One Water One Watershed Plan Update 2018

Moving forward together

Santa Ana River Watershed

ONE WATER ONE WATERSHED PLAN UPDATE 2018

The One Water One Watershed Plan Update 2018 is the Integrated Regional Water Management Plan for the Santa Ana River Watershed, compliant with the 2016 Integrated Regional Water Management Plan Standards. This plan was developed with the support of a 2016 Proposition 1 Integrated Regional Water Management Planning Grant (No. 4600011851), with the resources made available by the member agencies of the Santa Ana Watershed Project Authority, and with countless hours of volunteer labor by stakeholders.

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...A United Voice for the Santa Ana River Watershed

OWOW Steering Committee Members

Jasmin A. Hall, Convener | SAWPA Commissioner
Bruce Whitaker, SAWPA Commissioner
Vacant, Orange County Supervisor
Vacant, Riverside County Supervisor
Curt Hagman, San Bernardino County Supervisor
Laura Roughton, Riverside County Municipal Representative
Jose Solorio, Councilmember, City of Santa Ana
James Hessler, Altman Plants
Garry W. Brown, Orange County Coastkeeper
Linda Ackerman, Regional Water Quality Control Board
Deborah Robertson, Mayor, City of Rialto

I, Jasmin A. Hall, Convener and SAWPA Commission Representative of the One Water One Watershed (OWOW) Steering Committee, do hereby state that the following action was taken by unanimous vote of those present on the OWOW Steering Committee at its January 24, 2019 meeting:

> Recommend the One Water One Watershed (OWOW) Plan Update 2018 be adopted by the SAWPA Commission.

Jasmin A. Hall, Convener
One Water One Watershed (OWOW) Steering Committee

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RESOLUTION NO. 2019-4

A RESOLUTION OF THE COMMISSION OF THE SANTA ANA WATERSHED PROJECT AUTHORITY ADOPTING THE ONE WATER ONE WATERSHED PLAN UPDATE 2018, THE INTEGRATED REGIONAL WATER MANAGEMENT PLAN FOR THE SANTA ANA RIVER WATERSHED

WHEREAS, the Santa Ana Watershed Project Authority (SAWPA) Board of Commissioners is the designated governing body for the Santa Ana River Watershed Integrated Regional Water Management Regional Water Management Group that is responsible for the development of the Plan and has the responsibility for implementation of the Integrated Regional Water Management Plan;

WHEREAS, SAWPA declares its intent to adopt the "One Water One Watershed (OWOW) Plan Update 2018", the Integrated Regional Water Management Plan for the Santa Ana River Watershed;

WHEREAS, SAWPA has made the OWOW Plan Update 2018 available to the public and the notice of the public hearing on its adoption was given in the manner prescribed by law; and,

WHEREAS, all persons desiring to be heard at the public hearing were given the opportunity to present their views to the Board of Commissioners, and any written communications received by SAWPA concerning adoption of the OWOW Plan Update 2018 were publicly presented at the public hearing.

NOW, THEREFORE, BE IT RESOLVED that the Board of Commissioners adopts the OWOW Plan Update 2018, and authorizes the General Manager to take all appropriate actions to carry out the intent of the OWOW Plan Update 2018; and

BE IT FURTHER RESOLVED that the General Manager is authorized to submit the adopted Plan as a deliverable of the California Department of Water Resources (DWR) Integrated Regional Water Management Planning Grant obtained from DWR pursuant to the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Water Code Section 79700 et seq.).

ADOPTED this 19th day of February 2019.

SANTA ANA WATERSHED PROJECT AUTHORITY

By: _____
Ronald W. Sullivan, Chair

Attest: _____
Kelly Berry, Clerk of the Board

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
µg/L	micrograms per liter
ACHP	Advisory Council on Historic Preservation
AD	Assessment District
AF	acre-feet
AFY	acre-feet per year
AMI	advanced metering infrastructure
AMR	automatic meter reading
amsl	above mean sea level
ASBS	Areas of Special Biological Significance
BBLDWP	Big Bear Lake Department of Water and Power
BMP	best management practice
CAFO	confined animal feeding operations
CalWARN	California Water/Wastewater Agency Response Network
CCA	Critical Coastal Area
CDP	Criterium DecisionPlus
CEDEN*	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act
CFD	Community Facilities District
CNRA	California Natural Resource Agency
CO_2e	carbon dioxide equivalent
COP	Certificate of Participation
Corps	U.S. Army Corps of Engineers
CWAD	Conditional Waiver of Waste Discharge Requirements for Discharges from Agricultural Operations in the San Jacinto Watershed
DCI	Disadvantaged Communities Involvement
DIF	development impact fee
DTA	David Taussig and Associates Inc.
DWR	Department of Water Resources
EMWD	Eastern Municipal Water District
EPA	Environmental Protection Agency
ESCO	energy service company
ESPC	energy-saving performance contract
FAR	floor area ratio
FCD	flood control district
FVWD	Fern Valley Water District
GIS	geographic information system
G.O.	general obligation
greenhouse gas	GHG

Acronym/Abbreviation	Definition
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GUI	graphical user interface
HCP	Habitat Conservation Plan
HERO	Home Energy Renovation Opportunity
HOA	homeowners' association
IEUA	Inland Empire Utilities Agency
IMWD	Idyllwild Municipal Water District
IRWM	Integrated Regional Water Management
IWP	Integrated Watershed Plan
LRB	Lease-Revenue Bond
MART	Multi-Attribute Rating Technique
MCL	maximum contaminant level
Metropolitan	Metropolitan Water District of Southern California
mg/L	milligrams per liter
mgd	million gallons per day
MOA	memorandum of agreement
MOU	memorandum of understanding
MS4	municipal separate storm sewer system
MSHCP	Multiple Species Habitat Conservation Plan
NAHC	Native American Heritage Commission
NAICS	North American Industry Classification System
NGO	nongovernmental organization
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NO_3-N	nitrate as nitrogen
NPDES	National Pollutant Discharge Elimination System
NSMP	Nitrogen and Selenium Management Program
O&M	operations and maintenance
OC	Orange County
OCFCD	Orange County Flood Control District
OCWD	Orange County Water District
OWOW	One Water One Watershed
pCi/L	picocuries per liter
PCWD	Pine Cove Water District
PFOA	perfluorooctanoic acid
PFOS	perfluorooctyl sulfonate
PII	personally identifiable information
ppb	parts per billion
ppm	parts per million
PPP	Public–Private Partnership

Acronym/Abbreviation	Definition
PRC	Project Review Committee
PRV	pressure-regulating valve
PSP	proposal solicitation package
QA	quality assurance
QAP	quality assurance plan
QC	quality control
RCFCWCD	Riverside County Flood Control and Water Conservation District
Regional Board	Regional Water Quality Control Board
RWMG	regional water management group
SARCCUP	Santa Ana River Conservation and Conjunctive Use Program
SAWA	Santa Ana Watershed Association
SAWPA	Santa Ana Watershed Project Authority
SBCFCD	San Bernardino County Flood Control District
SBVWMD	San Bernardino Valley Municipal Water District
SCADA	supervisory control and data acquisition
SGMA	Sustainable Groundwater Management Act
SGPWA	San Gorgonio Pass Water Agency
SRF	state revolving fund
SWRP	stormwater resource plan
TCP	trichloropropane
TEK	Tribal ecological knowledge
TIFIA	Transportation Infrastructure Finance Innovation Act
TDS	total dissolved solids
TM	Technical Memorandum
TOC	total organic carbon
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
VOC	volatile organic compound
WCX	West Coast Infrastructure Exchange
WDR	waste discharge requirement
WIFIA	Water Infrastructure Finance Innovation Act
WQIP	Water Quality Improvement Plan
WQMP	water quality management plan
WWTP	wastewater treatment plant
WUE	water use efficiency

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EXECUTIVE SUMMARY

The One Water One Watershed Plan Update 2018 describes how collaborative watershed planning, water and land management, and project implementation supports improved sustainability, resilience, and quality of life throughout the Santa Ana River Watershed through 2040.

This One Water One Watershed (OWOW) Plan Update 2018 is the Integrated Regional Water Management (IRWM) Plan for the Santa Ana River Watershed (watershed). The OWOW Plan Update 2018 was written by and for stakeholders throughout the watershed. This plan considers the challenges and opportunities facing the entire watershed area of the Santa Ana Funding Region within the California IRWM Program. By inviting together stakeholders from all subregions, political jurisdictions, water agencies, non-governmental organizations, businesses, and the public, this OWOW Plan Update 2018 addresses all types of water as a single resource, inextricably linked to people, the land, and nature.

This plan is built on the strong foundations laid by the OWOW Plan, adopted in 2010, and the OWOW 2.0 Plan, adopted in 2014. These two earlier efforts were lauded within the watershed, across California, and the country. The OWOW 2.0 Plan received awards from planners, engineers, and business leaders for its good governance and stakeholder-led process.

The OWOW Plan Update 2018 was begun in July 2016 with a meeting of the OWOW Steering Committee. At that meeting, the Committee approved efforts to secure a planning grant from the state in support of the update process and adopted a policy document that described how projects can be included in the OWOW Program and made eligible for the expected implementation grants.

In the 28 months that followed, the OWOW 2.0 Plan was reconsidered in light of the significant changes impacting the watershed since early 2014. In those years the fiscal recovery began to be felt in portions of the watershed, and the State of California went through one of its most severe droughts on record. The communities of the watershed made strides to support conservation as a way of life in California, implementing widespread landscape retrofits and other conservation programs. Other significant investments were made throughout the watershed by agencies, cities, counties, and community members alike to make the watershed more resilient in response to uncertainty and more sustainable over the long term.

The OWOW Plan Update 2018 is subtitled "Moving Forward Together" to mirror the earlier plans, which focused on movement toward goals. Working together has been fundamental to the OWOW Program (and SAWPA) since the program's inception, and the OWOW Plan Update 2018 is built by the stakeholders for the stakeholders. "Moving Forward Together" also reflects the OWOW Program's commitment to ensuring that no one is left behind as progress is made, and that progress somewhere in the watershed does not cause any undue burden elsewhere in the watershed.

The Santa Ana Watershed Project Authority (SAWPA) is once again proud to facilitate the OWOW Program on behalf of all communities, waters, and lands across the watershed, and to present this OWOW Plan Update 2018.

OVERVIEW

The Santa Ana River Watershed faces enormous challenges adapting to changing conditions, many of which are at an unprecedented scale in its modern history. The watershed's population, already one of the most densely populated in the State, continues to grow and urbanize, increasing demands on water supply, water quality, and flood management. Climate change, population growth, the aging of infrastructure, and new awareness of environmental degradation affect how we manage water for the future.

Most agree that the water management approaches of the past fifty years are no longer sustainable in today's environment and economic climate. And most also agree that a more integrated and collaborative approach to water resource management shows tremendous promise for achieving sustainable water management everywhere. In the Santa Ana River Watershed, this approach is not new; it has been our practice and legacy since the first integrated plan was approved by the SAWPA Commission in 1998.

The goal of yesteryear was affordable water for a growing economy. Over time, the goal has changed to the complicated balancing act of environmental sustainability, quality of life and, economic growth in a changing environment dominated by water and financial scarcity. The strategy to achieve this goal is integrated water management. This means the various silos of water supply, flood management, water quality, ecosystem restoration, and recreation are brought together as one.

> ***SAWPA's approach—coordination, cooperation, and integration of water agencies to pool resources and manage water at the basin scale—is one of California's best models for integrated water management.***
>
> **—Public Policy Institute of California 2011, "Managing California's Water – From Conflict to Reconciliation"**

This approach ensures better coordination across functions that are often managed separately and across a broader geographic scale larger than the boundaries of individual agencies. Through integration at the watershed scale, economic and environmental performance is more effectively balanced. This water resource planning approach based on a watershed scale has even been recognized by independent review by objective and nonpartisan research organizations such as the Public Policy Institute of California, which cited SAWPA as an excellent example of integrated water management in the state.

VISION

To guide the development of the initial OWOW Plan, stakeholders in 2007 established a vision, goals, and objectives for the watershed. In those first planning sessions, a shared purpose was formed that underlies the rest of the plan and the projects and programs that are prioritized for implementation. This initial vision has been adjusted over time with each successive OWOW Plan.

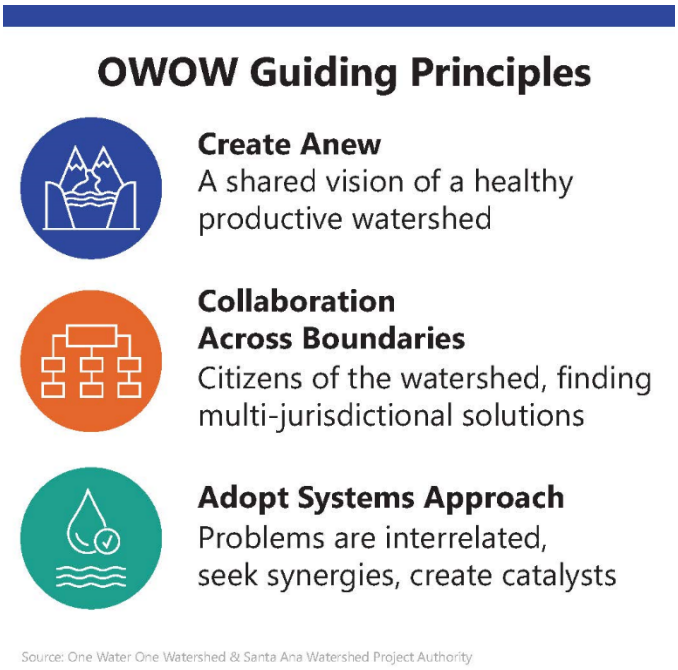
Today, the vision of the OWOW Program is a watershed that:

- Is sustainable, droughtproof, and salt balanced by 2040
- Avoids and removes interruptions to natural hydrology, protecting water resources for all
- Uses water efficiently, supporting economic and environmental vitality
- Is adapted to acute and chronic climate risk and reduces carbon emissions
- Works to diminish environmental injustices
- Encourages a watershed ethic at the institutional and personal level

The OWOW Program, and the OWOW Plan Update 2018, serve all people and communities in the watershed. The plan itself is developed by stakeholders drawn from across the diversity of communities and interests in the watershed. Gathered in workgroups called "Pillars," these stakeholders lead development of the goals and objectives of the plan, and then the recommended strategies for how to achieve those goals. The Pillars are the most important innovation of the OWOW Program and are the source of the OWOW Program's strength.

The OWOW Steering Committee, formed with the development of the original OWOW Plan, are the representative decision makers for the OWOW Program. Working under a delegated authority of the SAWPA Commission, the OWOW Steering Committee listens and reviews the various stakeholder interests, driving consensus where possible, seeking compromise when needed, allocating resources, and prioritizing strategies and projects for implementation.

The SAWPA Commission, constituted of one elected director from the five member agencies of SAWPA, is the approved Regional Water Management Group (RWMG) for the Santa Ana Funding Area, and therefore is ultimately responsible for the OWOW Plan Update 2018.



PRINCIPLES FOR WATERSHED PLANNING

Watershed planning is well established in the United States and around the world. The watershed has benefitted from watershed planning since SAWPA was formed in the early 1970s. The OWOW Program follows these watershed planning principles:

- Planning must be watershed-wide and bottom-up in order to allow for a holistic and systematic approach to watershed management.
- Involving stakeholders is fundamental, and must include those representing counties, cities, and water districts, as well as the private sector and the regulatory, environmental, and environmental justice communities. The active participation of a diversity of voices and interests ensures the integration of different interests in the watershed beyond political boundaries.
- Developing the plan must not be linked directly to any particular source of implementation funding. All opportunities, challenges, goals, and strategies must be considered in an integrated way to provide the most effective plan, and the most effective change in the watershed.
- Developing and implementing the plan must result in new agreements and partnerships, and no effort at improvement somewhere in the watershed can be at the unreasonable expense of another.
- Achieving sustainable water management that equitably balances competing interests to ensure long-term health and prosperity for society and nature is at the core of watershed planning.

OWOW PROGRAM GOVERNANCE

For the OWOW Program, the term "governance" describes the formal and informal collaborative decision-making that sits at the core of the bottom-up approach. Goals are set, strategies considered and recommended, and partnerships are built by those who step forward to participate in the program. In addition, explicit efforts which were initiated in the OWOW 2.0 Plan are continued in OWOW Plan Update 2018 to ensure that community expertise is sought from members of communities who have historically been underrepresented in integrated water management planning. Leadership and coordination of the OWOW Program occurs at several levels:

- The watershed community at large is involved through the 10 Pillar workgroups (called Pillars because together they carry the load of decision-making), representing different watershed issues. The Pillars identify issues, recommend solutions, and write the OWOW Plans.
- The OWOW Steering Committee is a representative decision-making body composed of elected officials and representatives from the Counties of Orange, Riverside, and San Bernardino; municipalities; water districts; the private sector; and the environmental and regulatory communities. The OWOW Steering Committee develops the goals and objectives of the OWOW Plans, makes strategic decisions, prioritizes project tasks, and issues recommendations.
- The SAWPA Commission has five members, each an elected leader from one of the member agencies of SAWPA. The SAWPA Commission provides final direction, review, and approval.

- SAWPA administration and staff facilitate the OWOW Program on behalf of all watershed stakeholders under the standards and authority of the California IRWM Program.

GOALS

The OWOW Plan Update 2018 has six goals, shown below. The goals are evolved from the earlier OWOW Plans. This evolution can be attributed to the changing understanding about the opportunities and challenges facing the watershed, as well as the lessons learned, and accomplishments achieved during implementation of the earlier plans.

The six goals of the OWOW Plan Update 2018 are to:

- Achieve resilient water resources through innovation and optimization.
- Ensure high-quality water for all people and the environment.
- Preserve and enhance recreational areas, open space, habitat, and natural hydrologic function.
- Engage with members of disadvantaged communities and associated supporting organizations to diminish environmental injustices and their impacts on the watershed.
- Educate and build trust between people and organizations.
- Improve data integration, tracking, and reporting to strengthen decision making.

PLANNING TARGETS

The OWOW Plan Update 2018 holds the vision as the target—that is, a sustainable watershed. Planning to achieve that vision comes from this entire document, focused on the six goals. By striving toward those goals, the watershed will move toward achievement of the vision. The vision is an "infinite game," in that the effort necessary to achieve and then remain within the vision can never end. Sustainability, as it is used in the OWOW Program, is not a destination, it is a process.

These goals will not be achieved by just building projects using general-obligation bond money. These goals reflect the broad view that the OWOW Program holds, and the systems thinking that

comes from the stakeholders and Steering Committee, all of which bring deep wells of individual expertise to the collaboration. Pooling these resources ensures that the planning targets and indicators of progress toward goals are equally broad, selected for their ease of measurement and clear meaning that can be understood by all participants.

For the OWOW Plan Update 2018, planning targets are drawn from an assessment tool developed in partnership with California Department of Water Resources. The tool uses two measurable indicators for each of the six goals. When completed annually, the tool will reflect progress towards the goals, helping all stakeholders and decision makers to revise management strategies when needed. In this way, the target is progress, which will be assessed annually.

RECOMMENDATIONS

Ten Pillar workgroups submitted Recommended Management Strategies and Policy Strategies, which are key to developing the correct suite of implementation efforts. There is only a fuzzy distinction between the two types of recommendations, and the workgroups were encouraged to consider first what strategies can be implemented by people, organizations, or agencies given current rules, technology, budgets, and authorities. These are the management strategies. Policy strategies, on the other hand, are those things that require the action of elected members of government, the development of new funding sources, or implementation of new technology. Again, the distinction between the two strategy types is loose, and often progress will require approaches that integrate both.

Below is a selection of recommendations from the Pillar chapters, selected to display the diversity of ideas and breadth of innovative thinking contributed by these workgroups:

WATER RESOURCE OPTIMIZATION PILLAR

Purchase MS4 credits.

The Municipal Separate Storm Sewer System (MS4) permit process is intended, among other things, to increase the amount of stormwater captured and recharged in the watershed. These permits require the owner to construct their project in such a way as to recharge stormwater on their site. However, in some cases it may be more ideal from a water management perspective to recharge the stormwater somewhere upstream. One way to introduce flexibility into this process would be to allow owners to purchase MS4 credits, which could be applied to recharge projects in other locations. There may also be an opportunity to allow these credits to be used throughout the watershed. For example, a project in Orange County could purchase credits that could be used for a project in the upper watershed.

RECYCLED WATER PILLAR

Facilitate recycled water exchange.

Nearly all wastewater treated above Prado Dam is currently discharged into the Santa Ana River. The lower watershed uses the effluent to recharge its groundwater basin and reduce the need for

imported water. In the proposed exchange, the upper watershed would continue to deliver treated wastewater to the lower watershed via the Santa Ana River instead of developing recycled water programs. The lower watershed would change the place of delivery for some of the water they plan to import to the upper watershed, which would replace the treated wastewater. Because recycled water is 100% reliable and imported water is about 60% reliable, storing imported water in the upper watershed (or other water bank) during wet years for use in dry years would mitigate the lower reliability of imported water.

DISADVANTAGED COMMUNITIES AND TRIBAL COMMUNITIES PILLAR

Manage plant palettes.

Long-term management plans should be developed, with input from California Native Americans, to increase the success of native plants and minimize health risks in the landscape. Incorporating traditional gathering and tending practices into management plans is becoming more common on both private and public lands. It is also important to recognize that native plants are very dependent on the correct water structure (amount, flow rate, and mineral content) being available at a specific location to help these plants and the communities that rely on them survive climate changes and different weather patterns.

Focus on critical infrastructure.

It is recommended that critical infrastructure, which supports a resilient water supply, effective sanitation, and sufficient flood protection, be prioritized in communities where it is deficient or threatened. Projects that achieve this recommendation should be prioritized for implementation and funding requests. In particular, the transition from insufficient septic to sanitary sewer is a high priority, as is the need to overcome localized flooding that impacts pedestrians. Small agencies require technical assistance and outside funding to support these transformations.

CLIMATE RISK AND RESILIENCE PILLAR

Address and mitigate public health risks.

Climate change will result in increased health risks through more extreme and persistent weather events, increased temperatures, and decreased water supply reliability. Members of disadvantaged communities, particularly individuals experiencing homelessness, are disproportionately at risk. Consideration and mitigation of public health risks, particularly for members of the most vulnerable communities, will be an important component of climate adaptation. It is recommended that efforts protect public health in the context of climate change by providing targeted education, developing programs that ensure the human right to water, and working with public health agencies to align programming and communication.

INTEGRATED STORMWATER MANAGEMENT PILLAR

Identify floodplains for habitat and infiltration.

Well-functioning floodplains provide habitat for a significant variety of plant and wildlife species and provides for natural reduction of flood flows. Flooding can recharge groundwater basins, improve water quality, and control erosion. Development in floodplains can permanently alter natural floodplain functions, destroy habitat of sensitive species, and reduce the beneficial connections between different types of habitat and adjacent floodway corridors. Identification of floodplains that are still in their natural state could directly preserve areas for open space, habitat, and natural hydraulic function.

LAND USE AND WATER PLANNING

Work with planning organizations and councils of government.

Collaborative effort should be undertaken to develop a checklist of land use planning tools that will increase groundwater recharge and that can be incorporated into local ordinances, an incentives-based program to encourage private property stormwater capture or hydrologic connectivity, and private property invasive weed management. Model ordinances and policies must be collaboratively developed related to complete streets, connectivity of trail systems and parks, tree planting and care, and early interaction with water agencies when making land-use decisions.

NATURAL RESOURCES STEWARDSHIP PILLAR

Provide sustainable funding for ongoing maintenance.

Over the past few decades, development interests, regulators, and environmental groups have worked together to encourage habitat conservation and enhancement while allowing for reasonable land development. Such efforts include natural community conservation plans and habitat conservation plans. These programs have provided large conservation areas to accommodate large developments but have taken years and large financial commitments to develop and implement. Sustainable funding sources for the maintenance of conservation areas can come from cooperative agreements between public landowners and organizations that conduct long-term stewardship of habitat and conservation areas.

WATER QUALITY PILLAR

Protect ocean water quality.

The primary emphasis with ocean water is maintaining water quality in order to protect marine resources and public health. Ocean water quality is evaluated using a number of different parameters and constituents related to beneficial uses. In the Regional Board's water quality control plan (Basin Plan), one of the key beneficial uses is REC-1 (full body contact recreation). In addition to recreation, the ocean waters also support important habitat areas, including two Areas of Special Biological Significance and their related onshore Critical Coastal Areas. Important coastal areas within the watershed include the Newport Beach Marine Life Refuge and the Irvine Coast Marine Life Refuge.

Implementing projects that manage urban wet- and dry-weather runoff throughout the watershed can benefit ocean water quality. Recommended are constructed wetlands, local urban runoff treatment systems, surface water diversions to publicly owned treatment works, source controls, and public education.

WATER USE EFFICIENCY PILLAR

Encourage implementation of advanced metering infrastructure.

Most customers in the Santa Ana River Watershed are metered, but there are still opportunities for advanced metering infrastructure (AMI) or automatic meter reading (AMR). Implementation of these technologies provides information that can detect leaks and help water agencies target water use efficiency programs. Frequent monitoring of use patterns allows water retailers to determine if customers are observing water use regulations. These include local day and time prohibitions as well as those rules imposed by the state, such as the prohibition against outdoor irrigation within 48 hours of measurable precipitation. In conjunction with the meters themselves, there is a growing market for customer portals, giving customers additional data about their own water use.

DATA MANAGEMENT AND MONITORING PILLAR

Develop a trust framework for data sharing.

The development of a regional trust framework is needed to establish trust between agencies as well as trust in the functionality of a regional data management system. Developing this agreed-on intent at the regional level will facilitate the establishment of a data management framework that can answer critical regional questions and inform water resource decision makers. Sharing of information and associated privacy considerations will be a critical policy consideration. Appropriate sharing of information will be key to extending this trust framework to individual water resource decision makers who participate as members of the public. The trust framework will also facilitate professional decision making and allow for a proactive, coordinated approach to compliance with state requirements.

WHAT'S INCLUDED IN THE OWOW PLAN UPDATE 2018

The OWOW Plan Update 2018 is available as PDF files that are available on the SAWPA website and elsewhere. The first PDF is the main body, consisting of nine chapters of material. The second PDF is the collected appendices.

The first chapter introduces the OWOW Program, the earlier OWOW Plans, and the watershed planning and management that preceded the OWOW Program—the Santa Ana River has benefitted from nearly 50 years of watershed planning.

Chapter 2 describes in depth the stakeholder processes, the governance model, and how the work of so many is integrated into the OWOW Plan Update 2018. The vision, goals, objectives, and planning targets, described briefly above, are the focus of Chapter 3, which also shares how the OWOW Program will assess its progress toward the goals.

Chapter 4 describes the Santa Ana River watershed in its dimensions as a physical and social space, and shares water and land management realities today. Chapter 5 contains the deep work completed by the Pillar workgroups. Included are the nearly 200 recommended management and policy strategies that, once taken up throughout the watershed, will help achieve the goals of the OWOW Plan Update 2018.

The remaining chapters share additional information that contextualizes the earlier chapters. Chapter 6 describes the process developed during the OWOW Plan Update 2018 process to carry out calls for projects, and then to prioritize activities in the watershed. Chapter 7 contains more information about integrated and sustainable water management and how those practices can yield benefits and other rewards. Chapter 8 has been only slightly updated from the OWOW 2.0 Plan, as its material about the challenges and opportunities to finance this work is still relevant. Chapter 9 describes how the OWOW Program manages the data of the program and reveals a series of data management and analysis tools that have been developed by SAWPA and others that can benefit those implementing IRWM programs and projects.

A number of important appendices follow the main body of the OWOW Plan Update 2018. Deeper analyses of the water supply portfolio, the condition of water quality, and habitat are there. Also included is an updated climate change analysis produced by the U.S. Department of the Interior Bureau of Reclamation (Reclamation), working in partnership with SAWPA. This analysis supported spatial prioritization of climate vulnerabilities for the OWOW Plan Update 2018. Reclamation is a valuable partner in the watershed.

Another significant partnership resulted in one of the appendices. Working with Environmental Science Associates and the Bay Institute, contracted by the California Department of Water Resources (DWR) to support the California Water Plan Update 2018, SAWPA produced an updated watershed assessment tool. Building on the OWOW 2.0 Plan, this tool aligns with the Sustainability Outlook, a critical section of the California Water Plan Update 2018. SAWPA and the stakeholders of the OWOW Program appreciate DWR's commitment to supporting the OWOW Plan Update 2018.

CONCLUSION

Benefits resulting from the implementation of the OWOW Plan Update 2018, and from the planning process itself, will materialize at different time horizons and will have very different characteristics. While some specific projects will be operational within a couple of years, other more ambitious efforts, such as those requiring significant investment, technological development, or new mindsets and behaviors, could take years or decades to be fully realized. Similarly, some infrastructural projects will provide immediate tangible benefits, while education and engagement programs will result in benefits that are less easily measured, but no less significant.

The development, adoption, and future implementation of the OWOW Plan Update 2018 has yielded and will yield these benefits in the watershed:

- Adoption of a collaboratively developed vision, goals, objectives, and strategies for the watershed to achieve sustainable water management by 2040
- Prioritization of multi-benefit projects – projects that provide benefits to more than one user or subregion of the watershed and that address more than one opportunity or challenge
- Recognition that society, the environment, and the economy are inextricably interdependent, and pursuing improvements in one cannot result in harm or neglect of another
- Consideration of implementable projects and programs that will:
    - Increase the reliability of water supplies
    - Improve water quality
    - Enhance habitat and open space
    - Increase recreational opportunities
    - Prepare for climate impacts and reduce carbon emissions

The OWOW Plan Update 2018 is aligned with the earlier OWOW Plans and continues a legacy of stakeholder-led planning for the watershed. Compliant with the 2016 IRWM Plan Standards, the OWOW Plan Update 2018 will support progress toward sustainable water management through collaborative action, grant-funded implementation, and programs of research and education. Acting together to implement the OWOW Plan Update 2018 will support economic prosperity, social health and equity, and a thriving environment.

The OWOW Plan Update 2018 exists because of the tremendous amount of work that was contributed by the staff of many agencies, non-profit workers, students, consultants, and volunteers of all kinds. The process of crafting it is nearly as important as the OWOW Plan itself will be once it is implemented. Collaborative planning yields partnerships, builds trust, and creates the conditions for the success of sustainable water management and healthy watersheds. Resting on this strong foundation, the OWOW Plan Update 2018 joins its earlier versions as emblematic of collaborative watershed planning.

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1. INTRODUCTION TO ONE WATER, ONE WATERSHED

1.1. OVERVIEW

The One Water One Watershed (OWOW) Program supports watershed-wide collaborative planning and project implementation to achieve the 2040 vision for a sustainable Santa Ana River Watershed (watershed). The name of the program describes the core philosophy that all forms of water are resources and have value, and that the path to a more sustainable water future demands planning and collaborative work at the watershed scale.

The watershed approach demands that the OWOW Program engage all subregions, political jurisdictions, water agencies, land managers, and non-governmental stakeholders (private sector, environmental groups, and the public). One Water strategies direct us to consider that no matter the management context (imported, local surface water and groundwater, stormwater, and wastewater effluent) water is water, inextricably linked to human and natural landscapes.

The watershed encompasses the majority of the OWOW Program region. Other critical inland and coastal watersheds have varying physical connectivity to the Santa Ana River but are strongly linked by policies (e.g., the Santa Ana Regional Water Quality Control Board (Regional Board) jurisdiction) and by social (cities, counties, travel for jobs and recreation) and infrastructure (water supply, sanitation) systems.

The OWOW planning process is supported by a diverse group of stakeholders led by a Steering Committee composed of public officials from counties and cities in the watershed; representatives from the environmental, regulatory, and business communities; and representatives from the Santa Ana Watershed Project Authority (SAWPA). The Steering Committee is supported by technical experts and stakeholders who self-select and volunteer as part of 10 "Pillar" workgroups, which develop goals, recommend strategies, and support implementation. See Figure 1.1-1, OWOW Program Organization, for Steering Committee members and Pillars. SAWPA is the California-approved regional water management group (RWMG) for the process, facilitating the planning process and providing technical input and support through its staff and consultants.

Figure 1.1-1. OWOW Program Organization

The collaborative, transparent, and watershed-wide view embraced by the OWOW planning process from the outset builds on previous planning efforts in the watershed and seeks to improve the way we manage all water and other environmental resources. As you will see as you read further, the OWOW Plan Update 2018 continues the regional approach to complement existing centralized infrastructure with decentralized facilities (e.g., groundwater desalination), technology, natural infrastructure, and human capital.

In addition to supporting collaborative watershed management for the Santa Ana River Watershed, the OWOW Plan Update 2018 fulfills the requirements of the California Department of Water Resources (DWR) Proposition 1 Integrated Regional Water Management (IRWM) Planning Grant award and the 2016 IRWM Plan Standards. Table 1.1-1 reveals the links between this plan and the IRWM Program.

Table 1.1-1. Current IRWM Program and Process Evolved through the OWOW Planning Process

DWR IRWM Plan Standard	OWOW Plan Update 2018 Chapter
Governance	Chapter 2: Crafting the OWOW Plan Update 2018
Region Description	Chapter 4: Watershed Setting
Objectives	Chapter 3: OWOW Vision, Goals, and Objectives
Resource Management Strategies	Chapter 5: Recommended Management and Policy Strategies
Integration	Chapter 2: Crafting the OWOW Plan Update 2018 Chapter 5: Recommended Management and Policy Strategies
Project Review Process	Chapter 6: Project/Program Review, Evaluation, and Prioritization
Impact and Benefit	Chapter 7: Impacts and Benefits of Sustainable Integrated Solutions
Plan Performance and Monitoring	Chapter 9: Data Management Efforts and Tools
Data Management	Chapter 9: Data Management Efforts and Tools

Table 1.1-1. Current IRWM Program and Process Evolved through the OWOW Planning Process

DWR IRWM Plan Standard	OWOW Plan Update 2018 Chapter
Finance	Chapter 8: Finance
Technical Analysis	Chapter 9: Data Management Efforts and Tools
Relation to Local Water Planning	Chapter 5: Recommended Management and Policy Strategies
Relation to Local Land Use Planning	Chapter 5: Recommended Management and Policy Strategies
Stakeholder Involvement	Chapter 2: Crafting the OWOW Plan Update 2018
Coordination	Chapter 2: Crafting the OWOW Plan Update 2018
Climate Change	Chapter 5: Recommended Management and Policy Strategies

IRWM = Integrated Regional Water Management; OWOW = One Water One Watershed; DWR = California Department of Water Resources.

1.2. HISTORY OF SANTA ANA RIVER WATERSHED PLANNING

SAWPA is a joint-powers agency that was initially formed in 1967 to support watershed-wide planning and projects in support of sustainable water supplies. The SAWPA Commission is made up of one elected representative from each of its five member agencies (Eastern Municipal Water District, Inland Empire Utilities Agency, Orange County Water District, San Bernardino Valley Municipal Water District, and Western Municipal Water District).

Since its formation, SAWPA and its member agencies have been on the forefront of water resource planning for the region, undertaking the first water quality management program study for the watershed. These early planning roots provided the important water quality data and analysis for the development of the first Regional Board water quality control plan (Basin Plan). SAWPA has worked closely with the Regional Board in all Basin Plan updates and watershed planning efforts.

The 1998 SAWPA Water Resources Plan was one of the first watershed-wide water resource plans undertaken by SAWPA to optimize all available water resources in the watershed in an integrated fashion. SAWPA initiated this plan after the Metropolitan Water District of Southern California (Metropolitan) kicked off their first Integrated Resource Plan in 1995. Because only three of the five SAWPA member agencies were Metropolitan member agencies, the SAWPA Commission directed staff to prepare a similar water resource plan for the watershed that would examine all available water resource development opportunities and assets within the watershed. The plan identified new water resource development projects recognizing that the watershed is served with imported water by both the San Bernardino Valley Municipal Water District, a State Water Project contractor and a SAWPA member agency, in addition to Metropolitan. SAWPA's planning staff prepared the entire 1998 Water Resources Plan.

In 2002, SAWPA updated and expanded the water resources planning in its Santa Ana Integrated Watershed Plan (IWP), a two-volume planning document that examines water resource management strategies to address regional needs in an integrated fashion using strategies

included water storage, water quality protection and improvement, water recycling, storm- and floodwater management, and environment and habitat protection.

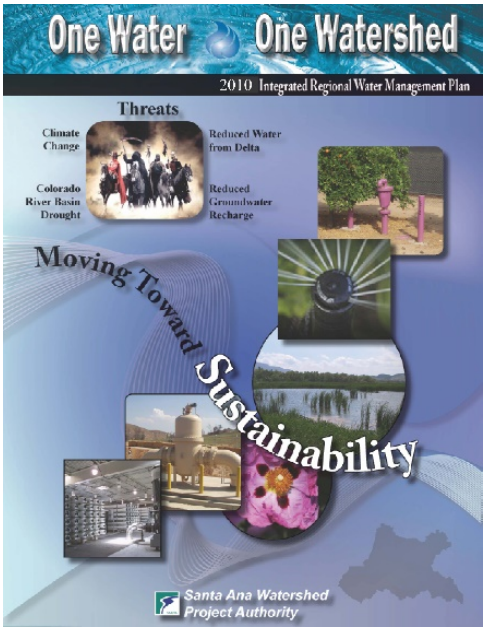
The IWP built upon member agency long-term water resource plans and management programs, providing a vehicle to ensure effective and concerted planning efforts on a regional basis. The need for water resources projects to achieve zero reliance on imported water supply and the amount of salt-removal facilities necessary to achieve a salt balance in the watershed were highlighted, as was the importance of a watershed-wide wetlands program and watershed plan that integrates wetlands, trails, habitat, open space, education, and invasive species removal. The IWP also provided a foundational evaluation of the Inland Empire Brine Line (at the time of the report it was called the upper Santa Ana Regional Interceptor) and describes a future long-term beneficial use of the Inland Empire Brine Line as the critical facility required to meet the SAWPA goal of transporting highly saline, non-domestic water discharges out of the upper watershed to protect its groundwater resources.

The 2002 IWP set the stage for a successful effort to communicate the challenges and opportunities of the watershed to the California Legislature. The result was an allocation of $235 million in the Proposition 13 Water Bond, resources necessary for the watershed to enact many of the priority items called out in the IWP.

In 2005, SAWPA prepared the Santa Ana IWP 2005 Update, an IRWM Plan. This report, also prepared by SAWPA planning staff, updated much of the work from the 2002 report, incorporating the urban water management plans (UWMPs) performed by SAWPA member agencies and sub-agencies, and provided an updated listing of priority projects to achieve the goals of the watershed stakeholders. Recognizing the significant size of the watershed in geography and population, and the sheer complexity of coordination and integration of projects, the 2005 report sought to briefly describe and highlight the many detailed resource planning processes and documents that led to a list of proposed prioritized regional integrated projects, as opposed to serving as a detailed technical or scientific water resource evaluation in itself. Because of these efforts, the plan supported the distribution of $25 million from the Proposition 50 IRWM Implementation Grant Program to projects in the watershed.

1.2.1. OWOW PLAN: MOVING TOWARD SUSTAINABILITY

The first time SAWPA facilitated the creation of the OWOW Plan, the result was a broad-based, stakeholder-driven assessment of the watershed. Rather than engage a consultant to prepare a plan, SAWPA facilitated a process where all segments of the water community gathered in workgroups called "Pillars" (see Figure 1.1-1) to produce an IRWM Plan for the watershed. The name "Pillar" was chosen because it conveys the importance of multiple shared efforts to carry a load, just like pillars in a building. In the OWOW Plan, more than 300 stakeholders described current conditions within the watershed and developed specific strategies and targets to make the watershed sustainable by 2030.



The OWOW Plan stakeholders considered all aspects of water, from flood risk management to water supply reliability to habitat and open space. To manage such a complex process, SAWPA engaged the broader community and created a Steering Committee consisting of county supervisors, mayors, and business leaders, as well as water agency officials. Once the OWOW Plan was complete and approved, the Steering Committee recommended funding regionally-beneficial, integrated projects under the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84). The Steering Committee selected a wide variety of projects from across the watershed and from varied disciplines, including local water supply development and stormwater and habitat management. All projects considered provided multiple benefits to a broad area, using scarce resources for many purposes.

With the growth of the IRWM planning framework, multi-benefit and multipurpose projects have moved to the forefront and have become one of the primary goals of OWOW Program implementation. Historically, the additional effort required to develop multi-objective solutions has made true multi-benefit projects relatively uncommon. In California, the IRWM Program was instituted specifically to incentivize collaborative planning, much of which has been prompted by SAWPA's historical integrated watershed programs.

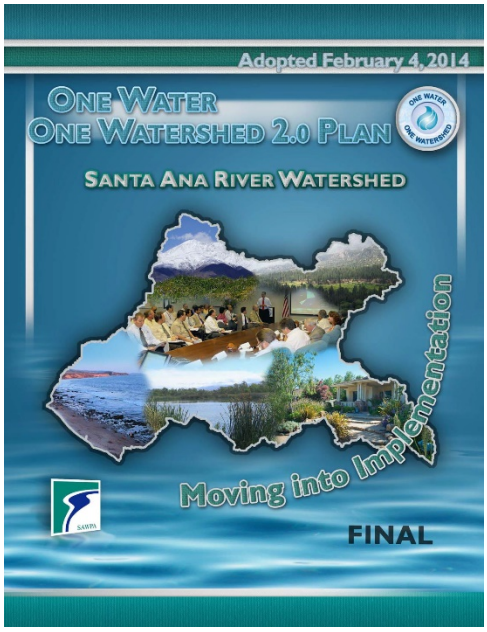
Some of the earliest multi-benefit water projects were accomplished through a partnership between those interested in flood risk reduction and groundwater management. Spreading grounds along the base of local mountains have reduced flood flows and recharged groundwater basins for nearly 100 years. Early on, the Orange County Water District partnered with the Orange County Flood Control District to provide recharge basins within flood control basins. More recently, the Inland Empire Utilities Agency has worked with the San Bernardino County Flood Control District to modify the operation of the flood control system to maximize recharge opportunities. The Orange County Flood Control District has also partnered with the Irvine Ranch Water District to store recycled water in some flood basins. All of these projects were facilitated primarily by operational changes rather than by the construction of new infrastructure, although in some cases the flood control system was upgraded. Operational changes could occur only when each party understood the needs and assets of the other.

The OWOW Plan was adopted on November 16, 2010.

1.2.2. OWOW 2.0 PLAN: MOVING INTO IMPLEMENTATION

When it was time to update the OWOW Plan, SAWPA and its stakeholders ensured that the integrated water resources planning for the Santa Ana River Watershed Project went beyond simply meeting DWR's IRWM Grant Program Guidelines, to raise the bar for what an IRWM Plan could achieve. A deliberate effort by SAWPA expanded the group of collaborators and stakeholders involved to be broader and more representative all water users.

The OWOW 2.0 Plan update effort forged a new model. Instead of pouring more work into the old model the effort ensured stakeholders would not be reformulating solutions to the same problems that were still being resolved. Instead, SAWPA envisioned and facilitated IRWM planning that provides a "systems approach" as a more effective template for collaboration and water management. Systems approaches recognize the interrelationships between different aspects of a particular subject. In this case, the stakeholders working on the OWOW 2.0 Plan update sought to understand how the different water systems, natural and human, interacted with each other. Doing so allowed opportunities for multi-benefit efforts, and the unexpected challenges of contradictory solutions were brought forward in the OWOW 2.0 Plan.



Many past water plans were made by and for the water management professional, often with a focus on water supply reliability and on ensuring supplies were available to address ever-growing demands. However, in light of the ongoing water scarcity challenges faced by the state and the watershed, the OWOW 2.0 Plan process recognized the need to establish a new planning approach to catalyze change that could apply to all regions across the state.

This innovative approach asked that all sectors of the watershed community (water suppliers, water consumers, stormwater managers, parks and recreation providers, environmental stewards, land developers, local government agencies, etc.) adopt a water ethic focused on living within our means and living with the local natural environment. It also recognized that excessive irrigation water use and waste creates downstream pollution, restating the fundamental idea of the watershed approach that all decisions impact all parts of the watershed, and that upstream events have impacts downstream.

The OWOW 2.0 Plan effort also recognized all water users as water decision makers. Making sure that all who make decisions about water and the watershed have timely and useful information is key. Public stewardship of water comes not from gathering further data, but rather from effectively sharing existing water information. Everyone needs to be educated to better understand where

their water comes from, how it is used, how people impact it, and where it goes after it is used. New or expanded existing materials, curricula, and web-based tools have been and are currently being developed to answer this need.

Creating Anew

In the course of facilitating the OWOW 2.0 Plan update, SAWPA made sure that the collaboration expanded across multiple jurisdictional and institutional boundaries. The goal of these new partners and partnerships was restoration of the natural hydrology, protection of aquifers, enhancement and improvement of ecosystems, and the development of landscapes appropriate to the arid and semi-arid environments of the watershed. The underlying ethic associated with this work was one of awareness: awareness that water should not be for waste transport, because there are intrinsic links between upstream and downstream, and awareness of conflicts that may arise as greater quantities of stormwater and recycled water are captured and stored. The OWOW 2.0 Plan also created effective outreach and deployed liaisons to disadvantaged communities, environmental communities, Native American Tribes, and land use planning sectors that are key to implementing effective integrated watershed planning.

OWOW 2.0 Plan: A New Model of Water Planning

The OWOW 2.0 Plan fulfilled the IRWM Program requirements while also pursuing the holistic vision, goals, and objectives selected and approved by the watershed stakeholders and the OWOW Steering Committee. The focus areas below were first described by the OWOW 2.0 Plan but remain important to the OWOW Plan Update 2018.

Water Demand Reduction Strategies

This encouraged programs such as "cash for grass" and indoor water-efficient appliance rebates, outdoor irrigation efficiency measures, and new programs where landscaping and irrigation experts are hired to educate homeowners, homeowners' associations, and businesses in better methods. It also provides incentives to retrofit high-water-use lawns and greenways into California Friendly and WaterSmart landscaping. This education process was supported increasing awareness of the full water cycle and water quality impacts to quality-of-life issues.

Water Quality Improvement and Awareness

With increased capture and collection of rainwater and subsequent recharge to local groundwater, the quality of stormwater and nonpoint-source pollutants must be addressed. Web-based tools are being developed or expanded to allow the public access and to foster awareness of the water quality conditions at local lakes, streams, and beaches, keeping the public informed so they know which resources are safe to use for recreation throughout the region.

Targeted and Expanded Community Outreach

The OWOW 2.0 Plan supported the need all people have for clean, safe, and reliable water supplies. The effort used trusted facilitators with native language skills for outreach to low-income and non-English-speaking communities rather than relying on surveys or mailers, which often are poorly translated and fail to address the water-related needs of these communities.

Restoration of Natural Systems and Hydrology

The OWOW 2.0 Plan identified mutual-benefit projects that capture, store, and infiltrate rainwater, with assurances that the water is clean and safe for people and wildlife. Continued IRWM planning and removal of non-native, water-thirsty plants restores the region's habitat and saves water.

Expanded Collaboration

Specific effort was made to connect to federal and state landholders, including the U.S. Department of Agriculture Forest Service (Forest Service), U.S. Department of the Interior Bureau of Land Management, March Air Reserve Base, California State Parks, and Natural Resources Conservation Service. Because a large percentage of the region and the headwaters of the Santa Ana River are on federal lands, collaboration with federal entities is critical to the health of the watershed. Further, under a memorandum of understanding between the U.S. Department of the Interior Bureau of Reclamation and SAWPA, federal funding supported the OWOW 2.0 Plan update process.

Impacts from the Broader Economy

The OWOW 2.0 Plan was written in the period following the Great Recession, before the fiscal impact was recovered. For that reason, it spoke to how budget limitations change how goals are achieved. Because of the slow recovery from the fiscal crisis faced by the nation, the state, and the watershed, funding for large-scale projects had become less certain. In the aftermath, and continuing today, federal earmarks have largely vanished, and state bond funding is unpredictable. The period included significant financial limitations and was increasingly calling upon citizens and stakeholders to craft responsible, sustainable solutions. Such solutions allow limited resources to be used efficiently, providing more bang for the buck and addressing various needs through integration.

Water–Energy Nexus

The OWOW 2.0 Plan recognized and focused on the reality that nearly all water resource infrastructure requires energy, and approximately 19% of all energy in California is used to transport, treat, and heat water. Water is also necessary in the production and transmission of energy. A focus on the water–energy nexus was key to the OWOW 2.0 Plan, including the formation of the Energy and Environmental Response Pillar.

The OWOW 2.0 Plan was adopted on February 4, 2014. It has been awarded recognition by the Harvard Kennedy Business School, the American Planning Association, and the American Society for Civil Engineers, among others.

1.2.3. OWOW PLAN UPDATE 2018: MOVING FORWARD TOGETHER

The OWOW Plan Update 2018 was begun in July 2016 with a meeting of the OWOW Steering Committee. At that meeting, the Committee approved efforts to secure a planning grant from the state in support of the update process and adopted a policy document that described how projects can be included in the OWOW Program and made eligible for the expected implementation grants.

In the 28 months that followed, the OWOW 2.0 Plan was reconsidered in light of the significant changes impacting the watershed since early 2014. In those years the fiscal recovery began to be felt in portions of the watershed, and the State of California went through one of its most severe droughts on record. The communities of the watershed made strides to support conservation as a way of life in California, implementing widespread landscape retrofits and other conservation programs. Other significant investments were made throughout the watershed by agencies, cities, counties, and community members alike to make the watershed more resilient in response to uncertainty and more sustainable over the long term.

The OWOW Plan Update 2018 is subtitled "Moving Forward Together" to mirror the earlier plans, which focused on movement toward goals. Working together has been fundamental to the OWOW Program (and SAWPA) since the program's inception, and the OWOW Plan Update 2018 is built by the stakeholders for the stakeholders. "Moving Forward Together" also reflects the OWOW Program's commitment to ensuring that no one is left behind as progress is made, and that progress somewhere in the watershed does not cause any undue burden elsewhere in the watershed.

Four rounds of Proposition 84 implementation grants have been received during the years since the OWOW 2.0 Plan was approved, supporting watershed-wide efforts to conserve water, and to optimize the many water supply storage and delivery systems in the watershed. The combined calls for projects in the OWOW Program requested about $1.95 billion for the available ~$115 million allocated by the program. The scale of creative and necessary water improvements in the watershed should not be overlooked, nor should the significant local expenditures that occur year after year as the communities of the watersheds pay for the right changes. The projects funded by Proposition 84 are emblematic of how the IRWM program supports shared effort that otherwise may not be achieved. One project from the Proposition 84 Drought Round brought together SAWPA's technical services and consultants to provide a watershed-wide data collection and analysis in support of per-parcel outdoor watering budgets. The data collected and the tools that resulted are now being used to support conversion to budget-based rates at water

> ***All the moving parts in this effort are what make it challenging and amazing at the same time, especially for government agencies. As complex as the process is, we are proving it can be done. Agencies can work together outside of their silos. It is not easy work but with a common end goal of resilience within the whole watershed this is a WIN for everyone.***
>
> **—Laura Roughton, OWOW Steering Committee Member, City of Jurupa Valley Councilmember**

retailers and other targeted conservation efforts throughout the watershed (see Chapter 9, Data Management Efforts and Tools, for more on this effort).

Santa Ana sucker (*Catostomus santaanae*)

Another project is the Santa Ana River Conservation and Conjunctive Use Program (SARCCUP), which received a grant from Proposition 84 2015 Round to develop the infrastructure necessary to better manage the 1 million acre-feet (AF) of potential storage capacity in the watershed's groundwater basins. SARCCUP is also removing about 640 acres of invasive giant reed ("Arundo"; *Arundo donax*) and building about 40 acres of native riparian habitat to benefit the endangered Santa Ana sucker (*Catostomus santaanae*). The program plans to increase dry-year yield by 180,000 AF by storing additional local and imported water during wet years for extraction during drier times when the availability of other water sources is limited. A decision support model was built to simulate and identify how water moves through the watershed and the SARCCUP facilities to plan for regional groundwater banking. SARCCUP is being led by a project committee of the SAWPA Commission and implemented by SAWPA member agencies and a non-profit organization.

These projects represent working at a watershed-wide scale, reflecting how the OWOW Plan encourages progress towards sustainability in the watershed. The OWOW Plan Update 2018 was built on the work of past OWOW Plans, and all the significant efforts in the watershed. As the Pillars were convened, it became clear that several of the areas of focus from earlier plans needed to change. The nature of integrated water management throughout the watershed recommended the blending of several pillars and the retirement of another. For the OWOW Plan Update 2018, the Water Resources Optimization Pillar became home for many water supply-related discussions that in the OWOW 2.0 Plan were handled by separate Pillars. As work began at this update, even further consolidation occurred where the Recycled Water Pillar and the Water Resources Optimization Pillar joined together to produce one set of recommendations and one assessment of the status of the water supply portfolio of the Santa Ana River Watershed. This reflects how deeply the "all of the above" strategy and depth of existing partnerships in the region has become commonplace within water supply management here in the watershed.

The culture of integrated work in the watershed also revealed that the Government Alliance Pillar was no longer necessary because of how successfully it achieved making collaboration the default mode for watershed management agencies of all kinds. In its place, the Data Management and Monitoring Pillar was created. This Pillar formed because many felt that strategic thinking was needed in the watershed to ensure that the increasingly sophisticated and inexpensively gathered water data was being effectively used to support better decision making. It was felt here, and elsewhere in California, that water data was too often simply piling up unused, and at worst it was

making decision making more difficult because the data was disjointed, poorly aligned, and insufficiently available to decision makers.

The OWOW Plan Update 2018 deliberately used a process that had evolved during earlier OWOW planning processes. The stakeholders gathered to collaboratively update the goals of the plan, focusing on the year 2040. These goals were then adopted by the OWOW Steering Committee as the planning targets for the OWOW Plan Update 2018. The Pillar workgroups, gathered in their topical teams, considered how their focus was related to the goals, and then provided recommended management strategies and policy strategies that would support achievement of those goals.

To properly reflect the role that the OWOW Plan Update 2018 plays in the watershed, the OWOW Steering Committee took two important actions. First, in line with the Stormwater Resources Management Planning Act, the OWOW Steering Committee formally accepted several new subregional plans into the OWOW Plan Update 2018. Stormwater resources management plans are required by California law to be adopted into their respective IRWM Plan, but the OWOW Steering Committee chose to invite any subregional, related plan "owner" who wished to make a presentation and request inclusion in the OWOW Plan. By doing so, the OWOW Steering Committee chose to reinforce how the watershed goals in the OWOW Plan Update 2018 are intentionally broad to encompass the sustainability goals for land and water in the Santa Ana River Watershed, and that the success of any plan or any project that helps achieve these broad goals is in fact helping implement the OWOW Plan Update 2018.

The OWOW Steering Committee also formalized the distinction between projects that will help implement the OWOW Plan and those projects that will compete for funding within the California IRWM Program. The OWOW Plan Update 2018, like the earlier OWOW Plans, plays a role that is compliant with the California IRWM Program, but is also much broader in scope. In this Update, the OWOW Steering Committee developed two critical systems to reflect this distinction. Beginning in 2018, the OWOW Steering Committee authorized a "Call for Projects" wishing to be included in the OWOW program. This effort encourages all good ideas into the program, anything at all that could help achieve the OWOW goals using the strategies encouraged by the Pillar workgroups. To be in the program, a project proponent had the minimal task of describing where the project was, what partners were involved, about how much it would cost, and, most importantly, how it would help achieve the goals of the OWOW Plan Update 2018. This call is also now permanently open—that is, anyone can submit a project any time and at periodic future meetings the OWOW Steering Committee will act to adopt new projects into the program.

The OWOW Steering Committee adopted this system, knowing it is entirely distinct from the California IRWM Program implementation grant cycles. When a grant is available in the Santa Ana Funding Region, the OWOW Steering Committee will conduct a separate call for projects seeking

grants, competitively evaluate proposed projects, and provide a suite of projects or programs for the SAWPA Commission to deliver to DWR in an implementation grant funding proposal.

The above-described efforts by the OWOW Steering Committee, the Pillars, and the gathered stakeholders of the OWOW Plan Update 2018 reveal the next step of OWOW Program growth. Like the OWOW Plans that came before it, the OWOW Plan Update 2018 was built from the bottom up by the stakeholders, who set the goals and made the recommendations for how to achieve those goals. Using the current OWOW Plan as a bridge across other plans, showing how they are interrelated, and encouraging integrated efforts is not new; however, it is more pronounced in this OWOW Plan Update 2018.

This is why the subtitle for the OWOW Plan Update 2018 is Moving Forward Together.

1.3. INTEGRATED LOCAL WATER PLANNING

Water managers throughout the watershed make plans to drive investments and future operations. Some plans, like UWMPs, are mandated by the state, while some are completed voluntarily in support of the organization. Others are collaborative planning efforts, integrated plans either in name or in principle. The Santa Ana River Watershed benefits from the work these plans set in motion, and the long-term sustainability of water management in the watershed in many ways will come primarily from those planning efforts.

The OWOW Plan Update 2018 thinks at the scale of the entire watershed, which is made up of all the smaller areas that the other plans consider. Only the Basin Plan of the Santa Ana Regional Board considers the same geographic extent as the OWOW Program.

The OWOW Plan Update 2018, however, is unlike the subregional plans and the Basin Plan in that it considers a broad set of interrelated issues, all critical to the sustainability of the watershed. In this effort to broadly define what is important to managing the watershed sustainably, the OWOW Plan Update 2018 relies on all the subregional plans that grapple with some aspect that the OWOW Program knows is important.

A list of subregional plans that are related to the goals and objectives selected by the stakeholders of the OWOW Plan Update 2018 process is included at the end of this section. This list is in no way exhaustive; because of the extent of the watershed is so great both in size and in population, including every plan is impossible. The OWOW Program page at www.sawpa.org will maintain a living list of related plans that are completed in the watershed. This list will include municipal and county general plans, plans made by the federal government about the National Forest, flood risk management infrastructure plans, UWMPs, stormwater resource management plans, groundwater sustainability plans, and many subregional integrated water management plans and integrated resources plans, to name a few.

Referencing other plans and meaningfully including them in this way is an important acknowledgment that the OWOW Plan Update 2018 is an (upside-down) umbrella, supporting these other planning efforts by reflecting their interrelationships and encouraging actions that will achieve multiple objectives scattered across the subregional plans. For example, a general plan may consider the restoration of a creek as a recreational asset, while a stormwater resource management plan may consider that same creek as an infiltration opportunity. The OWOW Plan Update 2018 encourages the entities pursuing those two efforts to collaborate and ensure that the project achieves both goals. In this way the OWOW Plan Update 2018 suggests that, if the subregional plans are carried out, particularly in an integrated way built on partnerships, the overall goals in the watershed can be achieved.

Other plans whose "owners" approached the OWOW Steering Committee to take official action to include a subregional plan in the OWOW Plan Update 2018 are listed below. Some of these requests are driven by state policy (the stormwater resource management plans), and some are driven by the decision to align with and share support between the included plan and the OWOW Plan Update 2018.

- Santa Ana River Parkway and Open Space Plan – California Coastal Conservancy (March 2018)
- Orange County Stormwater Resource Plan – Orange County Public Works (April 2017)
- 2016 Chino Basin Storm Water Resources Plan: Functional Equivalency Document – Chino Basin Watermaster (May 2016)
- Newport Bay Watershed Idea Book – Newport Bay Conservancy (January 2015)
- San Bernardino County Stormwater Resource Plan (January 2019)

The included plans that are listed below include a short description of the plan and a web address where the plan can be found. A list of these and other significant subregional plans can be found in Appendix G.

1.3.1. THE OC PLAN (2018)

The OC Plan combines and updates two existing plans that were prepared by the County of Orange. The North Orange County Watershed Management Area IRWM Plan was completed in 2011 and the IRWM Plan: Central Orange County Management Area was completed in 2012.

The goals established in The OC Plan are to improve water supply, protect water quality, enhance the environment and habitat, provide flood risk management, improve the quality of life, and address climate change. The OC Plan will accomplish these objectives through an established ranking of projects to help further state and regional goals.

The OC Plan is an IRWM Plan in the sense that it is designed to be compliant with the DWR's 2016 IRWM Plan Standards, and in the more generic sense as it convened collaborative planning on

behalf of regional and multi-benefit work. It is a plan for a subregion of the Santa Ana River Watershed in the same way that the Upper Santa Ana River Watershed IRWM Plan (2015) is, as previously described in the OWOW 2.0 Plan. The OC Plan and updates can be found online at http://www.ocwatersheds.com/programs/waterways/stormwater/documentspr/theocplan.

1.3.2. STORMWATER RESOURCE MANAGEMENT PLANNING

For the OWOW Plan Update 2018, three stormwater resource management plans were brought before the OWOW Steering Committee for adoption into the plan. These plans and the requirement for adoption into the OWOW Plan Update 2018 were added by the legislature in 2014.

Although adoption of these plans into the OWOW Plan Update 2018 is driven by a requirement, the interdependence of the two planning efforts is representative of the integrated planning that the OWOW Program encourages. To this end and as described elsewhere, the projects held within the stormwater resource management plans were directly imported into the project submission tool for the OWOW Plan Update 2018. This simplifies the requirements for project proponents, knowing that not only is the stormwater resource management plan adopted, but those projects have also been incorporated into the IRWM Plan.

The process that has become formalized during this update cycle is relatively straightforward:

1. An agency producing a stormwater resource management plan contacts SAWPA staff.
2. That agency is scheduled to present the plan before the next available OWOW Steering Committee meeting.
3. Following the presentation and a period of questions and answers, the OWOW Steering Committee acts upon a recommendation to adopt the stormwater resource management plan into the OWOW Plan Update 2018.

1.3.3. SANTA ANA REGIONAL BOARD BASIN PLAN

The State Water Resources Control Board and the nine Regional Boards are responsible for the protection the quality of California's waters. Each of the nine Regional Boards adopts a water quality control plan, or Basin Plan, that recognizes and reflects regional differences in existing water quality, the beneficial uses of the region's groundwater and surface waters, and local water quality conditions and problems.

The Santa Ana Regional Water Quality Control Board is responsible for Region 8, often called the Santa Ana Region, and is a nearly perfect match to the OWOW Program planning area. The Basin Plan for the Santa Ana Region is the basis for the Regional Board's regulatory programs, establishing water quality standards for the groundwater and surface waters of the region. The Basin Plan includes an implementation plan describing the actions by the Regional Board and others that are necessary to achieve and maintain the water quality standards.

Strong partnerships have formed around the needs of the Basin Plan. Collaborative and integrated solutions are common in the region, reflected in success in achieving water quality standards in ways that support integrated water management. The Basin Plan is a sister plan to the OWOW Plan, each focused on ensuring a healthful watershed. For more information regarding the Regional Board's Basin Plan (last updated February 2016), visit https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/.

1.3.4. FOREST MANAGEMENT PLANNING

Three national forests are located within the watershed: Angeles National Forest, which covers over 650,000 acres and is located northwest in the watershed; Cleveland National Forest, which covers 460,000 acres and is located in the southern area of the watershed; and San Bernardino National Forest, which covers over 670,000 acres and is located in the northern and eastern areas of the watershed (see Figure 1.3-1). Much of the natural streamflow in the watershed comes from rain and snowfall in and around the forest areas of the San Bernardino, San Gorgonio, and San Jacinto Mountains. Each of the National Forests use several planning efforts to manage their resources, implementation schedules, and locations of their future projects. Land management plans are the long-term planning documents that are adopted every 20 to 25 years and watershed improvement programs and program of work planning documents describe specific projects, such as fuel breaks and forest thinning, and implementation timelines.

The Southern California National Forests recognize the importance of IRWM planning as they have identified "improving watershed conditions through cooperative management" as a major goal for all three forests. In order to help prioritize projects, through their Southern California National Forest Visions strategic planning process, they identified subwatersheds with poor health, with conditions such as high road densities, agriculture, and urban developments within the floodplains located outside of National Forest boundaries (Southern California National Forests Vision, page 41). Many of the degraded watersheds included land owned by other parties, making it important for the National Forest to collaborate with outside entities. In the spirit of this cooperation, the San Bernardino and Cleveland National Forests in 2017 re-signed a 2011 memorandum of understanding entitled "Forest First" with SAWPA to engage and develop mutually beneficial regional projects.

For more information regarding the Southern California National Forests Vision, see https://www.fs.usda.gov/main/angeles/landmanagement/planning.

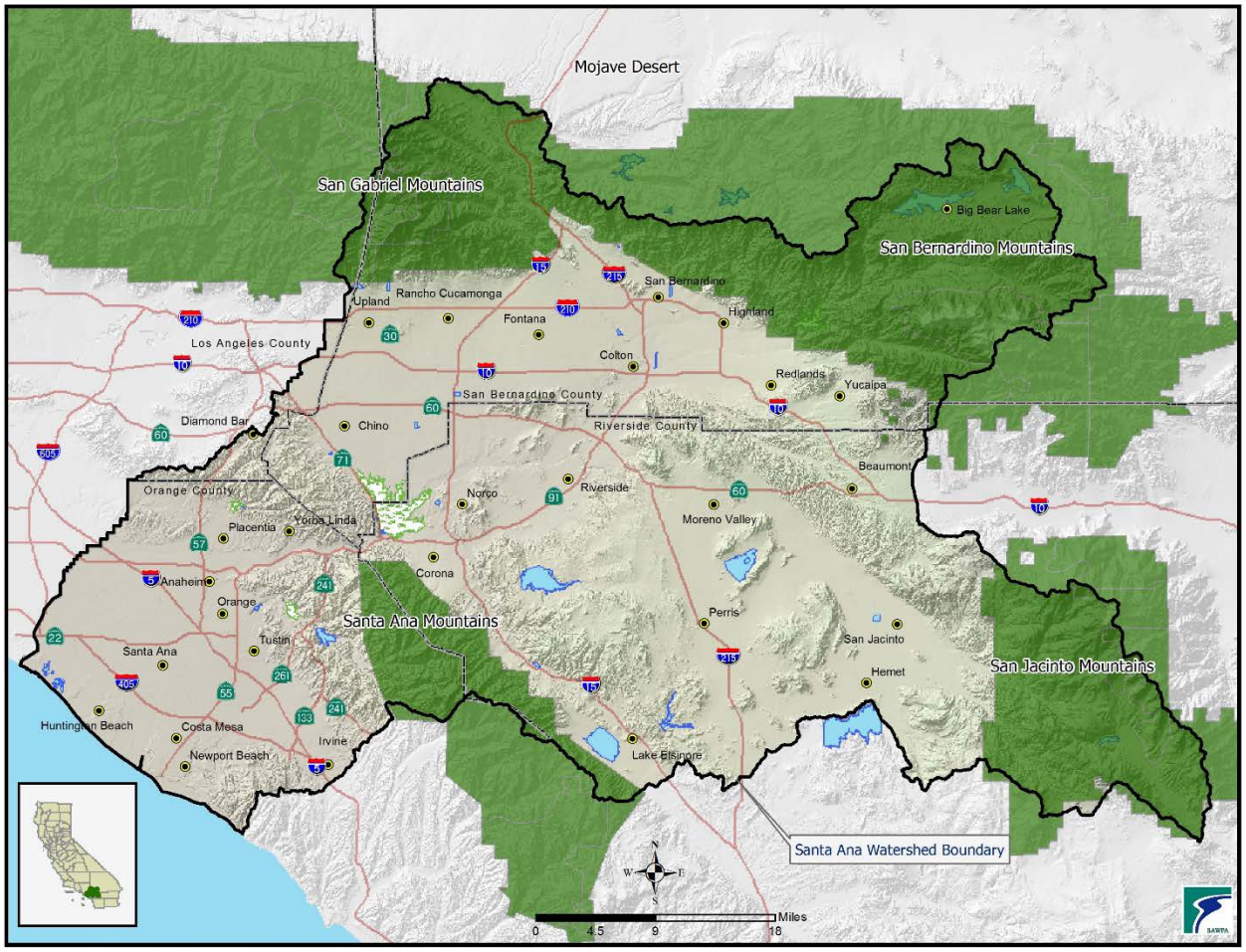


Figure 1.3-1. Forested Areas in the Santa Ana River Watershed

1.3.5. SUPPORTIVE SUBREGIONAL PLANS RELEASED SINCE OWOW 2.0 PLAN ADOPTION

The list below is not exhaustive and is always growing. An up-to-date list will be maintained as a digital resource on the OWOW Program website (www.sawpa.org).

- Eastern Municipal Water District 2015 UWMP – June 2016
- Inland Empire Utilities Agency 2015 UWMP – June 2016
- Municipal Water District of Orange County 2015 UWMP – May 2016
- 2015 San Bernardino Valley Regional UWMP – June 2016
- Western Municipal Water District 2015 UWMP Update – June 2016
- Eastern Municipal Water District Sewer System Management Plan 2016
- Orange County Water District Long-Term Facilities Plan 2014 Update – November 2014
- Bay Delta Conservation Plan/California WaterFix 2016
- The OC Plan: Integrated Regional Water Management for the North and Central Orange County Watershed Management Areas – March 2018

2. CRAFTING THE OWOW PLAN UPDATE 2018

2.1. STAKEHOLDER INVOLVEMENT AND OUTREACH

Engaging stakeholder involvement in a large, diverse watershed is challenging. The One Water One Watershed (OWOW) Program is different from other planning processes, particularly because the OWOW Program was designed to be a bottom-up rather than a top-down process. Encouraging participation from different groups of people and those holding varying viewpoints throughout the Santa Ana River Watershed (watershed) fosters the ability to reach larger numbers of stakeholders.

Many of the same processes, structures, and tools were used for stakeholder outreach for the OWOW Plan Update 2018 as for the initial OWOW Plan and the OWOW 2.0 Plan, though determining the most effective means communication with stakeholders and groups continues to evolve. During the process many stakeholder meetings were held, with notices sent using a mass-email platform. SAWPA staff also maintains a Twitter account (@SAWPA_OWOW) that shares news, grant opportunities, and other relevant material. The SAWPA website has a significant area committed to the OWOW Program, and is used to convey meeting notices, documents and other background material. Below is a description of how stakeholders become involved in the program in many different ways.

Beyond the engagement with groups described below, the OWOW Steering Committee meetings every 2 months are public meetings, conducted in accordance with the Ralph M. Brown Act, which details requirements for public access to meetings held by legislative bodies, including governing bodies, subcommittees, and commissions. Meeting minutes are prepared and kept by SAWPA staff and posted on the SAWPA website. For a full timeline of major OWOW Plan Update 2018 milestones, including stakeholder outreach events, see Appendix A, OWOW Plan Update 2018 Timeline.

2.1.1. THE OWOW COMMUNITY

With over six million residents in the watershed and the Integrated Regional Water Management (IRWM) region, the OWOW Program works on behalf of many types of communities, with a diversity of interests, needs, expectations and dreams. The OWOW Program engages with:

- All Residents of the Santa Ana River Watershed. For example, young families concerned about the quality of their drinking water, retired residents on fixed incomes, or political advocates working to improve their communities.
- Decision Leaders and Elected Officials. On behalf of the OWOW Program, SAWPA is a leader in providing information and cooperative models for decision leaders from water and general government, senior management and technical staff from agencies engaged in water and resource management, the regulatory community, and non-governmental organizations.

- Stakeholders Engaged in the SAWPA Roundtable Process. SAWPA manages a number of multi-agency roundtable and task force efforts focused on specific water problems or issues within the watershed. The content is often technical in nature and is best communicated through means such as email, but the actions of these groups often have results that are of interest to broader audiences.

2.1.2. THE MESSAGE OF OWOW

The OWOW Program receives and communicates how stakeholders support reaching the goal of a sustainable watershed. The following key message points guide outreach messaging:

- A watershed ethic is crucial for implementing an integrated watershed vision. All watershed community members should know:
    - Where your water comes from.
    - How much water you use.
    - What you put into the water before it leaves your home or business.
    - Where it goes after you use it.
    - That you are a stakeholder in what happens in the watershed.
- Developing creative solutions is necessary to overcome challenges in this watershed.
- SAWPA is the approved Regional Water Management Group responsible for achievement of IRWM Program standards within the Santa Ana Funding Area.
- SAWPA facilitates the OWOW Program on behalf of all stakeholders and to ensure a bottom-up and watershed-wide planning effort grounded in One Water and watershed management principles.
- The OWOW Program and the role of SAWPA as facilitator is a California state model for leadership in watershed planning and can provide a forum and tools for development of integrated solutions.
- The OWOW Program is a leader in developing new ways to see and to respond to problems, and we share this information and insight with our stakeholders.
- Projects that provide multiple benefits are the most cost-effective ways of working, and the OWOW Program provides facilitation / information to support development of these projects.
- The OWOW Program uses a collaborative model focused on win–win solutions.
- The world is changing, and collaborative watershed planning like the OWOW Program can help manage how communities can be resilient and thrive during these changes.
- The OWOW Program emphasizes the use of local resources because they provide more reliability and sustainability.
- Achieving and maintaining sustainability is smart both economically and environmentally.
- The OWOW Program is always evolving, facilitated by SAWPA, to develop and share new models for working in response to changing conditions.

2.1.3. PILLAR WORKGROUPS

The OWOW Pillar workgroups represent one of the most effective means to ensure public involvement in the planning process. Invitations to participate in the Pillar meetings are made widely across the watershed and are entirely voluntary. Members of the public may choose to participate in one or many Pillars based on their level of interest. Each Pillar is led by a chair who is a subject area expert, who receives a list of volunteers and can also invite potential participants to attend and support the planning efforts. For example, a water supply expert likely knows other water supply experts within and outside the region. Many Pillars also have a co-chair, who is responsible for maintaining a list of interested contacts, and SAWPA provides names of additional contacts. The knowledge and contacts of the Pillars provide an important link to watershed stakeholders. SAWPA also assigns one staff watershed manager staff to serve as liaison to each Pillar, supporting meeting set-up and the work of the group.

The Pillars are responsible for developing the recommended strategies for how the watershed can achieve the goals of the OWOW Plan Update 2018. Each Pillar tackled this assignment slightly differently depending on who was involved. Ten chapters were submitted by the ten Pillars; however, one Pillar submitted two chapters (Disadvantaged Communities and Tribal Communities) and two Pillars submitted one chapter (Water Resources Optimization and Recycled Water).

2.1.4. ENGAGED STAKEHOLDERS

The OWOW Plan Update 2018 gathered together stakeholders from across the watershed, mirroring the extensive engagement achieved by the OWOW 2.0 Plan process. The master contacts database includes a diverse base of more than 4,000 stakeholders, including those with an interest in water and representatives from cities and counties within the watershed. It includes representatives from 120 agencies associated with water, including flood control districts, water conservation districts, and water supply agencies. It also includes representatives from the 63 incorporated cities within the watershed, including mayors, key department heads, city council members, and planning commissioners. The database also includes an up-to-date list of members of the California legislature who represent portions of the watershed.

Also included are representatives from the federal government; Native American Tribes; the real estate community; members of the environmental advocacy groups, and members or representatives from communities facing environmental injustices; agricultural and land development communities; consultants; trade associations; academia; non-profit organizations; and others simply interested in water.

The working relationships during the development of the IRWM Plan were very positive overall, and in many cases, long term. Throughout SAWPA's history of administering collaborative working groups and task forces, strong working relationships have been built with the many entities listed in Section 2.1. The collaborative activities of workgroups or task forces, also known as SAWPA's Roundtable or Task Forces, are described in detail in Section 2.3, Collaboration, Coordination, and Integration.

Disadvantaged Communities Involvement Program

During the OWOW Plan Update 2018, the Disadvantaged Communities Involvement (DCI) Program funded by Proposition 1 was also underway. The DCI Program timeline was slightly different, and therefore its conclusions were not available for inclusion in this report. The first effort there was to complete a strengths-and-needs assessment of the disadvantaged, economically distressed, and underrepresented communities of the watershed. This work was undertaken using an ethnographically-informed process of interviews and listening sessions intentionally designed to draw forward the expertise held by members of the community about their community. This process will yield the *Community Water Ethnography of the Santa Ana River Watershed* report, which will later be brought before the OWOW Steering Committee for inclusion in the OWOW Plan Update 2018.

An effort which became more significant as it was undertaken focused water stakeholders on the issue of homelessness in the watershed. Funded by the DCI Program, two symposia were held in 2017 in the watershed, building new connections between people who are working to manage homelessness and those managing aspects of the watershed. Two short descriptions of the events can be found at www.sawpanews.org. These events are examples of the type of watershed coordination activity that support new partnerships in pursuit of leveraging resources and ensuring efforts do not contradict one another.

Native American Tribes

For OWOW Plan Update 2018, supported by the DCI Program, California Rural Water Association facilitated the creation of a section of Chapter 5 that discusses how the goals of OWOW can be accomplished by and with the Tribal Communities of the watershed (Section 5.3). This section relies on participation by Tribal members and their employees at two Tribal Workshops co-convened by California Rural Water Association and SAWPA. The workshops shared an early outline and then a late draft of the chapter, garnering in-person comments and extensive reviews of the chapter. This stand-alone section is a first for the OWOW Program. Participants in the workshops affiliated themselves on sign-in sheets with the communities shown in Table 2.1-1 (listed alphabetically).

Table 2.1-1. Native American Tribes Involved in the OWOW Planning Process

Morongo Band of Mission Indians	San Manuel Band of Mission Indians
Soboba Band of Luiseño Indians	Tongva

Others were notified of the work based on the Native American Heritage Commission Tribal Consultation List for Riverside, Los Angeles, San Bernardino, and Orange Counties (dated June 7, 2017), as shown in Table 2.1-2 (listed alphabetically).

Table 2.1-2. Tribal Consultation List Notifications

Agua Caliente Band of Cahuilla Indians	Augustine Band of Cahuilla Mission Indians
Cabazon Band of Mission Indians	Cahuilla Band of Indians

Table 2.1-2. Tribal Consultation List Notifications

Campo Band of Mission Indians	Ewiiaapaayp Tribal Office
Gabrielino Band of Mission Indians	Gabrielino/Tongva San Gabriel Band of Mission Indians
Gabrielino/Tongva Nation	Gabrielino Tongva Indians of California Tribal Council
Gabrielino-Tongva Tribe	Jamul Indian Village
Juaneno Band of Mission Indians	Juaneno Band of Mission Indians Acjachemen Nation-Romero
La Jolla Band of Luiseno Indians	La Posta Band of Mission Indians
Los Coyotes Band of Mission Indians	Manzanita Band of Kumeyaay Nation
Mesa Grande Band of Mission Indians	Morongo Band of Mission Indians
Pala Band of Mission Indians	Pauma Band of Luiseno Indians – Pauma & Yuima Reservation
Pechanga Band of Mission Indians	Ramona Band of Cahuilla Mission Indians
Rincon Band of Mission Indians	San Fernando Band of Mission Indians
San Manuel Band of Mission Indians	San Pasqual Band of Mission Indians
Santa Rosa Band of Mission Indians	Serrano Nation of Mission Indians
Soboba Band of Luiseño Indians	Sycuan Band of the Kumeyaay Nation
Torres-Martinez Desert Cahuilla Indians	Viejas Band of Kumeyaay Indians

State, Federal, and Regional Agencies or Universities

Agencies and universities that have specific responsibilities or knowledge within the watershed were contacted during the OWOW planning process and involved in the process as appropriate. The universities and colleges listed below have worked as consultants and participants in many multi-agency efforts with SAWPA, including the American Society of Civil Engineers Infrastructure Report Card, demographic studies for watershed as part of the SAWPA IRWM, joint research projects, the Emerging Constituents Program Task Force, and many other forums. SAWPA's working relationships with state agencies are very strong, particularly with the Santa Ana Regional Water Quality Control Board (Regional Board) which participates in just about every workgroup and task force effort, as well as OWOW Program development. Agencies and universities involved in the process include those shown in Table 2.1-3 (listed alphabetically).

Table 2.1-3. Agencies and Universities Involved in the OWOW Planning Process

Association of California Water Agencies	California Baptist University
California Department of Fish and Wildlife	California Department of Parks and Recreation
California Department of Transportation	California Department of Water Resources
California State Polytechnic University, Pomona	California State University, Fullerton
California State University, San Bernardino	Local Agency Formation Commission for San Bernardino County
Orange County Department of Education	Pitzer College
Riverside County Regional Park and Open-Space District	Riverside University Health System–Public Health (formerly Riverside County Department of Public Health)

Table 2.1-3. Agencies and Universities Involved in the OWOW Planning Process

San Bernardino County Department of Behavioral Health	Santa Ana Regional Water Quality Control Board
South Coast Air Quality Management District	Southern California Association of Governments
University of California, Irvine	University of California, Riverside
U.S. Army Corps of Engineers	U.S. Department of Agriculture Forest Service, Pacific Southwest
U.S. Department of the Interior Bureau of Reclamation	U.S. National Oceanic and Atmospheric Administration Fisheries
U.S. National Park Service	Western Governors' Association
Western Riverside Council of Governments	

Municipal and County Governments and Special Districts

SAWPA has conducted extensive outreach to the entities shown in Table 2.1-4 (listed alphabetically), including presentations to city councils and boards of supervisors, and has invited cities and counties to be involved in the OWOW planning process. SAWPA has worked with many under various workgroups and task forces and in some cases, has even served on these organizations' boards.

Table 2.1-4. Governments and Special Districts Involved in the OWOW Planning Process

Big Bear City Community Services District	Big Bear Lake Department of Water and Power
Chino Basin Desalter Authority	Chino Basin Water Conservation District
City of Anaheim	City of Banning
City of Beaumont	City of Big Bear Lake
City of Brea	City of Buena Park
City of Calimesa	City of Canyon Lake
City of Cerritos	City of Chino
City of Chino Hills	City of Claremont
City of Colton	City of Corona
City of Costa Mesa	City of Cypress
City of Diamond Bar	City of Eastvale
City of Fontana	City of Fountain Valley
City of Fullerton	City of Garden Grove
City of Grand Terrace	City of Hemet
City of Highland	City of Huntington Beach
City of Irvine	City of Jurupa Valley
City of La Habra	City of Lake Elsinore
City of Lake Forest	City of Lakewood
City of Loma Linda	City of Los Alamitos
City of Menifee	City of Montclair
City of Moreno Valley	City of Murrieta
City of Newport Beach	City of Norco

Table 2.1-4. Governments and Special Districts Involved in the OWOW Planning Process

City of Ontario	City of Orange
City of Perris	City of Placentia
City of Pomona	City of Rancho Cucamonga
City of Redlands	City of Rialto
City of Riverside	City of Running Springs
City of San Bernardino	City of San Jacinto
City of Santa Ana	City of Seal Beach
City of Stanton	City of Temecula
City of Tustin	City of Upland
City of Villa Park	City of Westminster
City of Wildomar	City of Yorba Linda
City of Yucaipa	East Orange County Water District
Edgewater Community Services District	Jurupa Community Services District
Lake Elsinore and San Jacinto Watersheds Authority	Orange County Board of Supervisors
Orange County Public Facilities and Resources Department	Orange County Resources and Development Management Department
Orange County Water District	Riverside County Department of Waste Management
Riverside County Economic Development Agency	Riverside County Park and Open Space District
Rubidoux Community Services District	San Bernardino County Board of Supervisors
San Bernardino Valley Water Conservation District	San Timoteo Watershed Management Authority

Wholesale and Retail Water Purveyors

The entities shown in Table 2.1-5 (listed alphabetically), which participated in the OWOW planning process, include local agencies, mutual water companies, or water corporations as defined by Section 241 of the California Public Utilities Code.

Table 2.1-5. Wholesale and Resale Water Purveyors Involved in the OWOW Planning Process

Banning Heights Mutual Water Company	Bear Valley Mutual Water Company
Beaumont Cherry Valley Water District	Big Bear Municipal Water District
Box Springs Mutual Water Company	Cucamonga Valley Water District
Eagle Valley Mutual Water Company	East Orange County Water District
East Valley Water District	Eastern Municipal Water District
El Toro Water District	Elsinore Valley Municipal Water District
Fern Valley Water District	Fontana Water Company
Gage Canal Company	Home Gardens County Water District
Idyllwild Water District	Inland Empire Utilities Agency
Irvine Ranch Water District	Lake Hemet Municipal Water District
Lee Lake Water District	Marygold Mutual Water Company
Meeks and Daley Water Company	Mesa Consolidated Water District
Metropolitan Water District of Southern California	Monte Vista Water District

Table 2.1-5. Wholesale and Resale Water Purveyors Involved in the OWOW Planning Process

Municipal Water District of Orange County	Muscoy Mutual Water Company
Nuevo Water Company	Orange Park Acres Mutual Water District
Pine Cove Water District	Rancho California Water District
Rancho Santa Margarita Water District	Riverside Highlands Water Company
Running Springs Water District	San Antonio Water Company
San Bernardino Municipal Water District	San Bernardino Valley Municipal Water District
San Gorgonio Pass Water Agency	Santa Ana River Water Company
Santiago County Water District	Serrano Water District
Southern California Water Company	Terrace Water Company
Trabuco Canyon Water District	West Valley Water District
Western Heights Mutual Water Company	Western Municipal Water District
Yorba Linda Water District	Yucaipa Valley Water District

With so many organizations and agencies, some overlap exists and some facilities and infrastructure may be shared. However, based on the long history of cooperation and past integrated water resource planning, conflicts and competing policies that affect integrated water planning and management have been minimal among participants in the OWOW planning process.

Wastewater Agencies

SAWPA has worked directly with the following wastewater agencies and companies through our collaborative workgroups and task forces. All were contacted and invited to participate in the OWOW Program.

- Big Bear Regional Wastewater Authority
- Orange County Sanitation District
- Western Riverside County Regional Wastewater Authority

Where wastewater divisions and departments are operated by a city or by joint water and wastewater entities, these agencies are shown under the city or water agency categories. SAWPA has worked extensively with each of these wastewater agencies through the Santa Ana River Dischargers Association, as well as working with them on several task force efforts, such as the Basin Monitoring Program Task Force. The wastewater agencies have been particularly active in the Water Quality Pillar and Water Recycling Pillar efforts of the OWOW Program.

Flood Management Agencies

SAWPA has a strong and positive working relationship with all three flood control agencies through their involvement in the Integrated Stormwater Management Pillar, the Regional Water Quality Monitoring Task Force, the various TMDL (total maximum daily load) task forces administered by SAWPA, the Inland Empire Brine Line improvement project coordination, and low-impact development projects and other forums.

The flood management agencies involved in the OWOW planning process are as follows:

- Riverside County Flood Control and Water Conservation District
- San Bernardino County Public Works
- Orange County Flood Control Division

Self-Supplied Water Users

Users who provide their own water supplies include agricultural, industrial, and residential uses; park districts; school districts; colleges and universities; and others. SAWPA has worked with the following self-supplied water users in this OWOW plan update:

- March Air Reserve Base

Environmental Stewardship Organizations

Environmental stewardship organizations include watershed groups, fishing groups, land conservancies, and environmental groups. Recognizing the importance of the relationship of water and the environment, the OWOW Program has many environmental community members in the Natural Resources Stewardship Pillar, and in many collaborative workgroups and task forces. The organizations shown in Table 2.1-6 (listed alphabetically) participated in the OWOW Plan Update 2018 process.

Table 2.1-6. Environmental Stewardship Organizations Involved in the OWOW Planning Process

Audubon Society	California Coastal Conservancy
Coastal Coalition	Endangered Habitats League
Friends of the Northern San Jacinto Valley	Friends of the Santa Ana River
Inland Empire Resource Conservation District	Inland Empire Waterkeeper
Newport Bay Naturalists and Friends	Orange County Coastkeeper
Redlands Conservancy	Rivers and Lands Conservancy
Riverside Corona Resource Conservation District	San Jacinto Basin Resource Conservation District
San Jacinto River Watershed Council	Santa Ana Watershed Association
Sierra Club, San Gorgonio Chapter	Southern California Wetlands Restoration Project
The Nature Conservancy	The Wildlands Conservancy
Western Riverside Regional Conservation Authority	

Community Organizations

Community organizations engaged in the OWOW Plan Update 2018 include land owner organizations, taxpayer groups, social or environmental justice organizations, and recreational interests, shown in Table 2.1-7 (listed alphabetically).

Table 2.1-7. Community Organizations Involved in the OWOW Planning Process

Advancement Project California	American Civil Liberties Union
California Rural Water Association	Canyon Lake Property Owners Association
Catalina's List	Inland Communities Organizing Network
Jurupa Area Recreation and Park District	Orange County Conservation Corps
Trails 4 All	Santa Ana River Trail and Parkway Partnership

Industry or Business Organizations

Organizations consulted and involved in the OWOW planning process include those representing agriculture, developers, and other industries appropriate to the watershed, as shown in Table 2.1-8 (listed alphabetically).

Table 2.1-8. Industry and Business Organizations Involved in the OWOW Planning Process

American Society of Civil Engineers	Building Industry Association: Baldy View Chapter
Building Industry Association of Riverside County	Green Media Creations
Green Valley Initiative	Inland Action Group
Milk Producers Council	Raincross Group
Riverside County Farm Bureau	San Bernardino County Farm Bureau
Valley Group	Western Riverside County Agricultural Coalition

Other Interested Groups

OWOW Plan Update 2018 outreach and involvement efforts included other entities appropriate to the watershed, as shown in Table 2.1-9 (listed alphabetically).

Table 2.1-9. Other Interested Groups Involved in the OWOW Planning Process

Basin Technical Group of San Bernardino Valley	Brown and Caldwell
California Foundation on Environment and the Economy	Canyon Lake Chamber of Commerce
CDM	Chino Basin Watermaster
Chino Valley Chamber of Commerce	Cities of Murrieta and Temecula Business Group
Corona Chamber of Commerce	David Taussig & Associates
Ferguson Group	Greater Riverside Chamber of Commerce
Iger & Associates	Inland Empire Economic Partnership
Kennedy Jenks	Lake Elsinore Chamber of Commerce
National Water Research Institute	Newport Bay Watershed Executive Committee
Ontario Chamber of Commerce	RBF
Riverside Food Systems Alliance	San Antonio Canyon Stakeholders Committee
San Bernardino Area Chamber of Commerce	Santa Ana River Dischargers Association
SE Corporation	Southern California Water Committee
Stantec	Stillwater Sciences
Temecula Valley Chamber of Commerce	The Irvine Company

Table 2.1-9. Other Interested Groups Involved in the OWOW Planning Process

TKE Engineering	Urban Water Institute
Water Education Foundation	Western Riverside Council of Governments
Winning Words	

2.1.5. PUBLIC MEETINGS, CONFERENCES, AND PRESENTATIONS

The core of any public outreach program is the direct contact with interested stakeholder groups. The OWOW Plan Update 2018 relied on the strong familiarity that the OWOW Program has earned over many years of engagement. During this update cycle, SAWPA staff has been invited to speak before Councils of Government and other organizations about the process. As the OWOW Plan Update 2018 is approved, over ninety meetings were conducted in support of its development. As part of the OWOW Program, SAWPA staff has made more than 50 presentations to specific stakeholder groups, both to inform and to invite participation. Since July 2016, SAWPA has hosted multiple workshops, forums, and presentations in San Bernardino County, Orange County, and Riverside County to discuss the benefits of collaboration and multi-benefit watershed projects.

Since September 2011, SAWPA has hosted semi-annual OWOW watershed conferences. The most recent one was held on May 25, 2017, at the Ontario Convention Center, Ontario, California. A 2019 State of the Santa Ana Conference is scheduled on March 29 at California State University Fullerton. The annual conference is an opportunity for the public to become involved in the OWOW Program. The conferences also serve to reinforce the OWOW Program goals by encouraging a watershed focus and deepening collaboration in developing multi-benefit projects.

2.1.6. EMAIL BLASTS AND SOCIAL MEDIA

SAWPA maintains an extensive email list of about 4,000 contacts and distributes periodic communication to stakeholders using Constant Contact. The list is updated regularly, and anyone requesting information is added to the list. The mailing list also includes stakeholders outside the watershed who are interested in watershed issues.

The contact list includes representatives from 121 agencies associated with water, from flood control and water conservation districts to water supply agencies. It also includes contacts from the 66 incorporated cities within the watershed, including mayors, key department heads, city council members, and planning commissioners, and is kept up to date with the current California legislative representatives in the watershed. Also included are representatives from county, state, and federal governments; Native American Tribes; the real estate community; members of the environmental, agricultural, and development communities; consultants; trade associations; academia; media; nonprofit organizations; and others simply interested in water. SAWPA staff manage the @SAWPA_OWOW twitter handle, which is used as another communication channel to stakeholders in and outside the watershed. Twitter is used to communicate news and funding opportunities in the watershed, and occasionally to highlight items of interest to the watershed community.

SAWPA also maintains a presence on Facebook at https://www.facebook.com/SAWPAnews/, which is occasionally used for OWOW Program notifications. Video, when produced, is loaded to Facebook and YouTube (http://www.youtube.com/user/SAWPATUBE).

2.1.7. SAWPA WEBSITE

To support the OWOW planning process, SAWPA has made recent improvements to its website, including the OWOW Program webpage, which provides watershed stakeholders and the public with information and updates relating to SAWPA's IRWM program.

From the OWOW Program page can be found a story map about OWOW, copies of the OWOW Plans, descriptions of how the Program is governed, tools, and the project database.

Upcoming Events

The SAWPA website has an events calendar with a subscription option, which shares all public events taking place at SAWPA headquarters or on behalf of the OWOW Program anywhere in the watershed.

2.2. GOVERNANCE STRUCTURE

The One Water One Watershed Plan Update 2018 is the result of a bottom-up approach where the entire watershed community can participate in setting goals and prioritizing strategies for moving forward (Figure 2.2-1). The stakeholders—the local agencies, organizations, and other interested parties within the watershed—thoroughly examine the issues and contribute to these discussions. Expanding the involvement and collaboration of stakeholders at the ground level makes it possible to incorporate the deeper understanding of local issues afforded by stakeholders, as well as generating greater buy-in and support for the OWOW Program.

Figure 2.2-1. OWOW Program Organization

For the OWOW Program, the term "governance" describes the formal and informal collaborative decision-making that sits at the core of the bottom-up approach. Goals are set, strategies considered and recommended, and partnerships are built by those who step forward to participate in the program. In addition, explicit efforts which were initiated in the OWOW 2.0 Plan are continued in OWOW Plan Update 2018 to ensure that community expertise is sought from members of communities who have historically been under-represented in integrated water management planning (see the Disadvantaged Communities section). Leadership and coordination of the OWOW Program occurs at several levels:

- The watershed community at large is involved through the 10 Pillar workgroups (called Pillars because together they carry the load of decision-making), representing different watershed issues. The Pillars identify issues, recommend solutions, and write the OWOW Plans.
- The OWOW Steering Committee is a representative decision-making body composed of elected officials and representatives from the Counties of Orange, Riverside, and San Bernardino; municipalities; water districts; the private sector; and the environmental and regulatory communities. The OWOW Steering Committee develops the goals and objectives of the OWOW Plans, makes strategic decisions, prioritizes project tasks, and issues recommendations.
- The SAWPA Commission has five members, each an elected leader from one of the member agencies of SAWPA. The SAWPA Commission provides final direction, review, and approval.
- SAWPA administration and staff facilitate the OWOW Program on behalf of all watershed stakeholders under the standards and authority of the California IRWM Program.

2.2.1. PILLAR WORKGROUPS

In order to manage the technical and planning work, the stakeholders self-organize into separate Pillar workgroups based on specific water resource management areas, issues, or concepts. The Steering Committee approves the Pillar names and general scope of their attention. The Pillar workgroups, all volunteers, select how they will work together, have at times decided to change the name of their Pillar, and in the end deliver a subchapter that identifies the priority strategies most needed in the watershed to achieve the goals of the OWOW Plan.

Volunteers

Each Pillar has between 5 and 40 volunteer members, depending on the topic and interest level. The volunteers include participants from local agencies, special districts, non-profit organizations, university officials, Native American Tribes, and private citizens.

Chairs

Each Pillar is led by a volunteer chair with expertise in the watershed issue assigned to each particular group. The Pillar chairs are responsible for organizing, leading, and facilitating the workgroup process. SAWPA selected the Pillar chairs based on specific stakeholder

recommendations, and SAWPA contacted each recommended person to determine their interest in serving in the position. The final list of chair appointments was approved by the Steering Committee and ratified by the SAWPA Commission. No limits are placed on the duration of the position; however, a Pillar chair may hold only one chair position at a time.

Pillar Integration Coordination

In addition to identifying issues and potential strategies for their particular area of interest, the Pillars were asked to view the watershed problems from a multidisciplinary perspective that extended beyond their topic, and to consider other Pillars' perspectives. For example, the Water Resources Optimization Pillar had to keep environmental and habitat restoration issues in mind when developing their strategies. Through this process, synergies were developed and multi-benefit programs were identified. For example, this approach made it possible to incorporate the understanding that many downstream water resource and water quality problems could be more effectively and efficiently addressed upstream at the source, thus requiring collaboration with other entities. Over time, this collaboration among the Pillars provided a more unified vision, resulting in new integrated and multi-beneficial solutions to water resource challenges, which increased collaboration among jurisdictions and geographies. To further encourage collaboration between Pillars, the responsibilities of each were designed to overlap. This blurring of borders enhances the benefits of a unified vision for the watershed.

One of the main functions of the Pillars is to prepare the water resource management strategy chapters of the OWOW Plans. For the initial OWOW Plan, each Pillar prepared a subchapter of the OWOW Plan, documenting current conditions and issues, and describing current and future watershed management strategies. For the OWOW 2.0 Plan, the Pillars updated the subchapters to reflect recent changes and focused efforts on proposing new regional and integrated projects and programs to address the goals and objectives of the OWOW 2.0 Plan. For the OWOW Plan Update 2018, the Pillars worked together to address a series of legislative requirements and policy changes described in the 2016 IRWM Plan Guidelines, in particular the new requirements of AB 1249 (Salas, Chapter 717, Statutes 2014), Water Code Section 79742(e) related to ensuring that this plan supports overcoming climate vulnerabilities, and the introduction of the Sustainable Groundwater Management Act and its requirements.

The planning approach taken for the development of the OWOW Program transcends previous IRWM planning efforts by de-emphasizing planning solely as a prerequisite for an impending grant funding opportunity, or for the development of a list of specific projects. Rather, the emphasis was placed on building a collaborative approach among stakeholders to help meet long-term (2030 horizon) goals and objectives in an integrated and multi-beneficial manner.

OWOW Plan Pillar Structure

Under the initial OWOW Plan, 10 Pillars were established and organized along resource management areas (see list below), largely aligned with the Resource Management Strategies

identified in the California Department of Water Resources (DWR) Proposition 84 2016 IRWM Grant Program Guidelines (IRWM Guidelines).

Pillar Structure under the Initial OWOW Plan:

- Water Supply Reliability
- Flood Risk Management
- Water Quality Improvement
- Environment and Habitat Enhancement
- Water Recycling
- Parks, Recreation, and Open Space
- Water Use Efficiency
- Climate Change
- Water and Land Use
- Environmental Justice

OWOW 2.0 Plan Pillar Structure

In July 2011, as part of the OWOW 2.0 Plan development, SAWPA and the OWOW Program Steering Committee reviewed the OWOW Plan and made several revisions to the original OWOW Pillar structure to promote collaboration between groups for a more well-rounded vision. These new Pillars, along with their alignment with the DWR Proposition 84 IRWM Guidelines, are listed in Table 2.2-1.

