley Water reservoirs, are habitat for special status species, including steelhead trout listed as threatened under the federal Endangered Species Act. Valley Water strives to operate its reservoirs to maintain downstream habitat and fisheries in good condition, as required under federal and state laws and regulations.

Valley Water operates five diversion facilities and Uvas and Chesbro reservoirs under 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, South Central California 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 Valley Water. 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 Valley Water water rights.

Groundwater

Valley Water manages the Santa Clara and Llagas Groundwater Subbasins within Santa Clara County (see Figure 2-9, p.36). 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
- local 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 the groundwater subbasins. Since groundwater pumping exceeds natural recharge, Valley Water conducts managed recharge. Valley Water uses both runoff captured in local reservoirs, and imported water to recharge groundwater through nearly 265 acres of recharge ponds and 90 miles of local creeks.

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

Valley Water 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, Valley Water'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.

Figure 2-8: Valley Water Operated Reservoirs

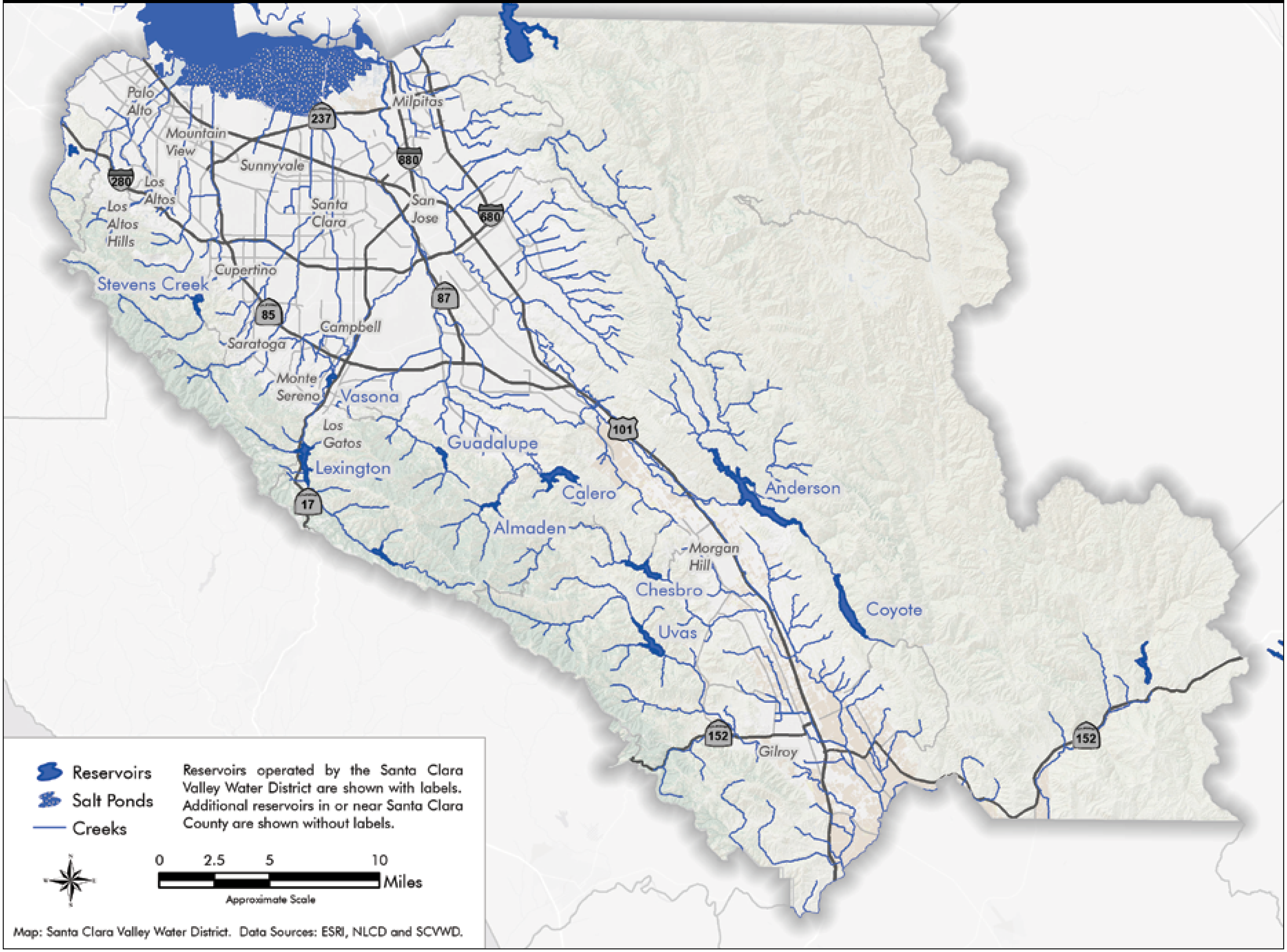


Table 2-3: Average Natural and Managed Recharge

Groundwater Management Area	Natural Recharge (AFY)	Managed Recharge (AFY)	Total (AFY)
Santa Clara Plain	30,000	61,500	91,500
Coyote Valley	2,500	12,000	14,500
Llagas	22,000	24,000	46,000
Total	**54,500**	**97,500**	**152,000**

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 (SWP) and the federal Central Valley Project (CVP) 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.

Valley Water has contracts for 100,000 AFY of SWP water and 152,500 AFY of CVP water. However, water availability and environmental conditions can impact the actual amount of water delivered. As a result, Valley Water only receives, on average, about 170,000 AFY from these two sources combined.

CVP supplies are typically conveyed through San Luis Reservoir in Merced County. Valley Water 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 Fruta 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.

SWP supplies are typically delivered to the county 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 the Penitencia Water Treatment Plant, or delivered to the Rinconada Water Treatment Plant and recharge facilities via the Central Pipeline (see Figure 2-10, p.38).

Valley Water is allocated a certain amount of Delta water exports each year depending on hydrologic and storage conditions. Water that is not needed by Valley Water 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. Valley Water has 350,000 AF of storage capacity in the Semitropic Groundwater Storage Bank. Valley Water does not retrieve its stored water directly from the groundwater basin at Semitropic. In dry years, Valley Water "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 José, Santa Clara, Sunnyvale, Mountain View, and Palo Alto, and to Stanford University and the Purissima Hills Water District.

REGULATORY AND POLICY FRAMEWORK

California has a limited supply of fresh water, especially in time of drought, and diverse entities, including Valley Water, hold various rights to a certain amount of that supply. Valley Water 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.

Valley Water reports to the State Water Resources Control Board on its water rights on an annual basis. Valley Water updates its Urban Water Management Plan in compliance with California Water Code every five years. As the groundwater management agency for the county, Valley Water updated its Groundwater Management Plan in 2016 to meet the requirements of the recent Sustainable Groundwater Management Act. Valley Water already complies with groundwater level monitoring requirements and submits its data to the California Department of Water Resources (DWR) on an annual basis. Valley Water 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.

Recent legislation directs DWR and the State Water Board to develop new water-supply standards and targets for indoor and outdoor residential water use, water use for landscapes with dedicated irrigation meters, and water loss levels.

PERTINENT PLANS, POLICIES, PERMITS

2016 SCVWD Groundwater Management Plan

2012 SCVWD Water Supply and Infrastructure Master Plan

2010 SCVWD Urban Water Management Plan

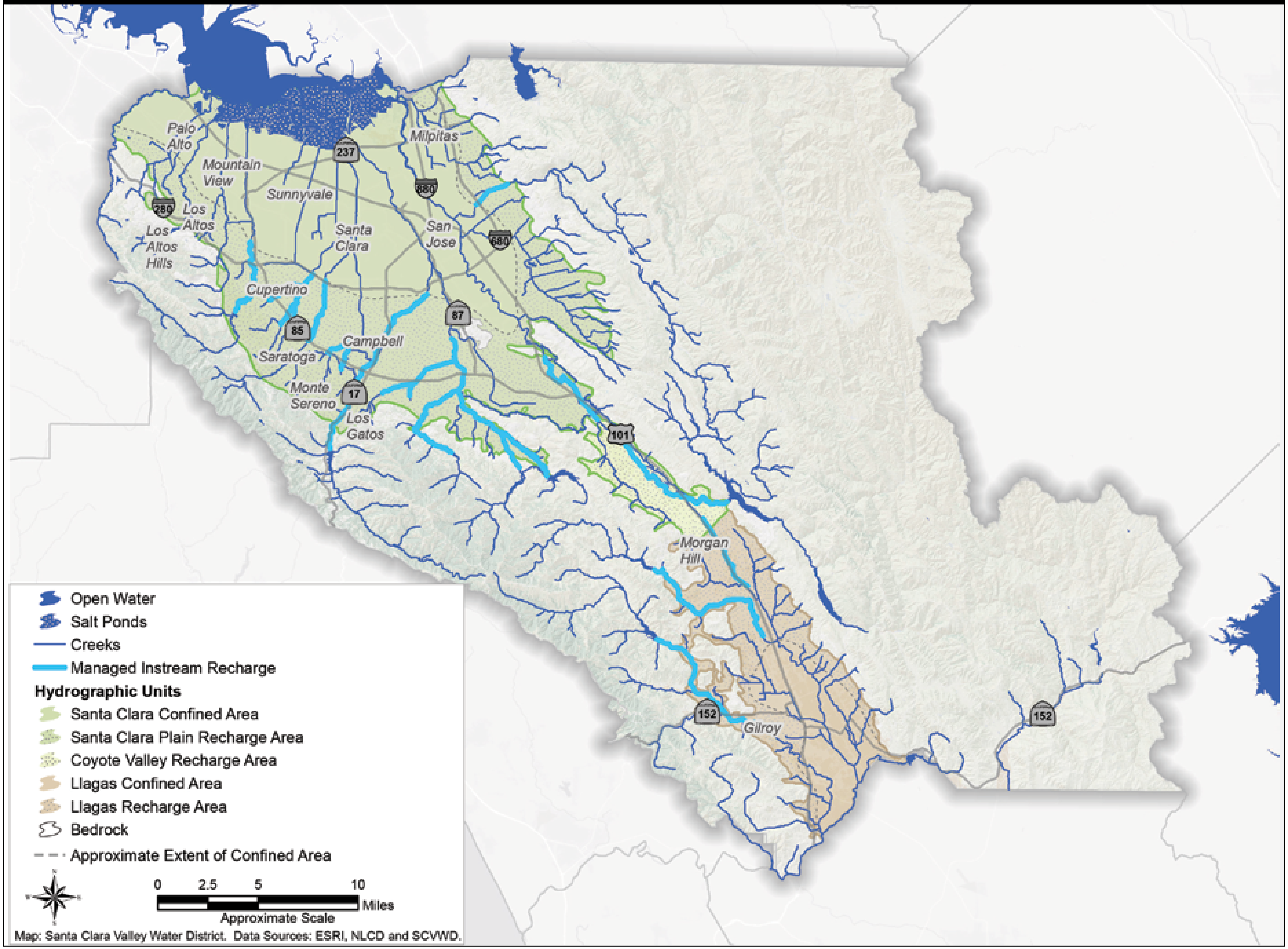
Fisheries Habitat Restoration Plan (in progress to support Water Rights Change Petitions)

Lake and Streambed Alternation Agreements

South Bay Water Recycling Strategic and Master Plan

South County Recycled Water Master Plan

Figure 2-9: Groundwater & Instream Recharge



Recycled Water

Recycled water is a growing source of water for Santa Clara County and an integral part of the water supply portfolio for Valley Water. Using recycled water helps augment drinking water; provides a dependable, drought-resistant, locally controlled water supply; and reduces reliance on imported water. Recycled water is currently more than five percent of the regional water supply in the County and is distributed for non-potable uses such as landscape and agricultural irrigation, industrial use, and dual-plumbed facilities. In 2018, the county used about 18,000 acre-feet (AF) of recycled water for irrigation, industry, and agriculture.

Valley Water in collaboration with its partners – including the cities of San Jose, Santa Clara, Sunnyvale, Palo Alto, Mountain View, Gilroy, and Morgan Hill – pursues the goal of expanding recycled water so that it supplies at least 10 percent of countywide water demands. This may involve expanding the use of recycled water for indirect potable reuse (using purified recycled water for groundwater recharge), as well as direct potable reuse (augmenting raw water and treated water supplies with purified water).

Currently in north 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 (SJ/SC RWF). 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. Also the cities of Sunnyvale and Palo Alto together produce approximately three MGD of recycled water annually. In south county, the South County Regional Wastewater Authority (SCRWA) manages wastewater treatment for the cities of Gilroy and Morgan Hill. In partnership with Valley Water, 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).

The Silicon Valley Advanced Water Purification Center (SVAWPC) purifies up to eight MGD of treated wastewater from SJ/SC RWF through advanced technologies (microfiltration, reverse osmosis, and UV disinfection). This purified water is then introduced into the SBWR distribution system. The resulting high quality recycled water can be used for a wider variety of applications. In addition to improving water quality, the SVAWPC also serves to demonstrate to the community the advanced treatment processes necessary for future indirect and direct potable reuse projects which could potentially help to augment their future drinking water supplies. The SVAWPC also serves as a center for increasing the knowledge and understanding necessary for developing potable reuse projects. As such, Valley Water staff conduct important pilot studies and research projects in collaboration with academic centers and national research institutions.

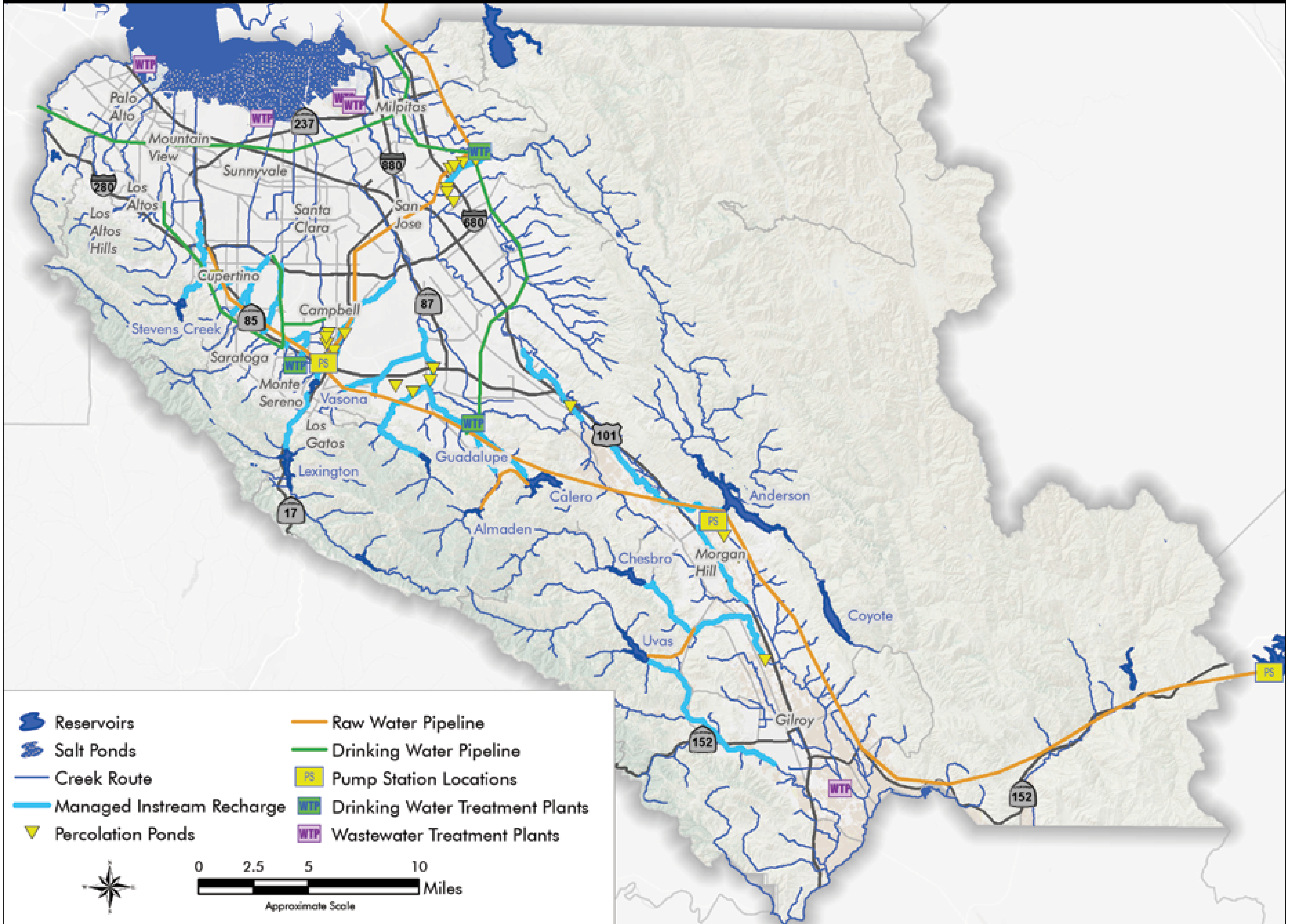
Valley Water objectives with respect to potable reuse are 1) to supply at least 24,000 AFY by the year 2028 and 2) to supply future expansion of to 45,000 AFY. Through the Countywide Water Reuse Master Plan, Valley Water will be initiating the development of 24,000 AFY of potable reuse. Based on the current schedule, the final Master Plan completion timeline is June 2020.

Silicon Valley Advanced Water Purification Center

Water Conservation

Water conservation is another critical part of Valley Water's water supply program, especially with state mandates and emergency drought regulations. As a result of water conservation investments made by Valley Water and its retailer customers since 1992, water use in the county has remained relatively flat despite a 25 percent increase in population. Valley Water plans to continue expanding water conservations savings. In FY 2019-2020, 74,198 AF of water were saved. Valley Water's goal is to achieve about 110,000 AFY of savings by 2040.

Figure 2-10: Water Supply Distribution



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

KEY CHALLENGES

Reliance on imported water: Valley Water 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. Valley Water is participating in statewide planning to improve water supply reliability and protect the Delta environment. Additional water received from SFPUC faces many of the same threats as other imported water.

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 of climate change-related increases in temperature and shifts in precipitation pattern may impact demands.

Complex Operating Environment: Valley Water'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.

Invasive quagga mussels of various sizes. Photo: USFWS

Aging infrastructure: Some of Valley Water's infrastructure was constructed more than 80 years ago and needs repair, rehabilitation, or replacement. This infrastructure provides the foundation of Valley Water's water supply system. Necessary capital improvement projects include dam seismic retrofits, pipeline maintenance, and treatment plant upgrades. Without these investments, Valley Water cannot ensure the future reliability of the county's water supply. Valley Water 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, which are species of freshwater bivalves native to Europe, 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. Valley Water monitors for mussels in its reservoirs, lakes, and pipelines. Santa Clara County Parks manages recreation (boating and fishing) on Valley Water reservoirs and is responsible for the invasive mussel boat inspection program. To date, mussels have not been detected in Valley Water facilities or those feeding into Valley Water facilities.

2.2.3 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 planning.

Protecting water quality is a central responsibility of Valley Water. Valley Water is responsible for complying with various federal and state water quality laws and regulations and works to reduce threats from contamination to 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 Valley Water 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.

Valley Water divides water quality management 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 Valley Water'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 planning.

WATER QUALITY PROTECTION

Source Water Quality

To protect source water quality, Valley Water 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 Valley Water'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 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. Valley Water is committed to protecting from contamination local and imported water supply sources that feed Valley Water's three drinking water treatment plants.

To assess the quality of Valley Water's reservoirs that are used to directly supply water to Valley Water's water treatment plants, and to identify potential contaminating sources, Valley Water conducts water quality monitoring at San Luis, Anderson, and Calero reservoirs, as well as

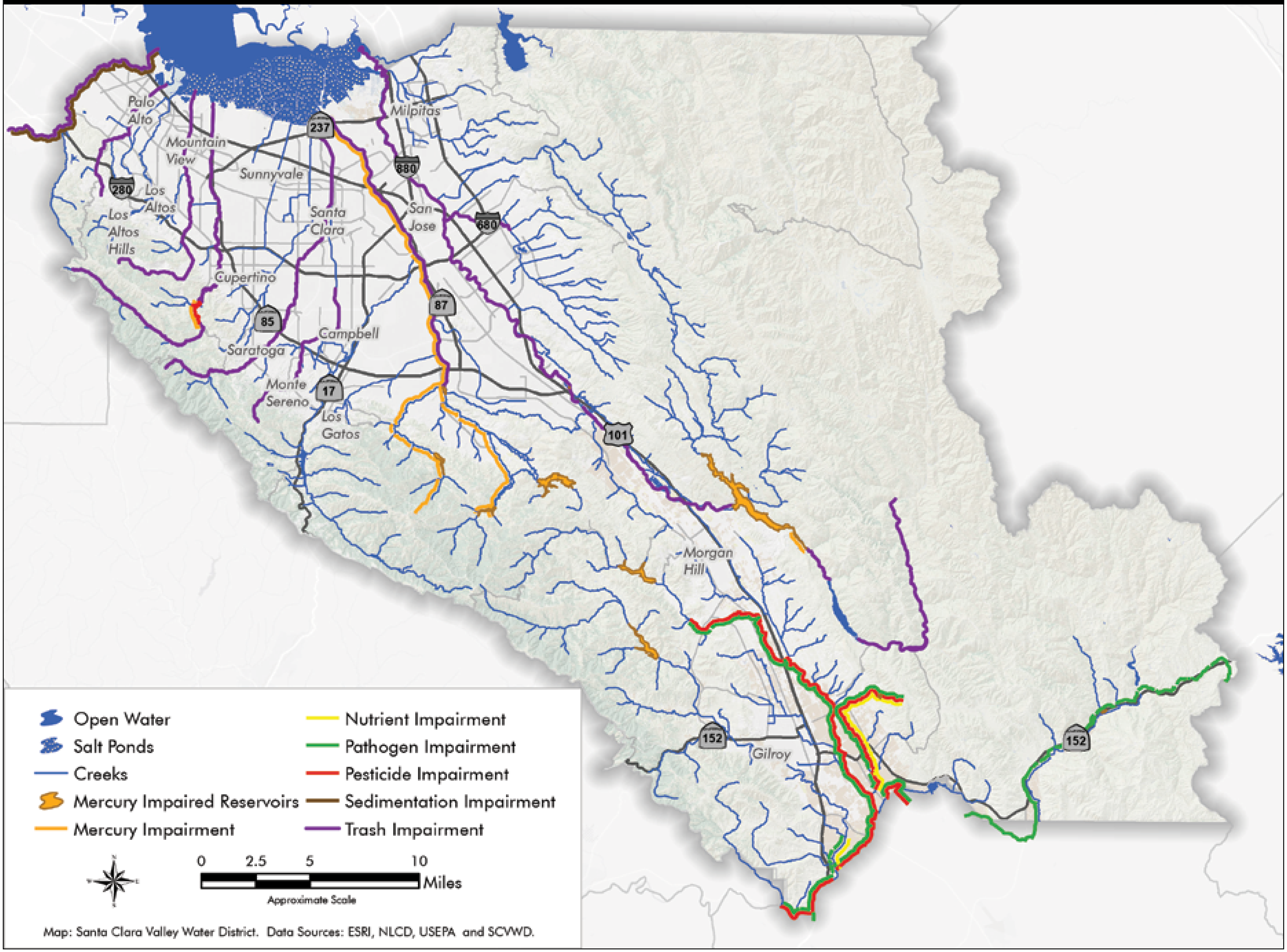
GENERAL REGULATORY FRAMEWORK

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 Uvas and Llagas Creeks in 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. Valley Water activities must adhere to Basin Plans.

Figure 2-11: 303d Impaired Water Bodies



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

at the reservoirs and streams that feed into them. Although Almaden Reservoir does not directly supply drinking water to Valley Water'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 Valley Water to identify contaminating sources.

Valley Water 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.

To help select 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.

Valley Water 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.

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: Valley Water

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 2-11, p.42).

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. Valley Water has a memorandum 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 Encampment Cleanup Project, Valley Water staff and agency partners conduct encampment cleanups 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

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.

sediment. Runoff and releases from reservoirs 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 Valley Water 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 Valley Water. The SCVURPPP was created to assist permittees with compliance of 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 Valley Water). 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 stormwater 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 addressing pollutants of concern.

SCVURPPP and Valley Water have developed a Stormwater Resource Plan (SWRP) for the Santa Clara Basin within Santa Clara County funded by a grant from the State Water Resources Control Board. A SWRP is a document that describes the local watershed, identifies water quality issues, and uses a metrics-based approach to identify local and regional green stormwater infrastructure projects that may be implemented. Green stormwater infrastructure uses vegetation, soils and natural processes to capture runoff, reduce the quantity of pollutants and runoff entering the storm drain system, help recharge groundwater, reduce flooding, and provide other ecological and community benefits. The SWRP will assist municipalities in developing Green Infrastructure Plans required by the MRP and will make projects included in the plan eligible to receive state bond funding for implementation. Development of the Santa Clara Basin SWRP and a SWRP for south county are being in done in conjunction with One Water planning in order to realize multi-benefit projects with a stormwater component.

Valley Water has conducted numerous creek monitoring and assessment efforts to supplement the data collected through the urban runoff program. These include a microbial source tracking study in the Pajaro River Watershed, collaborating with others on monitoring mercury in the Guadalupe watershed, and monitoring trash in creeks.

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. Valley Water participate in south county water pollution prevention programs by providing assistance and training materials, but does not currently fund south county programs.

Total Maximum Daily Loads (TMDLs)

Watersheds managed by Valley Water are subject to a number of Total Maximum Daily Loads (TMDLs) that set pollution reduction goals to protect humans and wildlife (see sidebar).

The Guadalupe River watershed is known for its historic mercury mines. Mining in the hills above San José occurred from 1846 until 1975 and released a significant amount of mercury into the watershed and ultimately San Francisco Bay.

Mercury can change chemical forms depending on conditions in water or sediments, such as the stratification within reservoirs. Stratification is a separation of the water into 2 layers of differing temperature: the epilimnion (top layer) and the hypolimnion (bottom layer). During stratification, oxygen can be depleted in the hypolimnion. Under low-oxygen conditions, mercury can be converted to methylmercury, a highly-toxic compound that accumulates in fish tissue and presents serious health risks to birds and people consuming fish. Methylation can also occur in riparian wetlands and baylands outside of reservoirs.

The state has issued a human health hazard and "no fish consumption" advisory for fish from this watershed. The San Francisco Bay Regional Water Quality Control Board addressed mercury pollution in the Guadalupe River Watershed by amending the Water Quality Control Plan for the San Francisco Bay Basin in 2008 to establish the Guadalupe River Watershed Mercury TMDL (Guadalupe TMDL) after working with Valley Water and other stakeholders. The Guadalupe TMDL provides a watershed-wide mercury management strategy. In addition to being the primary regulatory means of achieving water quality goals in the watershed, the Guadalupe TMDL will simultaneously reduce the amount of mercury in the Bay in accordance with the broader San Francisco Bay Mercury TMDL's requirements.

Specifically, Valley Water reservoirs and lakes listed under the Guadalupe TMDL as impaired for mercury include Calero, Almaden, and Guadalupe reservoirs, and Lake Almaden. Mercury enters the reservoirs primarily via runoff from the lands draining the historic mercury mining district. Other sources include atmospheric deposition from global and local sources, soil erosion from areas not known to contain mines, urban stormwater runoff, seepage from landfills, and Central Valley Project water inputs to Calero Reservoir.

