

CHAPTER 4 Water Resources

Goal and Guiding Principles

GOAL: Protect and restore water resources to benefit local communities and the environment, and to provide resilience to a changing climate.

GUIDING PRINCIPLES:

- Protect, manage, and restore critical watershed areas to sustain local water supply and quality, maintain habitat and environmental conditions, and reduce flood risk.
- Work closely with partners to coordinate watershed protection and restoration efforts across jurisdictional boundaries.
- Engage the community in watershed education and outreach activities.

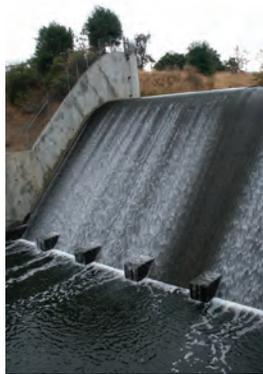
The Open Space Authority is committed to protecting and restoring open space lands to ensure that they function as intact, healthy watersheds. In doing so, we aim to help sustain clean local water supplies, improve water quality, and reduce risk of downstream flooding. A direct connection exists between keeping open space lands intact and watershed health, yet ensuring the protection and restoration of our watersheds through informed land use decisions and adequate public investment in open spaces remains a challenge. By making prudent investments in watershed conservation, we can protect strategic open spaces that provide these essential watershed services and reduce the need to pay for costly built infrastructure.

Throughout the Bay Area, watershed and riparian ecosystems have largely been disrupted. Many natural landscape features that provide stability and support services to our riparian systems, also known as “green infrastructure”, have been negatively impacted by urbanization. The loss of green infrastructure such as undeveloped floodplains, unpaved surfaces, resilient riparian corridors, and groundwater recharge areas have led to the creation of built substitutes

including levees, storm drains, armored stream channels, and managed aquifer recharge ponds. While many of these built systems, also known as “gray infrastructure”, are necessary, there are many outstanding opportunities within the Authority’s jurisdiction to expand the role of green infrastructure to provide watershed services. For example, protecting watersheds lands can increase groundwater recharge, subsequently enhancing local water supplies.

Declining state and federal funding for water-related projects is prompting local agencies to seek integrated and cost-effective solutions to maintain water resources. The integration of green infrastructure can provide multiple,

large-scale benefits, and at the same time, potentially reduce the enormous costs for gray infrastructure. Statewide, regional, and local initiatives like FloodSAFE California, Bay Area and Pajaro River Watershed Regional Water Management Groups, and Santa Clara Valley Water District’s Safe, Clean Water & Natural Flood Protection Program are integrating new approaches that sustain and restore many of the natural processes that enhance water



Cait Hutnik

Investments in open space protection can reduce the need for costly built infrastructure.

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resources and ecosystem health. The Soap Lake Floodplain project is an example of a green infrastructure project where protection of agricultural lands and natural habitats in the floodplain along the Upper Pajaro River reduces the potential for downstream flooding and the need for costly levees and stormwater infrastructure. This and other initiatives support Integrated Regional Water Management (IRWM), which seeks to ensure watershed-wide system flexibility and resilience by using a combination of built and green infrastructure solutions (see sidebar).

Core Strategies for Integrated Regional Water Management (IRWM)

1. Integrate land use and water management planning
2. Leverage natural watershed features
3. Adopt a “Best Mix” of green and grey infrastructure
4. Implement at a systems scale
5. Provide multiple benefits

Adapted from Bay Area IRWMP Coordinating Committee 2013

Watershed boundaries are geographic and not political, making regional collaboration critical. Fortunately, nearly all watersheds within the County originate here – meaning the residents and land managers of Santa Clara County are largely responsible for the health of our water resources. The Open Space Authority is committed to working with partners and landowners to steward critical watershed areas and promote the integration of green infrastructure into the built environment. By taking an IRWM approach with our partners, the Authority can help reduce costs to the public, enhance ecosystem health, and restore the

natural services that are critical for the long-term provision of safe and clean drinking water, flood management, and habitat.

Important Areas for Water Resource Conservation and Stewardship

Water Supply, Recharge, and Storage

The Santa Clara Valley overlies two vast groundwater aquifers that supply water to the majority of the County. These aquifers are recharged with rainfall captured by our local watersheds and imported water that originates from the Sierra snowpack. Much of this water is temporarily stored by a network of reservoirs that release it to our Valley’s creeks and recharge areas throughout the year, refilling our groundwater basins via in-stream or constructed groundwater recharge areas. As this water percolates down from the surface into the aquifers, it is naturally filtered and conveyed by the basins, reducing the costs for water treatment and delivery.

By 2035, Santa Clara County’s projected demand for water will surpass supply during a normal water year, and drought year shortages could begin as soon as 2015 without additional investments in water supply reliability (SCVWD 2012). Uncertainty regarding the severity of climate change impacts on our water supply requires that we take action to ensure we are able to do more with less water. Although some threats to the reliability of our imported water are outside of our control, we can actively protect and enhance the reliability of our local water supply (see sidebar).

Clean water supplies

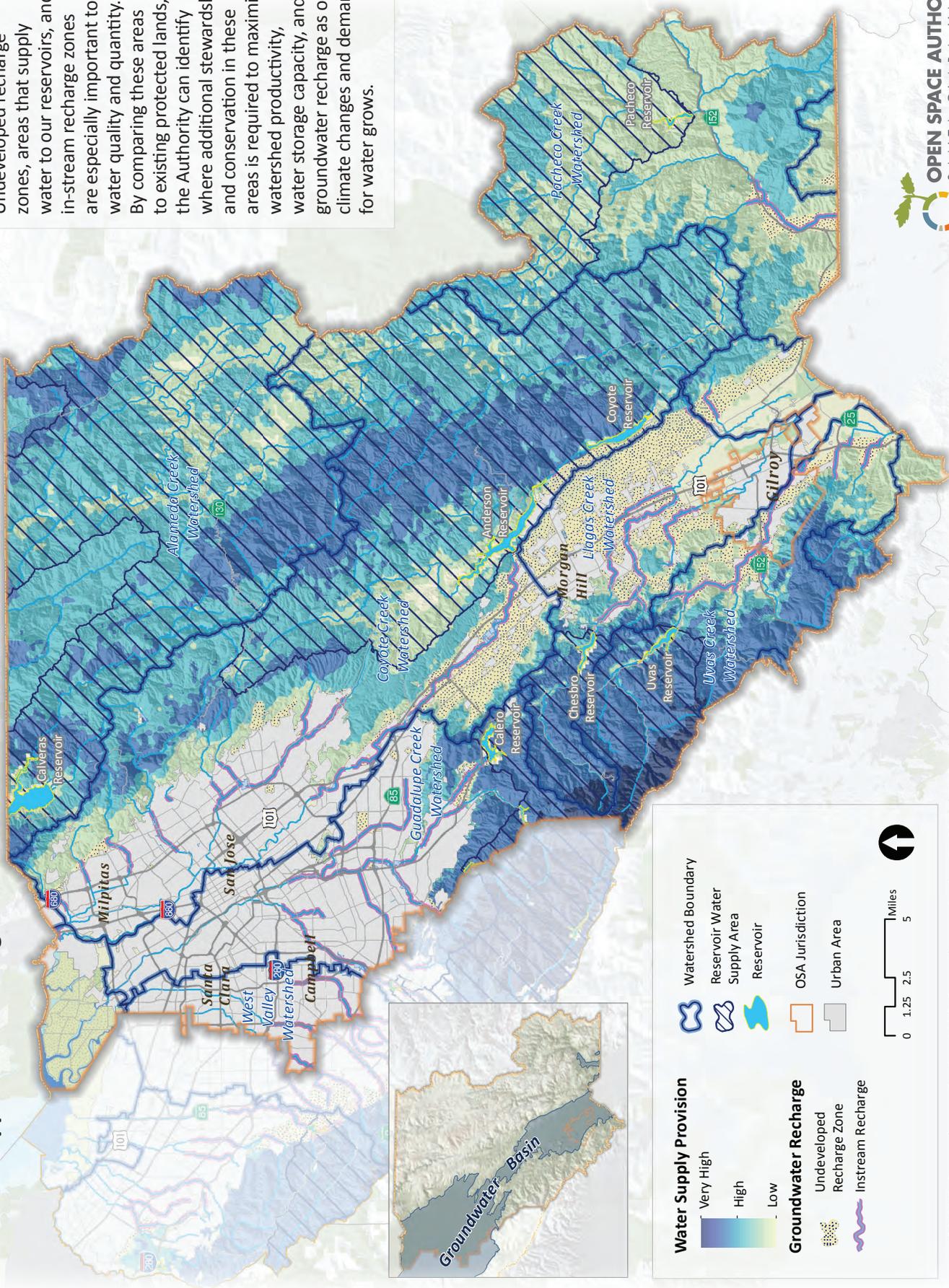
Watersheds, streams, and riparian areas not only support critical wildlife habitat and ecosystem health, they also capture clean, safe supplies of water. Approximately 50% of the County’s water supply comes from watersheds within County boundaries, and nearly all of the area’s water depends on local watersheds and aquifers for delivery, filtration, and storage.