Table 2.2-1. Pillar Structure under the OWOW 2.0 Plan

Pillars	Corresponding IRWM Guidelines Resource Management Strategies
Water Resources Optimization	• Reduce water demand • Improve operational efficiency and transfers • Increase water supply • Improve water quality
Beneficial Use Assurance	• Improve water quality
Water Use Efficiency	• Reduce water demand
Land Use and Water Planning	• Increase water supply • Improve water quality • Practice resource stewardship
Stormwater Resource and Risk Management	• Improve flood management
Natural Resources Stewardship	• Practice resource stewardship
Operational Efficiency and Water Transfer	• Improve the efficiency of water transfers and infrastructure in the watershed

Table 2.2-1. Pillar Structure under the OWOW 2.0 Plan

Pillars	Corresponding IRWM Guidelines Resource Management Strategies
Disadvantaged and Tribal Communities	• Included in IRWM Guidelines as part of Impact and Benefit standard
Government Alliance	• Create partnerships between DWR and member agencies
Energy and Environmental Impact Response	• Included in IRWM Guidelines as a separate standard

OWOW Plan Update 2018 Pillar Structure

Changes to the Pillar Structure

During the OWOW Plan Update 2018 planning process, the Pillars underwent further changes, as follows: the Beneficial Use Assurance Pillar became the Water Quality Pillar to better characterize its overall responsibilities. The Energy and Environmental Impact Response Pillar changed its name to Climate Risk and Response to more accurately reflect the Pillar's primary focus. To reflect the independent character and unique needs of the two communities, the Disadvantaged and Tribal Communities Pillar became the Disadvantaged Communities and Tribal Communities Pillar. The Stormwater: Resource and Risk Management Pillar became the Integrated Stormwater Management Pillar, which better captures the integrated approach the Pillar promotes. The Government Alliance Pillar was retired and the Operational Efficiency and Water Transfer Pillar was integrated into the Water Resources Optimization Pillar. These changes better reflect the Pillar goals and objectives of the OWOW Plan Update 2018 and are reflected in Table 2.2-2.

During the work undertaken by the Pillars, two changes were made by the participants. First, the Water Resources Optimization Pillar and the Water Recycling Pillar decided to work collaboratively and submitted a single section of Chapter 5. Alternatively, the Disadvantaged Communities and Tribal Communities Pillar decided to craft two sections of Chapter 5, one focused on recommendations related to disadvantaged communities and one related to Tribal communities.

Table 2.2-2. Pillar Structure under the OWOW Plan Update 2018

Pillars	Corresponding IRWM Guidelines Resource Management Strategies
Water Resources Optimization	• Agricultural Water Use Efficiency • Conjunctive Management and Groundwater Storage • Conveyance – Regional/Local • Desalination • Matching Quality to Use • Recharge Area Protection • Recycled Municipal Water • Surface Storage CALFED • Surface Storage Regional/Local • System Reoperation • Water Transfers • Watershed Management
Water Quality	• Conjunctive Management and Groundwater Storage • Drinking Water Treatment and Distribution • Ecosystem Restoration • Groundwater Remediation/Aquifer Remediation • Matching Quality to Use • Pollution Prevention • Salt and Salinity Management • Sediment Management • Urban Runoff Management • Water Dependent Recreation
Disadvantaged Communities and Tribal Communities	• Drinking Water Treatment and Distribution • Flood Risk Management • Land Use Planning and Management • Outreach and Engagement • Urban Water Use Efficiency • Water and Culture • Water-Dependent Recreation • Watershed Management
Climate Risk and Response	• Agricultural Water Use Efficiency • Economic Incentives • Land Use Planning and Management • Matching Quality to Use • Outreach and Engagement • System Reoperation • Urban Water Use Efficiency

Table 2.2-2. Pillar Structure under the OWOW Plan Update 2018

Pillars	Corresponding IRWM Guidelines Resource Management Strategies
Integrated Stormwater Management	• Conjunctive Management and Groundwater Storage • Flood Risk Management • Recharge Area Protection • Sediment Management • System Reoperation • Urban Runoff Management • Watershed Management
Land Use and Water Planning	• Agricultural Lands Stewardship • Conjunctive Management and Groundwater Storage • Ecosystem Restoration • Forest Management • Land Use Planning and Management • Outreach and Engagement • Recharge Area Protection • Urban Runoff Management • Water and Culture • Water-Dependent Recreation • Watershed Management
Natural Resources Stewardship	• Agricultural Lands Stewardship • Conjunctive Management and Groundwater Storage • Ecosystem Restoration • Forest Management • Land Use Planning and Management • Outreach and Engagement • Recharge Area Protection • Water and Culture • Water-Dependent Recreation
Water Recycling	• Matching Quality to Use • Recycled Municipal Supply • System Reoperation
Water Use Efficiency	• Agricultural Water Use Efficiency • Matching Quality to Use • Outreach and Engagement • Urban Water Use Efficiency
Data Management and Monitoring	• Outreach and Engagement

2.2.2. OWOW STEERING COMMITTEE

The OWOW Steering Committee oversees the development of the OWOW Plan. This decision-making body sets policy, approves the Goals and Objectives, and later reviews and approves the OWOW Plan. Some decisions remain within the Steering Committee, while some that are related to the IRWM Program must go before the SAWPA Commission for ratification.

Steering Committee Makeup and Administration

The OWOW Program Steering Committee consists of 11 members from the three counties (Orange, Riverside, and San Bernardino) within the Santa Ana River Watershed.[1] The following describes the composition of the Steering Committee:

- One supervisor from Orange County
- One supervisor from Riverside County
- One supervisor from San Bernardino County
- One mayor or city council member from a watershed city in Orange County
- One mayor or city council member from a watershed city in Riverside County
- One mayor or city council member from a watershed city in San Bernardino County
- Two SAWPA Commissioners selected by the SAWPA Commission
- One member representing the business community
- One member representing the environmental-advocacy community
- One member of the Santa Ana Regional Water Quality Control Board

In September 2012, the transition of OWOW Steering Committee members was clarified with adoption of an amended governance document defining the position terms and transition process.

The OWOW Steering Committee members serve 4-year terms with staggered end dates and may be appointed for multiple terms. A seated member who loses the status on which membership in the OWOW Steering Committee is based (for example, leaving an elected office) will continue as a member of the OWOW Steering Committee through the balance of that Steering Committee term, or until the entity that selected the member selects a new representative. Steering Committee members are selected as follows:

- SAWPA Commission representatives are selected by the Commission.
- County supervisors are selected by their respective boards.
- City representatives are selected by a majority vote of the council of governments in the respective county:
    - Riverside County: Western Riverside Council of Governments.
    - San Bernardino County: San Bernardino Council of Governments.

1. A small portion of Los Angeles County is within the Santa Ana River Watershed. The OWOW Program works to support planning and projects in this area, as does the neighboring Greater Los Angeles County IRWM Region. The two regions periodically communicate when opportunities and challenges arise in this area of overlapping jurisdiction. Both regions participate in the California IRWM Roundtable of Regions.

    - Orange County: Orange County Council of Governments.
- Business and environmental community representatives are selected by a majority vote of the eight governmental representatives on the OWOW Steering Committee, based on an application process conducted during a public meeting.
- The Santa Ana Regional Board representative is selected by the Regional Board.

During prior years, the OWOW Steering Committee benefitted from the San Bernardino County Supervisor being also a member of a local Tribal community and therefore able to share both perspectives and represent many communities. Since the departure of this Supervisor, there has not been a Tribal member participating on the OWOW Steering Committee. As can be seen in Chapter 5, Tribal members have made a recommendation that the OWOW Program work to ensure that Tribal communities have a voice in the governance of the Regional Water Management Group (RWMG).

The time commitment associated with the OWOW Steering Committee participation is somewhat dependent on the development activity of the OWOW Program and whether a funding opportunity occurs. Generally, the Steering Committee meets every 2 months. SAWPA provides full administrative support to the Steering Committee which is a Brown Act compliant governing body. SAWPA staff develop meeting agenda and facilitate Steering Committee meetings. The SAWPA general manager participates in each Steering Committee meeting.

Steering Committee Functions

The OWOW Steering Committee is responsible for the development of the OWOW Plans, and for developing suites of projects which can compete for IRWM Program funding when available. Developing the OWOW Plan begins by receiving from the stakeholders what are the highest priorities and most important goals for the watershed, and formally setting the goals for the OWOW Plan. Once set, the stakeholders can work to plan the right strategies for achieving those goals.

When implementation grants are available through the IRWM Program, the Steering Committee is responsible for setting eligibility criteria and developing a rating and ranking system for the competitive process of selecting projects that will be submitted by the region to the funding authority (almost always DWR).

In each case, the OWOW Plan and the suite of projects proposed for funding are approved by the Steering Committee, and passed to the SAWPA Commission for ratification, as the SAWPA Commission is the approved RWMG.

In carrying out its duties, the Steering Committee:

- Acknowledges that water resources of the Santa Ana River Watershed should be put to maximum beneficial use and that water waste must be prevented
- Recognizes water as a public resource and respects existing agreements governing the

water resources of the Santa Ana River Watershed Region

- Seeks regional solutions for regional problems
- Encourages collaboration across boundaries and between multiple parties in project development
- Considers subregional plans and planning efforts

During the OWOW planning process, the Steering Committee will fulfill the following functions:

- Oversee the development of an IRWM Plan
- Identify institutional barriers and opportunities for more efficient management that further advance the integration of water management activities
- Advocate for policy changes that increase interagency effectiveness and efficiency in integrated water management
- Provide incentives for the development of multi-benefit integrated projects through the allocation of state bond funds

2.2.3. SAWPA COMMISSION

SAWPA is governed by a Commission, which is described below. SAWPA is the approved RWMG for the Santa Ana Funding Area of the IRWM Program. As a regional water agency for the Santa Ana River Watershed, SAWPA has a long history of supporting watershed collaborative efforts of this kind.

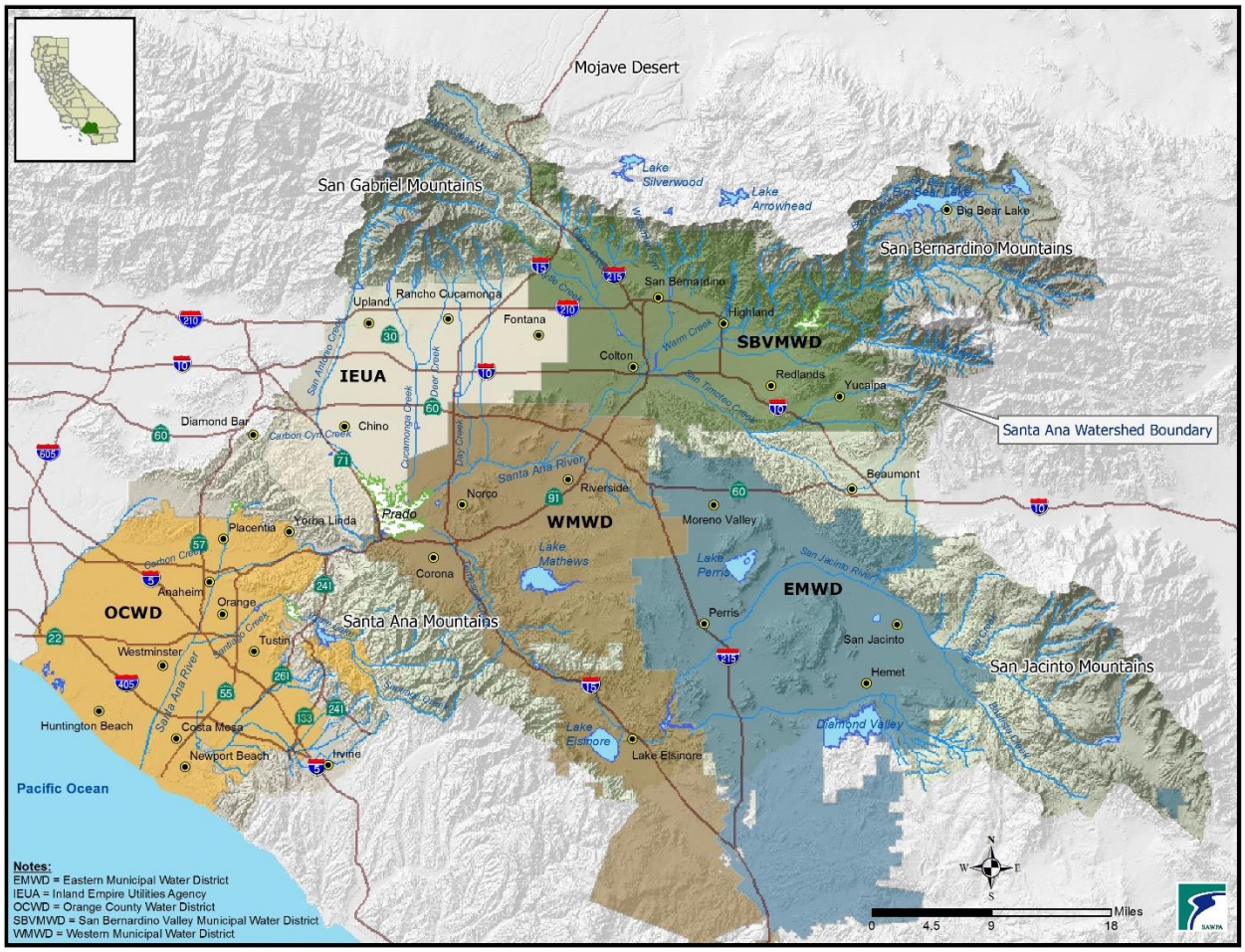
SAWPA and Its Member Agencies

SAWPA is the only DWR-approved RWMG for the California IRWM Program Santa Ana Funding Area. SAWPA is a joint powers authority focusing on a broad range of water resource issues, including water supply reliability, water quality improvement, recycled water, wastewater treatment, groundwater management, brine disposal, and integrated regional planning. Its stated mission is to develop and maintain regional plans, programs, and projects that will protect the Santa Ana River Basin's water resources and maximize beneficial uses within the watershed in an economically and environmentally responsible manner. As a joint powers authority consisting of more than three local agencies, more than two of which have statutory authority over water supply or water management, the RWMG meets the requirements of California Water Code Sections 10540, 10541, and 10539.

SAWPA's staff serve at the direction of the SAWPA Commission, which is composed of its five member agencies: Eastern Municipal Water District, Inland Empire Utilities Agency, Orange County Water District, San Bernardino Valley Municipal Water District, and Western Municipal Water District (see Figure 2.2-2, SAWPA Member Agencies). All five of these agencies have statutory

authority over water supply and water management in their service areas. These agencies service areas cover the majority of the land area within the Santa Ana River watershed.

Figure 2.2-2. SAWPA Member Agencies



Member Agencies

Eastern Municipal Water District

Eastern Municipal Water District is a retail water agency servicing an area of approximately 555 square miles in western Riverside County. The district serves a population of approximately 785,000 in seven incorporated cities and unincorporated portions of western Riverside County. In addition to its role as a retail agency, it also provides wholesale water to the sub-agencies Lake Hemet Municipal Water District, City of Hemet, City of San Jacinto, City of Perris, Nuevo Water Company, Elsinore Valley Municipal Water District, and Rancho California Water District.

As a member agency of the Metropolitan Water District of Southern California (Metropolitan), Eastern Municipal Water District gained a supply of imported water from the Colorado River Aqueduct and ultimately, water from Northern California through the State Water Project (SWP), which transports

water from Northern California via the California Aqueduct. The district's initial mission was to deliver imported water to supplement local groundwater supplies. Over time, the district's role changed as additional agency responsibilities were added, including groundwater production and resource management, wastewater collection and treatment, and finally regional water recycling.

Inland Empire Utilities Agency

Inland Empire Utilities Agency's service area covers about 242 square miles in the southwestern corner of San Bernardino County, and the agency serves a population of approximately 875,000. The agency provides regional wastewater service and imported water deliveries to nine contracting agencies: the City of Chino, City of Chino Hills, Cucamonga Valley Water District, City of Fontana, City of Montclair, City of Ontario, City of Upland, Fontana Water Company, and Monte Vista Water District.

As a member agency of Metropolitan, Inland Empire Utilities Agency provides supplemental water and regional wastewater treatment for both domestic and industrial clients and energy recovery/production facilities. In addition, the agency has become a recycled water purveyor and a biosolids/fertilizer treatment provider, and continues to focus on water supply salt management to protect the region's vital groundwater supplies.

Orange County Water District

Orange County Water District's service area covers more than 350 square miles, including the Orange County Groundwater Basin. The basin provides a water supply to more than 20 cities and water agencies, serving over 2.5 million people. Orange County Water District owns 1,600 acres in and near the Santa Ana River in Anaheim and Orange, which it uses to capture flows and recharge the groundwater basin. The district also owns 2,400 acres above Prado Dam, which uses it for water conservation and water quality improvement.

Orange County Water District's mission is to manage and protect the Orange County Groundwater Basin in northern and central Orange County. The groundwater basin supplies approximately two-thirds of the water used by over two million residents in the district's service area. Metropolitan imports the remaining one-third from the Colorado River and from Northern California through the Sacramento–San Joaquin Bay Delta SWP.

San Bernardino Valley Municipal Water District

San Bernardino Valley Municipal Water District's service area covers about 353 square miles, primarily in southwestern San Bernardino County, with a very small portion of its service area in Riverside County. The area within the district includes a population of around 695,000. San

Bernardino Valley Municipal Water District spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley. This service area includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, Grand Terrace, East Highland, Mentone, and Yucaipa. The district's mission is to import water into its service area through participation in the SWP. San Bernardino Valley Municipal Water District also is responsible for managing groundwater and surface water within its boundaries.

Western Municipal Water District

Western Municipal Water District's service area covers a 527-square-mile area of western Riverside County with a population of about 880,000 people. The district serves more than 24,000 retail and 8 wholesale customers with water from the Colorado River and the SWP. As a member agency of Metropolitan, Western Municipal Water District provides supplemental water to the cities of Corona, Norco, and Riverside and the water agencies of Box Springs, Eagle Valley, Lake Elsinore, Temescal Valley, and Temecula. The district also serves the unincorporated areas of El Sobrante, Temescal Creek, Woodcrest, Lake Mathews, and March Air Reserve Base. In addition, the district operates and maintains domestic and industrial wastewater collection and conveyance systems for retail and contract services customers in Lake Hills, March Air Reserve Base, Home Gardens, Corona, and Norco.

About one-fifth of the water that Western Municipal Water District purchases from Metropolitan comes from the Colorado River Aqueduct, and about four-fifths comes from the SWP, which transports water from Northern California via the California Aqueduct. The district currently imports a small quantity of water from the San Bernardino Basin and intends to increase these imports with the implementation of the Riverside–Corona Feeder project. The district also has several wells for pumping in its Murrieta Division.

Role of SAWPA and Member Agencies in RWMG Process

Over its five decades of existence, SAWPA has assisted with the preparation of the Santa Ana Regional Board's water quality control plan (Basin Plan) and multiple watershed management plans. Over the last 30 years, regional water planning has developed a growing emphasis on integrated watershed plans, and frameworks for such plans were shared by federal agencies. SAWPA, as a watershed entity, took the lead in preparing these plans for the Santa Ana River Watershed. Under its 2002 Santa Ana Integrated Watershed Plan, SAWPA staff and its consultants wrote and prepared much of the three-volume document, including extensive outreach with stakeholders throughout the watershed. Many collaborative outreach meetings were held to ensure input was obtained and included in the Santa Ana Integrated Watershed Plan. SAWPA fulfilled this role again during the June 2005 Update.

For the OWOW Plan Update 2018, SAWPA staff administered the program and supported the Pillar workgroups and the OWOW Steering Committee. These roles include hiring and managing

consultant services to support the planning process, and convening watershed stakeholder events for discussion, planning, and education. A cooperative funding agreement was executed with the U.S. Department of the Interior Bureau of Reclamation for support on climate change analysis.

SAWPA RWMG Administrative and Oversight Role

SAWPA is the approved RWMG, with the Commission governing the aspects of the OWOW Program that engage with the CA IRWM Program. This administrative oversight for the Santa Ana Funding Area IRWM Program includes coordinating the planning effort and administering grants. SAWPA arranges meetings of the OWOW Steering Committee, preparing agendas, taking and distributing minutes of the meetings, preparing staff reports when directed by the SAWPA general manager, and carrying out other related duties. The SAWPA Commission reviews the OWOW Program documents for compliance with applicable laws and guidelines, and when appropriate approves the OWOW Plan as the RWMG's IRWM Plan.

When the IRWM Program provides implementation grants, the SAWPA Commission is responsible to receive a proposed suite of implementation projects and programs from the OWOW Steering Committee. If found to be compliant with the IRWM Program and the Project Solicitation Package, the proposed suite of projects will be approved by the SAWPA Commission for a grant application to the funding authority. If awarded, the grant will be between the funding authority and SAWPA, with project proponents engaged through sub-agreements with SAWPA. Grant reporting and invoicing is aggregated by SAWPA for submission to the funding authority.

SAWPA OWOW Program Implementation

As the administrator of the OWOW Program and the RWMG for the Santa Ana River Watershed, SAWPA also works closely with several subregional IRWM planning efforts in the watershed to ensure their work is engaged by the OWOW Program, and that related efforts support each other. SAWPA staff reached out to all stakeholders of the subregional IRWM planning efforts and invited them to participate in the OWOW Program Pillar processes. In some cases, SAWPA staff also participated in the subregional IRWM planning process. Where subregional IRWM Plans had already been completed, these plans were shared with the Pillars to serve as background material for the Pillar planning efforts. In all cases, SAWPA took a leadership role in coordinating between the subregional IRWM lead agencies and the OWOW Program to ensure subregional planning work would be folded into the watershed-wide OWOW planning process as seamlessly as possible.

An innovation of the OWOW Plan Update 2018 was direct importing of project lists from subregional plans. In the "call for projects to be in the plan," SAWPA technical staff worked with counterparts from the following planning efforts to ensure the suites of projects submitted to those plans were directly imported into the OWOW Project Database, and that project proponents were instructed how to review the import and take ownership of the database entry. Appendix B, Projects Submitted for the OWOW Plan Update 2018, provides more information regarding the

projects submitted. The list will continue to be updated and is available on the SAWPA OWOW Program website (www.sawpa.org). Currently included in this effort are:

- The OC Plan (March 2018) (subregional IRWM Plan of North and Central Orange County)
- The Santa Ana River Parkway and Open Space Plan (March 2018) (California Coastal Conservancy)
- The Upper Santa Ana River Watershed IRWM Plan (January 2015) (subregional IRWM Plan for the watershed upstream of Prado Dam Reservoir)
- 2016 Chino Basin Stormwater Resources Management Plan (Functional Equivalency Document (May 2016) (Chino Basin Watermaster)
- Orange County Stormwater Resources Management Plan (March 2017)

As the RWMG, SAWPA serves as the state liaison for the Santa Ana Funding Area on behalf of the OWOW Program stakeholders and is responsible for all final report submittals, plan adoption processes, grant application submittals, and administrative oversight for the OWOW Program funding. SAWPA coordinates with neighboring IRWM regions about water resource planning efforts, primarily through the Roundtable of Regions but also on a case-by-case basis when items arise.

2.2.4. EVALUATION OF THE GOVERNANCE STRUCTURE

As part of the OWOW 2.0 Plan update, an evaluation was conducted of the OWOW Program's governance structure to ensure that the existing structure does in fact reflect a balance of interested persons or entities representing different sectors and interests, and provides them the opportunity to participate regardless of their ability to contribute financially to the IRWM Plan. Consideration was given to other possible governance models that address inefficiencies in the interplay between different authorities and roles of federal, state, local, and Tribal governments in water resource management, as described in a September 2010 publication prepared by the Johnson Foundation Freshwater Summit entitled *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges*. Periodic self-examination and assessment of appropriate water resource governance is important to ensure that such governance reflects a jurisdictional framework that integrates water quality and quantity management across geographic scales of governance, and to make recommendations about how to streamline intergovernmental interactions if such improvements are necessary. Further, opportunities should be explored to expand the application of successful cross-jurisdictional governance models that can be adapted to different authorities, create opportunities for local level leadership and innovation, and establish mechanisms for resolving inter-jurisdictional disputes.

As an initial step, DWR's 2016 IRWM Guidelines were reviewed to determine requirements for IRWM governance. Requirements for governance are defined as follows:

- Regional decision-making process: In describing decision making, define how information is collected and processed within the governance structure, and how a decision is vetted with stakeholders in the RWMG.

- Equal distribution of power and voice among stakeholders: Define what structures or procedures are in place that ensure there is an equal playing field for all stakeholders involved in the RWMG.
- Equal opportunity and representation of stakeholders in multiple roles (leadership, advisory) regardless of economic and power status within the RWMG: Define roles in the governance structure and explain how someone occupies that role. Explain how the governance structure invites participation in the workings of the RWMG.
- Terms of service for positions within the structure: Define the kind of time commitment that the positions require and their turnover.

The SAWPA member agencies have long recognized the value of having a watershed approach available to support their respective missions. As the OWOW Program formed, SAWPA, its member agencies and other stakeholders acknowledged the Program would best be served by an expanded governance structure. The OWOW Steering Committee was created to ensure broader spectrum of watershed stakeholders were engaged in decision-making. Through the Steering Committee, the OWOW Program benefits from the diverse perspectives of water, land, and civic leaders.

In evaluating other RWMG structures compared to the OWOW Program governance, one of the most striking differences was how the Pillars workgroups permit one of the most comprehensive grass-roots involvement processes in IRWM planning across the state. Using the Pillars centered on water resource strategies and asking for their voluntary involvement, even to the point of Pillars composing and authoring sections or chapters of the OWOW Plans has helped to ensure strong support by all those who have participated. This approach is uncommon compared to other IRWM regions, where a single consultant usually is hired to oversee the IRWM Plan development and work with stakeholder groups for input, however the consultant is ultimately responsible for writing the plan. Further, many of the 50 recognized IRWM regions across the state use the same consultant for their IRWM Plan development. This uniform approach for plan preparation, although effective in ensuring consistency and meeting IRWM Guidelines and requirements, may fail to achieve the buy-in and support of stakeholders or fulfill the synergistic development of integrated regional solutions as is intended by the California IRWM Program.

As the facilitator of the OWOW Program, SAWPA prioritizes a fair, neutral, and transparent process. This effort is reflected throughout the program, where all voices are acknowledged and respected. The governance mechanisms support decision-making based on the recommendations and strategies of stakeholders, where leaders select the direction and goals laid out by participants. Over the 10 years of the OWOW Program, evolution in conflict resolution, stakeholder engagement, and collaborative decision-making has occurred. For OWOW Plan Update 2018 this progression included changes in the Pillar structure, transitions in membership of the Steering Committee, and changes in the policies of incorporating projects into the OWOW Plan.

The OWOW Program during the OWOW 2.0 Plan update strengthened the significant commitment to engaging with "disadvantaged communities" in the watershed, represented by a renamed Pillar and the engagement of a specialized consultant who performed community engagement. OWOW Plan Update 2018 grew from that earlier commitment, and the conterminous Disadvantaged Communities Involvement Program supported this work.

The Santa Ana River watershed has many State and Federal agencies managing some aspect of the watershed. The previously mentioned publication, *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenge*, described the importance of including these managers in regional water planning. For the OWOW 2.0 Plan, the new Government Alliance Pillar, co-chaired by representatives from the U.S. Department of the Interior Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers, created a Government Resource Guide, developed as a lasting tool for local and regional managers. Having completed this work, the Government Alliance Pillar was disbanded for the OWOW Plan Update 2018. The OWOW Program retains a commitment to coordination among the federal, state, and local agencies in the implementation of future projects.

Finally, in review of the governance structure, mention is due the support to the OWOW planning process from the multi-agency task forces that SAWPA currently administers as a regional and watershed facilitator. These task forces focus on a range of issues, including surface and groundwater water quality, threatened species preservation and restoration, and establishing park and recreation trail opportunities that are integrated with water resources, among others. Taken together, these task forces include the participation of over 100 different agencies and organizations in the watershed. These task forces often involve retail and wholesale water agencies, groundwater management agencies, wastewater agencies, NGOs, businesses, universities, and other organizations, and their work has been integrated into the OWOW planning process, expanding the support and involvement of stakeholders throughout the watershed.

2.2.5. PLANNING UPDATES AND ADOPTION

The OWOW Plan will continue to be a living document that will be updated every 3 to 5 years in a coordinated manner with local, regional, and statewide plans. OWOW Plan updates will be adopted formally by the Steering Committee and ratified by the SAWPA Commission. There may be occasions where informal changes are conducted by SAWPA staff to reflect minor process, organization, or water management changes. The Pillars will continue to be an instrumental part of the update process by providing technical expertise and ensuring that the points of view of different disciplines and interest groups are taken into consideration.

Plan updates will incorporate, for example, changes to city general plans, land use elements, stormwater management plans, water and wastewater master plans, urban water management plans, county land use planning documents, and Southern California Association of Governments land use data.

In addition, new water management strategies will be incorporated into future versions of the OWOW Plan as additional knowledge is gained on the state of the watershed, new technologies and best practices are adopted, and changes in policy and public mindsets occur. Ensuring compliance with IRWM Plan Standards as released by DWR will also trigger small or large update efforts.

Starting with OWOW Plan Update 2018 a formal process has been developed to support a continuously-open Call for Projects to be Included in the Plan. This is distinct from calls for projects when grants are available. The OWOW Steering Committee will, at each formal meeting, receive a memorandum listing any projects that have been submitted by proponents since the last OWOW Steering Committee meeting. They will act to formally "include" the projects into the OWOW Plan (for more, see Chapter 6, Project/Program Review, Evaluation, and Prioritization). This system formalizes something that was handled ad hoc in earlier years.

Project proponents who wish to have their projects included in the OWOW Plan Update 2018 can enter project details at the online Project Submission Tool, designed, hosted, and maintained by SAWPA (http://www.sawpa.net/owow2018/main.htm). Having a project in the plan provides multiple benefits to the proponent, including access to IRWM implementation grant competitions, access to stormwater grant funding competitions, presence on a map tool that can help develop partnerships, as well as acclaim for being part of the watershed-wide effort.

The OWOW Plan Update 2018 will be provided to cities, counties, water suppliers, nonprofit organizations, and other regional and state agencies for use in their water resource planning efforts. It is anticipated that the findings will support planning efforts and updates to general plans, strategic plans, and other plans and programs. The document also will provide helpful input to Metropolitan's Integrated Resources Plan and DWR's California Water Plan Update 2018.

Any project proponent who is selected to receive funding available through the IRWM Program must officially adopt the OWOW Plan Update 2018 through their organizational administrative process prior to execution of a subgrant award from SAWPA within the IRWM Program. A list of project proponents that have adopted the OWOW Plan Update 2018 can be found on the OWOW website at www.sawpa.org.

2.3. COLLABORATION, COORDINATION, AND INTEGRATION

As is likely to occur within any watershed, sometimes conflicting goals or priorities of various watershed agencies can hinder progress toward collaboration and coordination. Within the Santa Ana River Watershed there are over 100 large and small water districts (Figure 2.3-1), local, regional, state and federal agencies, and public/private stakeholder groups. SAWPA recognizes that all of these stakeholders have their own valid interests in ensuring that there is sufficient clean, reliable water in the watershed, and SAWPA takes the initiative to keep all of these groups working together to solve the watershed's issues under the OWOW planning process and various other roundtable forums.

SAWPA strives for a collaborative approach to bring together the planning community, including both public and private sector planners, to advance the benefits of planning on a watershed scale and integrating watershed-wide thinking into the everyday planning process. Working with varied interests and agendas, this watershed planning process has opened the doors to great partnerships, funding opportunities, connectivity, and increased awareness of planning projects and opportunities—both in the city next door and in the community on the other side of the watershed.

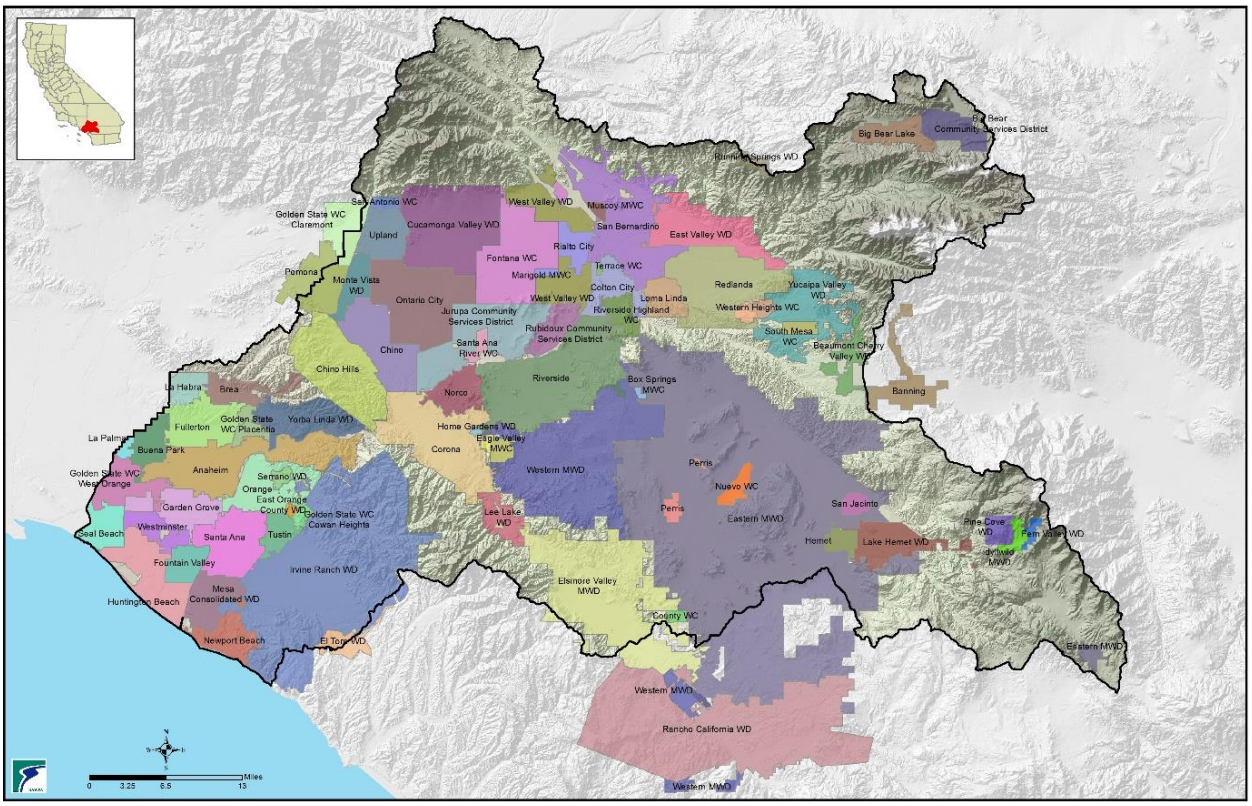


Figure 2.3-1. Santa Ana River Watershed Water Agencies Service Areas

As many cities and counties are in the process of updating their general plans, funding opportunities and greater collaboration between water agencies, non-governmental organizations (NGOs), and local land use authorities are facilitating beneficial projects such as conservation, open space, restoration, enhancement, connectivity, and multi-benefit approaches. In this way, planners are finding themselves in a new place: one of noting the quality of these projects and how to get them through the regulatory planning process with more agreement and greater speed. State law is helpful in this process because conservation, safety, open space, and land use are required elements of every general plan in the State of California. These elements provide essential components of good watershed plans. In addition, newly proposed fire hazard planning guidelines, as well as the more traditional floodplain management guidelines for preparation of general plans, include helpful explanations and instructions for planners trying to make sense of how watershed planning can be and should be integrated into general plan updates.

In developing regional plans and prioritizing multi-benefit projects, we should coordinate efforts not only with other planning agencies within the region, but also across regional boundaries. During the preparation of the OWOW Plan Update 2018, SAWPA staff exchanged information and discussed priorities with planners from regions adjoining the watershed. For example, SAWPA staff coordinated closely with planners and project proponents in south Orange County, the Los Angeles and San Gabriel River Valleys, and the upper Santa Margarita, Mojave, and Coachella Valley regions.

2.3.1. SAWPA AS WATERSHED COORDINATOR

SAWPA administers, coordinates, and facilitates efforts to address regional water management issues. SAWPA was formed to lead resolution of water issues and conflicts and is one of the primary reasons why it was formed in the first place. From the early 1930s to the late 1960s, litigation occurred between upstream and downstream water agencies in the watershed over water rights issues affecting the Santa Ana River, and an adjudicated settlement occurred. As part of the recommendations for the adjudicated settlement, a cooperative approach to resolving regional differences and conflicts was suggested, which was later realized by the creation of SAWPA.

> ***SAWPA has created a platinum template for integrated regional planning and a cooperative stakeholder process that can and should be copied across the States.***
>
> **—Frances Spivy-Weber, Former Vice-Chair, State Water Resources Control Board**

> ***Today we are presented with more and more challenges. SAWPA continues to play a vital role in initiating and facilitating roundtables in which stakeholders can develop solutions.***
>
> **—Garry Brown, Orange County Coastkeeper and Inland Empire Waterkeeper Executive Director**

The cooperative approach continues today in the regular meetings among the SAWPA member districts but also among the many multi-agency and multi-organizational collaboration that SAWPA supports through Roundtables and Task Forces. Both the Santa Ana Regional Water Quality Control Board and the State Water Resources Control Board Strategic Plan have acclaimed the Roundtables and Task Forces as outstanding examples of collaborative efforts to resolve water quality issues. SAWPA staff coordinate multi-agency agreements, manage consultant contracts, and administer discussion meetings. The end products of these efforts are successful programs and projects that represent the best in collaboration and facilitation support services.

The multi-agency roundtables, task forces, and workgroups shown in Table 2.3-1 (in alphabetical order) are in place at the time of the OWOW Plan Update 2018. Each of these is coordinated by SAWPA or has participation by SAWPA Commission or staff. These partnerships represent positive steps toward integrated and collaborative solutions.

Table 2.3-1. Roundtables, Task Forces, and Workgroups

Arundo Habitat Management	Basin Monitoring Program Task Force
Emerging Constituents Task Force	Forest First
Imported Water Recharge Workgroup	Lake Elsinore and Canyon Lake TMDL Task Force
Lake Elsinore/San Jacinto Watersheds Authority	Middle Santa Ana River Watershed TMDL Task Force
Regional Water Quality Monitoring Task Force	Santa Ana River Discharge Association
Santa Ana River Mitigation Bank	Santa Ana River Trail & Parkway
Santa Ana Sucker Conservation Team	Southern California Salinity Coalition
Team Arundo	Water–Energy Community Action Network

Because the OWOW Plan Update 2018 describes shared goals and strategies for achieving those goals, its long-term implementation will require coordinated activity between all those with related responsibilities. In SAWPA's role as a watershed coordinator, it is committed to the long-term implementation of the ideas within the OWOW Plan Update 2018. In addition, SAWPA will lead the successful implementation of any projects or programs funded by IRWM implementation grants, along with the project proponents to which SAWPA issues sub-agreements.

2.3.2. OVERVIEW OF GOVERNING LAWS, JUDGMENTS, AND AGREEMENTS

Past and current governing laws, judgments, and agreements that have had significant influence on water management and addressed conflicts in the watershed are listed in Appendix C.

2.3.3. COLLABORATIVE EFFORTS WITH AREAS ADJACENT TO OR OVERLAPPING THE WATERSHED

The immediately surrounding or overlapping RWMGs are shown on Figure 2.3-2, including the South Orange County Watershed Management Area and the Upper Santa Margarita, Coachella Valley, San Gorgonio, Mojave, Greater Los Angeles County, and Gateway Regions. The most recent close partnership was with the Upper Santa Margarita IRWM during the 2014 Emergency Drought Round of Proposition 84.

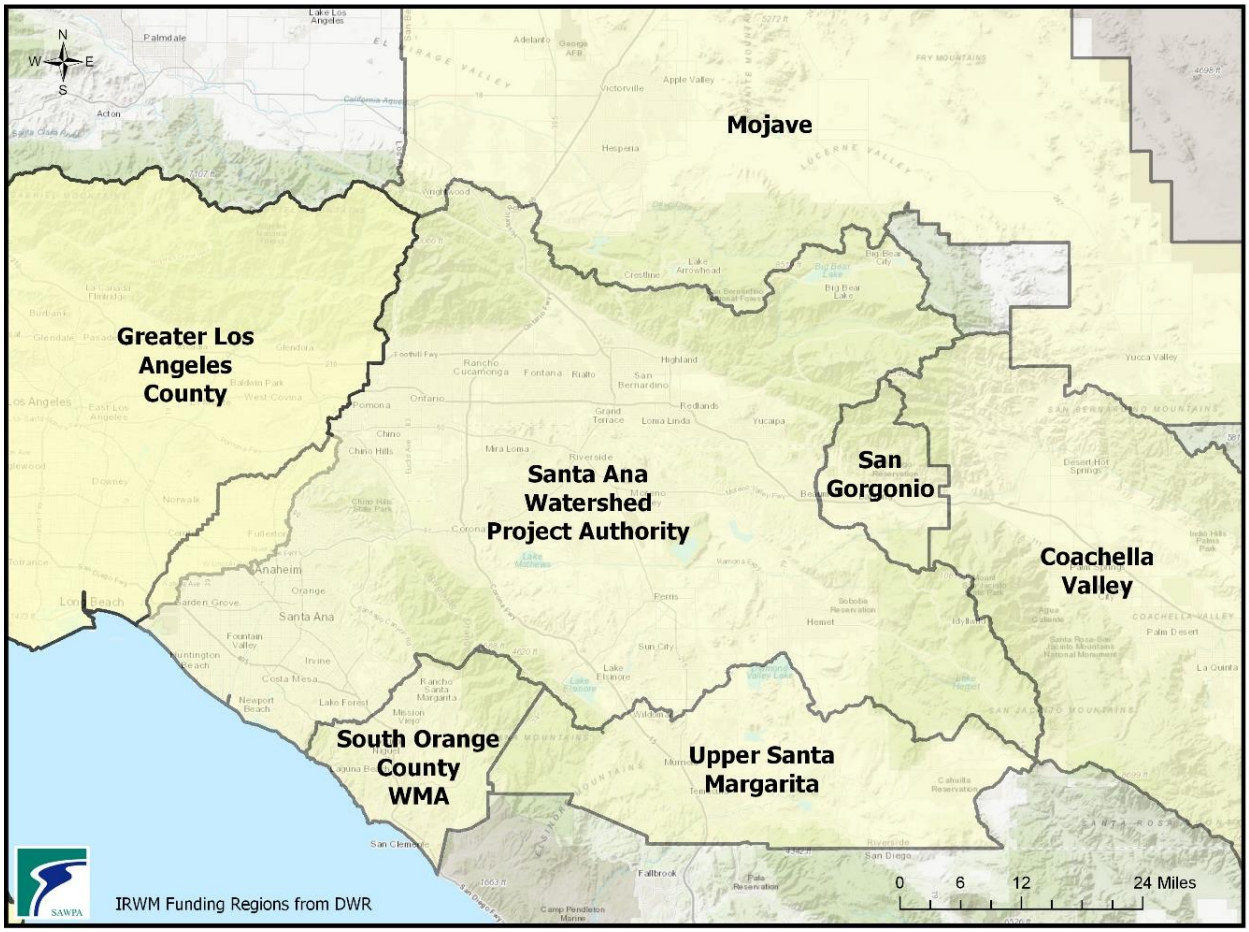


Figure 2.3-2. IRWM Funding Regions in Southern California

Roundtable of Regions

On behalf of the OWOW Program, SAWPA plays a significant role in promoting cooperation and coordination with neighboring regions as well as IRWM regions across the state through the Roundtable of Regions network. This coalition of IRWM regions voices and discusses common issues and concerns and has worked closely with DWR on many occasions.

The Roundtable of Regions has conducted informational surveys, organized collaborative workshops and conferences, and provided important input to DWR on grant applications and other legislative issues affecting IRWM regions. At the IRWM conferences, SAWPA has been closely involved in the sponsoring, planning, and presentation of the Roundtable of Regions events.

At the state level, SAWPA has participated on behalf of the watershed in many events, strategic sessions with DWR, and contributed to a focus group that resulted in the March 2017 Stakeholder Perspectives report released by DWR. This document contains recommendations from statewide practitioners of integrated water management to sustain and strengthen the California Integrated Regional Water Management Program.

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3. OWOW VISION, GOALS, AND OBJECTIVES

3.1. VISION

To guide the development of the initial One Water One Watershed (OWOW) Plan, the Santa Ana Watershed Project Authority (SAWPA), working with the Steering Committee and Pillars, established a vision along with goals and objectives for the Santa Ana River Watershed (watershed) that would allow a holistic approach to resource management. This initial vision has been adjusted over time with each successive OWOW Plan.

The vision of the OWOW Program is a Santa Ana River watershed that:

- Is sustainable, droughtproof, and salt balanced by 2040
- Avoids and removes interruptions to natural hydrology, protecting water resources for all
- Uses water used efficiently, supporting economic and environmental vitality
- Is adapted to acute and chronic climate risk and reduces carbon emissions
- Works to diminish environmental injustices
- Encourages a watershed ethic at the institutional and personal level

3.1.1. SHARED UNDERSTANDINGS

The stakeholders who gathered to develop the OWOW Plan created a set of shared understandings to help frame their collaborative planning and implementation efforts. The statements below remain at the core of the collaboration that is the OWOW Program.

- All water in the Santa Ana River Watershed is a precious resource. Climate change, continuing Colorado River drought, questions about the Sacramento–San Joaquin Bay Delta's vulnerability and its ability to reliably deliver water to Southern California, and interruptions to the hydrologic cycle as the result of our own successful growth and development will stress our ability to manage water and maintain the health of our watershed for economic and environmental sustainability.
- We are committed to investing time and resources for high-quality planning, both long range and short range, to ensure the best possible outcome and to achieve the vision of the Santa Ana River Watershed as droughtproof and salt balanced with continued economic and environmental vitality.
- As major conceptual changes are being considered, the quality of life of the residents must be protected, and the economic impact of a recommended change must be understood before implementation.
- To meet these challenges, the leadership in the watershed must consider significant review of current practices and expectations. The best solutions will likely engender new ways of thinking about water use and its value.

- Many advances in conservation and water use efficiency are needed, and the planning process should also consider whether agricultural water conservation measures could free up water for urban use or whether water could be purchased from agriculture for urban use.
- We are committed to employing emerging technologies to further urban water efficiencies and to develop new water supplies.

3.1.2. PRINCIPLES

With the vision established and the power of shared understanding, the stakeholders next established principles to guide the watershed planning. These principles serve as the guiding rules or qualities that most can support, and reflect the essential elements for watershed planning:

- The planning process must be watershed-wide and bottom-up using a holistic and systematic approach to watershed management.
- Planning must involve stakeholders representing counties, cities, and water districts, as well as the private sector and the regulatory, environmental, and environmental justice communities. The active participation of this diverse group of stakeholders integrates the different interests in the watershed across political boundaries.
- The OWOW Program must pursue multiple water and watershed objectives, including the following:
    - Ensuring reliable water supply
    - Ensuring high-quality water for all users
    - Preserving and enhancing the environment
    - Promoting sustainable water solutions
    - Managing rainfall as a resource
    - Preserving open space and recreational opportunities
    - Maintaining quality of life (including addressing the needs of members of overburdened communities)
    - Providing economically effective solutions
    - Improving regional integration and coordination
- The OWOW Program will drive integration whenever warranted, moving from a priority on providing abundant high-quality water at the lowest cost possible, to instead manage water resources sustainably and with regard for the needs of the environment.
- Watershed-wide planning transcends specific funding opportunities.
- Implementing the OWOW Program must be grounded in agreements among the watershed stakeholders.
- The OWOW Program must improve living conditions throughout the watershed, ensuring that an improvement in the welfare of one area is not at the expense of others.

3.2. GOALS AND OBJECTIVES

The OWOW Plan Update 2018 has six goals, which evolved from the earlier OWOW Plans. This evolution can be attributed to the changing understanding about the opportunities and challenges facing the watershed, as well as the lessons learned, and accomplishments achieved during implementation of the earlier plans.

The six goals of the OWOW Plan Update 2018 are as follows:

- Achieve resilient water resources through innovation and optimization.
- Ensure high-quality water for all people and the environment.
- Preserve and enhance recreational areas, open space, habitat, and natural hydrologic function.
- Engage with members of disadvantaged communities and associated supporting organizations to diminish environmental injustices and their impacts on the watershed.
- Educate and build trust between people and organizations.
- Improve data integration, tracking, and reporting to strengthen decision making.

To develop these goals, OWOW stakeholders gathered in two meetings that explored the past goals for their applicability to the current day. These ideas were brought before the OWOW Steering Committee, which engaged and provided guidance to stakeholders and SAWPA staff. The final goals and objectives were adopted by the OWOW Steering Committee as a foundational resource for the drafting of management and policy strategies. The OWOW Pillar workgroups used the adopted goals to develop their sections of the report, which are in Chapter 5.

In Table 3.2-1, the six goals are shown with many objectives; however, these objectives are not exhaustive. To achieve the goals, many more improvements will be required than the listed objectives. The listed objectives describe the near-term pursuits needed for the watershed to move toward achievement of the goals. Neither the goals nor the objectives have been prioritized; rather, among all the available opportunities and challenges in the watershed, the gathered stakeholders selected these to be of equal priority during the implementation window of the OWOW Plan Update 2018. Because these describe the highest priority across a spectrum of activities and authorities, they are unprioritized within this list.

Table 3.2-1. OWOW Plan Update 2018 Goals and Objectives

Goals	Objectives
Achieve resilient water resources through innovation and optimization.	Increase the reuse of water.
	Innovate to increase water-use efficiency, conservation, and interregional transfers.
	Manage precipitation as a valuable watershed resource.
	Reduce carbon emissions from water resource management.

Table 3.2-1. OWOW Plan Update 2018 Goals and Objectives

Goals	Objectives
	Safely strengthen links between flood protection, stormwater management, and water conservation.
	Sustainably manage groundwater basins.
	Plan for OWOW Program implementation beyond state grants.
Ensure high-quality water for all people and the environment.	Achieve and maintain salt balance in the watershed.
	Ensure that every human being in the watershed has safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.
	Protect and improve source water quality.
	Protect beneficial uses and attain water quality standards in freshwater and marine environments.
	Reduce water systems' vulnerability to climate impacts.
	Support alignment of regulatory action with watershed goals.
Preserve and enhance recreational areas, open space, habitat, and natural hydrologic function.	Conduct regional efforts to remove and manage invasive species.
	Preserve and restore beneficial hydrologic function of streams, arroyos, water bodies, and the coastal zone.
	Protect and restore wildlife corridors and habitat connectivity.
	Protect endangered and threatened species and species of special concern.
	Support healthy watershed policies with local land use authority.
Engage with members of disadvantaged communities and associated supporting organizations to diminish environmental injustices and their impacts on the watershed.	Adopt best practices for environmental justice action throughout water management.
	Analyze and confront unequal community vulnerabilities to climate impacts.
	Ensure that community voices help identify strengths and needs.
	Strive to include community cultural values in watershed management decision making.
	Support broad-based collaboration to alleviate homelessness and its impact on the watershed.
Educate and build trust between people and organizations.	Adopt policies strengthening transparency in water management decision making.
	Collaborate with educators to broaden youth knowledge about water.
	Develop strong ongoing consultation and partnership with Native American Tribes.
	Ensure that conservation is a way of life in the Santa Ana River Watershed.
	Innovate communication strategies for diverse communities.
	Maintain and grow watershed and sub-watershed collaborative water management efforts.

Table 3.2-1. OWOW Plan Update 2018 Goals and Objectives

Goals	Objectives
Improve data integration, tracking, and reporting to strengthen decision making.	Apply new technologies to maintain and enhance transparency and efficiency.
	Collaborate to produce regular publicly accessible watershed health reports.
	Develop standard data formats and data fields for comparative analyses.
	Increase appropriate access to data for decision makers, managers, and the public.
	Reduce redundancy in data collection in overlapping programs.
	Streamline regulatory reporting requirements.

3.3. ASSESSING PROGRESS TOWARD THE GOALS

To be an effective adaptive management tool, the OWOW Plans must update goals, develop strategies, support implementation, and then evaluate if the goals are being achieved. In adaptive management this evaluation step is often found hardest to complete. But doing so is of critical importance, and the OWOW Plans have always established this evaluation step to monitor for progress in watershed improvement.

OWOW 2.0 Plan contained a Watershed Assessment Tool, produced by the Council for Watershed Health using a system created first from an ecosystem valuation study conducted on behalf of the California Department of Water Resources (DWR). The Watershed Assessment Tool, like many other such watershed monitoring tools, proved how complex managing a watershed can be, primarily through an effort to link indicators of watershed health to an understanding of how the OWOW Program was impacting the watershed. Though valid and valuable, the tool proved difficult to use because of a reliance on inaccessible data or unmonitored systems.

In the years between OWOW 2.0 Plan adoption and the OWOW Plan Update 2018, the Water Foundation worked with Inland Empire Utilities Agency to pilot a Sustainable Water Management Tool. SAWPA was involved in this work and saw an opportunity to use some of the innovative ideas from that process.

As part of the California Water Plan Update 2018, DWR developed a Sustainability Outlook Tool for monitoring change in water resources statewide and sought partners to pilot the use of the tool. SAWPA formed a partnership with DWR in a new feedback tool for the OWOW Program that aligns with the ideas in the Water Plan, and supports the broad-based effort underlying the OWOW Program. More detail about this work can be found in Appendix D.

3.4. PLANNING TARGETS

The OWOW Plan Update 2018 holds the vision as the target—that is, a sustainable watershed. Planning to achieve that vision comes from this entire document, focused on the six goals. By striving toward those goals, the watershed will move toward achievement of the vision. The vision is an "infinite game," in that the effort necessary to achieve and then remain within the vision can never end. Sustainability, as it is used in the OWOW Program, is not a destination, it is a process.

For that reason, the OWOW Plan Update 2018 considers "progress toward the goals" as the planning target. Progress is the target. Table 3.4-1 shows how the OWOW Program, during implementation of the OWOW Plan Update 2018, will annually communicate with the OWOW Steering Committee and the stakeholders about progress. Using these indicators, decision makers at all scales will be able to adjust and adapt to the feedback received from the shared effort to improve the watershed.

These goals will not be achieved by just building projects using general-obligation bond money. The goals reflect the broad view that the OWOW Program holds, and the systems thinking that comes from the stakeholders and Steering Committee, which all bring various expertise to the collaboration. Because of this, the planning targets and indicators of progress toward goals are equally broad, selected for their ease of measurement and clear meaning that can be understood by all participants.

Table 3.4-1. Goals, Indicators, and Metrics

Goal	Indicator	Metric	Rationale
Achieve resilient water resources through innovation and optimization.	Optimization of locally managed supplies	Percentage of total annual supply sourced or managed locally	Optimizing supplies and storage in the region will make us more resilient. Water that is sourced locally or imported and stored locally is more reliable than water that is imported and must be immediately used.
	Efficiency of outdoor water use	Percentage of watershed population in agencies using parcel-level data to assess outdoor water use	Implementing innovative technology and data management can increase irrigation efficiency and help make landscapes less irrigation dependent. Landscape irrigation is the single largest use of water in the watershed and improving its efficiency will significantly increase watershed resilience.
Ensure high-quality water for all people and the environment.	Maintenance of groundwater salinity at or below target levels	Non-exceedance of groundwater salinity standards	Management of water quality in the groundwater basins of the watershed is essential to preserving their utility. Groundwater basins are the watershed's most important local water storage tool, and salinity levels are a primary consideration for maintaining a high-quality, reliable water supply.
	Safety of water for contact recreation	Percentage of monitored sites where recreational use is likely and identified as low risk due to bacterial contamination	Bathers in our streams, lakes, and coastal waters must be protected from undue health hazards from water quality impairment.
Preserve and enhance recreational areas, open space, habitat, and natural hydrologic function.	Abundance of vegetated riparian corridor	Area of vegetated riparian corridor	Active engagement in conserving and restoring riparian vegetation is necessary to retaining and enhancing the values supported by this resource. Vegetation within the riparian corridors of the watershed provides valuable habitat for a large number of species, including those with special status. It also provides beauty and shade for people recreating alongside streams and lakes.
	Abundance of conserved open space	Area of conserved open space	Deliberate management and protection is necessary to maintain the recreational and ecosystem values of open space.
Engage with members of disadvantaged communities and associated supporting	Equitable access to clean drinking water	Difference in the drinking water contaminant index from CalEnviroScreen between less resourced parts of the community and more	Ensuring that all people in the watershed have clean drinking water is essential to human health and prosperity within the watershed.

Table 3.4-1. Goals, Indicators, and Metrics

Goal	Indicator	Metric	Rationale
organizations to diminish environmental injustices and their impacts on the watershed.		resourced parts of the community	
	Proportionate implementation of climate change adaptation strategies	Difference in tree and shrub density between less resourced parts of the community and more resourced parts of the community	Targeted implementation of climate change adaptation strategies that address the potential for increased dangerous heat, a climate change impact predicted in the watershed, will reduce the extent to which vulnerable people are inequitably impacted.
Educate and build trust between people and organizations.	Collaboration for more effective outcomes	Percent of entities regulated by a total maximum daily load (TMDL) that have made financial or in-kind contributions to TMDL implementation	Collaborative action with shared outcomes must be prioritized by water managers because many of the complex challenges facing the watershed cannot be overcome by a single organization.
	Adoption of a watershed ethic	Total gallons of potable water used per capita per day watershed-wide	Helping conservation become a way of life in California involves education and civic action. As more people learn how precious our water and watershed are, many of the challenges will be more easily overcome.
Improve data integration, tracking, and reporting to strengthen decision making.	Broader access to data for decision making	Percentage of watershed population in agencies whose residential customers receive relative performance information about their water use	Everyone who uses water is a decision maker. Informing people how they are using water relative to past and/or budgeted use will improve decisions, increase efficiency, and make us more resilient.
	Participation in an open data process	Percentage of watershed population in agencies participating in establishment of a regional data sharing system	Our ability to create data is outstripping our ability to make effective use of it. Ensuring that data produced is meaningful, is applied to decision making, and is shared freely without jeopardy is a critical next step for the watershed.

4. WATERSHED SETTING

4.1. PHYSICAL SETTING

The One Water One Watershed (OWOW) Plan is responsible for the Santa Ana Funding Area of the California Integrated Regional Water Management (IRWM) Program, which includes multiple watersheds, with the Santa Ana River Watershed (watershed) the largest in area by a considerable margin. The OWOW Plan boundaries nearly match the boundaries of the Santa Ana Regional Water Quality Control Board (Regional Board). The watershed, depicted in Figure 4.1-1, drains a 2,840-square-mile area. The watershed is home to over 6 million people and includes major population centers in Orange, Riverside, and San Bernardino Counties, as well as a small area of eastern Los Angeles County. The Santa Ana River flows over 100 miles and drains the largest coastal stream system in Southern California. It discharges into the Pacific Ocean at the City of Huntington Beach. The total stream length of the Santa Ana River and its major tributaries is about 700 miles.

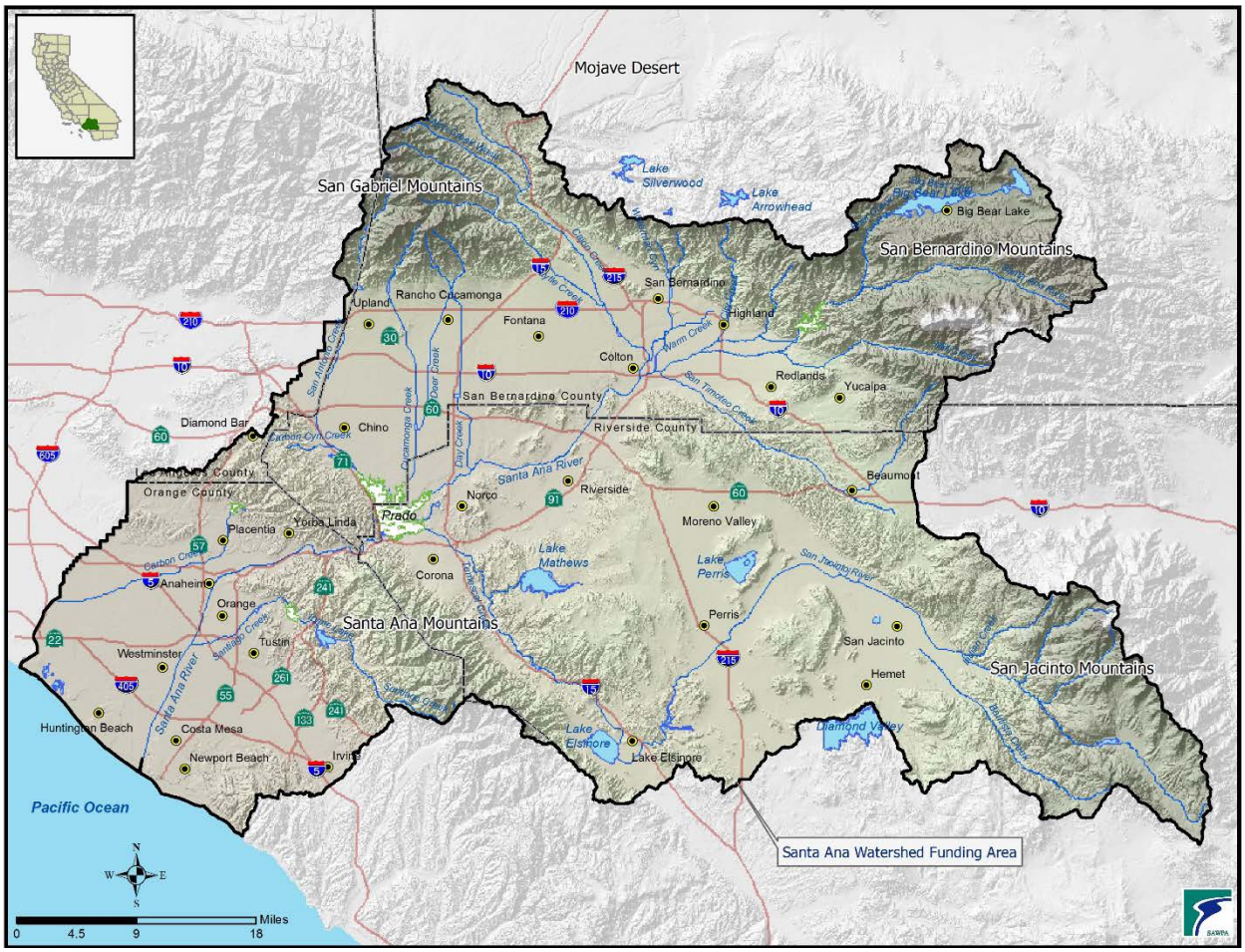

Figure 4.1-1. Santa Ana Funding Area of the IRWM Program

The upper watershed, or headwaters, including the highest point in the drainage system, is delineated by the east–west ridgeline of the San Gabriel and San Bernardino Mountains. Past this ridgeline lies the Mojave Desert, which is part of the Lahontan Basin. The principal tributary streams in the upper watershed originate in the San Bernardino and San Gabriel Mountains. These tributaries include San Timoteo, Reche, Mill, Plunge, City, East Twin, Waterman Canyon, Devil Canyon, and Cajon Creeks and University Wash from the San Bernardino Mountains, while Lone Pine, Lytle, Day, Cucamonga, Chino, and San Antonio Creeks are tributaries from the San Gabriel Mountains.

In the southern portion of the watershed, the regional boundary divides the Santa Margarita River drainage area, which is not part of the watershed, from that of the San Jacinto River. The San Jacinto River, which is part of the watershed, starts in the San Jacinto Mountains, runs west through Canyon Lake, and normally ends in Lake Elsinore. In wet years, the San Jacinto River will overflow the lake and connect with the Santa Ana River through the Temescal Wash. Flood flows from the San Jacinto River produce a broad, shallow wetlands area called Mystic Lake.

The other important watersheds in the Santa Ana Funding Region include the Newport Bay Watershed, which encompasses approximately 154 square miles. The Newport Bay Watershed is bounded to the north by the Santiago Hills (Loma Ridge) and to the south by the San Joaquin Hills. The Tustin Plain, a broad alluvial valley, occupies the largest portion of this watershed. The Newport Bay Watershed is within the U.S. Geological Survey Hydrologic Unit 18070204. The Newport Bay Watershed includes the San Diego Creek subwatershed, with an area of 119 square miles, which is the largest system draining into upper Newport Bay. The Santa Ana–Delhi Channel drains 17 square miles and Big Canyon Wash drains 2 square miles. The remaining 16 square miles is divided among several small subwatersheds that discharge into lower Newport Bay.

Three other important watersheds are the Anaheim Bay–Huntington Harbour, Lower San Gabriel River and Coyote Creek watersheds. The Anaheim Bay–Huntington Harbour watershed is about 81 square miles, drained by the Bolsa Chica Channel and the East Garden Grove–Wintersburg Channel. About 85 square miles of the Coyote Creek Watershed are considered within the Santa Ana Funding Area because it is within Orange County. The remainder of the Coyote Creek Watershed is in Los Angeles County. Coyote Creek is tributary to the San Gabriel River, which drains eastern Los Angeles County with a discharge in Long Beach.

Because these other watersheds are in essence subwatersheds and are much smaller than the Santa Ana River Watershed, this report and general convention describe the Funding Area and the Santa Ana River Watershed as interchangeable. Ensuring that the smaller watersheds are included in the plan and are engaged during the implementation of projects that strive to achieve the OWOW goals is important to the OWOW Program. For readability and ease of communication, the OWOW Plan Update 2018 does not always list all of these different hydrologic systems when discussing the broader management system.

4.1.1. CLIMATE

The watershed has a Mediterranean climate, with hot, dry summers and cooler, wetter winters. Average annual precipitation ranges from 12 inches in the coastal plain to 18 inches in the inland alluvial valleys, reaching 40 inches or more in the San Bernardino Mountains. Most of the precipitation occurs between November and March in the form of rain, with variable amounts of snow in the higher mountains of the watershed. The weather cycle of the region results in high surface water flows in the spring and early summer period, followed by typically low flows during the dry season. Winter and spring floods generated by snowmelt or rain in the high mountains are not uncommon. Similarly, during the dry season, severe thunderstorms in the high mountains periodically have generated torrential floods in local streams.

Impacts from a Changing Climate

The changing climate is already negatively impacting California and the watershed. Among the many challenges, historic hydrologic patterns can no longer be relied on to forecast the water future. As such, the system of imported water that provides significant supply to the region has become less reliable. Precipitation and associated runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management, and ecosystem functions. The average early snowpack in the Sierra Nevada has decreased, the sea level has risen along California's coast, and the state's average temperature has risen. A statewide average temperature statistic masks that most of the increased temperature readings are at night and during the winter season, with higher elevations showing the greatest increase. These areas have increased in temperature much more than the statewide average change and are therefore more impacted by the change. Rainfall has become increasingly variable, with Southern California experiencing both its driest and its wettest years on record within the past decade.

Significant impacts from climate change are expected in the watershed, the precise nature of each will vary across the watershed. The OWOW 2.0 Plan identified direct impacts to the common water management sectors (see Table 4.1-1). For the OWOW Plan Update 2018, these were considered in-light of new analysis within the State of California, and from a renewed partnership with the U.S. Department of the Interior Bureau of Reclamation (Reclamation). Additional impacts were considered and are included below the table and within the Climate Risk and Response Pillar section in Chapter 5.

Table 4.1-1. Climate Change Impacts under the OWOW 2.0 Plan

Water Management Sector	Climate Change Impacts
Water Supply	• Insufficient local water supply • Increased dependence on imported supply • Inability to meet water demand during droughts • Shortage in long-term operational water storage capacity
Water Quality	• Poor water quality • Increased water treatment needs

Table 4.1-1. Climate Change Impacts under the OWOW 2.0 Plan

Water Management Sector	Climate Change Impacts
Flooding	• Increased flash flooding and inland flooding damage • Increased coastal flooding and inundation of coastal community storm drains • Damage to coastal community sewer systems from sea-level rise
Ecosystem and Habitat	• Damage to coastal ecosystems and habitats • Adverse impacts to threatened and sensitive species from reduced terrestrial flows and sea-level rise

Generally, it became clear that to properly prioritize climate vulnerabilities the spatial variability of the watershed must be considered. The known vulnerabilities are each a high priority somewhere in the watershed. Increased incidence of wildfire and sea-level rise are both vulnerabilities in the Santa Ana River Watershed, but they are of a higher priority in the parts of the watershed where they are more likely to manifest.

At the coast, sea-level rise will impact land use, recreation and its important economic benefits, and the management of groundwater basins. Moving upstream, flashier precipitation events are expected to impact localized flooding, larger-scale flood risk management, and the challenges related to nonpoint-source pollution in urban runoff. Communities of vulnerable populations (low-income, elderly, youth) will be impacted be increased extreme heat, particularly an increase in night-time high temperatures. Urban heat island effects will become more pronounced by extreme heat days and the growth of developed landscape. Still further upstream, the wildland–urban interface will likely confront additional incidents of wildfire followed by slope instability. In the upper watershed, forest and meadows will be stressed by changes in precipitation and temperature which in turn will produce impacts down the entire watershed, in addition to burdening significant species and open space recreation.

Because climate risk is systemic across the watershed, this OWOW Plan Update 2018 considers climate adaptation and mitigation as critical to all aspects of implementation. Water and watershed projects today must be resilient to the changing conditions of climate and respond directly to minimize the risk the watershed and its communities face from the projected climate impacts. For this reason, the OWOW Program has adopted an eligibility criterion for projects seeking IRWM grant funding where they must be resilient to the changing future conditions which include the impacts of climate.

The nature of the climate vulnerabilities is also acknowledged in OWOW Plan Update 2018 as impacting the speed or scale that known challenges are faced by the watershed. What this means is that most projects that would be done to improve the reliability, effectiveness, or efficiency of water and watershed systems are the same projects that should be undertaken to diminish climate vulnerabilities. Preparing for drought, managing urban nonpoint pollution, protecting habitat or species … these are all efforts that are needed with or without projected climate change impacts.

The two vulnerabilities that are slightly different are sea-level rise, and the public health impacts of increased heat. Sea-level rise adaptation is a critical need for the coastal communities of the watershed, and attention must be paid by all watershed communities to the potential impact of sea-level rise on the imported water flows from the Sacramento–San Joaquin Bay Delta (Delta).

The OWOW Plan Update 2018 acknowledges the public health challenges that increased heat may bring to the watershed, but has not yet grappled with how integrated water management will be impacted or can be supportive of adaptation to these challenges. Future work is needed among watershed managers, public health professionals, and the community at large.

Key to overcoming the impacts of climate change in the watershed will be collaborative adaptive management, which is fundamental to the OWOW Program, and a well-established way of working in the watershed at multiple scales. The OWOW Plan Update 2018 includes important feedback mechanisms to the decision makers and stakeholders about progress towards the shared goals. The OWOW Plan Update 2018 makes a commitment to the cycle of analysis, planning, implementation, and monitoring whereby stubborn challenges and missed opportunities can be identified and engaged with.

4.1.2. HYDROLOGY AND GEOMORPHOLOGY

The flow of water in the streams of the Santa Ana River watershed is significantly different today than prior to the installation of flood management and water supply infrastructure. Only 20% of the Santa Ana River is a concrete channel, mostly near the mouth of the river in Orange County. Runoff from irrigated landscapes and discharge from wastewater treatment plants change the volume, timing, and frequency of historical surface flows, supporting perennial base flow in many parts of the developed Santa Ana River stream network. Historically, as populations increased, urban runoff and wastewater flows increased on the Santa Ana River. Between 1970 and 2000, the total average volume rose from less than 50,000 to more than 146,000 acre-feet per year (AFY), as measured at Prado Dam. Estimated future discharges of water from publicly owned treatment plants to the Santa Ana River are expected to decline due to conservation and increased recycling. This, along with reductions in rising groundwater, means that projected Santa Ana River base flows reaching Prado Dam are significantly lower that what occurred from the early 1990s to 2005 (OCWD Long-Term Facilities Update 2014, page 2-16). As a result of their modeling, the Orange County Water District (OCWD) developed three base flow projections, as shown in Figure 4.1-2.

Rivers and streams are very dynamic, and much more than water flows in them. The movement of materials, energy, and organisms associated with the streams, riparian areas, and adjoining upland environments depends on the movement of water within the watershed. To the extent that this movement is altered by human action, the system can become dysfunctional for species that depend on it, reducing ecosystem functionality.

Because flows in the upper watershed consist mainly of snowmelt and storm runoff from the undeveloped land in the San Bernardino and Cleveland National Forests, water quality tends to be high, with low concentrations of total dissolved solids, nitrates, and other pollutants. In this zone, the Santa Ana River channel is confined in its lateral movement, contained by the slope of the high, mountainous terrain. Within the upper watershed, the Santa Ana River and its tributaries travel around large boulders and over sand and gravel bars punctuated by pools and riffles reaching depths of about 6 feet.

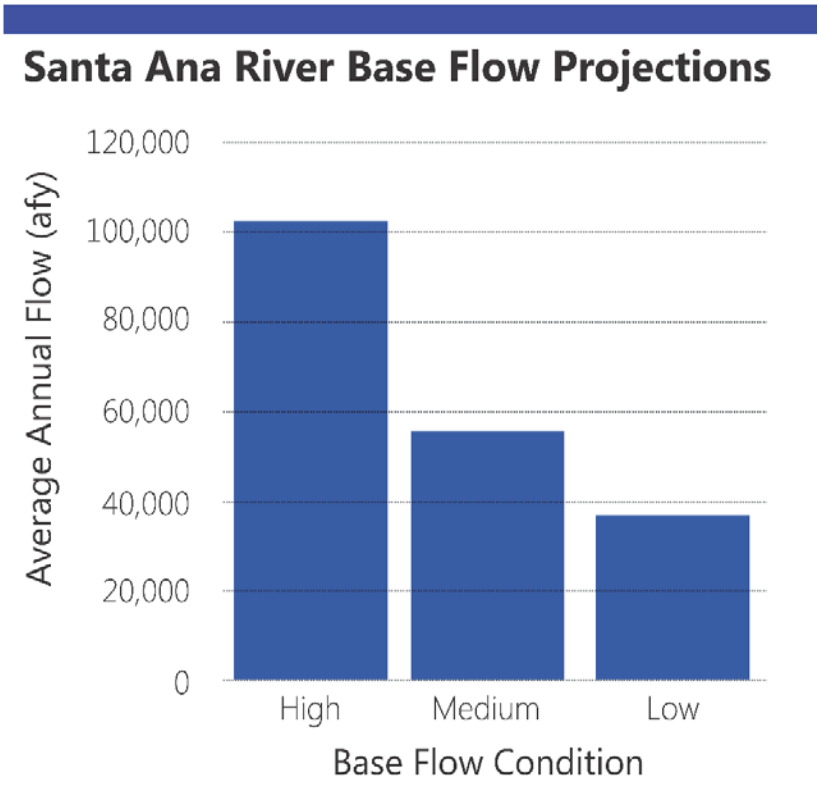

Figure 4.1-2. Santa Ana River Base Flow Projections

River flow from Seven Oaks Dam to the City of San Bernardino consists mainly of storm flows, flows from Lower San Timoteo Creek, and groundwater that is rising due to local geological features. From the City of San Bernardino to the City of Riverside, the river flows perennially, and much of the reach is operated as a flood control facility.

From the City of Riverside to the recharge basins below Imperial Highway, river flow in Orange County consists of highly treated publicly owned treatment works effluent, urban runoff, irrigation runoff water, imported water applied for groundwater recharge, and groundwater forced to the surface by underground barriers. Near Corona, the Santa Ana River cuts through the Santa Ana Mountains and the Peralta–Chino Hills, which together form the northern end of the Peninsular Ranges in Southern California.

The Santa Ana River then flows down onto the Orange County coastal plain, where the channel lessens in gradient, the valley floor is reached, and the soft features of the channel where sediment has deposited are more prevalent. Santiago Creek, the only major tributary to the lower Santa Ana River, joins the Santa Ana River in the City of Santa Ana. Prior to channelization of the lower watershed in the mid-1800s was characterized by a channel that meandered slowly across broad floodplains, and during heavy winter storms it would flood vast areas of the Orange County coastal plain. Currently, the Santa Ana River is a concrete channel from 17th Street in the City of Santa Ana to Adams Avenue in Huntington Beach.

The riverbed is ordinarily dry from 17th Street in the City of Santa Ana to the Victoria Street Bridge. The Greenville–Banning Channel, which carries stormwater discharge and urban runoff, is channelized to the Victoria Street Bridge, where it joins the Santa Ana River. Discharge from the Greenville–Banning Channel combines with tidal flow from the Pacific Ocean, and the Santa Ana River is wet from the Victoria Street Bridge to the mouth of the Santa Ana River.

A video flythrough of the Santa Ana River Watershed is available here: http://www.youtube.com/watch?v=HXDQCXKP6lM.

4.1.3. GROUNDWATER

Groundwater is a major source of water supply in the watershed and is a key component for each agency in the watershed. Protection of this source is critical to maintain the viability of local water supplies. None of the managed groundwater basins from which supply is sourced are in jeopardy of overdraft. There are, however, many key groundwater quality issues in the watershed, including the management of salt, nitrates, and contamination plumes, as well as the presence of nitrates, arsenic, perchlorate, and hexavalent chromium (chromium-6) in water supply wells. The Santa Ana Regional Board's water quality control plan (Basin Plan) identifies 39 groundwater management zones in the watershed, as shown on Figure 4.1-3.

The configuration of bedrock and the extensive faulting in the watershed area strongly affect the groundwater in the watershed. Most groundwater basins are unconfined, much like a bowlful of sand that has had water poured in halfway to the top. However, the area's geology, including the variable depth to bedrock and the presence of faults, causes pressure zones where water flows toward, or all the way up to, the surface. In general, groundwater flows in the same direction as surface waters: from the mountains in the east/north to the Pacific Ocean in the west. There are about 40 groundwater basins in the watershed, many of which are interrelated. Some of the largest groundwater basins include the Chino Basin (Chino/Ontario/Fontana area), the Orange County Basin, the Bunker Hill Basin (San Bernardino), the San Timoteo Basin (Yucaipa/Banning/Beaumont area), and the San Jacinto/Hemet Basins.

Four primary faults traverse the watershed, with other minor faults either branching off from, or running parallel to, the major faults (Figure 4.1-4). Within the upper watershed, the San Andreas Fault divides the San Bernardino Mountains from the San Gabriel Mountains and branches off into the San Jacinto Fault near San Bernardino. Known as Southern California's most active fault, the San Jacinto Fault affects groundwater in the San Jacinto River and the Santa Ana River, forcing groundwater to the surface at the Bunker Hill Dike. Toward the central watershed, the Elsinore–Whittier Fault passes under the Prado Dam from the northwest to the southeast. Toward the coast, the Newport–Inglewood Fault enters the region from the Los Angeles area and passes offshore near Newport Beach.

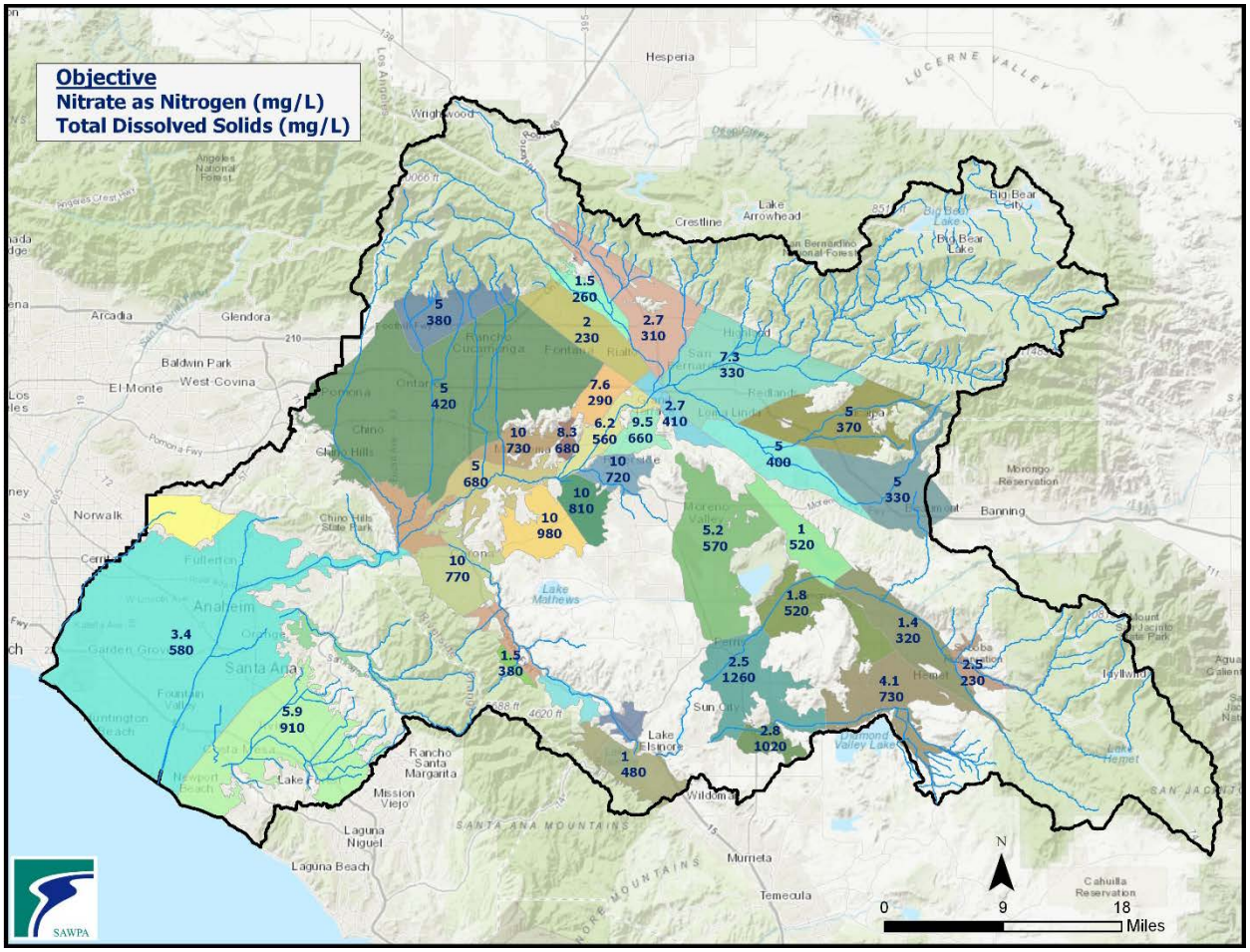

Figure 4.1-3. Groundwater Management Zones in the Santa Ana River Watershed

A major change since the adoption of the OWOW 2.0 Plan is the passage of the Sustainable Groundwater Sustainability Management Act (SGMA) in 2014. Several of the watershed's groundwater basins as defined by DWR Bulletin 118 have formed a Groundwater Sustainability Agency (GSA) by the state's mandated deadline of 2017 and are developing a corresponding Groundwater Sustainability Plan (GSP).[1] Most of the GSAs in the watershed are in the process of developing their GSPs and some have received grant funds for this purpose.

SGMA provided an alternative compliance option that allowed for the preparation of an alternative that demonstrated sustainable management of the groundwater basin for at least 10 years. Agencies and jurisdictions overlying the Coastal Plain of Orange County complied with SGMA through the preparation of the Basin 8-1 Alternative (OCWD, City of La Habra, and Irvine Ranch

[1] Bulletin 118 is California's official publication on the occurrence and nature of groundwater statewide. Bulletin 118 defines the boundaries and describes the hydrologic characteristics of California's groundwater basins and provides information on groundwater management and recommendations.

Water District 2017). Except for the Cities of La Habra and Brea, who plan to manage a portion of Basin 8-1, the agencies and jurisdictions overlying Basin 8-1 do not plan on forming GSAs.

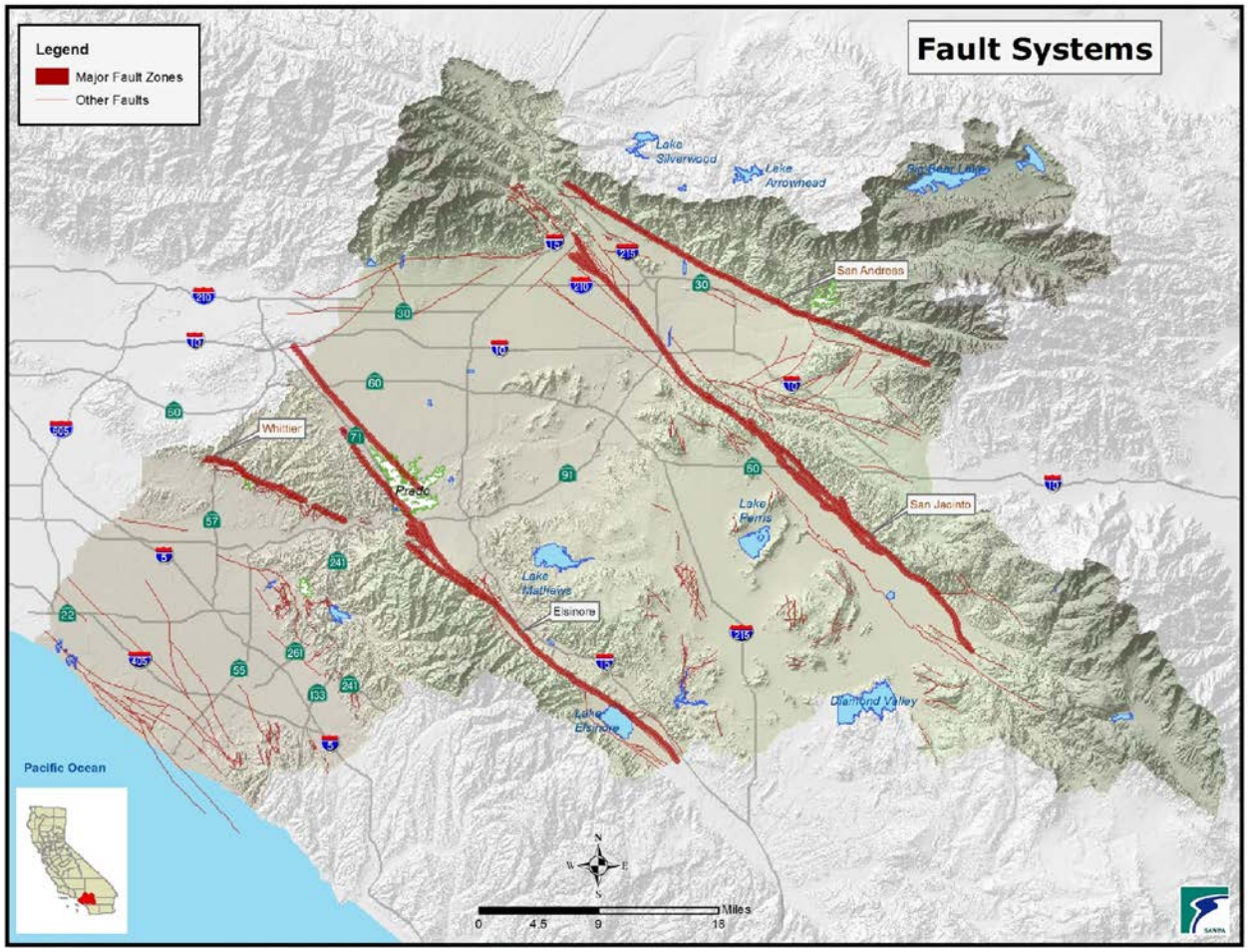

Figure 4.1-4. Fault Systems in the Santa Ana River Watershed

Table 4.1-2 provides a list of all Bulletin 118 groundwater basins in the watershed, if a groundwater sustainability notice has been submitted to DWR, the GSA name and member agencies, and the basins' priority ranking (see Figure 4.1-5 for locations of GSAs). The priority of basins and sub-basins determines whether SGMA provisions apply in any given basin. In 2014, DWR prioritized groundwater basins through its California Statewide Groundwater Elevation Monitoring (CASGEM) Program and then conducted reprioritization of some basins in 2018 as SGMA requires that DWR reassess the prioritization anytime DWR updates Bulletin 118 basin boundaries. DWR expects to release the final 2018 SGMA Basin Prioritization results, which are currently in draft form, in late spring 2019.

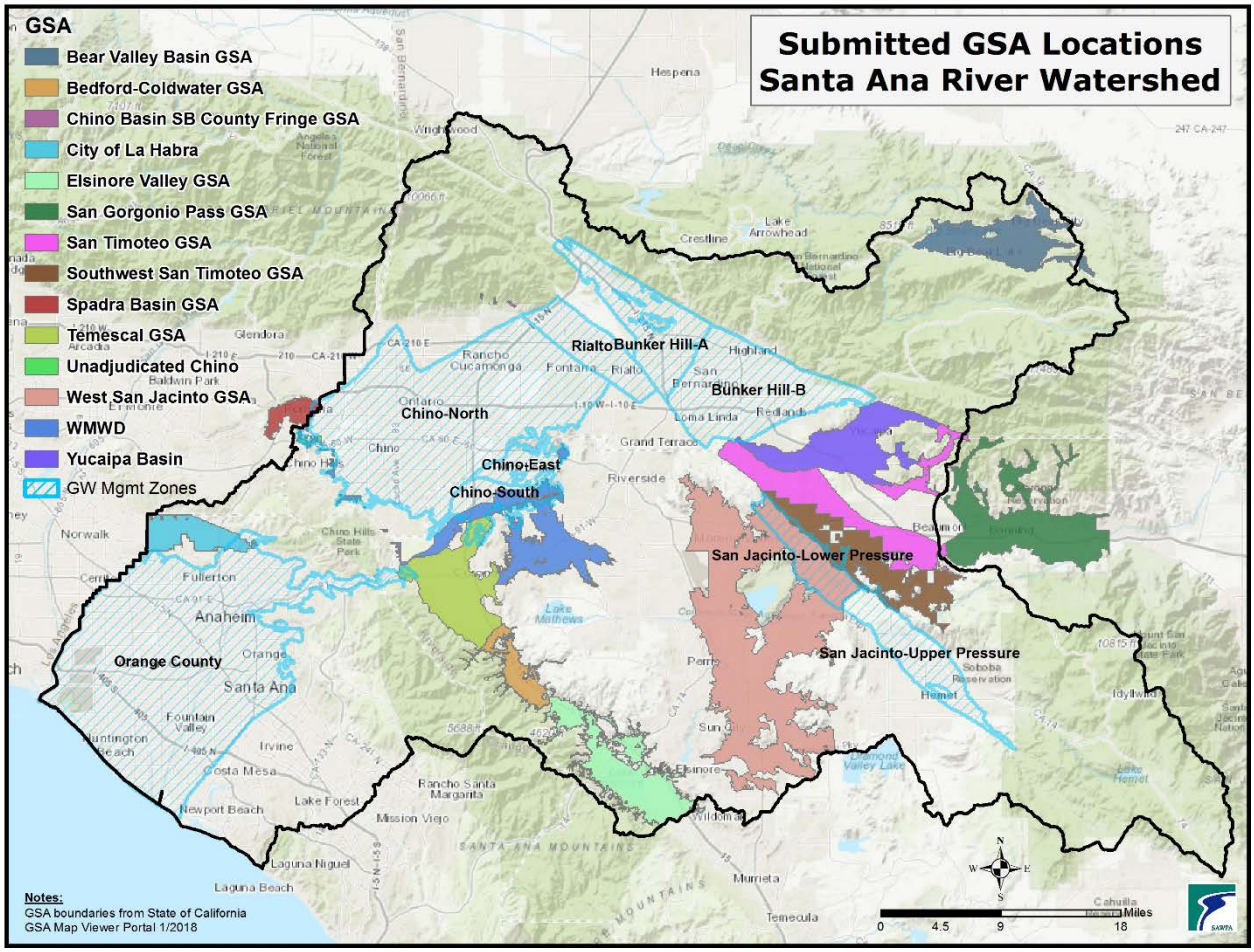

Figure 4.1-5. Submitted GSA Locations in the Santa Ana River Watershed

Table 4.1-2. Bulletin 118 Groundwater Basins in the Santa Ana River Watershed

Bulletin 118 Groundwater Basin	2018 Basin Draft Prioritization	GSA or Alternative Submitted	GSA Members
Bear Valley Basin	Very Low	Bear Valley Basin GSA	• City of Big Bear Lake Department of Water and Power
Big Meadows Valley	Very Low	None	N/A
Coachella Valley – San Gorgonio Pass	Medium	San Gorgonio Pass GSA	• City of Banning • Cabazon Water District • Banning Heights Mutual Water Company • San Gorgonio Pass Water Agency
Coastal Plain of Orange County (Basin 8-1)	High	Basin 8-1 Alternative (Cities of Brea and La Habra)	• City of Brea • Orange County Water District • City of La Habra • Irvine Ranch Water District

Table 4.1-2. Bulletin 118 Groundwater Basins in the Santa Ana River Watershed

Bulletin 118 Groundwater Basin	2018 Basin Draft Prioritization	GSA or Alternative Submitted	GSA Members
Elsinore–Bedford–Coldwater Basin	Very Low	Bedford–Coldwater Sub-Basin GSA	• City of Corona • Elsinore Valley Municipal Water District • Temescal Valley Water District
Elsinore Valley	Medium	Elsinore Valley GSA	• Elsinore Valley Municipal Water District
San Gabriel Valley	Very Low	Spadra Basin GSA	• City of Pomona • Walnut Valley Water District
San Jacinto	High	West San Jacinto GSA	• Eastern Municipal Water District
Seven Oaks Valley	Very Low	None	N/A
Temecula Valley	Very Low	None	N/A
Upper Santa Ana Valley – Cajon	Very Low	None	N/A
Upper Santa Ana Valley – Chino	Very Low	Chino Basin San Bernardino County Fringe Areas GSA	• San Bernardino County
		Unadjudicated Portion of the Chino Groundwater Basin within Los Angeles County GSA–Pomona Fringe Area GSA	• City of Pomona
		Southeastern Chino Basin GSA	• Western Municipal Water District
Upper Santa Ana Valley – Cucamonga	Very Low	None	N/A
Upper Santa Ana Valley – Bunker Hill	Very Low	None	N/A
Upper Santa Ana Valley – Rialto Colton	Very Low	None	N/A
Upper Santa Ana Valley Riverside-Arlington Sub-Basin	High	Riverside–Arlington Sub-Basin GSA	• Western Municipal Water District
Upper Santa Ana Valley – San Timoteo	Very Low	San Timoteo Sub-Basin GSA	• City of Redlands • San Gorgonio Pass Water Agency • Beaumont Cherry Valley Water District • Yucaipa Valley Water District
	Very Low	Southwest San Timoteo GSA	• Eastern Municipal Water District

Table 4.1-2. Bulletin 118 Groundwater Basins in the Santa Ana River Watershed

Bulletin 118 Groundwater Basin	2018 Basin Draft Prioritization	GSA or Alternative Submitted	GSA Members
Upper Santa Ana Valley – Temescal	Medium	Temescal Sub-Basin GSA	• City of Corona • City of Corona • Home Garden County Water District
Upper Santa Ana Valley – Yucaipa Basin	High	Yucaipa GSA	• Yucaipa Valley Water District • San Bernardino Valley Municipal Water District • San Gorgonio Pass Water Agency

GSA = Groundwater Sustainability Agency; N/A = not applicable.

All "High" and "Medium" priority basins are required to be managed under a GSP by January 31, 2022. On April 1 following GSP adoption and annually thereafter, GSAs are required to report on progress toward sustainability to DWR.

The watershed has 10 adjudicated groundwater basins that were legally formed when local entities extracting groundwater turned to the courts to resolve water right disputes (see Figure 4.1-6). SGMA also established a process for the local watermasters, or agencies that oversee adjudicated basins, to submit an annual report that includes total water use and the annual change in groundwater storage by water year. Because adjudicated areas are not required to develop a GSP, DWR determined that SGMA prioritization should exclude those portions of the basin that were adjudicated and are listed as "Very Low" priorities.

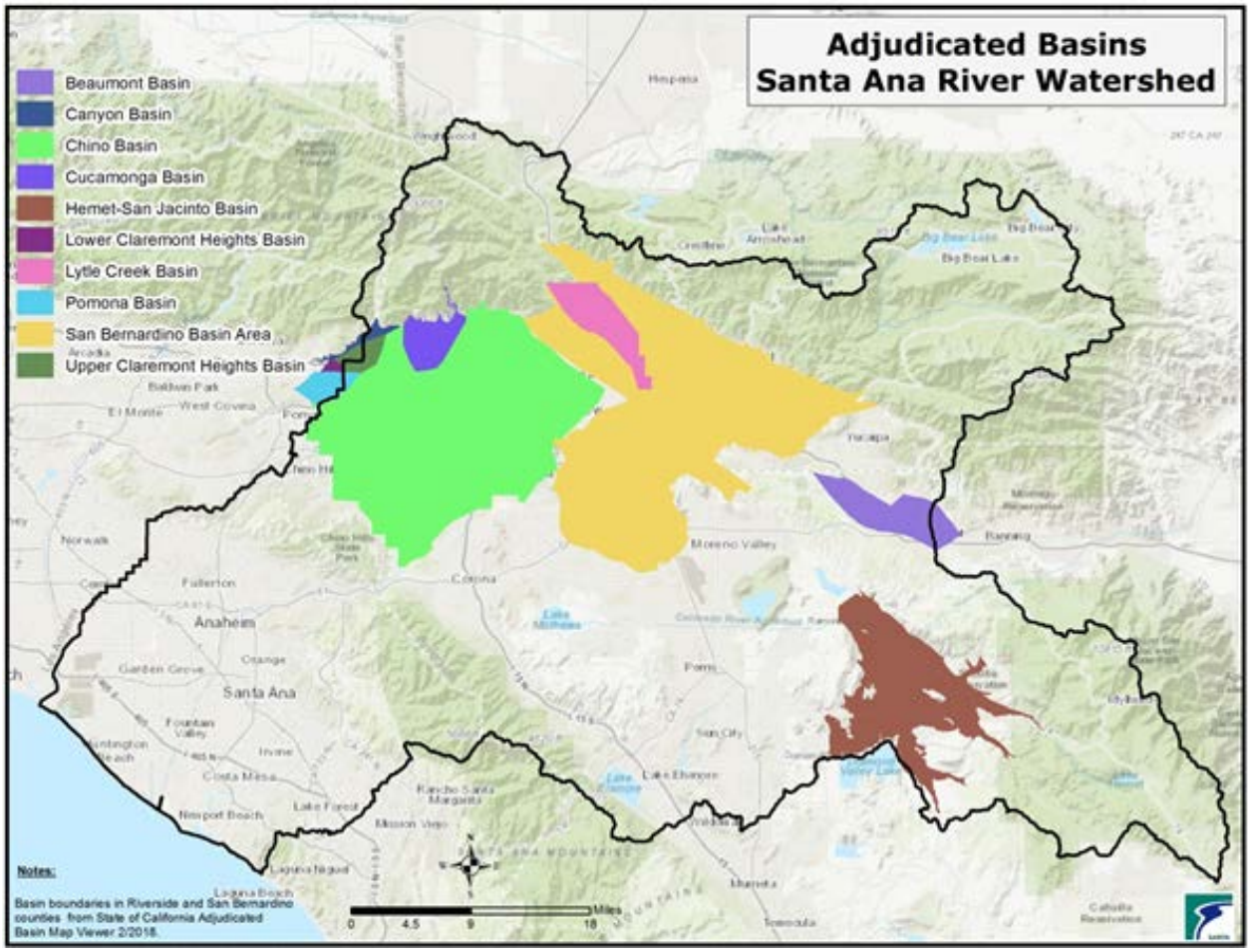

Figure 4.1-6. Adjudicated Basins in the Santa Ana River Watershed

Groundwater Contaminant Plumes

Areas in the watershed with groundwater plumes contaminated with volatile organic compounds (VOCs) and perchlorate are shown on Figure 4.1-7. The major plumes, including areas with elevated levels of perchlorate, are described below. All of these plumes are being monitored by local agencies, the Regional Board, California Department of Toxic Substances Control, and/or the U.S. Environmental Protection Agency's Superfund Program.

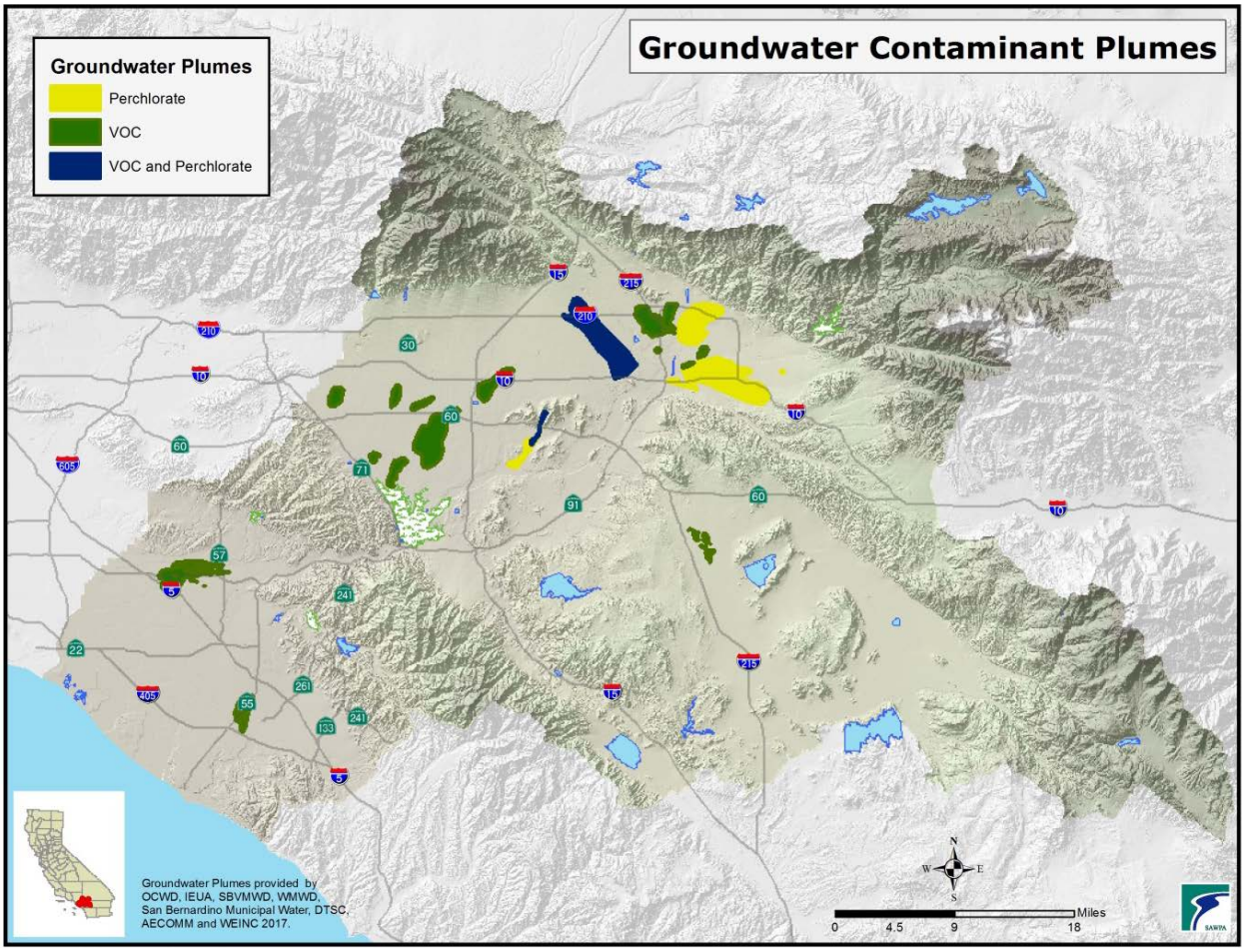

Figure 4.1-7. Groundwater Contaminant Plumes

Upper Watershed Plumes

Treatment plants at the Newmark–Muscoy Superfund Site are operating to remove VOC contamination. A total of 13 extraction wells produce on average approximately 26,000 AFY, which is treated at four treatment plants. The Crafton–Redlands site is a 6-mile-long plume of VOC and perchlorate contamination affecting approximately 46 drinking water wells. A number of wellhead treatment units and treatment plants to remove these contaminants are being operated by the Cities of Redlands, Loma Linda, and Riverside. The Rialto–Colton site is a plume of perchlorate and trichloroethene that has impacted several drinking water wells. Additional VOC plumes include the Santa Fe Depot, Norton Air Force Base, and March Air Reserve Base.

March Air Force Base

Various contaminants from historical practices at March Air Force Base (base) have impacted the local groundwater in Moreno Valley and the border of the City of Riverside, requiring the base to become a Superfund Site. Contaminants such as VOCs, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, PCBs, heavy metals, dioxin, and recently perfluorooctane acid/

perfluorooctanoic sulfonate (PFOA/PFOS) have been identified throughout the base. Groundwater extraction systems have limited the contaminants' migration off base while reducing contamination within the base's groundwater area.

Chino Basin Plumes

VOC plumes include the Stringfellow Superfund Site, Milliken Landfill, Ontario Airport, Flatiron Facility, Test Cell Facility, Chino Airport, California Institute for Men, Kaiser, Wyle Labs, and Pomona. Groundwater in several areas is impacted by elevated levels of perchlorate. Sources of perchlorate include the Stringfellow Superfund Site, Chilean nitrate fertilizer that was imported in the early 1900s for the citrus industry, and other manmade sources such as ammunition manufacturing. The Chilean fertilizer perchlorate is typically a nonpoint source and it is distributed across large areas.

Orange County Groundwater Basin Plumes

A shallow, approximately 6-square-mile VOC plume exists in the Anaheim/Fullerton area. The North Basin Groundwater Protection Project is being constructed to extract and treat contaminated groundwater. Other VOC plumes exist in Orange, Santa Ana, the Seal Beach Naval Weapons Station, and the closed Marine Corps Air Stations at Tustin and El Toro. Various other sites have generally shallow VOC contamination or other contaminants. Using reverse osmosis and ion exchange, desalters treat high TDS, nitrate, and perchlorate levels in a section of Tustin.

Assembly Bill 1249 Compliance

California Water Code, Section 10541(e)(14) (Assembly Bill 1249), requires that an area within the boundaries of an integrated regional water management plan that has nitrate, arsenic, perchlorate, or chromium-6 contamination in the region, must include a description of the (1) location and extent of that contamination, (2) the impacts caused by the contamination to communities within the region, (3) existing efforts being undertaken in the region to address the impacts, and (4) additional efforts needed to address the impacts.

To comply with Assembly Bill 1249 requirements, watershed agencies conducted searches within jurisdictional boundaries to identify any drinking water production wells where sampling indicated elevated levels of nitrate, arsenic, perchlorate, or chromium-6. The following summarizes results of the searches and descriptions of actions taken in cases where elevated levels of these constituents were found. Individual well sites and areas with elevated levels are shown on Figure 4.1-8. Unless otherwise indicated, agencies conducted database searches of drinking water well samples between calendar years 2014 and 2016 for any well with an occurrence of the maximum contaminant level (MCL) for perchlorate greater than 6 micrograms per liter (µg/L), nitrate (as N) greater than 10 milligrams per liter (mg/L), arsenic above 12 µg/L, and chromium-6 greater than 10 µg/L.

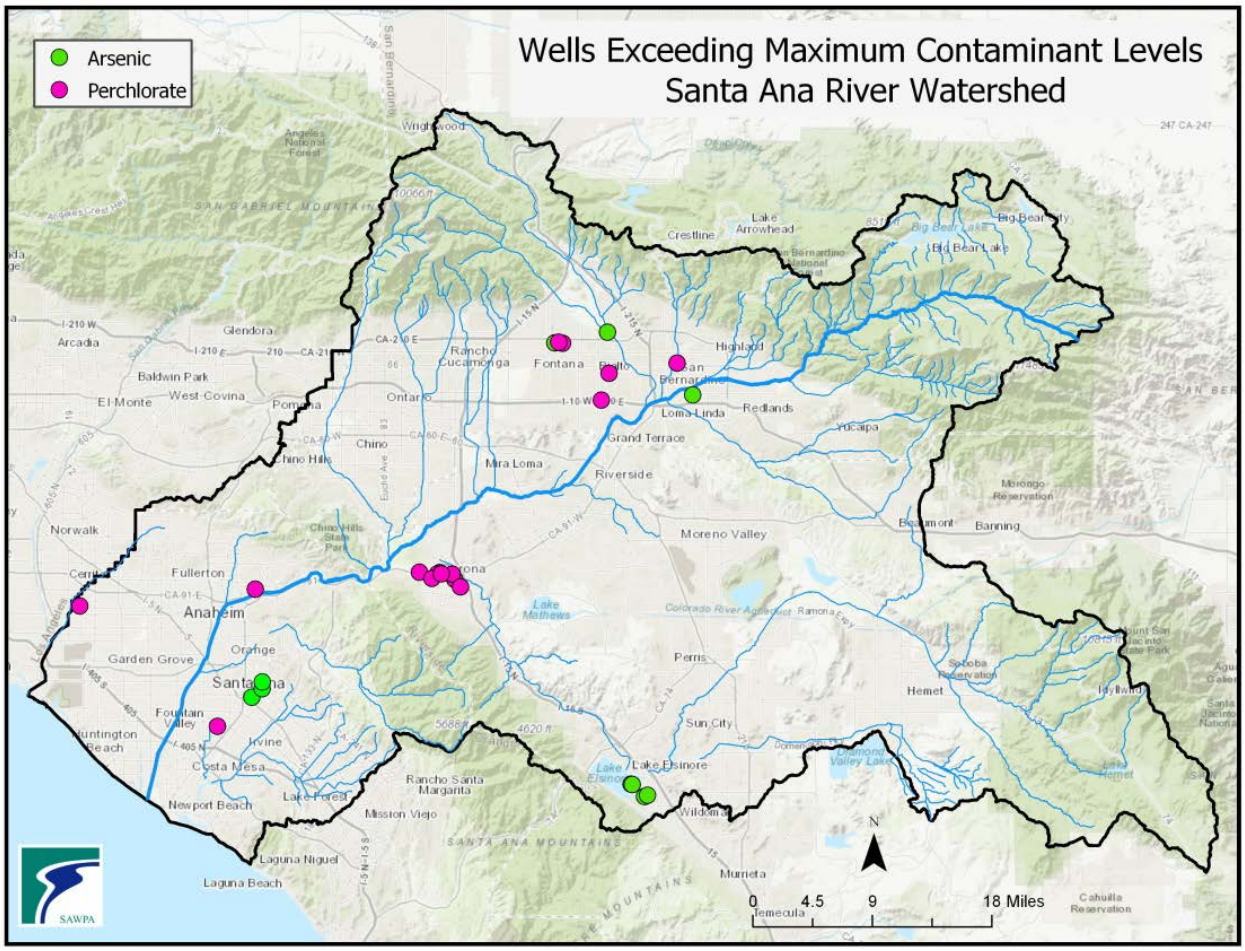

Figure 4.1-8. Wells Exceeding MCLs for Perchlorate and Arsenic

City of Loma Linda

There were no samples with a chromium-6 concentration greater than 10 parts per billion (ppb). The city has two wells (Mt. View 6 and Richardson 5) with perchlorate concentrations higher than 6 ppb. These wells were designed, built, and equipped by Lockheed Martin as part of an agreement to provide pump and treat operations within the Bunker Basin and are operated by the City of Loma Linda. Ion exchange is the method used to remove the perchlorate. Each well is sampled monthly. Two wells (Mt. View 3 and Mt. View 5) have arsenic concentrations that exceed 10 µg/L. The water from wells with arsenic concentrations above the MCL is blended before introduction into the distribution system.

City of San Bernardino Municipal Water District

The City of San Bernardino Municipal Water Department conducted a database search for calendar years 2013–2017. There were no production wells with exceedances of the MCLs for perchlorate or arsenic or chromium-6 above 10 µg/L.

West Valley Water District

Untreated raw water in Well No. 2 shows arsenic at 12 µg/L. The West Valley Water District constructed an arsenic treatment removal plant that removes arsenic before the water enters the distribution system. Well Nos. 16 and 18A are greater than 6 µg/L for perchlorate, but this is untreated raw water before treatment. The West Valley Water District constructed an ion exchange perchlorate removal system that removes perchlorate before the water enters the distribution system.

Yucaipa Valley Water District

One sample taken from Well Nos. 66–71 on March 17, 2016, contained an arsenic concentration of 11 µg/L. To address arsenic in City water, an arsenic removal facility was installed, providing treatment to two wells. Water from the various wells is blended to further dilute any contaminants and to achieve all applicable health and safety standards.

East Valley Water District

Only one well had a perchlorate result over 6 µg/L. The well was taken out of service at that time and is currently listed as inactive.

Eastern Municipal Water District

A database search was conducted for nitrate, arsenic, perchlorate, and chromium-6 from 2012 through 2017 for all Eastern Municipal Water District (EMWD) potable wells in the San Jacinto, Hemet, Lakeview, Perris, and Menifee regions.

In the Canyon Groundwater Management Zone, Well No. 26, Cienega, had arsenic levels that exceeded the state and federal MCL, with values ranging from 10 µg/L to 13 µg/L in 2015 and 2016. Well No. 26 flows into the Washington Forebay Booster, where it blends with Well Nos. 17, 26, 34, 36, 14, and 80, reducing arsenic to acceptable levels before introducing the water into the distribution system. Groundwater pumped from Well No. 26 does not enter the distribution system without first going into the Washington Forebay Booster and undergoing blending. The Washington Forebay Booster serves as the compliance point of distribution; therefore, there is no impact to the communities within the region.

There is an existing effort to reduce the amount of contaminants in the potable water distribution system that is sourced from the wells noted for the purposes of blending. Water from Well No. 26 flows to the Washington Forebay Booster and is only distributed into the system after blending with other water sources. The blend of wells allows for a reduction in arsenic concentration to meet state and federal regulations.

At this time, there are no additional efforts necessary to address the impacts.

Although arsenic was observed in Well No. 26, Cienega, the issue has been mitigated to reduce these levels to meet water quality goals.

Riverside Basin

Riverside Public Utilities conducted a water quality database search for nitrate, arsenic, perchlorate, and chromium-6 from 2014 to 2016 for all drinking water production wells operated by Riverside Public Utilities within the Riverside Basin (note that the Riverside–Arlington Sub-Basin has been separated further into the Riverside Basin and Arlington Basin; this discussion refers only to the Riverside Basin). All drinking water wells where there was an occurrence of perchlorate concentration greater than the 6 µg/L MCL, chromium-6 concentration greater than the former MCL of 10 µg/L, arsenic concentration greater than the 10 µg/L MCL, or nitrate (as N) concentration greater than the 10 mg/L MCL were identified.

For all Riverside Public Utilities drinking water wells within the Riverside Basin, arsenic, perchlorate, and chromium-6 were not detected at concentrations greater than their MCL. Nitrate concentrations greater than 10 parts per million (ppm) were detected in two drinking water wells during 2014–2016. The water from these two wells is blended with groundwater pumped from other wells to reduce the concentrations of nitrate prior to entering the distribution system.

The Regional Board manages nitrates through the Basin Plan, which contains water quality objectives for nitrates within groundwater management zones of the watershed. The nitrate levels that are above the MCL within the basin occur in the Riverside–F Groundwater Management Zone, which has a Basin Plan water quality objective of 9.5 ppm and a current ambient concentration of 10.9 mg/L.

Chino Basin

Where concentrations of these contaminants in potable supply wells exceed federal or state drinking water standards, the well water is treated via reverse osmosis, ion exchange, blending with other local or imported water supplies, and/or other techniques to produce a water supply that complies with the standards before being delivered to customers.

The management of nitrates in groundwater and local surface waters is a component of the watershed's salinity management plan. In the Chino–North Groundwater Management Zone, the Regional Board established (in the Basin Plan) maximum-benefit objectives for TDS and nitrate that allow for programs of recycled water reuse and imported water and recycled water recharge. The maximum-benefit objectives are contingent on the implementation of specific projects and programs that ensure the long-term protection of the beneficial uses of the Chino Basin, including the following:

- The construction and operation of 40,000 AFY of groundwater desalination facilities in the southern portion of the Chino Basin
- The construction and operation of artificial recharge facilities to enhance the recharge of high-quality stormwater and imported water
- The management of the TDS and nitrate concentrations in artificial recharge to less than or equal to the objectives

- The management of TDS and nitrate concentrations in recycled water
- The management of groundwater levels in the southern portion of the Chino Basin to limit rising-groundwater outflow of poor-quality groundwater to the Santa Ana River, which protects the beneficial uses of the river in Orange County
- The implementation of groundwater and surface-water monitoring programs and triennial estimation of ambient TDS and nitrate concentrations in Chino Basin groundwater

Elsinore Valley Municipal Water District

Elsinore Valley Municipal Water District performed a database search of all drinking water sources operated by the district. Arsenic was the only constituent found in concentrations above the MCL. Raw arsenic concentrations that exceed the MCL were found in four wells, as shown in Table 4.1-3. Water from these wells is treated prior to distribution.

Table 4.1-3. Arsenic Concentrations and Treatment Methods

Well	Arsenic Sampling Results	Treatment Methods
Cereal 1 Well	4 of 28 > MCL	Blending water with other wells (Summerly, Diamond, Corydon) prior to sending water into distribution system. Arsenic levels are reduced to below the MCL.
Cereal 3 Well	13 of 15 > MCL	Water sent through a groundwater treatment plant for arsenic removal. Arsenic levels are reduced significantly below the MCL prior to distribution.
Cereal 4 Well	22 of 23 > MCL	Water sent through a groundwater treatment plant for arsenic removal. Arsenic levels are reduced significantly below the MCL prior to distribution.
Corydon Well	1 of 24 > MCL	Blending water with other wells (Summerly, Diamond, Cereal 1) prior to sending water into distribution system. Arsenic levels are reduced to below the MCL.

City of Corona

The City of Corona's database search found no samples with a chromium-6 concentration greater than 10 µg/L or arsenic concentrations greater than 10 µg/L. Perchlorate concentrations greater than 6 µg/L were found in some wells. Water from City of Corona wells containing perchlorate above the MCL is being treated by reverse osmosis at the Temescal Desalter, or through blending of low concentration sources with high concentration sources, to ensure that the level of perchlorate in water being delivered to the customers is below the MCL.

Orange County Groundwater Basin

OCWD's database search found no samples with a chromium-6 concentration greater than 10 ppb. Arsenic concentrations were greater than 10 µg/L in at least one sample in three production wells, as follows:

- IRWD-5: 2 of 4 samples > 10 µg/L as MCL; well water is blended before entering distribution system
- LP-CITY: 13 of 40 samples > 10 µg/L as MCL; well screen has been recently modified to reduce contribution from zones with elevated arsenic concentrations; average concentration in well water entering distribution system maintained below the MCL
- YLWD-15: 6 of 14 samples > 10 µg/L as MCL; well water is blended in a reservoir before entering distribution system

Perchlorate concentrations greater than 6 µg/L were found in one water sample from three production wells. Potable water from these wells is treated via reverse osmosis or ion exchange at treatment plants and/or blended with groundwater pumped from other wells prior to being served to residents to reduce concentrations to below the MCL.

4.1.4. SURFACE WATER QUALITY

Fortunately, water quality in the Santa Ana River has improved in recent years due to technological developments and water quality planning. Most of the native fishes of the watershed are adapted to clear, unpolluted water that can support food resources and provide the various habitat conditions necessary to complete their respective life cycles. Although fish kills due to toxic substances entering streams are dramatic examples of the effects of pollution, these instances are acute (short term) rather than chronic (long term). The chronic effects on aquatic resources of non-lethal forms of pollution can be more serious, decreasing growth, inhibiting reproduction, or impairing movement. Chronic elevated water temperatures and high sediment loads are examples of this type of pollution, even though toxic chemicals are not involved. Other examples include elevated but non-toxic levels of ammonia, increases in salinity, and low levels of dissolved oxygen. The quality of wastewater point discharges to the river and tributaries has improved markedly in recent years due increasing water quality monitoring and clean up technologies. However, the nonpoint-source discharges coming from urban runoff remains a concern to the native freshwater fishes making the issue of chronic, low-level pollution a major concern. Impaired water bodies can be seen on Figure 4.1-9.

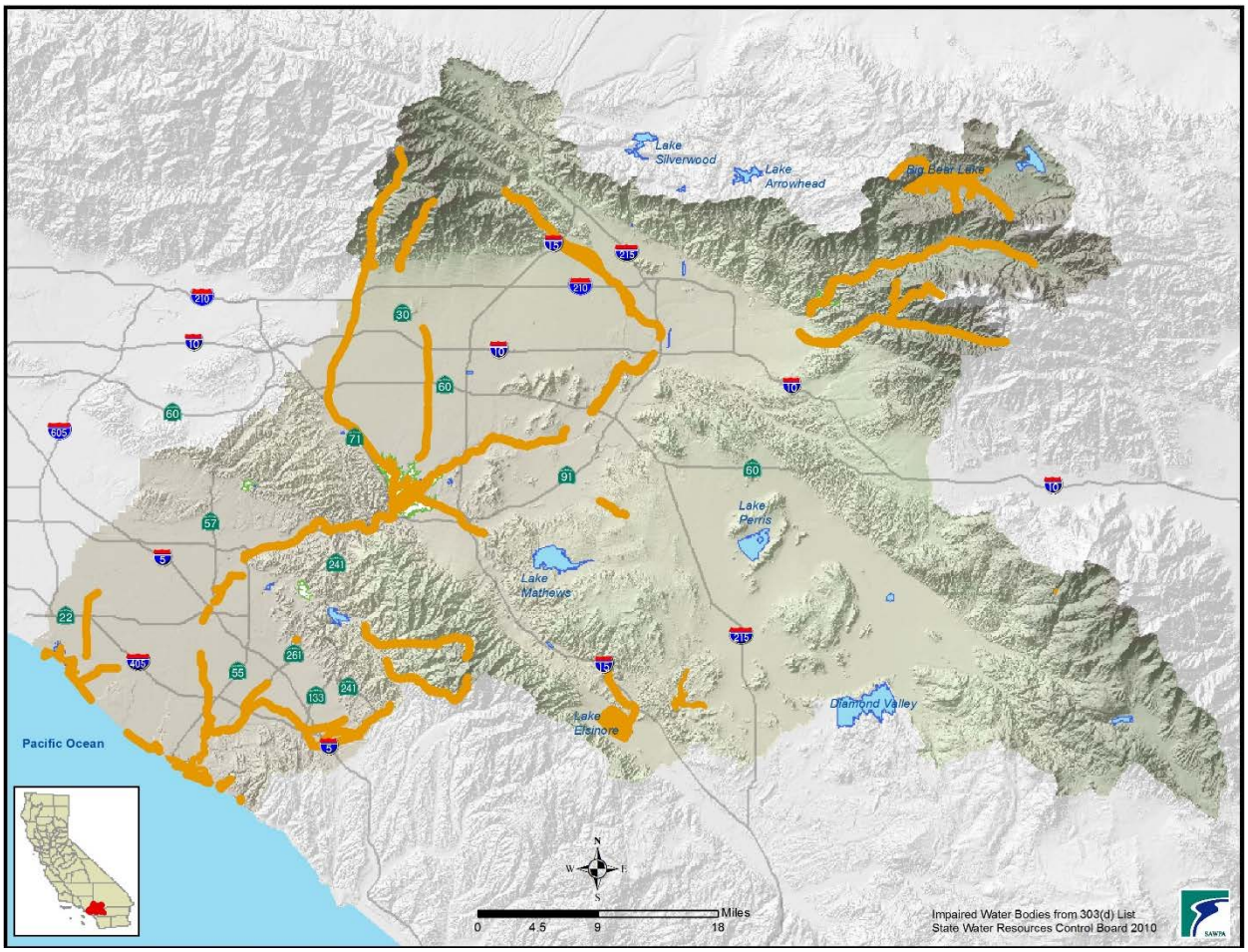

Figure 4.1-9. Impaired Water Bodies in the Santa Ana River Watershed

4.1.5. OPEN SPACE, HABITAT, AND NATIVE SPECIES

Open Space and Recreation

Taking advantage of the watershed's beautiful landscape, the Santa Ana River Trail, highlighted in Figure 4.1-10, links open space areas throughout the watershed. Building the Santa Ana River Trail has been a highly successful collaborative effort and should be used as a model for other recreation projects in the future. The Santa Ana River Trail's achievements could only have been accomplished through a variety of partnerships, combining the expertise and resources of multiple counties, cities, and other groups. Per the 2018 Santa Ana River Parkway and Open Space Plan, the majority of the trail has been constructed with several gaps remaining to be completed: 11 miles in San Bernardino County, 12 miles in Riverside County, and 3 miles in Orange County. It is projected that the remaining gaps can be completed by 2023.

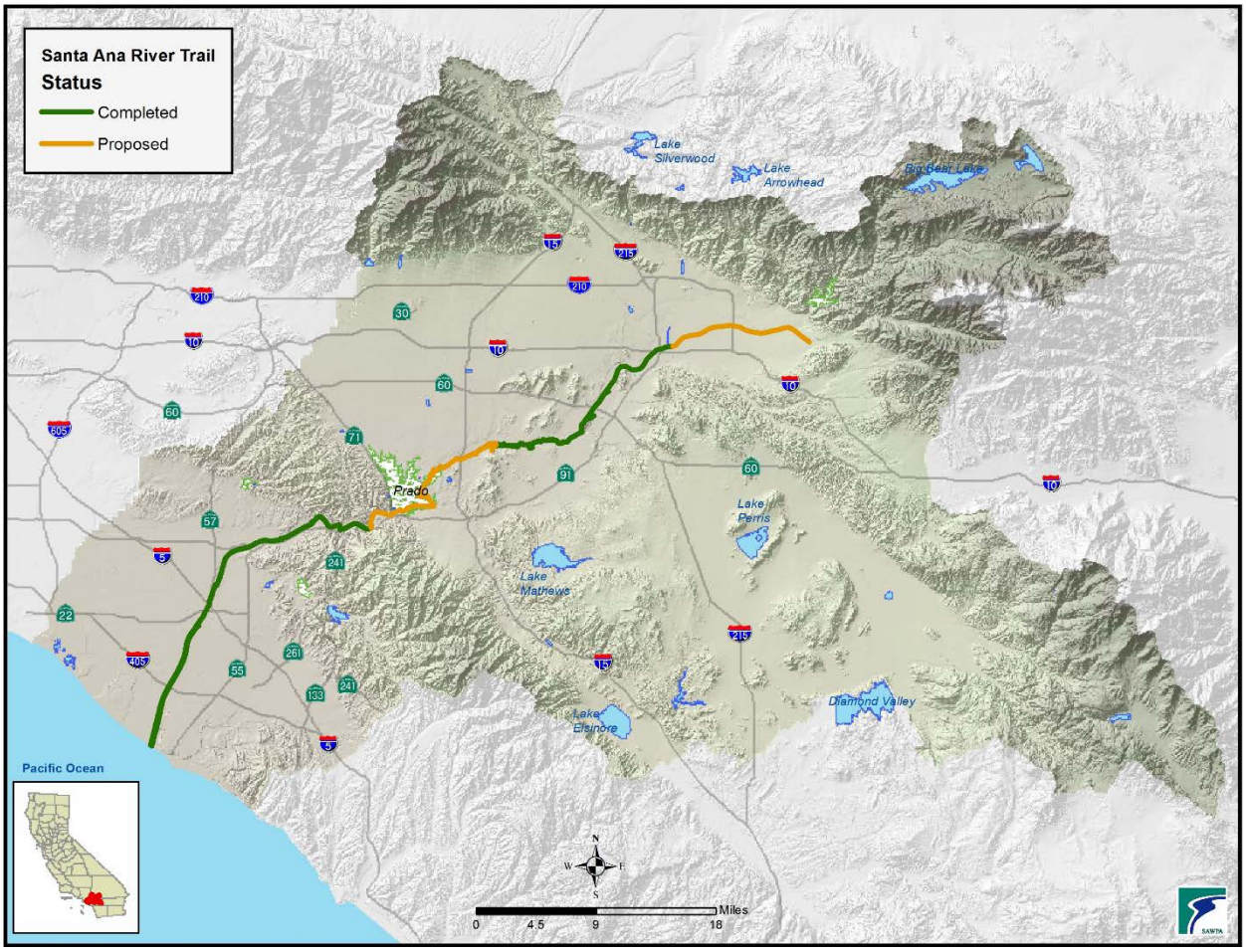

Figure 4.1-10. Santa Ana River Trail

Bicyclists along the Santa Ana River Trail

Habitat

Although there are several types of habitat within the watershed boundary that are not directly water-oriented (for example, chaparral, pine forest, oak woodland, and grassland), the primary focus in the OWOW Plan Update 2018 is on water-oriented habitat types (such as alluvial fans, riparian woodland, emergent wetlands, vernal pools, lakes, streams, estuaries, tidelands, and open ocean). These water-oriented habitats tend to show up on maps as corridors that connect the larger, non-water-oriented habitats. The OWOW Program is particularly interested in water-oriented habitat locations that are candidates for protection or enhancement.

As noted by Moyle (2002), most of California's inland waterways today bear little resemblance to the streams and lakes encountered by the first European explorers and settlers. In the Santa Ana watershed, where flood control and channelization activities have left portions of streams channelized and concrete-lined where once riparian forests grew along a meandering stream, this observation is certainly true. Fortunately, today only 20% of the Santa Ana River is concrete lined. Dam construction and flood control activities are not the only factors influencing the watershed in ways that adversely impact habitat critical for aquatic resources. The following factors have also played a role:

- Stream channel alteration
- Draining of streams and lakes, especially adjacent wetlands
- Livestock grazing and the impact on aquatic and riparian vegetation, sedimentation, and water pollution
- Historical logging practices
- Bark beetle infestation
- Mining, particularly in-stream aggregate mining
- Watershed changes resulting in cumulative affects to aquatic resources

Constructed wetlands (Figure 4.1-11) have a wide range of benefits, including surface water protection. Constructed wetlands designed to treat secondary effluent directly affect the reclaimed water supply. If water produced from the wetlands is of suitable quality to be recharged into groundwater aquifers, diminishing groundwater resources can be supplemented, or in some areas, reclaimed water can be recharged as part of a groundwater remediation program. Southern California wetlands provide vital habitat for migratory waterfowl, forming part of the Pacific Flyway, the critical migratory corridor for birds that connects Alaska and Canada to Latin America. Opportunities for wildlife enhancement were considered in the construction/preservation of many of the wetlands shown on Figure 4.1-11, which have environmental features that increase habitat diversity and wildlife productivity.

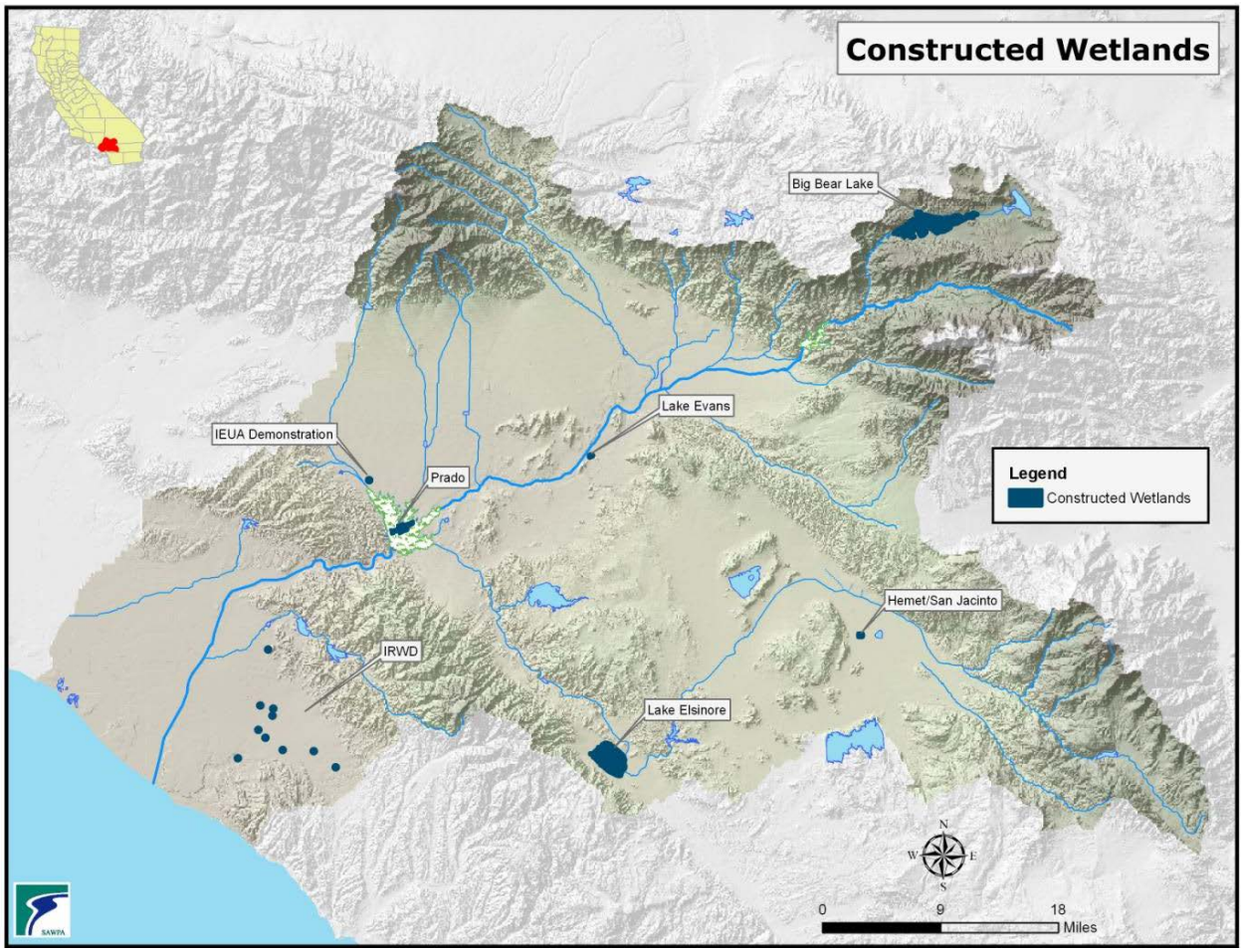

Figure 4.1-11. Constructed Wetlands in the Santa Ana River Watershed

Special-Status Species

The varied geography and natural features of the watershed provide habitat for a number of federally and/or state-listed endangered species (see Figure 4.1-12 for occurrence of endangered species in the watershed, Figure 4.1-13 for areas designated as Critical Habitat, and Figure 4.1-14 for Santa Ana Sucker (*Catostomus santaanae*) Critical Habitat). Because the OWOW Plan Update 2018 focuses on the resources in and around the Santa Ana River, listed species of concern herein are those that occupy aquatic, wetland, riparian, alluvial fan, or riparian-adjacent areas. A fuller inventory of

Arroyo toad (*Anaxyrus californicus*)

Least Bell's vireo (*Vireo bellii pusillus*)

rare plants and animals in the watershed can be found in the California Natural Diversity Database, maintained by the California Department of Fish and Wildlife (https://www.wildlife.ca.gov/Data/CNDDB). Among the important species in the watershed of particular interest in relation to the OWOW Program are two plants (Santa Ana River woolly star (*Eriastrum densifolium* ssp. *sanctorum*) and slender-horned spineflower (*Dodecahema leptoceras*)), one fish (Santa Ana sucker), one amphibian (arroyo toad (*Anaxyrus californicus*)), three birds (least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and bald eagle (*Haliaeetus leucocephalus*)), two mammals (San Bernardino kangaroo rat (*Dipodomys merriami parvus*) and Stephens' kangaroo rat (*Dipodomys stephensi*)), and one insect (the Delhi sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*)).

Any project or policy recommended by the OWOW Plan Update 2018 will assess potential impacts to listed species and incorporate measures to avoid impacts to these species.

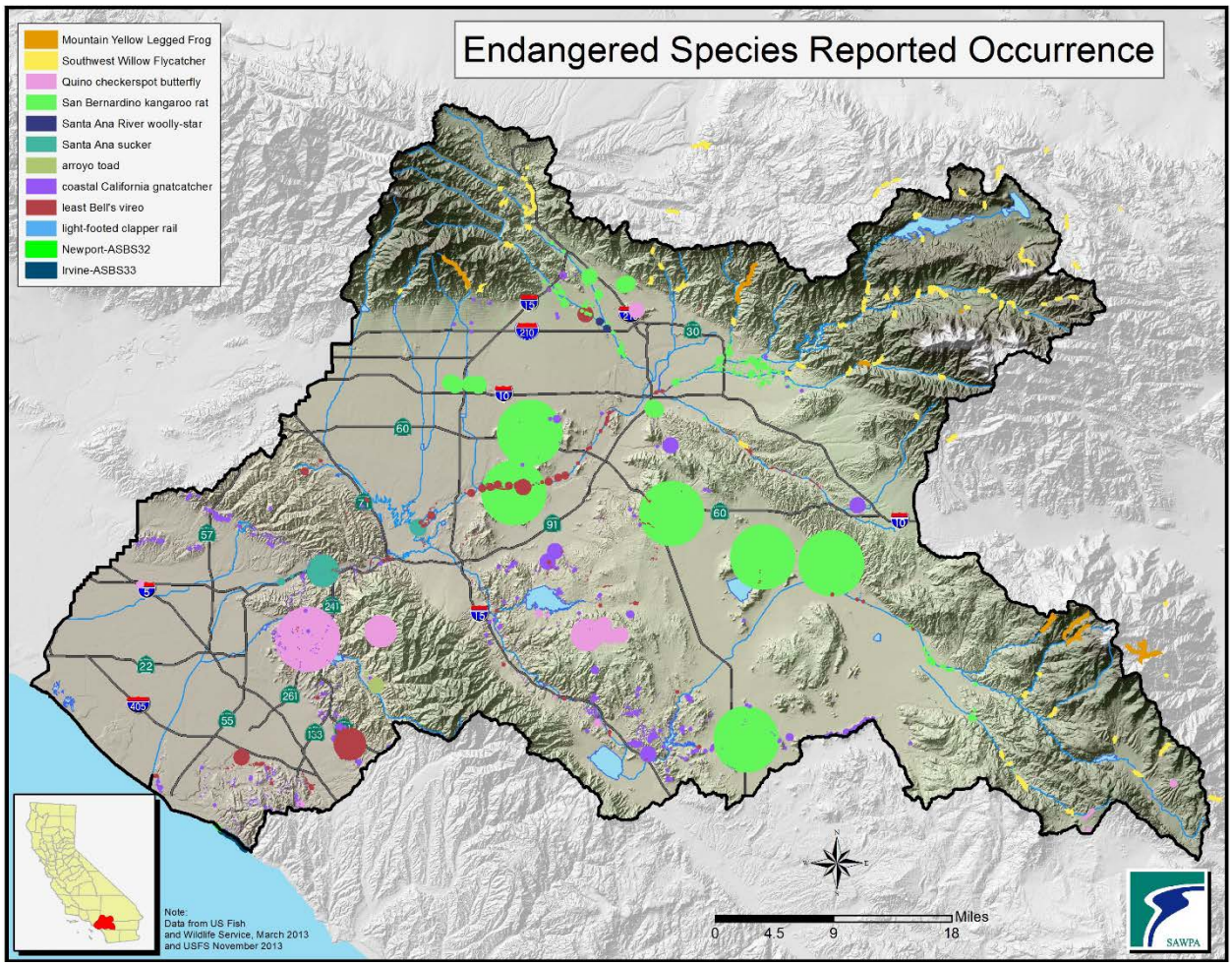

Figure 4.1-12. Endangered Species Reported Occurrence in the Santa Ana River Watershed

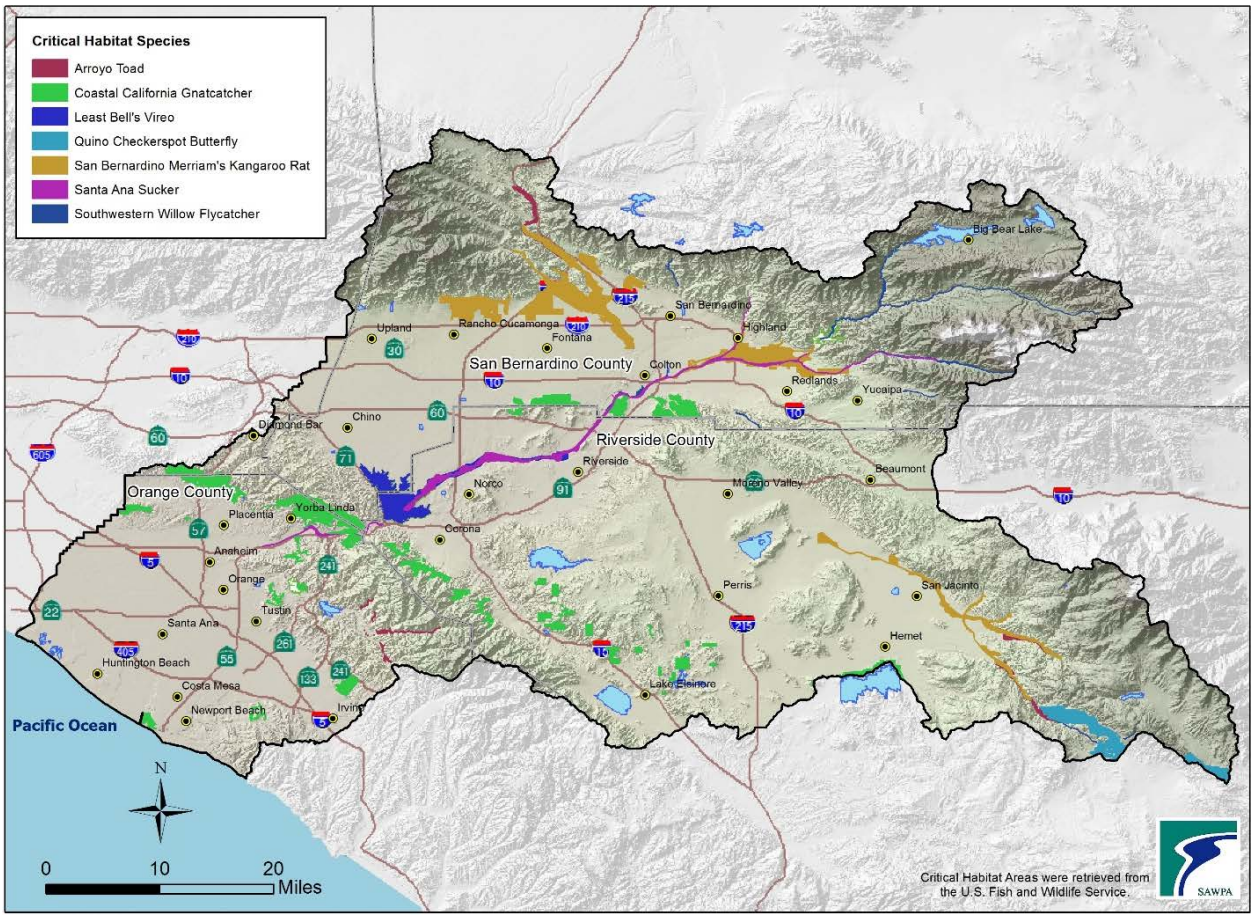

Figure 4.1-13. Critical Habitat within the Santa Ana River Watershed

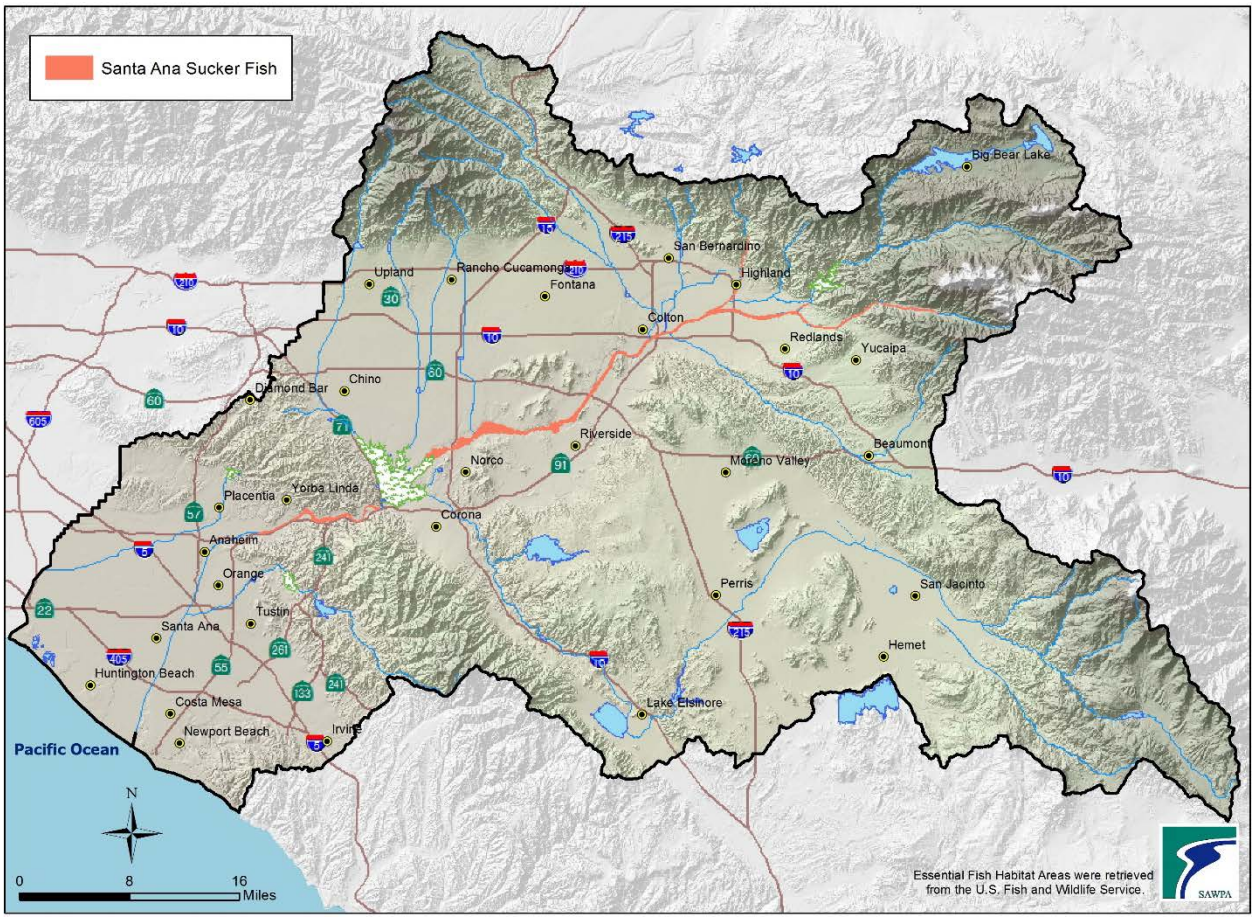

Figure 4.1-14. Santa Ana Sucker Critical Habitat within the Santa Ana River Watershed

4.1.6. NATURAL HAZARDS

The Santa Ana River Watershed and the communities it contains are subject to multiple natural hazards. Local jurisdictions are responsible for maintaining Local Hazard Mitigation Plans, or similar planning within their General Plans. Water and watershed managers maintain planning for emergency response and risk reduction. The processes of the physical world remain a hazard to communities and water managers alike. Figure 4.1-15 conveys some of the key features of natural hazards but is not exhaustive. Included are the many seismic faults that underlie the watershed, as well as areas classified as subject to liquefaction or slope movement by the federal government (see also Figure 4.1-4, Fault Systems in the Santa Ana River Watershed). Figure 4.1-16 depicts all the areas of the watershed considered vulnerable to a 100-year flooding event. Other natural hazards include heat, disease transmitted by insects or animals, and natural incidences of wildfire, each of which is touched upon by the Climate Risk and Response Pillar.

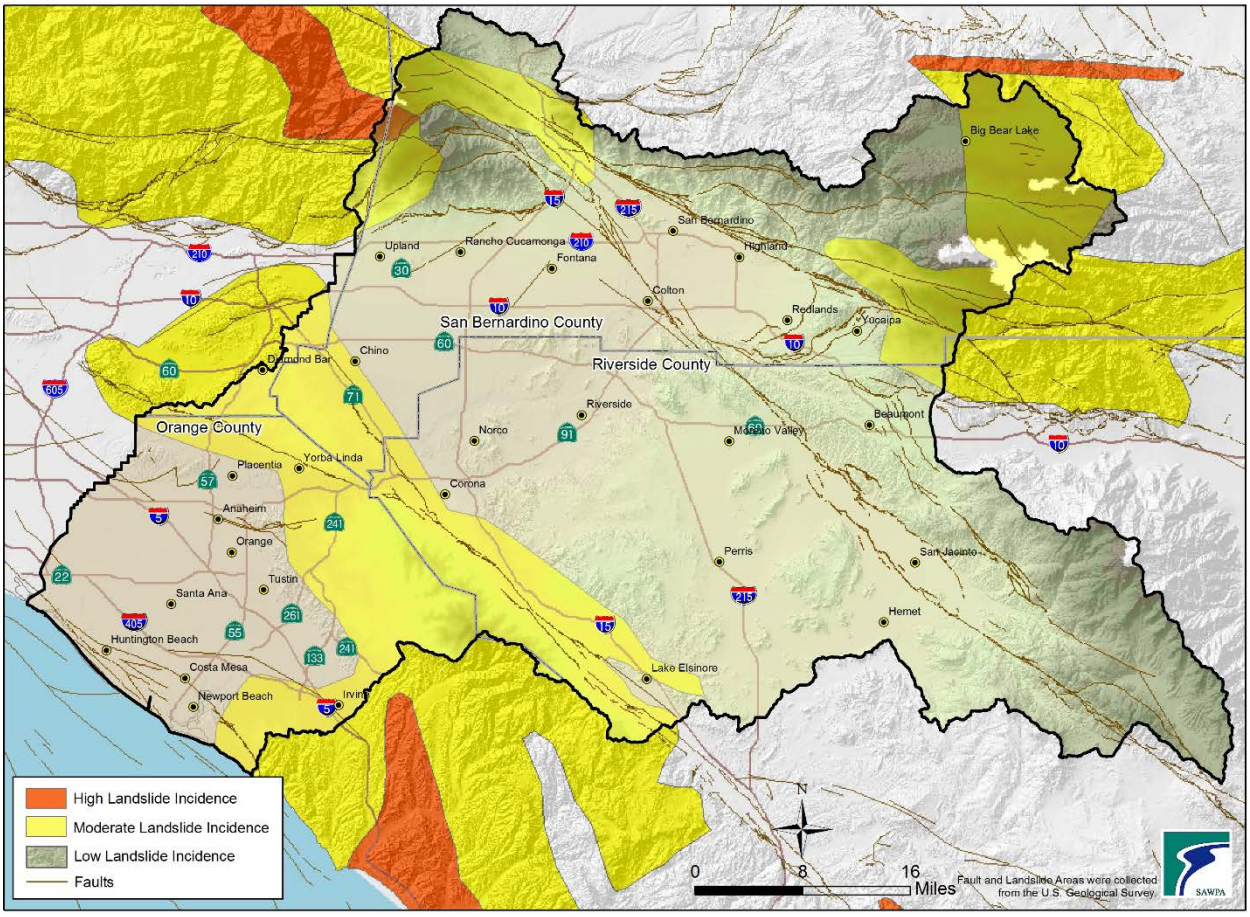

Figure 4.1-15. Natural Hazards in the Santa Ana River Watershed

Managing natural hazards at the watershed scale is not customary, and therefore is not pursued at length in OWOW Plan Update 2018, with the exception of considering how those hazards are exacerbated by climate change.

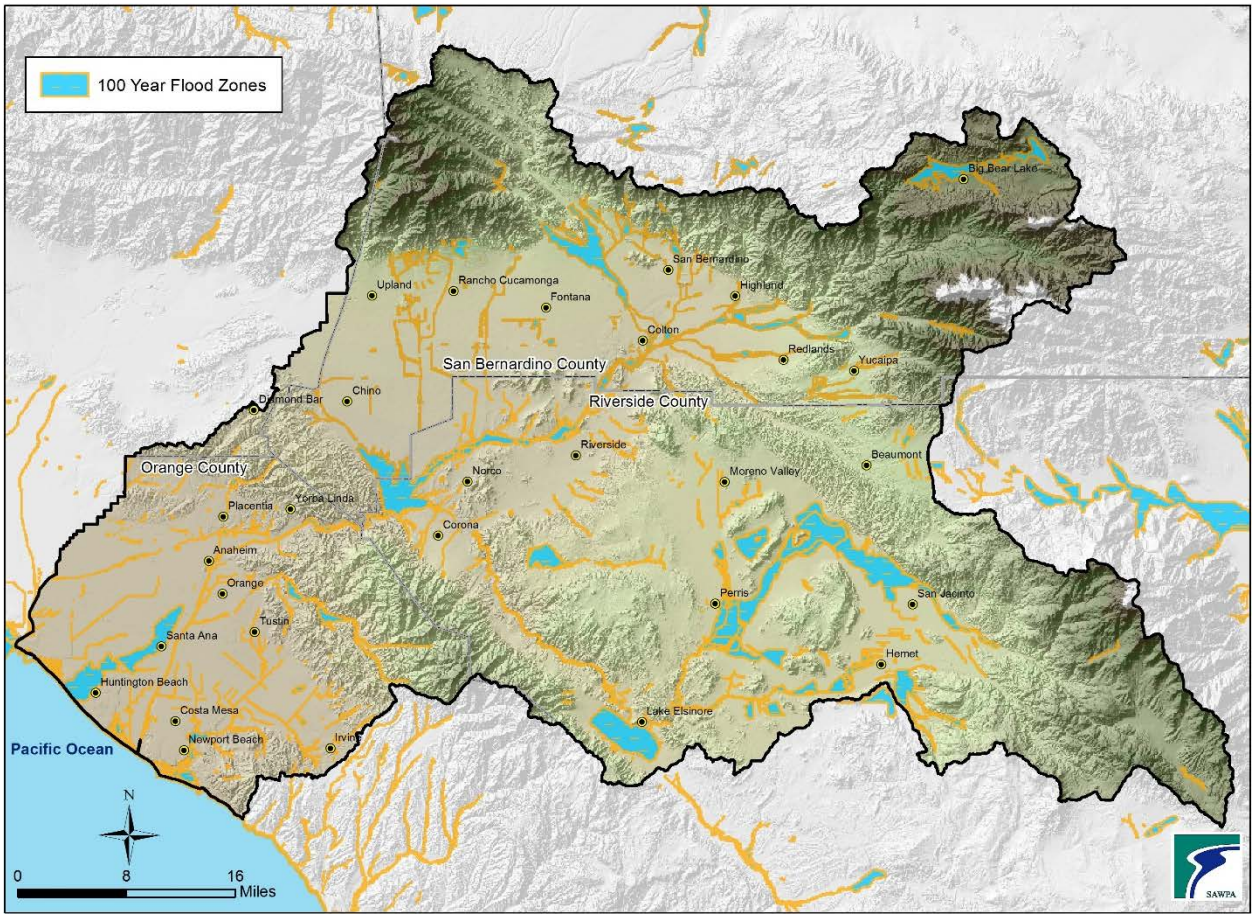

Figure 4.1-16. 100-Year Flood Zones in the Santa Ana River Watershed

4.2. SOCIAL SETTING

The Santa Ana River Watershed is governed in part by hundreds of public agencies, each of which is in some way answerable to the communities of the watershed. Closest to the people are City and County governments, which have the largest influence on daily life, but also often the least explicit role or understanding of watershed dynamics.

Federal, state, regional, and local agencies have significant roles in the watershed. The more local, the more directly the voice of the people is engaged in the activities undertaken in the watershed.

The people of the watershed are predominantly living and working in urban or suburban settings. Others are in rural and mountainous areas. There has been significant population growth in recent years and is expected to continue growing at a considerable pace over the next 40 years. According to the U.S. Census Bureau, the watershed had a population of 5.9 million in 2010 and is expected to reach 9.9 million by 2050, or an average annual growth rate of 1.3% (Table 4.2-1). The growth rate has slowed substantially, but today there is a recovering development trajectory. The demographic makeup of the watershed is also experiencing a shift (Table 4.2-2). Although recent Southern California Association of Governments reports show that the watershed will continue to

grow and reach long-term population estimates, the timeline is uncertain. Until the issues of higher unemployment and high foreclosure rates within the region are resolved, population growth rates will be slowed.

Table 4.2-1. Santa Ana River Watershed Population Projections through 2050

County	2010	2020	2030	2040	2050
Orange County	2,562,475	2,771,010	2,918,484	3,024,360	3,073,545
Riverside County	1,690,984	1,925,751	2,200,272	2,432,891	2,618,286
San Bernardino County	1,736,961	1,896,012	2,107,055	2,321,321	2,530,283
Total Population	5,990,421	6,592,773	7,225,810	7,778,573	8,222,115

Source: California Department of Finance (January 2018) population data normalized for the Santa Ana River Watershed based on 2010 census tract census data.

Demographic estimates for the watershed indicate that much of future population growth will take place in Riverside and San Bernardino Counties, because Orange County is already fairly built out. According to the U.S. Census Bureau, Riverside County grew by 37.5% between 2000 and 2010 (or an annual average of 3.6%), compared to 9.1% for the State of California as a whole (an average of less than 1% per year). Population growth will continue at an average of 1.9% per year through 2035, according to Riverside County Center for Demographic Research.

Similarly, San Bernardino County grew by 18.0% in the same period (or 1.8% per year), or almost twice the state rate. In contrast, Orange County grew by 6.3% in the same period, which is below the statewide average. Table 4.2-2 shows key demographics in the watershed.

Table 4.2-2. Santa Ana River Watershed Demographics

County	Population (Aged above 5 Years Old)	Age	Percentage of Population 25+ Years Old with Advanced Degree (Associate's, Bachelor's, Graduate, or Professional)	Median Household Income	Percentage of Individuals below Poverty Line	Non-White Racial/Ethnic Breakdown	Spanish-Speaking Household	Percentage of Population That Immigrated to America
San Bernardino	2,035,210	54.5% of population between 20 and 60 years old Median age 32.5	27.1%	$53,433	19.5%	Asian: 6.3% Black: 8.9% LatinX: 49.2%	34%	21%
Riverside	2,189,641	52.4% of population between 20 and 60 years old Median age 34.5	28.7%	$56,603	16.8%	Asian: 7.4% Black: 7.6% LatinX: 45.5%	33%	22%
Orange	3,010,232	56.1% of population between 20 and 60 years old Median age 37.1	45.5%	$76,509	12.8%	Asian: 17.9% Black: 1.7% LatinX: 43.7%	26%	30%
Los Angeles	9,818,605	57.1% of population between 20 and 60 years old Median age 35.6	37.2%	$56,196	18.2%	Asian:13.7% Black: 8.7% LatinX: 47.7%	40%	

Source: U.S. Census Bureau, 2010 census data.

4.2.1. DISADVANTAGED COMMUNITIES

The Santa Ana River Watershed contains one of the fastest-growing regions in California and some of the state's poorest residents. In 2000, the per capita income of portions of the Inland Empire was about 25% below the state average. Figure 4.2-1 depicts watershed income in the Santa Ana River Watershed by census tract, based on 2015 American Community Survey estimates. This disparity in income has been worsened in recent times by the recent economic downturn, which has had a detrimental effect on the region in general and has specifically impacted laborers in disadvantaged communities with limited job skills.

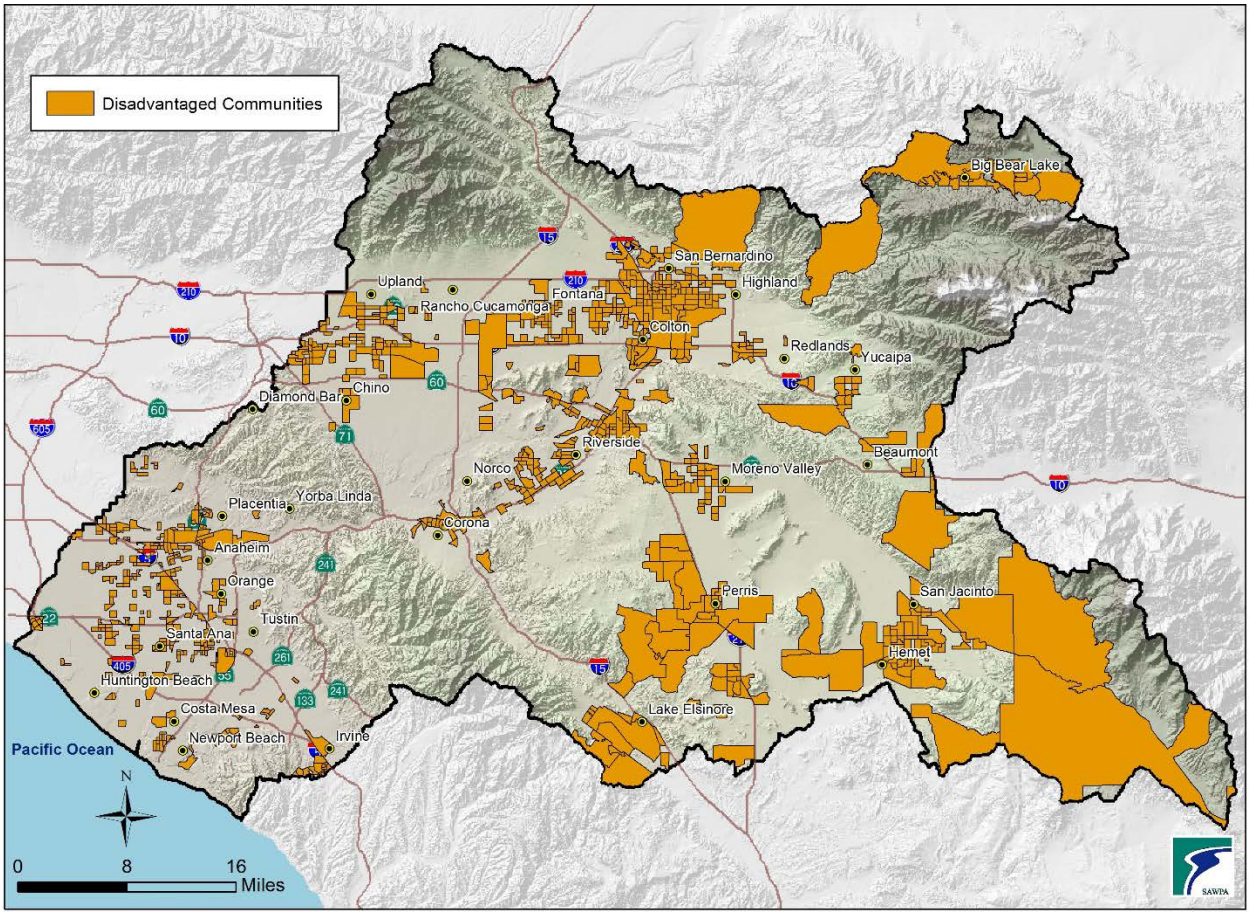

Figure 4.2-1. Disadvantaged Communities in the Santa Ana River Watershed

The term "disadvantaged communities" is understood to be problematic because, when used as a label for people and the community where they live, it can be discouraging at best and insulting at worst. As a term, however, it is a key component in state policy, including the IRWM Program, and therefore must be addressed. For the OWOW Plan Update 2018, the term "disadvantaged community" is used only when necessary to describe aspects of the California policies that also use the term. Elsewhere this plan instead references "low-income" or "overburdened" communities as a more conscientious way of describing and not labeling the people of the watershed.

Using the statistical process in the California Public Resources Code, about 25% of the watershed population reside in a census tract considered disadvantaged. Many of the cities of the watershed contain at least some census tracts that include low household incomes (Table 4.2-3). This way of identifying need is a necessary aspect of water policy, however, does not well resolve the senses of community that most people have in their day-to-day lives. It is fair to assume that almost no one knows which census tract they live within, and certainly do not consider themselves in a community with only those who also live there. Community is more complex than any geographic lines can capture, whether they be census or city boundaries.

Table 4.2-3. Disadvantaged Communities in the Santa Ana River Watershed

Watershed Counties	Watershed Cities with Disadvantaged Census Tracts
Los Angeles	Claremont, Pomona
Orange	Anaheim, Buena Park, Costa Mesa, El Toro, Fullerton, Garden Grove, Huntington Beach, Irvine, La Habra, La Palma, Laguna Woods, Lake Forest, Los Alamitos, Newport Beach, Orange, Placentia, Santa Ana, Seal Beach, Stanton, Westminster
Riverside	Beaumont, Calimesa, Cherry Valley, Corona, East Hemet, Glen Avon, Hemet, Highgrove, Home Gardens, Homeland, Lake Elsinore, Lakeland Village, March AFB, Mira Loma, Moreno Valley, Norco, Nuevo, Perris, Quail Valley, Riverside, Romoland, Rubidoux, San Jacinto, Sedco Hills, Sun City, Sunnyslope, Valle Vista, Wildomar, Winchester, Woodcrest
San Bernardino	Big Bear City, Big Bear Lake, Bloomington, Chino, Colton, Fontana, Grand Terrace, Highland, Idyllwild-Pine Cove, Loma Linda, Montclair, Muscoy, Ontario, Rancho Cucamonga, Redlands, Rialto, San Bernardino, Upland, Yucaipa

For the communities of the watershed, which are often overlapping in ways that belie the underlying political jurisdictions, many challenges are faced, and opportunities held. Some of these challenges or opportunities are similar throughout the watershed and some are highly localized in one or several communities.

Unlike elsewhere in California, for the most part members of all communities in the Santa Ana River Watershed have access to safe drinking water, and the few pockets where this is not true are under management to ensure improvement. A larger but still relatively small number of people have insufficient sanitation systems for their homes and businesses. This too is a relatively well-understood problem and solutions are underway in almost all cases.

Instead, the challenges in this watershed, described in OWOW 2.0 Plan and restated here, are grounded in a lack of human and financial resources to most effectively manage water, and to build resilience into systems being strained by changing conditions. Smaller communities lack the tax base to support specialized staff and infrastructure retrofit (and sometimes, simple operations and maintenance).

As was described in the application from the watershed to begin the Disadvantaged Communities Involvement Program, many community members don't have a strong connection to the decisions that are made about water. The fragmented nature of water management—housed in multiple agencies, each with unique authorities, service areas, and decision-making processes—leaves many communities uncertain how to engage to make sure their needs are met. This particular challenge—ensuring that communities are able to contribute to the decisions being made that will impact them—is core to the Disadvantaged Communities Involvement Program, and something this OWOW Plan Update 2018 encourages.

California law and several water-related policies and programs, including Proposition 1, also recognize the concept of an "economically distressed area." This is any community where the median household income is below 90% (but above 80%, which is the threshold for disadvantaged communities) of the statewide median household income. Figure 4.2-2 is a map of census tracts that have median household income statistics sufficient to be considered an economically distressed area.

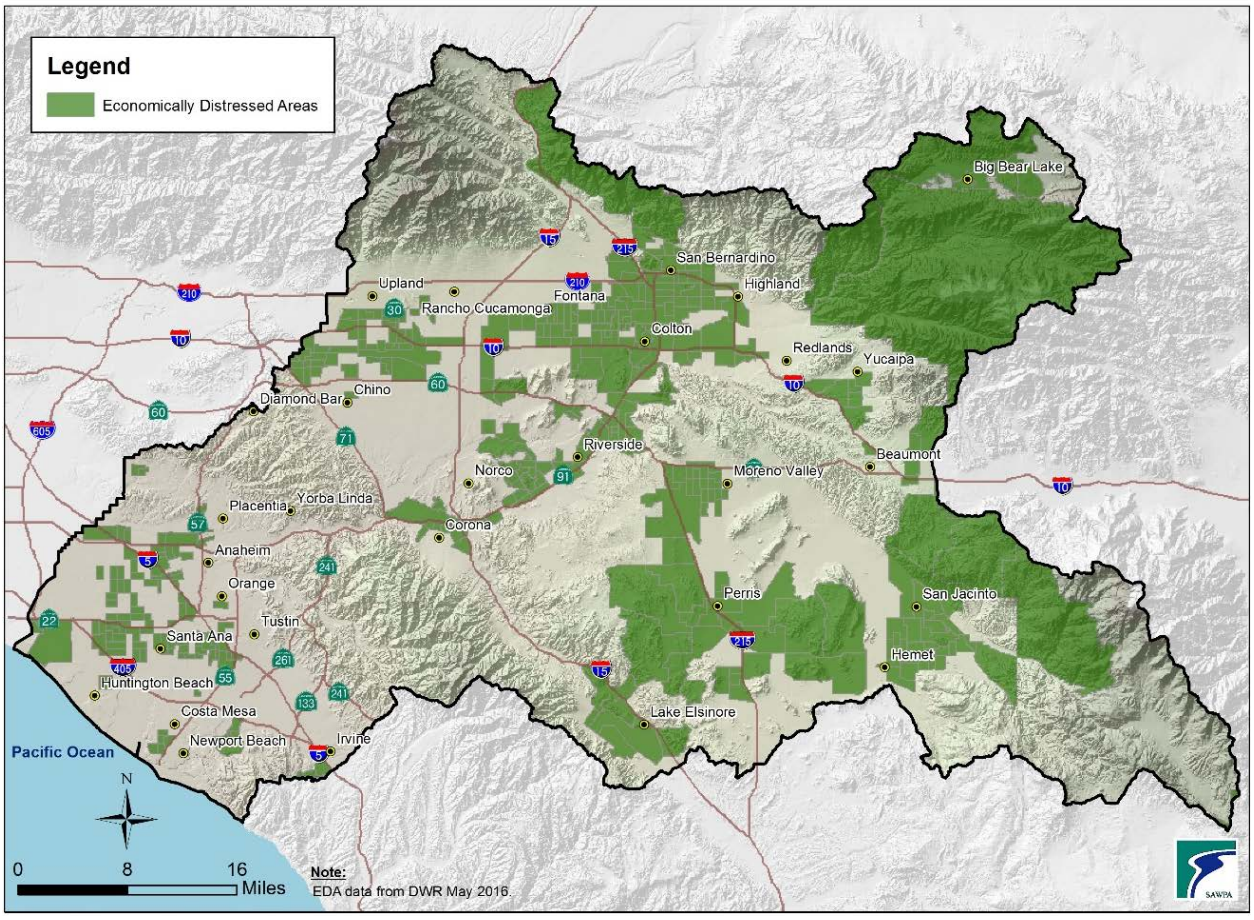

Figure 4.2-2. Economically Distressed Areas

4.2.2. TRIBAL COMMUNITIES

The Soboba Band of Luiseño Indians, the San Manuel Band of Serrano Mission Indians, the Morongo Band of Mission Indians, and the Santa Rosa Band of Cahuilla Indians reside within the watershed boundary. Just outside the watershed are communities of the Agua Caliente Band of Cahuilla Indians, the Cahuilla Band of Mission Indians, the Ramona Band of Cahuilla Mission Indians, and the Pechanga Band of Luiseño Indians.

Soboba Band of Luiseño Indians

The Soboba Band of Luiseño Indians is a federally recognized Indian Tribe that resides on 3,172 acres of land at the foothills of the San Jacinto Mountains in Riverside County. The reservation has deep canyons and rolling hills, ranging from 1,600 feet above mean sea level (amsl) beginning at the San Jacinto River, which borders the reservation's western boundary, to about 2,600 feet in the northeastern and southern portions. The Tribe has a current enrollment of approximately 1,200 Tribal members, who are governed by a five-member elected Tribal council. The Sobobas have a rich and diverse history, as members come from both Cahuilla and Luiseño ancestry. The Soboba people have farmed land that was irrigated from surface water from the San Jacinto River, from two of its tributary streams, Poppet and Indian Creeks, and from more than 40 perennial springs.

San Manuel Band of Serrano Mission Indians

The San Manuel Band of Serrano Mission Indians is a federally recognized Indian Tribe located near the city of Highland, California. The Serrano Indians are the indigenous people of the San Bernardino highlands, passes, valleys, and mountains who share a common language and culture. The San Manuel Reservation was established in 1891, when the Tribe was recognized as a sovereign nation with the right of self-government. The Tribe is actively seeking to provide a better quality of life for its citizens by building infrastructure, maintaining civil services, and promoting social, economic, and cultural development.

Morongo Band of Mission Indians

The community of the Morongo Band of Mission Indians, a federally recognized Indian Tribe, is set at the foot of the San Gorgonio and San Jacinto Mountains and spans more than 35,000 acres. The Morongo Reservation was one of nine small reservations set aside in 1865; today, it hosts one of the largest Tribal gaming facilities in the nation. Employing more than 3,000 people, the Tribe has become the largest private-sector employer in the Banning–Beaumont region and is a major contributor to the Coachella Valley economy. The Tribe is also actively working with government and community leaders to explore the best paths of future development and planning to yield a better quality of life for its residents.

Santa Rosa Band of Cahuilla Indians

The Santa Rosa Band of Cahuilla Indians, a federally recognized Tribe, is headquartered in Riverside County, between Palm Springs and Anza, and occupies 11,021 acres of land. The reservation is composed of four noncontiguous parcels, with the largest being located in the area of Sew'ia, or

New Santa Rosa (Vandeventer Flat), where residents of the reservation live. The three remaining parcels, which include Toro Peak, where the Tribe operates a telecommunications relay station, are located east of the main parcel. Elevation ranges from 4,200 feet amsl at Sew'ia to 8,700 feet amsl at Toro Peak. Currently, there are 110 recognized Tribal Members (age 18 and over); approximately 70 individuals live on the reservation. The people of Sew'ia are one of eight Cahuilla Bands, which include Cahuilla, Ramona, Los Coyotes, Torres–Martinez, Augustine, Cabazon, Agua Caliente, and Morongo.

WASTEWATER TREATMENT PROJECT
by Soboba Band of Luiseño Indians

One success story is already in the making. The Soboba Band of Luiseño Indians joined forces with EMWD, Lake Hemet Municipal Water District, and the federal Bureau of Indian Affairs to propose and be awarded a wastewater treatment facility. The effort included an initial planning and predesign phase, led by a qualified management team experienced in the development process and associated wastewater treatment facility planning, design, construction, and operations. The initial evaluation phase verified the most viable treatment alternative, then completed a detailed design and construction planning effort.

A parcel of land outside the reservation owned by Soboba was incorporated into the reservation. Annexation of this property was necessary for inclusion in the feasibility study. The consultant prepared and completed the feasibility study and investigated various wastewater collection, treatment, storage, and reuse options that could significantly reduce Soboba's expenses by combining outside funding to build and operate an on-site wastewater treatment plant. Part of the analysis included a topographic, funded by the Federal Emergency Management Agency (FEMA), to meet the specification required for an analysis of the wastewater treatment facilities and related infrastructure with 1-foot contours.

The final development plan described an opportunity to more efficiently phase an on-site wastewater treatment plant using existing facilities to manage wastewater at an off-site publicly owned treatment works. Soboba further studied this phased option, and an addendum to the feasibility study was prepared.

Many of the water infrastructure needs of Tribal communities in the watershed mirror the needs of non-Tribal communities. During development of the OWOW Plan Update 2018 participants in the Disadvantaged Communities and Tribal Communities Pillar engaged with members of Tribes to develop recommended strategies for overcoming the challenges faced by Tribes in pursuit of the shared goals of the watershed.

4.2.3. LAND USE

Chapter 1.2 of the OWOW Plan summarized the history of land use patterns and practices in the Santa Ana River Watershed, and shared lessons learned about the impacts land use decisions have on water resources. The chapter closes with the suggestion that collaborative partnerships between regional water management agencies and local governments and private sector developers and environmental organizations can address the sustainability of prior and future land use decisions. The OWOW 2.0 Plan proposed solutions to the challenges faced in the watershed as only being limited by the determination to collaboratively solve complex land use and watershed sustainability problems.

Water resources management is inextricably linked to our land use patterns; however, rarely does a water resources manager have land-use authority. Our current land use planning and practices have

damaged and threaten to further damage our water-supply reliability, and are costly in many other ways, including loss of historic watershed functionality, habitat deterioration and high carbon emissions for transportation. These problems can be stopped and even reversed if local government planning and water agency planning, real estate developers, and the environmental community work together to fully incorporate water in the development process. No one agency can be successful working alone. Working together, the watershed can increase the understanding that unavoidable impacts do result from previous long-standing accepted building practices. Embracing a sustainable development ethic meets human needs and preserves the environment in the watershed. Meeting today's needs without degrading the ability to meet needs in the future sits at the intersection of land and water planning and management.

Parts of the watershed are again developing rapidly (Figure 4.2-3). These changes in how precipitation interacts with the land surface impacts groundwater replenishment, flood risk management, temperature and humidity, as well as habitat and recreation. As open space is converted to development, or developed landscapes are made denser, or agricultural land is converted to urban or suburban development, the watershed is fundamentally changed.

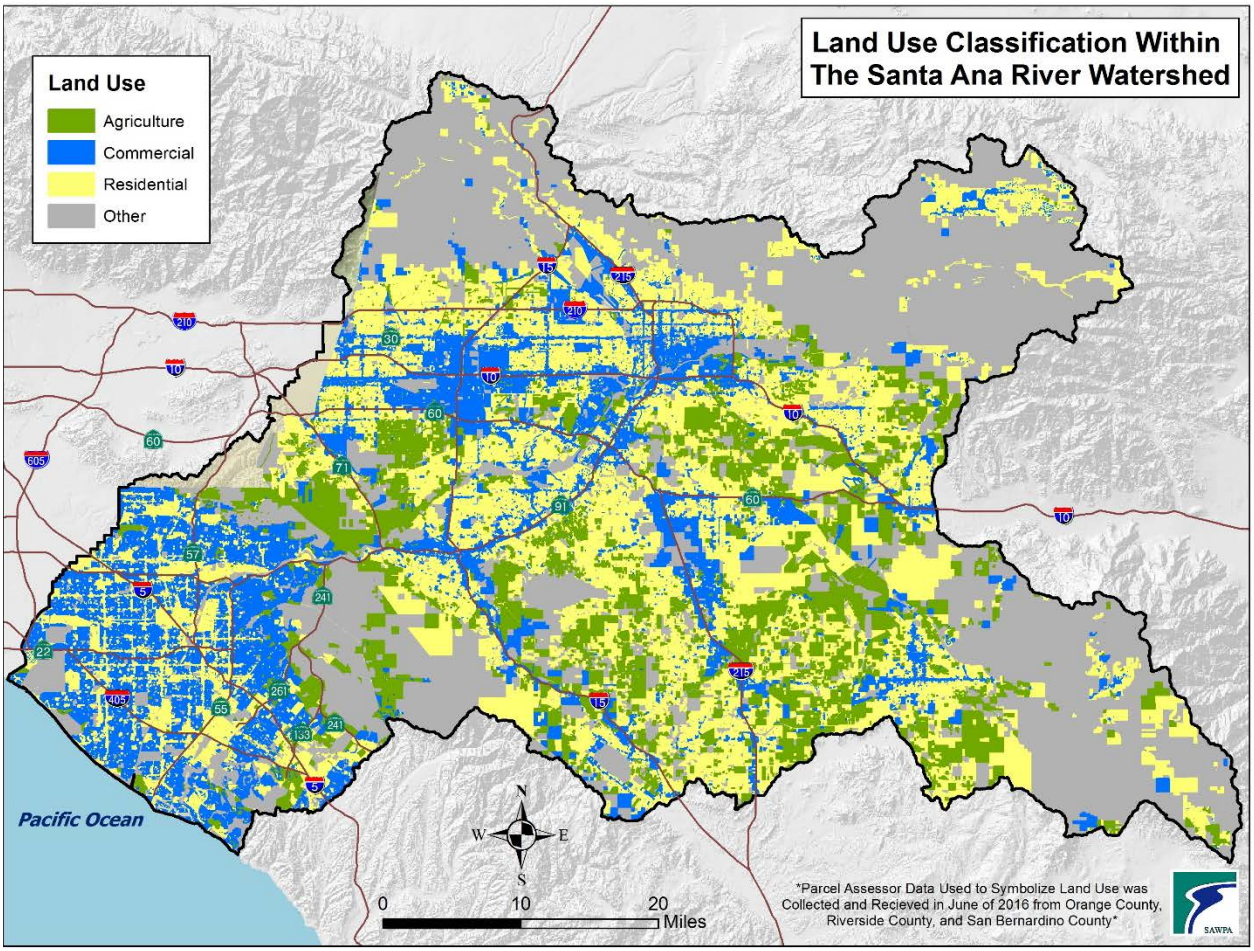

Figure 4.2-3. Santa Ana River Watershed Land Use

The OWOW Plan Update 2018 contains a suite of recommended strategies to undertake at the intersection of land use and water management to support sustainability of the watershed, the water supply, and the people who live or work here.

4.3. WATER MANAGEMENT SETTING

The OWOW Program facilitates a collaborative process to discuss water management and sustainability throughout the watershed. All aspects of water management are considered in this OWOW Plan Update 2018, and Chapter 5 provides the recommended management and policy strategies to support achievement of the goals of the OWOW Plan.

4.3.1. WATER INFRASTRUCTURE IN THE SANTA ANA RIVER WATERSHED

To find ways to improve water reliability for the future, the existing water infrastructure system must be considered as the foundation to build on. Particularly in this watershed, when we describe water infrastructure, we are describing not just the large-scale systems, services, and facilities that are necessary to support the collection, storage, treatment, and delivery of water to customers in the region, but also many other systems, services, and facilities, such as trails, parks, and land use, that may use or have a connection with water. In addition, because water demands and supplies are interrelated with a variety of other natural and artificial support systems, several different maps are included in this chapter to fully convey the opportunities to coordinate among infrastructure systems, as well as land use for the development of multi-beneficial integrated projects.

The importance of an effective water-related infrastructure system cannot be overstated. The American Society of Civil Engineers conducted evaluations of the infrastructure in the watershed in 2010, as conveyed in two separate infrastructure report cards, one for San Bernardino and Riverside Counties and one for Orange County. These infrastructure report cards evaluated the condition, capacity, operations, and security of infrastructure as criteria for assigning grades to the systems. In San Bernardino and Riverside Counties, the most populated and developed areas of the counties lie in the western portions (Inland Empire) of the watershed and within the Santa Ana Regional Board's boundaries. Figure 4.3-1 shows the various water retail service areas within the Santa Ana River Watershed.

Room for improvement clearly exists with reference to water-related infrastructure grades for the Inland Empire, particularly because this area struggles to maintain and provide water-related infrastructure for two counties.

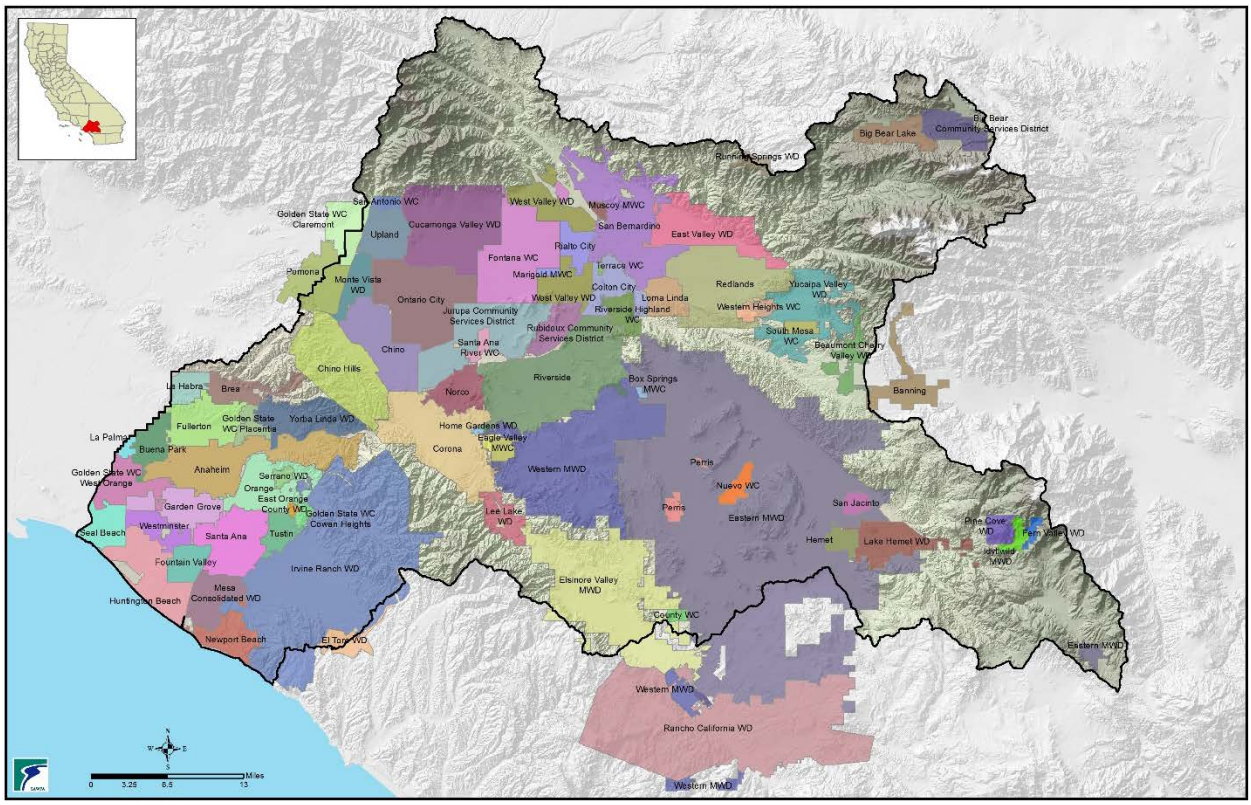

Figure 4.3-1. Water Retail Service Areas in the Santa Ana River Watershed

Historic Water Infrastructure Development

A sense of the water development history of the region helps inform understanding of the water-related infrastructure in the watershed. Prior to the colonial period, people relied on the natural flows of the watershed to support communities with water and food and lived in ways and places that sheltered from floods. Before the Mission and Rancho periods of the 1800s, the primary land use in the watershed consisted of grazing cattle and horses. With the arrival of Mormon settlements, agricultural lands began to be developed, using the readily available surface springs as a dependable source of irrigation water. As more and more settlers arrived, and new communities were founded demanding more water supplies, issues of water rights arose along with competition for the best diversion points. Gradually, a system of water rights was established and shares in the water supply became marketable commodities. As agricultural activity continued to increase in the inland areas of the watershed, more and more infrastructure was needed to provide the necessary water. First windmills, then motors, and finally, deep well turbines were installed. With increasing urbanization, the dominant land use of the region, agriculture, was gradually subsumed over time by residential, commercial, and industrial areas to serve a burgeoning population drawn to the semi-arid, warm climate of this region.

Water Supply Infrastructure

In the late 1920s, to ensure adequate water supplies for the population growth of Southern California and following the lead of the City of Los Angeles in its construction of the Los Angeles Aqueduct, efforts to raise money to import water from other places began. The Metropolitan Water District of Southern California (Metropolitan) built and still operates the Colorado River Aqueduct, which each year imports millions of acre-feet of water from the Colorado River (Figure 4.3-2) westward across the Mojave Desert and into the Santa Ana River Watershed. After State Water Project (SWP) facilities were extended into the region in the early 1970s, State Water Contractors received deliveries from Northern California's Bay Delta Region to constructed pipelines to deliver imported water to serve the rapidly growing water demands of the region. Connections were established for the watershed by four State Water Contractors: Metropolitan, San Bernardino Valley Water District, San Gorgonio Pass Water Agency, and the San Gabriel Valley Municipal Water District, as shown on Figure 4.3-3.

Figure 4.3-2. Colorado River Aqueduct

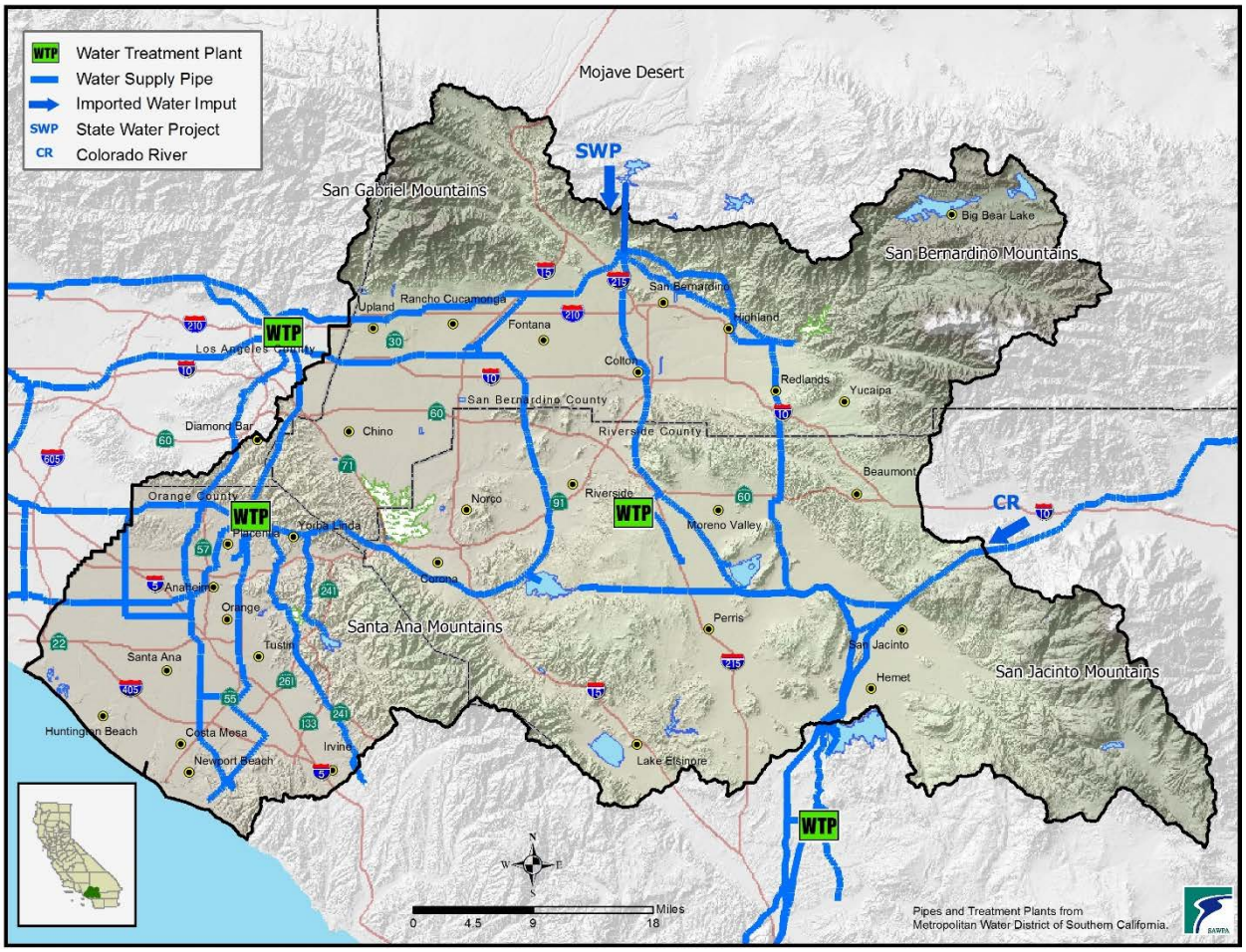

Figure 4.3-3. Imported Water Infrastructure in the Santa Ana River Watershed

Flood Risk Management Infrastructure

The Santa Ana River Watershed has experienced flooding on numerous occasions in the American era, including floods in 1825, 1862, 1884, 1914, 1916, 1927, 1938, 1965, 1969, 1980, 1983, 1995, 2005, and 2010. The critical event in flood management in the watershed was the 1938 flood. In that event, Orange County experienced California's worst flooding of the 20th century. The City of Anaheim experienced 15 feet of water in some places, and 182,000 total acres were inundated. Dozens of deaths occurred. In Riverside and San Bernardino Counties, the 1938 flood made it painfully clear that the County governments did not have an adequate program of flood protection. The Orange County FCD was formed in 1927, San Bernardino County created its flood control district in 1939, and Riverside County followed the same course in 1944.

After use of available local and imported water by urban populations, wastewater treatment infrastructure in the watershed collects and treats the effluent at the locations shown on Figure 4.3-4; the majority are located near the Santa Ana River due to their proximity to a discharge location.

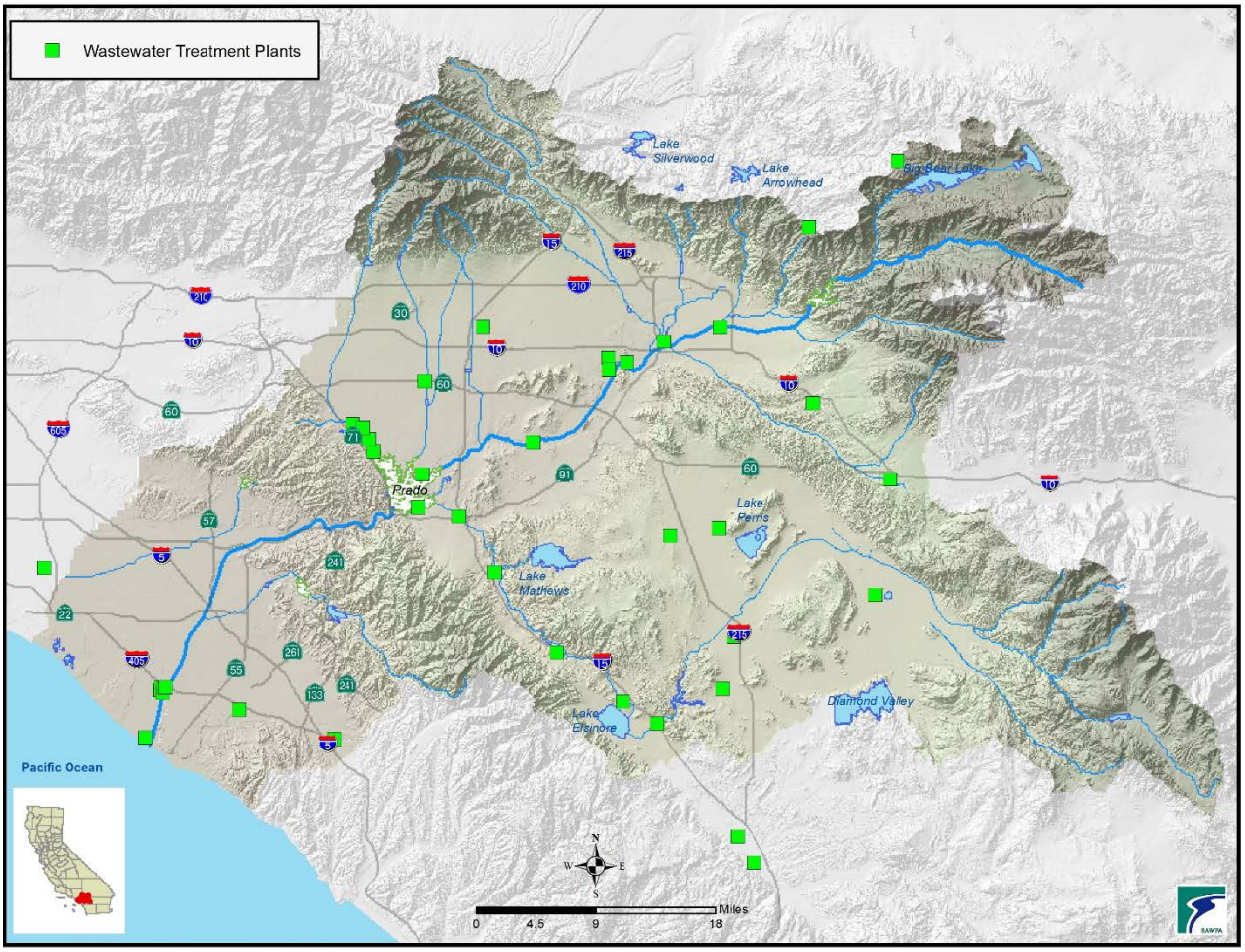

Figure 4.3-4. Wastewater Treatment Facilities in the Santa Ana River Watershed

The once-reliable flows of the Santa Ana River, which by the late 1800s often dwindled to a near trickle during the summer months, were gradually replaced over time with predominantly steady and reliable tertiary-treated discharge flows that could be captured downstream for reuse and recharge by downstream entities. Major infrastructure developed to support water reuse is shown on Figure 4.3-5.

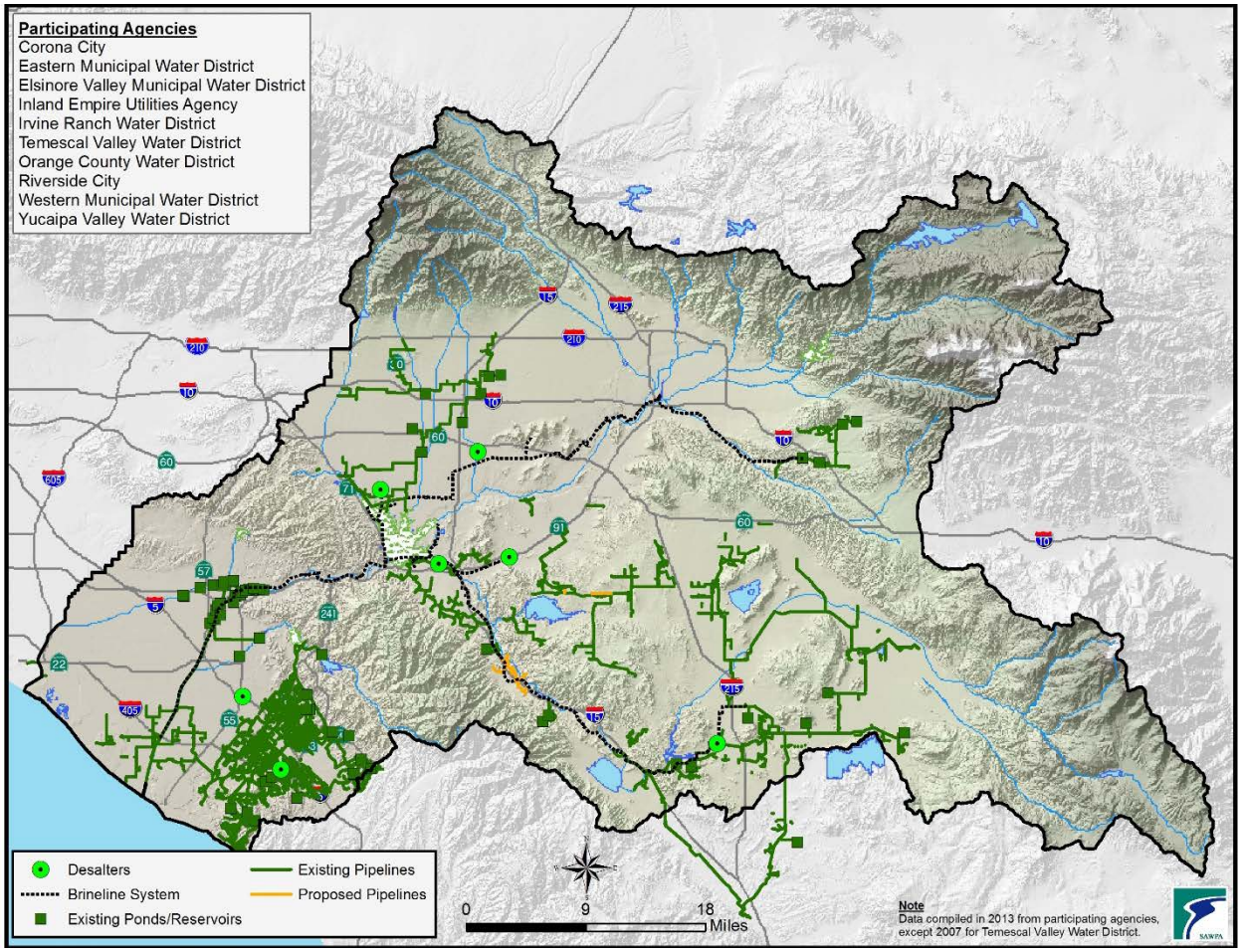

Figure 4.3-5. Major Recycled Water Infrastructure in the Santa Ana River Watershed

Salt Management Infrastructure

One of the main concerns arising from the heavy use of the watershed for past agricultural practices, and now from the imported water and use of water, is salt buildup. Almost a century of agricultural and industrial use has resulted in salts and other constituents of concern infiltrating many aquifers and streams within the watershed. The combined impact of regulations and local runoff control efforts have helped ensure steady progress in controlling salt and contaminants in the watershed and improving water supplies.

As part of the solution to the total dissolved solids (TDS; salts) issues within the watershed, SAWPA constructed approximately 93 miles of the 16- to 84-inch-diameter Inland Empire Brine Line to convey non-reclaimable high-saline brine out of the watershed, as shown on Figure 4.3-6. These brine flows are collected throughout the upper watershed and sent to Orange County Sanitation District wastewater treatment facilities before final discharge to the ocean. SAWPA owns capacity rights in the brine line downstream of Prado Dam, and owns the brine line pipeline upstream of Prado Dam. With projected future growth, both developmentally and economically, the

watershed's reliance on this 93-mile-long pipeline will continue to be a critical factor in the overall plan to minimize future drought impacts, achieve the desired salt balance, and improve the quality of the water resources in the upper Santa Ana River Basin. Therefore, maintaining the integrity of the brine line and optimizing its future use are extremely important.

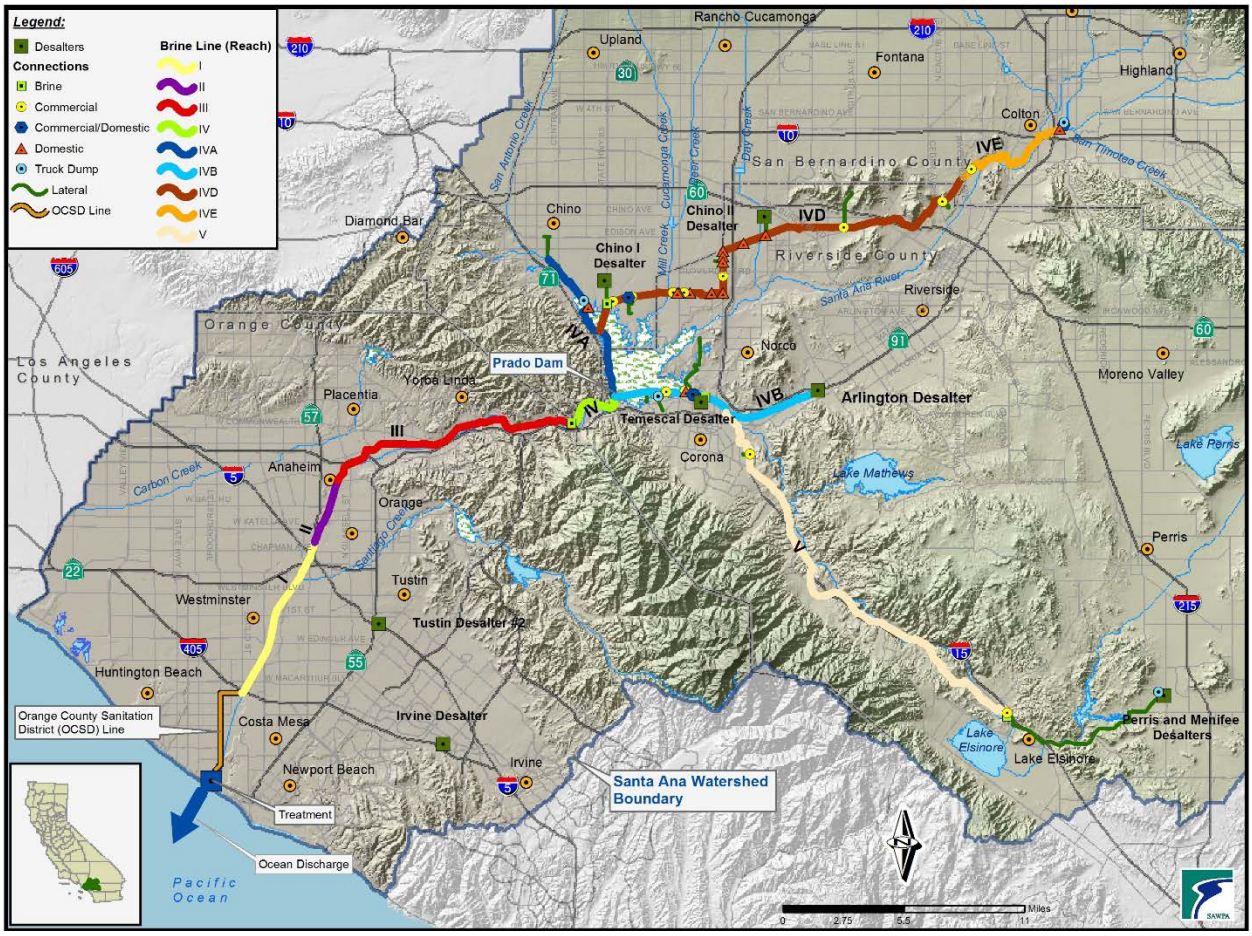

Figure 4.3-6. Inland Empire Brine Line and Connections

4.3.2. WATER SUPPLY

There are 76 retail water agencies and 10 wholesale water agencies whose boundaries overlie the watershed (see Figure 4.3-1 for major retailers). The key objective for water supply reliability is a cost-effective, diverse water supply and water storage portfolio that makes better use of existing facilities and supplies; improves overall water use efficiency; achieves a practical level of interconnections and redundancy; and optimizes water storage for use during drought periods. Maintaining a robust and reliable water supply within the watershed is a key piece of the OWOW Plan Update 2018.

The watershed gets about 50% of its water from local precipitation in the form of surface water and stored as groundwater. The watershed imports about 35% of its water using the SWP and the

Colorado River Aqueduct. The remaining 16% of the watershed's water supply is recycled water. Each of these sources is explored in the sections that follow.

Based on data from the 2015 Urban Water Management Plans, the watershed can meet its demands in the average, single-year drought, and multi-year drought scenarios while maintaining a reliability margin of 10% or greater to help offset future risk (Figures 4.3-7 through 4.3-9).

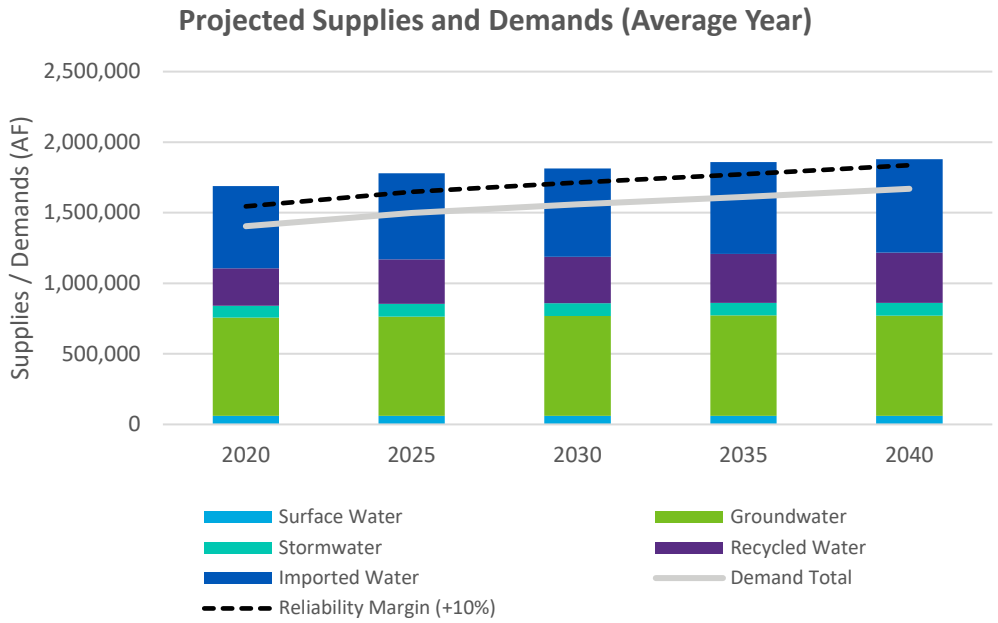

Figure 4.3-7. Average Year Supply/Demand

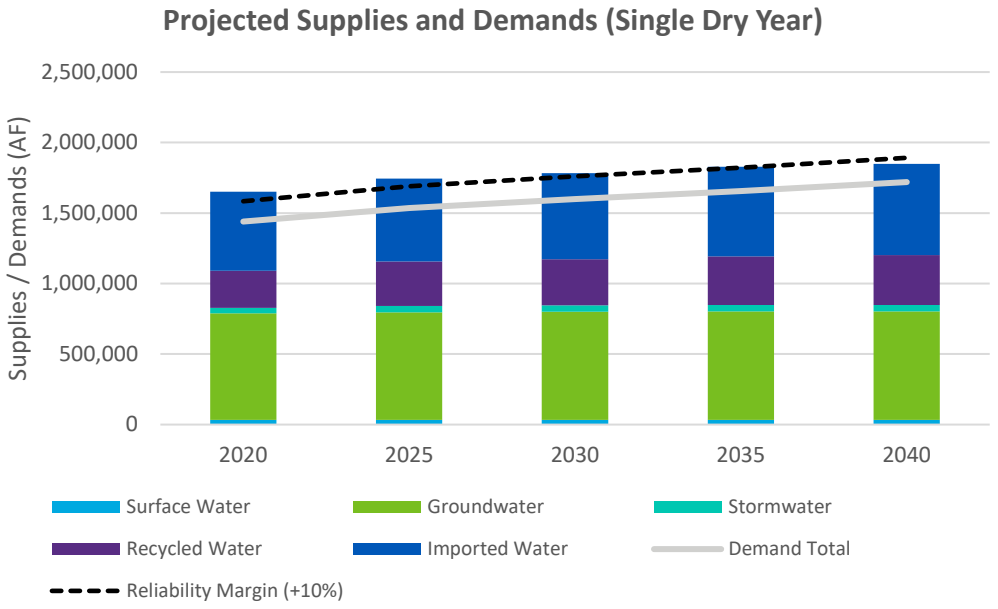

Figure 4.3-8. Single Dry Year Supply/Demand

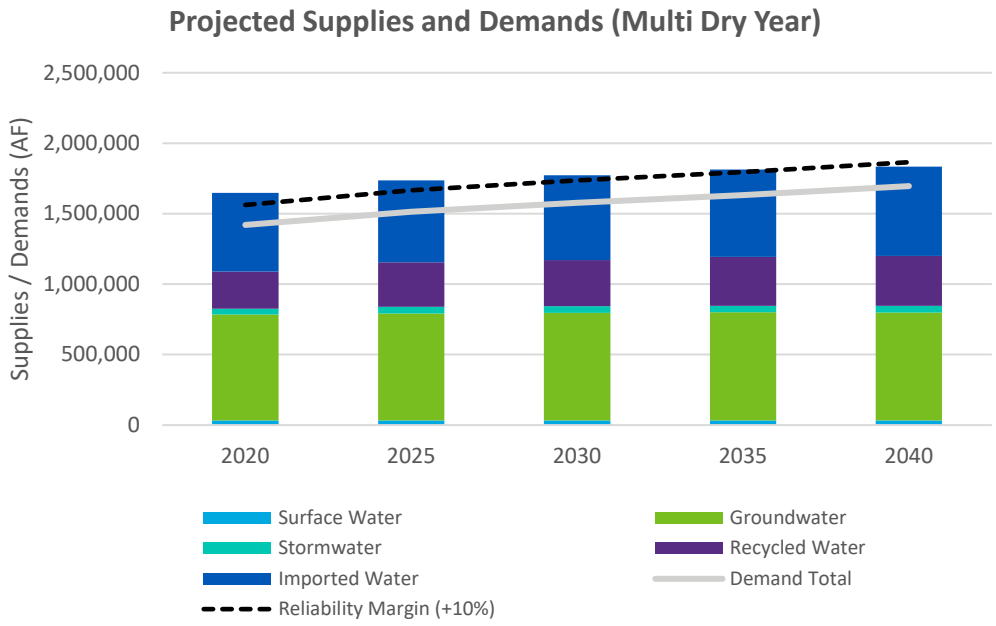

Figure 4.3-9. Single Dry Year Supply/Demand

Key to maintaining and strengthening this reality is a continued focus on the implementation of water management concepts as recommended in the Water Resources Optimization Pillar (Section 5.9 of the OWOW Plan Update 2018). The analysis of water supply reliability scenarios can be found in Appendix E.

Precipitation Stored as Groundwater

The underground pore space between soil granules provides space to store water, referred to as groundwater, which can be later extracted using wells. To avoid double-counting water supplies, the OWOW Plan Update 2018 limits the term "groundwater" to precipitation stored as groundwater. Imported water stored in the ground is classified as "imported water." The watershed's underground storage space functions like a series of underground reservoirs. These underground reservoirs, or basins, range from a few hundred to over one thousand feet in thickness. Basins upstream from Prado Dam underlie about 1,200 square miles of the watershed, while basins downstream from Prado Dam underlie about 400 square miles of the watershed. The yields of nearly all the basins within the watershed have been estimated using past hydrology; for planning purposes, agencies have assumed that this past hydrology will continue to repeat itself and have not included any possible effects from climate change. However, in view of the fact that hydrological patterns are expected to alter in the future due to climate change, with associated impacts to demand and supplies, climate change impacts are discussed and addressed separately later in this document.

In general, the watershed relies on precipitation stored as groundwater to provide about 50% of the water supply. See Figure 4.1-3, Groundwater Management Zones in the Santa Ana River Watershed, for

the larger groundwater basins within the watershed (individual basins and sub-basins have been omitted for clarity). These basins provide storage space for local and imported water supplies that can be used during droughts or other shortages. The amount of storage space in the lower watershed is based on the storage volume that could be available in approximately 8 out of 10 years.

Artificial Replenishment

Artificial replenishment involves storing additional water in the basins in addition to the precipitation stored as groundwater. The most common type of artificial replenishment is spreading water into open pits, or basins, and allowing it to soak into the ground down to the water table. Another commonly used method is called in-lieu replenishment. This method involves replacing the use of groundwater with another source of water. This corresponding reduction in groundwater pumping results in less water being removed from the basins, which effectively acts to replenish the groundwater supply. Finally, the most costly method of artificial replenishment is to inject the water into the basins using injection wells. Of the various methods available, artificial replenishment through spreading basins is the most common throughout the watershed (see Figure 4.3-10).

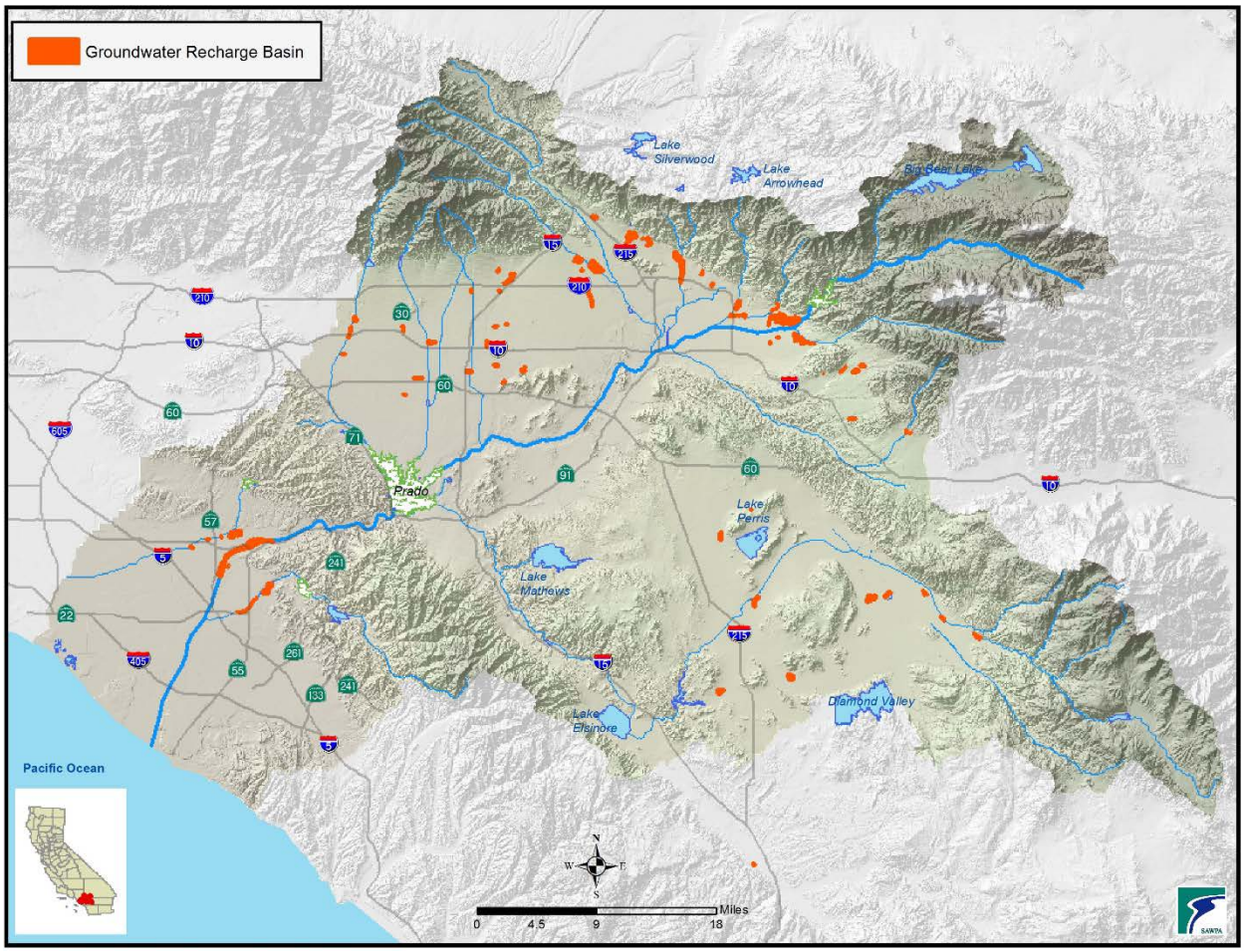

Figure 4.3-10. Groundwater Recharge Facilities in the Santa Ana River Watershed

One challenge to groundwater supplies in the watershed is poor water quality, typically due to TDS (or salts) and nitrates. These salts accumulate mostly through use and evaporation, but also are introduced to the water supply by way of agricultural fertilizers and septic tanks. Further, numerous forms of contamination, such as trichloroethene and perchloroethene (commonly used solvents) and perchlorate (which is found in fertilizer, fireworks, and explosives), are evident in the watershed. All these forms of contamination must be removed, using various treatment methods, before the water can be introduced into the water supply system. Additional information on water supply quality can be found in Section 4.3.3.

Precipitation as Surface Water

The amount of precipitation that flows from rivers and streams that is diverted and used represents about 9% of the total water supply. Local surface water is largely seasonal: most of the water comes in the wet or rainy season and is dramatically reduced in the dry season to snowmelt, natural springs, and treated wastewater flows. Facilities such as dams and flood control detention basins divert and slow storm runoff, providing additional opportunity for groundwater replenishment. In the upper watershed, only a portion of storm runoff is being diverted and used as surface water. Much of the runoff from the upper watershed is captured by the Prado Dam and later is used by the lower watershed. The Seven Oaks Dam and other dams in the watershed perform similar functions in their respective locations.

Imported Water

The watershed relies on water imported from the Colorado River Aqueduct and SWP for a little more than one-third of its water supply. Water is imported into the area by the Metropolitan Water District of Southern California (Metropolitan), San Gorgonio Pass Water Agency, and San Bernardino Valley Municipal Water District.

As shown on Figure 4.3-3, Imported Water Infrastructure in the Santa Ana River Watershed, there are significant regional pipelines (48 inches in diameter and larger) and surface storage reservoirs in the watershed. These pipelines provide opportunities for water transfers, especially in an emergency situation. Table 4.3-1 provides a list of surface water reservoirs and their capacities in the watershed.

Table 4.3-1. Surface Water Reservoir Capacities

Reservoir	Capacity (Acre-Feet)
Lake Arrowhead	48,000
Big Bear Lake	73,000
Diamond Valley Reservoir	800,000
Lake Elsinore	45,000
Canyon Lake	12,000
Lake Mathews	178,500
Lake Perris	120,000

Table 4.3-1. Surface Water Reservoir Capacities

Reservoir	Capacity (Acre-Feet)
Prado Dam	Flood control and conservation
Seven Oaks Dam	Flood control (conservation pending)
Lake Silverwood	74,970
Irvine Lake	25,000

Imported Water Quality

The quality of imported water that is used for recharging groundwater directly affects groundwater quality. Imported water quality also affects the quality of discharges from wastewater treatment plants for certain constituents, such as salinity. This section provides a summary of key water quality constituents within the imported water systems.

Colorado River

Colorado River salinity averages 630 mg/L but can fluctuate by more than 300 mg/L. Salinity in the basin is due to both natural sources and anthropogenic activities. Salinity changes are gradual over time due to large storage reservoirs along the river. Figure 4.3-11 shows historical TDS levels at Lake Mathews.

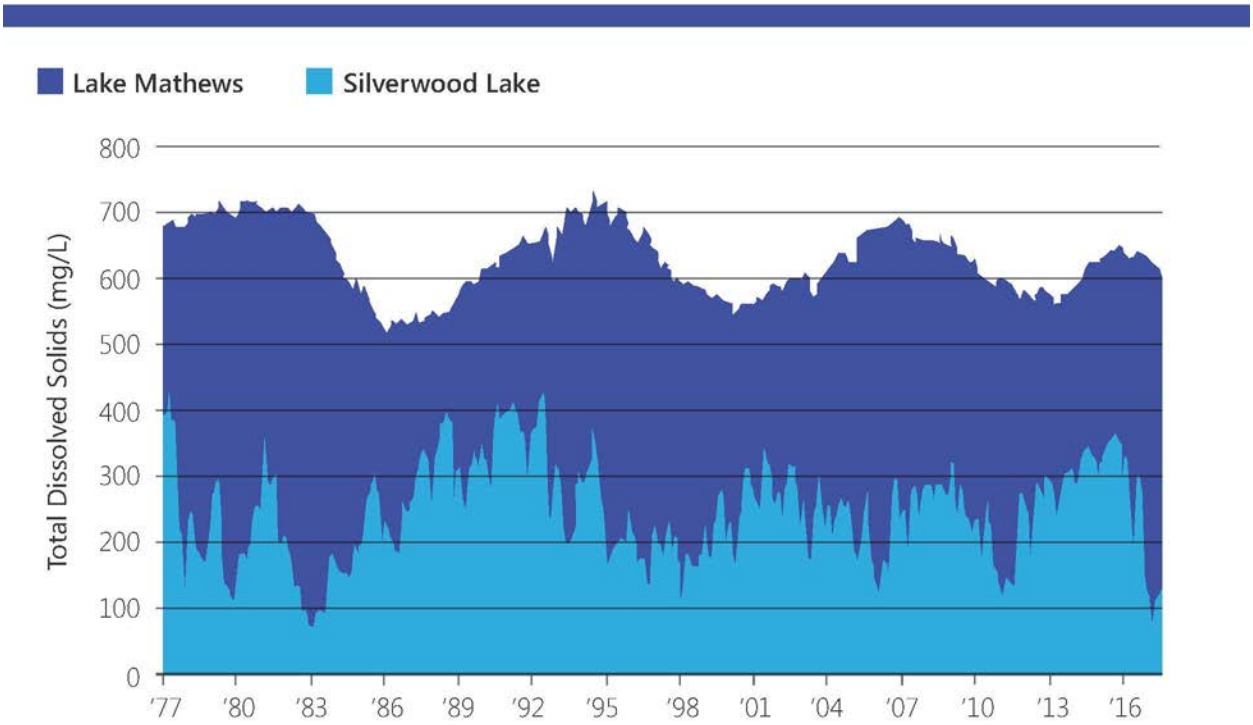

Figure 4.3-11. Imported Water TDS Levels

The Colorado River Basin Salinity Control Forum developed the Salinity Control Program to achieve agreed-on numeric criteria along the Lower Colorado River. This includes improving agricultural irrigation practices in the Upper Colorado River Basin and reducing salinity from natural sources. SWP supplies are blended with water from the Colorado River Aqueduct to reduce the salinity of delivered water.

Nutrients

Phosphorus is the limiting nutrient for algal growth in the system. Despite relatively low concentrations (near 0.010 mg/L), any increase can cause algal growth; excessive growth can result in unpleasant taste and odor, filter clogging, total organic carbon (TOC), and toxins. Nitrate (as N) levels in recent years at the intake of the aqueduct have averaged <0.5 mg/L, well below the MCL of 10 mg/L.

Perchlorate

Perchlorate has been detected at low levels in the water supply. In the late 1990s, the Nevada Division of Environmental Protection began remediating perchlorate contamination from two chemical manufacturing sites in Henderson, Nevada, linked to contamination in the Colorado River. Perchlorate levels in the river have declined and since 2006 levels have typically been non-detectable at the entry point of the conveyance system.

Uranium

Uranium is a naturally occurring radioactive element found at low levels in rock, soil, and water. Uranium levels at the intake average 2.8–3.3 picocuries per liter (pCi/L), much lower than the MCL of 20 pCi/L. However, a 16-million-ton pile of uranium tailings from a former uranium mill site near Moab, Utah, lies approximately 750 feet from the Colorado River, approximately 650 miles upstream of Lake Havasu. The U.S. Department of Energy began removing the tailings to an engineered disposal site in 2009, with approximately 8.9 million tons removed as of January 2018. There continues to be a threat of the tailings being washed directly into the Colorado River during a significant flood or earthquake.

Chromium-6

There is a contaminated groundwater plume adjacent to the Colorado River near Needles, California, that contains chromium-6 originating from past waste disposal practices at the Pacific Gas & Electric Company's Topock Compressor Station. The California Department of Toxic Substances Control is the lead regulatory agency responsible for cleanup activities for the natural gas compressor station site. Final design of the project was completed and construction is anticipated to begin by the end of 2018. Chromium-6 levels in the river downstream of the site have been mostly non-detect (<0.03 µg/L), with an occasional low background level (0.03–0.09 µg/L).

State Water Project

The water quality in the SWP is measured in the California Aqueduct, just upstream of the Tehachapi Afterbay where the aqueduct bifurcates into the east and west branches.

Total Organic Carbon and Bromide

TOC originates from decayed plant material and organics from wastewater and urban and agricultural runoff, whereas seawater intrusion is the primary source of bromide in the Delta. TOC and bromide react with disinfectants during the water treatment process. Disinfection byproducts are considered carcinogenic and may cause adverse reproductive or developmental effects in animals at very high doses. From 1997 to 2015, TOC levels ranged from <0.6 to 9.3 mg/L and bromide levels ranged from 0.01 to 0.47 mg/L. Ozone treatment has been added to all of Metropolitan's water treatment plants to reduce the formation of chlorine disinfection byproducts.

Salinity

Salt in the Sacramento and San Joaquin Rivers originates from natural sources, agricultural discharges, urban runoff, and tidally influenced seawater excursions into the Delta. TDS concentrations in the East Branch of the California Aqueduct average 250 mg/L but can vary significantly in response to hydrologic conditions in the Delta watersheds. Historical TDS levels at Silverwood Lake are shown on Figure 4.3-11.

Nutrients

Wastewater discharges and agricultural drainage in the Delta are two primary sources of nutrient loading. Between 1997 and 2015, nitrate (as N) levels ranged from 0.11 to 7.0 mg/L, well below the MCL of 10 mg/L, and total phosphorus levels ranged from 0.01 to 1.0 mg/L.

Arsenic

Arsenic is a naturally occurring element found in rocks, soil, water, and air, and is used in certain agricultural applications, wood preservatives, paints, dyes, and soaps. Of all the regulated inorganic chemicals, arsenic is the most problematic in the water supply. One source of arsenic is groundwater in the Central Valley, which enters the California Aqueduct through water exchange and banking programs. Routine monitoring between 1997 and 2015 at key SWP locations has not recorded arsenic levels above the MCL. The maximum concentration, 6 µg/L, was recorded in November 2014, January 2015, and February 2015 at the Tehachapi Afterbay. Although levels are still below the MCL of 10 µg/L, increasing coagulant dosages during drinking water treatment may be needed to maintain safe levels for delivered water.

Recycled Water

The watershed currently recycles enough water to meet about 16% of the watershed's demand. Water recycling, also known as water reclamation or water reuse, is a reliable, economically feasible, and environmentally sensitive means to preserve the state's potable water resources, assist with drought mitigation, and reduce the demand on potable water supplies.

Currently, recycled water is used to irrigate agricultural crops, urban landscapes, golf courses, and freeway medians; replenish groundwater basins; flush toilets and urinals; and act as a barrier to

seawater intrusion into freshwater groundwater basins. It is also increasingly used by industry in cooling processes, in construction, and for other purposes. In the future, the level of recycling will increase to help meet the needs of the state's burgeoning population. A full assessment of recycling in the watershed can be found in Appendix F.

4.3.3. WATER QUALITY

Brief History of Water Quality in the Santa Ana River Watershed

By the time the California Porter-Cologne Water Quality Act was passed in 1969, population growth, agriculture, and industry had created a legacy of water quality problems in the Santa Ana River Watershed. Irrigated agriculture, fertilizer use, and dairy operations added nutrients and salts to groundwater supplies. Use of pesticides contributed to the contamination of surface water, soils, and groundwater basins. In some locations, chemicals used in military facilities and industrial processes were improperly disposed of, resulting in the migration of hazardous substances into groundwater. Impacts from urbanization of the watershed include: stormwater runoff from urban areas and non-storm nuisance flows from landscape irrigation, which resulted in increased salt concentrations, elevated levels of nutrients, and bacteria in receiving water bodies. Local agencies, non-governmental organizations, and other stakeholders, working in conjunction with regulatory agencies, have made progress in restoring the quality of water in the watershed. Despite these efforts, challenges remain.

Surface Water

Current Conditions

Typically, the highest quality water can be found in less developed and non-agricultural areas of the watershed because agricultural, industrial, commercial, and residential developments have caused water quality degradation. Surface waters in the watershed are shown on Figure 4.3-12. Figure 4.3-13 shows TMDL projects. See Figure 4.1-9 for impaired water bodies.

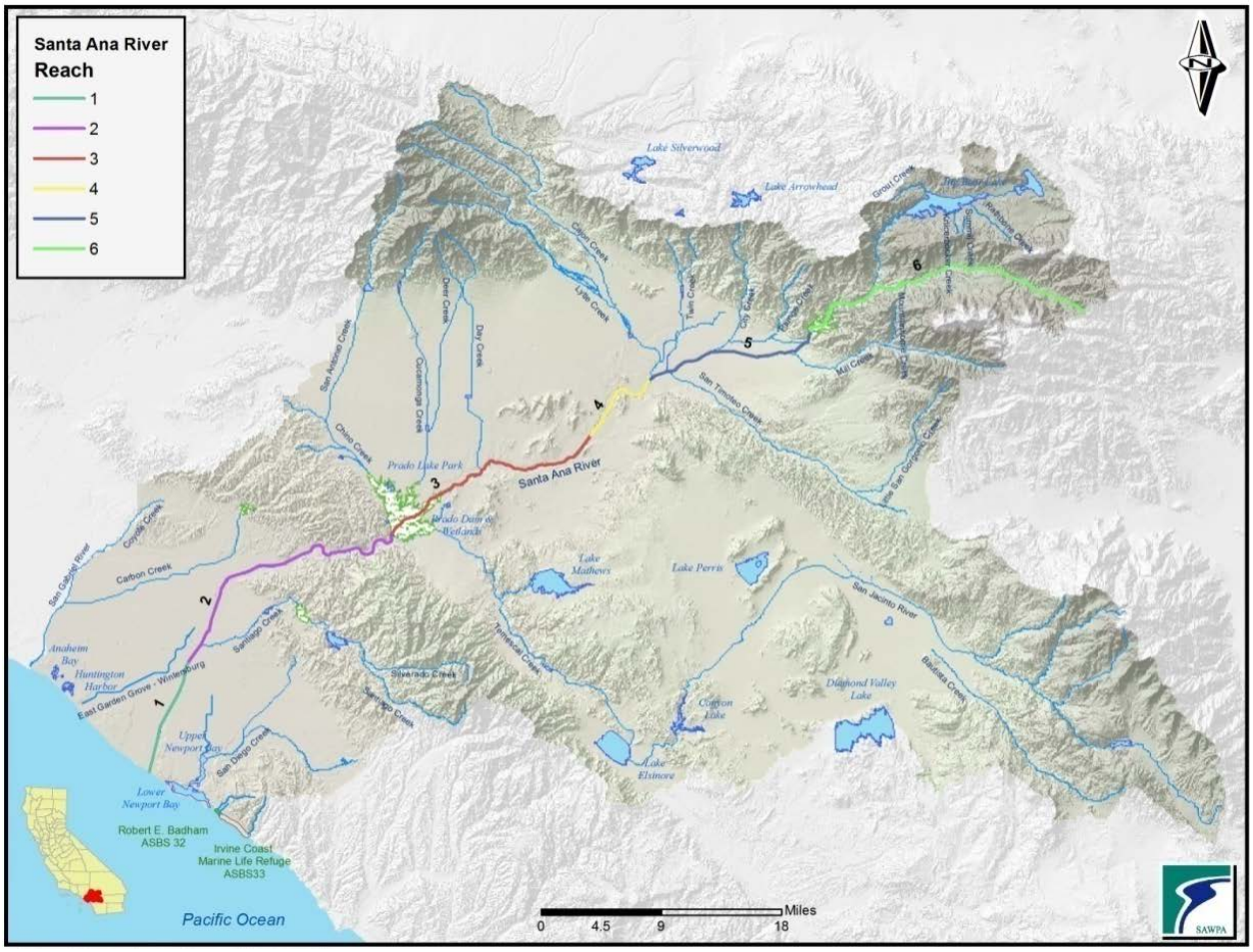

Figure 4.3-12. Surface Water Bodies in the Santa Ana River Watershed

Santa Ana River

Southwestern willow flycatcher (*Empidonax traillii extimus*)

Reach 6. The water quality of Reach 6 (upstream of Seven Oaks Dam) and tributaries is generally very good, with low to very low levels of TDS, indicator bacteria, or other pollutants. Some of the mountain reaches of these streams support self-sustaining populations of trout and other native aquatic species. Several rare, threatened, and endangered species inhabit these areas, including unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), San Bernardino kangaroo rat (*Dipodomys merriami parvus*), southern mountain yellow-legged frog (*Rana muscosa*), speckled dace (*Rhinichthys osculus*), Santa Ana River woolly star (*Eriastrum densifolium* ssp. *sanctorum*), least Bell's vireo (*Vireo bellii pusillus*), and southwestern willow flycatcher (*Empidonax traillii extimus*). Past and present land use practices

have negatively impacted water quality in Big Bear Lake. Impounding water behind Seven Oaks Dam reduces water quality because of sediment entrapment and algae growth.

Reach 5. The water quality of Reach 5 (Seven Oaks Dam to the San Jacinto Fault) is generally very good. Segments of many of the streams in this reach support or have the potential to support a wide range of beneficial uses.

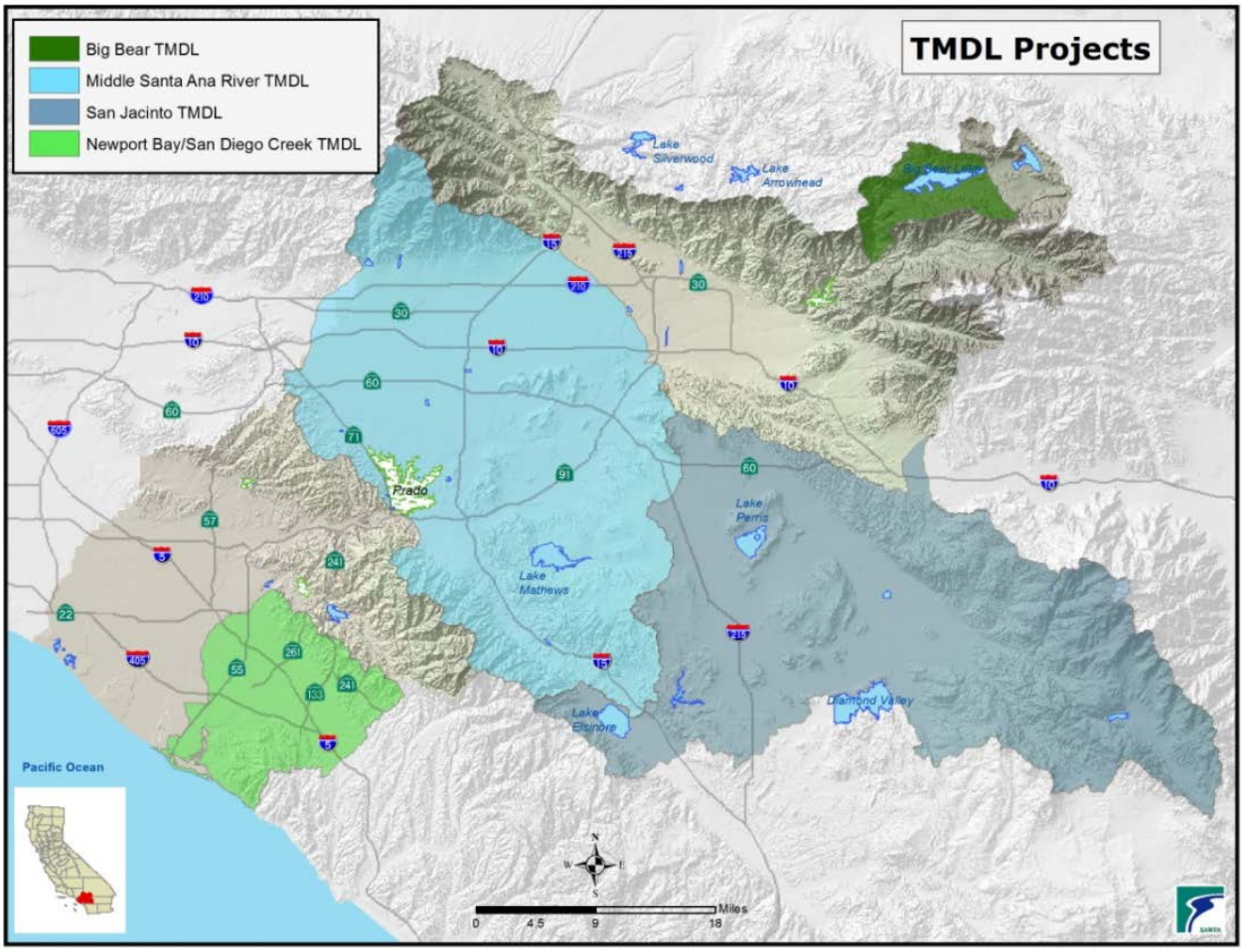

Figure 4.3-13. TMDL Projects in the Santa Ana River Watershed

Reach 4. Reach 4 extends from the San Jacinto Fault downstream to the Mission Boulevard Bridge in Riverside. In this reach, water quality objectives are being met, with the exception of fecal coliform bacteria.

Reach 3. Reach 3 is the river segment from Mission Boulevard Bridge to Prado Dam. Rising groundwater feeds small tributary creeks that are important breeding and nursery areas for native fish. Surface water bodies in the Chino Basin drain to this reach. The Orange County Water District (OCWD) operates the Prado Constructed Wetlands to reduce nitrogen load in the Santa Ana River. Temescal

Creek stretches from Lake Elsinore to Prado Basin. Most of the flow in the creek originates downstream of Lake Elsinore because water overflows from the lake to Temescal Creek only during very wet periods.

Reach 2. In Reach 2 (Prado Dam to 17th Street in the City of Santa Ana), OCWD recharges as much of the river water as possible into the Orange County Groundwater Basin. Immediately downstream of the dam, the river channel supports some aquatic habitat.

Reach 1. Reach 1 extends from 17th Street to the tidal prism at the ocean. This reach is normally dry and operated for flood control. There are no numeric water quality objectives for Reach 1. The river's main tributary in Orange County is Santiago Creek.

San Jacinto River, Canyon Lake, and Lake Elsinore

The San Jacinto River originates in the San Jacinto Mountains, flows through the San Jacinto Valley, through Canyon Lake, and drains into Lake Elsinore. Lake Elsinore has no natural outlet. Historically, the lake was known to dry completely; imported and recycled water are now used to maintain the water level. Nutrients from sources such as septic systems, farming, reclaimed water, and land use practices can cause significant algae growth in the lakes, thereby impairing recreational use and degrading aesthetic values. Excessive algae growth in the lake depletes dissolved oxygen, resulting in occasional fish kills. The Lake Elsinore and Canyon Lake Nutrient TMDL Task Force has implemented studies and water quality projects that have significantly improved water quality in these two water bodies.

Lake Perris

Lake Perris is owned and operated by the California Department of Water Resources (DWR) as the terminal reservoir of the East Branch of the California Aqueduct (SWP). Water quality concerns include pathogens, taste and odors, algal toxins, and anoxia within the lake's bottom layer. The lake is an important recreational area with more than a million visitors each year.

Lake Mathews

Lake Mathews is the terminal reservoir for the Colorado River Aqueduct, owned and operated by the Metropolitan Water District of Southern California (Metropolitan). In 2012, Metropolitan, the County of Riverside, and Riverside County Flood Control and Water Conservation District completed the Lake Mathews Watershed Study and developed a watershed model to assess the effects of pollution in the runoff from future developments. The study evaluated and prioritized stormwater management options that would be pursued to ensure long-term protection of the lake.

West Orange County and Coastal Watersheds

Several subwatersheds located in Orange County are considered part of the Santa Ana River Watershed even though they are not within the Santa Ana River drainage area. These areas include

portions of the San Gabriel River Watershed within Orange County, Anaheim Bay and Huntington Harbour, Newport Bay Watershed, and Newport coastal streams; see Figures 4.3-14 and 4.3-15.

Coastal bays and harbors and coastal area tributary streams are shown on Figure 4.3-16.

Figure 4.3-14. Orange County Subwatersheds in the Santa Ana River Watershed

San Gabriel River Watershed–Coyote Creek

The San Gabriel River Watershed includes land within Los Angeles County and approximately 86 square miles within Orange County. The Coyote Creek and Carbon Creek tributaries originate in the foothills of northern Orange County. This area is highly urbanized, and dry- and wet-weather runoff discharges pollutants into the river. Seal Beach is located just south of the mouth of the San Gabriel River and is impacted by local drainage as well as by the water quality of the river.

Anaheim Bay and Huntington Harbour Watershed

The Anaheim Bay and Huntington Harbour Watershed drains approximately 80 square miles in northwestern Orange County. Cattle ranching, agriculture, and commercial port facilities preceded

rapid urbanization in the 1940s. Discharges containing metals and pesticides from a variety of sources including boating-related activities; stormwater, urban, and agriculture runoff; and past historical inputs have negatively impacted water quality.

Figure 4.3-15. Coastal Area and Tributary Streams

Newport Bay Watershed

The Newport Bay Watershed covers approximately 152 square miles in central Orange County (see Figures 4.3-14 through 4.3-16). The Upper Newport Bay is a unique area containing a fragile coastal ecosystem that is designated as a State Ecological Reserve and a Critical Coastal Area that supports seven diverse estuarine habitats with several hundred species of marine and terrestrial flora and fauna, including six federally and state-listed threatened and endangered species (five bird species and one plant species). The bay's fish diversity is rated as the highest of the seven major coastal embayments between San Diego and Point Conception; it provides critical habitat for commercially and ecologically important species. The Lower Newport Bay is a small boat harbor. The Rhine Channel, located at the western end of lower Newport Bay is considered by the Regional Board as one of Orange County's hot spots for toxic sediments. Selenium is a naturally occurring trace element that is found in ancient

marine sediments in the Newport Bay Watershed. When selenium is released to surface waterbodies, such as via passive groundwater seepage and groundwater cleanup/dewatering operations, it may accumulate in the food chain to levels that can be harmful to fish and birds. In 2005, the Regional Board and Newport Bay Watershed stakeholders created the Nitrogen and Selenium Management Program (NSMP) to develop a comprehensive understanding of levels of selenium and nitrogen in groundwater discharges and a management plan for controlling these levels.

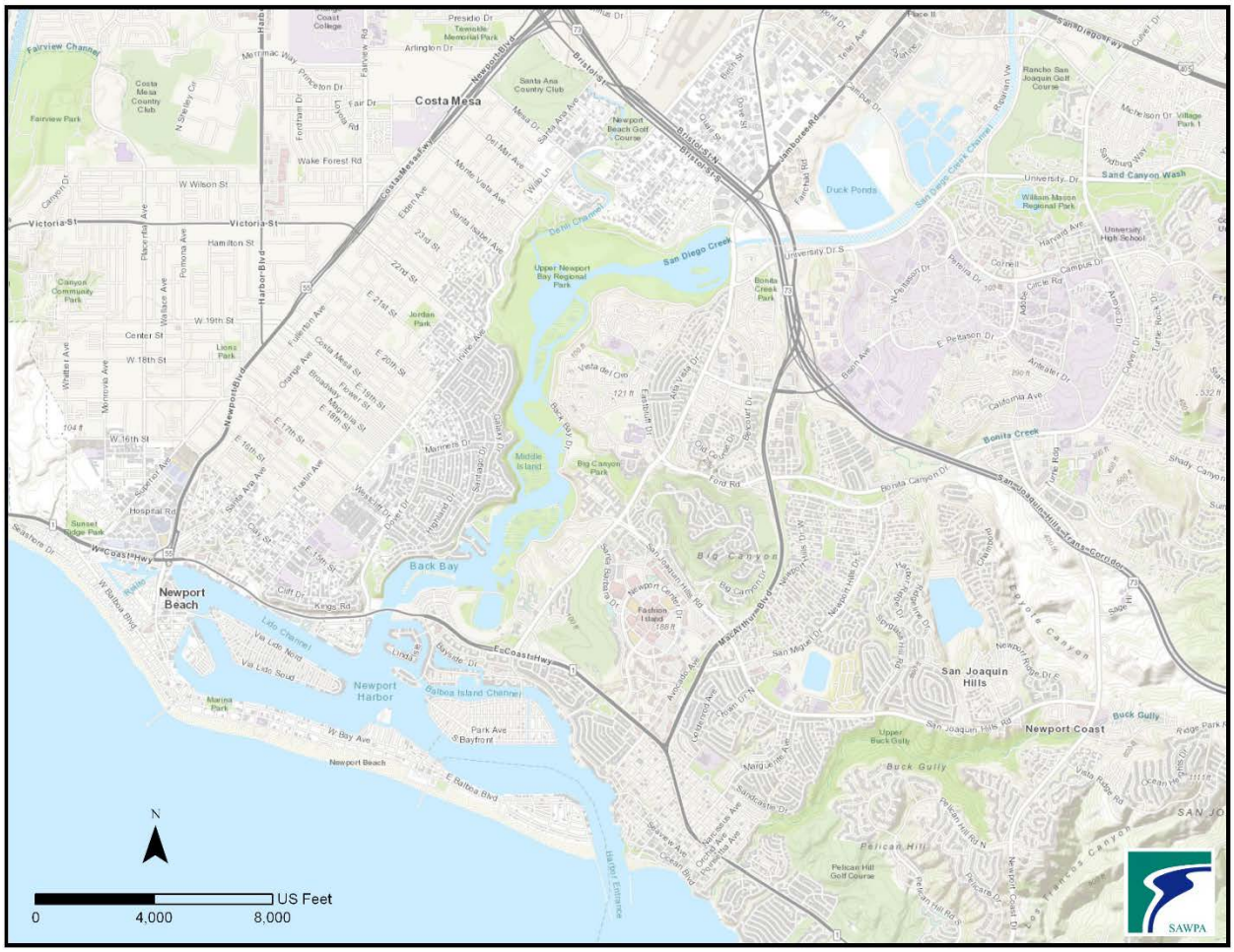

Figure 4.3-16. Newport Bay Watershed Area

Newport Coastal Streams Watershed

This watershed encompasses approximately 8 square miles south of the Newport Bay Watershed. Several coastal canyons drain this area directly into the ocean, into two Areas of Special Biological Significance (ASBS).

Efforts to Improve Surface Water Quality

Agriculture and Dairies: Water Quality Protection

Regulatory agencies in the watershed have taken a number of actions to address water quality impacts related to agricultural and dairy practices in the region. Water discharges from agricultural operations can affect water quality by transporting pollutants, including pesticides, sediment, nutrients, salts, pathogens, and heavy metals, from cultivated fields into surface waters. Some surface water bodies and groundwater basins are impaired at least in part because of pollutants from agricultural sources.

The Regional Board issued R8-2007-0001 (NPDES No. CAG018001): General Waste Discharge Requirements (WDRs) for Concentrated Animal Feeding Operations (Dairies and Related Facilities) within the Santa Ana Region, prohibiting all dairies from discharging process wastewater or stormwater runoff up to a 25-year, 24-hour rainfall event and requiring each facility to develop an engineered waste management plan. This permit was amended with adoption of R8-2013-0001, which updated compliance requirements for the dairies.

Riverside County Ordinance 427.2 regulates safe transportation and application of manure in certain Riverside County districts by requiring operators and/or landowners to report manure application in order to minimize impacts to neighboring properties, local waterways, underground water supplies, and soil resources.

The San Jacinto Basin Resource Conservation District and the Western Riverside County Agriculture Coalition developed a multi-phase process for establishing and running a manure manifest system as part of the Integrated Regional Dairy Management Plan. The manure manifest system addresses nutrient and salt loadings by specifying that manure be applied to land at rates consistent with cropping practices and groundwater conditions. The manure manifest system will prohibit over-application at sites where potential impacts to groundwater basins are a concern.

The Conditional Waiver of WDRs for Discharges from Agricultural Operations in the San Jacinto Watershed (CWAD) is a program developed by the Regional Board (Orders R8-2016-0003 and R8-2017-0023) to address nitrate and salt contamination of groundwater basins in the San Jacinto area and excessive nutrients, algal blooms, and toxicity impacts in Lake Elsinore and Canyon Lake. The CWAD allows farmers an alternative to WDRs by allowing operators to propose their own methods of limiting discharges and protecting water quality with the option of cooperatively managing their discharges as a coalition group, sharing sampling and reporting requirements and forming a water quality trading plan to facilitate salt and nutrient offsets. The CWAD will track the use of best management practices (BMPs) by agricultural operators and will also include a groundwater monitoring program.

Salinity Management

Since 2008, water agencies that recharge groundwater basins with imported or recycled water that includes imported water have been conducting a program under the direction of the Regional Board to address potential salinity impacts on groundwater basins. Cooperating agencies prepare a summary of the amount of imported water recharged in each groundwater management zone every 3 years, analyze the impact of such recharge on salinity levels, and compare projected water quality to historical ambient water quality. Every 6 years, agencies prepare a report that projects ambient water quality in each groundwater management zone, accounting for salt inputs from surface waters and reflecting the effects of all existing and reasonably foreseeable recharge projects. This program addresses the potential salinity impacts of using imported water for groundwater recharge and creates a cooperative means of achieving compliance with salinity objectives without issuing WDRs.

Recreational Water Quality Standards

The Stormwater Quality Standards Task Force (Task Force) worked with the Regional Board on Basin Plan amendments, adopted in 2012 and approved by the U.S. Environmental Protection Agency in 2015, that changed beneficial use designations and water quality objectives, where appropriate, for water contact recreation. The Task Force's work was the most thorough consideration of recreational use standards ever undertaken in California. Basin Plan Amendments included changing the appropriate indicator to *E. coli* with new geometric mean objectives, an agreement on how to address single sample data, the protection of water designated for non-contact recreation, and implementing a strategy for a high-flow suspension of recreational uses during dangerous flood conditions. The Task Force joined with the Middle Santa Ana River Bacterial Indicator TMDL Task Force in creating the Santa Ana River Watershed Monitoring Program that was approved by the Regional Board in 2016 (R8-2016-0022).

Constituents of Emerging Concern

Constituents of emerging concern include a wide range of chemical constituents, including pharmaceuticals, personal care products, pesticides, and other synthetic organic compounds. Some of these constituents are known or suspected to have endocrine-disrupting effects, if present at a sufficiently high concentration. The SAWPA Emerging Constituents Program Work Group developed a surface water quality characterization program and an annual sampling program that was conducted in calendar years 2010 through 2013. The regional program was replaced when the State Board established formal monitoring requirements in January 2013 as part of the California Recycled Water Policy.

Trash Provisions

The State Board adopted Trash Provisions to address the impacts of trash on the beneficial uses of surface waters. The Trash Provisions establish a statewide water quality objective for trash and a

prohibition of trash discharge, or deposition where it may be discharged, to surface waters of the state. For Phase I co-permittees that have regulatory authority over priority land uses, the Trash Provisions require implementation through requirements incorporated into Phase I municipal separate storm sewer system (MS4) permits and/or through monitoring and reporting orders.

Existing Surface Water Management Plans

Implementation of existing surface water management plans will help to address surface water quality issued identified above. Existing water management plans are listed on the OWOW Program page at www.sawpa.org.

Salinity and Nutrients

High salt and nitrate concentrations are two long-standing groundwater quality issues in the watershed. Sources of elevated salts include mineral content in the sediments, recharge and drainage patterns, source water quality, irrigation, wastewater discharges, and historic land use. Elevated levels of nitrates in groundwater originate primarily from use of fertilizers, confined animal feedlots, wastewater treatment facilities, and septic systems.

In January 2010, SAWPA completed the Phase 1 Salinity Management Plan Technical Memorandum, which identifies a significant long-term salt imbalance in the watershed. Salinity problems are anticipated to worsen if no action is taken, as the importation of surface water high in TDS continues, water reuse increases, and industrial and commercial growth continues. In addition, climate change predictions indicate an increase in drought conditions in the watershed. One of the most important impacts this may have would be an increase in salinity of water resources.

Modeling predicts that several groundwater management zones in the watershed will exceed Basin Plan TDS standards in the future. Five of the seven management zones have some assimilative capacity that will allow them to meet TDS standards for some years (Beaumont, Bunker Hill–B, Chino–North, Elsinore, and Yucaipa), while the remaining two already are in excess of TDS standards and thus have no assimilative capacity available (Bunker Hill–A and Temescal).

Efforts to Improve Salt and Nutrient Contamination Issues

Construction and use of salinity management facilities, such as brine lines and desalters, are being used to prevent salt buildup and to remediate high TDS groundwater basins. This section discusses ongoing efforts aimed at achieving and maintaining a salt balance in the watershed and efforts to manage nitrogen.

Watershed-Wide Salt and Nutrient Management Program

The Basin Plan provides a comprehensive, watershed approach to controlling nitrogen and TDS in the watershed, while also encouraging water recycling and reuse. The Basin Plan requires that concentrations of TDS and nitrate in each groundwater management zone be estimated every 3 years.

These ambient conditions are compared to the water quality objectives to determine the amount of assimilative capacity—if any—in each zone. In areas where there is no assimilative capacity, the Regional Board will not permit waste discharges that degrade water quality. Figure 4.3-17 shows the Basin Plan water quality objectives for TDS and nitrates in groundwater management zones. Ambient water quality for the years 1996 to 2015 for TDS is shown on Figure 4.3-18 and for nitrates in Figure 4.3-19. Areas with nitrate (as N) greater than the maximum contaminant level (MCL) of 10 mg/L, using the ambient water quality statistics) in groundwater, are shown on Figure 4.3-20.

The program includes maximum benefit demonstrations used in the Chino, Beaumont/Yucaipa, and San Jacinto Basins. In these basins, the Regional Board approved the use of "maximum benefit" objectives in place of the traditional use of historical quality (anti-degradation objectives) to protect groundwater quality. Agencies are implementing projects, such as groundwater desalination plants, expanded stormwater capture and recharge basins, and comprehensive groundwater management plans, to protect groundwater quality. The anti-degradation objectives remain as the default condition if water quality is not maintained.

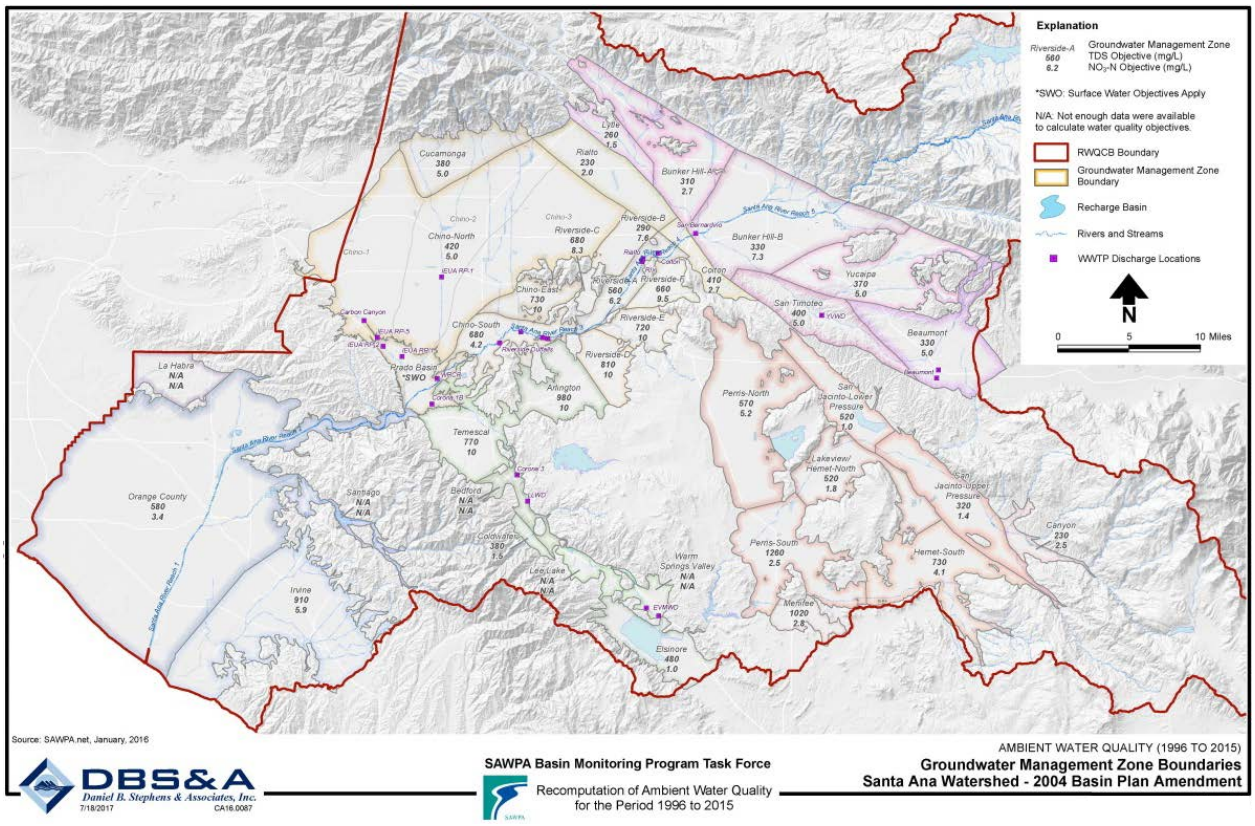

Figure 4.3-17. Groundwater Management Zones and Water Quality Objectives for TDS and Nitrate (as N)

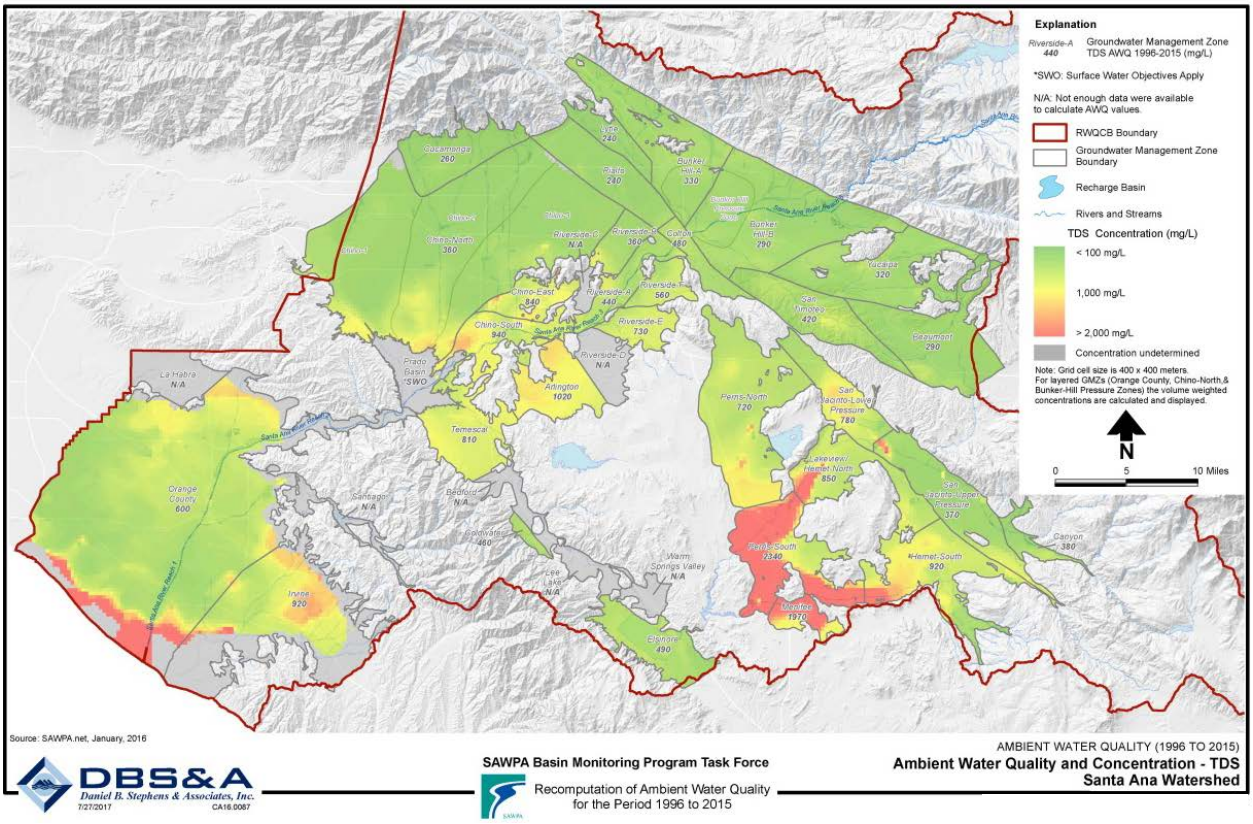

Figure 4.3-18. Ambient Water Quality Objectives for TDS (1996–2015)

Salinity Management Facilities

The Inland Empire Brine Line was built by SAWPA over a period of 25 years (1975 through 2000) to collect and transport industrial brine that could not be treated at inland wastewater treatment facilities. The section of the 93-mile-long Brine Line that runs above the Riverside–Orange County line (Reaches IV and V) is owned and operated by SAWPA. Reach IV serves the Cities of Riverside, Chino, and San Bernardino; Reach V lies along the Temescal Wash and terminates near the City of Lake Elsinore where EMWD connects its brine line. In Orange County, the Brine Line (Reaches I, II, and III) is owned by the Orange County Sanitation District (OCSD) and is referred to as the Santa Ana Regional Interceptor.

The Brine Line is used to dispose of brine from groundwater desalters, industrial wastewater high in TDS concentrations, water with high nutrient levels, and other domestic and industrial wastewater. The wastewater is treated at OCSD's plant in Huntington Beach prior to discharge to the ocean. Additional brine lines have been constructed by the Inland Empire Utilities Agency and the Irvine Ranch Water District. Salinity management facilities in the watershed are shown in Figure 4.3-21. These facilities are vital to ongoing protection of water quality in the watershed.

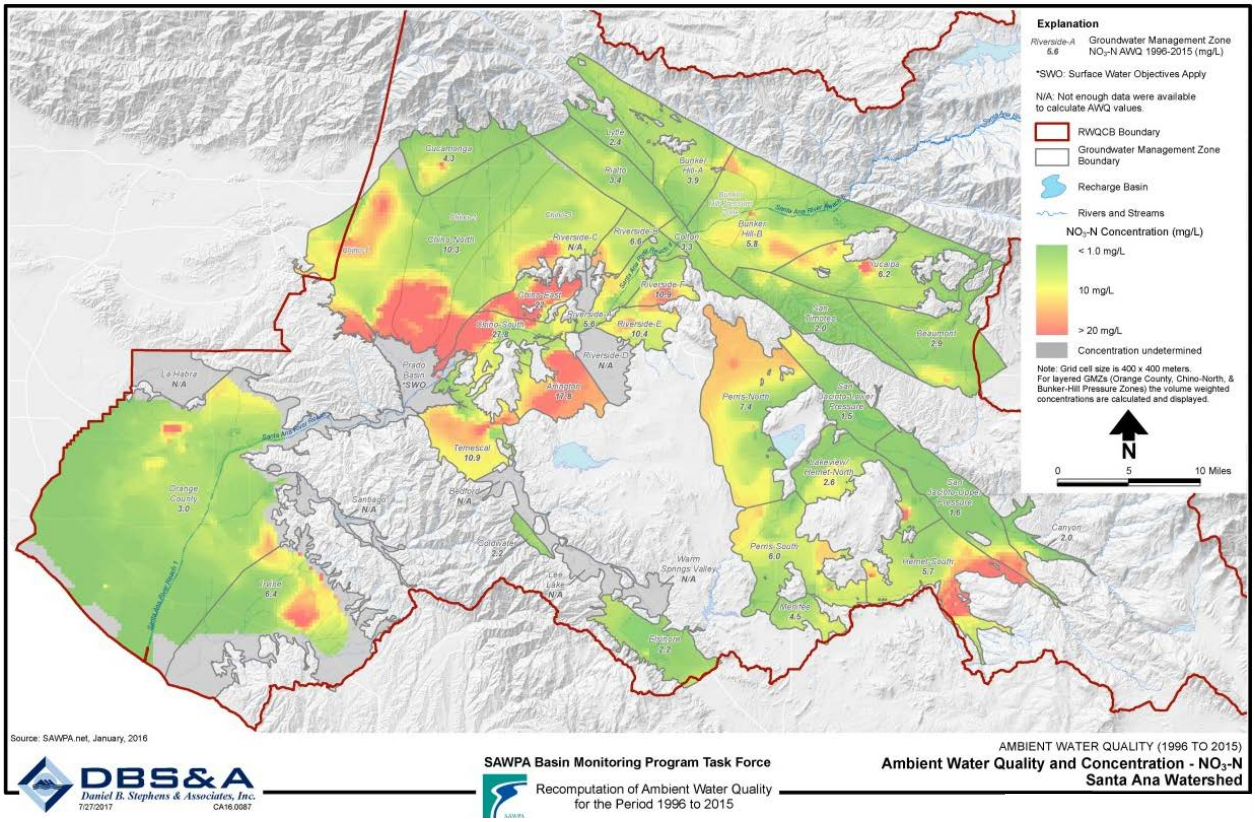

Figure 4.3-19. Ambient Water Quality Objectives for Nitrate (as N) (1996–2015)

There are a number of projects planned or ongoing in the watershed that will address salinity issues, including the following:

- Yucaipa Valley Water District wastewater desalting and reuse
- City of Riverside water supply and wastewater desalination projects
- Western Municipal Water District and City of Corona water supply projects
- EMWD groundwater desalter expansion and wastewater desalting and reuse

Potential long-term options to address the need for additional salt removal include the following:

- BMPs including source control measures aimed at reducing salt mass balances
- Desalters for water supply and wastewater
- Implementing measures to reduce TDS in effluent
- Zero liquid discharge/evaporative ponds
- Additional brine exports using Sanitation Districts of Los Angeles non-reclaimable wastewater system

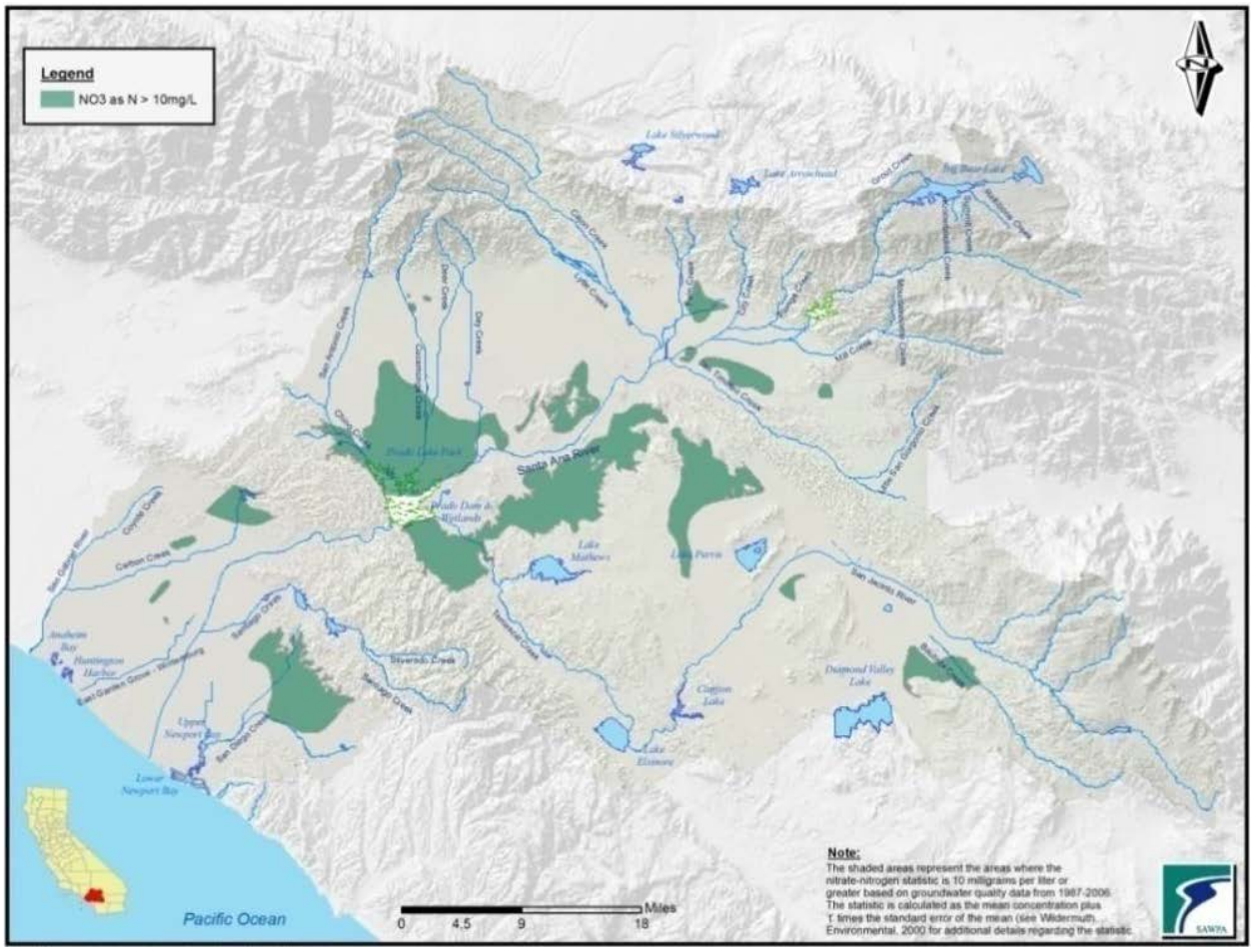

Figure 4.3-20. Areas with Nitrate (as N) Concentrations above MCL

The Salinity Management Plan projects a need for future brine exports in the amount of 35.5 million gallons per day (nearly 271,000 tons of salt per year), which is approximately 23% greater than the nominal capacity of the Inland Empire Brine Line.

Other Salinity Management Programs

Septic tank discharges are creating significant water quality problems that have triggered local agency and Regional Board regulatory responses in the unincorporated areas of Quail Valley (north of Canyon Lake) and Enchanted Heights (west of Perris). The basin is dotted with several other areas believed to be at risk of water quality degradation from septic systems. A septic system management plan has been developed by Riverside County Flood Control and Water Conservation District. In addition, the County of Riverside adopted three ordinances to ban new septic systems unless the systems are designed to remove 50% of the nitrogen in the discharged wastewater. The Beaumont–Cherry Valley Water District program to provide sewer service to a major portion of the area has applied for State Revolving Fund loans for this effort.

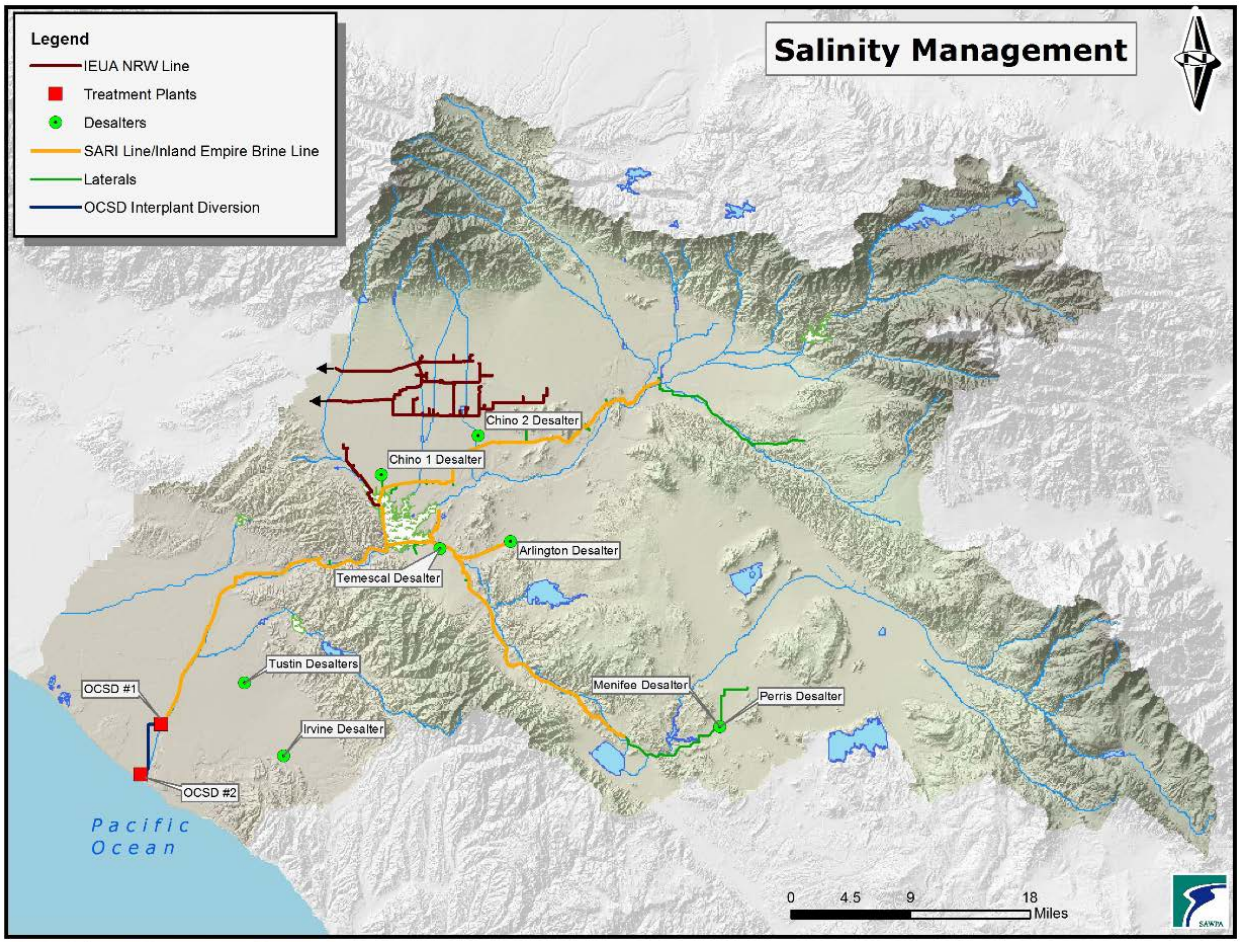

Figure 4.3-21. Santa Ana River Watershed Salinity Management Facilities

A Groundwater Salinity Management Program developed by EMWD in 2012 addresses several water quality issues in the San Jacinto Watershed. The Perris South Sub-Basin contains a surplus of marginal to unusable quality groundwater that flows into the adjacent high-quality Lakeview Sub-Basin, rendering several wells unusable and threatening the remaining production of the basin. Blending to improve water quality is not an option due to the lack of access to imported water. Therefore, three desalination facilities, two constructed and one being designed, will recover high TDS water in the Menifee and Perris South Groundwater Management Zones for potable use. In addition to providing clean drinking water, the desalters will play a role in reducing the migration of brackish groundwater into areas of good-quality groundwater.

Additionally, EMWD and Elsinore Valley Municipal Water District have jointly created a salt and nutrient management plan for the Upper Temescal Valley, combining Warm Springs, Lee Lake, and Bedford Groundwater Management Zones into one groundwater management zone. On November 7, 2017, the Santa Ana Regional Board approved the *Salt and Nutrient Management Plan for the Upper Temescal Valley.* EMWD and Elsinore Valley Municipal Water District will be

working toward incorporating the proposed Anti-Degradation Water Quality Objectives for TDS and Nitrate into the Basin Plan for the Santa Ana Region.

Ocean Water and Coastal Areas

Ocean water quality is evaluated using a number of different parameters and constituents related to beneficial uses. Full body contact recreation and sportfishing are both negatively impacted by poor water quality. In addition, important habitat areas in the Santa Ana River, including two areas of special biological significance (ASBS) and their related onshore Critical Coastal Areas (CCAs), are face poor water quality.

The California Health and Safety Code requires ocean waters adjacent to public beaches be tested for indicator bacteria to ensure public safety. This program establishes uniform and consistent water quality monitoring, response, and public notification requirements for the entire California coastline. The loss of beneficial use of ocean recreational waters is represented by days and the linear area of oceanfront or bayfront that is in violation of the Assembly Bill 411 standards, calculated as Beach Mile Days. Table 4.3-2 lists the total number of Beach Mile Days posted for beaches due to violation of standards.

Table 4.3-2. Total Number of Beach Mile Days Posted due to Violations

Year	Seal/Surf-Side/Sunset	Bolsa Chica	Huntington City	Huntington State	Newport Beach	Crystal Cove
2006	0.6	0.7	0.9	21.9	1.9	0.4
2007	0.5	0.6	1.4	61.0	0.6	0.1
2008	1.3	0.2	0.7	26.2	0.6	0.4
2009	0.5	0.1	0.5	11.0	0.6	0.0
2010	0.3	0.1	0.2	8.1	0.7	0.2
2011	0.3	0.1	1.3	3.4	0.5	0.1
2012	2.6	0.5	0.1	14.5	0.6	0.3
2013	2.0	0.0	0.2	2.3	0.6	0.1
2014	3.7	0.1	0.1	2.3	3.3	0.3
2015	4.5	0.2	0.1	0.4	1.0	0.0

Algae Water Quality Issues

Algae are found universally in all aquatic environments. Under certain conditions, harmful algae blooms can occur. Some species of algae are capable of producing potent biotoxins. The California Health and Safety Code prohibits the consumption of sport-harvested sea mussels every year from May 1 to October 31 because of risk of paralytic shellfish poisoning (PSP). PSP toxins concentrate in the tissue of filter feeders like mussels. The toxin is harmless to the shellfish but extremely toxic to people and animals when consumed. The cause of these blooms is not clearly understood. Oceanographic currents, wind, nutrient levels, sunlight, temperature, and

global sea temperature oscillations like El Niño are thought to be factors. Research is ongoing to assess the association between bloom initiation and nutrient-associated rainfall runoff and anthropogenic sources.

Newport Beach Marine Life Refuge (CCA No. 70/ASBS No. 32)

The Newport Beach Marine Life Refuge is bounded to the west by a line heading oceanward 1,000 feet along Poppy Avenue in Corona Del Mar, and to the east by a line heading oceanward 1,000 feet along the western limits of Crystal Cove State Park. It extends from the mean high tide line to 1,000 feet offshore or 100 feet of ocean depth, whichever is nearer. This ASBS is designated to protect dolphin breeding areas and other marine species. Water quality is impacted by the following:

- Stormwater and dry-weather runoff from Buck Gully and its major tributary and from over two dozen direct discharge pipes from residential neighborhoods along the coastal edge of the ASBS
- Sediment transported from Buck Gully and coastal bluffs
- Beachgoer scavenging and trampling, despite educational efforts to discourage taking of tide-pool species

Irvine Coast Marine Life Refuge (CCA No. 71/ASBS No. 33)

The Irvine Coast Marine Life Refuge is bounded by the Newport Beach Marine Life Refuge to the west and to the east by a line heading oceanward 1,000 feet along the Irvine Cove cliffs at the edge of Laguna Beach. It extends from the mean high tide line to 1,000 feet offshore or 100 feet of ocean depth, whichever is nearer. Like its immediate neighbor, this ASBS is designated to protect dolphin breeding areas and other marine species. It is impacted by the following:

- Stormwater and dry-weather runoff from the Pelican Hill/Point area and from Los Trancos Canyon and Muddy Creek
- Stormwater and dry-weather runoff from direct discharge facilities draining through Crystal Cove State Park, Pacific Coast Highway, and Pelican Point
- Beachgoer scavenging
- Sediment transported from Los Trancos Canyon, Muddy Creek, and coastal bluffs
- Pollutants from upcoast and downcoast discharges

Efforts to Improve Ocean Water Quality

The Orange County Coastkeeper, founded in 1999, is a non-profit organization dedicated to the protection and preservation of the marine habitats and watersheds in Orange County. This is accomplished through programs of education, restoration, enforcement, and advocacy. Members work with businesses, developers, cities, elected officials, and regulatory agencies to develop

solutions to the problems of polluted urban runoff. The long-term goal is to protect and preserve all of Orange County's water bodies and restore them to healthy, fully functioning systems that will protect recreational uses and aquatic life. Some current projects are as follows:

- Eelgrass Restoration in Upper Newport Bay. Reestablishment of eelgrass (*Zostera* spp.) will provide habitat that enables the repopulation of many marine animals. Eelgrass grows in shallow waters and is vulnerable to human disturbances.
- Olympia Oysters. The Olympia oyster (*Ostrea lurida*) is one of the only native oyster species on the west coast of the United States and Canada. Once an important food source and ecologically important as habitat for aquatic organisms, this species has all but disappeared from the local coastal areas. Oyster habitat restoration is being conducted in conjunction with the eelgrass restoration project.

4.3.4. FLOOD CONTROL

Flood control in the Santa Ana River has been the focus of U.S. Army Corps of Engineers projects starting with the authorization of Prado Dam in 1936. The dam was completed in 1941. Levees were constructed in Riverside in 1955.

Prado Dam was built primarily for downstream flood protection, and 92% of the watershed lies above it, as shown on Figure 4.3-22. More recently, the dam also has become a vital component of the water supply management program in the region and has allowed the creation of ecologically important habitat areas behind the dam. Prado Dam was originally designed to provide protection against flooding in a 200-year event but as the watershed urbanized, the protection had decreased to a 70-year event with the downstream channel only having capacity for a 50-year event. To address these deficiencies, the U.S. Army Corps of Engineers initiated study of the Santa Ana River Mainstem Project in 1964. Construction of the Santa Ana River Mainstem Project was initiated in 1989.

The Santa Ana River Mainstem Project is located along a 75-mile reach of the Santa Ana River in Orange, Riverside, and San Bernardino Counties (see Figure 4.3-22). The project's objective is to provide the developed and developing areas in the watershed with approximately 100-year flood protection through the end of the project life.

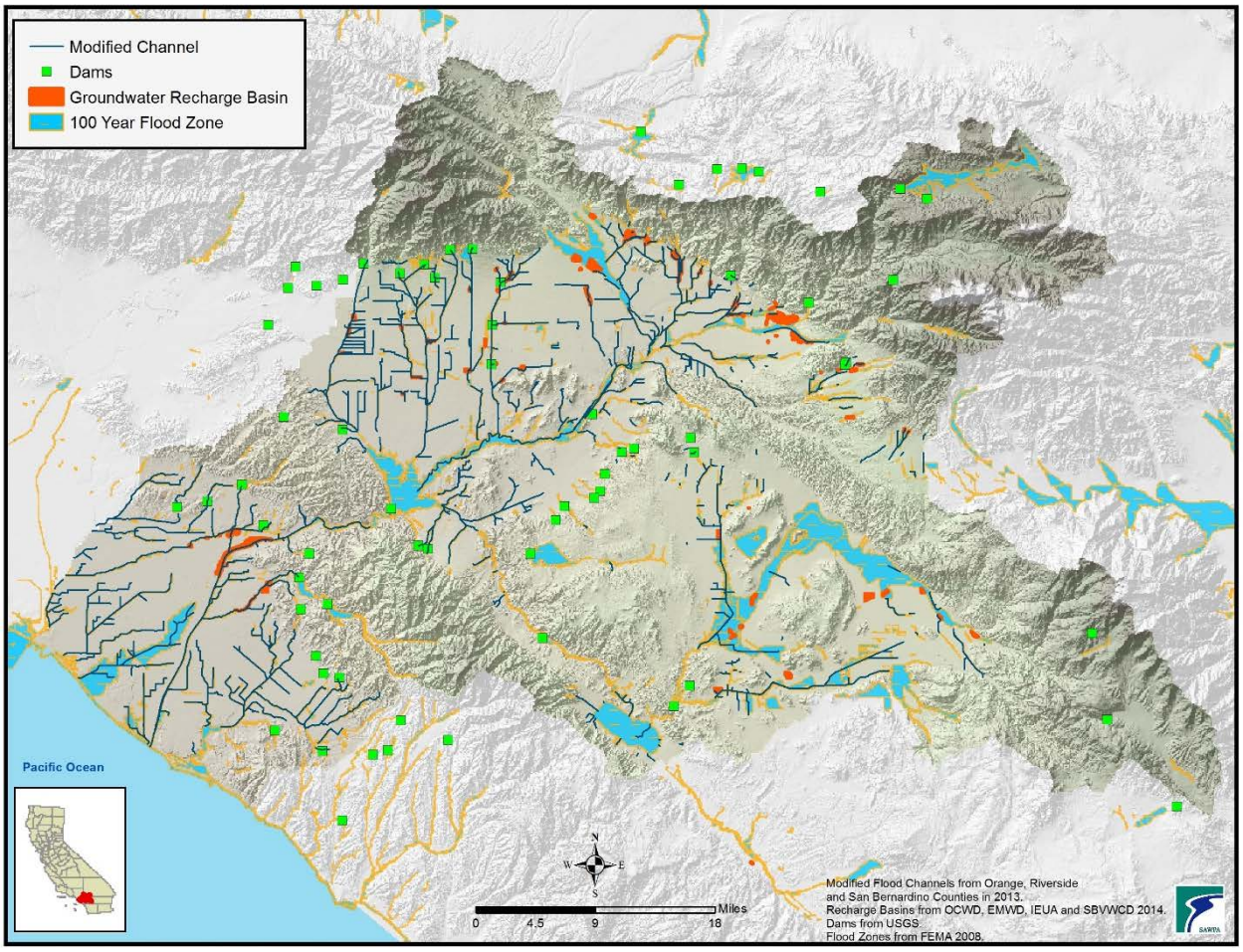

Figure 4.3-22. Built Flood Control Systems and 100-Year Flood Zones in the Santa Ana River Watershed

4.3.5. CONSERVATION AND REDUCING REGIONAL DEPENDENCE ON DELTA SUPPLY

With pressures on available local groundwater and imported water supplies in the watershed increasing due to continuing drought conditions, increasing population, climate change impacts, and mandated cutbacks in imported water, particularly from the Delta, collaborative and integrated water resource planning is critical for a sustainable future. A study by the Pacific Institute, "Waste Not, Want Not: The Potential for Urban Water Conservation in California," concludes that water use efficiency is the most cost-effective way to maximize our diminishing water supplies, which makes it one of the most important components for diversifying the region's water portfolio in the coming years.

Over the past decade, Southern California water agencies have implemented significant water use efficiency measures. These programs include the large-scale replacement of old, inefficient water fixtures and upgrades of building and plumbing codes in the state, requiring low-flow toilets and showerheads in all new development. We anticipate that these types of regulatory mandates will continue to be enhanced as emerging technologies become available. Through these programs, the amount of water imported into much of Southern California has remained fairly constant,

meeting demands despite significant development and population increases. However, with the water supply outlook continuing to worsen, water use efficiency will be a critical resource management strategy that this region will need to embrace.

With implementation of expanded water use efficiency practices and other integrated local water resource development, the OWOW Program will help reduce dependence on Delta supply regionally.

4.4. ENVISIONING THE FUTURE

To find ways to improve water reliability for the future, the existing water infrastructure system must be considered as the foundation to build on. Particularly in this watershed, when we describe water infrastructure, we are describing not just the large-scale systems, services, and facilities that are necessary to support the collection, storage, treatment, and delivery of water to customers in the region, but also many other systems, services, and facilities, such as trails, parks, and land use, that may use or have a connection with water. In addition, because water demands and supplies are interrelated with a variety of other natural and artificial support systems, several different maps are included in this chapter to fully convey the opportunities to coordinate among infrastructure systems, as well as land use for the development of multi-beneficial integrated projects.

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5. RECOMMENDED MANAGEMENT AND POLICY STRATEGIES

This chapter includes 10 sections submitted by the Pillar workgroups (see Figure 5-1). Most sections follow a similar format, in which the workgroup begins by describing how the topic of the section is related to the One Water One Watershed (OWOW) Plan Update 2018 goals. By clarifying these linkages, the Pillar sections convey how each of these aspects of water management is necessary to achieve the integrated and sustainable outcomes described in the vision.

Figure 5-1. OWOW Program Organization

Next, each Pillar section describes Recommended Management Strategies and Policy Strategies. Herein are the most important contributions of the Pillars, and the key to developing the correct suite of implementation efforts. There is only a fuzzy distinction between the two types of recommendations, and the workgroups were encouraged to consider first what strategies can be implemented by people, organizations, or agencies given current rules, technology, budgets, and authorities. These are the management strategies. Policy strategies, on the other hand, are those things that require the action of elected members of government, the development of new funding sources, or implementation of new technology. Again, the distinction between the two strategy types is loose, and often progress will require approaches that integrated both.

Following the recommendations are more lengthy passages that support the recommendations with background explanation, research, or related material. This is followed by a description of how each Pillar section is related to the other Pillars, and then supporting material or other items the Pillar felt was important to include.

5.1. WATER RESOURCES OPTIMIZATION

5.1.1. LINKS TO THE OWOW GOALS

Water Resources Optimization considers how the Santa Ana River Watershed (watershed) can ensure a reliable, resilient, and sufficient supply of water for the people, environment, and economy of the watershed. Aspects of all six of the OWOW Goals are woven into the recommendations below. Chiefly, though, the goal to *achieve resilient water resources through innovation and optimization* is at the core of the work below. Successful efforts to manage water quality and watershed health, to engage with communities throughout the watershed, and to efficiently develop data and reporting in support of decision making are all related to achieving optimal water resources.

5.1.2. RECOMMENDED MANAGEMENT STRATEGIES

To increase reliability, the following water management strategies are recommended (in alphabetical order):

- Capture stormwater
- Implement emergency measures
- Increase storage
- Optimize imported water
- Recycle water
- Reduce demand

Over the next 5 years, implementation of the water management concepts in Table 5.1-1 marked with ☑ is recommended to achieve water supply reliability over the broadest area of the watershed at the most reasonable cost. Each of these concepts is described in Section 5.1.3, Basis for Recommendations.

Table 5.1-1. Summary of Water Management Strategies and Watershed-Wide Project/Program Concepts to Improve Water Supply Reliability

Strategy Concept (in Alphabetical Order)		Progress over Past 5 Years	Estimated Benefit
Capture Stormwater			
	Development standards that enhance stormwater capture	Conceptual	Increased stormwater capture
☑	Enhanced Santa Ana River stormwater capture at Prado Dam	Conceptual	10,000 AFY
☑	Enhanced Santa Ana River stormwater capture below Seven Oaks Dam	Phase 1A in construction	7,650 AFY

Table 5.1-1. Summary of Water Management Strategies and Watershed-Wide Project/Program Concepts to Improve Water Supply Reliability

	Strategy Concept (in Alphabetical Order)	Progress over Past 5 Years	Estimated Benefit
☑	Enhanced stormwater capture from tributaries of Santa Ana River	Environmental review	10,000 AFY
☑	Forest First: Forest management for reduction in hazardous fires and debris flows and increase in water yield	In progress	Increased stormwater capture, reduced fire risk and debris flows
☑	Increasing size of flood control facilities for stormwater capture	Conceptual	Increased stormwater capture
☑	MS4 credits	Under review	Increased stormwater capture
☑	Riverside North Aquifer Storage and Recovery Project	Environmental review	2,000 AFY
☑	Re-operation of flood control facilities	In progress	More investigation required
	Implement Emergency Measures		
	Emergency measures such as mutual aid and coordination	In progress	Preparation for catastrophic event
	Increase Storage		
☑	Groundwater storage	Conceptual	Maximize available storage capacity to manage wet/dry cycles
☑	Surface water storage	In progress	Help in offsetting drought and climate change
	Optimize Imported Water		
☑	California WaterFix	Environmental impact report certified	Stopping reductions to imports from the SWP and improving water quality
	Prevention of invasive species from clogging infrastructure	In progress	Achieving consistent delivery
☑	Wet-year imported water storage program	In progress (SARCCUP)	SARCCUP increasing wet-year storage by 180,000 AF
	Recycle Water		
	Importation of recycled water from outside the watershed	Conceptual	More investigation required
☑	Ocean desalination	Awaiting final permit approval	56,000 AFY
☑	Recycled water exchange	Conceptual	Capital and energy savings ($100s of millions) and improved water quality
☑	Recycled water for potable use	Conceptual	More investigation required

Table 5.1-1. Summary of Water Management Strategies and Watershed-Wide Project/Program Concepts to Improve Water Supply Reliability

	Strategy Concept (in Alphabetical Order)	Progress over Past 5 Years	Estimated Benefit
	Recycled water use to offset potable demand	In progress	Widely implemented by several agencies; part of the projected water supply portfolio
	Recycling of wastewater flowing to the ocean	In progress	157,000 AFY
	Reduce Demand		
☑	Outdoor conservation	Widely implemented	Help in meeting SB X7-7 required demand reductions
☑	Public education to encourage water conservation	Widely implemented	Help in meeting SB X7-7 required demand reductions
	Reduction of evapotranspiration	Conceptual	More investigation required
☑	Water rate structures that encourage conservation	Implemented by one agency	Water savings ranging from 5% to 17% reduction from previous use

☑ indicates a concept recommended for focus during the next planning cycle.
AFY = acre-feet per year; MS4 = Municipal Separate Storm Sewer System; SWP = State Water Project; SARCCUP = Santa Ana River Conservation and Conjunctive Use Program; AF = acre-feet; SB = Senate Bill.

5.1.3. BASIS FOR RECOMMENDATIONS

The development of these recommended management strategies was informed by the evaluation of water supply reliability scenarios described in Appendix E, Water Supply Reliability Scenarios. These management strategies were all found to improve water supply reliability in the watershed.

Additional details relevant to each strategy are presented below.

Use stormwater as a resource.

Capturing stormwater runoff within the watershed is challenging because the watershed tends to be either extremely wet or extremely dry. However, there is still an opportunity to capture more stormwater throughout the watershed during non-flood years.

Because stormwater originates at high elevations it can be delivered by gravity, saving energy costs. Diverting stormwater high in the watershed also provides the opportunity to use the water more than once before it reaches the ocean. This water is also high quality, which helps the watershed achieve both surface water and groundwater quality objectives established by state and federal agencies. The watershed is currently working on the following projects that will use more local stormwater.

The upper watershed has obtained a water right for the additional stormwater detained by Seven Oaks Dam and is currently designing and constructing facilities that will enable the diversion of up

to 500 cubic feet per second and up to 80,000 acre-feet per year (AFY). A conceptual design of improvements and operational changes that will result in additional stormwater capture from the tributaries of the Santa Ana River is also being considered.

Riverside Public Utilities, in partnership with the San Bernardino Valley Municipal Water District and others, are developing a design for a rubber dam that would cross the Santa Ana River and be used to divert flows into off-stream recharge basins. At Prado Dam, a project is underway to raise the storage elevation, allowing additional storage. An economic analysis of raising the storage capacity of Prado even higher was completed.

MS4 Credits

The Municipal Separate Storm Sewer System (MS4) permit process is intended, among other things, to increase the amount of stormwater captured and recharged in the watershed. These permits require the owner to construct their project in such a way as to recharge stormwater on their site. However, in some cases it may be more ideal from a water management perspective to recharge the stormwater somewhere upstream. One way to introduce flexibility into this process would be to allow owners to purchase "MS4 credits" that could be applied to recharge projects in other locations. There may also be an opportunity to allow these credits to be used throughout the watershed. For example, a project in Orange County could purchase credits that could be used for a project in the upper watershed.

Re-Operation of Flood Control Facilities

This concept involves working with flood control agencies to re-operate flood control facilities, with the goal of increasing stormwater capture, increasing flood get-away capacity, and revising decades-old storage curves. For example, when weather forecasts do not show any impending storms, the flood control agencies may be able to release stormwater at a slower rate. This relatively minor operational change would make stormwater flows easier to capture and put to use. It also would result in impounding the water longer, which would increase artificial recharge during the holding period.

Increasing Size of Flood-Control Facilities for Stormwater Capture

Under this concept, the watershed would work with flood control agencies to increase the size of existing, or new, detention basins. Larger detention basins would slow the flow of stormwater and increase the recharge area, increasing the amount of stormwater artificially recharged. In addition, larger basins also would provide greater flood protection. This strategy would be viable only in areas of the watershed that have vacant land.

Forest First: Forest Management for Reduction in Hazardous Fires and Debris Flows and Increase in Water Yield

This concept would increase stormwater capture by working under the Forest First Memorandum of Understanding (MOU) with the Santa Ana Watershed Project Authority (SAWPA) to support collaborative projects among the U.S. Forest Service and downstream flood control and groundwater management agencies to manage forests, including (1) fuels reduction, (2) chaparral restoration, (3) meadows restoration, and (4) forest maintenance road runoff control. With collaboration between upstream and downstream parties, water flows from the forest may be spread more evenly over the hydrograph cycle, allowing for slower and more even flows from the forest lands to the plains, which would result in increased recharge. This will also reduce sediment transport, particularly after forest burn events, and improve water quality downstream.

Development Standards That Enhance Stormwater Capture

This concept would increase stormwater capture by implementing new development standards that promote the construction of infrastructure that will increase the infiltration of stormwater, such as porous concrete, infiltration galleries, and perforated pipelines. These facilities could be implemented in public areas such as parking lots, schoolyards, parks, and greenbelts, as well as private areas, by establishing a requirement in local development codes.

Emergency Measures such as Mutual Aid and Coordination

Despite careful planning, there will still be catastrophic events and unforeseen circumstances. Each of the water agencies in the watershed must have an emergency plan that complies with both the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).

Wherever possible, water agencies should pursue interconnections to increase redundancy and provide aid during an emergency situation. All of the water agencies should have mutual aid agreements in place. One mutual aid option used by many of the water agencies is to join the California Water/Wastewater Agency Response Network (CalWARN; www.calwarn.org). CalWARN provides a standard mutual aid agreement and also maintains a database of personnel and equipment that could be made available during an emergency. It is recommended that each of the water agencies in the watershed join CalWARN and upload their personnel and equipment data. In addition to participating in mutual aid agreements, the water agencies also may want to consider additional coordination with one another through a regional group. Two such groups already have been formed in the watershed: the Water Emergency Response Organization of Orange County (WEROC) and the Emergency Response Network of the Inland Empire (ERNIE). Water agencies should consider partnering with one of these groups, or perhaps forming an additional group, if necessary.

Water agencies should would together to develop strategies and messages that can be deployed in a coordinated and unified way in the event of a catastrophic event where extraordinary conservation

would be required. In these situations, the only way demands can be met is by asking the public to implement extraordinary conservation measures such as halting all outside irrigation, limiting the frequency of bathing, etc. In the upper watershed, outside uses account for nearly 70% of water use.

The watershed is encouraged to work together to maximize outside funding opportunities that can support these coordination activities to prepare for emergency operations.

Increase storage.

In general, the hydrology for the watershed can be characterized by a short series of wet years followed by a longer series of dry years. When the wet years come, they tend to be really wet, or "flood" type years. Thus, a fundamental water management challenge for the watershed is to capture the water during wet years, when it is plentiful, and store it for later use during dry years. The water may be stored in surface water reservoirs or in the groundwater basins within the watershed.

In addition to storing water locally in the watershed, there are also opportunities to store or bank water (surface and groundwater) outside the watershed. Statewide there are extensive groundwater basins and surface storage opportunities, many of which are located on upstream reaches of the State Water Project (SWP) and require minimal infrastructure investment.

The watershed has a number of surface water reservoirs. Additional surface storage space would allow the capture of additional stormwater and imported water and would enhance reliability during a disaster. Therefore, the watershed should increase surface water storage both inside and outside the region. Due to rapid development within the watershed, the number of potential reservoir sites inside the watershed diminishes every year. Potential surface storage opportunities outside the watershed include any additional reservoirs constructed as part of the SWP and/or the Colorado River Aqueduct.

Nearly all of the available groundwater storage space in the watershed has been allocated to the Santa Ana River Conservation and Conjunctive Use Program (SARCCUP) or other programs. Should additional groundwater storage space be desired, the watershed could pursue storage in a water bank in the Central Valley.

Optimize imported water.

The watershed is dependent on imported water to meet approximately one-third of its current and future needs. The reliability of water imported from the Sacramento–San Joaquin Bay Delta (Delta) is uncertain. However, the watershed may be able to implement strategies that could help offset the various uncertainties, and possibly even increase the amount of imported water available to the watershed.

Developing infrastructure and partnerships to ensure that in wet years as much water as is available be stored for later use is a top priority. This concept not only improves water supply

reliability but could also reduce costs by dramatically reducing the amount of imported water that is purchased during dry years when the "market rate" is the highest.

The watershed has made strong progress on this strategy. The largest SWP Contractor for the watershed, Metropolitan, has had a wet-year storage program for many years that stores water in surface reservoirs and groundwater basins, including in the Central Valley. San Bernardino Valley Municipal Water District, the SWP Contractor serving portions of the upper watershed, has imported nearly 1 million AF of imported water in the San Bernardino Basin Area since the early 1970s. Most recently, the watershed has been implementing SARCCUP, which will rely on groundwater basins to store up to 180,000 AF of wet-year water.

In addition, a Chino Basin Water Bank is currently being developed that would accommodate a scalable framework to allow new and stored wet-year water to be available for the entire watershed.

Nearly all of the reduction of imported water deliveries through the SWP is due to environmental restrictions in the Delta, exacerbated by drought years and climate change. The California WaterFix (see https://www.californiawaterfix.com/) has "coequal goals" of improving the health of the ecological system while also protecting SWP deliveries. The California WaterFix would transport SWP deliveries under the Delta via tunnels. These new facilities will increase the reliability of deliveries and improve SWP water quality by reducing total dissolved solids (TDS) concentrations, thereby reducing water recycling costs.

Prevention of Invasive Species from Clogging Infrastructure

Quagga mussels (*Dreissena bugensis*) and the closely related zebra mussels (*Dreissena polymorpha*) are small shellfish, usually less than a half inch in size. Once only found in the Great Lakes, the quagga mussel has now been discovered in Lake Mead, the Colorado River Aqueduct, and a local reservoir in San Diego County. They live and reproduce in pipes, causing them to clog. Once they are established, they are very difficult to eradicate. Quagga mussels can be controlled by super chlorination and drying out, sometimes requiring the temporary drawing down of water supplies. The additional maintenance costs associated with controlling these mussels could cost tens of millions of dollars a year. There is concern that quagga mussels could become more widespread and migrate into the watershed through untreated water pipelines or larvae carried on boats and other watercraft. The watershed should participate in any programs, such as the one initiated by Metropolitan, that target preventing these species from entering water infrastructure.

Treat and reuse recycled water.

Treating and reusing wastewater, referred to as recycled water, provides the most reliable sources of water in the watershed. Wherever recycled water can be put to use, it effectively replaces a like amount of potable water. Over the years, the watershed has seen significant accomplishments in the development of recycled water. In fact, at present, nearly all of the recycled water from the upper watershed is being discharged into the Santa Ana River and being reused at various

locations downstream. In the future, the upper watershed plan to develop enhanced recycling programs could change where much of this resource is used. Should enhanced recycling occur in the upper watershed, it would reduce the amount of recycled water flowing to the lower watershed. This could be offset in the lower watershed by increasing water recycling, increasing conservation measures, desalting ocean water, and/or purchasing more imported water. There may also be an opportunity for the upper watersheds to leave their treated wastewater in the river in exchange for the lower watershed providing a replacement source of like quantity and reliability to the upper watershed. This concept was first introduced in the OWOW 2.0 Plan and has been further developed in OWOW Plan Update 2018 as "Recycled Water Exchange." For more analysis about recycled water, see Appendix F.

Nearly all wastewater treated above Prado Dam is currently discharged into the Santa Ana River. The lower watershed uses the effluent to recharge its groundwater basin and reduce the need for imported water.

The recycled water exchange would exchange treated wastewater from the upper watershed for a like amount of imported water delivered to the upper watershed.

- *Treated wastewater flows remain in the river for the lower watershed.* The upper watershed would continue to deliver treated wastewater to the lower watershed via the Santa Ana River instead of developing recycled water programs.
- *The lower watershed provides imported water to the upper watershed.* The lower watershed would change the place of delivery for some of the water they plan to import to the upper watershed, which would replace the treated wastewater.
- *Comparable reliability is achieved.* Recycled water is 100% reliable and imported water is about 60% reliable. Storing imported water in the upper watershed, or other water bank, during wet years for use in dry years would mitigate the lower reliability of imported water.

A preliminary evaluation of the Recycled Water exchange concept identified the following benefits as compared to current plans:

- *Less salt.* The only source of imported water available to the upper watershed is the SWP, which is higher quality than water from the Colorado River and many of the groundwater basins in the watershed. To the extent that SWP water delivered to the upper watershed replaces Colorado River water delivered to the lower watershed and/or is stored in a basin of lower water quality, there could be a water quality improvement in the watershed.
- *One-third return on investment.* Delivery of imported water moves from the lower watershed to the upper watershed. Since approximately 1/3 (0.33) of every acre-foot delivered to the upper watershed ends up as treated wastewater in the river, the lower watershed receives 1.33 AF for every acre-foot delivered, a 33% return on investment!

- *Lower cost – less energy*. The energy required to pump recycled water throughout a water system is substantial. This concept would eliminate these energy costs. Since the imported water delivered to the upper watershed from the lower watershed would have been imported anyway, there would be no increase in energy associated with this component of the concept.

Recycled Water for Potable Use

Legislation is required to allow recycled water to be used for potable use. The watershed should work together to promote such legislation, and begin the process of community engagement to ensure people and leaders will be supportive of this safe, proven technological solution.

Recycling of Wastewater Flowing to the Ocean

Orange County Sanitation District disposes of effluent from its Plant No. 1 into the ocean. This effluent could be treated and used for a variety of purposes including the offset of any reduction in recycled water flows to the lower watershed due to recycling in the upper watersheds.

By 2030, Orange County Sanitation District will dispose of effluent from its Plant No. 2 into the ocean. However, based on current Department of Public Health requirements, this water cannot be recycled because it includes the effluent from the Inland Empire Brine Line, which contains discharges from the Stringfellow Hazardous Waste Site, and other sources that would require further characterization by the Department of Public Health. The watershed should consider working with the Department of Public Health on a strategy that would allow this effluent to be recycled.

Ocean Desalination

The lower watershed borders the Pacific Ocean which is a technically and institutionally feasible source for water supply; however, ocean desalination has historically been more expensive both in capital and operational costs compared to existing supplies. Ocean water desalination requires significant base-loaded energy, which is costly and can be carbon-intensive. Ocean water desalination is also subject to significant regulatory scrutiny depending on the potential environmental impact of the specific project. As the cost of new water supplies increases, the cost of ocean water desalination may be closer to other alternative new water supplies. Therefore, evaluations are expected to continue for ocean water desalination projects.

Over the last several years, a number of water agencies have been investing significant effort and funds in ocean desalination program development work in Southern California. There are currently two sites along coastal Orange County, in Dana Point and Huntington Beach, that have completed extensive exploratory studies and permit applications to construct desalination facilities; however, to date they have not completed the permitting process. The Huntington Beach Seawater Desalination Project is being developed by Poseidon Resources LLC (Poseidon), a private company, and would be located near the AES Power Plant in the City of Huntington Beach adjacent to Pacific Coast Highway. The proposed project would produce up to 50 million gallons per day (56,000 AFY)

of drinking water, to provide approximately 10% of Orange County's water supply needs. In May 2015, Orange County Water District (OCWD) executed a non-binding term sheet with Poseidon that outlined the overall structure of a potential partnership between OCWD and Poseidon regarding the project. On August 28, 2017, the Santa Ana Regional Board confirmed a complete application for a Water Code Section 13142.5(b) determination (feasibility of site, design, technology, and mitigation measures considered independently and then collectively) and Report of Waste Discharge for renewal/reissuance of the National Pollutant Discharge Elimination System permit for the proposed desalination project. The California State Lands Commission certified the desalination project's supplemental environmental impact report in October 2017. The Santa Ana Regional Board will next focus on the adequacy of analysis and studies submitted as part of the determination application and Report of Waste Discharge through the neutral third-party peer review process of the State Water Resources Control Board (State Board).

Reduce demand.

Governor Edmund G. Brown Jr.'s 2016 Executive Order B-37-16, "Making Water Conservation a Way of Life," outlines the framework needed to use water more wisely, eliminate water waste, strengthen local drought resilience, and improve agricultural water use efficiency and drought planning. The concepts outlined in the following paragraphs are recommended for the watershed and align with the Governor's framework.

Water Rate Structures That Encourage Conservation

Water rate structures that increase the per-unit cost as demand increases have been shown to reduce consumption. While many of the retail water agencies have this type of rate structure in place, there are still agencies in the watershed that do not use a conservation-based rate structure. The following agencies in the watershed have implemented, or are in the process of implementing, water rate structures that encourage conservation: Irvine Ranch Water District, Monte Vista Water District, Elsinore Valley Municipal Water District, Eastern Municipal Water District, Western Municipal Water District, City of Corona, City of Chino, City of Chino Hills, East Valley Water District, and El Toro Water District. A Proposition 84 grant was obtained by SAWPA and used to help cover some of the cost to implement this rate structure.

Public Education to Encourage Water Conservation

Educating the public on the state's and watershed's water supply system is a crucial component to implementing permanent change in water use habits and gaining support for water supply investments. Water conservation education is being performed throughout the watershed. A new landscape handbook, SoCal Yard Transformation Guide, written by the watershed, targets public education. In 2019 a Spanish-language edition of the Guide is expected to be ready for distribution.

Outdoor Conservation

Outdoor water conservation is key to reducing urban demand. The upper watershed uses 60%–70% of its water outdoors. A significant number of outdoor water use efficiency programs are in place. The watershed has made considerable progress in this area through the Water Saving – Garden Friendly, Defend the Drop, and Water–Energy Community Action Network programs and others. More emphasis is being placed on outdoor water use in the existing water conservation education programs. In the Proposition 84 2014 round grant, $6,400,000 was made available to public agency and homeowner association projects for removal of turf.

Reduction of Evapotranspiration

One of the only measurable "losses" in the watershed is evapotranspiration, the combined water loss associated with evaporation and transpiration. The losses associated with evaporation might be reduced by developing and implementing specific programs such as planting trees or constructing shade structures to increase the amount of shaded area. However, more analysis is required to estimate savings and determine whether the increased water use by any new shade trees would offset any potential decrease in evaporation associated with their shade. This strategy would be most appropriate in the areas of the watershed with the highest evaporation rates, namely the upper watershed.

Agencies in the watershed continue to remove Arundo (*Arundo donax*), a noxious weed that is estimated to consume 48 AFY of water per acre of Arundo (CIPC 2011, p. 47). The SARCCUP will remove 640 acres. The Southern California Integrated Watershed Program, funded by Proposition 13, removed 3,184 acres; habitat programs funded in part by Proposition 50 removed 700 acres; and the Arundo Management–Habitat Restoration Program, a collaborative effort between SAWPA, Santa Ana Watershed Association, and Riverside County Regional Park and Open-Space District, removed and maintained plant regrowth on 2,166 acres.

5.1.4. CONTRIBUTORS – WATER RESOURCES OPTIMIZATION

The following water professionals volunteered to take responsibility for writing a portion of this Pillar section (in alphabetical order by first name):

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5.2. WATER QUALITY

5.2.1. LINKS TO THE OWOW GOALS

This Water Quality Pillar sets forth Recommended Management Strategies in support of the overall One Water One Watershed (OWOW) Program goals. The Water Quality Pillar chiefly supports the goal of *ensuring high-quality water for all people and the environment*; however, *achieving resilient water resources through innovation* and *optimization* and *preserving and enhancing recreational areas, open space, habitat, and natural hydrologic function* are directly impacted by, or cause impact upon, the recommended management strategies below. These goals can be achieved by efforts to match water quality to water use; implement source water protection programs; cleanup of contaminated areas; recharge of recycled water, stormwater, and imported water; and pollutant source identification and control.

The recommended management strategy of public outreach and education directly supports the OWOW Program goal of *educating and building trust between people and organizations*.

The recommended management strategy of collaboration among water and wastewater agencies in the watershed to share data and efforts to determine sources of contamination directly supports the OWOW Program goal of *improving data integration, tracking, and reporting to strengthen decision making*.

5.2.2. RECOMMENDED MANAGEMENT STRATEGIES

Achieve salt balance in the watershed.

- Continue to work with the Southern California Salinity Coalition and the Basin Monitoring Program Task Force to develop long-term plans to achieve a watershed salt balance.
- Work with SAWPA and Los Angeles County Sanitation Districts to manage the brine lines and develop future plans for long-term sustainability.
- Develop drought management plans and work with the Regional Water Quality Control Board (Regional Board) to modify discharge permit conditions for TDS while maintaining surface water quality in the watershed, keeping in mind that wastewater dischargers experience difficulties meeting discharge requirements for TDS during drought conditions.

Improve groundwater quality.

- Clean up contaminated areas:
  - Pump and treat for local plumes.
  - Treat wellheads (e.g., for arsenic and perchlorate).
  - Clean up desalters.
- Identify and control pollutant sources.
- Recharge with recycled water, stormwater, and imported water.

- Ensure groundwater where nitrate, arsenic, perchlorate, or chromium-6 contamination exists is subject to management efforts to mitigate the impact of these contaminants.

Respond to new regulations.

- Participate in Association of California Water Agency water quality workgroups and other stakeholder groups to respond to lower detection limits for compounds such as 1,2,3-trichloropropane (TCP) and 1,4-dioxane.
- Encourage water and wastewater agencies in the watershed to collaborate, sharing data and efforts to determine sources of contamination, to respond to new federal health advisories established for perfluorooctanoic acid/perfluorooctyl sulfonate (PFOA/PFOS) that will require additional testing and could lead to production well shutdowns
- Through the Emerging Constituents Task Force, assist agencies in complying with new regulations the State Board is developing for monitoring constituents of emerging concern, including biomonitoring, which will increase compliance efforts and costs.

Protect surface water and ocean water quality.

- Manage urban runoff using methods including the following:
  - Best management practices (BMPs) that include constructed wetlands.
  - Constructing localized urban runoff treatment systems.
  - Surface water diversions to publicly owned treatment works or other treatment systems.
- Research water resource impacts due to homeless encampments and develop remedial actions as necessary.
- Require National Pollutant Discharge Elimination System permits for other dischargers, such as dewatering operations.
- Implement source control and treatment, including by publicly owned treatment works.
- Perform public outreach and education.

Prepare for climate change.

- Develop long-range plans to respond to expected or projected impacts to water resources due to climate change. Sea-level rise may cause damage to coastal areas, wetlands and habitat, and may require additional control measures to protect groundwater from seawater intrusion.

5.2.3. BASIS FOR RECOMMENDATIONS

Water quality in the watershed has been influenced by population growth, agriculture, and industry. The following sections briefly describe the regulatory framework driving water quality protection, and the current water quality issues that formed the basis for the recommendations presented within this Pillar.

Regulatory Framework

Drinking Water Regulations

The California Safe Drinking Water Act (Health and Safety Code, Section 116270 et seq.) directs the California State Water Resources Control Board (State Water Board), Division of Drinking Water to set standards for drinking water quality. Drinking water regulations are addressed in Title 17 and Title 22 of the California Code of Regulations. These include establishing the Maximum Contaminant Limits (MCLs) and treatment requirements for potable water and recycled water. The California Safe Drinking Water Act is implemented in concert with the Federal Safe Drinking Water Act.

Water Quality Control Plan, Santa Ana River Basin

The State Board and the Regional Water Quality Control Boards are responsible for implementing California's Porter-Cologne Water Quality Control Act and the Federal Clean Water Act. These State and Federal laws provide the overall framework for managing water quality. Extensive voluntary efforts of stakeholders play an important role in protecting and improving water quality in the watershed. Examples include Orange County Coastkeeper's eelgrass restoration program in Upper Newport Bay, and Inland Waterkeeper's water quality and habitat restoration programs.

The Santa Ana River Watershed is under the jurisdiction of the Santa Ana Regional Water Quality Control Board, Region 8 (Regional Board). The Water Quality Control Plan, Santa Ana River Basin (Basin Plan) guides the Regional Board's water quality control programs, water quality management decisions, and enforcement efforts. The Basin Plan establishes water quality standards, which include beneficial uses, water quality objectives, and implementation plans to achieve the standards.

Since its last major revision in 1995, the Basin Plan has been amended 14 times. Amendments added total maximum daily loads (TMDLs) in 1998, 1999, 2003, 2004, 2005, and 2006; made provisions for and included time schedules in waste discharge requirements (2000); revised bacterial objectives in ocean waters (1997); incorporated a revised nitrogen/total dissolved solids (N/TDS) management plan (2004); prohibited use of septic systems in the Quail Valley Area of Riverside County (2006); incorporated "maximum benefit" TDS and nitrogen objectives and salt management plan for the San Jacinto Upper Pressure Management Zone (2010); incorporated TMDLs for organochlorine compounds for San Diego Creek, Upper and Lower Newport Bay, Orange County (2011); and incorporated updates related to the salt management plan for the Santa Ana River Basin (2012).

In California, water quality regulatory programs are administered primarily through the issuance of the (federal) National Pollutant Discharge Elimination System (NPDES) Permits and state Waste Discharge Requirements. These permits regulate discharges to surface water bodies of both

wastewater and urban runoff from municipal and industrial systems, and stormwater runoff from municipal separate storm sewer systems (MS4s), industrial sources, and construction sites.

Examples of major water quality monitoring programs in the watershed include:

- The Basin Monitoring Program Task Force administered by SAWPA collects and analyzes data in order to calculate the ambient TDS and nitrate concentrations in the region's groundwater basins every 3 years.
- The Imported Water Recharge Workgroup documents the TDS and nitrate load to groundwater basins from the use of imported water for groundwater recharge and estimates the resulting TDS and nitrate concentrations in the future.
- The Emerging Constituents Workgroup sampled and analyzed surface waterbodies in the watershed for a select group of emerging constituents.
- The Middle SAR Watershed TMDL Task Force/Regional Water Quality Monitoring Group addresses the exceedances of the fecal coliform objective established to protect REC 1 use of water bodies.

Impaired Water Bodies and Total Maximum Daily Loads

The federal Clean Water Act Section 303(d) requires states to identify as impaired those waters that do not, or are not, expected to meet water quality standards. Impaired waterbodies are placed on the 303(d) List of Water Quality Limited Segments, which initiates a process to develop TMDLs. A TMDL defines how much of a pollutant a water body can tolerate and still meet water quality standards. Each TMDL must account for all sources of the pollutant, including wastewater treatment plant discharges, nonpoint-source pollutants in runoff, forested lands, agriculture, legacy contaminants, on-site disposal systems, and air deposition.

California Toxics Rule

The California Toxics Rule was promulgated by the U.S. Environmental Protection Agency to set numeric water quality criteria for priority toxic pollutants and other provisions for water quality standards to be applied to California waters. The criteria apply to all inland surface waters and enclosed bays and estuaries regulated by the Clean Water Act.

California Ocean Plan

The California Ocean Plan is the state water quality control plan for ocean waters as required by the Clean Water Act. Beneficial uses are listed, and water quality objectives are set for marine waters, including protection of Areas of Special Biological Significance, rare and endangered species, marine habitat, fish migration, recreation, fishing, aesthetic enjoyment, and others. Water quality objectives are implemented through waste discharge limitations, monitoring, and enforcement.

Ocean Water-Contact Standards – AB 411

In 1996, Assembly Bill (AB) 411 required the establishment of bacteriological ocean water quality standards to protect public health (California Code of Regulations [CCR] Sections 7956-7962). The AB 411 standards require that waters adjacent to ocean and bay public beaches be monitored for total coliforms, fecal coliforms, and enterococci bacteria. When any waters adjacent to a public beach fail to meet any of the standards, warnings are issued to the public. In the event that sewage spills are known or suspected, public access to the affected waters is restricted.

Surface Water

Current Conditions

Water quality concerns in surface waters of the watershed include nutrients from farming, septic systems, reclaimed water, and land use practices; algal toxins, anoxic conditions, and taste and odor that result from high nutrient concentrations in surface waters; pathogens; and pollutants discharged from dry- and wet-weather runoff in urban areas.

In addition, the region faces a number of emerging and future challenges, including the following:

- Salinity management becoming more difficult due to increased water recycling
- Increased drought conditions causing challenges in meeting regulatory water quality standards
- Effectively reacting to the upward trend of TDS in wastewater and wastewater effluent
- Remediating unintended consequences of water conservation measures, including loss of revenue from water sales, less available recycled water, and increased infrastructure operations and maintenance costs
- Establishing new pathogen indicators
- Reevaluating water quality standards to ensure that limited resources are allocated appropriately
- Revising the Lake Elsinore/Canyon Lake Total Maximum Daily Load (TMDL)
- Setting new residual chlorine objectives
- Complying with new state regulations such as water quality objectives for biostimulatory substances
- Setting new statewide sediment toxicity standards
- Managing sediment loading
- Encouraging appropriate low-impact development
- Remediating pollution from septic systems
- Tracking new contaminants of emerging concern, such as 1,2,3-TCP

- Continuing to manage salinity and nutrients, including long-term maintenance of the Inland Empire Brine Line (Brine Line)

See Table 5.2-1 for a brief summary of surface water conditions for each water body in the Santa Ana River drainage area.

Table 5.2-1. Surface Water Conditions in the Santa Ana River Drainage Area

Water Body	Water Quality and/or Identified Issues
Santa Ana River	
Reach 6	• This reach has generally good water quality. • Low to very low levels of TDS, indicator bacteria, or other pollutants characterize Reach 6. • Impounding water behind the Seven Oaks Dam reduces water quality because of sediment entrapment and algae growth.
Reach 5	• This reach has generally good water quality. • Segments of many of the streams in this reach support or have the potential to support a wide range of beneficial uses.
Reach 4	• Water quality objectives are being met with the exception of fecal coliform
Reach 3	• OCWD operates the Prado Constructed Wetlands to reduce nitrogen load in the Santa Ana River. • Rising groundwater feeds small tributary creeks that are important breeding and nursery areas for native fish.
Reach 2	• Immediately downstream of the dam the river channel supports some aquatic habitat.
Reach 1	• There are no numeric water quality objectives for Reach 1.
San Jacinto Watershed, including Canyon Lake and Lake Elsinore	• Nutrients from sources such as septic systems, farming, reclaimed water, and land use practices can cause significant algae growth in the lakes. • Excessive algae growth in the lakes depletes dissolved oxygen, resulting in occasional fish kills.
Lake Perris	• Issues include pathogens, taste and odors, algal toxins, and anoxia within the lake's bottom layer.
Lake Mathews	• A watershed model is needed to assess the effects of pollution in the runoff from future developments.

TDS = total dissolved solids.

West Orange County and Coastal Watersheds

Several subwatersheds located in Orange County are considered part of the Santa Ana Watershed although they are not within the Santa Ana River drainage area. These areas include portions of the San Gabriel River–Coyote Creek Watershed that are in Orange County and the Anaheim Bay–Huntington Harbour Watershed, Newport Bay Watershed, and Newport Coastal Streams Watershed. Coastal bays and harbors and coastal area tributary streams are shown on Figure 5.2-1.

See Table 5.2-2 for a brief summary of surface water conditions for water bodies outside the Santa Ana River drainage area.

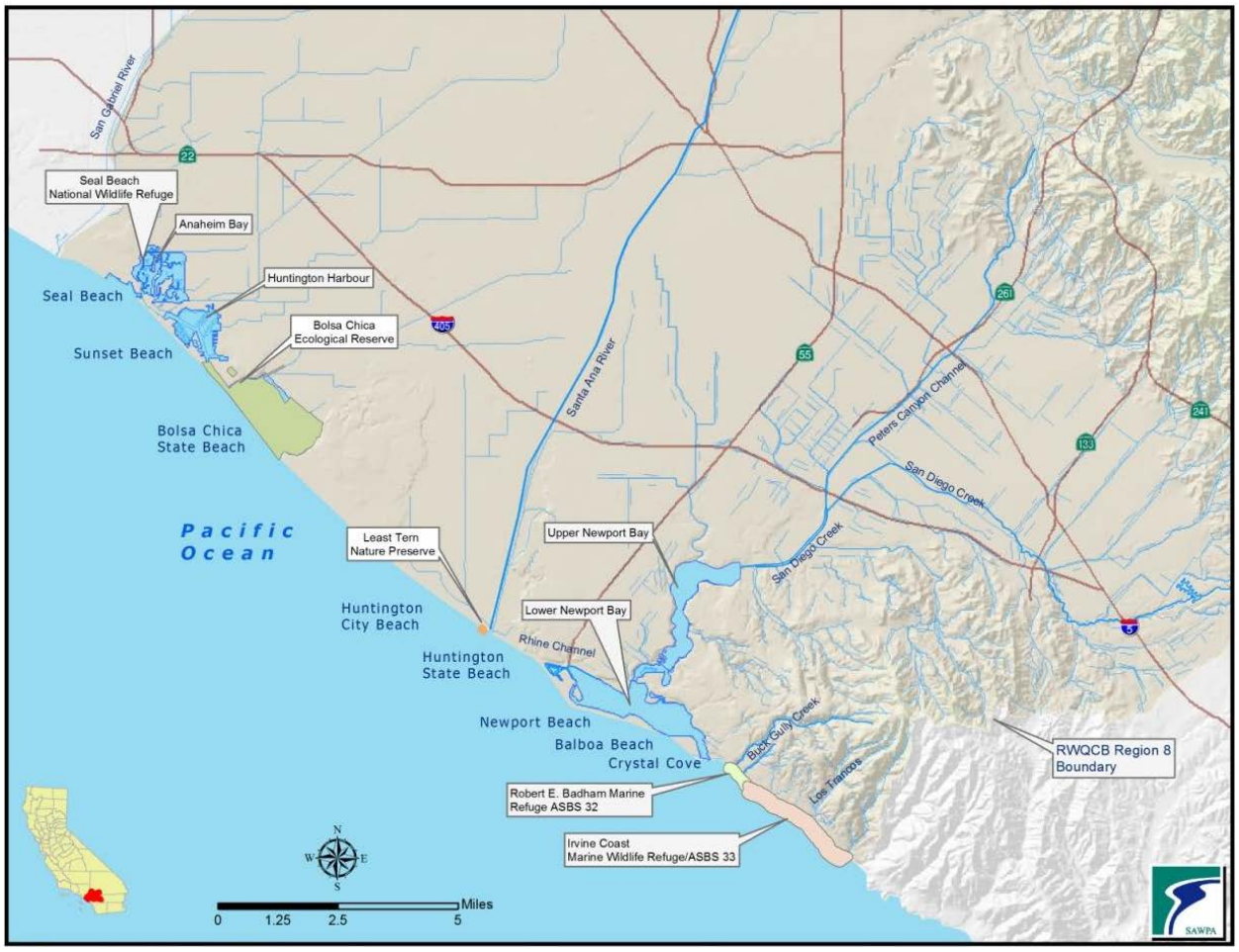

Figure 5.2-1. Coastal Areas and Tributary Streams

Table 5.2-2. Surface Water Conditions outside the Santa Ana River Drainage Area

Water Body	Water Quality and/or Identified Issues
San Gabriel River–Coyote Creek Watershed	• This area is highly urbanized and dry- and wet-weather runoff discharges pollutants into the river. • Seal Beach is located just south of the mouth of the San Gabriel River and is impacted by local drainage as well as the water quality of the river.
Anaheim Bay–Huntington Harbour Watershed	• Discharges containing metals and pesticides from a variety of sources, including boating-related activities; stormwater, urban, and agriculture runoff; and past historical inputs, have negatively impacted water quality.
Newport Bay Watershed	• Upper Newport Bay is a unique area containing a fragile coastal ecosystem; the area, designated as a State Ecological Reserve and a Critical Coastal Area, supports seven diverse estuarine habitats with several hundred species of

Table 5.2-2. Surface Water Conditions outside the Santa Ana River Drainage Area

Water Body	Water Quality and/or Identified Issues
	marine and terrestrial flora and fauna, including six federal and state listed, threatened, and endangered species (five bird species, one plant species). • The Regional Board considers the Rhine Channel, located at the western end of lower Newport Bay, one of Orange County's hot spots for toxic sediments.
Newport Coastal Streams Watershed	• Several coastal canyons drain this area directly into the ocean, into two Areas of Special Biological Significance.

Groundwater

Groundwater is a major source of water supply and a key component for each agency in the watershed. Protection of this source is critical to maintain the viability of local water supplies. Identified water quality issues include the following:

- High salt and nitrate concentrations
- Recycling wastewater, which increases TDS
- Increase in drought conditions, which increases salinity of water resources
- Proper regulation and management of septic systems
- New statewide treatment requirements that must be met
- Contamination due to volatile organic compounds (VOCs), perchlorate, and other constituents
- Brine-line challenges, including long-term financial viability, declining flows and increased buildup of solids, and lack of alternatives to use of existing lines

Perfluorooctanoic Acid and Perfluorooctyl Sulfonate

The U.S. EPA established health advisories in 2016 for PFOA/PFOS. These compounds are fluorinated organic chemicals that were used in carpets, clothing, furniture fabrics, paper packaging for food, firefighting, and some industrial processes. Although these chemicals are no longer produced or used in the United States, exposure through contaminated drinking water from past manufacturing operations may still be a risk. Adverse health effects from exposure include developmental effects to fetuses or breastfed infants, cancer, liver tissue damage, and immune system effects. Water suppliers in the watershed have begun testing for these chemicals and are developing remediation plans when necessary.

1,2,3-Trichloropropane

1,2,3-TCP is a chemical used as a cleaning and degreasing solvent and is found in some pesticide products. In 2017, California set a maximum contaminant level of 5 nanograms per liter for 1,2,3-TCP. Although it is not regulated on the federal scale, this chemical has been found to be carcinogenic in mice and is suspected to be a human carcinogen. This chemical was widely

detected in groundwater throughout California. 1,2,3-TCP degrades slowly in groundwater and small quantities can contaminate a large volume of water.

Hindrances to Groundwater Cleanup Projects

Cleanup of contaminated groundwater is frequently difficult, complicated, and costly. When possible, regulatory agencies require responsible parties to conduct and/or pay for remediation of the contamination. In some cases, local agencies may desire to implement a remediation project to protect local water supplies. When this occurs, local agencies encounter hurdles, such as lack of legal authority to recover cleanup costs and potentially responsible parties legally challenging California Environmental Quality Act (CEQA) documents in an effort to delay the cleanup efforts. Consideration should be given to streamlining CEQA to facilitate groundwater cleanup projects implemented by public agencies, such as a Statutory Exemption for groundwater cleanup projects or a streamlined approach to compliance with CEQA.

Imported Water – Water Quality

Water agencies in the watershed receive imported water from the Colorado River Aqueduct and the SWP. The majority of this supply used by local agencies is imported by the Metropolitan Water District of Southern California. The quality of imported water that is used for recharging groundwater directly affects groundwater quality. Imported water quality also affects the quality of discharges from wastewater treatment plants for certain constituents, such as salinity. This section provides a summary of key water quality constituents within the imported water systems.

Colorado River

The Colorado River Watershed encompasses 242,000 square miles, including portions of seven states and portions of Mexico. Dams and reservoirs control river flows, and Lake Havasu, formed by Parker Dam, serves as the forebay for the Colorado River Aqueduct. Some issues related to imported water quality are as follows:

- Salinity
- Nutrients
- Perchlorate
- Uranium
- Chromium-6

State Water Project

Water for the SWP originates at Lake Oroville, on the Feather River, and flows through the Sacramento–San Joaquin Bay Delta into the California Aqueduct to water users in Central and Southern California. Water quality issues in this system, as measured in the California Aqueduct,

just upstream of the Tehachapi Afterbay where the aqueduct bifurcates into the east and west branches, are summarized as follows:

- Organic carbon and bromide
- Salinity
- Nutrients
- Arsenic

Ocean Water and Coastal Areas – Current Conditions

The primary emphasis with ocean water is maintaining water quality in order to protect marine resources and public health.

Ocean water quality is evaluated using a number of different parameters and constituents related to beneficial uses. In the Regional Board's water quality control plan (Basin Plan), one of the key beneficial uses is REC-1, full body contact recreation. In addition to recreation, the ocean waters also support important habitat areas, including two Areas of Special Biological Significance and their related onshore Critical Coastal Areas. Important coastal areas within the watershed include the Newport Beach Marine Life Refuge and the Irvine Coast Marine Life Refuge. Water quality issues in ocean water and coastal areas include the following:

- Stormwater and dry-weather runoff
- Direct discharge pipes from residential neighborhoods along the coastal edge of the Areas of Special Biological Significance
- Transported sediment
- Beachgoer scavenging and trampling
- Pollutants from upcoast and downcoast discharges
- Harmful algae blooms

Matching Water Quality with Water Use

The possibility of replacing potable water supplies used for landscape irrigation with pumped groundwater containing some contamination should be considered in discussions on improving local water supply reliability. In cases of groundwater with low levels of contaminants, use of this water for irrigation could have several benefits beyond reduced use of potable water supplies. When used for irrigation and carefully managed to allow for infiltration, the water may naturally be purified of some contamination through absorption by vegetation or through natural attenuation.

5.2.4. CONTRIBUTORS – WATER QUALITY

The Pillar workgroup coordinated the preparation of this report. The Pillar members listed below provided direction and assisted in collecting the information contained in this report and reviewed

and commented on draft versions. The Pillar met in person and also held conference calls on a number of occasions.

Contributors to the OWOW Plan Update 2018 Water Quality section include the following (in alphabetical order by first name):

ROLE	ORGANIZATION
Chair	
Mike Markus	Orange County Water District
Contributors	
Al Javier	Eastern Municipal Water District
Ashley Gibson	Yucaipa Valley Water District
Eric Lindberg	Santa Ana Regional Water Quality Control Board
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Ray Heimstra	Orange County Coastkeeper
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5.3. TRIBAL COMMUNITIES

5.3.1. LINKS TO THE OWOW GOALS

The goals of the OWOW Plan Update 2018, which describe a path towards a more healthful watershed, are shared by all communities in the watershed, including Tribal communities. Seeking resilient and clean water supplies for people and the environment, preserving and enhancing open space, engaging with all communities in ways appropriate to their customs and capacities, educating and building trust, and managing data to strengthen decision making—these ideas are all present in the recommendations that follow.

Key in these recommendations is the need for continued development of appropriate ties between the governments of Tribal communities and the government agencies, at all levels, that have intersecting or adjacent responsibilities. This is best embodied by the OWOW Plan Update 2018 goal to educate and build trust between people and organizations. Much of the work proposed below reflects the importance of that goal to the contributors to this Pillar section.

5.3.2. RECOMMENDED MANAGEMENT STRATEGIES

Follow best management practices for Tribal engagement and participation.

At a Tribal workshop, Tongva Tribal Elder Julia Bogany shared the importance of acting in conscientious ways when we deal with one another and the Earth. She shared that each of us takes time every day to take care of ourselves and our outward appearance as a representation of who we are. The Earth also represents who we are and is a reflection of ourselves. We need to take time to look and pay attention to what is being reflected back at us.

Historically, the State of California's water planning processes and associated funding programs have not included California Native American Tribes. Concerns regarding outreach include the format, method, frequency, and cultural sensitivity of soliciting Tribal participation in IRWM planning and the lack of elective outreach to Tribes is a critical implementation process.

This can limit the ability of Tribes to control and access water and watershed uses in accord with their indigenous and aboriginal rights. In turn, this limits their ability to continue their cultural, religious, and sustainability practices.

It is recommended that SAWPA facilitate an annual workgroup meeting with California Native American Indian Tribes and agency staff to provide opportunities for collaboration by communicating regularly with Tribes. As a part of this partnership, the workgroup can review and report on progress made on policies, strategies, and plans. The workgroup could identify documents that need to be developed or updated. For example, it would provide support for the development of plant palettes (see Plant Palette Management Strategy recommendation below) for current and future land use management plans that include species of cultural significance to the Tribal communities.

BMP solutions may include the following:

- Create early opportunities for information and engagement, which can influence the outcome of the planning process.
- Maintain inclusive communication, with an emphasis on two-way communication, so that state agencies as well as California Native American Tribes can learn how planning processes work and who should be contacted.
- Identify community issues, needs, and values, so that California Native American Tribes are assured that they are stakeholders in the process and understand they have fundamentally participated in the decision-making process and are invested in the outcome.
- Educating California agencies about California Native American Tribes communication barriers by acknowledging that cultural differences in knowledge, language, and meaning exist. This helps to develop respect, understanding, and trust among Tribes and agencies.
- Communicate with all affected parties well in advance of the decision-making process and allow adequate time for response and continue communication after a decision has been made.
- Provide a location where representatives can gather and be engaged. Some Tribes may have resources to be engaged, while other Tribes may not. Consideration of how and where a Tribe would prefer to engage is essential.

Provide technical assistance and capacity building for Tribal communities.

The federal government provides Tribes and states with a source of grants to build capacity to manage environmental programs. Within their jurisdictions, Tribal governments are both a government and a participant since they can be regulators, landowners, and owners or operators of economic developments. As a government they direct resources to operate and maintain regulated facilities. In addition to business revenues, their revenue sources are similar to other governments. These sources can include taxes, federal funds, resource fees, and royalties. Activities that build capacity include hiring and training staff, environmental monitoring, planning, assessments, and planning.

Small water systems can face unique financial and operational challenges in consistently providing drinking water that meets EPA standards and requirements. Capacity development is a process for water systems to acquire and maintain adequate technical, managerial, and financial (TMF) capacity. "TMF capacity" enables water systems to have the capability to consistently provide safe drinking water.

Access to drinking water and waste water technical assistance is critical for many small water systems, including those in Native American communities. The specific needs of Tribal communities vary greatly. In 2012, it was estimated that 10,934 homes, or approximately 36,000 people, in Tribal

communities in California either lack a drinking water supply, lack safe drinking water, or have an inadequate water supply.

Programs that support technical assistance providers can be a lifeline to these Tribal water systems. Technical assistance for Native Americans should be respectful of sovereignty, culture, and traditional beliefs.

It is recommended that agencies provide funding to third-party technical assistance providers to assist Tribal small water and wastewater systems with training and technical assistance.

Use Tribal ecological knowledge

Tribal ecological knowledge (TEK) can inform watershed approaches to minimize impacts and include cultural aspects in watershed profiles. These landscape-level tools will involve different scales of assessment, from broad map-based analyses, to on-the-ground rapid assessments, to intensive assessments for high resolution of local conditions. This work is informed by cultural data such as oral environmental histories, site inventories, archaeological studies, and resource management reconstructions. Ultimately landscape and watershed profiles will describe both natural and cultural resource conditions with greater Tribal involvement and better reflection of California's true history of Tribal stewardship.

Recommended strategies include the following:

- Develop and implement strategies and approaches that better incorporate TEK into watershed, water, and water-related resource planning and management activities. Policies should consistently respect TEK as a management strategy for decision making.
- Develop and implement cultural awareness/sensitivity training for water sector leaders and staff.
- Expand awareness of Tribal relationships to water among non-Tribal communities in the watershed.

Engage watershed management and land use

Managing water resource programs on a watershed basis is environmentally, financially, and socially beneficial and both have a shared responsibility to use public resources effectively and efficiently. It is recommended that the watershed develop and maintain stronger collaboration between land use planners, water managers, and Tribal governments. This activity will promote more efficient and effective land use patterns and enhance IRWM practices.

Protect stream buffers and riparian areas and prevent loss of habitat

Tribal partnerships and co-management of culturally sensitive areas, traditional use areas, and culturally significant plants is desired. One way this can be accomplished is through a conservation easement within state or county lands. A conservation easement is a legal agreement tailored to

protect the natural resources on a specific piece of land. This is done by conveying some of the landowner's rights or by permanently restricting specific uses or development of the land. Conservation easements are commonly used by agencies and organizations as a tool for protecting and managing natural open spaces. This approach is particularly useful in areas that have been sacred to California Native Americans for thousands of years and that are central to their creation story. The easement is an opportunity to grant permanent rights to the Tribe, allowing them to work in formal partnership with agencies to further a shared goal of natural restoration, preservation, and public education.

Create a strategy for plant palette management

Long-term management plans should be developed, with input from California Native Americans, to increase the success of native plants and minimize health risks in the landscape. Incorporating traditional gathering and tending practices into management plans is becoming more common on both private and public lands. It is also important to recognize that native plants are very dependent on the correct water structure (amount, flow rate, and mineral content) being available at a location so as to help these plants and the communities that rely on them survive climate changes and different weather patterns.

Manage data partnerships and confidentiality-related issues

The rights and responsibilities surrounding ownership, access, and retention of data, as well as stewardship of data, is a point of negotiation for both Tribes and agencies when conducting research in and with a native community. To build and enhance long-term relationships, it is useful to define and clarify any potential issues during initial negotiations. Ideally, Tribal entities could be involved in the development of any proposed research prior to the development of a grant proposal. Such future discussions may include delineating the appropriate uses of data derived from a particular project.

5.3.3. RECOMMENDED POLICY STRATEGIES

Develop Tribal sovereignty training.

Like other governments, Tribal sovereignty may be defined as the right of Tribal governments to make their own laws and to be governed by those laws. Training courses on Tribal sovereignty provides staff the skills and knowledge necessary to work with Native Americans. Training is an effective way for public, local, and state organizations to understand the unique status of Indian Tribes and their historical relationship with the federal government including government programs, responsibilities, and initiatives. Agencies can contract with Native American non-governmental organizations to conduct on-site training.

Include Tribal representation within IRWM organization and structure.

Develop guidelines and determine what can be and needs to be done to ensure that Tribes' roles as sovereign entities are respected in watershed planning. These guidelines should ensure genuine participation of Tribes in planning and funding initiatives.

A December 2013 Final Report of the IRWM Tribal Collaboration Effectiveness Study to the California Department of Water Resources (DWR), IRWM Division, University of California, Davis, made the following recommendations:

- The governance structure (including all decision-making committees) of each Regional Water Management Group (RWMG) should provide the appropriate number of seats for Tribal government representatives on each body.
- The RWMG should create an open period of 2 months in which interested Tribes in their region may submit a Letter of Interest on behalf of their Tribal Council for a governing body or Committee seat. A call for submissions would be sent out to all Tribes in the area, disseminated via Tribal networks, and posted on the DWR website and on each IRWM Plan website.
- Interested Tribes should determine among themselves which Tribal representatives will fill those seats, in the event that there are more applicants than designated seats. Independent supporting agencies, regional organizations, and Tribes can help facilitate the call for Letters of Interest and collection of responses.

It is therefore recommended that the OWOW Steering Committee be restructured to ensure an appropriate number of seats exist to ensure Tribal representation in the OWOW Program.

Develop guidelines for cultural sensitivity within the IRWM.

Cultural connections of water and water dependent resources can involve a wide range of activities, which may include cultural subsistence, language, beliefs, practices, and traditions. Cultural considerations by their nature are inherently linked to most resource management strategies, and likely frame, develop, and promote key management decisions which are vital to ensuring legal compliance and sustainable practices. Management choices for some cultural elements are guided by statutory requirements while cultural resources representing historic artifacts, sites, and structures may be protected under the National Historic Preservation Act (NHPA). Today, there is a new urgency in planning and protecting cultural resources. Many view the preservation of these resources as the link between historical and cultural beliefs.

Recommended guidelines are listed as follows:

- Raising awareness both within the preservation community and among our partners about the existence of traditional cultural landscapes and their importance to Indian Tribes and Native American organizations. The purpose of this outreach is to ensure that Native American traditional cultural landscapes are considered early in land management and project planning decisions.
- Public agencies should develop long-term, meaningful relationships with Indian Tribes to ensure effective and early consultation that leads to better planning and, where appropriate, identifying areas of cultural sensitivity.

- In recognition of their governmental status, establish a meaningful consultation process between California Native American Tribal governments and lead agencies, respecting the interests and roles of all California Native American Tribes and project proponents, and the level of required confidentiality concerning Tribal cultural resources, at the earliest possible point in the CEQA environmental review process, so that Tribal cultural resources can be identified, avoided or preserved in place, or when necessary, mitigated via culturally appropriate mitigation and mitigation monitoring programs. California Public Resources Code Chapter 1.75, Sections 5097.9–5097.991, and Section 7050 of the California Health and Safety Code may be used as a reference related to Native American Human Remains. Participating agencies should review the legal requirements associated with any potential conflict related to Native American traditional cultural, artifacts, sites, and structures that may be protected under the NHPA, the Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act.

Ensure that Tribal communities can compete for and receive state funding.

It is recommended that the RWMG ensure that eligible Tribal projects within the watershed are included in funding deliberations. Developing a Tribal consultation policy could further define this process. At the very minimum, engagement efforts must be undertaken to ensure that Tribes participate by identifying projects to include in the current OWOW Plan. It is further recommended that Tribes seek and receive support letters and appropriate partnership when applying for non-IRWM grants for Tribal projects that will implement OWOW Program goals and objectives.

Support indigenous rights to water.

The Winters Doctrine, *Winters v. United States* 207 U.S. 564 (1908), holds that when Congress reserves land for an Indian reservation, Congress also reserves water to fulfill the purpose of the reservation. When this doctrine is applied to the water laws of the western states, Tribal rights to water are almost always senior to other claimants.

California Native Americans maintain that they never relinquished their water rights; however, many Tribes may have yet to quantify their water rights. It is recommended that RWMGs acknowledge the gaps in regional data and provide support for indigenous rights to water. Water portfolios and balances describe the distribution of water throughout the hydrologic cycle, water use by the urban and agricultural sectors, water in the environment, and water supply sources used to meet these uses. Documents that include or refer to quantities of water should acknowledge that Tribal water right quantities may not be included in the reference or calculations because of a lack of quantification.

Fund a Tribal working group.

It is recommended that SAWPA facilitate and fund a Tribal Working Group to ensure that Tribal consultation is occurring on all plans, strategies, and protocols being adopted within a watershed. One specific contribution such a Working Group can make to land management plans is by

assisting SAWPA with the creation of plant palettes that recognize the importance of culturally significant plants and seek to include them and protect them within the watershed. Ideally, the Working Group would be a dynamic collaboration between numerous Tribal communities and SAWPA, as well as other stakeholders, to ensure cohesive understanding and shared responsibility. It is also important to understand that from a Tribal standpoint riparian habitat restoration projects are not always innocuous. Projects should give consideration to minimizing overall ground disturbances based on cultural resources that may exist on the surface and subsurface could be damaged or destroyed. Furthermore, such disruption can impede or alter a Tribal member's ability to gather plants that have cultural significance. Using probability analysis for both archaeological and habitat-based resources would preserve sensitive areas and keep both archaeological and plant species information confidential. Limiting access to this information by irresponsible data gatherers is important.

5.3.4. BASIS FOR RECOMMENDATIONS

Tribal Sovereignty and Jurisdiction

Tribal sovereignty refers to the right of Tribes or federally recognized American Indian nations to exercise limited jurisdiction within and sometimes beyond reservation boundaries. Self-determination is the principle in international law that nations have the right to freely choose their sovereignty and international political status with no external compulsion or external interference. Federal Indian law and policy have changed over the course of history. Prior to the treaty era, Tribes were totally sovereign nations possessing all rights and powers that derive from being independent nations. Between 1778 and 1828, treaties were negotiated with Tribes for land by the newly created United States of America. The United States has a unique legal and political relationship with Tribes as provided in the United States Constitution; treaties; federal statutes, executive orders, and memoranda; Supreme Court decisions; and other case law (Bryan, 2009).

The Indian Reorganization Act of 1934, landmark legislation in affirming the government to government relationship between Tribal nation and the federal government, is part of the foundation for Tribal self-governance as it exists today. Also known as the "Howard Wheeler Act," the act expressly gave new rights to Native Americans, reversed some of the earlier privatization of common holdings, and encouraged Tribal sovereignty. In addition, the Indian Self-Determination and Education Assistance Act (Public Law 93-638) and the Indian Health Care Improvement Act were passed in 1975 and 1976, respectively. Self-determination policies have enabled Tribes to administer service programs and make decisions regarding Tribal membership, as well as to regulate research on their lands.

The American Indian Religious Freedom Act, a U.S. federal law and a joint resolution of Congress, was passed in 1978. It was created to protect and preserve the traditional religious rights and cultural practices of American Indians, Eskimos, Aleuts, and Native Hawaiians. These rights include, but are not limited to, access to sacred sites; repatriation of sacred objects held in museums; freedom to worship through ceremonial and traditional rites, including within prisons; and use and

possession of objects considered sacred. The act required policies of all governmental agencies to eliminate interference with the free exercise of Native religion, based on the First Amendment, and to accommodate access to and use of religious sites to the extent that the use is practicable and is not inconsistent with an agency's essential functions.

There is a legal distinction between Indian Tribes that are federally recognized and those that are not. Federal recognition signifies that the U.S. government acknowledges the political sovereignty and Indian identity of a Tribe, and from that recognition flows the obligation to conduct dealings with that Tribe's leadership on a government-to-government basis. When federally recognized Tribes speak of *government-to-government consultation*, they are often referring to consultation between a designated Tribal representative and a designated representative of the federal government or state agency. The 2010 U.S. Census indicated there was a Tribal population in California of 362,801.

IRWM planning could cross jurisdictional boundaries of currently designated Tribal lands. Recognizing and respecting the sovereignty of all California Native American Tribes is critical for effective collaboration to take place. When Tribes are engaged in projects on their aboriginal indigenous lands yet off their currently recognized lands, there are questions of Tribes' traditional jurisdictions overlapping with the politically recognized jurisdictions of federal and state agencies, private landowners, and other parties. OWOW governance may consider an MOU or memorandum of agreement (MOA) with Native American Tribes to include the Tribes within the RWMG to facilitate planning efforts. In some cases, there have been requirements placed on participating Tribes to include a "Limited Waiver of Sovereign Immunity" clause within an MOU/MOA. While this has not always been acceptable to Tribes, RWMGs should work with Tribes to develop alternative agreements that may not imply the need for a Limited Waiver of Sovereign Immunity.

Comprehensive water quality planning is mandated by the federal Clean Water Act (for navigable waters), California Water Code (for groundwater and surface waters), and the state's Porter-Cologne Water Quality Control Act. The Clean Water Act requires states to adopt water quality standards and authorizes the preparation of wastewater management plans. The State Boards and Regional Water Quality Control Boards (Regional Boards) have primary responsibility for water quality, including setting water quality objectives and standards, and designating beneficial uses for water. The Porter-Cologne Water Quality Control Act devises and adopts water quality control plans (Basin Plans) and authorizes the State Board to adopt, review, and revise state water policy.

Even when a beneficial use category or definition is established, specific waters are not designated with that beneficial use unless a water quality standards action occurs to make the designation, which is typically done through the adoption of a Basin Plan amendment. Generally, the Regional Boards designate specific water bodies within their respective region where the use applies. A Regional Board's water body designation would occur through its basin planning process in

accordance with California Water Code Sections 13244 (hearing and notice requirements) and 13245 (approval by the State Board).

The State Board recently developed two new beneficial uses: Subsistence Fishing and Cultural. This creates an opportunity to apply these new Tribal beneficial uses to be applied statewide and therefore to be included in each Regional Board's toolbox of water quality protections. Tribes and stakeholders can choose to press for the inclusion of these in local Basin Plans, total maximum daily levels, and in other State Board regulatory efforts. SAWPA should advocate for the adoption of the Subsistence Fishing and Cultural beneficial uses by the Santa Ana Regional Board (Region 8).

Government-to-Government Consultation

In consultation with Native American Tribes, there are many different statutes, regulations, executive orders, including state and federal policies directing agencies to consult with Tribes. Executive Order B-10-11 (Brown, 2011) identifies a *California Indian Tribe* and *Tribal* to include all federally recognized and other California Native Americans.

In 2009, President Obama signed a Memorandum on Tribal Consultation affirming his administration's commitment to "regular and meaningful consultation and collaboration with Tribal officials," and directing each agency to formulate specific plans to implement Executive Order 13175 (Clinton, 2000). Executive Order 13175 requires agencies to engage in meaningful and timely consultation with Tribes before promulgating any policies or projects that affect Tribes. Federal recognition is a legal distinction that applies to a Tribe's rights to a "government -to- government" relationship with the federal government and eligibility for federal programs.

Also, Executive Order B-10-11 established the position of a Governor's Tribal Advisor and requires all California state agencies to *encourage communication and consultation with California Indian Tribes*. The California Natural Resource Agency (CNRA) was the first California state agency to develop a Tribal Consultation Policy following the enactment of Executive Order B-10-11. All California Native American Tribes whether officially recognized by the federal government or not, represent distinct and independent governmental entities with specific cultural beliefs and traditions including connections to areas of California that are their ancestral homelands. Protection of traditional Tribal cultural places is important to all Tribes, whether federally recognized or not, and it provides all California Native American Tribes with the opportunity to participate in consultation with city and county governments for this purpose.

While CEQA and the National Environmental Policy Act have specific engagement, assessment and time period requirements, a more proactive collaborative approach with Tribes is recommended. Tribes are best viewed as co-equal government entities for early scoping of a project. Tribes have different capacities to comment and track projects for statutory compliance. Reports should not be finalized until Tribal consultations have concluded. Tribes have an intimate knowledge of culturally relevant sites, horticulture, and historical perspective of the watershed.

The Seventh Generation Principle is generally referred to in regards to decisions being made about our energy, water, and natural resources, and ensuring those decisions are sustainable for seven generations in the future. Tribes seek relationships between Tribal entities and non-Tribal entities that are forged with the Seventh Generation Principle in mind. Adopting a Tribal practice of deliberately considering the cumulative effects of management practices and consider the intergenerational impacts of projects.

A consultation policy, that establishes minimum standards for consultation, should be developed collaboratively with Tribes. A thoughtful policy approach would have a heightened awareness and be responsive to the Tribe's cultural and ancestral spaces. Often the National Environmental Policy Act and CEQA survey and site list are insufficient. Consultation policies should include culturally significant plants. Plant palettes must consider communities of plants that co-exist to thrive, rather than single species at a time.

5.3.5. INTEGRATION WITH OTHER PILLARS

While there are many areas in which this section aligns and overlaps with recommendations by the other Pillars, it should be noted that only one of the other Pillar sections mentions Tribes. Rather than highlighting each recommendation of each section in which there are common linkages to Tribes, this section identifies various themes in which the Pillar chapters align and overlap.

In the past, Tribal governments were dismissed as stakeholders or local governments. Today, statutes, legislation, and policies at all levels of government often contain the phrase "federal, state, and Tribal governments." Many federal environmental statutes, such as the Clean Water Act and Clean Air Act, have elevated federally recognized Tribes to the same regulatory status as state governments. In addition, the State of California now has an even broader definition of California Native Americans.

Involving and consulting with Tribes early in the development of agency processes, policies, and projects would foster coordination, collaboration, and communication between agencies, Tribes, and stakeholders responsible for water-related and climate/energy issues, allowing us to achieve greater efficiencies, enhance public services, and build public support for vital projects. Local government agencies should involve and consult with Tribes even when there is no federal or state requirement to do so, but federal and state agencies are requested to participate.

Water supply reliability and water quality within the watershed, which includes the California Native American Tribe reservations, have faced similar challenges related to multiyear droughts, climate change impacts, and vulnerability of stressed resources, including an aging infrastructure that threatens the quality of life within the reservations. Water supply management based on an average 50% precipitation across the watershed has impacted surface water supplies and stressed groundwater aquifers. California Tribes since time immemorial have exercised their inherent water rights within the watershed to implement and sustain their traditional practices and culture. California Tribes could benefit from the overall concepts within the OWOW Plan Update 2018 as

water management strategies are developed, ensuring that climate change is addressed; enhancing and restoring habitat, plants, and riparian areas; using grant funding; and optimizing collaborative working relationships with public agencies.

Some Tribal lands within the watershed are disadvantaged communities or are located in economically depressed areas. For other Tribal lands, there may not be available data to make a determination without proper consultation. There may be Native American Indian populations living within disadvantaged communities. A disadvantaged community can use funding that assists only those communities.

The benefits of integrating native plants and eliminating invasive species in a project are numerous. Careful consideration should be given to selecting species, locations, and management techniques in design plans. Consultation with California Native American Indian Tribes can greatly improve the success of a project. See Figure 5.3-1 for locations of Tribal lands in the watershed.

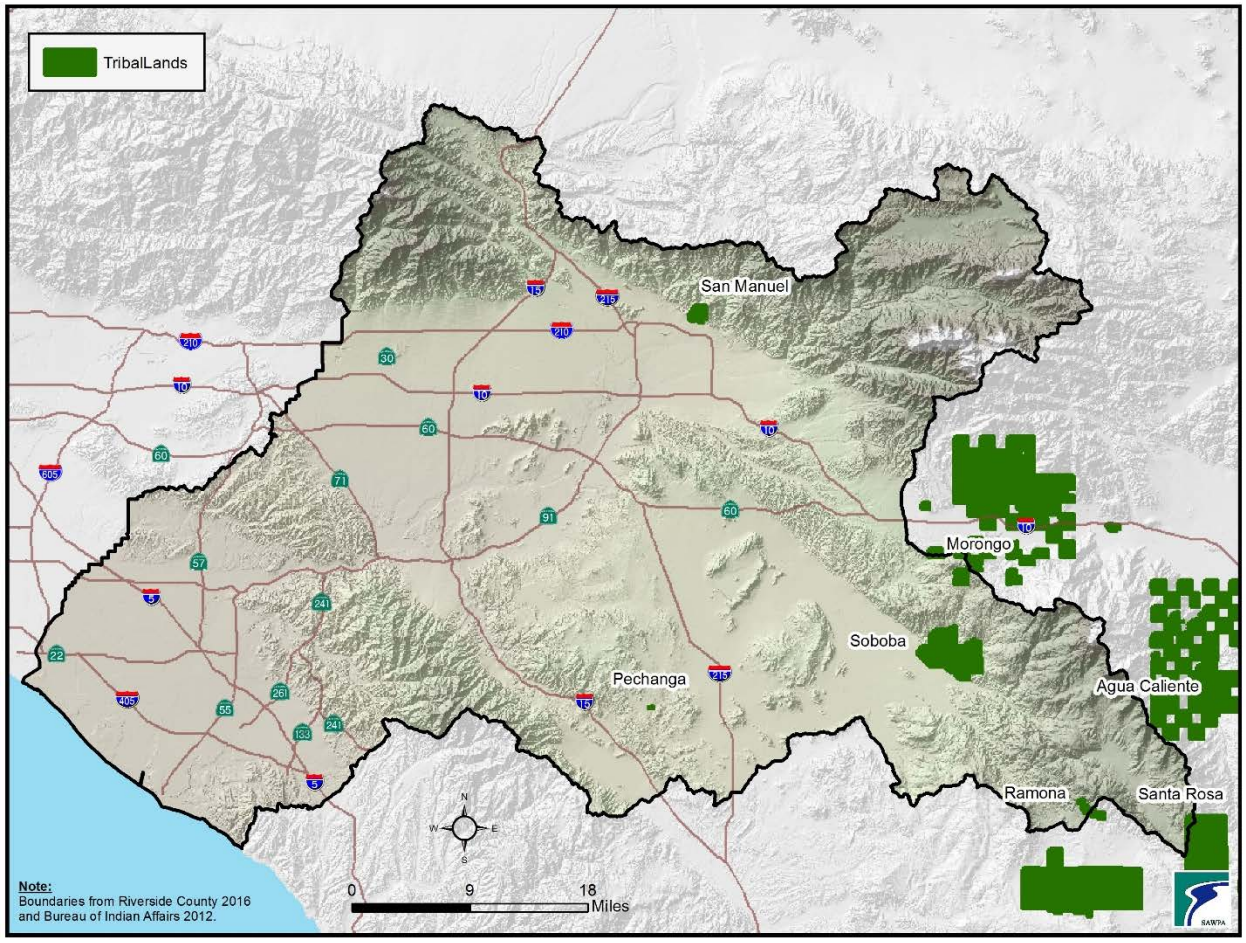

Figure 5.3-1. Tribal Lands in the Santa Ana River Watershed

5.3.6. CALIFORNIA NATURAL RESOURCE AGENCY CONSULTATION POLICY

Implementation of the Tribal Consultation Policy

Outreach. CNRA and its Departments must identify the Native American Tribes to consult at the earliest possible time in the planning process and allow a reasonable opportunity for Tribes to respond and participate. Each Department is responsible for meaningful consultation with Native American Tribes that promote regular and early consultation through communication and collaboration. Each Department will identify participants in the process including the decision makers and staff with an appropriate level of responsibility that can ensure that Tribal concerns will be brought forward. Each Department shall disseminate public documents, notices, and information to California Indian Tribes, Tribal communities, and Tribal consortia, minimally by contacting Tribal government officials. The documents, regarding the topic for consultation shall be made readily accessible to Tribes and be provided at the earliest opportunity. Notification should include sufficient detail of the topic to be discussed to allow Tribal leaders an opportunity to fully engage in a substantive dialogue. In the event the Department makes an attempt to initiate contact and does not receive a response, the Department should make reasonable and periodic efforts throughout the process to repeat the invitation. Each Department should conduct meetings, outreach, and workshops at times and locations that facilitate Tribal participation as much as possible. The Departments will be open to communication opportunities initiated by Tribes and seek opportunities for collaboration by communicating regularly with Tribes. Each Department should establish a mechanism to request relevant and available information, studies, and data from Tribes when conducting research or studies that relate to, or could impact, Tribal lands or cultural resources. The Department should seek to protect any confidential information provided to the fullest extent allowed by the law, recognizing that the Departments are subject to the California Public Records Act.

Tribal Liaisons. Each Department should designate a Tribal liaison, or liaisons, to serve as the central point of contact for Indian Tribes. The role of the Tribal liaison will be to ensure that Department outreach and communication efforts are undertaken in a manner consistent with this policy. Tribal liaisons should be encouraged and empowered to develop ongoing and regular communication with Tribal representatives. Where possible and where consistent with Administration policy and guidance, Tribal liaisons should use these ongoing relationships to inform Tribes of issues of interest that may not necessitate consultation, such as legislative proposals that may affect Tribal communities. Tribal liaisons should make an effort to provide feedback to the Tribes on how information obtained from a consultation informed the Department's decision-making process.

Tribal Liaison Committee. CNRA hereby designates the CNRA Tribal Liaison Committee, consisting of Department Tribal liaisons that will meet on a regular basis in the Office of the Secretary to review Tribal consultation efforts and opportunities in the Departments and share information.

Access to Contact Information. CNRA shall work with the Native American Heritage Commission (NAHC) to maintain a contact list of Tribal representatives from federally recognized and non-federally recognized California Indian Tribes.

Training. CNRA will provide training to Tribal liaisons and executive staff, managers, supervisors, and employees on implementation of this policy.

Consultation engagement with the Tribal communities within the watershed is highly recommended to ensure that effective communication and outreach is provided early in the process. Developing consultation and partnerships with the four Tribal communities within the watershed area is the most effective approach to ensure Tribal stakeholders are engaged. SAWPA should develop a *Tribal consultation policy* as identified by CNRA or similar. Federally recognized and non-federally recognized Tribes shall all be considered during the consultation process.

Ancestral Lands, Cultural Resources, Beneficial Uses, and Sacred Sites

In the arid southwest, Native Americans gravitated to water places. Cultural resources may not express on the landscape surface. This included specific water bodies and watersheds. Places that are deemed special or secured by an entire culture are often protected in a proper functioning condition. In addition, water places can be very dynamic in terms of natural earth processed, which alters the landscape and evidence of its inhabitants.

The Advisory Council on Historic Preservation (ACHP) is an independent federal agency that promotes the preservation, enhancement, and productive use of our nation's historic resources, and advises the President and Congress on national historic preservation policy.

The goal of the NHPA, which established the ACHP in 1966, is to have federal agencies act as responsible stewards of our nation's resources when their actions affect historic properties. The ACHP is the only entity with the legal responsibility to encourage federal agencies to factor historic preservation into federal project requirements.

As directed by NHPA, ACHP serves as the primary federal policy advisor to the President and Congress; recommends administrative and legislative improvements for protecting our nation's heritage; advocates full consideration of historic values in federal decision making; and reviews federal programs and policies to promote effectiveness, coordination, and consistency with national preservation policies.

According to ACHP, there are growing concerns about the impacts to Tribal ancestral properties of religious and cultural significance due to infrastructure development has occurred over the last several decades. As such, it is extremely important to identify and consider Native American traditional cultural landscapes within the watershed and clarify how these landscapes are to be managed within the OWOW Program and how they can be brought to the attention of policy level decision makers.

In September 2014, Assembly Bill (AB) 52 was signed into law by the Governor of the State of California. The bill specifies that a project which may cause a substantial effect or adverse change of Tribal Cultural Resources would require the "lead agency" to begin consultation with the affected or potentially affected California Native American Tribe, which maybe traditionally and culturally affiliated with the geographical area of the proposed project. Tribal Cultural Resources may include sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American Tribe. California Tribes were also provided a list by the NAHC that identifies public agencies likely to be a future lead agency within their traditional and cultural geographical boundaries.

A Traditional Cultural Property is a property that is eligible for inclusion in the National Register of Historic Places (NRHP) based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. Traditional Cultural Properties are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. Traditional Cultural Properties are best identified by consulting directly with members of a traditional community. Members often have a special perspective on properties that play important roles in their historically rooted beliefs, customs, and practices. While certain properties may be documented in the historic literature or through previous ethnographic or archaeological studies, information on other properties may have only been passed down through generations by oral history or practice. For Indian Tribes and Native Hawaiians, knowledge of Traditional Cultural Property locations may reside with Tribal Elders or traditional practitioners who may retain specific confidential information regarding the location of properties and the special qualities associated with them. Sensitivity to these issues may be necessary during any identification and documentation process.

In addition to federal and state regulatory compliance efforts and the project-based Tribal consultation that often results, SAWPA could undertake proactive cultural resources (which includes plants and plant gathering locations) sensitivity analysis to help allocate appropriate agency and Tribal resources when land disturbance projects are considered. With the advance of GIS-based mapping methods, it is now possible to employ more sophisticated and automated techniques to characterize the available data and to develop analytical methods to assist in the identification, investigation, and evaluation of the archaeological record and biological resources and habitats. By using criteria for mapping cultural heritage sensitivity, such as slope, distance from waterways, coastlines, and known archaeological places, as well as the presence of sand ridges, swamp margins, and ancestral streams, we can better facilitate avoidance of important Tribal resources, as opposed to monitoring their destruction, to produce a more effective result.

Indigenous Rights to Water

Indigenous people often understand themselves as having an intimate relationship to the environment and they consider every element and species to have life and to be sacred. To many indigenous people, water is life and water is sacred. Water is part of religion and cultural practices for purification, prayers, and ceremonies. Water is also part of indigenous identity and origin

stories, and indigenous people believe that the use of water is integrated with respect for the water as a living entity that gives life and supports the health, integrity, and character of an individual.

Exclusion of indigenous people in policy making and water management practices has led to an array of interpretation. While many seem to be perplexed about *Indigenous Water Rights,* it is very apparent that indigenous communities have often made ceremonial or spiritual uses of water that precede all other known uses, thereby combining religious rights with claims of prior appropriation rights and questions of reasonable and beneficial use. Indeed, water is perhaps the most vulnerable resource within indigenous communities, and thus a delicate matter of religious beliefs shared or valued by the majority. Indigenous people are a strong starting point for considering and understanding the *human right to water* and the possible implications that derive from such a right.

As climate change, drought, mismanagement and over-allocation of water has significantly decreased the availability and quality of water resources, these issues could impact Indigenous people's ability to fulfil their cultural and customary responsibilities (see "Support indigenous rights to water" in Section 5.3.3).

Best Management Practices for Tribal Engagement and Participation

Communicating appropriately and effectively with all California Native American Tribes about water-related issues that may affect them in their territories and ancestral homelands is paramount. An important element of integrated water planning also includes the traditional knowledge and uses of water which promotes the improved understanding of the Tribal perspectives and lessons to be learned from Tribal cultures and communities. Engagement is a crucial part of any collaborative process which promotes the establishment of strong communication and mutually respectful relationships.

Within the IRWM Program, some RWMGs have raised questions regarding which Tribes they need to include and how to identify Tribes within their regions. RWMG and IRWM Plans do not always differentiate between federally recognized Tribes, non-federally recognized Tribes, and Tribal organizations. Federally recognized Tribes are political entities, specifically defined by the federal Bureau of Indian Affairs, with which government-to-government consultation is required. Although not federally mandated, it is in the best interest of RWMGs to consult with non-recognized Tribes and Tribal organizations for consistency with state Executive Order B-10-11. In fact, Tribes are defined in the IRWM Guidelines to include "all Indigenous Communities of California." However, consultation or collaboration with any one Tribe by no means precludes legitimate consultation with all federally recognized Tribes in a region (Dolan 2013).

Participants in California water planning and policy making frequently operate from different perspectives, and the information gathered resides in silos. IRWM planning should provide common and transparent understanding of water problems and potential solutions by which to achieve a common goal with California's Tribes. In today's environment, Tribal and non-Tribal

entities, groups, and communities are exploring the benefits of collaborative relationships. Furthermore, for these collaborations to be successful and transformative, it is imperative that non-Tribal entities are knowledgeable of the unique status of Tribal governments and the unique, diverse concerns of the Tribal community in which they are working.

Include Tribal Representation within IRWM Organization and Structure

Tribes within the watershed have expressed a desire to have increased engagement and inclusion in watershed planning groups. As sovereign governments within the watershed, Tribes should be encouraged and provided with meaningful opportunities to participate in the IRWM decision-making process and collaborative work with the stakeholders within the watershed. Involving and consulting with Tribes would foster coordination, collaboration, and communication between agencies, Tribes, and stakeholders responsible for water-related and climate/energy issues, to achieve greater efficiencies, enhance public services, and build public support for vital projects.

For example, the North Coast Resource Partnership consists of a collaborative partnership between the North Coast Resource Partnership Policy Review Panel, the Technical Peer Review Committee, project staff, consultants, and the stakeholders within the North Coast Region. With the exception of Modoc County, which has only one representative, the Policy Review Panel consists of two representatives appointed by each County's Board of Supervisors and three Tribal Representatives appointed by North Coast Tribes as outlined in the Tribal Representation Process described in the North Coast IRWM Plan Memorandum of Mutual Understandings. The Technical Peer Review Committee is composed of technical experts also appointed by each County's Board of Supervisors and Tribal representatives. The Technical Peer Review Committee reviews and evaluates the development of the North Coast IRWM Plan and proposed projects based on technical criteria and the Policy Review Panel is the governing and decision-making body providing policy level direction and oversight for the North Coast Resource Partnership planning process.

State Funding for Tribal Communities

The State Board, California Department of Public Health, and DWR have traditionally provided multimillion-dollar bond-funded programs, which have provided grant and low-interest rate loan money to many local public agencies for IRWM planning, water conservation, distribution system rehabilitation, groundwater storage, water recycling, water quality improvement, conjunctive use projects, and drinking water treatment. These programs are intended to encourage local public agencies to adopt water management plans and practices that have multiple statewide or local benefits. Over $18 billion in grants and low-interest loans have been authorized via state-issued bond programs since 1996, most of which Tribal communities could not access independently; rather, Tribes were required to partner with public agencies.

Funding availability for California Indian Tribes (state and federally recognized) are available through several State of California agencies (California Environmental Protection Agency, California Air Resources Board, California Department of Resources Recycling and Recovery,

Department of Pesticides, and State Board). More recently, the passage of Proposition 1 (AB 1471; Water Quality, Supply, and Infrastructure Improvement Act of 2014) provides funding for small community wastewater projects, wastewater recycling, drinking water, stormwater, storage projects, and groundwater sustainability. As indicated in the legislation (Section 79712(a)), "Eligible applicants under this division are public agencies, nonprofit organizations, public utilities, federally recognized Indian Tribes, state Indian Tribes listed on the NAHC's California Tribal Trust Consultation list, and mutual water companies."

Tribal communities may benefit from the following funding sources:

- *Clean Water State Revolving Fund*, which can provide financing for eligible projects in perpetuity using state and federal funds, and to promote and protect the health, safety, and welfare of the inhabitants of the state. Projects under this funding source include education and outreach, nonpoint-source pollution, water quality control projects, and land acquisition for implementation of project(s).
- *Drinking Water State Revolving Fund* is a state and federal partnership to help ensure safe drinking water. Created by the 1996 amendments to the Safe Drinking Water Act, the program provides financial support (loans) to water systems and to "state safe water programs." Projects under this funding source include installation or upgrading of facilities to improve drinking water quality to comply with the Safe Drinking Water Act regulations, rehabilitation of water conveyance infrastructure and wells, mitigation of contaminated sources, upgrading or installation of finished water storage tanks, water system consolidation, and the creation of new systems.
- *Clean Water Act, Nonpoint Source 319 Grant Program* provides funds for projects or programs that will help reduce nonpoint-source pollution within the state, territories, and Tribal lands. Potential nonpoint-source pollution projects include runoff from industrial waste, sewage treatment plants, and illegal discharge into waterways, lakes, ponds, groundwater, and wetlands. Also, a wide range of programs can be developed and supported, including nonpoint-source training for Tribal staff, developing watershed-based plans, riparian planting, livestock exclusion fencing, lake protection, restoration activities, nonpoint-source ordinance development, and outreach and education.
- *Site Cleanup Subaccount Program* is a funding program established by Senate Bill (SB) 444 (Hill, 2014) that authorizes the State Board to issue grants for projects that remediate the harm or threat of harm to human health, safety, or the environment caused by existing surface or groundwater contamination. The State Board is currently developing the project, funding for which will be approximately $19 million annually.

Native American Heritage List (State Office of Historic Preservation/Tribal Historic Preservation Office)

The NAHC is charged with the duty of preserving and ensuring accessibility of sacred sites and burials, the disposition of Native American human remains and burial items, maintain an inventory

of Native American sacred sites located on public lands, and review current administrative and statutory protections related to these sacred sites.

The California State Office of Historic Preservation is responsible for administering federally and state-mandated historic preservation programs to further the identification, evaluation, registration, and protection of California's irreplaceable archaeological and historical resources.

Federally recognized Tribes with a reservation and/or Tribal trust lands can assume certain State Office of Historic Preservation duties. This program was made possible by the provisions of Section 101(d)(2) of the NHPA. A Tribe may assume the functions of a State Office of Historic Preservation by submitting a formal plan to the National Park Service describing how the proposed Tribal Historic Preservation Officer functions will be carried out. These responsibilities can include:

- Directing and conducting a comprehensive reservation-wide survey of historic properties and maintaining inventories of those properties
- Identifying and nominating eligible properties to the National Register and administering applications for listing historic properties on the National Register
- Preparing and implementing a comprehensive Tribal historic preservation plan
- Administering the Tribal program of federal assistance for historic preservation at the reservation (when funds are appropriated by the U.S. Congress)
- Advising and assisting, when appropriate, federal and state agencies and local governments in carrying out their historic preservation responsibilities
- Cooperating with the Secretary of the Interior, the ACHP, and other federal and state agencies, local governments, and organizations and individuals to ensure that historic properties are taken into consideration at all levels of planning and development
- Providing public information, education and training, and technical assistance in historic preservation
- Cooperating with local governments in developing local historic preservation programs and assisting local governments in certification (when feasible)
- Consulting with the appropriate federal agencies in accordance with the act on federal undertakings that may affect historic properties and the content and sufficiency of any plans developed to protect, manage, or to reduce or mitigate harm to such properties
- Advising and assisting in evaluating proposals for rehabilitation projects that may qualify for federal assistance

To find Tribes with a Tribal Historic Preservation Officer, go to the National Park Service website at https://grantsdev.cr.nps.gov/THPO_Review/index.cfm.

For Tribal cultural resources and CEQA (AB 52 (Gatto, 2014)), the Governor's Office of Planning and Research offers specific guidance (see the Office of Planning and Research website at https://www.opr.ca.gov/s_ab52.php). In addition, the NAHC has guidance on Tribal consultation specifically related to AB 52 compliance for CEQA leads (NAHC 2015; http://nahc.ca.gov/wp-content/uploads/2015/04/AB52TribalConsultationRequirementsAndBestPractices_Revised_3_9_16.pdf).

The NAHC provides guidance on complying with state law, including treatment of human remains found during construction (NAHC 2018; http://nahc.ca.gov/resources/a-professional-guide-for-the-preservation-and-protection-of-native-american-human-remains-and-associated-grave-goods/).

Tribal Ecological Knowledge

Tribal Ecological Knowledge (TEK) is based on accumulation of observation. It is knowledge that is transmitted through generations, practice in how Tribes carry out resource use practices, and beliefs about how people fit into ecosystems based on four factors: Philosophy, Practice, Spirituality, and Knowledge. The ability to communicate ecologically is not just a native or Indigenous relationship but extends to all people let alone at least to those who open themselves up to the spirituality.

For Tribes, cultural prosperity is dependent on caring for the natural world. Recreating past conditions requires an understanding of how people lived in their environments. For example, selective harvesting or culling was informed by traditional knowledge. Similarly, cultural burns involved fire mosaics that were timed and managed to generate specific types and qualities of resources. Other practices, such as rock drop structures enhanced groundwater recharge, stabilized stream flows, and created riparian habitat. The managed environment provided foods, medicines, and building materials for the Tribe. Removing people from the landscape is neither healthy nor sustainable. Tribes have centuries, even thousands of years of experience in observing, evaluating, and researching ecosystem conditions and management approaches.

The underlying relationship to the land requires taking care of Tribal homelands and their resources. TEK has been passed down over thousands of years through Tribal oral traditions. Fortunately, historical and ethnographic efforts are continuing to document this knowledge. Successful restoration efforts will need to incorporate the lessons from those who have knowledge but lack academic titles. Balancing the earth, renewing the earth, and individual renewal is essential.

The keepers and carriers of Tribal knowledge must seek each other out to continue to keep that knowledge alive. TEK is incorporated into stewardship of land and water resources. Co-management represents the future for incorporating TEK and Tribal rights into planning processes. As the first residents of California, Tribal communities have valued water for thousands of years. Water is critical to native people. It is central to Tribal lifeways and connected to language, culture,

ceremonies, traditional practices, and all aspects of daily life. If water systems flourish, native people and their legacy of rich cultural diversity will also flourish.

Watershed Management and Land Use

Land use planning, management and resource strategies play a critical role including watershed management, water use efficiency, groundwater quality, flood management, parks and recreation, climate change adaptive management, and agricultural lands stewardship. Important considerations of water issues and land use planning include not only the effects of the physical environment, but also the economic and social impacts of land use planning and development.

We all live in a watershed, the area that drains to a common waterway such as a stream, lake, estuary, wetland, aquifer, or the ocean—our individual actions can directly affect it, and working together will help protect our water resources. A regionally based watershed approach is the most effective framework to address today's water resource challenges. Watersheds supply drinking water, provide recreation opportunities, and sustain life. The link between land and its impact on water quality is critical and can enhance watersheds based on adaptive planning; creating more compact and sustainable communities, both urban and rural; and reducing the reliance on the state's water supply.

Tribal ancestral land base is traditionally a fraction of their historic territories. Tribes are major stakeholders in many watersheds throughout the region and the country. While each Tribe is distinct, one commonality is a historical and intrinsic connection to land that permeates the modern way of life. Increasingly, state and Tribal water resource professionals have continued to move forward to co-manage watersheds as a means for achieving greater results from their local land use and water quality protection programs. Managing water resource programs on a watershed basis is environmentally, financially, and socially beneficial and both have a shared responsibility to use public resources effectively and efficiently. Stronger collaboration between land use planners, water managers, and Tribal governments will promote more efficient and effective land use patterns and enhance IRWM practices.

California's projected growth and urban development increases the pressure on natural resource conservation and amplifies the need for a comprehensive land use decision-making process integrated with water management. Integrated water management strategies describe the co-benefits of a working relationship between land use planning and water management by demonstrating how sustainable land use decisions, in both urban and rural areas can improve water supply affordability and quality, lead to more efficient energy and public resource use, and produce land use benefits from improved water management.

Collaboration on development policies should encourage or mandate sustainable building practices and use of native plants, rain gardens, preserving stream buffers and riparian areas, and offsets for loss of habitat.

Co-Management of Riparian Areas, Habitat, and Buffers

Riparian buffers offer many benefits for wildlife, but they also improve water quality for humans. In general, the wider and more diversely planted the buffer, the more likely it is to yield positive benefits. Generally speaking, runoff from agricultural fields, lawns, and roads is deposited in the buffer rather than being allowed to enter the waterway. Trees and shrubs along a stream bank help to keep moving water from eroding the bank, further reducing sedimentation rates. Through the interaction of their soils, hydrology, and biotic communities, riparian buffers maintain many important physical, biological, and ecological functions.

IRWM Plans implemented by public agencies, counties, municipalities, and Tribes advance sustainable watershed-based management of California's natural resources through implemented projects that facilitate streamflow improvement, enhance fish and wildlife populations, and secure public health in economically disadvantaged communities. These projects will ensure water supply reliability, implement stream and wetland restoration, and maintain and improve agricultural operations throughout the state. Resolution of impaired water quality can be hindered by lack of adequate funding. Funds are needed to develop a regional water quality monitoring plan; to conduct comprehensive subregional watershed and groundwater assessments; to implement upgrades that reduce publicly owned treatment works permit violations; and to build new facilities where the need exists.

MOA between San Manuel Band of Serrano Mission Indians and San Bernardino Valley Water Conservation District

In 2016 the San Manuel Band of Serrano Mission Indians entered into a Memorandum of Agreement (MOA) with the San Bernardino Valley Water Conservation District (SBVWCD) to empower the Tribe to conduct plant gathering for cultural and non-commercial purposes. As part of the MOA, San Manuel provided a list of culturally important plants and general uses. SBVWCD authorized the collection and use of these plants without the need of a permit and trusts the ecological knowledge of the Tribal members to ensure a sustainable collection. The MOA further set a platform for SBVWCD and the San Manuel Tribe to collaborate on preservation and restoration efforts in the Wash Conservation Area. The MOA should serve as a template for successful and respectful partnerships between agencies and Tribes.

Tribal partnerships and co-management of culturally sensitive areas and plants is desired. One way this can be accomplished is through a conservation easement within state or county lands. A conservation easement is a legal agreement tailored to protect the natural resources on a specific piece of land. This is done by conveying some of the land owner's rights or by permanently restricting specific uses or development of the land. Conservation easements are commonly used by agencies and organizations as a tool for protecting and managing natural open spaces. This approach is particularly useful in areas that have been sacred to California Native Americans for thousands of years and is central to their creation story. The easement is an opportunity to grant permanent rights to the Tribe, allowing them to work in formal partnership with agencies to further a shared

goal of natural restoration, preservation, and public education. Below is a strong example within the watershed of co-management.

Example: Lease between the Los Angeles Unified School District and the Gabrielino/Tongva Springs Foundation.

The Kuruvungna Springs (the Springs once served as the center of an historic Gabrielino Village) is presently considered sacred by the Gabrielinos. The Kuruvungna Springs, designated as California State Historical Site No. 522, provides a rich cultural and educational resource for Gabrielino Indians, University High School students, the Los Angeles community and the general public.

The parties developed a lease to ensure that the springs are maintained in its historic state, that the springs and plant growth are protected from vandalism, and that the springs will be adequately protected from threats posed by private development.

Provisions of the lease include:

- The property shall be used for the primary purpose of maintaining the springs and conducting tours in the vicinity of the springs.
- Maintenance work shall be performed on the property at least twice per month. Such maintenance work shall include removal of graffiti and of litter from the property.
- The lessee shall maintain liability insurance.

A written description and map of the property leased is also included in the lease.

Native Plants

The benefits of integrating native plants and eliminating invasive species in a project are numerous. Careful consideration to selecting species, locations and management techniques should be given to design plans. Consultation with California Native American Indian Tribes can greatly improve the success of a project. There are many plants that are culturally significant but are not listed as federally threatened or endangered. Therefore, these plants do not have the same protections and can be at risk when new landscapes are designed and implemented or as a constructed landscape matures. Long-term management plans can ensure the survival of native species. Tribes have engaged in co-management agreements with agencies to maintain and gather ethnobotanical landscapes in a sustainable manner.

California Native Americans have historically maintained culturally significant plants without the use of herbicides. Tribal members can be exposed to herbicides when they are applied to plants that are used for medicinal, nutritional, and technical or artistic purposes. If herbicides are applied to areas within or immediately adjacent to gathering sites, they can spread to native plants and remain in the soil. Some techniques for maintaining and gathering plants without the use of

herbicides include digging by hand into the root systems of plants, topping the flowering portions of plants to minimize pollination and distribution, and the judicious use of fire. Recognizing that plants in both natural and contracted landscapes may have a cultural value to the community which will help ensure that Tribal communities are consulted about management plans and that areas are appropriately designated and maintained as areas of cultural horticulture.

As with any natural renewable resource, having diverse locations for collecting plants to ensure there is sustainable supply is important. Tribal communities are very knowledgeable about the types of native plants that are critically absent in a watershed. For example, tule is increasingly difficult to find in certain regions of Southern California. It is also important to understand that Tribal cultural practices are not frozen in time and uses of plants can change. Some non-natives or invasive plants, which have caused natives to be extirpated from the watershed, have become culturally significant over the last 200 years. These may not need to be completely eradicated; leaving a small, but viable, stand could be appropriate. For example, tree-tobacco (*Nicotiana glauca*) and eucalyptus (*Eucalyptus* spp.), although introduced species, are now both used by Native Californians.

Data Partnerships and Confidentiality

Native communities across the state have traditionally been concerned with the release and handling of Tribal data, whether specifically related to Tribal programs (i.e., air, water, land, and community projects) or regarding sensitive and confidential cultural information like the location, nature, and use of certain archaeological and sacred sites or gathering areas. Data management in Indian Country has usually been defined by the application of "limited to internal use only" standards. In order to effectively identify and manage Tribal programs in Indian Country, Tribal governments usually require that sensitive data not be released publicly or shared outside of the organization for many reasons. Such an approach ensures that Tribal data, which is usually considered sensitive and confidential, will not be indiscriminately or accidentally released or misused/misapplied.

Secondary use of data, defined as a use or dissemination of information from a previous study or research of the original project, is a concern to Tribes and will also need to be addressed. Tribes may choose to maintain oversight of such data and to require researchers to seek specific approval prior to secondary uses of data. Federally recognized Tribes are sovereign nations, and so they often make collective claims to their traditional knowledge and intellectual property. Some Tribes may also claim ownership over data collected in research studies conducted with their citizens. Data sharing agreements offer a helpful mechanism for negotiating terms of data ownership and access between Tribes and agencies.

Native communities may or may not understand how data sharing agreements may place limitations on potential state funding and how that may affect their opportunities to either participate with other agencies, or apply for funding themselves. Such limitations and creative ways of overcoming them should also be topics for discussions during meetings about data sharing.

While significant data and research gaps remain today, individual Tribes are already addressing problems and improving data collection within their organizations. This will help ensure accessible information for Tribes to use in future community planning for individual Tribal communities.

5.3.7. CONTRIBUTORS – TRIBAL COMMUNITIES

ROLE	ORGANIZATION
Co-Chairs	
Gil Navarro	San Bernardino Valley Municipal Water District
Megan Brousseau	Inland Empire Waterkeeper
Contributors	
John Covington	Morongo Band of Mission Indians
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Tom Keegan	California Rural Water Association
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The following contributors (in alphabetical order by first name) participated in Tribal Workshops, adding their input by reviewing and influencing this chapter:

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5.4. CLIMATE RISK AND RESPONSE

Climate change and the acute impacts the watershed is experiencing, as well as predicted future impacts, are best addressed by an adaptive management effort inclusive of thoughtful planning, meaningful action, coordinated implementation and shared monitoring. The Climate Risk and Response Pillar developed and actionable, salient, and visionary set of recommendations that have resonance on its own as well as in the context of the overall OWOW Program. The concepts, management, and policy strategies developed in this Pillar also have a complement in the Disadvantaged Communities and Tribal Communities Pillar as well as many other OWOW Plan Update 2018 Pillars. Moreover, it is the intent of this Pillar to inform individuals, policy makers, and decision makers alike, in such a way that the Pillar's work can be easily shared and incorporated into other planning or policy documents.

This Pillar focuses on the identification of climate risks and the development of appropriate responses to those risks through recommended management and policy strategies. Progress toward the application of the recommended management and policy strategies will support the attainment of OWOW Plan Update 2018 goals and aid the watershed's adaptation to climate changes and mitigation of carbon pollution.

Understanding climate change impacts to water resources and planning for mitigation and adaptation are fundamentally important in ensuring the resilience of water resources and protecting water quality. Implementation of pollution prevention measures and stormwater management BMPs will reduce the impact of climate change on water quality and therefore on overall water resource resilience. Urban water use efficiency programs are important tools for decreasing water and energy use, contributing to water resource resilience and mitigating the effects of climate change on water supply availability. The development of these programs must incorporate the preservation of climate-adaptive green infrastructure and desirable landscapes that help reduce the effects of climate change and protect water quality. Consideration of energy intensity in the development of critical infrastructure can reduce carbon pollution from water resource management and support the goal of improved water resource resilience. Consideration of existing California sea-level rise risk assessments will direct projects, programs, and policies to diminish the threats to local communities and imported water supply reliability.

The climate risks faced by the communities of the watershed are numerous, but in most cases resolve in different priorities at different locations. For instance, increased wildfire risk is predominantly faced by the urban–wildland interface communities of the watershed, and by those tasked with managing the forests and open spaces. Increased heat and the danger it poses for vulnerable populations will be felt across the watershed, but the growing large populations of the inland valleys in San Bernardino and Riverside Counties will be increasingly at risk to this phenomenon, while coastal and mountain communities must be less so. Also considered are the secondary impacts caused by the urban heat island effect, including but not limited to increased

evapotranspiration, decreased water quality, and increased morbidity and mortality among vulnerable populations.

For this reason, a simple list of prioritized vulnerabilities is not provided as part of the OWOW Plan Update 2018. At the scale of the Santa Ana River Watershed, the proper regional management strategy is to be supportive of local decision makers prioritizing their vulnerabilities, and then collectively supporting Climate Response at the scale of the vulnerability. All of the climate-related vulnerabilities faced by the watershed are feasibly managed by the recommended strategies in this section, and through the work of the other Pillars, although some will be more challenging than others.

For many years the uncertainty of climate change impacts has driven much of the planning efforts to prepare for the future. The challenges of planning in the context of deep uncertainty are great, and currently the object of significant academic and high-level attention (for more, visit http://www.deepuncertainty.org/). Though uncertainty is considered a necessary factor in climate planning, for efforts like the OWOW Plan Update 2018, it is less significant to have the sophisticated long-term modeling and technical analyses. The OWOW Plan itself structures a collective effort at the scale of the watershed and is by itself a small piece of the overall management of the watershed. In the OWOW Program are linkages between other efforts, recommendations for prioritization and new ways of acting. With goals in 2040, the near-term challenges at the scale of the watershed are of higher priority than those which accumulate out 50 or 100 years. Long-term planning is for agencies with programs, projects, and infrastructure that will maintain for the long-term. Below, in the recommendations, are suggestions for strengthening response to deep uncertainty.

Efforts in the OWOW Plan Update 2018, led by this Pillar workgroup, admit that the expected changes in climate are now must less uncertain than has previously been considered. Changes in sea level, precipitation, temperature—these are all here today. For this reason most of the recommendations below are about how to prioritize the work of today to respond to the changes already in place.

Climate change is a risk that all watershed communities face, and the appropriate responses are in part local, and for the most part demand a recommitment to efforts already underway. This Pillar reviewed the following tools as it developed its contribution to the OWOW Plan Update 2018:

- Climate Change Handbook for Regional Water Planning (2011)
- Managing an Uncertain Future: Climate Change Adaptation Strategies for California Water (2008)
- Safeguarding California (2009)
- Climate Change Scoping Plan (2017)
- Cal-Adapt website (tools and resources)

Below are recommended management strategies that were developed to facilitate progress toward the goals of the watershed. They are intended to be easily implemented. Please note that these management strategies are not listed in any particular order or level of priority.

5.4.1. RECOMMENDED MANAGEMENT STRATEGIES

Prevent pollution and increase stormwater capture.

Climate change threatens water quality due to changes in the amount, intensity, timing, quality, and variability of runoff and recharge. Pollution prevention and stormwater capture are important strategies to address climate risk to water quality and to improve the long-term viability of local water resources.

Prevent pollution and increase stormwater capture aimed at increasing water quality by:

- As appropriate, routinely updating or developing new water quality management plans (WQMPs) (e.g., a standard urban stormwater mitigation plan) to ensure they are structured to match the expected conditions under climate change
- Increasing the frequency and management of sediment in flood control structures and water supply facilities

Increase urban water use efficiency and conservation.

Increasing urban water use efficiency and conservation are valuable and widely adopted tools for responding to the likelihood of more frequent drought periods under climate change. Efficient or conserved use also diminishes the carbon pollution associated with providing and heating water. It is likely, though, that the success of these programs will themselves be burdened by climate change impacts.

It is recommended that water use efficiency and water conservation programs consider the impacts of climate change by:

- Developing efficiency and conservation programs that factor in the impact of increased heat on evapotranspiration and the resulting impacts to desirable landscapes
- Ensuring that conservation programs do not damage climate-adaptive green infrastructure (e.g., urban trees, bioswales) through interagency or interdepartmental coordination and collaboration

Create and meet greenhouse gas reduction targets.

Under climate change it is important to consider both the energy and water intensity of projects and programs. Since energy production and use require water, and water production and use require energy, then it follows that projects and programs that depend on one also depend on the other. Reducing both energy and water use helps to mitigate carbon pollution and adapt to less reliable water and energy supplies.

It is recommended that energy intensity and water supply availability be considered in the development of critical water infrastructure by:

- Relying on the guidance and striving toward the goals provided by the California Air Resources Board in the AB 32 Scoping Document.
- Quantifying the energy intensity of alternatives when planning critical infrastructure
- Ensuring the sufficiency of water supply under climate change when planning critical infrastructure
- Making decarbonization a priority of future investments in water and wastewater conveyance
- Monitoring energy consumption and production in relation to system performance objectives under different supply scenarios
- Developing greenhouse gas (GHG) emissions targets and implementing programs to achieve reductions for water management operations
- Participating in voluntary registries for GHG emissions from the energy use associated with water
- Educating leaders and community members on the GHG value of water conservation (see Spang et al. 2018)

Assess risks of sea-level rise.

Sea-level rise has the potential to negatively affect water supply conditions both locally through impacts to coastal aquifers, and on imported water through impacts to the Sacramento–San Joaquin Bay Delta (Delta). A key component of understanding climate risk and developing appropriate response is to consider the impacts of sea-level rise.

It is recommended that managers, using updated tools, consider vulnerabilities to sea-level rise by:

- Ensuring sea-level rise projections are part of flood risk management analyses of discharge from critical drainage infrastructure
- Engaging with land-use authorities to consider coastal strategies for adapting to sea-level rise, particularly in cases where coastal water supply or sanitation infrastructure is at risk
- Analyzing the risk of sea-level rise impacts on imported water flows to prioritize collaboration and investment in reliability of imported flows

Address and mitigate public health risks in the context of climate change.

Climate change will result in increased health risks through more extreme and persistent weather events, increased temperatures, and decreased water supply reliability. Members of disadvantaged communities, particularly individuals experiencing homelessness, are disproportionately at risk.

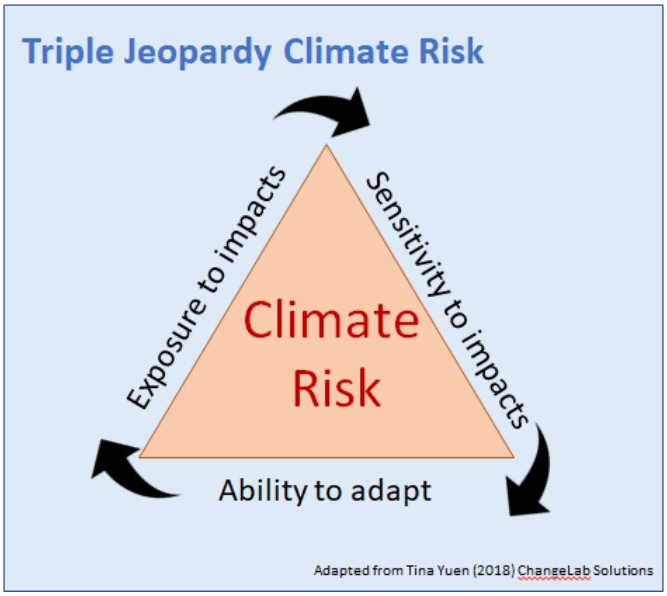
Consideration and mitigation of public health risks, particularly for members of the most vulnerable communities, will be an important component of climate adaptation.

It is recommended that efforts protect public health in the context of climate change by:

- Providing targeted education for all communities about best practices for staying hydrated and safe in more intense and frequent high heat events
- Developing programs and funding to ensure that all people have access to clean water
- Working with public health agencies, the air pollution management district, and vector control agencies to ensure that water management projects and programs do not support the spread of disease
- Developing or strengthening relationships with public health agencies to align programmatic activities, education efforts, and emergency response

Confront disproportionate climate risk.

Environmental health inequities associated with climate change stem from historic planning decisions that have resulted in unequal burdens faced by communities of color and lower socioeconomic status. One challenge described by the World Health Organization is that the communities facing greater risks are less involved in policy development due to the perception that public agencies are uninterested in the concerns and needs of that community (Torres 2013). An essential step in diminishing disproportional climate risk is building trust between members of disadvantaged communities and public agencies before the impacts of climate change are fully realized (Prevention Institute 2011).



The Climate Risk and Resilience Pillar considered the inequities in climate change impacts among different socioeconomic populations, acknowledging that it is of growing concern to public policy. A community's potential climate risk is a function of its exposure to climate impacts, sensitivity to those impacts, and ability to adapt (USDN 2017). Without intervention, this "triple jeopardy climate risk" cycle generates a feedback loop whereby policy inequities contribute to an enhanced exposure to risks, increasing the community's sensitivity to risk and reducing their ability to adapt. The reduced ability to adapt can increase the community's exposure and sensitivity to risk, making each underlying challenge more difficult to resolve.

Support ecosystem functions.

Healthy ecosystems provide important functions for climate mitigation and adaptation. Consideration and mitigation of altered habitat ranges due to increased temperatures will be critical in protecting and preserving the functions that these ecosystems provide.

It is recommended that efforts support ecosystem function for climate change mitigation and adaptation by:

- Supporting altered habitat ranges of native plant and animal species affected by climate change when implementing projects and programs, including monitoring altered habitat ranges, identifying and inventorying altered habitat ranges through collaborative planning, and if analysis has been done on altered habitat ranges, considering it in project planning
- Valuing the ecosystem benefits of fully functioning coastal and inland wetlands and meadows for mitigation, adaptation, and avoidance strategies

Manage forestry and fuels.

Forests are an important resource because they capture, treat, and infiltrate a majority of the rain that falls within the watershed. Climate change will increase stresses on forests, and continued forest management will be critical to preserving the forest as a resource for water management.

It is recommended to preserve and protect natural and urban forest health to diminish negative climate impacts by:

- Encouraging conservation programs in the watershed, particularly those that help buffer water supply sources from climate change impacts
- Creating plans to restore, sustain, and enhance forest health and watershed function
- Promoting natural and urban forest projects that adapt forests and communities to the impacts of climate change

Apply spatial prioritization.

The known vulnerabilities in the watershed will each have a spatial dimension to where they will most likely result in impacts. It is recommended that land and water managers explore the existing tools created by the State of California and others that support an understanding of which vulnerabilities are most likely to impact their operations or service area. Prioritization should be a spatial analysis, whereby managers at the urban–wildland interface, for instance, focus on the increasing incidents of wildfire and slope instability, and managers at the coast prioritize sea-level rise.

Climate projections now suggest increased heat and its impact on human health, infrastructure systems, energy and water demand, green infrastructure, and open space, may be a unifying challenge across the watershed. It is recommended that water and land managers initiate

partnerships with energy and public health sectors to consider an integrated approach to preparing for and mitigating the impacts of increased heat.

It is recommended that additional spatial climate impact modeling be undertaken at the scale of the Santa Ana River Watershed, or at the scale of the three counties. Downscale modeling undertaken by UCLA for the Greater Los Angeles Region has been extremely influential in city- and county-level policy. A similar effort at the three-county (or watershed) scale would undoubtedly be of use for adaptation and mitigation efforts.

Develop climate-informed projects and programs.

Climate change will have multiple interrelated impacts on the watershed. Programs and projects must be developed in the context of this suite of impacts to help avoid unforeseen consequences. In addition, capital projects must consider climate change impacts during the design phase to help ensure that project outcomes are not undermined by climate change during their lifespan.

- It is recommended to minimize unintended consequences of projects and programs in the context of climate change by:
  - Making decisions that consider how climate change will affect program and project outcomes, including consequences of the program/project that would occur because of or be exacerbated by climate change (e.g., if a project would decrease river flows, the project-related decrease in flow should be considered in addition to decreased flows resulting from climate change)
- It is also recommended to consider climate change projections within the lifespan of capital investments by:
  - Making capital investments that consider climate projections within their lifespan to ensure that they will be climate resilient and withstand the projected impacts of climate change (e.g., construction of infrastructure along coasts should consider the impacts of sea-level rise and ensure that project design can withstand climate change impacts projected to occur within the lifespan of the infrastructure)

Increase local and sustainable food production.

Climate change will have an impact on the amount of rainfall, average temperature, the types of pests and diseases, and the atmospheric carbon dioxide (CO_2) and ground level ozone (O_3) concentration. Climate change will also affect the types of crops that can be grown and the ranges where crops can be cultivated. Ensuring a sustainable local food supply increases food stability and security, and plays a role in mitigating carbon pollution by diminishing emissions from transportation of food.

It is recommended to increase local and sustainable food production by:

- Encouraging and incentivizing sustainable, local food systems and practices that can be continued without depleting non-renewable resources, that do not cause harm to the ecosystem, and that do not create or social or economic exacerbate inequities

- Encouraging and incentivizing individual, school, and community sustainable gardening programs
- Identifying open spaces and lands for local and sustainable food crop cultivation

Support local recreational areas and opportunities.

Impacts of climate change on recreational areas include: depletion of fresh water, depletion of snowpack, depletion of coastal and non-coastal wetlands, and loss of urban and wild forest lands.

It is recommended to plan for adaptation of existing recreational areas and opportunities that will undoubtedly be changed by climate change impacts.

- Ski areas in the watershed face the possibility of permanently snow-free and above-freezing temperatures. This will have economic impacts on owners, the workforce, and the broader economy.
- The National Forests trees species are under multiple and mutually reinforcing climate risks, including drought, invasive pests, and carbon starvation. The National Forests of the watershed host millions of visitors per year.
- The coastal beaches of Orange County are an important recreational and economic asset in the watershed, and sea-level rise is accepted to decrease the benefits of the coast (recreation, habitat, spending, and tax revenue). There will be increased costs of maintaining the beaches in the face of sea-level rise (see California's Fourth Climate Change Assessment, page 51).

5.4.2. RECOMMENDED POLICY STRATEGIES

Policy change at the local, regional, and state level help support the adoption of strategies to improve climate risk and response planning in the watershed. Participating stakeholders believe that those who can advocate for or undertake policy changes in support of climate mitigation and adaptation in the watershed are able to support the implementation of the recommended management strategies through the following recommendations:

- Strategies for financing capital investments, as well as operations and maintenance, must factor in climate risk. With risk priced into these strategies, funding will better be able to support the transition to climate-smart innovative technologies, engineering solutions, and natural infrastructures.
- The widely used principle of integrated water management that consists of incentivizing or demanding partnership models that leverage resources and ensure that duplication and working at cross-purposes is eliminated is itself an extremely effective climate response, and must be pursued widely.
- Explaining the need for and benefit of climate-adaptive projects and programs should be made a key effort of public engagement and outreach.

- Tribal communities must be included and actively involved in the planning and implementation process.

Statewide tools that can be used to consider adaptation strategies and facilitate resilience planning include California Coastal Commission's guidance for local coastal planning, CNRA's climate adaptation planning guide for local communities (2009 California Climate Adaptation Strategy; CNRA 2009); CEQA requirements; the State Board's Climate Change program (State Board 2018), and the DWR's "Potential Climate Change Vulnerabilities and Adaptation Strategies for Tribal Communities" (DWR 2014).

5.4.3. BASIS FOR RECOMMENDATIONS

To help assess possible long-term effects of climate change, SAWPA and the U.S. Department of the Interior Bureau of Reclamation (Reclamation) entered into a partnership in spring 2011 under the SECURE Water Act (Title IX, Subtitle F of Public Law 111-11) through the U.S. Department of the Interior's WaterSMART (Sustain and Manage America's Resources for Tomorrow) program and used Reclamation's West-Wide Climate Risk Assessment (Reclamation 2018) to help conduct a thorough climate change analysis for the watershed.

Key findings in Reclamation's Technical Memorandum (TM) No. 1, Climate Change Analysis for the Santa Ana River Watershed (Appendix H), were used in this update and to evaluate new research information on climate change implications for the watershed. In support of the OWOW Plan Update 2018, Reclamation was contracted to perform additional hydroclimate analysis, including research and literature review related. These analyses broadly follow the methodologies used for the watershed basin study. This work is summarized in TM No. 1 and included as Appendix H.

Additional effort was made to refer to local, regional, state, and federal climate planning. As is now well established across a variety of planning and research efforts, climate change is projected to affect many aspects of water resources management in the watershed. Local climate planning in the watershed is still nascent, and the OWOW Program has long been supportive of additional work in partnership with municipalities and counties. The work required as part of general planning by 2021 is an opportunity for the watershed agencies to engage with local climate planning. Because the region is still unevenly covered by climate planning, for the most part this section and the OWOW Plan Update 2018 more generally relied on statewide data and planning tools.

A critical first step to preventing, mitigating, and adapting to those impacts is identifying key water sector vulnerabilities. A climate change vulnerability assessment was conducted as part of the OWOW 2.0 Plan, including the prioritization of vulnerabilities. This effort is described in detail in Appendix G of the OWOW 2.0 Plan. The watershed vulnerability assessment checklist is included as Appendix I to this OWOW Plan Update 2018. Table 5.4-1 presents a summary of key vulnerabilities relative to the watershed first identified in the OWOW 2.0 Plan, with additions from the work of the

Climate Risk and Response Pillar workgroup during this update, and inclusive of the Resource Management Strategies associated with each.

Table 5.4-1. Watershed Vulnerabilities to Climate Change

Category	Vulnerability	Resource Management Strategies
Water supply	Insufficient local water supply	Agricultural Lands Stewardship Agricultural Water Use Efficiency Conjunctive Management and Groundwater Storage Conveyance – Regional/Local Desalination Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Groundwater Remediation/Aquifer Remediation Land Use Planning and Management Matching Quality to Use Outreach and Engagement Recharge Area Protection Recycled Municipal Water Salt and Salinity Management System Reoperation Urban Runoff Management Urban Water Use Efficiency Water Transfers Watershed Management
	Increased dependence on a less reliable imported supply	Conjunctive Management and Groundwater Storage Conveyance – Delta Conveyance – Regional/local Desalination Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Groundwater Remediation/Aquifer Remediation Matching Quality to Use Outreach and Engagement Recharge Area Protection Recycled Municipal Water Salt and Salinity Management Sediment Management Surface Storage – Regional/Local System Reoperation Urban Water Use Efficiency Water Transfers Watershed Management
	Inability to meet water demand during droughts	Agricultural Lands Stewardship Agricultural Water Use Efficiency Conjunctive Management and Groundwater Storage Crop Idling for Water Transfers

Table 5.4-1. Watershed Vulnerabilities to Climate Change

Category	Vulnerability	Resource Management Strategies
		Irrigated Land Retirement Desalination Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Groundwater Remediation/Aquifer Remediation Matching Quality to Use Outreach and Engagement* Recharge Area Protection Recycled Municipal Water Salt and Salinity Management Sediment Management Surface Storage – Regional/Local System Reoperation Urban Runoff Management Urban Water Use Efficiency Water Transfers Watershed Management
	Shortage in long-term operational water storage capacity	Conjunctive Management and Groundwater Storage Conveyance – Delta Conveyance – Regional/Local Desalination Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Groundwater Remediation/Aquifer Remediation Land Use Planning and Management Recharge Area Protection Recycled Municipal Water Salt and Salinity Management Sediment Management Surface Storage – CALFED Surface Storage – Regional/Local System Reoperation Urban Runoff Management Urban Water Use Efficiency Water Transfers
Water quality	Increased poor water quality	Desalination Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Groundwater Remediation/Aquifer Remediation Land Use Planning and Management Outreach and Engagement* Pollution Prevention Recycled Municipal Water Salt and Salinity Management

Table 5.4-1. Watershed Vulnerabilities to Climate Change

Category	Vulnerability	Resource Management Strategies
		Urban Runoff Management Urban Water Use Efficiency Watershed Management
	Increased water treatment needs	Conveyance – Delta Conveyance – Regional/Local Desalination Drinking Water Treatment and Distribution Economic Incentives (Loans, Grants, and Water Pricing) Groundwater Remediation/Aquifer Remediation Matching Quality to Use Outreach and Engagement Pollution Prevention Recycled Municipal Water Salt and Salinity Management Sediment Management Urban Water Use Efficiency
Flooding	Increased flash flooding and inland flooding damage	Conjunctive Management and Groundwater Storage Ecosystem Restoration Flood Risk Management Forest Management Land Use Planning and Management Outreach and Engagement Recharge Area Protection Sediment Management System Reoperation Urban Runoff Management Water and Culture Water-Dependent Recreation Watershed Management
	Increased coastal flooding and inundation of coastal community storm drains from sea-level rise and greater precipitation rates	Ecosystem Restoration Flood Risk Management Land Use Planning and Management Outreach and Engagement Sediment Management System Reoperation Urban Runoff Management Water and Culture Water-Dependent Recreation Watershed Management
	Damage to coastal community sewer systems and recreational assets from sea-level rise	Ecosystem Restoration Flood Risk Management Land Use Planning and Management Outreach and Engagement Salt and Salinity Management Sediment Management System Reoperation

Table 5.4-1. Watershed Vulnerabilities to Climate Change

Category	Vulnerability	Resource Management Strategies
		Urban Runoff Management Water and Culture Water-Dependent Recreation Watershed Management
Ecosystem and habitat	Damage to coastal ecosystems and habitats	Ecosystem Restoration Flood Risk Management Land Use Planning and Management Outreach and Engagement Salt and Salinity Management Sediment Management System Reoperation Urban Runoff Management Water and Culture Water-Dependent Recreation Watershed Management
	Increased stress on forested lands	Ecosystem Restoration Flood Risk Management Forest Management Land Use Planning and Management Outreach and Engagement Sediment Management System Reoperation Water and Culture Water-Dependent Recreation Watershed Management
	Adverse impacts to threatened and sensitive species from reduced terrestrial flows, sea-level rise, and changed ocean chemistry	Agricultural Lands Stewardship Ecosystem Restoration Flood Risk Management Forest Management Land Use Planning and Management Outreach and Engagement Pollution Prevention Recharge Area Protection Salt and Salinity Management Sediment Management Surface Storage – Regional/Local System Reoperation Urban Runoff Management Water and Culture Water-Dependent Recreation Watershed Management
Human health and well-being	Increased incident of dangerous extreme heat	Ecosystem Restoration Forest Management Land Use Planning and Management Outreach and Engagement Water and Culture

Table 5.4-1. Watershed Vulnerabilities to Climate Change

Category	Vulnerability	Resource Management Strategies
		Water-Dependent Recreation Watershed Management
	Loss of recreational opportunities	Agricultural Lands Stewardship Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Land Use Planning and Management Outreach and Engagement Pollution Prevention Recharge Area Protection Water and Culture Water-Dependent Recreation Watershed Management
	Decreased reliability of water supplies	Conjunctive Management and Groundwater Storage Conveyance – Delta Conveyance – Regional/Local Desalination Drinking Water Treatment and Distribution Economic Incentives (Loans, Grants, and Water Pricing) Ecosystem Restoration Forest Management Groundwater Remediation/Aquifer Remediation Land Use Planning and Management Matching Quality to Use Outreach and Engagement Pollution Prevention Recharge Area Protection Recycled Municipal Water Salt and Salinity Management Sediment Management Surface Storage – Regional/Local System Reoperation Urban Runoff Management Urban Water Use Efficiency Water and Culture Water Transfers Water-Dependent Recreation Watershed Management
	Burden of increased costs for water and watershed management	Conjunctive Management and Groundwater Storage Economic Incentives (Loans, Grants, and Water Pricing) Land Use Planning and Management Matching Quality to Use Outreach and Engagement Recycled Municipal Water System Reoperation Urban Water Use Efficiency

Table 5.4-1. Watershed Vulnerabilities to Climate Change

Category	Vulnerability	Resource Management Strategies
		Water and Culture Watershed Management

In response to these climate change vulnerabilities, in the OWOW 2.0 Plan the watershed identified the following proposed actions under a "no regrets strategy": urban water use efficiency, improved system conveyance, groundwater management, pollution prevention, stormwater BMPs, and forestry management. For the OWOW Plan Update 2018, this Pillar revisited and updated these strategies in the context of current conditions and key findings from Reclamation's updated climate change analysis (Appendix H). Consideration of water–energy nexus, risk assessment of sea-level rise, consideration of public health risks, supporting ecosystem functions, and consideration of all possible consequences of projects and programs were added.

Pollution Prevention and Stormwater Management

Analysis conducted by Reclamation indicates an increased risk of severe floods and a likelihood of longer and more severe fire season in the future as a result of climate change. More sudden, extreme storms and larger, more frequent wildfires will likely increase sediment flows within the watershed. Managing these flows through flood control structures and water supply facilities is critical to mitigating the effects of climate change on water quality.

Development activities typically change pre-development hydrologic conditions by altering drainage patterns and increasing impervious area, which can increase the rate and volume of runoff during storm events. Development, therefore, has the potential to compound the negative effects of climate change and lead to even greater threats to water quality. Implementing stormwater BMPs reduces storm runoff and pollution. In addition, BMPs improve groundwater recharge, improve air quality, reduce heat island effect, and decrease asphalt exposure to sun.

Project-specific water quality management plans (WQMPs) are important tools for quantifying and managing the water quality impacts of new development and significant redevelopment projects through the implementation of BMPs. The Municipal Separate Storm Sewer System (MS4) Permit adopted by the Santa Ana Regional Water Quality Control Board and issued to San Bernardino County for the upper and middle Santa Ana River Watershed, requires all new development and significant redevelopment projects to incorporate low-impact development BMPs. The development of project-specific WQMPs requires that hydrologic analysis for the 2-year storm event be conducted for the project site. For WQMPs to effectively mitigate the effects of climate change, it is fundamentally important that the expected conditions under climate change be reflected in the WQMP guidelines. For the BMPs resulting from the analysis to adequately manage stormwater and prevent pollution in the future, the 2-year flood event used to conduct runoff analysis must be based on conditions under climate change.

Urban Water Use Efficiency

Reclamation found that given the changes in precipitation and temperature that are expected under climate change, "a water shortage worse than the 1977 drought could occur one out of every six to eight years by the middle of the 21st century and one out of every two to four years by the end of 21st century" (Reclamation 2013, page 15). Urban water use efficiency is widely viewed as a fundamentally important method for responding to the likelihood of more frequent drought periods under climate change and improving water supply reliability. Legislation at the state level has mandated improved water use efficiency. Local agencies in California were required to adopt the Model Water Efficient Landscape Ordinance, or their own water efficient landscape ordinance that was at least as stringent, by December 1, 2015. The Model Water Efficient Landscape Ordinance promotes efficient water use in new and retrofitted landscapes through requirements of plant types, limits on turf areas, and mulch requirements. SB X7-7 was enacted in 2009 and mandates water conservation targets and efficiency improvements for urban and agricultural supplies. A central requirement of SBX7-7 is the reduction of per capita urban water use by 20% by the year 2020. Conservation of existing water supplies is of utmost importance to the growing population of the watershed. A representative analysis from Orange County shows that per capita water use will need to be reduced from the current rate of about 175 gallons per day to about 98 gallons per day by 2030.

Efficiency programs that focus on water conservation as a means for climate change mitigation and adaptation must consider the full suite of climate change impacts to ensure program success. For instance, developers of urban water use efficiency and conservation programs must factor in the impact of increased heat on evapotranspiration and the resulting impacts to desirable landscapes. If program designers fail to consider the effect of increased heat on evapotranspiration, then desirable landscapes may be underwatered and suffer negative impacts as a result.

In addition, conservation programs have the potential to negatively impact other means for climate adaptation and mitigation. For instance, before we implement water efficiency and conservation programs, we must consider the potential impacts to climate-adaptive green infrastructure. Green infrastructure, such as urban trees and bioswales, provides important climate change adaptation benefits, including reducing the heat island effect and providing habitat. We should ensure that water efficiency and conservation programs do not cause unintended negative impacts to green infrastructure that would damage climate resilience.

Consideration of Water–Energy Nexus

Water use and energy use are inextricably linked: energy production requires water use (for processing raw materials, generating electricity, etc.) and water production requires energy use (for pumping, treatment, conveyance, etc.). The development of critical infrastructure should consider the energy intensity of project alternatives and ensure sufficient water supply availability under climate change.

There are numerous innovative approaches for decreasing the net energy use and system losses of water conveyance and storage, including shade balls, in-conduit micro-hydro, solar shade structures over open-water conveyance channels, and pumped-storage strategies.

The OWOW 2.0 Plan included specific implementation actions for watershed stakeholders to help reduce energy consumption and ensure AB 32 Global Warming Solutions Act compliance. The recommended management strategies presented in this Pillar section provide additional tools to reduce energy and water use intensity.

Sea-Level Rise Risk Assessment

The California coast is subject to increasing hazards from sea-level rise caused by climate change. Higher sea levels would increase the frequency of coastal flooding, as well as its extent inland; prevent stormwater from draining to the ocean and bays, thus further increasing inland flooding; and accelerate erosion along the shoreline. Sea-level rise exacerbates coastal flooding when combined with occurrences of extreme storm events and high tides, in addition to other additive factors such as storm surge and wave run-up. Existing oceanic and atmospheric processes, such as the El Niño events and atmospheric rivers, have already caused significant damage to the coastlines of Southern California and resulted in high repair costs. Scientists recognize that the combination of extreme events with sea-level rise will likely cause more coastal damage.

Coastal communities are most vulnerable to rising sea levels. Critical infrastructure, homes, and other types of development are exposed to coastal flooding. In addition to coastal inundation, erosion, and stormwater drainage being pushed further inland, there is increased potential for loss of coastal marshes, wetlands, and beaches, as well as the possibility of saltwater intrusion into coastal aquifers as a result of sea-level rise. Staffing and financial resources are already being spent on salinity barriers to protect Orange County aquifers and on continual maintenance for Bolsa Chica and other important wetlands and marshes along the Orange County coastline.

Coastal Aquifers

OCWD conducted a study to evaluate the potential effects of projected sea-level rise on coastal Orange County groundwater conditions. Two locations near the Talbert and Alamitos seawater intrusion injection barriers were selected for analysis. The model for the analysis used data from well logs, aquifer pump tests, groundwater elevation measurements, hand-drawn contour maps, geologic cross sections, water budget spreadsheets, and other data stored in OCWD's Water Resources Management System database.

Regional mean sea level along the Southern California coast is projected to rise by 1.5 to 12 inches by 2030, 5 to 24 inches by 2050, and 16 to 66 inches by 2100. The analysis carried out by OCWD found that the Talbert Barrier would be effective at preventing seawater intrusions through the Talbert Gap for a sea-level rise of less than 3 feet. In the case of the Alamitos Barrier, seawater intrusion through the Alamitos Gap would likely be prevented once current plans to construct

additional injection wells are implemented. At both barriers, however, shallow groundwater concerns could limit injection rates and thus reduce the effectiveness of the barriers in preventing seawater intrusion with rising sea levels.

State Water Project

Approximately 30% of the water supply in the watershed is imported from the SWP. Reclamation's analysis found an increased potential for saltwater intrusion in the Delta as a result of climate change. Saltwater intrusion into the Delta would negatively impact the ability of the SWP to move water through the Delta to Southern California. Management of the Delta is outside the authority of agencies, cities, and counties in the watershed; however, because of the criticality of the SWP, it is appropriate for watershed stakeholders to be engaged with state policy related to the Delta and ensuring that the SWP is made less vulnerable to sea-level rise.

Consideration of Public Health Risks

Climate change has important public health implications for all residents of the watershed. The Fourth California Climate Assessment enumerates the public health impacts as "far-reaching, including direct and indirect impacts related to extreme heat, poor air quality, wildfires, infectious diseases, floods and mudslides, mental health concerns, and increasing disparities caused by disproportionate impacts to vulnerable populations" (Los Angeles Region Report, page 21.)

The Climate Risk and Response Pillar workgroup considered the inequities in climate change impacts (sometimes referred to as a *climate gap*) among different socioeconomic populations, knowing it is of growing concern in climate research. A literature review on the climate gap in California discusses the disproportionate impacts of climate change on the members of socially and economically disadvantaged communities (Shonkoff et al. 2011). Environmental health inequities associated with climate change stem from differences in ability to anticipate, cope with, resist, and recover from the impact of climate-driven weather events.

Threats to Individuals Experiencing Homelessness

Increased health risks due to climate change are not distributed equally among communities. Those who lack shelter, basic resources, and support networks are among the most vulnerable individuals in our communities. In 2009, Brodie Ramin of the University of Ottawa and Tomislav Svoboda of the University of Toronto published "Health of the Homeless and Climate Change" in the *Journal of Urban Health*, which examined intersections with climate change and issues affecting the health of individuals experiencing homelessness. The researchers concluded that the rate of death and illness could be greater in communities of people experiencing homelessness because they generally have higher rates of underlying disease, experience greater exposure to and poorer protection from the elements and occupy high-risk urban areas. When those stressors are made worse or more unpredictable by climate change, shelters see a spike in visitors, and service providers can become overwhelmed. During Southern California's historic heat wave in the

summer of 2016, Los Angeles city managers and the Centers for Disease Control said that vulnerable populations such as people who are experiencing homelessness have a much higher risk of heat-related health problems than people in the same community who have permanent access to shelter.

Urban air pollution from vehicle exhaust and particulate matter exists mostly outside, making those who cannot go inside more likely to suffer from lung and heart disease caused or worsened by air pollutants. The vast majority of individuals experiencing homelessness live in cities, where the urban heat island effect can magnify the disproportionate impacts heat waves can have on those who cannot easily seek relief. Because so much of their time is spent outside, members of the community who are experiencing homelessness are also more vulnerable to vector-borne diseases.

Individuals experiencing homelessness are also more vulnerable to environmental hazards like floods and storms because they are more likely to occupy marginal areas. Extreme weather events like storms, floods, and fires can threaten entire cities, but people experiencing homelessness suffer disproportionately compared to the general population due to reduced access to shelter and transportation. After a natural disaster, these individuals may also find themselves low on the priority list of who gets help, and the places that would normally assist them will most likely have more to do than they can handle, according to New York University sociologist E. Klinenberg (Koronowski 2016).

Severe and Continuous High-Temperature Events

Increased temperatures, including more frequent and severe heat waves as a result of climate change, lead to increased health risks. In addition to direct health risks associated with increased heat, the Reclamation Study (TM No. 1) describes how increases in heat can also lead to additional air pollution in urban areas, leading to additional health risks. The Intergovernmental Panel on Climate Change concluded in their 2007 Fourth Assessment Report that "hot extremes" and heat waves have a greater than 90% probability of increasing as our climate continues to change. All climate projections from the Reclamation Study (TM No. 1) demonstrated clear increasing temperature trends. Increasing temperatures will result in a greater number of days above 95°F in the future. By 2070, it is projected that the number of days above 95°F will quadruple in Anaheim (from 4 days to 16 days) and nearly double in Riverside (from 43 days to 82 days). The number of days above 95°F in Big Bear City is projected to increase from 0 days historically to 4 days in 2070. This a public health issue for communities that are more vulnerable in extreme heat situations, like the elderly, young children, and those without sufficient air conditioning, including people experiencing homelessness.

Vector and Disease Shifts

Vector-borne diseases are illnesses that are transmitted to humans by bite or sting; in Southern California, vectors include mosquitoes, ticks, and fleas. These vectors can carry infective

microorganisms (pathogens) such as viruses, bacteria, and protozoa, which can be transferred from one carrier (host) to another. In the United States, there are currently 14 vector-borne diseases that are of national public health concern. The seasonality, distribution, and prevalence of vector-borne diseases are influenced significantly by climate factors, primarily high and low temperature extremes and precipitation patterns.

Climate change can result in modified weather patterns and an increase in extreme events, which can affect disease outbreak by altering biological variables such as vector population size and density, vector survival rates, the relative abundance of disease-carrying hosts, and pathogen reproduction rates. Collectively, these changes may contribute to an increase in the risk of a pathogen being carried to humans.

Climate change is likely to have both short- and long-term effects on vector-borne disease transmission and infection patterns, affecting both seasonal risk and broad geographic patterns in disease occurrence over decades. However, models for predicting the effects of climate change on vector-borne diseases are subject to a high degree of uncertainty, largely due to two factors: (1) vector-borne diseases have complex transmission cycles that involve intermediate hosts as well as vectors and humans and (2) in addition to climate change, other significant social and environmental factors drive vector-borne disease transmission. For example, although climate variability and climate change both alter the transmission of vector-borne diseases, they will likely also interact with many other factors, including how pathogens adapt and change, the availability of hosts, changing ecosystems and land use, demographics, human behavior, and adaptive capacity. These complex interactions make it difficult to predict the effects of climate change on vector-borne diseases. It is expected that individuals experiencing homelessness will continue to be disproportionately impacted by any increases in vector-borne diseases.

Supporting Ecosystem Functions

Shifts in climate will affect the distribution of living organisms, including people, animals, and plants. The Reclamation Study (TM No. 1) discusses that even with variability between climate-change scenarios, all projections include rising temperatures and increasing levels of atmospheric carbon dioxide. As projects are developed in the watershed, they will take into consideration the projected changes in temperature, existing analysis, and monitoring efforts.

Plants

As temperature increases and water availability decreases, some plant species will shift to habitat that was previously populated by riparian (riverside or river-dependent) species and other plants will shift to higher elevations. As temperatures rise, increased air-conditioner use will result in increased carbon emissions. Increased frequency of wildfires and pest infestations may also be caused by warmer temperatures, further stressing ecosystems and increasing competition between native and invasive plant species. SAWPA's Arundo Habitat Management Task Force combats the spread of invasive giant reed (Arundo; *Arundo donax*) in partnership with the Riverside County

Regional Park and Open Space District. The goal of the task force is to eliminate Arundo from the watershed. To date, 3,000 acres of Arundo have been removed and replaced with native plants, providing approximately 10,000 additional feet of water per year. The Santa Ana River Mitigation Bank furthers the task force efforts by providing mitigation credits for removing Arundo and other water-intensive invasive plant species in lieu of individual project mitigation. Additional restoration, forestry, and fire fuel management projects will assist in climate adaptation and support continued viability of valuable forest and riparian ecosystems.

Animals

As drier conditions reduce the amount of available water, some animals will be more likely to come to residential areas for water and food, thereby creating human–animal conflict. Other local animal species will shift to stay within their preferred weather range, whether by changing location within the region, leaving the region, or moving into the region. It is projected that animals will move north from Central America and Mexico. Another issue that may have some local effect on species richness and diversity is climate change's effects on the migration of songbirds. Climate change is affecting when these species migrate, causing the birds to not be at their breeding grounds during critical periods. Implementing projects that recognize and plan for altered habitat ranges for native animals will support continued habitat and healthy ecosystems in the watershed.

People

There is an expectation that populations and industrial areas will shift. Sea-level rise may affect housing distribution or construction design in storm-surge-prone areas of the Orange County coastline. Fires may affect housing distribution or construction materials in forested areas, particularly in the San Bernardino National Forest. In terms of climate-change-related human migration, Governor Brown has suggested that people will migrate to California, and Oregon officials have talked about Californians migrating to Oregon (which has had its own climate-change-related challenges). It is not clear how climate change will impact the watershed in terms of climate-change migration into and out of the region or climate-change gentrification or decline of communities. Bringing climate change analysis and predictions to the forefront of project planning will support the continued viability of communities in the watershed.

Forestry and Fuels Management

Urban and natural forests provide many climate-buffering ecosystem functions. Climate change may degrade the health of natural and urban forests, which are an important part of the water supply and public health system. There are climate adaptation plans in place for natural landscapes (e.g., the Southern California Climate Adaptation Project—see http://www.cakex.org/case-studies/southern-california-climate-adaptation-project), which should be widely supported and implemented. Continued coordination with statewide programs will be important for the promotion of watershed-based forest projects that combat climate change. The California Department of Forestry and Fire Protection is tasked with developing urban forest canopy goals

and strategies to attain them, supporting community efforts to adopt these goals and strategies in their own plans, and implementing the strategies to achieve the goals (see CAL FIRE urban forestry webpage at http://www.fire.ca.gov/resource_mgt/resource_mgt_urbanforestry).

The U.S. Department of Agriculture Forest Service (Forest Service) and SAWPA have collaborated on plans to restore, sustain, and enhance forest health, including the Forest First initiative. In 2017, to continue this relationship, the Forest Service's San Bernardino National Forest and Cleveland National Forest and SAWPA created a new MOU (17-MOU-11051200-009) to further improve the health and resiliency of the subwatersheds that are critical to delivering quality water supplies to neighboring communities. As home to the headwaters of the Santa Ana River, the National Forests encompass approximately 30% of the watershed's land mass. These forest areas also receive 90% of the watershed's annual precipitation. Forest management practices have direct effects on both water quality and quantity, particularly relative to forest fires and their effects on soil erosion and water storage. The collaborative efforts in the Forest First initiative include four main watershed restoration strategies that provide significant benefits to downstream water supply and quality:

Strategy 1. Forest fuels management, which would focus on reducing understory growth that can contribute to the intensity of fires, making them more devastating and difficult to fight.

Strategy 2. Restoration of chaparral plant communities in areas that have not recovered due to repeated fires, and where native vegetation has been replaced by grasses that increase runoff, instead of the chaparral capturing and dispersing rainfall, and allowing moisture to percolate and recharge groundwater basins.

Strategy 3. Meadow restoration that would involve returning water that had been converted to conveyance back to a meadow sheet flow so that the meadow can function in a natural groundwater recharge capacity.

Strategy 4. Retrofitting roads to reduce water conveyance, reduce fire risk, and increase the number of fire breaks.

Further details on this initiative are available on SAWPA's website at http://www.sawpa.org/task-forces/forest-first/.

This "no regrets strategy" analysis allows SAWPA, its member agencies, and key stakeholders to assess proposed projects and specific adaptation strategies, and the associated costs and benefits in terms of productivity, mitigation potential, resilience, and sustainability. The most promising projects and strategies can then become part of SAWPA's toolbox of climate change adaptation strategies. SAWPA's "no regrets strategy" will, however, tend to encourage incremental adaptation responses as opposed to more expansive adaptation responses.

Individual forest management and adaptation projects can be cost-effective solutions to improved water resource management in the face of climate change. The *Technical Memorandum on*

Methodology to Estimate Economic Benefits of Forest Restoration Projects (Cardno ENTRIX 2012) describes the methods used to estimate the cost savings to the watershed from forest thinning and forest road retrofitting projects. The analysis included some level of uncertainty, but it did not account for future climate scenarios. Therefore, taking into account future climate scenarios that include increased frequency and intensity of forest fires, cost savings resulting from reduced fire risk due to forest thinning and forest road improvement projects are expected to increase.

SAWPA will continue to encourage conservation programs in the watershed, particularly those that help buffer water supply sources from climate change impacts. These projects could include forest thinning, fuel management, and sediment management projects in natural forest, as well as urban forest enhancement projects that increase carbon sequestration. Continued monitoring and analysis of tree health, forest fire risk, and climate projections will be important factors to consider in the planning of programs in the watershed.

Climate-Informed Project and Program Development

The California Attorney General's Office acknowledges that there is nothing speculative about climate change and requires general plans, CEQA documents, and projects to incorporate consideration of GHG emissions. Climate change is a topic that affects all aspects of general plans, including each of the requisite elements: land use, circulation, housing, conservation, open space, noise, safety, environmental justice, and air quality. The state Office of Planning and Research released new general plan guidelines in 2017 that require GHGs and climate adaptation to be addressed in the requisite safety element (OPR 2017). Therefore, all jurisdictions in the state require discussion, consideration, assessment, and actions to mitigate and adapt to climate change.

Any action taken in response to climate risk has the potential to cause unintended consequences that may weaken climate response in other areas. For example, water conservation programs may have the unintended consequence of weakening or even killing trees and desirable landscapes that provide climate change adaptation benefits, including reducing the impact of increased temperatures, promoting infiltration of runoff, and providing habitats for sensitive species. Projects and program developers should strive to identify unintended consequences in the context of climate change and to minimize or eliminate those impacts within the project or program.

Projects that involve the development of capital investments should include evaluation of how climate change could impact the project during its lifespan. Projects should consider climate change impacts during the design phase to ensure that the project will withstand the potential impacts of climate change. For instance, new infrastructure development, or the retrofit of existing infrastructure, in coastal areas must factor the impacts of projected sea-level rise. Failure to anticipate the impacts of climate change on capital investment projects may significantly alter the lifespan of the project and have far-reaching consequences.

Economic Burden

Climate-resilient capital investments consider climate projections to ensure that projects can withstand the impacts of climate change. One important impact to consider is the economic impact associated with climate projections. The number of severe storms has increased dramatically in the last decade, increasing more than fourfold compared to the 1990s. Drought events have almost doubled in number in the last decade, compared to the 1980s and 1990s. As a result of severe storms and hurricanes, flooding events in the last decade have nearly doubled compared to the 1990s. The cost from these weather events influenced by human-induced climate change, with at least $1 billion each in economic losses and damages, has significantly escalated: from $145.7 billion in the 1980s and $211.3 billion in the 1990s to $418.4 billion in the last decade—double what it was in the 1990s and almost triple what it was in the 1980s (FEU-US 2018).

5.4.4. BUREAU OF RECLAMATION ANALYSIS

Appendix H contains new analyses from Reclamation, driven by the update of the climate model since the previous OWOW planning effort. Using updated climate modeling, Reclamation provided answers to the following questions:

- What will be the climate impacts on the ski industry in Big Bear?
- What are the projected climate change impacts on chaparral and forest ecosystems?
- What are current and expected climate change impacts on forest and urban trees in this watershed?
- What are the expected changes in extreme temperatures?
- How will groundwater and water supplies be impacted by projected climate change?
- How will inland water bodies be impacted by changed precipitation patterns?
- How will climate change impact wildfire patterns in the watershed?

Most interestingly, some projections have changed from the previous modeling efforts in the OWOW 2.0 Plan. New modeling suggests that precipitation patterns will change in such a way that the amount of surface flows in streams and into inland water bodies will increase. Using the current modeling, a larger range of variability in groundwater levels was found, despite additional surface flows being predicted. A response to each of the questions above is provided in Appendix H.

5.4.5. INTEGRATION WITH OTHER PILLARS

It is the policy of the OWOW Program that as more effects of Climate Change manifest, new tools are developed, and new information becomes available, the OWOW Plan Update 2018 will revisit climate vulnerabilities and reevaluate Recommended Management Strategies. This adaptive management approach will inform the work of other Pillars, particularly those integrated with the Climate Change Pillar.

5.4.6. CONTRIBUTORS – CLIMATE RISK AND RESPONSE

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Chair	
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5.5. DISADVANTAGED COMMUNITIES

5.5.1. OWOW PLAN UPDATE 2018 GOALS AND DISADVANTAGED COMMUNITIES

The recommendations of this chapter fall chiefly in the goals to educate, build trust, and to engage with members of disadvantaged communities. Throughout this chapter the reader will find that, to achieve the other goals of the OWOW Plan, these are prerequisites, or perhaps co-requisites.

Most water and watershed management is conducted by public agencies, followed by non-profit corporations, private companies, and then all who own and/or maintain land. Because public agencies rely on the consent of the communities they serve, strong engagement is a critical component of successful public-sector water and watershed management. In recent years it has become all the clearer that the customary models of "outreach" are no longer sufficient to ensure communities are able to contribute, monitor, and support the agencies which serve them.

There are many examples in the watershed of rigorous and effective engagement between communities and water and watershed managers. Many of the recommendations are centered on developing or strengthening, and then maintaining strong links between community members and management agencies.

Ensuring resilient water supplies, high-quality water, and open space are goals shared by members of disadvantaged communities. Ensuring too that these are distributed equitably to all communities is a piece of the recommendations here. This chapter also encourages grappling with the challenges at the intersection of these goals, the California Human Right to Water, and people who are experiencing homelessness.

5.5.2. RECOMMENDED MANAGEMENT STRATEGIES

Adopt best practices for engagement and participation.

It is recommended that water agencies formally adopt engagement best practices. Engagement must be thought of as a multi-stage process that includes listening and knowledge-sharing on both sides, building trust through relationships, encouraging active (rather than passive) participation, and establishing a pattern of follow-up, transparency, and accountability. Following an engagement model rather than an education-only model leads to community members feeling supported and valued and leads them to have real ownership over the end products.

Best practices for engagement revolve around the following process:

- Recognize the expertise within the community members who participate. They will be experts about their lived experience, their community. Honoring that expertise will strengthen engagements.
- Identify the purpose of the engagement – is it to inform, empower, or solicit input?
- Connect with community-based organizations and other apt groups to organize and develop the engagement process.

- Be proactive and mindful, ensuring your efforts are representative of those you engage. A diversity of outreach and communication methods should be employed to ensure that all voices are included.
- Recognize that people experiencing homelessness are a disadvantaged community that requires unique forms of engagement.
- Be clear with participants about the purpose and process of engagement.
- Follow up with participants.

Long-term engagement must begin with investment in public engagement infrastructure (e.g., forming a department that will work with an equity lens on engagement). Make sure that there are clearly defined goals for engagement.

Focus on critical infrastructure.

It is recommended that critical infrastructure which supports a resilient water supply, effective sanitation, and sufficient flood protection be prioritized in communities where it is deficient. Projects that achieve this recommendation should be prioritized for implementation and funding requests.

Developing programs that support the transition from septic to sanitary sewer must be a high priority in regions where the septic systems are degraded or undersized. This work must be inclusive of both implementation funding for infrastructure, but also financing or grant programs to provide the private-property hook-ups.

This workgroup recommends a focus on localized flooding, and the impact it can have on communities that rely on alternative transportation. Children walking to school or people waiting for buses can be jeopardized by high flows and ponding on streets where stormwater drainage is insufficient. These projects can support multiple benefits like groundwater infiltration, urban greening, and production of safe routes to schools.

It is also recommended that smaller water and watershed management agencies be supported with technical assistance and partnerships to ensure critical infrastructure under their management can be evaluated, augmented, and maintained.

Provide technical assistance and programs of direct support.

As described above, disadvantaged communities frequently lack the human and financial capacity to pursue grants or develop and implement projects. Regional organizations like the counties or SAWPA and its member agencies can develop technical assistance or programs of direct support. At the simplest this is coordination and sharing of opportunities, for instance making sure everyone knows about an opportunity with enough time to engage.

Also recommended is for regional agencies to develop and provide access to grant writing expertise. These staff can be assigned to both internal and external grant writing, supporting others

in the watershed. Agencies that serve low-income communities often have the most need for grant support but also the least capacity to submit competitive applications.

CASE STUDY: WECAN

The Santa Ana Watershed Project Authority (SAWPA) designed and is implementing the Water–Energy Community Action Network Program (WECAN) throughout the Santa Ana River Watershed (watershed). The need for a water and energy conservation program designed to assist low-income communities was clear to SAWPA, its member agencies, and its partners across the watershed. The willingness for local agencies to support the program with community engagement and local funding reveals its importance.

Programs of direct support were raised by multiple members of the workgroup, recommending that the region set up programs that support low-income homeowners improve their property to have cleaner water, more effective sanitation, or conserve water with low-water plumbing or landscaping. Ideas included water conservation programs like the Water–Energy Community Action Network (WECAN; see sidebar), or one where a homeowner could get a low- or no-interest loan from a wastewater utility to support sewer hook-up, paid off over time on the utility bill. This same program was discussed for re-piping homes to ensure that tap water quality degraded on the customer side of meters.

This program assists members of disadvantaged communities in the watershed to save water and energy at home. WECAN replaces hot-water fixtures and toilets with more efficient versions, and turf lawns with climate-appropriate landscapes, for eligible residents at no cost. This multi-faceted program is funded in part by a grant from DWR from the California Climate Investments Program, and benefits from assistance and support of project partners.

The lessons learned from WECAN are a helpful guide for agencies interested in creating similar community programs. First, because the program is funded by the Greenhouse Gas Reduction Fund, WECAN is ultimately achieving GHG reductions. To accomplish the goal of carbon, water, and energy savings and engagement with overburdened communities, SAWPA partnered with water agencies, community groups, and private businesses. Having a regional entity like SAWPA with experience in collaborative projects and complex financial management is key to the success of the program. Other agencies interested in executing programs for residents at no cost may benefit from state support, but also may engage resources that already exist in their region. Involving partners from private and public, state, and community organizations ensures the success of a comprehensive and adaptable program.

Use a holistic approach for recognizing communities.

People belong to many communities, defined by the places they live and work and the other people around them. Communities can also be defined by shared challenges or opportunities. The idea that a community must be bounded by a physical or legal boundary is well entrenched in environmental management and should be redefined as important but not necessary. In the context of watershed

management, which acknowledges how features and aspects of water inherently cross-jurisdictional boundaries, so too the concepts of community must become more fluid.

The idea that a community can form around a challenge or opportunity is intuitively obvious once considered, though this is rarely part of planning efforts. The Disadvantaged Communities Involvement Program in 2017 began considering all people experiencing homelessness as a community. By defining a non-geographically bounded community, it opened new lines of engagement, of planning, and perhaps of project implementation.

It is also recommended that people be allowed to self-identify the community most meaningful to them during engagements. In cases where a project is considered at a particular location, outreach efforts must work to understand all the communities that may have a relationship with the project site, not just the politically bounded community that one finds on maps.

Lastly, it is recommended that a structured analysis of the watershed be conducted where communities may face the challenges of low-income but are not "visible" in the statewide dataset of disadvantaged communities. Well established protocols for income surveys can be conducted to better understand the challenges faced by communities and permit targeted funding to be allocated to solutions. These tools were previously used to support work in Quail Valley.

Provide appropriate support for alleviating homelessness.

During 2017 and early 2018, the issue of homelessness in the watershed reached crisis levels. The Disadvantaged Communities Involvement Program conducted two symposia about the intersections of water management and homelessness. Table 5.5-1, produced for the December 2017 symposium, shows the lessons learned and examples of how others in California have developed water-related programs that work to alleviate homelessness.

It is recommended that water programs and projects that have a relationship to homelessness review the materials here and develop partnerships with people experiencing homelessness and the agencies and organizations that provide services. Collaborative work to alleviate homelessness while also bringing benefits to the watershed are possible, and likely result in more durable solutions to both challenges.

High-Priority Needs

A lack of adequate access to bathroom facilities, sanitation, and water services in homeless encampments leads to health risks for people living there. The resulting leaching of raw sewage into the waterways degrades water quality and causes greater infrastructure costs for the water sector. To mitigate these health and environmental risks, it is recommended the water sector support mobile sanitation and toilet services that are accessible to encampment residents while municipalities work on increasing the stock of permanent housing options. Like any emergency response, short-term needs must be acknowledged and managed, in the context that short-term answers will not work over the longer term.

Encampments near waterways can contribute bacteria and trash pollution to the water bodies. Parts of the watershed have regulations limiting bacteria levels in the water, and the Clean Water Act regulates trash and debris. To minimize the impacts of homeless encampments on the water quality, it is recommended that sanitation, flood management, and open space managers support trash services for people living in encampments or programs to support encampment residents to participate in efforts to keep their living areas and the waterways clean. This recommendation should also be considered an emergency response approach, conducting short-term solutions that are not appropriate over the long term. While the seemingly simple solution is the removal of the homeless encampments, it is important to note that those who are homeless, while already displaced, face even greater levels of displacement when encampments are broken up. These individuals, while appearing to create nuisance, are still consumers/constituents of our water services. With more and more people being unable to afford housing, we are seeing high levels of homelessness, tent encampments, and human suffering, adding a not-so-easy complication on top of an already difficult situation. See Table 5.5-1 for the issues related to specific watershed concerns, as well as possible models for addressing them.

Table 5.5-1. Priority Issues and Possible Models

Watershed Concern	Issue	Possible Model
Flood Protection	People experiencing homelessness who live in the riverbed are at greater risk of hazards from increased river flow and flooding.	Citynet (http://citynet.org/) and Orange County Rangers conduct outreach along the Santa Ana River Trail prior to anticipated flood events and dam discharge to ensure the safety of the people experiencing homelessness who live in the flood channel.
Water Quality	Streamside encampments can contribute bacteria and trash pollution to the water bodies. Parts of the watershed hold regulatory limits on how much bacteria can be in the water; trash is also regulated under the Clean Water Act. Both pollutants can cause harm to habitat, plants and animals, and people.	Downtown Streets Team (http://streetsteam.org/san-jose) out of San Jose in collaboration with Santa Clara Valley Water District has recruited people experiencing homelessness to help clean the Coyote Creek. The Clean Creeks, Healthy Communities project has restored recreational activity to the Coyote Creek area, as well as allowing for the return of natural riparian habitat.

Table 5.5-1. Priority Issues and Possible Models

Watershed Concern	Issue	Possible Model
Sanitation and Health	Without adequate bathroom facilities and water service in homeless encampments lead to compromised hygiene, which can pose a health risk. The summer 2017 hepatitis A outbreaks in San Diego and Los Angeles are examples of public health emergencies that can occur when people lack the ability to remain clean.	Lava Mae (https://lavamae.org) repurposes retired buses into showers and toilets on wheels to deliver hygiene and "radical hospitality" among homeless communities in San Francisco and Los Angeles.
Human Right to Water	People experiencing homelessness do not have access to "safe, clean, affordable and accessible water adequate for human consumption, cooking and sanitary purposes," which was declared a human right in California law in 2013.	The California State Water Resources Control Board provides a Human Right to Water Portal (https://www.waterboards.ca.gov/water_issues/programs/hr2w/), a website for the public to find information about California's effort to assure that every Californian has access to safe, clean and affordable drinking water. Legislation has been considered that would support this human right for all Californians. Additional work is needed at all levels of government as this California law becomes policy, and practice throughout the state. Homelessness presents significant challenges to enacting this policy.
Riparian Habitat and Recreational Areas	Waste from encampments ends up in the waterways, harming fragile habitat, stressing endangered species, and discourages recreation by many users. The risk of cooking and heating fires becoming uncontrolled is considerable.	Russian Riverkeeper (https://RussianRiverkeeper.org/) out of Sonoma County has instituted an innovative program to provide people experiencing homelessness with trash pickup service to help them keep the Russian River clean and build trust with the community.

5.5.3. RECOMMENDED POLICY STRATEGIES

Investigate and adopt appropriate policies related to the Human Right to Water.

It is law in California that all people have "a right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes." The work to implement this very broad policy remains underway in 2019, primarily at the State Board.

This pillar workgroup believes that a substantial majority of the existing and planned water and watershed management activities in the Santa Ana River watershed can be accurately described as fulfilling the goals of this policy. It is recommended that agencies and organizations evaluate how the existing provision of water and sanitation are worthy of acclaim considering the California policy, and where appropriate adopt language linking ongoing successes with attainment of the policy.

Alternatively, items needing improvement, as identified in this chapter and elsewhere in the OWOW Plan Update 2018, must be considered in light of the Human Right to Water policy. It is recommended that public agencies enact policies, and where appropriate ordinances, that serve to ensure the human right to water is achieved equitably and for all people in the watershed.

Set a policy of supporting regional efforts to alleviate homelessness.

The close alignment between water sector interests and the goal of ending homelessness through the housing first approach suggests the fruitfulness of cross-sector collaboration. It is recommended that the water and watershed management community find creative ways to support the development of local programs that effectively implement the housing first approach because without such efforts, the water sector cannot effectively meet its goals.

It is further recommended that water supply and sanitation agencies support efforts to meet the humanitarian needs of people experiencing homelessness who are not yet able to be placed in shelter. Water for drinking and washing are critical for human health, and all members of the community deserve access to water to avoid illness and death. The Pillar workgroup acknowledges this is a contentious recommendation, but if the disaster were an earthquake, caring for victims would not be debated.

Participate in point-in-time counts.

Annually, counties and cities take part in a Homelessness Point-in-Time Count (see Table 5.5-2), which derives data for the U.S. Department of Housing and Urban Development that helps allocate federal resources throughout the year. The agencies responsible for the Point-in-Time Counts seek volunteers to assist with the survey taking, and because water agencies are familiar with many of the stream-adjacent areas where people experiencing homelessness often camp, agency staff could be valuable partners for the social services departments. The time commitment is usually about 3 hours of training, and then 5–6 hours on the day of the count, once per year.

Table 5.5-2. Point-in-Time Homelessness Counts in Santa Ana River Watershed Counties

Area in the Watershed		2016	2017	2018
Riverside County	Sheltered	814	768	631
	Unsheltered	1,351	1,638	1,685
Orange County	Sheltered		2,208	
	Unsheltered		2,584	

Table 5.5-2. Point-in-Time Homelessness Counts in Santa Ana River Watershed Counties

Area in the Watershed		2016	2017	2018
Los Angeles County	Sheltered	12,173	14,966	13,369
	Unsheltered	34,701	40,082	39,396
San Bernardino County	Sheltered	696	687	675
	Unsheltered	1,191	1,179	1,443

Sources: Riverside County: Riverside County Department of Public Social Services (DPSS), Riverside County Homeless Count & Survey Report, May 2018; Orange County: OC Continuum of Care, 2017 Report prepared by Focus Strategies (Orange County only conducts PIT counts every 2 years, so no data is available for 2016 and 2018); Los Angeles County: Los Angeles Homeless Services Authority (LAHSA); San Bernardino County: San Bernardino County 2018 Homeless Count and Subpopulation Survey Final Report, March 2018, and 2016 report.

Consider and seek to minimize displacement.

The term displacement describes the process whereby residents in low-income communities get priced out by rising housing costs because of new investments in the public infrastructure of the community. It is a well-established challenge when seeking to improve infrastructure in communities that are overburdened that by so doing, the community can be disrupted, *displaced*. This is an unintended consequence; however, there are many ways the chances of displacement can be minimized.

There is little within the authority of water infrastructure agencies that permits direct efforts to minimize displacement. It is therefore recommended that water and watershed managers develop partnerships with those who have authority necessary to understand and minimize the potential for displacement in water infrastructure projects. This is particularly vital in the transition from septic to sewer in regions where septic systems are degraded or undersized, which is both a necessary effort to diminish environmental injustices and a potential source of displacement.

Ensure that communities can reach you.

The water and watershed management sector is crowded, with many overlapping jurisdictions. It is recommended that all water and watershed managers develop multi-lingual and consistent tools for community members to communicate with the agency. In the event a community member reaches the wrong agency, a culture of supporting them finding the right contact should be adopted. Community members can be wary of asking for help for a number of reasons, and a culture of supporting them regardless should be adopted.

5.5.4. BASIS FOR RECOMMENDATIONS

The California Water Code Section 79505.5 defines a disadvantaged community as "a community with an annual median household income that is less than 80 percent of the statewide annual median household income." California Water Code Section 13476(j) describes a severely disadvantaged community as one "with a median household income of less than 60 percent of the statewide median household income." DWR maintains a Disadvantaged Communities Mapping

Tool (https://gis.water.ca.gov/app/dacs/), which uses the American Community Survey data from 2010 to 2014 to reflect disadvantaged communities via census blocks, census tracts, and census places. Figure 5.5-1 shows which census tracts in the Santa Ana River watershed are designated by DWR as being either disadvantaged communities, or severely disadvantaged communities.

Using these census tracts as the basis for assessing need and developing projects remains the most effective way of complying with state policy. However, in the OWOW Plan Update 2018, relying on work of the ongoing Disadvantaged Communities Involvement Program, some communities have been engaged whose spatial definition is not created by a census tract. The best example is the collected group of people in the watershed experiencing homelessness. These people are a community of need, yet not defined by their spatial proximity. When considering water projects that have a nexus with homelessness, the community of people experiencing homelessness is a stakeholder in the process.

There are other regions of the watershed where, due to the pace of development or a lack of data, where low-income communities exist yet are not revealed by the underlying census data. Quail Valley, for instance, is a low-income community which does not appear in the Disadvantaged Communities Mapping Tool, yet an income survey was completed to verify that the community, lacking sufficient wastewater infrastructure, did qualify for assistance.

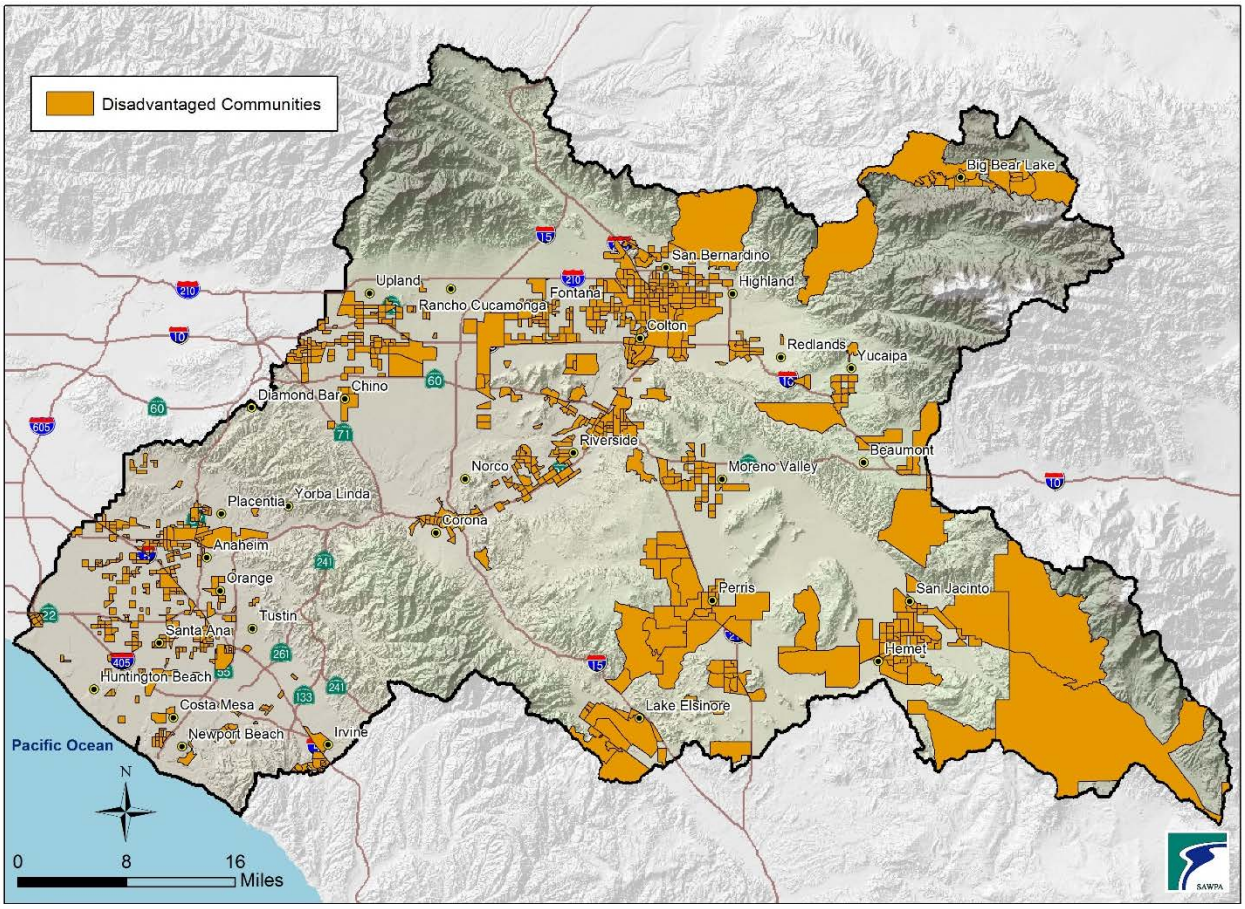

Figure 5.5-1. Disadvantaged Communities in the Santa Ana River Watershed

Table 4.2-3, Disadvantaged Communities in the Santa Ana River Watershed, describes all the cities and named unincorporated areas of the watershed that contain at least one census tract that qualifies as a "disadvantaged community"; Table 5.5-3 presents statistics regarding these communities in the watershed.

In most cases the challenges faced by members of disadvantaged communities result from historic disinvestment, systemic racism, environmental injustices, among other systemic challenges. Throughout this chapter are recommendations that can overcome injustices. As much as challenges are present in communities, so too many opportunities exist. In fact, most low-income and overburdened communities are necessarily resilient, which is itself an opportunity to support improvements.

Table 5.5-3. Community Statistics

County	Population (Aged above 5 Years Old)	Age	Percentage of Population 25+ Years Old with Advanced Degree (Associates, Bachelors, Graduate. or Professional	Median Household Income	Percentage of Individuals below Poverty Line	Non-White Racial/Ethnic Breakdown	Spanish-Speaking Household	Percentage of Population That Immigrated to America
San Bernardino	2,035,210	54.5% of population between 20 and 60 years old; median age 32.5 years old	27.1%	$53,433	19.5%	Asian: 6.3% Black: 8.9% LatinX: 49.2%	34%	21%
Riverside	2,189,641	52.4% of population between 20 and 60 years old; median age 34.5 years old	28.7%	$56,603	16.8%	Asian: 7.4% Black: 7.6% LatinX: 45.5%	33%	22%
Orange	3,010,232	56.1% of population between 20-60 years old, median age is 37.1 years old.	45.5%	$76,509	12.8%	Asian: 17.9% Black: 1.7% LatinX: 43.7%	26%	30%
Los Angeles	9,818,605	57.1% of population between 20-60 years old, median age is 35.6 years old.	37.2%	$56,196	18.2%	Asian:13.7% Black: 8.7% LatinX: 47.7%	40%	

Engage in best practices.

At times, community outreach is seen as a cursory notification for an upcoming event. For many water agencies, it may be conducted by sending a bill insert, or using an email blast or a website posting. These outreach methods should be customized to the needs of specific communities. It may be possible that English is not the best language for effective communication, and substantial cultural differences may also affect how messages are received. To become effective at communication, water and other public agencies must develop real and meaningful relationships with the communities they serve. These relationships must be about more than a particular project and should be nurtured and maintained even in the absence of a specific project or planning issue.

Residents should be engaged as early as possible to maintain their sense of ownership at every stage of the process. A participatory planning process—one in which all the stakeholders are involved—is often the most effective and inclusive way to work with community members. This process provides community ownership and support; information about community history, politics, and past mistakes; and respect and a voice for everyone. It also takes time, care, mutual respect, and commitment. To conduct such a process well, stakeholders must be identified, and communication techniques must be used that are specifically designed to reach them. Also, the process must be maintained over time, so momentum will not be lost. By implementing a planning process that meets all these requirements, it is likely that SAWPA can conduct successful community interactions that truly work and meet Disadvantaged Communities unique needs.

Build relationships.

It is important to maintain a sense of transparency and fairness while building relationships with community organizations and leaders, even if informal leaders or informal communities (homelessness, and others). It is critical to ensure relationships do not become one-sided or extractive. Telling local leaders why you're interested in their expertise and how you plan to incorporate any feedback and knowledge shared and be prepared to offer information and (potentially) assistance in return. In short, make sure that community organizations' and leaders' time is valued, and that they have clear reasons to build relationships with you in good faith.

See residents as experts.

Residents should be seen and treated as local experts: recognize that people whose everyday, long-term experiences with how water works in their communities have access to knowledge that water agencies and other "outside" experts don't have. As such, residents can be invaluable sources of information on what has and hasn't worked in the past, how new projects or initiatives might be received, and how success should be measured. Treating residents like local experts means balancing information sharing on both sides. For example, meetings might be organized as "listening sessions" that allow residents to speak first and encourage broader, more in-depth discussion of residents' ideas and feedback, rather than formal presentations with resident questions at the end.

Ensuring that community expertise is welcomed to planning processes during the initial stages is a critical step in producing long-term relationships and trust.

Understand barriers to engagement.

Effectively engaging with residents of disadvantaged communities requires understanding the barriers that can hinder their participation in government processes. Apathy is not a legitimate explanation for why barriers exist. There are socioeconomic disparities that impact participation, for instance age, income, or education. Racial disparities also impact participation and are intertwined with socioeconomic disparities. The most direct way to assess barriers is to ask local community organizations and leaders about what has and has not worked in the past. Be open to being surprised; barriers to engagement and participation may not be what you think they are.

Common barriers include inaccessible outreach events (i.e., location and time of meetings can be prohibitive factors as can financial cost of participation), language barriers, lack of civic knowledge and skills (e.g., knowing the "right" authority to reach out to, or what a special district is), and personal sense of political efficacy (i.e., feeling like they can effect change).

Research also shows that public officials have difficulty engaging with less affluent residents. Some specific barriers that public officials encounter in successful engagement are the standard format of public engagement (i.e., the typical public meeting) or having limited skill in engaging with individuals who are less likely to engage (e.g., persons of color, low-income, elderly, young, and mobile).

Engage in culturally and linguistically appropriate ways.

All spoken and written materials should be available in the full range of languages spoken and/or read in the community. Whenever possible, demonstrate awareness of local norms for holding similar meetings and events: What do residents expect in terms of meeting length, format, and formality? Which local leaders do people defer to? Are there any particularly sensitive topics that should be treated with extra care? It is important to be mindful of when a conversation becomes so technical that it is no longer accessible to people who aren't water professionals, or who are simply new to learning about water issues. This happens most commonly when speakers rely on acronyms or technical terms that aren't intuitive to outsiders, or assume that certain aspects of how water management works are already known to everyone in the room. Pausing to explain individual terms and concepts without judgment is a good first step; taking care to speak in generally understandable language is even better.

Make the process accessible.

Water and watershed management is extremely complicated and crowded with jargon and strangely used words. At the end of the day, though, the work done on behalf of a community must be understood by the community. Consider the apocryphal quote of Einstein "if you can't explain it simply, you don't know it well enough." Logistics are involved here too. Community

material and meetings need to support all levels of literacy and variety of languages spoken in a community. Meetings themselves must be at times and in places that allow all to participate without worry or discomfort. Food and child care should be provided. Child care that engages kids separately in the meeting content can be a bonus effort that builds goodwill, and likely strong project content. Meetings should be held at times that are accessible to participants with a variety of work and home commitments, and in spaces that can be easily reached via public or private transportation. Hosts should ensure that the meeting space itself is as comfortable as possible (sufficient parking and bathrooms, easy to move through, no distracting ambient noise or lighting, etc.) Any presentations should also be made as accessible as possible, with slides and text available in hard copy ("access copies"). All spoken and written materials should be available in the full range of languages spoken and/or read in the community.

In situations where members of a community are unable to attend meetings, efforts must be made to send staff to them. People experiencing homelessness, in particular, may be unable or unwilling to leave their material goods and pets in order to participate in a community event.

Acknowledge the importance of good communication and follow-up.

Continued communication and follow-up with residents is critical for maintaining transparency, trust, and accountability. Good relationships are built over time. This is a process that involved residents seeing evidence that their participation is taken seriously and treated with respect. Follow-up can include continued updates on ongoing projects (including evidence of how residents' feedback has been incorporated), as well as simply checking in to repeat residents' concerns, and verify that they've been heard and recorded as their speakers intended. Follow-up can happen both immediately and at different time in the future. In a meeting, for example, collaborative note-taking strategies can be used as a relatively instant feedback mechanism to check that all participants are on the same page.

Maintain the dignity of individuals.

All members of the public should be respected and made to feel welcome to attend and engage in public meetings, regardless of their age, gender, race, ability, educational level, or housing status. Public meetings must be made known to, and be accessible to, homeless community members and the leadership within the homeless communities. As such, hospitality and sanitation (and likely transportation) should be provided, so as to minimize or eliminate the stigma of appearing in a public setting.

Focus on specific infrastructure needs.

The process which created the OWOW 2.0 Plan identified some of the most common challenges facing small and rural disadvantaged communities, including failing septic systems, social or institutional isolation, language barriers, flood risk, and lack of financial or human resources. The OWOW 2.0 Plan

asserted that "the water sector and its key stakeholders recognize proposed [disadvantaged community] water project needs and engage these communities early in the process."

The OWOW 2.0 Plan identified common infrastructure challenges faced by disadvantaged communities in the watershed:

- Limited funding/funding sources
- High infrastructure costs
- Poor water quality
- Limited water supplies
- Failing septic systems/undersized treatment facilities
- Increasing demands on existing water resources
- Flooding or drought
- Inadequate community support
- Limited project communication
- Poor groundwater quality/cost of groundwater cleanup

There are legitimate water quality issues that impact low income and Tribal communities throughout the watershed, but there are perceptions of unsafe water where water supplies are clearly safe for public consumption reflect a different problem. Ensuring all communities have information they trust and understand, as well as the financial and technical resources, and administrative and regulatory policies they need to make informed decisions that can result in benefits to all members of communities within the watershed.

As the OWOW Plan Update 2018 is implemented, and calls for projects seeking grants are completed, efforts to build, repair, replace, or enhance infrastructure that meets critical needs in disadvantaged communities must be prioritized. This prioritization may be forced by a particular funding opportunity. Instead, watershed-wide efforts to identify, plan, and implement specific projects must remain a priority of all water managers in the watershed.

CASE STUDY: Quail Valley

The community of Quail Valley is located in southwestern Riverside County, immediately north of Canyon Lake. Eastern Municipal Water District (EMWD) provides water for the community. All residences within the community are on individual septic systems and there are presently no facilities for collection and conveyance of wastewater from the project area to the EMWD regional treatment facility.

Failing septic systems in Quail Valley have resulted in polluted water in the community and in downstream Canyon Lake. The Riverside County Department of Environmental Health observed in its February 2005 study that there are widespread instances and evidences of septic system failures in the Quail Valley area. The surfacing groundwater in the Quail Valley area also shows high pathogenic contamination.

In 2005, EMWD hired PBS&J to prepare a study to identify and evaluate the collection system within Quail Valley. The objective of the study is to find a feasible solution to the problem of septic system pollution. Considering the various constraints, the conventional gravity and the combination sewer were the most feasible alternatives to be considered for the design of the sewer system for Quail Valley.

https://www.emwd.org/about-emwd/news-information/reports-plans-and-studies/quail-valley-sewer-improvements-alternative-study

One example of this work from earlier phases of the OWOW Program is that of Quail Valley, in Riverside County. This region is characterized by low-income communities whose homes have undersized and failing septic systems. Eastern Municipal Water District has taken the lead developing solutions, using multiple lines of funding and many partners.

Make use of Technical Assistance programs from the state.

While researching state funding for disadvantaged communities in California, California State University discovered that there were inconsistencies in the regulatory frameworks that qualified communities for these funding programs. During 2017 and 2018 they worked with multiple technical assistance programs to demonstrate the dissimilarity and provide comprehensive services to the most vulnerable populations in the state. For example, funds from the California Energy Commission could assist with electrical engineering, the Strategic Growth Council works with air quality, DWR taps into the social sciences to provide community outreach and engagement, and the State Water Resources Control Board funds hydraulic and civil engineering through their Technical Assistance program.

California State University has an enormous capacity across its 23 campuses, allowing it to occupy the unique position of knitting programs together and meeting the nuances of multiple technical assistance efforts, and the local contexts for many communities.

Consider all communities of the watershed.

Low-income residents of the watershed live in both small rural and mountain communities, suburban communities, as well as dense urban areas. The diversity of challenges is matched to these diverse landscapes. In the smaller communities there often is insufficient need to benefit from economies of scale necessary to build and maintain adequate water and wastewater systems. Also, many of these communities lack the resources and in-house

expertise necessary to apply for grants and loans to help make water infrastructure projects more feasible. They also often lack access to the technical expertise to determine the best project alternative to appropriately plan and manage long-term operations and maintenance needs.

It is exceedingly rare in the Santa Ana River Watershed that a residence does not receive clean and safe drinking water at the tap. In places where this is not true or is jeopardized by insufficient funding for operations and maintenance, or system upgrades, the region must focus on this goal.

The insufficiency of septic systems in disadvantaged communities is a more frequent challenge in the watershed, and the impacts upon the home or business owners, as well as the environment, much receive continued focus and effort throughout the watershed. And, as is described below, these efforts must consider and seek to diminish the chance of displacement and gentrification.

Flood risk management, too, is robust in the watershed; however localized flooding can impact private property, transportation, and safety. Significant opportunities exist for solving localized flooding through discreet projects that achieve multiple benefits.

Lastly, low-income communities often are challenged to develop and implement improvements due to a lack of human or financial capacity. Exploring and developing new financial models to support communities must be a component of regional planning and collaboration.

Respect the Human Right to Water.

The implications of the Human Right to Water policy in California are at the time of this plan still being developed. It is chiefly the responsibility of the State Water Resources Control Board, which has created a web portal that describes their work and their plans.

This policy is likely to become the source of more activity in California in the future. It will be important to develop strategies for describing how, in the Santa Ana River Watershed, that for the most part these rights are achieved. Equally important, however, will be pursuing the analysis of where these rights are not being supported sufficiently, and engage policy, programs and projects that extend these rights to all people in the watershed.

In the context of clean drinking water, there are opportunities to support new projects. The State Water Resources Control Board has funding available through grants and loans from the Drinking Water State Revolving fund to assist public water systems in financing some or all of the cost of preliminary activities necessary to construct a drinking water improvement project including, but not limited to, legal costs, studies, planning, preliminary engineering, and design for a project. Specifically, there are limited principal forgiveness loans, as well as grants for publicly owned systems serving disadvantaged communities.

Eligible applicants include publicly owned community water systems (e.g., counties, cities, districts); privately owned community water systems (e.g., for-profit water utilities, non-profit mutual water

companies); non-profit or publicly owned non-community water systems (e.g., public school districts); and community water systems created by the project.

Water agencies can apply for funding for planning/design and construction of drinking water infrastructure projects, such as treatment systems, distribution systems, interconnections, consolidations, pipeline extensions, water sources, and water meters. Specific projects could be focused on providing clean water to disadvantaged communities, including the homeless.

Consider needs related to homelessness.

In a 2015 report entitled "Ending Homelessness for People Living in Encampments," the U.S. Interagency Council on Homelessness notes that "the presence of encampments in our communities is an indicator of the critical need to create more effective and efficient local systems for responding to the crisis of homelessness," and "forced dispersal of people from encampment settings is not an appropriate solution or strategy, accomplishes nothing toward the goal of linking people to permanent housing opportunities, and can make it more difficult to provide such lasting solutions to people who have been sleeping and living in the encampment." It recommends "a thoughtful, coordinated, and collaborative plan and process to ensure that people can be linked to appropriate housing options and that the presence of encampments in the community can be resolved."

The U.S. Interagency Council on Homelessness's recommendations have implications beyond ending homelessness. Creating systems that end unsheltered homelessness by placing people in permanent, affordable housing as an immediate response to their crisis also connects them to our water infrastructure. Therefore, Housing First increases access to water for some of our most vulnerable and economically disadvantaged residents who struggle daily to meet their survival level water needs—a strategy that aligns with the goals of the water sector. And because the housing first approach is the only proven solution to homelessness, it is also the most effective way to permanently remove encampments that contribute to pollution in our water channels. Consistent with the mission of the water sector, it improves the water quality for all.

The crisis today results from policies that failed to (1) provide sufficient affordable housing to end homelessness and (2) recognize and respond to the water needs of people living in unsheltered locations. For individuals and families living in unsheltered locations, the river system of the watershed is a harsh place to be homeless. A regional shortage of affordable housing and emergency and transitional shelter forces more than half of people experiencing homelessness to live in unsheltered locations. As documented in the Policy Advocacy Clinic, University of California Berkeley Law's 2015 report, *California's New Vagrancy Laws: The Growing Enactment and Enforcement of Anti-Homeless Laws in the Golden State*, unsheltered people become targets of laws that make it a crime to sleep in public.

Who are the unsheltered people experiencing homelessness, and how do they survive?

There is not consistent data about who and how many people are experiencing homelessness in the watershed. A survey conducted by CityNet under contract with Orange County, in early 2018 at a burgeoning encampment of people along the river trail in Orange County suggest that they are among our most disadvantaged residents. More than half of the homeless individuals surveyed reported a disability and/or health condition; 42% reported a mental health condition. Many people with disabilities cannot walk long distances to access water, and some resort to drinking and cleaning dishes with contaminated water that flows from pipes into the Santa Ana River. They attempt to sanitize the water with bleach, but report intestinal problems, sores on in their mouths and on their bodies, and other ailments associated with a lack of clean water and hygiene, such as cellulitis. Most find that local businesses and other water sources cut off access when traffic for water becomes visible.

Supply the basic need for water.

According to the standards set by the World Health Organization (WHO), people in emergencies require about 5 gallons of water per capita per day, and those experiencing long-term displacement need around 13 gallons of water per day. For people living in unsheltered encampments in the Watershed, poor access to water compounds the stressors of homelessness to create an alarming humanitarian crisis. For example, Orange County has installed one water-filling station to provide water to a 2-mile encampment of over 400 individuals. The station can accommodate one small bottle at a time, and when rigged to accommodate larger containers, can fill a 5-gallon jug in 5.5 minutes. Even if people used the filling station non-stop 24 hours a day, it could only accommodate the immediate minimum water needs for survival for less than half of the encampment.

Address the impact of homelessness on water quality.

It is considered a well-established truth that homeless encampments affect the quality of water for all communities, however there is no conclusive research that encampments are point sources of pollution. It is also possible that on a per-capita basis someone experiencing homelessness may be no more impactful than someone who is housed. Regardless of concrete data, there exists the logistical reality that humans create waste and that waste needs to be appropriately managed. The notion that provision of services "enables" people living in encampments to remain homeless or can encourage criminal activity is understood to be false. Local municipalities and counties however react to that notion by showing reluctance to provide trash collection services, shower facilities, and even restrooms to encampment areas. Without these services, and without legal alternatives to unsheltered people experiencing homelessness, encampments become, from the perspective of water quality control policy, unpermitted sources of discharge of trash, human waste, and other refuse into water channels, potentially causing ecological damage like a factory dumping chemicals.

CASE STUDY: Upland Right-of-Way Food Gardens

In the past, the City of Upland denied front-yard urban food gardens on the grounds that leaded gas would pollute the food grown. There is now no lead in gasoline. Staff at the city believed urban food gardens would decrease the value of adjacent homes. In fact, now urban food gardens have been proven to increase the value of the home and the adjacent community. Even land developers like Lewis Homes allow urban food gardens and provides land to do so on their properties. I know because the Upland city water manager Jeff Bloom believed in urban food gardens and approved them 10 years ago. My water wise urban food garden on the city parkway in front of my house uses less than 50% of the water used to grow my grass. Research on my Upland water wise food garden was featured at the Sacramento, Calif. Dept. of Natural Resources Climate Change College with Dr. Amber Paris.

Over the past 10 years I have had my urban water wise food garden grow hundreds of pounds of carrots, strawberries, potatoes, tomatoes and other vegetables that have been harvested for and by my local Upland community for free. And there has never been any vandalism. This is the eco-psychology of urban food gardens as mentioned by the Washington, DC-based Lester Brown Academy of Sustainability. Food is grown locally with no carbon emissions and is there in an emergency like an earthquake.

—Dr. Robert Kamansky

Engage with unsheltered people to understand needs.

Unsheltered people are among the most politically voiceless of any marginalized and disenfranchised group. Engagement with unsheltered people must support their needs and must be sensitive to their many challenges. Civic engagement among unsheltered people is low, for example, because individuals worry about leaving their property unattended to participate in events or meetings. People are often wary of police, and for that matter, any public official, as cities and counties often target encampments with enforcement of public nuisance laws such as sleeping in public places—laws that unsheltered people cannot possibly comply with given the extreme shortage of shelter and affordable housing in the watershed. Moreover, homelessness entails a constant struggle for survival, putting civic engagement low on the list of priorities.

Sensitivity to these challenges requires engagement that supports the specific needs of people living in encampments. Meetings could take place in the encampment, for example, so that people can participate without leaving their property. Alternately, volunteers could watch property while unsheltered individuals attend meetings. Any plan should minimize police presence when possible to avoid traumatizing people. The plan could compensate people experiencing homelessness for their time, recognizing that participation draws them away from critical survival activities. Leaders in homeless encampments may emerge and should be cultivated. At the same time, goals should include building trust and rapport with as many unsheltered people as possible, as needs and perspectives within homeless encampments may vary. Such engagement and participation requires on the ground relationship building.

Agencies want to help, but aren't sure how.

Individuals certainly want to help people experiencing homelessness and resolve the overarching problems, but agencies may not have such a priority in their mission. Agencies are not structured or are unable to justify helping. The argument that people experiencing homelessness are uncontrolled sources of water pollution is a case in point. The argument appears to be an effort to divest the municipalities of responsibility. Yet people experiencing homelessness are also city residents. Other city residents are provided with sanitation and water at a fee. Without these services, housed residents could also be (even greater) sources of pollutants. Housed residents get these services because there is a structure for the utility to be compensated. This isn't necessarily the case for people who are homeless.

One solution is to make affordable housing available. This could be done in the short term with more shelters and in the long term with zoning and building code modifications and investment in affordable housing at all levels of government. The stigma of being homeless or just plain poor makes both solutions politically difficult to sell to the housed community. The housed community may want to help, but they don't want to bear the negative consequences, even if those consequences are just a matter of perception.

Because much of the long-term solution set for homelessness is beyond the reach of water and watershed management agencies, it is the short-term and emergency response that is a more appropriate place for agencies to engage. Ensuring health for people and the environment undergirds the mission of most public water agencies, and the challenge of producing those outcomes when so many people are living unsheltered in the watershed suggests a critical role for watershed management.

Mitigate displacement of sheltered and unsheltered people.

Many members of disadvantaged communities are housing insecure. As discussed earlier, some may be unsheltered. Others may be sheltered persons living on the edge. Some may be owner-occupants barely scraping by; others may be renters with absentee landlords. Rental units in particular may be substandard, and in some cases unpermitted—but nonetheless are the only housing tenants could afford.

Multiple families may be crowded into single units as the only alternative to having no roof over their heads at all. Many tenants may be enduring poorly functioning septic systems, with stench and black-water common occurrences. The vulnerability of residents within disadvantaged communities may be heightened due to immigration status (which also increases fear of speaking up to improve unjust living conditions).

Under these circumstances, water infrastructure improvement projects in communities identified as disadvantaged run a heightened risk of triggering significant displacement of persons who are

currently sheltered. Critical analysis published by the Property and Environment Research Center (http://www.perc.org/blog/environmental-justice-or-gentrification) has shown that:

> Residents who moved into dirtier communities tend to place a higher priority on low-cost housing than on the environment. Cleaning up the environment may increase those costs by more than their willingness [or ability] to pay, as wealthier households bid up property values. As poor residents are more likely to rent their housing, they stand to lose from these increased housing costs.

Gentrification and displacement are public health issues. According to the Centers for Disease Control and Prevention, "displacement has many health implications that contribute to disparities among special populations, including the poor, women, children, the elderly, and members of racial/ethnic minority groups" (https://www.cdc.gov/healthyplaces/healthtopics/gentrification.htm). A 2015 report by the Prevention Institute and HEALU Network reveals: "The forced, involuntary, and "serial displacement" of communities is a serious concern that can widen health disparities and health inequities. Displaced residents are more likely to be low-income people of color" (https://www.preventioninstitute.org/publications/healthy-development-without-displacement-realizing-vision-healthy-communities-all).

People who are living unsheltered within the developed area, open spaces, or within riparian or flood management corridors also can be displaced by water management or water projects. Displacement in these situations is just as difficult for the people impacted, though it is an entirely different challenge for the managers to mitigate than in the case of situations where dwellings are impacted by displacement pressure. Elsewhere in this chapter is discussion of how to adjust water management practices to provide more effective multiple benefit programs that support people experiencing homelessness while accomplishing sustainable water management.

Given the realities described above, it is critically important for water agencies together with community leaders and other key stakeholders to weigh the potential unintended negative consequences of a water infrastructure project, and to develop strategies to mitigate the risks of displacement of sheltered residents associated with participation in, and completion of any project.

While an integrated policy on displacement is yet to be established by agencies in the watershed, "The People's Plan" by the United Neighbors in Defense Against Displacement (UNIDAD) coalition in South Los Angeles can be a valuable resource for coordinating and enhancing displacement-mitigation efforts. Similar to the engagement strategies laid out in the OWOW Plan Update 2018, "The People's Plan" supports listening sessions that prioritize the ideas offered by community members and highlights the importance of providing equitable language access to all community members. By bringing potentially impacted communities into the discussion from the get go, collaborative efforts may envision and, subsequently, avoid policy decisions that would typically result in displacement. Additionally, the plan emphasizes the importance of environmental justice

clauses in city and community plans, illustrating another preventive remedy for unforeseen and potentially devastating displacement consequences.

The People's Plan identifies specific incentives that should be prioritized when planning new housing developments. In the pursuit of creating a net gain of affordable housing opportunities, UNIDAD recommends:

- Creating an incentive program that covers every parcel designated for increased density
- Permitting higher allowable density increases for mixed-income and 100% affordable housing developments
- Creating a Transfer of Floor Area Ratio (FAR) Program that would grant 100% affordable housing projects 6:1 FAR and allow those developments to sell unused FAR to receiver sites (mixed-income developments that have already utilized an incentive program) or to an FAR bank established by the city
- Enhancing opportunities for affordable housing developers to acquire property
- Preserving existing affordable housing through the creation of an affordable housing inventory, submission of annual reports on existing affordable housing, and prevention and recovery of lost affordable housing

Finally, the People's Plan identifies actions that may be taken to enhance and protect the rights of low-income tenants. The People's Plan advocates for aligned coordination between housing departments, city agencies, and tenant rights organizations, reemphasizing the idea of cross-stakeholder integration from the OWOW Plan Update 2018. It also recommends creating a Low-Income Renter Advisory Commission to oversee the creation and implementation of Community Plans.

It is recognized that typically, larger questions of displacement fall outside the traditional responsibilities of a water agency. However, water agencies are urged to embrace opportunities to engage in new collaborative efforts where entities who are empowered to work towards diminishing displacement can become partners to water infrastructure improvement projects.

Below is described a series of specific recommendations for how to engage with issues of displacement during water infrastructure projects:

1. Develop and use a comprehensive tool to assess the risk of housing displacement of current residents of a given disadvantaged community where the need for a water infrastructure project has been identified (see The People's Plan for more details:
2. Identify and adopt concrete win-win strategies that provide financial relief to both owners and tenants within each project area community. For example:

a. If a rental property owner will be able to improve private property using grants or loans, that during the period of the loan or for a set period of the grant, that owner be prevented from increasing rents at a rate higher than the Consumer Price Index. This will permit the private property owner to achieve the enhancement, without also driving the displacement of current tenants.

b. If the value of any privately held property is improved through public investment in a water infrastructure project on publicly held property, that water agencies support efforts to adopt policies whereby, over a minimum of 10 years, owners and managers of residential and/or commercial rental units calculate any rent increase to be equal to no more than the current rate of inflation as determined by the Consumer Price Index.

c. In the event a given rental or owner-occupied unit is found to have significant code violations, it is recommended that water agencies support the adoption of policies whereby owners and property managers are extended amnesty in exchange for

CASE STUDY: Lack of Access to Water for People Experiencing Homelessness

Lack of water for drinking and hygiene is often a major public health crisis in homeless encampments. At one homeless encampment in Orange County, people reported dehydration, lack of water to take with medication, health issues such as urinary tract infections, sores that would not heal, recurrent cellulitis requiring hospitalization, insect bites that turned into serious infections, and respiratory conditions such as asthma.

In the beginning of the summer of 2017, the residents of the one 2-mile encampment of over 400 people along the Santa Ana River Trail worried daily about water. Lacking access to any public water facilities, save a single broken water fountain, some people, especially those with mobility impairments, collected water from the pipes that drain into the Santa Ana River, which they used for drinking and washing dishes. Some cleaned the water with drops of bleach, and many complained of mouth sores, diarrhea, and other intestinal ailments. Other residents of the encampment spread out into the local neighborhoods, drawing water from spigots on the exterior of businesses, taking ice from outdoor ice machines at local motels, using drinking fountains at local transportation hubs, and using restroom facilities in local fast food restaurants. Invariably, when traffic to obtain water became visible, the local businesses created barriers to access, and people living in the encampments adjusted. When the businesses removed the handles to exterior spigots, for example, people obtained square keys to release the water. When businesses hired security guards, people learned how to evade detection.

Overall, people reported increasingly tenuous, inadequate access to water as the summer wore on, and temperatures at the riverbed rose. Local charities sometimes appeared to hand out bottles of water, which people hoarded, given the unpredictability of the source. As one woman observed, "You never know whether they will show up, or if they do, if they will make it as far as your tent before they

bringing units up to code. Additional incentives could be provided through development of options for low-cost financing.

CASE STUDY: Lack of Access to Water for People Experiencing Homelessness (*continued*)

run out of water." Often, people survived on the bare minimum. As one man reported, "I can survive on 2 [5-gallon] jugs a day, but that means I don't wash my dishes or clean out my tent. Then, it starts to create a whole different set of problems."

In desperation, residents of the encampment rigged a communal shower by attaching a hose to the piping on a water valve and building a stall around it for privacy. People walked for miles to access the shower and fill 5-gallon jugs, buckets, and crates with water, using dollies, wagons, strollers, backpacks, bikes, and wheel barrels for transport. Some became expert at balancing 5-gallon jugs of water on their heads. Lines at the "shower" sometimes stretched for hours.

Reporting problems with runoff, local officials soon dismantled the shower and installed a cage over the valve to prevent further access. Orange County repaired the broken water fountain and installed a bottle filling station next to it, which serviced one small bottle at a time. People filled their larger vessels by attaching bicycle tubing to the water outlet and inserting the other end of the tubing into the jugs. It took over 5 minutes to fill one 5-gallon jug.

The World Health Organization estimates that, at minimum, people need about 5 gallons of water per day for domestic uses, including drinking, cooking, and personal/domestic hygiene. If the estimate includes washing clothes and cleaning the home—necessary for long-term encampments—the amount of water needed increases to about 13 gallons per day. These estimates do not include water used for toilet facilities. We estimate that the filling station could meet the bare minimum needs of around half of the encampment residents.

Orange County also funded a program that handed out bottles of water to people at the encampment. While helpful, many people reported that they generally received around one or two bottles a day—an insufficient amount to meet their daily water needs.

People adapted to the water shortage by taking "bird baths"—that is, they splashed bottles of water over themselves in an attempt to keep clean. Many tried to stay clean with wet wipes or rubbing alcohol. Yet, even if they managed to shower daily, people said it was impossible to stay clean. Dirt and dust covered them within an hour of showering. Shade was a scarce resource, so they became sweaty and dehydrated, making it even more difficult to stay clean.

The encampment contained one public restroom with four stalls that was open during daytime hours. Most people lived on the opposite side of the river, and many said the restroom was too far away to use. Without access to toilets, many used bedpans in their tents and then discreetly emptied their human waste along the riverbed. Some fashioned makeshift septic tanks inside their tents.

—Eve Garrow, PhD

5.5.5. CONTRIBUTORS – DISADVANTAGED COMMUNITIES

ROLE	ORGANIZATION
Co-Chairs	
Gil Navarro	San Bernardino Valley Municipal Water District
Megan Brousseau	Inland Empire Waterkeeper
Contributors	
Alyce Belford	San Bernardino County Behavioral Health
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5.6. INTEGRATED STORMWATER MANAGEMENT

The Integrated Stormwater Management Pillar is the new name for what was called Stormwater: Resource and Risk Management in OWOW 2.0 Plan. The members of the Pillar are primarily the same stakeholders and agencies that participated in OWOW 2.0 Plan, including the flood control districts for the three counties: Orange County Public Works, San Bernardino County Flood Control District (SBCFCD), and Riverside County Flood Control and Water Conservation District (RCFCWCD). While integrated stormwater management considers all aspects of water resources management from a regional or systemwide perspective, the underlying assumption of the Pillar members is that it would always include flood hazard mitigation and water quality improvement.

First, and foremost, integrated stormwater management would manage rainfall runoff as a valuable watershed resource rather than something to be safely conveyed to the ocean as quickly as possible. Secondly, the flood control districts also have water conservation as an integral part of their mission, so they are institutionally organized to achieve OWOW's goal of strengthening the link between flood protection and water conservation. Finally—and this is a new recommendation for the OWOW Plan Update 2018—through floodplain management, the flood control districts could assist in the preservation of areas for open space, habitat, and natural hydraulic function.

5.6.1. RECOMMENDED MANAGEMENT STRATEGIES

Encourage water operators to survey their inventory of assets as part of their stormwater resource plans (SWRPs) and identify those that are suitable for increasing stormwater recharge and/or mitigating dry-weather discharges.

On August 28, 2014, the California State Legislature passed SB 985, amending the Stormwater Resource Planning Act. The act requires SWRPs in order to receive grants for stormwater and non-stormwater runoff capture projects from bond acts approved by the voters after January 1, 2014. SWRPs are to list and prioritize in a quantitative manner projects designed to capture stormwater for potential future use and provide multiple benefits to maximize water supply, water quality, and environmental and other community benefits. Therefore, these projects will also have the benefit of reducing the pollution stormwater carries to receiving water bodies, which in turn can assist agencies with compliance with applicable MS4 permits and total maximum daily loads.

Guidelines for SWRP were adopted by the State Water Resources Control Board (State Board) in December 2015. The Guidelines are used by the State Board and other bond fund-dispensing agencies to determine whether an adequate SWRP has been prepared before it grants funds for stormwater and dry-weather runoff capture projects. The State Board indicates that an entity may have existing plans and agreements that are functionally equivalent to an SWRP.

Through a public process, an SWRP identifies projects and programs that emphasize the link that is a goal of the OWOW Program: stormwater as a resource. The planning process for an SWRP fosters the kind of integrated stormwater programs that are focus of this section.

At present there are two adopted SWRPs in the Santa Ana River Watershed (watershed): The Orange County SWRP and the Chino Basin SWRP. These plans were based on other existing plans and agreements. Showing the foresight of some of the agencies in the watershed, the Chino Basin SWRP is primarily based on the Optimum Basin Management Program that was first adopted in 2001.

Encourage local jurisdictions to identify floodplains within their jurisdiction that have habitat or have the potential for habitat restoration or for groundwater recharge.

Well-functioning floodplains provide habitat for a significant variety of plant and wildlife species and provides for natural reduction of flood flows. Flooding can recharge groundwater basins, improve water quality, and control erosion. Development in floodplains can permanently alter natural floodplain functions, destroy habitat of sensitive species, and reduce the beneficial connections between different types of habitat and adjacent floodway corridors. Wildermuth Environmental Inc. (2000) studied the effect of urbanization on the Chino Basin. The total loss due to urbanization and concrete-lined facilities was estimated to be on the order of 15,000 AFY. Therefore, the identification of floodplains that are still in their natural state could directly lead toward the OWOW Program's goal of preserving areas for open space, habitat, and natural hydraulic function (DWR and Corps 2013).

Encourage a survey of existing streams that have been adversely impacted by erosion from new development. This survey could be used to identify future streambed restoration programs.

The impacts of new development on watercourses and floodplains is not limited to the reduction of infiltration or destruction of habitat. A significant impact is the change in the flow regime, which often causes erosion, or hydromodification, in downstream watercourses. In response to these impacts, the National Pollutant Discharge Elimination System (NPDES) permits for the three counties prescribe hydromodification mitigation for new development and required the counties to develop hydromodification susceptibility maps. Yet, the adverse effects remain from all the development that occurred before the NPDES permits. The management recommendation is to identify those areas. The survey could be used to identify future stream restoration projects.

5.6.2. BASIS FOR RECOMMENDATIONS

Existing SWRP – Orange County

The Orange County SWRP (OC SWRP) is a functionally equivalent document that has been prepared by OC Environmental Resources per the requirements of SB 985 (County of Orange 2017). Four primary significant planning efforts were used for functional equivalency to meet the SWRP guidelines. These include (1) the 2013/2014 Reports of Waste Discharge; (2) Integrated Regional Water Management (IRWM) Plans for North, Central, and South Orange County; (3) Watershed Infiltration and Hydromodification Management Plan mapping tools; and (4) the South Orange County Water Quality Improvement Plan (WQIP) (OCSP 2018). In addition to meeting the SWRP guidelines, these four primary documents also provide the basis for project identification and prioritization.

The Reports of Waste Discharge were used to establish the "state of the environment" in Orange County watersheds. When the new Santa Ana Permit is adopted by the Santa Ana Regional Water Quality Control Board (Regional Board), it will require the development of watershed management plans for the four primary watersheds in the Santa Ana Region.

Orange County uses the required WQIP in South Orange County as part of its SWRP. The plans adopted in this area, which is not in the Santa Ana River Watershed, implement new development management programs to improve water quality and reduce hydromodification. Associated with it are the Watershed Infiltration and Hydromodification Management Plan, which identifies soils and areas susceptible to erosion. The WQIP has identified strategies such as watercourse rehabilitation to reduce erosion and improve water quality, while also enhancing aquatic habitat. The Watershed Infiltration and Hydromodification Management Plan spatial analysis can be used to identify locations for such rehabilitation and enhancement sites. Development of plans similar to this in the watershed is one of the recommendations of this Pillar.

Project identification and prioritization in the OC SWRP is for implementation and funding through the State Board's Proposition 1 Storm Water Grant Program; however, the framework established for prioritization will apply to stormwater projects seeking funding through any applicable State Bond financed grant programs per SB 985. Project prioritization is based upon water quality constituents of concern; opportunities for infiltration or capture and use; and groundwater replenishment (where possible). Goals for identification and prioritization of projects were drawn principally from the South Orange County WQIP, Report of Waste Discharge State of the Environment Reports for the portions of Orange County that are regulated by the Santa Ana and San Diego Regional Boards (which each are responsible for sections of Orange County), and IRWM Plans. All projects are prioritized according to the OC SWRP Management Objectives described in Table 5.6-1.

Table 5.6-1. Management Objectives and Project Objectives

Management Objectives	Project Objectives
Improve Water Quality	• Address NPDES and TMDL constituents of concern through nonpoint-source control • Increase infiltration and/or treatment of runoff to address WQIP priorities—indicator bacteria and/or nutrients • Decrease or eliminate dry-weather flows to reduce conveyance of pollutants to receiving waters and bacterial regrowth
Increase Water Supply Reliability and Efficiency	• Address unnatural water balance from urbanization through water conservation • Creation of new water supply through beneficial use of stormwater • Enhancing local water supply reliability through groundwater recharge

Table 5.6-1. Management Objectives and Project Objectives

Management Objectives	Project Objectives
Improve Flood Management	• Address channel erosion and geomorphic impacts from flood events • Decrease flood risk by reducing peak flow (i.e., control system flashiness)
Protect and Enhance Natural Resources and Community Benefits	• Habitat protection or enhancement • Erosion control to reestablish riparian habitat • Sediment and flow control to return to the more natural condition • Public education and outreach • Provision of new or enhancement of existing urban recreational use areas

Source: Table reproduced from OC SWRP (County of Orange 2017).

For further detail on the OC SWRP, please refer to http://www.ocwatersheds.com/programs/ourws/oc_stormwater_resource_plan.

Existing 2016 Chino Basin SWRP

The aggregation of the existing stormwater and dry-weather flow management programs and their implementation agreements in the Chino Basin are functionally equivalent to an SWRP. The Inland Empire Utilities Agency (IEUA), the Chino Basin Watermaster (Watermaster), the Chino Basin Water Conservation District (CBWCD), the San Bernardino County FCD (SBCFCD), and the watershed's cities and water districts have worked together since 2000 to implement a regional program within the Chino Groundwater Basin to increase groundwater recharge using stormwater and dry-weather runoff. This is demonstrated through a 15-year process of collaboration; the development of recharge master plans; the construction, operation, maintenance, and monitoring of new recharge projects facilities; periodic reviews of these recharge projects' performance; and periodic updates to recharge master plans. The IEUA, the Watermaster, the CBWCD, the SBCFCD, and the related parties completed the latest update to the Chino Basin Recharge Master Plan in 2013. The agencies implement projects that will increase the recharge of stormwater, dry-weather runoff, and recycled water within the watershed of the Chino Basin. These projects were incorporated into the IEUA's 2015 Integrated Water Resources Plan Phase 1 and will be further developed in Phase 2 of the Integrated Water Resources Plan, which is expected to begin in summer 2016. The combined efforts of the IEUA, the Watermaster, the CBWCD, and the SBCFCD to collect and recharge stormwater and dry-weather runoff is part of the larger integrated water resources management plan for the Chino Groundwater Basin called the Optimum Basin Management Program. This program includes comprehensive monitoring (surface water, groundwater, and land subsidence), stormwater and dry-weather runoff recharge improvements, salt and nutrient management, water quality improvements, the recovery of impaired groundwater for beneficial use, conjunctive use, land subsidence management, and safe yield management. The Optimum Basin Management Program is the equivalent of the SWRP.

For further details of the 2016 Chino Basin SWRP please refer to https://www.ieua.org/stormwater-resources-plan/.

San Bernardino County Santa Ana River Watershed SWRP

Development of the San Bernardino County SWRP covers the area outside the Chino Basin, and is partially funded by a Proposition 1 Grant from the State Board. A Technical Advisory Committee was formed in spring 2017, followed by public outreach events in summer 2017. The administrative draft was submitted to the State Board in March 2018 and has undergone review by the Technical Advisory Committee. A public comment period took place in summer 2018 (SBCFCD 2018). The SWRP was finalized in November 2018 and was adopted into the OWOW Plan Update 2018 in January 2019. SWRP information is available at http://cms.sbcounty.gov/dpw/FloodControl/SantaAnaRiverWatershedStormwaterResourcePlan.aspx.

Proposed Riverside County SWRP

In 2018 Riverside County is expected to select a consulting firm to prepare an SWRP in their County. As part of its planning process, the District expects to have a complete inventory of its existing facilities that could be retrofitted for use in recharge of stormwater or dry-weather runoff.

Alternative Compliance for New Development with Water Quality Permit Requirements

It bears mentioning that another water quality program may influence future development in the area is the opportunity for an alternative compliance program for new development. An alternative compliance program could allow the construction of regional treatment facilities to offset the water quality impacts of new development. The Western Riverside Council of Governments has taken the lead in organizing a working group to explore how an alternative compliance program might be administered and whether measures like floodplain preservation and stream restoration could be allowed as mitigation for new development. If an alternative compliance program is approved by the Santa Ana Regional Board, it would be the driver to achieve the OWOW Program's goals.

Floodplain Preservation and Restoration

Preserving floodplains and their functions can help achieve several objectives. First, from a public safety perspective, government ownership of floodplain property as part of a floodplain management program would permanently remove the property from consideration for private development. Second, through partnership with other watershed stakeholders, like Multiple Species Habitat Conservation Plan (MSHCP) management authorities or Resource Conservation Districts, the floodplains could be effectively managed to benefit the open space and existing habitat. This aligns with the OWOW Program's goals. Moreover, the floodplains could become sites for both habitat creation and stream restoration. Finally, the floodplain preservation will serve to further tighten the link between flood control and water conservation, because the sandy creek bottoms are natural infiltration areas.

The first step in such a program should be the identification of undeveloped floodplains within the watershed. Subsequent evaluation of the floodplains for infiltration, location over groundwater basins, use as a wildlife corridor or for habitat, suitability for restoration and/or creation of the stream, and use by residents for access or recreation could be used to prioritize floodplain acquisition.

As an example, the RCFCWCD has over $23 million allocated in its 5-year Capital Improvement Program to acquire properties within the Federal Emergency Management Agency (FEMA) Zone A Temescal Creek floodplain as a non-structural flood hazard mitigation program. The targeted properties are between the City of Lake Elsinore and the existing improved Temescal Creek Channel in the City of Corona. The RCFCWCD has targeted willing sellers for its acquisition activities.

Hydromodification

Rivers and streams are in a dynamic balance. A stable stream is the result of interaction between various factors of sediment load, sediment particle size, stream slope, and discharge. Alluvial streams that are in equilibrium most often have smooth, slightly concave profiles that flatten in the downstream direction. Alluvial streams in equilibrium often flow at minimum energy in a meandering course with fairly stable bankslopes.

Human alteration of the stream channel, such as channelization, in-stream mining, road construction, or floodplain encroachment by new development rapidly changes that dynamic balance. Channelization or encroachment prevents meandering, thereby steepening the bed slope and causing the stream to incise. Another factor that leads to incision is the paving of the tributary watershed area, removing the runoff's contact with natural soil on its way to the stream. Starved of sediment, the flow in the stream will have excess energy that must be spent, and streams typically use it to scour and incise the natural channel. Incision can also be caused by high-velocity discharges from concrete flood control facilities or road culverts. The excess energy again must spend itself in the scour of the channel. Incision leads to vertical bank slopes that can be a hazard to public safety, and when the river finally reestablishes its equilibrium, the incision often extends far upstream of the original incision point. In addition, the sediment generated is deposited in the downstream watercourse and reduces its flood capacity.

It may be possible to restore selected streambeds or at least make them more stable. This would help the OWOW Program achieve its goal to preserve and enhance ecosystems for open space, habitat, and natural hydraulic function.

Streambed restoration and stabilization can also improve water quality. Some water bodies in the watershed, like Lake Elsinore, are impaired by the nutrients phosphorous and nitrogen. Phosphorous is transported through the watershed by attaching itself to the sediment particles carried in the stormwater. Controlling erosion and making streams more stable means that less sediment is moved by the streams and fewer nutrients are moved into the impaired water bodies.

The first step in such a restoration and stabilization program would be the identification of the streams and watercourses that have been adversely impacted by erosion. This would provide a more detailed assessment of the watershed's overall health. Once streams are identified, subsequent evaluation of (1) the eroded streams' suitability for habitat restoration or creation, (2) the risk the erosion poses to public safety, and (3) its use by residents could be used to prioritize streams for restoration.

Flood Control Districts – Background

The missions of FCDs hold flood protection for public health and safety as their highest priority. FCDs are natural partners for many OWOW projects due to their broad jurisdictional areas, and parallel missions of water conservation and water quality improvement. Further, FCDs are natural partners because of their inventory of stormwater control projects which, under the right conditions, could be retrofitted and integrated with other uses.

Mission statements for the watershed FCDs are as follows:

RCFCWCD. "The objects and purposes of [the District] are to provide for the control of the flood and storm waters of the district and the flood and storm waters of streams that have their source outside of the district, but which streams and the waters thereof flow into the district, and to conserve the waters for beneficial and useful purposes by retarding, spreading, storing, retaining and causing to percolate into the soil within the district, these waters, or to save or conserve in any manner all or any of these waters and protect from these flood or storm waters, the watercourses, watersheds, public highways, life and property in the district, and to prevent waste of water or diminution of the water supply in, or unlawful exportation of water from the district, and to obtain, retain and reclaim drainage, storm, flood and other waters for beneficial use in the district" (Riverside County Flood Control Act, 1944).

SBCFCD. "To provide for the control of flood and storm waters of the District in order to protect watercourses, watersheds, public highways, life and property; to conserve such waters for beneficial purposes by spreading, storing and causing to percolate in the soil" (SBCFCD Flood Control Act of 1938).

OCFCD. "The purposes of this act are to provide for the control of the flood and storm waters of the district, and the flood and storm waters of streams that have their source outside of the district, but which flow into the district, and to conserve those waters for beneficial and useful purposes by spreading, storing, retaining, and causing them to percolate into the soil within the district, or outside the district, or to save or conserve in any manner all or any of those waters and protect from damage from those flood or storm waters, the harbors, waterways, public highways, and property in the district" (Orange County Flood Control Act, Chapter 723 of the State of California Statutes of 1927).

The FCDs have been implementing CIP projects and maintaining these facilities in the watershed for approximately 80 years, acting with legislative authority to protect life, property, and navigation. This includes debris basins in the steep foothills, engineered conveyance and storage facilities in the inland valleys, and dams and channel protection measures to allow flood runoff to flow to the ocean with a minimum of uncontrolled floodwaters. On a parallel track, the FCDs have implemented water conservation elements within their facilities, particularly as an aid to flood protection, and to remove sediment and improve water quality as it moves downstream in the watershed. These facilities were built and maintained to protect large pre-existing urban areas and to serve constantly growing urban and suburban areas in the watershed. These works were completed with local, state, and federal funding, and were constructed in part by the U.S. Army Corps of Engineers (Corps).

Each FCD has differing challenges based on their physiography (as described in Section 4.1.2, Hydrology and Geomorphology), on their proportion of existing urbanized area and remaining developable areas, and on economic factors. Orange County has the lowest gradient topography and conveyance system overall, has the greatest population and economic resources, yet probably has the biggest challenge to find new space for recharge basins or to enlarge FCD facilities to meet greater flood flows. Riverside County has high-gradient and lower-gradient areas, a smaller population, and less economic resources than Orange County, and has added constraints associated with a large existing MSHCP. San Bernardino County has the highest-gradient areas and the Seven Oaks Dam, significant sediment- and debris-removal needs, several large groundwater basins and potential for increased storage, and somewhat more developable area, yet it has fewer economic resources than the other counties. Each county has existing sites of groundwater contamination, but only Orange County has the issue of seawater intrusion.

There appears to be great benefit for significantly increasing the degree of project planning, design, implementation, and maintenance conducted collaboratively among the FCDs, with watershed partners including water suppliers, groundwater management agencies, Watermasters, sewer agencies, local land development authorities, the Corps, and the Forest Service. Each of these entities brings experience, design ideas, and potentially funding and maintenance resources to the project. A collaborative project development team also fulfills the objectives of IRWM Plan implementation and is more competitive in the quest for grant funding.

Collaborative projects using FCD facilities must acknowledge the overarching priority for flood protection. Projects must be designed to allow FCD facilities to function unimpeded and dynamically during and in preparation for potential flood conditions. In addition, FCD facilities may have other constraints regarding design and maintenance that support their flood protection function, and these must be accommodated by the design and operation of the project. FCDs are willing partners to accomplish watershed-based objectives, but must fulfill their legislative mandate when conditions demand it.

5.6.3. CONTRIBUTORS – INTEGRATED STORMWATER MANAGEMENT

ROLE	ORGANIZATION
Chair	
Jason Uhley	Riverside County Flood Control District
Contributors	
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Rick Whetsel	Santa Ana Watershed Project Authority
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Vivian Castro	Chino Basin Water Conservation District
Pillar Liaison	
Mike Antos	Santa Ana Watershed Project Authority

5.7. LAND USE AND WATER PLANNING

Land use decisions are one of the primary underlying factors influencing the existing water supply, water quality, and natural resource challenges in the Santa Ana River Watershed; these decisions can both cause and resolve these challenges. Compounding these challenges is population growth in the region. Key drivers in increased water demands are population growth within the lower watershed, OCWD's service area, which is projected to increase from approximately 2.38 million to 2.54 million by 2035 (OCWD 2014, page ES-2). The population center of Western Riverside County is over 1.7 million people and is projected to grow to approximately 2.4 million residents by the year 2035 (WRCOG 2018, page 4). In western San Bernardino County, IEUA's service area is one of the fastest growing regions in the United States, with the area population projected to surpass 875,000 this year (IEUA 2017, page 2). As shown in Figure 5.7-1, the California Department of Finance projects the watershed's population is expected to increase by 1.1 million between 2020 and 2040.

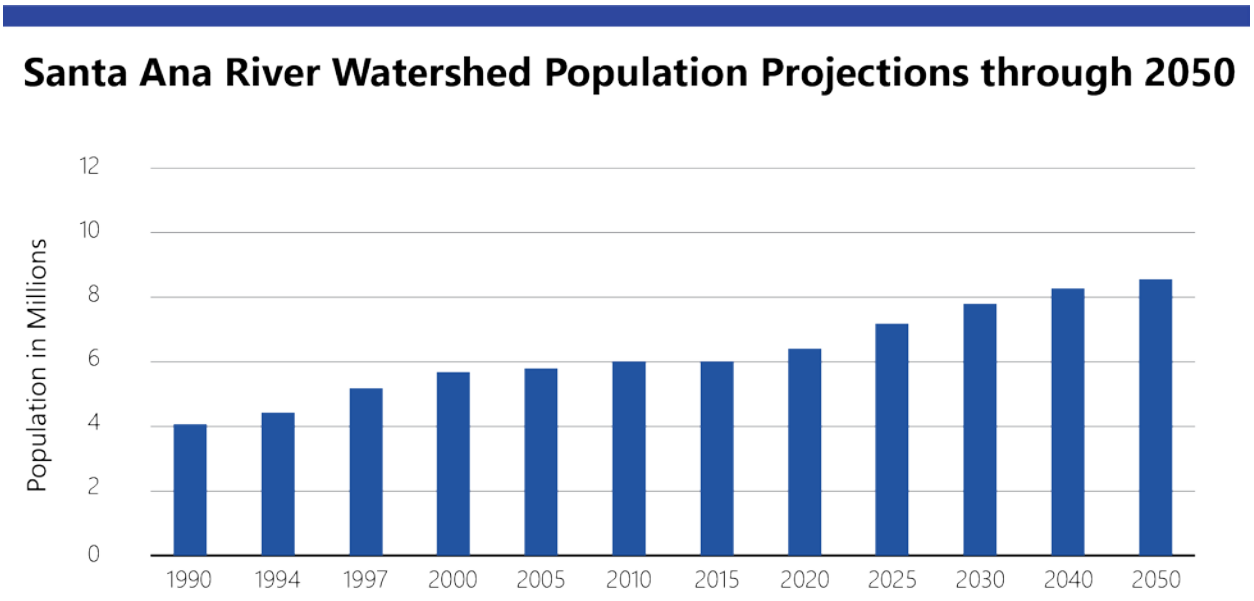

Figure 5.7-1. Population Projections for the Santa Ana River Watershed

Even with population growth potentially affecting water supply, water quality, and natural resources in the watershed, through regional planning and integrated projects many of the challenges associated with growth can be addressed. Most of the watershed has sufficient supplies during normal and dry years and many natural resource management strategies are in place across the region. For example, the San Bernardino County Vision planning process has identified that the water needs of County residents and businesses can be met through 2035, but only if water users implement conservation efforts and investments are made in water supply projects (County of San Bernardino 2018, page 1). Land use planning has affected natural resources in the region with some species such as the Santa Ana sucker being listed as threatened for urban development and related

land-use practices, but coalitions continue to form to address many of these issues (USFWS 2017, page I-14). The Upper Santa Ana River Habitat Conservation Plan coalition has been working since 2013 to address habitat issues for 24 species of plants, birds, animals, and mammals.

The OWOW 2018 Plan Update reflects the relationship between land use and water planning conducted through by agencies involved in addressing these challenges through general plans, urban water management plans and water quality and stormwater related planning. General plans include development of goals and policies and lay the foundation for land use decisions made by planning commissions, city councils, or board of supervisors. In connection to these plans, MS4 permits include several requirements aimed at linking water quality and watershed protection with land use planning processes during the development process.

5.7.1. RECOMMENDED MANAGEMENT AND POLICY STRATEGIES

Land use designations and development through time have resulted in areas of economic vitality and comfortable living, while leaving other areas in blighted conditions, with inequitable exposure to environmental hazards and poorly maintained infrastructure. To improve conditions and create a sustainable watershed, land use decisions must provide net watershed benefits.

To avoid land use decisions that cause a net degradation of watershed conditions, it is recommended that the management and policy strategies provided in this Pillar section be implemented. These strategies are intended to encourage action and to stimulate innovative approaches, to encourage dialogue and collaboration, and to provide tools and resources for local governments and water agencies. They are not intended to be mandates.

Below the work of this Pillar is gathered into recommended management and policy strategies, separated by the six OWOW Plan Update 2018 goals. A discussion of these ideas follows.

Goal 1: Achieve resilient water resources through innovation and optimization.

Management Strategies

1. Using grant funding or partnerships, encourage projects and identify incentives for water agencies, developers, agricultural producers, and other entities to collaborate on projects to capture and infiltrate stormwater runoff in strategic locations. Couple this incentives-based approach with the existing process where projects such as housing developments are reviewed and approved by regulatory entities.

Policy Strategies

1. Designate or create a watershed-wide entity or collective of agencies to develop model ordinances that incentivize low-impact development and urban–natural space buffers to provide habitat benefits.

2. Working with planning organizations, councils of governments, and water agencies, develop a checklist of land use planning tools that will increase groundwater recharge and that can be incorporated into local ordinances.
3. Designate or create a watershed-wide entity or collective of agencies to develop a list of incentives that local jurisdictions can use for development projects that propose high levels of water use efficiency.

Overview of Goal 1 Recommendations

These strategies are important for ensuring local water supply reliability, as the Water Resources Optimization Pillar has found that the watershed imports approximately 35% of its water supply from outside the watershed. Water supply reliability in the watershed will be challenged by multiyear drought both in the watershed and on the Colorado River, limited local water resources, the vulnerability of the Sacramento–San Joaquin Bay Delta, and the threat of climate change. In addition, vulnerabilities in watershed-wide and statewide infrastructure could increase in the event of major seismic events.

Instead of recommending mandates on local agencies to spur land use decisions that protect water resources, the Land Use and Water Planning Pillar recommends these strategies, which are focused on providing incentives for agencies to adopt policies and programs that provide multiple benefits. New policies such as model ordinances will inform land use planning decisions when they have a link to water resources. The policies could be readily adapted by local agencies from existing ordinances, such as the "Model Ordinance Governing Planning and Development on Alluvial Fans" that was recommended by stakeholders appointed to the DWR Alluvial Fan Task Force. Model ordinance procedures like these provide project proponents with information about sustainable land use issues before any project planning expenditures take place.

The Pillar also recommends using grant funding and/or partnerships between public agencies to spread and infiltrate stormwater in strategic locations. The MS4 permits in this watershed allow the development and significant redevelopment requirements of the Water Quality Management Plans to be achieved with regional stormwater treatment BMPs, an urban runoff fund, or a water quality credit system. Using this land use planning and permitting process, water supply managers and flood control agencies can work toward infiltrating stormwater in strategically located basins.

Goal 2: Ensure high-quality water for all people and the environment.

Management Strategies

1. Explore ways to build watershed-wide capacity for installing, maintaining, and monitoring multi-benefit water projects.
2. Restore or enhance hydrologic connectivity in trail systems, parks, and open spaces to infiltrate stormwater, improve water quality, and enhance habitat while also providing recreation and transit benefit.

3. Integrate green infrastructure strategies to remove unnecessary impervious surfaces to reduce runoff and erosion and prioritize natural infiltration and treatment strategies.
4. Develop innovative strategies to restore or enhance hydrologic connectivity in new development and redevelopment/revitalization and land use planning to reduce stormwater runoff, improve water quality, and increase groundwater recharge.

Policy Strategies

1. Identify high-priority areas in the watershed for stormwater capture or stormwater treatment.
2. Develop an ongoing watershed-wide operations and maintenance plan for stormwater projects and identify opportunities for partnerships with workforce development agencies to participate in ongoing maintenance and monitoring programs.
3. Develop an updated low-impact development plan that includes new and innovative ideas, such as:
    a. A "complete streets" plan that includes stormwater conveyance
    b. On-site compaction only for building pads and necessary structures
    c. Lot coverage provisions
    d. Limits on impervious surfaces to reduce runoff and avoid unintended consequences, such as high groundwater in nearby off-site locations
    e. Incentives to use biological control or mowing for weed management rather than disking
4. Develop a model complete streets program that balances priorities other than automobile transportation, such as safe pedestrian routes to schools, natural stormwater conveyance, and natural buffers.
5. Explore ways to use recycled water for fire suppression, especially in areas where recycled water infrastructure exists.
6. Actively coordinate with local jurisdictions to provide safe and affordable housing for people experiencing homelessness in order to transition encampments away from areas that may affect water quality and public health.

Overview of Goal 2 Recommendations

1. Goal 2's recommendations encourage new development to minimize its impact on water quality and to clean stormwater runoff on site, or at least before it enters the storm drains. The state has been successful with the development of low-impact development standards. What just a few years ago was a novel concept has become much more commonplace, but there are opportunities to double down on those efforts, as suggested by the strategies listed for this goal. Similarly, the "complete streets" concept, now part of our common vernacular, can be expanded to include creative ways to clean stormwater runoff.
2. The recommendations include the expansion of recycled water as a supply for fighting fires in wildland–urban areas, and to ensure that landscape and fire protection buffers are in-

place. Buffers are a health and safety issue that prevent the spread of wildfire that threatens life, property, habitat, and hydrologic function. Since the adoption of the OWOW 2.0 Plan in 2014, 101,000 acres of the watershed have burned in six major fires, causing water quality degradation with post-fire storm flows. Another water-quality-related issue is the recent increase in encampments of people experiencing homelessness in the watershed's floodplains. The recommendations include methods to protect public health by working with other public agencies who have the necessary expertise to find more appropriate housing options for our homeless population, protecting people from floodwaters and avoiding a possible influence on water quality. This concept needs to be explored with a sense of urgency.

Goal 3: Preserve and enhance recreational areas, open space, habitat and natural hydrologic function.

Management Strategies

1. Identify opportunities to restore flood control channels to increase in-stream groundwater recharge.
2. Implement an incentive program, such as rebates, that will reward property owners for granting right of entry for invasive weed removal.
3. Implement an incentive program, such as rebates, that will reward property owners for maintaining a catastrophic fire fuel break on their property.
4. Create an incentive program to reward cities and counties (perhaps through regulatory credits) for adopting arroyo preservation standards consistent with the City and County of Riverside Arroyo Preservation Ordinance.
5. Encourage the use of conservation easements for regulatory credits.

Policy Strategies

1. Develop robust urban–wildland interface standards with a focus on preserving and enhancing open space, habitat, and natural hydrologic function that can serve as a model for local jurisdictions.
2. Complete a study that assesses existing trails and parks within the watershed and identifies opportunities and funding sources for new recreational facilities, with a focus on underserved communities.
3. Fund a Regional Trails Coordinator position to work with jurisdictions within the watershed on open space and trail linkages across jurisdictional boundaries.
4. Identify land uses within a 1-mile buffer from the edge of the arroyos and other waterways to identify potential residential uses that could benefit from new parks or trails.
5. Using the City and County of Riverside Arroyo Preservation Ordinance as a basis, create a model ordinance for arroyo preservation for consideration and possible adoption by cities and counties throughout the watershed.

6. Using biologists and engineers, map all significant arroyos and major waterways within the watershed to define the "bed and bank" for use in tandem with the model ordinance described above.
7. Analyze existing park systems, trail networks, community gardens, and open space areas and develop a watershed-wide plan to improve connectivity and to increase safe bike and walking routes. Priority should be given to underserved communities.
8. Encourage Orange and San Bernardino Counties to use the Riverside County Multiple Species Habitat Conservation Plan as a model for habitat conservation and open space protection in their respective jurisdictions.
9. Commission a comprehensive study of the Santa Ana River Watershed, as an integral component of greenbelts for food production, to include the following:
    a. Assessment of existing farming operations in the watershed.
    b. Assessment of potential parcels for community gardens development.
    c. Creation of a checklist of urban-agriculture initiatives on public lands to demonstrate a variety of farming approaches, including food production farms, stormwater gardens, soil-building gardens, etc.
    d. Identification of potential modifications to zoning and land use policies to incentivize urban agriculture, including such things as establishing an urban-agriculture land use category and an urban-agriculture district to protect existing urban farms from future development.
    e. Identification of incentives for urban agriculture in new development and redevelopment projects.
10. Using the California Urban Forests Council's Urban Forest Management Plan Toolkit as a guide (see https://toolkit.climate.gov/tool/urban-forest-management-plan-toolkit), develop a model urban forest management plan, including an evaporation shade plan, that can be used by each jurisdiction within the watershed.
11. Based on the urban forest management plan, develop a model tree ordinance that includes suggested tree planting goals for each jurisdiction within the watershed and implementation strategies. The plan should include strategies for both private and public property, including incentives for private property owners to either plant trees or allow access to property for the purpose of tree planting.
12. Water agencies should continue working with the watershed's National Forests during the development of their long-term planning documents, called Land Management Plans and updated every 20–25 years, in order to create a nexus between forest-related and water resources projects. Through the development of these plans Forest land that is important for water supply, water quality and flood control projects and operations can be identified.
13. Restore wetlands, such as the ponds in the Hidden Valley Wildlife Area along the Santa Ana River, for water quality, habitat creation, and recreational purposes.

Overview of Goal 3 Recommendations

With an increased population, there will be a strain on existing outdoor resources such as the Cleveland and San Bernardino National Forests. According to the Santa Ana River Parkway and Open Space Plan, 44% of the area in and around the Santa Ana River has been developed and now provides little to no habitat for wildlife (CCC 2018).

With an increase in population comes an increase in the demands on recreational resources and open space. The recommended strategies included in this goal seek to incentivize local agencies to preserve and enhance the different open space resources, such as arroyos in urban areas, urban–wildland interfaces, and mixed conifer forests. Much like the water supply reliability recommendations, these recommendations were formulated on the principle that many local jurisdictions do not have the resources to implement new mandates that preserve open space and habitat; therefore, these management strategies are largely incentive based. By using grant funding and collective agency partnerships, these new incentive programs could maintain fuel breaks, restore lined channels, and preserve habitat by removing invasive weeds.

Long-term funding sources are still needed to maintain open space and habitat areas, and the Pillar recognizes that one-time incentive programs funded through temporary sources like grants are not sustainable. Through the policy recommendations, the Upper Santa Ana River Habitat Conservation Plan and model ordinances like the arroyo preservation effort in the City of Riverside will facilitate continuing projects that protect or enhance open space. Clearly the watershed-wide activity needed to achieve the habitat and restoration goals of the OWOW Program cannot be accomplished by a single agency or ground round. Habitat Conservation Plans are a collaborative tool for multiple partners to preserve and enhance open space through long-term, discrete project implementation.

Goal 4: Engage with members of disadvantaged communities and associated supporting organizations to diminish environmental injustices and their impacts on the watershed.

Management Strategies

1. Encourage the implementation of a tree planting program in underserved communities as described in Goal 3.
2. Identify disadvantaged communities within the Santa Ana River Watershed using CalEnviroScreen 3.0 (see https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30).

Policy Strategies

1. Encourage early coordination of land use projects in the watershed, before the development proposal has been fully designed.
2. Identify and integrate a public participation framework into decision-making processes to determine when public input from representative audiences is appropriate.

3. Solicit community input to ensure that interpretive signs and communication materials reflect the values, history, geography, and culture of the community, fostering a sense of place and building trust and engagement.
4. Provide community participation programming at the appropriate time and location, and in the appropriate languages, to maximize accessibility to audiences.
5. Encourage broad public notification of projects in disadvantaged communities, well beyond the standard 300-foot notification ring.
6. Create model "good neighbor" guidelines, with a focus on environmental justice. Such guidelines should emphasize relationships between industrial projects with harsh environmental impacts and nearby residential communities and water sources.
7. Using the "Housing First" model (see https://endhomelessness.org/resource/housing-first/), create a model housing project to demonstrate how transitional housing can be provided to homeless individuals currently residing along the Santa Ana River.

Overview of Goal 4 Recommendations

One of the main tenets of a just development review process is public participation, which starts with notification of interested parties. State law sets out minimum guidelines for public notification; however, it has become clear that *minimum* standards are frequently not sufficient, especially in disadvantaged communities. The standard 300-foot public notification ring from the project site often does not reach many homes, or it goes to the landowner and not necessarily to the resident, and the notification itself is not translated.

Land use decisions have long-term impacts and need to be understood and carefully reviewed by those most impacted by the proposed development. As reflected in the other goals' recommendations, an adequate supply of clean water is a basic human need for all people, including those in disadvantaged communities. Steps beyond the minimum state requirements need to be taken to ensure that disadvantaged communities are notified, understand the proposal, and have a voice in the decision-making process.

This section provides a number of strategies for helping to achieve these goals. These strategies are consistent with and support the goals of SB 1000. In addition, it calls for jurisdictions to develop good neighbor guidelines that allow for adequate buffers and precautions to protect residential communities from development that can affect their water supply or create flooding issues. As provided in Goal 3, traditional problems that disadvantaged communities face, such as flooded streets, overlap with the rising issues of homelessness in the watershed's floodplains.

Goal 5: Educate and build trust between people and organizations.

Management Strategies

1. Develop education/outreach programs that inform land use planners and decision makers on the interconnections between land use, water, and natural resources stewardship.

2. Partner with curriculum managers and teachers at school districts to identify authentic, project-based, and service-learning opportunities during site maintenance, installation, and monitoring for K–12 students.
3. Identify community/citizen science opportunities for the public to participate in planning and monitoring of projects (e.g., participating in biodiversity surveys before and after restoration projects are implemented, testing stormwater quality before and after green infrastructure projects, and hosting temperature or soil moisture sensors to examine impacts of urban forestry project).
4. Partner with the non-formal education providers and community-based organizations to provide hands-on educational programming, community-service projects, and interpretive tours.
5. Sponsor a contest to design interpretive sign displays that can be installed by the governing jurisdictions within the watershed to educate the public about connections between land use and watershed health.
6. In the project planning stage, establish a framework for public participation and implement an outreach strategy to solicit community input to identify project barriers and opportunities.
7. Work with local and state agencies and/or nongovernmental organizations to leverage and maximize funding opportunities for multi-benefit green infrastructure components for projects during the planning phase.
8. Develop partnerships to integrate multi-benefit components into groundwater recharge projects, such as stormwater capture and treatment, passive recreation opportunities, trail networks, native habitat, perimeter landscape demonstration projects, and interpretive signs.
9. Provide opportunities for coordination between planning, parks, and water agencies within the watershed in collaboration with local councils of governments and the Southern California Association of Governments.
10. Coordinate with a local regional organization, such as SAWPA, Southern California Association of Governments, Inland Empire Green Building Council, or other group, to create a "Watershed Friendly" certificate program that rewards and educates local jurisdictions, similar to Tree City USA or All American City designations.
11. Coordinate with county health departments on the health benefits of active and sustainable use of the watershed.
12. Develop and offer education/outreach programs that educate land use planners and decision makers on the interconnections between land use, water, and natural resources stewardship.
13. Identify workforce development partnerships and opportunities to integrate local workforce development agencies (e.g., Inland Empire Job Corps, California Conservation Corps, Regional Occupational Programs) into project implementation, monitoring, and/or maintenance efforts.
14. Partner with school district career and college readiness initiatives to create pathways for high school students to develop awareness, interest, and/or skills in the landscaping, conservation, and water industries.

Policy Strategies

1. Identify methods for local governments to consult water management agencies early in the land use decision-making process regarding technology, demographics, and growth projections.
2. Ensure that from start to finish, projects and programs involve the public, build relationships, and increase the sharing of and access to information. The participatory process should focus on making sure that all residents have access to clean, reliable, and affordable water for drinking and recreation.

Overview of Goal 5 Recommendations

As discussed in the Data Management and Monitoring Pillar section, the best method to ensure proper decisions are made by the watershed's hundreds of public agencies, the state and federal government, and local communities is making sure that all groups have access to the same good, fact-based information. When policy makers are fully informed, they can make good decisions, and when the public is armed with facts and good information, it can change behaviors for the good of the watershed.

The recommended education strategies in this section fall into several categories, such as youth involvement, frequent positive reinforcement, and science-based learning. Another component of the recommended strategies in this section involves the cooperation and collaboration between potential partners so their messages reach the widest audience. There are often limited resources for educational programs, but water districts, government agencies, education providers, and environmental groups can work together to use their resources more effectively.

Goal 6: Improve data integration, tracking, and reporting to strengthen decision making.

Management Strategies

1. Coordinate with the Southern California Association of Governments, data management consultants, and other agencies to create an overlay map and database showing the watershed with various layers, including existing development, general plan land use designations, and zoning designations. Within that database, implement the following:
    a. Develop an online resource library with hyperlinks.
    b. Align and connect watershed geodatabases.
    c. Develop a planning development tool with access to the databases.
    d. Create a central repository for grants aligned with the OWOW Plan Update 2018 goals.
2. Create and fund a position to manage and maintain the database.

Overview of Goal 6 Recommendations

One of the happy discoveries made while drafting the OWOW Plan Update 2018 is the abundance of information that is available. Each member of the Land Use and Water Planning Pillar cited

information from their agency or from agency resources that others were unfamiliar with. This was such a regular occurrence that it highlighted the need for a central repository of information. However, such information is only useful if it is accessible and periodically updated. Creating a central repository or an online library is crucial, and the information within needs to be continually managed to stay relevant.

The other key component of the recommended strategies in this section is creating regular opportunities for coordination between agencies. As watershed planning often uses map displays to convey complex information, an overlay map with a variety of useful data layers could be created and maintained by a central agency.

5.7.2. BASIS FOR THE RECOMMENDATIONS

For years, the OWOW Program has sought to encourage information sharing and collaboration between water and watershed agencies and Regional Land Use Planning Entities. Recently, regional land use planners in the watershed have taken the lead in working in partnership to manage multiple water demands and to offset climate change impacts to water supply. Efforts like the Western Riverside Council of Governments Climate Action Plan, the Riverside County Task Force, the San Bernardino Countywide Vision, and the Northern Orange County IRWM Plan have led to further information sharing and collaboration between land use planning agencies.

Some of these entities, such as the Riverside County Task Force, are necessary to provide water and planning professionals, members of the public, and elected leaders with more information on water supply projects like the California WaterFix that will help reduce water supply and ecosystem risks from climate change. Other efforts, like the San Bernardino Countywide Vision, have done regional analyses using population trend and water supply data to create a supply/demand water budget that local elected leaders and land use planning professionals can use to develop specific projects and programs. Through a collaborative planning effort, the Northern Orange County IRWM Plan effort has also developed specific strategies that focus on water facility reoperation and urban land use policies (https://cms.ocgov.com/civicax/filebank/blobdload.aspx?BlobID=10656, page 5-8). Land use planners and water managers will work together to draft future plans, such as the 2020 urban water management plans to coordinate water supply issues, and SWRPs to coordinate water quality and flood protection issues. Orange County finalized their SWRP in March 2017, the Chino Basin finalized their SWRP in March 2016, and the other two counties in the watershed are currently drafting their SWRPs. Land use planners and water managers will begin developing their urban water management plans in the coming years to coordinate changing land use patterns and the impacts to demand and supply forecasts.

These regional collaboration and planning efforts serve as the venue to draft solutions to climate change impacts on California's water supply. The collaborative effort to create and implement the OWOW Plans has led to projects that have reduced GHG emissions, created droughtproof water

supplies, and managed our forest to reduce hazardous fire risk. Each venue allows land use planners and water agencies to prioritize regional water issues and identify water management objectives.

It is clear reviewing the recommendations here that many of the goals of the OWOW Plan Update 2018 will rely on the authority of land use managers to succeed. Recent partnerships and examples of collaboration show that this watershed is in a strong position to grow and strengthen these partnerships to the attainment of regional, and watershed, goals.

5.7.3. CONTRIBUTORS – LAND USE AND WATER PLANNING

ROLE	ORGANIZATION
Chair	
Ken Gutierrez	Retired
Contributors	
Becky Rittenburg	Chino Basin Water Conservation District
Bruce Whitaker	City of Fullerton
Chris Tzeng	Western Riverside Council of Governments
Diana Ruiz	Riverside–Corona Resource Conservation District
Jane Block	Endangered Habitats League
Jay Eastman	City of Riverside
Jennifer Ares	Yucaipa Valley Water District
Kwasi Agyakwa	California Department of Transportation (Caltrans)
Laura Roughton	City of Jurupa Valley
Miguel Vazquez	Riverside University Health Systems–Public Health
Patricia Lock Dawson	Assembly Member Jose Medina's Office
Seth Wilson	Riverside Food Flood Systems Alliance
Susan Longville	San Bernardino Valley Municipal Water District
Tom Vo	Southern California Association of Governments
Larry McKenney	Santa Ana Watershed Project Authority
Pillar Liaison	
Ian Achimore	Santa Ana Watershed Project Authority

5.8. NATURAL RESOURCES STEWARDSHIP

One of the greatest questions for the success of habitat restoration in the watershed is future hydrology. As conservation and reclamation efforts grow within water and sanitation districts and the Santa Ana Regional Water Quality Control Board (Regional Board) seeks to eliminate urban runoff, areas that currently experience year-round flows may become seasonally or permanently dry. This will have an adverse effect on native vegetation and native fishes, birds and other wildlife (see Appendix J for further detail). In addition, the effects of climate change on watershed hydrology are uncertain. In the face of these challenges, maintaining current flows or restoring natural stream flows may be problematic and expensive.

There are many opportunities for improving habitat in the watershed, and there are numerous benefits for wildlife and people. However, the current fragmented management of habitat is one of the greatest barriers to success. Restoring and maintaining valuable habitat throughout the watershed will require a "big tent" approach that involves all of the stakeholders in the watershed. The OWOW Program is an example of the kind of effort that is needed to bring all of the elements and organizations together.

5.8.1. RECOMMENDED STRATEGIES

The following is a list of issues/challenges, followed by a brief discussion of potential approaches that take advantage of opportunities for improvement.

Create managed system and restoration targets.

A plan for sustainable management of conservation areas with targeted restoration efforts is essential for preventing further deterioration of habitat. Consideration for characteristics of each of the main habitat types—alluvial fan, riparian, wetland, and coastal and their specific ecosystems—will require habitat specific management plans and restoration criteria.

Managed System and Restoration Targets—Potential Approaches

- Develop a map of the watershed reflecting all the water-oriented habitat areas as described in this section.
- Use data and best available science to ensure that the rarest resources are prioritized for protection.
- Develop a landownership database along riparian corridors.
- Work with landowners to manage habitat more effectively and provide "assistance agreements."
- Develop an urban habitat management model that softens/blurs the transition from urban development to surrounding habitat areas, and allows urban gardens and green space to be used safely/responsibly by wildlife based in the habitat areas.
- Partner with transportation agencies to minimize fragmentation and incorporate wildlife crossings.

- Incorporate vector control efforts into habitat management efforts to avoid conflicting activities.
- Consolidate the various "vision plans" by various agencies regarding water-oriented habitat conservation.
- Develop regional plans to ensure key plant species re-introduction through cooperative efforts including mitigation.

Create water-oriented habits in the watershed.

The region's favorable climate and historically high employment rate make the region prime for development and urban growth, and it is expected to remain so in the future. This produces a great deal of pressure on water-oriented habitat. To address these pressures, this OWOW Plan Update 2018 recommends that the development community consider water-oriented habitats early in the development planning process.

Water-Oriented Habits—Potential Approaches

- Analyze the economic value of environmental and habitat enhancement to new and existing communities.
- Identify early what general and specific areas should be preserved at full buildout of the watershed rather than identifying them after landowners have prepared development plans (the latter approach can result in inequitable, piecemeal conservation efforts).
- Incorporate water-oriented habitat conservation into land use planning in a manner that provides a return on investment while protecting the environment.
- Modify the state tax structure to encourage conservation.
- Facilitate cooperation among regulators and private landowners to prioritize lands that could be purchased and set aside as public lands.
- Identify funding sources for such purchases or facilitate development agreements that transfer such lands to public agencies for future management.
- Consider the natural configuration of water-oriented habitat that does not recognize political jurisdictional boundaries; a regional coordination effort is needed to provide consistent planning and regulation across multiple jurisdictions.
- Consider restoring flows to banked areas as a mitigation approach to supporting habitat and natural hydrology where appropriate and without interfering with flood risk management activities.

Create sustainable wildlife corridors and expand restored areas.

Creating sustainable wildlife corridors will require land use planning coordinated across jurisdictional boundaries. Cooperation also must take place among all of the current regional conservation plans, mitigation providers, resource conservation districts, and non-profit conservation organizations.

Sustainable Wildlife Corridors and Expanded Restored Areas—Potential Approaches

- Facilitate legislation to simplify landowner habitat conservation programs.
- Develop an inventory of existing mitigation lands.
- Develop a watershed-wide, water-oriented habitat conservation program.
- Create new or operate existing mitigation banks to "pool" smaller mitigation requirements to enable the creation of larger, more beneficial habitat mitigation projects.
- Work with private landowners to manage habitat more effectively, provide "assistance agreements" that help those landowners manage their lands partnership, and management education.
- Build on successes of the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP; see Figure 5.8-1 for MSHCP areas in the watershed) and other similar efforts to expand conservation opportunities.
- Analyze and recognize the value of streams and their adjacent riparian land as wildlife corridors.

Provide sustainable funding sources for ongoing maintenance of conservation areas.

Over the past few decades, development interests, regulators, and environmental groups have worked together to encourage habitat conservation and enhancement while allowing for reasonable land development. Such efforts include natural community conservation plans and habitat conservation plans. These programs have provided large conservation areas to accommodate large developments but have taken years and large financial commitments to develop and implement. Despite significant bond funding in recent years, there still is a shortage of funding available in both the private and public sectors to purchase, operate, and maintain valuable habitat areas.

Challenges to the effort to restore areas of the Santa Ana River main stem include an in-lieu fee program and other mitigation program regulations that insist on long-term protections such as conservation easements, fee-title ownership, and real estate instruments over all areas where removal and restoration occur. This is not feasible in many places along the Santa Ana River because these lands are controlled by flood control agencies, parks districts, cities, counties, and the Corps. However, other long-term agreements need to be made among these agencies and organizations whose missions include invasive removal and native habitat restoration. Public and private landowners with ownership and jurisdiction over these areas need to work with mitigation providers, such as non-profit organizations, conservation authorities, and resource conservation districts, to develop long-term protection agreements that will satisfy the requirements of the Corps, the California Department of Fish and Wildlife (CDFW), the U.S. Fish and Wildlife Service, and the Regional Board.

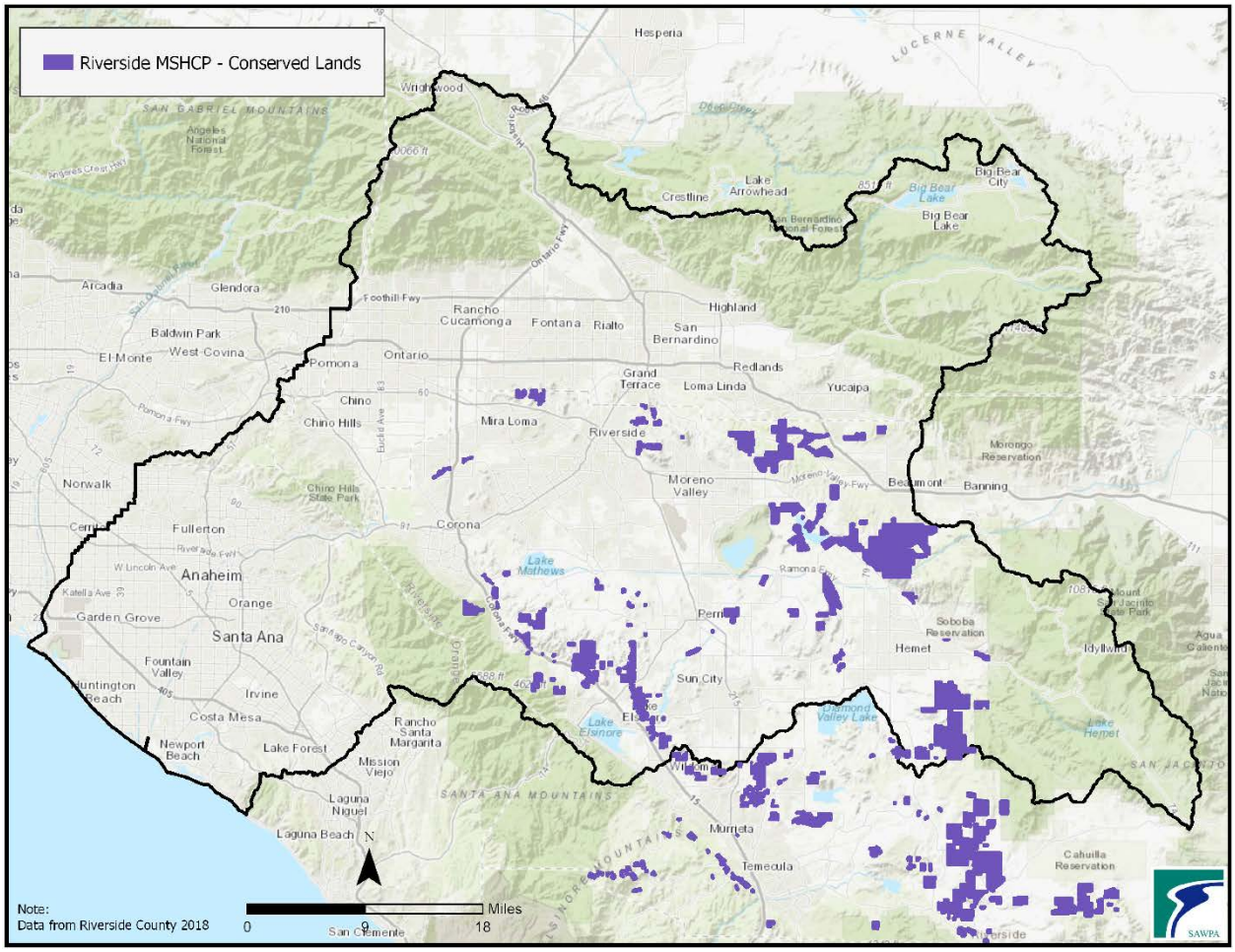

Figure 5.8-1. Conserved Lands under the MSHCP

The OWOW Program should include consensus among all agencies and organizations with ownership/stewardship over areas of the Santa Ana River main stem and tributaries that provide for long-term protection of areas where habitat restoration efforts are occurring or need to occur. This kind of cooperative agreement will be critical to the ability of governmental and non-profit organizations to secure mitigation funding to do the necessary habitat restoration work needed in the watershed. Without such agreements, the fragmentation of restored habitat in the watershed will continue to be a problem.

Sustainable Funding Sources—Potential Approaches

- Research and develop innovative funding arrangements to buy high priority, water-oriented conservation lands, construct needed improvements for appropriate public access, and fund ongoing operation and maintenance of those lands.

- Create cooperative agreements among public landowners and organizations that conduct long-term maintenance of habitat areas that provide reasonable protections in perpetuity for ongoing restoration.

Fund invasive species eradication and maintenance.

Restoring the river requires many partners, agencies, and landowners. Some of the key agencies include the following. The Corps has provided major funding through mitigation requirements and permits the wetland activities under Section 404 of the Clean Water Act. The U.S. Environmental Protection Agency receives, administers, and has distributed funds earmarked for habitat program. CDFW permits the wetland activities under Section 1601 of the Fish and Game Code, and has directed mitigation funds to mitigation providers, and contributes expertise to deal with some of the resource issues. The U.S. Fish and Wildlife Service oversees and must approve activities that could affect wetland resources and endangered species. The Regional Board approves activities that could affect water quality and provides oversight of the recognized beneficial uses of the wetland resources. The county flood control agencies maintain sections of the river for flood conveyance, cooperate toward achieving mutual goals, and issue entry permits. OCWD, which is responsible for managing the groundwater basin that provides approximately 75% of the water supply for more than two million Orange County residents, has provided major funding for habitat restoration throughout the watershed, provides personnel to manage wetlands and endangered species, and manages 2,400 acres of land as wildlife habitat near the middle of the river in the Prado Basin.

The historical and current sources of habitat restoration funding include developer fees directed by the Corps to in-lieu fee mitigation providers. Outside of in-lieu fee mitigation, CDFW and the Regional Board order mitigation measures that result in developer fees that that are directed to non-profit and governmental mitigation providers and conservation organizations. Grant and bond funding in the watershed also have funded the removal of thousands of acres of invasive plants, initial and ongoing restoration of habitat areas, biological monitoring of sensitive species, and conservation of habitat areas.

All of these sources and more should continue to support restoration and ongoing maintenance. Access to such funding should be expanded to benefit the watershed. New, innovative partnerships should be developed to direct funding to habitat issues.

Funding—Potential Approaches

- Create and update watershed-wide, public contact list of mitigation and conservation organization organizations and their capabilities and areas of expertise.
- Create a regional grant opportunities network and clearinghouse to direct more funding to the watershed for restoration and public education.
- Develop a wider range of in-lieu funding programs, habitat banks for water-oriented habitats throughout the watershed.

- Create and encourage innovative public/private/non-profit partnerships and collaboration to improve opportunities for bringing grant funding to the watershed.

Implement habitat restoration projects.

Much of the remaining invasive plant biomass and areas that could benefit from reestablishment activities (removal of invasive species followed by long-term, active planting and biological monitoring) in the watershed is on land owned by federal, state, and local governments for purposes other than water-oriented habitat conservation. In many cases, these lands currently are left unmanaged or are managed in a manner that discourages the development of habitat. There are many unused portions of public lands that could be set aside for habitat enhancement without impacting the landowner's primary purpose. An example may be flood control channels and basins that could provide habitat while still providing critical flood protection.

Habitat Restoration Projects—Potential Approaches

- Develop a public land database as a first step toward a more comprehensive, coordinated management plan.
- Develop a regional plan for public land use.
- Develop regional "safe harbor" type agreements that allow for long-term management of public lands for multiple uses including habitat conservation.
- Coordinate wildlife management with local parks departments.
- Provide expert assistance to public agency landowners to help them better understand how they can manage their lands for multiple purposes, especially short- or long-term habitat enhancement.
- Partner with public utilities in utility corridors.

Develop pollutant trading programs.

Constructed wetlands can be used to remove pollutants from surface runoff using natural processes. Formal pollutant trading programs provide the mechanism to pool funding from multiple, smaller sources to construct wetlands that would create habitat and increase the pollutant removal benefit. This has been explored and is challenged at the federal and state levels. Regulators are supportive of the concept, but issues arise because regulatory systems are poorly aligned, and have conflicting demands for the concept of pollutant trading programs related to wetlands.

Pollutant Trading Programs—Potential Approach

- Develop formal pollutant trading programs that facilitate pooling of funds to construct wetlands.

Foster community involvement in habitat conservation and restoration.

As development moves into the arroyos and hillsides of the watershed, more people are living closer to valuable habitat. Unfortunately, not enough emphasis has been placed on developing a land ethic across the watershed, even among those residents who live directly adjacent to some of the watershed's richest habitats. There is a great deal of potential to improve the connection between people and local habitats. For instance, along the northeastern slope of the Santa Ana Mountains, stewardship groups could be formed among residents to care for the habitat and wildlife in the local canyons and forest watercourses.

Some of the watershed's high-quality, water-oriented habitats are near disadvantaged communities, where little attention has been paid to stewardship of the local resources. Developing a local feeling of ownership of these habitats could benefit both the habitat and the community.

Community Involvement—Potential Approaches

- Develop a social marketing campaign, including opinion surveys to determine how to best enhance the people–habitat connection.
- Develop community ownership of local water courses and wetlands by forming wetland societies or stewardship/friends groups.
- Create educational centers near water-oriented habitat areas.
- Provide educational tours of both local and regional water-oriented habitat areas.
- Sponsor conferences that include outdoor seminars.
- Produce/distribute wildlife habitat maps and make them available on location and on the internet.
- Increase citizen science opportunities/involvement.
- Increase access to high-quality habitat.
- Provide field trips to elementary and high school students to increase watershed awareness.

Restore sediment downstream of dams.

Sediment buildup behind Prado Dam is a problem for this Corps flood control and water retention facility because its capacity to store water is being continuously degraded by upstream sediment that has nowhere to go once it reaches the dam.

Water that is discharged from Prado Dam picks up existing sand and sediment below the dam and transports the material to the coast. Because Prado Dam is cutting off the replacement source of sediment, the river below Prado Dam is sand starved. The lack of replenishment sand to the lower Santa Ana River will have significant negative impacts to groundwater recharge efforts in Orange County. Because sands are unable to get past Prado Dam, areas of the river below Prado Dam have started to armor. Riverbed armoring occurs when sediment replenishing is restricted, allowing the

particle size distribution to change and the remaining sediment to become more densely packed, resulting in reduced permeability. This process severely impedes the recharge capacity of the river.

The decreased flow of sediments downstream of Prado Dam also has affected natural habitats and decreased replenishment of beach sands. Multiple studies and field surveys have been performed to quantify the degradation of the Santa Ana River Channel below Prado Dam. OCWD is implementing a small-scale pilot project, the Prado Basin Sediment Management Demonstration Project. The purpose of this project is to demonstrate the feasibility of taking on a long-term sediment management plan for the Prado Basin. The Corps is also currently engaged in development in a feasibility study for ecosystem restoration throughout the Prado Basin.

Create MSHCPs and resource conservation districts in areas that are currently not covered.

There are several areas of the watershed where special conservation districts and formal habitat conservation plans do not exist that could benefit from their establishment.

A regional MSHCP is needed for the more populated areas of San Bernardino County. There have been several efforts in specific places, but there is no MSHCP covering the quickly growing southwestern San Bernardino County region. Western Orange County also has not been covered by an MSHCP.

In addition to the positive effects of habitat conservation plans, resource conservation districts provide valuable services that preserve and restore habitat, and help landowners protect and enhance habitat on their properties. There currently is no resource conservation district in Orange County. Other resource conservation districts (including Inland Empire Resource Conservation District, in conjunction with the Santa Ana Watershed Association (SAWA)) in the watershed have conducted habitat restoration work in Orange County, but this requires special permission from the Local Agency Formation Commission (LAFCO) to allow them to work outside of their district boundaries. Orange County has a unique mix of habitat that includes forest, chaparral, riparian, coastal sage scrub, marsh, and open ocean and could benefit greatly from the formation of a resource conservation district to serve the area.

A regional tool that shows which portions of the watershed are covered by special conservation districts and formal habitat conservation plans would be valuable, allowing integration and easy access to the correct contact points.

5.8.2. BASIS FOR THE RECOMMENDATIONS

As the watershed has been developed over the past two centuries, many water-oriented habitats have been altered by man. Where water-oriented habitats have been reduced, the flora and fauna have adapted, moved, or disappeared. Through the OWOW process, stakeholders will investigate

how to successfully manage water-oriented habitats while ensuring adequate public water supply, protecting water quality, and providing housing and commerce for a growing population.

Primary threats to aquatic resources within the watershed include past and ongoing loss and degradation of native habitat—approximately 90% of the wetland habitat in the watershed has been lost. Non-native invasive plants have taken over approximately half of the remaining wetlands, resulting in greatly increased threat of fire, reduced wildlife values, and increased flooding issues, particularly from non-native giant reed ("Arundo"; *Arundo donax*) breaking off and forming huge debris dams. Non-native vertebrate and invertebrate species are wreaking havoc as competitors and predators of native species. There has been a historical lack of coordinated natural resources management to counteract some of the effects of human-induced impacts on the wetlands, along with a lack of public awareness and stewardship of wetland resource. The future availability of water is also a significant issue in habitat restoration and ongoing maintenance.

Unnatural Hydrology

The Santa Ana River and its tributaries have been largely channelized and dammed to provide water storage and flood protection for the growing human population. There are many lakes, reservoirs, and dams on the tributaries, including Santiago Dam, Villa Park Reservoir, Brea Dam, Fullerton Dam, Prado Dam, Carbon Canyon Dam, San Antonio Dam, Lake Hemet, Railroad Canyon Lake, Lake Elsinore, Lake Mathews, Big Bear Lake, and Baldwin Lake. Seven Oaks Dam is situated on the main stem near its emergence from the San Bernardino Mountains, and captures about 7.2% of the total watershed. Prado Dam is located near the middle of the main stem, capturing 52% of the watershed.

As noted by Moyle (2002), most of California's inland waterways today bear little resemblance to the streams and lakes encountered by the first European explorers and settlers. In the watershed, this observation is certainly true as flood control and channelization activities have left portions of streams channelized and concrete-lined where once riparian forests grew along a meandering stream. Fortunately, today only 20% of the Santa Ana River is concrete-lined. Dam construction and flood control activities were not the only factors influencing the watershed in ways that adversely impact habitat critical for aquatic resources. The following factors also have played a role:

- Stream channel alteration
- Draining of streams and lakes, especially adjacent wetlands
- Livestock grazing and the impact on aquatic and riparian vegetation, sedimentation, and water pollution
- Historical logging practices
- Invasive plant infestations
- Invasive and feral animal populations
- Bark beetle infestation

- Mining, particularly in-stream aggregate mining
- Watershed changes resulting in cumulative effects to aquatic resources

Invasive Species

Human development and activities in the watershed have greatly reduced the floodplain and associated habitats, and deleteriously affected the Santa Ana River's natural function and processes. One of the most challenging agents of deleterious change has been a multitude of non-native, invasive species, primarily, but not exclusively, plants. One major problematic species, Arundo, at one point was reported to have taken over approximately 10,000 acres of river bottom, replacing native wetland habitats.

The Santa Ana River has been transformed by Arundo. Other weedy species, including perennial pepperweed (*Lepidium latifolium*), tamarisk (*Tamarix* spp.), castor bean (*Ricinus molle*), and tree of heaven (*Ailanthus altissima*), among others, cause major local issues, but Arundo is pervasive. It provides no redeeming wildlife value, and it carries fire, obstructs flood flows, causes damage to bridges and other structures, and results in expensive beach cleanups. Compared to native habitat, Arundo consumes nearly three times the water, and it provides poor stream shading, impacting water quality. Arundo consumes an estimated 56,200 AFY of water from the Santa Ana River alone—enough for more than 100,000 households.

Achieving total eradication of Arundo in some parts of the watershed will take decades. Arundo control started in the upper watershed and continues downstream, because Arundo invades by pieces that wash down and sprout in moist soil. Arundo seeds are sterile in our area, so the spread of Arundo has been entirely by vegetative means in the watershed.

Arundo on the Santa Ana River main stem has been nearly completely eradicated in an area that stretches upstream from the Mission Bridge in Riverside, through San Bernardino and Redlands, and through the major tributaries of Mill Creek and San Timoteo Canyon. The San Bernardino National Forest also has projects focused on Arundo removal. Arundo has also been nearly eliminated in the Riverside County areas of Mystic Lake, the San Jacinto River, and Mockingbird Canyon/Woodcrest. In Orange County, it has been nearly eradicated in the Carbon Canyon, Modjeska Canyon, Santiago Creek, and Blackstar Canyon areas. All of these areas are being kept under control. This leaves the Santa Ana River main-stem areas from Mission Bridge downstream, and then through the Prado Basin and the lower reaches in Santa Ana Canyon. There are still thousands of acres of Arundo in these areas. Mitigation providers need access to these lands and long-term agreements with public and private landowners to complete the task of eradicating Arundo from the watershed.

Certain species of non-native vertebrates, like the brown-headed cowbird (*Molothrus ater*), are extremely harmful to native species and are managed in association with endangered species

monitoring to prevent harmful effects to listed species. More than 100,000 cowbirds have been removed from the watershed since 1986.

In coastal regions, an invasive alga nicknamed "killer algae" or "alien seaweed," *Caulerpa taxifolia*, was found, according to the National Oceanic and Atmospheric Administration (NOAA), in Southern California's coastal waters in Huntington Harbour in Orange County. It is actually the result of a clone developed for aquarium foliage that escaped into the coastal waters. It originally was discovered in the Mediterranean, where it has had devastating consequences. In areas where the species has become well established, it has caused ecological devastation by overgrowing and eliminating native seaweeds, seagrasses, reefs, and other communities; has resulted in economic devastation by harming tourism, pleasure-boating, and recreational diving; and has had a costly impact on commercial fishing. The dense carpet that this species can form on the sea bottom could inhibit the establishment of juveniles of many reef species, and its establishment offshore could seriously impact commercial fisheries and navigation through quarantine restrictions to prevent the spread of this species. This alga poses a substantial threat to marine ecosystems in Southern California, particularly to the extensive eelgrass meadows and other benthic (sea-bottom) environments that make coastal waters such a rich and productive environment for fish and birds. The eelgrass beds and other coastal resources that could be directly impacted by an invasion of *Caulerpa taxifolia* are part of a food web that is critical to the survival of numerous native marine species, including the commercially and recreationally important spiny lobster (*Panulirus interruptus*), California halibut (*Paralichthys californicus*), and sand bass (*Paralabrax nebulifer*). *Caulerpa taxifolia* eradication measures have been undertaken in Huntington Harbour; however, constant monitoring is necessary to ensure that this threat is eliminated.

Invasive Fishes

Introduced fishes have a great impact on the aquatic resources of the watershed. The 33 species of introduced fishes greatly outnumber the four remaining native fish species. The number of species, per se, is not the problem; rather, the issue is the impact that introduced fishes and other aquatic organisms have on the native fishes of the watershed. Introduced fishes have dramatically changed the composition of the watershed's fish community and now act as a deterrent to the restoration and enhancement of the native fishes that remain. Some of the aquatic species that continue to be destructive include carp (*Cyprinus carpio*), bass (*Micropterus salmoides*), African clawed frog (*Xenopus laevis*), and red-eared slider (*Trachemys scripta elegans*).

The ways in which introduced fishes can affect the aquatic resources of the watershed include:

- Competition between native and introduced fishes for food and space
- Predation by introduced species on native fishes
- Habitat interference by introduced fishes that change habitat characteristics
- Introduction of diseases that may infect native fish or other aquatic animals
- Hybridization between closely related species

These factors have acted in concert over a long period of time to reduce the native fish community of the watershed to that which remains today. The OWOW Plan Update 2018 recognizes that history cannot be undone and the aquatic community cannot be restored to its pre-settlement condition; however, a conservation strategy can be implemented that will ensure the long-term viability of the watershed's aquatic communities.

Other Invasive Species

Destruction to habitat also can be caused by animals such as feral dogs, cats, and pigs. With no natural predators, the numbers of these animals have greatly increased in recent years. The feral pigs are the most destructive. They root, trample, and eat their way through sensitive plant and animal species' habitats. On National Forest managed lands, they have harmed the riparian habitat and oak grasslands by wallowing and turning over the soil in search of grubs, tubers, and bulbs. The eggs of ground-nesting birds also are on their menu, and they compete for vegetative food sources with other native animals. Their consumption of seeds such as acorns affects the ability for a habitat to regenerate naturally, potentially leaving areas they frequent in a desolated state.

Diminished Habitat Areas and Wildlife Linkages

Development, especially during the past 50 years, has destroyed hundreds of thousands of acres of habitat. The result is that much of the remaining habitat is fragmented, and connections among some remaining habitat areas have been irretrievably lost. The challenge to watershed stakeholders is to find innovative ways of preserving those connections that remain and creating new ones.

Transportation infrastructure—including roads, bridges, and rail lines—presents significant obstacles to wildlife movement, especially for large mammals that are accustomed to roaming extensive territories. Commercial and residential developments, unlike roads, create many other issues along with being a barrier to movement. These issues include introduction of non-native plants and non-native, predatory animals into the surrounding habitat areas.

Wildlife movement and habitat connectivity should be important considerations in any residential or commercial development. Community planners should make it a priority. Linking aquatic habitat to riparian, and riparian to upland, is an important effort for the watershed to undertake. Connecting patches of the same type of habitat can support biodiversity and an increased range of species.

Current major efforts to preserve habitat connections in the watershed focus on the high country ringing the watershed and facilitating movement into and out of the watershed from outside areas, including the San Gabriel River Watershed, the San Bernardino Mountains, San Diego County and the eastern and northern desert areas of San Diego, and Riverside and San Bernardino Counties. One example is an effort to preserve the linkage between the Palomar Mountains and the inland ranges of San Diego County through the southern Riverside County area to the Santa Ana Mountains.

While efforts to keep our watershed linked with surrounding natural areas are vital to species diversity and abundance, it is also important that intra-watershed linkages be preserved and created. Within the watershed, many conservation efforts are conducted with a focus on preserving habitat areas with linkages for wildlife.

Several efforts in the watershed are focused on road and freeway barriers. Many critical former wildlife movement corridors have been significantly disrupted by major freeways.

Riparian areas of the Santa Ana River and subwatersheds and drainages provide opportunities to preserve linkages for wildlife movement, especially for larger wildlife. Studies have shown that large mammals prefer to move through areas that are less confined and contain quality habitat on both sides of the obstruction and in the crossing area itself over areas that lack one or more of these characteristics.

Alluvial fan areas—such as those found along the lower elevations of the front ranges of the San Gabriel, Santa Ana, San Bernardino and San Jacinto Mountains—should be considered valuable not only for their aquifer-recharge abilities, but also for use as wildlife linkages. According to the California Alluvial Fan Task Force's Planning Manual for Development on Alluvial Fans, "Alluvial fan areas can provide connectivity between lowland and highland areas and provide critical habitat for sensitive plant and animal species downstream and downwind of the fans themselves" (California Alluvial Fan Task Force n.d.). For this reason, preservation of sensitive alluvial fan areas should be considered in all development plans.

Population increases in the watershed have resulted in the need for additional commercial and residential development, making the remaining open space areas attractive for these purposes. Developmental goals often conflict with conservation efforts to preserve habitat and the region would benefit from collaborative land use planning to ensure that continuous wildlife corridors are preserved to promote biological diversity and prevent isolated conservation areas that diminish species viability.

Climate Change and Natural Factors

The habitat within the watershed is affected by naturally occurring droughts, seasonal floods, and fires resulting both from naturally occurring lightning and from human activities. Climate change is an additional uncertain variable that can influence the intensity of these natural events and the resulting damage to habitat. It is more and more clear that the climate change impacts in the watershed will exacerbate most of the existing stressors, including within the hydrology and the population and development pressures.

Unsanctioned Recreational Uses

It is recognized that the Santa Ana River, in areas where stream flow is substantial, is a destination for recreation and relief from the heat of hot summer days. There are, however, no designated

areas for such uses along the main stem (except in the San Bernardino National Forest and within the city of Jurupa Valley) and efforts to restrict access have had limited success. Sensitive habitat is vulnerable to damage in the form of pollution as there are no trash receptacles or restroom facilities, as well as foot traffic. In some cases, people have constructed dams out of plastic bags in order to make a larger pool of water for swimming. This type of activity can damage the native aquatic habitat and natural stream flow.

Sensitive habitat also is at risk from all-terrain vehicle (ATV) recreation. Continued use can result in the development of ruts into which rainfall can find its way, exacerbating the problem by increasing erosion and runoff debris, as well as forming new channels that change the natural hydrology of the area.

Other restricted activities, specifically along the Santa Ana River Trail, are as follows:

- Discharge of firearms and hunting is prohibited along the Santa Ana River Trail.
- Motor vehicles are prohibited.
- Possession of alcoholic beverages is prohibited.
- No overnight camping is allowed along the Santa Ana River Trail, although it may be allowed in some adjoining park areas.
- Fireworks, grills, and campfires are prohibited.
- Geocaches are allowed where they do not affect natural, cultural, and historical resources; visitor safety; or other park users.

Implemented policies such as these are submitted and then reviewed by the Policy Advisory Group and Technical Advisory Committee for the Santa Ana River Trail. Composed of eight elected representatives from county and city government, these groups are responsible for policy creation and modification.

5.8.3. INTEGRATION WITH OTHER PILLARS

The natural systems of the watershed underlie the successes or failures in each of the other Pillars. Ensuring sufficient clean air, water, and natural landscape for the health of people and all the species of the watershed is fundamental to the success of the OWOW Program, and must be integrated wholly into other decisions. This is not a new idea, and much of the watershed already thinks in these ways. That said, there remains significant need for consistent efforts to protect the watershed's natural resources across all decision-making platforms.

5.8.4. PROJECT EXAMPLES

Two of the most immediate needs in the watershed in natural resources preservation and protection are wildlife connections and Arundo removal. Table 5.8-1 shows two concepts from the Natural Resources Stewardship Pillar's Implementation Concept Projects table.

Table 5.8-1. Natural Resources Stewardship Pillar Implementation Concept Projects

Project Title		Project Concept
NR2	Establish sustainable wildlife corridors and expansion of restored areas	Creating sustainable wildlife corridors will require land use planning coordinated across jurisdictional boundaries. Cooperation also must take place among all of the current regional conservation plans, mitigation providers, resource conservation districts, and non-profit conservation organizations.
NR4	Project that provides invasive species eradication and maintenance funding	All of these sources and more should continue to support restoration and ongoing maintenance. Access to such funding should be expanded to benefit the watershed. New, innovative partnerships should be developed to direct funding to habitat issues.

These two projects would occur along the main stem of the Santa Ana River, but would have far-reaching positive effects for habitat restoration, recreation, wildlife movement, disadvantaged communities, and water retention.

NR2—Project to Create Sustainable Wildlife Linkages and Expand Restored Areas

There are several areas in the watershed that have been identified by regulatory agencies and conservation groups as vital linkages that need to be preserved for movement of wildlife and species diversity. Most of these areas preserve a link among natural habitats from the San Diego County Mountains and deserts, through southwestern Riverside County, through the Santa Ana Mountains and Cleveland National Forest, and then across the Santa Ana Canyon through to Chino Hills State Park and the Prado Basin, and the rest of the Santa Ana River upstream. Of course, the linkages work in the other direction as well.

Significant chokepoints in these wildlife movement linkages are created in the watershed by roadways, especially Interstate 15 in the Temecula area, the 241 Toll Road in Orange County, and the 91 Freeway in the Santa Ana Canyon adjacent to the river.

The biggest challenge to such a project is providing a large enough crossing with the right characteristics to encourage crossings by everything from the smallest insects to the largest mammals. In a study published in *Biological Conservation* titled "Use of Highway Undercrossings by Wildlife in Southern California" (Ng et al. 2004), the authors wrote the following regarding wildlife crossings: "Our results show that while many native animals used passages beneath highways, the presence of suitable habitat on either side of the passage was a particularly important factor for predicting use" (Ng et al. 2004). The study also found that size of the passage was important especially with large carnivores and deer. The study authors recommended the following: "To increase the likelihood of utilization and to help prevent animals from crossing road surfaces, we suggest that simple improvements, such as habitat restoration near crossing points and animal-proof fencing that serves to funnel wildlife to passages, can facilitate animal movement between fragmented habitats that are bisected by roads" (Ng et al. 2004).

The 91 Freeway in the Santa Ana Canyon provides a significant barrier to wildlife movement, especially large mammals, including carnivores such as bobcats (*Lynx rufus*), coyotes (*Canis latrans*), and mountain lions (*Puma concolor*). At B Canyon in Riverside County, adjacent to the upstream edge of the Green Valley Golf Club, the freeway creates a barrier between two of the Riverside County MSHCP's major habitat areas—Existing Core A (Prado Basin/Santa Ana River) and Existing Core B (Cleveland National Forest). In the MSHCP, this is known as Constrained Linkage 1. The MSHCP recommends creating an adequate wildlife underpass or overpass at this location. Plans have been submitted by the Riverside County Transportation Commission to enlarge a culvert under the freeway to improve movement of wildlife. However, further measures are needed to improve this linkage for the future.

Bobcat (*Lynx rufus*)

In the Santa Ana Canyon outside of the MSHCP area, the 91 Freeway also constrains the linkage between the Cleveland National Forest and Chino Hills State Park, most notably at Coal Canyon. The corridor under the freeway was never vegetated and mountain lions are no longer using it, although historical use of this linkage is well documented. Currently, there is a considerable amount of construction taking place in this area, which also is hampering animal movement.

Suggested solutions include revegetating the Coal Canyon ramp undercrossing and improving oak–riparian structure coming down the drainage that leads to the large culvert there to enhance the likelihood that certain wildlife, including mountain lions, would approach the crossing. Other solutions include keeping the culvert clear of heavy sediment but with a sandy or dirt floor, cutting light and noise impacts at the crossing with sound walls or other measures, moving Caltrans and other equipment and construction-related activities to other locations, and improving some of the fencing around this area.

We recommend a project that would begin with a study of the current mitigation and construction measures taking place in these areas, determine what is lacking in planning and funding, and then develop a plan to create crossings that meet criteria for successful crossing sites. Implementation would include crossing construction, funnel fencing construction, initial and ongoing habitat restoration, mitigation of lighting and noise effects, and landscaping and monitoring. Partners could include the Western Riverside Regional Conservation Authority, the Corps, Caltrans, Riverside County Transportation Commission, SAWA, Riverside–Corona Resource Conservation District, and the Counties of Orange and Riverside.

NR4—Project to Eradicate Invasive Species and Provide Native Habitat

As noted earlier, Arundo has been nearly completely eradicated in the Upper Santa Ana River Watershed upstream from Riverside, and the San Bernardino National Forest also has projects focused on Arundo removal. There are also several ongoing invasive species removal and maintenance operations in Norco, Eastvale, and the Prado Basin. These downstream projects are in constant danger of re-infestation because of large, scattered Arundo infestations on the Riverside area of the Santa Ana River main stem in the area between the Mission Bridge and the Goose Creek Golf Course.

Within this stretch of the main stem, there are significant gaps where Arundo is present and presents a threat of re-infesting downstream areas that have been cleared by the Corps, SAWA, the resource conservation districts, and OCWD. However, the area also contains several large eradication and restoration projects managed by SAWA and the Riverside County Parks and Open Space District totaling nearly 1,500 acres. In the middle of this stretch of the river is Hidden Valley Wildlife Area, where SAWA has been eradicating approximately 775 acres of invasive plants over an approximately 1,000-acre project area since 2008 with Proposition 50 funding. In 2013, active planting and restoration had occurred on some of the more bare areas. In 2014, the Proposition 50 grant will expire and other funding will be needed to keep this area under control and in active restoration. Riverside County Parks also is working to remove Arundo on its own property.

Funding for removal and restoration of these "Arundo gaps" in the Riverside area of the Santa Ana River main stem will result in a more systematic removal of Arundo from the watershed and remediate some of the problems mentioned earlier in this chapter of spotty conservation areas and fragmented management of natural resources. Removing these large areas of Arundo also returns a significant amount of water to the river every year because of the plant's rapid growth and heavy water use compared to native vegetation. The removal of Arundo and restoration of native habitat also provide benefits to sensitive species including the least Bell's vireo (*Vireo bellii pusillus*), the southwestern willow flycatcher (*Empidonax traillii extimus*), and the Santa Ana sucker (*Catostomus santaanae*).

Potential partners in this project could include Riverside County Flood Control and Water Conservation District, Riverside County Parks and Open Space District, CDFW, the Inland Empire Resource Conservation District, Riverside–Corona Resource Conservation District, the City of Riverside, and the City of Jurupa Valley.

5.8.5. CONTRIBUTORS – NATURAL RESOURCES STEWARDSHIP

ROLE	ORGANIZATION
Chair	
Jeff Beehler	San Bernardino Valley Water Conservation District
Contributors	
Arlee Montalvo	Riverside County Resource Conservation District
Bill Wells	San Bernardino National Forest
Dave Woefel	Santa Ana Regional Water Quality Control Board

ROLE	ORGANIZATION
Diana Ruiz	Riverside County Resource Conservation District
Heather Dyer	San Bernardino Valley Municipal Water District
Jacob Scaggs	Inland Empire Resource Conservation District
Lee Reeder	Winning Words
Lisa Haney	Orange County Sanitation District
Mary Beth Najera	San Bernardino National Forest
Wendy Katagi	Stillwater Sciences
Pillar Liaison	
Ian Achimore	Santa Ana Watershed Project Authority

5.9. WATER USE EFFICIENCY

The Water Use Efficiency (WUE) Pillar started the 2018 One Water One Watershed (OWOW) Plan Update 2018 with a solid foundation constructed by its predecessors just 4 years earlier. Although the regulatory and legislative desire for increased efficiency in water use and reductions in waste has significantly expanded due to the statewide drought declarations in 2014 and 2015, the vast majority of the recommendations from the OWOW 2.0 Plan are still relevant. Of the many watershed-wide management strategies proposed under the prior OWOW Plans, WUE remains a cost-effective, high-priority strategy to meet future water demands throughout the watershed. The other OWOW Pillars and OWOW Steering Committee support an integrated approach to meeting the future needs of the growing watershed that prioritizes efficient water use, emphasizes consumer education, and ultimately seeks to change wasteful indoor and outdoor water use behaviors. WUE is a key component of the overall portfolio of existing and planned water supply strategies to ensure a sustainable watershed for future generations.

5.9.1. RECOMMENDATIONS

Although substantial improvements in water efficiency and reductions in water waste have been made throughout the watershed since the first OWOW Plan was developed more than a decade ago, it is clear that we will need updated outreach strategies, new customer support programs, and technological innovations in WUE to further reduce our collective water use. This section of the OWOW Plan Update 2018 seeks to identify new opportunities for strategic investment that will help customers become even more water wise and thereby help water suppliers meet water use targets as defined by future regulations.

Identify and implement strategies to improve efficiency.

In consideration of volatile imported water supply conditions, lower than average rainfall and runoff in the watershed over more than 15 years, and the changing regulatory and legislative environment, the primary objective of water suppliers throughout the watershed is to reliably meet the efficient demands of a growing population while reducing wasteful water practices in the watershed. To identify opportunities to achieve the efficient use of water, existing program successes as well as potential opportunities were identified by the Pillar members.

Messaging and Outreach

- Unified watershed-wide messaging that complements other planned or existing campaigns
    - iEfficient/Defend the Drop
    - Love H_2O
    - San Gorgonio Pass Regional Water Alliance
    - Save Our Water
- Watershed-wide awareness campaigns and messaging
    - Billboards, venues, and movie theaters

- Watershed-wide advertising campaigns
    - Rebates and/or events/workshops
    - Online and in social media platforms

Customer Support Programs

- Incentives and programs
    - Plumbing fixtures and appliances that exceed the plumbing code requirements
        - High-efficiency toilets
        - Clothes washers
        - Smart irrigation controllers
        - Low emission devices (sprinklers and drip)
        - Commercial devices
    - Landscape conversion support
        - Rebates and incentives
        - Workshops and events
        - Websites and publications
    - Capitalizing on existing regional programs and filling in the gaps with grant funding
- Direct install programs for disadvantaged communities
- Evaluation programs
- Web portals with water use statistics and self-help suggestions

CASE STUDY: Big Bear Lake DWP and Advanced Metering Infrastructure

Even without a customer portal, advanced metering infrastructure (AMI) is giving agencies such as the Big Bear Lake Department of Water and Power (BBLDWP) the ability to work with customers to prevent water waste. The BBLDWP sends customers a notice, and in some instances field staff to the customer's property, whenever continuous use suggests a possible leak. At that point the water may be turned off to prevent property damage and mitigate unnecessarily high water bills, which is beneficial in a resort community with a high rate of vacation homeowners. The BBLDWP also monitors water use to see if customers observe the local regulations on alternate day outdoor watering. If customers call concerned about a high bill, Customer Service and Conservation staff are able to check the AMI data to verify patterns of use and suggest a possible source. With only 70% of their project complete at the end of calendar year 2017, the BBLDWP saw savings of at least 3% due to water loss monitoring among those customers who had an AMI meter (when compared to a similar group of customers for the same benchmark and comparison period).

Develop tactics and technologies.

Encourage implementation of advanced metering infrastructure.

Most customers in the Santa Ana River Watershed are metered, but there are still opportunities for advanced metering infrastructure (AMI) or automatic meter reading (AMR). Implementation of these technologies provides information that can detect leaks and help water agencies target WUE

CASE STUDY: Emergency Drought Grant Program and Implementing Budget-Based Rates

Based on the savings demonstrated in the 2014 study by Baerenklau et al., the SAWPA member agencies and SAWPA have implemented the Emergency Drought Grant Program to incentivize retail water agencies in the watershed to adopt budget-based rates. East Valley Water District (EVWD) was the first agency to adopt the rate structure, because it reflected their board's policy priorities.

EVWD saw benefit in transitioning to a budget-based rate structure in 2015 because the structure treats customers fairly by considering their unique water needs and allows the lowest cost water to be used for essential use indoors. Under EVWD's previous flat rate structure, it was difficult to encourage EVWD customers to conserve because there was no escalating volumetric price. Another benefit was that the rate structure would increase EVWD's ability to offer additional water efficiency programs to its ratepayers. In coordination with the new rate structure, EVWD launched conservation programs that give customers access to financial assistance for professional landscape evaluation and survey, landscape redesign and replacement, and irrigation upgrades.

programs. Frequent monitoring of such patterns allows water retailers to determine if customers are observing water use regulations. These include local day and time prohibitions as well as those rules imposed by the state such as the prohibition against outdoor irrigation within 48 hours of measurable precipitation. In conjunction with the meters themselves there is a growing market for customer portals, giving customers additional data about their own water use. The 2004 National Multiple Family Submetering and Allocation Billing Program Study by Mayer et al. found that metered customers use on average 15% to 20% less water than those who are unmetered.

Routinely update aerial imagery of the watershed.

Aerial imagery continues to provide an efficient method to measure irrigated and irrigable landscapes. For a moderate-sized water agency, it may cost approximately $70,000 for an aerial flight and graphic information system (GIS) analyst review, while the same effort for the entire watershed can cost $807,000. With 76 retail water agencies in the watershed, that would be a savings of over $4 million if the retailers partnered on a single aerial survey effort.

Quantify the size, type, and location of agriculture within the watershed.

Water agencies are able to quantify the amount of agricultural land recorded by the county assessors, but programs that quantify crop type and climate zones could provide water agencies with information that can assist with planning and targeting WUE programs.

Standardize categorization of water uses.

Further analysis and peer-reviewed studies on water use by customer categories would provide water agencies with information that can assist with planning and targeting WUE programs by customer type. Through the April 2017 joint agency Executive Order B-37-16 Report,

the state is already promoting policies that would require agencies to identify commercial customers by their North American Industry Classification System (NAICS) codes.

- Sectors (residential, multifamily, commercial, landscape)
- Supply (potable, recycled, nonpotable)
- Classification codes (NAICS)

Encourage implementation of more progressive conservation-based water rates.

Conservation-based rates are an effective tool for promoting WUE. At its core, a conservation-based water rate sends a message to the customer via their regular water bill that a reduction in water usage equates to a reduction in the volumetric portion of their water bill. Various rate structures can serve as the platform to send a conservation message including Uniform Rates, Increasing Block Rates, Seasonal Rates, and Water-Budget Rates (CUWCC 1997). There are many reasons for agencies selecting one rate structure over another, and objectives that those rates should satisfy, included but not limited to, source and availability of water supply, revenue sufficiency, revenue stability, rate continuity, resource efficiency, affordability for customers, full cost pricing, fair and equitable, economic development, public understanding, and public policy concerns.

Although SAWPA has most recently incentivized the implementation of water-budget rates, in light of lessons learned from the efforts of the Project Agreement 22 Committee, one size may not fit all, so there may be cause to encourage more than just the single structure.

As the State of California considers water efficiency targets at the utility level, it may be possible to achieve the mandated level of efficient water use with multiple rate structures that are complemented with progressive customer support programs like the following:

- On-site efficiency evaluations
- On-line water budget information, not specifically tied to the rate
- Technological outreach platforms
- Web-based information on real-time water usage

In addition to seeking funding for the implementation of water-budget rates, the OWOW Program should seek ways to encourage implementation of emerging technologies that drive customer behaviors toward individualized water efficiency goals, increased WUE, and reduced water waste.

Develop individualized water budgets for end users and customer portals.

Developing individualized water budgets based on indoor and outdoor uses and sharing that information through customer portals provides another mechanism for water agencies to educate

customers. This approach can serve as a useful tool in cases where conservation-based water rates cannot be implemented. The Emergency Drought Grant Program's Web-Based Information Tool, which uses individualized customer budgets, estimates that 82% of the participating agencies[1] saw an increase in efficiency while participating in the program. Multiple providers offer custom portals that also work with a variety of meters and AMI programs. Portals can provide customers an idea of how their use compares with neighbors or similar households, hourly or daily water use reads, the ability to set text or email notifications based on irregular use, and much more.

CASE STUDY: Customer Parcel Water Budget Tool

SAWPA worked with Esri to develop the Customer Parcel Water Budget Tool so water managers can easily analyze the imagery and water budgets without needing GIS software, having internal GIS expertise, or having to use storage space on their servers. The web-based tool allows water managers to:

1. **Click on customer parcels to access parcel, address, land use, and landscape area data.**
2. **View monthly outdoor water budgets for both individual customers and entire service areas.**
3. **Download landscape measurements and outdoor water budgets.**
4. **Upload billing data to compare actual water use data to the budgets.**

Study/define efficient use metrics for various commercial indoor uses of water.

Because the watershed has a large variety of private industries, research on water use from common business practices could provide the basis for targeting WUE programs. Water audits of businesses often have to be kept confidential due to patents; therefore, disseminating research-based information to businesses would allow water agencies to encourage conservation in the commercial sector. Research in this area could also use NAICS codes, which are available for purchase on a regional basis, to categorize general water use trends by different business types.

Study the cost of separating mixed-use meters in existing commercial applications.

Because most of the water used in California is outdoors, separating commercial mixed-use meters has been a state policy for a number of years through Water Code Section 535 and the Model Water Efficient Landscape Ordinance. Further study would be useful as many water agencies do not separate mixed-use water production from multifamily or other customer categories, making it difficult to quantify water savings. The Model Water Efficient Landscape Ordinance, which was updated in 2010, does not require separating residential water meters for outdoor and indoor use if landscapes are less than 5,000 square feet.

[1] Participating agencies include EMWD, Monte Vista Water District, West Valley Water District, Yorba Linda Water District, and the Cities of Brea, Fullerton, Loma Linda, Newport Beach, Ontario, Rialto, and Tustin.

Study cost effectiveness of separately metering indoor and outdoor water use in new residential construction/development.

Although there has been research on submetering multifamily residences, there has been little research on the cost effectiveness of separating new single-family residential water meters. New residences, which are already required through Part 11 of California's Building Standards Code to have efficient indoor fixtures, could be an area of research focus since most of the water use in California is outside the home.

5.9.2. BASIS FOR RECOMMENDATIONS

The OWOW Plan Update 2018's WUE element is the product of a growing watershed-wide effort to diversify our portfolio of water supplies, droughtproof the watershed, and ensure a reliable water supply into the future. The following recommended management strategies identifies how to support existing water conservation strategies, enhance existing programs and measures, develop new WUE programs, and be a model for others in this arena. The OWOW Plan Update 2018 has assessed the current and existing WUE conditions and resources in the watershed.

The term "water use efficiency" (WUE) has been used in place of "water conservation" in this section. The phrase "water conservation" is routinely associated with short-term water use reduction programs that are implemented when water supplies are compromised due to drought or water shortage emergency, thereby implying a water "diet." By using the phrase "water use efficiency," the WUE Pillar is emphasizing long-term improvements in how we use water while maintaining quality of life standards.

With pressures on available local groundwater and imported water supplies throughout the watershed increasing as a result of cyclical drought conditions, increasing population, climate change impacts at both the source and at the point of use, and likely statewide mandates on the efficient use of water, collaborative and integrated water resource planning is critical for a sustainable future. A November 2003 study by the Pacific Institute, "Waste Not, Want Not: The Potential for Urban Water Conservation in California," concludes that WUE is the most cost-effective way to maximize diminishing water supplies, which makes it one of the most important components for diversifying the state's water portfolio in the coming years.

Significant investments in WUE programs, policies, and measures have been implemented by Southern California water agencies. These programs include the large-scale replacement of old inefficient water fixtures and upgrading of state building and plumbing codes, requiring low-flow toilets and showerheads in all new development. It is anticipated that these types of regulatory mandates will continue to be enhanced as emerging technologies become available. As a result of these efforts, the amount of water imported into much of Southern California has remained fairly constant, sufficiently meeting consumer demands despite significant development and population increases. However, with the water supply outlook continuing to present challenges to water managers, WUE will be a critical management strategy that the watershed will need to embrace.

WUE measures can be categorized as "active" programs, such as rebates, or "passive" programs, such as the incorporation of WUE into standardized plumbing codes. Through a combination of active and passive measures, it was estimated in the 2014 OWOW 2.0 Plan that more than 20% of forecasted water demand in the watershed can be met through the implementation of aggressive WUE programs. The OWOW Plan Update 2018 echoes this tenet.

The following subsections describe funding and programmatic resources available to water suppliers and their customers throughout the watershed. It also describes the known regulatory and legislative initiatives on the horizon that may influence future programmatic and local policy decisions in the watershed. These programs include the OWOW Program initiative; programs offered by DWR; funding support and programs coordinated by regional SWP Contractors, San Bernardino Valley Municipal Water District, and the Metropolitan Water District of Southern California (Metropolitan); and the U.S. Department of the Interior Bureau of Reclamation programs, as well as subregional programs provided by regional water wholesalers throughout the watershed.

California Department of Water Resources

DWR routinely offers funding mechanisms through the Integrated Regional Water Management (IRWM) process that are used by water agencies in the Santa Ana River Watershed. DWR also offers an urban planning assistance program to assist urban water suppliers in meeting the requirements of the Urban Water Management Planning Act by preparing comprehensive and useful water management plans, implementing water conservation programs, and understanding the requirements of the act. DWR is required to evaluate all applications for WUE grant and loan financing on the applicant agency's compliance with, and implementation of, its Urban Water Management Plan.

Metropolitan Water District Regional Programs and Support

Metropolitan provides incentive funding for a variety of programs, devices, and measures throughout its service area. These programs are offered to residential, commercial, industrial, institutional, and agricultural customers. Metropolitan administers a rebate portal at socalwatersmart.com to help make it easier for residential and commercial water users in their service territory to take advantage of funding opportunities. Metropolitan coordinates a robust public outreach and school education program to increase the awareness of water and efficiency related topics. The agency also hosts a monthly WUE meeting for their member agency conservation staff to share information and learn about important changes in the field.

A select sampling of Metropolitan programs includes:

- Weather-Based Irrigation Controller Programs and Rebates
- Agricultural and High Water Use Residential and Commercial Audits and Evaluations
- Rotating Sprinkler Nozzles for Sprinkler Heads Rebates

- Turf Reduction Rebate Programs
- Residential and Professional Landscape Classes (California Friendly)
- High-Efficiency Toilet Rebates
- High-Efficiency Clothes Washer Rebates
- Rain Barrel Rebates
- Commercial, Industrial, and Institutional Water Use Surveys and Rebate Program
- Industrial Process Performance Improvements Programs
- Public Awareness and Communications Campaigns

San Bernardino Valley Municipal Water District – Basin Technical Advisory Committee Conservation Subcommittee

Programs provided by the San Bernardino Valley Municipal Water District include the following:

- IEfficient/Defend the Drop
- Rebates
- Coordination meetings

Additional Regionally Coordinated Efforts

Water Saving Garden Friendly. A multi-agency program that provides web-based information on water-efficient landscaping to the public and a public-private partnership with The Home Depot that provides plant sales of water-efficient landscape plants. See http://www.watersavinggardenfriendly.com.

SoCal Yard Transformation Guide – Proposition 84 Funded. A complimentary 134-page manual was developed for the residential homeowner in the Santa Ana River Watershed. The manual, which is also available digitally in English and Spanish at www.socalyardtrans.com, provides insightful information regarding water, landscape design, soil, plant care and maintenance, native plants, irrigation, and sustainability.

University of California Cooperative Expansion Master Gardeners of Riverside County Program. A partnership with Western Municipal Water District to provide free monthly workshops for the public addressing landscape concerns using the latest research and information from the University of California Agriculture and Natural Resources division.

Inland Empire Landscape Contest. A biennial regional contest for western Riverside and San Bernardino County residents. Contestants submit photos of their water-wise landscape, which are judged by a panel of landscape architects and contest sponsors. Winners receive prize money and local agency commendations. See details at http://www.inlandempirelandscapecontest.com.

The Municipal Water District of Orange County Spray-to-Drip Conversion Pilot Project (S2D Program). The S2D Program provides rebates for customers to replace inefficient, high-water-use spray heads with efficient, low-water-use drip irrigation. The S2D Program targeted the conversion of 175,126 square feet of inefficiently irrigated area to low-water-use drip, reducing irrigation water use and runoff, and was projected to save more than 188 acre-feet over the life of the irrigation system improvements.

Western Riverside Council of Governments HERO Program. Provides financing to property owners to implement a range of energy saving, renewable energy, and water conserving improvements to their homes and businesses.

Locally and Independently Administered Programs

There are seven independent retail water providers within the watershed that are not part of larger member agencies. These include the City of Big Bear Lake Department of Water and Power (BBLDWP), Pine Cove Water District (PCWD), Idyllwild Municipal Water District (IMWD), Fern Valley Water District (FVWD), Beaumont Cherry Valley Water District, City of Banning, Crestline–Lake Arrowhead Water Agency, and Running Springs Water District.

As a result of their independence, some of these agencies, and others, operate locally administered WUE programs due to necessity, flexibility, or both. Some programs are common among multiple water providers. For example, several agencies offer free water conservation kits, including BBLDWP, FVWD, and PCWD. Kits commonly include items such as low-flow showerheads, toilet leak detection tablets, low-flow faucet aerators, and leak catch cups. High efficiency toilet rebates are offered at FVWD, BBLDWP, and PCWD.

CASE STUDY: Residential Pressure Regulation Program in the Inland Empire Utilities Agency Service Area

When under high pressure, water in the plumbing line is delivered to customers at a much higher rate and volume, than at lower pressure, causing more water to flow from a fixture over a set time-period. Through this IEUA Program, Pressure Regulating Valves (PRV) are installed at customer's meter, at the house, and/or at the point-of-connection for the irrigation system which automatically reduces the high incoming water pressure from water mains between 45 and 75 psi. In addition, PRVs ensure that end-use plumbing fixtures operate at the intended flow rate and reduce the incidence of excessively leaky pipes and fixtures. On average, 20,000 to 30,000 gallons per year per home can be conserved with no conscious water conservation efforts beyond installation of the device. The program, launched in June 2016, serviced 161 sites in FY 16/17 with an estimated savings of 13 acre-feet per year and lifetime savings of 130 acre-feet. The Program is projected to replace up to 500 PRVs over the next fiscal year.

These water providers are also able to pioneer unique programs such as rain barrels and water heater rebates, both available through PCWD and IMWD. Together these two agencies have provided more than 300 rain barrels in the last 4 years. PCWD also offers free wood chips, compost, and high-

efficiency washing machine rebates. Both IMWD and BBLDWP offer soil moisture sensors and auto shutoff nozzles for hoses.

BBLDWP began a retrofit on change of service program over a decade ago, ahead of state law, requiring property owners to verify low-flow fixtures in their home or place of business upon a transfer in ownership. The BBLDWP is implementing a complete AMI and leak detection program across their entire service area. Customers receive high water use letters in the summer if they exceed 50 CCF (hundred cubic feet) over the course of 2 months, which drives continued interest in the turf rebate program that they offer to both commercial and residential customers.

Running Springs Water District is also pursuing funding through the State Water Resources Control Board's Green Project Reserve low-interest loan program to install approximately 2,900 new potable water meters with AMR technology and a radio read mesh network to improve leak detection and water loss in their service area.

The San Gorgonio Pass Regional Water Alliance is a collaborative effort involving 13 regional water providers and local governments. The Alliance identifies regional water challenges and promotes common strategies and partnerships. The Community Action Partnerships for each county in the watershed offer programs in home weatherization for low-income individuals and families. They provide water-efficient devices such as faucet aerators, low-water-use shower heads and water heaters, and low-flow toilets.

While many water retailers administer and operate local programs, a few programs are highlighted to show exemplary efforts or pilots that could be adopted elsewhere or administered throughout the watershed.

Incentive Programs

Pool Covers. The City of Corona Department of Water and Power administers a rebate program for pool and spa covers. The rebate value is based on estimated water savings and avoided costs for water production.

Spray to Drip Conversions. Municipal Water District of Orange County administers a spray-to-drip conversion rebate program for both residential and commercial customers. Municipal Water District of Orange County's program is unique in that it offers simplicity and customizability for customers. Residential customers can purchase a kit of drip irrigation parts from local irrigation supply stores, or they may choose to build their own "virtual kit" of pre-approved parts. Residential customers receive a flat rebate per kit, up to a maximum number of kits per residence. Commercial customers are rebated based on square footage of landscape converted from spray irrigation to drip irrigation, and also must purchase a minimum quantity of pre-approved components.

Agricultural Production Conversions. Rancho California Water District implements a CropSWAP (Sustainable Water for Agricultural Production) Program. The CropSWAP program provides financial incentives to farmers for converting their high water use crops to lower water use varieties. Examples of projects that have already been completed through the CropSWAP program include avocado to wine grape, avocado to citrus, avocado to olive, and citrus to wine grape conversions. The benefits CropSWAP brings to Rancho California Water District include significant and cost-effective water savings and decreased demand for imported water, which is the Districts most expensive source of supply. The District-wide cost savings created by CropSWAP benefits all of the District's customers by keeping rates as low as possible. Another benefit of the program is that it helps to sustain the local agricultural economy.

Landscape Direct Installation Programs. Irvine Ranch Water District (IRWD) has recently piloted a number of direct installation programs, in which a contractor hired by the District will provide devices or services at a partially or fully subsidized price to the customer. IRWD recently piloted a weather-based irrigation controller direct install program and a water-wise landscape direct install program where a District contractor provides design templates, removes the existing turf grass, and installs California friendly plants and an efficient irrigation system. SAWPA has also implemented the Water-Energy Community Action Network (WECAN) Program (see the case study in Section 5.5.2. Recommended Management Strategies, in the Disadvantaged Communities section) that provides the direct installation of indoor and outdoor devices in communities that are deemed disadvantaged by the California EnviroScreen Tool.

Evaluation Programs

Residential Water Audits. Western Municipal Water District offers residential water audits to its residential customers. While these efficiency evaluations are intended for customers who are over their individual water budget, the program is still available to other customers as a customer service benefit. The benefit of residential water use surveys is that it is an opportunity to educate the customer about programming and updating their sprinkler timer, identifying potential water leaks, and a sense of good will to the customer.

Landscape Water Audits. Mesa Water District offers landscape water use surveys to its multifamily residential, commercial, industrial, and government customers. The goal of these surveys is to identify water savings opportunities, and to cross-promote financial incentive programs that may be of benefit. A Certified Landscape Irrigation Auditor is employed by the District and conducts the surveys.

Education Programs

Professional Landscaper Education. Chino Basin Water Conservation District and Eastern Municipal Water District currently administer the Qualified Water Efficient Landscaper (QWEL) program in each of their respective service areas. This U.S. Environmental Protection Agency WaterSense Recognized program provides a background and refresher of watershed wise practices and

education to professional gardeners and property managers. QWEL provides landscape professionals with 20 hours of education on principles of proper plant selection for the local climate, irrigation system design and maintenance, and irrigation system programming and operation. Through this hands-on course, professionals understand the particular characteristics of their clients' sites and plants, thus maximizing the use of limited water resources and helping clients save on their water bill.

Residential Landscape Water Conservation Education. While many water suppliers will host the California Friendly Landscape Workshops provided by Metropolitan, some suppliers have opted to teach their own locally customized content. Mesa Water District typically hosts two workshops each year, and focuses on irrigation efficiency, rainwater retention, and the benefits to food production in a water wise garden. The agencies' mountain communities have partnered to create a full color magazine style publication, the "Landscape Guide for Mountain Homes," which includes information on everything from native plants to slope control and fire-safe plants.

Water-Wise Demonstration Gardens. Virtually all water districts and water departments have constructed a water-wise demonstration garden for the purposes of promoting irrigation efficiency, climate-appropriate plants, and stormwater retention BMPs. These gardens will typically have signs and educational plaques describing the various water-saving features. Local examples include:

Riverside County
Santa Ana Watershed Project Authority's Patti Bonawitz Demonstration Garden
Riverside–Corona Resource Conservation District's Land Use Learning Center

San Bernardino County
BBLDWP's Xeriscape Demonstration Garden
Inland Empire Utilities Agency's Water Conservation Garden
Chino Basin Water Conservation District's Water Wise Demonstration Garden

Orange County
City of Westminster's Water Conservation Garden
Mesa Water District's Water Wise Demonstration Gardens
City of Newport Beach's Water Conservation Garden
Coastkeeper Garden adjacent to Santiago Canyon College

To reach the most water customers with consistent water conservation messaging, water agencies can implement regional bilingual educational programs by taking into account data provided by the U.S. Census on areas that report spoken languages other than English. Planning regional programs, such as residential and professional landscaper training, and translating these services can be a focus for future WUE programs.

5.9.3. WUE POLICY AND LEGISLATION

Since the OWOW 2.0 Plan, and mostly due to the significantly dry conditions experienced in the Sierra Mountains, state regulators and the Legislature have been actively engaged in water use prohibitions, restrictions, and policy updates. In 2018, the California Legislature enacted two bills—SB 606 and AB 1668—to establish new regulations to produce long-term improvements in water use efficiency. These two bills require urban water suppliers to implement permanent water use reporting and meet agency-wide targets that will be enforceable after 2022. Under the new legislation, suppliers' water use will be compared to a baseline (target). As opposed to calculating a baseline based on the amount of a water supplier's usage in preceding years, as was done with emergency drought regulations adopted by the State Board in 2015, the formula identified calculates the volume of water that is needed to efficiently meet the needs of the supplier's customers.

5.9.4. INTEGRATION WITH OTHER PILLARS

Integrating the strategies of multiple OWOW Pillars into watershed-wide multi-benefit programs will yield results greater than those achieved through the efforts of a single Pillar or project. Water resources are vital to the watershed, and resources including time and funding are vital to the successful implementation of WUE projects and programs. Watershed-wide collaboration in WUE program implementation and outreach, as recently exhibited through the efforts of the PA-22/23 partnerships, achieved greater success in program uptake and water use behavior change.

As available staff and funding resources are not uniform among member agencies, leveraging resources and programs across geographical areas can address equity and fair distribution of resources while maximizing results. WUE programs and WUE messaging can be spread across geographic areas to leverage resources and maximize benefits. Using watershed-wide communications outlets obtains the greatest benefit for the funding resources available by allowing the messages to reach the widest audience possible.

Pursuing watershed-wide implementation of programs will help to both leverage and balance resources, as agencies already implementing WUE will impart their expertise in the design and implementation of new watershed-wide WUE programs. These programs will then be available to the customers of smaller agencies, and watershed-wide programs will be able to employ new implementation formats and access new funding. The watershed's water suppliers will benefit from more consistent messaging and improved reliability of watershed-wide WUE programs.

5.9.5. CONTRIBUTORS – WATER USE EFFICIENCY

ROLE	ORGANIZATION
Chair	
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Contributors	
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Pillar Liaison	
Ian Achimore	Santa Ana Watershed Project Authority

5.10. DATA MANAGEMENT AND MONITORING

One of the OWOW Plan Update 2018 goals is to improve data integration, tracking, and reporting to strengthen decision making. Decision making occurs at three levels for three sets of water data users:

- The individual level (or user), which is anyone who uses water and makes decisions every day regarding how much to use (for instance, how much to water gardens and how long to shower)
- The professional level (or user), which includes water management or agency staff members who collect water data, report on water use, develop projects, present data to the public and policy makers, enforce established policies, and collaborate with and communicate information to other water resource decision makers
    - The policy-maker level (or user), which includes elected and appointed officials, who determine how to allocate resources and engage with other water decision makers in developing policies for improved water resource management

Building on previous advances made in watershed management and using the latest monitoring and data management tools, this Data Management and Monitoring Pillar section expands the conversation to include a discussion about new analytical methods, technologies, and advances that are currently available, as well as how to use available data to empower and improve decision making at each level.

New, more sophisticated technologies have the potential to enhance transparency and efficiency when applied strategically across the watershed. Modern analytics and data-management strategies can be used to turn raw data into information. Advances in modern data science, the open government data movement, and open source opportunities for collaboration make it possible to maintain independent databases to serve individual department or agency needs as well as integrating data through an application programming interface or other data infrastructure. The key to success is using open data methodologies like application programming interfaces and metadata to provide a framework to easily share and communicate the data to the end users in a way that is clear and meaningful. Often data is managed independently and stored across departments within an agency to meet department-specific requirements. In addition, the respective data systems of neighboring institutions or institutions that functionally deal with overlapping needs, such as a flood control district and a water utility, are not integrated. One of the outcomes of a centralized application programming interface framework is reducing redundancy in data collection where multiple agencies have overlapping programs and streamlining data use and sharing. Easily shared data that has been appropriately processed can provide a common understanding, be more meaningful, and support collaboration and integration for decision makers at all levels, thereby improving water resource solutions.

Agencies in the watershed are adopting new systems, such as advanced metering infrastructure (AMI) and supervisory control and data acquisition (SCADA) systems, that create more data to assist personnel in navigating complex challenges with near real-time information. However,

without thoughtful organization and dissemination, more data can cause confusion. Moreover, without synthesis, or without the ability to access data that is collected for a consistent purpose, data can be misinterpreted or used out of context; therefore, it is important for data to be well managed and curated so as provide critical management insights and inform better outcomes.

Planning for the creation and integration of data at a regional scale will be essential for maximizing the benefits of these systems by integrating at multiple levels, including up to the watershed level and the state level, as appropriate. In 2016, AB 1755, known as California's Open and Transparent Water Data Act, was passed to increase statewide data integration and interoperability. Facilitating this integration and interoperability at a regional level will be an important element of the OWOW Plan Update 2018. Coordinated application of improved data collection and management tools will ultimately strengthen decision making at the individual, agency, and policy-maker level, as well as in the water industry as a whole. Therefore, an essential component of the OWOW Plan Update 2018 is establishing benchmarks, monitoring progress toward a sustainable watershed, and identifying meaningful ways to coordinate, synthesize, and clarify data sources and uses. This Pillar section provides recommendations on how to successfully accomplish this while supporting and fulfilling the goals identified by the other Pillars and throughout the OWOW Plan Update 2018.

5.10.1. RECOMMENDED MANAGEMENT STRATEGIES

Develop a regional data management framework.

Development of a data management framework will allow for a comprehensive data management system that is managed by individual agencies and shared collectively throughout the region. This concept is called a "federated" system and is quite similar to the internet in how it would function. One agency would host the underlying architecture that follows rules created by all participants. Then, the data itself would be stored at the "home" agency, following the protocols established for format, metadata, and search tags. Then, using the system, people would be able to find and properly use data loaded by an organization or agency.

Discussing the data management needs at a regional level will enable the establishment of standards that can reduce redundancy, allow for comparative analysis, and streamline reporting requirements. Regional collaboration will inform proper application of information, protection of confidential information, and functionality of the data management system. This agreed-on framework will also include standardizing formats of how the data is "served," or presented, to different audiences (the levels of decision makers described previously), addressing specific needs. For example, data users will need to know what information can and cannot be compared to answer specific questions, so data must be linked to the specific functionality and source of each data set. Some data has strict applications and cannot be used out of context, while other data sets are more flexible.

Central to the development of the regional data management framework will be keeping the end use and functionality for the users in mind. Some data may need to be presented on an annual or seasonal basis to identify trends, even though it is collected monthly or weekly. Development of a quality assurance plan (QAP) to maintain quality assurance (QA) and quality control (QC) consistent with established state and federal standards will be necessary in the development and implementation of this framework. In addition, protocols and methods must be employed to ensure that data is properly collected, handled, processed, used, and maintained at all stages throughout the data life cycle. Embedding state reporting requirements into the framework could save agency staff time in complying with requirements, as well as improving interoperability in the comparison of data to make decisions at the regional level. Functionality and accessibility will be key design features of the framework, to ensure that data is easily available to support improved water resource decision making.

Increase availability of data for decision makers.

Decision making at the individual, professional, and policy-maker level is improved with information—sound action decisions require evidence of the consequences and implications of that action. Evidence requires the collection, analysis, and clear dissemination of data to address both intended and unintended and/or aberrant outcomes of policies and actions. Monitoring and measuring uses various watershed indicators, including natural, economic, and people-oriented effects. The data flow from these monitoring and measure programs will allow the actions of water resource decision makers to be based on the best available evidence, improving understanding of the watershed and the impacts of actions on its functioning and the benefits derived. To achieve this, it is necessary to develop a method for streamlining, managing, accessing, and maintaining the data that individual entities collect to support and evaluate the OWOW Program's progress toward its goals. The aim is not to create a large database; rather, it is to develop a user-friendly platform that gives access to standardized data. This platform will use existing information to facilitate management, operation, and policy innovation across agencies through data analysis, evaluation, and comparison to inform better decisions. Keeping all three levels of water decision makers in mind when developing this platform will be essential for its success in informing improved decision making by individuals, professionals, and policy makers.

Develop standard data formats and data fields for comparative analyses.

This Pillar recommends that water management agencies develop or strengthen tools for sharing public data to better inform water resource decision makers. The previously mentioned federated system would allow for data to be collected and managed by individual agencies as well as viewed or shared between stakeholders. This collaborative regional data network would be ideal for informing decisions at the individual, agency, and regional level. An integrated system with standard data format and fields would be able to connect data from multiple systems and present the data in a way that is meaningful, while maintaining the autonomy of independent data management systems. Clear standards for data quality, documentation, and archiving will be

critical for the interoperability of the federated system, leading to accurate interpretation of data at a regional scale and consideration of data in decision making.

Developing protocols for inclusion of metadata and context information about data sets that will help inform potential users of the limitations and meaningfulness of the data shared through the central methodology will be key to strengthening data-sharing tools. The methodology should appeal to and address the needs of three core water resource decision making parties: (1) the public, (2) analysts or water agency staff and management, and (3) policy makers, each of which has different needs and objectives surrounding the data. Standards for access, interpretation, tools, and permissions for using the data will take such differences into account to ensure that the data is used appropriately for decision making and communication. The methodology includes establishment of a trust framework as well as a data management framework, as depicted on Figure 5.10-1.

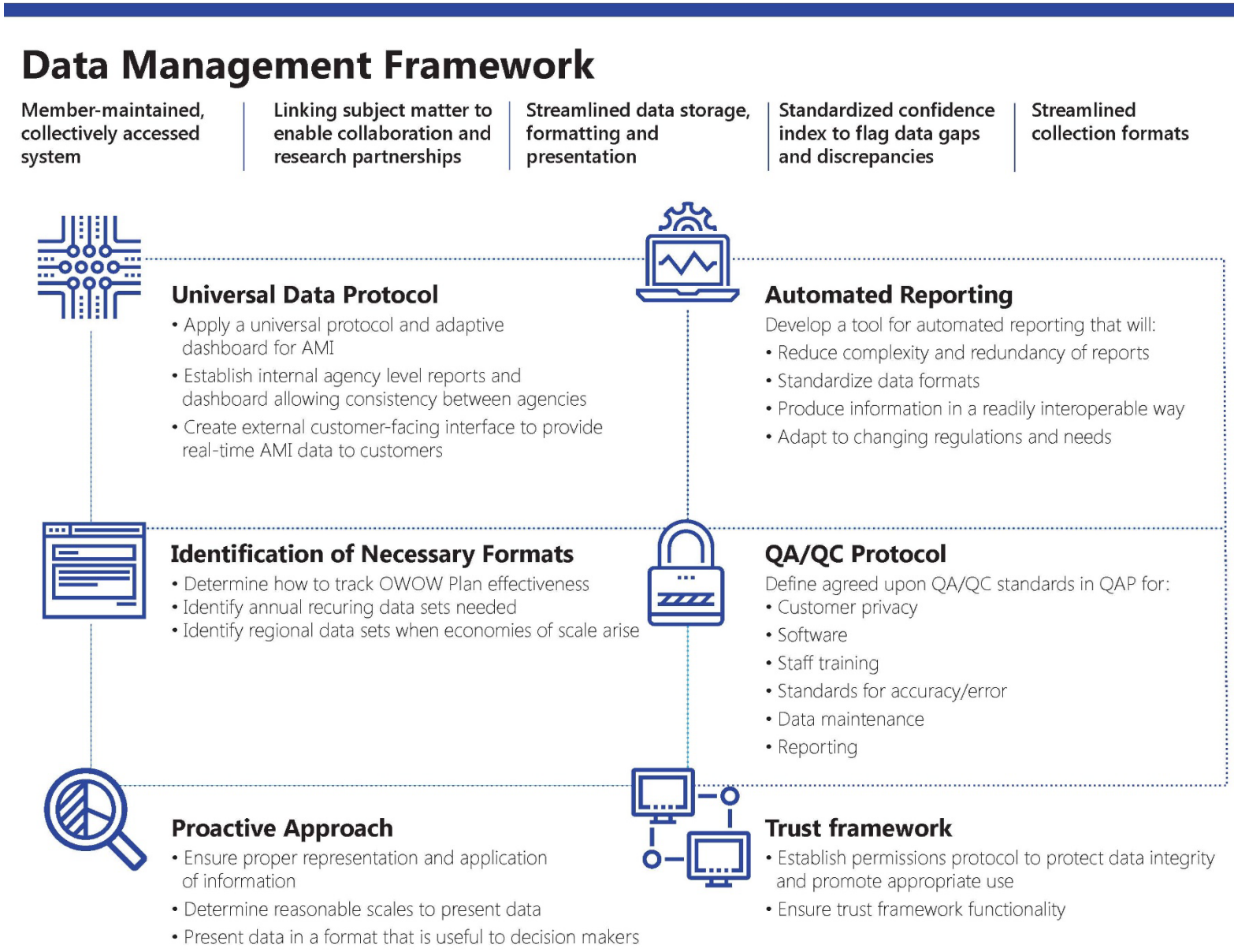

Figure 5.10-1. Development of a Data Management and Trust Framework

CASE STUDY: Water Quality Data Used for Research

Agencies within the watershed regularly collect water quality data that can be used by researchers and agencies to identify management trends and improve water resource management. One SAWPA researcher embarked on a flow study to evaluate wastewater treatment plant (WWTP) effluent and link the effluent flow and quality to surface water flow and quality in the Santa Ana River and its tributaries. Data collection and frequency on total dissolved solids measuring is difficult to get and is not consistent across WWTPs. Much of the effluent flow data is available on the California Integrated Water Quality System website, but not for all WWTPs and not for all years or months. In such cases, efforts are made to call the individual agencies and WWTPs to get the data on flow. Even less total dissolved solids data is available, and significantly more plants/agencies need to be contacted to try to get this data. It is a challenge to determine the exact discharge locations of the individual WWTPs. Finally, to fill in some of the data on surface water monitoring, SAWPA downloaded U.S. Geological Survey flow metering recordss. Unfortunately, policy changes are not often up to date in online data, so contact with individual WWTP managers was necessary to better understand what sort of changes they have made (if we notice a change in effluent, is it because of influent changes or because of treatment plant changes?—it is difficult to determine, but it is important to differentiate from an evaluation perspective). Obviously, it would be easier if there were some sort of central clearing house in terms of policy and operational changes that WWTPs make in response to regulatory changes.

5.10.2. RECOMMENDED POLICY STRATEGIES

Develop a trust framework.

This Pillar recommends the development of a regional trust framework to establish trust between agencies as well as trust in the functionality of a regional data management system. Developing this agreed-on intent at the regional level will facilitate the establishment of a data management framework that can answer critical regional questions and inform water resource decision makers. A primary question the watershed will need to keep firmly in mind is how to track the OWOW Program's effectiveness, whether performance indicators are necessary to evaluate its effectiveness, and if so what those indicators would be. Sharing of information and associated privacy considerations will be a critical policy consideration. Appropriate sharing of information will be key to extending this trust framework to individual water resource decision makers who participate as members of the public. The region may also want to consider economies of scale in data collection to reduce costs and duplication of effort at the agency level. For example, high-resolution aerial imagery may be more cost effective to collect at a watershed scale as opposed to within individual agency boundaries. The trust framework will also facilitate professional decision making and allow for a proactive, coordinated approach to compliance with state requirements, including those of AB 1755.

Ensure consistent data management QA/QC.

Maintaining a reliable data set at a watershed scale requires consistency in standards at both a project-specific scale and a regional scale. To achieve consistency, data management systems for the OWOW Program will conform to QA/QC standards agreed to by all program participants as defined in a QAP. To streamline the regulatory reporting requirements, the QAP must meet or exceed the data requirements of state and federal reporting and funding agencies. The QAP must also further the regional objective to develop standard data formats and data fields for comparative analysis.

Provide sufficient resources to support data collection and management.

This Pillar recommends that water management agencies conduct financial and skills inventories related to data collection, management, and sharing. Data collection is increasingly easy to achieve, and without strategic efforts to manage the incoming stream of information, the growing volume of data will lead to confusion rather than greater comprehension. Policy makers must evaluate whether sufficient resources and appropriately skilled staff are being deployed to ensure that management decisions are being assisted, rather than hampered, by the increasing availability of data. Maintaining this fiscal and political support for improved data management will require engagement with individual members of the public, keeping their needs in mind when identifying gaps in data collection, management, and sharing.

Support ongoing efforts to improve data management and collection.

Data management is an iterative process and requires a continual effort to curate and maintain high-quality data sets. Ensuring that accurate and refined information is readily available regarding water supply, water quality, and demand at any given time is critical for enhancing water security and sustainability. Keeping data sources (e.g., maps, dashboards, and software) updated is crucial to answering questions about progress within the watershed toward sustainability and plan/program progress. Access to current data can empower decision makers at all levels. Individuals may want to know how much water the average user uses, to compare with their personal water consumption and make adjustments accordingly. Professionals may want to identify data gaps and regional opportunities for efficiencies. Policy makers may want to know how much turf was in the region before turf rebates or prior to the drought, or how many medians still need to be updated, when deciding whether turf removal programs should be extended. Ongoing data processing, curation, and management requires an ongoing funding commitment to maintain the accessibility and function of the systems. When updates are deprioritized and treated as an ad-hoc expenses or efforts, we tend to end up with models/tools/data that provide a snapshot in time but are quickly outdated and difficult to keep using because they are not maintained. Making meaningful data more available to answer water resource decision-maker questions at all levels will increase buy-in to the data management system and further support the commitment of resources for ongoing improvements.

Support proactive data sharing and collaboration.

Different users of data, including (1) the public, (2), analysts/water agency staff and management, and (3) policy makers, have different needs and objectives surrounding the data. It is important to keep these different data users and their distinct needs in mind when making data-related decisions at the local, regional, and state levels. Agencies need to collect data that is not private and may need to share information gathered from this data to decision makers or the public. A critical component of privacy considerations is how the data is packaged to add context, minimize misinterpretation, and identify data shortfalls and the confidence index of the data. Historically, when data has been withheld due to privacy or policy concerns, information has been pulled from disparate sources that were publicly available, resulting in incorrect conclusions. Taking a proactive approach means understanding the needs of the data users and engaging with them to help identify what type of data can be used to answer questions, and what the limitations are of available data.

5.10.3. BASIS FOR RECOMMENDATIONS

Developing a federated system, allowing locally managed information to be shared with established protocols at a regional and state level, is supported through modern technology, researchers, and regulators. A federated system provides "An improved institutional setting for data management might support improved technical information and coordination overall. Each state agency might develop a routine data management policy for its major functions, so that these data and functions might be more transparent and more easily coordinated across agencies" (Lund 2018.) This federated system will allow for agencies to continuously maintain and update their data to meet their needs while taking a proactive approach to becoming involved in the state process and regional collaboration opportunities.

California's Open and Transparent Water Data Act

AB 1755, passed in 2016, requires that these state agencies coordinate and integrate existing water and ecological data from local, state, and federal agencies. The bill requires DWR, in consultation with the State Water Resources Control Board, the California Department of Fish and Wildlife, and the California Water Quality Monitoring Council, to create and maintain a statewide integrated water data platform. The goal is for data to be readily available in formats that suit users' needs and are useful for making the decisions at hand. This new state mandate provides an opportunity to take a proactive instead of reactive approach to data management and accessibility. During Pillar discussions, a story came up that was familiar to several of the agency staff who were taking part: Data that was produced by the agency was not made readily available for fear it would be misinterpreted or misused. Therefore, management of the data included the effort to be very deliberate choosing who could access it, to minimize the potential negative consequences of misuse. This effort was only sometimes successful, as often for one reason or another the data ended up being distributed. Because management systems were focused on minimizing the extent to which the data became distributed, it was less focused on ensuring that once the data was in fact shared, the users of the data understood the extent to which the data was meaningful. This often led to the misuse of the data.

Given the efforts at different scales in California in 2018, including the work on trust frameworks from University of California, Davis, and the early implementation efforts of the AB 1755 mandates at DWR, this Pillar recommends that the water agencies in the watershed collaborate to engage in the statewide discussion, ensuring that sharing protocols result in metadata and contextual information being bound to any data made widely available. The development of these protocols, whether done in house at a particular agency, in collaboration at a regional scale, or through one of the statewide efforts, will require base levels of financial resources and appropriately skilled staff. It will be critical for agencies to include data management in base budgets (Lund 2018), and for staff with the right technical and data management skills to be available in house or via contract.

Concept Abstract: Water utilities increasingly acquire real-time customer water use data from automated metering infrastructure systems. Creating an interoperable data management and reporting system at a regional scale, as proposed by the OWOW Data Management and Plan Performance Monitoring Pillar, requires seamless integration of large amounts of water use data from a variety of advanced metering infrastructure (AMI) systems. The concept being proposed is to develop and implement a data-sharing protocol common to all participating water agencies. Each participating agency would agree to follow industry best practices for QA/QC and provide their AMI data in a uniform format to a central data management system. Universal data-sharing agreements for AMI-based utilities are widely employed in the electrical utility market, where reliable data is shared among utilities and customers for a variety of purposes, such as emergency response, resource management, and compliance monitoring.

Increased Availability of Data for Decision Makers, Managers, and the Public

Two examples that illustrate the importance of the availability of such data are (1) the role of conservation actions and drought on effluent-dominated streams and (2) the use of AMI to facilitate financial management surrounding water and energy use in disadvantaged communities. Regarding the first issue, indoor water conservation efforts are an attractive and often low-cost strategy to help mitigate the impacts of drought. Yet, for those regions or areas whose wastewater is an integral part of stream quality and flow, conservation can have unintended consequences and, at the very least, impose significantly greater costs on WWTP operations; at worst, lower-quantity and lower-quality effluent flows can negatively impact instream watershed functions and the habitats of plant and wildlife species. The data for connecting conservation actions to wastewater treatment performance and output to stream quality and quantity seems to exist across multiple agencies, but currently it is not organized in any usable manner to help inform policy. Regarding the second issue, much attention has been given to AMI in terms of helping customers and agencies understand water use more accurately, with an emphasis on actual and real-time water use. Absent from this discussion is how AMI, if coupled with the appropriate messaging efforts by the water district, can provide disadvantaged communities with a tool to better manage their utility use and finances throughout the month. It is well known that uncertainty leads to inefficient actions. Given this, we can assume that disadvantaged communities may either use too

little water and electricity as they worry about whether their use is going to go over budget, or use too much water and electricity relative to their budget and thus perhaps have trouble paying their bills. AMI could be used to send daily reminders showing how a family's current water and electricity use is tracking compared to an overall monthly budget that they have specified.

New mechanisms for data collection and sharing are being developed at agency, regional, and state levels. Many of the new mechanisms reflect a trend toward proactive approaches for data sharing. The World Resources Institute discusses the ways that crowdsourcing and gathering information from businesses and other water users can be used to inform agencies regarding improved water management (WRI 2018).

California Data Collaborative Trust Framework: In response to the historic California drought, the state has initiated a process for re-visioning the collection and distribution of water and energy use data across the state. A non-profit data collaborative is developing a platform for increased collaboration across utilities. This framework takes a comprehensive look at how data is gathered and shared across the state, developing proactive approaches to sharing information, ideas, tools, solutions, and challenges. This is a system the watershed can look to as a model for data management.

Quality Assurance/Quality Control

QA/QC plans are standard practice at the project and agency level. Established best practices for QA/QC have also been developed by state and federal agencies. As watershed-wide data management tools are developed, QA/QC plans should be prepared in conformance with recognized data industry standards.

U.S. Geological Survey Standards for QA/QC: With a focus on quality goals, criteria, assessment, and validation methods, a QAP covers the full data lifecycle, from acquisition through publication (see USGS 2018 at https://www2.usgs.gov/datamanagement/plan/dmplans.php), and can:

- Identify data quality objectives for your data or project
- Identify requirements for:
  - Staff skills and training
  - Field and lab methods and equipment that meet data-collection standards

EXAMPLES:
Recognized Data Industry Standards

U.S. Geological Survey:
https://www2.usgs.gov/datamanagement/plan/dmplans.php

Other federal guidelines regarding public access to data:
https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf

U.S. Geological Survey:
https://www2.usgs.gov/datamanagement/plan/dmplans.php

Excerpts of the U.S. Geological Survey Standards are shown at left.

  - Software and file types to use for data handling and analysis that support data quality goals
  - Data standards, structure, and domains consistent with community conventions for other data in the same subject area
  - Periodic data-quality assessment using defined quality metrics
- Describe a structure for data storage that can also facilitate checking for errors and help to document data quality
- Describe approved data entry tools and procedures, when applicable
- Establish data-quality criteria and data-screening processes for all the data you will collect
- Include quality metrics that can determine current data-quality status
- Establish a plan for data quality assessments as part of the data flow
- Contain a process for handling data corrections
- Contain a process for data users to dispute and correct data

Other Federal Guidelines Regarding Public Access to Data: Each agency plan for both scientific publications and digital scientific data must contain the following elements (see OSTP 2013 at https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf):

- A strategy for leveraging existing archives, where appropriate, and fostering public–private partnerships with scientific journals relevant to the agency's research
- A strategy for improving the public's ability to locate and access digital data resulting from federally funded scientific research
- An approach for optimizing search, archival, and dissemination features that encourages innovation in accessibility and interoperability, while ensuring long-term stewardship of the results of federally funding research
- A plan for notifying awardees and other federally funded scientific researchers of their obligations (e.g., through guidance, conditions of award, and/or regulatory changes)
- An agency strategy for measuring and, as necessary, enforcing compliance with its plan
- Identification of resources within the existing agency budget to implement the plan
- A timeline for implementation
- Identification of any special circumstances that prevent the agency from meting any of the objectives set out in the "Increasing Access to the Results of Federally Funded Scientific Research" memorandum (OSTP 2013), in whole or in part

Privacy Concerns

Striking a balance between transparency and privacy is a challenge that requires establishment of an agreed-on framework up front as well as continuous evaluation over time at the agency, regional, and state level. Public data is information that can be freely used, reused, and distributed by anyone. There are no legal restrictions on who can access public data and what public data can be used for; however, not all data is public data. Personally identifiable information (PII) and critical infrastructure information are not considered public data. It would be dangerous for specific details about the location and operating functions of critical infrastructure to become known. This information could be exploited by individuals wishing to do harm. In the water industry, most of the data is not public data, from location of wells to pumping station details to customer usage. There are several approaches that can be applied to increase visibility of data while minimizing the risks of working with identifiable information.

De-identification is adopted as one of the main approaches of data privacy protection. It is commonly used in the fields of communications, multimedia, biometrics, big data, cloud computing, data mining, internet, social networks, and audio–video surveillance. *De-identification* is the process used to disconnect a person's identity from information. When used for metadata or general data about identification, the process is also known as *data anonymization*. Common strategies for de-identifying data sets include deleting or masking personal identifiers, such as name and social security number, and suppressing or generalizing quasi-identifiers, such as date of birth and zip code. *Pseudonymization* is a procedure by which the most identifying fields within a data record are replaced by one or more artificial identifiers, or pseudonyms. There can be a single pseudonym for a collection of replaced fields or one pseudonym per replaced field. The purpose is to render the data record less identifying and thereby reduce customer or patient objections to its use. Data in this form is suitable for extensive analytics and processing. Aggregating data also allows data to be presented in an anonymous format. For example, census data is not made available at the address level, but is instead aggregated into "block-level" zones, which are useful for identifying trends by neighborhood, but do not single out individuals.

Data anonymization enables the transfer of information across a boundary, such as between two departments within an agency or between two agencies, while reducing the risk of unintended disclosure and enabling evaluation and analytics post-anonymization. In the context of customer data, *anonymized data* refers to data from which the customer cannot be identified by the recipient of the information. The name, address, meter number, account number, and full zip code must be removed, together with any other information which, in conjunction with other data held by or disclosed to the recipient, could identify the customer. These industry-specific methods are consistent with federal and state laws relating to privacy protection.

Federal Law: The Privacy Act of 1974 (Public Law 93–579, 88 Stat. 1896, enacted December 31, 1974, 5 USC Section 552a), a U.S. federal law, establishes a Code of Fair Information Practice that governs the collection, maintenance, use, and dissemination of PII about individuals that is maintained in

systems of records by federal agencies. Personal information, described in U.S. legal fields as either *PII* or *sensitive personal information*, is information that can be used on its own or with other information to identify, contact, or locate a single person, or to identify an individual in context. The abbreviation *PII* is widely accepted in the U.S. context, but the phrase it abbreviates has four common variants (based on personal/personally and identifiable/identifying).

State Law: The State of California has enacted several laws geared toward the protection of personal information. The California state constitution declares privacy an inalienable right in Article 1, Section 1. The California Online Privacy Protection Act of 2003, effective as of July 1, 2004, and amended in 2013, is the first state law in the United States requiring commercial websites and online services to include a privacy policy on their website. In addition, California's SB 1386 requires organizations to notify individuals when PII is known or believed to be acquired by an unauthorized person. Most recently, in 2011, the California State Supreme Court ruled that a person's zip code is considered PII.

5.10.4. INTEGRATION WITH OTHER PILLARS

Quality data can improve the ability of other sections (and the partners in the watershed as a whole) to make data-driven management and planning decisions, including tracking program effectiveness, determining whether adjustments need to be made, and highlighting and tracking trends that can be used to inform critical decisions.

Chapter 9 of this OWOW Plan Update 2018 contains details of existing tools and data management systems in use in the watershed. Specific data management related to successful implementation of the OWOW Plan Update 2018 and the IRWM implementation grants is also described there.

5.10.5. CONTRIBUTORS – DATA MANAGEMENT AND MONITORING

ROLE	ORGANIZATION
Chair	
Halla Razak	Inland Empire Utilities Agency
Chair Delegate	
Liz Hurst	Inland Empire Utilities Agency
Contributors	
Daniel Carney	Eastern Municipal Water District
Dean Unger	Santa Ana Watershed Project Authority
Derek Lorbiecki	Esri
Jennifer McAdoo	U.S. Army Corps of Engineers
Kurt Schwabe	University of California, Riverside
Melissa Matlock	Western Municipal Water District
Mike Antos	Santa Ana Watershed Project Authority
Ryan Shaw	Western Municipal Water District
Suzanne Timani	Esri
Pillar Liaison	
Rick Whetsel	Santa Ana Watershed Project Authority

5.11. INTEGRATION AND IMPLEMENTATION

Throughout the development of the OWOW Plan Update 2018, SAWPA facilitated every-other-month "Pillar Integration Workshops." The workshop meetings promoted integration through presentations, small-group work, and discussion. In addition to supporting discussion between Pillar workgroups, these meetings produced the *rating and ranking system*, *eligibility criteria*, and *goals and objectives*, among other aspects of the OWOW Program.

The meetings investigated linkages and considered additional synergistic solutions, with three primary aims:

- Inform to increase awareness of synergy between the Pillar workgroup efforts.
- Evaluate linkages among proposed strategies, projects, and programs.
- Develop multi-benefit strategies, projects, and programs.

The benefits of an integrated system approach were reviewed with all participants, as developing shared vocabulary and common understandings is one of the cornerstones of effective collaboration and trust. One of the advantages of the OWOW Program is the ability to address similar project objectives by local interests with a larger scale, integrated regional project. Resources devoted to implementing multiple smaller projects, such as staffing, funding, and equipment, may benefit from economies of scale when project proponents can work together on a regional project. All IRWM plans must contain provisions for reviewing project objectives and considering new, expanded, or even different solutions that meet multiple local needs.

5.11.1. PILLAR RECOMMENDED IMPLEMENTATION ACTIONS

The OWOW Plan Update 2018 2.0 Plan reflects the interconnected needs of the watershed, examines linkages and develops synergy, and does not limit solutions to the needs of specific entities in the watershed. Opportunities for achieving ever greater integration were regular topics of discussion at OWOW Pillar integration meetings.

The tables below reflect a number of integrations between recommended strategies provided by each of Pillars, and the resource management strategies contained in the California Water Plan Update 2013 with the changes added to the DWR website since that plan was released.

Table 5.11-1 reflects the management and policy strategies that were proposed by multiple Pillars, each for their own purpose. These strategies can be considered of a higher priority because of this alignment, and as you will see, reflect important multi-benefit opportunities. This table was sorted to show the recommendations that were most frequently shared among the Pillars.

Table 5.11-1. Strategies Recommended by the Pillars

Recommended Strategies	Strategy Type (Policy or Management)	Water Resources Optimization / Recycling	Water Quality	Tribal Communities	Climate Risk & Response	Disadvantaged Communities	Integrated Stormwater Management	Land Use and Water Planning	Natural Resources Stewardship	Water Use Efficiency	Data Management & Monitoring
Data Integration	Both		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Engagement and Participation	Both		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Develop New Entities, Guidelines, and Models	Both		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Assessing the Impact(s) on Individuals or Families Experiencing Homelessness and Its Effects on the Watershed.	Management		Yes		Yes	Yes		Yes		Yes	
Education and Outreach	Both			Yes	Yes	Yes		Yes	Yes		
Adhere to Existing Policies	Policy			Yes	Yes	Yes		Yes		Yes	
Increase Stormwater Capture	Management	Yes	Yes		Yes			Yes			
Habitat Restoration	Management				Yes		Yes	Yes	Yes		
Provide Technical Assistance	Management			Yes		Yes		Yes		Yes	
Managing Urban Runoff and Erosion from Pre-Existing or New Developments	Management		Yes		Yes		Yes	Yes			
Watershed Management				Yes				Yes		Yes	Yes
Increase Groundwater Recharge	Management		Yes				Yes	Yes			
Water-Oriented Habitat Conservation	Management			Yes				Yes	Yes		

Table 5.11-1. Strategies Recommended by the Pillars

Recommended Strategies	Strategy Type (Policy or Management)	Water Resources Optimization / Recycling	Water Quality	Tribal Communities	Climate Risk & Response	Disadvantaged Communities	Integrated Stormwater Management	Land Use and Water Planning	Natural Resources Stewardship	Water Use Efficiency	Data Management & Monitoring
Mitigate Pollution and Contaminants	Management		Yes		Yes				Yes		
Tribal Representation within IRWM Governance Structure	Policy			Yes	Yes			Yes			
Educate Public on Health Benefits and Risks	Management				Yes			Yes			
Preserve and Enhance Recreational Areas	Management				Yes			Yes			
Improve Water Quality	Management		Yes					Yes			
Invasive Species Eradication	Management							Yes	Yes		
Disadvantaged Community Representation in IRWM Governance Structure	Policy					Yes		Yes			

Tables 5.11-2 and 5.11-3 list the 83 management strategies and the 56 policy strategies provided by the 10 Pillar workgroups. The tables also cross-walk between the OWOW Plan Update 2018 recommended strategies and the California Water Plan Resource Management Strategies, using the management objective categories to make the comparison.

5.11.2. CLIMATE CHANGE IN THE RESOURCE MANAGEMENT STRATEGIES

The Climate Risk and Response Pillar and the Reclamation effort both considered the projections for climate change impacts and the associated vulnerabilities in the watershed. In both cases it became clear that, with few exceptions, the work to create a more self-reliant and resilient watershed in response to population increase, drought and flood, and changing regulatory frameworks are themselves adaptive. Sea-level rise and increased heat are two items that require unique strategies that are discussed in OWOW Plan Update 2018. But, in general, throughout this chapter the Pillars make it clear that most every recommendation provides a benefit to the watershed's adaptation to a changing climate.

The OWOW Program and many participating agencies have, since OWOW 2.0 Plan, acknowledged the importance of the water–energy nexus, and its relationship to GHG emissions. Award-winning projects in the watershed use solar, battery storage, and co-generation strategies. It is also well understood that renewable energy often represents a cost savings for the communities served, so it achieves the multiple benefits of adaptation, mitigation, and economic sustainability.

5.11.3. SUMMARY OF THE RECOMMENDED STRATEGIES AND RESOURCE MANAGEMENT STRATEGIES

There is significant integration reflected in the recommendations made by the stakeholders in the OWOW Plan Update 2018 process. The Pillars, each focused separately on opportunities and challenges known to their expertise, have arrived at many creative, and sometimes complicated, recommendations. That there is natural alignment between many of these recommendations is a reflection of how well the Santa Ana River Watershed has adopted the principles of One Water and of watershed management.

It is interesting, and perhaps a foreshadowing, that data integration was the most common shared recommendation. Data integration as a water management strategy is not present, in so clear a way, in the California Water Plan Resource Management Strategies. Until recently the water management industry broadly considered data management only as an operational challenge. The transition to data-driven decision making and the provision of data to all decision makers (from water users to elected leaders) is causing significant changes in the watershed. Efforts like the Open and Transparent Water Data Act and the ongoing effort to develop a trust framework for data sharing in California suggest that the watershed is in step with thinking across the state. As data gathering becomes easier and less costly, the risk that increased data resources will become confounding rather than helpful in the management of water is real.

All three of these tables demonstrate the high importance the Pillars placed on the People and Water management outcomes, particularly engagement and education. This is likely a product of the OWOW Program approach of including a broad group of stakeholders, where expertise either is focused on a particular aspect of water management or is more grounded in a community or non-water subjects. Recognizing a need for deeper integration and education is certainly not unfamiliar in the California IRWM Program.

Public outreach and education is emphasized by multiple Pillars as a key need, both as a stand-alone strategy and as something requiring policy changes to strengthen existing efforts. The education, outreach, engagement, and participation of all stakeholders is clearly seen by water leaders and community members alike as central to overcoming challenges and profiting from opportunities.

Six of the ten pillars recommend increased engagement and participation as necessary to achieving more sustainability, from planning and development of capital projects to using climate-adaptive programs. The OWOW goal that recommends building trust was most frequently the source of these recommendations.

An effort to increase stormwater capture and infiltration is another shared management strategy across multiple pillars. These forms of optimization can also preserve and enhance recreational areas and promote water-oriented habitat. The Tribal Communities and Land Use and Water Planning Pillars both suggest links between stormwater management and recreational areas for important multi-benefit projects.

Several Pillars recommend the creation of new policies and incentive programs involving broad and distributed efforts; for example, tree-planting programs among disadvantaged communities, surveys of existing streams impacted by erosion because of new development, and the creation of "assistance agreements" that result in more water-oriented habitats and wildlife corridors. These same ideas suggest stronger relationships with land-use planning authorities to adjust policies that support the protection and enhancement of multiple beneficial uses by improving water quality and increasing stormwater recharge, and by restoring and enhancing hydrologic connectivity for redevelopment and land use. The link between land use and water quality is also suggested as beneficial to climate adaptation and GHG reduction.

Because of the moment in time when this OWOW Plan Update 2018 was being crafted, several of the Pillars decided to address the needs of people experiencing homelessness and the Human Right to Water. During 2016–2018, the watershed, along with California more broadly, is facing a housing crisis. Providing clean water and adequate sanitation remain at the forefront of water management discussions in California, including the Santa Ana River Watershed. Supporting the needs of people who are housing insecure is but one aspect of this challenge, which is found throughout the OWOW Plan Update 2018.

As the OWOW Plan Update 2018 was being written, the Disadvantaged Communities Involvement Program was also underway. The efforts there were included in many places in this OWOW Plan, focused specifically on the systems and relationships in place between water managers, elected leaders, members of disadvantaged communities, mutual water company staff and leaders, and Tribal communities. These linkages can be seen in the emphasis on many recommendations about stronger engagement efforts, access to decision making, and recommendations to broaden representation in governance.

Across the Pillars, the desire for more multi-benefit projects are woven throughout this chapter, where there is wide agreement that the long-term goals for the watershed depend on these synergies and partnerships. All of the proposed strategies are part of how the OWOW Program will implement the OWOW Plan Update 2018. Through the coordination of activities, engagement across agencies and communities, shared decision making, and transparent representative governance, the Santa Ana River Watershed will achieve the shared goals.

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Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
5.1 Water Resources Optimization							
Capture stormwater.		Flood Management		Conjunctive Management and Groundwater, Surface Storage – Regional and Local	Pollution Prevention	Land Use Planning and Management, Watershed Management	
Implement emergency measures.		Flood Management	Conveyance – Regional and Local, System Reoperation				Outreach and Engagement
Increase storage.			Conveyance – Regional and Local, System Reoperation	Conjunctive Management and Groundwater, Surface Storage – CALFED and State, Surface Storage – Regional and Local		Forest Management, Sediment Management	
Optimize imported water.			Conveyance – Delta, Conveyance – Regional and Local, System Reoperation, Water Transfers	Conjunctive Management and Groundwater, Surface Storage – Regional and Local			
Recycle water.			System Reoperation	Conjunctive Management and Groundwater, Municipal Recycled Water	Matching Water Quality to Use	Ecosystem Management, Land Use Planning and Management, Recharge Area Protection, Watershed Management	
Reduce demand.	Agricultural Water Use Efficiency, Urban Water Use Efficiency						Economic Incentives, Outreach and Engagement, Water and Culture
5.2 Water Quality							
Achieve salt balance in the watershed.				Conjunctive Management and Groundwater, Desalination – Brackish and Sea Water	Drinking Water Treatment and Distribution, Groundwater and Aquifer Remediation, Pollution Prevention, Salt and Salinity Management, Urban Stormwater Runoff Management		
Improve groundwater quality.				Conjunctive Management and Groundwater, Desalination – Brackish and Sea Water	Drinking Water Treatment and Distribution, Groundwater and Aquifer Remediation, Pollution Prevention, Salt and Salinity Management, Urban Stormwater Runoff Management	Land Use Planning and Management, Recharge Area Protection, Watershed Management	

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Respond to new regulations.					Drinking Water Treatment and Distribution, Groundwater and Aquifer Remediation, Pollution Prevention, Salt and Salinity Management, Urban Stormwater Runoff Management		Economic Incentives, Outreach and Engagement
Protect surface water and ocean water quality.					Matching Water Quality to Use, Urban Stormwater Runoff Management	Agricultural Land Stewardship, Ecosystem Restoration, Forest Management, Land Use Planning and Management, Sediment Management, Watershed Management	Economic Incentives, Outreach and Engagement, Water and Culture, Water-Dependent Recreation
Prepare for climate change.					Groundwater and Aquifer Remediation, Matching Water Quality to Use, Salt and Salinity Management, Urban Stormwater Runoff Management	Agricultural Land Stewardship, Ecosystem Restoration, Forest Management, Land Use Planning and Management, Recharge Area Protection, Sediment Management, Watershed Management	Economic Incentives, Outreach and Engagement
5.3 Tribal Communities							
Follow best management practices for Tribal engagement and participation.							Outreach and Engagement, Water and Culture
Provide technical assistance and capacity for building for Tribal communities.							Economic Incentives, Outreach and Engagement
Use Tribal ecological knowledge.	Agricultural Water Use Efficiency, Urban Water Use Efficiency	Flood Management	System Reoperation	Conjunctive Management and Groundwater	Groundwater and Aquifer Remediation	Agricultural Land Stewardship, Ecosystem Restoration, Forest Management, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water and Culture
Engage watershed management and use.						Watershed Management	Outreach and Engagement, Water and Culture
Protect stream buffers and riparian areas and prevent loss of habitat.					Urban Stormwater Runoff Management	Agricultural Land Stewardship, Ecosystem Restoration, Forest Management, Land Use Planning and Management, Watershed Management	

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Create a strategy for plant palette management.						Ecosystem Restoration, Forest Management, Land Use Planning and Management, Watershed Management	
Manage data partnerships and confidentiality-related issues.							Outreach and Engagement, Water and Culture
5.4 Climate Risk and Response							
Prevent pollution and increase stormwater capture.		Flood Management		Conjunctive Use and Groundwater, Surface Storage – Regional and Local	Pollution Prevention, Urban Stormwater Runoff Management		
Increase urban water use efficiency and conservation.	Urban Water Use Efficiency						Economic Incentives, Outreach and Engagement
Create and meet greenhouse gas reduction targets.						Forest Management, Watershed Management	Economic Incentives, Outreach and Engagement
Assess risks of sea-level rise.		Flood Management				Ecosystem Restoration, Land Use Planning and Management, Watershed Management	
Address and mitigate public health risks in the context of climate change.						Watershed Management	Outreach and Engagement
Support ecosystem functions.					Groundwater and Aquifer Remediation, Urban Stormwater Runoff Management	Ecosystem Restoration, Forest Management, Watershed Management	
Manage forestry and fuels.						Forest Management, Watershed Management	
Apply spatial prioritization of vulnerability.						Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water and Culture
Increase local and sustainable food production.						Agricultural Land Stewardship, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water and Culture
Support local recreation areas and opportunities.						Forest Management, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water-Dependent Recreation

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
5.5 Disadvantaged Communities							
Adopt best practices for engagement and participation.							Outreach and Engagement, Water and Culture
Focus on critical infrastructure.		Flood Management	System Reoperation	Conjunctive Use and Groundwater	Drinking Water Treatment and Distribution, Matching Quality to Use, Pollution Prevention, Urban Stormwater Runoff Management	Watershed Planning	Outreach and Engagement
Provide technical assistance and programs of direct support.						Watershed Planning	Outreach and Engagement
Use holistic approach for recognizing communities.							Outreach and Engagement
Provide appropriate support for alleviating homelessness.		Flood Management			Drinking Water Treatment and Distribution, Pollution Prevention	Land Use Planning and Management, Watershed Management	Economic Incentives, Outreach and Engagement, Water and Culture
5.6 Integrated Stormwater Management							
Identify floodplains that have habitat or the potential for habitat restoration or for groundwater recharge.		Flood Management		Conjunctive Use and Groundwater, Surface Storage – Regional and Local		Ecosystem Restoration, Forest Management, Land Use Planning and Management, Recharge Area Protection, Sediment Management, Watershed Management	Water-Dependent Recreation
Survey existing streams adversely impacted by erosion from new development.		Flood Management			Pollution Prevention, Urban Stormwater Runoff Management	Ecosystem Restoration, Land Use Planning and Management, Watershed Management	
5.7 Land Use and Water Planning							
Using grant funding or partnerships, encourage projects and identify incentives to collaborate on capture and infiltrate stormwater in strategic locations. Couple with process where housing developments are reviewed and approved by regulatory entities.				Conjunctive Use and Groundwater		Land Use Planning and Management, Recharge Area Protection, Watershed Management	Economic Incentives, Outreach and Engagement

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Explore ways to build watershed-wide capacity for installing, maintaining, and monitoring multi-benefit water projects.	Agricultural Water Use Efficiency, Urban Water Use Efficiency	Flood Management	System Reoperation			Watershed Management	Economic Incentives, Outreach and Engagement
Restore or enhance hydrologic connectivity in trail systems, parks, and open spaces to infiltrate stormwater, improve water quality, and enhance habitat while also providing recreation and transit benefit.				Conjunctive Use and Groundwater		Ecosystem Restoration, Forest Management, Land Use Planning and Management, Watershed Management	Water-Dependent Recreation
Integrate green infrastructure strategies to remove unnecessary impervious surfaces to reduce runoff and erosion and prioritize natural infiltration and treatment strategies.				Conjunctive Use and Groundwater	Pollution Prevention, Urban Stormwater Runoff Management	Land Use Planning and Management, Recharge Area Protection, Watershed Management	Economic Incentives, Outreach and Engagement
Develop innovative strategies to restore or enhance hydrologic connectivity in new development and redevelopment/revitalization and land use planning to reduce stormwater runoff, improve water quality, and increase groundwater recharge.				Conjunctive Use and Groundwater	Groundwater and Aquifer Remediation, Pollution Prevention, Urban Stormwater Runoff Management	Land Use Planning and Management, Watershed Management	
Identify opportunities to restore flood control channels to increase in-stream groundwater recharge.		Flood Management		Conjunctive Use and Groundwater			
Implement an incentive program, such as rebates, that will reward property owners for granting right of entry for invasive weed removal.						Ecosystem Restoration, Watershed Management	Economic Incentives, Outreach and Engagement

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Implement an incentive program, such as rebates, that will reward property owners for maintaining a catastrophic fire fuel break on their property.						Ecosystem Restoration, Forest Management, Watershed Management	Economic Incentives, Outreach and Engagement
Create an incentive program to reward cities and counties (perhaps through regulatory credits) for adopting arroyo preservation standards consistent with the City and County of Riverside Arroyo Preservation Ordinance.						Ecosystem Restoration, Forest Management, Land Use Planning and Management, Sediment Management, Watershed Management	Economic Incentives, Outreach and Engagement
Encourage the use of conservation easements for regulatory credits.						Ecosystem Restoration, Forest Management, Land Use Planning and Management, Watershed Management	Economic Incentives, Outreach and Engagement
Encourage the implementation of a tree planting program in underserved communities as described in Goal 3.					Pollution Prevention, Urban Stormwater Runoff Management	Forest Management, Watershed Management	Economic Incentives, Outreach and Engagement, Water and Culture
Identify disadvantaged communities within the Santa Ana River Watershed using CalEnviroScreen 3.0 (see https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30).						Watershed Management	Outreach and Engagement, Water and Culture
Develop education/outreach programs that inform land use planners and decision makers on the interconnections between land use, water, and natural resources stewardship.						Land Use Planning and Management, Watershed Management	Outreach and Engagement
Partner with curriculum managers and teachers at school districts to identify authentic, project-based, and service-learning opportunities during site maintenance, installation, and monitoring for K–12 students.						Watershed Management	Outreach and Engagement

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Identify community/citizen science opportunities for the public to participate in planning and monitoring of projects (e.g., participating in biodiversity surveys before and after restoration projects are implemented, testing stormwater quality before and after green infrastructure projects, and hosting temperature or soil moisture sensors to examine impacts of urban forestry project).						Watershed Management	Outreach and Engagement
Partner with the non-formal education providers and community-based organizations to provide hands-on educational programming, community-service projects, and interpretive tours.						Watershed Management	Outreach and Engagement
Sponsor a contest to design interpretive sign displays that can be installed by the governing jurisdictions within the watershed to educate the public about connections between land use and watershed health.						Watershed Management	Outreach and Engagement
In the project planning stage, establish a framework for public participation and implement an outreach strategy to solicit community input to identify project barriers and opportunities.						Land Use Planning and Management, Watershed Management	Outreach and Engagement

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Work with local and state agencies and/or nongovernmental organizations to leverage and maximize funding opportunities for multi-benefit green infrastructure components for projects during the planning phase.	Agricultural Water Use Efficiency, Urban Water Use Efficiency					Land Use Planning and Management, Recharge Area Protection, Sediment Management, Watershed Management	
Develop partnerships to integrate multi-benefit components into groundwater recharge projects, such as stormwater capture and treatment, passive recreation opportunities, trail networks, native habitat, perimeter landscape demonstration projects, and interpretive signs.				Conjunctive Use and Groundwater		Land Use Planning and Management, Recharge Area Protection, Sediment Management, Watershed Management	Water-Dependent Recreation, Economic Incentives
Provide opportunities for coordination between planning, parks, and water agencies within the watershed in collaboration with local councils of governments and the Southern California Association of Governments.						Land Use Planning and Management, Watershed Management	Outreach and Engagement
Coordinate with a local regional organization, such as SAWPA, Southern California Association of Governments, Inland Empire Green Building Council, or other group, to create a "Watershed Friendly" certificate program that rewards and educates local jurisdictions, similar to Tree City USA or All American City designations.						Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water and Culture
Coordinate with county health departments on the health benefits of active and sustainable use of the watershed.						Watershed Management	Outreach and Engagement

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Develop and offer education/outreach programs that educate land use planners and decision makers on the interconnections between land use, water, and natural resources stewardship.						Land Use Planning and Management, Watershed Management	Outreach and Engagement
Identify workforce development partnerships and opportunities to integrate local workforce development agencies (e.g., Inland Empire Job Corps, California Conservation Corps, Regional Occupational Programs) into project implementation, monitoring, and/or maintenance efforts.						Watershed Management	Outreach and Engagement
Partner with school district career and college readiness initiatives to create pathways for high school students to develop awareness, interest, and/or skills in the landscaping, conservation, and water industries.						Watershed Management	Outreach and Engagement
Coordinate with the Southern California Association of Governments, data management consultants, and other agencies to create an overlay map and database showing the watershed with various layers, including existing development, general plan land use designations, and zoning designations.						Watershed Management	Outreach and Engagement
5.8 Natural Resources Stewardship							
Create managed system and restoration targets.						Ecosystem Restoration, Watershed Management	
Create water-oriented habits in the watershed.						Ecosystem Restoration, Watershed Management	

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Create sustainable wildlife corridors and expand restored areas.						Ecosystem Restoration, Watershed Management	
Provide sustainable funding sources for ongoing maintenance of conservation areas.						Watershed Management	
Fund invasive species eradication and maintenance.					Pollution Prevention	Ecosystem Restoration, Watershed Management	
Implement habitat restoration projects.					Matching Water Quality to Use, Urban Stormwater Runoff Management	Ecosystem Restoration, Watershed Management	
Develop pollutant trading programs.					Pollution Prevention	Land Use Planning and Management, Watershed Management	
Foster community involvement in habitat conservation and restoration.						Ecosystem Restoration, Forest Management, Watershed Management	Outreach and Engagement, Water-Dependent Recreation
Restore sediment downstream of dams.				Surface Storage – Regional and Local		Sediment Management	
Create MSHCPs and resource conservation districts in areas that are currently not covered.						Ecosystem Restoration, Watershed Management	
5.9 Water Use Efficiency							
Identify and implement strategies to improve efficiency.							
Develop tactics and technologies.	Agricultural Water Use Efficiency, Urban Water Use Efficiency						Economic Incentives, Outreach and Engagement
Encourage implementation of more progressive conservation-based water rates.	Agricultural Water Use Efficiency, Urban Water Use Efficiency						Economic Incentives, Outreach and Engagement
On-site efficiency evaluations.							Outreach and Engagement
Develop individualized water budgets for end users and customer portals.	Agricultural Water Use Efficiency, Urban Water Use Efficiency						Economic Incentives, Outreach and Engagement

Table 5.11-2. Management Strategies Recommended by Pillars

Pillars and Recommended Management Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Study/define efficient use metrics for various commercial indoor uses of water.	Urban Water Use Efficiency						Economic Incentives, Outreach and Engagement
Study the cost of separating mixed-use meters in existing commercial applications.	Urban Water Use Efficiency		System Reoperation				
Study cost effectiveness of separately metering indoor and outdoor water use in new residential construction/development.	Urban Water Use Efficiency		System Reoperation				
5.10 Data Management and Monitoring							
Develop a regional data management framework.						Watershed Management	Outreach and Engagement
Increase availability of data for decision makers.						Watershed Management	Outreach and Engagement
Develop standard data formats and data fields for comparative analyses.						Watershed Management	Outreach and Engagement

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
5.3 Tribal Communities							
Develop Tribal sovereignty training.							Water and Culture, Outreach and Engagement
Include Tribal representation with IRWM organization and structure.							Water and Culture, Outreach and Engagement
Develop guidelines for cultural sensitivity within IRWM.							Water and Culture, Outreach and Engagement
Ensure that Tribal communities can compete for and receive state funding.							Water and Culture, Outreach and Engagement, Economic Incentives
Support indigenous rights to water.							Water and Culture, Outreach and Engagement
Establish and fund a Tribal Advisory Group for OWOW.							Water and Culture, Outreach and Engagement

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
5.4 Climate Risk and Response							
Provide strategies for capital investments that will better support the transitions of climate change.							Outreach and Engagement, Economic Incentives
Promote integrated water management with similar strategies in order to defend against climate risks.						Forest Management, Land Use Planning and Management, Watershed Management	Outreach and Engagement
Public engagement and outreach.							Outreach and Engagement
Native American Tribal representation.							Water and Culture, Outreach and Engagement
5.5 Disadvantaged Communities							
Investigate and adopt appropriate policies related to the Human Right to Water.				Drinking Water Treatment and Distribution			Water and Culture, Outreach and Engagement
Set policy of supporting regional effort to alleviate homelessness.		Flood Management				Ecosystem Restoration, Watershed Management	Water and Culture, Outreach and Engagement
Consider and seek to minimize displacement.							Outreach and Engagement
Ensure that communities can reach you.							Outreach and Engagement
5.7 Land Use and Water Planning							
Designate or create a watershed-wide entity or collective of agencies to develop model ordinances that incentivize low-impact development and urban–natural space buffers to provide habitat benefits.		Flood Management			Urban Stormwater Runoff Management	Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement
Working with planning organizations, councils of governments, and water agencies, develop a checklist of land use planning tools that will increase groundwater recharge and that can be incorporated into local ordinances.		Flood Management		Conjunctive Management and Groundwater		Land Use Planning and Management	Outreach and Engagement

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Designate or create a watershed-wide entity or collective of agencies to develop a list of incentives that local jurisdictions can use for development projects that propose high levels of water use efficiency	Agricultural Water Use Efficiency, Urban Water Use Efficiency						Outreach and Engagement, Economic Incentives
Identify high-priority areas in the watershed for stormwater capture or stormwater treatment.		Flood Management		Conjunctive Management and Groundwater	Urban Stormwater Runoff Management, Salt and Salinity Management	Land Use Planning and Management, Recharge Area Protection, Sediment Management, Watershed Management	Outreach and Engagement, Water-Dependent Recreation
Develop an ongoing watershed-wide operations and maintenance plan for stormwater projects and identify opportunities for partnerships with workforce development agencies to participate in ongoing maintenance and monitoring programs.				Conjunctive Management and Groundwater	Urban Stormwater Runoff Management, Salt and Salinity Management	Land Use Planning and Management, Recharge Area Protection, Sediment Management, Watershed Management	Outreach and Engagement
Develop an updated low-impact development plan that includes new and innovative ideas.					Urban Stormwater Runoff Management	Land Use Planning and Management, Recharge Area Protection	
Develop a model complete streets program that balances priorities other than automobile transportation, such as safe pedestrian routes to schools, natural stormwater conveyance, and natural buffers.					Urban Stormwater Runoff Management	Land Use Planning and Management, Recharge Area Protection	Outreach and Engagement
Explore ways to use recycled water for fire suppression, especially in areas where recycled water infrastructure exists.			System Reoperation	Municipal Recycled Water	Matching Water Quality to Use		

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Actively coordinate with local jurisdictions to provide safe and affordable housing for people experiencing homelessness in order to transition encampments away from areas that may affect water quality and public health.		Flood Management			Pollution Prevention	Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement
Develop robust urban–wildland interface standards with a focus on preserving and enhancing open space, habitat, and natural hydrologic function that can serve as a model for local jurisdictions.						Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement
Complete a study that assesses existing trails and parks within the watershed and identifies opportunities and funding sources for new recreational facilities, with a focus on underserved communities.							Outreach and Engagement, Water-Dependent Recreation
Fund a Regional Trails Coordinator position to work with jurisdictions within the watershed on open space and trail linkages across jurisdictional boundaries.						Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water-Dependent Recreation
Identify land uses within a 1-mile buffer from the edge of the arroyos and other waterways to identify potential residential uses that could benefit from new parks or trails.						Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water-Dependent Recreation
Using the City and County of Riverside Arroyo Preservation Ordinance as a basis, create a model ordinance for arroyo preservation for consideration and possible adoption by cities and counties throughout the watershed.		Flood Management				Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement, Water-Dependent Recreation

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Using biologists and engineers, map all significant arroyos and major waterways within the watershed to define the "bed and bank" for use in tandem with the model ordinance described above.		Flood Management				Ecosystem Restoration, Land Use Planning and Management, Watershed Management	
Analyze existing park systems, trail networks, community gardens, and open space areas and develop a watershed-wide plan to improve connectivity and to increase safe bike and walking routes. Priority should be given to underserved communities.							Water-Dependent Recreation
Encourage Orange and San Bernardino Counties to use the Riverside County Multiple Species Habitat Conservation Plan as a model for habitat conservation and open space protection in their respective jurisdictions.						Ecosystem Restoration, Watershed Management	
Commission a comprehensive study of the Santa Ana River Watershed, as an integral component of greenbelts for food production.	Agricultural Water Use Efficiency					Land Use Planning and Management	Outreach and Engagement, Water and Culture
Using the California Urban Forests Council's Urban Forest Management Plan Toolkit as a guide (see https://toolkit.climate.gov/tool/urban-forest-management-plan-toolkit), develop a model urban forest management plan, including an evaporation shade plan, that can be used by each jurisdiction within the watershed.						Ecosystem Restoration, Forest Management, Land Use Planning and Management, Watershed Management	Outreach and Engagement

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Based on the urban forest management plan, develop a model tree ordinance that includes suggested tree planting goals for each jurisdiction within the watershed and implementation strategies. The plan should include strategies for both private and public property, including incentives for private property owners to either plant trees or allow access to property for the purpose of tree planting.						Forest Management, Land Use Planning and Management	Outreach and Engagement
Water agencies should continue working with the watershed's National Forests during the development of their long-term planning documents, called Land Management Plans and updated every 20–25 years, in order to create a nexus between forest-related and water resources projects. Through the development of these plans Forest land that is important for water supply, water quality and flood control projects and operations.		Flood Management				Ecosystem Restoration, Forest Management, Recharge Area Protection, Sediment Management	
Restore wetlands, such as the ponds in the Hidden Valley Wildlife Area along the Santa Ana River, for water quality, habitat creation, and recreational purposes.					Pollution Prevention	Ecosystem Restoration, Sediment Management, Watershed Management	
Encourage early coordination of land use projects in the watershed, before the development proposal has been fully designed.	Urban Water Use Efficiency					Land Use Planning and Management, Watershed Management	Outreach and Engagement

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Identify and integrate a public participation framework into decision-making processes to determine when public input from representative audiences is appropriate.							Outreach and Engagement
Solicit community input to ensure that interpretive signs and communication materials reflect the values, history, geography, and culture of the community, fostering a sense of place and building trust and engagement.							Outreach and Engagement, Water-Dependent Recreation
Provide community participation programming at the appropriate time and location, and in the appropriate languages, to maximize accessibility to audiences.							Outreach and Engagement, Water and Culture
Encourage broad public notification of projects in disadvantaged communities, well beyond the standard 300-foot notification ring.						Land Use Planning and Management	Outreach and Engagement
Create model "good neighbor" guidelines, with a focus on environmental justice. Such guidelines should emphasize relationships between industrial projects with harsh environmental impacts and nearby residential communities and water sources.						Land Use Planning and Management	Outreach and Engagement
Using the "Housing First" model (see https://endhomelessness.org/resource/housing-first/), create a model housing project to demonstrate how transitional housing can be provided to homeless individuals currently residing along the Santa Ana River.					Pollution Prevention	Ecosystem Restoration, Land Use Planning and Management, Watershed Management	Outreach and Engagement

Table 5.11-3. Policy Strategies Recommended by Pillars

Pillars and Recommended Policy Strategies	Resource Management Strategies – Management Objectives (CA Water Plan 2013)						
	Reduce Water Demand	Improve Flood Management	Improve Operational Efficiency and Transfers	Increase Water Supply	Improve Water Quality	Practice Resource Stewardship	People and Water
Identify methods for local governments to consult water management agencies early in the land use decision-making process regarding technology, demographics, and growth projections.	Urban Water Use Efficiency					Land Use Planning and Management	Outreach and Engagement
Ensure that from start to finish, projects and programs involve the public, build relationships, and increase the sharing of and access to information. The participatory process should focus on making sure that all residents have access to clean, reliable, and affordable water for drinking and recreation.							Outreach and Engagement, Water and Culture
5.9 Water Use Efficiency							
[Calculate] a baseline based on the amount of a water supplier's usage in preceding years, as was done with emergency drought regulations adopted by the State Water Board in 2015, the formula identified calculates the volume of water that is needed to efficiently meet the needs of the supplier's customers.	Agricultural Water Use Efficiency, Urban Water Use Efficiency					Land Use Planning and Management, Watershed Management	Outreach and Engagement
5.10 Data Management and Monitoring							
Develop a trust framework.							Outreach and Engagement
Ensure consistent data management QA/QC.						Watershed Management	Outreach and Engagement
Provide sufficient resources to support data collection and management.						Watershed Management	Outreach and Engagement
Support ongoing efforts to improve data management and collection.							Outreach and Engagement
Support proactive data sharing and collaboration.						Watershed Management	Outreach and Engagement

6. PROJECT/PROGRAM REVIEW, EVALUATION, AND PRIORITIZATION

The One Water One Watershed (OWOW) Plan Update 2018 houses a list of projects submitted by watershed stakeholders. These projects have been identified by their proponents as being capable of helping achieve the goals laid out by the stakeholders and approved by the OWOW Steering Committee.

This list of projects is maintained for many reasons, only one of which is in support of compliance with the California Integrated Regional Water Management (IRWM) Program Standards and conventions. Unlike what is envisioned in the program, however, the OWOW Plan Update 2018 cannot be fully achieved by only the projects contained herein. As has been made clear before in this document, the OWOW Plan Update 2018 contains a vision for 2040, and a number of goals in the near term that will move the watershed toward that vision. All members of the watershed community will have roles to play achieving that vision, overcoming the uncounted small and large challenges, improving the watershed in many ways.

6.1. WHY HAVE PROJECTS IN THE OWOW PLAN UPDATE 2018?

During stakeholder engagement, five categories were discussed regarding why a project proponent wants to list their project within the OWOW Plan Update 2018.

First, for a project to be considered for funding from the California IRWM Program implementation grants it must be within an IRWM Plan. This is the long-standing practice of the OWOW Program and of IRWM efforts statewide.

The second reason was created by the 2014 Stormwater Resources Planning Act, which requires that any projects seeking state grant support to manage dry or wet weather runoff be contained in both a Stormwater Resources Management Plan (SRMP) and an IRWM Plan. Elsewhere we describe how the SRMPs are being adopted into the OWOW Plan Update 2018, and in both cases an effort was made to directly load all projects submitted to those plans.

A third reason to have your project listed in the OWOW Plan Update 2018 is to support pursuing other grants. Being able to describe the project as part of the regional plan is valuable for grant applications, and the Santa Ana Watershed Project Authority (SAWPA) frequently provides support letters when a stakeholder is pursuing funding for a project that helps achieve the goals identified in the OWOW Program.

Fourth, the database of projects maintained by SAWPA for the OWOW Program can provide opportunities for a project to be visible to others, leading to partnerships or new innovative multi-benefit designs. All projects submitted to the databased become visible in both tabular and spatial

webtools, so anyone can see what anyone else has submitted. Looking for topical or geographic alignment is supported by the tools, which in turn strengthens the implementation of projects that achieve the goals of the OWOW Plan Update 2018.

Fifth and lastly, there comes prestige and visibility from submitting a project through the robust, stakeholder-driven OWOW Program. The robust process that includes many voices suggests that projects contained therein have strong regional support, and therefore are worthy of acclaim.

6.2. CALL FOR PROJECTS TO BE INCLUDED IN THE OWOW PLAN

To invite project proponents to submit projects for inclusion in the plan, SAWPA developed an online tool that collects the necessary information. This call for *inclusion* is not the same as a call for grant applications. The OWOW Program, because of the many reasons to include projects and the many types of projects that can help achieve the goals, separates calls for projects in the OWOW Plan and calls for projects seeking any particular grant opportunity.

In addition to the online tool for direct submittal of projects, the OWOW Steering Committee requested that SAWPA staff work to directly import lists of projects that were collected in other planning efforts. During 2017 and 2018 project lists from the following plans were imported, and project proponents contacted to confirm the import process was successful for their project.

- The OC Plan (2018)
- Santa Ana River Parkway and Open Space Plan (2018)
- Orange County Stormwater Resources Plan (2017)
- 2016 Chino Basin Stormwater Resources Plan (2016)
- Upper Santa Ana River Watershed IRWM Plan (2015)

Projects that are submitted must be described properly to be included in the plan. Basic data about the proponent and the project partners is requested, followed by the project name, an abstract, and a discussion of the benefits and costs. Each project must describe a location on a map, which can be an address, or a spatial characteristic (a point, line, or polygon.)

The most important task of a proponent is describing how the project will help achieve one or many of the OWOW Plan Update 2018 goals, and how the project engages the California Water Plan Resource Management Strategies. Finally, the proponent provides description of any project benefits that will support members of disadvantaged communities or Tribal communities, or if the project diminishes environmental injustices or helps achieve the California Human Right to Water.

All projects that are submitted for inclusion in the OWOW Plan are held in the OWOW Program Project Database, visible at this link: http://www.sawpa.net/owow2018/main.htm. Appendix B includes a list of projects submitted to the Plan as of January 24, 2019. However, the Projects

Database is dynamic, reflecting routine updates and contributions by stakeholders. At each OWOW Steering Committee meeting, new submissions will be formally acted upon to become part of the current OWOW Plan.

The California IRWM Plan Standards encourages the ranking of projects in each IRWM Plan. The OWOW Plan Update 2018 does not rank projects, because unlike as described below, this list of projects is not competing against one another for anything. Projects included in the OWOW Plan Update 2018 will each in their way support achievement of the goals.

The technical feasibility of projects submitted to be part of the OWOW Plan is also not assessed. Because a project or program is in the OWOW Plan for reasons other than grant seeking, the technical feasibility does not need to be established. Rather, having all ideas in the OWOW Plan makes it is easier for synergies and partnerships to be established between like-minded proponents or similarly structured projects.

6.3. IRWM IMPLEMENTATION GRANTS

6.3.1. OVERVIEW

When the California Legislature or Voters make funding available to the IRWM Program, the OWOW Program is responsible for identifying appropriate expenditures in the Santa Ana Funding Area. Below is a description of how this work was conducted in past Grant Rounds, followed by how the OWOW Plan Update 2018 further evolved the process for Proposition 1 funding.

6.3.2. HISTORY OF IMPLEMENTATION GRANTS

Since the passage of the State of California Proposition 13 Water Bond in March 2000, the Santa Ana Watershed has successfully implemented multiple rounds of IRWM grants. This includes contracting with the State Water Resources Control Board to use $235 million in Proposition 13 Water Bond funds, matched with over $565 million in local agency funds, to construct over $800 million in projects.

In 2002, the voters approved another water bond called State Proposition 50 IRWM program, which provided over $500 million for IRWM projects. Through a competitive grant application process, the watershed received $25 million in grants to match over $225 million in local funding to implement major water resource projects.

When Proposition 84 was passed in 2006, the OWOW Program initial call for projects evaluated submittals in a two-step process to determine eligibility for inclusion in the OWOW Program and to prioritize projects for funding. The selection process was developed with goals of transparency, objectivity, and thoughtful deliberation. With the first round of project funding agencies in the watershed collaborated to ensure constituencies received multiple benefits that were regional in nature.

Under the 2011 Round 1 of Proposition 84 IRWM program $12 million was awarded to 13 integrated projects in the Santa Ana River Watershed (watershed), using a project evaluation and rating and ranking process that incentivized integration and collaboration for watershed management.

In 2012 the OWOW Program, using the second round of Proposition 84 project funding, further expanded the power of multi-agency cooperation to achieve more holistic and integrated projects. The primary focus for this second funding round encouraged projects that reflected a watershed approach. This created opportunities for local agencies to shape actions to restore hydraulic functionality, solve problems, and provide long-term sustainability. In the call for projects, 136 projects were submitted for rating and ranking. Of these projects, 52 requested funding in second round. Others provided project information for planning/partnership development purposes and to be eligible for other funding sources, such as Proposition 1E.

6.3.3. OWOW PROGRAM INNOVATION FOR PROPOSITION 1

Several process improvements have been introduced to the OWOW Program for Proposition 1. First, eligibility criteria were set in July 2016, starting the process in the region to develop multi-benefit and multi-party projects. These eligibility criteria and a new rating and ranking system were developed from lessons learned during earlier implementation grant rounds in the OWOW Program, and from changes in the IRWM Program over the years and through Proposition 1.

The OWOW Steering Committee adopted a policy for the Proposition 1 implementation grants that will assist the region in selecting innovative projects, or projects that are small in both benefit and cost. Unlike in past rounds where a project with large benefits and therefore large costs would out-compete projects with fewer benefits, in the first round of Proposition 1 implementation grants the OWOW Program will have two lists, where projects seeking $500,000 or less will compete against one another for 10% of the available grant funds, while the other 90% will be available through competition by projects with larger grant requests. The eligibility criteria and rating and ranking system described below will be identical in the two lists.

The steps for the region to develop a suite of projects for submittal of an expenditure plan to the California Department of Water Resources (DWR) are described below.

Call for Projects Seeking Grants

When a draft proposal solicitation package (PSP) is released by DWR (or another state agency) for any available funding in the IRWM Program, SAWPA technical staff will develop a section of the online project submittal tool in order to gather the appropriate information from project proponents. Upon release of a Final PSP, SAWPA will initiate a call for projects seeking grants, asking watershed stakeholders to submit projects. More information about this process is available at http://www.sawpa.org/owow.

Submitting Projects

There are two steps in submitting a project to be considered by the OWOW Program for funding within IRWM implementation grants. The first is described above in this chapter, where proponents must first submit their project to be included in the OWOW Plan Update 2018. The second step asks proponents to provide necessary information to ensure that projects fit the *Eligibility Criteria* and to allow the *Rating and Ranking* system to be applied to any particular funding opportunity within the California IRWM Program.

Eligibility Criteria

The OWOW Steering Committee approved *Proposition 1 IRWM Implementation Grant Project Eligibility – OWOW Program Policy* is housed on the OWOW website (www.sawpa.org/owow) and describes how the OWOW Program aligns regional priorities with those derived from legislation and voter-approved general obligation water bonds. This tool was first created in July 2016 in support of stakeholders wishing to begin developing projects. It has been updated twice at the request of stakeholders to bring in concepts about projects not unduly harming another portion of the watershed. For the OWOW Program, eligibility is grounded in both the available PSP and in local policy decisions. The PSP is the floor, but additional aspects of local need are employed to further focus the kinds of projects that receive funding.

Table 6.3-1 shows the eligibility criteria in place for the Proposition 1 Round 1 implementation grant round. Below the table are brief narrative descriptions of each eligibility criterion.

Table 6.3-1. Eligibility Criteria and Indicators

Eligibility Criteria	Indicator (Yes/No, Description)
Collaborative projects	More than one organization providing resources (money, labor, land, etc.)
Projects that contain at least two benefits	Benefits claimed in at least two classes
Projects consistent with the California Water Action Plan	Identify (select from a list) and explain
Projects in which all benefits accrue to members of disadvantaged communities	If asserted, the * below becomes *Not Applicable*
Projects that have identified required 50% match*	Describe the secured, eligible source of match funds
If construction projects, adherence to CEQA timeline*	CEQA ready 6 months from grant award
Sustainable projects that are resilient to changing conditions	Describe in the context of climate change, land use, population change, economic conditions, etc.

Table 6.3-1. Eligibility Criteria and Indicators

Eligibility Criteria	Indicator (Yes/No, Description)
Projects with benefits that are not achieved at the expense or detriment of another	Describe the analysis conducted to assert this answer. How was your conclusion reached?

Collaborative Projects

A critical component of the OWOW Program, which is shared by the IRWM Program, is a focus on collaborative work. This is the first eligibility screening tool, where a project proponent must express that at least two organizations are providing resources to support the implementation and future success of a particular project. In this case, "providing resources" can include match funding, in-kind labor or other support, land, future maintenance and operations, etc.

An exception was added in January 2019 for projects submitted by sovereign Tribal governments (or agencies thereof), where it would be inappropriate to demand that a non-Tribal partner be engaged in a project within the jurisdiction of the Tribe. The OWOW Program continues to encourage collaboration between Tribal governments and adjacent governments or civil-society organizations, but does not require it.

Projects That Contain at Least Two Benefits

A submitted project must describe how it will provide benefits to the watershed in at least two of the benefit classes described below. This aspect of eligibility will be drawn automatically from the forms within the project submittal tool.

Projects Consistent with the California Water Action Plan

One way that the OWOW Program implements this process is by having the Eligibility screen include questions like "Is the project consistent with the California Water Action Plan?" This one question encompasses a number of priorities and requirements that are fundamental to the California Water Action Plan.

Projects in which All Benefits Accrue to Members of Disadvantaged Communities

This aspect of eligibility is required as part of the Proposition 1 Round 1 PSP, and may or may not appear in future calls for projects seeking grants. In the Santa Ana River Watershed it is very difficult to provide a regional, multi-benefit project that supports only members of disadvantaged communities. The density and economic diversity of the developed lands of the watershed and the integrated nature of the water management system combine to make this eligibility difficult to attain.

Absent 100% benefit to members of disadvantaged communities, each proponent must answer the following two eligibility questions.

Projects That Have Identified Required 50% Match

This is also an eligibility requirement of Proposition 1. Earlier rounds of IRWM implementation grants have required some match, but at different proportions. Future funding opportunities will likely maintain this requirement.

If Construction Projects, Adherence to CEQA Timeline

This is a new requirement developed by DWR in their administration of Proposition 1 implementation grants. It requires that projects that must comply with CEQA be completely through the CEQA process and have permits in hand within 6 months of the implementation grant award.

Sustainable Projects That Are Resilient to Changing Conditions

Proponents must describe how the project proposed will be impacted by, and resilient to, the expected changing conditions in the watershed. This includes adaptiveness to climate change, but also to the expected impacts of population growth and the cyclical nature of the economy. A coastal project, for instance, that is unable to express that sea level rise projections are factored into the project plans will not be eligible, using this criterion.

The narrative provided will be a source for qualitative assessment by all reviewers and decision makers as the projects move forward in the process. Elsewhere in the project submittal tool proponents must describe an analysis of contribution to greenhouse gas emissions reduction from the proposed project. The answers there will join the collaborative decision making about project selection.

Projects with Benefits That Are Not Achieved at the Expense or Detriment of Another

This is a more recent addition to the OWOW Program eligibility screening, developed by stakeholders who understand that the watershed is interconnected and interdependent. It arose from a simple question: if water discharged to the river in the upper watershed is already captured in the lower watershed, can an upper watershed project suggest that capturing those same flows on site is providing a new benefit to the watershed? This led to the development of this eligibility criteria.

Proponents must narratively describe how a project has analyzed unintended consequences or impacts elsewhere in the watershed. The answer becomes part of the shared review of all proposed projects. If there is not agreement to the assertions made by the proponents, additional facilitation and collaboration will be conducted, seeking agreement.

Rating and Ranking Project Benefits

To assist decision making by stakeholders and the OWOW Steering Committee, and to support the competitive requirements of the Proposition 1 implementation grants, the OWOW Program rates and ranks projects based on the benefits they will provide the watershed. This system evolved from earlier work in the OWOW Program, again prioritizing fairness and transparency. Stakeholders

were directly involved in producing benefit classes, weighting, and developing the calculation that is used to rate and rank projects seeking grants. This system will be followed each time a funding opportunity appears for the IRWM Program and may result in slightly different eligibility criteria or rating and ranking, driven both by the funding opportunity and the current needs and priorities identified by the stakeholders of the watershed.

Each project proponent is required to quantify the benefits the project will provide the watershed in 12 benefit classes. In each, the project will have a similarly quantified benefit, and a qualitative description of how the figure was calculated. All projects will compete with all other projects in each benefit class to score weighted points based on the benefits they will provide.

Benefit Classes

For Proposition 1 IRWM funding opportunities, the 12 benefit classes were created from the text of Proposition 1, and the goals described by stakeholders and adopted by the OWOW Steering Committee. Proposition 1 has a focus on supporting regional self-reliance and climate change adaptation. The OWOW Plan Update 2018 goals and objectives, the management and policy strategies, and the benefit classes created for the Proposition 1 implementation grant round are all grounded in supporting regional self-reliance and climate adaptation. Any work done to improve the resilience of communities and the watershed is adaptive, and supports self-reliance. These two items are not their own discrete goals; rather, they are interwoven throughout.

The weighting of the benefit classes, on a scale of 1 to 10, was created during a stakeholder meeting where each participant (about 30 were present) ranked each benefit class in its importance over the coming 5 years. The weightings seen in the table are not percentages, and do not add up to 1. They instead express the importance held by the stakeholders for each benefit class.

Each benefit class has a total of 20 points available, and points earned in each benefit class will be multiplied by the weight of the benefit class to provide score for each class for each project. A sum of all the benefit class scores will provide each project a total score, for use in the ranking.

Each project proponent submitting a project for consideration will have to assert how that project provides at least two benefit classes, using the set indicators shown in Table 6.3-2. This is the core of the detailed project-specific impact and benefits analysis. All projects will then be compared to one another using their asserted benefits, and those assertions will be tested by public review throughout the competitive process.

Table 6.3-2. Benefit Class Weights and Indicators

Benefit Classes	Weight	Indicators
Water supply reliability, conservation, efficiency	9.2	Acre-feet per year of water supply made newly available in the watershed by the project

Table 6.3-2. Benefit Class Weights and Indicators

Benefit Classes	Weight	Indicators
Groundwater recharge and management	8.9	Acre-feet per year of new groundwater recharge from any source or new groundwater treated
Reclamation, treatment, and conveyance of water	8.5	Acre-feet per year of new reclaimed water treated or distributed
Multipurpose flood and stormwater (monitoring, capture, storage, cleanup, treatment, management)	8.4	Acres of watershed managed by project
Watershed/ecosystem/wetland protection, restoration	7.7	Acres of watershed managed by project
Benefits to members of disadvantaged communities	7.7	Percent of benefits accruing to disadvantaged communities
Benefits to large area of watershed	7.6	Acres of the watershed receiving benefits from the program
Drinking water treatment, distribution	7.4	Acre-feet per year of water treated or distributed
Public education component	7.4	Estimated number of person-contacts per year
Nonpoint-source pollution—reduction, management, monitoring	7.1	Acre-feet per year managed (reduced, treated, monitored) by the project
Fisheries restoration/protection	6.9	Acres of watershed managed by the project
Removal of invasive non-native species	6.3	Acres of watershed managed by project

Setting the Range of Benefits to Allocate Points

From the entire list of projects submitted, each benefit class will have a project where the most benefits are claimed. This project is therefore the "Max Benefit" project for that benefit class and will receive the full 20 points. All other projects with benefits in that class will receive a proportional number of points based on their benefits (see example table). A project that has no benefits claimed in a benefit class will receive zero points in that class.

Table 6.3-3 shows an example where four projects have been submitted to manage a certain number of acres. Project 1 submitted the greatest benefit, 120 acres managed. This earns Project 1 100% of the available points. Each of the other projects is then assessed for what proportion of the max benefit they expect to provide. They are given points using the same proportion.

Table 6.3-3. Example Projects

Project No.	Acres Managed	Proportion of MAX	Points Earned
1	120 (MAX)	100%	20
2	30	25%	5

Table 6.3-3. Example Projects

Project No.	Acres Managed	Proportion of MAX	Points Earned
3	12	10%	2
4	0	0%	0

Below is a fictitious sample project processed using the OWOW Program Rating and Ranking system. In the table you see how the project has earned a proportional amount of points in various benefit classes, which when multiplied by the weighting, gives a score for each benefit class and a total score for the project.

Table 6.3-4. Example Project Processed Using OWOW Program Rating and Ranking

Fictitious Sample Project Benefit Class	Weighting	Points Earned	Subtotal
Water supply reliability, conservation, efficiency	9.2	16	147
Groundwater recharge and management	8.9	12	107
Water reclamation, treatment, and conveyance	8.5	0	0
Multipurpose flood and stormwater (monitoring, capture, storage, cleanup, treatment, management)	8.4	10	84
Watershed/ecosystem/wetland protection, restoration	7.7	10	77
Benefits to members of disadvantaged communities	7.7	4	31
Benefits to large area of watershed	7.6	6	46
Drinking water treatment, distribution	7.4	0	0
Public education component	7.4	2	15
Nonpoint-source pollution: reduction, management, monitoring	7.1	11	78
Fisheries restoration/protection	6.9	0	0
Removal of invasive non-native species	6.3	0	0
		Total	**585**

Eligibility Screening and Quality Control

Once the call for projects seeking grants is closed, SAWPA staff will review the submittals to apply the eligibility screening. Projects that are not eligible for current funding opportunity, or for the OWOW Program, will be contacted and offered a chance to revise their submission. If the proponent chooses to not revise, their project will not be considered in the rating and ranking.

Projects that do not comply with the requirements of the grant opportunity will not be included for further consideration. As an example, for Proposition 1 Round 1 this includes items about climate change, groundwater quality, project readiness, and support for diminishing reliance on the

Sacramento–San Joaquin Bay Delta. Future funding opportunities may have different requirements, which will be factored into the eligibility.

Public Review: "Let's Connect!"

Having a public review of the submitted eligible projects, prior to the rating and ranking being applied, is important to the stakeholders. SAWPA developed "Let's Connect!", a program that borrows from "speed dating" and from "participatory budgeting," two different ways for people to make decisions together. OWOW Program stakeholders take seriously the lessons learned about collaboration in the Santa Ana River Watershed and asked for the grant-selection process to contain several open workshops to promote multi-jurisdictional project development among project proponents. This approach would support additional discussion about multi-benefit project development, possibly combine similar projects with similar benefits and helping ensure the decisions made have strong support.

SAWPA will host at least one "Let's Connect!" session after the initial call for projects and project information is received. This session allows all the project proponents to gather and discuss the proposals and seek new collaborative opportunities. This session was designed so that proponents could register to host a table about their proposed project, and other proponents then cycle through the tables every 10 or 15 minutes.

Following these engagement efforts, project submittals may change. After the changes are recorded in the system, the new project list will be processed through the *Rating and Ranking* system. This will rate each project for the benefits it will achieve and rank the projects against one another. Produced will be two ranked lists, one of projects seeking under $500,000 in grants, another of projects seeking greater than that value.

Public Review of the Rated and Ranked Projects

Unlike in past rounds where impartial technical experts were asked to review the rated and ranked project list, the OWOW Plan Update 2018 has amended the process to provide stakeholder review of the project list, and the benefits claimed by each proponent.

Once the rating and ranking is complete, the list of projects will be made public, and additional stakeholder engagement sessions scheduled. Relying on existing sequences of meetings, and additional "Let's Connect!" sessions, the list of projects will be reviewed by interested stakeholders. Making the list public, including the rating and ranking and all information provided by the project proponent, will allow discussions to effectively clarify concepts, ensuring that parties with differing opinions have equal opportunities for meaningful participation in the dialogue.

Using aspects of "participatory budgeting," SAWPA staff will facilitate this stakeholder effort of deciding how to allocate the available funds across the projects that are ranked highly by the process. Through a consensus and conflict-resolution process, a list of highly ranked projects will

be created that will benefit from an allocation of available grant funding. The rating and ranking system will be a guide for how stakeholders consider which projects are most impactful for the watershed, and the best suite of projects for using available funds. This process will grapple with the benefits and costs of the highest-ranked projects, and the financial capacities in place to ensure project implementation, if awarded grant support.

If consensus is not achieved through the stakeholder process, SAWPA staff will provide the OWOW Steering Committee a description of the outstanding conflict and the series of options, and rely on their decision-making authority to achieve the path forward. It is, however, the goal of the OWOW Program to consider the goals and objectives of the OWOW Plan, and the strategies which can be undertaken within each funding opportunity, to allow stakeholder processes to develop a consensus around which projects are submitted for funding.

Ultimately, a recommendation by SAWPA staff carrying the voices of stakeholders will be provided to the OWOW Steering Committee for approval of a list of economically and technically feasible projects for submittal to DWR. Following concurrence by the SAWPA Commission the expenditure proposal will be submitted.

Summary of Project Suite Creation Process

Through this process the OWOW Program will develop a project suite for each funding opportunity within the California IRWM Program. Proponents of projects in the OWOW Plan Update 2018 will decide if they wish to compete, and then will describe how their projects are eligible for the funding opportunity, and how the project will benefit achievement of the watershed goals. Competing eligible projects will be scored against each other by rating the benefits they will achieve, and then ranking the projects that will achieve the most benefits. See Figure 6.3-1 for a representation of the process.

The list of projects produced will be vetted by the stakeholders, resolving conflicts and creating new partnerships. This final step will ensure that the projects selected provide benefits appropriate to the funding opportunity, are distributed fairly without causing undue burdens, and are compliant with the available funding round. Ensuring that the appropriate information is included for each proposed project in the suite is also undertaken during this last step, including for example the project's contribution to greenhouse gas emissions reduction (if not previously calculated).

The final decision to propose a suite of projects that are sufficiently ready to proceed rests with the OWOW Steering Committee with concurrence from SAWPA Commission. That suite of projects, however, and how the funds are allocated across the projects, will be driven by stakeholders.

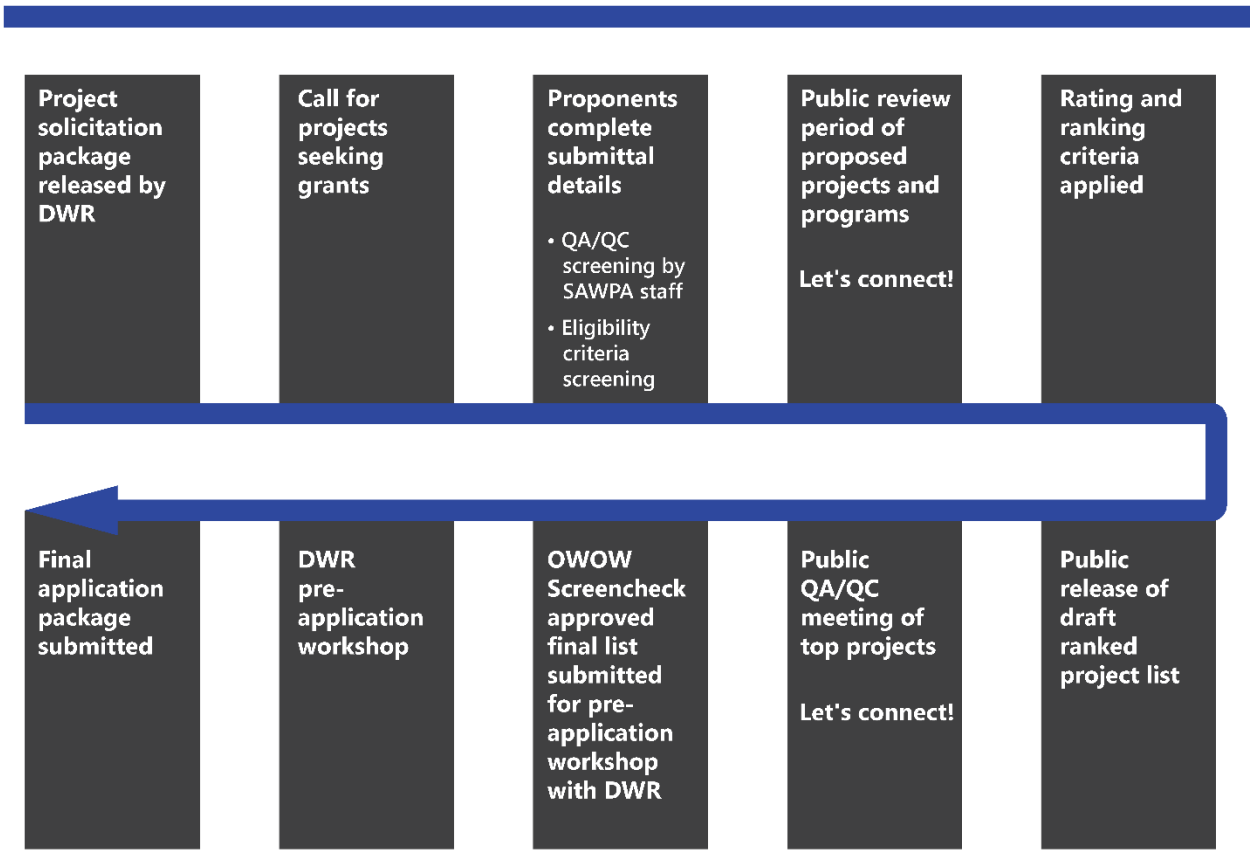

Figure 6.3-1. OWOW Plan Update 2018 Sequence of Grant-Seeking

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7. IMPACTS AND BENEFITS OF SUSTAINABLE INTEGRATED SOLUTIONS

During the last decade of One Water One Watershed (OWOW) Program, integrated management of water has become much more common in the Santa Ana River Watershed (watershed). This region was already considering collaborative solutions in the late twentieth century, and the OWOW Program continues to support refinement, development of new partnerships, and pushing the envelope about what is possible when bottom-up planning leads to collaborative decision making and multi-party, multi-benefit projects. The era where single-purpose agencies produce single-purpose projects is receding into history, although the production of multi-objective solutions and multi-benefit projects remains difficult and is often expensive and time consuming. The OWOW Program and the California Integrated Regional Water Management (IRWM) Program are both aimed at supporting the institutionalization of working this way; that is, making watershed planning leading to collaborative multi-benefit projects the way things are done.

The effort to leave behind single-purpose projects is not unique to water; for instance, in public health infectious diseases that plague much of the world can be treated by eliminating the infectious agent or interrupting the transmission of the pathogen. Public health programs traditionally focus on both approaches and use a team of physicians, sanitary engineers, and other professionals to address problems, often with great results.

However, in many cases, the development of more specialization in medical science has been correlated with the resurgence of some diseases, such as malaria. Recently, scientists have become concerned that the increasing emphasis on specialization has resulted in narrow training focusing on only a single aspect of a broader problem, often leading to a failure to find effective system-scale solutions (Moore 2008).

Water management through the twentieth century followed the same course, that if more and more sophisticated specialization. Similarly if we consider water as a natural substance critical to life, the environment, and the economy, it seems clear that projects that address as many of those interests be encouraged.

Some of the earliest multi-benefit water projects were done through a partnership between those interested in flood control and groundwater management. For instance, spreading grounds along the front slopes of local mountains have both attenuated flood flows and recharged groundwater basins for nearly 100 years.

Orange County Water District partnered early with Orange County Flood Control District to provide recharge basins within flood control basins. More recently, Inland Empire Utilities Agency has worked with San Bernardino County Flood Control to modify the operation of the flood control

system to maximize recharge opportunities. Irvine Ranch Water District has partnered with Orange County Flood Control District to store recycled water in some flood control basins. All these projects were facilitated primarily by operational changes and new institutional partnerships rather than by the construction of new infrastructure. Operational changes could occur only when both parties came to trust one another and understand each other's needs and assets.

For now, the development of multi-benefit projects is challenging and requires the continued sustained efforts of agencies that manage water. In the Santa Ana River Watershed (watershed) alone there are approximately 100 agencies that manage water in some way, and countless others that manage some aspect of land. This situation is not unique to this watershed. The federal government has 12 agencies and 8 separate committees all doing water-related work (Udall and Averyt 2009). Agencies need to prioritize collaborative projects and provide the staff with sufficient resources to ensure that such projects are developed.

The future however suggests that integrated management of water will become less specialized as more organizations are empowered with multi-benefit missions. Many of the large water districts in the watershed already act within several different water management authorities, and also belong to multiple long-running partnerships

One key asset in the watershed is the forethought expressed in the 1970s when the Santa Ana Watershed Project Authority (SAWPA) was created. This watershed benefits by having an institution which focuses on collaborative work at the watershed scale and has the authority to carry out work at that same scale. While multi-benefit projects remain the purview of partnerships of specialist institutions, it will remain necessary to have specialist integrators and network coordinators. First forming and then empowering a watershed authority was a critical adaptation, and those who created and maintain SAWPA as a resource for the region deserve accolades.

7.1. THE HARD AND REWARDING WORK OF INTEGRATION

The California IRWM Program exists to encourage integrated management of water at regional scales. Truly integrating the management of water at the watershed scale demands the presence of all who manage water, those who manage the land across which the water flows, and many who manage people, plants, and animals. It encourages thinking about public health, about education, about climate change, and environmental injustices.

The OWOW Program is driven to achieve this "all-in" process through the bottom-up approach, where the vision, goals, and strategies are developed by those who have a greatest stake in their success. The technical expertise and elected and appointed decision makers are in service to this broader constituency, as it should be in good environmental governance.

The OWOW Pillars are where these lofty ideas become applied, real work at improving the watershed. For OWOW 2.0 Plan, the Pillars gathered for a visioning workshop, and developed the following list of potential benefits that accrue from focusing on multi-benefit projects:

- Solving problems using a multi-benefit approach prevents the creation of other problems. Too often when a single-function project is developed, it has impacts on other water-related areas that are unanticipated.
- Multi-benefit problem solving reduces missed opportunities. A multi-benefit approach ensures a careful exploration of all aspects of a particular project, and results in the identification of small project changes that can produce large benefits.
- This approach can achieve long-term cost and resource savings for the public. When a multi-benefit project is developed, the cost of providing each benefit is often less than providing similar benefits to the public using two or more separate projects. As land and other public resources become scarce, these types of projects are more likely to be undertaken because they provide greater public benefit.
- Developing projects that provide multiple benefits develops trust. As groups develop multi-benefit projects, trust develops among different constituencies, each interested in a different aspect of the watershed. These groups are more likely to work toward similar solutions in the future if they have successfully developed multi-benefit projects together.
- Development of multi-benefit projects can improve communication. Through the development of a project, groups that differ in geography or area of interest develop better communication, developing a shared vocabulary and teaching each other.
- Multi-benefit projects often have diverse sources of funding. As multi-benefit projects are developed, multiple state and federal funding sources become available, providing cost-share opportunities and increasing the probability that a specific project will move forward.
- Development of multi-function projects allows sharing of human resources. Each agency or constituency interested in developing a project has access to individuals with unique abilities and perspectives. Teams formed from diverse groups often develop unique solutions to problems.

7.2. WORKING TOGETHER TO OVERCOME CHALLENGES

The Pillars workgroups that developed the OWOW 2.0 Plan created the table below, which reflects how they saw the implementation of an integrated watershed plan both within the IRWM Region and in partnership with neighboring regions. Their work considered what challenges (impacts) were on the horizon in the watershed, and how the proposed implementation of projects, programs, and the OWOW 2.0 Plan would support overcoming those challenges. This work remains relevant today, and describes perfectly what the Pillars and stakeholders accomplished during the 2-year process of crafting this OWOW Plan Update 2018. Table 7.2-1 reflects the persistence of some of the challenges faced, but also the legacy of robust integration here in the Santa Ana River Watershed.

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Water Resources Optimization Pillar			
• Increased expenses • Surface water loss • Ocean habitat loss • New discharge issues associated with brine line disposal	• Quantifies environmental and habitat needs • Allows cost-sharing partnerships to enhance and improve the capability of flood control infrastructure to capture and infiltrate storm flows • Allows sustainable growth • Provide high-quality supply to clean up contaminated groundwater basins • Promotes appropriate use of recycled water • Promotes change in water usage strategies • Encourages transition of landscaping to native plant types • Reduced water demands • Increases water supply • Improve water quality • Lowers the concentrations of imported salt in local surface and groundwater supplies • Surface storage provides opportunities for local recreation • Expands and enhances opportunities for recreational boating and sportfishing • Water utility easements provide trail opportunities • Enhances property value	• New outflow locations • New discharge locations • Additional storage/ infrastructure construction will increase greenhouse gas (GHG) emissions	• Incentive for high-quality industrial and commercial development • Supports smart growth, enhancing quality of life • Reduces the total carbon footprint associated with importing water • Provides mechanism to lower the concentration of industrial pollutants • Support less reliance on imported water supplies • Additional storage/ Infrastructure which help prepare for interregional drought, natural disaster, or terrorist attack

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Water Quality Pillar			
• Increase of GHG emissions • Increased energy use for water quality treatment • