Santa Clara River Watershed Section

WCVC IRWM Plan Update 2014

Santa Clara River Watershed Section

Section 7.0 Climate Change Impacts and Adaptation

Section 8.0 Relevant References, Studies, Plans and Reports

APPENDICES

A. Groundwater Flow Model Update
B. Salt and Nutrient Management Plan
C. Impaired Water Bodies – Section 303 (d)

WCVC IRWM Plan Update 2013

Santa Clara River Watershed Section

1.0 INTRODUCTION:

The purpose of the Santa Clara River Watershed Section of the Integrated Regional Watershed Management Plan (IRWMP) Update is to provide comprehensive watershed-specific information in a single document to facilitate IRWM planning and project development. The Watershed Section is meant to provide a summary of detailed information available and provide a link and reference to other sources of additional in-depth information if desired. References to these sources are provided within the text and at the end in the References Section.

1.1 IRWM Accomplishments

Since its adoption in 2006, the IRWM program has successfully helped facilitate the planning and funding of numerous projects that improve water management in the watershed and help achieve IRWM goals. Table 1 provides a list of projects and programs implemented since 2007 in the Santa Clara River Watershed as well as the IRWM goals that they help achieve.

Table 1. IRWM Projects and Programs Successfully Implemented in the Watershed Since 2007

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding	IRWM Goals Addressed* By Number
County Government Center Parking Lot Green Streets Urban Retrofit Project	Ventura County and Ventura County Watershed Protection District	Project involves innovative Low Impact Design (LID) to reduce parking lot runoff volumes, pollutant loads, and recharge groundwater through system that infiltrates runoff flows including irrigation water from adjacent landscape areas into the underlying soils. The project will provide stormwater pollution prevention outreach and education opportunities due to the County Government Center parking lot's high visitation frequency and visibility.	Project completion anticipated in April of 2016	Prop 84 grant-funding, Ventura County and Watershed Protection District local match funding	1 through 6
Piru Dump Bank Stabilization Project	Ventura County Watershed Protection District, Ventura County Engineering Services Department, and County Executive Office	The Piru Dump is a closed burn dump adjacent to the Santa Clara River. The bank adjacent to the Santa Clara River was eroded in 2004-2005 winter storms. The Piru Dump Bank Stabilization Project included reconsolidation of waste that had been washed into the river and building an engineered bank to prevent future erosion, protecting the river from future burn waste exposure.	Project completed in March of 2011	CalRecycle, County of Ventura and Watershed Protection District Funding	2, 3, 4, & 6
	Ventura County	Salt and Nutrient Management Plan (SNMP) is being developed for the	Plan completion	Proposition 84 Planning	

Table 1. IRWM Projects and Programs Successfully Implemented in the Watershed Since 2007

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding	IRWM Goals Addressed* By Number
Salt and Nutrient Management Plan for Lower Santa Clara River Watershed	Watershed Protection District, County of Ventura Waterworks District No. 16, United Water Conservation District, Farm Bureau of Ventura County, and cities of Fillmore, Santa Paula and Ventura	Lower Santa Clara River groundwater basins [Fillmore, Mound, Piru, Santa Paula and Oxnard Forebay]. The objective of the SNMP is to manage salts and nutrients from all sources on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses	scheduled for December of 2014	Grant, and Watershed Protection District and participating entities (ie. Cities of Fillmore, Santa Paula, and Ventura and County Waterworks District No. 16) local match funding	1, 2, 4, 5 & 6
Santa Clara River Watershed Feasibility Study – Modeling Efforts	United States Army Corps of Engineers, Los Angeles County Flood Control District and Ventura County Watershed Protect ion District	Feasibility Study being performed in order to develop technical data required to identify and understand the flood protection and water resource challenges and opportunities present in the SCR watershed. The feasibility study is expected to identify project opportunities with justified Federal interest that can then be further developed with more detailed studies that lead to Federally funded construction projects	Study components: Hydrology modeling completed in November of 2009, Geomorphology completed in May of 2011, Flood mapping in May of 2012, and Sediment Transport completion anticipated in 2015	United States Army Corps of Engineers, Los Angeles County Flood Control District and Ventura County Watershed Protection District Funding	2, 3, 4 & 6
Expanding		To complete a United States Bureau		United States Bureau of	1

Table 1. IRWM Projects and Programs Successfully Implemented in the Watershed Since 2007

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding	IRWM Goals Addressed* By Number
Recycled Water Delivery Project Feasibility Study	City of Ventura	of Reclamation Title XVI Water Reclamation and Reuse Program feasibility study for the proposed Expanding Recycled Water Delivery Project	March 2014	Reclamation Title XVI Grant & SWRCB Water Recycling Grant	
Phase 2 Santa Clara River Estuary Special Studies	City of Ventura and Participating Agencies in the Santa Clara River Watershed	Evaluated a variety of opportunities for diverting discharge to the SCR Estuary for the purposes of recycling the water and benefitting the local communities' water supply, including the creation of wetlands.	March 2013	City of Ventura	1, 4 & 5
Fillmore Integrated Recycled Water and Wetlands Project	City of Fillmore	Construction of new, tertiary treatment level wastewater treatment plant and wetlands	Completed in 2011	Proposition 50 and local funding	1 through 6
Piru Wastewater Treatment Plant	Ventura County Waterworks District No.16		Completed in 2011	American Recovery and Reinvestment Act of 2009 - ARRA	
Piru Wastewater Treatment Plant Tertiary Upgrade	Ventura County Waterworks District No.16	Upgrade to tertiary treatment to allow for recycled water use	To be completed in 2015	Proposition 84 and local funding	1, 2, 4, and 6
Santa Paula Water Recycling Facility	Santa Paula Water, Perc Water and Alinda	Construction of new tertiary treatment level wastewater treatment plant	Complete	Public/Private Partnership	1, 2, 4, and 6

Table 1. IRWM Projects and Programs Successfully Implemented in the Watershed Since 2007

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding	IRWM Goals Addressed* By Number
Natural Floodplain Protection Program	The Nature Conservancy	The Nature Conservancy is implementing the Natural Floodplain Protection Program to preserve a critical section of the floodplain in the Santa Clara River Watershed. This project will establish a Floodplain Conservation Zone, where private property easements will be acquired to prevent future development.	To be completed in 2015	Proposition 84 and local funding	1 through 6
El Rio Septic to Sewer Conversion Project	Ventura County Waterworks District	This project involved taking local residents off septic systems and connecting them to a sewer treatment facility – thus reducing degradation to local groundwater supplies	Completed in 2011	Proposition 50 and local funding	2
Oxnard Septic to Sewer Conversion Project	City of Oxnard	This project involved taking local residents off septic systems and connecting them to a sewer treatment facility – thus reducing degradation to local groundwater supplies	Completed in 2011	Proposition 50 and local funding	2
Regional Groundwater Flow Model Update – Phase 1	United Water Conservation District	An update to a regional groundwater flow model enabling local entities to better understand the surface/groundwater interaction and to coordinate project development and assess impacts to groundwater	Completed in 2013	Proposition 84 Planning Grant and local funding	1 and 6

Table 1. IRWM Projects and Programs Successfully Implemented in the Watershed Since 2007

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding	IRWM Goals Addressed* By Number
Santa Clara River Parkway Project	California Coastal Conservancy	The primary goal of the Santa Clara River Parkway Project is the acquisition, conservation, and restoration of floodplain lands within the Santa Clara River corridor	Ongoing	Coastal Conservancy Funding	1 through 6
Celebrate the Watershed – Public outreach event	Multiple Entities	A public outreach event that followed the successful Watershed University Program conducted in 2005.	Completed in May 2012	Local entities – in kind	5
GREAT Project – Groundwater Recovery and Treatment	City of Oxnard	The GREAT Program combines wastewater recycling, brackish groundwater desalination, groundwater injection, storage and recovery, and restoration of local wetlands to provide an additional water supply source to the Oxnard Plain through the year 2030	Total completion by 2030	Local funding and assorted grants	1, 2, 5 and 6

2.0 WATERSHED DESCRIPTION

2.1 Watershed Internal Boundaries

The Santa Clara River Watershed is one of three primary watersheds that make up the region included in the IRWM Plan for Ventura County (Figure 1). The Santa Clara River is the largest river system in Southern California remaining in a relatively natural state. The Santa Clara River headwaters are located in the San Gabriel Mountains and flow generally west to the Pacific Ocean in Ventura. The Santa Clara River and tributary system has a Watershed area of about 1,634 square miles. Major tributaries include Castaic Creek and San Francisquito Creek in Los Angeles County, and the Sespe, Piru, and Santa Paula Creeks in Ventura County. Approximately 40 percent of the Watershed is located in Los Angeles County and 60 percent is in Ventura County. Please see Figure 1 for a map of the lower Santa Clara River Watershed in Ventura County.

The Santa Clara River is the largest Watershed in the County and also has the lowest percentage of development. About 90 percent of the Watershed is to the east and north of the floodplain in the mountainous terrain of the San Gabriel Mountains, the Sierra Pelona, and the Topatopa Mountains of the Sespe back-country to headwaters near Pine Mountain and Mt. Pinos, and to the south of the river including the Santa Susana Mountains, Oak Ridge, and South Mountain. Much of this area is in the Angeles National Forest and Los Padres National Forest. The remaining 10 percent of the Watershed is relatively flat terrain of the Oxnard Plain, the Santa Clarita Valley, Castaic Valley, the Santa Clara River Valley, and the floors of the larger canyons, including the upper Soledad, lower Sand, Mint, Bouquet, Placerita, San Francisquito, Piru, Santa Paula, and the Sespe. Because of the jurisdictional overlap of the Oxnard Plain and the hydrologic connectivity it has to both the Santa Clara River and Calleguas Creek watersheds, it will be discussed in both watershed sections.

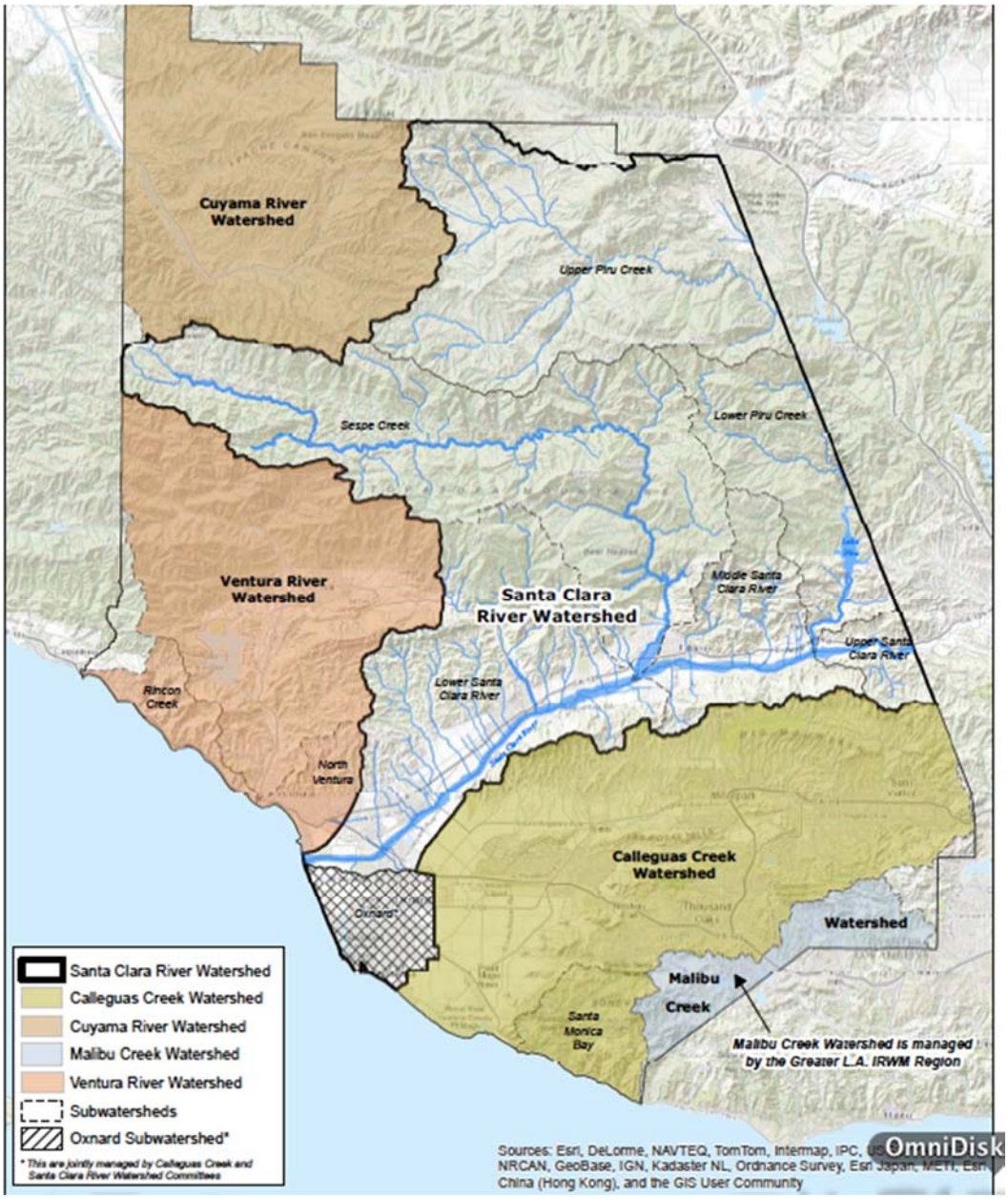


Figure 1. Watersheds in Ventura County - Santa Clara River Watershed Highlighted

The watershed also contains two primary groundwater basins and several groundwater sub-basins. The two groundwater basins in the Santa Clara River Watershed are the Acton Valley Basin and the Santa Clara River Valley Basin, both of which are drained by the Santa Clara River toward the Pacific Ocean to the west. The Santa Clara River Valley Basin is subdivided into six sub-basins: Santa Clara River Valley East, Piru, Fillmore, Santa Paula, Mound and Oxnard. Figure 2 shows the locations of the sub-basins in the lower Santa Clara River Watershed.

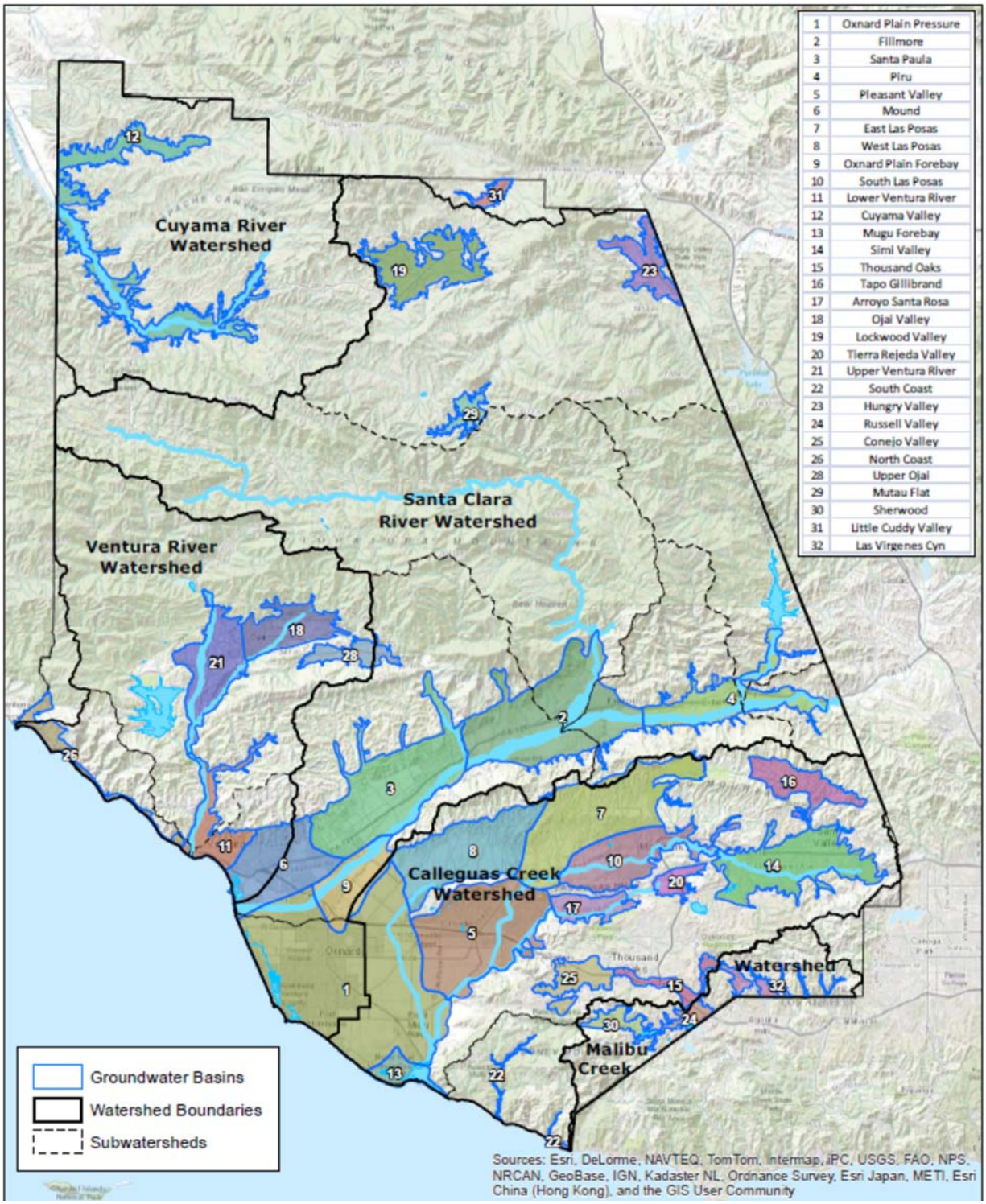


Figure 2. Groundwater Sub-basins in the all Ventura County Watersheds

2.2 Water Management Entities (Municipalities, land use agencies, flood management, water agencies, wastewater agencies, etc.)

The Santa Clara River Watershed's land uses, flood hazards, surface water, ground water, wastewater, as well as its ecological, cultural, environmental, recreational, and agricultural resources are managed and influenced by a consortium of government agencies and entities, non-profit organizations, advocacy groups, industry groups, and a host of water management agencies. Table 2 provides a list of agencies, organizations, and entities that are Watershed Coalition members, participants in the IRWM process, or have provided support to the IRWM process. Section 2.2.1 includes detailed information on the water suppliers within the Santa Clara River Watershed.

Table 2

Watersheds Coalition Members, Water Managers, Participants and Supporters of IRWM Process

Organization	Role
Cities	
City of Fillmore	Involved in water supply and/or water quality management and wastewater in the watershed. Land use authority within City boundaries
City of Oxnard	Involved in water supply and/or water quality management and wastewater in the watershed. Land use authority within City boundaries
City of Santa Paula	Involved in water supply and/or water quality management and wastewater in the watershed. Land use authority within City boundaries
City of Port Hueneme	Involved in water supply and/or water quality management and wastewater in the watershed. Land use authority within City boundaries
City of Ventura (San Buenaventura)	Involved in water supply and/or water quality management and wastewater in the watershed. Land use authority within City boundaries
Wholesale Water Agencies	
United Water Conservation District	Involved in water supply management in the watershed.
Retail Water Agencies	
Fillmore Irrigation Company	Involved in water supply and/or water quality management in the watershed.
Channel Islands Beach	Involved in water supply and/or water quality

Table 2

Watersheds Coalition Members, Water Managers, Participants and Supporters of IRWM Process

Organization	Role
Community Services District	management in the watershed.
Port Hueneme Water Authority	Involved in water supply and/or water quality management in the watershed.
County Agencies & Entities	
Ventura County Public Works Agency – Waterworks District No. 16 (Piru)	Involved in water supply and/or water quality management and wastewater in the watershed.
Ventura County Executive Office	County Department that manages the IRWM program
Ventura County Resource Management Agency	County Department tasked with adopting and implementing, land use policies
Ventura County Watershed Protection District	County agency that manages flood control, water quality, aquatic habitat, restoration and other watershed-level issues.
Ventura County Board of Supervisors	County decision makers overseeing grant administration and development of the IRWM plan update.
Ventura County Agricultural Commissioner	County Department that manages agricultural issues and water issues as they pertain to agriculture.
Environmental Stewardship Organizations	
Friends of the Santa Clara River	Active in promoting the conservation of watershed natural resources.
The Nature Conservancy	Active in promoting the conservation of watershed natural resources.
Southern California Wetlands Recovery Project	An alliance of federal, state, and local agencies and non-profits that acquire and restore coastal wetlands and watersheds in Southern California.
Trust for Public Land	Advocacy organization active in promoting the conservation of watershed natural resources.
Sierra Club	Active in promoting the conservation of watershed

Table 2

Watersheds Coalition Members, Water Managers, Participants and Supporters of IRWM Process

Organization	Role
	natural resources.
Surfrider Foundation	Advocacy organization active in promoting the conservation of watershed natural resources.
Ventura Coastkeeper	Advocacy organization active in promoting the conservation of watershed natural resources and conducing water quality sampling.
State, Federal, and Regional Agencies and Universities	
Regional Water Quality Control Board – Los Angeles Region	Regulatory authority for water quality management in the watershed.
California Coastal Commission	Manage land use and regulate water resources in the Coastal Zone.
California Coastal Conservancy	Manage and advocate for conservation of natural resources in the watershed. Manage the Santa Clara River Parkway Project
University of California Cooperative Extension – Farm Advisor	Conduct research and provide information to agricultural water users – to benefit water supply, water quality and ecosystem health
University of California – Santa Barbara	Researchers actively involved in ecological and hydrologic research in the watershed
California State University – Channel Islands	Researchers are actively involved in ecological and hydrologic research in the watershed
California Department of Fish and Wildlife	Manage natural resources within the watershed.
California Department of Water Resources	Implement and manage state water supplies and oversee IRWM program at the state level.
Ventura County Resource Conservation District	Manage soil and water conservation projects, wildlife habitat and watershed enhancement and restoration.
Southern California Assoc. of Governments	Plan, implement, and manage regional planning issues
California Department of Parks	Manage natural resources within the watershed.

Table 2

Watersheds Coalition Members, Water Managers, Participants and Supporters of IRWM Process

Organization	Role
and Recreation	
U.S. Forest Service –Los Padres National Forest	Manage natural resources within the watershed.
Natural Resources Conservation Service	Manage natural resources within the watershed.
U.S. Army Corps of Engineers	Manage natural resources within the watershed specifically levees and other federal waters.
U.S. Environmental Protection Agency	Manage natural resources within the watershed.
U.S. Bureau of Reclamation	Water wholesaler and producer of hydroelectricity.
U.S. Fish and Wildlife Service	Manage natural resources within the watershed.
Naval Base Ventura County	Encompass Port Hueneme and Pt. Mugu Naval bases
Wastewater Agencies (in addition to cities and County)	
Saticoy Sanitary District	Manage wastewater within the watershed.
Ventura Regional Sanitation District	Manage wastewater within the watershed.
Groundwater Basin Management Authorities	
Fox Canyon Groundwater Management Agency – per California Water Code	Manage groundwater in the watershed
Santa Paula Basin Pumpers Association – court adjudicated	Manage groundwater in the watershed
City of Fillmore/United Water Conservation District	Groundwater managers of Fillmore and Piru Groundwater Basins per AB 3030 provisions
Community Organizations and Recreational Interests	
Pleasant Valley Park and Recreation District	Manage parks, open space areas, and recreational resources within the watershed.

Table 2

Watersheds Coalition Members, Water Managers, Participants and Supporters of IRWM Process

Organization	Role
Flood Management Agencies	
Ventura County Watershed Protection District	County agency that manages flood control, water quality, aquatic habitat, restoration and other watershed-level issues.
Native American Tribes	
Individual members of various bands of the Chumash Tribe and	Advocate for Native American issues that pertain to water resource management.
Wishtoyo Foundation	Advocate for Native American issues that pertain to water resource management.
Agricultural and Business Groups	
Farm Bureau of Ventura County	Advocates for agricultural water issues
Coalition of Labor Agriculture and Business (COLAB)	Interest group advocating for the needs of local businesses and agricultural interests

Source: Regional Acceptance Process Application and IRWMP 2014, Governance Section

2.2.1 Local Agencies with Statutory Authority over Water Supply and Management

There are 54 entities that provide water in the portion of the Santa Clara River Watershed within the County of Ventura (Figure 3). This section includes information on those purveyors that serve at least 4,000 people. All five cities within the Santa Clara River Watershed manage stormwater, as co-permitees on the Municipal Separate Storm Sewer System (MS4) Stormwater Permit with the County of Ventura and the Ventura County Watershed Protection District.

Water purveyors within the United Water Conservation District (UWCD) wholesale district include Channel Islands Beach Community Services District, the City of Fillmore's Water Department, the City of Port Hueneme's Water Department, the Fillmore Irrigation Company, the City of Santa Paula, and the UWCD itself (VCWPD 2006). Some of the areas within the Santa Clara River Watershed, such as the City of Ventura are also located within the Casitas Wholesale District. and receive their water

supply mostly from the Ventura River. For a full list and information on the water purveyors in Ventura County, visit the WCVC website and search for the Inventory of Public and Private Water Purveyors in Ventura County, found here:

http://www.ventura.org/wcvc/documents/PDF/Inventory_Public_and_Private_Water_Purveyors-Ventura_County_2006.pdf

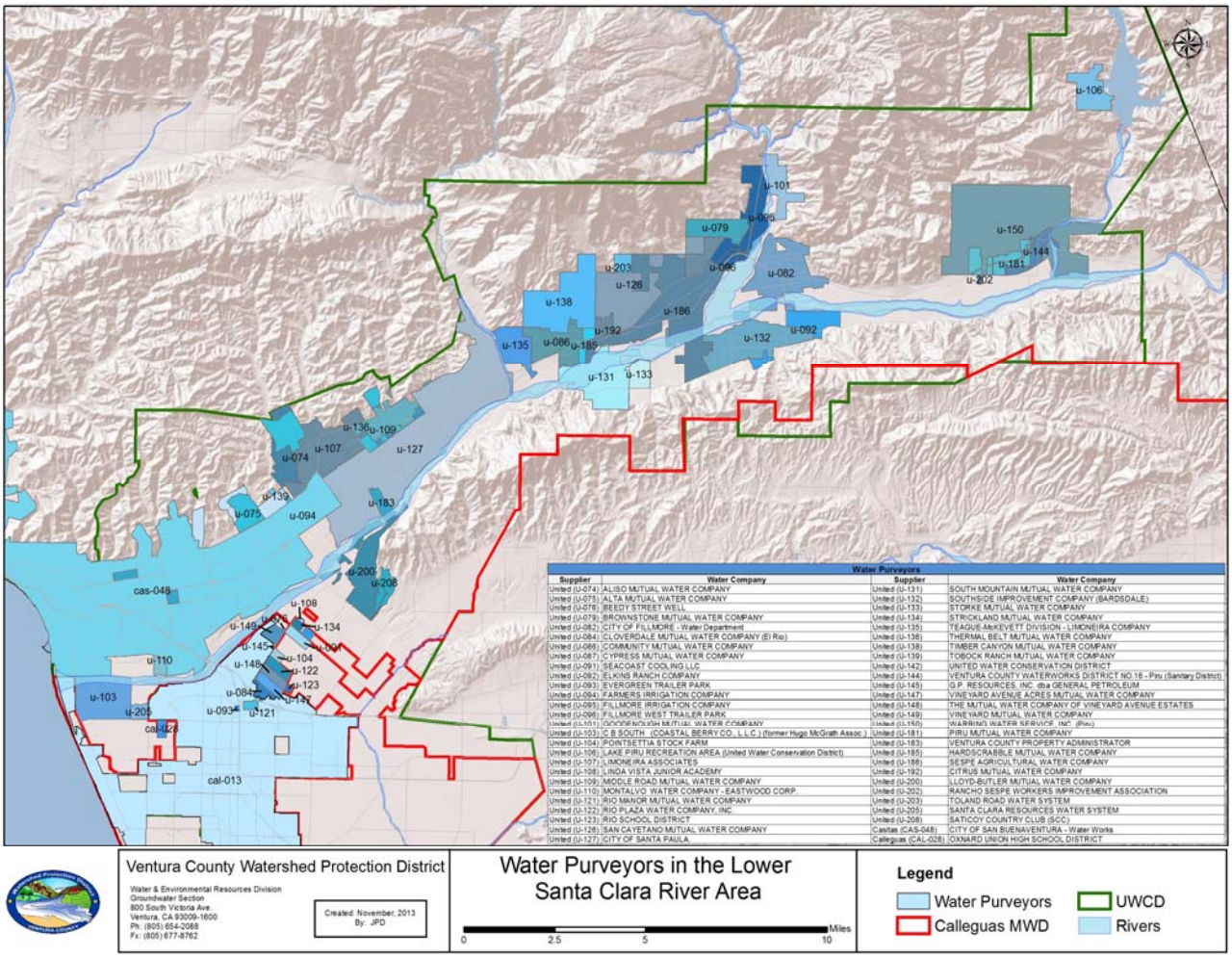


Figure 3. Water Purveyors in Lower Santa Clara River Watershed

2.2.1.1 Wholesale Water Agencies

United Water Conservation District

Summary: The United Water Conservation District (UWCD) is the primary wholesale distributor of water in the Santa Clara River Watershed for urban, agricultural, and environmental uses. It operates the Santa Felicia Dam and Freeman Diversion Dam, and releases water from Lake Piru to its spreading grounds to recharge aquifers

underlying the Santa Clara River Valley and the Oxnard Plain. In cooperation with the County of Ventura and the Fox Canyon Groundwater Management Agency, the UWCD is implementing solutions to the saline water intrusion problem beneath the Oxnard Plain. The UWCD, with both irrigation and domestic wells, provides wholesale water through its Oxnard – Hueneme pipeline to the City of Oxnard and Port Hueneme Water Agency (which includes the Naval Base Ventura County), plus several small mutual water agencies. It also wholesales agricultural water through its Pleasant Valley pipeline to the Pleasant Valley County Water District. It operates the Pumping-Trough Pipeline and reservoir to provide water to farmers in the pumping trough area in the Oxnard Plain.