Both before and after implementation of the Guadalupe TMDL, Valley Water has undertaken voluntary actions to address and control mercury contamination, including completing studies of methylmercury and bioaccumulation control measures. Valley Water operates hypolimnetic oxygenation systems to prevent low-oxygen conditions that occur during summer reservoir stratification. Valley Water conducts studies including a comparative analysis of the lakes and reservoirs affected by mercury mining, an effectiveness evaluation of hypolimnetic oxygenation and circulation in reducing methylmercury production and bioaccumulation, and calculation of inorganic and organic mercury loads from points of discharge. To conduct these studies, Valley Water staff monitors water quality in the affected reservoirs and one additional reservoir not affected by historic mining twice per month during oxygenation system operation, and once per month during the remainder of the year. Valley Water also collects fish tissue samples twice per year. In addition, Valley Water leads implementation of a coordinated monitoring program with landowners of the former mining district. Under this program, fish in creeks and mercury loads to the San Francisco Bay during storm flows are monitored. Valley Water's other reservoirs are also listed as impaired by mercury. The state is developing a program to address mercury in all reservoirs and Valley Water's studies are helping inform this process.

Agricultural well taps groundwater in southern Santa Clara Valley. Photo: Valley Water

Table 2-4: Completed 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

Groundwater Quality

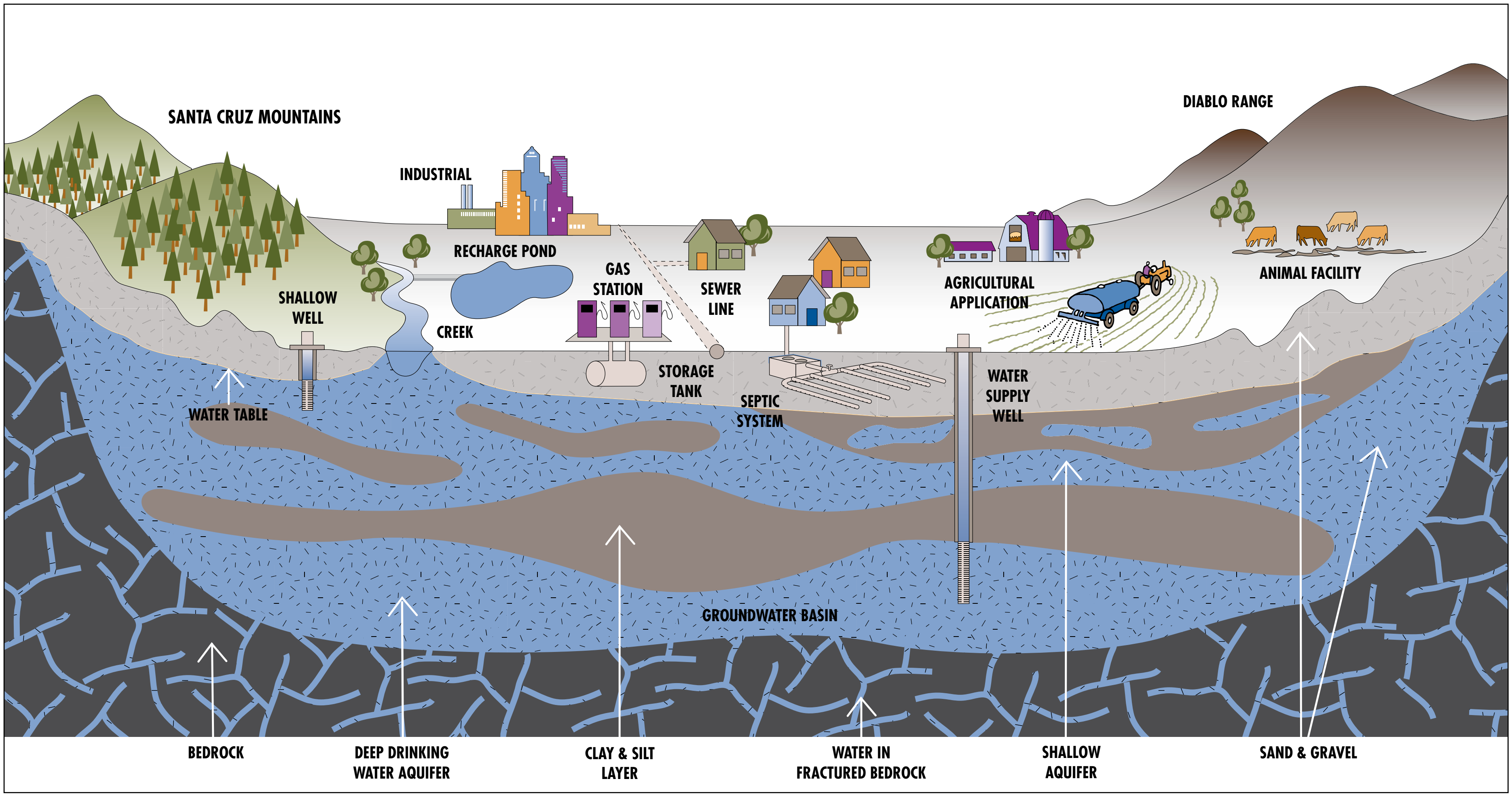
To protect groundwater quality, Valley Water works with a variety of partners and collaborators. Groundwater quality is threatened by industrial releases, leaking underground storage tanks, the application of fertilizers and pesticides, animal waste, and other land use activities.

The federal and state Safe Drinking Water Acts include provisions for groundwater quality protection. Valley Water 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. Valley Water'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.

Valley Water 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. Valley Water also monitors the quality of local and imported water used for groundwater recharge. 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, Valley Water 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, Valley Water and its partners regularly measure groundwater quality

Figure 2-12: The Groundwater Basin



in areas where recycled water is used for irrigation to assess changes in groundwater quality in order to minimize risks to groundwater. As Valley Water 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, via tidal creeks, and high total dissolved solids have been 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 2018, there were only eight domestic wells with perchlorate above the drinking water standards compared to 188 wells in 2004. Valley Water continues to advocate for the timely restoration of groundwater quality.

Recharge ponds near Los Gatos. Photo: Valley Water

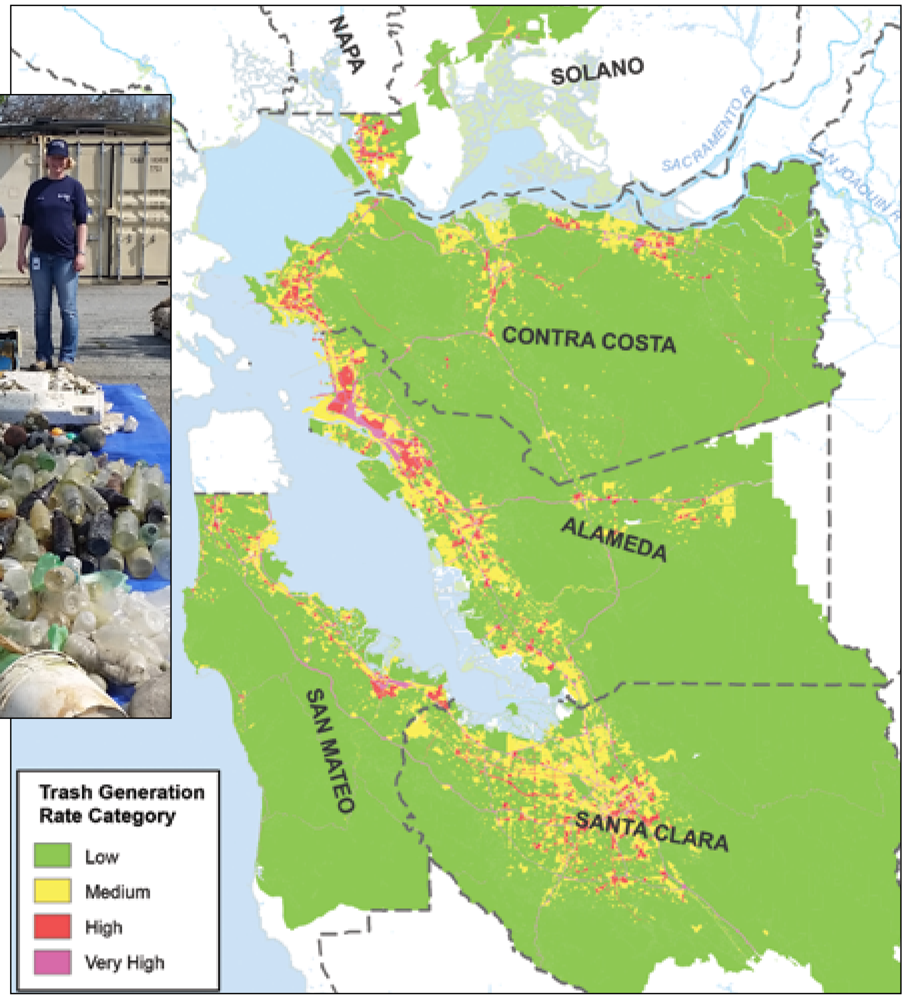
KEY CHALLENGES

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. Valley Water 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 in addition to 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 and Monterey Bay are significantly impacted by urban, agricultural, and industrial runoff. The threat is ubiquitous and growing, despite the urban runoff pollution 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 targeted at the many sources of current and emerging contaminants as data on impacts becomes 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 reducing 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, Valley Water 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, Valley Water is committed to working with municipalities and the County of Santa Clara on a countywide effort to reduce homelessness.

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.



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

Figure 2-13: Bay Area trash generation areas. Map: BASMAA

Photo: Yield from a recent trash clean up of Alviso Slough. Photo: Valley Water

2.2.4 FLOOD PROTECTION

INTRODUCTION

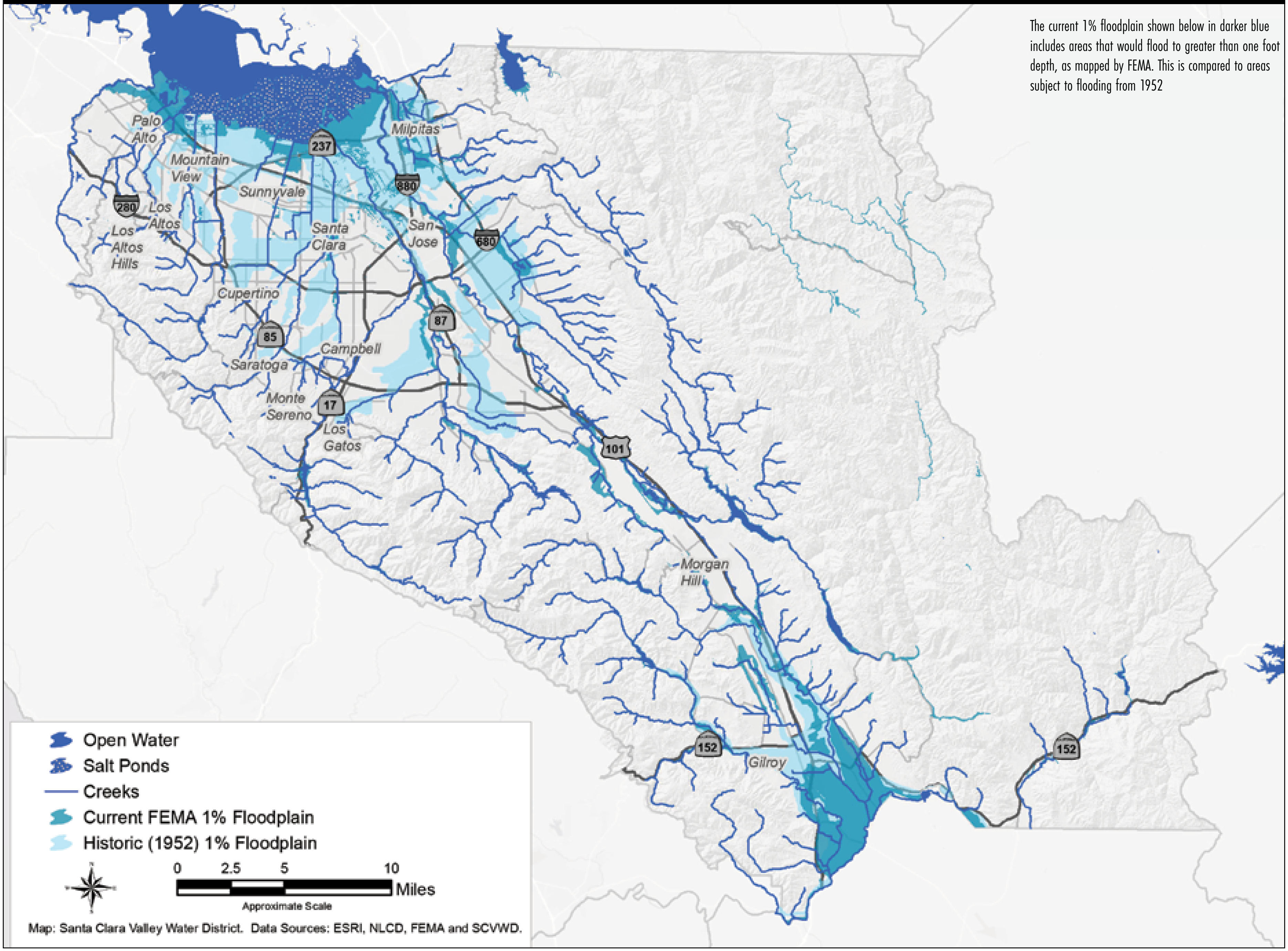
While flooding is a natural feature of creek landscapes, flooding of developed lands can create very significant risk to life and property. Valley Water and its federal and local partners aim to reduce this risk by building and managing flood protection projects, responding to high flow events, and educating the public.

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 2-5, p. 57). 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, Valley Water works with local municipalities and federal agencies to 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. Many major creeks in the now-urbanized Santa Clara Valley have already

Figure 2-14: Current & Historical Floodplains



The current 1% floodplain shown below in darker blue includes areas that would flood to greater than one foot depth, as mapped by FEMA. This is compared to areas subject to flooding from 1952

THE ONE PERCENT FLOOD

For guidance on flood risk, Valley Water has historically looked to published FEMA maps of one percent flooding, unpublished maps showing shallow one percent flooding, and records of historic flooding. Valley Water 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.

been changed in some way to improve their conveyance capacity. To maintain capacity, ensure access, and meet fire suppression requirements, Valley Water undertakes routine maintenance activities along and within creeks.

To provide more flood protection Valley Water employs both hardscape and softscape solutions, ranging from building earthen levees or concrete walls to enhancing floodplains. In recent years, Valley Water 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 flood risk but also improve wildlife habitat, water quality, and recreational opportunities for the community. Such multi-objective projects also reflect Valley Water'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 (see opposite), 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 such as flood-induced contamination, mold, wastewater management, and drinking water safety can have significant impacts on public health.

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 2-15, p.53). 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, servers, or other infrastructure. These facilities can be damaged or isolated by flooding and rendered out of service for long periods.

Whether the risk is to people, property, or facilities, Valley Water'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. Valley Water also hopes to provide more warning time before powerful incoming storms. To this end, Valley Water is working with state and regional partners to install advanced weather-forecasting technology.

Guadalupe Creek in Downtown San José . Photo: Valley Water

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 2-8, p.34 and 2-16, p. 54). 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 Valley Water'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 56, Valley Water has primary authority for floodwater management in Santa Clara County, but collaborates with its federal partner, the U.S. Army Corps of Engineers (USACE) 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.

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, Valley Water 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. Valley Water has targeted all new flood protection projects to follow the natural flood protection approach.

In an example of the natural flood protection approach, Valley Water designed the Guadalupe River Project through downtown San José 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 USACE, Valley Water widened and planted extensively in the floodplain and upland areas to decrease erosion and increase habitat space. Upriver, Valley Water is working to stabilize the channel and expand habitat for steelhead trout and other native fish. Photos: Valley Water

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.

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.

Figure 2-15: Critical Facilities & Flood Risk

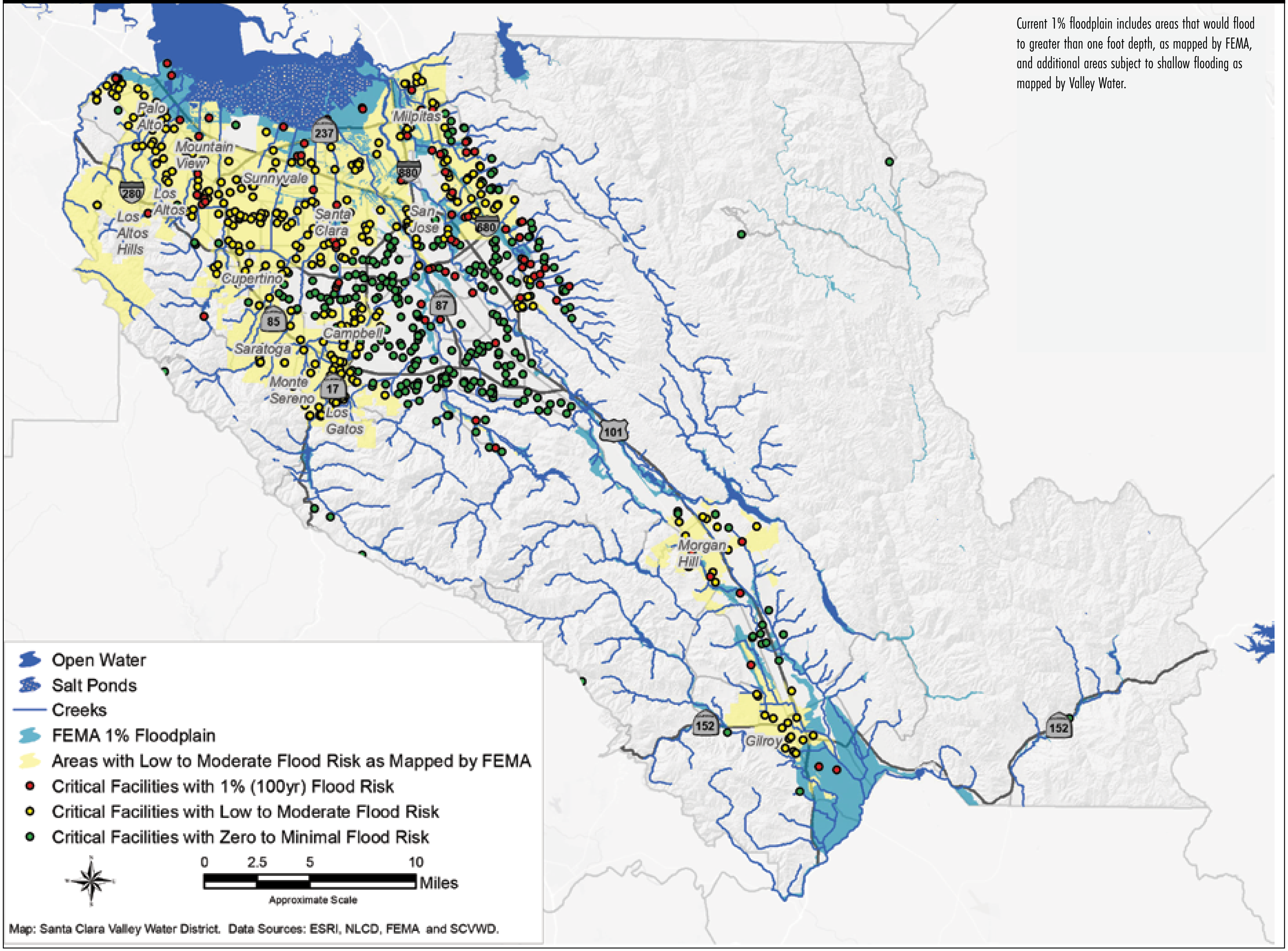
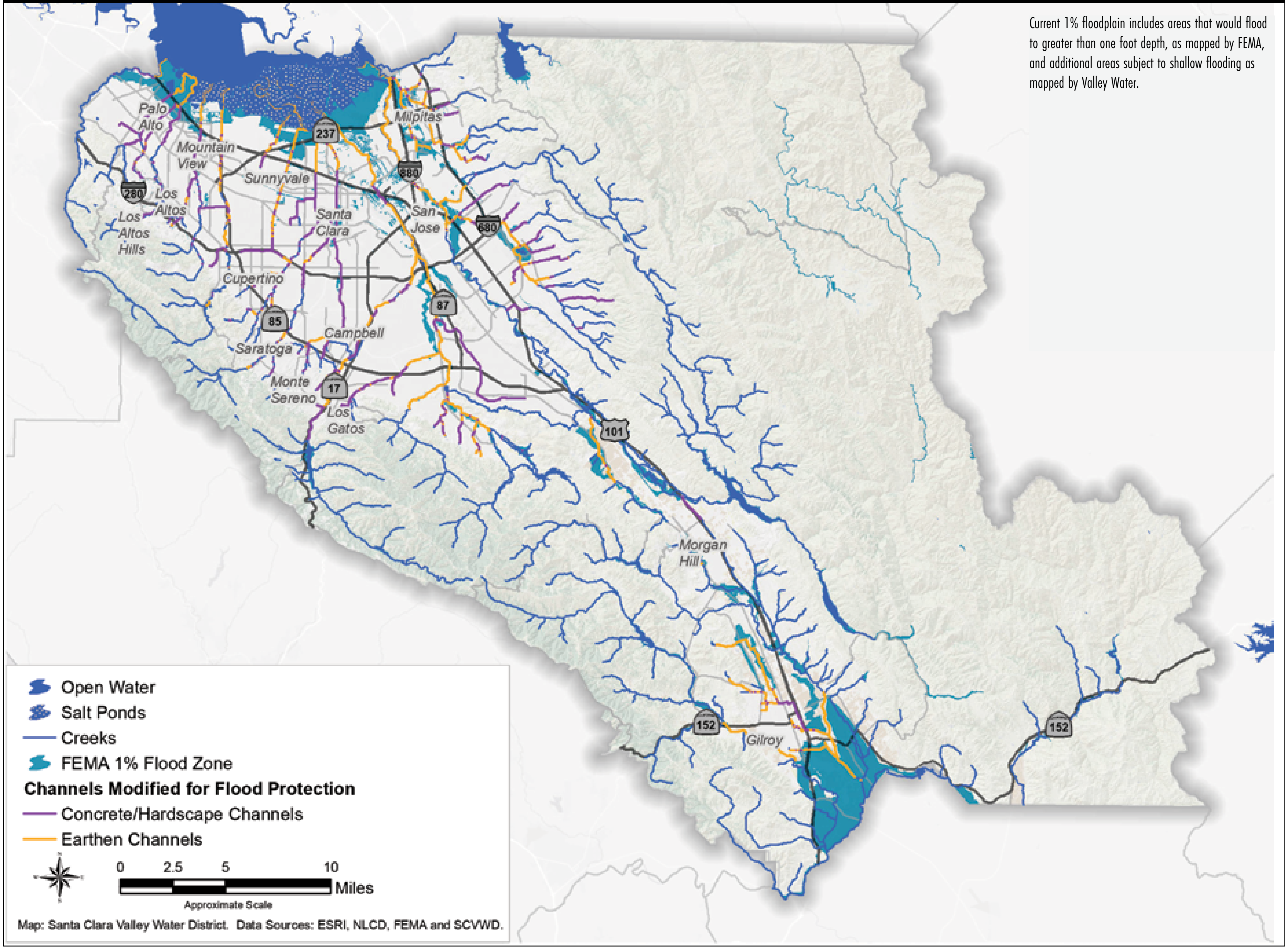


Figure 2-16: Major Flood Control Infrastructure



Current 1% floodplain includes areas that would flood to greater than one foot depth, as mapped by FEMA, and additional areas subject to shallow flooding as mapped by Valley Water.

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

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, Valley Water 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. Valley Water does not own or manage the entire length of all of the creeks within the county. Typically, Valley Water 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

Valley Water 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, Valley Water 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.

Hendrys Creek. Photo: Valley Water

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 filled with sediment 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 waters enter homes, schools, shops, or other structures.

Reducing negative impacts from erosion and sedimentation is a flood management, water quality, and maintenance issue for Valley Water. 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 cities, the county, or developers to prioritize areas for low impact development and green stormwater infrastructure improvements.

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 (USACE) and the Federal Emergency Management Agency (FEMA). USACE brings national economic and design standards to bear on the planning and design of each project. Once a project is constructed, USACE maintains a strong vested interest, and inspects against strict maintenance standards. FEMA is tasked with reducing flood damages.

FEMA does not regulate Valley Water activities. However, FEMA works with Valley Water to certify that Valley Water-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. Valley Water 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.

Valley Water 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 USACE, California Regional Water Quality Control Boards, the California Department of Fish and Wildlife, and the San Francisco Bay Conservation and Development Commission, Valley Water 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.

Valley Water's Stream Maintenance Program is the regulatory mechanism by which Valley Water 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 José, to maintain stream capacity and condition. Photo: Valley Water

Table 2-5: Recorded Flood Events on Santa Clara County Creeks by Watershed

Year	Lower Peninsula	West Valley	Guadalupe	Coyote	Pajaro
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				
2017	San Francisquito			Coyote	Uvas, West Little Llagas

KEY CHALLENGES

Continued risk of flooding: Despite decades of effort to provide flood protection, about 40 to 50,000 parcels 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: In previous years, Valley Water 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 Valley Water 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 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.

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; resulting in an increase in disconnected floodplains. 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, Valley Water has relied heavily on published studies by USACE 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. Valley Water is conducting its own studies to produce a more comprehensive assessment of risks than ever before, on a watershed-by-watershed basis.

New Analytical Tools for Assessing Flood Risk

For many years now, Valley Water has been using its Waterways Management Model (WWMM), first developed in 1984, to prioritize flood protection projects. WWMM primarily emphasized the economic benefits of reduced flood damages plus additional factors such as protecting developed areas, rehabilitating previously constructed facilities, protecting historical flood areas, reducing flood insurance costs, encouraging multi-purpose use of lands, and reducing maintenance costs. These factors continue to be important. However, community input, lessons learned over the past few decades of watersheds operation, and newly available tools for hydrologic and hydraulic modeling give us the ability to consider other important factors to prioritize flood management activities to most effectively reduce flood risk to life and property. Valley Water's updated flood risk analysis considers the economic benefit of reduced flood damage, as well as other factors such as:

- Maintenance first approach (making sure that previously built infrastructure continues to provide the level of service originally intended)
- Community health and safety based on risk factors like depth and velocity of flooding,
- Actual flood frequency (areas of repeated flooding or "hot spots") over the period of record
- Social vulnerability (disadvantaged communities) of the community at elevated flood risk
- Number of buildings and critical infrastructure subject to flooding (rather than solely the number of parcels)

By considering these various factors, Valley Water is developing a prioritized list of flood management activities based on a more comprehensive One Water review of risk and impact to the community.

2.2.5 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. Valley Water interest in protecting open landscapes throughout Santa Clara County derives from these benefits to water resources management. Open landscapes support several of Valley Water'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 2-18, p.62).

Much of the county can be classified as open space or agricultural landscape. The northern portion of the valley is highly urbanized, and Valley Water 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, Valley Water 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, Valley Water 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 Valley Water'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, Valley Water 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, Valley Water 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, Valley Water 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, Valley Water 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 Valley Water strives to support.

In recent years, Valley Water 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, Valley Water has purchased a total of 90 developed properties in San José alone, in support of flood protection on the Guadalupe River and Coyote Creek. Valley Water 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 Valley Water pollution prevention activities.

Landscapes for Groundwater Recharge

Natural groundwater recharge comprises about 15 percent of Valley Water'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

Valley Water views open land and trails as valuable public resources—opportunities for citizens to engage with the county's waterways ,wildlife, and natural landscapes. Since trail development is outside Valley Water's usual purview, it partners with other local agencies that plan, design, construct, maintain, and patrol trails for public use. Valley Water lands along creeks, reservoirs, and pipeline corridors are potential components of an underlying structure for a countywide network of trails (see Figure 2-17). While these activities provide a human benefit, impacts on natural habitats and associated species must also be carefully considered.

Using cooperative interagency agreements, Valley Water 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, Valley Water actively funds some efforts through a robust grant program. Between 2003 and 2015, Valley Water 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.

Guadalupe River Park Trail. Photo: Valley Water

Landscapes for Preservation, Restoration, or Mitigation

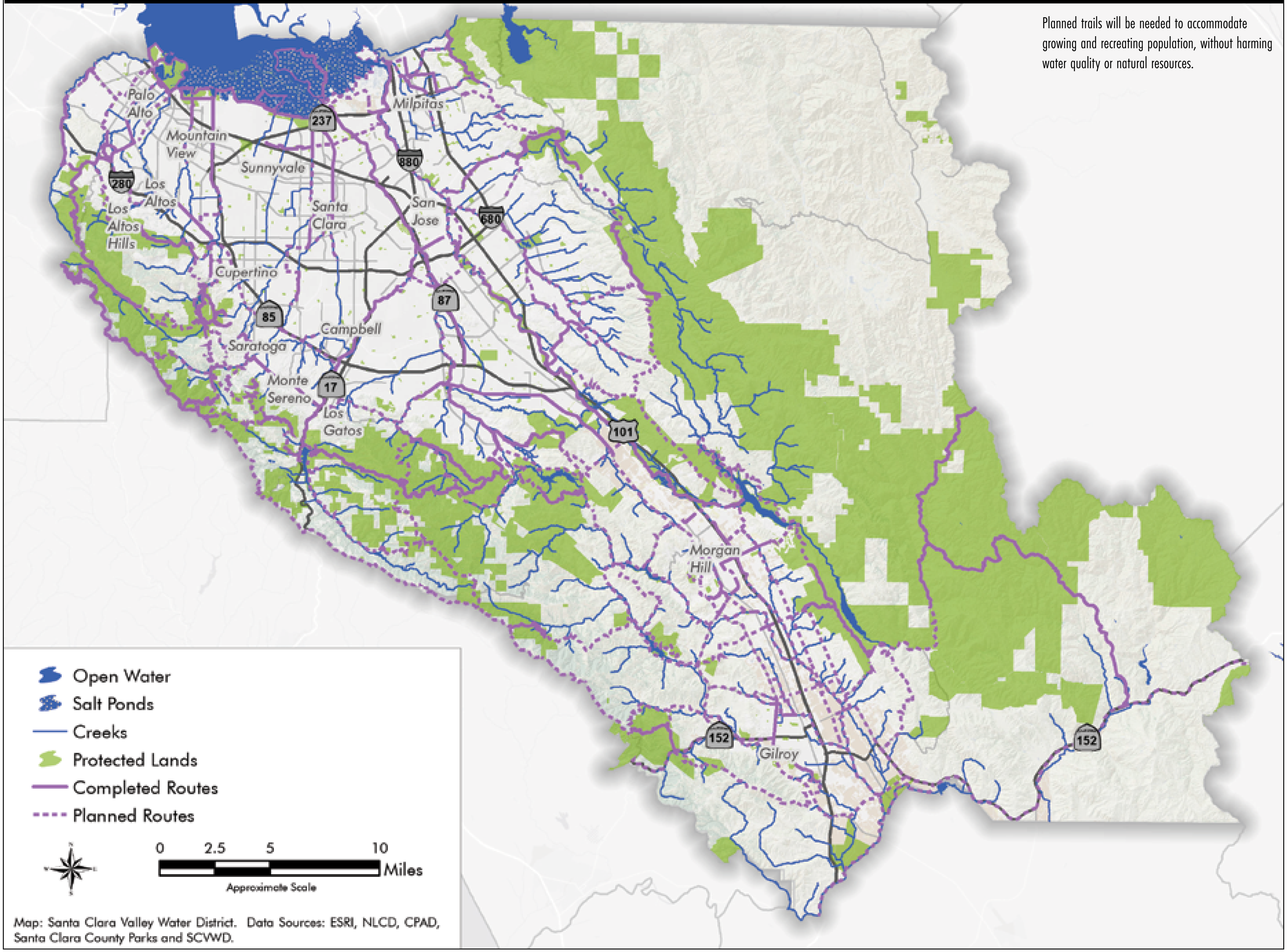
Some undeveloped areas are protected as habitat for fish and wildlife species, forests and woodlands, sensitive plant communities, and tidal marshes. Valley Water lands or waterways may include or be adjacent to such areas. These protected lands contribute to Valley Water's capacity to absorb rainfall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

Valley Water 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, Valley Water purchased open space referred to as the Coyote Ridge Preserve to meet mitigation requirements for impacts associated with Valley Water'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, Valley Water 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 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.

Figure 2-17: Countywide Trails Master Plan

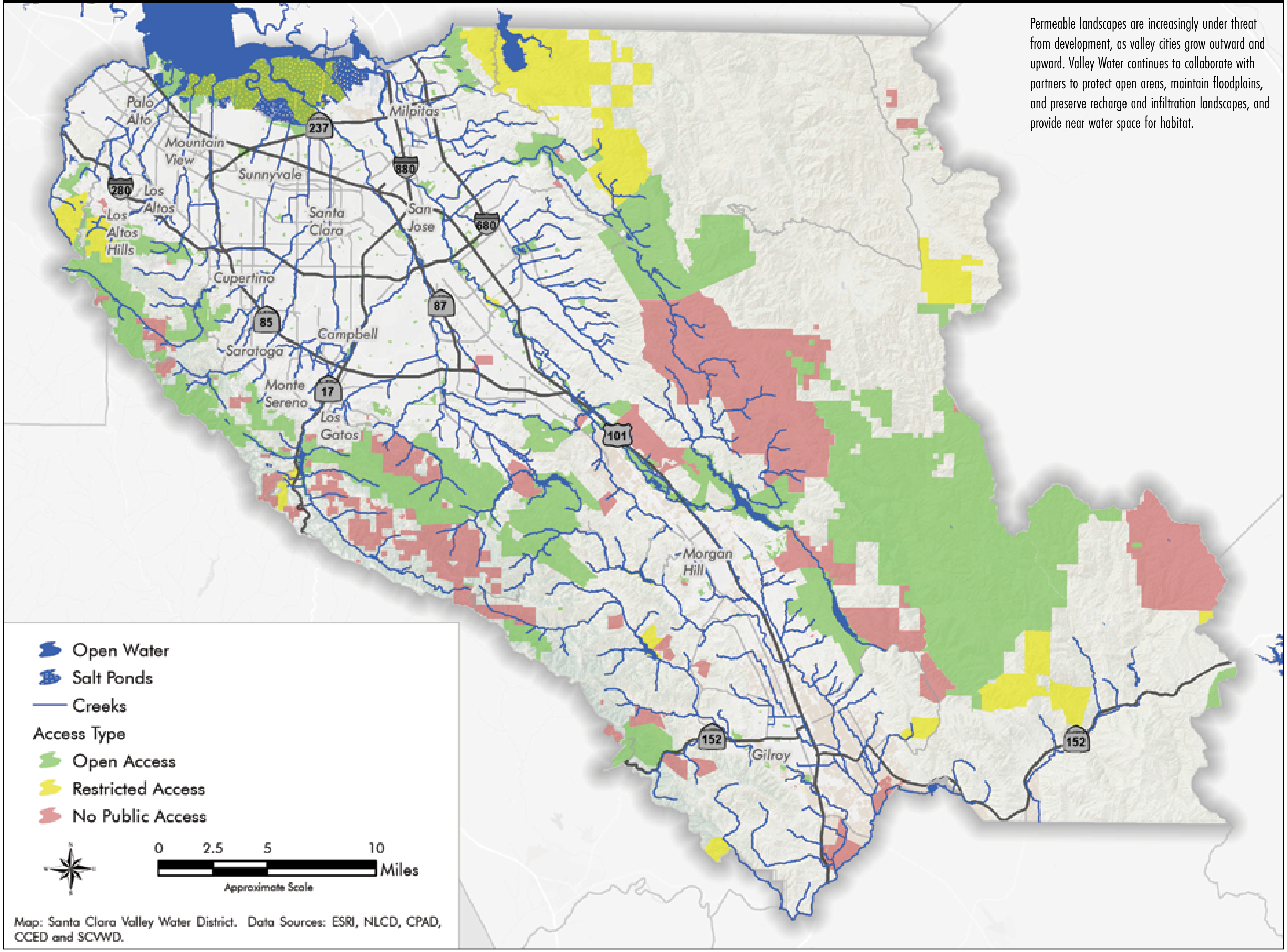
Planned trails will be needed to accommodate growing and recreating population, without harming water quality or natural resources.



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

Figure 2-18: Open Space/Protected Areas

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



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

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

REGULATORY AND POLICY FRAMEWORK

Protecting open landscapes for water infiltration, water quality, and flood protection is often something Valley Water 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.

Valley Water 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 Valley Water 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 VALLEY WATER POLICIES AND PLANS

City of San José Greenprint

Clean, Safe Creeks and Natural Flood Protection Program

County and city general plans

Countywide Trail Master Plan

Fisheries Aquatic Habitat Collaborative Effort

Guidelines and Standards for Land Use near Streams

Safe, Clean Water & Natural Flood Protection Plan

Santa Clara Valley Agricultural Preservation Plan

Santa Clara Valley Habitat Plan

Santa Clara Valley Open Space Authority Valley Greenprint

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

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

Working Landscapes

Responsible farming and grazing practices are vital to Valley Water's long-term vision. Farmlands not only provide a local food source but also 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 Valley Water objectives, and are thus valuable partners.

Valley Water provides irrigation and recycled water to farmers, and supports water conservation and groundwater protection activities in rural areas. Currently agriculture accounts for almost 10 percent (about 28,000 AF) of annual countywide water demand. Most of the agricultural water demand is met with groundwater — about 26,000 AFY on average — with the remainder coming from recycled water and untreated surface water.

Farmers in the valley grow diverse crops, including the garlic that makes 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. Crops had a gross annual value of $310 million in 2016. By other measures, agriculture in Santa Clara County supports 1,000 farms and 8,100 jobs, and contributes between $830 million and $1.6 billion per year to the local economy. While livestock grazing is diminishing, 2016 crop reports suggest county rangelands still support about 5,000 head of cattle. See map in Chapter 3.1 for land cover including hay/pasture and cultivated crops.

Altogether, rural working landscapes currently cover 447,821 acres or about 54 percent of Santa Clara County. In the last 30 years, the county lost 21,171 acres of farmland and rangeland to development and an additional 28,391 acres are at risk of conversion going forward , according to a countywide agricultural development and climate adaptation plan completed by the County and the Santa Clara Valley Open Space Authority in 2017. To conserve farmland, ranchland and local food production in the years ahead, the county and open space authority completed the plan mentioned above. Valley Water supports these and other initiatives that preserve permeable landscapes, and enhance One Water management.

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. Valley Water 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 Valley Water protection and maintenance of waterways, floodplains, and water resources remains an ongoing challenge.

Maintenance impediments and costs: Often what appears to be open space along waterways to the public, including Valley Water 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 Valley Water access for maintenance responsibilities such as sediment and vegetation removal must be preserved. For this reason Valley Water generally prefers to limit recreational improvements on creekside maintenance roads to one side of the channel. Still, Valley Water often incurs increased maintenance costs as a result of its efforts to support the public's use of Valley Water-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. Valley Water encourages trail proponents to avoid extensive trail improvements in areas where flood protection improvements have not been completed.

2.2.6 ECOLOGICAL RESOURCES

INTRODUCTION

Santa Clara County is a highly urbanized region with nearly two million human inhabitants. Despite this level of development and the resulting pressures 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. Valley Water 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 Valley Water's enacting legislation with the state that allows for watershed stewardship in addition to water supply and flood protection mandates.

Valley Water stewardship priorities include:

- Preserve creeks, baylands, and ecosystems through environmental stewardship
- Improve watersheds, streams, and natural resources as they pertain to ecological resources
- Promote the protection of creeks, baylands, and other aquatic ecosystems from threats of pollution and degradation
- Enhance 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

Valley Water goals and activities utilize the 2012 Santa Clara Valley Habitat Plan (see Appendix B).

The habitat plan, associated conservation plans (HCP/NCCP), and two, 50-year, multi-jurisdictional permits offer a pathway to ecosystem scale benefits. They also provide a coordinated process for permitting and mitigat-

ing impacts to eighteen listed species. Three cities, the county, and the Valley Transportation Authority are local partners along with Valley Water. 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, Valley Water intends to strengthen its stewardship of the county's natural environments, particularly as they relate to water resources. Valley Water owns relatively little land across the county, 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 Valley Water's 10 reservoirs. The Santa Cruz mountains include many protected areas, while the Diablo Range hosts extensive grazing lands.

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. 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. 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).

A narrow riparian zone in the dry, rural part of the County offers wildlife habitat, food, and a migration corridor through urban and agricultural areas. Riparian habitats also help filter runoff before flowing into creeks. Photo: Valley Water

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 Natural Communities 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. 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 portion of the valley floor is 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 were dug to drain natural wetlands, and these form parts of today's creek network. Vegetation along the creeks, often referred to as riparian habitat, typically occurs in narrow bands that are limited by the developed landscape. In some areas, urban trees, parks, and non-native, ornamental landscaping 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 developed 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 apart from tidal influence. 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 migratory 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 Valley Water is a partner, is benefiting special status marsh species (see pp.83).

See also Chapter 1: The County Setting; Chapter 2.1: Historical Ecology & Model (pp. 14-15); Chapter 2.2 Contemporary Landscape Model (pp.28-29); and Section 2.2.7 Baylands (p.75).

Looking north along the urbanized valley floor, with the Diablo Range in the background. Photo: Valley Water

Natural Communities

The hills, valley floor, and baylands of Santa Clara County support a variety of 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 2012 Santa Clara Valley Habitat Plan, seven natural communities 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 2.1. Aquatic species are described separately under the Fish section below. The following major natural communities are found in Santa Clara County.

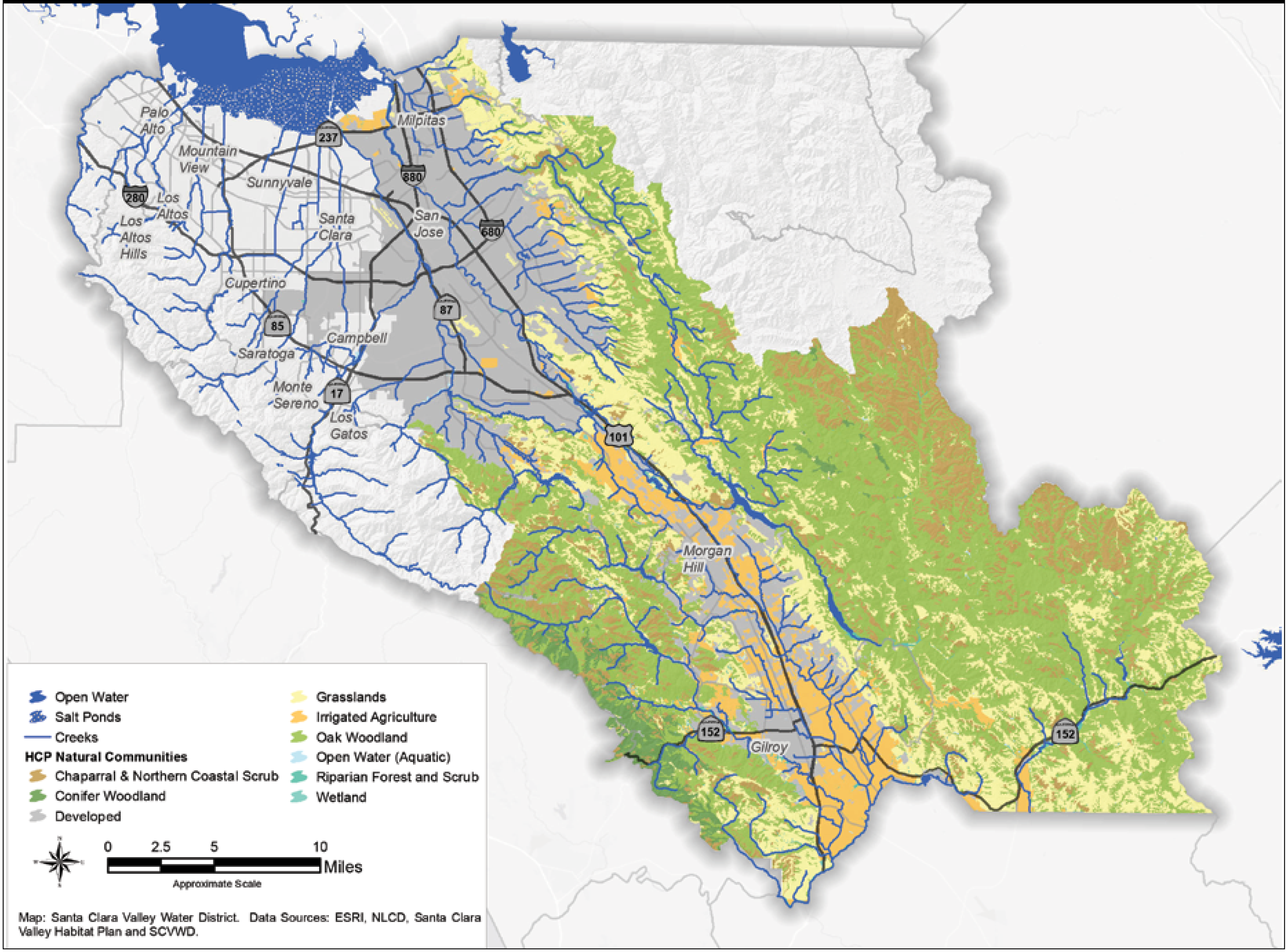
Grassland

Grasslands, which also include forbs (herbaceous flowering plants that are not grasses), grow throughout the county. 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.

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

Figure 2-19: **Habitat Conservation Plan - Natural Communities**



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

- 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. Native grasslands, seeps, and rock outcrops are habitat for several special status plant species.

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. Special status plant species also thrive in these natural communities, typically in the chaparral that grows on serpentine soils.

California quail. Photo: Rick Lewis

Oak Woodland

The most common land covers in the county are dominated by upland hardwood trees such as oaks. There are several different oak woodland natural communities in the county:

- 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. Special status plant species are sometimes interspersed in oak woodland communities.

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.

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. 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

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. Special status plants sometimes live in riparian vegetation communities.

Conifer Woodland

Conifer woodlands in Santa Clara County include redwood forest and knobcone woodland, found in the Santa Cruz Mountains on the west side of the county, and ponderosa pine, at higher elevations on the east side of the county in the Diablo Range. 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

Acorn woodpecker. Photo: Rick Lewis

California newt. Photo: Rick Lewis

gray squirrel, and striped skunk. 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.

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. 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, 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.

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 communities are regulated by the California Department of Fish and Wildlife.

The following natural communities in Santa Clara County are considered by CDFW to be sensitive:

- 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.

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 (which contain serpentine soil habitats). 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.

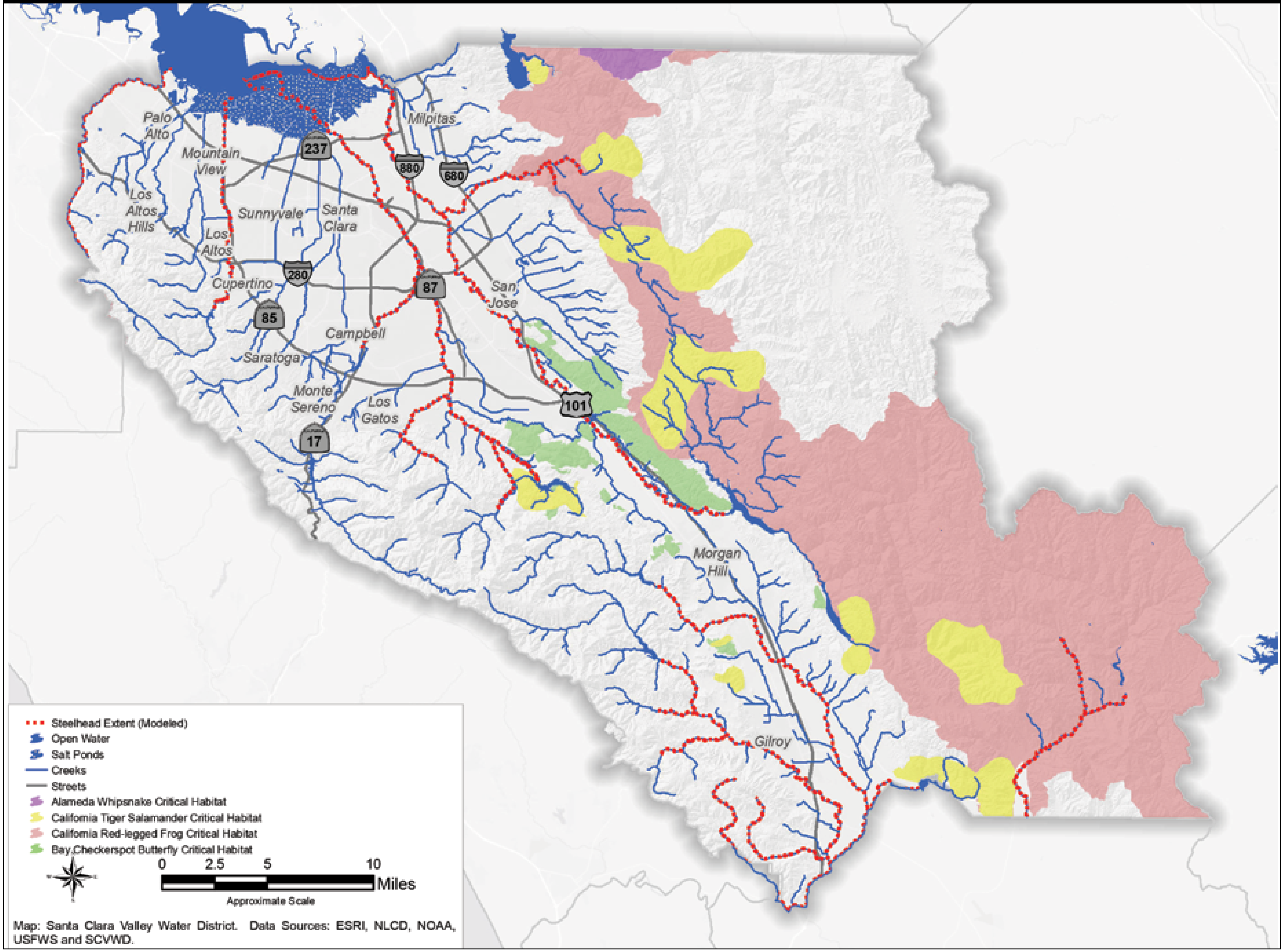
Wildlife

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 Valley Water'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 natural community types above.

Figure 2-20: Sensitive Species Critical Habitat



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 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, California red-legged frog, and western pond turtle. 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 of special status wildlife species that rely mainly on upland habitats are the Bay checkerspot butterfly, which feeds on a variety of plants associated with serpentine grasslands, and the Western burrowing owl, which utilizes open habitats such as grasslands. Western burrowing owls may also use levees and higher ground in the baylands. A complete list of special status wildlife species is included in Appendix A-1.

Through the One Water Framework, Valley Water 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 in the past.

Fish

Human impacts on the landscape, 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 2-21, p.74). Climate change, and a predicted increase in the number and duration of droughts, will exacerbate these problems.

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

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 Valley Water purview (see Figure 2-18, p.62). As such, Valley Water 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.

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.

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.

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 Department of 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, Fully Protected species, and plants with certain California Rare Plant Rankings. California Environmental Quality Act (CEQA) analysis for a project must take these additional species into consideration. 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.

Coyote ceanothus. Photo: Janell Hillman supported up to 17 different endemic species (see Appendix A-2). More recently, Valley Water biologists have more routinely detected 13 endemic species in county watersheds. (There are additional endemic species in the brackish and estuary areas of Santa Clara County, but these are not listed in Appendix A-2).

The introduction, naturalization, and straying of various fish species into county watersheds has increased species richness; however, some of this may be detrimental to native fish populations. Valley Water biologists have detected an estimated 33 non-endemic fish in county watersheds.

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).

Appendix A-3 gives insight into current Santa Clara County fish assemblages based upon observation, but yearly and seasonal changes can contribute to variations at any given time.

Special Status Fish Species

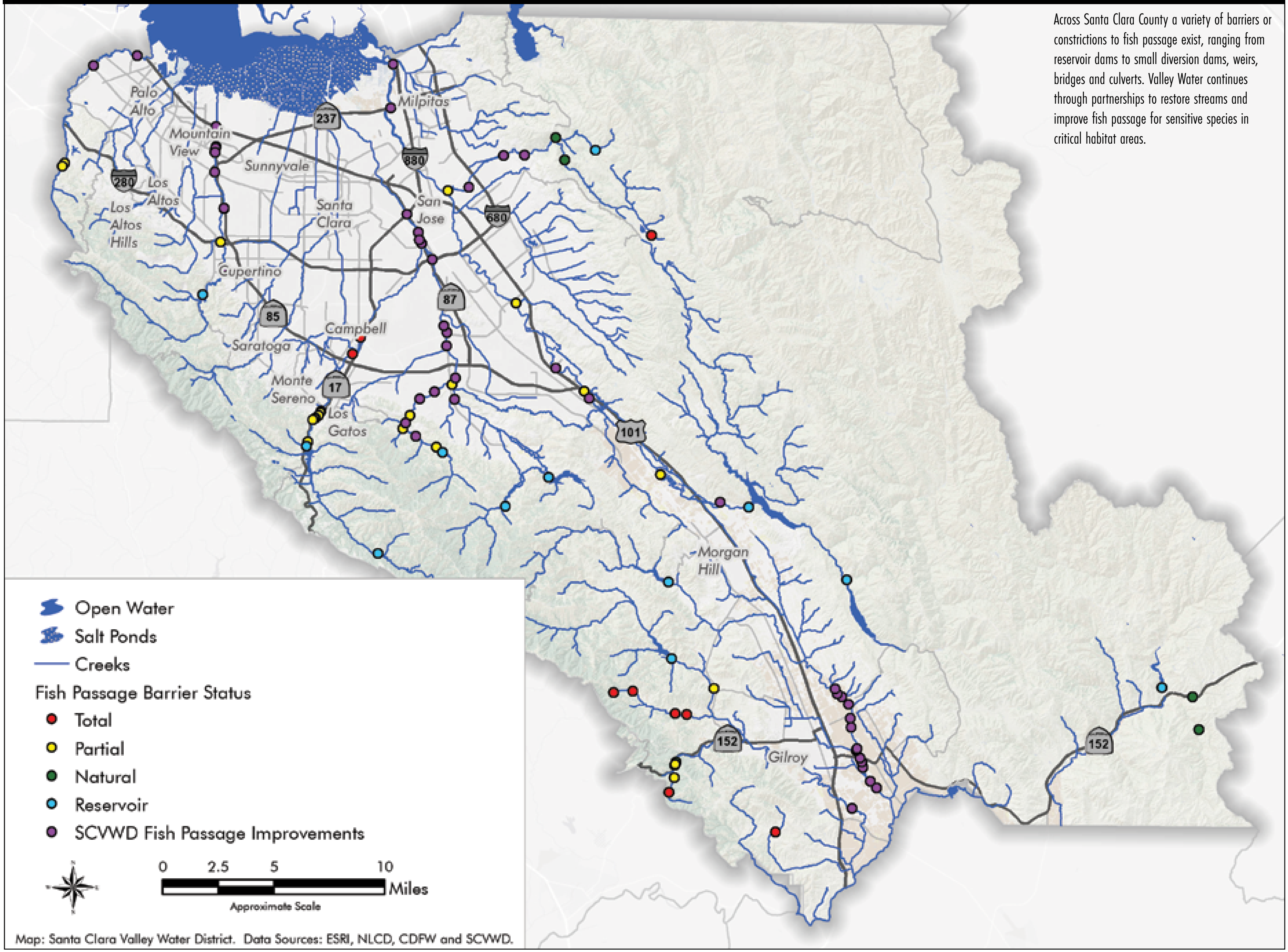
Several special status fish species are known to occur in Santa Clara County (Appendix A-3). These include steelhead trout and Pacific lamprey. Both species are anadromous, migrating from the ocean and Bay up to the watersheds to spawn.

These fish often 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, gravels to spawn in and deep pools, where they can survive in drought conditions.

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

Fish sampling in an intermittent pool in Coyote Creek. Photo: Nate Seltenrich

Figure 2-21: 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. Valley Water continues through partnerships to restore streams and improve fish passage for sensitive species in critical habitat areas.

REPRESENTATIVE BIOLOGICAL RESOURCES

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

California red-legged frog — Valley Water 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 this frog species. 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 their 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.

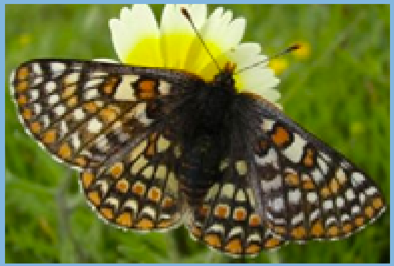
Steelhead — Valley Water reservoir operations and stream maintenance, among other activities, can be restricted by laws protecting threatened steelhead in Santa Clara and surrounding counties. Federal designations recognize two distinct stocks of steelhead representing the genetic diversity and life 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 (see Figure 2-17, p.61).

These fish can grow to weigh as much as 35 pounds, though they are generally smaller in Santa Clara County rivers. Steelhead are dark olive, with silvery white undersides, heavily speckled bodies, and a pinkish stripe running along their sides (the "rainbow" in rainbow trout). Steelhead is the same species as rainbow trout. Steelhead are anadromous; they migrate to the ocean as juveniles and return to fresh water as adults to spawn. Rainbow trout are permanent residents of freshwater systems.

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.

Photos: CDFW & USFWS

Bay checkerspot butterfly — The federally threatened Bay checkerspot butterfly was historically widely distributed to the east, west, and south of San Francisco Bay but is now restricted to a few remaining patches of suitable habitat within the western and south edges of the Bay Area, 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. Valley Water mitigation and habitat conservation activities for special status species associated with unique serpentine soils, including the Bay checkerspot butterfly, are extensive and include the creation of new habitats.

California sycamore — In its efforts to restore habitats and floodplains through the One Water Plan, Valley Water 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.

Sycamore tree. Photo courtesy Greg Golet, The Nature Conservancy

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, the creation of 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 by building dams, channelizing streams, draining wetlands, and putting in culverts which increase drainage networks. This increase, along with a decrease in sinuosity, has changed the physical characteristics of the county's streams.

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, riparian habitat has been destroyed to make room for agriculture, development or flood protection improvements. Streams have also been disconnected from their floodplains and adjacent uplands. This disconnection disrupts important natural stream functions that provide fish and wildlife habitat.

Non-native species: The populations of many native species are compromised by the presence of non-native species in their habitats. Non-native species introduced both intentionally and unintentionally by humans can spread disease, outcompete and displace native species, prey upon native species, hybridize with natives, or degrade habitats used by native species. Riparian and wetland habitats are subject to 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 fresh-water fish, some of which have been introduced to new watersheds in the Santa Clara Valley via water transfer facilities such as aqueducts or pipelines.

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

In habitats dominated by non-native fish, population size, distribution, and overall success of native fish can be reduced. 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 Valley Water.

Loss of sediment and woody debris: Streams that have been dammed no longer carry the sediment and woody debris they did historically. Important habitat for fish — such as riffles and pools — forms when sediment and woody debris are transported, moved around, and deposited downstream. This woody debris, while beneficial as habitat, must be managed so that it does not also exacerbate flooding in flood prone areas. 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.

Diminishing resilience: 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. A key challenge for One Water managers is to understand and attempt to balance factors contributing to resilience throughout a watershed, and in the context of major human alterations to the underlying ecosystems.

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 climate disruptions could transform bayside ecosystems.

2.2.7 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 2-22, p. 80). 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 to landscape-scale restoration of habitats including seasonal wetlands, mudflats, lagoons, low-lying grasslands, and associated uplands.

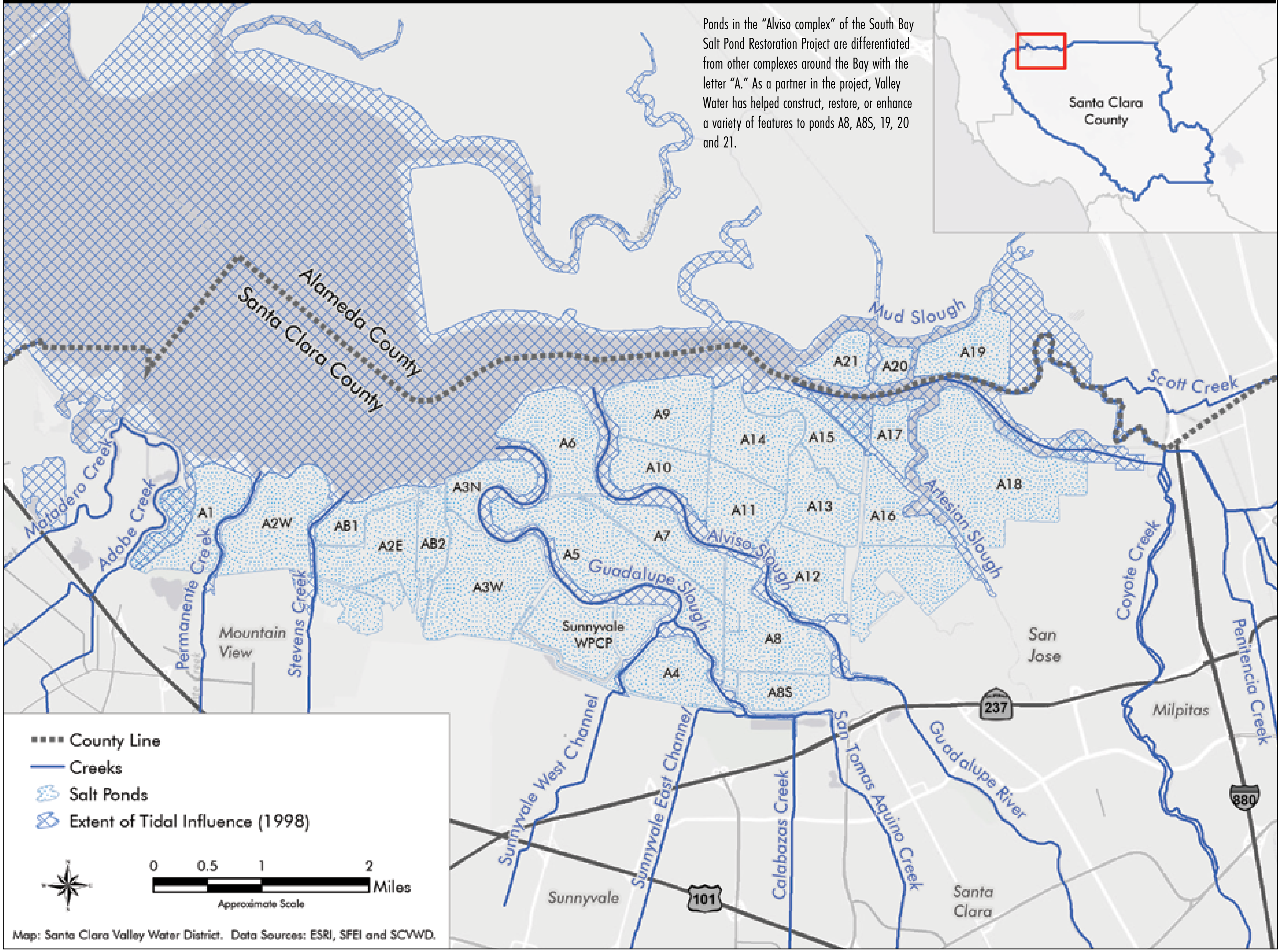
Valley Water is one of nine partners working on major restoration and flood protection projects along the 17 miles of shoreline that comprise some of Santa Clara County's northern boundary with San Francisco Bay. Bayland habitats now being returned to the tides as part of habitat restoration efforts also provide an invaluable buffer from storm surges and flooding for Santa Clara 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 near-shore 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, three wastewater treatment plants, employment centers, and suburban communities. The headquarters and offices of many Silicon Valley giants, stand on these former baylands.

Valley Water conducts work in areas of the baylands within its jurisdiction to manage drainage, flooding, runoff, and contamination from local watersheds into the Bay. Valley

Figure 2-22: Baylands



Monitoring baylands near Alviso Slough. Photo: Maureen Downing Kunz

Water 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 or are influenced by baylands or by the tides (see Figure 2-22, p. 80). 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.

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 Valley Water works with in the baylands are the U.S. Army Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA) on flood protection issues, and the California State Coastal Conservancy on baylands restoration projects.

Valley Water 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 (see Figure 2-14, p.50). FEMA-mapped areas are subject to development standards as implemented by the cities via floodplain management ordinances.

Valley Water maintenance or construction work at creek mouths or in wetland areas often triggers regulatory review and requires permits from agencies such as USACE, the California Department of Fish and Wildlife, the U.S. Fish & Wildlife Service, and the National Marine Fisheries Service. Valley Water 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 Section 2.2.3 Water Quality, p. 40 and Section 2.2.6 Ecological Resources, p. 65).

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 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 San José/Santa Clara Regional Wastewater Facility, and Valley Water'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. Valley Water 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 to mid 1900s, the baylands subsided by two to eight feet between 1912 and 1967. Although Valley Water 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.

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.

Valley Water 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 (see Figure 2-22, p.80). 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
- Valley Water
- 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 José, Santa Clara and Sunnyvale
- National Aeronautics and Space Administration
- San Francisquito Creek Joint Powers Authority
- Valley Water
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service

SOUTH BAY FLOOD PLANNING AND RESTORATION

Valley Water is a partner in two closely aligned projects that propose to restore portions of the marshlands and provide flood protection. Within these projects, Valley Water 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, Valley Water 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, Valley Water 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 José/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 (see Figure 2-23, p.84).

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. More information on these projects can be found in page 113, and page 140-141.

Figure 2-23: Shoreline Levee Alignment

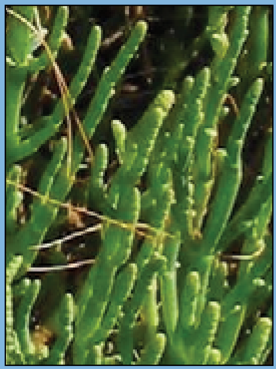
Levee alignments through a variety of economic impact areas (EIA).

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. Endangered salt marsh harvest mice hide in pickleweed's thick cover, which serves as a place to nest. It is also 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 one in six 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.


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

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, Valley Water 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 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 Valley Water 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 flows 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. Valley Water 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.

2.3 FUTURE CONDITIONS

New Water Trail landing at Alviso. Photo: Galli Basson

2.3 FUTURE CONDITIONS

2.3.1 INTRODUCTION

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

Evidence of climate change is already being observed in California. Overall, the Bay Area average annual maximum temperature increased by 1.7°F (0.95 °C) from 1950 to 2005. 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 past 50 years. As a result of the changing climate, wildfires are becoming more frequent and widespread. Historic precipitation data for California's central coast region show trends toward decreasing rainfall during the November to January period and 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 include continued increases in temperatures and heat waves and may include more intense precipitation events and more frequent and severe droughts. Climate change adds an additional layer of complexity and uncertainty to planning. Table 2-6 shows the projected temperatures for Santa Clara Valley.

The One Water Framework recognizes that climate change affects all aspects of water management, and that to be successful, adaptation planning needs to be integrated and comprehensive. Coordination with Valley Water's Climate Change Adaptation Plan (CCAP) will help achieve these goals.

"This year (2018) has been a harbinger of potential problems to come... The number of extremes that we've seen is consistent with what model projections are pointing to, and they're giving us an example of what we need to prepare for."

DAN CAYAN
SCRIPPS INSTITUTION OF OCEANOGRAPHY

2.3.2 CURRENT VS. FUTURE CONDITIONS

Valley Water is accustomed to managing resources within a changing environment with variable rainfall and periods of drought and flood. California precipitation is the most episodic in the nation. Large, discrete storms provide a substantial fraction of California's rainy season total precipitation, and annual precipitation is highly variable from year to year. Until recently, Valley Water 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 adaptive 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.

Table 2-6: Projected Temperature Santa Clara Valley

	San José Temp	San José 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

Cal-Adapt, 2015

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 after the middle of this 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. The powerful 2015-16 El Niño, one of the three largest in the historical record, resulted in winter wave energy that was over 50 percent larger than the typical winter in the Bay Area.

Shifting Precipitation Patterns

Precipitation in the Bay Area will continue to exhibit high year-to-year variability with very wet and very dry years. The largest winter storms will likely become more intense, and potentially more damaging, in the coming decades. 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 Valley Water, 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, damage creek ecosystems and habitat, and undermine water supply assets.

Heat, Temperature Change, and Drought

Cal-Adapt models project average temperatures will increase with climate change, with San José and Gilroy subject to temperatures 3.3° - 6.0°F higher than historic averages depending on emissions scenarios. 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 water supply (evaporative losses increase), public health, fire risk, air quality, agricultural production, and natural ecosystems within the county. 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 and may severely impact the Sierra snowpack.

Table 2-7: Climate Change Effects on Valley Water Resources

Climate Change	Potential Effects	Affected Key Valley Water 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 plant blooming and bird 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 plant blooming and bird 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 Baylands
Sea level rise	Increased flooding Changes in habitat	Landscape resources Baylands Water supply

Extreme Weather Effects

As climate change effects increase, the most immediate problem for Valley Water may be preparing for more extreme weather 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. Under a high emissions scenario, Cal-Adapt models project the number of extreme heat days per year in San José will increase from four historically to 23 by late century. San José will also experience more frequent and more intense heat waves. Extreme weather events coinciding with sea level rise are also 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.

Super Storms & 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 Santa Clara County 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 one 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 projections indicate a 77 percent increase in mean annual statewide area burned by late century (Fourth California Climate Assessment). 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 Valley Water facilities by adding debris and sediment to waterways or impacting physical assets in non-urban environments.

2.3.3 IMPACTS ON VALLEY WATER ACTIVITIES

In general, Valley Water 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 and in local source waters
- 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 and Delta due to sea level rise
- Increased bay and fluvial flood risk due to changes in storm patterns and intensities
- Increased bayshore 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 resulting in changes in characteristic species in a given area
- Transformation of bayland ecosystems due to sea level rise and other climatic disruptions

More specifically, Table 2-7, p 89, correlates climate changes discussed above with the effects on the various key resource areas addressed through One Water planning.

2.3.4 BEYOND CLIMATE CHANGE: OTHER FUTURE CHALLENGES

Climate change and the prospect of reoccurring drought are not the only challenges Valley Water anticipates facing in the future. Other challenges may include continued urbanization and population growth, as well as 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 Valley Water'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.

3 FRAMEWORK

FRAMEWORK

3.1 VISION

The One Water Framework provides a 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 help set up a decision-making framework that will guide more detailed planning and implementation on watershed and subwatershed scales while also applying to countywide programs.

One Water planning builds on mandates spelled out in Valley Water's authorizing legislation and ties directly to Board governance, such as its Ends policies (see Table 1-1, p.3). Board policy states that an integrated and balanced approach to managing a sustainable water supply, natural flood protection, and healthy watersheds is essential in preparing for the future. Local communities support this commitment.

One Water planning also reflects new thinking about how to integrate the multiple aspects of Valley Water's mission and provide Santa Clara County and Silicon Valley with safe, clean water for a healthy life, environment, and economy. In addition, it underscores the commitment of Valley Water's Board of Directors to long-term planning and to ensuring such planning and processes reflect the entire community, including traditionally marginalized groups.

This One Water Framework is the product of several years of working with more than 80 stakeholders. This work led to specific goals and objectives that reflect the overarching vision for the One Water Countywide Framework and its subsequent watershed plans.

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

One Water framework stakeholder meeting. Photo Valley Water

3.2 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 Valley Water and its partners in Santa Clara County. The resulting three goals and five objectives were carefully crafted to provide concise guidance for a decision-making process. 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 three goals align with Board governance policies for water supply, flood protection and environmental stewardship but also consider the perspective that each can support multiple objectives.

Through its efforts to achieve these integrated, multi-purpose goals, Valley Water intends more holistic management of water resource at a countywide and watershed scale. Developed goals and objectives will lead to strategies and real-world actions — in the form of supporting partnerships and policies and implementable projects and programs — that move Valley Water more fully into an era of managing the community's single most critical resource as One Water. The following three goals are described in terms of overall intent, rationale for inclusion, and resulting conditions assuming substantial levels of implementation.

GOAL 1: RELIABLE WATER SUPPLY

This goal concerns having enough clean water for both people and the environment, including water to support native species, endangered fish and riparian habitats in creeks. To meet this goal, water must also meet regulatory requirements governing both drinking and surface waters.

"Reliable" relates to both the quality and quantity of the water available to the county and managed by Valley Water. Under this goal, Valley Water's supplies for various beneficial resources will be reliable under a variety of hydrologic conditions and regulatory, environmental, and economic uncertainties. For Valley Water, this means continuing to efficiently manage the diverse supplies and substantial infrastructure already in place, as well as continuing to manage demand by aggressively implementing water conservation programs with the help of the community.

Guadalupe River Park Trail. Photo: City of San José

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. Examples of potential topics that span Valley Water's mission include FloodMAR (managed aquifer recharge), groundwater dependent ecosystems, instream recharge, public access and recreation at or near water supply facilities such as groundwater recharge ponds, and flow management.

The current iteration of One Water framework does not include all aspects of water utility management such as water treatment plants, pipelines and recycled water. Rather the intent is to focus on how natural and managed water is utilized and provides benefit in the watersheds. However, future versions of the framework and related watershed plans may expand activities under this goal to include greater integration of Valley Water's master planning documents and water resources management duties.

GOAL 2. IMPROVED FLOOD PROTECTION

This goal recognizes the importance of protecting the community from flooding and reducing flood risk by working with nature to the extent possible. This means enhancing stream corridors to support the conveyance of flood flows while at the same time providing benefits for natural communities and ecosystems. It means capturing rainwater, infiltrating it in desirable locations, and reducing runoff into streams, recognizing that rain is more of a resource than a hindrance.

This goal also acknowledges that it is in everyone's best interest to prepare for flooding, and to manage and mitigate associated risks. Managing runoff from rainfall and reducing 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. Flood protection can also mean partnering with municipalities, private landowners, and NGOs to help plan landscapes to better accommodate flooding while also enhancing habitats, improving water quality, and addressing climate change challenges.

The goal of improving flood protection includes maintaining existing infrastructure, improving facilities that require additional risk reduction, and keeping the community prepared and informed of potential flood risks.

Flooding in Rock Springs 2017. Photo: VW

GOAL 3. HEALTHY and RESILIENT ECOSYSTEMS

This goal underscores the importance of healthy and resilient watershed, riparian and tidal ecosystems, and the species that rely on these habitats to thrive. Making ecosystem health more relevant to every management decision is a key concept in One Water planning. Protecting and sustaining the plants, trees, fish and wildlife of the county's natural communities is centrasl to effective ecosystem management.

Resilience and health contribute to sustainability. A resilient system is one that can recover from disturbance. Resilience is a relevant, guiding concept for all of Valley Water's goals and management activities, but under this goal the focus is on ecosystems. In this context, Valley Water might undertake a project that connects more habitats along an intermittently developed stream corridor or that connects streams to the Bay. Connectivity projects might also include additional buffer areas. Such projects would help species to move among habitats in response to warmer temperatures or loss of host vegetation.

The One Water approach considers all of these kinds of aims and actions as pathways to healthier watersheds — whether they eventually lead Valley Water into preserving critical habitat, removing a minor creek constriction or providing an alternate habitat downstream for a sensitive species. Valley Water acknowledges that reaching this goal will require careful management of the watershed and strong community partnerships to be successful.

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

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 Santa Clara 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.

3.3 OBJECTIVES

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

For each objective, Valley Water developed two to four key attributes representing critical measures or components of that objective. As the One Water Framework is applied and implemented, Valley Water will track progress in meeting each objective by evaluating various metrics and targets associated with these attributes (see Chapter 4). 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 add up to SMART (specific, measurable, achievable, realistic, time based) objectives.

Development of One Water objectives engaged diverse communities that represent Santa Clara County. The effectiveness of the ongoing effort will derive from the quality, duration, and extent of community participation in decision making. Community engagement is woven throughout the following five objectives. Under One Water, engagement is not an end in itself but rather as a means to gathering community support for future priorities that protect, enhance and sustain water resources.

A. Protect and Maintain Water Supplies

This One Water objective is to protect and 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. While the current One Water Framework focuses more on local rainwater and groundwater and less on recycled water and water being treated at water treatment plants, these are all still elements of One Water in a broader sense.

Valley Water's strategy for maintaining a reliable current and future supply includes efforts to manage demand, to develop recycled water supplies, and to secure and optimize its flexible and interconnected water supplies and infrastructure.

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

Objective A is divided into several components, or attributes, supported by metrics and targets:

A.1: Protect, maintain, and develop local water supplies.

A.2: Support water supply demand management (water use efficiency, water conservation).

B. Protect and Improve Surface and Ground Water Quality

This One Water objective is to maintain high quality water in 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 Valley Water 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).

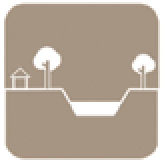
Meeting this objective, in conjunction with objectives for stream health, will require Valley Water to continue working with others to improve physical, chemical, and biological water quality parameters such as temperature, dissolved oxygen, turbidity, trash, and other pollutants of concern, as well as food supply for fish (benthic macro-invertebrates).

Objective B is is divided into several components, or attributes, supported by metrics and targets:

B.1: Support high quality surface water in reservoirs to support applicable human and aquatic life uses.

B.2: Support high quality surface water in streams to support applicable human and aquatic life uses.

B.3: Protect groundwater from existing and potential contamination, including saltwater intrusion.



C. Reduce Flood Risk

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, Valley Water can also meet multiple objectives. One Water projects will be developed to not only enhance natural riparian functions, but also to increase water infiltration, diversify habitats, manage woody debris, provide life-cycle cues to sensitive species, and move gravel and fine sediment through the system.

One component of reducing flood risk is expanding buffer lands adjacent to creeks, reservoirs, the Bay, and other water bodies. These buffers allow for natural creek meanders and periodic overtopping of floodwaters into safe areas. Expanding buffers will 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 Valley Water 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 the future, as Valley Water works to help creeks, communities, and shorelines adapt to climate change, extreme storms or heat, sea level rise, and increased urbanization.

Objective C is divided into several components, or attributes, supported by metrics and targets:

C.1: Maintain flood facilities.

C.2: Reduce risk of flooding from flows overtopping banks (creek and tidal).

C.3: Prepare and inform community of flood risks and take measures to improve safety and reduce damage.

D. Protect, Enhance & Sustain the Natural Ecosystem

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.

One aspect of promoting habitat resilience in watersheds is to encourage more natural stream flows (in terms of 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 Valley Water 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.

Objective D is divided into several components, or attributes, supported by metrics and targets:

D.1: Maintain healthy watersheds.

D.2: Enhance diverse, healthy riverine habitats.

D.3: Enhance diverse, healthy baylands and tidal marsh habitats.

E. Mitigate & Adapt to 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, and 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 and resilience in water resources management necessary to mitigate and adapt to uncertainties and unforeseen impacts. Climate change is important across all business areas for Valley Water and so is addressed by functional areas within its attributes and metrics.

Objective E is divided into several components, or attributes, supported by metrics and targets:

E.1: Mitigate Valley Water's contribution to climate change.

E.2: Prepare water supply resources to be resilient to changing climate.

E.3: Enhance the resilience of people, property, and ecosystems to increasing riverine and coastal flooding due to climate change.

E.4: Enhance the resilience of watershed to climate change.

5.4 STRATEGIES

To support the One Water vision, goals, and objectives, Valley Water 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, Valley Water may find that it is able to achieve One Water objectives with fewer strategies. In addition, it should be noted that Valley Water already implements many of the strategies. A list of potential strategies is provided in the adjacent Table 3-1.

