One Water
Guadalupe Watershed Setting Report

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SECTION 1: INTRODUCTION

This Watershed Setting Report serves as an expanded study of all the features covered in the 2024 One Water Guadalupe Watershed Chapter 2.

Understanding the Guadalupe watershed in the context of its setting helps to illustrate the challenges and opportunities One Water can address. This chapter identifies historical and present conditions for each of the five One Water Objectives (water supply, water quality, flood risk reduction, natural ecology, and climate change), as well as the challenges and opportunities for each objective that can be addressed in the future. Although not a One Water Objective, Land Use is added as a section since it affects all One Water's objectives. Similarly, since climate change affects all One Water objectives as the future is considered, it is interspersed throughout all the other objective sections in the future conditions discussion.

The Guadalupe watershed is complex, in that it varies widely between upland areas in the Santa Cruz Mountains, and lowlands in the valley floor. While certain aspects of the watershed have changed with time, there are others that remain relatively unchanged.

1.1 NATURAL FEATURES

The southern portions of the watershed reside in the Santa Cruz mountains, which are Mesozoic rock formations that are part of the Coast Range. These rocks are typically highly sheared and faulted, due to the prevalence of seismic activity. The San Andreas Fault follows the Coast Range on the west side of the watershed, while the lesser-known Sargent, Berrocal, and Monte Vista Faults run parallel to the San Andreas throughout the upper watershed. Rocks in this region consist of sedimentary rocks, volcanics and metavolcanics, and ultramafic rocks (CH2MHill, 2002).

The rest of the valley is an alluvial basin, which drains northwest to the San Francisco Bay. Soil types range from loamy soils to clays. There is some evidence that agricultural practices of the 1850s resulted in large amount of erosion, which contributed a large amount of sandy and fine sandy loams that are now deposited over the clay soils on the valley floor (Grossinger, et al., 2006).

The climate of the Santa Clara Valley is classified as Mediterranean, or semi-arid, with temperatures ranging from 42-62 degrees Fahrenheit in the winter to 56-81 degrees Fahrenheit in the summer (NOAA, 2024). Rainfall has been measured in the watershed since 1874, and the average annual rainfall is about 15 inches. The amount of rainfall varies greatly by elevation, with the mountain region receiving closer to 61 inches annually, and the river basin areas receiving closer to 15 inches annually (PRISM Climate Group, Oregon State University, 2023).

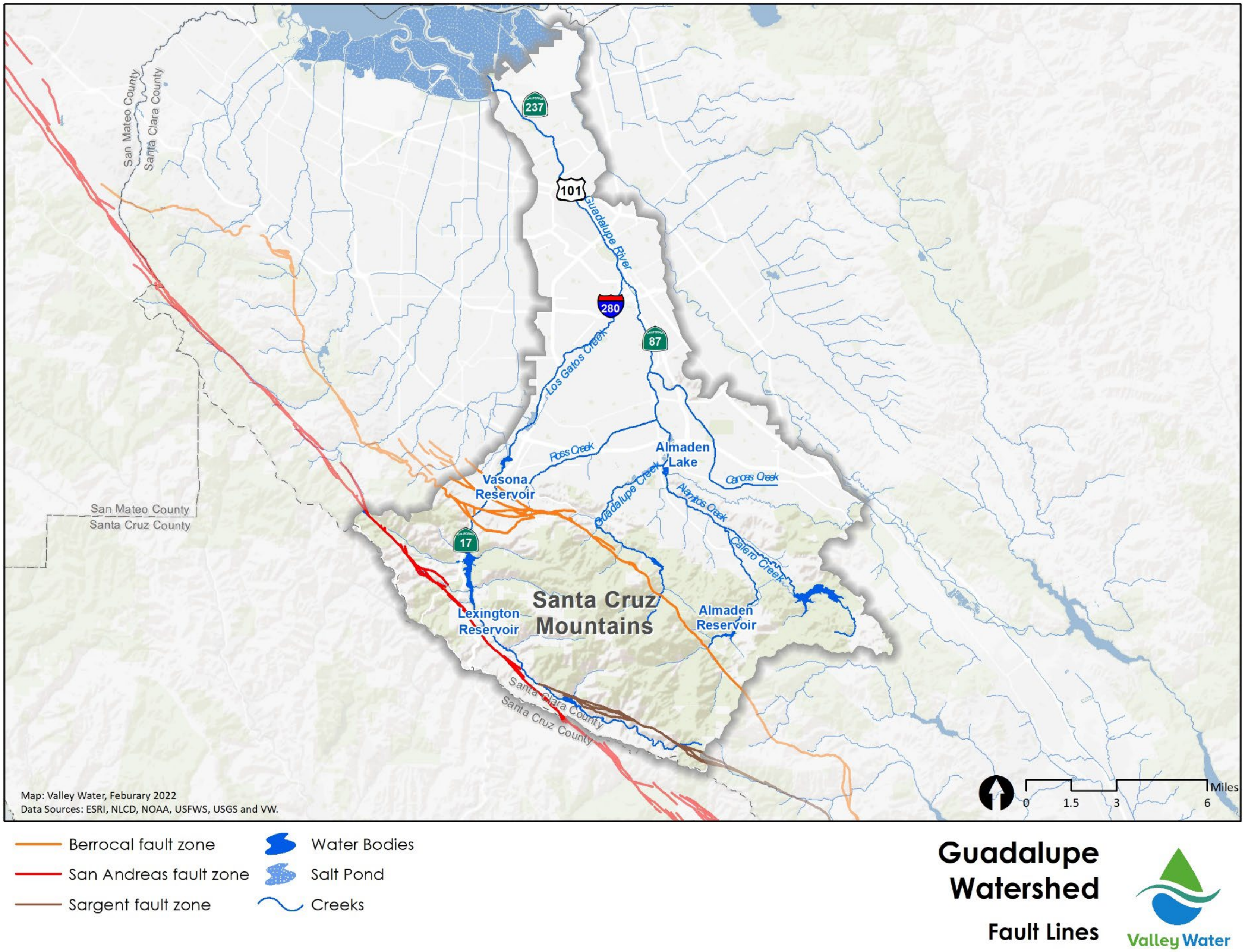

Figure 1: Fault Lines in the Guadalupe Watershed

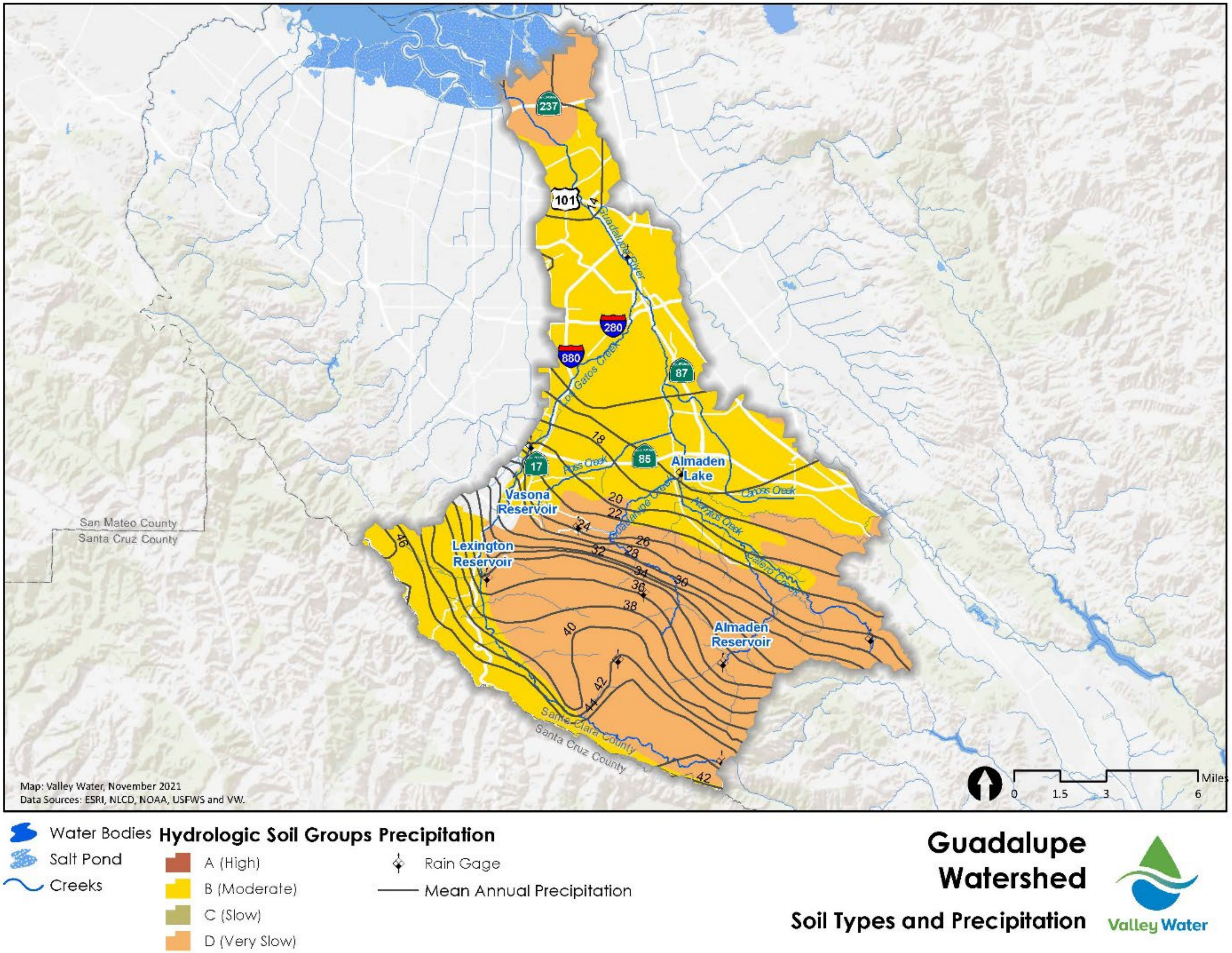

Figure 2: Soil Types

SECTION 2: LAND USE

2.1 HISTORICAL CONDITIONS

The Guadalupe Watershed, like all of Santa Clara Valley, has a rich history and relationship to human influence, starting long before Euro-American settlement in the 1800s.

Pre 1769: Indigenous Land Use

The Bay Area's native people groups actively managed the land in the Guadalupe Watershed for centuries before Euro-American settlement. Indigenous groups with lineage in the Guadalupe Watershed include the Muwekma Ohlone and the Tamien Nation. Early written accounts describe numerous villages and trails throughout the watershed. Active management of the landscape included controlled burns to manage vegetation (Grossinger, et al., 2006), tidal marsh modification to create salt ponds, and mining of cinnabar for use as pigment (Tetra Tech, Inc., 2006).

1770-1849: Missions and Pueblos

As Euro-American settlers colonized the region, cattle ranching became the dominant land use and Indigenous land management practices ceased. Mission Santa Clara and Pueblo San José were established (Grossinger, et al., 2006). Dams and ditches were installed along the Guadalupe River to control flooding (Tetra Tech, Inc., 2006).

1840's: Mercury Mining Begins

In the late 1840's the New Almaden Mining District began removing large amounts of cinnabar from the Alamitos subwatershed. The Los Gatos Creek subwatershed was used to produce redwood lumber (Tetra Tech, Inc., 2006). In 1848, California was acquired by the United States after the Mexican American War and the subsequent Treaty of Hidalgo. In 1849, The Gold Rush made the Santa Clara Valley central to mass immigration and development (Grossinger, et al., 2006).

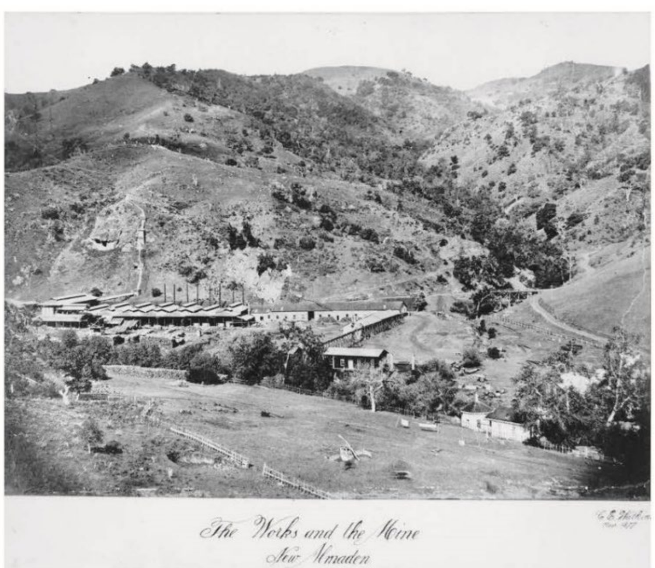

Figure 3: Mining furnaces at the Hacienda Furnace Yard at New Almaden in 1877 (Tetra Tech, Inc., 2006).

1850's-1860's: Decline of Ranching and Rise of Agriculture

Population growth resulted in extensive land use modifications in the watershed. Large-scale mercury mining in the Guadalupe subwatershed began in 1850 at the Guadalupe Mine Works (Most of which was eliminated by early 1900's, but some activity continued until 1975). Sometime between 1850 and 1876 (or potentially even earlier), the Guadalupe River was partially diverted to Alviso Slough, which had a naturally deeper channel, making it easier to navigate by ship. The Alviso Landing, a very successful and substantial town, developed to support the industries there. The flood of 1852-53 created the confluence of Los Gatos Creek and the Guadalupe River, and the surrounding willow groves were removed to make way for farmland. In 1857, Kirk Ditch was constructed to divert water from Los Gatos Creek to support agriculture irrigation, becoming the first of many diversions of Los Gatos creek for irrigation. Grazing land in the Santa Clara Valley was converted to farmland, and was used to grow wheat through the 1860's (Tetra Tech, Inc., 2006).

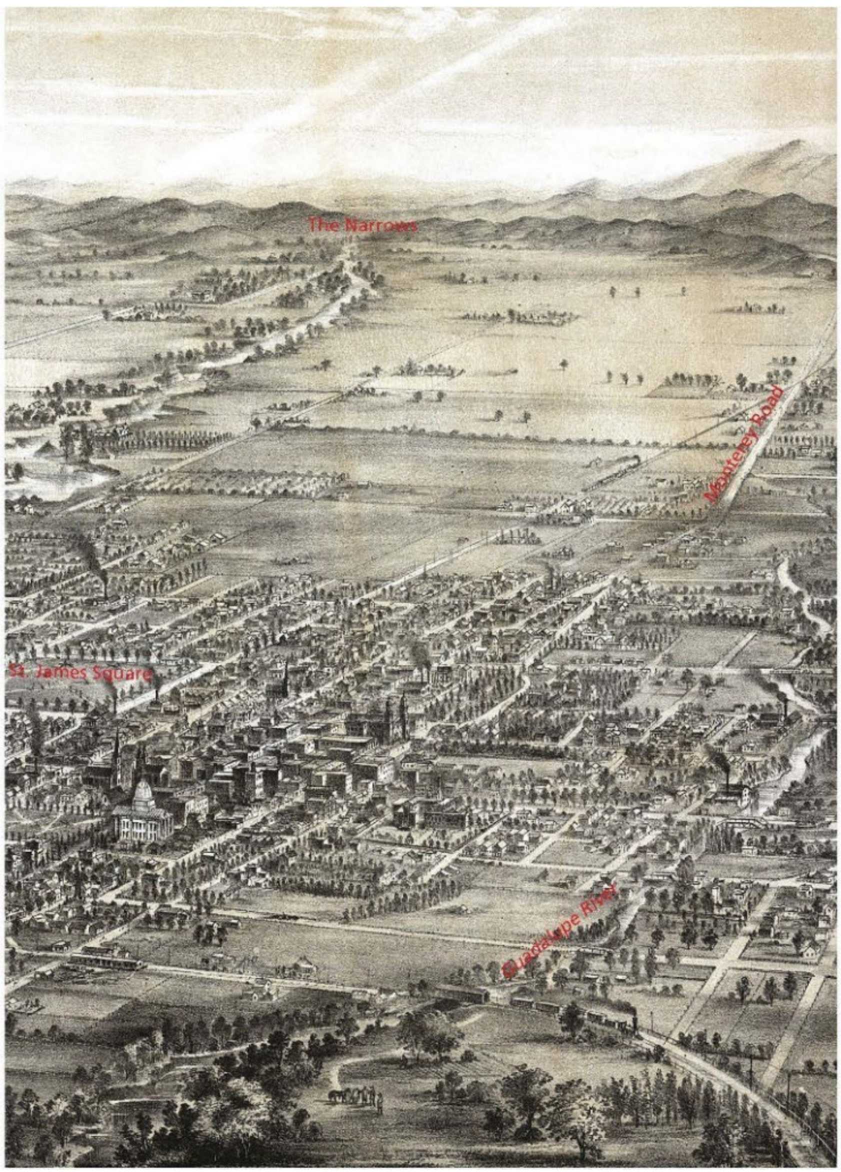

Figure 4: Santa Clara Street, 1869 (Grossinger, et al., 2006)

1870s-1880s: Shift from Wheat to Orchard Farming

Intensive cattle ranching and wheat farming contributed to the depletion of the topsoil. This, as well as market shifts, lead to the decline of wheat farming, which was replaced mainly by orchards (Grossinger, et al., 2006). In 1870, two small reservoirs (300 ac-ft each) were built along Los Gatos Creek to power the nearby Forbes Mill and other industries. The Los Gatos Creek was also a popular site for gravel harvesting, so much so that the South Pacific Railroad installed a track into the creek bed. Starting in 1876, two rock quarries began operating in the Santa Teresa Hills adjacent to Alamitos Creek. They are now known as the Sunset and Greystone Quarries. In 1886 the South Pacific Coast and Southern Pacific Railroads built spurs to New Almaden. In 1888 the confluence of the Los Gatos Creek and the Guadalupe River was straightened and widened to provide increased flood capacity (Tetra Tech, Inc., 2006).

1890's-1920's: Drought Changes Water Use

The following decades were marked by more frequent dry years which, combined with a growing population, created an increased demand for groundwater pumping and creek diversions to meet the water supply needs of the Santa Clara Valley (Grossinger, et al., 2006). By the 1920's, it was recognized that the groundwater table was declining. This era also marked the beginning of widespread conversion of tidal wetlands for salt production. Starting in 1898, salt ponds were constructed between Charleston and Guadalupe Sloughs. In response to a lower groundwater table, and higher demand for water supply, the Santa Clara Valley Water Conservation District was formed in 1929 (Tetra Tech, Inc., 2006). It was the county's first water district, and the predecessor to today's Valley Water.

1930's: Santa Clara Valley Water Conservation District

The 1930's began with more drought conditions and more groundwater decline. In 1933, The US Coast and Geodetic Survey performed a survey of the Santa Clara Valley and noticed marked land subsidence (Grossinger, et al., 2006). The newly minted Santa Clara Valley Water Conservation District rapidly constructed numerous reservoirs to store more water, described in further detail in the Water Supply section. Salt pond construction continued between Alviso Slough and Grey Goose Slough (Tetra Tech, Inc., 2006).

1940's-1960's: Suburban Expansion into the Watershed

The next two decades were defined by an expansion of development in the Santa Clara Valley. By the 1950's, Los Gatos Creek's secondary channel had all but disappeared as the creek became subject to more development and modification. Upstream of Los Gatos Creek, Lexington Reservoir was created by the construction of Lenihan Dam in 1952. This was followed closely by construction of Highway 17 in 1954, which ran parallel to Lexington Reservoir, which required the diversion of Los Gatos Creek into a concrete channel. By 1960, conversion of all tidal marsh between Alviso and Grey Goose Slough to salt ponds had occurred. By 1967, thanks in part to the new reservoirs and recharge projects, subsidence had mostly stopped (Tetra Tech, Inc., 2006). By this time, the use of the rock quarries in the Alamitos Watershed had also significantly declined.

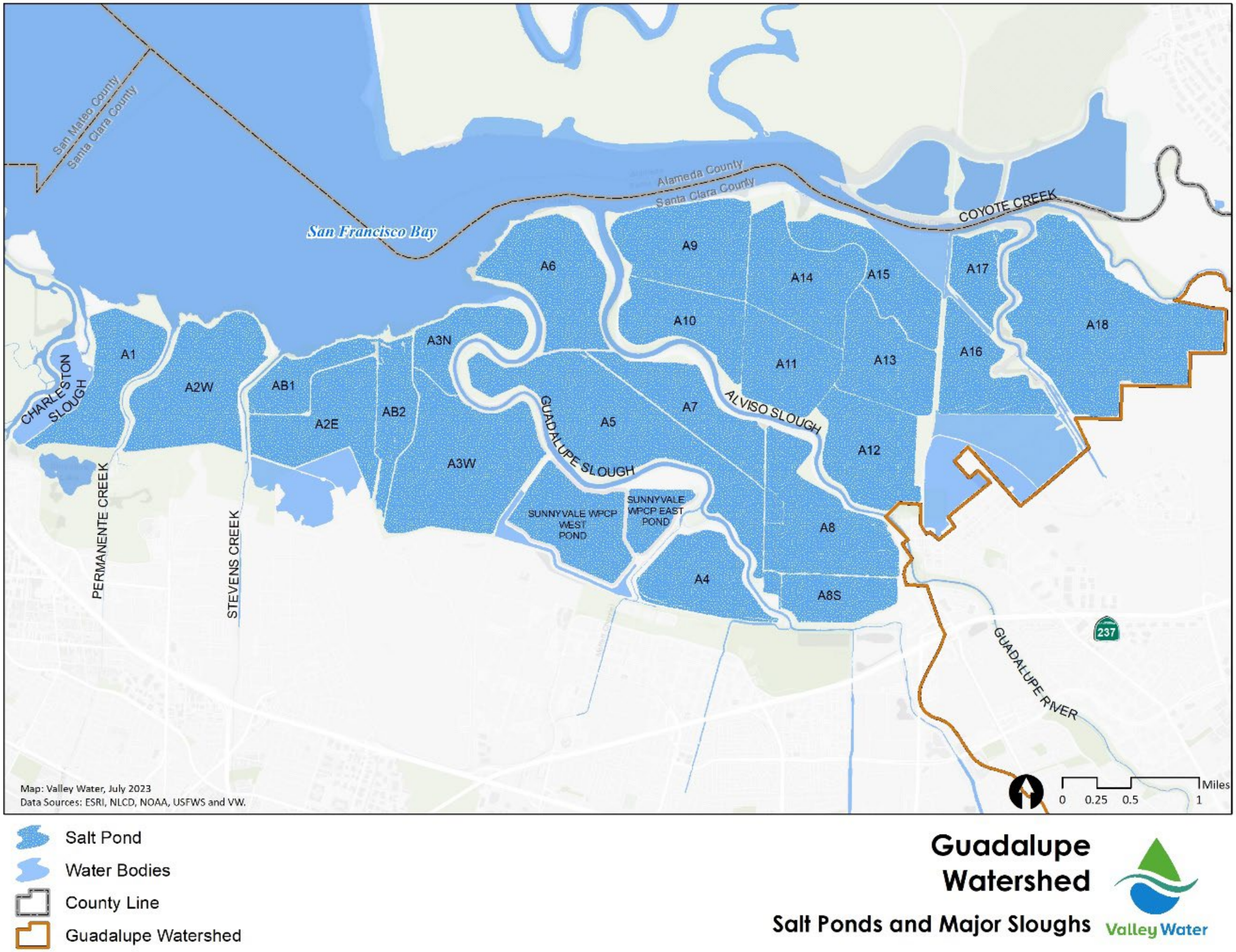

Figure 5: Salt Ponds and Major Sloughs

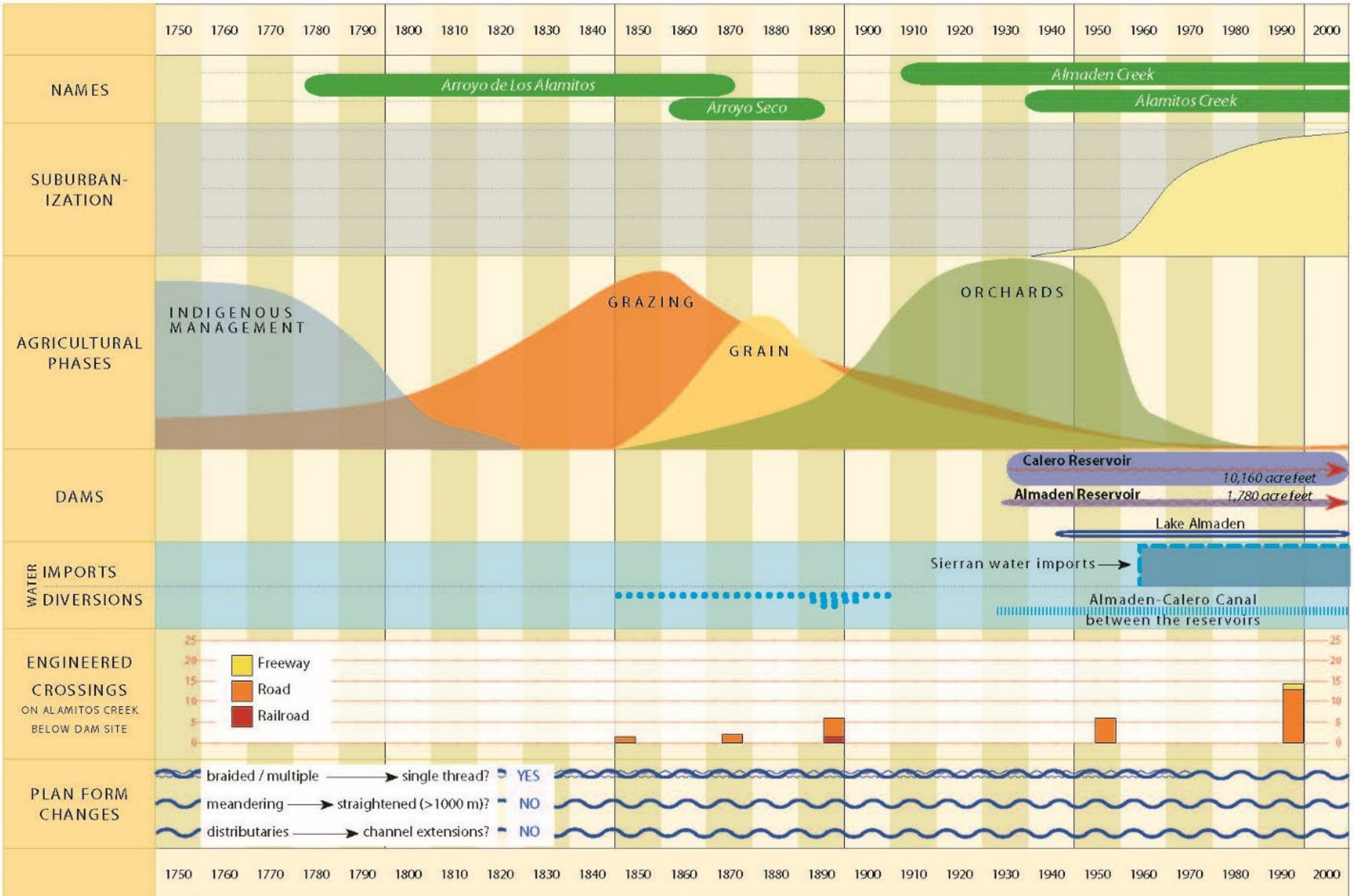

Figure 6: Land Use Timeline Alamitos Creek Subwatershed from 1750 to 2000 (Tetra Tech, Inc., 2006)

1970's to Present:

The 1970's marked a shift in the watershed from construction of water storage and recharge projects to flood protection projects. Farmland was gradually replaced by suburban expansion and mercury mining activities ended in 1975 (Tetra Tech, Inc., 2006). 1976-1977 marked a significant drought period in the valley, followed by several large flood events in the early to mid-1980's. During the next few decades, thanks in part to the dot com boom, the Santa Clara Valley experienced strong economic and suburban growth. Another period of intense drought affected the valley from 2011-2016.

2.2 PRESENT CONDITIONS

Urban Landscape: Major Cities and Urbanization

Urban land use often affects Valley Water's activities and requires coordination between Valley Water and local municipalities. About one third of the Guadalupe watershed is urban or suburban in land use, including portions of the cities and towns of San José, Santa Clara, Campbell, Los Gatos, and Monte Sereno. Each city or municipality, as well as Santa Clara County, has a general plan concerning land use, setting urban boundaries to limit sprawl while preserving open space, agriculture, and other natural resources. Population growth and development in the last few decades have been focused on the urban service areas (USAs) of the watershed, which are described below.

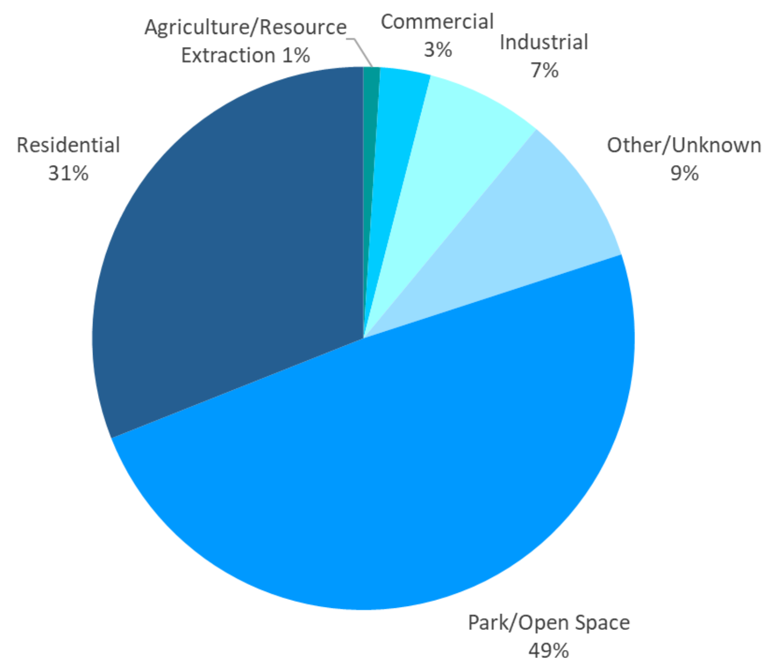

Figure 7: Land Use in the Guadalupe Watershed by Category

San José: The City of San José released the General Plan Update, Envision San José 2040, in 2011. It identified planned Growth Areas to focus development and support the concept of Urban Villages, or communities that are less reliant on automobile transportation. New growth is planned to occur in high-density, mixed-use developments, and will be focused on the Downtown, North San José, Specific Plan Areas, Urban Village Areas, and Employment Areas. Locating development near transit corridors and strengthening the connection between transit corridors is also a priority. (City of San José, 2011).

Santa Clara: The City of Santa Clara is highly developed, with few areas of vacant land available for development. There are four focus areas of development, three of which are within the Guadalupe Watershed: El Camino Real, Downtown, and Santa Clara Station (City of Santa Clara, 2010)

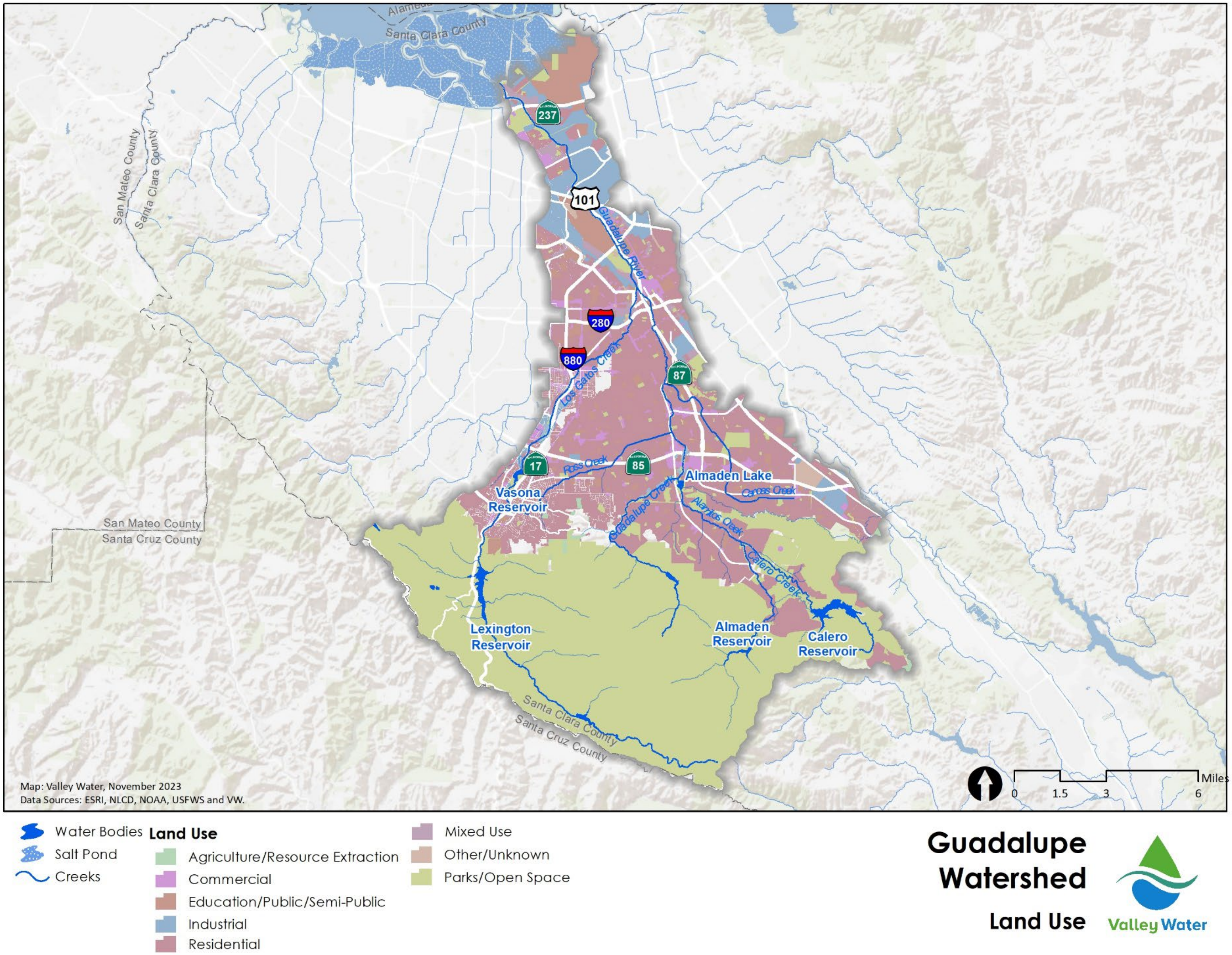

Figure 8: Guadalupe Watershed - Land Use in the Guadalupe Watershed

Campbell: In 2020, the City of Campbell prepared a General Plan update. It identified four Special Planning Areas to focus development while minimizing traffic, greenhouse gases, and health impacts. These areas are the Pruneyard/Creekside District, North of Campbell Avenue District, South of Campbell Avenue District, and San Tomas Area Neighborhood. (De Novo Planning Group, 2020)

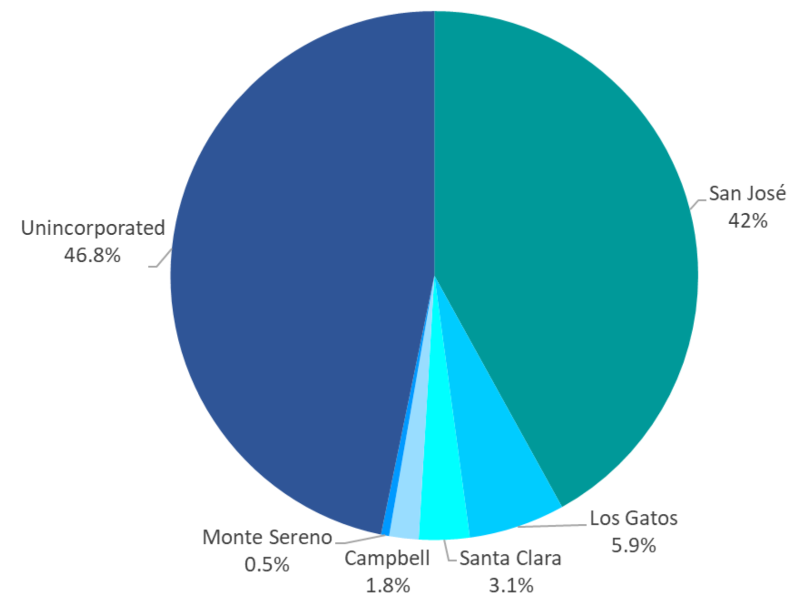

Figure 9: Watershed Area by City/Municipality

Los Gatos: In 2022, the Town of Los Gatos identified eight community growth districts to support mixed use and residential development. These include the Downtown, Los Gatos Boulevard, North Santa Cruz Avenue, Winchester Boulevard, Lark Avenue, Harwood Road, Pollard Road, and Union Avenue Districts (Town of Los Gatos, 2022)

Monte Sereno: This community is comprised of low-density residential housing, with very little vacant land for expansion. Additional growth will be accommodated by constructing accessory dwelling units on existing properties (City of Monte Sereno, 2008).

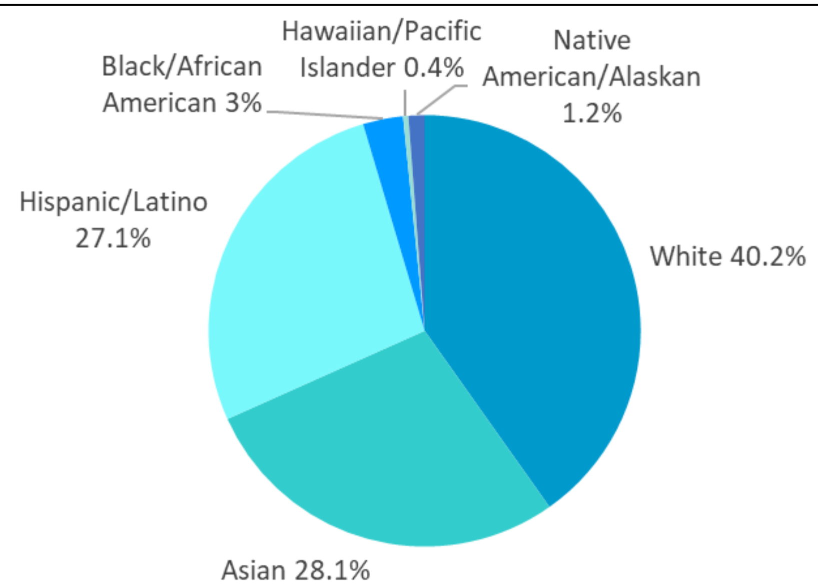

Figure 10: Racial Groups in Santa Clara County by Percentage

Population Growth and Urbanization

Santa Clara County is the most populous of all nine San Francisco Bay Area counties. The county's current population is about 1.9 million, with expected growth to 2.4 million by 2050 (Metropolitan Transportation Commission and Association of Bay Area Governments, 2021). About 37% of the current county population lives within the Guadalupe Watershed. Like Santa Clara County, the Guadalupe Watershed is home to diverse cultures, nationalities and racial groups (U.S. Census Bureau, 2021).

Disadvantaged Communities and Environmental Justice

A disadvantaged community is an area whose residents are disproportionately impacted from a combination of economic, health, and environmental burdens, such as poverty, high unemployment, environmental pollution, the presence of hazardous waste, or environmental degradation. These communities often are comprised of people who have suffered historical discrimination based on race, color, national origin, tribe, culture, income, immigration status, or English language proficiency.

For the purposes of Valley Water policies, projects, services, and programs, disadvantaged communities include any of the following:

- Low-income households (Household incomes below 80 percent of the Area Median Income (AMI) in Santa Clara County), as of 2020 AMI for average household of three is $100,950.
- Low-income census tracts (Census tracts where aggregated household incomes are less than 80 percent of the Area Median Income for Santa Clara County), as of 2020 AMI for average household of three is $100,950.
- An area defined by California Environmental Protection Agency (pursuant to Section 39711 of the California Health and Safety Code), using the CalEnviroScreen tool, which was developed to determine communities most burdened by environmental, socioeconomic and health factors.

Rural Landscape: Farmland and Rangeland

There is very little farmland and rangeland in the Guadalupe Watershed (1.5% of total land use), but the few areas that exist are mainly rangelands in the upper watershed in the foothills of the Santa Cruz Mountains.

Agricultural Land Conservation

Martial Cottle Park: This park is a 257-acre historical agricultural park owned in separate pieces by the State of California and Santa Clara County and operated as one park. The park was created as a gift from the owner of the property, Walter Cottle Lester, who specified that the park must be used for promoting and sustaining farming traditions and displaying the agricultural heritage of the Santa Clara Valley. The Park’s General Plan established four land uses for the park, including Park and Recreation, Leased Agriculture, Habitat Enhancement, and Cooperative management. Activities within the park are limited to farming, educational agriculture programs, and passive recreational activities such as picnicking and trails (Design, Community & Environment, 2011)

Open Space: State and Regional Parks – Conservation, Recreation and Trails

Creek corridors and parklands within urbanized areas provide important landscapes for trails, recreation, wildlife habitat conservation, and flood risk reduction. The value of various open landscapes for water quality and flood protection is described in Chapter 2.2.5 of the One Water Framework for Santa Clara County (pp. 59-64). The following section highlights trails and recreational open spaces associated with the creeks, groundwater recharge ponds, and reservoirs in the Guadalupe Watershed that are managed by Valley Water or other agencies.

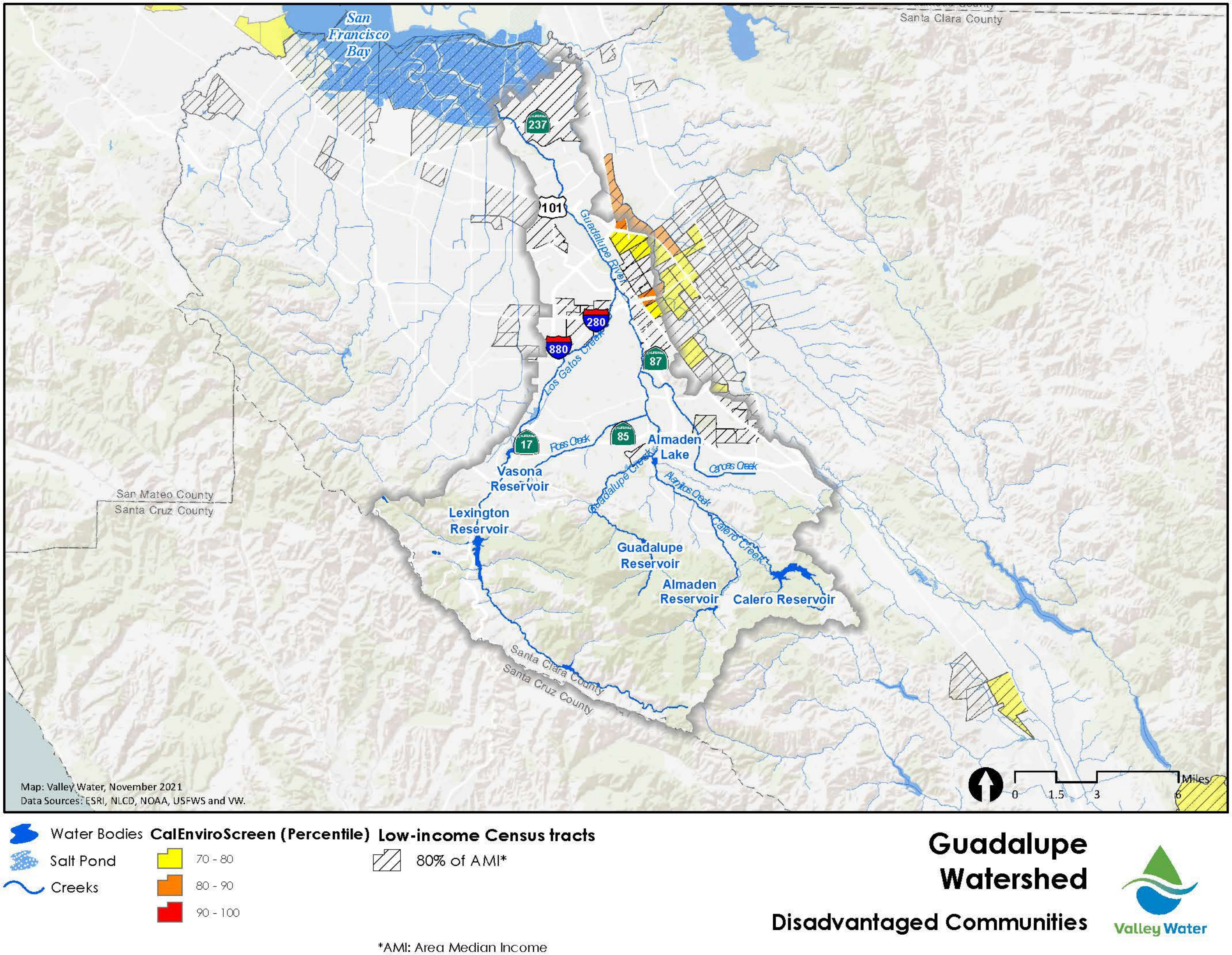

Figure 11: Guadalupe Watershed - Disadvantaged Communities Map

Conservation

Rancho Canada del Oro Open Space Preserve – This area is located in the Santa Cruz Mountains south of Calero Reservoir and is managed by the Santa Clara Valley Open Space Authority (OSA), an independent special district that preserves open space in Santa Clara County. OSA has two Conservation Focus Areas identified within the Guadalupe Watershed, including the South Bay Salt Ponds (Baylands) and the Southern Santa Cruz Mountains. (Santa Clara Valley Open Space Authority, 2014).

Sierra Azul – This land preserve is located between Lexington Reservoir and Almaden Reservoir and is managed by the Midpeninsula Regional Open Space District (Midpen). Midpen is a special district that preserves open space in the greater Santa Cruz Mountains region. It is the largest open space area that Midpen manages at over 19,000 acres of wilderness (Midpeninsula Regional Open Space District, 2014). Valley Water's Safe Clean Water D2 program is funding some of Midpen's habitat restoration work here.

El Sereno – This land preserve was acquired by POST and in is managed by Midpen and Peninsula Open Space Trust (POST). POST is a non-profit land trust with a mission to protect land on the San Francisco Peninsula and the southern Bay Area for the benefit of all. POST acquires land that is then generally transferred to government agencies like Midpen and OSA for long-term ownership and management. POST's work is organized into thematic program areas, which include wildlife linkages, redwoods, public access, and farmland.

Bear Creek Redwoods – This land preserve was acquired by POST and is managed by Midpen. Several of Midpen's priority actions include improvements to these open spaces within the Guadalupe watershed. Valley Water's Safe Clean Water D2 program is funding some of Midpen's habitat restoration work here. (Midpeninsula Regional Open Space District, 2014)

Santa Clara Valley Habitat Plan (VHP) – The VHP Permit Area overlaps 59,110 acres of the Guadalupe Watershed, about 13% of total VHP Permit Area (460,207 acres). This plan was adopted by the Santa Clara Valley Habitat Agency (SCVHA) in 2013 in partnership with the California Department of Fish and Wildlife (CDFW), United States Fish and Wildlife Service (USFWS), and six local partners including Valley Water. The Plan is a 50-year joint habitat conservation plan and natural communities conservation plan developed to serve as the basis for the issuance of incidental take permits and authorizations pursuant to Section 10 of the Federal Endangered Species Act and the California Natural Community Conservation Planning Act. The VHP defines measures to avoid, minimize, and mitigate impacts on covered species and their habitats, which includes payments of fees, while allowing for implementation of certain covered activities. Through payment of VHP fees, VHP covered species benefit directly from the SCVHA's targeted recovery of these species. Species not covered by the VHP benefit indirectly from the implementation of the SCVHA's conservation strategy that includes preservation, restoration, and enhancement of natural communities in which these species inhabit (ICF International, 2012).

Recreation

Open spaces are popular locations for recreational activities. Hiking and walking trails are common recreational amenities, but educational centers, boating and water sports, off-leash dog play, mountain biking, horseback riding, camping, picnicking, and community gathering areas are also forms of recreation that open spaces can provide.

Santa Clara County Department of Parks and Recreation – Santa Clara County Parks aims to provide, protect, and preserve regional parklands for the enjoyment, education and inspiration of this and future generations. Almaden Quicksilver Park, Calero County Park, Los Gatos Creek County Park, Martial Cottle Park, Sanborn County Park, Santa Teresa County Park, and Vasona Lake County Park are all owned and managed by Santa Clara County and at least partially located in the Guadalupe Watershed. Martial Cottle, Calero, Sanborn, and Santa Teresa County Parks have identified improvements included in the Santa Clara County Parks Strategic Plan (Santa Clara County Parks, 2018).

Trails

Trails have been developed along many of the watershed's major creek systems, especially along the Guadalupe River and Los Gatos Creek, where over the last three decades local agencies have created a parkway of linked public open spaces and picnic areas, fishing and water-skiing lakes, wildlife habitats, and multi-use trails. Valley Water recognizes these recreational assets and the valuable opportunities they provide for the public to engage with the county's waterways and natural resources. Rather than creating or maintaining trails, Valley Water often provides access to its land for trails and distributes grants for trail development by partner agencies.

Valley Water owns more than 3,308 acres of land and holds easements over another 868 acres , along creeks and other water bodies in the Guadalupe Watershed. Valley Water rights-of-way often include creek-side maintenance roads or levees parallel to the creeks to provide access for creek management activities. These facilities can often serve dual purposes, by providing an ideal location for another agency to build and manage trails. These trails provide dedicated and multi-modal recreational opportunities at the interface of riparian corridors, in contrast to roadside recreational facilities shared by vehicles, cyclists, and pedestrians. In this way, land owned by Valley Water along creeks, groundwater recharge ponds, and reservoirs helps support a network of interconnected trails in the Guadalupe Watershed.

Trails traverse both Valley Water lands and public lands. Due to the urbanized setting in much of Santa Clara County, land availability for trails and open space is limited. However, in contrast to the more urbanized areas of the Guadalupe Watershed where adjoining lands are often privately owned or developed with intensive uses that preclude trails, rural portions of the watershed have large areas of land owned by government institutions and non-governmental conservation organizations, or large landowners that may be open to considering trail construction on their property. As such, the watershed offers opportunities to plan for multi-purpose land uses that provide recreational trails, flood protection, and habitat preservation.

Related Trail and Recreation Plans

Valley Water has worked with other landowners and partners in the watershed to align agency goals and objectives through master plans for several decades. Valley Water encourages its partners to include as much specificity in their master plans as feasible so that future property acquisitions and development opportunities holistically consider trail and open space goals, along with long-term Valley Water priorities for water quality and flood management. Valley Water also encourages partners to route trails away from stream corridors and onto uplands as much as possible to minimize human disturbance of critical ecological resources in riparian areas, in accordance with the Valley Water's Public Trails Policy Criteria and Guidance.

Examples of master plans and strategic plans that provide guidelines for trail development and maintenance in the Guadalupe Watershed are described below. These plans inform Valley Water partnerships, joint use agreements, and capital plans concerning trail and recreation components.

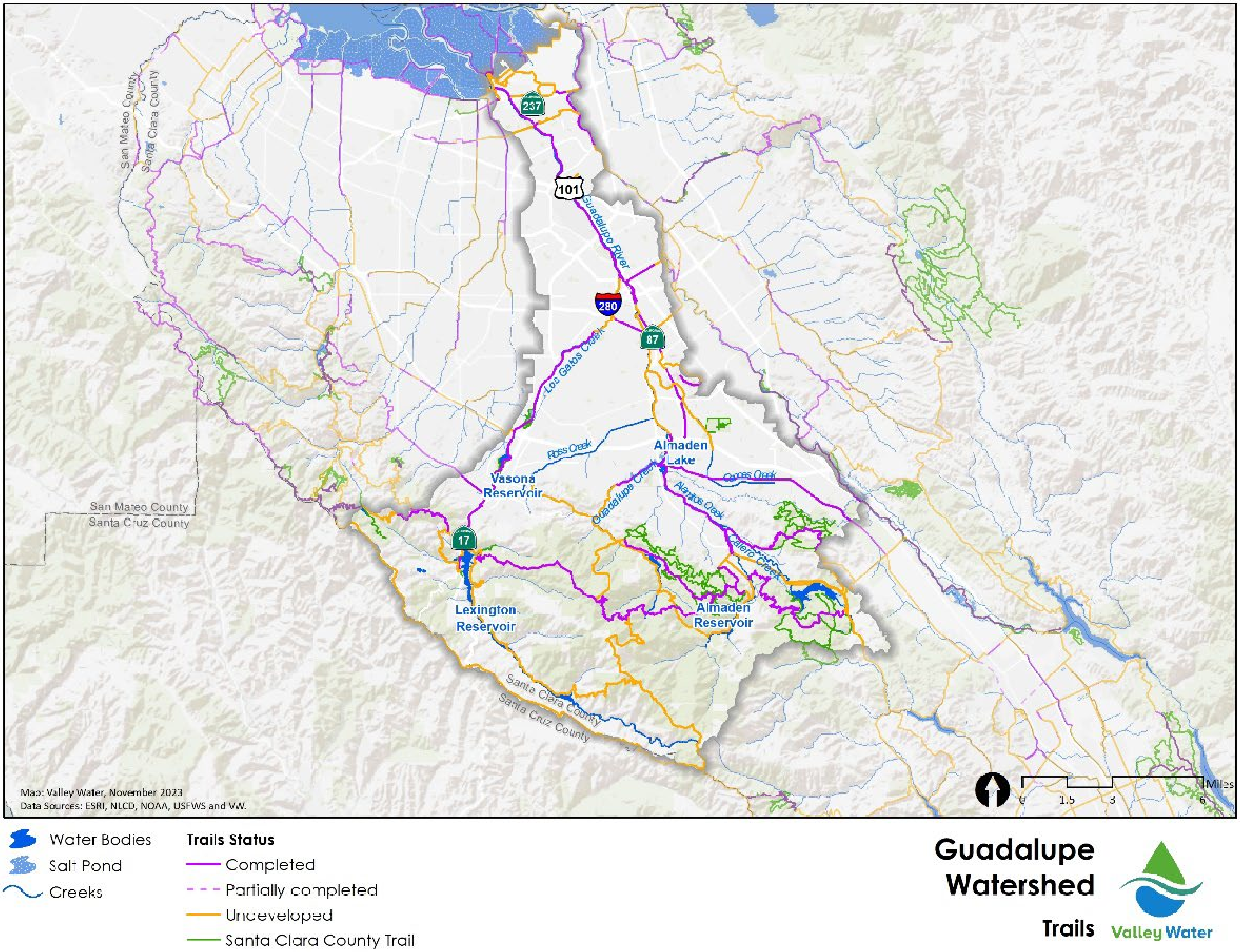

Figure 12: Guadalupe Watershed – Trails

Guadalupe River Park Master Plan (2002)

The Guadalupe River Park Master Plan established the Guadalupe River Park as an aesthetic and recreational resource. It combined flood risk reduction and park-design elements to create a unique space for people to feel part of the natural system (San Jose Redevelopment Agency, 2002).

Santa Clara Countywide Trail Master Plan

The Santa Clara Countywide Trail Master Plan was last updated in 1995 but is now undergoing a revision in 2023. In 1995, the master plan proposed 535 miles of off-street countywide trail routes (105 miles of which were in existence in 1995) and an additional 120 miles of bike trails. The plan links Guadalupe River trails through San José to other cities and parts of the Guadalupe Watershed (Santa Clara County Trails Plan Advisory Committee, 1995).

City of San José – Greenprint & ActivateSJ Strategic Plan

San José is the Guadalupe Watershed's largest city, and most trail and open space initiatives are carried out by the City's Parks, Recreation and Neighborhood Services Department. In September 2000, the City Council adopted the Greenprint for Parks and Community Facilities and Programs (Greenprint). The Greenprint includes principles of Environmental Sustainability and Productive Partnerships and describes eight planning areas that are wholly or partially within the Guadalupe Watershed (City of San Jose, 2009). The Greenprint was updated in 2009 and was replaced by the ActivateSJ Strategic Plan (ActivateSJ) in 2020. ActivateSJ is a people-focused strategic plan that identifies five guiding principles for San José's Parks and Recreation Department: stewardship, nature, equity & access, identity, and public life. These principles may guide the development of regional Greenprints in the future (San Jose Parks, Recreation, and Neighborhood Services, 2020).

2.3 FUTURE CONDITIONS, CHALLENGES, AND OPPORTUNITIES

The review of historical and present conditions in the Guadalupe Watershed with respect to land use led to the identification of numerous factors that will present challenges and opportunities in the future. These factors and their associated challenges and opportunities are described below.

Challenges

Many Agencies, Many Jurisdictions

Land use is highly diverse in Guadalupe Watershed, as are the municipalities and agencies with the authority to regulate land use. Cities, open space agencies, and other landowners have distinct interests, priorities, and regulatory mandates related to land use. Differing approval processes and long-range planning approaches among these entities can compound the complexities of land use decision-making. The existence of many agencies and many jurisdictions in the Guadalupe Watershed presents a challenge to a forward-looking watershed scale planning initiative like One Water.

While Valley Water does have the authority to maintain the existing facilities and regulate activities carried out by other parties on its fee-owned land, Valley Water does not have authority over city or countywide land use and development patterns. The ability to directly regulate land use lies with individual cities and the County, which establish zoning and general plan designations and have the authority to approve development proposals. As such, Valley Water has little influence over urban development that can have adverse effects on the riparian corridors and groundwater recharge areas it manages. This represents a fundamental challenge to Valley Water's ability to provide flood protection and stewardship in the Guadalupe Watershed.

Access and Equity
Underserved communities tend to have less “green spaces”, or areas of open space with accessible trails and other recreational uses. Creating equitable access and prioritizing open spaces and trails near underserved communities is a challenge worth pursuing.

Climate Change
Climate change is recognized as a threat multiplier for natural disasters like wildfire, severe storms, and floods. These natural disasters are historically occurring in the Guadalupe Watershed and climate change will continue to enhance their levels of risk. As such, promoting land use planning that accounts for climate-related risks and development practices that promote climate adaptation should be central to land use decision-making moving forward.

Urban development and existing land use patterns represent a challenge to effective climate adaptation. Once a particular area has an established land use, it is generally fixed for that area for a long period of time. Successful adaptation projects must accommodate existing patterns of land while also incorporating appropriate designs that address climate-related risks and meet the needs of the local community. In advancing climate adaptation, it is also critical to recognize that vulnerability to climate-related risks is unequally distributed across the Guadalupe Watershed. A community’s location, socioeconomic status, political influence, and other factors affect its level of climate vulnerability. Climate adaptation projects should consider this vulnerability and promote outcomes that enhance climate resilience and adaptation in an equitable manner.

Wildfire Risk
Climate change is expected to increase the risk and severity of wildfires. Santa Clara County is no stranger to wildfires. The SCU Lightning Complex fire in 2020 is a recent example of a local wildfire that burned a large portion of the rural areas in the east part of the county. Urbanized areas are not immune to wildfire either, as recent examples from other parts of the United States have demonstrated. The classified wildfire risk in the Guadalupe watershed is shown in Figure 13.

Opportunities
Land Use Coordination
Although Valley Water does not have jurisdiction over land use, it can partner with entities that do to promote efficient water use, flood risk reduction, stormwater runoff retention, riparian restoration, protection of water quality, and other actions with a connection to land use. Maintaining close collaboration as this plan moves into implementation is critical to overcoming the challenges presented by the many agencies and many jurisdictions present in the Guadalupe Watershed. By identifying linkages between One Water and the General Plans of nearby cities and towns, Valley Water and its partners can work together to support mutual goals. Shared goals for the watershed include limiting urban sprawl, not to limit development, but to focus development in the areas that has the infrastructure and services available to support that growth. Expanding public transit is another important opportunity to build transit-oriented developments that make communities more accessible while also reducing greenhouse emissions from cars. Notable future expansions include the Bart Silicon Valley Extension Program, which will connect BART service to Diridon Station and the Santa Clara Station. Transit-oriented developments are planned near these areas as well.

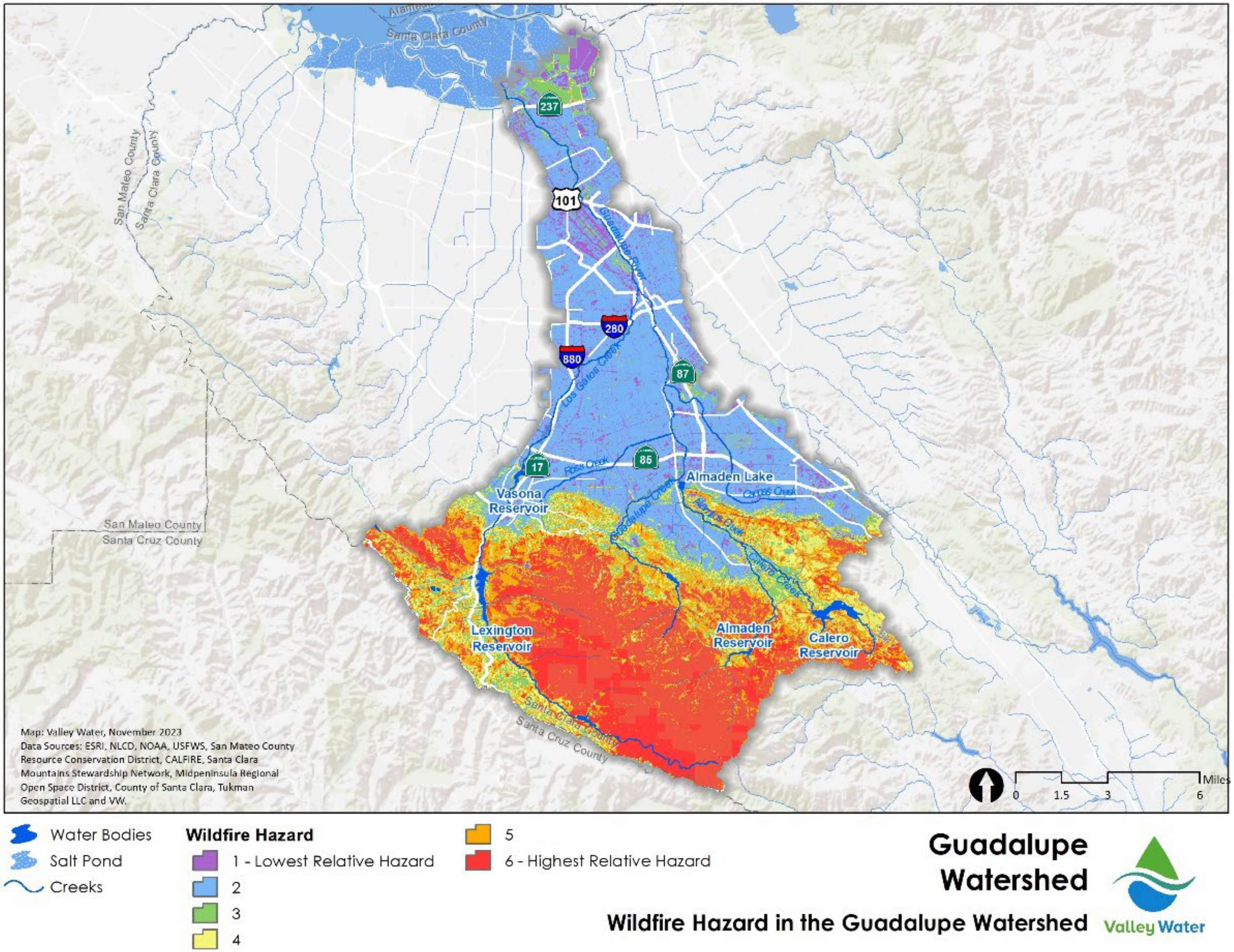

Figure 13: Wildfire Hazard in Guadalupe Watershed

Increased Ecological Connections

Since much of the open spaces and recreational areas in the watershed are not owned by Valley Water, partnerships to enhance ecological connections are a critical piece to making progress. Prioritizing, protecting, and expanding linkages between habitats can have multiple benefits to flood risk reduction and water quality as well as the environment. Similarly, acquiring land for use as open space or recreation in locations near waterways can provide opportunities to expand floodplains and enhance natural processes. Enhancing riparian corridors is also beneficial, providing increased habitat corridor movement and more space for many constrained rivers and channelized creeks while also providing opportunities for communities to connect with the natural environment. One notable example of this is the Re-Envisioning the Guadalupe River Park effort by SPUR, which seeks to transform the Guadalupe River Park from an underutilized space to an asset for the community and the environment (SPUR, 2019).

Promoting Smart Water Use and Reuse

Municipalities have great influence on water conservation and stormwater management in the ways they manage new developments. Promoting efficient water use and reuse in new developments by requiring water-efficient fixtures and appliances as well as drought tolerant landscaping can have huge benefits to water demand. Expanding stormwater capture and green stormwater infrastructure projects can help slow down the movement of water through the watershed during storms and help filter pollutants before they reach the waterways. Supporting the retrofit of existing “grey” infrastructure (concrete and hardscape) with “green” infrastructure (materials that allow percolation into the ground) can have similar benefits on how stormwater affects the watershed.

Although many of these actions are outside Valley Water’s jurisdiction, supporting partnerships to encourage these actions is an opportunity worth pursuing.

SECTION 3: ECOLOGY

3.1 HISTORICAL CONDITIONS

Historically, the Guadalupe Watershed supported a diverse array of habitats that were vital to the ecology and culture of the region, from oak woodlands in the south to extensive wetlands in the north (Beller, Salomon, & Grossinger, 2010). Figure 14 depicts a conceptual model of habitat patterns in the watershed prior to Euro-American modification (Beller, Salomon, & Grossinger, 2010). These patterns demonstrate the diversity and dynamics of historical riverine processes and how those fed and interacted with wetlands: whether continuous or not, channels draining into and running along the valley floor fed the high groundwater table and provided the occasional flooding that supported extensive and diverse wetlands. Many of the physical characteristics, like topography and hydrology, that shaped these habitats remain today, at least in part. The influence of the watershed's native peoples, however, is gone. Historical records indicate that native peoples actively fished, hunted, and gathered within the Guadalupe Watershed and there is evidence of fire management to manipulate vegetation patterns to maintain or increase plant productivity (Beller, Salomon, & Grossinger, 2010). Understanding of historical patterns and processes allows for planning and prioritization of ecological resource conservation and enhancement efforts that are appropriate for persistent or modified physical conditions, ensuring conservation strategies are effective and resilient.

Creeks and Rivers – Prior to Euro-American settlement, the creeks and rivers of the watershed were much less connected. Streams in the upper watershed were almost all discontinuous channels, which fanned out and infiltrated into the ground in the pervious soil of the foothills, or flowed into the wet meadows, wetlands, and willow groves in the impervious clay soils of the lower watershed (Beller, Salomon, & Grossinger, 2010). Los Gatos Creek, which originates in the Santa Cruz Mountains, meandered through the Los Gatos valley until it split into two channels, eventually reconvening, and dispersing into a vast willow grove before entering the Guadalupe River through a series of smaller overflow channels (Beller, Salomon, & Grossinger, 2010). Prior to the flood of 1852-3, when high flows in Los Gatos creek created a connection to the Guadalupe River, there was no defined confluence between the two channels. Alamitos and Guadalupe creeks combined to form the Arroyo Seco de los Capitancillos or Arroyo Seco de Guadalupe, what is now considered the upper Guadalupe River. The Arroyo Seco de Guadalupe spread out into multiple channels and ended in the willow and sycamore grove wetlands in the area now referred to as Willow Glen (Tetra Tech, Inc., 2006). Along the eastern margin of this area was a several-mile long sycamore grove. This was one of the largest of the willow groves (sausales in Spanish) that grew frequently in areas of the watershed where groundwater was close to the surface. Remnants of sycamore alluvial woodland remain in small pockets on Guadalupe, Alamitos, and Calero Creeks (San Francisco Estuary Institute - Aquatic Science Center and H.T. Harvey & Associates, 2017).

The historic Guadalupe River began in the springs of this willow grove, discontinuous from the Arroyo Seco de Guadalupe. The Guadalupe River was a sinuous, mostly single channel stream that meandered north to the Baylands, fed periodically by small tributaries on the valley floor (Beller, Salomon, & Grossinger, 2010). Originally, the Guadalupe River connected to the Guadalupe Slough, which entered the San Francisco Bay. However, the river was partially diverted to Alviso Slough around 1850, and was completely diverted by 1931 (Tetra Tech, Inc., 2006). By 1871, the Arroyo Seco de Guadalupe was connected to the Guadalupe River via the Lewis Canal, a straight section of channel that bypassed the

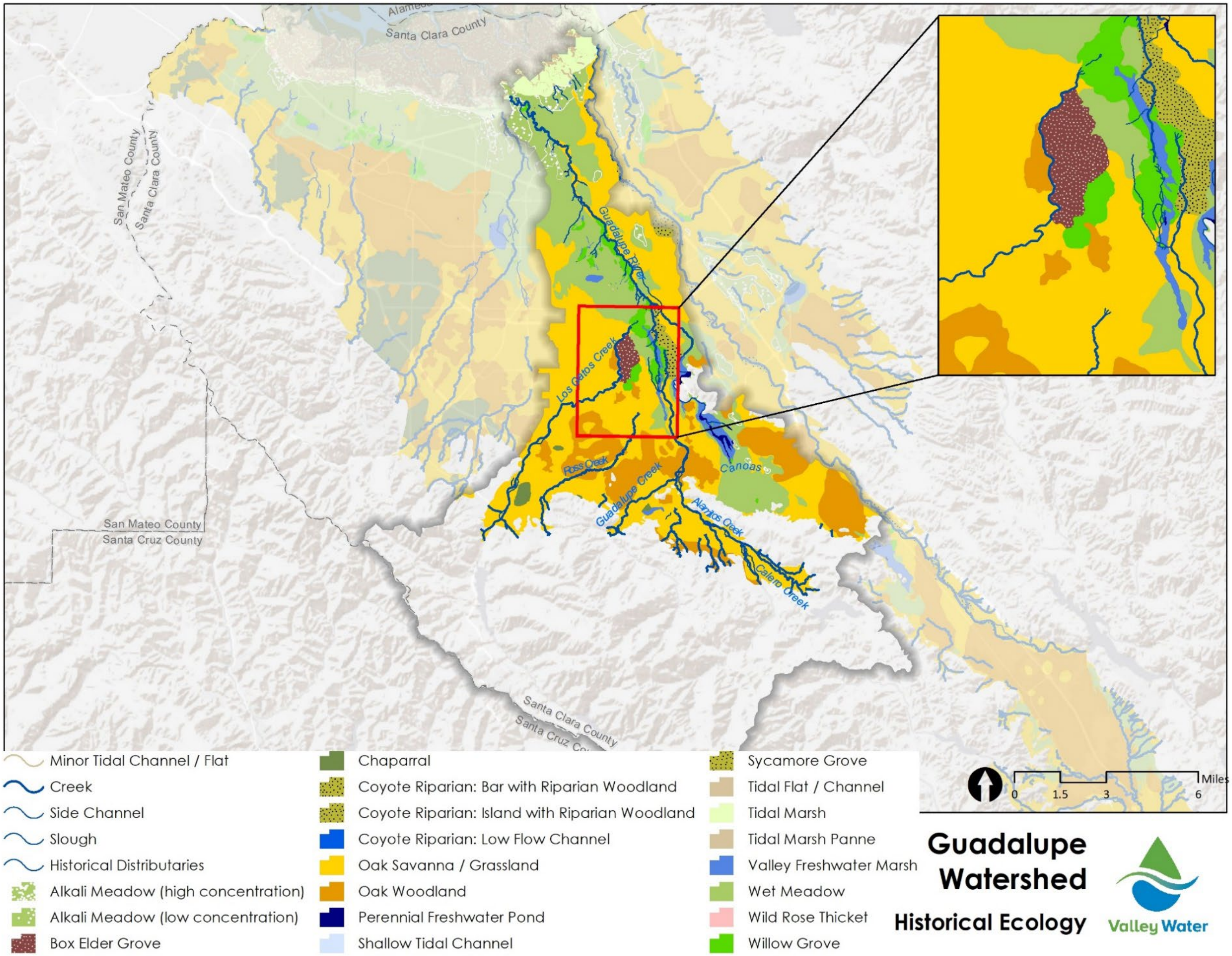

Figure 14: Historical Drainage Patterns and Natural Communities

head of the Guadalupe River and connected south of Willow Street (Beller, Salomon, & Grossinger, 2010). In the 1900s, the lower portion of the Guadalupe River was engineered into a straight channel. Figure 15 is an example of the profound changes in drainage patterns that have occurred in the watershed.

Figure 15: Comparison of historical (left) and contemporary (right) lower Guadalupe River, illustrating its channelization and loss of adjacent riparian forest (Beller, Salomon, & Grossinger, 2010)

Oak Woodlands and Grasslands – The headwaters and foothills of the watershed were dominated by oak woodland, chaparral, and grassland, as they still are today. Multiple historical accounts speak of huge swaths of land covered with large oak trees, such as Valley oak (*Quercus lobata*), live oak (*Q. agrifolia*), and black oaks (*Q. kelloggii*). One particularly large oak woodland, known as the Roblar (valley oak grove in California Spanish), stretched over 10 miles from Los Gatos Creek to San Franciscquito Creek at what is now the Santa Clara/San Mateo County boundary.

Marsh – Freshwater marshes grew in areas where groundwater reached the surface seasonally or year-round, typically near willow thickets. One of the largest freshwater marshes was referred to as the Tulares de las Canoas and was more than half a mile in width. The marsh was likely named after the tules that grew there, which were used to make canoes. Other notable marshes within the Guadalupe watershed include the marshes and ponds at the mouth of the Arroyo Seco de Guadalupe, and along the west side of the Guadalupe River (Beller, Salomon, & Grossinger, 2010). Within the marshes were perennial ponds, which were flooded year-round, and did not support vegetation.

Wet Meadows – Wet meadows covered large areas of the lower Guadalupe Watershed in areas with dense clay soils that poorly drained. They were typically treeless, composed almost entirely of grasses such as rhizomatous ryegrasses (*Leymus* spp.), wire rush (*Juncus balticus*), irisleaf rush (*Juncus xiphioides*), buttercup (*Ranunculus californicus*), and blue eyed grass (*Sisyrinchium bellum*), California wild rose (*Rosa californica*), wild nettles, and blackberries (Beller, Salomon, & Grossinger, 2010). Closer to the Bay, these meadows were characterized by poorly drained non-tidal soils and frequent tidal flooding, and vegetation typically included saltgrass (*Distichlis spicata*), alkali milk vetch (*Astragalus tener* var. *tener*), and common tarweed (*Centromadia pungens*) (Beller, Salomon, & Grossinger, 2010). These are referred to as alkali meadows, have declined significantly in area due primarily to coastal development, and support several special-status plant species.

3.2 PRESENT CONDITIONS

The following section summarizes current conditions of natural communities in the Guadalupe Watershed, with the intention of concisely explaining the need for recommended actions in the One Water Guadalupe Watershed Plan and providing the essential elements of a watershed approach to identifying appropriate and most essential areas for conservation and enhancement. Descriptions of present-day ecological resources in the watershed are presented by natural community type, with a strong emphasis on the riverine and riparian communities that Valley Water works in.

Natural communities are collections of plant and animal species that co-occur in the same habitat and interact through functional ecological relationships. Communities are typically characterized by one or more dominant plant species, which form land cover types, and the wildlife that tend to utilize that land cover. Although roughly 50% of the Guadalupe Watershed is intensely developed for residential and commercial land uses, parts of the watershed continue to support a variety of natural communities. The primary land cover types and associated natural communities found in the Guadalupe Watershed are listed in Table 1, depicted in Figure 16, and described in more detail below. Several of the natural communities, depending upon co-occurring species and habitat quality, are considered sensitive by CDFW and, as such, are required to be analyzed and mitigated for under CEQA and serve as focal points for conservation and enhancement efforts that preserve biodiversity (California Department of Fish and Wildlife, 2023). The diversity and extent of natural communities of the Watershed support about 80 special-status wildlife and plant species (Figure 16), though it is important to note that sensitive natural communities do not always contain special-status species.

Table 1: Natural Communities and Other Land Cover Types in the Guadalupe Watershed

Natural Community	Detailed Land Cover Name	Area (ac)	Percent of Watershed
Agriculture	Grain, Row-crop, Hay and Pasture	1,424	1%
	Orchard, Grove, Vineyard	222	
Chaparral and Shrubland	Mixed Serpentine Chaparral	488	7%
	Non-native Shrub	56	
	Diablan Sage Scrub	501	
	Chamise Chaparral	150	
	Mixed Shrub	6,278	
Conifer Woodland	Mixed Evergreen Forest	358	6%
	Pine/Cypress	600	
	Redwood/Douglas Fir	5,302	
Developed	Barren and Sparsely Vegetated	315	52%
	Developed	54,158	
	Landfill	56	
	Roads	1,503	

Natural Community	Detailed Land Cover Name	Area (ac)	Percent of Watershed
	Rural Residential	616	
Developed Parkland	Golf Courses/Urban Parks	1,999	2%
Grassland	Native Grasslands	1,816	6%
	Herbaceous	2,768	
	Naturalized Grassland	389	
	Rock Outcrop	19	
	Serpentine Bunchgrass Grassland	1,785	
	Serpentine Rock Outcrop/Barrens	35	
Oak Woodland	Blue Oak Woodland	451	22%
	Coast Live Oak Forest and Woodland	1,272	
	Deciduous Hardwood	230	
	Evergreen Hardwood	16,210	
	Mixed Oak Woodland and Forest	4,020	
	Non-native Forest and Woodland	1,935	
	Valley Oak Woodland	141	
Open Water	Concrete Lined Channels	42	2%
	Earth Lined Channels	3	
	Perennial Stream Channel	43	
	Pond	241	
	Reservoir	981	
	Water	799	
Riparian Woodland and Scrub	Exotic Trees and Shrubs	233	2%
	Mixed Riparian Forest and Woodland	761	
	Western Sycamore Woodland	77	
	Fremont Cottonwood Forest	220	
	Willow Riparian Forest and Scrub	396	
Wetland	Freshwater Marsh	104	1%
	Salt Marsh	872	
	Seasonal Wetland	20	
	Serpentine Seep	8	
Total		**109,898**	**100%**

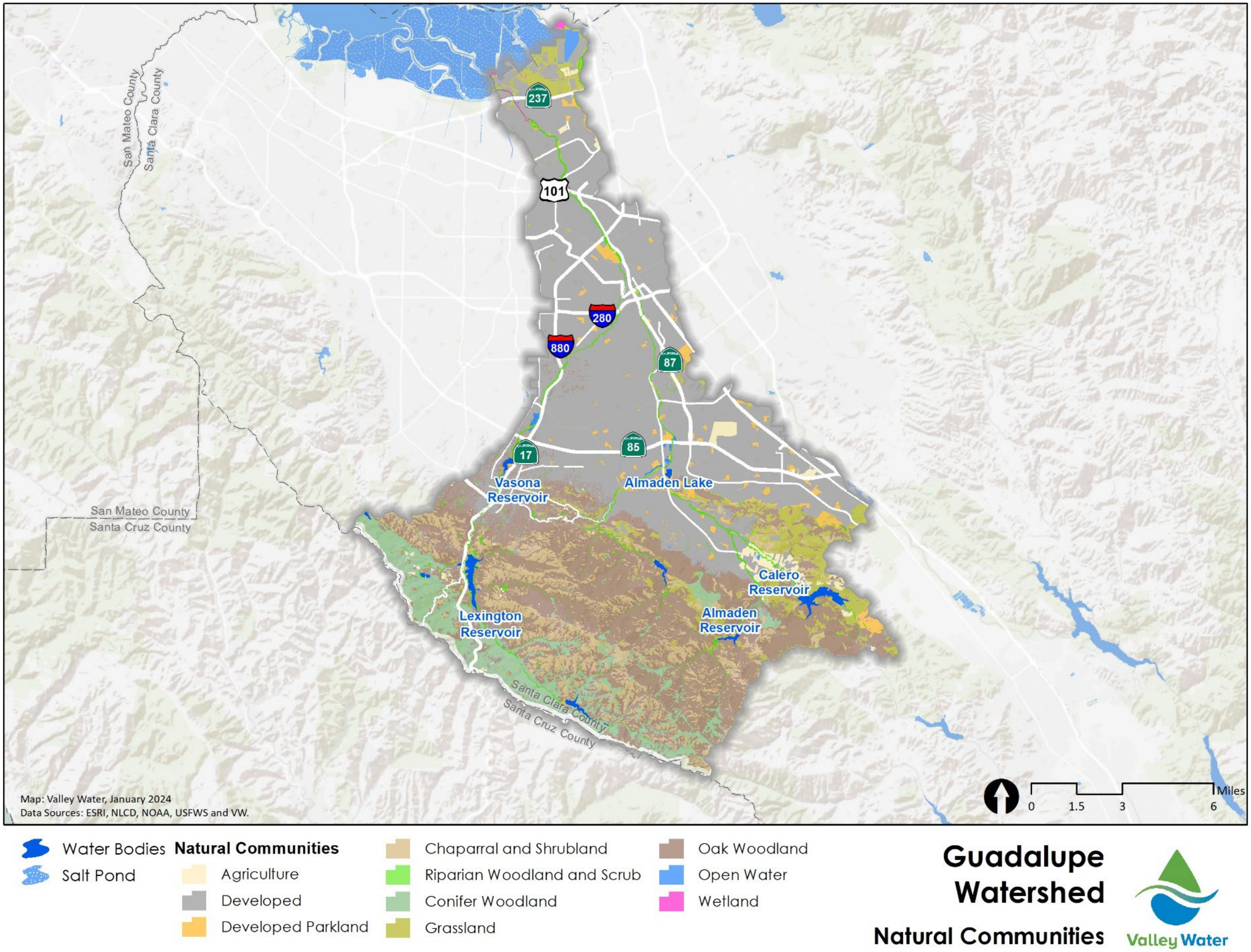

Figure 16: Guadalupe Watershed - Natural Communities

Table 2: Special-status Species in the Guadalupe Watershed

Scientific Name	Common Name	Status[1]	Associated Natural Communities
Invertebrates			
Bombus crotchii	Crotch's bumble bee	CC[2]	Chaparral scrub, oak woodland, grassland
Danaus plexippus	Monarch butterfly	FC[3]	Grassland, riparian, wetlands, woodlands, urban
Euphydryas editha bayensis	Bay checkerspot butterfly	FT	Chaparral scrub, grassland, serpentine seep
Fish			
Entosphenus tridentatus	Pacifc lamprey	SSC	Creeks
Acipenser transmontanus	White sturgeon	SSC	Brackish and tidal creeks, bay
Oncorhynchus mykiss	Steelhead – Central CA Coast DPS	FT	Creeks
Oncorhynchus tshawytscha	Chinook salmon - Central Valley fall-run ESU	SSC	Creeks
Spirinchus thaleichthys	Longfin smelt	FC[3]; CT	Brackish and tidal creeks, bay
Hesperoleucus venustus subditus	Southern coastal roach	SSC	Creeks
Lavinia exilicauda exilicauda	Sacramento hitch	SSC	Creeks
Cottus gulosus	Riffle sculpin	SSC	Creeks
Amphibians			
Ambystoma californiense	California tiger salamander - Central CA DPS	FT; CT	Oak Woodland, grassland, ponds, freshwater wetland
Anedies flavipunctatus niger	Santa Cruz Black Salamander	SSC	Oak woodland, conifer woodland, creeks, riparian
Dicamptodon ensatus	California giant salamander	SSC	Oak woodland, conifer woodland, creeks, riparian
Rana boylii	Foothill yellow-legged frog	FT; CE	Chaparral scrub, conifer woodland, creeks, oak woodland, riparian
Rana draytonii	California red-legged frog	FT; SSC	Creeks, reservoirs and ponds, freshwater wetland
Reptiles			
Actinemys marmorata	Western pond turtle	SSC[3]	Oak woodland, creeks, riparian, reservoirs and ponds, wetland
Anniella pulchra	Northern California legless lizard	SSC	Oak woodland, chaparral scrub, grassland, conifer woodland, riparian forest and scrub
Phrynosoma blainvillii	Coast horned lizard	SSC	Oak woodland, chaparral scrub, grassland
Birds			
Agelaius tricolor	Tricolored blackbird	CT; SSC	Freshwater wetland, tidal marsh, grassland, irrigated agriculture, reservoirs and ponds
Ammodramus savannarum	Grasshopper sparrow	SSC	Grassland

Scientific Name	Common Name	Status[1]	Associated Natural Communities
Aquila chrysaetos	Golden eagle	CFP	Conifer woodland, oak woodland, Chaparral scrub, grassland
Asio flammeus	Short-eared owl	SSC	Grassland, irrigated agriculture, wetland
Asio otus	Long-eared owl	SSC	Conifer woodland, grassland, oak woodland, riparian
Athene cunicularia	Burrowing owl	SSC	Developed, grassland, irrigated agriculture
Aythya americana	Redhead	SSC	Baylands, wetland, creeks, open water
Bucephala islandica	Barrow's goldeneye	SSC	Baylands, wetland, creeks, open water
Buteo swainsoni	Swainson's hawk	CT	Grassland, irrigated agriculture, oak woodland, riparian
Chaetura vauxi	Vaux's swift	SSC	Conifer woodland, developed, grassland, oak woodland, reservoirs and ponds, riparian, freshwater wetland, tidal marsh
Charadrius alexandrinus nivosus nivosus	Western snowy plover	FT; SSC	Baylands, tidal marsh
Circus cyaneus	Northern harrier	SSC	Oak woodland, grassland, freshwater wetland, tidal marsh
Contopus cooperi	Olive-sided flycatcher	SSC	Conifer woodland, oak woodland
Cypseloides niger	Black swift	SSC	Conifer woodland, oak woodland, riparian, reservoirs and ponds
Elanus leucurus	White-tailed kite	CFP	Oak woodland, grassland, riparian, irrigated agriculture, freshwater wetland, tidal marsh
Empidonax traillii	Willow flycatcher	CE	Conifer woodland, oak woodland, riparian
Falco peregrinus anatum	American peregrine falcon	CFP	Conifer woodland, developed, grassland, oak woodland, reservoirs and ponds, riparian, freshwater wetland, tidal marsh
Geothlypis trichas sinuosa	Saltmarsh common yellowthroat	SSC	Baylands, riparian, alkali meadow, freshwater wetland, tidal marsh
Haliaeetus leucocephalus	Bald eagle	CE; CFP	Conifer woodland, developed, grassland, oak woodland, reservoirs and ponds, riparian, freshwater wetland, tidal marsh
Icteria virens	Yellow-breasted chat	SSC	Oak woodland, riparian, wetland
Lanius ludovicianus	Loggerhead Shrike	SSC	Chaparral scrub, oak woodland, grassland
Laterallus jamaicensis coturniculus	California black rail	CT; CFP	Baylands, tidal marsh
Melospiza melodia pusillula	Alameda song sparrow	SSC	Baylands, tidal marsh, riparian
Passerculus sandwichensis alaudinus	Bryant's savannah sparrow	SSC	Baylands, tidal marsh, grassland
Pelecanus erythrorhynchos	American white pelican	SSC	Wetland, creeks, open water

Scientific Name	Common Name	Status[1]	Associated Natural Communities
Pelecanus occidentalis californicus	California brown pelican	FP	Baylands, wetland, open water
Progne subis	Purple martin	SSC	Conifer woodland, oak woodland, riparian
Rallus longirostris obsoletus	California Ridgway's rail	FE; CE; CFP	Tidal marsh
Rynchops niger	Black skimmer	SSC	Tidal marsh
Setophaga petechia	Yellow warbler	SSC	Riparian
Sternula antillarum browni	California least tern	FE; CE; CFP	Tidal marsh
Mammals			
Antrozous pallidus	Pallid bat	SSC	Chaparral scrub, conifer woodland, grassland, oak woodland
Corynorhinus townsendii	Townsend's big-eared bat	SSC	Chaparral scrub, conifer woodland, oak woodland, riparian
Eumops perotis californicus	Western mastiff bat	SSC	Oak woodland, chaparral scrub, conifer woodland
Lasiurus blossevillii	Western red bat	SSC	Oak woodland, conifer woodland, riparian
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	SSC	Chaparral scrub, oak woodland, riparian
Puma concolor	Mountain lion	CC[2]	Chaparral scrub, conifer woodland, oak woodland, riparian
Reithrodontomys raviventris	Salt-marsh harvest mouse	FE; CE; CFP	Tidal marsh
Sorex vagrans halicoetes	Salt-marsh wandering shrew	SSC	Tidal marsh
Taxidea taxus	American badger	SSC	Oak woodland, chaparral scrub, grassland
Plants			
Amsinckia lunaris	bent-flowered fiddleneck	CRPR 1B.2	Woodland, scrub, grassland
Arctostaphylos andersonii	Anderson's manzanita	CRPR 1B.2	Edges and openings in forest, chaparral
Arctostaphylos silvicola	Bonny Doon manzanita	CRPR 1B.2	Chaparral, conifer forest
Astragalus tener var. tener	alkali milk-vetch	CRPR 1B.2	Alkaline playas, grassland, vernal pools
Atriplex depressa	brittlescale	CRPR 1B.2	Alkaline scrub, meadows and seeps, playas, grassland, vernal pools
Atriplex minuscula	lesser saltscale	CRPR 1B.1	Alkaline scrub, playas, grassland
Balsamorhiza macrolepis	big-scale balsamroot	CRPR 1B.2	Chaparral, woodland, grassland
Calyptridium parryi var. hesseae	Santa Cruz Mountains pussypaws	CRPR 1B.1	Gravelly areas in chaparral, woodland
Centromadia parryi ssp. congdonii	Congdon's tarplant	CRPR 1B.1	Grassland
Chloropyron maritimum ssp. palustre	Point Reyes salty bird's-beak	CRPR 1B.2	Marshes and swamps
Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	CRPR 1B.1	Conifer forest
Chorizanthe robusta var. robusta	robust spineflower	CRPR 1B.1, FE	Gravelly areas in chaparral, woodland

Scientific Name	Common Name	Status[1]	Associated Natural Communities
Cirsium fontinale var. campylon	Mt. Hamilton thistle	CRPR 1B.2	Serpentine seeps
Collinsia multicolor	San Francisco collinsia	CRPR 1B.2	Serpentine conifer forest, scrub
Dirca occidentalis	western leatherwood	CRPR 1B.2	Mesic/riparian woodland, chaparral, conifer forest
Dudleya abramsii ssp. setchellii	Santa Clara Valley dudleya	CRPR 1B.1, FE	Rocky serpentine woodland, grassland
Eriogonum nudum var. decurrens	Ben Lomond buckwheat	CRPR 1B.1	Sandy chaparral, woodland, conifer forest
Eryngium aristulatum var. hooveri	Hoover's button-celery	CRPR 1B.1	Vernal pools
Extriplex joaquinana	San Joaquin spearscale	CRPR 1B.2	Alkaline chenopod scrub, meadows and seeps, playas, grassland
Fritillaria liliacea	fragrant fritillary	CRPR 1B.2	Serpentine woodland, scrub, grassland
Hoita strobilina	Loma Prieta hoita	CRPR 1B.1	Serpentine, mesic chaparral, woodland, riparian woodland
Horkelia cuneata var. sericea	Kellogg's horkelia	CRPR 1B.1	Gravelly areas in chaparral, conifer forest
Lasthenia conjugens	Contra Costa goldfields	CRPR 1B.1, FE	Mesic woodland, playas, grassland, vernal pools
Lessingia micradenia var. glabrata	smooth lessingia	CRPR 1B.2	Serpentine chaparral, woodland, grassland
Malacothamnus arcuatus	arcuate bush-mallow	CRPR 1B.2	Chaparral, woodland
Malacothamnus hallii	Hall's bush-mallow	CRPR 1B.2	Chaparral, scrub
Micropus amphibolus	Mt. Diablo cottonweed	CRPR 3.2	Rocky areas in forest, chaparral, grassland
Monolopia gracilens	woodland woollythreads	CRPR 1B.2	Serpentine soils in conifer forest, chaparral, grassland
Navarretia prostrata	prostrate vernal pool navarretia	CRPR 1B.2	Mesic scrub, meadows and seeps, mesic grassland, vernal pools
Penstemon rattanii var. kleei	Santa Cruz Mountains beardtongue	CRPR 1B.2	Chaparral, conifer forest
Plagiobothrys glaber	hairless popcornflower	CRPR 1A	Marshes and swamps, meadows and seeps
Puccinellia simplex	California alkali grass	CRPR 1B.2	Alkaline flats, lake margins, vernally mesic, chenopod scrub, meadows and seeps, grassland, vernal pools
Sanicula saxatilis	rock sanicle	CRPR 1B., CR	Rocky, scree, talus in broadleafed upland forest, chaparral, grassland
Streptanthus albidus ssp. albidus	Metcalf Canyon jewelflower	CRPR 1B.1, FE	Grassland
Streptanthus albidus ssp. peramoenus	most beautiful jewelflower	CRPR 1B.2	Serpentine chaparral, woodland, grassland
Suaeda californica	California seablite	CRPR 1B.1, FE	Marshes and swamps

Scientific Name	Common Name	Status[1]	Associated Natural Communities
Trifolium hydrophilum	saline clover	CRPR 1B.2	Marshes and swamps, grassland, vernal pools

Source: (California Department of Fish and Wildlife, 2023); (California Department of Fish and Wildlife, 2023); (California Department of Fish and Wildlife, 2023); (The Calflora Database [a nonprofit organization], 2023); (California Native Plant Society, Rare Plant Program, 2023); Valley Water Biologists

[1] Listing status codes:
CC= Candidate for listing under CA Endangered Species Act (CESA)
CE= Listed as endangered under CESA
CFP= Designated as Fully Protected by CA Department of Fish and Wildlife (CDFW)
CT= Listed as threatened under CESA
FC= Candidate for listing under federal Endangered Species Act (ESA)
FE= Listed as endangered under ESA
FT= Listed as threatened under ESA
SSC= Designated as Species of Special Concern by CDFW

CRPR = CA Rare Plant Rank by CDFW
1A= Presumed extinct in CA and rare/extinct elsewhere
1B.1= Rare, threatened, or endangered in CA and elsewhere; seriously threatened in CA
1B.2= Rare, threatened, or endangered in CA and elsewhere; fairly threatened in CA

[2] Species is currently under review for listing under the California Endangered Species Act (CESA). The species is temporarily-afforded the same legal protection as listed threatened and endangered species under the CESA.
[3] Species is currently under review for listing under the Federal Endangered Species Act (FESA). The species does not receive legal protection under the FESA unless it is officially listed as threatened or endangered under the FESA.

Riverine and Riparian

Streams provide valuable habitat, convey stormwater runoff through developed areas, sustain riparian and bayland ecosystems, and provide aesthetic and recreational resources, among other functions and services. As such, these habitats are protected under a variety of local, state, and federal regulations, and their condition and management are a key concern for Valley Water. Due to the importance and Valley Water's connection to riverine and riparian communities, this plan provides a great deal of focus to these valuable ecosystems.

Streams (i.e., rivers, creeks, and canals) in the Guadalupe Watershed include perennial, intermittent and ephemeral watercourses. In normal rainfall years, perennial streams support year-round flow, intermittent streams have flows through the wet season (November-April) and are often dry most or all of the dry season (May-October), and ephemeral streams carry water only during or immediately following a rainfall event.

Riparian Vegetation

In the hills of the watershed, riparian vegetation can consist of oak woodland and chaparral scrub vegetation types and, in the baylands, wetland and marsh vegetation types described in later sections. Along most creeks, however, riparian vegetation consists of one of the following vegetation types:

Mixed riparian forest and woodland - Forests and woodlands are typically composed of dense, mature red, arroyo, and/or yellow willows and Fremont or black cottonwood, with California sycamore, valley oak, coast live oak, California bay, California black walnut, California buckeye, white alder, and bigleaf maple occurring frequently to occasionally. Understory vegetation is dependent on overstory canopy density. *Populus fremontii* stands are a subset of this type and are dominated by Fremont cottonwood.

Willow riparian forest and scrub – Scrub typically consists of scattered red, arroyo, and yellow willows, as well as sand bar willow and mulefat, occurring in and along the margins of open sandy washes.

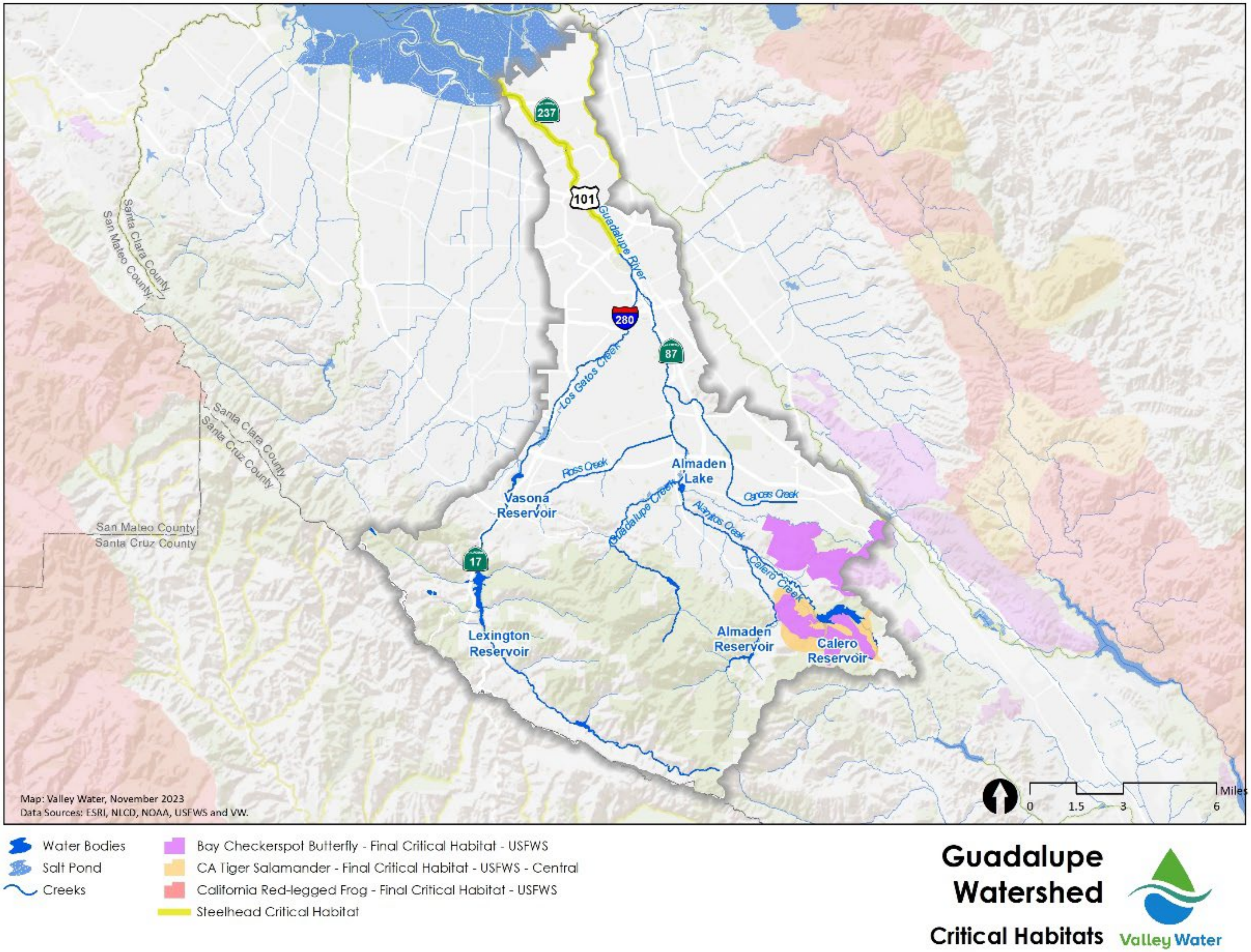

Figure 17: Designated Critical Habitats in the Guadalupe Watershed

Exotic trees – The presence of water allows for a wide variety of non-native and typically invasive trees and shrubs to establish along creeks. Eucalyptus and highly invasive giant reed are two of the more common species associated with this vegetation type.

Because of the more reliable water availability, riparian areas are prone to invasion by non-native plants. Invasive plants tend to thrive and spread aggressively, negatively altering native vegetation distribution, habitat suitability for wildlife, soil stability, and water quality, thus degrading habitat quality and the overall ecological value of a site. In addition, invasive plants can exacerbate flooding and fire danger, undermine structural assets, and obstruct access to roads, levees and trails. A few examples of invasive plants in the watershed include giant reed, Cape ivy, eucalyptus, and stinkwort. Figure 18 depicts occurrences of non-native, invasive plant communities in the watershed that may be appropriate to serve as targets or priorities for removal efforts. These are certainly not the only occurrences of non-native plants in the watershed, but where an invasive species is dominating the vegetation.

The presence and width of riparian vegetation around a creek channel, referred to as the riparian corridor, influences the degree to which that vegetation (forest, shrub, or meadow) can provide ecosystem services or functions. These functions include sunning or shading of the channel, stabilizing stream banks, providing leaf litter and large woody debris, sequestering and filtering stormwater runoff, dissipating flood waters, and recharging groundwater, all of which support fish and aquatic, semi-aquatic, and terrestrial wildlife. Approximately 10% of the creek channel length in the watershed, most of which is in the forested uppermost reaches, support riparian corridors wide enough to provide all of these services (San Francisco Estuary Institute & Aquatic Science Center, 2013). Middle reaches of the watershed historically supported very wide riparian corridors, but these have been significantly reduced from a series of anthropogenic causes: historical clearing for fuel supply and agriculture; depressed groundwater levels from historical farmland irrigation; and urbanization and levee building.

Beavers

The North American beaver, which is native to California and designated as a furbearing mammal, has been observed in the Guadalupe River, Los Gatos Creek, and Almaden Lake. It is considered a keystone species whose dam-building activities can have both disruptive and beneficial impacts on surrounding habitat. On one hand, beavers eat and cut down riparian trees, and their dam-building activities can cause hazardous flooding and eliminate existing natural biodiversity. However, their dams can also repair eroded channels, reconnect streams to their floodplains, expand wetland, riparian, and wet meadow habitats for many plants and animals, and increase wildfire resiliency. Recognizing their contribution to resilient ecosystems and nature-based solutions, the California Department of Fish and Wildlife launched a beaver restoration program in 2022. The program aims to develop a beaver management and conservation plan for the state. This will be especially important for the Guadalupe Watershed, where the needs of cold-water fish populations and flood protection must be balanced with those of climate change and water quality.

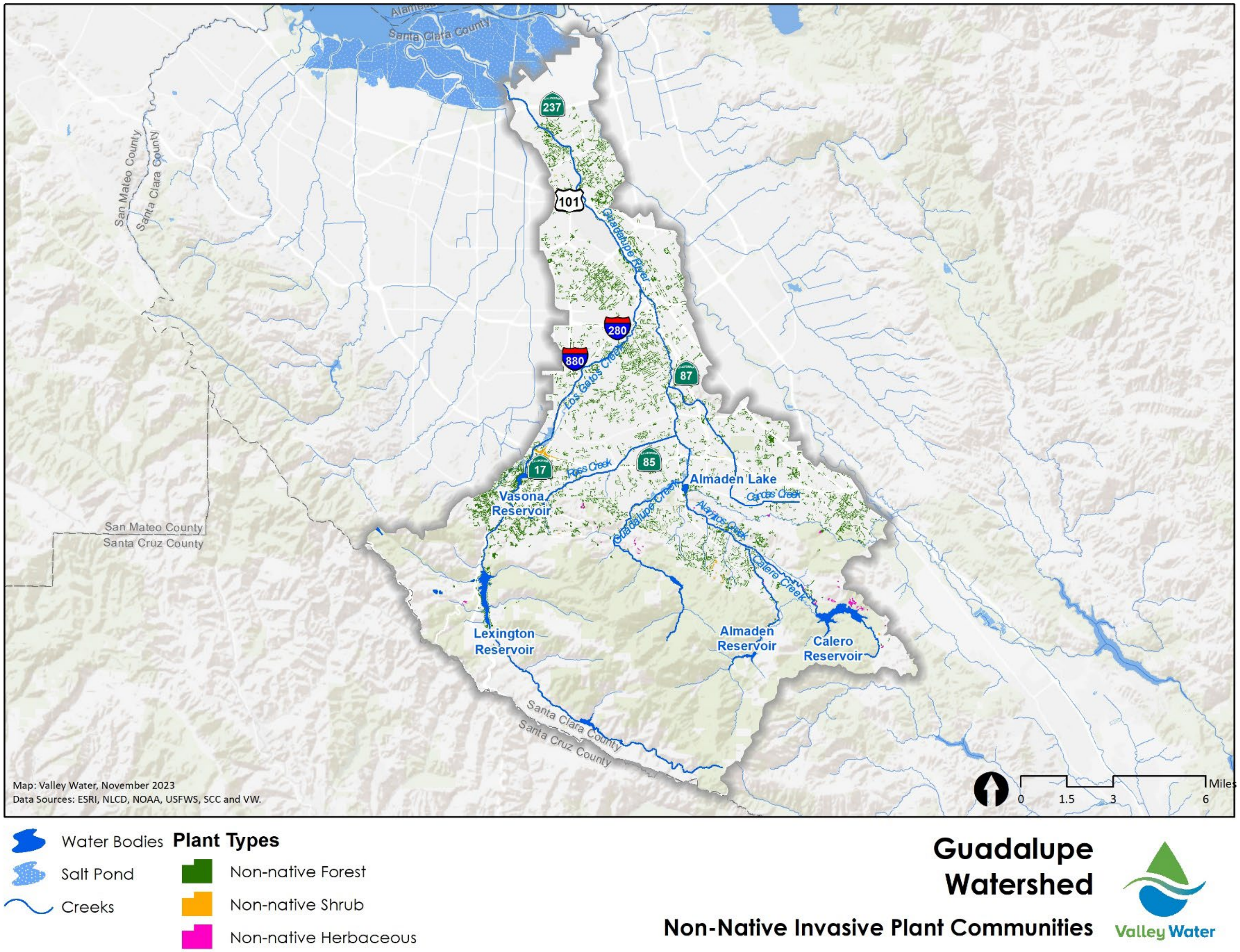

Figure 18: Non-native Invasive Plant Communities in the Guadalupe Watershed

Sycamores

Sycamore trees are a somewhat common species in mixed riparian forests in the watershed. Where they are the dominant tree and occur sparsely across broad floodplains and terraces with relatively course substrates, they are typically considered sycamore alluvial woodland. Sycamore alluvial woodland is a type of riparian vegetation, supportive of a similar suite of wildlife species and ecosystem functions, that was historically more prevalent in the Guadalupe Watershed, especially in the area now known as Willow Glen (Grossinger, et al., 2006). Stands of sycamore alluvial woodland are now limited to patches on Calero, Guadalupe, and Alamitos Creeks (San Francisco Estuary Institute - Aquatic Science Center and H.T. Harvey & Associates, 2017). It is characterized by open canopy woodlands dominated by California sycamore, often with white alder and willows. Other associated species can include bigleaf maple, valley oak, coast live oak, and California bay. The understory is typically disturbed by winter flows, with herbaceous vegetation sparse or patchy. Given sycamores' ability to thrive with limited summer water and intermittent flows, sycamore alluvial woodland may be a sustainable restoration target given future climate projections, if supportive physical conditions can be re-established (San Francisco Estuary Institute - Aquatic Science Center and H.T. Harvey & Associates, 2017). That said, it is challenging to find genetically pure seed, due to hybridization with non-native London plane trees, and to propagate native sycamores, and reconstructing supportive hydrology can be difficult to execute successfully.

As a result, 20% of creek channel length in the watershed now supports little to no riparian vegetation (San Francisco Estuary Institute & Aquatic Science Center, 2013). Additional analysis of where narrow riparian corridors could be effectively widened and enhanced could provide targets or priorities to address the most degraded reaches.

Riverine and Riparian Condition

With the exception of the headwaters and foothills, creeks in the watershed and much of the baylands are channelized, constrained by levees, and surrounded by urban development. This severely limits the floodplain width of watershed creeks, which leads to changes in sediment movement, narrowing of the riparian corridor, and simplification of aquatic habitat. Development and levees right up to the edges of creeks or channels can also increase downstream flood risk by limiting where high flows can slow and spread out. Concerns over flood risk and streambank erosion in developed areas, as well as the historical desire to more effectively drain water away from agricultural, commercial, and residential areas, resulted in approximately 20 miles of creek being channelized, lined in concrete, or placed into underground culverts, as well as the addition of approximately 200 miles of storm drains (San Francisco Estuary Institute & Aquatic Science Center, 2013). Other development-related impacts to creeks include the addition of lateral drainages and outfalls (increasing scour and erosion), groundwater pumping (contributing to channel incision and hydrologic alterations), and impervious surfaces (increasing the amount and rate of runoff entering creeks and reducing groundwater infiltration). The historical 95 miles of natural streams in the watershed have been reduced to 54 miles of natural streams and 23 miles of unnatural streams today, not including storm drains, of which there are more than 251 miles (San Francisco Estuary Institute & Aquatic Science Center, 2013). This change reflects the degree to which the watershed has been artificially plumbed to increase drainage. Nearly 90% of the remaining natural creek channel length occurs in relatively undeveloped portions of the Guadalupe Watershed (San Francisco Estuary Institute & Aquatic Science Center, 2013). This is good news for the watershed: intact headwater streams help buffer downstream areas from both extreme wet and dry conditions. The remaining 10% occur in the densely developed portion of the watershed, and some of these are now considered “unnatural” channels such as engineered channels and ditches (San Francisco Estuary Institute & Aquatic Science Center, 2013).

The condition of Guadalupe Watershed creeks was measured and assessed in 2012 and again in 2022. California Rapid Assessment Method (CRAM) surveys were conducted at over 50 sites, representing the range of stream and land use patterns in the watershed (San Francisco Estuary Institute & Aquatic Science Center, 2013). Based on the resulting CRAM scores, streams in the non-urban portions of the watershed are in moderately good to good health. These streams generally have undeveloped lands around them which buffer the stream and provide natural flow patterns; include benches or inset floodplains along their channels for flow retention and habitat development; have a variety of aquatic habitat features, such as woody debris, pools, and riffles; and support a diversity of primarily native plants.

What is CRAM?

CRAM is a standardized, cost-effective tool for assessing the overall health of wetlands, streams, and their riparian areas. CRAM surveys quantify buffer and landscape context; hydrologic connectivity; physical conditions in the channel; and vegetation in and around the channel. In addition to assessing ambient conditions at various spatial scale, CRAM can be used to plan and assess restoration and mitigation projects. For more information on CRAM: http://www.cramwetlands.org.

In the urban area, about half of the stream miles are in moderately good to good health and the other half are in poor to moderately-poor health. These streams have much higher amounts of nearby and surrounding development; flow may be unnatural or highly managed; aquatic habitat is simplified; and vegetation may be missing, sparse, or dominated by non-native species (San Francisco Estuary Institute & Aquatic Science Center, 2013). Figure 19 maps sites with poor condition riverine habitat on the valley floor by landownership, which may be appropriate to serve as targets or priorities for enhancement efforts, as well as site with good conditions that may be appropriate for conservation and maintenance. Despite the dramatic alterations, urban reaches of the watershed continue to support native and special-status fish and wildlife, and the preservation and enhancement of those reaches is necessary to sustain those species. As such, poor condition reaches should be focal areas for enhancement to make substantive improvement in watershed health and support wildlife but will require additional analysis and planning to identify the most appropriate actions and sites.

Fish Community

The watershed’s riverine habitat supports the migration, spawning, rearing, and persistence of numerous native fish species and several special-status species (Table 2). Recent fish surveys (within approximately the past 20 years) have documented seven native fish species and fourteen non-native fish species in riverine habitat within the Guadalupe Watershed (Table 3). In general, rural areas have higher diversity and abundance of native fish than sites in the lower valley floor, and the upper tributaries (e.g., Guadalupe, Alamitos, and Calero creeks) have higher native fish diversity and abundance than lower Los Gatos Creek and the Guadalupe River. Fish community distribution throughout the watershed can be seen in Figure 20.

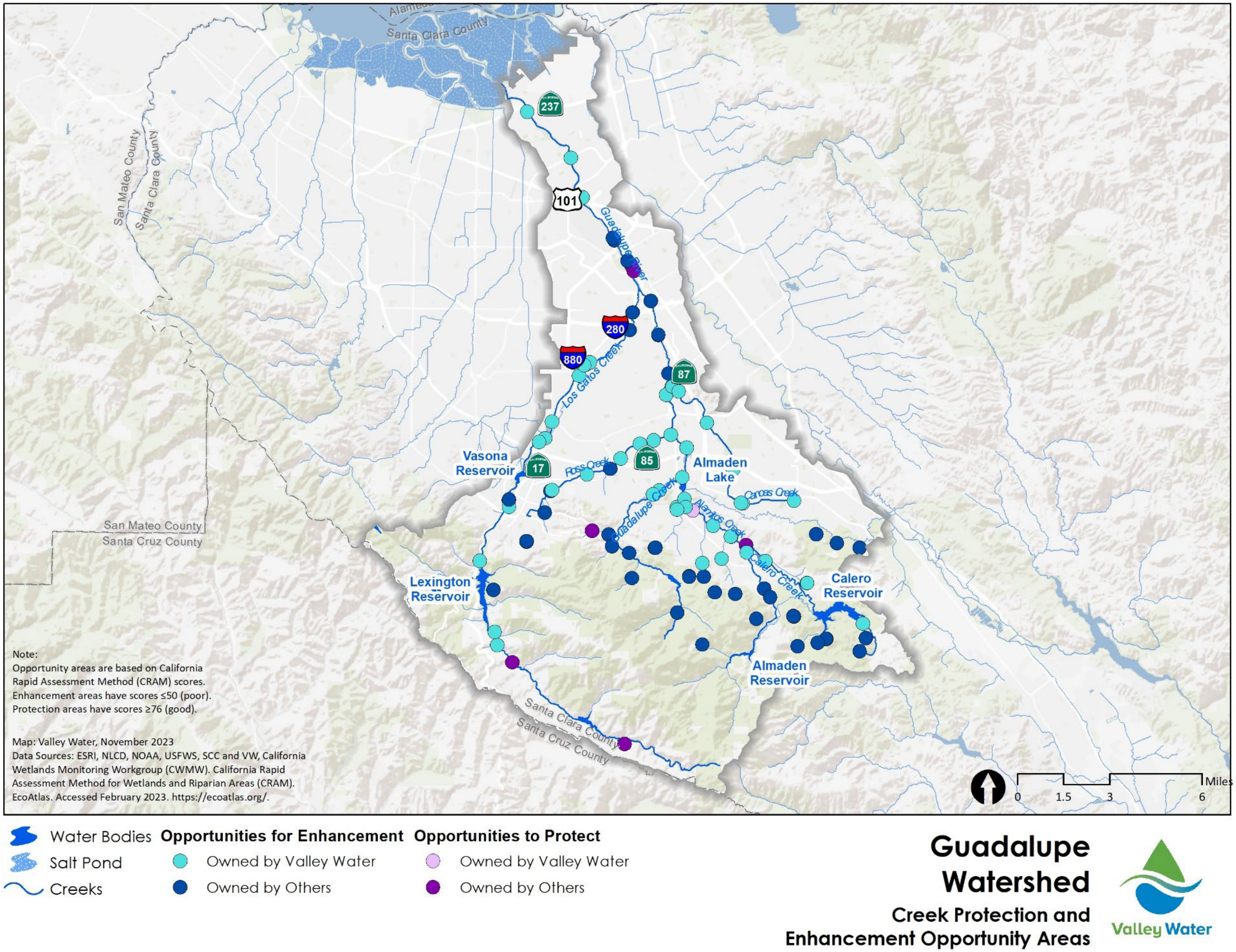

Figure 19: Creek Areas Where Good Conditions Could be Protected or Poor Conditions Could be Enhanced in the Guadalupe Watershed

Table 3: Riverine fish species in the Guadalupe Watershed

Scientific Name	Common Name	Native/Non-native
Cottus asper	Prickly sculpin	Native
Cottus gulosus[SSC]	Riffle sculpin	Native
Catostomus occidentalis	Sacramento sucker	Native
Hesperoleucus venustus subditus[SSC]	Southern coastal roach	Native
Lavinia exilicauda exilicauda[SSC]	Sacramento hitch	Native
Oncorhynchus mykiss[FT]	Rainbow trout/steelhead	Native
Entosphenus tridentatus[SSC]	Pacific lamprey	Native
Oncorhynchus tshawytscha[SSC]	Chinook salmon	Unknown[1]
Hysterocarpus traskii	Tule perch	Non-native[2]
Lepomis cyanellus	Green sunfish	Non-native
Lepomis macrochirus	Bluegill	Non-native
Pomoxis nigromaculatus	Black crappie	Non-native
Gambusia affinis	Western mosquitofish	Non-native
Micropterus salmoides	Largemouth bass	Non-native
Micropterus punctulatus	Spotted bass	Non-native
Cyprinus carpio	Common carp	Non-native
Carassius auratus	Goldfish	Non-native
Ameiurus nebulosus	Brown bullhead	Non-native
Ictalurus punctatus	Channel catfish	Non-native
Misgurnus anguillicaudatus	Pond loach	Non-native
Menidia beryllina	Inland silverside	Non-native

Sources: (Leidy, 2007); (Stillwater Sciences, 2018); (Valley Water, 2019b), (Valley Water, 2019e), (Valley Water, 2020b), (Valley Water, 2020d), (Valley Water, 2021a), (Valley Water, 2021c), (Valley Water, 2022a), (Valley Water, 2023a), (Valley Water, 2024)

FT = Listed as federally threatened under ESA

SSC – Designated as Species of Special Concern by CDFW

[1]Although a definitive answer on the nativity of Chinook salmon to the Guadalupe Watershed cannot be made, evidence suggests that the species is not native to the watershed. This region is the southernmost extent of the species' range, there is no substantial archaeological evidence of historical presence, the historical hydrology of the watershed was not in alignment with Chinook salmon run-timing and would not have supported a persistent run in most years, and present-day fish are genetically closely related to fish of hatchery origin (SCVWD, 2018) (Garcia-Rossi & Hedgecock, 2002). It is likely that these fish have naturalized and have a sustained run supported by natural reproduction and hatchery supplements.

[2]Tule perch are native to California and were observed in the Coyote Creek watershed, which is adjacent to the Guadalupe Watershed, in 1922 (Hubbs, 1925). Though the species is regionally native, (Snyder, 1905) and (Leidy, 2007) suggest that tule perch were likely not historically present in the Guadalupe Watershed. Tule perch have been introduced to Calero Reservoir, which is assumed to be the source of the population found in Alamitos and Calero Creeks. Though considered non-native, tule perch are not believed to be harmful to the ecosystem and do not predate on native fish species.

The Guadalupe Watershed is home to the Federally Threatened Central California Coast steelhead. These fish have a diverse life history in which they are born in freshwater streams and migrate to the ocean to live as adults through a process called anadromy. Mature adults then return to their natal creeks and rivers to spawn, and the process starts over again. The non-anadromous, or resident, form of this species is known as rainbow trout. Rainbow trout and steelhead are the same species. To help manage the populations of and improve conditions for these special fish, they are a high priority for Valley Water watershed planning efforts. Additionally, Central Valley fall-run Chinook salmon, which is designated as a federal and state species of special concern, use stream reaches within the Guadalupe Watershed. Due to their overlap in habitat and life history requirements, Valley Water's management efforts for steelhead also support the conservation of Chinook salmon.

The following local factors, and interactions between these factors, can impact fish populations (see the following section for details): hydrologic modifications, urban and agricultural development, geomorphic alterations, competition with and predation by non-native species, poor water quality, lack of habitat diversity and complexity, mercury contamination, and passage impediments (Tetra Tech, Inc., 2006), (Moyle, Quirones, Katz, & Weaver, 2015), (NMFS, 2016). In addition, stressors outside the freshwater habitat like ocean conditions, food availability, and fishing can have a strong influence on anadromous fish populations, such as steelhead and Chinook salmon.

Fish Habitat Conditions

Steelhead, referred to as steelhead/rainbow trout in this plan, in the Guadalupe Watershed are part of the Central California Coast (CCC) Distinct Population Segment (DPS), which is listed as threatened under the federal Endangered Species Act. Parts of the watershed are designated critical habitat for steelhead/rainbow trout (Figure 17) and the species is a valuable indicator of overall aquatic habitat connectivity and health. As such, descriptions of fish habitat conditions in this plan are focused on steelhead/rainbow trout.

Barriers to passage, poor water quality (e.g., high stream temperatures, turbidity, nutrient impairment, pollution), lack of suitable habitat for different life stages, and non-native species are the primary challenges that steelhead/rainbow trout face in California rivers (they face a myriad of different challenges during their life history stages in estuaries and the ocean). Sediment deposition, altered hydrology, grade control structures, dams and drop-structures, in-channel lakes and large pools, and culverts all contribute to challenging passage conditions. Higher water temperatures can lead to conditions that are not optimal for certain life history stages. High turbidity and high nutrients have also been shown or hypothesized to impair aquatic habitat quality in the watershed. Nonpoint sources of pollution (e.g., urban runoff and fine sediment), mercury contamination, and trash also degrade aquatic habitat quality. In addition to directly affecting habitat suitability for fish, poor water quality may limit benthic macroinvertebrate production, which is a primary food source for fish and other aquatic species. Reaches downstream of dams or other stream impoundments typically have reduced supply of coarse sediment and large woody debris that is critical to certain life history stages, and much of the lower watershed is characterized by long, deep pools that provide limited habitat value. Fortunately, many of these challenges can be ameliorated with targeted restoration and management efforts.

New Zealand Mudsnails

New Zealand mudsnails are very small aquatic snails native to New Zealand but have spread to many western states. This highly invasive species can establish dense populations that reduce the number of native macroinvertebrates, which are also important food sources for fish. New Zealand mudsnails have regularly been observed in the Guadalupe River and Alamitos Creek but are now also being detected in Guadalupe Creek and Calero Creek.

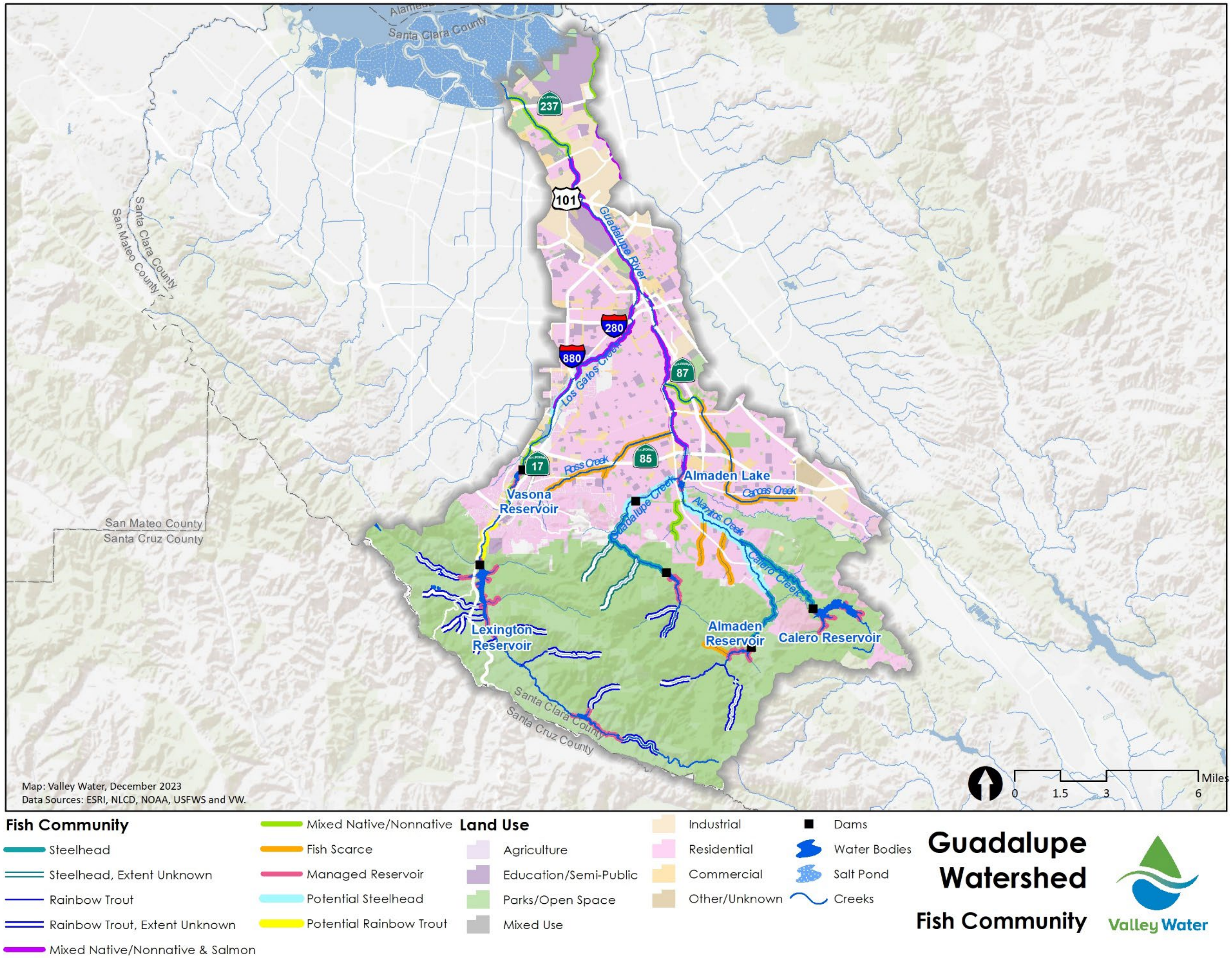

Figure 20: Fish Community Distribution in the Watershed

Conditions in the major subwatersheds—Guadalupe River and Los Gatos, Guadalupe, Alamitos, and Calero creeks—for steelhead/rainbow trout are summarized in Table 4 and Figure 21 through Figure 24. The subwatersheds have varying habitat conditions due to different land and water use conditions. This range of quality provides opportunity for restoration in degraded areas and preservation in high-quality areas. Where known factors limiting steelhead/rainbow trout habitat exist, recommended enhancements should be implemented, such as those outlined in the Study of Santa Clara County Steelhead Streams to Identify Priority Locations for Gravel Augmentation and Large Woody Debris Placement Santa Clara County, California (Balance Hydrologics, 2018).

Lakes, Reservoirs, and Ponds

The Guadalupe Watershed includes other aquatic habitats, all of which are human-made lakes or ponds. Natural ponds, which were not prevalent even historically, have been drained, filled, or otherwise developed.

Stock ponds are human-made ponds used to water grazing livestock in the hills of the watershed. Generally, pond vegetation is influenced by surrounding land use, wildlife and livestock activity, and site soil and hydrology. Associated vegetation can include floating plants such as duckweed, or rooted plants such as cattails, bulrushes, sedges or other annual vegetation. Stock ponds removed from grazing pressure can be vegetated by willows, cattails, reeds, bulrushes, sedges, and tules if the appropriate soils and hydrology is also present. Stock ponds provide valuable habitat for special-status species such as California tiger salamander, California red-legged frog, western pond turtle, and tricolored blackbird, all of which are found breeding at stock ponds. Therefore, it is important that as needed, ponds are managed to promote the use by these special-status species. Management techniques may include periodic dredging of sediment filled ponds to increase their hydroperiods (i.e., how long they hold water), eradication of fish originally stocked by ranchers, control of non-native American bullfrog, installation of basking structures, and fencing of the pond or a portion of the pond (depends on grazing pressures and which special-status species is being managed for).

American Bullfrogs

In ponds and other aquatic habitats, non-native bullfrogs prey on birds, California red-legged frog, California tiger salamander, and native fish. Bullfrogs are one of the primary vectors for chytrid fungus, which has devastated frog populations elsewhere. While there are a number of Valley Water-led efforts to detect, map, treat, remove or address non-native species in the watershed, only continued early detection and treatment can ensure that recently identified species and infestations are controlled before spreading further. These practices will require a watershed approach, rather than piecemeal treatment only on Valley Water property, to result in ecological resource condition improvements.

In addition to the special-status species that may occur in stock ponds, common wildlife species include California newt, California toad, aquatic garter snake, American coot, and pie-billed grebe.

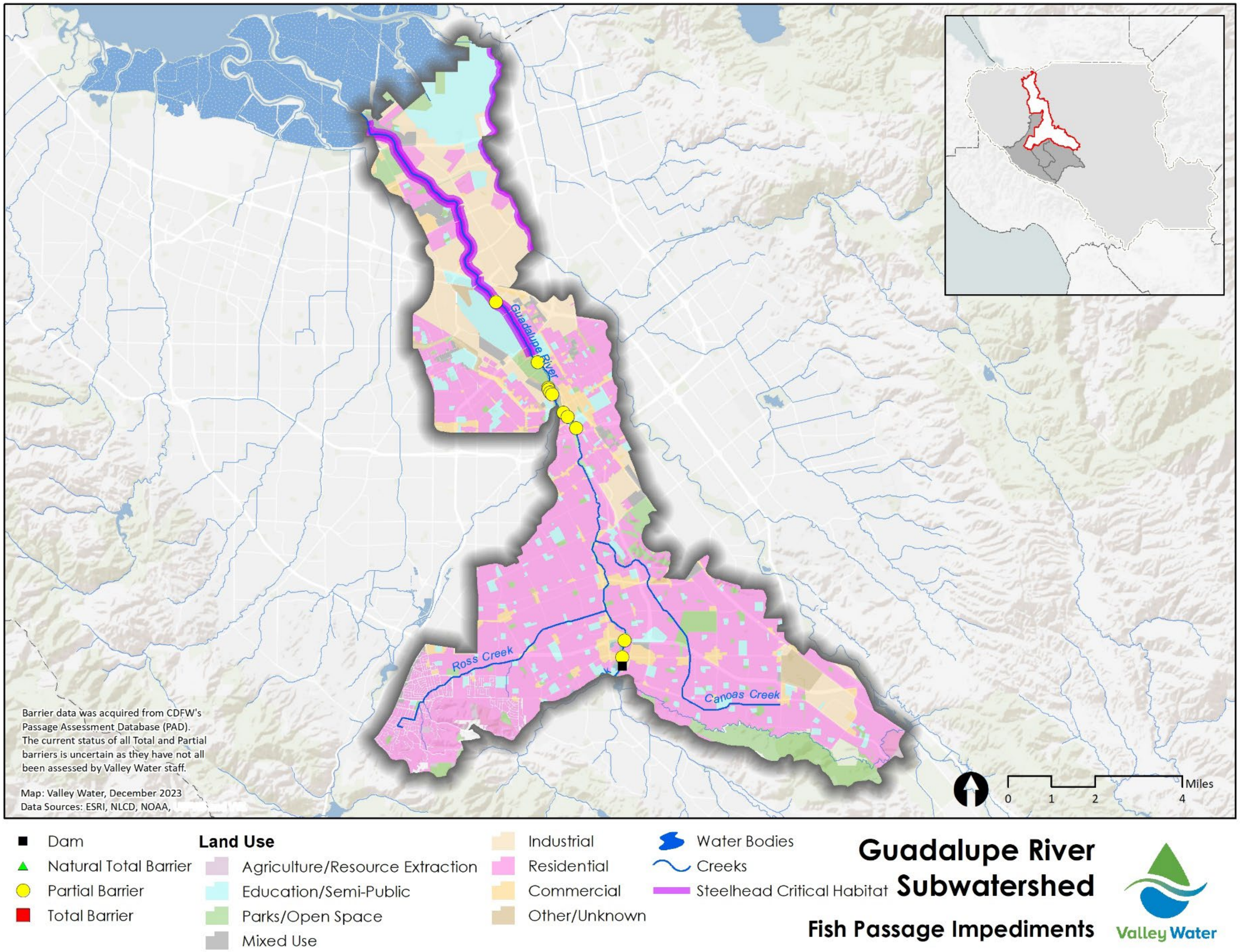

Figure 21: Fish habitat conditions in the Guadalupe River Subwatershed

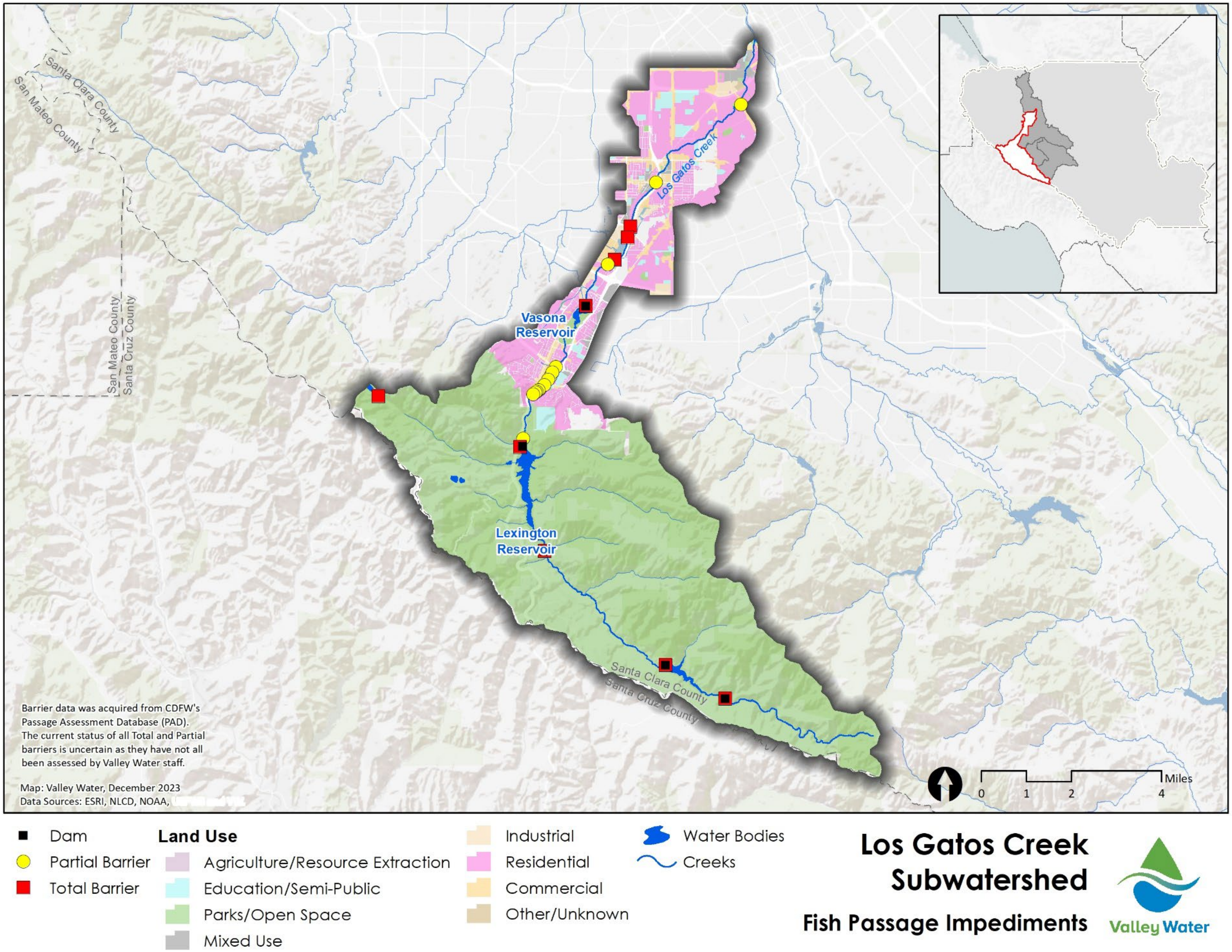

Figure 22: Fish habitat conditions in the Los Gatos Creek Subwatershed

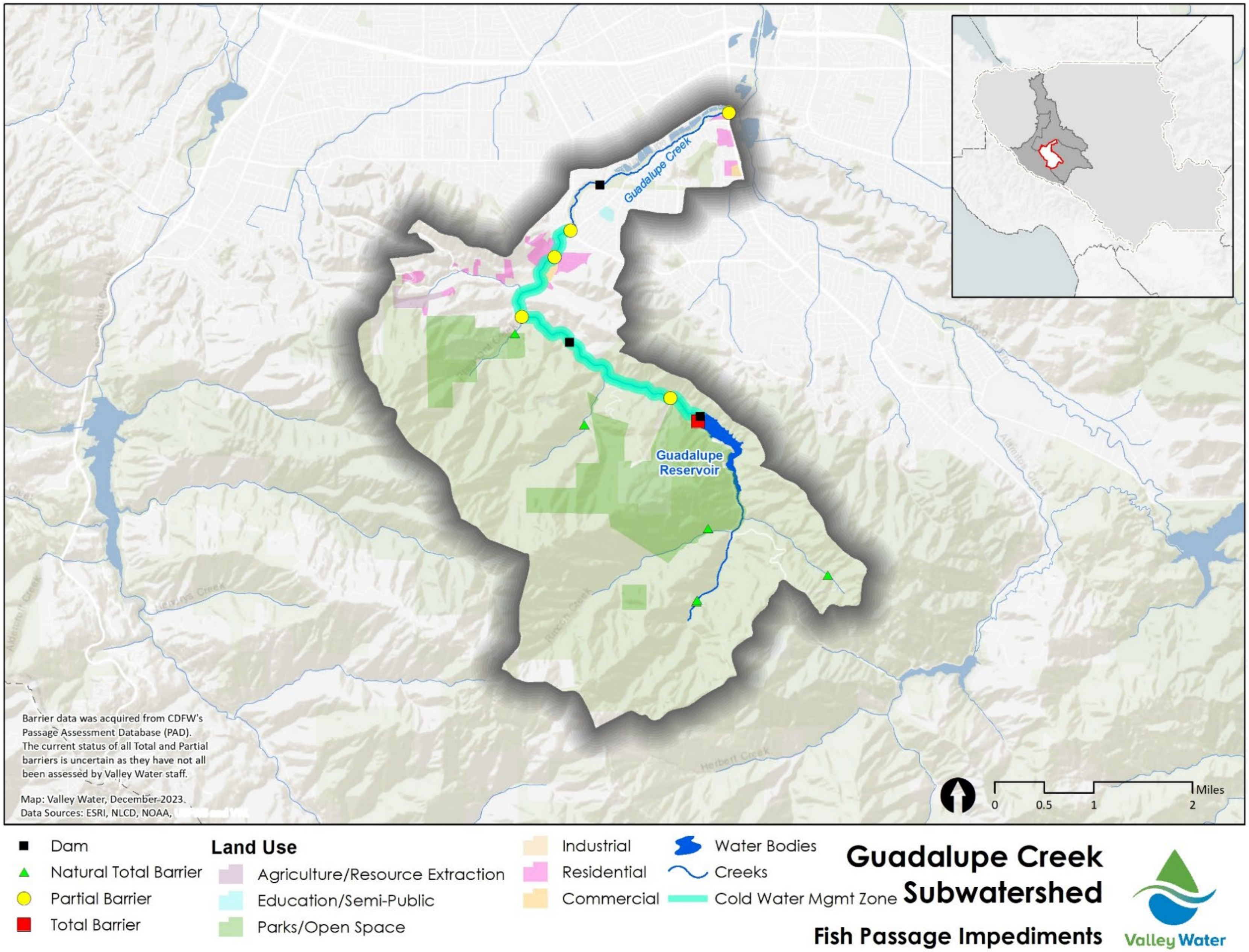

Figure 23: Fish habitat conditions in the Guadalupe Creek Subwatershed

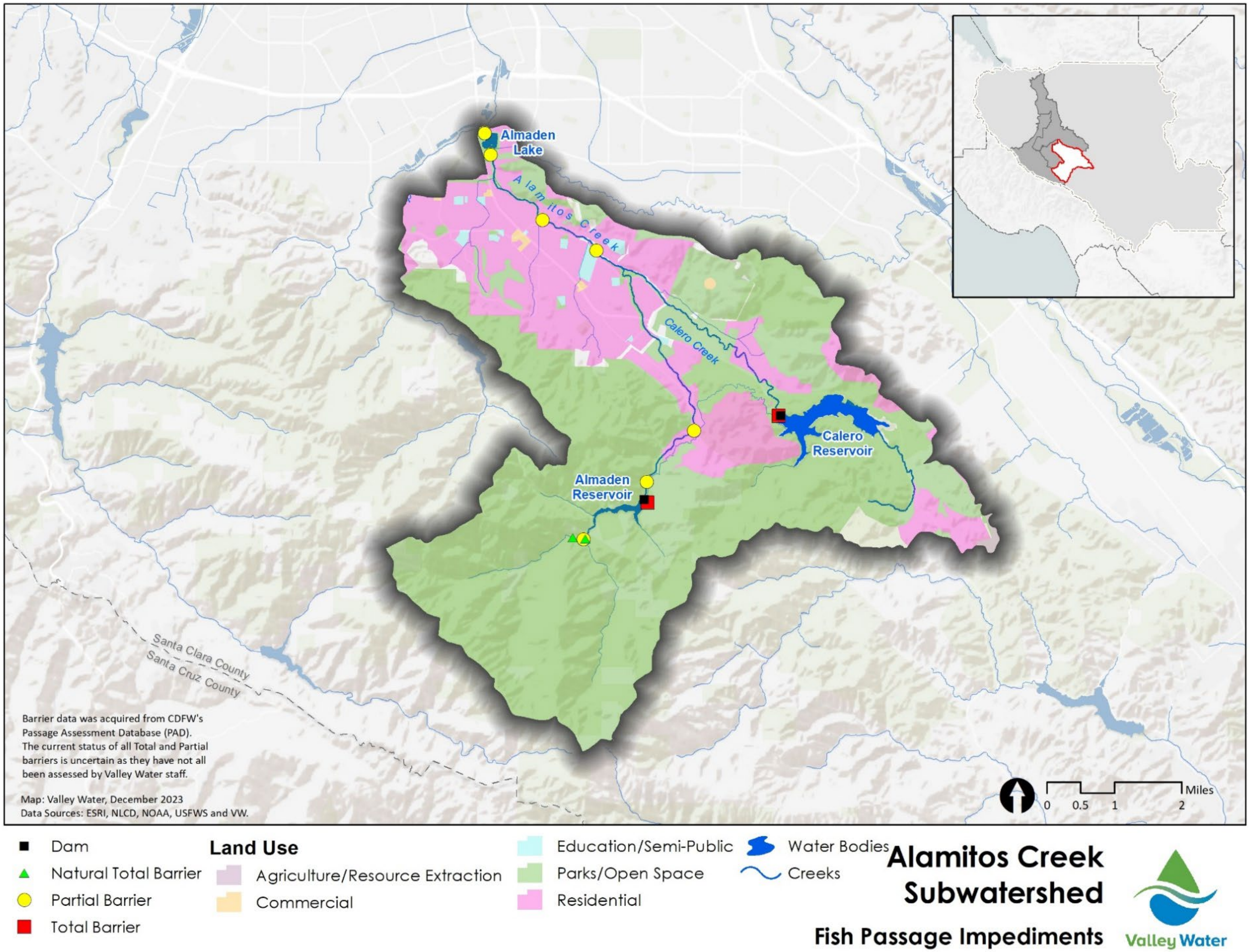

Figure 24: Fish habitat conditions in the Alamitos Creek and Calero Creek Subwatersheds

Table 4: Summary of aquatic habitat conditions for steelhead/rainbow trout in Guadalupe River subwatersheds

Condition	Guadalupe River	Los Gatos Creek	Guadalupe Creek	Alamitos Creek	Calero Creek
Steelhead Use	• Mainly used as a migratory corridor • Used for seasonal rearing when and where conditions are suitable • Reduced spawning potential due to watershed position • Designated critical habitat from SF Bay to West Hedding Street	• Can be used for all life history stages when and where conditions are suitable • Undetected below Camden Avenue drop-structure since 2014 • Resident rainbow trout present above Vasona Reservoir	• Used for all life history stages • Cold Water Management Zone from Guadalupe Reservoir to Camden Avenue to support spawning and rearing • Resident rainbow trout present above Guadalupe Reservoir	• Used for all life history stages • Resident rainbow trout present above Almaden Reservoir	• Used for all life history stages
Fish Passage Impediments[1]	• Partial impediments only from sediment and debris accumulation	• Several partial impediments from weirs and a grade control structure downstream of Camden Avenue drop-structure • Full impediment from Camden Avenue drop-structure (end of anadromy) • Additional full and partial impediments from drop-structures, dams, and other structures (e.g., flood control channels, chutes, culverts) upstream of Camden Avenue drop-structure	• Partial impediments from aggraded sediment, a wooden flashboard dam at Hicks Road, an old dam near the horse stables below Guadalupe Reservoir*, and the Pheasant Creek culvert* • Full impediment from Guadalupe Reservoir Dam (end of anadromy)	• Partial impediments from Almaden Lake (due to entrainment), weirs, and a drop-structure at Bertram Road bridge* • Full impediment from Almaden Reservoir Dam (end of anadromy)	• Full impediment from Calero Reservoir Dam (end of anadromy, but there is no suitable habitat upstream of the dam for steelhead)
Water Quality Impairments[2]	• Mercury • Trash • Pesticides (diazinon)	• Water temperature • Pesticides (diazinon)	• Mercury	• Mercury	• No listings
Other Habitat Conditions	• Long mid-channel pools degrade water quality, simplify aquatic habitat, limit food production, and concentrate non-native fish • Sediment deposition during high flow events can hinder passage in some reaches • Trash, pollutants, and streambank erosion from encampments • Increase in water	• Long mid-channel pools degrade water quality, simplify aquatic habitat, limit food production, and concentrate non-native fish • Little to no coarse sediment or woody debris supply to some reaches • Trash, pollutants, and streambank erosion from encampments • Increase in water temperature from	• Little to no coarse sediment or woody debris supply to some reaches • Trash, pollutants, and streambank erosion from encampments in lower reaches	• Little to no coarse sediment or woody debris supply to some reaches • No suitable habitat through Almaden Lake	• Little to no coarse sediment or woody debris supply

Condition	Guadalupe River	Los Gatos Creek	Guadalupe Creek	Alamitos Creek	Calero Creek
	temperature from Almaden Lake	impoundments			
Completed Enhancement Projects	• Upper Guadalupe River Reaches 10B and 12 aquatic habitat enhancements • Upper Guadalupe River Reach 6 Aquatic Habitat Improvement Project – Phase 1 • 9 major passage barrier remediations (fish ladder, channel improvements, weir installations and retrofits)	• Los Gatos Creek Instream Habitat Complexity Project (between Highway 17 and Creekside Way)	• Guadalupe Creek Restoration Project (Masson Dam to Almaden Expressway) • 4 major passage barrier remediations (fish ladders, channel improvements, weir retrofit)	• Alamitos Creek Instream Habitat Complexity Project (near Mazzone Drive) • Alamitos Creek Geomorphic Restoration Project (near Greystone Lane) • Passage barrier remediation of the Mazzone Drive drop-structure	
Enhancement Priorities[3]	• Plan and implement gravel and large woody debris augmentation in priority locations[4] • Continue Upper Guadalupe River Reach 6 Aquatic Habitat Improvement Project • Incorporate aquatic habitat enhancements into USACE Upper Guadalupe River Flood Control Project • Assess feasibility of modifying Alamitos drop-structure to enhance habitat	• Plan and implement gravel and large woody debris augmentation in priority locations[4] • Remediate passage impediments downstream of Camden Avenue drop-structure • Assess feasibility of beneficial use of large wood and sediment from Lexington Reservoir	• Plan and implement gravel and large woody debris augmentation in priority locations[4] • Remediate passage impediments downstream of the reservoir	• Plan and implement gravel and large woody debris augmentation in priority locations[4] • Remediate passage impediments downstream of the reservoir • Separate and restore Alamitos Creek through Almaden Lake	• Plan and implement gravel and large woody debris augmentation in priority locations[5]

Sources: (Smith, 2013); (SCVWD et al., 2003); (Hobbs, Cook, & La Luz, 2014); (Valley Water and Stillwater Sciences, 2015), (Valley Water and Stillwater Sciences, 2016), (Valley Water and Stillwater Sciences, 2017); (Tetra Tech, Inc., 2006), (Valley Water, 2019e), (Valley Water, 2020b), (Valley Water, 2021a), (Valley Water, 2022a), (Valley Water, 2023a), (Valley Water, 2023c), (Valley Water, 2024); (Tetra Tech, Inc., 2006).

[1] See Figure 21 through Figure 24 for locations. List excludes natural barriers. Data was acquired from (California Department of Fish and Wildlife, 2023). The current status of all total and partial barriers is uncertain as they have not all been assessed by Valley Water staff. *Indicates a priority barrier under FAHCE.

[2] (California State Water Resources Control Board, 2021)

[3] See One Water Guadalupe Watershed Plan List of Priority Actions for more details.

[4] (Balance Hydrologics, 2018)

[5] (AECOM, 2024)

Percolation ponds are constructed water supply facilities located where gravels and sands have been naturally deposited at or near ground level and where water can easily soak into the underlying aquifer. When filled with water, these ponds have lake-like conditions. In the Guadalupe Watershed, Valley Water manages numerous off stream percolation ponds. Due to changes in water levels and periodic sediment maintenance to maximize recharge, there is typically very little perennial wetland or aquatic vegetation in percolation ponds, although annual species may establish when water levels are high, and when dry, empty ponds can become a source of weed seed, including notably stinkwort, shortpod mustard, and fennel. For these same reasons, percolation ponds do not tend to provide much wildlife habitat, although many birds may use the open water habitat to rest and forage.

Reservoirs designed to store water occur in the upper Guadalupe Watershed. These relatively large water bodies are impounded by dams and are managed for water storage, supply and recreation. Fluctuations in water levels affect the type of vegetation present along reservoir shorelines. If reservoir edges are shallow, plant species similar to those of ponds can be present, including a mix of native and non-native species.

Almaden Lake

Almaden Lake was created by in- and off-stream gravel quarry operations, circa late 1940s to 1960. The off-stream quarry consisted of two main large pits along the east side of Alamitos Creek. After the quarry operations ceased, heavy storm events eroded the levee that separated the creek from the quarry, resulting in discharge of creek waters into the pits, creating the 32-acre lake. Almaden Lake is now jointly owned by Valley Water and City of San José Parks Department, which manages the lake and surrounding area as a popular regional park. Since the formation of Almaden Lake, mercury-laden sediment originating from the historical New Almaden Quicksilver mine has been depositing into the lake. Water and sediment at the bottom of the lake frequently experience anoxic conditions due to the lake's depth and seasonal algal blooms. Under such conditions, microbes transform the mercury into methylmercury, a strong neurotoxin that bioaccumulates in the tissues of organisms. Fish and other aquatic organisms with elevated methylmercury from the lake can disperse downstream into Guadalupe River and eventually southern San Francisco Bay. The comingling of Almaden Lake with Alamitos Creek results in an impediment to fish passage and conditions that can imperil native fish and degrade aquatic habitat downstream. Migrating fish can be entrained in the lake, making it difficult for anadromous fish to find Alamitos Creek at the upstream end of the lake. When native fish become entrained, they are vulnerable to predation from non-native fish, which dominate the fish community in the lake. Due to the unnaturally varied depths within the lake, and the lake's large surface area and long residence time, surface temperatures of the lake are elevated compared to upstream Alamitos Creek. The lake also has high concentrations of coliform bacteria and is subject to seasonal blue-green algae blooms. These issues result from fecal matter from waterbirds, combined with lack of water circulation during low flow periods, warm temperatures, and nutrient loading, which together support algae blooms and continued presence of elevated bacteria levels. Poor quality water from the lake contributes to degraded water quality downstream in the Guadalupe River. Separating Alamitos Creek from Almaden Lake is a priority action in the Valley Habitat Plan (https://scv-habitatagency.org/), Santa Clara Valley Regional Conservation Investment Strategy, and an important type of action in the National Marine Fisheries Service recovery plan for the region and FAHCE.

Bulrushes, cattails, smartweeds, white sweet clover, perennial pepperweed, and stinkwort are all common elements of the reservoir shoreline in this watershed. In recent years, when open area appears at reservoir edges due to reservoir dryback, stinkwort has become a primary colonizer and is therefore becoming a higher management priority. There are populations of the aquatic weeds water-primrose and parrotfeather at Vasona Reservoir, which are challenging to treat due to restrictions on aquatic herbicide use. Giant reed is also present at Vasona. Almaden, Calero, and Guadalupe reservoirs abut or are situated directly on serpentine soils, and as a result there are several noteworthy populations of special-status plants close by. In addition to the special-status species that may occur in reservoirs (see Table 2), common wildlife species include black-crowned night heron, western grebe, and common yellowthroat.

Reservoirs in the Guadalupe Watershed are typically dominated by non-native fish species, such as largemouth bass, bluegill, black crappie, common carp, inland silverside, and threadfin shad. Other non-native species that have been observed in reservoirs during surveys, though at lower numbers, include tule perch, white crappie, pumpkinseed, brown bullhead, bigscale logperch, golden shiner, green sunfish, and redear sunfish. Sacramento sucker, prickly sculpin, and resident rainbow trout are the only native species to have been found (SCVWD, 2017); (Valley Water, 2020a), (Valley Water, 2021d); Valley Water unpublished data, (Valley Water, 2022a), (Valley Water, 2023a)). Fish assemblages are variable among reservoirs. It is possible that additional species occur but may have gone undetected by the survey methods used (e.g., boat electrofishing, seining). In addition to the special-status species that may occur in reservoirs (see Table 2), common wildlife species include: black-crowned night heron, western grebe, and common yellowthroat.

Wetlands

Wetlands are areas subject to seasonal or perennial flooding or ponding or possessing saturated soil conditions and support predominantly hydrophytic (water-loving) herbaceous plant species. Plants growing in wetlands can tolerate lengthy periods of inundation and low levels of soil oxygen; hence the presence of flood-tolerant species is often a good wetland indicator status even if the ground appears dry for most of the year. Wetlands provide important ecosystem services, such as filtering runoff, sequestering carbon, buffering storm surges, and providing wildlife habitat.

The extent of wetlands in the watershed is greatly reduced from historical conditions, primarily from land reclamation for agricultural and urban development and hydrologic alterations. The watershed currently has approximately 1,200 acres of freshwater wetland vegetation along the shores of reservoirs, in and around livestock ponds, around the margins of percolation ponds and other human-made depressions, and along creeks in the valley floor upstream of tidal influence (San Francisco Estuary Institute & Aquatic Science Center, 2013). (Acres of these features may differ from those in Table 1 due to different mapping sources and methods.) Common plant species include cattails, bulrushes, sedges, and rushes, as well as annual species such as water primrose, willow herb, watercress, and various smartweeds. In addition to the special-status species that may occur in freshwater wetlands (see Table 2), common wildlife species include Pacific treefrog, killdeer, mallard, and red-winged blackbird and wetlands provide foraging habitat for species like the great blue heron and northern raccoon.

Nearly all wetland habitat remaining after development in the Guadalupe watershed is salt marsh. Tidal salt marsh is a wetland influenced by bay and ocean tides. As Guadalupe River nears the South Bay, a transition occurs from a freshwater environment to an estuarine environment. Though greatly reduced in size and highly altered, these baylands still support valuable and functional tidal brackish or salt marsh and mudflats (Tetra Tech, Inc., 2006). Vegetation patterns are highly sensitive to relatively slight changes in topography and tidal inundation. Dominant plant species include cordgrass, pickleweed, marsh jaumea, alkali health, and marsh gumplant. This vegetation and the tidal channels that run through many tidal salt marshes help support many special-status animal species (see Table 2). In addition, an abundance of migratory shorebirds and waterfowl are frequent users of salt marsh and mudflats in the baylands of the watershed.

Many historical baylands areas were diked for salt production and filled for development, leaving relatively small strands of tidal salt marsh along sloughs and modified stream channels. Channelization of tributary creeks continues to impact marsh habitat in the baylands by cutting off sediment supply, and a lack of transition habitat between remaining marsh and upland natural communities reduces the quality of marsh habitat for native plants and wildlife (Tetra Tech, Inc., 2006). Many special-status plant species that historically occurred in tidal marsh areas of the baylands have been extirpated due to habitat modification and pressures from development. Tidal salt marsh is considered a sensitive natural community by CDFW and is required to be analyzed and mitigated for under CEQA. Valley Water is a partner in two major bayland restoration and protection projects along the South Bay shore: the South Bay Salt Ponds Restoration Project and South San Francisco Bay Shoreline Project.

Hardwood Woodland

The most common land cover type in the watershed is dominated by upland hardwood trees: roughly 22% of the watershed is characterized by various species of oak and other hardwoods, typically sparsely distributed in a grassland matrix. While one or more species of oak—coast live oak, valley oak, and/or blue oak—is typically the dominant species in these woodlands, bay laurel, buckeye, tanoak, madrone, and foothill pine are commonly associated trees and snowberry, poison oak, and California blackberry are commonly associated shrubs (if a shrub layer is present at all). In the Guadalupe Watershed oak woodlands are found distributed across the eastern side of the Santa Cruz mountains, typically on well-drained north-facing valley slopes and/or valley bottoms. They are also the dominant riparian habitat along many seasonal channels. The hardwood woodland land cover type includes the following more-detailed natural communities:

Coast live oak woodland and forest — most common oak forest type.

Mixed oak woodland and forest — widespread in the watershed where no oak species is clearly dominant or different species of oak are co-dominant.

California bay forest—more common on mesic slopes and in drainages, often intermixed with coast live oak stands.

Tanoak forest—stands common in the Santa Cruz Mountains.

Blue oak woodland — found in the driest portions of the watershed in the foothills.

Valley oak woodland — more typically found on valley bottoms where tree roots can penetrate to groundwater, and less on ridge tops.

Oak trees and woodlands provide habitat and food for numerous wildlife species and are the foundation of numerous food webs that support hundreds of terrestrial vertebrate species, thousands of native insect species, and many associated native plants (Spotswood, et al., 2017). In addition to the special-status species that may occur in oak woodlands (see Table 2), common wildlife species in these natural communities include California alligator lizard, oak titmouse, acorn woodpecker, Western harvest mouse, and bobcat. Oak woodlands also provide upland habitat for amphibian species such as California newt and California toad. In addition to wildlife habitat, oak woodlands support ecological functions and physical processes such as rainwater interception, surface flow filtering, nutrient cycling, uptake of carbon and nitrogen, and decomposition of leaf litter. In addition, oak trees require little water after establishment, allowing them to establish and grow successfully during periods of drought and under a warmer future climate. As such, native oaks are excellent foundational species for habitat creation and enhancement projects, whether upland or riparian. They are also excellent choices for streetscapes, backyards, and landscaping areas without lawns.

Grassland

Grasslands make up roughly 6% of the Guadalupe Watershed. These areas are dominated by grasses and forbs (herbaceous flowering plants that are not grasses), with little to no tree or shrub cover. The grassland in the watershed is roughly split between herbaceous (forb-dominated) grassland, California annual grassland, which is dominated by non-native annual grasses that have become naturalized in California, and serpentine bunchgrass grassland. Small components of serpentine rock outcrops and barrens, and both California native and Mediterranean non-native mixed perennial and annual grasslands are also present. The grassland land cover type include

California annual grassland

Serpentine bunchgrass grassland

In addition to the special-status species that may occur in grasslands (see Table 2), common wildlife species in these natural communities 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. Grasslands also provide critical foraging habitat for pollinators, including species in decline such as the Western monarch butterfly and the Crotch's bumble bee.

Even when dominated by non-native grasses, grasslands provide important ecosystem services such as carbon sequestration, nutrient cycling, and agricultural benefits (Jones & Donnelly, 2004). They provide pervious surfaces that absorb rain and filter runoff, slowing runoff and reducing nutrient and sediment pollution flowing into creeks and reservoirs.

Chaparral Scrub

Chaparral scrub is characterized by dense stands of drought- and often fire-adapted evergreen woody shrubs with little or no understory, interspersed with grassy openings. Dominant shrubs include chamise, manzanita, scrub oak, ceanothus, sagebrush, and coyote brush, but hollyleaf cherry, leather oak, toyon, coffee berry, sticky monkeyflower, and black sage also occur. In the Guadalupe watershed, chaparral and scrub makes up about 7% of the land cover and is found well distributed across the eastern foothills of the Santa Cruz mountains. The chaparral scrub land cover type includes the following more-detailed natural communities:

Northern coastal scrub/Diablan coastal scrub — can occur both on and off serpentine soils

Mixed serpentine chaparral — typically dominated by California sagebrush and black sage

Northern mixed chaparral/chamise chaparral

Coyote brush scrub — in addition to the hills portion of the watershed, also found scattered throughout the watershed.

Chaparral scrub provides valuable habitat and food resources for many species. In addition to the special-status species that may occur in chaparral scrub (see Table 2), common wildlife species in this natural community include western fence lizard, Pacific gopher snake, California quail, wrentit, rufous-crowned sparrow, brush rabbit, and gray fox.

Like oak woodlands, chaparral scrub can represent the dominant riparian habitat along many seasonal, high gradient channels in the upper Guadalupe Watershed. In addition to wildlife habitat, chaparral scrub provides pervious surfaces that absorb rain and filter runoff. This slows runoff and reduces nutrient and sediment pollution flowing into creeks and reservoirs.

Many of the characteristic shrub species of chaparral scrub vegetation are adapted to, and reliant on, occasional low-intensity fire for seed germination and/or creating the physical conditions necessary for young plant establishment and growth. Suppression of natural wildfires, in combination with development, is limiting the extent and altering the composition of chaparral scrub natural communities in the Guadalupe watershed. In addition, a number of chaparral scrub plant species are susceptible to Phytophthora plant pathogens. In addition to P. ramorum, which is responsible for Sudden Oak Death, numerous other species of Phytophthora have been detected in the watershed, with associated impacts and/or mortality of coyote ceanothus, toyon, California sagebrush, coffeeberry, coyote brush, sticky monkeyflower, and other native shrub species (Swiecki and Bernhardt 2018, Phytosphere Research, unpublished data, collected for Valley Water).

Serpentine Vegetation

Serpentine habitats are present in the Guadalupe watershed in the foothills on the western side of the valley, primarily in the vicinity of Calero Reservoir, Almaden Reservoir, Santa Teresa and Almaden Quicksilver County Parks, Tulare Hill, and Midpeninsula Regional Open Space District's Sierra Azul Preserve. Serpentine-associated natural communities make up a portion of the grasslands and chaparral scrub in the watershed (Figure 16), and include:

Serpentine bunchgrass grassland — generally lower vegetation cover compared to California annual grassland, and with fewer non-native annual grasses; typically dominated by native bunchgrasses and native forbs.

Serpentine rock outcrop/barrens — sparsely vegetated serpentine rock outcrops; often occur as a matrix in serpentine grasslands and provide important habitat for some species like Santa Clara Valley dudleya and annual plantain, which provides habitat for bay checkerspot butterfly.

Serpentine seep — seeps are areas where water stands at or just below the surface and creates wetland habitat; often surrounded by native grassland.

Mixed serpentine chaparral — typically dominated by bigberry manzanita, leather oak, California sagebrush and black sage.

As introduced previously, serpentine soils are challenging for many plants to grow in and, as a result, there is a high degree of endemism (i.e., species not found in other habitats). Many of the special-status species listed in Table 2 are associated with serpentine soils and geologic features. As such, these natural communities are high priorities for regional, and even state-level, conservation efforts.

A number of Valley Water water supply system features in the Guadalupe Watershed overlap with serpentine soils and associated natural communities: the Calero and Almaden Reservoirs, the Almaden-Calero canal and portions of the Coyote Alamitos Canal. The canals require occasional maintenance and numerous occurrences of special-status plant species, many of which are restricted to serpentine habitats, have been documented along the canals. Conservation of serpentine vegetation, particularly in the hills of the watershed, will assist with regulatory compliance, as well as maintain the habitat values and functions associated with wetland, grassland and chaparral scrub land cover types, such as absorbing rain and filtering runoff before it enters creek channels and reservoirs.

Conifer Woodland

The hills of the watershed, especially along the southwestern edge of the watershed but also to a lesser extent in the south-central foothills, support relatively extensive stands of native conifer woodlands, which make up 6% of the watershed's land cover. These areas are dominated by Douglas fir and redwood forest, with smaller areas of pine, cypress, and mixed evergreen woodland. There are also many planted conifers, both native and non-native, in the developed portions of the watershed. The conifer woodland land cover type includes:

Redwood and redwood-douglas fir forest

Pine/cypress

Mixed evergreen forest

Knobcone pine woodland

Douglas fir and redwood forest are a much more common land cover type in the northern coast ranges and farther north, but summer fog in our area acts to supplement precipitation and extend the southern extent of these forest alliances into the outer Coast Ranges, including the Santa Cruz Mountains which extend along the western side of the Guadalupe Watershed. Co-dominant tree species include tanoak, madrone, and bay.

In addition to the special-status species that may occur in conifer woodlands (see Table 2), common wildlife species in this land cover type include California slender salamander, Steller's jay, Cooper's hawk, Western gray squirrel, and black-tailed deer.

Like oak woodlands and chaparral scrub, conifer woodlands provide pervious surfaces that absorb rain and filter runoff, slowing runoff and reducing nutrient and sediment pollution flowing into creeks and reservoirs. Like chaparral scrub, redwood forests are adapted to, and reliant on, occasional low-intensity fire for seed germination and/or creating the physical conditions necessary for young plant establishment and growth. Suppression of natural wildfires may be limiting the extent and altering the composition of conifer woodlands in the Guadalupe watershed. Changing climatic conditions resulting in a decrease in fog days may result in poorer health of this forest type in the future.

Habitat Connectivity

Habitat loss and fragmentation are the leading threats to biodiversity (Penrod, et al., 2013). Due to these threats, protecting, restoring, and enhancing habitat connectivity has become a conservation imperative to protect the species that remain in our current landscapes, now, and into the future. For many years, conservationists have recognized the importance of habitat connectivity via landscape linkages at the regional scale and wildlife corridors at the local scale.

Currently, increasing attention is being directed toward habitat connectivity as a mechanism of maintaining biodiversity in the face of population growth and climate change (California Department of Fish & Wildlife, 2020). As a result, it has taken a more prominent role in state legislation (e.g., Assembly Bill 2344) and in policy and planning decisions by transportation agencies and municipalities (Santa Clara Valley Open Space Authority and Conservation Biology Institute, 2017), and there are many wildlife connectivity projects in progress statewide, with the number of such projects steadily increasing.

Numerous separate state, regional, and local connectivity assessments and conservation plans recognize the importance of the Guadalupe Watershed for habitat connectivity. As shown in Figure 25, two landscape linkages between the Santa Cruz Mountains and the Diablo and Gabilan ranges have been identified within the watershed. Collectively, these landscape linkages make up a significant percentage of the watershed overall, 43%. The primary goal of conserving and restoring these landscape linkages is to promote wildlife movement and ecological processes between the existing large landscape blocks (Penrod, et al., 2013).

In the upper watershed, the Santa Cruz Mountains largely consists of continuous natural habitats that have not gone through significant land conversions. Ongoing connectivity conservation efforts within this mountain range is focused on the permanent protection of these areas and improving the ability for wildlife to safely cross roads and highways such as SR-17, which California Department of Fish and Wildlife has identified as one of the top three priority barriers to habitat connectivity in the Bay Area (one out of the twelve top priority barriers statewide) (California Department of Fish & Wildlife, 2022). In contrast, most of the valley floor has been converted to commercial and residential land uses. However, some remnant natural habitats remain in the Baylands along the northern portion of the valley floor. Ongoing connectivity conservation efforts within the Baylands is focused on restoration of tidal marshes, freshwater wetlands, and adjoining riparian habitats, and creation of ecotone habitat to allow for upslope marsh migration in response to sea level rise.

What We Mean When We Say

Connectivity: defined as “the degree to which the landscape facilitates or impedes movement” (Taylor, Fahrig, Henein, & Merriam, 1993).

Landscape linkages: broad areas that allow for the movement of wildlife and plant species from one area of suitable habitat to another and that support ecological processes (Ament, et al., 2014).

Corridors: distinct linear features whose primary function is to connect two or more significant habitat areas (Beier & Loe, 1992).

Large Landscape Blocks: areas of high ecological integrity that build upon the existing conservation network of lands in the area (Penrod, et al., 2013). Also referred to as core habitats.

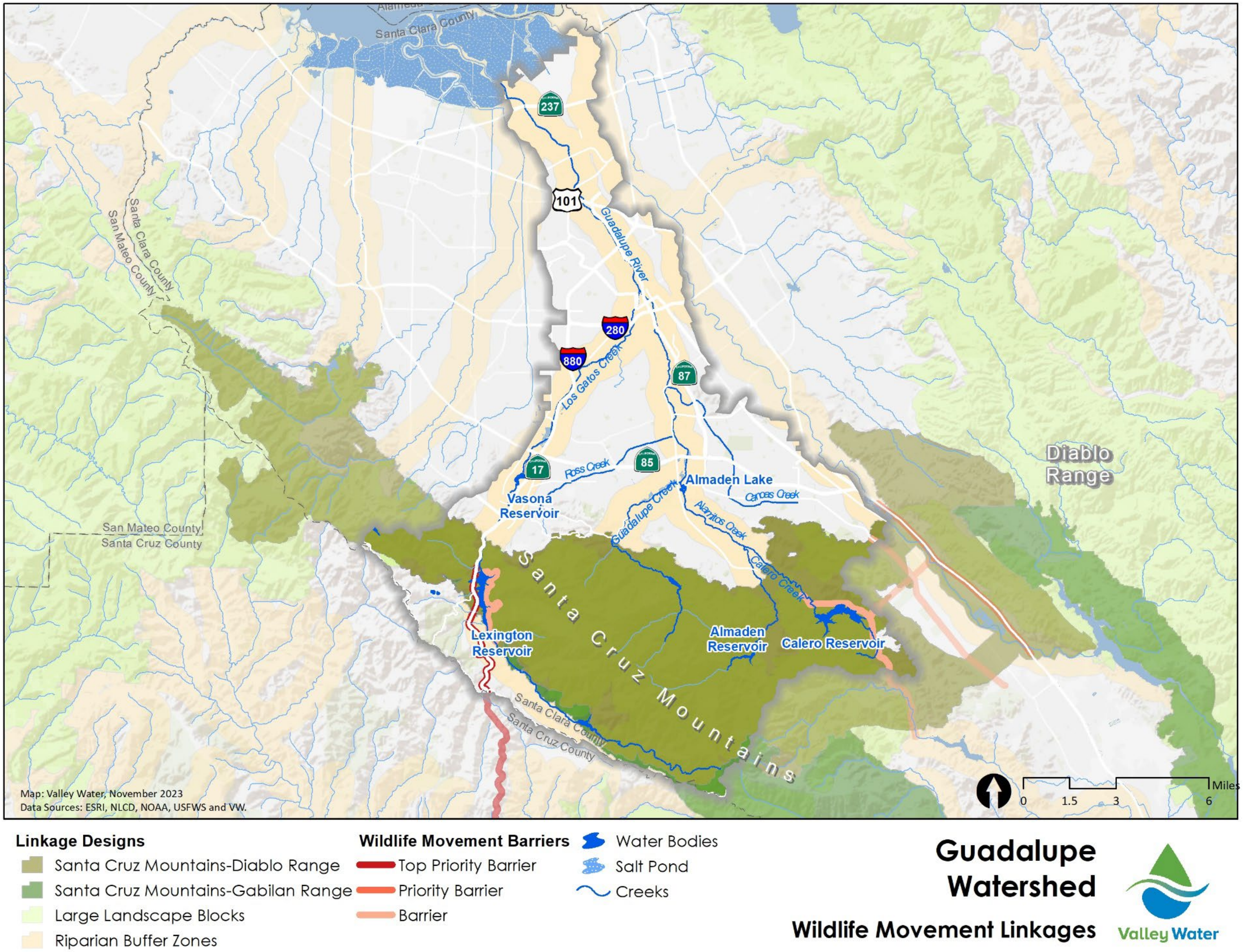

Figure 25: Landscape linkages and wildlife movement barriers in the Guadalupe Watershed

Collaborating Plans

The following plans complement One Water and should be used to inform and prioritize future ecological resource enhancement efforts:

*The **Santa Clara Valley Habitat Plan** provides a framework to protects natural resources and endangered species while streamlining permitting for covered projects.*

*The **Santa Clara Valley Resource Conservation Investment Strategy** is the first of its kind and promotes the conservation of natural resources in Santa Clara County through the identification of actions and priorities that can help guide investments and/or identify high priority opportunities for mitigation.*

*The **State Wildlife Action Plan** is a statewide plan that assesses the health of the state's natural resources, identifies immediate and future challenges and outlines actions to be taken to address these challenges before species and habitats become too rare or costly to restore.*

*The **Coastal Multispecies Recovery Plan (NMFS)** is a guidance document that identifies recovery actions that contribute to the protection and recovery of CCC steelhead throughout the DPS.*

3.3 FUTURE CONDITIONS, CHALLENGES, AND OPPORTUNITIES

Vision for Future Conditions

One Water provides an opportunity to articulate an informed vision for the future conditions of ecological resources that accounts for past and current conditions, the challenges, and opportunities to improving those conditions, and the relevant vision and objectives of other programs and plans. Attainment of this vision provides the basis and justification for the priority actions in the One Water Guadalupe Watershed Plan. The One Water objectives and metrics provide a vision, listed below, for ecological resources in the watershed. Elements of these vision statements are referred to as attributes in One Water and are directly tied to metrics and targets that are intended to track and document progress toward the vision.

1. ***Fish can travel freely in the watershed's rivers and streams***
    a. There is unimpeded access to suitable habitat.

2. ***Wildlife can move freely in the watershed***
    a. Natural lands and rangelands are conserved, expanded, enhanced, and connected to facilitate wildlife movement.

3. ***Streams are healthy and can support aquatic life***
    a. There is suitable spawning and rearing habitat for steelhead.
    b. There should be suitable fish habitat in a variety of accessible reaches to help make fish populations more resilient to drought and climate change.

4. ***Ecological conditions of streams are consistently improved***
    a. Modified channels are enhanced to improve ecological condition and human communities.
    b. The watershed's natural sources and transport of gravel and coarse sediment should be prioritized to build and maintain aquatic habitat.

5. ***Riparian habitat is increasingly protected and improved***
    a. Native vegetation communities around creeks are sufficient in width and structural complexity to filter runoff, stabilize banks, contribute to aquatic habitat, provide habitat, and facilitate wildlife movement.
    b. Unique natural communities such as alkali meadows, seasonal wetlands, and sycamore alluvial woodland are preserved and protected.

Fundamental to achieving these visions is the preservation, expansion, and protection of undeveloped buffers around creeks. Figure 26 depicts the protection status of creek channels in the watershed; those mapped as unprotected may be appropriate to serve as targets or priorities for protection and expansion of buffers.

By incorporating the Fish and Aquatic Habitat Collaborative Effort (FAHCE) management objectives for the watershed, the vision for several major reaches of the watershed is more specific:

- There is suitable spawning and rearing habitat in Guadalupe Creek from Guadalupe Dam to its confluence with the Guadalupe River, Calero Creek from Calero Dam to its confluence with Alamitos Creek, Alamitos Creek from Almaden Dam to its confluence with Lake Almaden, and Los Gatos Creek from the Camden Avenue drop-structure to its confluence with the Guadalupe River.
- There is adequate passage for migrating adults to reach suitable spawning and rearing habitat and for out-migrating juveniles.

Additional visions for ecological resources were identified at the Ecological Enhancement Workshop, further described in the Public Participation Process, Appendix A of the One Water Guadalupe Watershed Plan:

- There should be suitable fish habitat in a variety of reaches to help make fish populations more resilient to drought and climate change. This vision is an extension of FAHCE management objectives and its attainment may justify, for example, rearing habitat enhancements in the mainstem Guadalupe River and/or feasibility assessments of fish passage options on Los Gatos Creek above the Camden Avenue drop-structure since these reaches tend to support wetted habitat for longer periods and in more years; and/or studies into the benefits and feasibility of providing fish access above Almaden Dam where there are tributaries that may support year-round suitable habitat.
- The watershed's natural sources and transport of gravel and coarse sediment should be prioritized to build and maintain aquatic habitat. Although dams trap a significant supply of

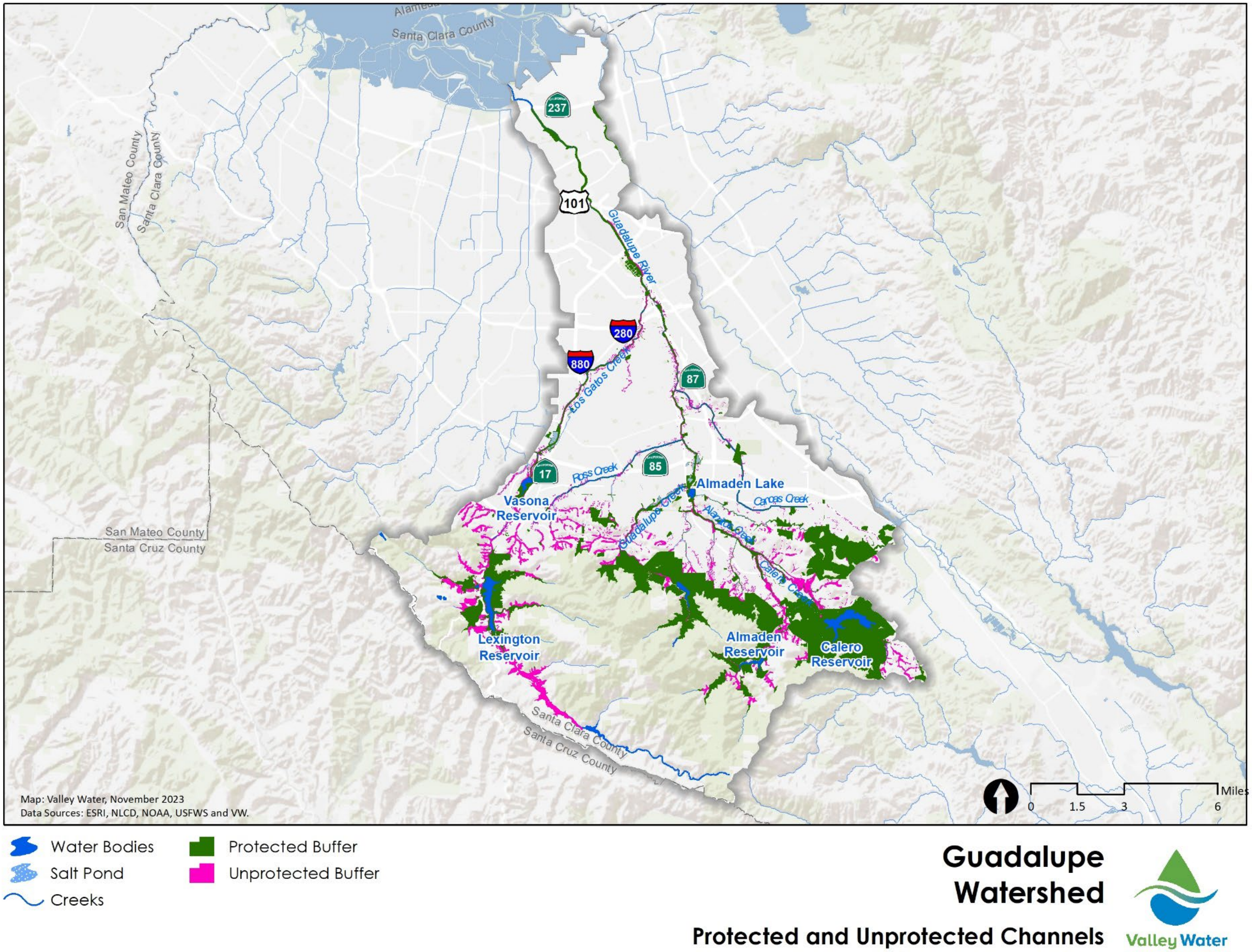

Figure 26: Protected and unprotected creeks channels in the Guadalupe Watershed

coarse sediment, several tributaries continue to supply the watershed with coarse sediment. Prioritizing the use of such sources may justify, for example, actions to improve sediment routing and reduce the need for removal for flood protection, and feasibility studies to maximize the potential for sediment reuse.

- We should continue to learn from the investments made in ecological enhancement. Given the cost and complexity of many important enhancement actions in the Guadalupe Watershed Plan, opportunities to monitor and learn about the effects of actions on habitat and populations should be seized.

Challenges

In addition to the present conditions described previously, the following factors are some of the major opportunities and constraints for achieving the visions for the Guadalupe Watershed.

Invasive Species

Because of the more reliable water availability, riparian areas are prone to invasion by non-native plants. Invasive plants tend to thrive and spread aggressively, negatively altering native vegetation distribution, habitat suitability for wildlife, soil stability, and water quality, thus degrading habitat quality and the overall ecological value of a site. In addition, invasive plants can exacerbate flooding and fire danger, undermine structural assets, and obstruct access to roads, levees, and trails. A few examples of invasive plants in the watershed include giant reed, Cape ivy, eucalyptus, and stinkwort. Figure 18 depicts occurrences of non-native, invasive plant communities in the watershed that may be appropriate to serve as targets or priorities for removal efforts.

Sediment Supply

Reservoirs in the hills capture and interrupt the downstream transport of coarser sediment (e.g., gravels and cobbles). The result is downstream channels with lowered bed elevation and armored surface layer (San Francisco Estuary Institute & Aquatic Science Center, 2013). Limited lateral channel migration also cuts off a historical source of coarse sediment, and contributes to channel down-cutting, or incision, that further limits ecologically beneficial floodplain inundation and simplifies aquatic habitat. For example, much of Guadalupe River is characterized by long, deep pools that provide limited habitat value as a result of historical incision. Streambank erosion within entrenched channels can lead to excessive delivery of fine sediment that reduces habitat quality and can impair water quality. Historical floodplain and in-channel gravel mining pits, namely Almaden Lake, also trap sediment. Despite the trapping of sediment in some portions of the watershed, there are also areas of problematic sediment deposition, such as the Guadalupe River through Downtown San José, Randol and McAbee creeks in the Alamitos Creek subwatershed. In these areas, Valley Water must repeatedly remove sediment to maintain channel capacity and fish passage. Sediment removed from reservoirs and problematic depositional areas could provide a cost-effective and less-environmentally-impactful supply of sediment for deep, simple, incised reaches or for building resilience of shoreline habitats to sea level rise. This is not allowable, however, due to the elevated mercury content of sediment from the Guadalupe Watershed and regulations that preclude reuse of such sediment, even where such reuse would be in the same creek or watershed.

Unsheltered Encampments

The Guadalupe River and its riparian corridor, particularly within and around downtown San José, has been significantly impacted by encampments and related uses of unsheltered individuals. Riparian vegetation, which normally acts to slow or buffer natural wildfire, has been burned, in some places repeatedly, by fires that start from campfires or intentional arson. Trees and shrubs have been removed for campfire fuel, to make space for encampments, and to build or camouflage structures. In addition to destroying habitat that does not readily recover from burning, fires in riparian areas create hard soil surface crusts repellant to water, and when combined with loss of vegetation can lead to sheet or gully erosion that not only impacts water quality but also has the potential to damage infrastructure and adjacent private property. Poaching occurs at creek-side encampments. Tarps, netting or shopping carts are used to block the channel and capture fish. Barriers such as these can be detrimental to wildlife because many portions of urban creeks are narrow, with no safe way to go around such obstacles. There are also threatened fish species with low populations, and poaching interferes with efforts to restore fish species. Encampment trash is a major pollutant in the watershed and appears to invite and exacerbate illegal dumping. Hazardous waste is regularly encountered at encampments, such as batteries, generators, oils, pesticides, aerosol cans, and various electronics, as is biological waste, which pollutes waterways, spreads disease, and creates unsafe conditions for field staff, volunteers, and the public. In some locations, streambanks have been extensively excavated to create flat areas for encampments, paths, and stairways. These activities weaken creek banks and increase fine sediment supply to creeks. Encampment-related impacts are not only diminishing the condition and quality of existing creeks and riparian areas, but they are precluding the ability for Valley Water and others to implement successful enhancement and mitigation projects. At several such project areas, planted trees have been chopped down; new plantings have been trampled; protective fences have been damaged; and irrigation infrastructure has been stolen. Valley Water and others in Santa Clara County have undertaken numerous and costly efforts to reduce the environmental harm of encampments. Until sufficient housing and health services are available to reduce the unsheltered population along urban creek corridors, however, efforts to conserve and enhance riverine and riparian ecological conditions will be extremely limited, less successful, and more expensive.

Climate Change

Sea level rise will change vegetation patterns and habitat conditions near the Bay and climate extremes will lead to more extreme temperatures and storms, which will affect wildlife and habitat. Modeling for the region has predicted reduced early and late wet season runoff, and possibly a longer dry season, with greater inter-annual variability, and potentially increased rainfall intensity (Flint & Flint, 2012). Forecasts of increased precipitation show it concentrated in midwinter months, such that peak flows are increased. It is likely that rising temperature will increase the total annual evaporative losses throughout the watershed. Unless these losses are offset by increased precipitation and storage, the total annual amount of water in the watershed will probably decrease (San Francisco Estuary Institute & Aquatic Science Center, 2013). The watershed will likely become drier, with less acreage of wetlands, lower aquifers, and greater total lengths of ephemeral or episodic streams, while increased rainfall intensity during the wet season could increase peak flows (San Francisco Estuary Institute & Aquatic Science Center, 2013). The increased erosive power of these greater flows would probably initiate a new period of channel incision and head-cutting, especially where the flows are contained by the entrenched channels. The resulting increase in sediment yield above the reservoirs will increase the rate at which the reservoirs fill-in with sediment and lose water storage capacity. Channel incision and other erosion in the catchments of streams that do not drain to any reservoirs would increase sediment yields to streams in the valley, causing them to aggrade (San Francisco Estuary Institute & Aquatic Science Center, 2013). This aggradation would be exacerbated by sea level rise that elevates the base elevation of streams and would likely increase the risk of flooding in some areas of the lower watershed. More intense or frequent storms may also directly result in increased flooding, regardless of channel aggradation. The effects of these physical changes in landscape form and structure on the ecological services of the watershed would be many and varied, and ecological enhancement efforts need to be planned to be successful under these variable and uncertain conditions.

Critical Infrastructure as Wildlife Barriers

Pieces of human infrastructure such as highways, dams, grade control structures and bridge undercrossings present passage barriers to wildlife. However, considering removal or modification of these structures proves to be complicated. One example of this is the Guadalupe Dam and Reservoir, which presents a formidable fish passage barrier, yet provides water supply benefits and incidental attenuation of flood waters that significantly reduces flooding downstream. Additionally, historic sediment deposits laden with mercury are trapped upstream of the dam within the reservoir, keeping these pollutants from traveling further downstream into the watershed.

Opportunities

There are community resources and multi-benefit project opportunities that have and will facilitate the enhancement of ecological resources in the Guadalupe River:

Multi-Benefit Actions

As the One Water planning process seeks to demonstrate, management and enhancement actions for ecological resources can and do provide benefits for other water management priorities. Wider floodplains can store more high flow and reduce flood risk. Wider and denser riparian corridors slow and filter stormwater runoff and improve water quality. Water management for groundwater recharge can help sustain natural communities that qualify as groundwater dependent ecosystems. Reservoir and dam operations can be managed to protect and enhance downstream fish and aquatic habitats, while also supplying water and reducing flood risk. Expansion of habitat for wildlife or other ecosystem services has potential to offset greenhouse gas emissions. When management or infrastructure changes are being planned for one of these water management priorities, the others can be considered and included when feasible. The multiple benefits provided should be considered and quantified when evaluating costs.

Stakeholder Interest

There are numerous stakeholders in the watershed with a focus or strong interest in ecological resource protection and enhancement. These include, but are not limited to, local tribes, non-profit organizations, regulatory agencies, land use planning groups, and municipalities and community groups. Many of these stakeholders are already engaged in related processes and projects, such as this One Water Plan, the Guadalupe River Project Adaptive Management Team, the Guadalupe River Integrated Working Group, Re-Envisioning the Guadalupe River Park, and more. Coordination with and between these stakeholders can bring technical and regulatory expertise to efforts; improve project designs and capture additional benefits; provide additional funding resources; and facilitate project implementation; among other things.

Ecological Enhancements in Future Projects

There are major public works projects being planned for the Guadalupe Watershed, such as seismic retrofitting of dams, flood risk reduction measures, urban renewal and redevelopment, and continued maintenance of previously implemented public works projects, such as the Lower and Downtown

Guadalupe River Projects. Opportunities to preserve and enhance ecological conditions should always be sought in conjunction with such efforts. This may require expanding a project’s footprint or adding a different element of work, but it can help make stewardship more cost effective, reduce or mitigate a project’s environmental impacts, and achieve ecological resource improvement targets.

SECTION 4: WATER SUPPLY

Providing Santa Clara County residents, businesses, and farmers with safe, clean water for municipal, commercial, and agricultural use is a central responsibility of Valley Water. Reliable and sufficient water supply is also important for local fish and wildlife. The following section focuses on water supply infrastructure and operations located in the Guadalupe Watershed.

4.1 HISTORICAL CONDITIONS

Water supply in the Santa Clara Valley has changed as land use and management have evolved. As population and settlement in the Santa Clara Valley increased, the demand for more water followed.

1850's-1860's: Decline of Ranching and Increase in Agriculture

Santa Clara Valley rapidly developed into a leading agricultural region. During this time, most of the valley used dry farming techniques, not tapping groundwater for irrigation. Artesian water in the lower valley supported wheat and other crops with low water requirements. Additional water needed was supplemented with stream diversions (Tetra Tech, Inc., 2006). In 1857, Kirk Ditch was constructed to divert water from Los Gatos Creek to support agriculture irrigation, becoming the first of many diversions of Los Gatos creek.

1890's-1920's: Drought Changes Water Use

The ensuing decades were marked by an increased number of dry years combined with population growth, leading to additional groundwater pumping and creek diversions to meet the water supply needs of the Santa Clara Valley (Grossinger, et al., 2006). In 1893, the Pioneer Ditch System diverted a large amount of water from Alamitos Creek for farmland near the present-day Almaden Lake Park. Operation of the system was discontinued in 1909. By this time, Los Gatos Creek had at least 25 miles of diversion ditches supporting local agriculture. The invention of the electrical pump made groundwater more available, and by 1920 over two thirds of agricultural land was using irrigation (Tetra Tech, Inc., 2006). The resulting decline of the groundwater table and land subsidence were recognized as early as the 1920's, shown in Figure 27. Beginning in the 1920s and continuing until 1986, in-stream percolation dams were used seasonally for groundwater recharge (Valley Water, 2021b).

1930's: Santa Clara Valley Water Conservation District

The 1930's began with more drought conditions and more groundwater decline. In 1933, The US Coast and Geodetic Survey performed a survey of the Santa Clara Valley and noticed marked land subsidence (Grossinger, et al., 2006). The newly minted Santa Clara Valley Water Conservation District rapidly constructed numerous dam projects to expand water storage and recharge groundwater. In 1932 the Alamitos Percolation Pond was constructed. In 1935, Almaden, Calero, Guadalupe, and Vasona dams were constructed. That same year, the Almaden-Calero Canal was constructed to transfer water from Alamitos to Calero subwatersheds. The Page Percolation Ponds in Los Gatos were also constructed in 1935 (Tetra Tech, Inc., 2006).

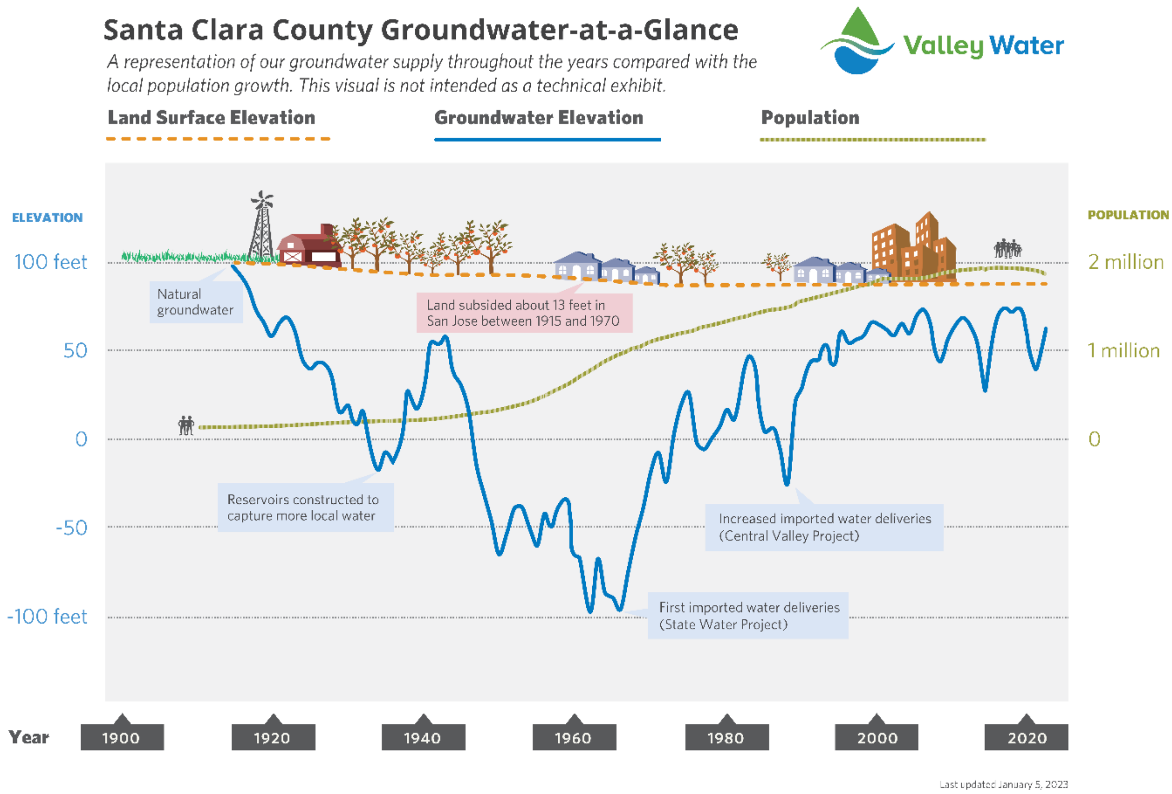

Figure 27: Groundwater Levels and Subsidence over Time

1940's-1960's: Suburban Expansion into the Watershed

Upstream of Los Gatos Creek, Lexington Reservoir was created by the construction of Lenihan Dam in 1952. In 1958 the Oka Lane Percolation Ponds were constructed, and the Page Ponds were reconstructed along Los Gatos Creek. The Sunnyoaks Percolation Ponds were added in 1967, served by Page Ditch. On the Guadalupe Creek, Los Capitancillos Percolation Ponds and Masson Dam were constructed in 1962 and 1964, respectively. In 1963, the Alamitos Percolation Pond was reconstructed in the Alamitos Creek subwatershed (Tetra Tech, Inc., 2006). By 1967, thanks in part to the many new reservoir and recharge projects, subsidence had mostly stopped in the Santa Clara Valley (Valley Water, 2021b). Other factors that contributed to slowing subsidence was the State Water Project water deliveries and Rinconada Water Treatment Plant operations beginning in 1967 that delivered treated water, helping to reduce demand for groundwater pumping and acting as in lieu recharge in North County.

1970's to Present:

A second percolation pond was added to the Alamitos Pond complex in 1976. In 1982, Almaden Lake Park opened for public use, with the titular Almaden Lake created from an old gravel quarry. In 1994, spreader dams used for percolation were removed as part of the Guadalupe Creek Restoration Project (Tetra Tech, Inc., 2006). Because of the dramatic increase in groundwater pumping for the growing agricultural use and population growth during the first half of the twentieth century, up to about 14 feet of permanent (inelastic) subsidence was observed in San José from about 1915 to 1969 (Valley Water, 2021b). The historic costs of subsidence have been estimated to more than $947 million in 2021 dollars

(Valley Water, 2021b). However, permanent subsidence largely stopped around 1970 because of Valley Water's expanded conjunctive water management, including the managed aquifer recharge program, which allowed the groundwater conditions to recover substantially in the following decades.

4.2 PRESENT CONDITIONS

Valley Water manages a county-wide water supply using a variety of water supply sources, including local surface water, groundwater, natural recharge, recycled and purified water, and imported water conveyed from the Sacramento-San Joaquin River Delta (Delta). A general description of Valley Water's water supply, use, and management activities throughout Santa Clara County can be found in section 2.2.2 of the One Water Framework pages 31-39 (Valley Water, 2021e).

The following section focuses on water supply infrastructure and operations located in the Guadalupe Watershed. Six reservoirs, seven systems of ponds for managed groundwater recharge, and several other supply and delivery facilities are located in the watershed and are also connected to Valley Water's network of facilities that supply water throughout Santa Clara County.

GUADALUPE WATERSHED
33,610
Acre-feet of reservoir capacity (without temporary restrictions)
16,500
Acre-feet per year of average natural recharge
8,750
Acre-feet of recycled water delivered to customers

Four of Valley Water's thirteen retailers provide water to the residents and businesses within the Guadalupe Watershed. A majority of the watershed is served by San José Water Company, which is Valley Water's largest retailer. The water retailers with service areas within the Guadalupe Watershed are shown in Figure 28.

Groundwater

Groundwater supplies about half of the water used in Santa Clara County. Valley Water is the Groundwater Sustainability Agency (GSA) for the county's groundwater subbasins, responsible for sustainably managing local groundwater (Valley Water, 2021b). The Santa Clara Valley has two interconnected groundwater subbasins, the Santa Clara Subbasin and the Llagas Subbasin. The Santa Clara Subbasin has two groundwater management areas, the Santa Clara Plain and Coyote Valley (Valley Water, 2021). The Guadalupe Watershed overlies parts of the Santa Clara Plain, which is in north county and bounded by the Santa Cruz Mountains to the west and the Diablo Mountain Range to the east. The Santa Clara Plain is more than 25 miles long and 15 miles wide and has a surface area of 280 square miles. The estimated operational storage capacity of the Santa Clara Plain is 350,000 acre-feet (Valley Water, 2021b). The northern part of the Santa Clara Plain is a confined aquifer that underlies a laterally extensive aquitard, which restricts groundwater recharge from surface water. The remaining southern portion of the Santa Clara Plain is an unconfined aquifer with no extensive aquitard and is suitable for groundwater recharge (Valley Water, 2021b).

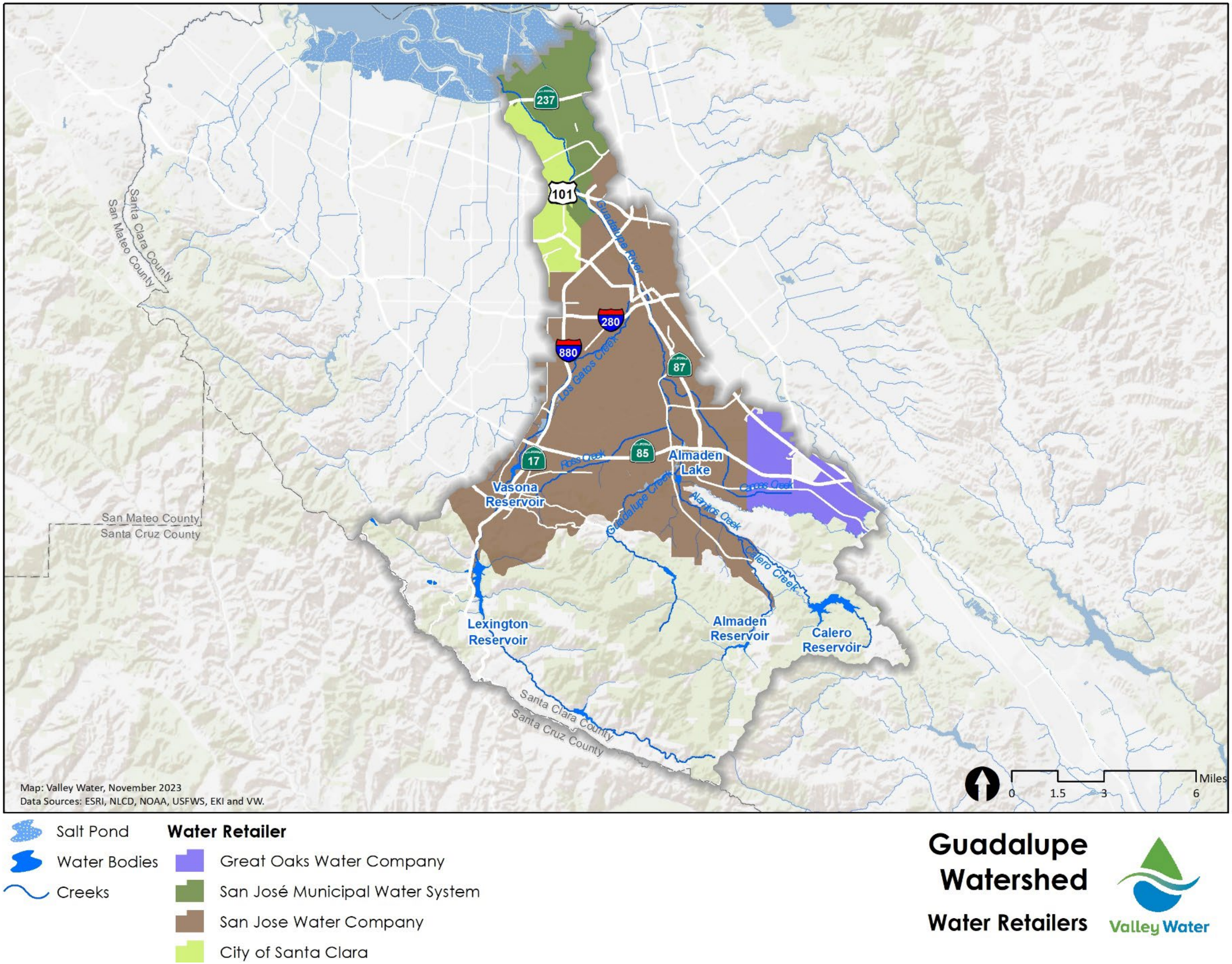

Figure 28: Water Retailers in the Guadalupe Watershed

Recharge areas are primarily comprised of high permeability aquifer materials like sands and gravels that allow surface water to infiltrate into the aquifers. Natural recharge, which includes infiltration of precipitation and runoff in the valley floor, is insufficient to meet current demands on groundwater (Valley Water, 2021b). Between 2012 and 2021, average natural recharge in the Guadalupe Watershed was estimated to be 8,800 acre-feet per year (AFY) and average groundwater pumping was 27,200 AFY.

Since groundwater pumping exceeds natural recharge, Valley Water has an extensive managed aquifer recharge program to help maintain groundwater levels and avoid land subsidence. Managed recharge operations occur in two primary recharge systems in the Guadalupe Watershed, including the Guadalupe and Los Gatos Recharge Systems. The Guadalupe Recharge System has a total recharge capacity summarized below in Table 5 (Valley Water, 2021b).

To maintain groundwater levels, optimize conjunctive use, and minimize the risk of resumed permanent subsidence, Valley Water needs to maintain its groundwater recharge capacity in the Guadalupe Watershed. Without Valley Water's conjunctive use programs, groundwater elevations would be considerably lower than they are today, reducing water supply. Valley Water has established an acceptable subsidence rate of no more than 0.01 feet per year based on multi-year average and has established water level thresholds at ten subsidence index wells. Valley Water manages the system so that groundwater levels are maintained above those thresholds to ensure a low risk of unacceptable land subsidence (Valley Water, 2021b).

Table 5: Water Supply Management in the Guadalupe Watershed

Water Use (Average Acre-Feet per Year)	
Groundwater Pumping*	27,200
Groundwater Recharge Capacity (Acre-Feet per Year)	
Guadalupe Recharge System	
Alamitos Creek	2,200
Calero Creek	900
Guadalupe River	4,200
Guadalupe Creek	2,900
Ross Creek	2,200
Alamitos Ponds	1,500
Guadalupe Ponds	6,600
Los Capitancillos Ponds	2,900
Kooser Ponds	1,700
Subtotal Recharge Capacity	**25,100**
Los Gatos Recharge System	
Los Gatos Creek	5,800
Camden Ponds	2,200
McGlincy Ponds	7,700
Oka Ponds	1,500
Page Ponds	5,300
Sunnyoaks Ponds	2,200
Subtotal Recharge Capacity	**29,700**

Total Recharge Capacity	**42,300**
Reservoir Storage Capacity (Acre-Feet)	
Almaden Reservoir	1,555
Calero Reservoir	9,738
Guadalupe Reservoir	3,320
Lexington Reservoir	18,534
Vasona Reservoir	463
Total Reservoir Storage Capacity	**33,610**

* Reported as the average annual from 2012 to 2021

Alamitos Ponds

The Alamitos Ponds are part of the Guadalupe Recharge System and include two percolation ponds adjacent to the Guadalupe River near Blossom Hill Road in South San José, also directly adjacent to Valley Water's Headquarters. The larger pond to the south was originally converted from a gravel mining pit in 1932 and reconstructed in 1963. The reconstruction of the southern pond reduced the storage, so the northern pond was constructed in 1976 to compensate for these modifications as well as modifications to the Guadalupe River upstream of Blossom Hill Road. The ponds receive water diverted from the Alamitos Diversion on the Guadalupe River and the Masson Dam on the Guadalupe Creek. The ponds operational depth ranges from 11 to 12 feet, and the combined surface area is 10 acres.

Guadalupe Ponds

The Guadalupe Ponds are part of the Guadalupe Recharge System and include four percolation ponds north of Blossom Hill Road in South San José. Three of the ponds are directly adjacent to the Guadalupe River, and the fourth is west of the river near Almaden Expressway and Highway 85. The ponds were constructed in 1967 and are designed to recharge groundwater. The ponds operational depth is between 14 and 24 feet, and they have a combined surface area of 32 acres. They receive water diversions from the Guadalupe River, Guadalupe Creek, and the Almaden Valley Pipeline.

Kooser Ponds

The Kooser Ponds are part of the Guadalupe Recharge System and include four percolation ponds north of Kooser Road in San José, near the larger Los Capitancillos Ponds. Their depth varies between 5 and 9 feet and their total surface area is 1.25 acres. The Kooser ponds receive water from the Almaden Valley Pipeline via the Kooser Pipeline, and discharge to Ross Creek.

Los Capitancillos Ponds

Los Capitancillos Ponds are part of the Guadalupe Recharge System and include 11 percolation ponds adjacent to the Guadalupe Creek west of Almaden Expressway in South San José. The ponds were first operated in 1962 and reconstructed in 1964. They cover 38 acres or surface area and their depth varies between 7 and 17 feet. The ponds receive water from Guadalupe Creek at Masson Dam or from the Almaden Valley Pipeline.

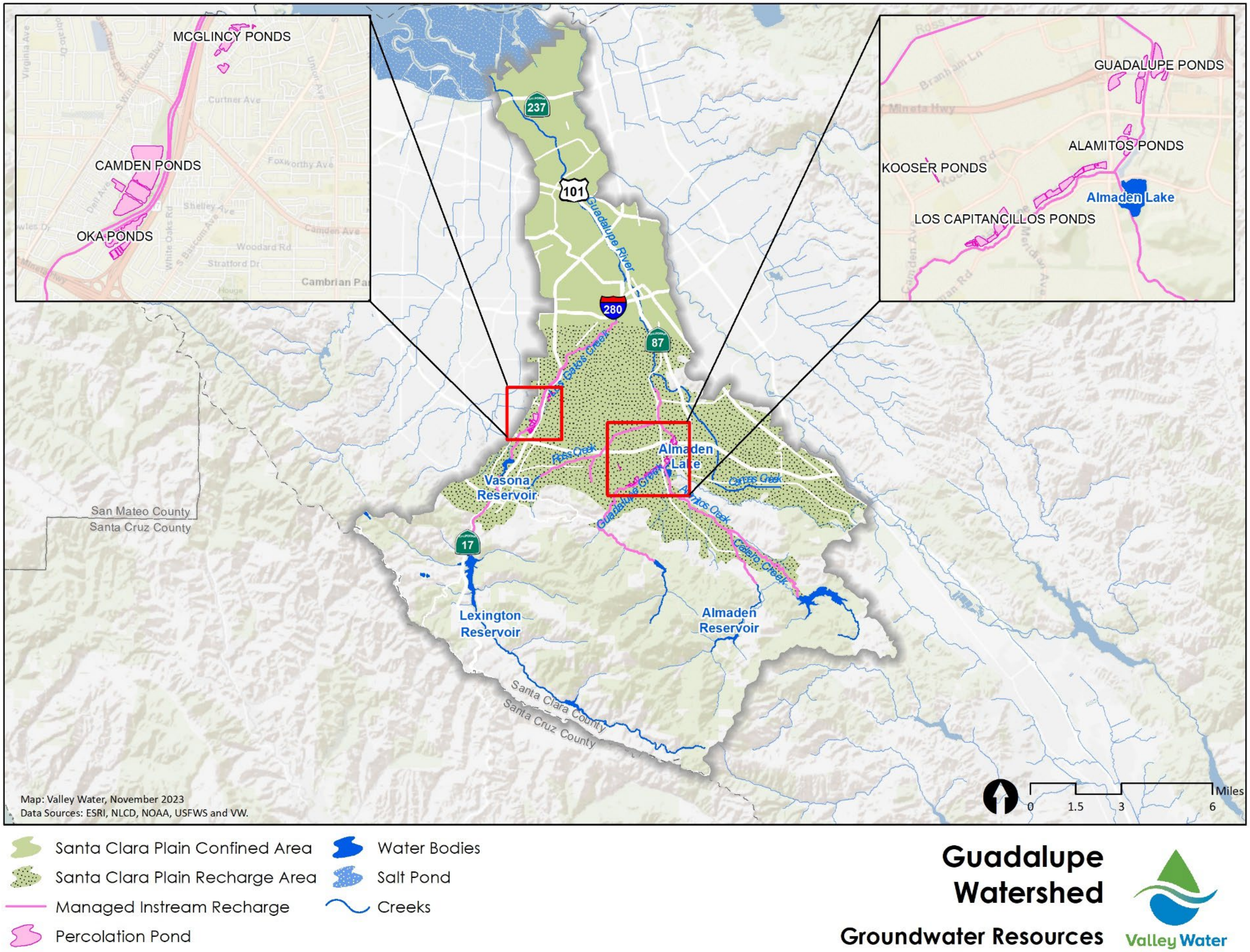

Figure 29: Guadalupe Watershed - Groundwater Resources in the Guadalupe Watershed

Camden Ponds

The Camden Ponds are part of the Los Gatos Recharge System and include three percolations ponds adjacent to the west bank of Los Gatos Creek in the City of Campbell. The ponds were constructed in 1962 with an operational depth between 7 and 17 feet and a total surface area of 35.5 acres. They receive water from Los Gatos Creek at Kirk Diversion Dam or the Central Pipeline via Upper Page Ditch.

McGlincy Ponds

The McGlincy Ponds are part of the Los Gatos Recharge System include six percolation ponds near McGlincy Lane east of Highway 17. The ponds were constructed in 1959 and receive water from Los Gatos Creek and the Central Pipeline via Kirk Ditch. The ponds have an operational depth between 9 and 16 feet and a total surface area of 9 acres.

Oka Ponds

The Oka Ponds are part of the Los Gatos Recharge System and include four percolation ponds south of the Camden Ponds between Los Gatos Creek and Highway 17. The ponds were constructed in 1958 and cover 10 acres of surface area with operational depths from 4 to 16 feet. They receive water from Los Gatos Creek at Kirk Diversion Dam or the Central Pipeline via Kirk Ditch. Water from the last pond connects to McGlincy Ponds via the Kirk Ditch.

Local Surface Water

The Guadalupe Watershed contains 22 creeks and five District-owned and operated reservoirs designed to capture and store local rainfall runoff for downstream groundwater recharge. Valley Water manages these reservoirs to not only capture runoff, but also to provide carryover storage as a hedge against a dry year or outages.

FAHCE

Valley Water’s reservoir operations and water rights in the Coyote Creek, Stevens Creek, and Guadalupe River are governed by the FAHCE Fish Habitat Restoration Plan. The effort addressed a legal challenge to Valley Water’s water rights and operations and impact to local fisheries in the Coyote Creek, Stevens Creek, and Guadalupe Watersheds. A conditional settlement agreement committed the parties to carrying out certain activities necessary to implement a restoration program that balances water supply needs of Santa Clara County with improvements of populations and habitat of fisheries in the three watersheds. The FAHCE restoration program includes managing reservoir operations to maintain flows in the creeks, conducting certain scientific studies, and undertaking restoration work in the creeks including barrier removals, gravel augmentation, and placement of woody debris.

Almaden Lake

Almaden Lake was created by in- and off-stream gravel quarry operations, circa late 1940’s to 1960. The off-stream quarry operation was located along the east side of Alamitos Creek and was comprised of two main large pits. After the gravel quarry operations ceased, heavy storm events eroded the levee that separated the creek from the quarry, resulting in discharge of creek waters into the former quarry area, creating Almaden Lake. The lake’s bottom is unnaturally varied, and in places deep due to the remnant pits. Remnant dikes that separated individual pits during quarry operations remain but are now submerged below the water surface.

Almaden Reservoir

The Almaden reservoir was created in 1936 with construction of the Almaden Dam across Alamitos Creek near the community of New Almaden. The reservoir releases water into Alamitos Creek for groundwater recharge. In the event of large storms that produce more than the reservoir can contain, excess water is diverted to Calero Reservoir via the Almaden-Calero Canal.

Calero Reservoir

Calero Reservoir was constructed in 1935 and is located south of the Santa Theresa Hills neighborhood of San José. The primary purpose of the reservoir is providing downstream groundwater recharge, but it also supports flows to provide fish passage, adequate temperature and depth levels, and flood risk reduction. Calero Reservoir can release water to Calero Creek as well as to the Almaden Valley Pipeline, which delivers raw water to Santa Teresa Water Treatment Plant, Rinconada Water Treatment Plant, and Vasona Pumping Station. Calero Reservoir receives water from the impounded Calero watershed, the nearby Almaden Reservoir via the Almaden-Calero Canal, and imported water from the Delta via San Luis Reservoir. Calero Dam is currently undergoing seismic safety upgrades.

Guadalupe Reservoir

The Guadalupe Reservoir was completed in 1935 along Hicks Creek on Guadalupe Creek. The dam and reservoir are one of the six original reservoirs approved for construction by voters in May 1934. The reservoir's surface area is 73 acres.

Lake Elsman

Lake Elsman is located on Los Gatos Creek in the Santa Cruz Mountains upstream of Lexington Reservoir. The dam elevation is 1,145 feet and has a surface area of approximately 66 acres. The San José Water Company manages the dam and water levels in Lake Elsman.

Lexington Reservoir

Lexington Reservoir is located adjacent to State Route 17 in unincorporated western Santa Clara County approximately one mile south of the Town of Los Gatos. The primary purpose of the reservoir is providing downstream groundwater recharge in Los Gatos Creek and seven systems of percolation ponds downstream. Four of the systems are in the Guadalupe Watershed and three in the Stevens Creek Watershed.

Vasona Reservoir

Vasona Reservoir is located on Los Gatos Creek downstream of Lexington Reservoir in the Town of Los Gatos and adjacent to State Route 17. The primary purpose of the reservoir is storing and releasing water for groundwater recharge in Los Gatos Creek and the 29 percolation ponds downstream. Stream water is diverted from Los Gatos Creek at Kirk Diversion Dam to the ponds via the Page and Kirk ditches.

Alamitos Creek

Alamitos Creek begins below Alamitos Reservoir and ends at the confluence with Guadalupe Creek and the Guadalupe River. Tributaries include Greystone Creek, Randol Creek, Jacques Gulch Creek, Barret Canyon Creek, and Herbert Creek.

Los Gatos Creek

Los Gatos Creek begins in the Santa Cruz Mountains and ends at the confluence with the Guadalupe River. Tributaries include Lime Kiln Creek, Soda Springs Creek, Aldercroft Creek, Black Creek, Briggs

Creek, Moody Gulch, Hendry's Creek, and Austrian Gulch. Hendry's Creek and Aldercroft Creek contribute water most of the year, while Biggs Creek, Black Creek, and Beardsley Creek contribute water during the wet season (Tetra Tech, Inc., 2006).

Guadalupe Creek

in the Santa Cruz Mountains and ends at the confluence of Alamitos Creek and the Guadalupe River. Tributaries include North Los Capitancillos Creek, Rincon Creek, Shannon Creek, Pheasant Creek, and Cherry Springs (Hicks) Creek. North Los Capitancillos Creek, which is upstream of Guadalupe Reservoir, contributes water mainly during flooding events and is considered 'flashy' (water collects quickly and drains quickly). Rincon Creek, although it flows all year due to being spring fed, is also considered to be 'flashy' (Tetra Tech, Inc., 2006).

Guadalupe River

The Guadalupe River begins at the confluence with Alamitos Creek and Guadalupe Creek near Coleman Road and Almaden Expressway, after which it flows north until reaching the Alviso Slough, which discharges to the San Francisco Bay.

Raw Water Conveyance

Valley Water owns and operates a system of local pipelines and ditches to transport and distribute imported and locally conserved raw water for treatment or for groundwater recharge. The systems in the Guadalupe watershed are discussed below.

Almaden Valley Pipeline

The Almaden Valley Pipeline begins at the Calero Reservoir and ends at the Vasona Pump Station in the Town of Los Gatos. It can also convey raw water from the Calero Pipeline and deliver water to the Santa Teresa Main Pipeline. The pipe is 12 miles in length, and ranges from 72 to 78 inches (Tetra Tech, Inc., 2006).

Calero Pipeline

The Calero Pipeline connects the Cross Valley Pipeline east of Calero Reservoir and the Almaden Valley Pipeline west of Calero reservoir. It is 13,700 foot long and carries raw water parallel to McKean Road along the eastern and northern end of Calero Reservoir (Tetra Tech, Inc., 2006).

Central Pipeline

The Central Pipeline crosses the Los Gatos and Guadalupe River subwatersheds and conveys raw water from the Piedmont Valve Yard in east San José to the Vasona Pump Station in Los Gatos. In emergencies the pipeline can also be used to carry water in the opposite direction. The 13.1-mile pipeline crosses the valley to the north of downtown San José and then parallels Los Gatos Creek to the Vasona Pump Station. The Central Pipeline crosses Upper Penitencia Creek and the Upper Penitencia Bypass near the Southern Pacific Railroad tracks, then heads west, crossing over Coyote Creek north of Mabury Road and crosses Guadalupe River between West Taylor Street and West Hedding Street. Finally, the Central Pipeline crosses Los Gatos Creek at State Route 17 (Tetra Tech, Inc., 2006).

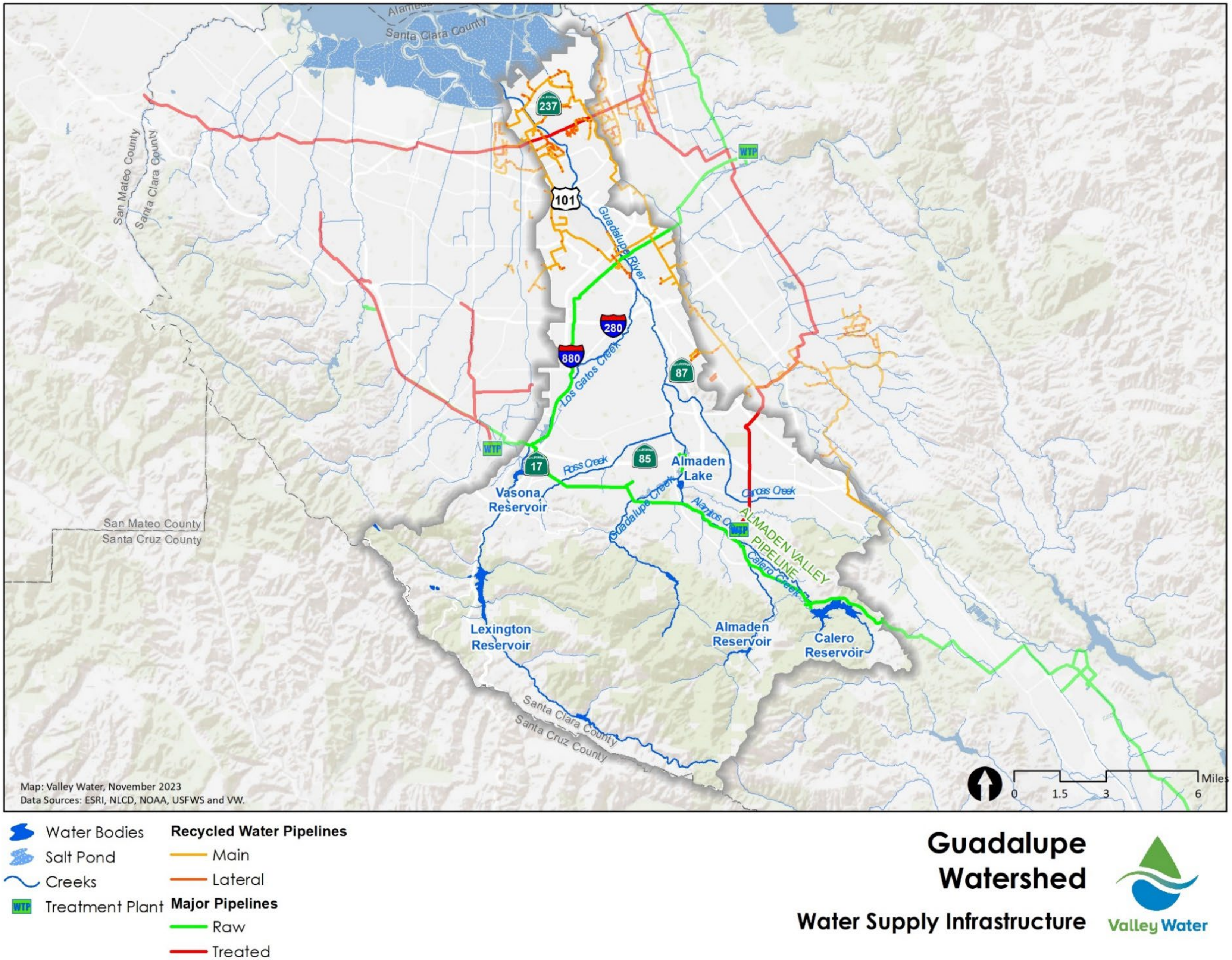

Figure 30: Water Supply Infrastructure

Almaden-Calero Canal
The Almaden-Calero Canal is a series of concrete-lined, open channels connected with siphons and a metal flume. The canal conveys water from Almaden Reservoir to the larger Calero Reservoir during the wet season. Originally constructed in the 1930's, the canal has fallen into disrepair, and drainage through the canal is inefficient (Tetra Tech, Inc., 2006). Valley Water continues to operate the canal when the conditions for water transfer are met. Yearly maintenance activities have kept the canal operational, albeit at a lower carrying capacity. Valley Water has a capital project to restore the canal's capacity and improve its condition.

Masson Diversion Dam
The Masson Diversion Dam is a flashboard dam on a V-shaped concrete footing, located on Los Gatos Creek between Singletree Way and Capitancillos Drive. The dam diverts water to a 30-inch pipe which distributes water to the nearby percolation pond systems. The dam is in operation year-round, unless Guadalupe Dam spills over the spillway, in which case diversion operations cease until the next dry season (Tetra Tech, Inc., 2006).

Page Ditch
The Page Ditch was created in 1857 to provide irrigation for agriculture but was retrofitted to serve recharge purposes after the recognition of groundwater decline during the 1920s (Tetra Tech, Inc., 2006). The ditch originates in Los Gatos near the Page Drop Structure on Los Gatos Creek. Water is diverted from the ditch into the Camden Percolation Ponds before entering the Page Percolation Ponds System. Some of the water is diverted to the Page Settling Basin on Dell Avenue and some water bypasses this facility. After traveling via a pipeline from Dell Avenue to Winchester Boulevard, water is then diverted from the Page Ditch to fill the Page Ponds and the Sunnyoaks and Budd Avenue ponds via a pipeline from the Page Ponds. Water remaining in the ditch is carried via open channel to Smith Creek, which is in the San Tomas Aquino Watershed in the West Valley (Tetra Tech, Inc., 2006).

Kirk Ditch
Kirk Ditch is the canal connecting Los Gatos Creek with the Oka Percolation Ponds and the McGlincy Percolation Ponds (Tetra Tech, Inc., 2006). The canal begins at the Kirk Dam and can take water from Los Gatos Creek or the Central Pipeline. North of the Oka Percolation Ponds, the Kirk Ditch passes under State Route 17 and then parallels the freeway on the east side to reach a pipeline under Camden Avenue. This pipeline takes the remainder of flow in the canal to its terminus at the McGlincy Ponds (Tetra Tech, Inc., 2006).

Imported Water
The Guadalupe Watershed receives imported water conveyed through the Delta from the federal Central Valley Project (CVP) and the State Water Project (SWP), and from the San Francisco Public Utilities Commission (SFPUC) Regional Water System (linked to Hetch Hetchy). CVP supplies are delivered to the watershed from San Luis Reservoir via the Santa Clara Conduit, which terminates at Coyote Pumping Plant near the base of Anderson Dam. CVP supplies are delivered to the Rinconada and Santa Teresa Water Treatment Plants, surface water permittees, or Calero Reservoir in the Guadalupe Watershed via the Cross-Valley Pipeline.

SWP supplies are delivered to the watershed from the Delta via the South Bay Aqueduct (SBA), which terminates at the South Bay Aqueduct Terminal Tank adjacent to the Penitencia Water Treatment Plant in the Coyote Creek Watershed. SBA supplies are delivered to the Rinconada Water Treatment Plant and recharge facilities in the Guadalupe Watershed via the Central Pipeline.

SFPUC delivers drinking water directly to the City of Santa Clara and portions of San José (and other customers in other watersheds). Average SFPUC deliveries to Santa Clara are about 4,000 AFY and deliveries to San José Muni are 5,000 AFY. SFPUC supplies are considered treated water and are of excellent quality, consistently meeting or exceeding drinking water standards.

Treated Water

Treated water deliveries provide "in-lieu" groundwater recharge, which helps keep groundwater supplies from diminishing and land from subsiding. By meeting demands that would otherwise be met by pumping groundwater, these programs provide in-lieu recharge (as if the groundwater subbasins had been recharged by that amount).

Santa Teresa Water Treatment Plant

The Santa Teresa Water Treatment Plant (STWTP) serves south San José and east San José in the Guadalupe Watershed. STWTP produces about 35,000 AFY of treated water using primarily Federal/State Water Project supplies. It should be noted that Penitencia Water Treatment Plant (PWTP) in the Coyote Creek Watershed, which primarily uses SWP/CVP supplies, also provides treated water to the STWTP service area (~20,000 AFY), since the two treatment plants share distribution pipelines. Both STWTP and PWTP can also use local supplies. Valley Water treated water consistently meets or exceeds drinking water standards.

Rinconada Water Treatment Plant

The Rinconada Water Treatment Plant (RWTP) serves the cities of Santa Clara, Monte Sereno, Los Gatos, Campbell, as well as the western and central portions of San José in the Guadalupe Watershed. RWTP produces about 40,000 AFY of treated water using primarily sources from the Federal and State Water Projects but can also use local supplies. Valley Water treated water consistently meets or exceeds drinking water standards.

Recycled and Purified Water for Potable and Non-Potable Reuse

Recycled water is an important source of water for irrigation and industrial use. Since 2015 an average of 12,500 Acre Feet (AF) of recycled water produced by the South Bay Water Recycling program is delivered annually to customers residing in the Guadalupe Watershed. Recycled water is produced from wastewater that has been treated to meet strict standards set by the California Division of Drinking Water per regulations under the Title 22 section of California's Code of Regulations. Purified water receives additional treatment to meet drinking water standards. Usage of recycled water helps conserve drinking water supplies, provide dependable, drought-proof, and locally-controlled water supply, reduce reliance on imported water, offset demands on groundwater, and provide in-lieu groundwater recharge. It also helps reduce the volume of fresh wastewater discharged from Publicly Owned Treatment Works (POTWs), which contributes to diminishing higher salinity tidal marsh habitats in the South Bay necessary to sustain native species.

To adapt to increasing uncertainties and secure a reliable, sustainable water supply for the region, Valley Water set a goal to meet 10% of Santa Clara County's total water demands by a combination of recycled and purified water for non-potable and potable reuse. Reuse improves resilience to future uncertainties, including drought and climate change. Valley Water's Board of Directors also established a long-term goal of producing up to 24,000 acre feet per year (AFY) of purified water for potable reuse (drinking water) by the year 2040 to bolster supplies.

Water Conservation

Valley Water and all major retail water providers partner in regional implementation of a variety of water-use efficiency programs (water conservation programs) to permanently reduce water use in the county. Valley Water's long-term savings target is to achieve 109,000 acre-feet per year in water savings by 2040 (110,000 acre-feet per year when including stormwater capture projects). Valley Water currently implements approximately 20 different ongoing water conservation programs including incentives and rebates, free device installation, free delivery of water-saving devices and educational resources, one-on-one home visits, site surveys, and educational outreach to reduce water consumption in homes, businesses, and agriculture. These programs are designed to achieve sustainable, long-term water savings.

Related Plans

Urban Water Management Plan

The Urban Water Management Plan (UWMP) is a long-range planning document that is required by CA Department of Water Resources. The UWMP is essentially a state-mandated master plan that includes an agency's projected water supplies and demands over the next 25 years, as well as water shortage contingency planning and conservation efforts. The plan is required to be updated every five years, and failure to comply with this legal requirement will jeopardize an agency's eligibility for State funding. The plan was last updated in 2020 and next plan update will be in 2025.

Water Supply Master Plan

The Water Supply Master Plan (WSMP) is Valley Water's guiding document for long-term water supply investments to ensure water supply reliability for Santa Clara County. Updated about every five years, this long-range plan assesses future county-wide demands and evaluates and recommends water supply and infrastructure projects to meet those demands to achieve Valley Water's level of service (LOS) goal through the planning horizon. Valley Water's LOS goal is "Meet 100 percent of annual water demand during non-drought years and at least 80 percent demand in drought years." The most recent plan, Water Supply Master Plan 2040, was adopted by the Valley Water Board of Directors (Board) in 2019. Valley Water is currently developing the WSMP 2050, which extends planning horizon to 2050 and is expected to be completed by the end of 2024.

4.3 FUTURE CONDITIONS, CHALLENGES, AND OPPORTUNITIES

The future of Water Supply in the Guadalupe Watershed will be shaped by a unique set of challenges and opportunities, some ongoing, and some to be anticipated in the years to come.

Challenges

Climate Change

Climate change is predicted to bring impacts such as warming temperatures, shrinking snowpack, extreme weather, prolonged droughts, and wildfire. Some of these impacts are already being experienced across California and Santa Clara County. Future projections indicate that the Santa Clara Valley could experience a change in hydrologic patterns and an increase in rainfall averages, as well as an increase in the length and intensity of droughts. This means that the valley's extreme events (storms and droughts) could become even more extreme compared to historic conditions, changing the ways that Valley Water manages and utilizes its water supply. The reliability of local and imported water will become increasingly uncertain, and additional climate impacts such as increased wildfires could threaten water supply infrastructure and power supply. Collectively, climate-related impacts have the potential to compound and simultaneously impact multiple aspects of Valley Water's operations. Climate change will make it more challenging to balance priorities such as providing enough water supply to meet demand while maintaining stream flows and water quality amidst severe drought conditions.

Valley Water developed a Climate Change Action Plan (CCAP), which was adopted by the Board of Directors in July of 2021. The plan addresses Valley Water's climate vulnerabilities and provides actions to address them. The 2021 Groundwater Management Plan (Valley Water, 2021b) presents a projected groundwater budget that incorporates future climate change and describes likely operational flexibility to compensate for changes in groundwater storage, and Valley Water's water supply planning team is evaluating how climate change could impact future local and imported water supplies through long-range planning efforts.

Uncertainties Surrounding Imported Water Supplies

Compounded with climate change, uncertainty surrounding state regulations applicable to imported water sourced from the Delta, as well as drought and competing demands from other water uses pose challenges to water supply both countywide and within the Guadalupe Watershed. A significant portion of Valley Water's water supply is not local, nor under Valley Water's complete control. Valley Water relies on the CVP and SWP for 40% of its water supplies on average (Valley Water, 2023d). Consequently, threats to the Delta, such as levee failures, saltwater intrusion, and declining fish populations, pose problems to water supply reliability and water quality for Santa Clara County, thereby within the Guadalupe Watershed as well.

Constraints on In-stream Recharge:

In the Guadalupe watershed, Valley Water has water rights which can be used for in-stream recharge. Alteration of flows and certain potential projects identified by the FAHCE settlement agreement have the potential to reduce the amount of water Valley Water is able to recharge in the Guadalupe Watershed.

Changes in Land Use and Water Demand:

Changes in land use and new development can increase demand for water and, if not offset with new supplies or additional water conservation, can create water shortages. The uncertainties in water demand forecasting associated with climate change will make advanced planning for increased development and demand even more challenging. It is important that planned water conservation savings (a One Water metric) are achieved in the Guadalupe watershed and throughout the County. However, effective One Water management will continue to require Valley Water's engagement with land use decisions in areas critical to supply and recharge.

Restrictions on Reservoir Storage:

Recent advancements in the understanding of earthquakes and how to best design infrastructure to withstand them has led to design codes for dams that are more robust. One specific concern relevant to the Bay Area is liquefaction, in which the soil underneath dams becomes liquified during ground shaking, causing dams to slump. Although the dams were built to the current standards of the time they were constructed, seismic evaluations on Valley Water's dams with current design standards revealed that there are several dams that need upgrades to meet current design codes. In the Guadalupe Watershed, Almaden, Calero, and Guadalupe Reservoirs are in need of seismic retrofits. For safety reasons, these reservoirs operate with a restricted capacity to reduce to risk of damage to the dam during a large earthquake.

Seawater intrusion along the Bayshore and Lower Guadalupe River

Due to historical groundwater pumping and land subsidence, particularly in the middle of the twentieth century, seawater intrusion has been observed in the shallow aquifer of the Santa Clara Plain (Valley Water, 2021b). Currently, the greatest inland extent of the seawater intrusion occurs near the Guadalupe River and leakance of saltwater beneath the tidal stream flow in the Guadalupe River is a likely mechanism that contributes to seawater intrusion in the shallow aquifer (Valley Water, 2021b).

Implementation Challenges of Direct and Indirect Potable Reuse

Direct potable reuse is the planned introduction of purified water either directly into a public water system or into a raw water supply upstream of a water treatment plant. Indirect potable reuse is the term for purified water that has passed through an environmental buffer, such as a lake or a groundwater aquifer, before being treated at a water treatment plant for use as drinking water. While a promising way to reduce the need for new water supplies for potable water use, there are regulatory and technical implementation challenges that impact these types of uses in Santa Clara County.

Opportunities

Expanding Water Supplies

There are several strategies that have the potential to increase water supply in Santa Clara County, or to enhance reliability of those supplies. Many of these strategies are fully explained in more detail in the Valley Water's Water Supply Master Plan. One strategy is to expand the use of recycled water by expanding the current distribution system to reach more users, as well as constructing more treatment plants capable of producing recycled water. Another strategy is expanding the use of Forecast-Informed Reservoir Operations (FIRO), which uses advanced forecasting techniques to maximize the amount of water in Valley Water's local reservoirs.

Expanding Groundwater Recharge

Flood-Managed Aquifer Recharge (FloodMAR) is one way in which groundwater recharge could be expanded to increase water supply and potentially reduce stormwater runoff into urban areas. A pre-feasibility study identified that capturing hillside runoff onto open space before it reaches roads and storm sewers may be the most feasible approach to Flood-MAR in Santa Clara County. Valley Water is continuing studies to assess the feasibility of this in Santa Clara County. Unlike our existing managed aquifer recharge or large scale FloodMAR contemplated for the Central Valley, Valley Water expects the amount of water captured to be relatively smaller. Valley Water presents updates on Flood-MAR feasibility in Santa Clara County to the Water Conservation and Demand Management Committee.

Non-Potable Water Reuse through Stormwater Capture

Stormwater is a critically untapped resource and could be an alternative water supply. Capture for onsite reuse or recharge can provide an alternative non-potable water supply, but it does have challenges. Currently, there are no adopted water quality standards to use stormwater as with recycled water. An investment in stormwater capture can also be an investment in surface water quality improvement, flood control, green space creation, street beautification, water conservation, and groundwater recharge.

SECTION 5: WATER QUALITY

The following section focuses on water quality issues across Guadalupe Watershed, including source and surface waters as well as attributes associated with chemical, biological and physical water quality.

5.1 HISTORICAL CONDITIONS

Water quality in the Guadalupe watershed has been directly impacted by local and watershed-wide land use changes that date back to the time of Spanish and Mexican land grants in 18th and 19th century California. The rapid increase in the local population caused by the Gold Rush had an adverse impact on water quality due to agricultural draining and human stream modifications.

Livestock grazing starting in the late 1700s negatively affected water quality in the Guadalupe watershed by adding pathogens and excess nutrients to the creeks, as well as causing stream bank erosion and increased sediment load to the creeks (Tetra Tech, Inc., 2006). These grazing impacts continue to this day in the upper watershed.

In the early 1900s, orchards replaced many pastures. During this time, the number of dairies also increased as the population of Santa Clara Valley grew. Water quality impacts from orchards included an increase in fine-grained sediment discharges to creeks as well as pesticide toxicity impairments. Dairies degraded water quality by introducing pathogens and excess nutrients to the waterways.

Urban development in the 20th century increased pollution from runoff into storm drains and creeks, which continues to this day. Through the middle of the 20th century, groundwater pumping for urban uses resulted in six to eight feet of land subsidence in downtown San José, exacerbating fine-grained sediment deposition from municipal storm sewers in creeks (Tetra Tech, Inc., 2006).

Industry and mining also contributed historic and ongoing pollution to the Guadalupe watershed (Figure 31). The indigenous mining of cinnabar in the hills of the Guadalupe watershed was increased significantly when mercury mining operations occurred between 1845 and 1975 in what is now the present location of the Almaden Quicksilver County Park. The New Almaden mines were the first large-scale mining operation in California and among the most productive mercury mines in the history of the United States. The principal mercury ore, cinnabar (mercury sulfide), is typically contained within a host silica carbonate rock. Processing cinnabar involved crushing the ore and reducing it to elemental mercury in retorts or furnaces. The burned rocks, referred to as calcines, were dumped in piles near the processing areas or used as road base material. The calcine piles remain at the site and vary in area, steepness, mercury concentration, and particle size distribution (Tetra Tech, Inc., 2006).

While Clean Water Act legislation in the 1970s led to major improvements in water quality throughout the region and nation, sediment, trash, pathogens and pesticides remain ongoing problems for the Guadalupe Watershed.

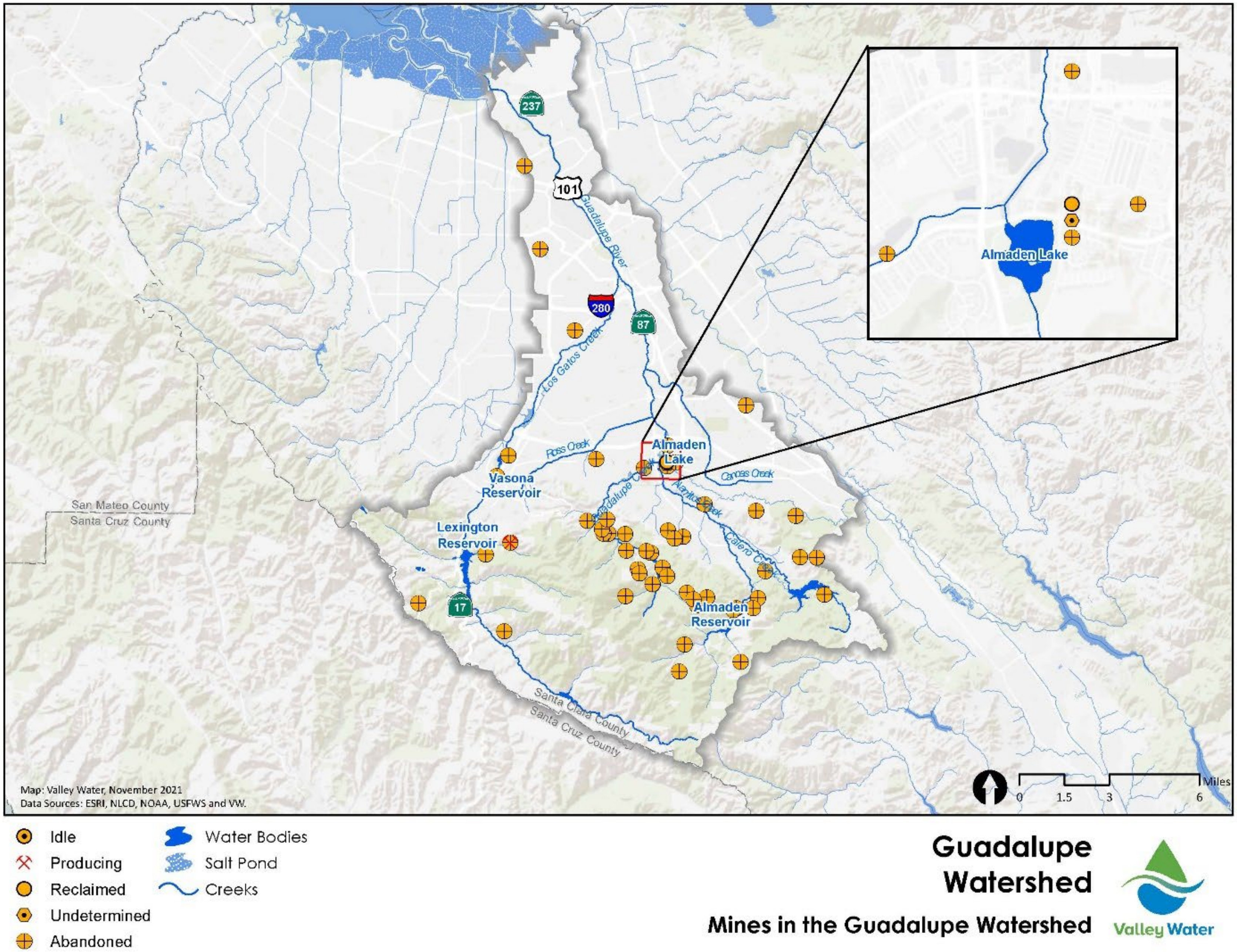

Figure 31: Guadalupe Watershed - Mines in the Guadalupe Watershed

5.2 PRESENT CONDITIONS

In a well-functioning watershed, natural processes work to sustain good water quality — water in which native fish and other biota thrive and humans can safely use. However, mining, ranching, agriculture, industrial activities, manufacturing, urbanization, and construction of water management infrastructure have all altered the natural dynamics of many streams. In addition to changing natural hydrology, direct and indirect pollution from both human and natural sources undermines the water quality necessary to support beneficial uses.

A general description of Valley Water's water quality protection and management activities throughout Santa Clara County, including the regulatory context, can be found in section 2.2.3 of the One Water Framework (pp.40-48) (Valley Water, 2021e), as well as its Appendix C. A discussion of how past conditions and land use changes affected water quality can be found in Section 2.1. of the Framework (pp. 11-22).

Valley Water's water quality management is categorized into three types: source water (in reservoirs for eventual treatment for human use, groundwater recharge, or ecological purposes), surface water (in creeks and urban runoff), and groundwater. In general, primary water quality issues in the Guadalupe Watershed include mercury, sediment, trash, pathogens, urban runoff, elevated temperature, pesticides, and algal blooms from excess nutrients (Figure 32). While Valley Water's overall water quality goal remains to protect the beneficial uses of these waters, new thinking about the relationships between water quality, natural flood protection, water supply, and watershed restoration informs One Water planning.

Source Water

Protecting the quality of source water in the five reservoirs in the Guadalupe Watershed, and their associated sources, is central to Valley Water's operations. Calero Reservoir is the only reservoir of the five that directly provides local drinking water and is monitored for source water quality as a result. Almaden Reservoir is also monitored for source water quality since it is connected to Calero Reservoir, while the remaining reservoirs primarily support groundwater recharge and ecological purposes. Every five years, Valley Water conducts the Local Watershed Sanitary Survey (WSS) for Calero and Almaden reservoirs in Guadalupe Watershed and Anderson and Coyote Reservoirs in Coyote Watershed. The latest survey occurred in 2021, covering the years between 2016 and 2020. In general, water quality in Calero and Almaden Reservoirs was good during this period and did not experience significant impacts from potential contaminant sources. Potential contaminant sources to the reservoirs are summarized in Table 6 below. The table lists watershed activities that can contaminate water in the reservoirs, as well as the potential risk of each activity. Valley Water classifies water quality threats to its reservoirs as either low, medium, medium-high, or high. Risk level is based on treatability and likelihood of contamination.

Valley Water's water quality management priorities and concerns for the five reservoirs address not only direct impacts to the reservoirs themselves, but also impacts that may arise to water treatment plants (WTPs) downstream. The most significant contaminant sources are those associated with pathogens (e.g., livestock, wildlife, and wastewater) due to public health risks. Calero and Almaden Reservoirs are most vulnerable to these contaminants from recreation, high density residential development, and historic Valley Water and its partners do to monitor and manage it.

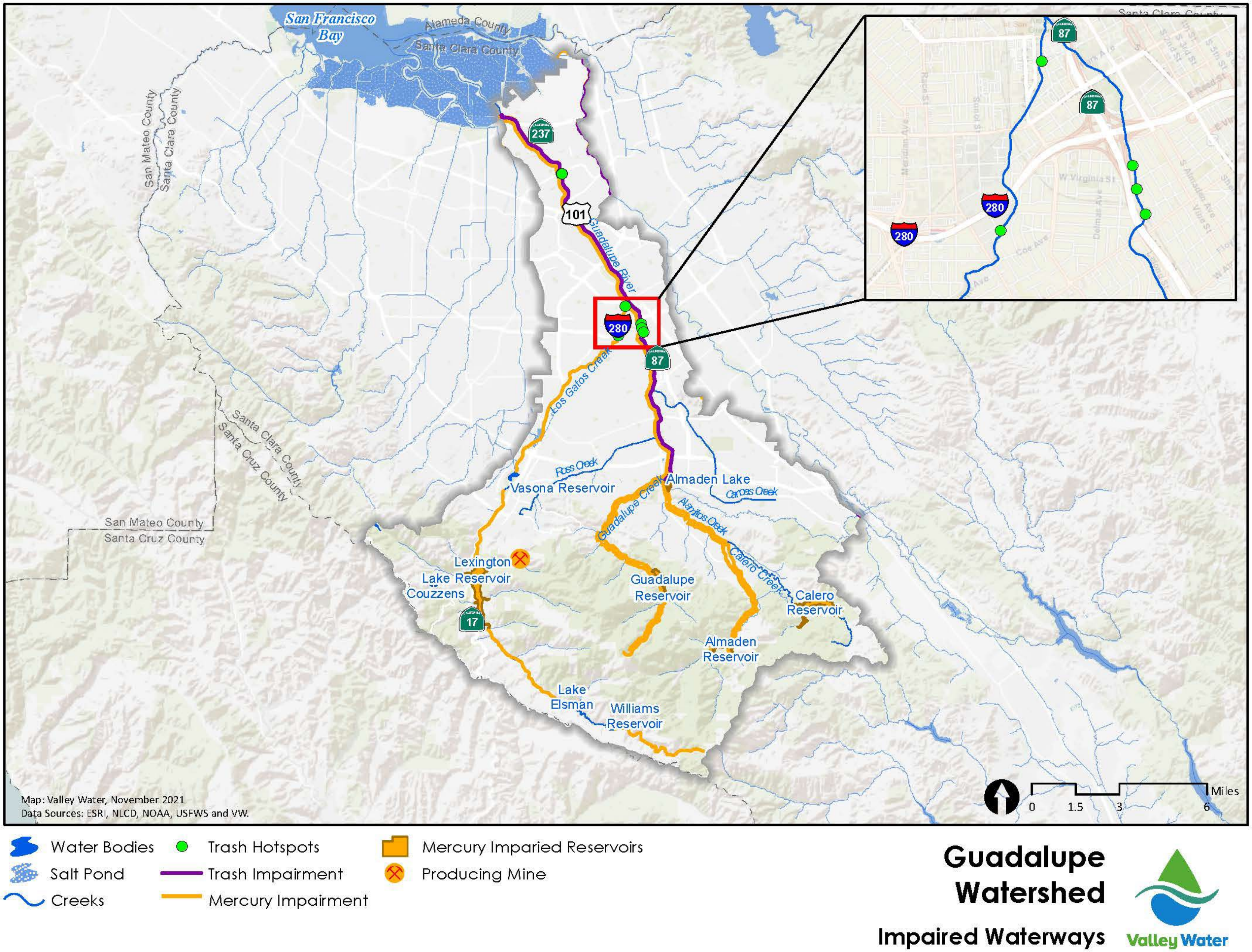

Figure 32: Impaired Waterways

Table 6: Potential Contaminant Sources and Risk Level

Risk Associated with Contaminant Sources

Watershed Activities	Potential Risk
Geologic Hazards and Inactive Mines	High*
Grazing and Concentrated Animal Facilities	Medium-High
Hazardous Materials	Low
Pesticide and Herbicides	Low
Recreation	Medium
Sewage Systems	High
Urban Runoff/Spills	Low
Wildfires	Medium-High
Wildlife	Medium

*Risk is high in Almaden Reservoir watershed.

Pathogens

There were slightly elevated *E. coli* and *Enterococci* on Calero Creek, just downstream of Calero Reservoir, based on very few stormwater monitoring samples, but were within historical range. *E. coli* may be introduced from the upstream private homes with equestrian uses, equestrian use of County Park trails, or wildlife such as feral pigs. Recreational trails can contribute pathogens through storm runoff that can carry pollutants from the trails to the reservoir. The relative contribution of pathogens from the trail system is unknown, but probably minor. Wild animals can contribute pathogens, nutrients, and sediments to the reservoir as well. Feral pigs are often considered the greatest wildlife threat to water quality due to their tendency to cause erosion through their rooting behavior and to their role as carriers of the pathogenic protozoa.

Golf courses can also contribute nutrients, pathogens, and pesticides to source and surface waters. Cinnabar Golf Course is located south of Calero Reservoir along Calero Creek. Cinnabar Golf Course submits regular self-monitoring results to the San Francisco Water Quality Control Board to ensure that it is not contributing pathogens from its wastewater collection and treatment facilities.

Nutrients, Pesticides

Recreational activities (e.g., trails and golf courses) can also contribute nutrients to Calero Reservoir, through storm runoff. As mentioned above, Cinnabar Golf Course submits regular self-monitoring results to ensure that it is not contributing nutrients from its greenways. High nutrient inputs into Calero from the golf course and from imported water previously stored in San Luis Reservoir, combined with large shallow areas within the reservoir, make Calero prone to algal blooms. Excessive algal growth can result in taste and odor problems due to 2-Methylisoborneol (MIB), geosmin and other byproducts of algal growth that have an earthy/musty taste and odor. The death and decay of algal blooms can lead to anoxic conditions in the hypolimnion (the bottom layer of a stratified reservoir) and the subsequent release of sulfide, manganese, and iron from the sediment. Elevated levels of geosmin concentrations were experienced in summer and fall of 2017 and elevated MIB concentrations were experienced at Calero Reservoir in 2020. Valley Water also monitors the Title 22 suite of regulated chemicals within Calero and Almaden Reservoir and has not detected any pesticides.

Sediment, Turbidity

Wildfires can cause increased erosion and sedimentation in reservoirs. The area surrounding Calero and Almaden Reservoirs is prone to wildfire, though there have been no recent recorded wildfires within the surrounding subwatershed. Storm runoff from erosive soils in the Alamitos subwatershed and from trails and golf courses may cause elevated turbidity, high concentrations of Total Organic Carbon (TOC), and high Total Dissolved Solids (TDS) in the reservoirs.

The Almaden-Calero Canal is open along most of its alignment and much of it is adjacent to public roads and road crossings. In the upper reach along Bertram Road, the terrain is steep with some earth movement and the area near Cinnabar Hills Road is made up of residential developments of large homes with large impervious surfaces. All of these vulnerabilities increase the risk of sediment and other contaminants reaching the Canal, which will only increase as the New Almaden area develops and traffic increases.

Mercury

The inactive quicksilver mines within the Alamitos watershed still pose a pollutant risk to source waters. The Almaden Reservoir, Guadalupe Reservoir, Calero Reservoir, Lake Almaden, and Lexington Reservoir are listed for mercury on the State's 303(d) list of impaired water bodies due to mine tailings. From a human health perspective, ingestion of methylmercury from mercury-contaminated fish is the main concern. Fish with elevated mercury have been found in Guadalupe Reservoir, Almaden Reservoir, Alamitos Creek, and Almaden Lake (Tetra Tech, Inc., 2006). Valley Water conducts monthly water quality monitoring in Almaden, Calero, Guadalupe, and Stevens Creek Reservoirs as part of the total maximum daily load (TMDL) requirements.

Drought Impacts, Invasive Species

During extreme drought years, the water quality in Calero Reservoir has been impacted. Since Calero operates as a terminal reservoir to store San Luis Reservoir water, it's water quality may be impacted by San Luis Reservoir supplies. For instance, during the high drought years in 2013 to 2016, the water quality in Calero Reservoir was significantly impacted by drought, particularly for bromide and chloride, due to the lack of supply from San Luis Reservoir. San Luis Reservoir water quality is degraded during droughts when, for example, lower inflows to the Delta increase Delta salinity levels. Additionally, in the 2014 and 2015 drought years, TOC levels in Calero Reservoir increased, but this trend was not observed during the 2016 or 2020 drought conditions. Another potential wildlife contaminant to the reservoirs are invasive mussel species that can inhibit source water supply systems. Quagga and zebra mussels are monitored monthly at all Valley Water reservoirs (except Vasona Reservoir). To date, no veliger or adults have been detected in any of the local reservoirs.

Surface Water

Section 303(d) of the 1972 Federal Clean Water Act requires states to identify water bodies that do not meet water quality objectives and are not supporting their designated beneficial uses. Several surface water bodies are listed on the State's 303(d) list as impaired, and currently implement water quality improvement programs under Total Maximum Daily Load (TMDL) requirements or regulatory stormwater compliance. Primary surface water quality concerns for the Guadalupe Watershed include sediment, trash, mercury, and urban runoff pollutants of concern. The sections below further describe these concerns.

Stormwater

Throughout the Guadalupe Watershed, stormwater runoff is considered the largest pathway of pollutants to aquatic systems. Although stormwater runoff is part of the natural hydrologic cycle, human activities can alter natural drainage patterns, introduce pollutants, and increase erosion, degrading natural habitats. In the urbanized sections of the watershed, runoff can pick up pollutants such as trash, pesticides, pathogens, and various legacy pollutants such as PCBs. To protect surface waters, communities, construction companies, industries, and others within the watershed are regulated under the Clean Water Act through the National Pollutant Discharge Elimination System (NPDES) permits for stormwater discharges. Valley Water, the Cities of Campbell, San José, Santa Clara, Monte Sereno, and Town of Los Gatos within the Guadalupe Watershed are responsible for implementing and complying with the Municipal Regional Stormwater NPDES Permit (MRP) for the San Francisco Bay Region.

Trash

Various urban reaches of all creeks in the Guadalupe Watershed are impacted by trash. This trash can come from illegal dumping, unsheltered encampments along the creeks, and untreated storm drain outfalls. Valley Water has a memorandum of agreement to work cooperatively with the City of San José to conduct encampment cleanups in cooperation with the San José Police Department and the City's Environmental Services and Housing Departments throughout the Guadalupe Watershed within City of San José boundary. Through the Good Neighbor Program's Encampment Cleanup Project, Valley Water staff and agency partners remove trash, debris, and hazardous materials from creeks throughout the county. Additionally, under the MRP, permittees are required to implement trash load reduction actions from on-land sources and in the municipal separate storm sewer systems (MS4) to reach 100% reduction in trash discharged from the MS4 by 2025. To reach this milestone, local agencies implement various on-land actions (e.g., street sweeping, on-land cleanups) and install full trash capture devices to capture trash in the MS4 before it enters the receiving waters. Reports on trash load reduction efforts are submitted annually and are available via the Water Board's Stormwater Multiple Application and Report Tracking System (SMARTS) - https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.xhtml.

Mercury

Erosion and runoff from legacy calcine piles, waste rockpiles (unprocessed rock), and road material cause mercury-laden sediment to be transported into nearby surface waterbodies that are tributaries to the Guadalupe River (Tetra Tech, Inc., 2006). Mercury in large doses can be debilitating to the human nervous system. It is especially dangerous for pregnant women (developing fetuses), infants, and children, where it is more likely to cause neurological and developmental harm. The form of mercury of concern from a human health perspective is methylmercury from ingestion of mercury-contaminated fish. Fish with elevated mercury have been found in Guadalupe Reservoir, Almaden Reservoir, Alamitos Creek, and Almaden Lake (Tetra Tech, Inc., 2006). Additionally, Guadalupe River, Alamitos Creek, Guadalupe Creek, Almaden Reservoir, Guadalupe Reservoir, Calero Reservoir, Lake Almaden, and Lexington Reservoir are listed for mercury on the State's 303(d) list of impaired water bodies.

PCBs

PCBs are a mixture of individual liquid or solid chemicals that are odorless or mildly scented. PCBs are no longer produced in the United States but were once used as flame retardants and in electrical components, and in sealants such as caulk and expansion joints. PCBs-containing oil was also used in some locations for dust control. Due to the nature of their uses, their presence in the landscape is most common in areas of older industrial land use. The regional Water Quality Control Board requires that local agencies reduce the load of PCBs from urban runoff by 90%. To do this, municipalities have developed various programs including a screening program to keep PCBs from building materials out of the storm drain system during building demolition; inspection and referral to the Regional Board of industrial source properties; and strategic implementation of green stormwater infrastructure to achieve PCBs load reduction.

PFAS

Per- and Polyfluoroalkyl Substances (PFAS) are a group of thousands of synthetic chemicals that resist heat, oils, stains, and water. They have been widely used in consumer products like nonstick cookware, carpets, waterproofing clothing, furniture fabrics and food packaging. They are also used in industrial processes and firefighting foams. Because of their widespread use, persistence in the environment, and potential health impacts PFAS are a concern for water resources.

Surface water from Los Gatos Creek was sampled and analyzed for PFAS as part of a site investigation of the former San José Fire Training facility in the Guadalupe Watershed. Several PFAS were detected in these samples, with the highest values observed downstream of the site. Valley Water has also tested PFAS in stormwater, percolation ponds, and recharge source waters in the Los Gatos Recharge System. PFAS were generally not detected in recharge source waters but were present at generally low levels in various pond and stormwater samples.

Temperature

Los Gatos Creek is listed on the State’s 303(d) list of impaired water bodies for elevated temperature. Temperatures in the creek can increase when water resides in pooled areas such as lakes and reservoirs, as well as when the creek is exposed to sunlight with no shaded canopy. Legacy flood and erosion control efforts on the creek have resulted in significant amounts of hardscape can also increase temperatures due to surface water runoff.

Groundwater

Valley Water’s groundwater protection programs have ensured that groundwater is a viable water source for current and future beneficial uses. The managed recharge program has helped to prevent permanent land subsidence since the early 1970s, as well as to mitigate threats of seawater intrusion from the San Francisco Bay. Valley Water’s 2021 Groundwater Management Plan (Valley Water, 2021b) outlines the many programs and activities that protect groundwater supplies and quality.

The Santa Clara Plain groundwater management area is the primary source of groundwater for the northern Santa Clara Valley. The Santa Clara Plain generally produces groundwater of good to excellent quality for all beneficial uses identified by the San Francisco Bay Regional Water Quality Control Board, which include, but is not limited to, supply for purposes of municipal and domestic use, industrial service supply, industrial processes, agriculture, and groundwater recharge, and freshwater replenishment to surface waters. Unless otherwise designated by the Water Board, all groundwater is considered suitable, or potentially suitable, for municipal or domestic water supply. There are numerous threats to groundwater quality resulting from commercial, industrial, and residential development, including urban runoff, industrial chemicals, and underground storage tanks. Residential and agricultural use of nitrogen-based fertilizers and pesticides, as well as septic system use in rural areas, can also affect groundwater quality.

Continued efforts to maintain and protect the quality of natural and managed groundwater recharge are critical to providing a reliable supply of high-quality water for Santa Clara County. Some of these programs include reviewing land use plans and encouraging the preservation of natural infiltration and the reduction of impervious surfaces in areas that contribute to groundwater recharge; implementing Valley Water's well ordinance program to protect groundwater resources from contamination; assessing the vulnerability of groundwater subbasins to land use activities; and coordinating with regulatory agencies on groundwater cleanups.

Valley Water conducts ongoing monitoring to assess groundwater quality in the Santa Clara Plain groundwater management area, including regional monitoring, domestic well sampling, and focused monitoring in areas of historic seawater intrusion. The goal of Valley Water's groundwater quality monitoring is to collect data to support the evaluation of regional groundwater quality conditions for the shallow (<150 feet) and principal aquifers (>150 feet) and, the extent and severity of contamination including the presence of contaminants above drinking water standards, changes in water quality over time, and potential threats to the long-term viability of groundwater resources. The 2021 Groundwater Management Plan describes water quality related outcome measures and associated outcome measure-lower thresholds (Valley Water, 2021b). The outcome measures and lower thresholds are quantifiable goals to track performance of sustainable management and are functionally equivalent to measurable objectives under SGMA.

County wide, Valley Water collects groundwater quality from nearly 300 monitoring and domestic wells, including dedicated wells that are sampled each year, wells tested through a voluntary sampling program, and wells near recycled water irrigation sites (Valley Water, 2023b). Valley Water also obtains groundwater quality data from almost 250 public water supply wells from the State's Division of Drinking Water database every year (Valley Water, 2023b). Groundwater in the Santa Clara Plain continues to have very good quality (Valley Water, 2023b). Public water systems must comply with drinking water standards, which may require treatment or blending prior to delivery. The most common contaminant found in Santa Clara County is nitrate, which is more of a concern in south county beyond the Guadalupe Watershed. Nitrate can interfere with the blood's ability to transport oxygen and is of greatest concern for infants and pregnant women as it can cause serious illness; symptoms include shortness of breath and blueness of the skin. The U.S. Environmental Protection Agency is developing drinking water regulations for several specific PFAS. While PFAS do not appear to be widespread in local groundwater, some water retailer wells are expected to be impacted if the EPA regulations are adopted as proposed, which could require treatment or other actions.

Seawater Intrusion

Due to historic high groundwater pumping and land subsidence, particularly in the years following World War II, seawater intrusion has been observed in the shallow aquifer of the Santa Clara Plain adjacent to San Francisco Bay (Valley Water, 2021). Seawater intrusion (also called saltwater intrusion) refers to the temporary or permanent flux of seawater into coastal freshwater aquifers.

Seawater intrusion is a groundwater management concern because it can degrade groundwater quality and, if severe enough, result in undesirable conditions that may include limiting groundwater as a water supply for municipal and industrial uses, agriculture, and domestic uses, or degrading groundwater dependent ecosystems or infrastructure. Reclaiming freshwater aquifers after seawater intrusion is very costly and time-consuming, if not practically infeasible in many cases. Therefore, sustainable groundwater management programs and actions that prevent or mitigate seawater intrusion are preferred to costly remediation (Valley Water, 2021b). Valley Water's 2021 Groundwater Management Plan includes a seawater intrusion outcome measure that is based on decades of water quality monitoring in the Santa Clara Plain. Most supply wells in the Santa Clara Plain are screened in the deeper, principal aquifer zone, where no widespread seawater intrusion has been observed (Valley Water, 2021b). Significant increases in groundwater pumping or sea level rise due to climate change could lead to renewed seawater intrusion. Therefore, Valley Water's groundwater quality monitoring program and seawater intrusion outcome measure are designed to characterize the extent of seawater intrusion and be an early-warning indicator of worsening conditions so that appropriate groundwater management actions can be implemented.

5.3 FUTURE CONDITIONS, CHALLENGES, AND OPPORTUNITIES

The future of water quality in the Guadalupe Watershed will be shaped by a unique set of challenges and opportunities, some ongoing, and some to be anticipated in the years to come.

Challenges

Stormwater Runoff

Stormwater runoff is a key pathway contributing to pollutants in the Guadalupe Watershed. In particular, non-point source pollution from urban runoff can raise water temperatures, reduce biological conditions, scour channels, and mobilize various pollutants (e.g., trash, pesticides, sediment, PCBs, nutrients, pathogens, contaminants of emerging concern). Increasing temperatures due to climate change may increase the warming effects of urban runoff, reducing the potential for streams to support sensitive organisms such as steelhead. Continued sediment toxicity from new pesticides continues to be a challenge to control at the watershed level as regulation and use is controlled by the California Department of Pesticide Regulation (DPR). Hydrograph modification management also is a challenge for water quality in the urban reaches, especially related to sedimentation and erosion, however stormwater regulations have been adopted and implemented to minimize future effects.

Unsheltered Encampments

Homelessness is a problem throughout the country and has a major impact on the amount of trash, erosion, and human pathogens in urban creeks including Guadalupe River and Los Gatos Creek. Joint agency unsheltered encampment cleanups and supportive services programs continue but at best only keep pace with this significant societal problem.

Climate Change

Changes to the climate will also affect groundwater and water supply. Rising sea levels mean an increasing risk of seawater intrusion along the bayfront, which could be exacerbated by increased groundwater pumping due to increased demand and lack of other water supplies. Sea Level rise also increases the risk of groundwater shoaling (rising) and emergence, which could mean more nuisance flooding in commercial and residential areas, could affect subsurface and surface infrastructure, and could mobilize contaminants in the subsurface groundwater into other previously unaffected areas.

Increased cycles of drought could affect water supply and require new ways of securing and conserving water in times of extended drought.

Ongoing Threats to Calero Reservoir

Calero Reservoir continues to be primarily impaired by mercury contamination from historical mining and other sources in the watershed. It is listed on the State's Clean Water Act section 303(d) list of impaired water bodies due to elevated mercury levels in fish. Additional contaminants that threaten the waterbody include pathogens from livestock and wildlife, and contaminants related to recreational use, rural road runoff, boating, and imported water. Since Calero Reservoir serves as Valley Water's local drinking water supply, these impairments and threats may require additional treatment or monitoring in the future.

Opportunities

Implementing Green Stormwater Infrastructure

Opportunities to implement the Santa Clara Basin Stormwater Resources Plan include regional green stormwater infrastructure projects in collaboration with local municipalities. Significant progress has been made in the past several years to implement green stormwater infrastructure in an individual project/parcel-based manner. Larger "regional" green infrastructure projects in partnership with municipalities could result in significantly more water quality and other benefits at a much lower overall project lifetime cost. Implementing such projects will likely involve cooperation between multiple agencies.

Remediating Mercury Mining

There are several opportunities to remediate mercury mining-impacted areas on public and private property. Although a significant amount of work has already been done by the County of Santa Clara and others in the New Almaden Mining District of the Guadalupe Watershed, unabated sources of mercury still contribute to mercury loading to reservoirs and creeks. Remedial work at these sites could result in additional load reductions to creeks and San Francisco Bay.

Stormwater Capture and Use

Stormwater capture and use can help improve surface water quality. Most pollutants are bound to particles, and capturing stormwater allows particles to settle and filter out where soil microbes can break some of them down. Capturing and slowing stormwater reduces creek erosion and sedimentation, and can provide aesthetic, recreational, and traffic calming benefits. It can also provide heath island effect mitigation and reduce localized flooding. There is also potential to utilize it as an alternative water supply.

SECTION 6: FLOODING

6.1 INTRODUCTION

This section highlights the past, present, and future conditions in the Guadalupe Watershed with respect to flood risk and describes the methodology used to manage and assess flood risk and vulnerability in the watershed holistically.

Flood risk reduction involves keeping the water away from people and people away from the water during large storm events. For Valley Water and its federal and local partners, reducing flood risk involves maintaining the flow capacity of streams, reducing flood risk through capital investments, and communicating flood risk to the local communities. Flood protection projects are designed and built to reduce the risk of flooding, but it is not possible to completely eliminate flood risk. There is always the potential of a storm event that could trigger flood flows beyond a flood protection project's designed capacity.

As described in Section 2.2.4 of the One Water Framework for Santa Clara County (pp. 49-58) (Valley Water, 2021e), 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. Once the water reaches the valley floor, flows can overtop banks leading to widespread flooding. These floods typically produce shallow moving water that is dangerous for people and cars and can inundate homes, streets, and structures. Simultaneously, rainwater may pool on neighborhood streets, or carry clogging debris to street drains, overwhelming urban drainage systems.

Watershed Description

The Guadalupe Watershed in Santa Clara County drains northward, collecting in successively larger tributaries until it reaches the Guadalupe River and drains to the San Francisco Bay. The watershed encompasses a 170 square-mile area between the Coyote and West Valley Watersheds and includes portions of the cities of San José, Los Gatos, Monte Sereno, Campbell, and Santa Clara, as well as unincorporated Santa Clara County. Figure 33 displays the Guadalupe subwatersheds by area in acres.

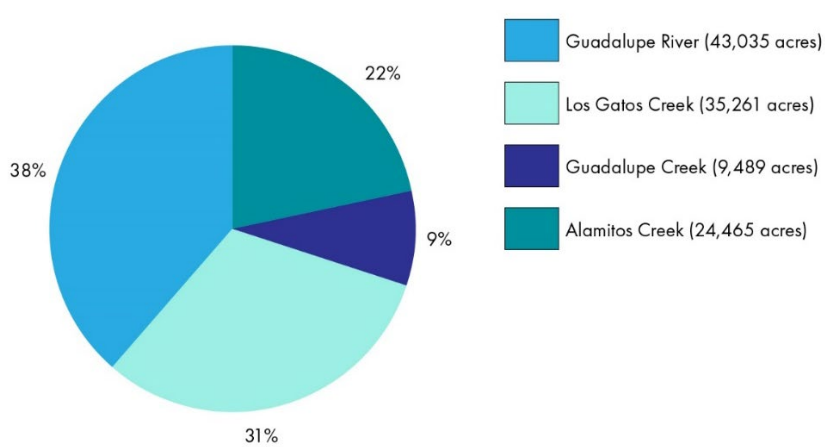

Figure 33: Guadalupe Subwatershed Areas

The historical drainage pattern of the watershed has been modified by human intervention, creek channelization, and urbanization, including the construction of impervious areas and the installation of extensive storm drain networks. Urbanization affects the hydrology of the watershed by reducing infiltration into the ground, decreasing the time it takes for rainwater to make it to the creeks, and increasing peak flows in creeks during storm events.

Figure 34 shows the different subwatersheds within the overall Guadalupe Watershed, described in more detail below.

Alamitos Creek Subwatershed

The Alamitos Creek subwatershed drains an area of approximately 38.2 square miles through Alamitos Creek and its tributaries: Calero Creek, Randol Creek, Greystone Creek, and Golf Creek. Alamitos Creek is a 7.7-mile-long stream with headwaters at Almaden Dam in the Santa Cruz mountains to the transition to Guadalupe River at Almaden Lake. Calero Creek is a 3.8 mil-long tributary with headwaters at the Calero Dam to the Alamitos Creek confluence.

Guadalupe Creek Subwatershed

The Guadalupe Creek subwatershed drains an area of approximately 14.8 square miles through Guadalupe Creek and its tributaries. Guadalupe Creek is a 6-mile-long stream with headwaters in the Santa Cruz mountains to the transition to Guadalupe River at Almaden Lake. Calero Creek is a 3.8 mil-long tributary with headwaters at the Calero Dam to the Alamitos Creek confluence. The major tributaries include Hicks, Pleasant, and Shannon Creek.

Los Gatos Creek Subwatershed

The Los Gatos Creek subwatershed drains an area of approximately 55 square miles. The main stem of Los Gatos Creek is a 12-mile-long stream with headwaters at Lexington Dam in the Santa Cruz mountains to the confluence with Guadalupe River near downtown San José. The main tributaries that drain into Los Gatos Creek are Trout, Almendra, and Daves Creeks.

Guadalupe River Subwatershed

The Guadalupe River watershed drains a total of 67.2 square miles. The subwatershed is divided into 3 sections: Upper Guadalupe River, Downtown, and Lower Guadalupe River.

The Upper Guadalupe River drains an area of 41.4 square miles through Upper Guadalupe River and its two tributaries: Ross Creek and Canoas Creek. Upper Guadalupe River is a 6.4-mile-long stream with headwaters at the south end of Almaden Lake to the crossing of Highway 880 near the south end of downtown San José. Ross creek is a 6.2-mile-long channel from the foothills of the Santa Cruz mountains to the Guadalupe River confluence at Almaden Expressway, and Canoas Creek is a 7.4-mile-long channel from Cottle Road to the Guadalupe River confluence at Almaden Expressway.

The Downtown Guadalupe River drains the downtown San José area of approximately 5.1 square miles. This reach of Guadalupe River is a 2.5-mile-long stretch from Highway 280 to Highway 880. Los Gatos Creek is a 12-mile-long tributary with headwaters at Lexington Reservoir to the Guadalupe River confluence downstream of Highway 87.

The Lower Guadalupe River drains an area of approximately 20.1 square miles. This reach of Guadalupe River is a 11.5-mile-long stretch from Highway 880 down to the San Francisco Bay.

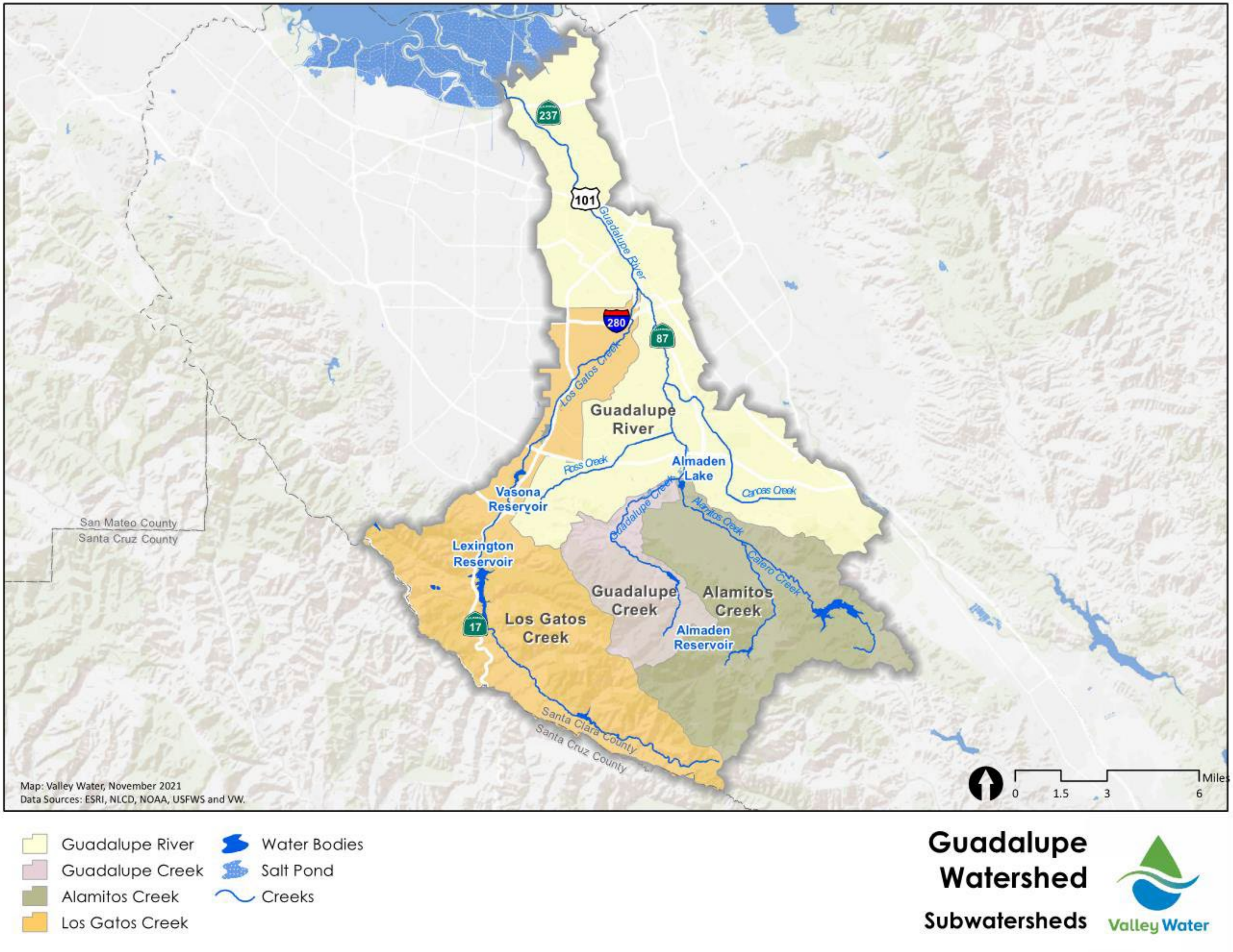

Figure 34: Guadalupe River Subwatershed Map

6.2 FLOOD MANAGEMENT

Valley Water's Role in Flood Risk Reduction

As the primary agency with authority to provide flood protection in Santa Clara County, Valley Water manages flood risk in partnership with local, state, and federal agencies. Valley Water does this in three key ways. First, by communicating risk to the community through regular outreach, preparedness campaigns, flood forecasting, and emergency action plans. Second, by maintaining existing natural channels and flood infrastructure, and third, by building new infrastructure to reduce flood risk.

Flood Communication and Preparedness

Within the Guadalupe Watershed, Valley Water partners with municipalities and Santa Clara County to provide education and information to the public on the risks of flooding, to provide flood warnings, and to coordinate emergency responses during flood events. Valley Water started an annual flood awareness campaign in 2018 to educate property owners that are within a flood zone about what they can do to protect their homes and assets from flooding. Every winter, Valley Water sends out pamphlets to those living in a FEMA flood zone (high-risk floodplain) with information on being flood-ready, preparedness tips, essential emergency phone numbers, and links to helpful resources such as the FEMA website and AlertSCC. Valley Water also provides useful flood preparedness information on their public website, X (Twitter) account, Facebook account, and blog: valleywaternews.org.

Participation in the Community Rating System

The Community Rating System (CRS) is a voluntary program created under FEMA's National Flood Insurance Program (NFIP) to reduce flood damages through nonstructural activities such as increasing public awareness and preparing for flood emergencies. CRS points earned by Valley Water can be used by any participating community in the County to lower flood insurance premiums via the CRS scoring and rating system. Adding their own CRS points to Valley Water's base of activities, the cities of Santa Clara and San Jose within the Guadalupe Watershed have CRS ratings of seven (7) and their residents therefore receive a 15% discount on flood insurance. The cities of Campbell and Monte Sereno and Town of Los Gatos do not participate in the CRS program. The remainder of the Guadalupe Watershed is located within unincorporated Santa Clara County, which does not participate in the CRS program, although it has historically. As of 2018, their rating is "Rescinded", and residents currently do not receive a discount on flood insurance. Santa Clara County is considering reactivating its participation in the CRS.

In general, Valley Water's role in the NFIP is limited to providing structural measures to contain flows in creeks (or other connected infrastructure). It is the local municipality's role to engage in land use planning and compliance with NFIP to protect people from flooding. These measures can include construction of buildings so that their lowest floor is well above existing mapped flood elevations, land use planning to direct flood waters through streets and open areas and adequately sized storm water detention and infiltration facilities.

Flood Warning System

Valley Water has developed, and continues to update in real time, a web-based flood warning system for flooding hot-spots within Santa Clara County, providing flood-prediction maps based on real-time rainfall forecasting and radar data. This system helps local emergency managers and members of the public understand immediate flood risks to their communities. The Guadalupe Watershed is a priority location within this system, with forecast points at locations on Ross Creek, Canoas Creek, and Upper Guadalupe River, as well as seven real-time cameras for monitoring water levels in the creeks.

Emergency Response

During heavy rainfall events, Valley Water monitors creek levels, predicts where flooding may occur, and communicates these risks to affected communities and agencies (e.g., cities, county, Caltrans, etc.). This monitoring is done leading up to and during storm events. If the flooding risks are high enough, Valley Water may open its Emergency Operations center (EOC), which coordinates with other city/county EOCs to ensure that flood risk areas are identified and communicated to the communities, and resources (such as sandbags for the public and heavy equipment to remove large debris) are deployed to help mitigate flood risk before, during, and immediately after the event.

Maintaining Existing Flood Protection Infrastructure

Stream Maintenance Program

Valley Water's watersheds operation and maintenance crews inspect and maintain stream conditions across Santa Clara County to safely convey water during storm events, primarily through the agency's Stream Maintenance Program (SMP). This program focuses on streams that have been improved with engineered flood protection projects to provide continued flood protection for homes and businesses. Maintenance work includes bank repair, sediment removal, vegetation removal, invasive species removal and weed control, and sometimes repair of flood protection structures such as floodwalls and levees. Maintenance performed on natural streams without a completed flood project is limited, due to potential negative impacts to natural habitat. Valley Water is only allowed to perform regular maintenance of the creeks in Guadalupe Watershed along reaches that it owns or for which it has easements.

Asset Management

The Watershed Asset Management Program supports the watersheds operation and maintenance crews by analyzing the conditions of Valley Water's existing flood protection infrastructure and prioritizing maintenance needs. The goal of the asset management program is to provide planning services to minimize the cost of owning watershed assets without jeopardizing Valley Water's financial health, the environment, the community, or service delivery and reliability. The program creates asset management plans and maintenance guidelines that provide information for each watershed asset, including conveyance capacity, recharge capabilities, bank stability, and environmental commitment. Documentation also includes the level of service that each asset was designed and should be maintained to, as well as the current state and future needs of each asset.

The Watershed Asset Management Program also conducts analyses to determine the probability of failure and consequence of failure for each asset, which are combined to calculate the risk of failure, referred to as the Business Risk Exposure (BRE). This information is provided to other watersheds units for use in planning ongoing maintenance and capital work.

There are several additional programs within Valley Water to manage its infrastructure and maintain the level of service originally intended:

The F8 Program: Sustainable Creek Infrastructure for Continued Public Safety

The Safe Clean Water and Natural Flood Protection F8 program (Sustainable Creek Infrastructure for Continued Public Safety) assesses and prioritizes existing creek and watershed infrastructure, prepares watershed asset management plans, and implements the recommendations provided in the asset management plans. This program was created to support Valley Water's existing programs to manage its infrastructure and maintain the level of service originally intended. This program assesses and prioritizes existing creek and watershed infrastructure, prepares watershed asset management plans, and implements the recommendations provided in the asset management plans. This preserves the life and strengthens the reliability of the flood protection infrastructure.

WARP: Watershed Asset Rehabilitation Program

To supplement operation and maintenance resources or for projects outside the scope of SMP, stream maintenance work may also be performed through Valley Water's Watershed Asset Rehabilitation Program (WARP). These are considered small capital improvement projects.

Watershed Assets & Current Conditions

As described above, the current conditions of watershed assets are thoroughly and carefully tracked. Figure 35 maps out the existing flood protection infrastructure in the Guadalupe watershed. It shows whether a concrete structure was built or if it was kept as an earthen channel. The earthen channels may be a reach where the natural channel is expanded, an earthen trapezoidal-shaped reach, or a reach with earthen levees. The map shows that most of the channels in the watershed have some kind of flood protection project built along them. There is almost an equal mix of concrete and earthen channels with the majority of Guadalupe River mostly kept earthen and natural.

Figure 35 also shows the risk of failure (based on BRE scores) related to each reach. It is separated into low, medium, and high risk. It is important to note that this risk of failure equates to the risk that an asset doesn't function as intended and is not the same as the risk of flooding discussed in the next section. As shown on the map, most of the upper watershed, including Guadalupe Creek and Alamitos Creek and its tributaries, is low risk with some medium risk reaches. Around the middle of the watershed, most of the channels are medium risk. This area includes Los Gatos Creek, Ross Creek, Canoas Creek, and Guadalupe River from Highway 680 to Almaden Lake. There is a small portion of high risk along Guadalupe River through downtown San José. Along the lower portion of Guadalupe River, the channel is at high risk because it does not meet the level of service for which it was designed.

6.3 ASSESSING FLOOD RISK & VULNERABILITY

When assessing flood risk, it is important to consider flooding's effects on people, property, and critical facilities such as fire and police stations, hospitals, transportation networks, utilities, drinking water and wastewater treatment plants. During a flood event, floodwater depth and velocity, as well as the amount of warning time, all interact to determine the level of risk to the community. Although the economic damages of flooding can be estimated by different software tools, risks to health and safety are harder to quantity. Through One Water, Valley Water is gathering information to generate updated flood risk maps and create new tools to help understand all these variables.

Hydrology – Water in the Environment

There are 36 active stream gages located within the Guadalupe Watershed, all but one of which are owned and operated by Valley Water; the other is owned by the US Geological Survey. Valley Water also owns and operates 10 rain gages and 5 reservoir gages in the watershed. Valley Water uses data from all these gages to calibrate hydrologic and hydraulic models, measure water in the environment, and assess flood risk.

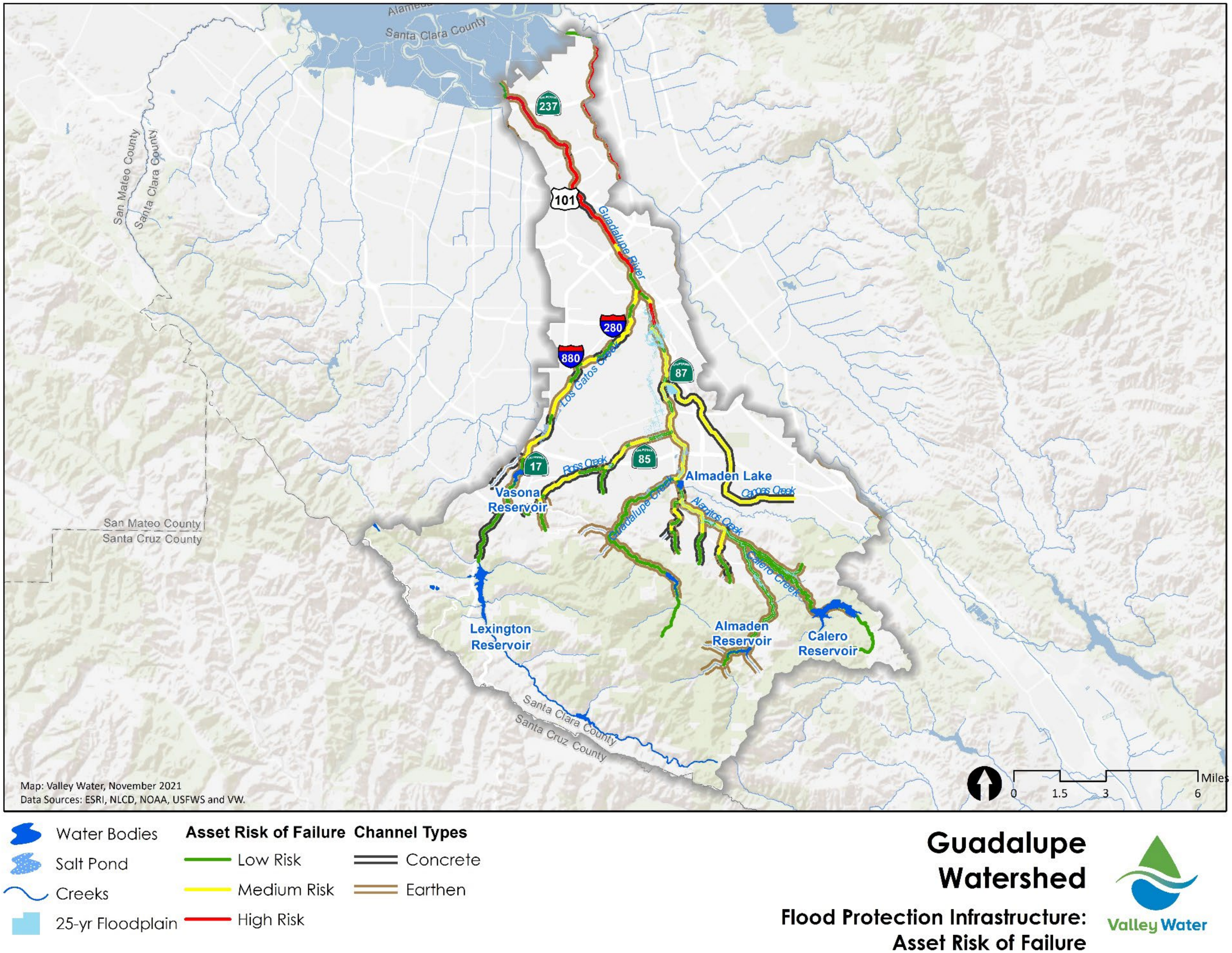

Figure 35: Flood Protection Infrastructure: Asset Risk of Failure (Not Risk of Flooding)

In addition to collecting hydrologic data, Valley Water also maintains a database of hydrologic models—in the US Army Corps of Engineers (USACE) "HEC-HMS" format—for modeling extreme storm scenarios (1% flood events). Valley Water has computed flow distributions for various recurrence interval storms on all the larger creeks within the Guadalupe Watershed. USACE updated and calibrated the HEC-HMS hydrology model and produced the final Guadalupe Watershed Hydrologic Assessment Report in November 2009. In 2015, Valley Water added the "Guadalupe Hydrology Addendum and in 2018 the final design flows were presented in the "Design Flood Flow Manual for All District Watersheds" (Valley Water, 2018). This data can be used in steady and unsteady hydraulic modeling performed within the watershed. The following are the estimated peak flows from the hydrologic modeling:

Table 7: Peak Flows in the Guadalupe River and Tributaries

Location	Drainage Area mi²	2.33 year Q 43%	5 year Q 20%	10 year Q 10%	25 year Q 4%	50 year Q 2%	100 year Q 1%	200 year Q 0.5%	500 year Q 0.2%
Calero Crk D/S Calero Dam	6.94	190	190	190	200	260	390	520	730
Calero Crk D/S Santa Teresa Crk	11.63	220	510	730	860	1010	1170	1330	1520
Alamitos Crk D/S Almaden Dam	11.87	290	1080	1890	2870	3620	4270	4870	5510
Alamitos Crk D/S Calero Creek	27.84	780	1670	2830	4300	5430	6420	7330	8300
Randol Crk U/S Alamitos Crk	2.3	260	440	530	660	750	840	1120	1280
Alamitos Crk D/S Randol Crk	31.84	1000	1980	3170	4840	6120	7280	8350	9480
Guadalupe Crk D/S Guadalupe Dam	5.95	60	280	450	900	1310	1720	2170	2700
Guadalupe Crk D/S Shannon Crk	12.68	260	550	770	1290	2040	2740	3490	4370
Guadalupe River D/S Alamitos Crk	53.22	1390	3150	4100	6630	8990	11170	13300	15680
Guadalupe River D/S Ross Crk	65.22	1850	3910	5150	7570	10190	12660	15080	17900
Guadalupe River D/S Canoas Crk	89.1	2530	4870	6270	8870	11700	14370	17000	19910
Guadalupe River @ West Alma Ave	92.83	2620	5000	6420	9030	11880	14580	17250	20200
Guadalupe River U/S Los Gatos Crk	95.76	2670	4990	6400	9090	1200	14700	17390	20350
Guadalupe River D/S Los Gatos Crk	150.79	3320	6060	7720	10470	14260	17970	22430	27950
Guadalupe River @ Hwy 17	154.79	3390	6150	7840	10430	14410	18170	22660	28200

Location	Drainage Area mi²	2.33 year Q 43%	5 year Q 20%	10 year Q 10%	25 year Q 4%	50 year Q 2%	100 year Q 1%	200 year Q 0.5%	500 year Q 0.2%
Guadalupe River @ Hwy 101	162.09	3610	6470	8200	10790	14770	18600	23160	28770
Guadalupe River @ Hwy 237	171.45	3880	6530	8280	11360	15230	19020	23560	29170

Source: (Valley Water, 2018)

Hydraulics – Creek Behavior and Floodplain Analyses

Valley Water also maintains a library of computational flow models for creeks and floodplains within Santa Clara County. The most common program that is used to build these models is the USACE HEC-RAS program. As of late 2023, most creeks with flood damage potential within the Guadalupe Watershed (urban, rural, or agricultural areas) have complete updated hydraulic models. Model runs have been created for a variety of flood scenarios, markedly improving Valley Water's understanding of flood-prone areas in the Guadalupe Watershed.

Hydrologic and Hydraulic Studies

The most relevant hydrology studies for the Guadalupe Watershed are the USACE 2009 study (U.S. Army Corps of Engineers, 2009), the SCVWD 2015 addendum (Valley Water, 2015), and the 2023 Integrated Catchment Model (ICM) study (Wood Rogers, 2023). The first two studies collectively provided estimates of design flows for the Guadalupe Watershed and were based on HEC-HMS models which assumed the ultimate design condition where all flow is contained in the creeks with no spills. The 2023 ICM study incorporated the watershed's detailed storm drain network, which resulted in reduced peak flows along the channel due to storm drain storage and attenuation. The calibrated ICM model has consistently performed well with gage data in historical storms during calibration and in peak flow analyses by Valley Water.

There are several recent efforts to provide current hydraulic models with updated flood inundation boundaries:

2D Modeling for E19 (Emergency Operations):

Valley Water has performed 2D modeling for various floodplains as part of its emergency operations program. These Maps have been used to create E19 tables for California Nevada River Forecast Center, which describe anticipated/potential flooding areas when certain gages reach different stage levels. These tables are also used in Valley Water's Flood Warning System, which is a real time web-based warning system for flooding hot spots within Santa Clara County. Maps Created for this purpose are shared with communities to help with their emergency operations actions. This is an ongoing program with updates carried out as needed. Some triggers that can result in updated flood maps are new flood projects, updated terrain data, flooding events which provide opportunities to collect new storm data for model calibration, etc.

2D Modeling for Upper Guadalupe River Project:

As part of the Safe, Clean Water Priority E8 Upper Guadalupe River Flood Protection project (in partnership with USACE), AECOM built a 2D model in 2020 for USACE for estimating the benefit/cost ratios of the Upper Guadalupe River Project. This effort was done as part of the USACE General Re-evaluation Study due to increased construction cost estimates for the proposed project.

ICM Modeling for North San José:

Wood Rogers built, calibrated, and validated Innovyze Infoworks ICM hydrologic and hydraulic modeling of the City of San José (Wood Rogers, 2023). This modeling includes the storm drain systems in the hydrologic analysis to get accurate timing of peak flows entering the water ways. The North San José ICM model added the City of Santa Clara storm drain system to generate a complete system for the Lower Guadalupe River watershed. The Upper Guadalupe Watershed ICM model is being used to generate 72-hour storm simulations and floodplain mapping for the 2, 5, 10, 25, 50, 100, and 500-year storms.

The hydrology and hydraulics information described above has enabled Valley Water to create detailed flood maps that illustrate where communities in the watershed are subject to flooding.

Flood Hazards

There are many different types of flood hazards the Guadalupe Watershed could experience. Common types of flood hazards are described below.

Overbank Flooding from Creeks

Although several flood risk reduction projects have been completed in the Guadalupe Watershed, some developed land remains subject to flooding. There are several reasons for this, including historical drainage channels being sized for smaller storms, changing hydrology estimates over time, and sedimentation and vegetation growth in existing channels. After all planned projects in Valley Water's 2025-2029 Capital Improvement Program are completed, 1,212 acres watershed-wide will still be susceptible to overbanking and flooding from a 25-year flood event.

Dam Spills

Dams primarily store water for potable use and recharge purposes, but they also naturally attenuate peak flows during large storm events, reducing flood flows downstream. In periods of heavy rain, reservoirs can fill to capacity and flow over the dam spillway. Spillways are specially designed weirs, sighted below the top of the dam to prevent the dam from being overtopped and damaged, which can lead to dam failure. Large flows from dam spillway releases can contribute significantly to flooding in the creeks and rivers downstream. And although highly unlikely, dam failure can also result in catastrophic flooding.

Levee Failure and/or Overtopping

Levees are constructed alongside creeks and rivers to increase flood protection. Communities protected by levees may enjoy many benefits, including relief from insurance requirements and floodplain management regulations, as well as a certain level of protection from flood events. However, levees can overtop if a flood event exceeds the levee's design capacity, which can lead to levee failure if damage occurs. Floods resulting from a levee failure could be even worse than if the levees had not been in place, due to the higher amount of water the levees hold back. This is called *residual risk*, because it is the risk that remains after a flood project is completed. Within the Guadalupe Watershed, there are approximately 45.3 miles of levees along the different creeks and rivers, as shown in Figure 37.

Transportation Constrictions

Many roads and highways traverse flood-prone areas, and can be subject to periodic flooding, which is dangerous for drivers and damaging to vehicles. When transportation infrastructure floods, it disrupts business and daily activities, causing *indirect* costs to the population. Transportation infrastructure itself can also interrupt, redirect, or exacerbate flooding and street drainage. Major transportation infrastructure in the watershed includes Highways 17, 85, 87, 101, and 237, Interstates 280 and 880, and Almaden Expressway.

Storm Drain Overflow

Storm drains are designed and maintained by cities, typically for 10–25-year storm events. They often have insufficient drainage capacity or get blocked by trash or sediment build up, causing localized flooding. These areas are included on FEMA maps as Special Flood Hazard Areas, and thus subject to regulatory requirements.

Mud Damage from Flooding

Overbanking floodwater typically carries high sediment loads, which settle out and deposit on the floodplain, resulting in additional damage to structures and their contents and high clean-up or replacement costs for streets, parks, landscaping, and any affected buildings or vehicles. Although muddy water will damage the length and breadth of any flooded area, the most susceptible locations for mud damage are the floodplains closest to creeks, since the sediment tends to settle out as soon as it leaves the creek.

Contaminated Flood Waters

During any flooding event, flood waters spill into areas that could be contaminated with human waste, livestock and other biological wastes, chemical wastes, and wild animals or insects, and can carry these hazards with them into other areas. These contaminated flood waters can create a health hazard and can make the public vulnerable to infectious diseases, chemical exposure, and other injuries or sickness.

Deep or High-Velocity Flooding

Flood flows that are deep or fast-moving can present a significant danger to life safety. One Water worked to identify which areas of the Guadalupe Watershed are subject to deeper and higher velocity flows during flood events. This type of data was not widely used in the past and will be part of the prioritization for completing flood projects and initiating new ones in the future. Table 8 shows the flood hazard classifications used for this study.

Table 8: Flood Severity/Hazard Characterization

Flood Severity Category	Depth*Velocity Range (Ft^2/sec)	Description
Low	<2.2	Possibly unsafe for small vehicles
Medium	2.2 – 5.4	Unsafe for all vehicles, children, elderly.
High	5.4 – 16.1	Unsafe for all pedestrians and vehicles.
Very High	16.1 – 26.9	Unsafe for all pedestrians and vehicles. Buildings require special engineering design/construction.
Extreme	>26.9	Unconditionally dangerous. Not suitable for any type of development or evacuation access.

Social Vulnerability: Protecting People and Critical Facilities from Flooding

Where physical flood hazards intersect areas of high vulnerability, the risks of flooding increase. Communities without resources to fully recover from a flood event, as well as facilities that support these communities during or after a flood event, are particularly vulnerable to flood events. Several factors including poverty, lack of access to transportation, and crowded housing may weaken a community's ability to prevent human suffering and financial loss in the event of a disaster. Valley Water used several sources of data to help determine those disadvantaged communities more vulnerable to flood risk.

CalEnviroScreen 4.0

CalEnviroScreen is a health screening tool developed by the Office of Environmental Health Hazard Assessment within the California Environmental Protection Agency. The online mapping tool "analyzes data on environmental, public health and socioeconomic conditions in California's census tracts to provide a clear picture of cumulative pollution burdens and vulnerabilities in communities throughout the state." (CalEPA, 2021). The data and information help determine those areas with disadvantaged communities that are more vulnerable to health and safety hazards such as pollution and flood risk. The One Water incorporated this data into the vulnerability assessment to help determine those areas more vulnerable to the risk of flooding. Valley Water considers areas with population characteristics scoring between 70% and 100% in the screening analyses as more vulnerable to flood risk.

Area Median Income

The area median State statutory limits are based on federal limits set and periodically revised by the U.S. Department of Housing and Urban Development (HUD). HUD's limits are based on surveys of local area median income (AMI). Valley Water considers 80% or less of AMI to be low income. This data was combined with the CalEnviroScreen information to map out those areas that are considered disadvantaged communities and more vulnerable to flood risk.

Critical Facilities

Critical facilities are important for maintaining health and safety services. Even people who don't live or work in a floodplain can be affected by flooding if a critical facility is flooded or is inaccessible due to flooded roadways. For the purposes of One Water's flood analysis, critical facilities include fire stations, police stations, hospitals, and utilities. See Figure 36 for critical facilities located in the Guadalupe Watershed.

Critical facilities can be damaged by flooding and out of service for long periods as a result. In addition, flooding can block access to vital services for the people that need them. For some activities and facilities, even a slight chance of flooding is too great a threat. A critical facility should not be constructed in a floodplain if at all possible. This may include not only the 25-year or the FEMA-mapped 100-year special flood hazard area, but also the 500-year flood hazard area or residual risk areas protected by levees. If a critical facility already exists in a floodplain, it should be given specific attention in floodplain management and emergency response plans, so that it can continue to function and provide services during and after the flood. This may include planning for specific mitigation or flood protection measures for individual facilities. There are 12 critical facilities within the 500-year storm event and 6 critical facilities within the 25-year storm event (1 hospital, 1 police station, 3 fire stations, and the Gilroy Sewage Treatment Plant). Figure 38 and Figure 39 illustrate known critical facilities in relation to the 25-year floodplain.

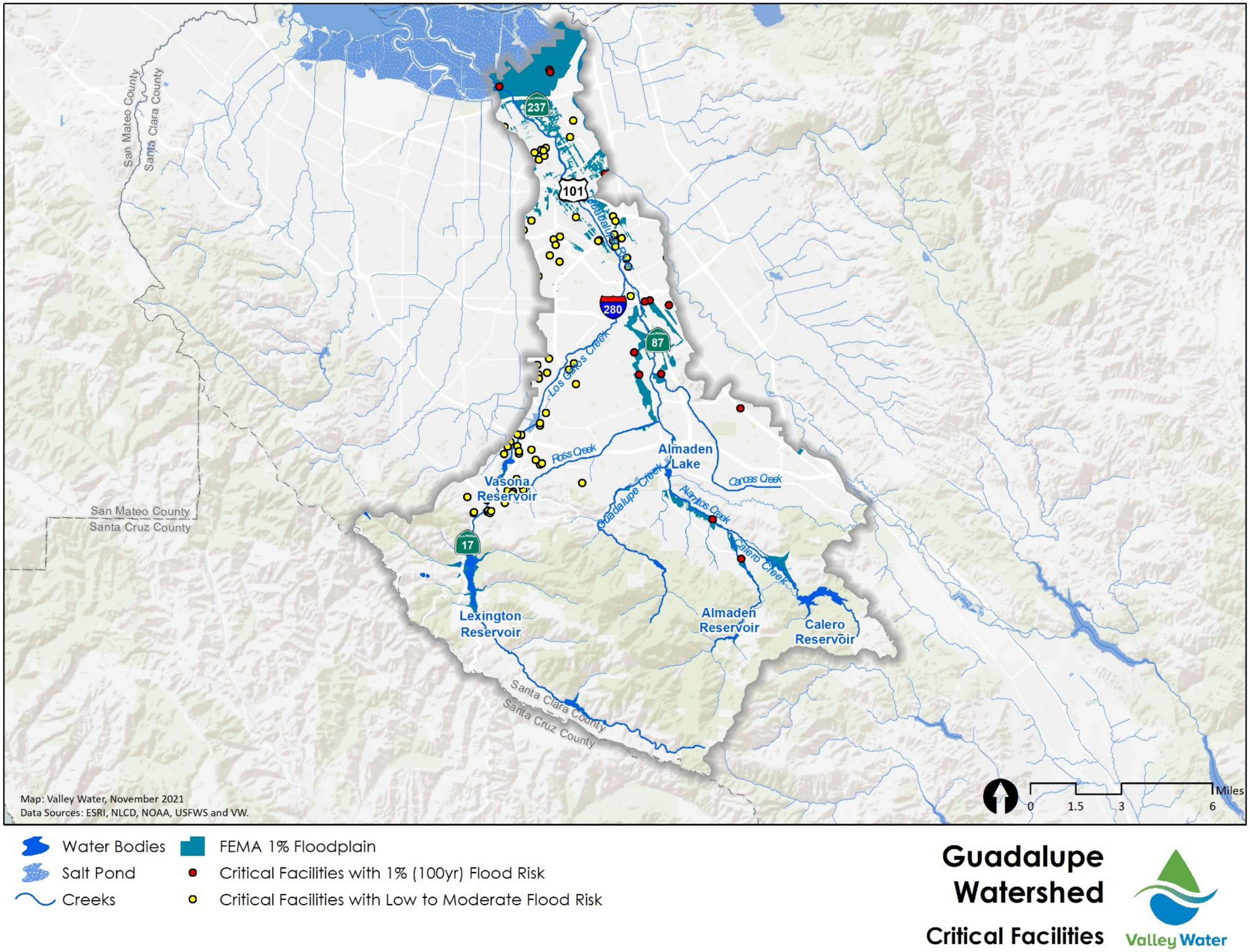

Figure 36: Guadalupe Watershed - Critical Facilities

Flood Vulnerability Assessment

Traditionally, flood risk reduction projects focused on removing properties from the FEMA 100-year flood zone and were prioritized mainly based on a combination of economic damages, costs, flood risk, and politics. Although some projects did target vulnerable communities such as Alviso, this approach did not specifically factor in vulnerability as part of project prioritization, in part because vulnerability studies had not been conducted. With One Water's new Flood Vulnerability Assessment, the focus is on more frequently occurring flood events (25-year), deep and/or fast-moving floodwaters, and social vulnerability where residents are more susceptible to flooding.

The Flood Vulnerability Assessment combines physical and statistical hazards and considers socioeconomic conditions to create a holistic assessment of flood vulnerability in the County. Physical hazards in this analysis include flood depths and velocities and locations of critical facilities. Flood depths and velocities were modeled using the U.S. Army Corps of Engineers HEC-RAS software and combined to assess physical hazards to people and structures. Combined depth and velocity values were weighted on a scale based on severity. Critical facilities including hospitals, police stations, and fire stations, were also mapped.

This analysis also incorporated statistical hazards to address areas with continual flood issues. Statistical flood data included historic flood events since 1952 and known problem areas referred to as Flood Hot Spots by Valley Water's Field Information Team.

Finally, socioeconomic conditions were included to account for an area's ability to access resources and recover from a flood event. The datasets for socioeconomic conditions were CalEnviroScreen 4.0 and Area Median Income, both described previously above.

Physical hazards, statistical flooding, and socioeconomic conditions were given scores and then combined to create a ranked hazard map. Areas with the highest score contain the highest combined hazard physically, statistically, and socially. The hazard map then displays this ranking by color, with reds and dark oranges indicating a higher flood vulnerability and risk than light orange or yellow.

6.4 HISTORICAL CONDITIONS: FLOODING & FLOOD PROTECTION PROJECTS

The sections below go into more detail on the past historical flooding issues within the study area, present conditions and flood reduction projects built or proposed, and the future challenges and opportunities to reduce the risk of flooding to the community while focusing on concepts that could provide multi-benefits to the community, economy, and to the environment.

Past Flood Events

The Guadalupe River has a long history of flooding, with the earliest recorded event occurring in the winter of 1852-1853. Figure 37 shows the footprint of all the documented historical flooding in the Guadalupe watershed since 1952. Between 1952 and 2023, there were 14 years with recorded flood events within the Guadalupe Watershed. The worst floods occurred in 1955 and 1958.

Most significant flooding has occurred along the downtown Guadalupe River and lower Guadalupe River reaches. Downtown Guadalupe River last flooded in 1995 during the construction of the Downtown Guadalupe River project. Significant flooding along Lower Guadalupe River last occurred during the storms of 1982 and 1983, with significant damage to the Alviso community. Alviso is located adjacent to the San Francisco Bay and has suffered from both tidal and riverine flooding due to significant

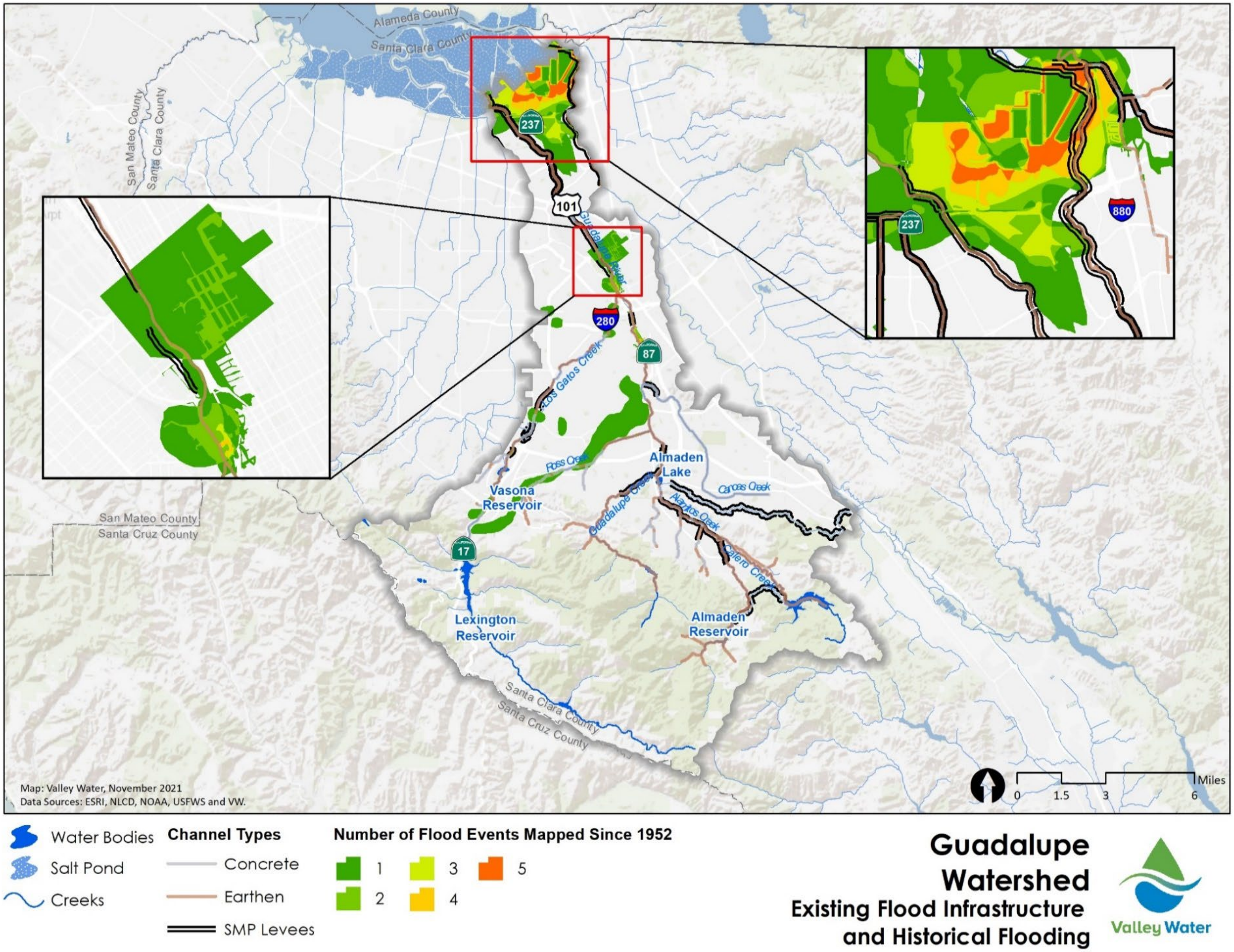

Figure 37: Guadalupe Watershed - Historic Flood Events in the Guadalupe Watershed

subsidence in the 1900s. Flooding risks to Alviso today are much lower than they were historically due to both construction of the salt pond berms and of the Lower Guadalupe and Coyote Flood Protection Projects. Residual flooding risks due to berm or levee failure and/or overtopping remain, however, there is one ongoing project (Phase 1 of the South San Francisco Bay Shoreline Project) currently under construction to further protect the area from coastal flooding risk. Significant flooding also occurred along Ross Creek downstream of Highway 85 to the Guadalupe River confluence during the 1952 storm event. The following table (Table 9) summarizes the historical flood events since the mid-1800s.

Table 9: Historical Flood Events in Guadalupe River

Flood Event Date	Summary of Event	Peak Discharge at USGS San José Gage[1] (cfs)
Winter 1852 – 1853[2]	Downstream from Montague Expressway, Guadalupe River merges with Coyote Creek	Unknown
Winter 1861 – 1862[2]	Known as the Great Flood of 1862, it affects most of the State of California. Historical documentation indicates extensive flooding along Guadalupe River and Coyote Creek	Unknown
1907[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
March 7-9, 1911[2]	Guadalupe River and Coyote Creek merge together at various points.	Unknown
1914-1915[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
1915-1916[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
1916-1917[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
1918-1919[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
March 5, 1930[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	4,330
1930-1931[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
February 13, 1937[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	6,070
December 11, 1938[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	6,660
February 27, 1940[1]	More than 7 inches of rain fell in Los Gatos in a 2-day span. 3,200 acres of agricultural land and the Alviso community flooded.	8,680
January 23, 1943[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	6,350
February 2, 1945[1]	Unknown	6,600
1951[3]	Unpublished wet cycle (known and possible flooding) identified by USACE	Unknown
January 12, 1952[3]	Guadalupe River: Lands from Montague Expwy to the bay, including Alviso, were inundated with floodwaters for over a	8,000

Flood Event Date	Summary of Event	Peak Discharge at USGS San José Gage[1] (cfs)
	month. Downtown flooding near the confluence with Los Gatos Creek. Ross Creek: Large swath of flooding from the foothills of Santa Cruz mountains down to Jarvis Avenue. Los Gatos Creek: The channel overspilled its banks in four locations but did not spread; resulting in only minor damages to residences. Locations: San Fernando Street to San Carlos Street; Lincoln Avenue to Highway 280; at Camden Avenue; and from Blossom Hill Road to the foothills of the Santa Cruz mountains. Alamitos subwatershed: High flows caused much erosion and shallow flooding resulting in agricultural damages due to soil and debris deposition on orchard land, as well as some damage to residences and public parks.	
December 23, 1955[4]	Guadalupe River: flooding along the lower reach, from the bay to Brokaw Road, greatly impacted Alviso where almost the whole city was inundated (depths up to 5 feet). In addition to residential & commercial impacts, there were significant agricultural impacts and about 1,500 feet of levees needed to be repaired. Almaden Reservoir spilled. Ross Creek: large swath of flooding from the Santa Cruz mountains foothills to Jarvis Avenue. Alamitos subwatershed: mainly impacted agricultural and park land, homes in the New Almaden community, and a couple of summer resorts. Damages also reported in Los Gatos subwatershed.	5,570 (5,740[4])
April 2, 1958[1]	Alviso flooded and stayed inundated for 17 days (depths up to 4ft). Flooding of 2 blocks north of Hwy 17 and flooding in Alamitos Creek. Almaden Reservoir spilled.	9,150
1963	unknown	6,300
1967	unknown	6760
1968	unknown	5170
January 14, 1978[5]	Minor flooding at Calero Creek, upstream of Fortini Rd., and Ross Creek, downstream of Topping Way. Canoas Creek experienced severe erosion upstream of Capital Expwy.	6,430a
February 19, 1980[6]	Minor local flooding	7,910
March 31, 1982[7]	Guadalupe River overbanks, causing evacuations, and 1-10 ft of flooding. 20 homes and 5 businesses report damage. Majority of flooding was in lower reach from Brokaw Rd down to the bay, greatly impacting Alviso and agricultural land. Minor flooding from Virginia St. to Alma Avenue.	7,340
January 24, 1983[8]	Guadalupe River: Similar to 1982 flooding, the river overbanked in two locations, causing up to 10 ft of flooding. Majority of flooding along lower reach impacting Alviso plus flooding between Virginia St and Alma Avenue.	7,130 (8,400[7])

Flood Event Date	Summary of Event	Peak Discharge at USGS San José Gage[1] (cfs)
February 18, 1986[9]	Guadalupe River: Primarily street flooding with no major damages. Flooding at St. John, St. James, and Emory streets and Alma Avenue. Los Gatos Creek: flooding downstream of Lark Avenue. Mostly street flooding, some mobile homes damaged. Ross Creek: Street flooding in two locations due to debris blockage in culverts at the Cherry and Jarvis Ave. crossings. Guadalupe Creek: the creek flooded to the west downstream of the intersection of Hicks Road and Shannon Road.	9,140
January 9, 1995[10]	Guadalupe River flooding at three locations: along River Street; at Virginia Street where water flooded Highway 87; and near Alma Avenue. The flood waters reached a depth of 15 feet between Highway 87 and Guadalupe River, with depths of 6 feet over Highway 87 and VTA light rail tracks. The river also spilled its banks south of Interstate 280 flooding homes and cars. Ross Creek: Overbanking occurred at Cherry Avenue along Montmorency Drive and at Jarvis Avenue. Canoas Creek flooding at 4 locations: Redbird Drive, Kingfisher Drive, Calero Avenue, and Blossom Avenue. Calero Creek: Overbanking occurred at McKean Road.	9,290
March 10, 1995[10]	Highest flow on record, flooding Highway 87 and portions of downtown. Many residences and businesses are evacuated. Guadalupe River: The river spilled its banks to the east between Taylor Street and Highway 87, flooding a large portion of downtown San Jose. Many streets, homes, and business were flooded; as well as Highway 87. The creek also flooded to the west along this stretch, although to a much less extent.	11,000
February 1998[11]	Guadalupe River: overbanking near Alma Avenue in San Jose, flooding the Elks Lodge parking area and the Highway 87 underpass. Flows also broke out downstream of Virginia Street, flooding Highway 87 and closing the roadway. Ross Creek: Northside overbanking at Cherry Avenue flooding the area around Montmorency Drive.	7,541

Sources:

1. (U.S. Geological Survey, 2022) 2. (Grossinger, et al., 2006) 3. (County of Santa Clara Planning Commission, 1952) 4. (USACE, San Francisco District, Corps of Engineers, U.S. Army, 1956) 5. (Valley Water, 1978) 6. (Valley Water, 1980) 7. (Valley Water, 1982) 8. (Valley Water, 1983b) 9. (Valley Water, 1986) 10. (Valley Water, 1995) 11. (Valley Water, 1998)

Past Flood Risk Reduction Projects and Studies

The Guadalupe River has been the subject of many flood management projects and studies, starting with the Flood Control Act of 1941. Notable flood management events in the Lower Guadalupe River are summarized in Table 10 below.

Table 10: Past and Present Flood Risk Reduction Projects

Year*	Creek	Downstream limit	Upstream limit	Flood Protection Infrastructure	Level of Protection (Year)**
Current	Guadalupe River	Gold Street	Interstate 880	The Lower Guadalupe River Project aims to restore the one percent flood flow level of service originally provided by the 2004 project. Currently in Planning Phase.	100
Current	Guadalupe River	Interstate 280	Blossom Hill Road	Upper Guadalupe River Project will provide flood risk reduction to the 5.5 miles of Guadalupe River channel between Interstate 280 to Blossom Hill Road. It includes a partnership with USACE for planning, design, and construction. Because the project has not received federal funding since 2014, USACE initiated a General Re-evaluation study in January of 2021 with the intention of evaluating alternatives that would make the project more competitive for funding.	100
Current	N/A	N/A	N/A	The South San Francisco Bay Shoreline Protection Project will provide tidal flood protection to the shoreline, as well as restore and enhance tidal marsh habitat by creating wetlands and ecotones. Partnerships: the California State Coastal Conservancy, the U.S. Army Corps of Engineers (USACE), and other regional stakeholders. The first phase of the project will construct improvements in North San José and the community of Alviso, which was prioritized due to the high risk of tidal flooding and the presence of critical infrastructure such as the San José-Santa Clara Regional Wastewater Facility and the Silicon	Varies

Year*	Creek	Downstream limit	Upstream limit	Flood Protection Infrastructure	Level of Protection (Year)**
				Valley Advanced Purification Center. While construction has started on EIA 11, EIAs 1-4 were studied as part of Phase II, and was concluded with no Federal interest in the project. USACE is studying EIAs 5-10 as part of Phase III, and a tentative schedule is yet to be determined.	
2021	Ross Creek	Guadalupe River Confluence	Blossom Hill Road	The Ross Creek Feasibility Study was done to identify alternatives that could provide 25-year flood risk reduction along Ross Creek. Potential 100-year (Non-FEMA certified) alternatives were also briefly considered[6].	25
2018	Guadalupe River	Gold Street	Interstate 280	Staff completes hydraulic analyses to re-evaluate the flow conveyance capacity of the Lower Guadalupe River. Results indicate that a section of the Lower Guadalupe River no longer has conveyance capacity for the 1% flood event for which it was designed[5].	N/A
2016	Guadalupe River	Interstate 280	Union Pacific Railroad	Reach 6 channel flood protection with eastside floodway widening and restoration[7].	100
2004	Guadalupe River	Gold Street	Interstate 280	Lower Guadalupe River Project: improvements along the Lower Guadalupe River from Alviso Marina to Interstate 880. Downtown Guadalupe River Project: USACE completes flood protection improvements from Interstate 880 to Interstate 280 (DGRP)[1].	100
2001	Guadalupe Creek	N/A	N/A	Guadalupe Creek is realigned to increase channel sinuosity[2].	N/A
1995	Guadalupe River	Gold Street	Interstate 280	Lower Guadalupe River: interim levee restoration project constructed to carry design flow with 50% freeboard[3]. Based on winter storm events, a hydraulic analysis showed that the river does not have planned conveyance capacity as required by the 1992 LCA.	N/A

Year*	Creek	Downstream limit	Upstream limit	Flood Protection Infrastructure	Level of Protection (Year)**
1985	Guadalupe River	Hwy 85	Guadalupe Creek Confluence	Levees along left bank looking downstream (west bank) for most of reach[8].	100
1983	Guadalupe River	UPRR (Alviso)	Highway 101	Construction is completed on the Guadalupe River Union Pacific Railroad (UPRR) in Alviso to Highway 101, which was intended to provide 1% flood protection[4]. Flood protection consisted mainly of levees built along both banks.	100
1983	Ross Creek	Cherry Ave	Cherry Ave	An extra 12'x9' reinforced concrete box (RCB) culvert added next to existing 12'x9' RCB[9].	unknown
1981	Alamitos Creek	Almaden Lake	Camden Avenue	Levees along left bank (looking downstream). 7300 to 7600 cfs design flows.	100
1970s	Alamitos Creek	Camden Avenue	McKean Road	Levees along both banks built by private contractors prior to 1980. 5400cfs design flow.	N/A
1972 - 1974 & 1979	Guadalupe Creek	Alamitos Creek confluence	Camden Avenue	Guadalupe Creek flood protection project widened the flood corridor and converted the creek to an excavated channel[2]. 1972 - 1974: channel widening and flood protection levees were constructed along north bank from Almaden Expwy to 6600ft US (the end of the ponds)[10].	100
1962-1978	Golf Creek	Alamitos Creek Confluence	Golf Creek Drive	Flood protection elements constructed: channel realignment, invert modifications, sacked concrete slope protection. Design Flows: 1100 – 160 cfs.	100
1976	Canoas Creek	Almaden Road	Nightingale Drive	concrete lining apron along invert. Maintenance ramp added[11].	100
1973	Randol Creek	Alamitos Creek Confluence	Brett Harte Drive	Levee along left bank looking downstream.	N/A
1971	Canoas Creek	Nightingale Drive	Cottle Road	Small natural channel expanded into trapezoidal channel, concrete invert with earthen slopes[12].	100
1970s	Alamitos Creek	Almaden Lake	McKean Road	Flood control project widened Alamitos Creek and modified Randol, Greystone, and Golf Creeks[2].	Unknown

Year*	Creek	Downstream limit	Upstream limit	Flood Protection Infrastructure	Level of Protection (Year)**
				Camden Ave to McKean Rd: Levees along both banks built by private contractors (design flow: 5400 cfs).	
Varies: 1950s – 1980s	Los Gatos Creek	Guadalupe River Confluence	Lexington Reservoir	Flood protection built into some sub-reaches throughout reach. No records of constructed work to provide flood protection for defined water surface elevation. Facilities: drop structures, bank revetments, levees. Although no design flow. 2002 LOMR – 100-year protection at 6950 cfs below Vasona Dam.	100
1967	Ross Creek	Topping Way	Stony Brook Rd (end of Crk)	Underground 42" Reinforced Concrete Pipe (RCP) and 36" RCP (1967 date of Construction Drawings[13].	Unknown
1965	Ross Creek	Blossom Hill Rd	Shannon Rd	Reinforced Concrete Box (RCB) from Blossom Hill Rd to Blossom Hill Park. Dimensions vary (w x h): 7'x6' and 9'x6'. 8'x9' Concrete U Frame along Blossom Hill Park. 60" RCP from the Park to Shannon Rd[14].	Unknown
1963	Ross creek	Shannon Rd	Topping Way	60" underground Reinforced Concrete Pipe (RCP) – Shannon Rd to Shady View Lane. 54" RCP – Shady View Lane to Hilow Road. 6'x7.5' (w x h) concrete U Frame – Hilow Road to Topping Way[15].	Unknown
1963	Guadalupe River	S.F. Bay	Interstate 880	Lower Guadalupe River improvements constructed: channel modifications and levees[4].	100
1960	Canoas Creek	Almaden Road	Nightingale Drive	Creek realignment: earthen trapezoidal channel built connecting Canoas Creek to Guadalupe River at Almaden Road - from Nightingale Ave to Almaden Road. Levees constructed along right bank looking downstream[16].	100
1957	Ross Creek	Kirk Rd	Camino Del Cerro	Earthen trapezoidal channel with some berms/levees (not certified). Culverts at Almaden Rd, Union Rd. 770 cfs design flow.	100
1956	Ross Creek	Guadalupe River Confluence	Kirk Rd	Earthen trapezoidal channel with berms/levees (not certified) in some	unknown

Year*	Creek	Downstream limit	Upstream limit	Flood Protection Infrastructure	Level of Protection (Year)**
				areas. Design flow of 1200cfs w 2ft freeboard	
1945	Guadalupe River	N/A	N/A	USACE completes the Preliminary Examination Report and authorizes flood control investigations for all streams in the south San Francisco Bay[4].	N/A
1941	Guadalupe River	N/A	N/A	Preliminary examination and survey of the river authorized as part of the Flood Control Act of 1941[4].	N/A
1935	Guadalupe Creek	N/A	N/A	Guadalupe Reservoir Built	N/A

*** Year is based on starting year of construction, As-Builts, or Construction Plans. It may not be exact and is from best available information.**

**** The Level of Protection the Project was built to (i.e. flow magnitude) may not currently be provided due to hydrologic modeling changes, hydraulic modeling changes, climate change, maintenance issues, etc.**

Sources:

1. (Valley Water, 2019f) 2. (Tetra Tech, Inc., 2006) 3. (CH2MHill, 2002) 4. (USACE, 2007) 5. (Valley Water, 2019c) 6. (Valley Water, 2021f) 7. (Valley Water, 2016) 8. (Valley Water, 1985) 9. (Valley Water, 1983a) 10. (Valley Water, 1974) 11. (Valley Water, 1976) 12. (Valley Water, 1971) 13. (Santa Clara County Flood Control and Water District, 1967) 14. (Santa Clara County Flood Control and Water District, 1965) 15. (Santa Clara County Flood Control and Water District, 1963) 16. (Santa Clara County Flood Control and Water Conservation District, 1960)

6.5 PRESENT CONDITIONS (EXISTING FLOOD RISK & VULNERABILITY)

The elements described in the Assessing Flood Risk & Vulnerability Section above, have enabled Valley Water to create detailed flood risk and vulnerability maps that illustrate neighborhoods subject to flooding. With One Water's new Flood Vulnerability Assessment, the focus is on health and safety during frequent flooding events, or the 25-year event. The following channels have 25-year flow capacity or more and therefore would not flood during a 25-year storm event: Los Gatos Creek, Alamitos Creek and its tributaries, Guadalupe Creek, downtown Guadalupe River, and Lower Guadalupe River.

Figure 38 & Figure 39 show the extents of the estimated 25-year flooding footprint in the whole watershed. Historically, there were estimated to be approximately 10,000 parcels in the 25-year floodplain. That estimate has been reduced due to existing flood protection projects and updated hydrology to about 3,155 parcels and 992 acres currently in the 25-year floodplain. Out of those 3,155 parcels, about 40 parcels are within disadvantaged communities. The map shows the flood vulnerability assessment results with low- to high-risk areas.

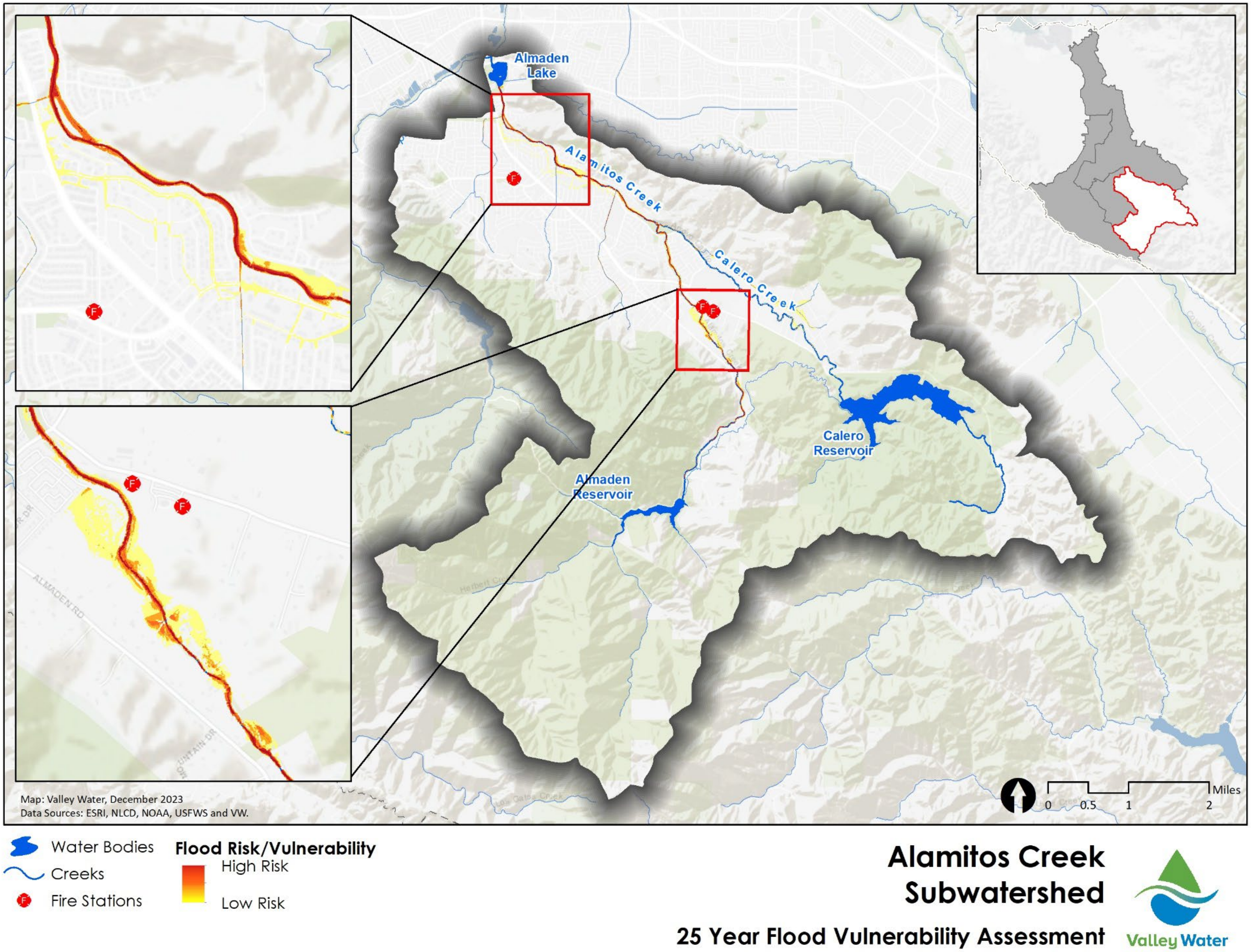

Figure 38: 25-Year Flood Vulnerability in Alamitos Creek Subwatershed

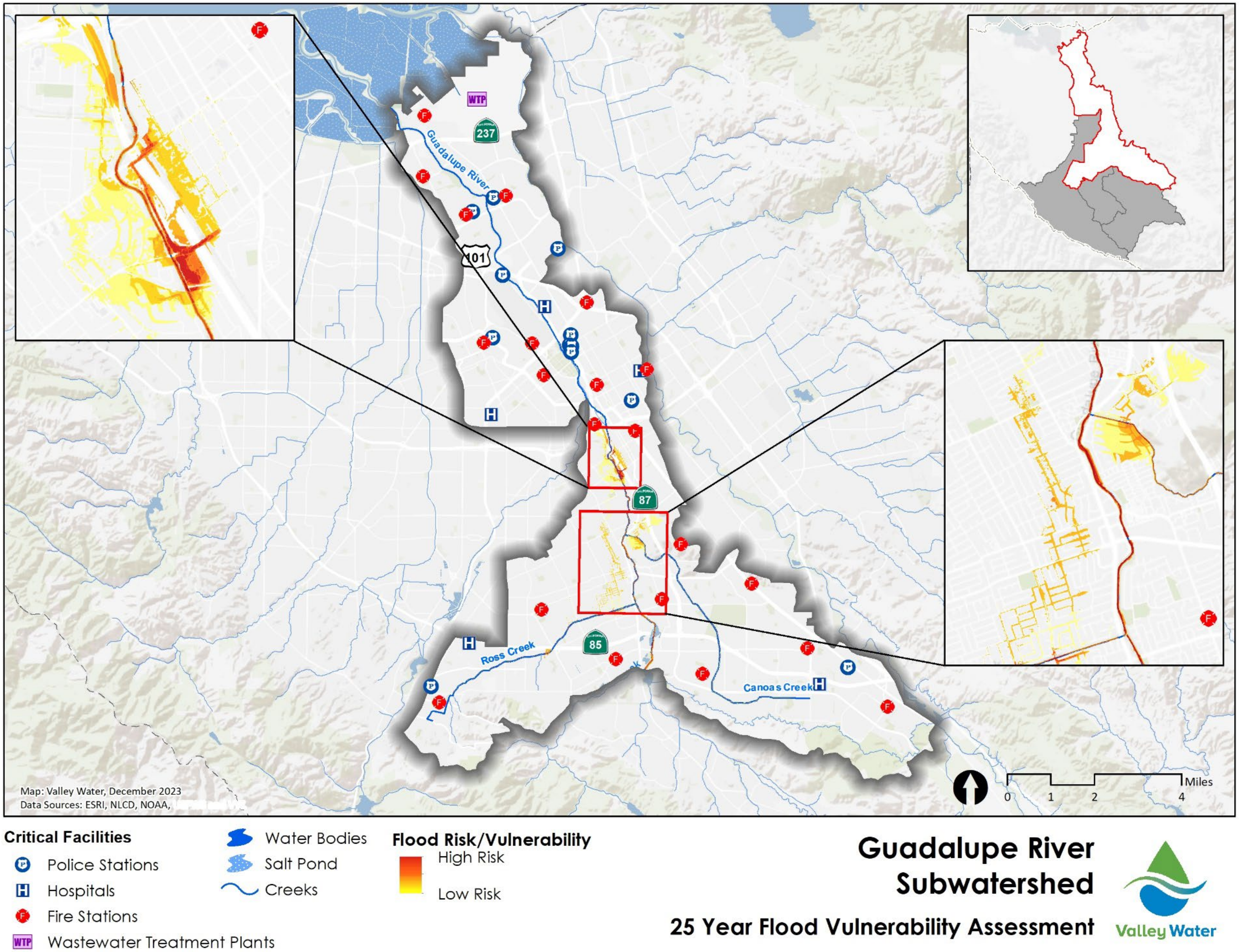

Figure 39: 25-Year Flood Vulnerability in Guadalupe River Subwatershed

The following descriptions relate to the potential flooding from a 25-year storm event.

Alamitos Creek Subwatershed

Flood protection levees were constructed along Alamitos Creek and Randol Creek back in the late 1970s and 80s. These levees stretch along the south bank of Alamitos Creek from Almaden Lake to Camden Avenue, and along both banks from Camden Avenue to McKean Road. The levees were to provide 100-year protection when constructed, but now have structural issues as well as limited capacity with updated hydrology, with some areas having less than 25-year capacity. Flooding along Alamitos Creek and its tributaries was assessed to have low risk and vulnerability to flooding.

Flooding along the leveed reach of Alamitos Creek would occur mainly along roadways with depths lower than 1 foot but reaching 2 feet in some areas. This potential flooding is relatively minor and would be contained within Alamitos Creek, Almaden Road, and Randol Creek. Flooding would also occur along the rural areas of Alamitos Creek upstream of McKean Road. These flood flows would not spread out very far beyond the Alamitos Creek riparian corridor, with most of the flood flows ponding up to 4 feet along open land.

Guadalupe River Subwatershed

Upper Guadalupe River

There have been some flood protection projects already built in Upper Guadalupe River, with over 25-year protection provided for the reach upstream of the Canoas Creek confluence. The reach from Highway 280 up to the Canoas Creek confluence does not have 25-year flow capacity. Overbanking could occur from Highway 280 up to Willow Glen Road, resulting in significant flooding covering 300 acres and 1074 parcels to the east and west side of the Guadalupe River. The flooding along the west side of the river is a mix of shallow faster waters and ponding areas with depths of 3 to 6 feet. This area is considered low to moderate flood vulnerability and has no disadvantaged communities. The flooding to the east of the river results in significant ponding up to 15 feet to the east of Highway 87. There is also significant flooding on Highway 85 just south of the Highway 280 interchange (depths up to 10 feet). This potential overbanking to the east of Upper Guadalupe River would result low to high flood vulnerability, mainly due to the high depths. There is also a small portion of flooding occurring in a disadvantaged community in this location.

Ross Creek

Flooding along Ross Creek during a 25-year storm event would cover about 231 acres and 1,214 parcels and would mainly occur from Kirk Road down to the Guadalupe River confluence. The flood flows would spread out significantly to the north of Ross Creek along the floodplain to the west of Guadalupe River. This flooding eventually meets up with and comingles with flooding from Upper Guadalupe River near the intersection of Bird Avenue and Willow Glen Way. Most of the flooding would be shallow with less than 1 foot depth, although there would be a few spots of ponding with up to 3 feet of depth. This flooding is considered low to medium risk due to higher velocities being a potential hazard, but there are no disadvantaged communities in this area.

Canoas Creek

Flooding along Canoas Creek would occur due to the backwater affect at the Guadalupe River confluence. This would result in approximately 244 acres and 422 parcels being flooded from the confluence up to about 2,000 feet downstream of the Dow Drive crossing. There would be significant ponding of flood flows along the floodplain to the south of Canoas Creek, with depths reaching up to 7 feet. The flooding to the south of Canoas Creek would be a mix of shallow flow (less than 1 foot) along the roadways and ponding up to 3 feet along the residential properties. The overbanking along Canoas Creek results in low to medium flood risk and vulnerability, mainly due to some high flood depths and the potential to flood frequently at relatively low storm events.

There is also minor flooding that would occur in the rural areas along Calero Creek. These flood flows do not spread out much further than the riparian corridor, with the majority of the flooding being ponding less than 1ft along open land, although some small areas would pond up to 3 feet.

6.6 FUTURE CONDITIONS, CHALLENGES, AND OPPORTUNITIES

The future of flood management in the Guadalupe Watershed will be shaped by a unique set of challenges and opportunities, some ongoing, and some to be anticipated in the years to come.

Challenges:

Limited Access for Maintenance:

Valley Water has the right to maintain or modify reaches of creeks that it owns or for which it has an easement (71 of 233 miles of creek in the Guadalupe Watershed). As Valley Water improves creeks for capacity, it generally carries out work from downstream to upstream. This is common practice to avoid causing unintentional expanded flood risk for communities that may otherwise occur if work was done upstream and allowed more water to flow downstream to unimproved creek channels. Most of the channels in the valley portion of the watershed—from bank to bank—are either owned by Valley Water or there is an easement for Valley Water to provide and/or maintain flood protection. But there are some channels where Valley Water does not own the creek or have an easement, and often Valley Water staff cannot access these creeks to assess the potential impacts of, or remove, vegetation, trash, or sediment that may be blocking or slowing flow.

Limited Creek Corridor Right-Of-Way (Width):

Historically, urbanization in the Guadalupe Watershed led to the development of land within natural floodplains and in many cases, immediately adjacent to creeks. These land use patterns physically confine creeks to a narrow corridor, separate the creek from its natural floodplain, and leave little, if any, space to construct flood protection infrastructure. Re-establishing more natural river geomorphology in these areas would require expensive and logistically challenging real estate acquisitions, since the creek corridors are already narrow. This is not often an affordable option in the developed portions of the Santa Clara Valley.

Climate Change:

Flood protection projects are designed based on statistical analysis of past events. The future is likely to be very different from the past due to climate change, with most models predicting more intense, but possibly less frequent, rainstorms in Santa Clara County. This reality calls for a new approach in planning for future flood protection measures. Additionally, if hydrologic conditions change from those assumed in design, previously constructed projects may not provide their desired level of protection.

Sea Level Rise:

Another aspect of climate change is sea level rise (SLR). SLR increases flooding risk during both coastal flood events, which can flood inland areas directly, and by increasing backwater during riverine flooding events. Significant infrastructure built near the shoreline that could be affected by sea level rise includes the Alviso community, San Jose-Santa Clara Regional Wastewater Facility and the Silicon Valley Advanced Water Purification Center. As noted above, the San Francisco South Bay Shoreline Project's goal is to provide flood protection against a 100-year coastal flood event with up to 2.69 ft of sea level rise for Santa Clara County's coastline. Phase I, which spans the reach between Coyote Creek and Guadalupe River, is currently under construction and will protect the community of Alviso and other areas from existing coastal flooding risk, primarily due to the risk/potential of non-accredited berm failure.

Aging Infrastructure:

Many major infrastructure and capital projects are reaching their design life of 50+ years. Most of the flood risk infrastructure and capital projects in the Guadalupe Watershed are more than 35 years old. Rehabilitation may become a significant need in the near-term due to higher probability of failure as the infrastructure gets older and more frequent maintenance is needed.

Opportunities:

Planning Studies for Flood-Vulnerable Areas

There are several areas identified through the Flood Vulnerability Assessment that are at risk of flooding (Figure 38 and Figure 39) including Calero Creek, Alamitos Creek, Upper Guadalupe River, Canoas Creek, and Ross Creek. Most of the areas identified as high-risk will be addressed through the Upper Guadalupe River Project, currently in the design phase in partnership with the U.S. Army Corps of Engineers. For all other areas, new planning studies should be undertaken to evaluate flood risk reduction alternatives and recommend a final project that can be designed and constructed.

Promoting Environmentally Friendly Development:

To holistically reduce flood risk in the watershed, development agencies can promote land development techniques, such as permeable pavement and Low Impact Development (LID), that support flood risk reduction. Holistically incorporating LID practices reduces the volume and speed of stormwater runoff and decreases costly flooding and property damage. One of the main ways to reduce flood risk is to promote building structures outside of the floodplain. These LID techniques may not have a large effect on reducing the riverine flood risk, but it can have a big impact on local flooding due to issues such as non-permeable surfaces and inadequate storm drain sizes. Also, these techniques help support groundwater replenishment, water quality, green development and impervious area removal, parks and open space for temporary stormwater capture and reuse.

Flood Detention (multi-use land and facilities for temporary flood storage):

Multi-purpose flood detention facilities could be used to expand flood storage capacity and reduce peak flows downstream by temporarily storing flood waters in basins of various types and sizes. During non-flood periods (most of the time), the basins would not be inundated and could serve as natural parks, recreational sports fields or even parking garages, depending on the needs of the public and desires of the landowner or agency who owns the facility. During the flood event, the basin would fill and afterwards naturally drain back to the creek and the basin land use would be restored.

Improvements with Rehabilitation:

Rehabilitation of capital projects, while very costly, may create opportunities to redesign older, hardscaped systems and replace them with more environmentally friendly systems. New and strategic partnerships could provide financial opportunities, ecological or geomorphic improvements, and increased community support. The rehabilitation of hardscaped channels into more natural systems is one of the metrics for measuring One Water's long-term objectives (see Chapter 1 for more on this topic). In addition to Valley Water maintenance of aging infrastructure, land use agencies can assist in allowing for future flood protection by minimizing density of development near streams. Moving forward, Valley Water hopes to work with municipalities that have land use jurisdiction to wisely plan development so that is protected from existing or potential induced flooding.

Flood Forecasting:

Valley Water is developing a real time, web-based flood warning system for flooding hot-spots within Santa Clara County, including the Guadalupe River Watershed. This will provide the public with flood prediction maps based on real time rainfall forecasting and radar data. This system will also help emergency managers understand immediate risks.

Expanding groundwater recharge with Flood-MAR:

Flood-Managed Aquifer Recharge (Flood-MAR) is one way that groundwater recharge could be expanded to increase water supply and potentially reduce stormwater runoff into urban areas. A pre-feasibility study identified that capturing hillside runoff onto open space before it reaches roads and storm sewers may be the most feasible approach to Flood-MAR in Santa Clara County. Valley Water is continuing studies to assess the feasibility of Flood-MAR in the county. Unlike our existing managed aquifer recharge or large-scale Flood-MAR contemplated for the Central Valley, staff expects the amount of water captured by Flood-MAR to be relatively smaller in Santa Clara County. Overall, the Guadalupe Watershed has a medium to low suitability index for Flood-MAR.

CONCLUSION

For more information on how this Setting report relates to the Guadalupe Watershed, see the 2024 One Water Guadalupe Watershed Plan.

REFERENCES

AECOM. (2024). *Second Phase Study of Santa Clara County Steelhead Streams to Indentify Priority Locations for Gravel Augmentation and Large Woody Debris Placement Project.*

Ament, R. A., McGowen, P., McClure, M. L., Rutherford, A., Ellis, C., & Grebenc, J. (2014). *Highway mitigation for wildlife in Northwest Montana.* Sonoran institute, Bozeman. Retrieved from http://largelandscapes.org/media/publications/Highway-Mitigation-Wildlife-NWMontana_1.pdf

Balance Hydrologics. (2018). *Study of Santa Clara County Steelhead Streams to Identify Priority Locations for Gravel Augmentation and Large Woody Debris Placement.* Santa Clara County, California.

Beier, P., & Loe, S. (1992). *A checklist for evaluating impacts to wildlife movement corridors.* Wildlife Society Bulletin 20: 434-440.

Beller, E. E., Spotswood, E. N., Robinson, A. H., Anderson, M. G., Higgs, E. S., Hobbs, R. J., . . . Grossinger, R. M. (2019, January). Building Ecological Resilience in Highly Modified Landscapes. *BioScience, 69*(1), 80-92.

Beller, E., Salomon, M., & Grossinger, R. (2010). *Historical Vegetation and Drainage Patterns of Western Santa Clara Valley.* Oakland: San Francisco Estuary Institute.

CalEPA. (2021). *CalEnviroScreen 4.0.* Office of Environmental Health Hazard Assessment.

California Department of Fish & Wildlife. (2020). *California Wildlife Barriers 2020: Priority wildlife movement barrier locations by region.* Sacramento, CA: California Department of Fish & Wildlife.

California Department of Fish & Wildlife. (2022). *Restoring California's Wildlife Connectivity 2022: Priority wildlife connectivity project locations by region.* Sacramento, CA: California Department of Fish & Wildlife.

California Department of Fish and Wildlife. (2023, May). *Biogeographic Information and Observation System (BIOS)*. Retrieved from Government Version: https://apps.wildlife.ca.gov/bios/?bookmark=326

California Department of Fish and Wildlife. (2023). *California Natural Communities List*. Retrieved from https://wildlife.ca.gov/Data/VegCAMP/Natural-Communities

California Department of Fish and Wildlife. (2023, May). *California Natural Diversity Database (CNDDB)*. Retrieved from Government Version: https://apps.wildlife.ca.gov/bios6/?bookmark=326

California Department of Fish and Wildlife. (2023, August). *Passage Assessment Database (PAD)*. Retrieved from California Department of Fish and Wildlife: https://nrm.dfg.ca.gov/PAD/

California Department of Fish and Wildlife. (2023). *Special Animals List April 2023.* Retrieved May 10, 2023, from https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406

California Native Plant Society, Rare Plant Program. (2023, May). *Inventory of Rare and Endangered Plants of California (online edition, v9.5)*. Retrieved from http://www.rareplants.cnps.org

California State Water Resources Control Board. (2021). *2018 Integrated Report.* California Environmental Protection Agency.

CH2MHill. (2002). *Lower Guadalupe River Planning Study.* San Jose: Valley Water.

City of Monte Sereno. (2008). *Monte Sereno General Plan.* Monte Sereno: City of Monte Sereno.

City of San Jose. (2009). *Greenprint 2009 Strategic Plan Update.* San Jose, CA: City of San Jose.

City of San José. (2011). *Envision San Jose 2040 General Plan.* San Jose: City of San Jose.

City of Santa Clara. (2010). *City of Santa Clara 2010-2035 General Plan.* Santa Clara: City of Santa Clara.

County of Santa Clara Planning Commission. (1952). *Flood Problems in Santa Clara County.* San Jose: County of Santa Clara Planning Commission.

De Novo Planning Group. (2020). *General Plan 2040 Council Review Draft August 2020.* Campbell: City of Campbell.

Design, Community & Environment. (2011). *Martial Cottle Park State Park General Plan and County Park Master Plan.* Berkeley: County of Santa Clara Parks and Recreation Department and California State Parks.

EOA, Inc., Paradigm Environmental & Lotus Water. (2019). *Santa Clara Basin Stormwater Resource Plan.*

Flint, L., & Flint, A. L. (2012). *Simulation of climate change in San Francisco Bay Basins, California: Case studies in th eRussian River Valley and Santa Cruz Mountains.* USGS Scientific Investigations Report 2012-5132. http://pubs.er.usgs.gov/publication/sir20125132.

Garcia-Rossi, D., & Hedgecock, D. (2002). *Provenance Analysis of Chinook Salmon (Oncorhynchus tshawytscha) in the Santa Clara Valley Watershed. Report for the Santa Clara Valley Water District.* University of California, Davis: Bodega Marine Laboratory.

Grossinger, R. M., Askevold, R. A., Striplen, C. J., Brewster, E., Pearce, S., Larned, K. N., . . . Collins, J. N. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley.* Santa Clara Valley Water District. Oakland: San Francisco Estuary Institute.

Hobbs, J., Cook, J., & La Luz, F. (2014). *Steelhead Smolt Outmigration and Survival Study: Pond A8, A7 & A5 Entrainment and Escapement: Final Report.* Fremont: Prepared for National Marine Fisheries Serviec and the South Bay Salt Pond Recreation Program/Don Edwards San Francisco Bay National Wildlife Refuge.

Hodgson, D., McDonald, J. L., & Hosken, D. J. (2015). What do you mean, 'resilient'? *Trends in Ecology and Evolution, 30*(9), 503-506.

Hubbs, C. L. (1925). *The Life-Cycle and Growth of Lampreys.* Paper of the Michigan Academy of Sciences, Art and Letters 1:587-603.

ICF International. (2012). *Santa Clara Valley Habitat Plan.* San Francisco: ICF International.

Iwamura, T. I. (1999). *Geology of the watersheds.* San Jose, California: In Comprehensive Reservoir Watershed Report, edited by Santa Clara Valley Water District.

Jones, M. B., & Donnelly, A. (2004). *Carbon sequestration in temperate grassland ecosystems and the influence of management, climate and elevated CO2.* New Phytologist.

Leidy, R. A. (2007). *Ecology, Assemblage Structure, Distribution, and Status of Fishes in Streams Tributary to the San Francisco Estuary, California.* San Francisco Estuary Institute Contribution No. 530.

Metropolitan Transportation Commission and Association of Bay Area Governments. (2021). *Plan Bay Area 2050.* San Francisco, CA.

Midpeninsula Regional Open Space District. (2014). *2014 Vision Plan.* Los Altos: Midpeninsula Regional Open Space District.

Moyle, P. B., Quirones, R., Katz, J. V., & Weaver, J. (2015). *Fish Species of Special Concern in California. Third Edition.* Saramento, CA: Prepared by California Department of Fish and Wildlife.

NMFS. (2016). *Final Coastal Multispecies Recovery Plan.* Santa Rosa, California: National Marine Fisheries Service, West Coast Region.

NOAA. (2024, February 22). *National Weather Service*. Retrieved from Climate: https://www.weather.gov/wrh/Climate?wfo=mtr

Penrod, K., Garding, P. E., Paulman, C., Beier, P., Weiss, S., Schaefer, N., . . . Gaffney, K. (2013). *Critical Linkages: Bay Area & Beyond.* Fair Oaks: Science & Collaboration for Connected Wildlands.

PRISM Climate Group, Oregon State University. (2023). *PRISM Climate Data*. Retrieved December 18, 2023, from https://prism.oregonstate.edu/

San Francisco Estuary Institute - Aquatic Science Center and H.T. Harvey & Associates. (2017). *Sycamore Alluvial Woodland: Habitat Mapping and Regeneration Study.* Richmond, CA: Prepared for the California Department of Fish and Wildlife Local Assistance Grant Program, A Report of SFEI-ASC's Resilient Landscapes Program and H.T. Harvey & Associates, Publication #816, San Francisco Estuary Institute.

San Francisco Estuary Institute & Aquatic Science Center. (2013). *Statistical Design, Analysis and Graphics for the Guadalupe River Assessment. Technical Memoranda Two, Four & Five.* Richmond, California: Report Prepared for the Santa Clara Valley Water District Agreement Number A3562F.

San Jose Parks, Recreation, and Neighborhood Services. (2020). *ActivateSJ Strategic Plan (2020-2040).* San Jose, CA: City of San Jose.

San Jose Redevelopment Agency. (2002). *Guadalupe River Park Master Plan.* San Jose, CA: City of San Jose, Santa Clara Valley Water District, United States Army Corps of Engineers.

Santa Clara County Flood Control and Water Conservation District. (1960). Map and General Construction Plan for Ross Creek Improvement from Shannon Road to Topping Way. CA, Santa Clara County: As-Built.

Santa Clara County Flood Control and Water District. (1963). Map and General Construction Plan for Ross Creek Improvement from Shannon Road to Toppping Way. CA, Santa Clara County: As-Built.

Santa Clara County Flood Control and Water District. (1965). Map and General Construction Plan for Ross Creek Improvement from Blossom Hill to Road to Shannon Rd. CA, Santa Clara County: As-Built.

Santa Clara County Flood Control and Water District. (1967). Map and General Construction Plan for Ross Creek Improvement from Topping Way to Stony Brook Rd. CA, Santa Clara County.

Santa Clara County Parks. (2018). *2018 Strategic Plan.* Los Gatos, CA.

Santa Clara County Trails Plan Advisory Committee. (1995). *Countywide Trails Master Plan.* San Jose, CA: Santa Clara County Board of Supervisors.

Santa Clara Valley Open Space Authority. (2014). *The Santa Clara Valley Greenprint: A guide for protecting open space and livable communities.* San Jose, CA.

Santa Clara Valley Open Space Authority and Conservation Biology Institute. (2017). *Coyote Valley Landscape Linkage: A Vision for a Resilient, Multi-benefit Landscape.* San Jose, CA. 74p: Santa Clara Valley Open Space Authority.

SCVWD. (2017). *2016 and 2017 Fish Assemblage Report for the Guadalupe River Watershed Mercury Total Maximum Daily Load.* San Jose, CA: Prepared for the Santa Clara Valley Water District.

SCVWD. (2018). *Historical Occurrence of Chinook Salmon (Oncorhynchus tshawytscha) in the Guadalupe River Watershed, Santa Clara County, California.* San Jose, CA: Prepared by Santa Clara Valley Water District, Environmental Mitigation and Monitoring Unit.

SCVWD et al. (2003). *Settlement Agreement Regarding Water Rights of the Santa Clara Valley Water District on Coyote, Guadalupe, and Stevens Creeks.*

Smith, J. J. (2013). *Northern Santa Clara County Fish Resources.* San Jose, CA: San Jose State University.

Snyder, J. (1905). *Notes on the fishes of the streams flowing into San Francisco Bay.* Report, U.S. Bur. Fish. for 1904 (July 14, 1905), 327-338.

Spencer, W. D., Beier, P., Pendor, K., Winters, K., Paulman, C., Rustigan-Romsos, H., . . . Pettler, A. (2010). *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California.* Prepared for the California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration.

Spotswood, E., Grossinger, R., Hagerty, S., Beller, E., Grenier, J., & Askevold, R. (2017). *Re-Oaking Silicon Valley: Building Vibrant Cities with Nature.*

SPUR. (2019). *Re-Envisioning the Guadalupe River Park.* San Francisco: SPUR.

Stillwater Sciences. (2018). *Los Gatos Creek Bridge Replacement Project Fish Relocation Summary.* Morro Bay, California: Prepared by Stillwater Sciences to Leo Tidd and Luis Berger.

Taylor, P., Fahrig, L., Henein, K., & Merriam, G. (1993). *Connectivity is a vital element of landscape structure.* Oikos 68(3): 571-573.

Tetra Tech, Inc. (2006). *Guadalupe Watershed Stewardship Plan.* San Jose: Valley Water.

The Calflora Database [a nonprofit organization]. (2023, May). *Calflora: Information on California plants for education, reserach and conservation*. Retrieved from https://www.calflora.org/

Topping, B., Kuwabara, J., & Marvin-DiPasquale, M. e. (2004). *Sediment Remobilization of Mercury in South San Francisco.* USGS; USDOI.

Town of Los Gatos. (2022). *2040 General Plan.* Los Gatos: Town of Los Gatos.

U.S. Army Corps of Engineers. (2009). *Guadalupe Watershed Hydrologic Assessment.* San Francisco: Valley Water.

U.S. Census Bureau. (2021, August 20). *USA Census 2020 Redistricting Tracts*. Retrieved from ArcGIS Online: https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/USA_Census_2020_Redistricting_Tracts/FeatureServer

U.S. Geological Survey. (2022, January 11). *National Water Information System: Web Interface*. Retrieved May 29, 2022, from USGS Water Resources: https://nwis.waterdata.usgs.gov/nwis/peak?site_no=11169000&agency_cd=USGS&format=html

USACE. (2001). *Final General Re-Evaluation and Environmental Report for Proposed Modifications. Volume I, SCH#199902056. Guadalupe River Project, Downtown San Jose.*

USACE. (2007). *Draft Lower Guadalupe and Downtown Guadalupe River Flood Protection Project.* San Jose: USACE.

USACE, San Francisco District, Corps of Engineers, U.S. Army. (1956). *Report on Floods of December 1955 and January 1956 in Northern California Coastal Streams.* San Francisco: USACE.

Valley Water. (1971). Map and General Construction Plan for Canoas Creek from Nightingale Drive to Cottle Road. CA, Santa Clara County: As-Built.

Valley Water. (1974). Map and General Construction Plan for Guadalupe Creek: From Almaden Expressway to 6600ft Upstream. CA, Santa Clara County: As-Built.

Valley Water. (1976). Map and General Construction Plan for the Maintenance Measures on Canoas Creek: Almaden Expressway to Nightingale Drive. CA, Santa Clara County: As-Built.

Valley Water. (1978). *Flood Emergency Report, Jan. 13 Through Jan. 17, 1978.* San Jose: Valley Water.

Valley Water. (1980). *Flood Emergency Report: Feb. 13 throught Feb. 22, 1980.* San Jose: Valley Water.

Valley Water. (1982). *Report on Flooding and Flood Related Damages: January 1 to April 30, 1982.* San Jose: Valley Water.

Valley Water. (1983a). Map and Construction Plan for Ross Creek at Cherry Avenue. CA, Santa Clara County: As-Built.

Valley Water. (1983b). *Report on Flooding and Flood Related Damages: January 1 to April 30, 1983.* San Jose: Valley Water.

Valley Water. (1985). Map and Construction Plan for Guadalupe River from Blossom Hill Road to Alamitos Creek Confluence. Santa Clara County: As-Built.

Valley Water. (1986). *Report on Flooding and Flood Related Damages: February 12th thru 20th, 1986.* San Jose: Valley Water.

Valley Water. (1995). *Report on Flooding and Flood Related Damages: Santa Clara County, January 3 to March 11, 1995.* San Jose: Valley Water.

Valley Water. (1998). *Report on Flooding and Flood Related Damages in Santa Clara County February 2-9, 1998.* San Jose: Valley Water.

Valley Water. (2015). *Hydrology Addendum for Canoas and Ross Creek.* San Jose: Valley Water.

Valley Water. (2016). Map and Construction Plan for Upper Guadalupe River Reach 6 from Interstate 280 to Union Pacific Railroad. Santa Clara County: As-Built.

Valley Water. (2018). *Design Flood Flow Manual for All District Watersheds.* San Jose: Valley Water.

Valley Water. (2019a). *Annual Groundwater Report.*

Valley Water. (2019b). *Guadalupe River 2018 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2019c). *Guadalupe River Project - Tasman Drive to Interstate 880 Problem Definition and Refined Objectives Report.* San Jose: Valley Water.

Valley Water. (2019d). *Water Supply Master Plan 2040.* San Jose: Valley Water.

Valley Water. (2019e). *Water Year 2018 Juvenile Oncorhynchus mykiss Rearing Monitoring in the Guadalupe River Watershed.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2019f). *Lower Guadalupe River Project from the Alviso County Park to Interstate 880 (District 3) (San Jose).* San Jose: Valley Water.

Valley Water. (2020a). *2018 and 2019 Fish Assemblage Report for the Guadalupe River Watershed and Stevens Creek Reservoir Mercury Total Maximum Daily Load Monitoring.* San Jose, CA: Prepared by Valley Water.

Valley Water. (2020b). *2019 Juvenile Oncorhynchus mykiss Rearing Monitoring in the Guadalupe River Watershed.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2020c). *2020 Urban Water Management Plan.* San Jose: Valley Water.

Valley Water. (2020d). *Guadalupe River 2018-2019 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Alamitos Drop Structure.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2021a). *2020 Juvenile Oncorhynchus mykiss Rearing Monitoring in the Guadalupe River Watershed.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2021b). *2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins.*

Valley Water. (2021c). *Guadalupe River 2019-2020 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Alamitos Drop Structure.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2021d). *Guadalupe River Watershed Mercury TMDL: 2020-2021 Progress Report on Methylmercury Control Measures in Reservoirs.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2021e). *One Water Santa Clara Countywide Framework.*

Valley Water. (2021f). *Ross Creek Flood Protection Project Draft Feasibility Study.* Feasibility study, San Jose.

Valley Water. (2022a). *2021 Juvenile Oncorhynchus mykiss Rearing Monitoring in the Guadalupe River Watershed.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2022b, 06 10). *Almaden Lake Improvement Project*. Retrieved from Valley Water: https://www.valleywater.org/project-updates/almaden-lake-improvement-project

Valley Water. (2022c, July 05). *Calero Dam Seismic Retrofit Project*. Retrieved from Valley Water: https://www.valleywater.org/project-updates/calero-dam-seismic-retrofit-project

Valley Water. (2022d, July 5). *Guadalupe Dam Seismic Retrofit Project*. Retrieved from Valley Water: https://www.valleywater.org/project-updates/guadalupe-dam-seismic-retrofit-project

Valley Water. (2023a). *2022 Juvenile Oncorhynchus mykiss Rearing Monitoring in the Guadalupe River Watershed.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water. (2023b). *Annual Groundwater Report for Calendar Year 2022.* San Jose: Santa Clara Valley Water District.

Valley Water. (2023c). *Fish and Aquatic Habitat Habitat Collaborative Effort Final Program Environmental Impact Report.* Santa Clara County, California: Santa Clara Valley Water District. June 30, 2023. State Clearinghouse #2015022008.

Valley Water. (2023d). *Where Your Water Comes From*. Retrieved from Valley Water: https://www.valleywater.org/your-water/where-your-water-comes

Valley Water. (2024). *Guadalupe River Watershed Monitoring Program 2022-2023 Monitoring Season Results.* San Jose, CA: Prepared by Valley Water, Environmental Mitigation and Monitoring Unit.

Valley Water and Stillwater Sciences. (2015). *Water Year 2014 Final Mitigation Monitoring Report for the Lower, Downtown, and Upper Guadalupe River Projects, San Jose, California.*

Valley Water and Stillwater Sciences. (2016). *Water Year 2015 Final Mitigation Monitoring Report for the Lower, Downtown, and Upper Guadalupe River Projects, San Jose, California.*

Valley Water and Stillwater Sciences. (2017). *Water Year 2016 Final Mitigation Monitoring Report for the Lower, Downtown, and Upper Guadalupe River Projects, San Jose, California.*

Watershed Managment Initiative. (2003). *Watershed Assessment Report. Watershed Managment Plan Volume Two.* Palo Alto: Watershed Managment Initiative.

Wood Rogers. (2023). *Guadalupe River ICM Model Development.* San Jose: Valley Water.