With projected population growth, demand for water in the Bay Area is expected to increase by 22% by 2035, by which time the Bay Area water resources are projected to be insufficient (SPUR 2013a). Climate change will add even more stress and unpredictability to regional water supply.

In coordination with the Santa Clara Valley Water District (SCVWD) and other partners, the Authority will pursue the protection, restoration, and stewardship of watersheds, streams, and groundwater recharge areas that are critical to maintaining an adequate and safe water supply for the residents of Santa Clara County. **Figure 7** identifies important areas where the Authority can invest in open space to protect and enhance the reliability and health of our water resources. Key areas of rainfall percolation and aquifer recharge are on the Valley floor, particularly in the area

Figure 7: Water Supplies and Recharge

Undeveloped recharge zones, areas that supply water to our reservoirs, and in-stream recharge zones are especially important to water quality and quantity. By comparing these areas to existing protected lands, the Authority can identify where additional stewardship and conservation in these areas is required to maximize watershed productivity, water storage capacity, and groundwater recharge as our climate changes and demand for water grows.



Data sources: SCVWD Groundwater Basins, DWR Groundwater Basins, TBC3 Cal Basin Characterization Model.



The Calero Reservoir is used to replenish the groundwater that supplies much of the area's drinking water.

of Coyote Valley, the last remaining undeveloped groundwater recharge area for Silicon Valley. Important watershed areas for rainfall capture and water supply provision include the Upper Uvas and Llagas watersheds, which feed both the Chesbro and Uvas reservoirs, and the Upper Coyote Watershed to the east, which supplies the Coyote and Anderson Reservoirs.

The Authority will work with the SCVWD and other

partners to promote stewardship and effective land management practices to protect open space and agricultural areas that maintain the landscape's natural ability to capture rainfall and recharge the groundwater basin. In addition, the Authority will work with SCVWD to ensure that stewardship of its reservoirs' watersheds maintains watershed productivity and reservoir capacity. In coordination with the SCVWD, the Authority will pursue protection and restoration of lands with headwater streams, major tributaries, and other water capture areas to protect and maintain natural services provided by healthy watersheds.

Many areas identified in the *Valley Greenprint* are under private ownership and support active ranching and farming operations. Although many of these working lands provide a suite of natural services to our residents, most landowners receive little if any financial support to continue maintaining and stewarding the health of these lands. The Authority is committed to working with its partners and willing landowners to pursue opportunities and programs that ensure these critical areas receive adequate support and protection. Securing grants for off-channel storage ponds, for example, can provide much-needed water for agricultural activities during dry months and can enhance habitat for wildlife.