In general, Valley Water 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, Valley Water needs to partner with other agencies and organizations (local, regional, state, federal, scientific, NGO) to meet its goals and objectives. Valley Water 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 3-1: 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-E
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-E
3	Emphasize two-way transparent and open communication with community and key stakeholder groups	A-E
4	Leverage near-water trails and other recreational and public spaces for education and stewardship, e.g. with interpretive panels	C,D
Develop science-based policy and priorities		
5	Prevent encroachment on Valley Water rights of way	A-E
6	Monitor indicator attributes for long-term success of identified target species	D
7	Develop and substantiate ecosystem services in cost-benefit analyses	D
8	Ensure that project designs are based on best available science regarding sea level rise and anticipated changes in precipitation patterns	D,E
9	Actively engage land-use and regulatory agencies to develop and implement policies that protect and conserve water resources	A-E
10	Assess potential post-disaster opportunities (fire, flood, other) and develop emergency recovery plans for rebuilding smart and strengthening future resilience	A-E
11	Identify and recommend policies that would prevent hazards to public health and safety along waterways	B,C
Develop partnerships that support mutual objectives		
12	Work with land-use agencies to create resilient water-related wildlife habitat in coordination with new development	D
13	Pursue public-private partnerships with appropriate recognition and incentives for voluntary actions consistent with Valley Water objectives	A-E
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-E
15	Actively participate in general planning especially during policy development	A-E

Table 3-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Develop partnerships that support mutual objectives - cont'd		
16	Collaborate with agencies, organizations, and land owners (through appropriate incentives consistent with Valley Water 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,E
17	Partner with land-use agencies and land owners (through appropriate incentives consistent with Valley Water objectives) to preserve natural recharge and headwater areas (water supply and base flow enhancement)	A
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-E
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, water retailers, well owners, land-use agencies, and regulatory agencies on groundwater management	A
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-E
23	Coordinate with larger regional, state, and federal efforts on climate change adaptation	E
24	Increase wildfire education and prevention	A,B,D,E
25	Coordinate prevention, response, and recovery plans for floods, earthquakes, droughts, fire, and catastrophic events with local, county, state, and federal government agencies	A,C,E
26	Facilitate post-disaster land acquisition policy discussions	C,E
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-E
28	Collaborate with neighborhoods, nonprofits, local governments, private property owners, and growers on water management projects	A-E
29	Support appropriate resource-sensitive recreational activities and opportunities on reservoirs, streams, and other publically-owned water bodies	A,B,D

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 José

Table 3-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
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-E
31	Support resilient native wildlife communities/adaptability of habitat	D,E
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	D
33	Manage to support a diversity of complex habitats, communities, and habitat resources (by providing or installing refugia, micro-topography, complex vegetative structure, coarse woody debris in channels, other physical heterogeneities)	D
34	Manage and promote functional vegetation communities when managing water for beneficial uses or flood protection	A-E
35	Prevent introduction/establishment of new invasive species and pathogens and remove existing invasive species in and around aquatic environments	D
36	Plant native plant species where appropriate and consider infiltration and absorption for plant health	D
37	Pursue 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	C,D,E

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 3-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Take action to meet the objective - cont'd		
38	Pursue 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	C
39	Look for opportunities to purchase or encumber riparian land	A-E
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	B,D
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)	B,C,D,E
42	Continue to protect, maintain, and develop local surface water supplies	A
43	Continue to protect, maintain, and develop imported water supplies	A
44	Continue to protect, maintain, and develop non-potable recycled water, indirect potable reuse, and direct potable reuse	A,E
45	Continue to increase water conservation savings and expand demand management measures	A,E
46	Continue to manage groundwater in conjunction with other supplies (local surface, imported, recycled, conserved)	A,E
47	Complete local reservoir seismic retrofits to remove operating restrictions and improve public safety	A
48	Continue to maintain existing water utility infrastructure	A,B
49	Expand off-stream groundwater recharge capacity and conveyance	A,E

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 José are all examples supported by the Santa Clara Valley Urban Runoff Pollution Prevention Program, of which Valley Water is a partner. Photos: SCVURPPP

Table 3-1: Potential Strategies to Address One Water Goals and Objectives - *cont'd*

#	Strategy	Supports Objective(s)
Take action to meet the objective - cont'd		
50	Increase managed/artificial recharge	A,B,E
51	Develop regional green stormwater infrastructure including low impact development (LID), green streets and regional stormwater capture.	A,B,C,E
52	Ensure that non-potable and indirect potable reuse projects protect groundwater quality	B
53	Remove, remediate, or manage mercury in waterways	B
54	Prevent and clean up trash in waterways	B
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	D,E
56	Protect and restore bayland and riparian habitats that buffer storm impacts and protect water quality	C,D,E
57	Prepare plans to be adaptive to and provide resilience against floods, droughts, and catastrophic events	A,C,E
58	Expand water storage capacity in and outside of the county	A,E
59	Maintain reliable, accessible supply of emergency supplies (e.g. sandbags, pipe repair materials, water)	C,E
60	Expand education efforts on groundwater and potable reuse	A,E
61	Get input from tribes, disadvantaged, and underrepresented communities on water management decisions	A-E
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
63	Support freshwater flows that sustain estuary processes, habitats and restoration efforts	A,D

Multi-Objective Projects: Restoring Habitat and Reducing Mercury Methylation

Valley Water 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: Valley Water

4 MEETING THE OBJECTIVES

Photo: Lonnie K. Spin

MEETING THE OBJECTIVES

INTRODUCTION

The One Water Plan focuses on improving water resource and watershed conditions over the long term. Demonstrating success requires 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 and the framework's five objectives and more detailed attributes help categorize the work necessary to meet the One Water vision and goals. Valley Water developed these objectives and supporting attributes with information shared through a stakeholder process and with advice from a Science Advisory Hub, as described in Chapters 1 and 3.

The framework described below covers the steps necessary to establish and implement the One Water decision-making process and its resulting projects.

4.1 Develop attributes and metrics in the Framework and set targets per watershed.

4.2 Identify which metrics show the greatest need for improvement (largest gap between baseline and target).

4.3 Identify opportunities with emphasis on those that can help meet these needs.

4.4 Prioritize projects based on which provide the biggest benefit.

4.5 Recommend projects for implementation

While the process is described here, and key components such as attributes and metrics are detailed, carrying out the process and recommending projects for implementation will be completed in subsequent One Water watershed plans, rather than within the One Water Framework.

4.1 DEVELOPING ATTRIBUTES, METRICS AND TARGETS

Valley Water will assess progress in meeting objectives and their attributes by tracking specific metrics and targets. To select those attributes, metrics, and targets that would be most useful, feasible, and relevant, Valley Water reviewed preliminary objectives and measures, consulted literature, and discussed options with the Science Advisory Hub.

The hierarchy of a measurable objective under One Water includes attributes, the metrics within each attribute, and the targets set for each metric; in total these components create a measurable objective.

Attributes are important characteristics that together help describe an objective. For the objective "Reduce Flood Risk," one example attribute is "Reduce risk of flooding from flows overtopping banks (creek and tidal)." The most useful attributes are those that can be measured in a scientifically defensible way. Through the planning process, and with the help of science advisors, Valley Water has developed a concise list of attributes (typically between 3 and 4) for each objective — see Table 4-2 (p. 109).

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. For example, the attribute "Reduce risk of flooding from flows overtopping banks (creek and tidal)," includes the metric "Number of developed parcels, including critical facilities, subject to frequent flooding (25-year flood event)."

Ribbon cutting ceremony in Adobe Creek watershed with Valley Water Board Member Gary Kremen. Photo: Valley Water

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 such data; and
- the potential usefulness of the metric to other agencies and the public.

Targets are an optimistic but achievable endpoint for each metric, quantified where possible to indicate success. When a collection of key metrics is met, the overarching attribute may be considered met. And when a collection of attributes reaches their established targets, the relative objective may be considered met.

The One Water approach takes the long view that attaining success may take decades, and that the planning framework should consider 50 to 100 years into the future with frequent check-ins to evaluate progress. 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 and metrics, toward a target endpoint over time, can reveal positive or negative trends. Table 4-1 (p.108) provides an overview of these relationships.

4.2 IDENTIFYING AREAS NEEDING MORE ATTENTION

To identify water resource objectives that require additional support, One Water's five objectives will be measured via a set of attributes and corresponding metrics. For each metric, Valley Water will determine the baseline condition (starting point), the desired target, and percent of the target achieved to date within each of the county's five primary watershed areas. Thus each watershed will have measurable components to assess its overall watershed health and degree to which water resource improvements are successful.

Figures 4-1 and 4-2 below present a hypothetical example of how the status evaluation process might work. The example is hypothetical because measures and targets are still being finalized for the One Water Framework and are not representative until applied to a particular watershed. As shown, any objective, attribute or metric can be weighted for its relative importance by adjusting the width of its bar. Such a visual analysis can be expanded 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.

As it is updated through time, a status chart can also be useful in pointing to areas that may need additional resources. 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.

Hypothetical Example of One Water Status Evaluation

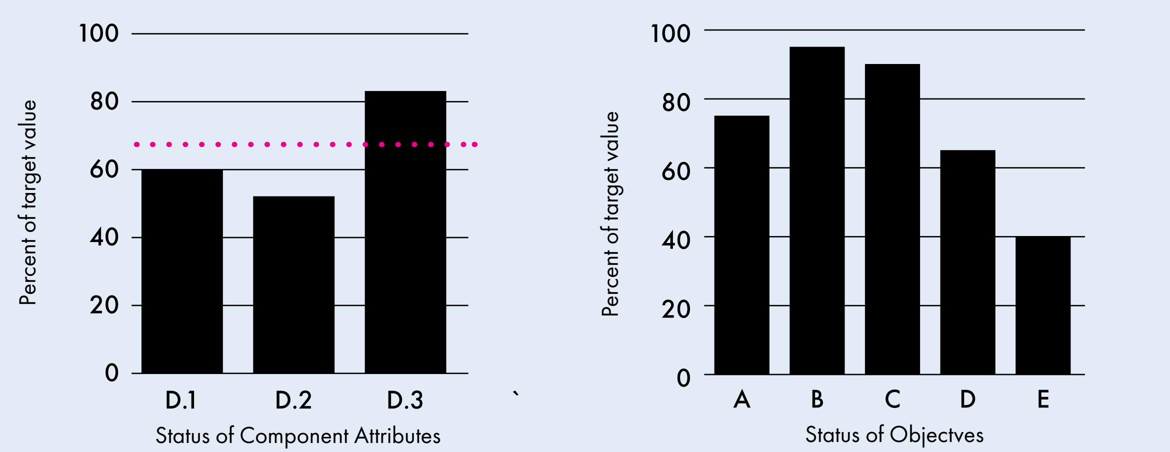
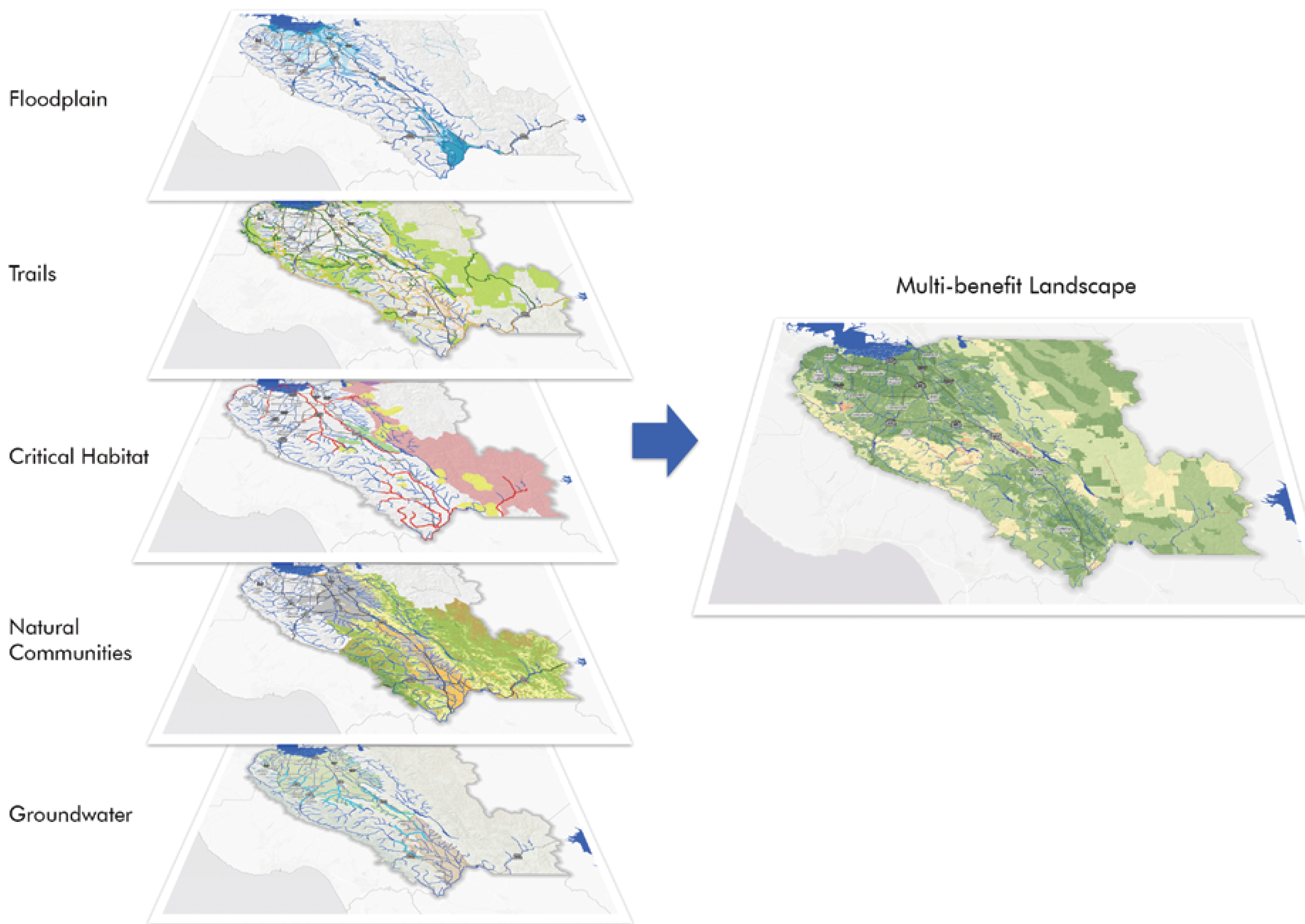


Figure 4-1 demonstrates that each objective is comprised of a series of attributes and subsequent metrics. Within each attribute, metric scores will be averaged to determine that attribute's score. The attributes may be averaged to give a score for the overall objective (average for objective D shown here as a dotted line).

Figure 4-2 shows how the status of the five One Water objectives might be displayed in the One Water tracking process. In this hypothetical example, all objectives are weighted equally as shown by the equal widths of the of the five status bars. 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 area between the status bar and the target indicates the amount of progress yet to be made before reaching the established targets. In this example, objectives B and C are shown as performing very close to their targets, indicating that current approaches are on track. Objectives D, on the other hand, appears as a shorter bar on the chart, indicating that more attention is needed in this area.

Figure 4-3: One Water Multi-Benefit Heat Map



Hypothetical example of how available spatial data layers may be stacked to create a heat map that illustrates priority multiple-benefit locations across the watershed landscape.

4.3 DEVELOPING AN OPPORTUNITIES LIST

One Water will be implemented by developing and carrying out programs, projects, policies and partnerships – namely a list of "opportunities" – that achieve progress in meeting identified targets.

Opportunities will be identified and developed through a collaborative decision-making process. One list of opportunities will be developed per watershed while some larger issues such as broad policies or programs that apply countywide will also be identified for further consideration.

Developing a broad list of project opportunities requires two steps: first, data collection, then stakeholder engagement.

The data collection step focuses on developing and maintaining a substantial data warehouse to support One Water planning, with data categorized on a per-objective basis and in coordination with a multitude of subject matter experts. One method used to analyze data is to overlap available data layers across the landscape to show relationships between data in a process called 'heat mapping' (see Figure 4-3). Areas where several pieces of data overlap and show potential for a multi-objective project are displayed as hot or prioritized for further consideration. This data also allows us to identify areas that are in less than ideal condition; for example, a riparian corridor with little vegetation or buffer to accommodate flood protection or water quality concerns.

The stakeholder engagement step centers on interacting with the community and soliciting input on both challenges and opportunities they have observed. For the One Water Framework, this engagement included the Stakeholder Work Group described in Chapter 1 as well as outreach to a wide variety of Valley Water divisions and departments and resources agency staff. At both countywide and watershed scales, stakeholders and Valley Water staff were and will be encouraged to propose ideas for improving the condition of Santa Clara County and its watersheds with respect to One Water goals and objectives.

During data collection and stakeholder engagement, staff will also look for opportunities to coordinate with existing plans and programs as their actions relate to safe, clean water, flood protection and environmental stewardship (see Appendix B).

The One Water decision-making process will combine heat map priorities and stakeholder and Valley Water staff input to yield a list of opportunities that blend general ideas on how to address known issues with specific activities at identified geographic locations. Each opportunity will be compared with the five One Water objectives to see how they relate to various aspects of water resources management and to determine how those opportunities best meet objectives in need of additional support based on scoring for attributes and metrics.

Each opportunity's level of detail will vary depending on available data, expertise, and any prior action. In general, the opportunities will be scoped to a basic level within each watershed-specific plan.

4.4 PRIORITIZING PROJECTS

Opportunities that relate to the five One Water objectives shall be captured and tracked for future consideration. Those that address the most pressing needs and are likely to raise the bar from baseline condition toward target conditions will be evaluated and ranked for further consideration. While all opportunities are viewed as having merit and so will be captured in an appendix for each watershed-specific plan, Valley Water Board approval and potential resource constraints necessitate the creation of a prioritized list of projects or project portfolios.

Steps to prioritize opportunities:

Step 1: Screen opportunities for those that meet pressing needs and challenges as identified through collecting data on objectives and their component attributes and metrics.

Step 2: 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 benefits to key attributes, metrics and targets.

Step 3: Evaluate the highest-rated opportunities for implementation based on feasibility and funding, with an option to gather watershed-specific portfolios of projects for Board recommendation.

4.5 RECOMMENDING PROJECTS FOR IMPLEMENTATION

The assembled list of screened and evaluated opportunities (see section 6.4) will result in a ranked list of specific actions or projects. The list will be vetted through the capital improvement plan process and considered for recommendation to Valley Water's Board of Directors.

These actions and projects will be considered the priority projects for each watershed and may be recommended as single stand-alone projects or presented to the Board as multi-benefit portfolios of projects. Creating portfolios of high-ranking projects will allow for recommendations that support watershed planning, offer funding options depending on Valley Water needs and available funds, and demonstrate alignment with Board governance policies and Board strategies.

Projects and/or portfolios will typically be recommended to the Board at the scale of the One Water watershed plans and not the One Water Framework. However, Appendix C describes efforts that are countywide or applicable across multiple watersheds. These opportunities are divided into ongoing activities and potential activities and shared for future consideration.

Design charrette with Valley Water staff, SFEI, and the Science Advisory Hub for the Upper Penitencia Creek multi- objective project. Photo: Sara Duckler

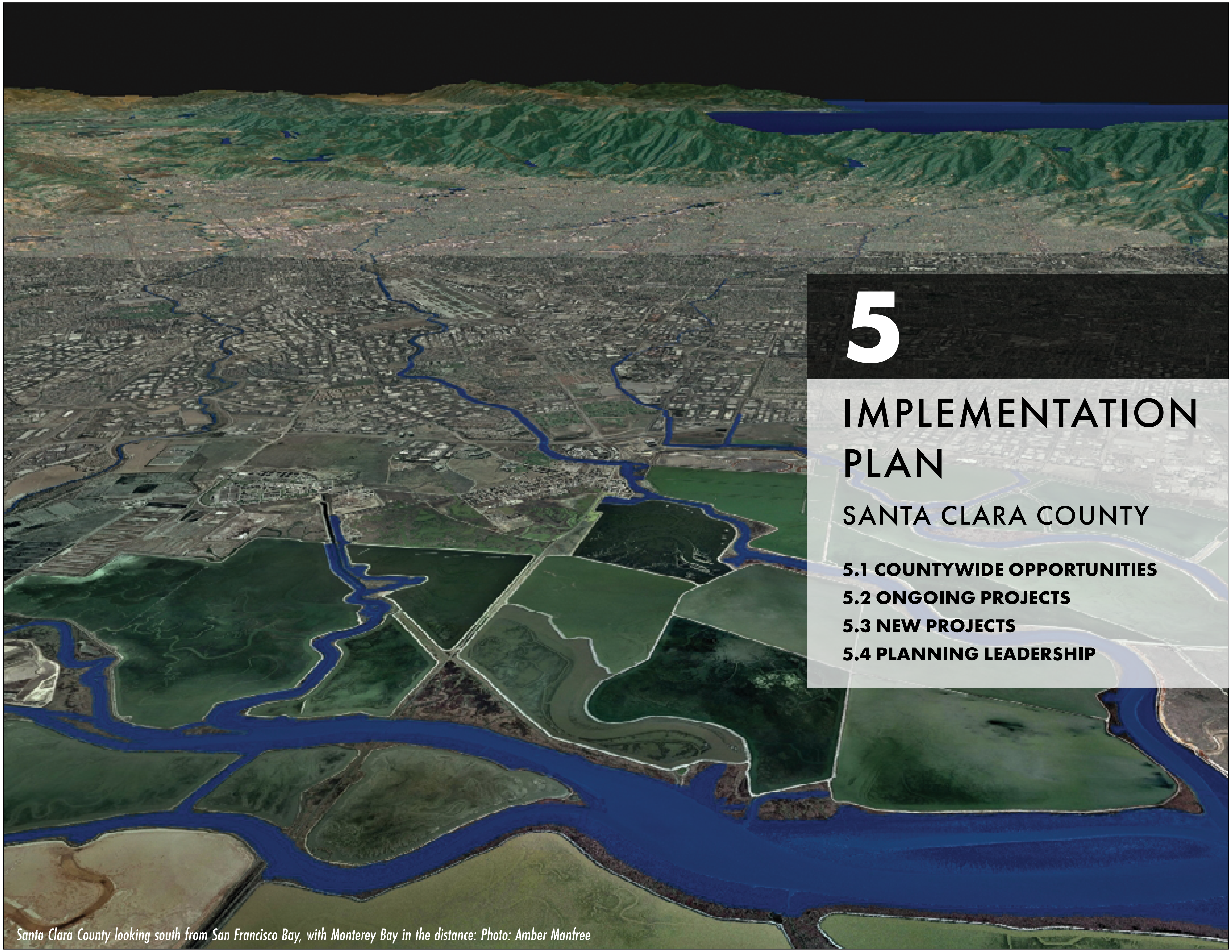
Table 4-1: Objectives & Attributes Summary

One Water Objective	Key Attribute (for tracking & assessing)
A. Protect and maintain water supplies	Protect, maintain, and develop local surface and ground water supplies. Support water supply demand management (water use efficiency, water conservation).
B. Protect and improve surface and ground water quality	Support high quality surface water in reservoirs for applicable human and aquatic life uses. Support high quality surface water in streams for applicable human and aquatic life uses. Protect groundwater from existing and potential contamination.
C. Reduce flood risk	Maintain flood facilities. Reduce risk of flooding from flows overtopping banks (creek and tidal). Prepare and inform community of flood risks and taking measures to improve safety and reduce damage.
D. Protect, enhance and sustain natural ecosystems	Maintain healthy watersheds. Enhance diverse, healthy riverine habitats. Enhance diverse, healthy baylands and tidal marsh.
E. Mitigate and adapt to climate change	Mitigate Valley Water's contribution to climate change. Build climate change resilient water supply resources. Increase the resiliency of people, property, and ecosystems to increasing riverine and coastal flooding due to climate change. Build climate change resilient watershed ecosystems.

Table 4-2

Vision: Manage Santa Clara County water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values.

Goals				
Reliable Water Supply		Improved Flood Protection	Healthy & Resilient Ecosystems	
Objectives				
A. Protect and Maintain Water Supplies	**B. Protect and Improve Surface and Ground Water Quality**	**C. Reduce Flood Risk**	**D. Protect, Enhance and Sustain Natural Ecosystems**	**E. Mitigate and Adapt to Climate Change**
Attributes • Metrics & Targets				
A.1: Protect, maintain, and develop local surface and ground water supplies • A.1.1 Operational capacity at Valley Water reservoirs • A.1.2 Recycled water production • A.1.3 Managed recharge capacity • A.1.4 End of year groundwater storage **A.2: Support water supply demand management (water use efficiency, water conservation)** • A.2.1 Annual water conservation savings	**B.1: Support high quality surface water in reservoirs for applicable human and aquatic life uses** • C.1.1 Chemical integrity (e.g. pH, Disolved Oxygen (DO), nutrients, pesticides, regulated contaminants) • C.1.2 Biological integrity (e.g. bacteria, harmful algal blooms, invasive species, toxicity, fish tissue, mercury) • C.1.3 Physical integrity (e.g. temperature, turbidity, trash) **B.2: Support high quality surface water in streams for applicable human and aquatic life uses** • B.2.1 Chemical integrity integrity (e.g. pH, DO, nutrients, pesticides, regulated contaminants) • B.2.2 Biological integrity (e.g. bacteria, harmful algal blooms, invasive species, toxicity, fish tissue, mercury) • B.2.3 Physical integrity (e.g. temperature, turbidity, trash) **B.3: Protect groundwater from existing and potential contamination** • B.3.1 Trends in concentrations of nitrate, chloride and total dissolved solids in index wells	**C.1: Maintain Flood Facilities** • C.1.1 Flood protection facilities have defined level of protection establishing maintenance targets • C.1.2 Flood protection facilities are inspected, assessed, documented and maintained annually **C.2: Reduce risk of flooding from flows overtopping banks (creek and tidal)** • C.2.1 Number of developed parcels, including critical facilities, subject to frequent flooding (25-year flood event) • C.2.2 Number of critical facilities subject to a 200-year flood event • C.2.3 Number of miles of stream with natural buffer conditions of at least 100 ft from top of bank where parcel is in the floodplain. • C.2.4 Manage for channel configurations that support appropriate geomorphic processes **C.3: Prepare and inform community of flood risks and taking measures to improve safety and reduce damage** • C.3.1 Community Rating System (CRS) participation and rating of communities in Santa Clara County • C.3.2 Plans are maintained and tested to protect against disasters: Emergency Action Plans (EAPs) • C.3.3.a An accurate and actionable water year outlook (e.g. drought/wet) in the fall or early winter • C.3.3.b A confident forecast on whether a storm will impact us in the next 3 to 7 days, as well as its relative strength • C.3.3.c An accurate quantitative precipitation forecast (QPF) with rainfall amounts within the next 1 day	**D.1: Maintain healthy watersheds** • D.1.1.a CRAM overall index and attribute scores from a probability-based ambient stream condition survey at the watershed scale • D.1.1.b CRAM overall index and attribute scores at the landscape scale of the valley floor • D.1.1.c CRAM overall index and attribute scores at the landscape scale of a particular subwatershed or creek • D.1.2 CRAM overall index and attribute scores of depressional wetlands in the watershed • D.1.3 CRAM overall index and attribute scores of estuarine wetlands in Santa Clara County • D.1.4 Acres of priority buffer land protected or acquired; shall be measured by a) mainstem creek and b) tributaries • D.1.5 Number of terrestrial wildlife corridor enhancement efforts **D.2: Enhance diverse, healthy riverine habitats** • D.2.1 Riparian: Channel length with continuous riparian forest, by functional riparian width class; shall be measured by a) mainstem creek and b) tributaries • D.2.2 Riparian: Area (acres) of riparian forest or woodland a) central California sycamore alluvial woodland, b) willow riparian forest and scrub, c) mixed riparian forest and woodland, d) oak woodland; shall be measured by a) mainstem creek and b) tributaries • D.2.3 Riparian: Area of all key non-native and invasive plant communities. Net acreages per watershed as mapped along waterways • D.2.4 Instream: Number of human-made in-channel barriers that hinder steelhead trout movement • D.2.5 Instream: Benthic macro invertebrate (BMI) composition • D.2.6 Stream corridor continuity, and abundance, width, and condition of stream buffer • D.2.7 Area (acres) of non-tidal and floodplain wetlands, by wetland type • D.2.8 Stream flows that support healthy aquatic habitat and appropriate geomorphic processes **D.3: Enhance diverse, healthy baylands and tidal marsh** • D.3.1 Percentage of streams re-connected to Bayland tidal marsh • D.3.2 Total acreage of tidal marsh • D.3.3 Area (acres) of core tidal marsh arranged in large patches (>500 acres)	**E.1 Mitigate valley water's contribution to climate change** • E.1.1 Net CO2 emitted by Valley Water **E.2: Build climate change resilient water supply resources** • E.2.1 Percentage/volume of water supply that is drought resistant/resilient or conserved • E.2.2 Volume of water supply treated by green infrastructure projects **E.3: Increase the resiliency of people, property, and ecosystems to increasing riverine and coastal flooding due to climate change** • E.3.1 Percent of flood protection projects that account for changes in sea level due to climate change. • E.3.2 Number of new partnerships/ programs/ projects with external organizations related to land use coordination and collaboration for flood protection **E.4: Build climate change resilient watershed ecosystems** • E.4.1 Channel length with continuous riparian native habitat • E.4.2 A measure of channels with habitat features that help sustain native aquatic species



5 IMPLEMENTATION PLAN

SANTA CLARA COUNTY

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

IMPLEMENTATION

INTRODUCTION

This final chapter of the One Water Framework for Santa Clara County represents the countywide programmatic activities and policies identified through the process laid out in Chapters 3 and 4. These projects focus on larger programs and policy development as opposed to watershed- or site-specific projects that will be identified in the watershed-specific master plans.

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 refined, evaluated, and selected for inclusion in each watershed plan. This inclusion of prioritized projects with an anticipated measurable benefit sets this master planning effort apart from past long-term planning efforts in the watersheds. Upon completion of all five watershed-specific plans, this comprehensive, countywide One Water Framework will be further reviewed for priorities across watersheds, with the long-term plan being to revisit One Water every five years for updates.

Photo: Rick Lewis

5.1 COUNTYWIDE OPPORTUNITIES

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

In general, the types of activities considered include:

- Work taking place in multiple watersheds
- Operations and maintenance 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

Countywide opportunities have not been ranked as they are all viewed as requiring additional investigation as large-scale programs or policies; while considered at a countywide scale, implementation at a watershed-scale may be preferred.

5.2 ONGOING PROJECTS

Countywide projects identified by staff fall into two categories: those that constitute ongoing efforts that continue to require resources and those that represent new opportunities. A brief description of each opportunity follows with additional detail included in Appendix C.

Ongoing One Water Projects at the Countywide Scale

South Bay Salt Ponds Restoration Project

Related One Water Objectives: C, D, E

This opportunity is to continue participation in the South Bay Salt Ponds Restoration Project (SBSPRP) 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 Valley Water efforts include:

- Serving on the Project Management Team (PMT) and the Technical Advisory Committee(TAC) reviewing the scientific investigation results and adaptive management process;
- Providing significant funding (approximately $2.6 million) for scientific investigations for monitoring legacy mercury impacts on wildlife to answer permitting questions so the full-scale restoration of the former salt ponds (ponds A5-A11, see also Figure 2-22, p. 80). can proceed;
- Assisting the project with the construction of the Pond A8 horizontal levee that will be a good substrate for marsh vegetation to grow on.

In addition, Valley Water is coordinating closely with SBSPRP on Valley Water's Calabazas, San Tomas Aquino Creeks, and Pond A8 Realignment Project and exploring potential partnership opportunities for implementation. The project is aimed at reducing sedimentation and resulting maintenance work, improving habitat conditions, and helping SBSPRP achieve its goals. A vision document for the project was completed in late 2018 with the San Francisco Estuary Institute.

Shoreline Study Project

Related One Water Objectives: C, D, E

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 Valley Water, 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, 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, see Figure 2-23, p. 84). 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.

Stormwater Resource Plan

Related One Water Objectives: A, B, C, D, E

This opportunity is to implement the Santa Clara Basin Stormwater Resource Plan (which was finalized in June 2019) to increase stormwater capture, treatment, and use throughout northern Santa Clara County. This can be accomplished through implementation of Green Stormwater Infrastructure (GSI). GSI is defined as stormwater-related infrastructure on public and private lands, such as roads and parking lots, that includes low impact development such as infiltration, biofiltration, and/or use of best management practices to collect, retain or detain stormwater runoff in order to limit the discharge of pollutants from streets to the storm drain system and infiltrate stormwater into the groundwater basin. GSI provides many benefits beyond water quality improvement, such as groundwater replenishment, flood attenuation, creation of attractive streetscapes, habitat, reduction of heat island effect, and bicycle and pedestrian accessibility. GSI can include retention and detention basins, bioswales, constructed wetlands, buffer strips, permeable pavement, green streets, rain gardens, storage (e.g. cisterns) and other measures to capture, treat, slow down, and/or sink stormwater.

The cities and county are developing GSI plans as required by Regional Water Quality Control Board permit requirements. Potential sites for GSI will also be identified by participating in the development of the regional Santa Clara Basin Stormwater Resource Plan, reviewing other Valley Water projects, and partnering with other agencies. Potential sites will be prioritized based on their ability to achieve One Water targets, feasibility, and readiness. High priority sites should be recommended for implementation through the annual budget and Valley Water Capital Improvement Plan process. The project list and priorities should be reviewed annually and updated at least every three years.

Examples of Valley Water involvement in stormwater resources management activities include the following:

1. Participation in development of the Santa Clara Basin Stormwater Resource Plan through Valley Water involvement in the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).

2. Board approval of planning for rain barrels, cisterns, rain gardens, and stormwater capture projects on urban and agricultural lands as part of the Water Supply Master Plan, with an estimated water supply benefit of these projects of 1,000 acre-feet per year.

3. Planning the Upper Penitencia Flood Protection Project, including evaluation of stormwater detention and retention in coordination with partner agencies.

4. Valley Water partnering with agencies in south Santa Clara to develop a Stormwater Resource Plan for Morgan Hill, Gilroy and the surrounding county lands.

Stormwater improvements to Hacienda Avenue in Campbell. Photos: SCVURPPP

Homeless Encampment Cleanup

Related One Water Objectives: B, C, D

This opportunity is to create guidelines and recommend Board policy for Valley Water 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.

Current Valley Water efforts include:

- Participating in the monthly Joint Encampment Planning Meeting that provides a forum for numerous Santa Clara County agencies and non-government organizations to coordinate encampment clean-up activities. The meetings also provide updates on housing services and public agency staff safety.
- Conducting Good Neighbor Program clean up activities. Valley Water Field Operations staff conduct activities addressing encroachment and pollution concerns.
- Providing Valley Water grants to organizations addressing homelessness, as well as conducting clean ups.
- Participating in the Zero Litter Initiative, which coordinates with Caltrans and the Valley Transportation Authority, as well as with Union Pacific Railroad. All these organizations have seen an increase in homeless encampment impacts on their properties and operations.
- Hosting of a homeless encampment ad hoc committee by Valley Water Board of Directors. The committee helps the Board stay apprised of the situation and work on solutions, such as use of Valley Water properties and support for rangers and police, and organizations such as the Downtown Streets Team.

In addition to these kinds of efforts, agencies at the local, regional, and state level are working together or independently to address the urban crisis of homelessness. This crisis continues to have adverse impacts on human mental and physical health, ecosystem health and public safety.

In general, Valley Water staff are deploying various tools for managing the problem, including providing trash collection near homeless encampments, patrols to discourage re-encampment, and vegetation management. These and other activities addressing the homeless challenge have created unanticipated budget impacts for several Valley Water units. Valley Water, for example, has had to dedicate higher than projected labor and financial resources to the problem. Though the 2000 Safe, Clean Water and Natural Flood Protection Program bond measure allocated $8 million over 15 years to such efforts, funding has been depleted. The Homeless Encampment Ad Hoc Committee is working on this financial challenge. In addition, Valley Water has had to expend significant financial resources on proper sorting, disposal, and transport of hazardous materials collected from the creekside encampments. Ultimately, only providing more housing through the efforts of human and social resources agencies will address the underlying problem of homelessness.

Near Water Recreation Coordination

Related One Water Objectives: A, B, C, D

This opportunity is to create a Valley Water Board Policy for near-water or on-the-water recreation within or adjacent to Valley Water Facilities. The intent of such a policy is to provide guidance for the community and Valley Water as to how natural, educational, and recreational experiences (such as trails) 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 Valley Water right-of-ways near streams, reservoirs, and the Bay.

Hazardous Tree Abatement

Related One Water Objectives: C, D, E

Valley Water is developing a Hazard Tree Abatement Program for Valley Water-owned properties at a countywide scale. Abatement activities may include not only the removal, but also the pruning and bracing, of hazardous trees. This will allow Valley Water to develop a prioritized, efficient, and effective way to conduct the work, including receiving authorization from permitting agencies and satisfying mitigation requirements. The program would improve upon permitted activities, reduce risks associated with falling/fallen trees, reduce fire danger associated with dead trees,and improve habitat for native species.

5.3 NEW PROJECTS

Valley Water staff identified and evaluated the following countywide projects and opportunities, a process that included stakeholder input. These opportunities are likely to be rolled into existing Valley Water programs or budgeted in future years based on resource availability.

Proactive Right-of-Way Identification and Acquisition

Related One Water Objectives: A, B, C, D, E

This opportunity is focused on identifying and 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 establishing criteria to identify lands with potential for acquisition or easement, developing a process to evaluate, prioritize and track lands, recommending action to the Board of Directors, and acquiring fee or easement or otherwise protecting land as it becomes available. Criteria for establishing priorities include such factors as maintenance access, riparian corridor continuity, and floodplain connectivity.

Buffer zone maintenance along Coyote Creek. Photo: Valley Water

Trail bridge over Coyote Creek. Photo: Santa Clara Valley Open Space Authority

Update Guidelines and Standards for Land Use Near Streams

Related One Water Objectives: B, C, D

This opportunity is to update the "Guidelines and Standards for Land Use Near Streams (Guidelines) (2007)" developed by the Water Resources Protection Collaborative (WRPC) in an effort led by Valley Water. The county's municipalities adopted these Guidelines for use in the planning, design, and approval of both public and private projects located near streams. The Guidelines are also available to the public at large. This update would incorporate lessons learned during implementation of the Guidelines over the past twelve years; reference, where appropriate, the Santa Clara Valley Habitat Plan; address current issues of concern; and reformat the document to be more user friendly to all intended audiences including municipal staff, the development community, private land owners, and the general public. The SCVWD Water Resources Protection Manual, which was developed as a tool for implementing the Water Resources Protection Ordinance, would also be updated for consistency with the Guidelines as appropriate. Benefits of updating the Guidelines and Manual include: reaffirmation of the commitment of Collaborative members to protecting and enhancing/restoring stream corridors; creation of an user-friendly document, or summary document, to assist all users (including private property owners) in protecting and enhancing stream corridors; and updated guidance to Valley Water staff.

Systematic Watershed Approach to Sediment and Vegetation Management

Related One Water Objectives: B, C, D

This opportunity is to develop a programmatic approach to sediment and vegetation management beyond Valley Water's existing Stream Maintenance Program operations, with the intent to effectively manage streams and watersheds and reduce maintenance needs. 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 problematic sediment deposition. The approach will also undertake analysis to understand the appropriate movement of sediment through the system, and how to facilitate through-movement. It can also serve to address systemic erosion issues.

Expand Invasive Plant Removal Program

Related One Water Objectives: C, D

This opportunity is to create a comprehensive program to remove invasive plants along creek-sides, near reservoirs, and around baylands. Establishing a program at the countywide scale will allow Valley Water to build on existing efforts (such as the stream maintenance program), add consistent protocols, guide work with partner agencies and organizations, and implement removal and management programs at smaller scales. Benefits of considering guidance and approach at a larger scale and then implementing at a smaller scale (such as per watershed, subwatershed, or creek) include: 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; help in identifying invasive plants on a countywide scale among partner agencies and organizations; and improved relationships with landowners for corridor connectivity.

Invasive plants clog a local waterway. Photo: Santa Clara Valley Open Space Authority

Costa's hummingbird. Photo: Rick Lewis

5.4 PLANNING LEADERSHIP

This One Water Countywide Framework provides critical guidance for Valley Water to implement integrated water resources management and master planning. Building on substantial existing planning through Valley Water's Water Utility Enterprise and Watersheds division, this document represents a Valley Water-wide effort to plan more efficiently and effectively for the future. Through partnerships, both existing and new, Valley Water is a technical resource, a collaborator, and a leader for the management of water resources across Santa Clara County.

This Framework is just the first step. Supporting watershed plans will be developed initially and then updated routinely to aid Valley Water in planning, prioritizing, and implementing projects and programs at a watershed scale for the improvement of all water resources.

A

APPENDIX A

Burrowing owl. Photo: Nina Merrill, Valley Water

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/Steelhead	*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	CDFW-SSC
White Sturgeon	*Acipenser transmontanus*		-
Threadfin Shad	*Dorosoma petenense*		-
American Shad	*Alosa sapidissima*		-
Fathead Minnow	*Pimephales promelas*		-
Hitch	*Lavinia exilicauda*	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/ Steelhead**	*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*		-

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

Common Name	Scientific Name	Endemic	Protection Status
Three-Spined Stickleback	*Gasterosteus aculeatus*	YES	-
Prickly Sculpin	*Cottus asper*	YES	-
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 Valley Water 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 wood- land, 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	Campanula-ceae	1B.2	None	None	1250	275	May-Jun	Chaparral (rocky, usually serpentinite)
Campanula sharsmithiae	Sharsmith's harebell	Campanula-ceae	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	Chenopodia-ceae	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
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

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
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	Campanula-ceae	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
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

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
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	Mielichhoferia-ceae	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), cismon-tane 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
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

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
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
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 checkerbloom	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)

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
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	Potamogetona-ceae	2B.2	None	None	2150	300	May-Jul	marshes and swamps (assorted shallow freshwater)
Suaeda californica	California seablite	Chenopodia-ceae	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].

For the CDFW list of sensitive natural communities:
https://www.wildlife.ca.gov/Data/VegCAMP/Natural-Communities/List#sensitive%20natural%20communities

B

APPENDIX B

COORDINATION WITH PLANS, PROGRAMS, NEIGHBORS

APPENDIX B:

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

INTRODUCTION

Valley Water 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 Valley Water manages or supports via active partnership. Each of these plans will inform, or become a critical component of, the One Water Framework. 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 José, Gilroy, and Morgan Hill), the County, and the Valley Transportation Authority are local partners along with Valley Water. 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 Valley Water 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 Framework 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)

Valley Water 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 Valley Water 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, Valley Water 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 Valley Water, 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 Valley Water'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. Valley Water 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 Valley Water's water rights change petition to amend Valley Water'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 Valley Water 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 Valley Water's obligations under the FAHCE Settlement Agreement, terms and conditions of its water right licenses, and other obligations and requirements Valley Water must adhere to. Implementation of the FAHCE restoration program will benefit Valley Water and One Water Framework 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

Valley Water 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 Valley Water'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 Framework 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 Valley Water Board of Directors.

Asset Management Program

An Asset Inventory has been developed to track key assets Valley Water owns, operates, and maintains within Valley Water's three business areas: Water Utility, Administration, and Watersheds. Valley Water's Asset Management Program provides guidance to manage its assets for the best long-term use of public resources. Valley Water 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 Valley Water 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 Valley Water programs would ensure that all new assets are added into the Asset Inventory. In addition, the One Water Framework 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 Framework goals and objectives, ensuring Valley Water'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 Valley Water 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 Valley Water channels and facilities, and 2) maintain the structural and functional integrity of Valley Water facilities. Valley Water 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. Valley Water 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 Framework 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 AND WATER QUALITY PLANS AND PROGRAMS

The county's primary water resources agency, largely responsible for maintaining a reliable supply of water, Valley Water 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. Valley Water supplies treated water to and manages groundwater for local water retail agencies, which in turn provide it to their customers in Santa Clara County. Valley Water also provides groundwater management for thousands of private well users. The One Water Framework 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

Valley Water 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 Valley Water'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, Valley Water 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 Valley Water's, projected groundwater storage serves as an early warning sign and a good indicator of potential shortages.

Groundwater Management Plan

Per the District Act, Valley Water'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 Valley Water'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. Valley Water 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 water and groundwater supplies.

Valley Water's 2016 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. Valley Water submitted this Board-adopted plan to the Department of Water Resources as an Alternative Plan to meet the requirements of the Sustainable Groundwater Management Act, including more analysis of surface water-groundwater interactions. The Groundwater Management Plan commits Valley Water to further evaluate groundwater-surface water interactions, which will help inform One Water priorities.

Urban Water Management Plan

Valley Water, 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 Framework implementation will be reflected in future UWMP updates.

Water Supply and Infrastructure Master Plan

This 2019 plan presents a strategy for meeting Santa Clara County's water supply needs through the year 2040. 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 80 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 Framework. The projects and programs in the Water Master Plan support the objectives of the One Water Framework, and implementation will be coordinated with One Water Framework implementation.

Valley Water is scheduled to update the Water Master Plan in 2017. The projects and programs proposed by One Water Framework 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 Valley Water, 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 Framework.

Delta Conveyance Project

The Delta Conveyance Project would help secure Delta-conveyed supplies. The effort, previously known as California WaterFix has been in planning for over a decade. An Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) was completed on a two-tunnel project for California WaterFix, but the project has been revised to a single tunnel and will require new environmental analysis. The project will need to secure permits, resolve legal issues, and secure financing.

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. Valley Water 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 Valley Water's approach to water quality issues.

Valley Water efforts to improve water quality in Santa Clara County implement several One Water Framework 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 Framework.

COORDINATION WITH NEIGHBORING COUNTIES

Valley Water engagement with the county's neighbors occurs across multiple fronts that span water supply, flood protection, and watershed stewardship. Valley Water 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.

APPENDIX B-1: Partnership Activities With Neighboring Counties

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

C

APPENDIX C

OPPORTUNITIES

Photo: Lonnie K. Spin

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

Geographic Area	Baylands
Project Focus	Baylands and lower watersheds
Primary Objectives	C, D, E 
Valley Water Role	C
Potential or Current Partners	Cities of San José, 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 SUPPORTS

Goals

- Healthy and resilient ecosystems

Objectives

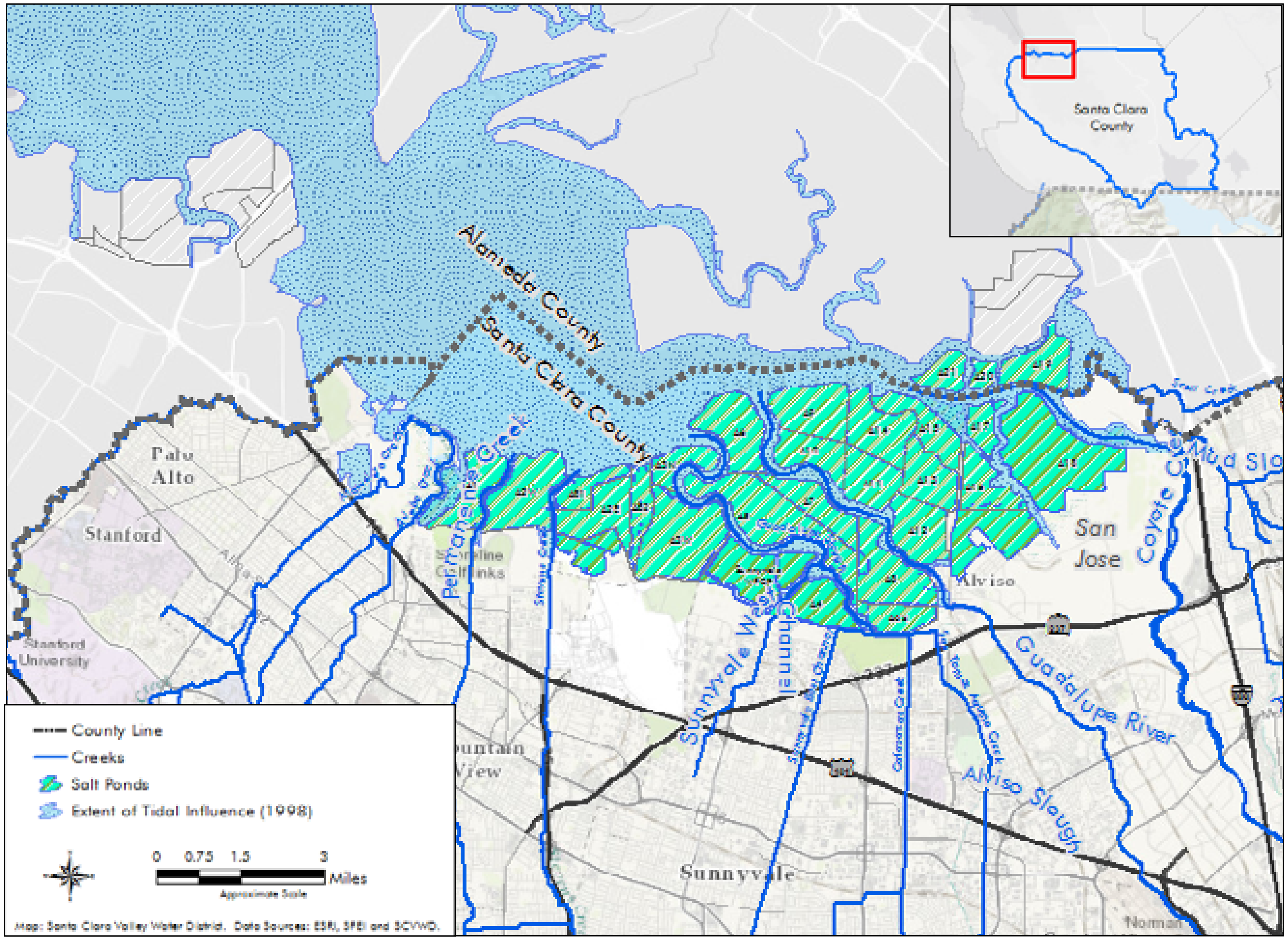
- Reduce flood risk
- Protect, enhance and sustain natural ecosystems
- Mitigate and adapt to climate change

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



Project 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 Valley Water role Provide relevant expertise and data Identify implementation activities Assist in carrying out implementation as it relates to Valley Water missions
Potential Funding	Safe, Clean Water Program, 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 José. In the next five years, mercury issues will be resolved so that full-scale restoration of Pond A5-8 can go forward.

ONGOING OPPORTUNITY: Continue Coordinated Effort on the Shoreline Study

Geographic Area	Baylands
Project Focus	Baylands and lower watersheds
Primary Objectives	C, D, E 
Valley Water Role	P, C
Potential or Current Partners	California Coastal Conservancy, City of Mountain View, City of Palo Alto, City of San José, 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

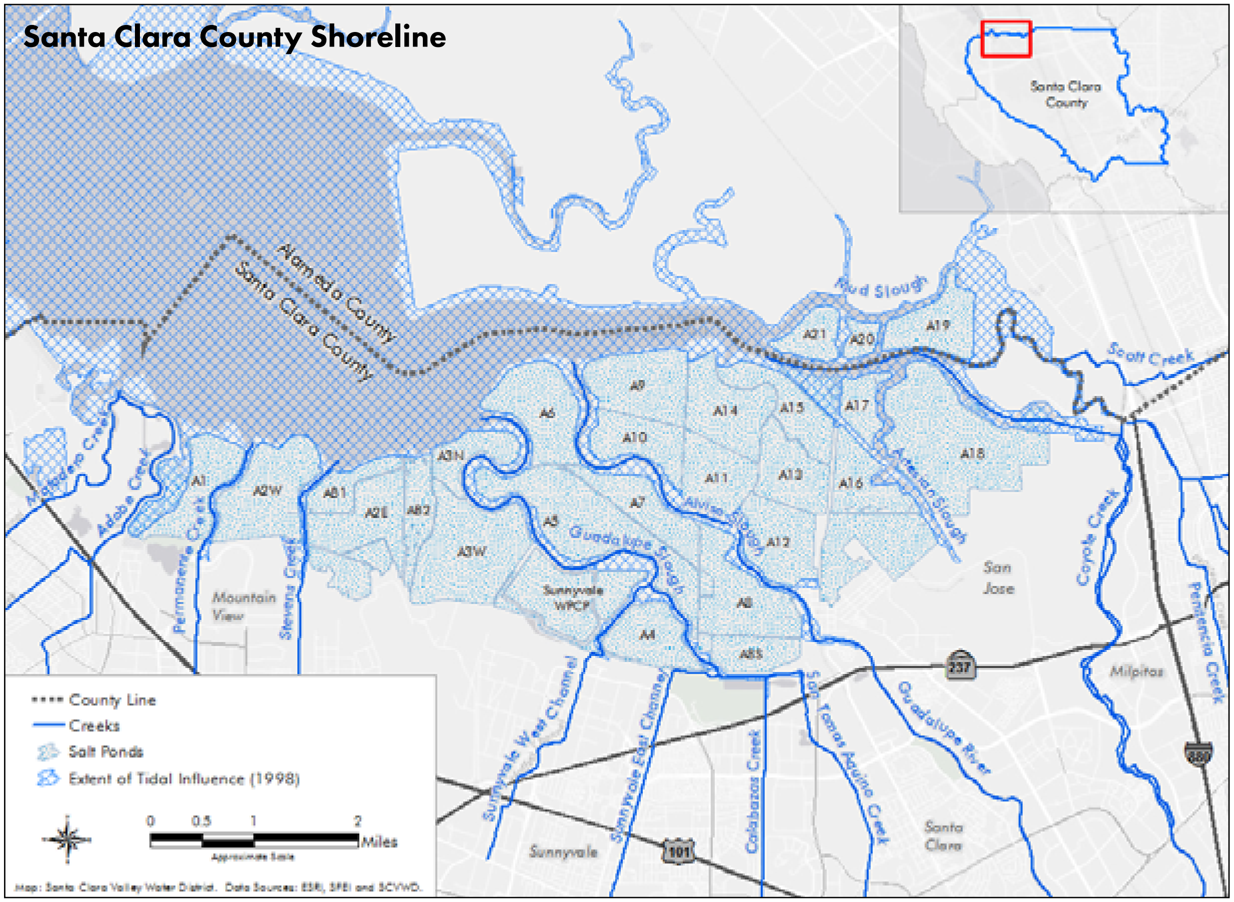
PROJECT SUPPORTS

Goals
- Improved flood protection
- Healthy and resilient ecosystems

Objectives
- Reduce flood risk
- Protect, enhance and sustain natural ecosystems
- Mitigate and adapt to 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 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 Valley Water, 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 Valley Water role Provide relevant expertise and data Identify implementation activities Assist in carrying out implementation as it relates to Valley Water mission
Potential Funding	Safe, Clean Water Program, 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

ONGOING OPPORTUNITY: Implement a Stormwater Resource Plan

Geographic Area	Countywide
Project Focus	All Watersheds
Primary Objectives	A, B, C, D, E 
Valley Water Role	C
Potential or Current Partners	Municipalities, open space districts

PROJECT SUPPORTS

Goals

- Reliable water supply
- Improved flood protection
- Healthy and resilient ecosystems

Objectives

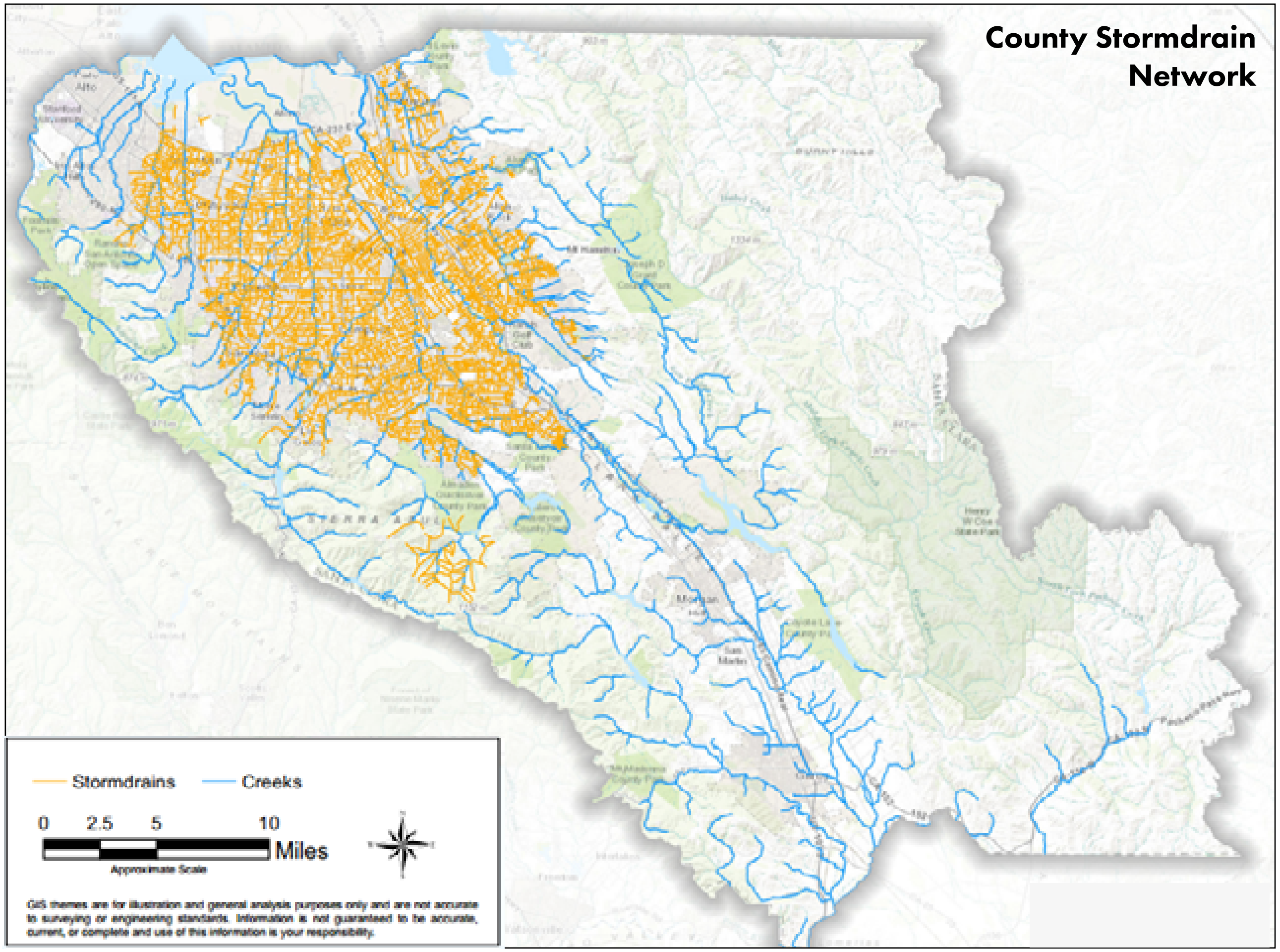
- Protect and maintain water supplies
- Protect and improve surface and ground water quality
- Reduce flood risk
- Protect, enhance and sustain natural ecosystems
- Mitigate and adapt to climate change

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)

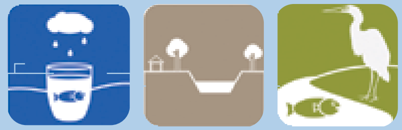


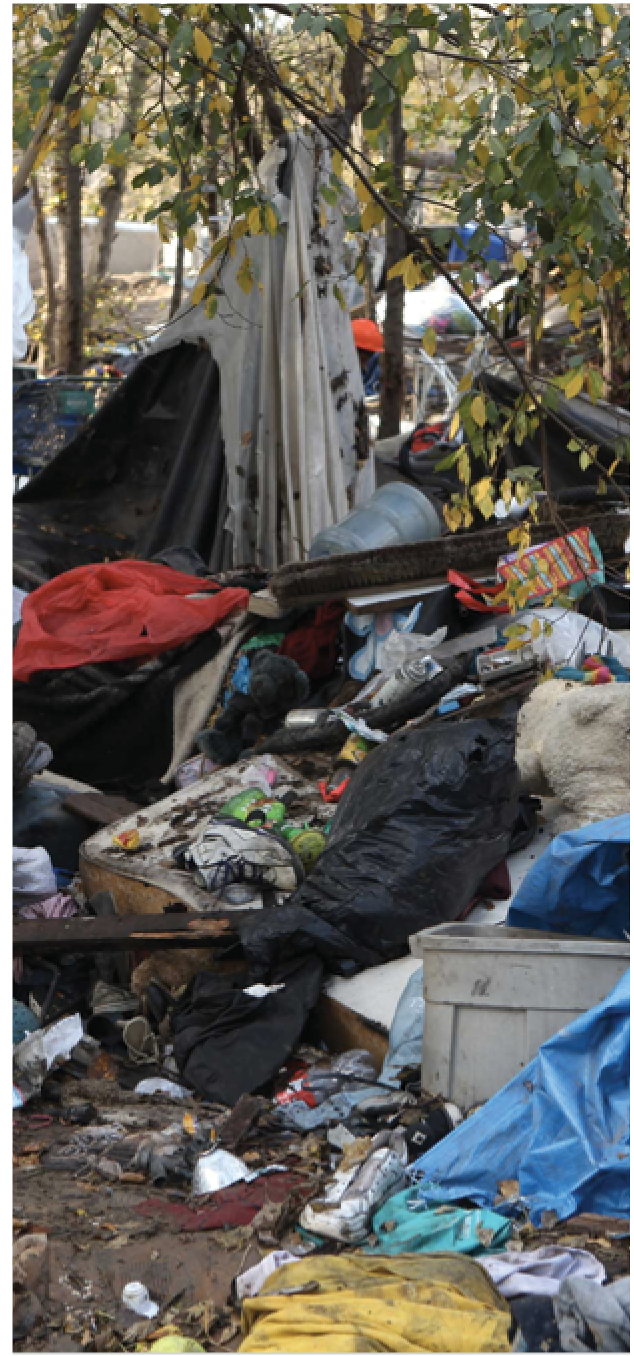
Project Overview

This opportunity is to participate in creating a Stormwater Resource Plan (SWRP) for Santa Clara Basin within Santa Clara County and to work towards implementing multi-benefit projects. The SWRP is a planning document that uses a map-based approach to identify and prioritize local and regional Green Stormwater Infrastructure (GSI) projects that can be implemented to improve local surface water quality through enhanced stormwater management. GSI reduces the quantity and improves the quality of water flowing into our creeks, while also providing other possible benefits, including groundwater infiltration, flood attenuation, aesthetics, reduction in heat islands, and other community benefits. The Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) and District staff as well as technical consultants developed the plan with assistance from a technical advisory committee as well as stakeholder input. The California Water Code identifies funds available for multi-benefit storm water management projects which may include, but shall not be limited to: green infrastructure, rainwater and storm water capture projects and storm water treatment facilities and requires a Storm Water Resource Plans as a condition of receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters. Valley Water is also partnering with Morgan Hill, Gilroy, the County of Santa Clara, and additional stakeholders on a stormwater resource plan for South County.

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 Valley Water and partners Identify components of a SWRP Identify and prioritize sites for stormwater retention/LID/green infrastructure Implement stormwater improvements
Potential Funding	Safe, Clean Water Program, Priority B2, Proposition 1 grant
Budget and Projected Timeline	TBD

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

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	B, C, D 
Valley Water Role	C
Potential or Current Partners	Municipalities, NGOs



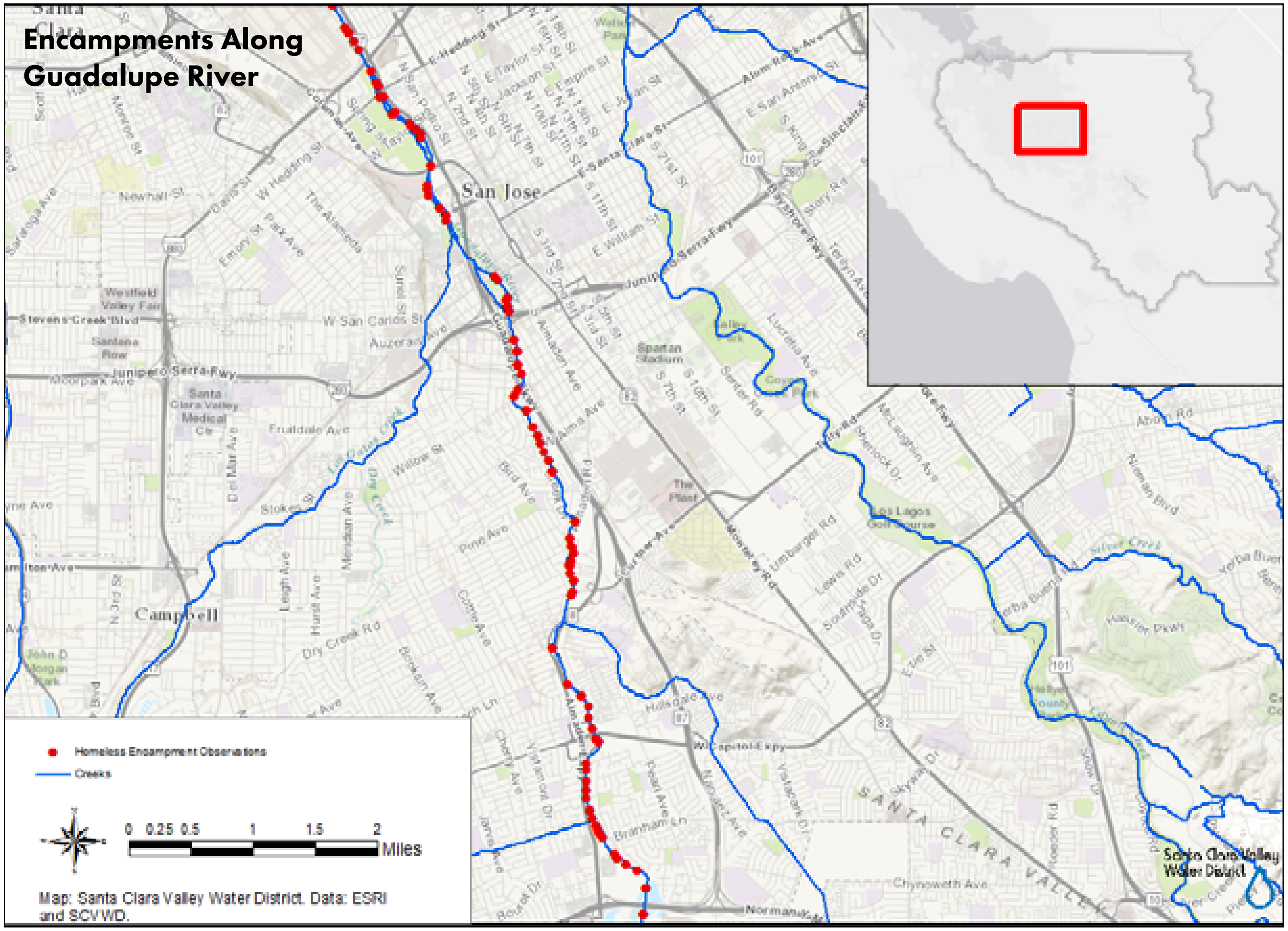
PROJECT SUPPORTS

Goals
- Improved flood protection
- Healthy and resilient ecosystems

Objectives
- Protect and improve surface and ground water quality
- Reduce flood risk
- Protect, enhance and sustain natural ecosystems

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 Valley Water right-of-way
- Pursue public-private partnerships with appropriate recognition and incentives for voluntary actions consistent with Valley Water 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

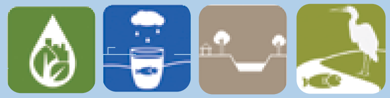


Project Overview

This opportunity is to create guidelines and recommend Board policy for Valley Water 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.

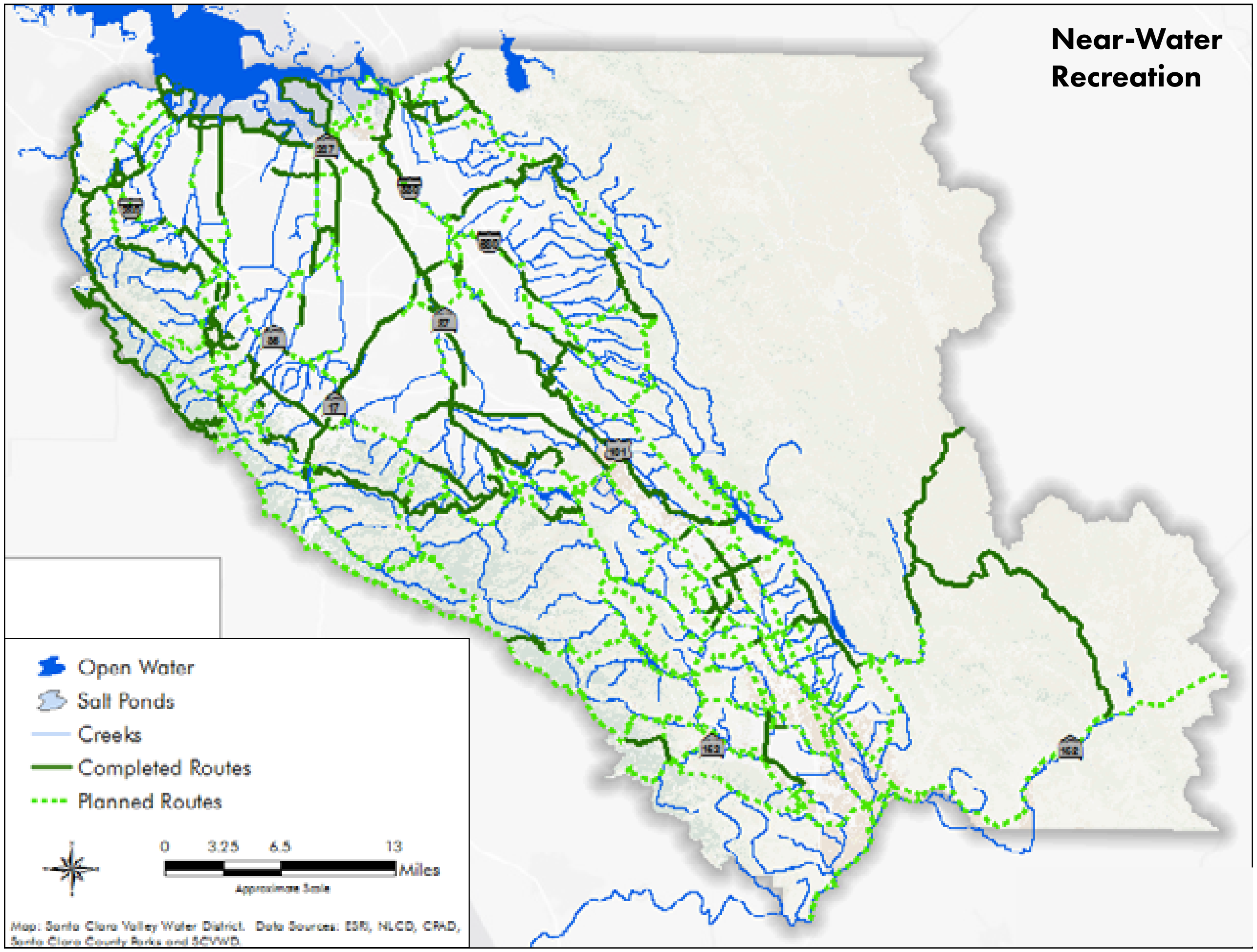
Benefits	Clarification of Board policy Clearer expectations of Valley Water's role in addressing the larger societal challenge
Project Components	Identify existing policies at Valley Water and partner agencies Identify constraints and opportunities concerning encampments Develop policy recommendations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

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

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	A, B, C, D 
Valley Water Role	C, T
Potential or Current Partners	Municipalities, open space districts

PROJECT SUPPORTS

Goals	• Reliable water supply • Improved flood protection • Healthy and resilient ecosystems
Objectives	• Protect and maintain water supplies • Protect and improve surface and ground water quality • Reduce flood risk • Protect, enhance and sustain natural ecosystems
Strategy	• Prevent encroachment on Valley Water right-of-way • Support appropriate resource-sensitive recreational activities and opportunities on reserviors, 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
Attributes	• Leverage near-water trails and other recreational and public spaces for education and stewardship, e.g. with interpretive panels • Surface waters – including reservoir, creek and bay waters – support healthy aquatic ecosystems and human health (i.e., beneficial uses) • Near-water recreation



Project Overview

The goal of this objective is to create a Valley Water Board Policy for near-water or on-the-water recreation within or adjacent to Valley Water Facilities. The intent of such a policy is to provide guidance for the community and Valley Water 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 Valley Water right-of-ways near streams, reservoirs, and the Bay.

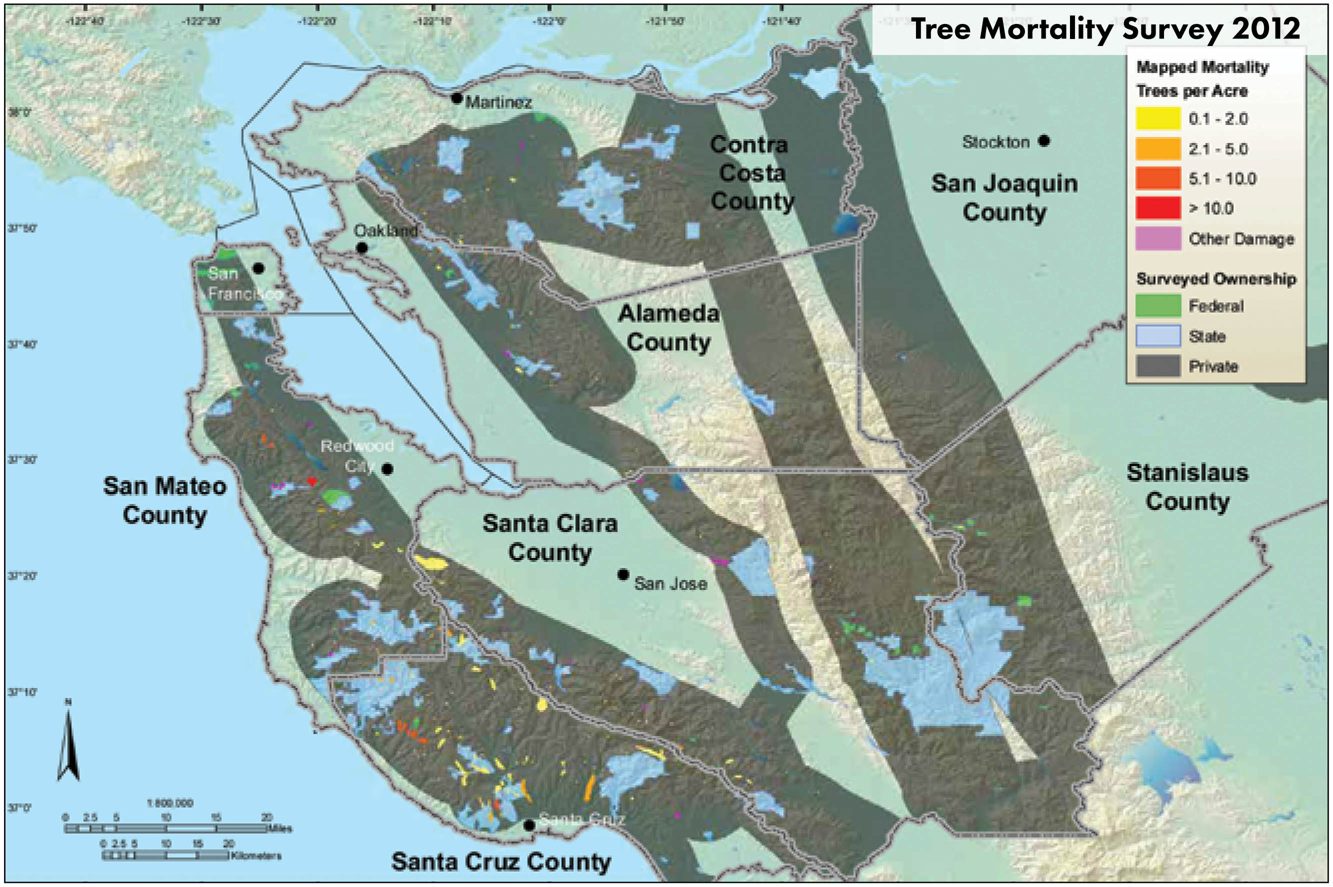
Benefits	Clarification of Board policy Clearer expectations for partner agencies and public
Project Components	Identify existing policies at Valley Water and partner agencies Identify constraints and opportunities for near-water and on-the-water recreation Develop policy recommendations Discuss any approved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

ONGOING OPPORTUNITY: Develop a Hazard Tree Abatement Program

Geographic Area	Countywide
Project Focus	Valley Water fee and easement
Primary Objectives	C, D, E   
Valley Water Role	P
Potential or Current Partners	County, Municipalities, Open Space Districts

PROJECT SUPPORTS

Goals	• Healthy and resilient ecosystems
Objectives	• Reduce flood risk • Protect, enhance and sustain natural ecosystems • Mitigate and Adapt to climate change
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

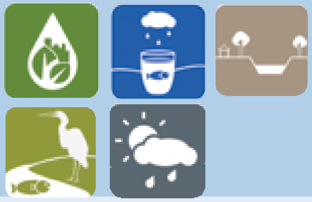


Project Overview

This opportunity is to establish a Hazard Tree Abatement Program for Valley Water-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 Valley Water to develop a prioritized, efficient, and effective way to conduct the work, including receiving authorization from permitting agencies.

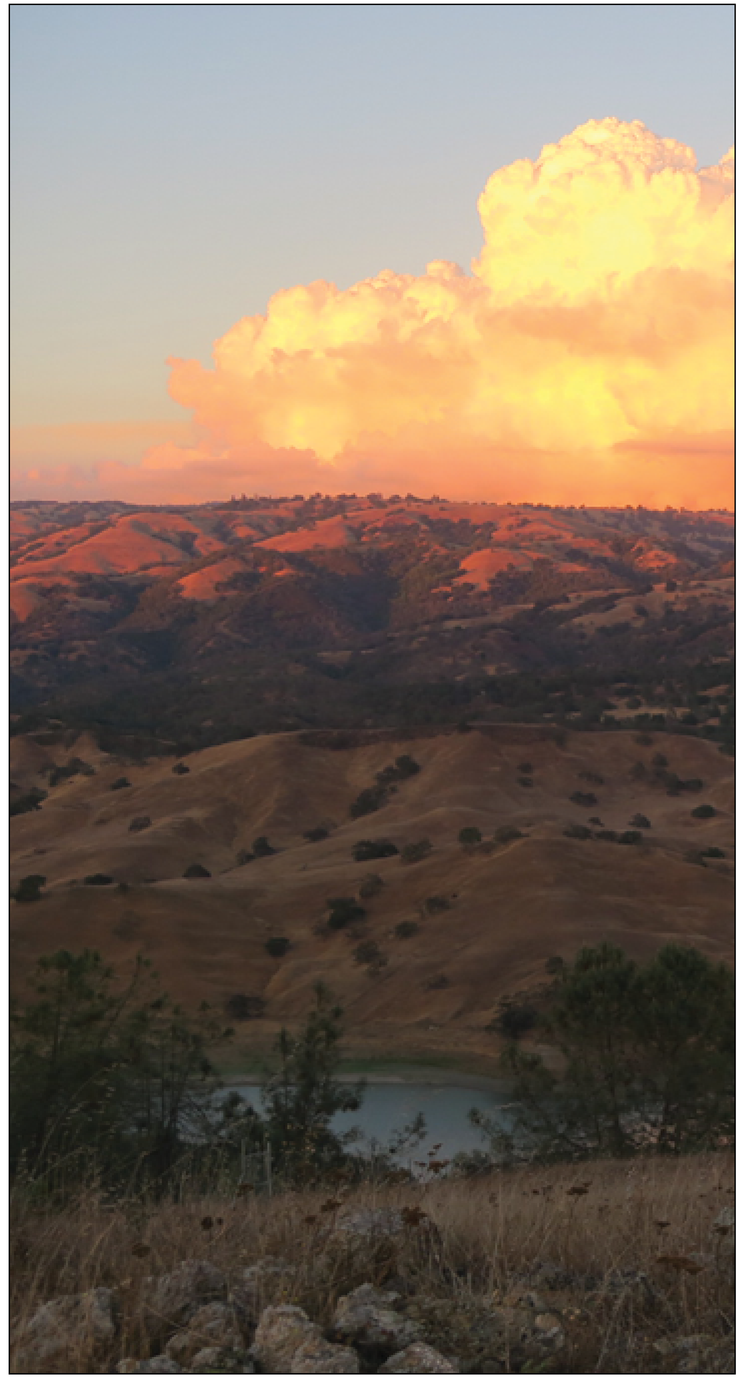
Benefits	Established program to allow for permitted activities Reduce risks associated with falling/fallen trees Reduce fire danger associated with dead trees Improve habitat for native species
Project Components	Map hazardous trees Develop criteria for prioritized action Identify permitting agency concerns, 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	Approximately $750,000

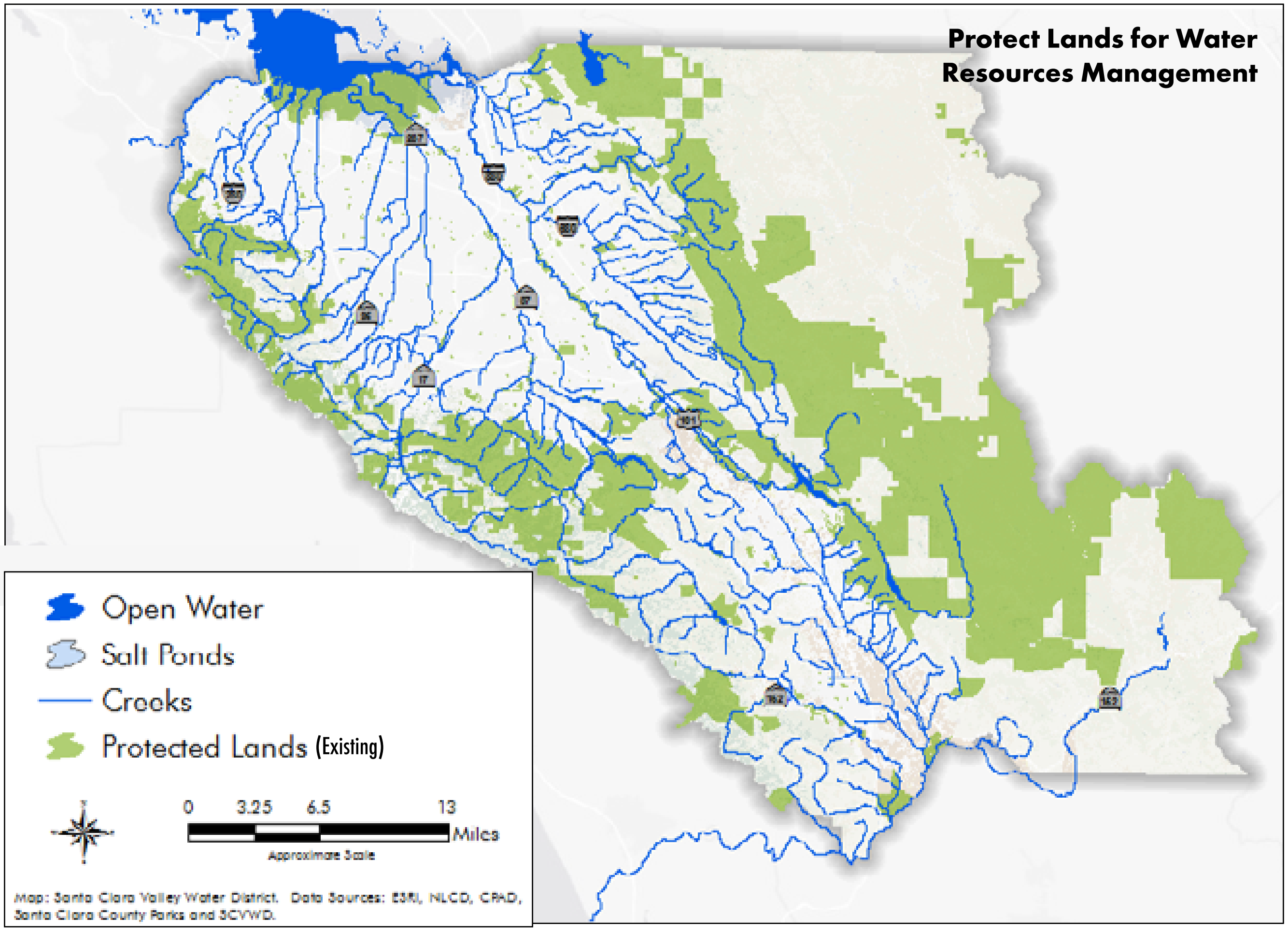
NEW OPPORTUNITY: Proactive Right of Way Identification and Acquisition

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	A, B, C, D, E 
Valley Water Role	P, C, T
Potential or Current Partners	County, Open Space Districts, SFPUC, TNC, VHA

PROJECT SUPPORTS

Goals	• Reliable water supply • Improved flood protection • Healthy and resilient ecosystems
Objectives	• Protect and maintain water supplies • Protect and improve surface and ground water quality • Reduce flood risk • Protect, enhance and sustain natural ecosystems • Mitigate and adapt to climate change
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 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 Valley Water 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 Valley Water's post-disaster land acquisition policy; the update will ensure that acquisition priorities are in place before any natural or man–made disaster.

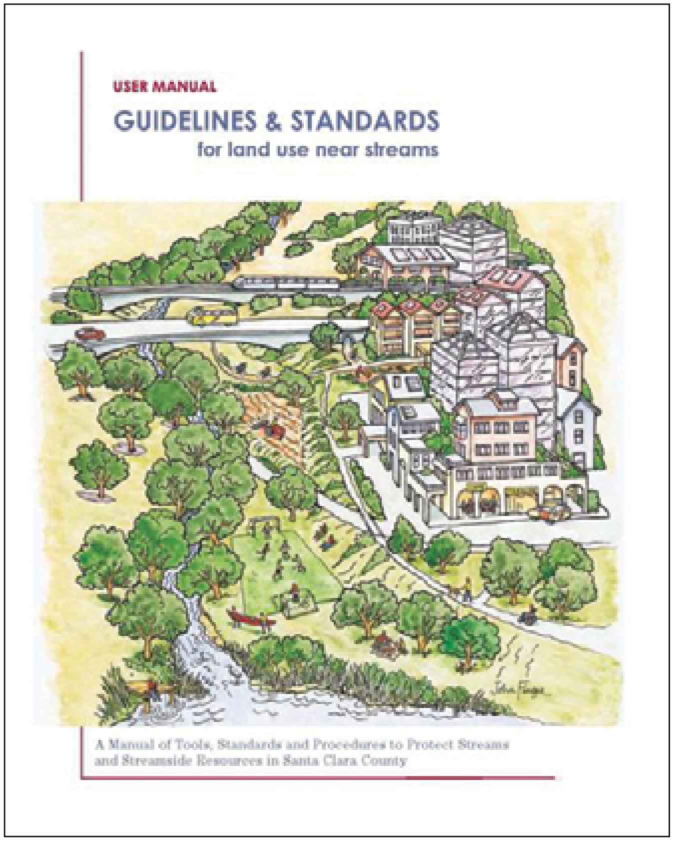
Benefits	Proactive approach to watershed protection
Project Components	Identify general geographic areas of property need based on objectives Identify specific properties and their ownership, land use, and adjacent land use Prioritize and recommend properties for protection or acquisition if and when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

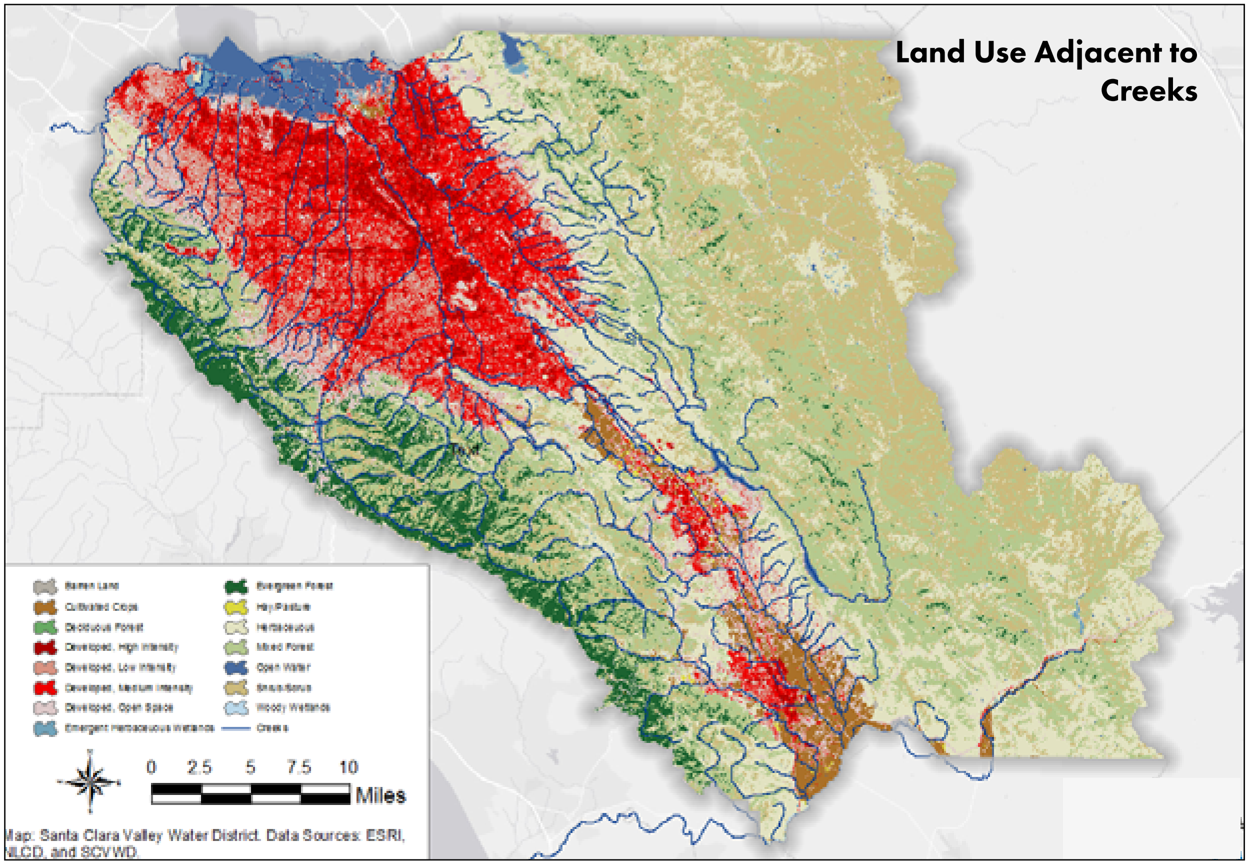
NEW OPPORTUNITY: Update the Guidelines and Standards for Land Use Near Streams (2007)

Geographic Area	Countywide
Project Focus	Near water bodies
Primary Objectives	B, C, D 
Valley Water Role	P
Potential or Current Partners	Municipalities, private property owners, community stakeholders

PROJECT SUPPORTS

Goals	• Improved flood protection • Healthy and resilient ecosystems
Objectives	• Protect and improve surface and ground water quality • Reduce flood risk • Protect, enhance and sustain natural ecosystems
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 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 Valley Water. 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 Valley Water 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 Valley Water Water Resource Protection Manual Seek adoption by the governing body of each municipality in the county of the updated Guidelines document Seek adoption by Valley Water Directors of the updated Water Resources Protection Manual
Potential Funding	TBD
Budget and Projected Timeline	TBD

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

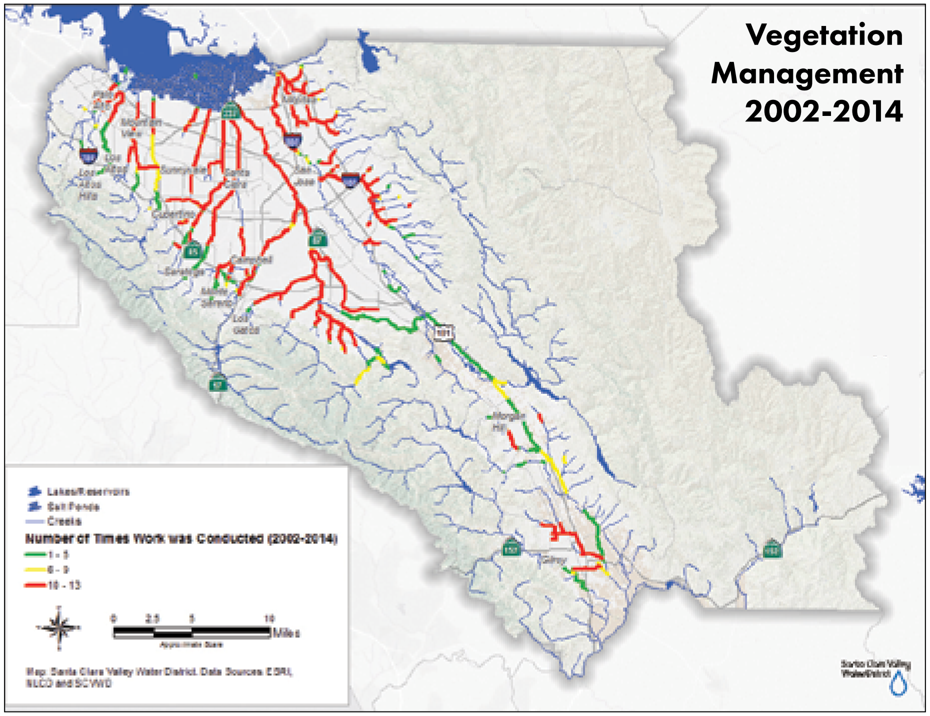
Project Overview

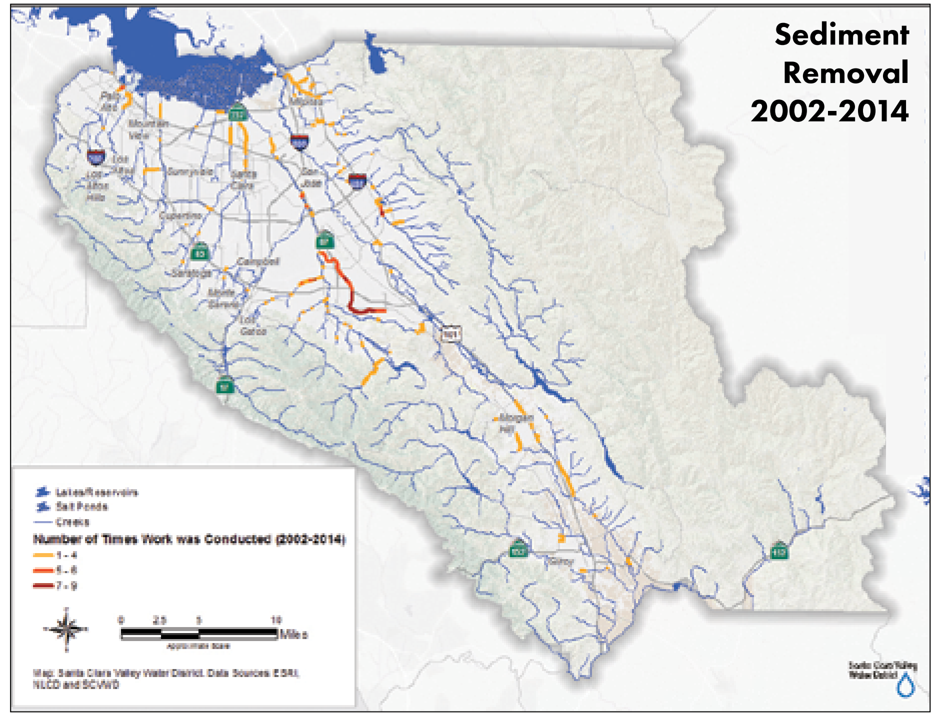
This opportunity is to develop a programmatic approach to sediment and vegetation management beyond existing Stream Maintenance Program operations. Such an approach will aid in identifying recurring maintenance work that may be better addressed as a larger activity (e.g., capital project) to mitigate 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	B, C, D 
Valley Water Role	P, C
Potential or Current Partners	

PROJECT SUPPORTS

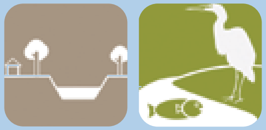
Goals	• Healthy and resilient ecosystems
Objectives	• Protect and improve surface and ground water quality • Reduce flood risk • Protect, enhance and sustain natural ecosystems
Strategy	• Develop and disseminate adequate data and tools for integrated water resource management • Create creek corridors 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 Valley Water 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	Safe, Clean Water Program
Budget and Projected Timeline	TBD

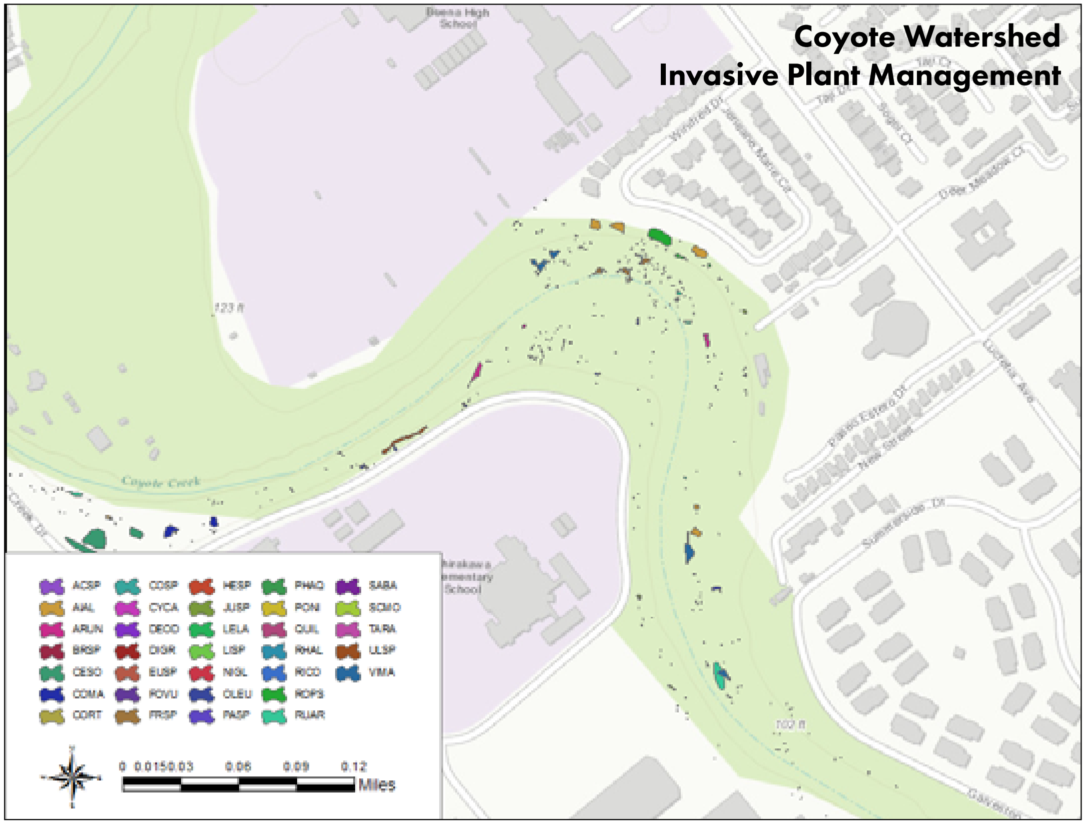
NEW OPPORTUNITY: Expand Invasive Plant Removal Program

Geographic Area	Countywide
Project Focus	Near reservoirs, streams, and the Bay
Primary Objectives	C, D 
Valley Water Role	C, L, T
Potential or Current Partners	County, Municipalities, and Open Space Districts

PROJECT SUPPORTS

Goals	• Healthy and resilient ecosystems
Objectives	• Reduce flood risk • Protect, enhance and sustain natural ecosystems
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 communities 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

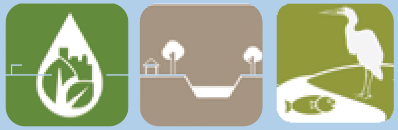


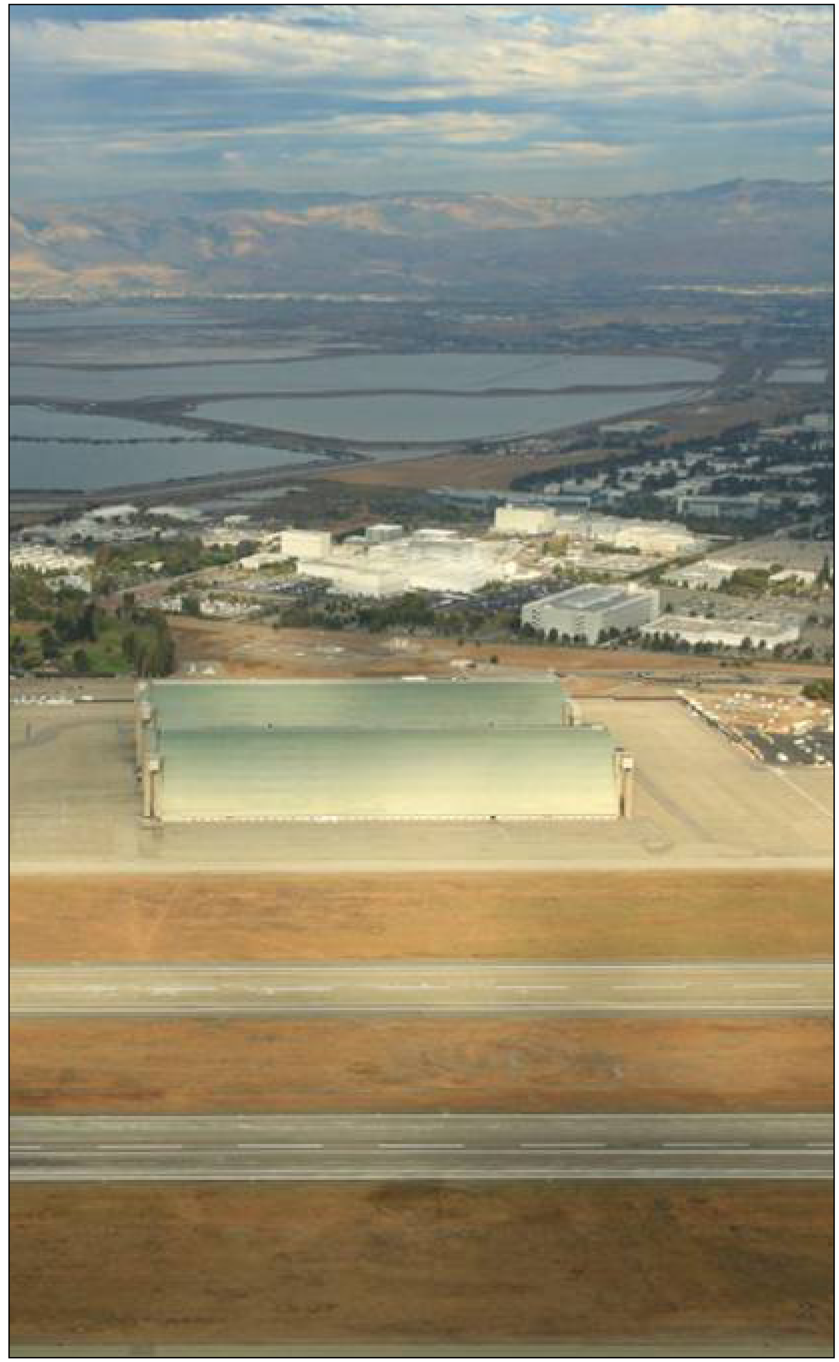
Project Overview

This opportunity is to create a comprehensive program to remove invasive plants along creeks, near reservoirs, and around baylands. The activity may require Valley Water policy revisions and technical analysis to establish prioritization and techniques. Establishing a program at the countywide scale will allow Valley Water 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	Safe, Clean Water Program D2
Budget and Projected Timeline	TBD

NEW OPPORTUNITY: Continue Sunnyvale Shoreline Cooperative Effort

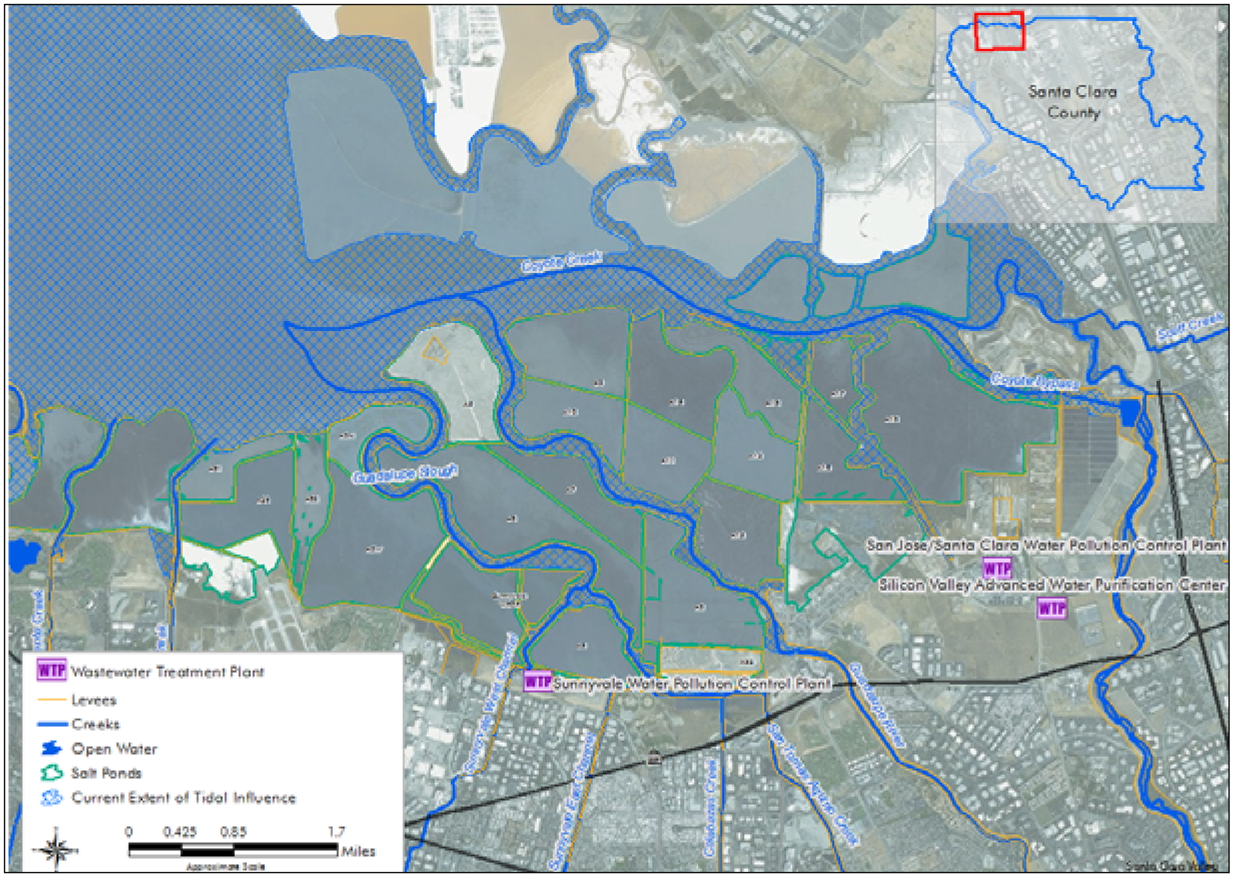
Geographic Area	Baylands
Project Focus	Baylands and lower watersheds
Primary Objectives	A, C, D 
Valley Water Role	T, C
Potential or Current Partners	City of Sunnyvale, South Bay Salt Pond Restoration project partners, Shoreline Study partners



Moffett Field north of Sunnyvale. Photo: Marc Holmes, The Bay Institute

PROJECT SUPPORTS

Goals	• Reliable water supply • Improved flood protection • Healthy and resilient ecosystems
Objectives	• Protect and maintain water supplies • Reduce flood risk • Protect, enhance and sustain natural ecosystems
Strategy	• Collaborate with neighborhoods, nonprofits, local governments, private property owners, and growers on water management projects • Manage and promote functional vegetation communities when managing water for beneficial uses or flood protection • Continue to protect, maintain, and develop local surface water supplies
Attributes	• Surface waters – including reservoir, creek, and bay waters – support healthy acquatic ecosystems and human health (i.e., beneficial uses) • Baylands along the shoreline that provide "desired" — need to define — functions and services over the short- and long-term • Hydrologically functional, diverse, connected Bayland habitats that sustain desired functions/benefits over the long-term



Project Overview

This opportunity involves the Sunnyvale Water Pollution Control Plant located in Sunnyvale on the South Bay shoreline. The plant is anticipating significant upgrades in the near future. In addition to improving wastewater treatment and water quality, upgrades could provide other benefits when approached holistically. These include additional access to recycled water for purification and potable reuse, tidal marsh restoration, and flood protection.

Benefits	Potential utilization of site for recycled water improvements Future benefits for tidal restoration and water quality improvements Mitigation for Sunnyvale E/W Flood Protection Project and others Flood protection Recreational benefits
Project Components	Site suitability analysis Integrated mitigation banking for capital flood protection projects Identify regulatory restrictions Identify multi-benefit opportunities Coordinate with City of Sunnyvale at Pollution Control Plant, South Bay Salt Pond Restoration Project, and Shoreline Study Assist in carrying out implementation as it relates to Valley Water mission
Potential Funding	Safe, Clean Water Program, Proposition 1
Budget and Projected Timeline	TBD

One Water acknowledgments - continued

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Special thanks to Lonnie Spin for finding and sharing some of the District's archival photos.

Print Date:
Version 6, February 2021

Font: Futura PT, an OpenType font licensed from the Adobe Type Library

Managing water resources holistically and sustainably to benefit people and the environment in a way that is informed by community values

Valley Water

Clean Water • Healthy Environment • Flood Protection