Date of Agency Formation: 1950

Enabling Legislation: Water Conservation Act of 1931

Current Services as Authorized: Wholesale irrigation and Municipal and Industrial (M&I) water, Recreational facilities, hydroelectric generation, Groundwater recharge, Water quality monitoring, Seawater intrusion abatement, and Regional groundwater management

Other Services as Contained in Enabling Legislation: Make survey and investigations of water supply and resources. Appropriate, acquire, and conserve water and water rights. Conserve, store, and spread water. Acquire or construct dams, dam sites, reservoir and reservoir sites, canals, ditches, conduits, spreading basins, wells, etc. Build facilities to protect the District from damage by flood. Sell, deliver, distribute water and construct or install facilities for water delivery. Acquire or construct recreational facilities. Treat, purify, and reclaim sewage or storm water. Contract with other government agencies to acquire or dispose of water

Size of Current Service Area: Approximately 199,344 acres

Population Served: Approximately 325,000

2.2.1.2 Retail Water Purveyors

Channel Islands Beach Community Services District

Summary: The Channel Islands Beach Community Services District provides water, sewage, and rubbish collection services in the unincorporated Silver Strand, Hollywood Beach, and Hollywood-by-the Sea. It was formed in 1982 as a successor to the Channel Islands County Water District. Under contract, it also provides water and/or sewage services to portions of Channel Islands Harbor in the city of Oxnard. This services

district is authorized to provide a variety of services, including police and fire protection, street improvements and maintenance, street lighting, and undergrounding of utilities.

Date of Agency Formation: December 14, 1982

Enabling Legislation: California Government Code Section 61000 et seq.

Current Services as Authorized: Water, sewage, sanitation, and community service

Other Water Related Services Authorized in Enabling Legislation: Recreation, utility undergrounding, flood protection works.

Service Area: Approximately 6,322 acres

Population Served: Approximately 10,000

Agreements with Others to Provide Services:

- Joint Powers Agreement (JPA) with the City of Port Hueneme creating the Port Hueneme Water Agency, 1994, amended 2000.
- Sewer Maintenance Agreement with the City of Port Hueneme, 1996.
- Water Service Agreement with the County of Ventura, 1996.
- Solid Waste Agreement with RCI, Inc. 1997
- Water and Sewer Service Agreement with the City of Oxnard

Port Hueneme Water Authority (PHWA)

Summary: The City and the Channel Islands Beach Community Services District (CIBCSD) formed the PHWA in July 1994, as a means to better manage the sub-regional urban water supplies for their customers. Two neighboring Naval Bases also became participants in the PHWA, namely the United States Naval Base Ventura County - Point Mugu (NBVC-PM) and Naval Base Ventura County – Port Hueneme (NBVC-PH). The PHWA Board of Directors is composed of three council members from the City and two directors from the CIBCSD.

Date of Agency Formation: July 1994

Pleasant Valley County Water District

Summary: The Pleasant Valley County Water District operates and maintains a distribution system for agricultural water. The water is obtained from the United Water Conservation District and Camrosa Water District. This supplements groundwater supplies and helps alleviate salt water intrusion under the Oxnard Plain.

Date of Agency Formation: October, 1956

Current Services as Authorized: Store, produce, and distribute agricultural water

Size of Current Service Area: Approximately 12,656 acres

Ventura County Waterworks Districts No.16, Piru

Summary: Ventura County Waterworks District (VCWD) No.16 provides sanitation services to the entire community of Piru and water service in the Pacific Avenue area. The Piru Wastewater Treatment Plant (PWWTP) provides water and sewer service to the community of Piru, a Disadvantaged Community in the unincorporated area of Ventura County. The original wastewater treatment plant was originally constructed in 1974, and was upgraded to a capacity of 500,000 gallons per day in 2011 when other upgrades to the facility were completed to meet the RWQCB's water quality requirements. The system uses tertiary treatment that uses an Oxidation Ditch Wastewater System in order to generate recycled water for landscaping and agriculture.

For more information search the Ventura County website for "Overview of Project and Ventura County Waterworks District No. 16"

2.2.1.3 Sanitary Districts

Saticoy Sanitary District

Summary: The Saticoy Sanitary District provides sewage collection and treatment services for the community of Saticoy. The District boundaries were expanded in 2001 to include all of the Saticoy community.

Date of Agency Formation: September 1941

Enabling Legislation: Health and Safety Code Section 6400 et seq.

Current Services as Authorized: Collection and treatment of sewage

Size of Current Service Area: Approximately 248 acres

Population Served: Approximately 1,500

Ventura Regional Sanitation District

Summary: The Ventura Regional Sanitation District (VRSD) is an enterprise public agency providing a variety of solid waste management, wastewater collection and

treatment, and water supply services. VRSD serves the Water/Wastewater and Solid Waste needs of Ventura County, including: Camarillo, Fillmore, Ojai, Oxnard, Port Hueneme, Ventura, Santa Paula, and Thousand Oaks as well as eight special districts including : Camarillo Sanitary, Camrosa Water, Channel Islands Beach Community Services, Ojai Valley Sanitary, Saticoy Sanitary, Triunfo Sanitation and Ventura County Waterworks Nos. 1 (Moorpark) and 16 (Piru).

Date of Agency Formation: July 1970

Enabling Legislation: Health and Safety Code Sec. 4700 et seq.

Size: Approximately 1,120,493 acres

Current Services as Authorized: Countywide, except territory within the Moorpark and Simi Valley Unified School Districts - Services are to acquire, construct, and operate sewage collection, treatment and disposal works, acquire, construct, and operate refuse transfer or disposal facilities, and perform solid waste management.

2.2.1.4 Other Districts

Ventura County Resource Conservation District

Summary: The Ventura County Resource Conservation District (VCRCD) was organized in 1979 by the consolidation of the Ojai and South Ventura County Resource Conservation Districts. Those Districts encompassed the Ventura River and Calleguas Creek watersheds. As a part of the consolidation, most of the remaining County unincorporated area was annexed to the VCRCD, including the Santa Clara River watershed. All of the incorporated city areas were excluded from the VCRCD. As unincorporated areas are annexed to cities, a concurrent detachment from this District occurs. VCRCD services are extended by contract to cities that desire assistance with erosion and other conservation issues. Areas of Ventura County that are covered by Resource Conservation Districts from Los Angeles County are not part of this District. These areas include the Bell Canyon, Oak Park, and Frazier Park areas.

Date of Agency Formation: December, 1979

Enabling Legislation: Public Resources Code Section 9074 et seq.

Current Services as Authorized: Serves the unincorporated areas of the county, excluding the cities - Services include developing district wide comprehensive plans for soil and water conservation including improvement of farm irrigation, land drainage, erosion control, and flood prevention. Conduct surveys, investigations, and research relating to the conservation of resources.

Size of Current Service Area: Approximately 1,089,533 acres

Population Served: Approximately 92,666

2.2.1.5 Groundwater Management Agencies

Fox Canyon Groundwater Management Agency

Summary: The Fox Canyon Groundwater Management Agency (FCGMA) was formed by State Assembly Bill 2995. In 2006, the FCGMA adopted the following mission statement: *"The Fox Canyon Groundwater Management Agency (Agency), established by the State Legislature in 1982, is charged with the preservation and management of groundwater resources within the areas or lands overlying the Fox Canyon aquifer for the common benefit of the public and all agricultural, municipal and industrial users."*

Date of Agency Formation: January 1, 1983

Enabling Legislation: Water Code Appendix, Section 121-401, et seq.

Current Services as Authorized: Groundwater management through well extraction regulation

Other Services Authorized in Enabling Legislation:
The original State legislation created the FCGMA to manage groundwater in both overdrafted and potentially seawater-intruded areas within Ventura County. The prime objectives and purposes of the FCGMA are to preserve groundwater resources for agricultural, municipal, and industrial uses in the best interests of the public and for the common benefit of all water users (FCGMA, 2007). Protection of water quality and quantity along with maintenance of long-term water supply are included in those goals and objectives. The FCGMA utilizes ordinances and resolutions to regulate groundwater extractions from public and private wells. Sole source of income to agency is through extraction fees for management, with $4.00 per acre foot the maximum allowed by law.

Size of Current Service Area: Approximately 120,066 acres

2.2.1.6 Flood Control Agencies

Ventura County Watershed Protection District

Summary: The Ventura County Watershed Protection District (District) was formed, in part, to provide for the control and conservation of flood and storm waters and for the protection of watercourses, watersheds, public highways, life and property in the County of Ventura from damage or destruction from these waters. On January 1, 2003, the name was changed to the Ventura County Watershed Protection District to reflect changes in community values, regulatory requirements, and funding opportunities. The name change also reflected the District's desire to emphasize integrated watershed management and solve flood control

problems with environmentally sound approaches. The District's mission is to protect life, property, watercourses, watersheds, and public infrastructure from the dangers and damages associated with flood and stormwaters.

Date of Agency Formation: January, 1944

Enabling Legislation: Water Code Appendix, 46-1, 46-7

Current Services as Authorized:

- County-wide (except for the islands of Anacapa and San Nicolas),
- Control flood and storm waters
- Establish, protect, and regulate designated flood ways
- Import water
- Provide for recreational use and beautification of lands in connection with carrying out broad flood control objectives
- Acquire, construct, and operate recreational facilities and landscaping in connection with any dam, reservoir, flood control, or storm drainage facility or improvement

2.2.1.7 Cities That Provide Water Supply Services

*Cities and population served**

- Fillmore (15,162)
- Oxnard (201,555)
- Port Hueneme (21,856)
- Santa Paula (29,963)
- Ventura (107,738)

* US Census 2012 Population Estimates

For more information on water supply entities in Ventura County, search for the Ventura County Regional Acceptance Application Process

2.2.2 Other Potential Participants

There are several "disadvantaged" communities (DAC) within the County and Santa Clara River Watershed. As defined by Proposition 50 Grant Guidelines, a disadvantaged community is one with an annual median household income that is less than 80 percent of the statewide annual median household income ($49,305) (American Community Survey 2011). There are several Native American tribes represented in Ventura County including the Chumash, Barbareno and Ventureno Indians. There has been ongoing outreach to tribal interests throughout the IRWM planning process beginning in 2005. The Native American Heritage Commission was contacted to confirm the appropriate contacts for further outreach. The Santa Clara River Watershed Committee welcomes input and participation from groups and individuals that represent these

communities as well as any environmental justice organizations, neighborhood councils, and social justice organizations.

2.3 Watersheds and water systems

2.3.1 Major Water Related Infrastructure

Much of the watershed's water related infrastructure supports water conveyance to groundwater recharge basins. United Water Conservation District is responsible for groundwater recharge in the Ventura County portion of the Santa Clara River Valley and on the Oxnard Plain, and for the wholesale distribution of water to purveyors on the Oxnard Plain. UWCD operates Lake Piru, with an 83,000 acre-feet capacity, as a storage reservoir. Lake Piru water is released to the Santa Clara River for recharge of the Piru, Fillmore, and Santa Paula basins as it moves downstream. The Piru diversion on Piru Creek recharges upstream groundwater basins at recharge ponds in Piru. The Freeman Diversion in Saticoy conveys river water to spreading grounds where it recharges groundwater for subsequent use by municipal and agricultural pumpers. The Freeman diversion has an average yield of approximately 69,000 AFY, diverted from the river. Total groundwater pumping within United's service area is approximately 180,000 AFY.

United Water Conservation District maintains much of the water supply infrastructure within the Santa Clara River Watershed. The following infrastructure, as shown in Figure 4, supports the water supply system in the watershed;

- Santa Felicia Dam
- Lake Piru
- Piru Spreading Grounds
- Freeman Diversion
- Saticoy Spreading Grounds
- El Rio Spreading Grounds
- Oxnard-Hueneme Pipeline
- Pleasant Valley Pipeline

Additional infrastructure-support projects proposed by United primarily include maintenance, upgrades, and enhancement of existing water supply infrastructure systems. The following is a list of proposed projects listed in the United Water Conservation District 2007 Water Management Plan:

- Freeman Diversion and Related Projects
- Forebay Recharge Project: Diverting some of United's water rights to the Ferro and Riverpark pits. A second phase would increase United's water diversion rights necessitating a new canal and extention of the existing Freeman Canal to convey the increased flow to Ferro and Riverpark Pits.
- Refacing of the Freeman Diversion Dam

- Piru Diversion Upgrade
- Moss Screen Gate Upgrade
- Santa Paula Basin Recharge Facilities
- Santa Felicia Dam New Outlet Tower
- Oxnard/Calleguas Intertie to the El Rio Spreading Grounds
- El Rio Bypass Pipeline
- Santa Felicia Dam Spillway Upgrade
- Eastern Oxnard Plain Projects
- Pilot Aquifer Storage and Recovery (ASR) Well near Hueneme Road
- Seawater Intrusion Barrier
- Pumping Trough Pipeline Extension

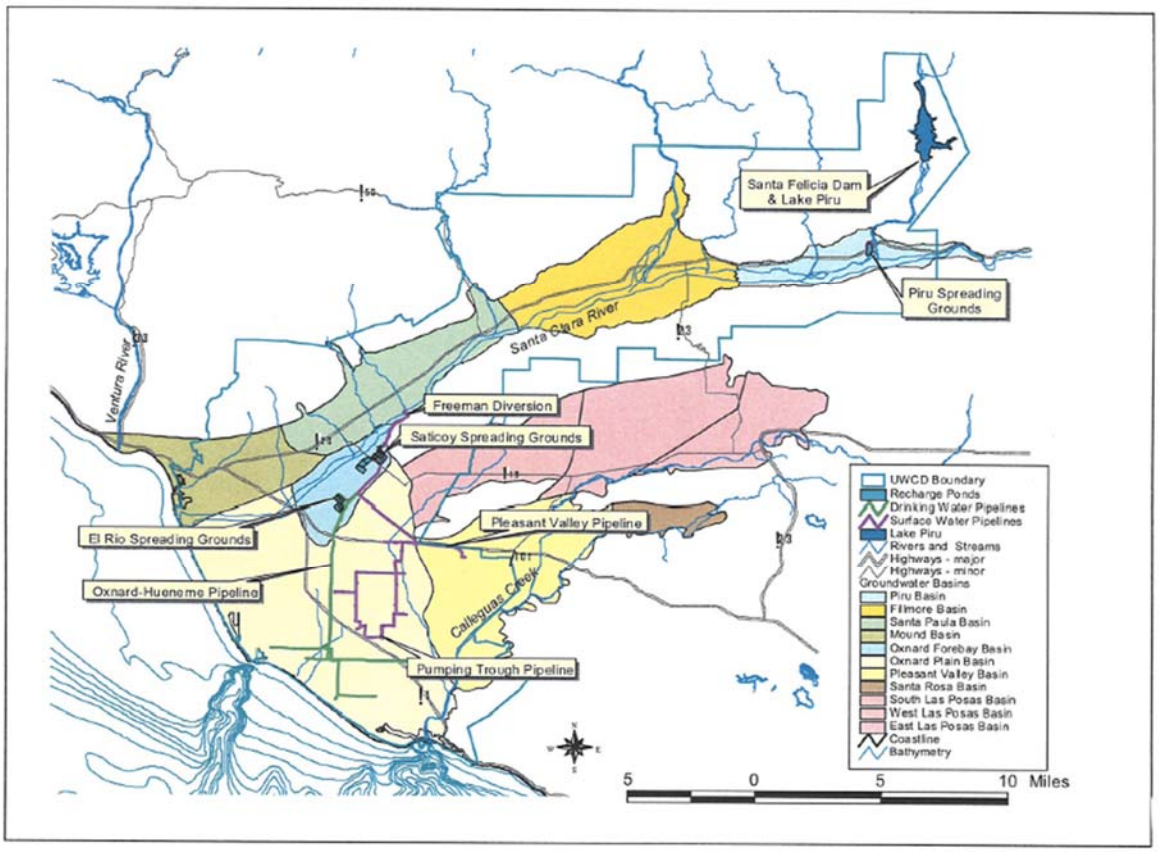


Figure 4. United Water Conservation District's water supply infrastructure in the Santa Clara River Watershed and surrounding areas

Watershed Infrastructure Managed by City of Ventura

Currently, the City of Ventura's water system serves 31,650 water service connections, which includes the population of the City, some additional areas outside the City boundaries, all residential, commercial, industrial and irrigation customers, and fire protection users. The

western portion of the City is within the Casitas Municipal Water District service area in the Ventura River Watershed. However, the mid and eastern portion of the City is within United Water Conservation District's boundaries in the Santa Clara River Watershed.

The City of Ventura's water system is a complex system of 16 pressure zones, 13 wells, 21 booster stations, approximately 380 miles of pipelines ranging from 4-inches to 36-inches in diameter, and a total storage capacity of approximately 52 million gallons in 32 tanks and reservoirs that spans both watersheds. The system delivers water from sea level to a maximum elevation of over 1,000 feet. The City operates three purification facilities, including one membrane filtration treatment plant for surface water sources on the west side of the City, and two iron/manganese removal treatment plants for groundwater sources on the east side.

The City also maintains and operates the Ventura Water Reclamation Facility (VWRF), which treats wastewater and discharges a portion to the Santa Clara River Estuary and some is used by Ventura as recycled water. The VWRF is a tertiary treatment facility with primary clarification, equalization basins, an activated sludge process designed for biological nutrient removal, secondary clarification, tertiary filtration, chlorination and dechlorination. The VWRF discharge is capped at 9 million gallons a day to the Estuary, but it also produces recycled water for landscape irrigation. The VWRF treats domestic, commercial, and industrial wastewater flows from the City.

Santa Clara River Watershed Wastewater Treatment

There are seven wastewater treatment and water reclamation plants in the Santa Clara River Watershed. Combined, the plants can treat approximately 39.7 million gallons of water per day. See Table 3 for a list of all wastewater treatment and water reclamation plants in the watershed.

Table 3.
Water Treatment Facilities in the Santa Clara River Watershed

Water Treatment Facility	Average Treatment Volume in million gallons per day (mgd)[1]
Oxnard Wastewater Treatment Plant	31.7
Montalvo Municipal Improvement District Treatment Facility	1.1
Saticoy Sanitary District Wastewater Treatment Plant	0.3
Santa Paula Wastewater Treatment Plant	4.2
Fillmore Wastewater Treatment Plant	1.8
Piru Wastewater Treatment Plant	0.5
Todd Road Wastewater Treatment Plant	0.06

[1] Treatment volumes were obtained in 2012 from respective treatment plant personnel

2.3.2 Flood Management Infrastructure

Flood management and infrastructure are essential along the Santa Clara River and its tributaries as they are characterized as a flashy system, often exhibiting very low flow in dry periods that increase exponentially during winter storm events. In the rainy season (November through March) river flows increase, peak, and subside rapidly depending on the intensity of rainfall events. Total annual rainfall can vary greatly within a particular year and between years. This results in intermittent or non-existent flows in many tributaries during the summer months. In the main stem of the river, flow depends on the geologic conditions that govern groundwater-surface water interactions (Stillwater, 2007).

In addition to floodwaters, sediment erosion and transport processes in the watershed are also important in developing flood infrastructure and management strategies. The main tributary to the River is the Sespe Creek, which can contribute almost half of the river's ultimate flow to the ocean during storm events. The sediment load coming out of the Sespe, Pole, Hopper, and Santa Paula Creeks is extremely high due to steep slopes and a high percentage of slope failure areas in the Watershed. It is common for channels to fill with sediment during storm events, reducing their conveyance capacity to almost nothing and causing breakouts and flooding damage. The breakouts can wash across roads such as Highway 126, causing road closures and isolating communities from medical help during storm events. Breakouts of Hopper Creek have also threatened a water treatment plant located downstream. The episodic and extreme nature of flow in the Santa Clara River results in the majority of total sediment transport occurring in very short periods of time. This naturally episodic sediment flux is an important factor in the reproduction, foraging behaviors, and life histories of many species (Stillwater, 2007).

The combined influence of sediment and water runoff from the tributary watersheds have a significant impact on infrastructure such as roads, bridges, and levees and lead to bank erosion along the river. Areas such as the Santa Paula Airport adjacent to the river are commonly threatened by storm flow. Downstream areas of the river are also flooded by relatively low-storm flows; for instance, the access roads near the Highway 101 bridge-crossing flood during storm events. Slopes are so low in the downstream portions of the Watershed that culvert outlets into the river are commonly equipped with flap gates to prevent high river flows from flooding adjacent agricultural land and developed areas. However, if high river flows close the flapgates, runoff from adjacent Watersheds cannot be drained, leading to localized flooding in the downstream areas of the river.

The watershed's two surface water storage reservoirs and the dams that create them also contribute to flood management. The lower Santa Clara River is supplemented by controlled flow releases from Pyramid Lake and the Santa Felicia Dam that holds Piru Reservoir. These dams and reservoirs assist water managers in controlling the

downstream flow of Piru Creek. Despite these control mechanisms, large flow variability still exists within the Watershed because dams regulate only 34% of the watershed (Stillwater, 2007).

Levees

Since the 1950's when major levee construction first began in Ventura County, there has been a progressive increase in the extent of bank protection along the Santa Clara River. As of 2005, 33% of the total length of the Santa Clara River has some form of bank protection (URS, 2005). Levees, a form of bank protection, act to confine high discharges and significantly reduce the width of the river during large flood events. However, levees are vulnerable to damage and scour during repeated large flood events (e.g., January and February 1969; January and February 2005). Recently, the perception of levees has changed and their apparent disadvantages have made the construction of new levees less desirable. This is partly because of the large expense involved in continued levee maintenance, and partly because of their negative impacts on natural river systems. During flooding events, these impacts include unnatural alignment in the river course, increased scour and erosion on opposite unprotected banks, and increased chance of bed erosion. When floods recede, these impacts result in increased sediment deposition. Additionally, it has been found that levees increase the rates of channel incision because of increased velocities and scouring (Stillwater Sciences, 2007).

Levees along the Santa Clara are constructed and maintained by federal, county, and private entities. Because of the costly nature of structural flood control to both economic and ecological resources, alternative strategies for flood management are being considered. Alternative strategies can preserve the natural floodplain and its ability to attenuate downstream flood impacts as well as provide adequate protection to urban and agricultural resources.

The natural floodplain of the Santa Clara River remains relatively intact i.e. there are relatively few levees and other infrastructure that attempts to confine it. A floodplain left in its natural state offers numerous ecological and economic benefits and ecosystem services such as fertile soil distribution, water supply through groundwater infiltration, and biodiversity provided by floodplain habitat. The highly prosperous agricultural industry gains from the ecosystem services provided by the Santa Clara River because the natural environment provides these benefits at no cost. Furthermore, all Ventura County residents benefit from water supply, biodiversity, and flood attenuation that natural floodplains provide.

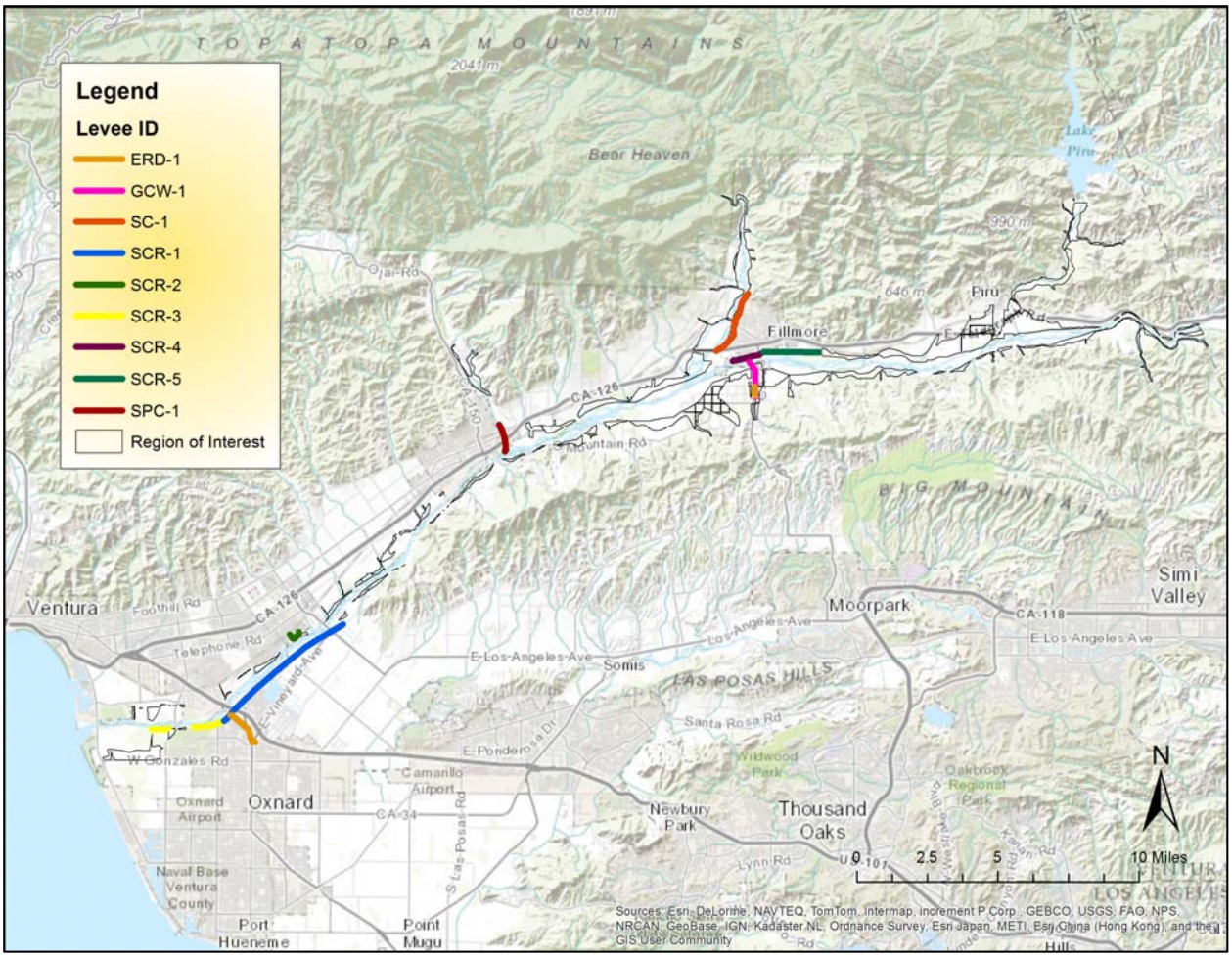


Figure 5. Major Levees within the Santa Clara River Watershed. The region of interest delineates some regions within the 500 year floodplain of the River.

2.4 Climate Change Impacts on Water Supply and Demand Projections

This section provides climate change projections at the state and watershed level, and focuses on potential vulnerabilities and adaptation strategies for the Santa Clara River Watershed. This discussion is followed by detailed water supply descriptions for the major water supply jurisdictions in the watershed including supply, the sources of that supply, and demand projections based Urban Water Management Plan data. For more on vulnerabilities and climate change adaptation strategies for the Santa Clara River Watershed see Section 10.

2.4.1 State Water Plan Update (2009) Water Demand and Climate Change Scenarios

Climate change is expected to impact the Southern California through changes in statewide precipitation and surface runoff volumes, as well as the availability of local

surface and imported water supplies. Additionally, sea level rise is expected to degrade the San Francisco Bay Delta water quality and impact coastal water and wastewater infrastructure, requiring substantial capital investments by local agencies. All of these uncertainties related to climate change could potentially reduce the ability of local agencies to meet southern Califorina's water demand.

Model simulations using the Intergovernmental Panel on Climate Change's (IPCC) 21st century climate scenarios suggest increasing temperatures in California, with greater increases in the summer (Cayan 2008). Changes in annual precipitation across California may result in changes to surface runoff timing, volume, and form. By the end of the century, the Sierra Nevada snowpack is expected to decline as warmer temperatures raise the elevation of snow levels, reduce spring snowmelt, and increase winter snowmelt and runoff. Locally, climate change is expected to result in hotter summer months and more extreme winter storms. Winter runoff may result in flashier flood hazards, with flows potentially exceeding reservoir storage capacity that result in lost storage when discharges end up in the ocean. Higher flow volumes may scour stream and flood control channels, degrading aquatic and riparian habitats already impacted by shifts in climate. Further, hotter summer temperatures would increase wildfire hazards in arid southern California regions.

Changes in climate and runoff patterns may create competition between sectors. The agricultural industry's demand for water could increase due to higher evapotranspiration rates caused by increased temperatures. In addition, environmental water supplies would need to be retained in reservoirs for management of instream flows necessary to maintain habitat for aquatic species throughout the dry season. For southern California, this would likely result in reduced supplies available for import through the State Water Project during the non-winter months (California Climate Change Portal 2008; Cayan 2008; Hayhoe 2004).

The State Water Plain Update 2009 uses three baseline scenarios to better understand the implications of future conditions on water management decisions. The scenarios are referred to as baseline because they represent changes that are plausible and could occur without additional management intervention beyond those currently planned. Each scenario affects water demands and supplies differently. Scenario 1, "Current Trends," assumes recent trends will continue with less irrigated cropland due to urban expansion and flood damage, endangered species water allocation, and water quality issues remaining unsolved. It also assumes a population of 60 million in California by 2050. Scenario 2, "Slow & Strategic Growth," assumes a population of 45 million people. It also assumes compact urban development and less conversion of agricultural lands and less commuting and more comprehensive water management initiatives are implemented. Finally, Scenario 3, "Expansive Growth," assumes a population of 70 million Californians and this growth is more resource intensive than in the past. Growth

occurs more as low-density housing and expands into irrigated croplands and water, protection of water quality and endangered species is driven by lawsuits, and energy conservation program implementation slows.

Total Demand

Change in total water demand for the three scenarios, Current Trends, Slow & Strategic Growth and Expansive Growth is shown in Figure 6. The change in water demand is based on the difference between the historical average (1998-2005) and future average (2043-2050) water demands. Future demand is shown with and without climate change. The change in water demand without climate change is shown with solid bars and those with climate change is shown with hatched bars. As shown in the figure, there is considerable variation in the magnitude of demand increases across the three scenarios. Equally noticeable, Slow & Strategic Growth shows a dramatic reduction in demand when compared with Current Trends; from 1,325 thousand acre-feet down to a reduction of 140 thousand acre-feet. Considering twelve climate change alternatives (hatched bar), a pronounced range of water demand changes are observed under all three scenarios.

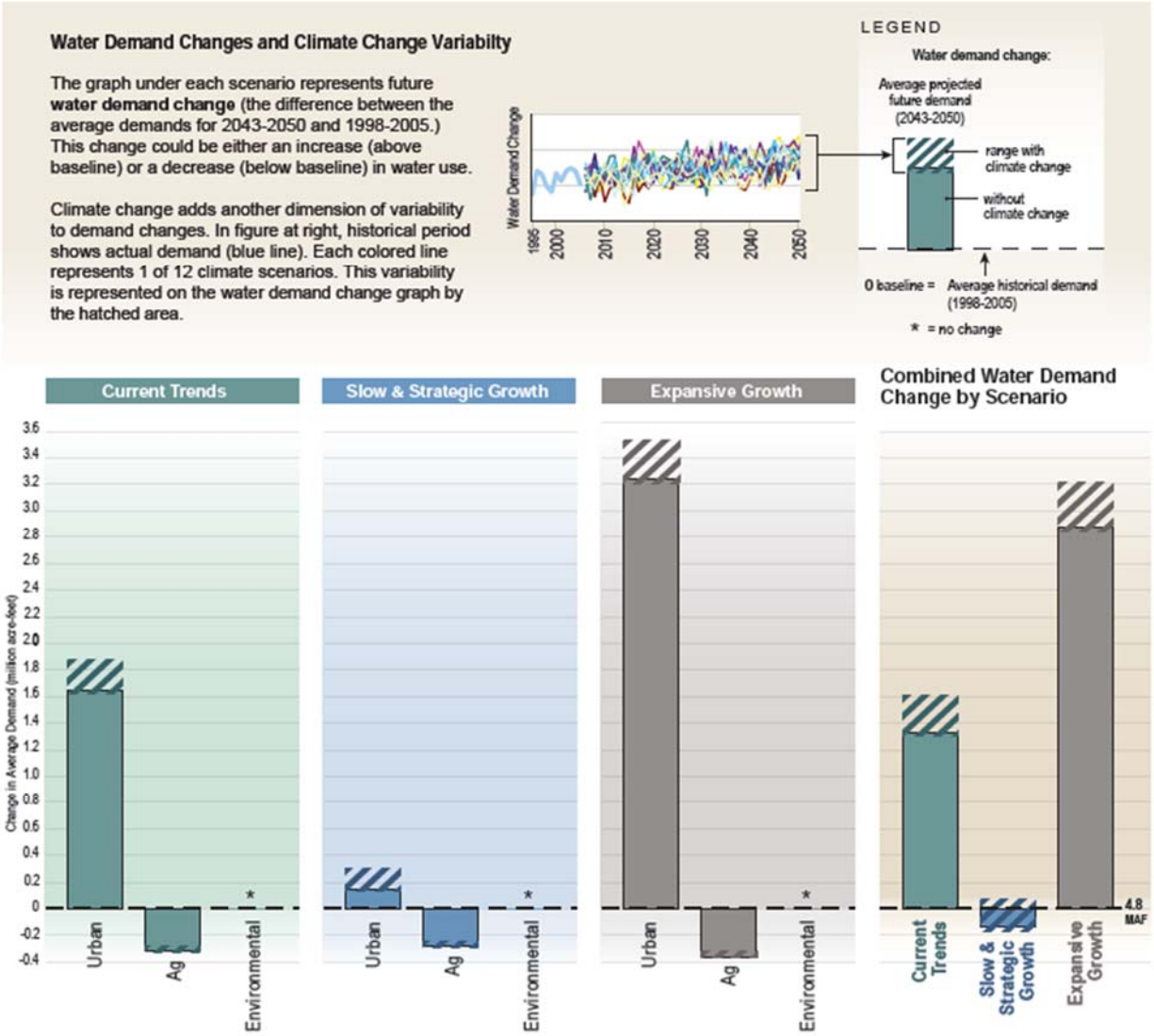


Figure 6. Water demand changes by scenario in the South Coast Hydrologic Region

Urban Demand Change

Figure 6 shows urban water demand change in the left-most bar with and without climate under the Current Trends, Slow & Strategic Growth, and Expansive Growth scenarios. Without climate change, all three scenarios show an increase in urban water demand. Expansive Growth, however, shows marked increase in water demand when compared with Current Trends; an increase from 1,645 thousand acre-feet with Current Trends to 3,240 thousand acre-feet with Expansive Growth scenario. This shows urban growth and expansion in the South Coast area dramatically increases demand for water. The Slow & Strategic Growth scenario, however, shows a smaller relative increase in water demand (145 thousand acre-feet). When climate change is considered, all three

scenarios showed an increase in urban water demand across most future climate sequences.

Agricultural Demand Change

Change in agricultural water demand in the South Coast region is shown in the center bar for each scenario in Figure 6. Future agricultural water demand is generally reduced due to a reduction in irrigated acreage from urbanization and increased background water conservation. Without climate change (solid bar), Expansive Growth shows a slightly larger reduction (360 thousand acre-feet), followed by Current Trends scenario (320 thousand acre-feet). Under the Slow & Strategic Growth scenario, however, agricultural demand shows a slightly lower reduction of about 285 thousand acre-feet. When climate change is considered (hatched bar), water demand reductions are the same or less than demand reductions without climate change.

Environmental Demand Change

Figure 6 shows a base environmental water demand of about 130,000 acre-feet in southern California. No additional environmental water demands are assumed beyond current commitments.

For more information on State-level climate change projections visit:

Water Demand and Climate Change Scenarios from the 2009 (or the latest version) Water Plan Update:

http://www.waterplan.water.ca.gov/

Climate Change Projection Tools

Although climate change models are data-intensive and are quite complex, there are user-friendly tools available that easily display model projections for specific locations, such as the Santa Clara River Watershed. The Cal-Adapt website (http://cal-adapt.org) provides a view of potential climate change impacts at the local level and is continually updated by scientific research. The site contains raw data and visualization tools that project temperature, snowpack, sea level rise, precipitation, and wildfire risk in local areas (California Energy Commission, 2013).

Climate Change Model and Emission Scenario Selection

Projecting future climate requires sophisticated computer models. The 2009 Climate Scenarios Project used projections from six global climate models, all of which had been

run with two selected emissions scenarios (A2—mid-high; B1—lower). There are different emission scenarios to account for the variability of future emissions management, and there are different climate models that predict how the environment will react to these scenarios. This approach allows the consideration of a variety of potential future conditions and is referred to as "climate sensitivity" and accounts for Earth's response to certain physical processes, including a number of "feedbacks" that might amplify or lessen warming.

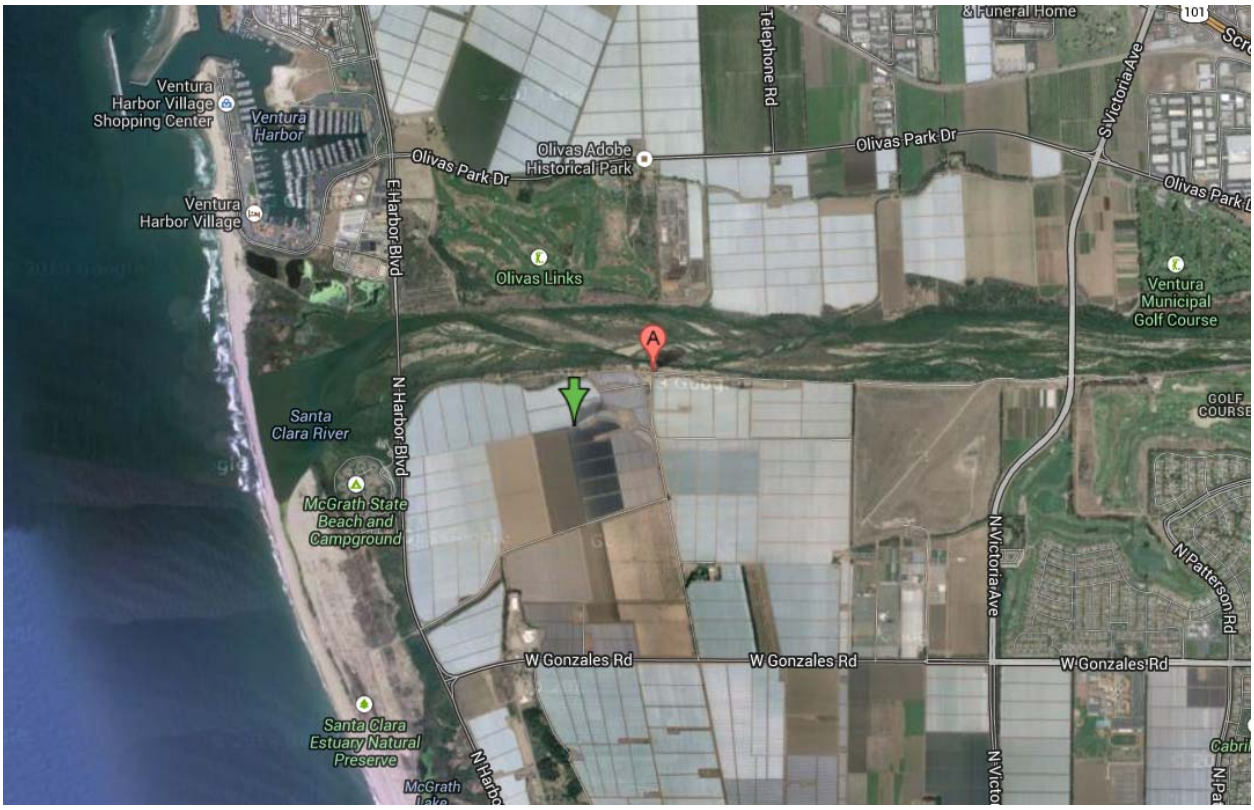
Ventura County has retained a consultant to conduct climate change impact projections and an assessment of vulnerabilities. Data and model projections were used from various sources including the Pacific Institute, Cal-Adapt, the Program for Climate Mode Diagnosis and Intercomparison (PCMDI), and the World Climate Research Programme's Working Group on Coupled Modeling (WGCM). These global climate models were coupled with the A2 emissions scenario to produce the following projections for the Santa Clara River Watershed area.

2.4.2 Watershed-Specific Climate Change Projections and Impacts

Environmental conditions are provided in the following section for the lower and upper Santa Clara River Watershed. The data and analysis provided include projections of future evapotranspiration, the evaporation of moisture from the pores of plants to the atmosphere, summer precipitation, winter precipitation, minimum temperatures, and maximum temperatures. These environmental indicators provide insights into future environmental conditions and what resources are vulnerable to these changes. Sea level rise and a wildfire risk projections are also provided for major areas of the Watershed.

Lower Watershed

A location within the agricultural areas near the river mouth was selected as the geographic input for the climate models (Figure 7.). Although this location is highly specific, climate change analysis can be generalized for adjacent areas within the lower watershed.

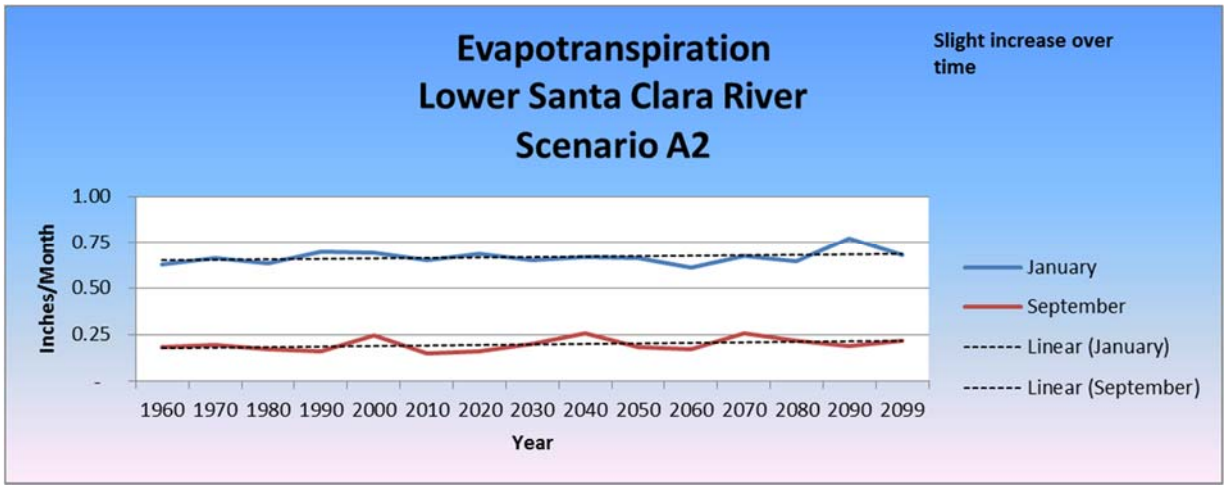


Source: Hewitt, A. 2013

Figure 7. Location of geographic data input for the two climate models in the lower watershed.

Lower watershed Evapotranspiration

Evapotranspiration is projected to increase slightly by the year 2100 in the lower watershed. Figure 8. shows the January and September climate projections in red and blue as well as their accompanying linear regression lines. Despite some variation from historical levels and a slight increase overall, evapotranspiration levels may not be significant enough to cause significant harm to agricultural resources or native vegetation and the fuel and fire risks they pose.

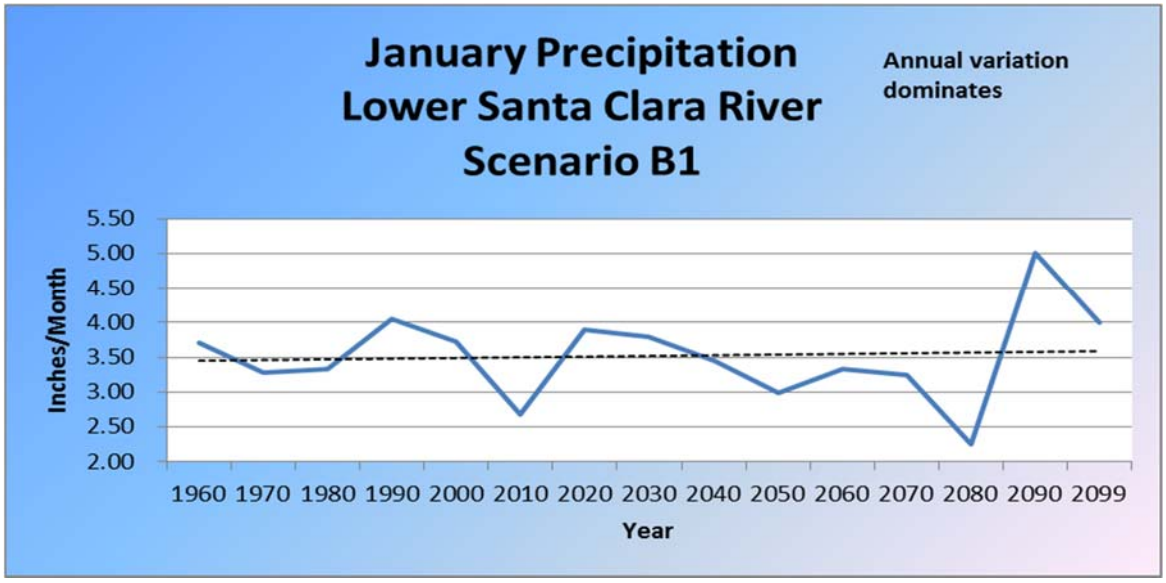


Source: Hewitt, A. 2013

Figure 8. Evapotranspiration in the Lower Santa Clara River

Lower Watershed Precipitation

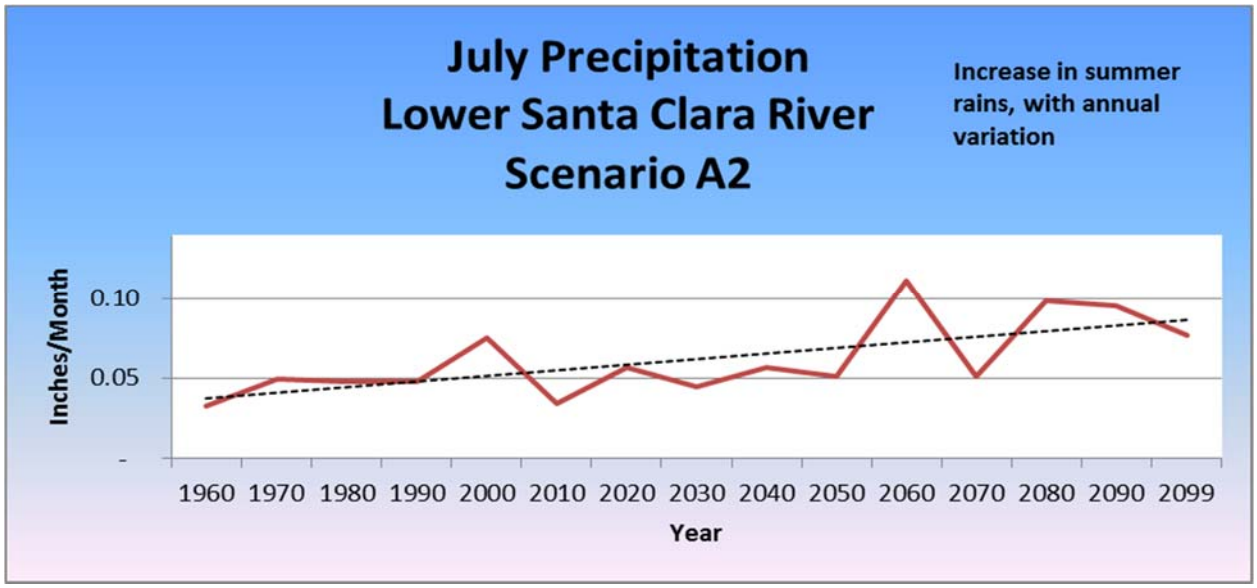
California tends to get a majority of its precipitation in the winter, and future projections indicate increased variation in annual totals. Thus, the number of years where rainfall is more than abundant or extremely scarce will likely increase (Figure 9.). This has implications for flood management, water supply contingency planning, agricultural crop production, and fuels management.



Source: Hewitt, A. 2013

Figure 9. Annual precipitation projections in January in the Lower Santa Clara River

Another projected trend of interest is that summer precipitation levels are expected to increase with annual variability (Figure 10.). This has implications for agricultural crops, which may benefit from reduced irrigation costs but may also be adapted to dry periods during the summer season. This trend may also have implications for flood management and potential benefits for reducing fire risk, especially in wildland areas where vegetation becomes easily ignitable due to a lack of moisture.



Source: Hewitt, A. 2013

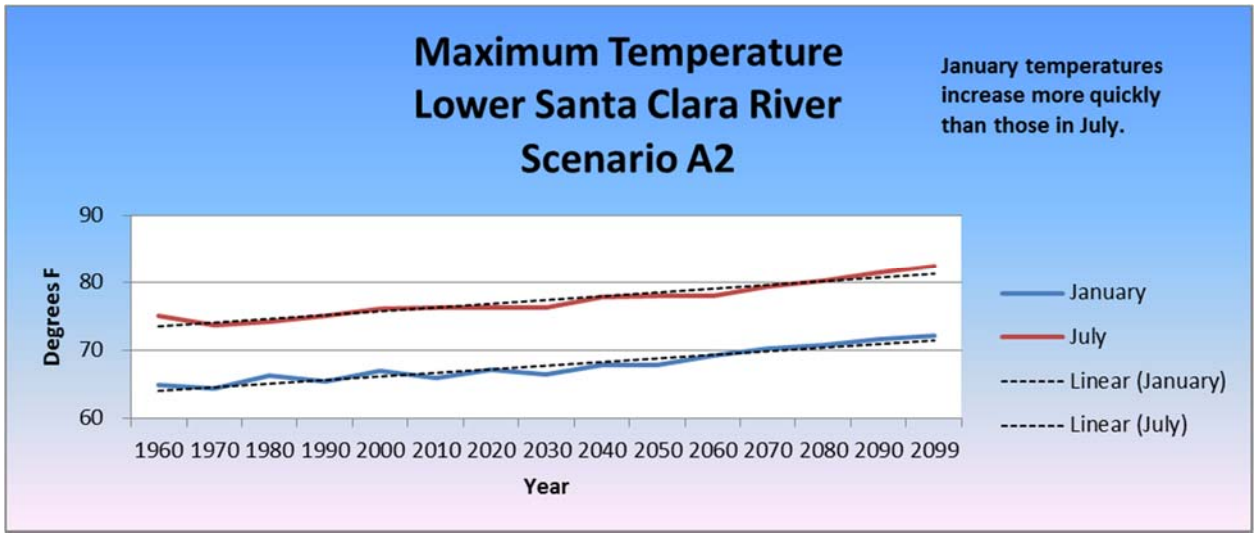
Figure 10. Annual precipitation projections in July in the Lower Santa Clara River

Lower Watershed Temperature

Maximum temperatures are projected to increase in both summer and winter seasons (Figure 11. and Figure 12). Total increases of 6.3° and 6.22° are projected respectively from the period of 2010 to 2100 for maximum temperatures. Minimum temperatures, representing night-time lows, are also projected to increase over the same time period. Higher energy costs may be likely because of the additional heating and cooling throughout the year.

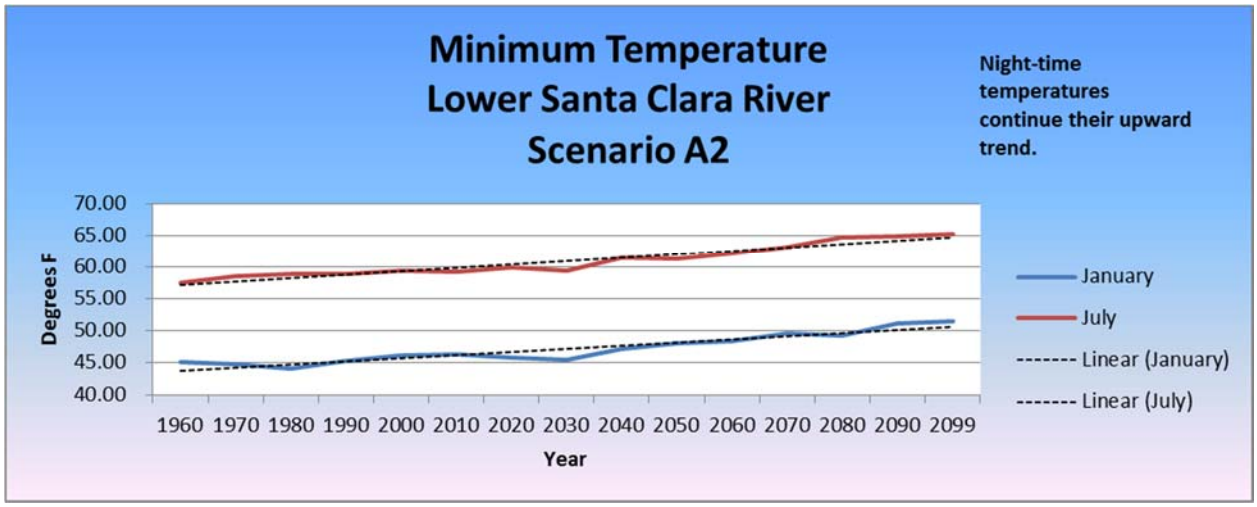
Temperature increases will have both beneficial and harmful implications for agriculture. A potential benefit of climate change is fewer losses to winter frosts. This will be especially beneficial to the upper watershed's abundance of row crops. However, higher minimum temperatures may impact winter crops that do best in cooler climates. Many fruit and nut trees are sensitive to temperature changes. As the temperature rises, so does the fruit development rate, resulting in reduced fruit size. A minimum number of chill hours (hours during which temperatures drop below 45 F) are required for

proper bud setting; too few hours could cause late or irregular bloom, decreasing fruit quality and subsequent marketable yield (Cal-adapt 2011a). With an increase in overall temperatures, the chill hours are becoming reduced in many areas of the state, rapidly approaching a critical threshold for some fruit trees. Additionally, higher energy costs may be likely because of the additional heating and cooling for residential, commercial, and industrial spaces throughout the year.



Source: Hewitt, A. 2013

Figure 11. Maximum temperature projections in winter and summer in the Lower Santa Clara River

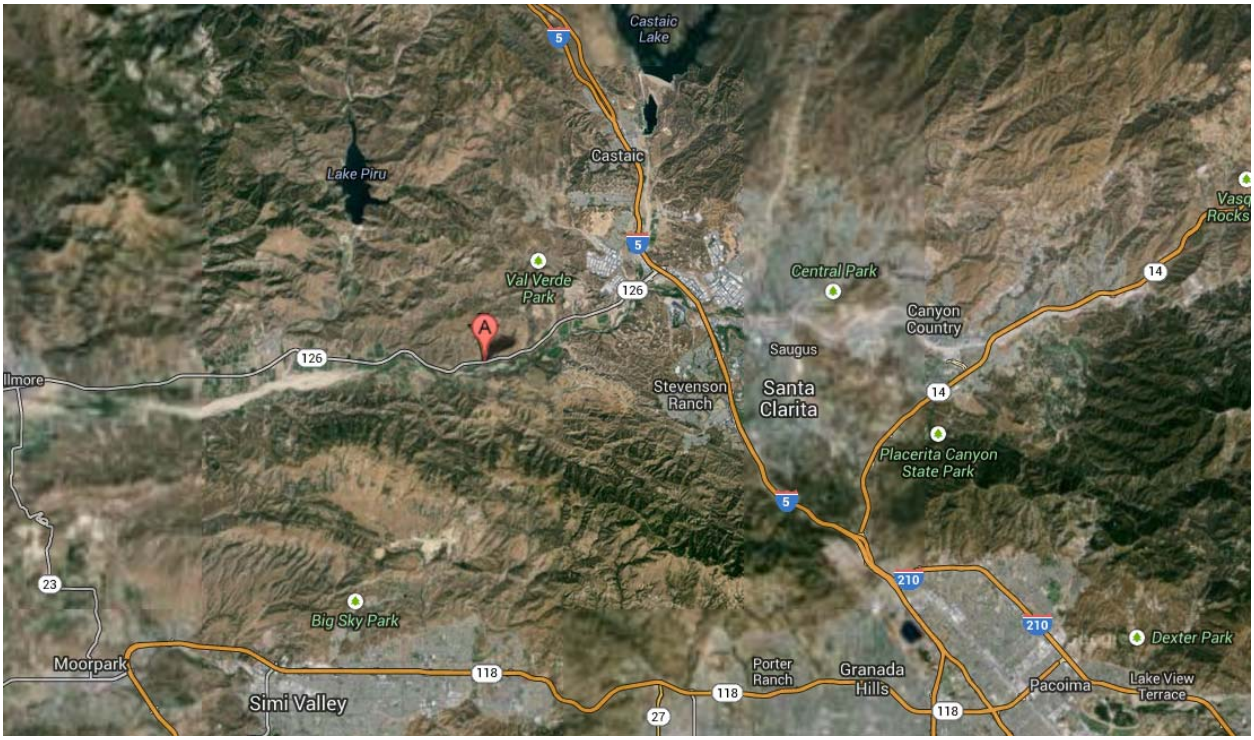


Source: Hewitt, A. 2013

Figure 12. Minimum temperature projections in winter and summer in the Lower Santa Clara River

Upper Watershed

A location near the river along Highway 126 near Piru was selected as the geographic input for the climate models (Figure 13.). Although this location is highly specific, climate change analysis can be generalized for adjacent areas within the upper watershed.



Source: Hewitt, A. 2013

Figure 13 Location of geographic data input for the two climate models in the upper watershed.

Upper Watershed Evapotranspiration

The results of evapotranspiration modeling are similar to the lower watershed in that significant changes are not anticipated in the next one hundred years. Figure 14. shows minor variation in evapotranspiration rates for both January and September. Risks associated with wildfire and crop damage may not increase; however, they will also be dependent on other factors such as precipitation and maximum temperature.

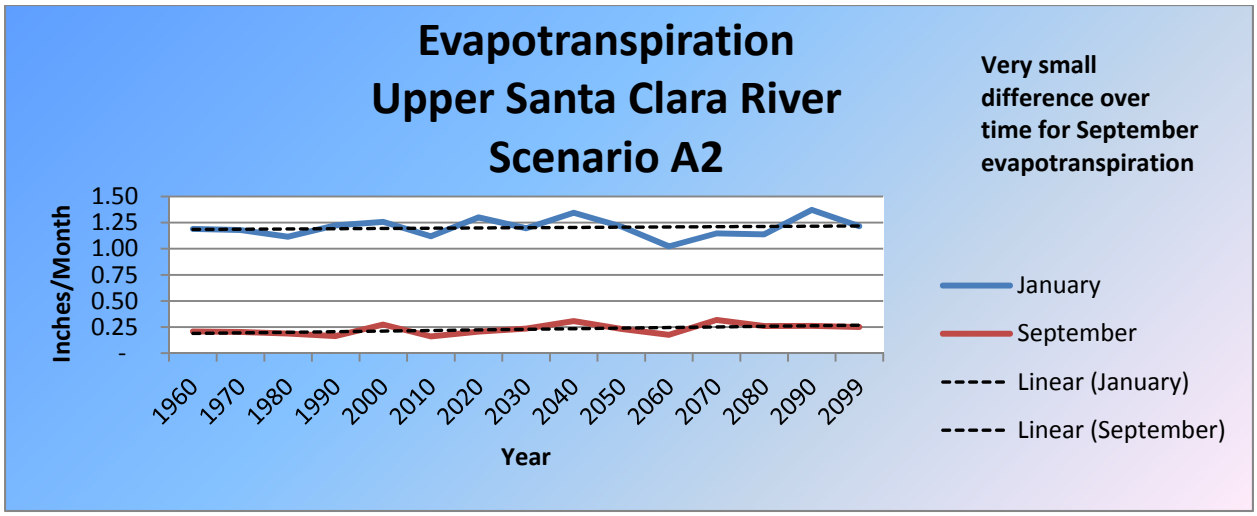
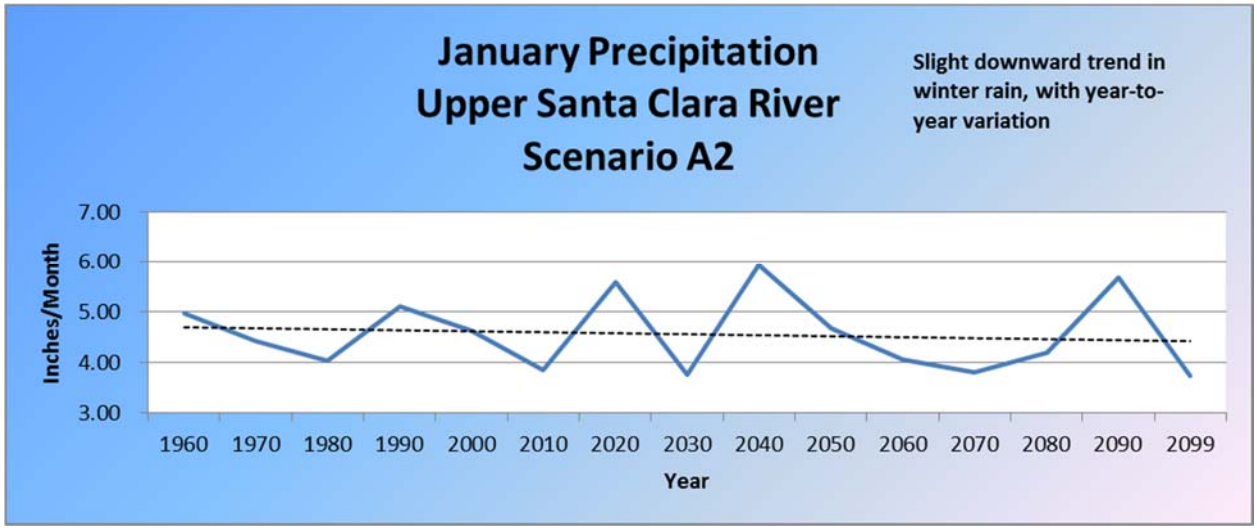


Figure 14 Source: Hewitt, A. 2013

Upper Watershed Precipitation

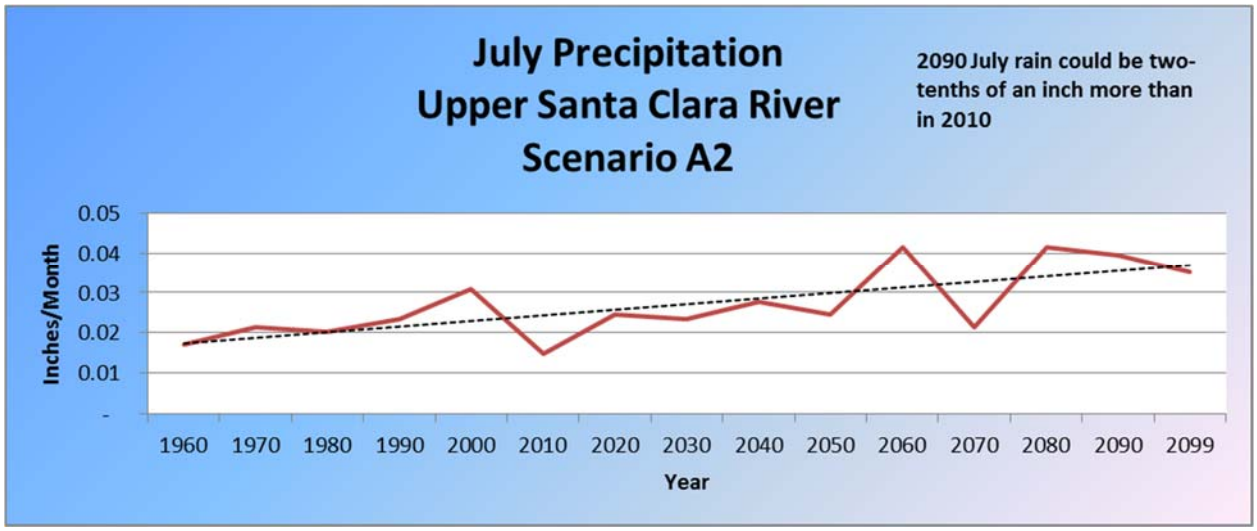
Average winter precipitation is projected to decline slightly as noted by the downward slope of the regression line in Figure 15. Additionally, precipitation rates may become more extreme with years of higher high precipitation levels and lower low levels. This has implications for flood management, water supply contingency planning, agricultural crop production, and fuels management in wildland areas. Water planning efforts should take into account this potential vulnerability to more extreme precipitation scenarios.



Source: Hewitt, A. 2013

Figure 15. Annual precipitation projections in January in the Upper Santa Clara River Watershed

Summer precipitation rates tends to be fairly low for most of California; however, climate change projections predict an increase of more than 0.2 inches for the month of July by the year 2090 (Figure 16). Variation in these rates may increase as well. This has implications for agricultural crops, which may benefit from reduced irrigation costs but may also be adapted to dry periods during the summer season. This trend may also have implications for flood management, potential benefits for agricultural water supply, and benefits for reducing fire risk, especially in wildland areas.

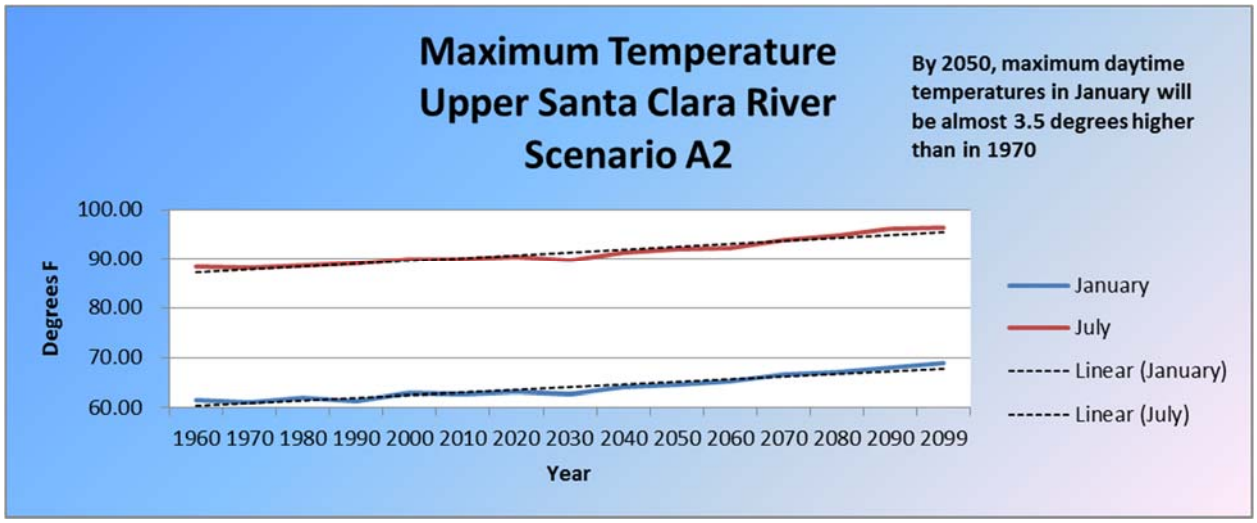


Source: Hewitt, A. 2013

Figure 16. Annual precipitation projections in July in the Upper Santa Clara River Watershed

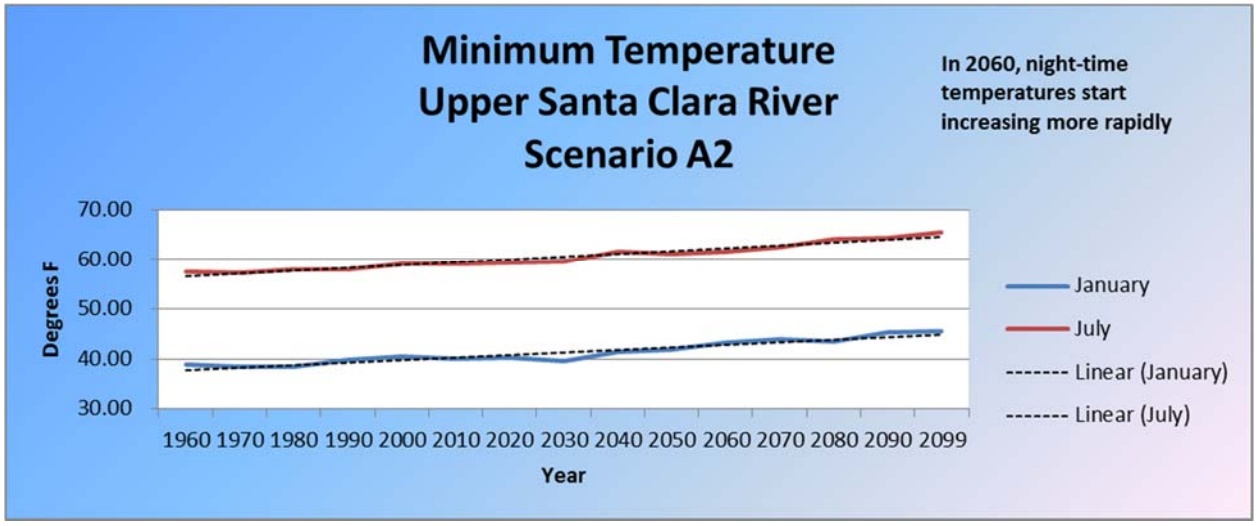
Upper Watershed Temperature

Maximum temperatures are projected to increase in both summer and winter seasons (Figure 17. and Figure 18). Although these graphs do not display daily extreme events, these will likely be more extreme in nature and may leave some agricultural areas vulnerable to extreme heat impacts. Minimum temperatures, representing nighttime lows, are also projected to increase over the same time period. In fact, minimum temperatures are projected to increase more rapidly by 2060. For more information on the impacts of temperature increases on agriculture see Section X (lower watershed temperature).



Source: Hewitt, A. 2013

Figure 17. Maximum temperature projections in winter and summer in the Upper Santa Clara River



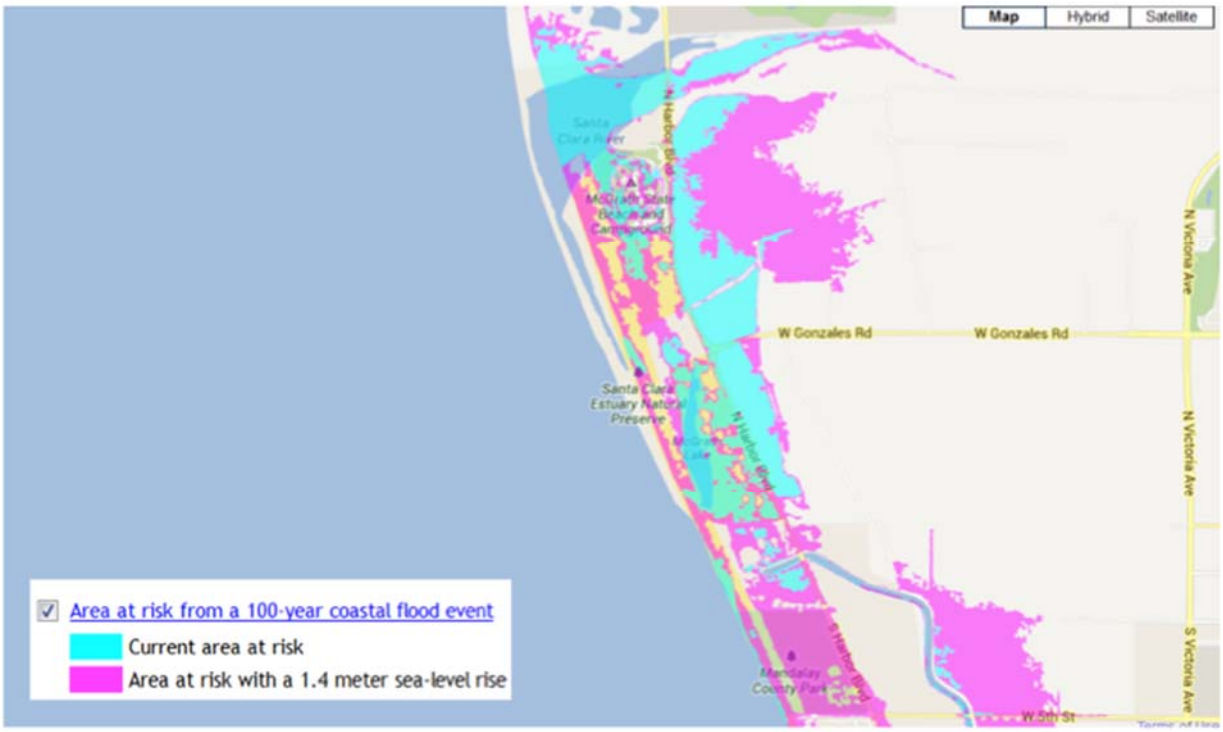
Source: Hewitt, A. 2013

Figure 18. Minimum temperature projections in winter and summer in the Upper Santa Clara River

Sea Level Rise

Climate change models were also used to predict flood hazards due to sea level rise for coastal areas of the Santa Clara River Watershed. The area most vulnerable to these impacts is the river mouth and Santa Clara River Estuary. Areas at risk from 100-year coastal flood events coincide with major precipitation events and can cause significant

damage when river flooding coincides with large surf associated with winter storms. Figure 19. shows areas currently threatened by a 100-year coastal flood in blue, and the areas in pink represent the increased area impacted due to a 1.4 meter sea level rise scenario. The 1.4 meter value is higher than many average global estimates from various climate change scenarios for the turn of the century; however, a study focused specifically on California indicated this higher increase in mean sea level (Cayan 2009). Sea level rise will also cause the extent of existing wetlands to migrate inland spreading saline or brackish water into areas that were previously dry or composed of freshwater systems. The projected migration of wetlands near the Santa Clara River mouth by the year 2100 is shown in Figure 20. Climate change adaptation strategies should include measures to account for spreading wetlands. Potential strategies could include managed retreat that allows these new wetland areas to serve as habitat or, when feasible, development of structural barriers to prevent water from encroaching.



Source: Hewitt, A. 2013

Figure 19. Sea level rise projections for a 100-year coastal flood event with a 1.4 meter sea level rise scenario

Source: Hewitt, A. 2013

Figure 20. Wetland Migration by 2100

Wildfire Risk

Wildfire can have a significant impact on flood risk, water quality, and wildlife habitat. Areas stripped of vegetation, especially in the hillsides that surround the river, may be especially vulnerable to flooding because of decreased infiltration and steeper slopes. Without root systems holding soils in place, erosion is also likely to follow after fire and can cause substantial sedimentation in the watershed. This can lead to higher treatment costs if water quality standards are not met and can stress sensitive species that rely on aquatic habitats. Increased prevalence of wildfire can also stress water supply if substantial amounts of local water are used to fight them.

Figures 21-24 represent the ratio of additional fire risk for an area as compared to the expected burned area for each geographic grid cell. The ratio of additional risk was calculated for 30 year averaged periods ending 2020, 2050, and 2085, for four climate change models (CCSM3, GFDL, PCM1, CNRM) and two scenarios (A2, B1). All major population centers within the Santa Clara River Watershed are projected to have higher wildfire risk, with the exception of Oxnard due to a lack of wildland areas.

More detailed information about these data can be found in:

Westerling, A. L., Bryant, B. P., 2008. Climate Change and Wildfire in California. Climatic Change (2008) 87 (Suppl 1): s231-s249.

The threat of increased wildfire is an important issue to consider for regional water planning and climate change adaptation. Appropriate measures such as managing fuel loads and risks to water infrastructure and allocating water to high-risk areas during drought are some of the many options to consider to prepare for future increased wildfire risk.

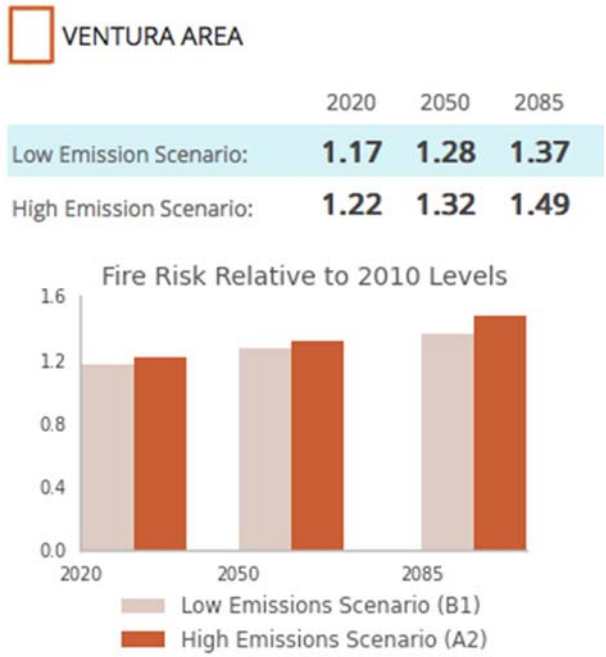


Figure 21. Wildfire risk in Ventura under future climate change scenarios

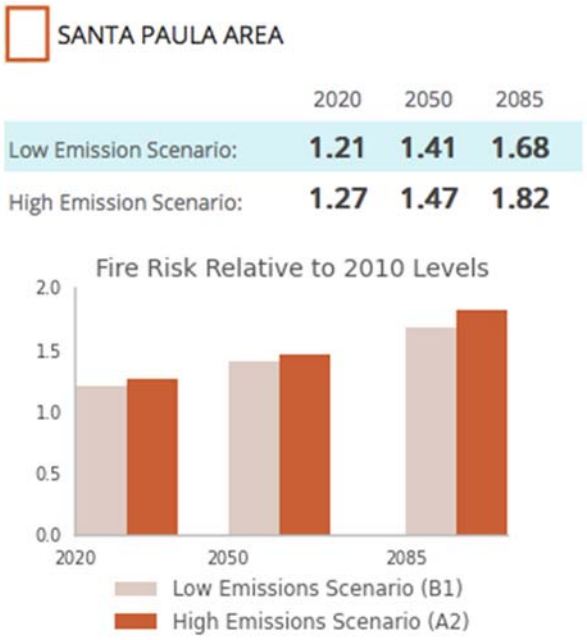


Figure 22. Wildfire risk in Santa Paula under future climate change scenarios

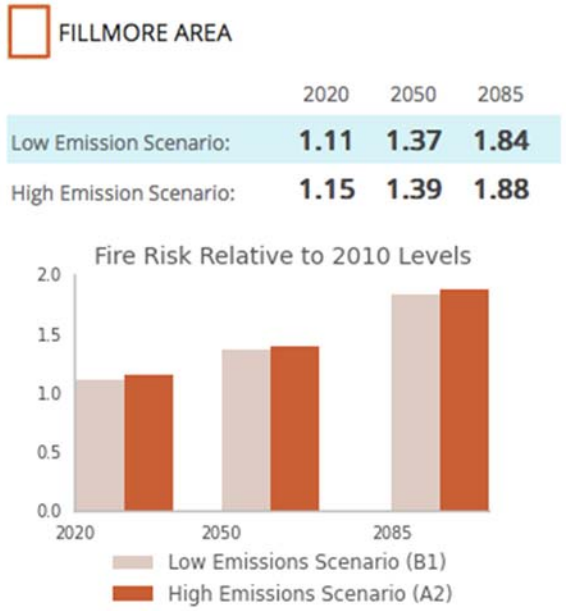


Figure 23. Wildfire risk in Fillmore under future climate change scenarios

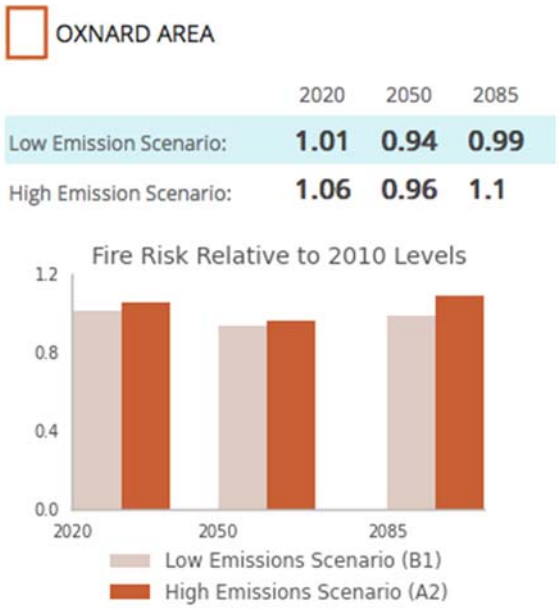


Figure 24. Wildfire risk in Oxnard under future climate change scenarios

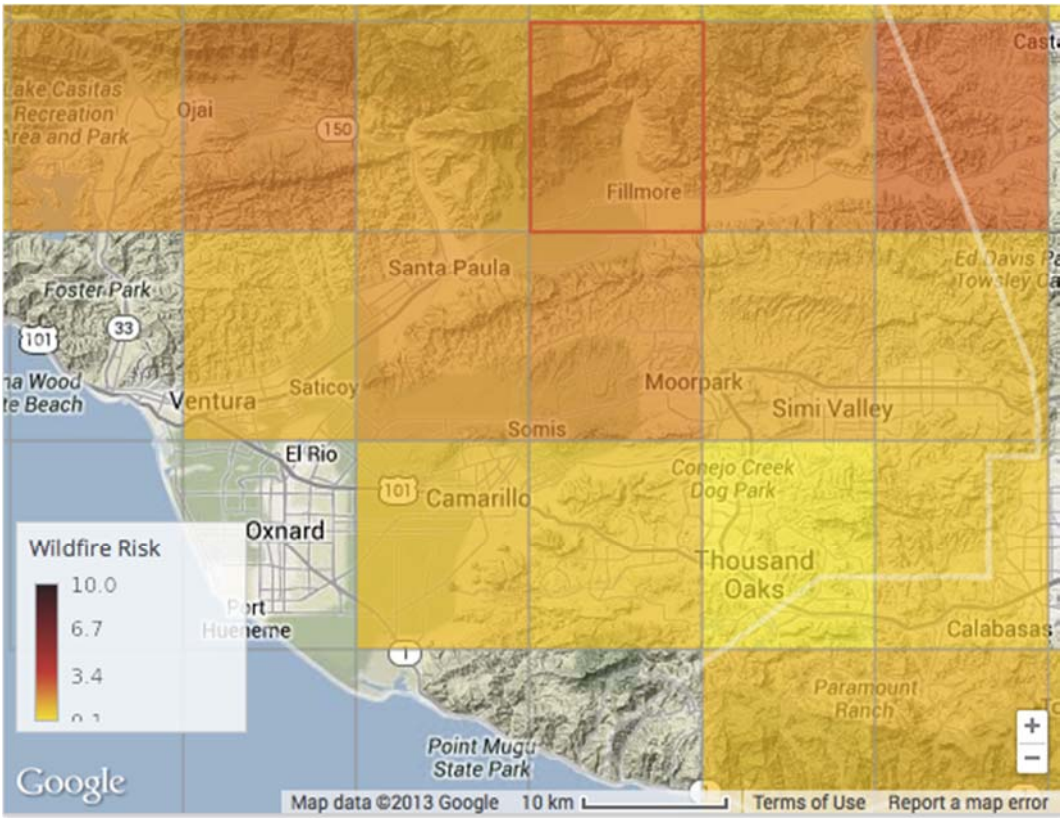


Figure 25. Future projected increase in area burned in 2085 for the high emissions scenario in the Santa Clara River Watershed

2.5 Water Supply and Demand in the Watershed

2.5.1 Urban Water Supply and Demand Projections

Water supply and demand projections can be found in Urban Water Management Plans (UWMP) throughout the Santa Clara River Watershed. The California Urban Water Management Planning Act of 1983 (UWMP Act) requires all publicly or privately owned entities that serve water for municipal purposes to more than 3,000 service connections or serve more than 3,000 acre-feet of water per year to prepare an updated UWMP. These plans must be updated once every five years, at the beginning or mid-point of each decade, to support long-term resource planning.

A link or source is provided at the end of each section as a resource for more information. The following Cities and systems have a plan in place that dictates water supply and demand projections and planning for future use:

- City of Oxnard
- Oxnard-Hueneme System
- City of Port Hueneme
- City of Ventura
- City of Santa Paula
- City of Fillmore (Contingency Plan)

***City of Oxnard-Demand*:**

The City of Oxnard's water demand projections are based on projected development. Oxnard plans to reach build out, a condition where all major lands zoned for development have been built, by 2030 for River Park, the South Shore, South Ormond Beach, Teal Club, and the area included in the Sakioka Farms Community Plan (City of Oxnard UWMP 2012). Water demand projections are based on this scenario and include current development applications for known projects, infill, redevelopment, and densification. For projects not specified by any City plans, demand was estimated at one percent over baseline demand per year. Table 5. provides projected baseline water demand and new demand based off predicted development.

Table 5

Baseline and New Water Demand for the City of Oxnard (Acre-Feet)

	2010[a]	2015	2020	2025	2030	2035
Baseline Demand[b]	26,722	32,996	32,996	32,996	32,996	32,996
New Demand[c]	-	3,033	6,688	8,113	9,443	10,773
Total Project Demand	26,722	36,029	39,684	41,109	42,439	43,769

Notes: Source: Oxnard UWMP, 2012

(a) 2010 demands represent actual consumption.
(b) Baseline demand represents demand from existing customers and is expected to remain stable through 2035.
(c) New demand represents an increase in demand as a result of future currently known development projects with Specific Plans, as well as future infill, redevelopment, and other development designated in the City General Plan.

The Oxnard City Council has put in place a water demand "neutrality" policy, in which any new development within the City must offset its water demand with a supplemental water supply. First established in 2008 and recently reaffirmed in 2011, the policy considers "new development" as any development that is planned (anticipated in the current General Plan) and any unplanned future development occurring in the City. Under the policy, a development can be water neutral by meeting its projected demand through: existing FCGMA groundwater allocations that are transferred to the City; contributing to increased efficiency by funding water conservation or recycled water retrofit projects; providing additional water supplies; or any combination of these options. While this City policy has not been codified, it has been applied to development project approved since 2008.

City of Oxnard- Supply:

The City's current water supply consists of imported surface water from Callaguas Municipal Water District (CMWD), local groundwater from UWCD, and local groundwater from City wells. The City blends water from these three sources to achieve an appropriate balance between water quality, quantity, reliability, and cost. From 2006 to 2010 the blend ratio of imported surface water and groundwater (either from UWCD or City wells) has varied between 1:1 and 1:2. Figure 26. provides projected water supply, demand, and surplus for the City of Oxnard.

Figure 27. provides a break down of water sources in Oxnard through the year 2035. This data shows a small decrease in reliance on groundwater and imported sources as recycled water is established as a small source, making up roughly 11 percent of Oxnard's water supply by 2025.

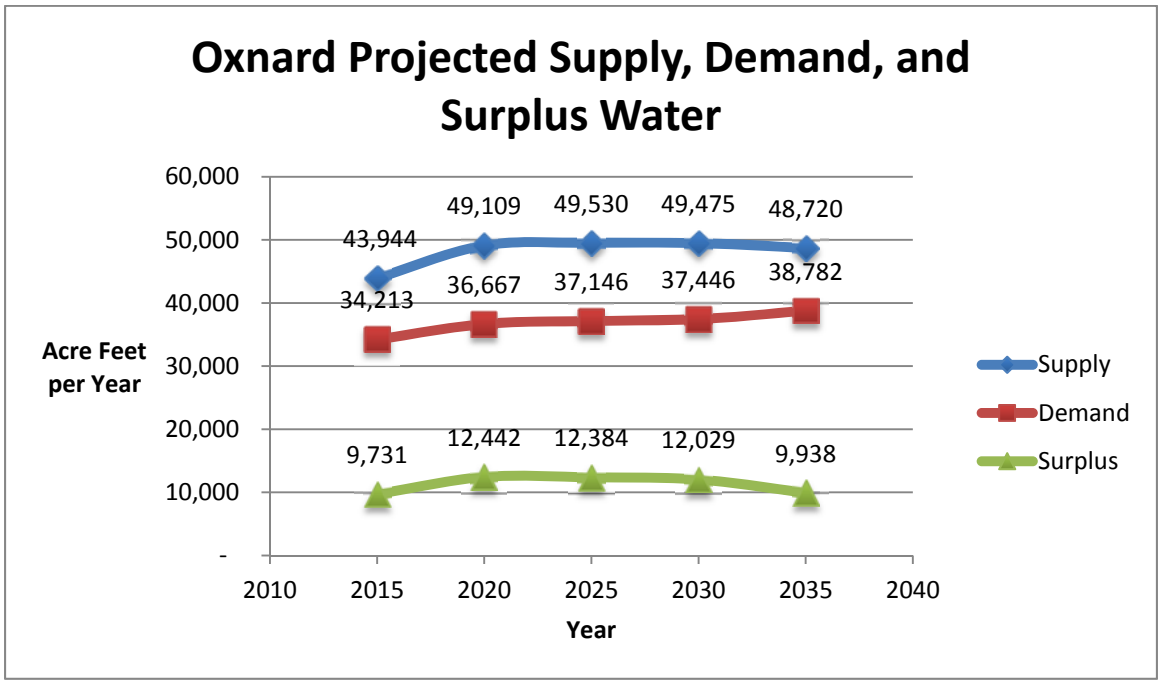


Figure 26. Oxnard's projected water supply, demand, and surplus in acre-ft./year

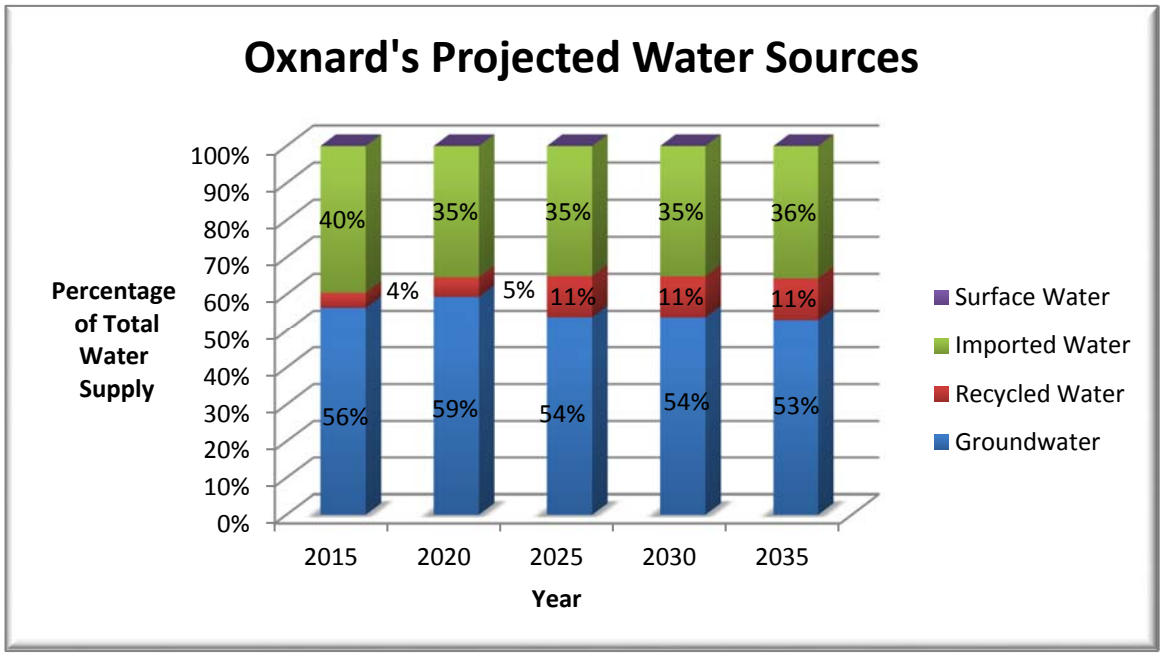


Figure 27. Oxnard's projected water supply broken down by source type

For more information on projected supply and demand for the City of Oxnard, consult the latest UWMP, found here:

http://publicworks.cityofoxnard.org/14/99/1004/

Oxnard-Hueneme System (OH) - Demand

The Oxnard-Hueneme (OH) system is run by UWCD and is located on the Oxnard Plan and supplies drinking water to the City of Oxnard, City of Port Hueneme, the two naval bases Port Hueneme and Point Mugu, Channel Islands Community Services District, and other small mutual water companies.

Because the Oxnard Plain aquifer is recharged through runoff from the Santa Clara River watershed, the water diverted through the Freeman Diversion has improved United's ability to recharge groundwater. OH demand is being decreased due to the Groundwater Management Agency (GMA) pumping reductions. Water conservation by agriculture has decreased agricultural demands by as much as 25 percent. Water demand management has improved since the last major drought (1985-1991), and the

Oxnard- Hueneme System (OH) - Supply

The reliability of the OH water supply depends on several factors including groundwater conditions, weather trends, United's management of surface and ground water, GMA demand management efforts, water conservation, and, perhaps most importantly, water quality limitations. The worst drought experienced by the OH System was the 1985 to 1991 seven-year drought (UWCD 2011). By the end of that drought, nitrate levels in some OH wells were high, and groundwater levels had fallen below several well pump intakes. To maintain pumping capacity, several well pumps were reinstalled with deeper bowls. Deep aquifer wells were also used to help meet demand.

For additional supply and demand projection discussion on the Oxnard-Hueneme System, consult United Water's UWMP for the Oxnard-Hueneme System here:

http://www.unitedwater.org/reports-5/water-supply

City of Port Hueneme- Demand

An estimate of projected water demand can be made by projecting the average total demand for the previous six years by the City growth rate of 0.48 percent obtained from Southern California Association of Governments (SCAG). The average total demand

from 2005 through 2010 is 2,684 and includes both dry and wet years. With these assumptions and two others including build out is reached in 2030 and demand management measures are successfully implemented, it is projected that the City's total demand in 2030 would be approximately 3,057 AFY and 2,805 AFY. All sectors are assumed to grow at the same annual growth rate.

In 2005, the City began the installation of 5,200 new water meters with "radio-read" and data logging capabilities. This program includes both the installation of meters on 3,660 unmetered accounts and replacement of 1,540 aging existing conventional meters. This program enables the City to determine a more accurate assessment of water demand by water sector. The program was completed in 2009 and the City began volumetric billing in August 2009.

City of Port Hueneme- Supply

The City purchases all water from the Port Hueneme Water Agency (PHWA), which in turn receives water from the UWCD and CMWD. It is a cost-effective conjunctive use water supply arrangement which reduces historical sea water intrusion along the coast, enhances fire protection, improves water quality, encourages wastewater reclamation, and complies with Fox Canyon Groundwater Management Agency (FCGMA) county-wide extraction reduction schedule (Port Hueneme UWMP 2011).

The PHWA annexed to the state water system and was successful in arranging the exchange and transfer of state water entitlement water on a long-term basis in the future. The imported state water from the Metropolitan Water District of Southern California (MWD) and the CMWD will help to ensure long-term reliability of quantity and quality for the PHWA customers. Figure 28. provides a breakdown of the City of Port Hueneme's different water sources through 2035. It shows that the City plans to consistently supply 70 percent of its water as groundwater and 30 percent from imported sources such as the SWP.

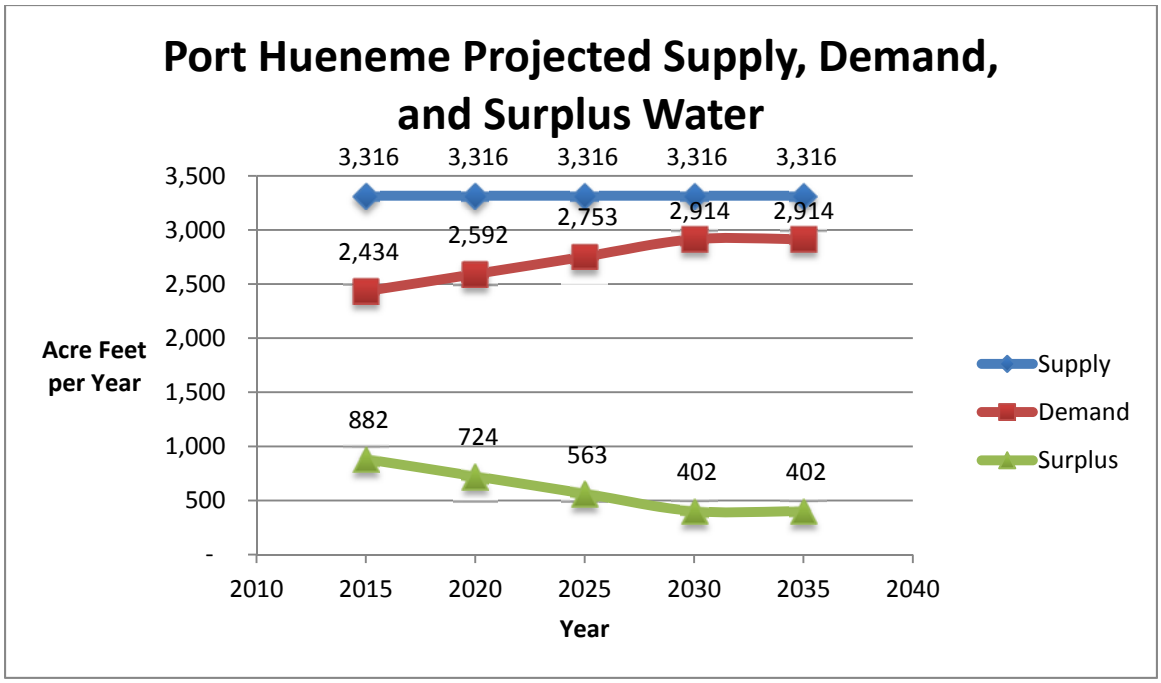


Figure 28. Port Hueneme's Projected Supply, Demand, and Surplus Water

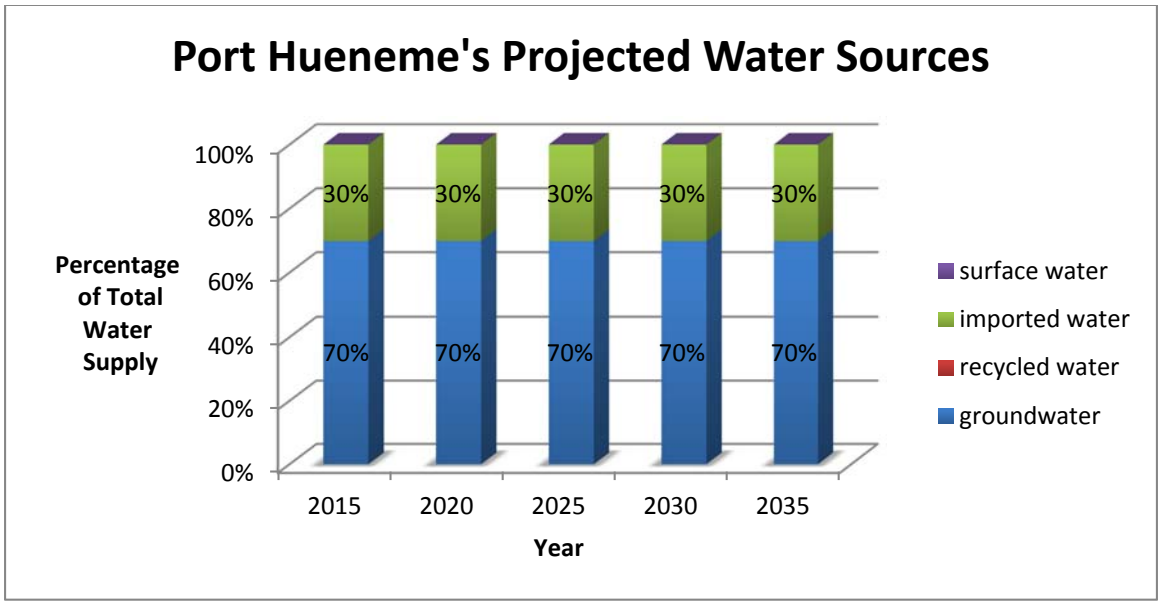


Figure 29. Port Hueneme's Projected Water Supplies

For additional supply and demand projection discussion on the City of Port Hueneme, consult its UWMP here:

http://www.water.ca.gov/urbanwatermanagement/UWMP2010.cfm

City of Ventura- Demand

The City water service area is an established community comprised primarily of residential areas with opportunities for infill development. Total historical water demand has varied slightly year to year, but has otherwise remained fairly steady since 1995 despite increases in population because of the successful implementation of long-term conservation programs. In 1990, the City used 196 gallons per capita per day (gpcd), yet in 2000, it was 190 gpcd, and in 2005, per capita water use was 170 gpcd (City of Ventura UWMP 2011). For the 2011 UWMP, 168 gpcd, the average per capita use between 2000 and 2009, was used to project base demand. This gpcd value is multiplied by the projected population for each year to get a total daily and annual demand through the year 2035.

In order to reduce the baseline water demands to meet the City of Ventura's per capita water use targets, a combination of recycled water supplies and conservation savings are planned for development.

City of Ventura- Supply

There are presently five distinct water sources providing water to the City water system including:

- Casitas Municipal Water District (Lake Casitas)
- Ventura River Foster Park Area (Foster Park)
- Surface Water Intake
- Upper Ventura River Groundwater Basin/Subsurface Intake and Wells
- Mound Groundwater Basin
- Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)
- Santa Paula Groundwater Basin

The City plans to maintain these existing supplies, which also include 700 AFY of recycled water from the Ventura Water Reclamation Facility. It also plans to gain an additional 3,900 AFY by 2020 from well improvements at Foster Park and Saticoy Well No. 3. The City has a 10,000 AFY contract amount from the California State Water Project (SWP), which is not utilized within the City service area because there are no facilities to deliver the water to the City. In 1999, the City became a signatory to the SWP Monterey Amendment Settlement Agreement that allows the City and other SWP contractors to sell surplus allocated water back to the SWP pool of supplies in a "turn

back" pool. The City has worked with UWCD, which requests (depending on local hydrologic conditions and percent of SWP water available each year) some portion of the City's annual SWP allocation at the turn back pool rate. This provides water recharge benefits to the County area as a whole. Finally, the citizens of Ventura voted in 1993 in favor of desalinating seawater over importing water through the SWP, as the preferred supplemental water supply option.

The City receives roughly 50% percent of its water supply from the three groundwater basins, Mound, Oxnard Plain, and Santa Paula. Two wells currently operate from the Mound Basin, Victoria Well No. 2 and Mound Well No. 1; however, Mound Well No. 1 is inactive and slated for capping due to issues. Mound basin is not in overdraft and currently supports a City extraction of 4,000 AFY through 2035. The City's historical allocation of water in the Oxnard Plain Basin has been steadily reduced through the years and is now set by the FCGMA. The City's current allocation of the Oxnard Plain Basin aquifer is 4,100 AFY. The current demand from the Santa Paula Basin is 1,600, but Ventura is allocated 21,000 AF over any seven-year period. In addition, the City of Ventura is moving forward with designing and constructing Saticoy Well No. 3 (CIP 97899), which will improve water supply capacity to roughly 3200 AFY.

Figure 30. provides projected supply, demand, and surplus for the City of Ventura through 2035. Figure 31. provides a breakdown of the City's supply sources during the same time period.

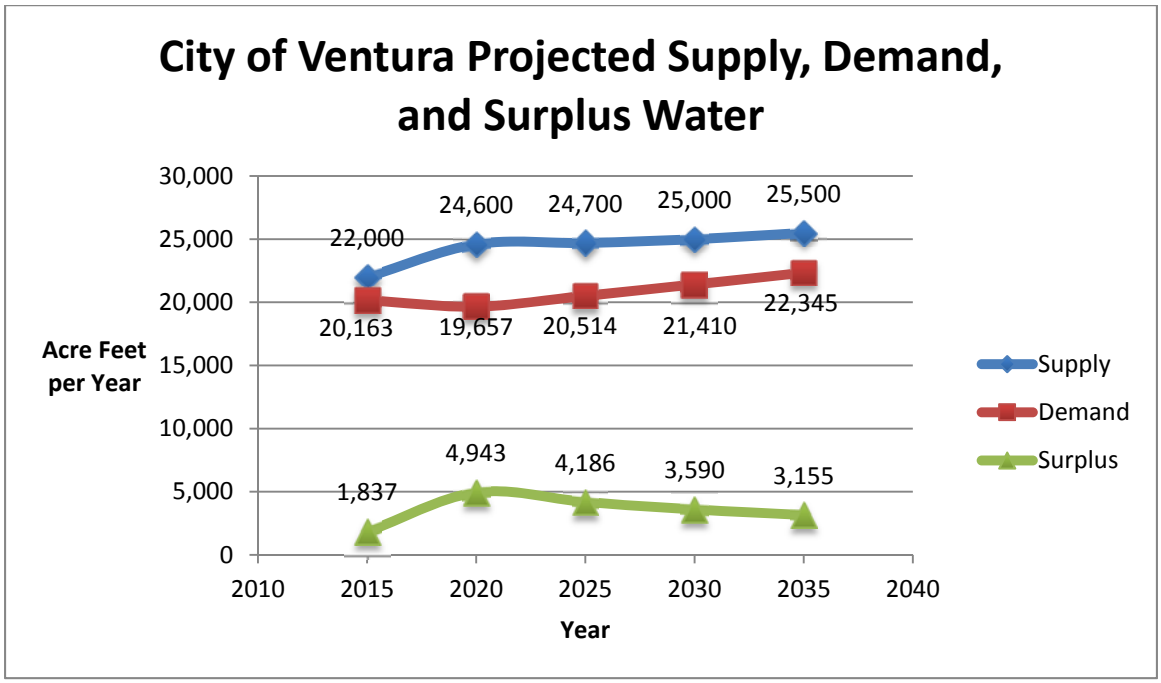


Figure 30. provides projected supply, demand, and surplus for the City of Ventura

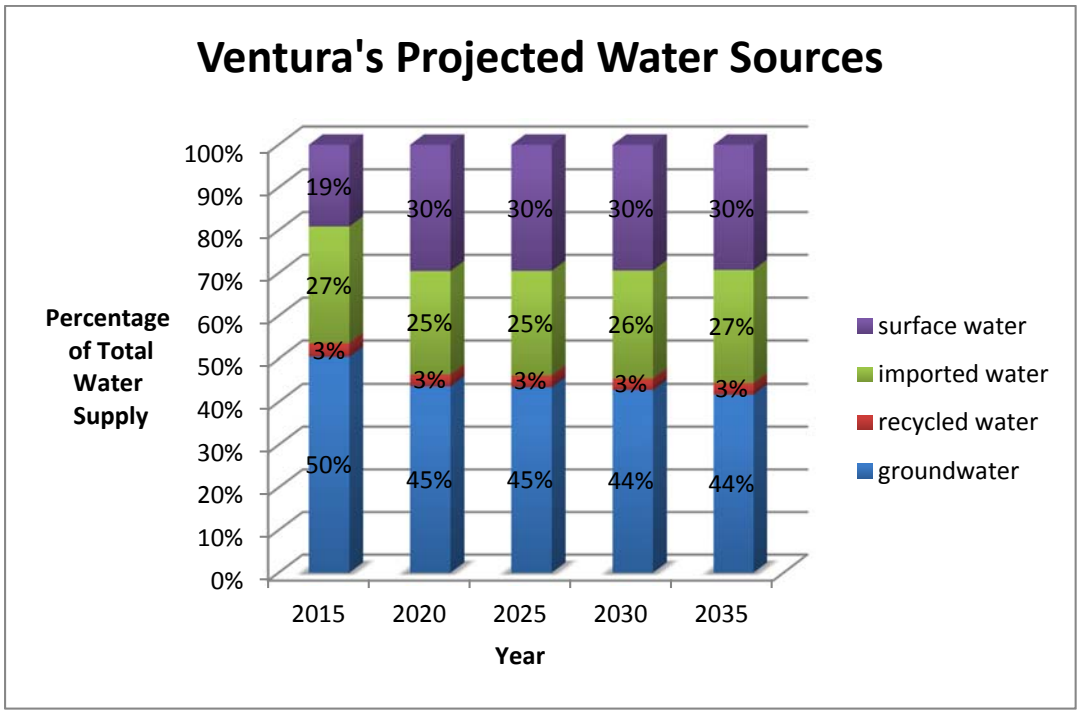


Figure 31. Ventura's water supply sources

For more information on the City of Ventura's projected supply and demand, review the latest Urban Water Management Plan here:

http://www.cityofventura.net/water/conservation

Santa Paula-Demand

Existing total demand across all land use categories is 4,416 AFY (Santa Paula UWMP 2011). Potable water demands for potential residential and commercial development are projected to increase demand by 1,697 AFY by the year 2035. This indicates that total potable water demands (existing plus potential) were estimated to be 4,840 AF in 2015 and increase to 6,103 AF by 2035. The future water demands are utilized in subsequent sections to evaluate and develop sources of water supply.

Future water demand values do not include savings due to additional potential demand management measures. The projected potable water demands do not include irrigation demands for future parks, recreation areas (including school landscaped areas), community landscaping, and golf courses because these irrigation demands will be met

by use of recycled water from the City's future recycled water system. Irrigation demands for future developments such as parks and recreation areas will be approximately 904 AFY by 2035 and recycled water system capacity must meet these needs.

Santa Paula- Supply

Santa Paula is projected to have an increasing supply and surplus through 2035 as seen in Figure 32. This is because of existing supplies, including City wells and irrigation water extracted from Santa Paula Creek. Supply is also projected to increase from groundwater allocations and transfers, and recycled water as a facility comes online. These sources taken into account, Santa Paula is projected to increase its supply from 5,983 AFY to 9,918 AFY over the next 22 years. Because demand is projected to increase by less than 2,000 AFY, a surplus is expected under average predicted conditions. The breakdown of different water sources over the period of 2015- 2035 is shown in Figure 33. The increase in supply of recycled water will allow the City to rely less on groundwater, although it is still a substantial portion (79%) of its supply.

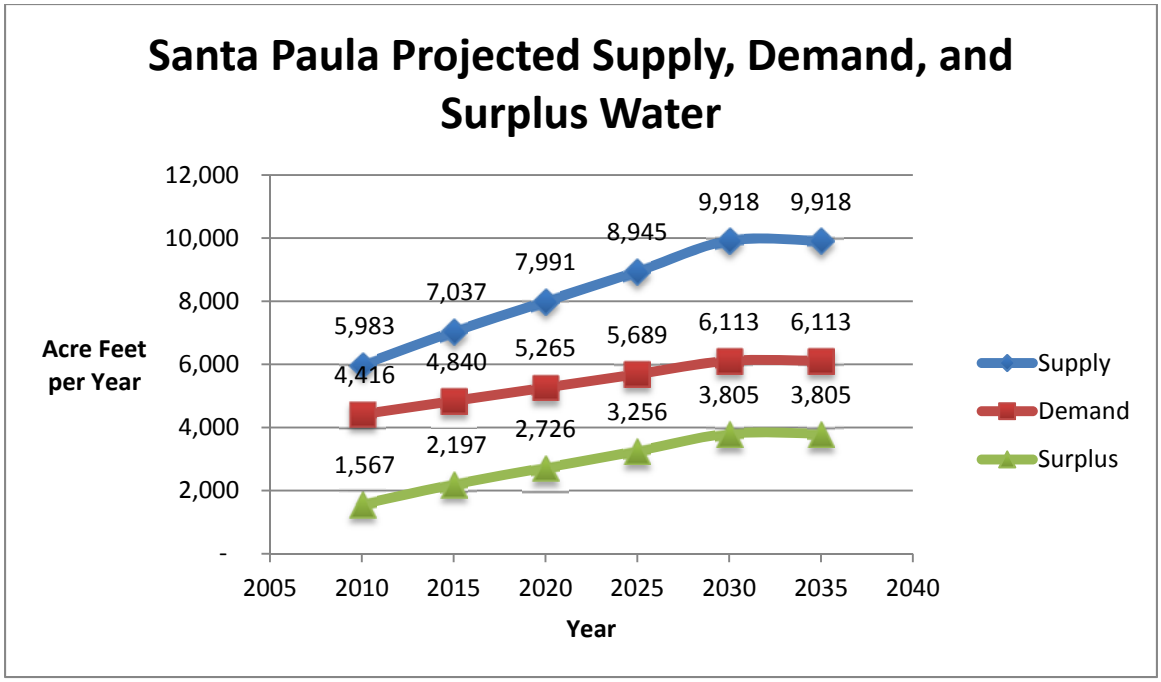


Figure 32. Santa Paula's Supply, Demand, and Surplus of Water through 2035

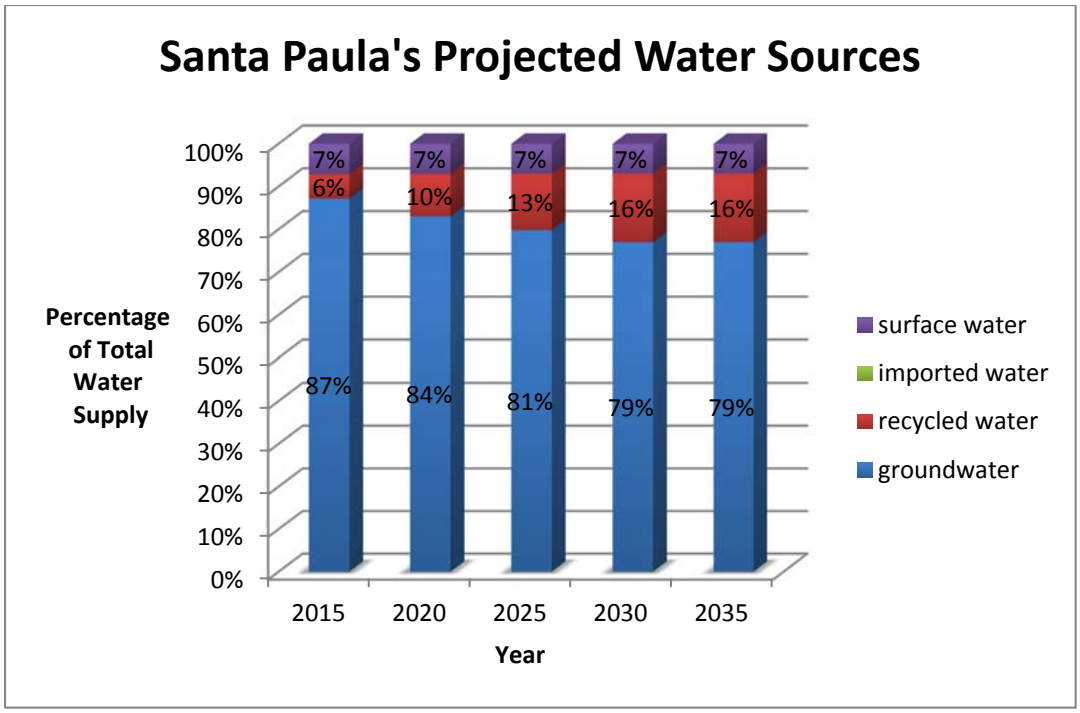


Figure 33. Santa Paula's Projected Water Supplies

For more information on the City of Santa Paula's projected supply and demand, review the 2010 Urban Water Management Plan here or search for the latest update:

http://www.water.ca.gov/urbanwatermanagement/2010uwmps/

Fillmore- Demand

Total annual water consumption is approximately 2,500 AFY for non-agricultural uses and approximately 44,000 AFY for agricultural uses. Since 2000, the City has implemented numerous conservation measures and has been successful in reducing per capita consumption. Because of new plumbing efficiency standards, landscape guidelines, and other conservation programs, water demand is only increasing at a rate of about 2.6% per year while the number of services increased 14.7%. Water demand management measures implemented by the City include plumbing retrofits for all new structures and remodels and distribution system water audits that include leak detection and repairs. Although there are many additional demand management measures the City could implement, it has determined that many are unnecessary or financially infeasible to implement.

Fillmore- Supply

The City of Fillmore relies almost exclusively on the Fillmore aquifer. The City also has the ability to import State Water through United Water Conservation District and has explored the potential for brackish water desalination (Fillmore 2000).

The City provides approximately 2,500 AFY from two wells to non-agricultural users, and agricultural users pump approximately 44,000 AFY (Fillmore 2000). Agricultural pumping rates fluctuate during dry and wetter years; however, residential rates remain fairly constant. Sespe Creek is the primary source of recharge for the portion of the Fillmore aquifer that is utilized by the City of Fillmore and has flow volumes that are dependent on annual and seasonal variations in precipitation levels in the watershed. The Fillmore aquifer is approximately 8,000 feet deep and contains approximately 7,300,000 total AF of water. The primary wells for the City of Fillmore draw from the top 300 feet of the aquifer. The City also has an older well that draws from 1,820 feet deep. The water at this depth must be treated for iron and manganese to meet Department of Health Services water quality requirements.

The City of Fillmore built a wastewater treatment plant (WWTP) in 1956, and upgraded it in 1978 and 1993 to produce disinfected secondary treatment level wastewater. The treated wastewater from this facility is percolated into groundwater supplies downstream of potable wells. As of 2000, Fillmore was percolating approximately 1,100 acre-feet per year.

The City built a Water Recycling Plant, completed in 2010, to replace the existing Wastewater Treatment Plant. It is projected to produce 2,651 acre feet/ year by 2020, but will fluctuate based on input flows (City of Fillmore UWMP 2005). The City uses this water to irrigate landscaping areas and will relieve some of the needs for development of additional water extraction wells.

Fillmore's surplus supply is projected to remain steady for the next ten years, and the supply set aside for urban uses is still significantly larger than demand. Total pumping of the aquifer is consistently lower than the estimated safe yield of 75,000 AFY, and has contingency measures in place in the event of an overdraft. The average annual pumping for the last 20 years from the Fillmore aquifer is 44,612 AF, and peak pumping occurred in the drought of the 1990's at 55,718 AF. The aquifer has been full or nearly full over the past sixty years, and the basin is monitored annually by water users and UWCD.

The City is entitled to 1,000 acre-feet per year of State Project Water that is supplied through UWCD. Although there is no infrastructure in place, the City takes these deliveries from the Santa Clara River.

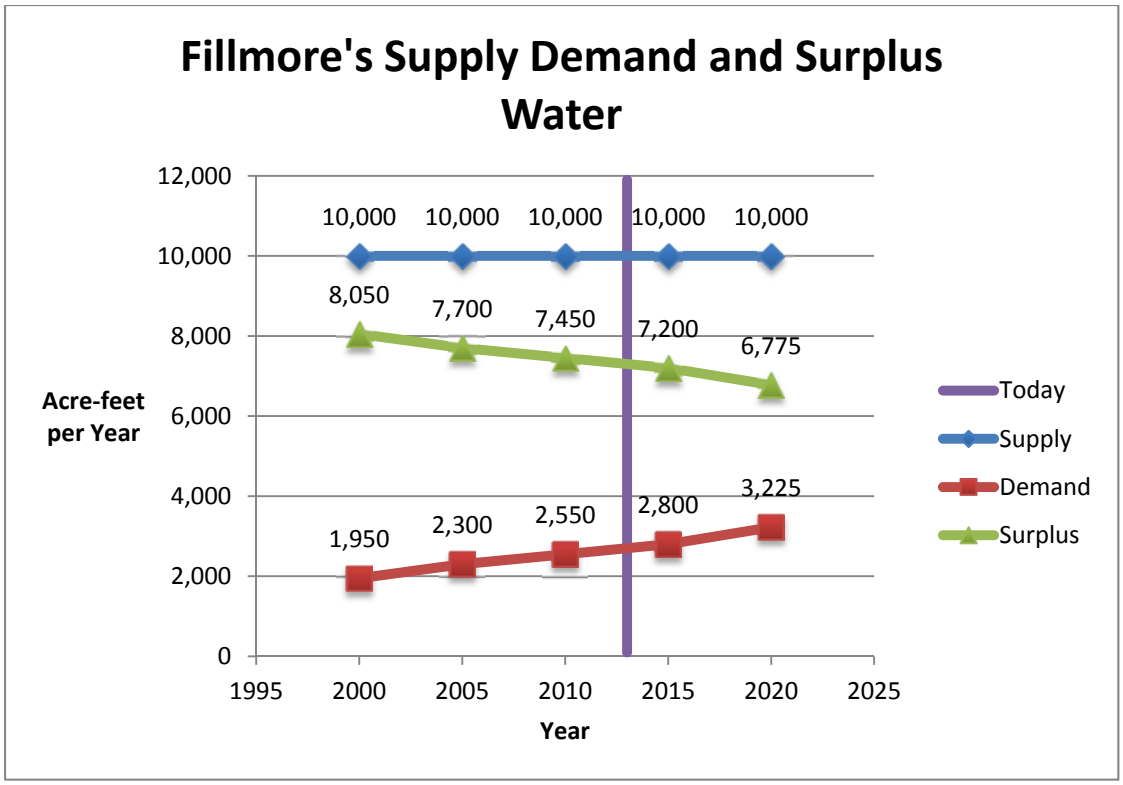


Figure 34. Fillmore's Supply, Demand, and Surplus of Water through 2020

For more information on the City of Fillmore's projected supply and demand, review the 2005 Urban Water Management Plan here or search for the latest update:

http://engineering.fillmoreca.com/ENGINEERING/Urban%20Water%20Management%20Plan/

2.5.2 Agricultural Water Supply and Demand

As is the case with the entire Region, agricultural water use accounts for most of the water demand in the Santa Clara River Watershed. Most growers use groundwater pumped from their own wells, or purchase groundwater and/or surface water provided by a retail or wholesale water provider. Crop type and associated water use varies within each watershed as shown in figures 35 and 36.

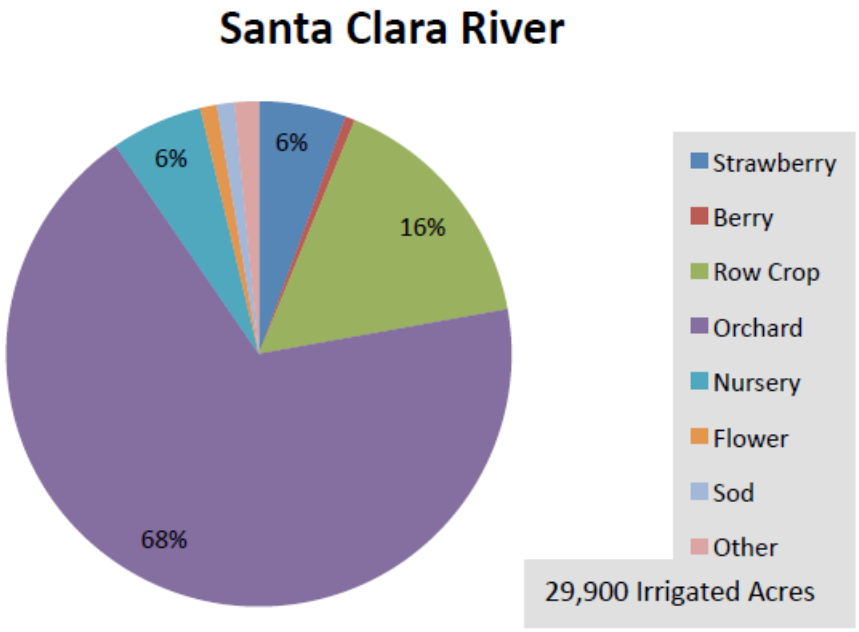


Figure 35. Santa Clara River Irrigated Acres percentage by crop.

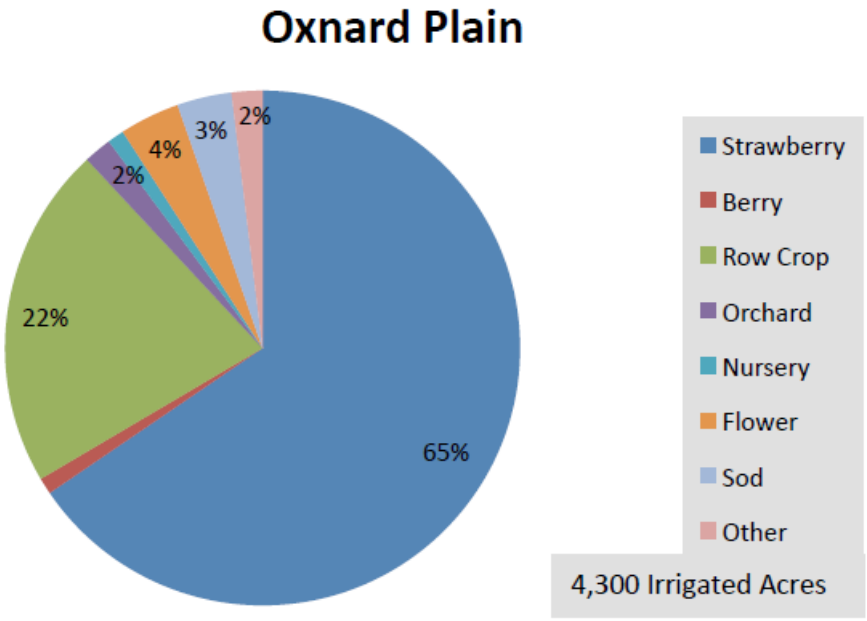


Figure 36. Irrigated Acres percentage by crop in the Oxnard Plain.

2.6 Water Quality

2.6.1 Programs to Protect and Improve Water Quality

California's State Water Resources Control Board and 9 regional boards have regulatory authority over water quality. This authority primarily stems from its pioneering clean water act, the 1969 Porter-Cologne Water Quality Control Act (Porter-Cologne Act). Through the Porter-Cologne Act, the State Water Board and the Regional Water Boards have broad duties and powers to preserve and enhance all beneficial uses of the state's complex waterscape. The State Water Board manages the National Pollution Discharge Elimination System, Total Maximum Daily Load program, and the Groundwater Ambient Monitoring Assessment program in California as well as numerous other water quality programs.

National Pollutant Discharge Elimination System

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) Permit Program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Stormwater runoff from industrial sources, municipal storm drains, and other point sources are included in the National Pollution Discharge Elimination System (NPDES) program (USEPA 2013a). Under this program, dischargers must obtain a permit with water quality conditions and technological controls in order to discharge effluent into waters of the US. Discharges may be non-stormwater in nature (i.e. cooling water, treated sanitary waste) or be primarily composed of stormwater runoff from construction or industrial sites (covered by statewide general permits in California) or runoff discharged through Municipal Separate Storm Sewer Systems (MS4).

Non-point sources, such as agricultural discharges are not covered by the NPDES program; however, the state has other regulatory options available including issuing waste discharge requirements (WDRs – essentially, a state permit), waiving, or conditionally waiving those requirements. Coverage by a conditional waiver for agricultural discharges is available for owners/operators of irrigated lands in Los Angeles and Ventura Counties, either individually or through a group. Additionally, USEPA has a nonpoint source pollution demonstration grant program to expand the research, programs, and grants to develop nonpoint controls and management practices. See Section 3 for more information about the Agricultural Waiver and the Ventura County Agricultural Irrigated Lands Group.

Total Maximum Daily Load Program

The federal Clean Water Act also has provisions for improving water quality in areas that do not meet water quality standards, called "impaired" waters. Section 303(d) of the Federal Clean Water Act requires that states develop a list of water bodies that do not meet water quality standards, establish priority rankings for waters on the list, and identify the loading reductions needed by point and nonpoint sources to the water body in order for the water body to meet water quality standards, called Total Maximum Daily Loads (TMDL). The approach to achieving the loading reductions (the TMDL Implementation Plan) is also included when the state is developing the TMDL. The list of impaired water bodies is revised periodically (typically every two years) in California.

For more information on the TMDL Program visit:

http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/

Conditional Waivers for Irrigated Lands

The California Water Code authorizes State and Regional Water Boards to conditionally waive waste discharge requirements (WDRs) if this is in the public interest. Over the years, the Regional Water Boards issued waivers for over 40 categories of discharges (Farm Bureau 2013). Although waivers are almost always conditional, the historic conditional waivers had few conditions. In general, they required that discharges not cause violations of water quality objectives, but did not require water quality monitoring.

Senate Bill 390, signed into law on October 6, 1999, required the Regional Water Boards to review their existing waivers and to renew them or replace them with WDRs. Under SB 390, waivers not reissued automatically expired on January 1, 2003. To comply with SB 390, the Regional Water Boards adopted revised waivers. The most controversial waivers were those for discharges from irrigated agriculture. Discharges from agricultural lands include irrigation return flow, flows from tile drains, and storm water runoff. These discharges can affect water quality by transporting pollutants including pesticides, sediment, nutrients, salts (including selenium and boron), pathogens, and heavy metals from cultivated fields into surface waters (Farm Bureau 2013). The Los Angeles Regional Board, which oversees Ventura County, adopted its first Conditional Waiver program on Nov. 3, 2005. The waiver was renewed on Oct. 7, 2010, for another five years and includes extensive monitoring requirements and implementation of management practices if Water Quality Benchmarks are exceeded.

For more information on the Ag Waiver Program visit:

http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/waivers/index.shtml

Groundwater Ambient Monitoring and Assessment Program

The Groundwater Ambient Monitoring and Assessment (GAMA) Program is California's comprehensive groundwater quality monitoring program and was started in 2000. It provides a publically accessible database of groundwater quality data throughout the state. As many as two million Californians get their water from private domestic wells or by water systems serving fewer than 15 service connections. The California Department of Public Health does not regulate water quality from these sources, thus private domestic well owners are responsible for maintaining their well and are encouraged to test their well water quality.

For more information about the Groundwater Ambient Monitoring and Assessment (GAMA) visit:

http://www.waterboards.ca.gov/water_issues/programs/gama/

California Surface Water Ambient Monitoring Program

The California Surface Water Ambient Monitoring Program (SWAMP) was created by State Legislature's mandate for a program that would coordinate all water quality monitoring conducted by the State and Regional Water Boards. SWAMP has established relationships with scientists from the University of California, California State University, California Department of Fish and Game (CDFG), Office of Environmental Health Hazard Assessment (OEHHA) and other State agencies who assist with monitoring design, implementation, quality assurance, data management, and assessment. The SWAMP mission is to provide resource managers, decision makers, and the public with timely, high-quality information to evaluate the condition of all waters throughout California. SWAMP accomplishes this through carefully designed, externally reviewed monitoring programs, and by assisting other entities state-wide in the generation of comparable data that can be brought together in integrated assessments that provide answers to current management questions.

For more information on SWAMP visit:

http://www.waterboards.ca.gov/water_issues/programs/swamp/

Southern California Coastal Water Research Project

The Southern California Coastal Water Research Project (SCCWRP) is a public agency that was formed in 1969 to enhance the scientific understanding of linkages among human activities, natural events, and the health of the Southern California coastal

environment; to communicate this understanding to decision makers and other stakeholders; and to suggest strategies for protecting the coastal environment for this and future generations.

For more information on SCCWRP visit:

http://www.sccwrp.org/Homepage.aspx

For more information on the federal Clean Water Act visit:

http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45

http://www2.epa.gov/laws-regulations/summary-clean-water-act

2.6.2 Current Water Quality Conditions

Surface Water Quality

Section 303(d) of the Clean Water Act requires that water bodies that do not meet or are not expected to meet water quality standards be identified, listed and prioritized. Various reaches of the Watershed are 303(d)-listed as impaired for nutrients, bacteria, salts, trash, and legacy pesticides. The Santa Clara River Estuary and Beach is on the 2010 303(d) list for coliform while a portion of the river upstream of the estuary is listed for ammonia and coliform. Portions of the river have chloride exceedances. The Estuary is also listed for toxaphene and residual amounts of other legacy pesticides in fish tissue. Natural oil seeps discharge significant amounts of oil into Santa Paula Creek. Despite their comparatively good overall water quality, there are elevated levels of salts in some large tributaries which may be in some cases from natural sources or in others may be remnant discharges of brine from abandoned oilfields. Table xx in Appendix 3 lists all impairments in the Santa Clara River Watershed.

Salts

Salts are a water quality issue in the Santa Clara River Watershed. Much of the water that feeds the upper Santa Clara River originates from the State Water Project where it picks up salt before it is pumped into the California Aqueduct. Salt is also added to the river from POTW facilities that discharge treated wastewater into the upper river. The largest source of salts, which are primarily made up of chloride, are from brine produced by self-regenerating household water softeners that discharge into sewers. Elevated salt levels weaken plants and can have devastating effects on agricultural crop yields.

Because of its nature as a flashy system, much of the year, the majority of the water flowing in the Santa Clara River consists of highly treated discharges from wastewater treatment plants upstream in Los Angeles County.

As a result, the RWQCB has ordered the Santa Clarita Valley Sanitation District of Los Angeles County, which operates the wastewater treatment plants in Valencia and Saugus, to reduce the level of salt in the effluent they discharge into the river. The allowable limit has been set at a level that will protect salt-sensitive crops in Ventura County. Local agencies have also banned water softeners and are planning to switch to a new water-purification system using ultraviolet light instead of chlorine, and are planning to build a reverse osmosis plant to treat some wastewater.

http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

Nutrient (nitrogen compounds) TMDL – Identified wastewater treatment facilities as the major contributor of nitrogen compound loading with nonpoint sources and minor point sources contributing a much smaller fraction of these loads. In addition, agricultural runoff and malfunctioning or leaking septic systems contribute to high nutrient levels.

High nitrate concentrations in groundwater are a localized problem in the Oxnard Plain Forebay and Santa Rosa basins. In and adjacent to the Forebay, nitrates affect drinking water wells of UWCD's Oxnard-Hueneme wellfield, mutual water companies, and the City of Oxnard, particularly during and following dry periods.

Groundwater Water Quality

Water Quality in the Fox Canyon Groundwater Management Agency (FCGMA) Area:

Seawater intrusion has long been a concern within the FCGMA and was the problem for which the FCGMA was originally formulated to help fix. The intrusion occurs exclusively along the coastline in the Oxnard Plain basin. The U.S. Geological Survey also identified another type of saline intrusion on the Oxnard Plain as salts moving from the surrounding marine clays and older geologic units as pressure in the aquifers is reduced from over-pumping. Chloride has also become a problem along Arroyo Las Posas, where groundwater from an area in the East and South Las Posas basins must be blended with lower-chloride water to meet irrigation suitability.

Chloride is also a problem in the Piru basin near the Los Angeles County line, where high chlorides from discharge of wastewater treatment plants along the Santa Clara River have degraded the recharge water for the basin. This chloride problem is currently isolated to the Piru basin, although long-term recharge of poorer quality water could

eventually move through the groundwater basins along the Santa Clara River and reach the Freeman Diversion.

The information above has been excerpted from the FCGMA Groundwater Management Plan (May 2012). For more information the document can be found on the GMA website at:

http://www.fcgma.org/publicdocuments/plans.shtml

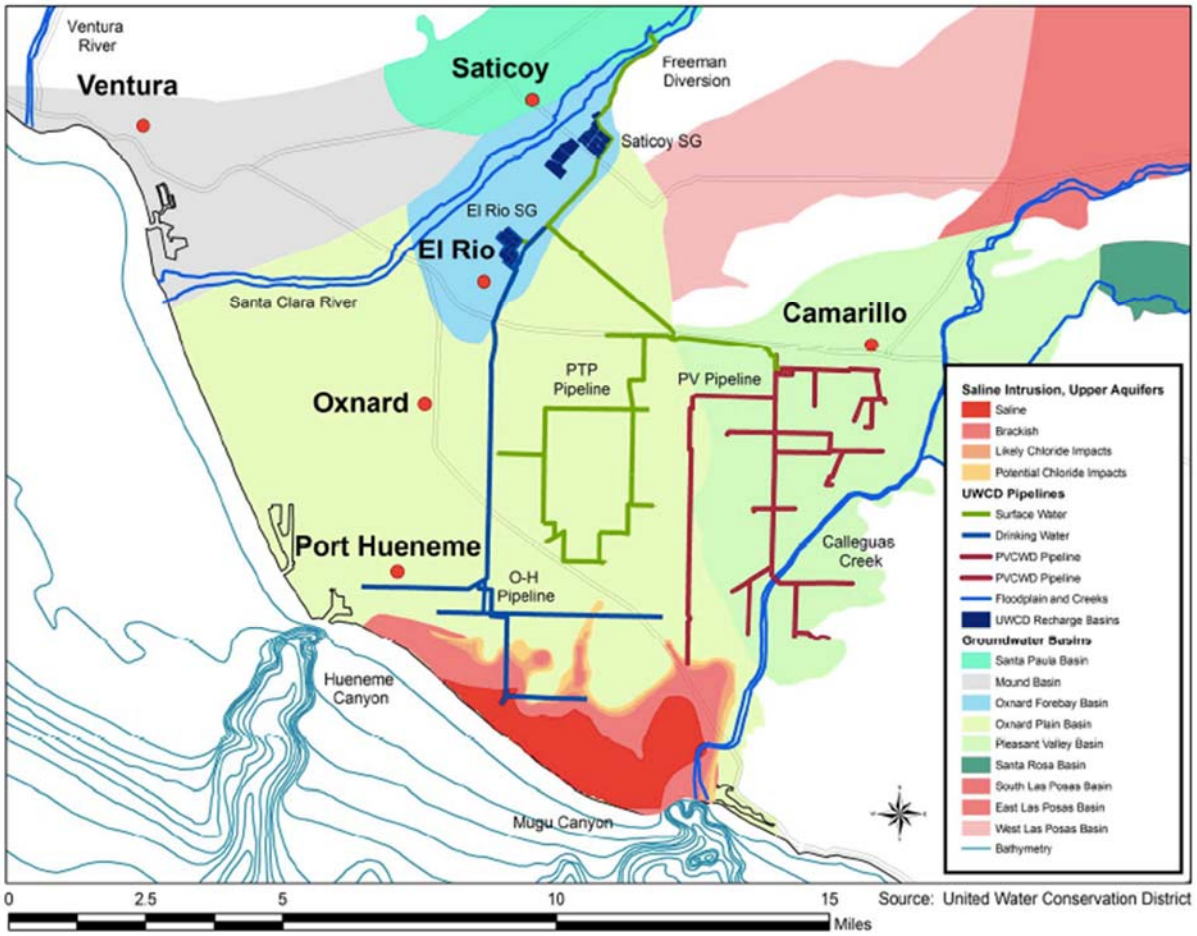


Figure 37. Saline Intrusion in the Upper Aquifers.

Beneath the Oxnard Plain, overdraft of the Oxnard aquifer has been largely eliminated in recent years through effective management practices and constant recharge activities. However, even with targeted improvements, some areas still remain impacted by saline waters previously drawn into the aquifer. Projects such as the Pumping Trough Pipeline (1986), the Freeman Diversion (1991) and the Noble Pit spreading basin (1995), coupled

with wet-to-average climatic conditions and reduced pumping, contributed to improving conditions in these groundwater systems. The Upper Aquifer System (UAS) consists of the Oxnard and Mugu Aquifers while the Lower Aquifer System (LAS) consists of the Hueneme and Fox Canyon Aquifers. Conditions in the UAS have improved partially at the expense of the LAS, which has been pumped heavily in recent years. The LAS is seriously overdrafted in the southern Oxnard Plain and Pleasant Valley basins, where the intrusion of saline water continues. The United Water Conservation District (UWCD) has constructed a new UAS well field near Saticoy to utilize UAS water that is more easily replenished. This allows an increase in water deliveries, while at the same time helping to alleviate the seawater intrusion problem in the overdrafted areas by providing an underutilized source of water. The Fox Canyon Groundwater Management Agency (FCGMA) has also tightened restrictions and instituted strict management procedures on all groundwater extractions and well operators located on parcels above the Fox Canyon aquifer. For more information about the FCGMA and related management procedures, see the latest draft FCGMA Groundwater Management Plan located on their website at:

http://publicworks.countyofventura.org/fcgma/index.htm

Basin-Specific Groundwater Quality

Piru Basin

Similar to the Fillmore Basin directly downgradient, the Piru Basin contains groundwater with TDS values averaging 1,435 mg/l. Sulfate often exceeds the maximum contaminant level (MCL) for drinking water, but is tolerated by the primarily agricultural groundwater uses (citrus irrigation). 2013 water samples from fourteen wells have sulfate (SO_4^{-2}) concentrations greater than the secondary MCL for drinking water and four have manganese (Mn) concentrations greater than the secondary MCL. Three wells in the Piru Basin located south of Highway 126 have consistently been found to have selenium levels that exceed the primary MCL for drinking water of 0.05 mg/l (50 µg/l). Elevated selenium concentrations occur in those wells perforated in the interval between approximately 125 to 250 feet below ground surface. A well located north of Highway 126 and perforated at a similar elevation does not have high selenium.

For more information on groundwater quality, see the Ventura County Watershed Protection District Water and Environmental Resources Division 2013 Groundwater Section Annual Report:
http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District/About_Us/VCWPD_Divisions/Water_and_Environmental_Resources/Groundwater_Resources/

Fillmore Basin

The Fillmore Basin, though small in geographic area, has a total aquifer thickness of almost 8,000 feet in some places. Despite the depth of the basin, County records indicate that water wells are generally no deeper than approximately 950 feet. Water quality can vary greatly depending on depth of the well. Shallow groundwater is generally younger and recharged by river flows with varying chemistry. Deeper groundwater is older and has acquired its chemistry through dissolution of constituents from the surrounding sediments. There are approximately 706 water supply wells in the Fillmore Basin; 450 are active. Historically, nitrate (NO3-) concentrations have been elevated because of extensive use of fertilizers and septic system discharges, but of the ten wells sampled this year only two showed elevated NO3- concentration relative to the primary MCL for drinking water. Groundwater samples from all ten wells are above the secondary MCL for drinking water for sulfate (SO42-). TDS ranges from 1040 mg/l to 3190 with an average for the wells sampled this year of 1645 mg/l, well above the secondary MCL for drinking water.

For more information on groundwater quality, see the Ventura County Watershed Protection District Water and Environmental Resources Division 2013 Groundwater Section Annual Report:
http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District/About_Us/VCWPD_Divisions/Water_and_Environmental_Resources/Groundwater_Resources/

Santa Paula Basin

The Santa Paula Basin is a court adjudicated groundwater basin. In an effort to prevent overdraft, a June 1991 judgment ordered the creation of the Santa Paula Basin Pumpers Association (SPBPA). The SPBPA regulates extractions in the Santa Paula Basin. The judgment stipulated an allotment of 27,000 acre-feet per year could be pumped from the basin. Water quality in the basin has not changed substantially since 2007. The depth to the water bearing material is 65 to 160 feet. There are approximately 364 water supply wells in the Santa Paula Basin; 164 are active. TDS concentrations for water in the four wells sampled in 2013 vary from 1050 to 2740 mg/l, with an average value of 2063 mg/l for wells sampled this season; all above the current secondary MCL for drinking water. Water samples from all the wells have concentrations above the secondary MCL for sulfate and manganese and three have concentrations above the secondary MCL for iron.

For more information on groundwater quality, see the Ventura County Watershed Protection District Water and Environmental Resources Division 2013 Groundwater Section Annual Report:
http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District/About_Us/VCWPD_Divisions/Water_and_Environmental_Resources/Groundwater_Resources/

Mound Basin

The Mound Basin is generally divided into the Upper Zone (from ground surface to 300 feet) and the Lower Zone (from 450 to over 1000 feet below grade). Most active water wells (regardless of use) are perforated in deep (Lower) water bearing zones.
The average TDS concentration for the five wells sampled in 2013 is 1626 mg/l. Sulfate concentration was greater than the secondary MCL for drinking water in all five wells sampled, iron is above the secondary MCL in one well, and manganese was above the secondary MCL in four of the wells sampled. A water sample from one well was analyzed for inorganic chemicals (Title 22 metals). All inorganic constituents were below the primary MCL for drinking water. Water quality of the wells sampled in the Mound Basin is similar to that in the Santa Paula Basin.

For more information on groundwater quality, see the Ventura County Watershed Protection District Water and Environmental Resources Division 2013 Groundwater Section Annual Report:
http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District/About_Us/VCWPD_Divisions/Water_and_Environmental_Resources/Groundwater_Resources/

Oxnard Forebay Basin

The Oxnard Plain Forebay Basin is the principal recharge area for the Upper and Lower Aquifer Systems of the Oxnard Plain Pressure Basin. Approximate depth to the water bearing unit is 25 to 50 feet. There are approximately 367 wells in the Oxnard Plain Forebay Basin; 54 are active water supply wells. The Oxnard Plain Forebay generally has acceptable water quality except for the southern portion where high nitrate concentrations are common. The area to the north is predominantly agricultural with a few residential areas that still rely on individual septic systems. All three wells sampled in 2013 had TDS and sulfate concentrations above the secondary MCL for drinking water. Two wells had nitrate concentrations above the MCL for drinking water.

For more information on groundwater quality, see the Ventura County Watershed Protection District Water and Environmental Resources Division 2013 Groundwater Section Annual Report:
http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District/About_Us/VCWPD_Divisions/Water_and_Environmental_Resources/Groundwater_Resources/

Current Local Water Quality Programs and Projects

Lower Santa Clara River Salt and Nutrient Management Plan

In 2008 the State Water Resources Control Board adopted the Recycled Water Policy, encouraging the use of recycled water and establishing a mandate to increase its use by 200,000 afy by 2020 and by an additional 300,000 afy by 2030. The policy also encourages development of regional or sub-regional salt and nutrient management plans for groundwater basins in California in order to streamline the permitting of the majority of recycled water projects by the Regional Water Quality Control Boards while still implementing state and federal water quality regulations. Funds to develop a Salt and Nutrient Management Plan for the lower Santa Clara River groundwater basins (see study area in Figure 38) were secured through the Proposition 84 planning grant. The full Lower Santa Clara River Salt and Nutrient Management Plan can be found in Appendix B. The Recycled Water Policy is available at

http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2013/rs2013_0003_a.pdf

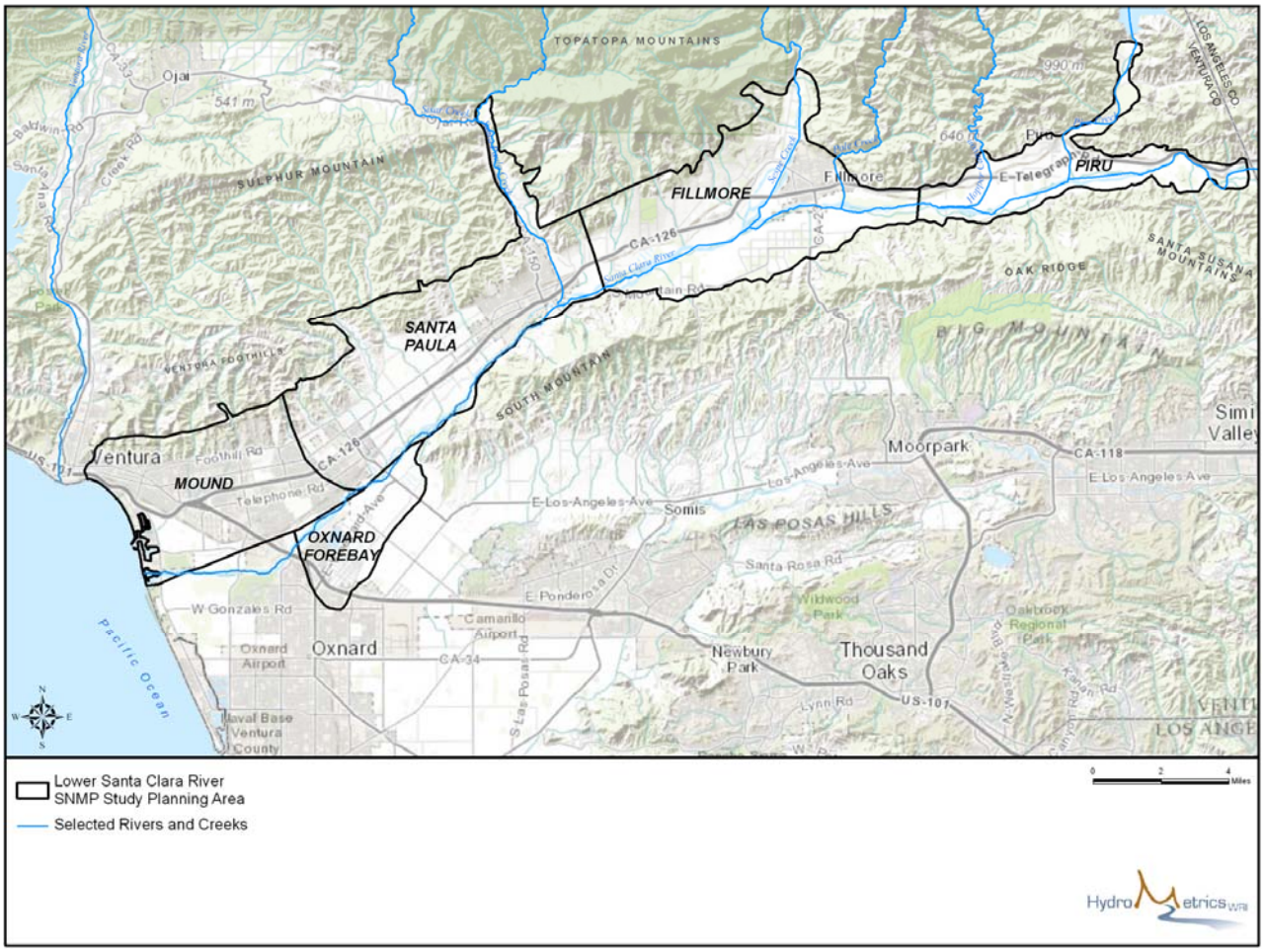


Figure 38. Lower Santa Clara River Salt and Nutrient Management Plan Study Area

Upper Santa Clara River Salt and Nutrient Management Plan

A salt and nutrient management plan is also being developed for the Upper Santa Clara River Watershed. More information can be found at the following website:

www.scrwaterplan.org

The Ventura Water Reclamation Facility:

The Ventura Water Reclamation Facility has been reclaiming water for landscape irrigation since the mid 1960's and has been providing tertiary treatment for irrigation water since 1973. Since that time a portion of the effluent has been discharged to the Santa Clara River Estuary. Operating under a habitat enhancement exemption since 1976, it is currently mandated by its 2013 NPDES permit to discharge at least 5.6 MGD to the estuary for habitat support.

Brackish Water Reclamation Demonstration Facility:

Port Hueneme Water Agency (PHWA) negotiated a 40-year agreement with the UWCD to improve water quality through desalination treatment, ensuring the water supplied by UWCD met drinking water standards. Even though UWCD groundwater is considered potable, it has elevated total dissolved solids (TDS) (approximately 1,000 parts per million [ppm]) and hardness (500 ppm). The PHWA established a water quality improvement goal of 370 ppm TDS and 150 ppm hardness which will help ensure compliance with future federal and state water quality standards. PHWA's 4.0 million gallon per day (MGD) desalination water treatment facility, known as the Brackish Water Reclamation Demonstration Facility (BWRDF), was partially funded by the United States Bureau of Reclamation. The BWRDF is located along Perkins Road, immediately to the north of the City of Oxnard Wastewater Treatment Plant. The BWRDF uses reverse osmosis (RO) and nanofiltration (NF) for brackish water desalination. In addition to being an active full-scale potable water treatment plant, the BWRDF also conducts research regarding brackish water treatment and membrane separation. The research is intended to assist water suppliers worldwide in selecting an appropriate desalination process to treat water supplies that have heretofore been unacceptable for use due to the expense and operational complexity of inefficient water treatment technologies.

Santa Clara River Comprehensive Monitoring Plan:

In 2006, the Santa Clara River Comprehensive Monitoring Plan (CMP) was developed to address water quality issues throughout the watershed and develop a uniform system of water quality sampling and data analysis to inform future water quality management strategies. AMEC Earth and Environmental, Inc. (AMEC) was retained by the Ventura County Watershed Protection District (VCWPD), under the direction of the State Water Resources Control Board (SWRCB), to compile and review existing water quality data, determine data gaps, and develop a CMP for the Santa Clara River. To develop the CMP, AMEC gathered existing monitoring data for the Santa Clara River, assembled a comprehensive water quality and flow database, identified data gaps, evaluated the constituents monitored and made recommendations regarding modifications to existing monitoring protocol and procedures necessary to ensure development of a comprehensive water quality monitoring program. Based on these results and the identified need to develop a monitoring program that would establish baseline conditions in the watershed, AMEC recommended a slightly modified systematic sampling program and selected monitoring locations at regular intervals along the Santa Clara River.

The Comprehensive Monitoring Plan and Water Quality Database can be found here:

http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District/Programs_and_Projects/Santa%20Clara%20River%20Comprehensive%20Monitoring%20Plan

Ventura County Agricultural Irrigated Lands Group (VCAILG)

The Ventura County Agricultural Irrigated Lands Group (VCAILG) is a program run by the Ventura County Farm Bureau that monitors water quality effluent associated with agricultural runoff. The goal of the program is to maintain its Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Within the Los Angeles Region, commonly known as the "Conditional Waiver" or "Ag Waiver." The program requires the owners of irrigated farmland to measure and control discharges from their property, including irrigation return flows, flows from tile drains, and stormwater runoff. These discharges can affect water quality by transporting nutrients, pesticides, sediment, salts, and other pollutants from cultivated fields into surface waters. The Conditional Waiver allows individual landowners and growers to comply with its provisions as individuals or by working collectively as a "discharger group." Given the high cost and complexity of obtaining individual discharge permits, the Farm Bureau enlisted the cooperation of other agricultural organizations, water districts and individuals to form VCAILG, which is intended to act as one unified discharger group for those agricultural landowners and growers who agreed to join. The program has been running since 2006, and sampling showed that some agricultural runoff was violating water quality standards. As a result, VCAILG developed Water Quality Management Plans that outline processes and strategies to ensure agricultural discharges meet water quality standards. On a farm level, landowners and growers are asked to provide VCAILG with information on their management practices, participate in education efforts, and implement Best Management Practices to reduce or eliminate contaminated discharges.

For additional information and reports on VCAILG programs visit:
http://www.farmbureauvc.com/water_quality.html#vcailg_docs

State of the Watershed- Report on Surface Water Quality:

This 2006 report by the RWQCB, LA Region provides background information on the watershed setting, biological resources, and provides an assessment of water quality in the context of the state regulatory framework. These include beneficial uses,

impairments, and management recommendations to improve water quality within the watershed.

The State of the Watershed Report on Surface Water Quality report can be found here:

http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/Water_Quality_and_Watersheds/ws_santaclara.shtml

2.7 Social and Cultural Composition of the Watershed

This section provides a summary of key demographic data and information on Disadvantaged Communities (DAC).

Table 6. Demographic and Economic Data for Primary Jurisdictions in the Watershed

Jurisdiction	Population	Median Household Income	Major Industries	Ethnicity Breakdown
Cities				
Ventura[1]	110,873	$65,123	Construction (11%); Public administration (8%); Professional, scientific, and technical services (7%); Accommodation and food services (6%); Educational services (5%); Administrative and support and waste management services (5%); Health care (4%)	White (67.5%) Hispanic (25.1%) Asian (2.8%) Two or more races (2.5%) Black (1.3%) American Indian (0.6%) Native Hawaiian and Other Pacific Islander (0.1%) Other race (0.1%)
Oxnard[1]	201,555	$58,090	Agriculture, forestry, fishing and hunting (14%); Construction (9%); Administrative and support and waste management services (7%); Public administration (5%); Accommodation and food services (5%); Professional, scientific, and technical services (4%); Repair and maintenance (4%)	Hispanic (69.9%); White (16.1%); Asian (8.6%); Black (2.9%); Two or more races (2.2%); Native Hawaiian and Other Pacific Islander alone (0.1%); American Indian alone (0.09%); Other (0.03%)

Table 6. Demographic and Economic Data for Primary Jurisdictions in the Watershed

Jurisdiction	Population	Median Household Income	Major Industries	Ethnicity Breakdown
Santa Paula[1]	29,963	$51,895	Agriculture, forestry, fishing and hunting (18%); Manufacturing (15%); Construction (11%); Retail trade (8%); Administrative and support and waste management services (7%); Health care and social assistance (6%); Accommodation and food services (6%)	Hispanic (78.8%); White (19.7%); Two or more races (0.6%); Asian (0.5%); Black (0.2%); American Indian (0.09%); Other (0.06%)
Fillmore[1]	15,162	$58,942	Construction (15%); Retail trade (13%); Accommodation and food services (8%); Other services, except public administration (7%); Manufacturing (7%); Educational services (6%); Public administration (6%)	Hispanic (74.8%); White (20.9%); Asian (3.2%); Two or more races (0.7%); Black (0.3%); Native Hawaiian and Other Pacific Islander (0.1%); American Indian (0.07%)
Port Hueneme[1]	21,856	$50,811	Retail trade (13%); Manufacturing (10%); Public administration (9%); Construction (8%); Accommodation and food services (7%); Professional, scientific, and technical services (6%); Transportation and warehousing (6%)	Hispanic (51.3%); White (34.0%); Asian (6.9%); Black (4.1%); Two or more races - 587 (2.7%); Native Hawaiian and Other Pacific Islander (0.6%); American Indian (0.4%)
Other				
Unincorporated Ventura County[2]	94,937	No Data	Agriculture (33.1%); Professional- Management (14.1%); Education-Health (12.8%); Public Administration (7.6%); Wholesale (7.0%); Leisure-	White (61.9%); Hispanic (30.4%); Asian (4%); Black (1%); American Indian (0.4%); All Other (2.4%)

Table 6. Demographic and Economic Data for Primary Jurisdictions in the Watershed

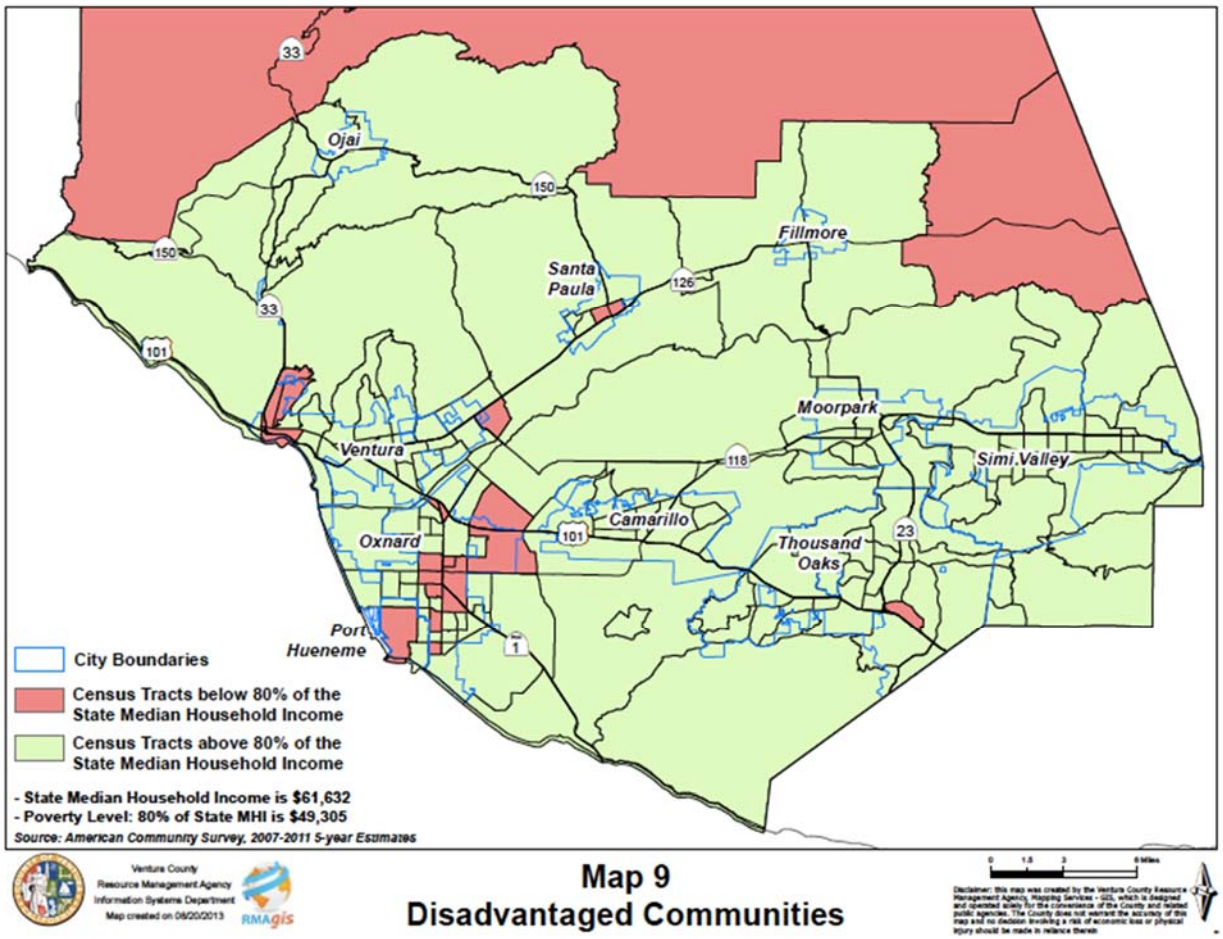
Jurisdiction	Population	Median Household Income	Major Industries	Ethnicity Breakdown
			Hospitality (5.4%); Construction (4.7%); Retail (4.1%); Other (12.2)	

[1] Data from City-Data.com

[2] Data from SCAG Southern California Association of Governments May 2013 Profile of the unincorporated area of Ventura County: http://scag.ca.gov/resources/pdfs/2011LP/UnIncVenturaCounty.pdf

2.7.1 Disadvantaged Communities

There are several areas within the Santa Clara River Watershed that qualify as disadvantaged communities (DAC) as defined by the Proposition 84 IRWM Grant Guidelines. These communities are characterized by average income levels that are less than 80% of the statewide median household income. The statewide median is $61,632, making the DAC level $49,305 per household. In the most recent (2007-2011) American Community Survey Estimates of Median Household Income, several new areas now qualify as disadvantaged compared to the last 5-year estimates. Figure X shows the DACs throughout the watershed and County.



2.8 Issues and Needs in the Watershed

Stakeholders in the lower Santa Clara River Watershed (in Ventura County) develop the following list of key issues of concern with respect to water supply, water quality, flood management, recreation, and environmental/habitat concerns. The following is the list of those issues.

- Water Supply
  - Groundwater overdraft
  - Imported water supply reliability
  - Water distribution system reliability – interconnection
  - Water conservation
  - Water recycling – education of end users
  - Enhancement of local supply – improved reliability
- Water Quality
  - Seawater intrusion
  - Agricultural runoff – TMDL
  - Agricultural and urban erosion – sediment loading/hydrology model

    - Stormwater/urban runoff – quality and management
    - RWQCB fines/penalties
    - Stormwater permit compliance and implementation
- Flood Management
    - Floodplain development and land use planning
        - Steep slopes and sensitive areas
        - Hydrology – peak flow
        - Structures and damage
        - Habitat loss
    - Infrastructure
        - Aging levees
- Environment/Habitat Restoration
    - Habitat restoration
        - Endangered species and fish
        - Invasive species concerns
    - Disadvantaged communities
- Recreation and Education
    - Need for more recreational access and trails along the River
    - Lack of public awareness of water and related issues

3.0 GOVERNANCE AND STAKEHOLDER INVOLVEMENT

The IRWM program is made up of the General Membership, the Steering Committee, and the three Watershed Committees that represent each of the major watersheds in Ventura County. The General Membership consists of all interested stakeholders in the County, and this body has ultimate authority on all IRWM decisions. The Steering Committee acts as a leadership entity for the WCVC and is comprised of two representatives from each watershed committee and two non-voting County staff members. Steering Committee members communicate regional issues and decisions to their constituents and provide programmatic and fiscal oversight to the IRWMP process. Watershed committees establish goals, objectives and performance measures, and identify implementation projects and programs. Decisions are made on a consensus basis and forwarded to the Steering Committee for discussion and action prior to being considered by the General Membership as required by the WCVC Charter.

3.1 Santa Clara River Watershed Committee

In July 2006, a stakeholder group was formed to develop a long-term watershed management plan for areas along the lower Santa Clara River Watershed. The Santa Clara River Watershed Committee (SCRWC) was formed under the auspices of the

Watersheds Coalition of Ventura County (WCVC). It is anticipated that these efforts will be coordinated more closely in the future with the upper Santa Clara River Watershed stakeholders.

The SCRWC has focused its efforts on developing objectives and future project concepts that will address water issues and problems in the Watershed. Attendance at these meetings has included more than 30 people representing State and Federal agencies (such as Fish and Wildlife Service, Army Corps of Engineers, Regional Water Quality Control Board) and local water agencies, Cities, the local Resource Conservation District, U.C. Cooperative Extension, the County Board of Supervisors and public interest and environmental groups (such as the Nature Conservancy, Friends of the Santa Clara River). Interested parties from Los Angeles County such as the City of Santa Clarita, Castaic Lake Water Agency, County Sanitation Districts and Los Angeles County Public Works Agency are also participating in the SCRWC meetings. Currently, three conveners provide input into the SCRWC activities: Supervisor Kathy Long, Ventura County Board of Supervisors; E.J. Remson, Nature Conservancy; and Mike Solomon, United Water Conservation District.

Currently, meetings are convened by Ventura County Supervisor Kathy Long with support and coordination from the IRWM Project Manager. SCRWC meetings are typically held every other month. Representatives of the upper Santa Clara River IRWM group frequently attend these meetings. These meetings are open to the public and all other interested parties.

In early 2014 a Watershed Coordinator was appointed to enhance communication, outreach and implementation of watershed management projects and programs. The Coordinator oversees the committee process and works closely with the IRWM Program Manager.

Table 7

Stakeholders Participating in Santa Clara River Watershed Management Efforts

Agency or Organization
Cities
City of Camarillo
City of Fillmore
City of Oxnard

Agency or Organization
City of Santa Paula
City of Port Hueneme
City of Ventura (San Buenaventura)
Wholesale Water Agencies
United Water Conservation District
Major Retail Water Agencies[1]
Pleasant Valley Mutual Water Company
Ventura County Waterworks District #1 - Moorpark
Fillmore Irrigation Company
Channel Islands Beach Community Services District
County Agencies
Ventura County Public Works Agency
Ventura County Executive Office
Ventura County Resource Management Agency
Ventura County Watershed Protection District
Ventura County Board of Supervisors
Ventura County Agricultural Commissioner
Environmental Stewardship Organizations
Friends of the Santa Clara River
Ventura County Resource Conservation District
California Wildlife Conservation Board
California Native Plant Society
The Nature Conservancy
Wetlands Recovery Project
Trust for Public Land
Surfrider Foundation
Sierra Club
Ventura Coastkeeper
State, Federal, and Regional Agencies and Universities
Regional Water Quality Control Board – Los Angeles Region
California Coastal Commission
California Coastal Conservancy
U.C. Cooperative Extension – Farm Advisor
University of California – Santa Barbara
California State University – Channel Islands
California Department of Fish and Wildlife
California Department of Water Resources
Southern California Assoc. of Governments
California Department of Parks and Recreation
U.S. Forest Service –Los Padres National Forest
Natural Resources Conservation Service
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

Agency or Organization
U.S. Bureau of Reclamation
U.S. Fish and Wildlife Service
Naval Base Ventura County
Wastewater Agencies
Camarillo Sanitary District
Saticoy Sanitary District
Ventura Regional Sanitation District
Groundwater Basin Management Authorities
Fox Canyon Groundwater Management Agency – per California Water Code
Santa Paula Basin Pumpers Association – court adjudicated
City of Fillmore/United Water Conservation District – groundwater managers of Fillmore and Piru Groundwater Basins per AB 3030 provisions
Community Organizations and Recreational Interests
Association of Water Agencies of Ventura County
Pleasant Valley Park and Recreation District
League of Women Voters
Flood Management Agencies
Ventura County Watershed Protection District
Native American Tribes
Individual members of various bands of the Chumash Tribe and Wishtoyo Foundation
Agricultural and Business Groups
Farm Bureau of Ventura County
Building Industry Association
Ventura County Economic Development Association
Coalition of Labor Agriculture and Business

3.2 Coordination with Upper Santa Clara River IRWM Region

The Santa Clara River Watershed, one of the last remaining natural rivers in Southern California, is the largest watershed in Ventura County. The 1600 square mile Watershed spans two Counties - Los Angeles and Ventura – and efforts are underway between the two Counties to work collaboratively to address issues of mutual concern and benefit, such as water quality improvement. The portion of the watershed located in Los Angeles County is typically referred to as the Upper Santa Clara River Watershed, while the portion in Ventura County is referred to as the Lower Santa Clara River Watershed.

The Upper Santa Clara River Watershed IRWM Region formed in 2007 and has been coordinating closely with the WCVC IRWM Region. Prior to the formation of IRWM Regions, there have been a variety of collaborative efforts that have included both the Upper and Lower Santa Clara River areas. A few of these are listed below.

• Alternative Water Resource Management Project – Led by Los Angeles County Sanitation Districts with participation in both counties – currently underway

• Watershed U – Collaboration throughout the watershed led by U.C. Cooperative Extension with participation in both counties - 2005
• Memorandum of Understanding between United Water Conservation District and water agencies in the Upper Santa Clara River Watershed regarding groundwater modeling, water rights, quality, and quantity
• Upper and Lower Santa Clara River Conservation Plans prepared by The Nature Conservancy – with participation in both counties
• Natural Floodplain Management efforts – including land acquisition for easements in the flood plain, led by The Nature Conservancy with participation in both counties
• Santa Clara River Parkway Project – led by California Coastal Conservancy – with participation in both counties – currently underway
• Santa Clara River Enhancement and Management Plan – joint planning effort with entities in both counties and the Army Corps of Engineers - Completed in 2005
• Army Corps Feasibility Study – geomorphology assessment – joint effort with both counties and the Army Corps of Engineers – currently underway
• Land use planning – ongoing discussions between Ventura and Los Angeles County planning agencies regarding land development projects in the Upper Santa Clara River Watershed
• Ongoing efforts to improve habitat and provide stewardship for resources in the entire watershed – some local environmental groups cover the entire watershed working in both counties to coordinate efforts
• Ongoing coordination between Los Angeles and Ventura County regarding flood control

The two groups have coordinated through the respective stakeholder processes, planning efforts, and project selection processes to ensure that the entire watershed is protected and managed despite the county lines. Joint meetings between the two IRWM Groups are held periodically. The two regions are also in the same funding area under Proposition 84, so ongoing coordination is beneficial.

The two Regions continue to strive for comprehensive management of the entire watershed and to address common needs and concerns. While the two Regions function well separately, close coordination is beneficial to both.

4.0 PLAN GOALS, OBJECTIVES and PRIORITIES

4.1 Background

In 2010 a group of interests along the Santa Clara River Watershed in both the upper and lower watershed IRWM Regions met to establish a vision, mission and objectives for the entire watershed. These were adopted by the Regional Water Management Groups in each Region, as well as some individual entities, and provide overall guidance to the activities in each Region. Please see details below.

Vision

The Santa Clara River system (i.e., the Santa Clara River, its tributaries, and associated floodplain) is one of the last remaining river systems relatively intact in the state and is recognized as exceptional in its value and quality by local communities and the public in southern California and beyond. The river system drains a 1600-square-mile watershed the majority of which is publicly owned, and encompasses a river corridor supporting a thriving agricultural industry and several urban communities. All of these uses help define the character of the watershed. The Santa Clara River system merits appropriate stewardship to ensure that the river, its natural resources, the economic activities it supports, and the ecosystem services it provides are protected for generations to come. This stewardship protects the river's ecological integrity, provides water supplies for various uses, minimizes damage resulting from floods, and supports sustainable economic development.

To this end, we envision a Santa Clara River system that:

- Allows for **natural river processes**, to the maximum extent feasible, including permitting the river to freely meander within its floodplain and to accommodate flows within the natural range of variation.
- Allows for the preservation and **protection of existing and future sustainable uses** in the watershed including cultural, agricultural, and educational activities, low impact recreation, scientific studies, and aesthetic and spiritual enjoyment.
- Emphasizes environmentally sensitive **flood management** that allows for a functional floodplain while minimizing damage to life and property.
- Maintains **biodiversity** through matrix of native aquatic, riparian, and upland habitat with minimal habitat fragmentation and barriers, with emphasis on enhancing recovery of species of conservation concern.
- Is **unimpaired by pollution** or **invasive non-native species**.
- Is managed by cooperating public entities, private landowners, and organizations working toward the **common vision**.
- **Supplies water** for agriculture, groundwater recharge, and habitat maintenance.

Mission Statement

The Santa Clara River Watershed alliance is dedicated to the conservation of the Santa Clara River, from its headwaters and tributaries to its estuary, for the mutual benefit of the natural resources dependent on the river and the people who live, work, and recreate along the river.

4.2 Santa Clara River Watershed Goals and Objectives:

IRWM Plan Goal 1: Reduce dependence on imported water and protect, conserve and augment water supplies

Watershed Objectives

- Implement projects and programs that increase and enhance the beneficial uses of local water supplies, including stormwater. Improve water supply reliability.
- Enhance understanding about the watershed by gathering and synthesizing more data and information regarding water supply (capacity, safe yield, flows) and water demand.
- Ensure secure water supplies by helping local water agencies address the impacts of future droughts and other water shortages.
- Document efforts being made by local water districts, environmental interest groups and other agencies to improve the management of local water supplies and to identify ways to build on these efforts for greater future success.
- Protect groundwater supplies through groundwater recharge projects and protection of recharge areas.
- Develop watershed management plan to enhance understanding of watershed characteristics and appropriate actions.

IRWM PLAN GOAL 2: Protect and improve water quality

Watershed Objectives

- Implement projects and programs that improve and protect water quality.
- Meet State and Federal water quality standards.
- Manage and remove salts in the watersheds and help establish and comply with TMDL requirements.

IRWM PLAN GOAL 3: Protect people, property and the environment from adverse flooding impacts

Watershed Objectives

- Explore use of incentives for avoiding construction of physical structures in the floodplain.
- Explore use of incentives for use of non-structural floodplain protection methods.
- Implement projects and programs which will result in reduced damage due to flooding.
- Develop and implement land use measures that will help mitigate the impacts of new development in floodplains.

IRWM PLAN GOAL 4: Protect and restore habitat and ecosystems

Watershed Objectives

- Implement projects and programs to protect, improve and restore habitats.
- Integrate and coordinate ecosystem restoration efforts.
- Research and implement projects to remove invasive species.
- Develop a master permit for removal of invasive plant species.

IRWM PLAN GOAL 5: Provide water-related recreational, public access, stewardship, engagement and educational opportunities

Watershed Objectives

- Develop programs which enhance the public's knowledge and awareness of water issues and engage them in the integrated regional water management process and stewardship of the watershed.
- Improve public access and recreation opportunities when implementing new projects and programs.

IRWM PLAN GOAL 6: Prepare for and adapt to climate change

Watershed Objectives

- Assess vulnerabilities to the affects of climate change.
- Implement projects and programs which help the region adapt to climate change.

5.0 RESOURCE MANAGEMENT STRATEGIES

5.1 Background

The purpose of this section is to describe the diversification of water management approaches taken in the Santa Clara River Watershed to address future water management needs in an uncertain future and help meet IRWM Plan goals. A resource management strategy (RMS) is a project, program, or policy that helps local agencies and governments manage their water and related resources. The 29 RMS, as defined in the California Water Plan Update 2009, are tools to help develop appropriate projects and programs for implementation of the IRWM Plan, and to help mitigate, or adapt to,

climate change These strategies can be mixed and matched to provide multiple water and resource benefits, diversify the local water portfolio, and help the Region become more self-sufficient. Each of these strategies is described in detail in Section 6 of the Regional IRWM Document (Volume I ?)

The RMSs can be considered as tools in a toolkit. Just as the mix of tools in any given kit depend on the job to be accomplished, the combination of strategies will vary from region to region, depending on climate, projected growth, existing water system, environmental and social conditions, and regional goals. At the local level, it is important that the proposed strategies complement the operation of existing water systems. Some strategies may have little value in certain regions. For example, because of geology, the opportunity for groundwater development in the Sierra Nevada is not nearly as significant as in the Sacramento Valley. Other strategies may have little value in particular conditions. For example, precipitation enhancement may not be effective during droughts. Water managers at different geographical scales will have different perspectives on the assortment and cost-effectiveness of RMSs for meeting the needs and priorities of the locality or region, or statewide.

5.2 Resource Management Strategies Implemented in Santa Clara River Watershed

Most of the Resource Management Strategies (RMS) developed for the WCVC IRWM Plan Update are applicable to the Santa Clara River Watershed. The strategies fall into six broad categories including 1.) Reduce Water Demand, 2.) Improve Operational Efficiency and Transfers, 3.) Increase Water Supply, 4.) Improve Water Quality, 5.) Practice Resource Stewardship, and 6.) Improve Flood Management. Table 8 provides the primary Ventura County IRWMP RMSs as well as information on whether they are implemented in the Santa Clara River Watershed and/or at the regional level.

Table 8

Current RMS Implementation in the Santa Clara River Watershed and Regional WCVC

Resource Management Strategy	Santa Clara River Watershed	Regional
Reduce Water Demand		
Agricultural Water Use Efficiency	✓	✓
Urban Water Use Efficiency	✓	✓
Improve Operational Efficiency and Transfers		
Conveyance — Delta		Not applicable

Table 8

Current RMS Implementation in the Santa Clara River Watershed and Regional WCVC

Resource Management Strategy	Santa Clara River Watershed	Regional
	Not applicable	
Conveyance — Regional / Local	✓	
System Reoperation	✓	-
Water Transfers	✓	✓
Increase Water Supply		
Conjunctive Management and Groundwater	✓	
Desalination	✓	
Precipitation Enhancement	Not applicable	Not applicable
Recycled Municipal Water	✓	
Surface Storage — CALFED	Not applicable	Not applicable
Surface Storage — Regional/Local	✓	
Improve Water Quality		
Drinking Water Treatment and Distribution	✓	
Groundwater and Aquifer Remediation	✓	
Matching Water Quality to Use	✓	✓
Pollution Prevention	✓	✓
Salt and Salinity Management	✓	
Urban Runoff Management	✓	
Practice Resource Stewardship		
Agricultural Lands Stewardship	✓	✓
Economic Incentives	✓	
Ecosystem Restoration	✓	✓
Forest Management	✓	✓
Land Use Planning and Management	✓	✓
Recharge Areas Protection	✓	
Water-dependent Recreation	✓	✓

Table 8

Current RMS Implementation in the Santa Clara River Watershed and Regional WCVC

Resource Management Strategy	Santa Clara River Watershed	Regional
Watershed Management	✓	✓
Improve Flood Management		
Flood Risk Management	✓	✓

6.0 IMPLEMENTATION PROJECTS AND PROGRAMS

6.1 Proposed and Recent Projects

A number of projects and programs have been proposed and implemented in the Watershed as part of the IRWM Program since 2006. Those projects which have been, or will be, implemented with funding from Proposition 50 and Proposition 84 are listed in Table 9 below.

Table 9

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding
Salt and Nutrient Management Plan for Lower Santa Clara River Watershed	Ventura County Watershed Protection District, County of Ventura Waterworks District No. 16, United Water Conservation District, Farm Bureau of Ventura County, and cities of Fillmore, Santa Paula and Ventura	Salt and Nutrient Management Plan (SNMP) is being developed for the Lower Santa Clara River groundwater basins [Fillmore, Mound, Piru, Santa Paula and Oxnard Forebay]. The objective of the SNMP is to manage salts and nutrients from all sources on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses	Plan completion scheduled for December of 2014	Proposition 84 Planning Grant, and Watershed Protection District and participating entities (ie. Cities of Fillmore, Santa Paula, and Ventura and County Waterworks District No. 16) local match funding
Fillmore Integrated Recycled Water and Wetlands Project	City of Fillmore	Construction of new, tertiary treatment level wastewater treatment plant and wetlands	Completed in 2011	Proposition 50 and local funding
Piru Wastewater Treatment Plant Tertiary Upgrade	Ventura County Waterworks District No.16	Upgrade to tertiary treatment to allow for recycled water use	To be completed in 2015	Proposition 84 and local funding
Natural Floodplain Protection Program	The Nature Conservancy	The Nature Conservancy is implementing the Natural Floodplain Protection Program to preserve a critical section of the floodplain in the Santa Clara River Watershed. This project will establish a Floodplain Conservation Zone, where private property easements will be acquired to prevent future development.	To be completed in 2015	Proposition 84 and local funding
El Rio Septic to Sewer Conversion Project	Ventura County Waterworks District	This project involved taking local residents off septic systems and connecting them to a sewer treatment facility – thus reducing degradation to local groundwater supplies	Completed in 2011	Proposition 50 and local funding

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding
Oxnard Septic to Sewer Conversion Project	City of Oxnard	This project involved taking local residents off septic systems and connecting them to a sewer treatment facility – thus reducing degradation to local groundwater supplies	Completed in 2011	Proposition 50 and local funding
Regional Groundwater Flow Model Update – Phase 1	United Water Conservation District	An update to a regional groundwater flow model enabling local entities to better understand the surface/groundwater interaction and to coordinate project development and assess impacts to groundwater	Completed in 2013	Proposition 84 Planning Grant and local funding
South Oxnard Flood Protection and Community Enhancement Project	Ventura County Watershed Protection District	This is a multi-benefit flood protection project in partnership with the City of Oxnard and The Nature Conservancy. In partnership with the City of Oxnard, the Ventura County Watershed Protection District will replace a deficient trapezoidal concrete drain channel with buried reinforced concrete box culverts that will provide enhanced flood protection as well as enhance future plans for community connectivity, aesthetics, and recreational opportunities. The project will also enable creation of a linear park may to incorporate bioswales to improve low-flow (non-storm) water quality, a significant concern in this community.	2017	Proposition 84 and local funding

Project Title	Implementing Entity or Lead Agency or Partners	Brief Description	Estimated Completion Date	Major Sources of Funding
Invasive Plant Control, Ecosystem Restoration and Watershed Protection	U.C. Santa Barbara	This project involves an arundo (*Arundo donax*; giant reed) control and habitat restoration program in the Santa Clara River floodplain for the river reach between Sespe Creek and Santa Paula Creek (7 river miles). Existing and new information will be synthesized to identify and prioritize properties in the riparian zone for invasive plant control, restoration, and protection.	2016	Proposition 84 and local funding

6.2 High Priority Types of Projects and Programs

In order to establish a list of high priority types of projects and programs for future implementation, the Santa Clara River Watershed Committee considered the projects already approved, underway or completed, the goals and objectives for the Watershed and the resource management strategies. In addition, committee members considered future needs and priorities and developed a list of priority types of projects and programs for implementation in the next 2-10 years. See Table 10 below.

Table 10

Priority Program and Project Types

To help accomplish IRWM Plan Goals and Objectives

Santa Clara River Watershed

Approved on October 24, 2013

Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
Water Supply Enhancement		
Potable water distribution, treatment and storage		
New facilities to store, treat or distribute potable water		
Rehabilitation, replacement or removal of existing facilities to store, treat or distribute potable water		
Facilities to remove pollutants or contaminants from drinking water supplies		
Surface Water		
Projects to enable the diversion and/or storage of surface water		
Groundwater		

	Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
	Construction of groundwater extraction facilities (wells)		
	Development of monitoring wells		
	Development of programs for ongoing groundwater modeling, management and planning	♦	♦
	Groundwater replenishment facilities – including stormwater capture	♦	
	Installation of injection wells to augment groundwater basins storage and/or prevent seawater intrusion		♦
	Projects to enable or enhance aquifer storage and recovery	♦	
	Wellhead protection projects (e.g., proper well abandonment, development restrictions)		
	Surface and Groundwater		
	Projects that enable conjunctive management of surface and groundwater supplies	♦	♦
	Non-Potable Water		
	Implementation of projects which result in development and delivery of recycled wastewater for irrigation or other beneficial uses	♦	♦

	Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
	Projects which result in development of non-potable surface and/or groundwater for irrigation or other beneficial uses		♦
	Facilities to enable the pumping and treatment of poor quality water for beneficial uses		♦
	Other Sources and Options		
	Projects which include desalination and transport of brackish water or seawater		♦
	Rainwater collection systems (cisterns)		♦
	Greywater systems		
	Water banking, exchange and transfer	♦	
	Emergency inter-tie facilities		
	Water Demand Management (Efficiency)		
	Implementation of Urban Water Use Efficiency Measures: *Residential Survey Programs, Residential Plumbing Retrofit, System Water Audits, Metering w/Commodity Rates, Large Landscape Conservation, High Efficiency Clothes Washers, Public Information Programs, School Education Programs, Commercial Industrial Institutional, Wholesaler Agency Assistance Programs, Conservation Pricing,Conservation*		

Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
Coordinator, Water Waste Prohibitions, Residential Ultra Low Flush Toilet Replacement Programs	♦	♦
Development of drought contingency and emergency plans	♦	
Implementation of agricultural water-use efficiency measures	♦	♦
Water Quality Improvement		
Wastewater Treatment and Discharge Facilities		
Rehabilitated or upgraded wastewater treatment, collection and discharge systems	♦	
Relocated and/or enhanced protection of wastewater collection, treatment and discharge systems		
Contaminants and Salts Management		
Control and/or enforcement of prohibitions on illegal discharge of controlled or toxic substances		
Projects that remediate contaminated water		
Removal of on-site water softening devices and other measures to reduce salt loading		♦

Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
Projects which remove and dispose of salts from local water sources		♦
Replacement of problematic septic tank systems with sewer connections, fertilizer application reduction and other measures to reduce nutrient loading	♦	♦
TMDL Development and Implementation		
Development of TMDLs	♦	
TMDL Monitoring	♦	
TMDL Implementation	♦	
Stormwater Management and Treatment		
Low flow stormwater treatment and other methods to remove contaminants from stormwater (LID)	♦	♦
Other Water Quality Programs/Projects		
Facilities or projects to control nonpoint source pollution	♦	♦
Facilities to control point source pollution	♦	
Water quality monitoring	♦	♦

Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
Brownfields remediation		
Flood Management		
Flood Protection Facilities and Monitoring		
Levee construction or remediation - levee removal and set-backs		♦
Channel improvement (e.g., erosion control/bank stabilization and protection)		
Removal of hazards or facilities from floodways		
Storm monitoring and modeling	♦	
Land or easement acquisition for watercourse preservation, restoration and flood management	♦	♦
Ecosystem Protection and Restoration Strategies - Stewardship		
Projects that control and remove invasive species and/or prevent their reoccurrence	♦	♦
Projects or programs which protect existing habitats from degradation	♦	

	Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
	Projects which create, protect, restore or enhance wetlands and other water related ecosystems	♦	♦
	Land acquisition and/or easements for protection and restoration of habitat areas landscape linkages/wildlife movement	♦	♦
	Protection and restoration of fish and wildlife migration corridors and landscape linkages		
	Projects which restore the natural hydrograph and sediment transport in local watercourses		♦
	Development of mitigation banks to offset new impacts		
	Collection and management of biological resources data in coordinated, comprehensive database with related overlay zones or map layers		
	Recreation, Public Access and Education		
	Development of active and passive recreation areas (i.e. parks and trails) which provide for appropriate public access to water-related recreation – including appropriate outreach and education		♦
	Land Use Planning and Regulation		

	Program and Project Types	Priority Projects Recently Implemented	Priority for Future Implementation
	Development of or updates to land use plans, policies and ordinances which result in improved water management, habitat protection and/or flood protection (e.g., floodplain development restrictions, riparian corridor buffers, sensitive habitat overlays)		♦
	Creation of land use development standards and conditions which reduce impervious surface areas in new construction and retrofits – Low impact development (LID)		♦
	Development of incentives related to land use permitting for land owners to protect and restore habitats and ecosystems on their property		
	Climate Change Mitigation and Adaptation		
	Projects that achieve or facilitate greenhouse gas reduction		♦
	Adaptation strategies to minimize impacts of climate change	♦	♦
Regional Approaches - Countywide			
Coordination, monitoring, assessment, characterization, and analysis among agencies (e.g., GIS spatial database)		♦	♦
Regional facilities which enhance water supply, water quality or protect			♦

Program and Project Types	**Priority Projects Recently Implemented**	**Priority for Future Implementation**
against flood impacts		
Implementation of regional outreach and education programs	♦	♦
Regional water use efficiency programs or projects	♦	♦

7.0 CLIMATE CHANGE IMPACT ANALYSIS AND ADAPTATION STRATEGIES

Continued global warming will increase pressure on California's water resources that are already over-stretched by the demands of a growing economy and population. Although climate change vulnerabilities remain, the Resource Management Strategies (RMS) outlined in the IRWM Update are designed to assist the watershed in adapting to the challenges posed by climate change. Much of Ventura County relies on some surface water partially supplied by the State Water Project, thus shortages in supply at the state-level have the potential to impact water supply in the Santa Clara River Watershed.

Water supply is at risk statewide because of projected decreases in water volume and storage capacity associated with snowpack and the uncertainty of precipitation levels. Rising temperatures are projected to result in earlier spring snowmelt in California's mountains that have been relied on historically for a significant amount of water storage. As the climate warms, water that had previously been stored as snowmelt later into the warmer seasons will need to be stored elsewhere as it becomes runoff. In addition, there is inherent uncertainty in future precipitation levels; however, current models, such as those used by Cal-Adapt project, predict that arid areas such as the coastal regions of southern California will become drier. By the end of the century, if temperatures rise to moderate predictions and precipitation (and associated snowpack) decreases, late spring stream flow could decline by up to 30 percent (Cal adapt 2011b).

Although providing sufficient water supply at the state and local level poses a serious challenge in Ventura County, the Resource Management Strategies outlined in the IRWM Update provide a variety of planning-based and technical tools to develop solutions. Sustaining and facilitating a thriving and profitable agricultural industry in Ventura County is an inherent goal of the IRWMP. Agricultural areas could be hard hit by future droughts, with California farmers having as much as a 25 percent decrease in water supply by the year 2100 (Cal-Adapt 2011b). One RMS designed to preserve and increase supply included in the IRWM Update is the implementation of conjunctive use strategies. This RMS involves recharging groundwater aquifers during wet years and relying on these stored resources in dry years. Another strategy laid out by the IRWMP involves using water sources whose water quality matches the needs of its use. For example, one RMS encourages the use of recycled water for landscape irrigation and for injection wells used to prevent further saltwater intrusion by creating a groundwater barrier.

Water supplies are also at risk from rising sea levels, particularly in the Santa Clara River Watershed. An influx of saltwater can degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion is not only a problem on the Oxnard

Plain, but it also threatens water quality and reliability of the major state fresh water supply that is pumped from the southern edge of the Sacramento/San Joaquin River Delta. Sea level rise can potentially exacerbate the saltwater intrusion that exists on the Oxnard Plain that has resulted from over-pumping groundwater.

The implementation of additional Regional Management Strategies, such as water transfers, is a solution currently being implemented to address uncertain water supply. A combination of climate-change induced sea-level rise and over-pumping of groundwater in the Oxnard Plain will result in significant effects to groundwater quality. Water transfers from other areas to the Oxnard Plain are a strategy for preventing these impacts. For instance, the Freeman Diversion supplies diverted river water through the Pleasant Valley Pipeline to agricultural pumpers, reducing the need to pump groundwater. Also, groundwater management entities such as the Fox Canyon Groundwater Management Agency can encourage RMS such as agricultural efficiency measures and a fee schedule for pumping that provide an economic incentive to conserve. Other RMS, such as treatment and distribution, and groundwater and aquifer remediation, are also strategies outlined in the IRWMP that can help solve these problems.

A growing population means increasing demand; anthropogenic demand coupled with a hotter climate could lead to increasing water shortages. The IRWM plan outlines RMS that address rising demand with both urban and agricultural efficiency measures. Examples of this strategy include plumbing retrofits and rebates for water efficient appliances for urban users. Agricultural efficiency measures being put in place include creating incentives for micro sprinklers or drip irrigation technologies. Through the implementation of efficiency measures across all sectors, the uncertainty and potential shortages associated with future supply can be minimized.

Coping with the most severe consequences of global warming will require major changes in water management and allocation systems. At the state level, as more winter precipitation falls as rain instead of snow, water managers will have to balance the need to maintain full reservoirs for water supply and the need to maintain reservoir space for winter flood control. Some additional storage could be developed; however, these options must be weighed against the high economic and environmental costs of developing additional storage capacity in the form of reservoirs and dams.

Flood management is an essential component to a climate adaptation strategy. RMS for flood management include preserving and potentially expanding recharge areas. This strategy creates a flexible water system that has the capacity to take on large volumes of water and store them in recharge areas where they can gradually seep into the groundwater, preventing flooding of nearby areas or running to the ocean. There are RMS already in place that increase flood resilience; these consist of a systematic

examination of flood control infrastructure to prioritize maintenance and replacement. Another flood management strategy designed to increase resilience to climate change is the implementation of planning policies that locate human settlements and infrastructure away from flood-prone areas. Some of the most desirable areas to live, including river and ocean-front areas are often the most dangerous, considering the rising risks of floods associated with larger storm events and sea-level rise. Siting human settlement and infrastructure such as roads and bridges in these flood-prone areas is risky not only because of the potential loss due to flood damage but also because of the high cost of providing infrastructure such as dams and levees to protect them. Flood control structures are costly to build and maintain and are ultimately not built to withstand the strongest storms and floods. Incorporating resource management strategies such as recharge basins, implementation of flood control infrastructure maintenance, and planning policies that limit development in high-risk areas all promote climate change resilience.

The stressors imposed by climate change mentioned above, increased temperature, decreased water supply, increased demand, and increased flood risk, all have the ability to exacerbate impacts on water quality. Water quality standards are often met by having flexibility in drawing from different sources with varying water quality levels. With increasing demands and decreased supplies, the ability of water managers to meet these water quality standards becomes more challenging. Reduced supply coupled with aging infrastructure and the water quality contamination associated with increased flood risks can pose major water quality challenges for the Santa Clara River Watershed. Continued implementation of RMS that work to preserve and improve water quality is essential. Urban runoff can be a major source of pollution, thus urban runoff management strategies, such as the implementation of Low Impact Design (LID) are an essential RMS. LID aims to reduce stormwater runoff at the lot level by decreasing impervious surfaces and increasing infiltration. Other specific recommendations drawn from RMS include upgrades to aging sanitary sewer and wastewater treatment plant infrastructure and ensuring that groundwater wells are abandoned properly ensuring they do not act as conduits for surface or groundwater pollution. Vigilant stewardship of water quality is an essential adaptation strategy not only for human use but also to preserve the aquatic habitats and clean water wildlife depend on.

SECTION 8.0 REFERENCES AND CITATIONS

Cal-Adapt. 2011a. “Rising Temperatures in Agriculture.” Cal-adapt blog. Retrieved from: http://cal-adapt.org/blog/2011/apr/12/rising-temperatures-agriculture/

Cal-Adapt. 2011b. “Securing an Adequate Water Supply.” Cal-adapt blog. Retrieved from: http://cal-adapt.org/blog/2011/apr/12/securing-adequate-water-supply/

California Climate Change Portal. 2008. California EPA and California Energy Commission

California Department of Transportation, *Ventura County Economic Forecast.* 2012

California Department of Water Resources. *California Water Plan Update 2009 and 2005.*

California Department of Water Resources. *State Water Project Reliability Report, 2011 and* 2005

California Department of Water Resources. State Water Project Reliability Report, November 2005

California Department of Water Resources, 1954, *Seawater intrusion: Oxnard Plain of Ventura County: Bulletin No. 63-1*, 59p.

California Department of Water Resources, 1971, *Seawater intrusion: aquitards in the coastal ground water basin of Oxnard Plain, Ventura County: California Department of Water Resources Bulletin 63-4*, 567p.

California Energy Commission. 2013. Climate Projection Tools Web Application. Cal-Adapt Website: http://cal-adapt.org. provides a view of potential climate change impacts at the local level.

California Regional Water Quality Control Board- Los Angeles Region. State of the Watershed-Report on Surface Water Quality of the Santa Clara River Watershed. 2007.http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/watershed/index.shtml

California Regional Water Quality Control Board, Los Angeles Region. *Water Quality Control Plan for the Los Angeles Region.* November 17, 1994.

California State Polytechnic University Pomona, Landscape Architect Department. Craig et al. *Re-Imagining Access ARCS of Experience for the Santa Clara River” 2009.*

Camrosa Water District. *Final Urban Water Management Plan*. December 2010.

Cayan, D.R., et al. 2009. *Climate change scenarios and sea level rise estimates for the California 2008 Climate Change Scenarios Assessment*. California Climate Change Center

City-Data. 2013. Population, Median Household Income, Major Industries, Ethnicity Breakdown. Retrieved from: http://www.city-data.com/

City of Fillmore UWMP. 2005. *Urban Water Management Plan*. Retrieved from: http://engineering.fillmoreca.com/ENGINEERING/Urban%20Water%20Management%20Plan/

City of Fillmore UWMP. 2000. *Urban Water Management Plan*. Retrieved from: http://engineering.fillmoreca.com/ENGINEERING/Urban%20Water%20Management%20Plan/

City of Oxnard UWMP. 2012. *Urban Water Management Plan*. 2012.

City of Oxnard. *Groundwater Recovery Enhancement and Treatment (GREAT) Program – Final Program Environmental Impact Report.* Prepared by CH2M HILL, May 2004.

City of Ventura UWMP. 2011. City of San Buenaventura Department of Public Works. *Urban Water Management Plan*. June 2011.

City of San Buenaventura, California Department of Parks and Recreation and California State Coastal Conservancy. *Ventura River Estuary Enhancement and Management Plan.* Prepared by Wetlands Research Associates, Hyden Associates, Lawrence Hunt, Paul Lehman, and Philip Williams and Associates, Ltd, March 1994.

City of San Buenaventura. *2004 Biennial Water Supply Report.* September 2004.

City of San Buenaventura. *Master Plan for Reclaimed Water System*. August 1992.

City of San Buenaventura. *Ventura Water Renovation Facility Master Plan*. Prepared by Montgomery Watson. September 1993.

City of San Buenaventura. *Water System Operational Evaluation and Improvement Program– Final Report*. Prepared by Boyle Engineering Corporation. June 1993.

Cities of San Buenaventura and Oxnard. *Final Report. West Ventura County Water Reliability Study*. Prepared by Kennedy Jenks Consultants. December 2003.

County of Ventura, *Ventura County Water Conservation Management Plan, Vols. I-III*. 1983

County of Ventura, Regional Water Quality Control Board. *208 Areawide Water Quality Management Plan.* 1979-1980

County of Ventura, Agricultural Commissioner, *Ventura County 2011 Annual Crop Report, "Connecting the Dots."* 2011, 2008, and 2006.

County of Ventura Watershed Protection District. *Flood Mitigation Plan for Ventura County, California*. Prepared by URS Corporation. November 2005.

County of Ventura, *Ventura County Hazard Mitigation Report.* October, 2010

County of Ventura, *Ventura Countywide Wastewater Reuse Study – Issues Papers*. November 1982

County of Ventura, *Ventura Countywide Wastewater Reuse Study – Environmental Impact Report*. November 1982

County of Ventura and Ventura Regional County Sanitation District, *Countywide Wastewater Re-use Study – Report 2*. June 1980.

County of Ventura Watershed Protection District. *Ventura Countywide Stormwater Quality Management Program: Annual Report for Permit Year 4, Reporting Year 10*. October 2004.

County of Ventura Waterworks District No. 1 (Moorpark). *Urban Water Management Plan.* December 2010.

County of Ventura Waterworks District No. 8 (Simi Valley). *Urban Water Management Plan*. December 2010.

County of Ventura Watershed Protection District. *Santa Clara River Enhancement and Management Plan.* Prepared by AMEC Earth and Environmental. May, 2005.

County of Ventura Watershed Protection District. *Santa Clara River Enhancement and Management Plan – Flood Protection Report.* Prepared by County staff. June 1996.

County of Ventura Resource Management Agency, Planning Division. *Environmental Impact Report for Focused General Plan Update*. Section 4.16. June 2005.

County of Ventura Resource Management Agency and Public Works Agency. *Ventura County Water Management Plan. Volume I. Goals, Policies and Programs*. November 1994.

County of Ventura Resource Management Agency and Public Works Agency. *Ventura County Water Management Plan. Volume II. Technical Appendix*. November 1994.

County of Ventura Public Works Agency. *Ventura Countywide Stormwater Quality Management Program Report. Stormwater Quality Management Plan*. November 2001.

Environmental Now/Southern California Wetlands Recovery Project. *Watershed Management Plan Characterization Report for Coastal Southern California*. November 2002.

Farm Bureau. 2013. "Irrigated Lands Regulatory Program." Ventura County Agricultural Irrigated Lands Group (VCAILG) Website. Retrieved from: http://www.farmbureauvc.com/water_quality.html

Fox Canyon Groundwater Management Agency. *Groundwater Management Plan* – May 2007.

Hayhoe, K; Cayan, D; Field, C.B. 2004. *Emissions Pathways, climate change, and Impacts on California. Proceedings of the National Academy of Sciences.* PNAS.

Hewitt, A. 2013. Climate Change Data and Report for the WCVC. Anacapa Consulting Services.

Larry Walker and Associates, *Notice of Intent (NOI) to Comply with Los Angeles County Regional Water Quality Control Board Conditional Ag Waiver*, Prepared on behalf of the Ventura County Agriculture Irrigated Lands Group, August 2006

Port Hueneme UWMP. 2011. City of Port Hueneme. *Final Report - Urban Water Management Plan*. October 2011. Retrieved from: http://www.water.ca.gov/urbanwatermanagement/2010uwmps/

Santa Paula Basin Technical Advisory Committee. *Investigation of Santa Paula Basin* Yield. Prepared by Santa Paula Basin Experts Group. July 2003

Santa Paula UWMP. 2011. City of Santa Paula. Urban Water Management Plan Update. Prepared by Kennedy Jenks Consultants. June 2011.

Southern California Association of Governments (SCAG). 2013. Profile of the unincorporated area of Ventura County: http://www.scag.ca.gov/Documents/UnIncAreaVenturaCounty.pdf

State of California, State Water Resources Control Board and California Environmental Protection Agency. *2010 Integrated Report (Clean Water Act Section 303(d) List / 305 (b) Report),* 2010

State of California, State Water Resources Control Board and California Environmental Protection Agency. *Water Quality Control Plan for Ocean Waters of California*. 2012. *http://www.waterboards.ca.gov/water_issues/programs/ocean/index.shtml*

Stillwater 2007. *Santa Clara River Parkway Floodplain Restoration Feasibility Study. Assessment of Geomorphic Processes for the Santa Clara River Watershed, Ventura and Los Angeles Counties*. August 2007.

United States Department of the Interior, Bureau of Mines, *A Dictionary of Mining, Mineral, and Related Terms.* 1968

United Water Conservation District. *Urban Water Management Plan for the Oxnard-Hueneme District*. February 2010.

United Water Conservation District, City of Fillmore, et al. *AB 3030 Groundwater Management Plan For Piru/Fillmore Basins.* 1996

United Water Conservation District. 2011. Final Urban Water Management Plan Update. Oxnard-Hueneme System Supply and Demand. pp. 60-62.

US Census Bureau, *Ventura County QuickFacts*, 2012, Retrieved from: http://quickfacts.census.gov/qfd/states/06/0624092.html

US Census. 2011. American Community Survey (2007-2011). Retrieved from: http://www.census.gov/newsroom/releases/archives/news_conferences/20121203_acs5yr.html

USEPA. 2013a. National Pollution Discharge Elimination System, Clean Water Act Webpage. Retrieved from: http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45

USEPA. 2013b. Laws and Regulations: Summary of the Clean Water Act. Retrieved from: http://www2.epa.gov/laws-regulations/summary-clean-water-act

Ventura County GIS and Mapping. 2013. Watershed Population data.

Ventura County Watershed Protection District. 2006. *Inventory of Public and Private Water Purveyors in Ventura County*, March 2006, VCWPD, Retrieved from: http://portal.countyofventura.org/portal/page/portal/ceo/divisions/ira/WC/Library

Ventura Regional County Sanitation District. *208 Areawide Waste Treatment Management Plan for Ventura County.* May 1978

Watershed Coalition of Ventura County. 2009. *Region Acceptance Process Application, WCVC, Integrated Region Water Management Region*, April 2009. Retrieved from: http://portal.countyofventura.org/portal/page/portal/ceo/divisions/ira/WC/Library/Prop_84_Docs/Region_Acceptance_Process_Application_FINAL.pdf

Westerling, A. L., Bryant, B. P., 2008. Climate Change and Wildfire in California. Climatic Change (2008) 87 (Suppl 1): s231-s249.