Flood Protection

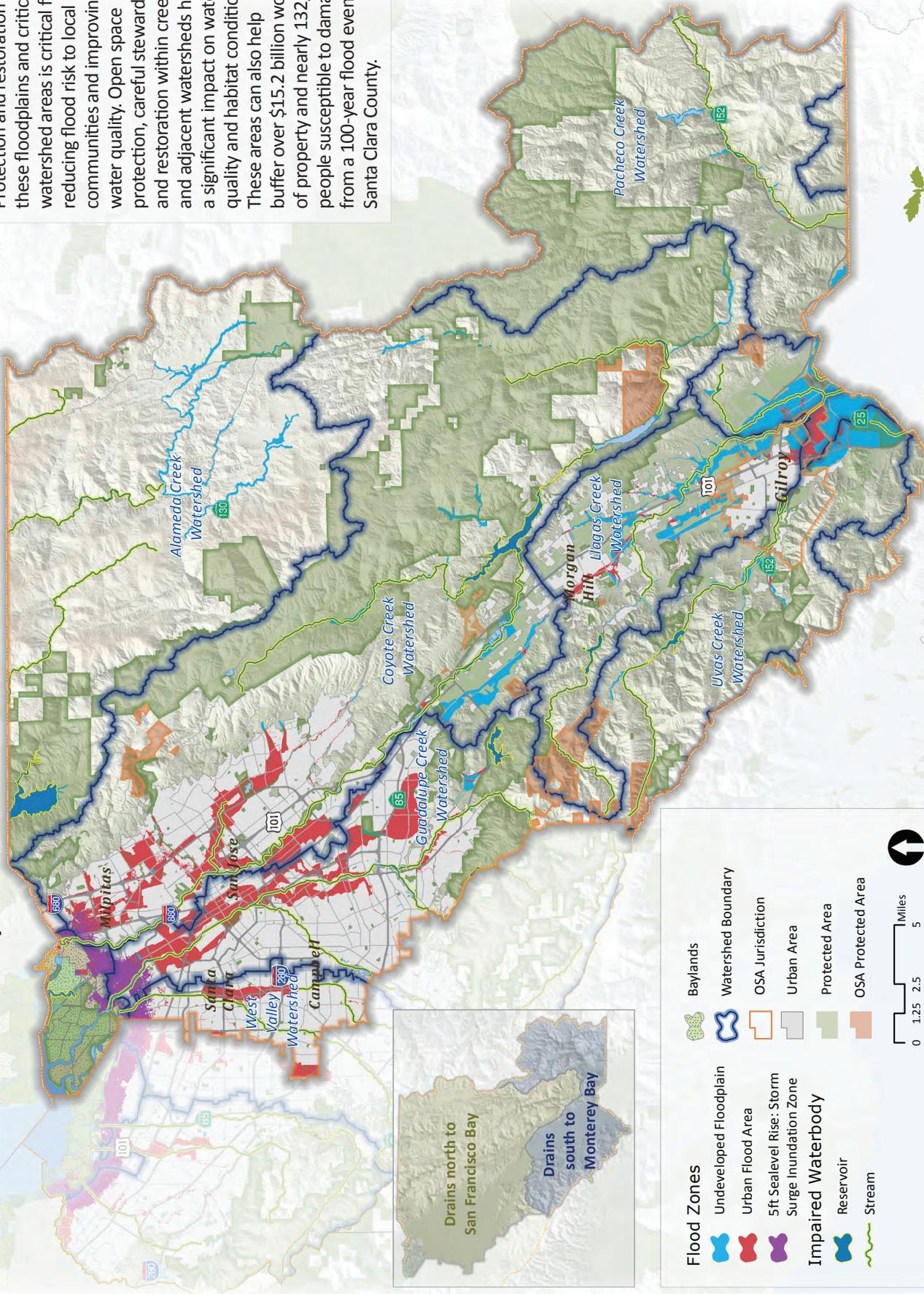
Over \$15 billion worth of property and more than 132,000 people are susceptible to flood damage in Santa Clara County, making it one of the most exposed counties in the state in terms of flood risk (FloodSAFE California 2013). Despite immense investment in flood protection – over a billion dollars over the last 30 years alone (SCVWD 2014) – sea level rise and more severe and unpredictable storms resulting from climate change will put our cities at even greater risk (Natural Resources Agency 2013). Protecting and restoring remaining floodplains and flood-prone areas before they are lost to development is necessary to reduce flood risk to local communities.

Prior to development, the majority of the Santa Clara Valley was used for agricultural production and was often subject to seasonal flooding. However, as farms and orchards were developed to support permanent structures and cities, levees, floodwalls, and even reservoirs were built to reduce risk of damage. As a result, many areas that were once active floodplains are now heavily urbanized, and if flooded, would cause significant economic loss. When allowed to occur in appropriate areas, flooding can provide enormous benefits and risk reduction to downstream areas. Flooding is a natural process that enables streams to fan out waters, dissipating energy over large areas rather than staying in-channel. This allows the water to slow down, drop out sediment, and recharge groundwater, reducing damage to stream channels and urban areas downstream.

Figure 8 identifies areas within the County where remaining floodplains can be protected to reduce downstream flood risk. These areas include large agricultural floodplains upstream from urban areas, notably the Coyote Valley, San Martin area, and eastern and southern Gilroy.

Figure 8: Flood Risk and Water Quality

Protection and restoration of these floodplains and critical watershed areas is critical for reducing flood risk to local communities and improving water quality. Open space protection, careful stewardship, and restoration within creeks and adjacent watersheds has a significant impact on water quality and habitat conditions. These areas can also help buffer over \$15.2 billion worth of property and nearly 132,000 people susceptible to damage from a 100-year flood event in Santa Clara County.



Flood Zones	Baylands
Undeveloped Floodplain	Watershed Boundary
Urban Flood Area	OSA Jurisdiction
5ft Sealevel Rise: Storm Surge Inundation Zone	Urban Area
Impaired Waterbody	Protected Area
Reservoir	OSA Protected Area
Stream	

0 1.25 2.5 5 Miles

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Data sources: SCVWD HMP Catchment, USGS WBD & NHD, SCVWD Waterbodies, SCVWD 1% Floodplains, SWRCB 2010, FMMP 2010, USGS 2013 SLR.

Flooding in agricultural areas is less costly than in urban areas. Agreements with landowners can be negotiated that provide compensation in exchange for allowing flooding to occur on agricultural or other undeveloped properties. A flooding easement could, for example, prohibit levee construction on farmland and compensate the landowner for allowing his or her lands to be flooded during extreme storm events. Undeveloped or natural floodplains adjacent to streams and wetlands can be restored to provide additional flood protection while also providing increased groundwater recharge, water filtration, and habitat value. The Authority will work with its partners to identify new tools, approaches, and opportunities to ensure the protection of our remaining floodplains.

Water Quality

The State Water Resources Control Board identifies over 228 miles of streams as “impaired” by pollution (SWRCB 2013) (**Table 2**), including nearly all of the main stem streams in Santa Clara County. Land use practices that increase storm water runoff into creeks or reduce channel stability can result in high sediment and runoff, carrying heavy metals or non-point source pollutants into streams and wetlands. These land use practices can pose severe threats to water quality and riparian species.

Through focused land acquisition, the Authority and our conservation partners can protect open space and reduce the potential for pollution and water contamination that stem from development and urbanization. In addition, the Open Space Authority will ensure that land stewardship and agricultural practices on the lands it owns and manages are protective of water quality, and will actively pursue partnerships that promote resource stewardship.

Agencies such as the Natural Resources Conservation Service (NRCS) and Resource Conservation Districts (RCDs) can provide technical and financial assistance to private landowners for resource stewardship and water-safe land use practices. The Authority can use lands under its ownership to test and demonstrate innovative and cost-effective techniques, providing workshops and guidance to landowners on practices to conserve water or improve water quality.



Derek Neumann

Natural floodplains adjacent to streams can provide flood protection as well as groundwater recharge, water filtration, and habitat value.

Table 2: Impaired water bodies of Santa Clara County and pollutant type (SWRCB 2013, Mendenhall 2014, Central Coast Regional Water Quality Control Board 2014).

Water body	Mercury and other metals	Pesticides, pathogens, organics	Low dissolved oxygen	Nutrients	Sediment	Toxicity	Turbidity	Water pH	Water temperature	Trash
Alameda Creek		X								
Alamitos Creek	X									
Almaden Lake	X									
Almaden Reservoir	X									
Anderson Reservoir	X	X								
Arroyo Del Valle		X								
Arroyo Mocho		X							X	
Calaveras Reservoir	X									
Calero Reservoir	X									
Carnadero Creek		X	X	X	X		X	X		
Chesbro Reservoir	X									
Coyote Creek (Santa Clara County)		X								X
Furlong Creek		X		X	X		X			
Guadalupe Creek	X									
Guadalupe Reservoir	X									
Guadalupe River	X	X								X
Llagas Creek (above Chesbro Reservoir)		X						X	X	
Llagas Creek (below Chesbro Reservoir)		X	X	X	X		X			
Los Gatos Creek		X								
Matadero Creek		X								X
Miller Canal		X		X	X			X	X	
Pacheco Creek		X	X	X	X		X			
Pajaro River	X	X	X	X	X		X	X		
Permanente Creek	X	X				X				X
San Benito River	X	X			X	X		X		
San Felipe Creek		X								
San Francisco Bay, South	X	X								
San Francisquito Creek		X			X					X
San Tomas Aquinas Creek										X
Saratoga Creek		X								X
Silver Creek (Santa Clara County)										X
Stevens Creek		X				X			X	X
Stevens Creek Reservoir	X	X								
Tequisquita Slough		X		X	X			X		
Uvas Creek (above Uvas Reservoir)		X						X	X	
Uvas Creek (below Uvas Reservoir)		X	X	X	X		X			
Uvas Reservoir	X	X								

Urban Creeks

Urban creeks and nearby uplands provide open space and recreational opportunities for city residents, while also providing the opportunity to connect, restore, and expand the riparian corridors and improve watershed health. Although the scale of analysis within the *Valley Greenprint* does not identify specific locations for urban creek enhancement, the Authority is committed to working with its partners to identify opportunities for green infrastructure enhancement and integration in urban areas.

The Open Space Authority will explore expanding its Urban Open Space Program to include urban creek restoration and floodplain protection projects that would improve water quality, reduce pollution, reduce flood risk, increase water retention and infiltration, and improve habitat for native species. The Open Space Authority's role in urban creeks can also include partnerships and funding opportunities for the development of educational, interpretive, and citizen science programs to improve urban waterways in particular and watershed health in general. By working with SCVWD, cities, and other partners the Authority can identify, protect and restore urban waterways to enhance their ability to function as green infrastructure. Key funding sources for these projects could include the SCVWD, Federal Emergency Management Agency (FEMA), United States Environmental Protection Agency (USEPA), cities, and local non-governmental organizations.

Strategies for Protecting Water Resources

- 1. Prioritize conservation and stewardship projects that link protection and enhancement of water supplies with flood control, water quality, groundwater recharge, and climate resilience.**
 - a. Initiate and participate in joint projects with the Santa Clara Valley Water District, the San Francisco Public Utilities Commission, and others to protect water resources, particularly in upper watersheds, groundwater recharge areas, urban areas, and undeveloped floodplains.
 - b. Advocate policies and use land protection measures that prevent urban development in groundwater recharge areas, particularly the Coyote Valley.
 - c. Encourage cities and public agencies to integrate protection of wetlands, floodplains, and riparian areas into land use and capital planning and mitigation projects to increase resilience to climate change impacts.
 - d. Expand the Authority's Urban Open Space Program guidelines to promote restoration of urban streams and riparian habitats, groundwater recharge areas, and floodplains.
 - e. Implement restoration projects in urban areas to reduce impervious surfaces and urban runoff, slowing water and increasing opportunities for infiltration into groundwater basins.
 - f. Explore pilot projects to increase local water supplies through construction of small-scale managed aquifer recharge projects such as the RCD's Bokariza project in the lower Pajaro River watershed.
 - g. Develop programs with the Natural Resources Conservation Service, Resource Conservation Districts, and other partners to implement watershed protection, stewardship, and restoration programs on working farms and ranches through conservation easements, water-related ecosystem service payments, or performance-based management agreements.
 - h. Develop fuels management plans and initiatives to reduce potential for erosion, landslides, and sedimentation following a catastrophic fire.



cc William Warby

Protecting water supplies includes water quality, groundwater recharge, flood control, and climate resilience.



The Open Space Authority will prioritize projects that link protection and enhancement of water supplies with flood control, water quality, groundwater recharge, and climate resilience.

2. Participate in watershed-level planning efforts to identify and coordinate regional priorities for water resource protection.

- a. Participate in the Bay Area and Pajaro Integrated Regional Water Management planning efforts to identify opportunities for protecting water resources. Seek partnerships with the SCVWD, Pajaro River Flood Prevention Authority, the Association of Bay Area Governments, the San Francisco Estuary Institute, the San Francisco Estuary Partnership, the San Francisco Bay Bird Observatory, Trout Unlimited, The Nature Conservancy, and other organizations to fund and implement priority projects.
- b. Participate in Santa Clara Valley Water District's water resources watershed master planning efforts to identify and prioritize land conservation and stewardship projects and investments, including opportunities for watershed restoration on Authority preserves.
- c. Engage in watershed-based conservation partnerships including the Upper Alameda Watershed Partnership and the Upper Pajaro Conservation Collaboration. These partnerships aim to identify non-regulatory tools, strategies, and financial incentives to promote watershed conservation and stewardship in these agricultural landscapes.
- d. Promote coordination between regulatory agencies and watershed stakeholders to facilitate priority watershed restoration projects, including larger riparian buffers or setbacks in both urban and rural settings. Explore feasibility of expanding the Integrated Watershed Restoration Program for San Mateo and Santa Cruz Counties to include Santa Clara County to streamline permitting and use of grant funds for watershed restoration projects.
- e. Support efforts of the NRCS and RCDs to fund local watershed coordinator position(s) and secure grant funds for restoration.
- f. Advocate for county and city land use planning and policies that protect water resources through protective zoning and strong riparian protection ordinances.

3. **Promote the use of new tools, partnerships, and resources to protect water resources and services through public and private investments.**
 - a. Complete and build on efforts such as the *Healthy Lands & Healthy Economies* initiative (Batker *et al.* 2014) to quantify the economic value of open spaces and working lands to protect local groundwater supplies, reduce water treatment costs, and provide flood control.
 - b. Develop specific case studies by watershed (for example, the Coyote watershed and Santa Clara Valley aquifer) that identify multi-benefit water resource conservation projects and potential new funding sources.
 - c. Seek funding from the NRCS Conservation Innovation Grant program and other sources to evaluate emerging markets for water quality improvements, wetland restoration, habitat conservation, and carbon sequestration.
 - d. Explore use of market-based incentives for protecting strategic water resources in the Santa Clara Valley through development of a pilot ecosystem services credit trading and banking project.
4. **Protect and restore water resources on Open Space Authority properties.**
 - a. Ensure that leases and management agreements for the Authority's agricultural tenants are written to protect water resources from depletion, pollution, development, and fire, including promotion of organic operations to limit the use of pesticides and fertilizers.
 - b. Ensure that management plans for Authority lands identify opportunities to improve water quality and aquatic habitat (for example, by decommissioning unnecessary roads, upgrading culverts, or restoring ponds and riparian areas).
 - c. Demonstrate and interpret watershed restoration programs and projects on Open Space Authority preserves. Work with the NRCS, RCDs, and the SCVWD to develop public workshops and training about watershed protection techniques and funding sources.



Stephen Joseph

The Open Space Authority can demonstrate best practices for water resources on its own properties, including pilot projects that feature new tools and techniques.

- d. Seek funding and partnerships for pilot projects on Open Space Authority preserves to demonstrate effectiveness of new tools and techniques for water capture and recharge, such as off-stream ponds and managed recharge basins. Small-scale projects located throughout upper and middle watersheds can increase water supplies and reduce the need for downstream flood protection.

5. **Engage the community in watershed research, education, and outreach activities.**
 - a. Seek funding and partnerships with the NRCS, RCDs, and SCVWD to develop interpretive materials and watershed education programs for use by Authority staff and volunteers on Authority properties.
 - b. Encourage local schools and watershed educators to utilize Authority lands in their programs, and seek funding and partnerships with the NRCS, RCDs, and SCVWD to support those programs.
 - c. Promote research and citizen science on Authority lands to collect information about watershed health.
 - d. Feature water conservation and watershed restoration projects funded through US Department of Agriculture Natural Resources Conservation Service programs such as the Wildlife Habitat Incentive Program, Environmental Quality Incentives Program, and other grants to encourage local use of those funding sources.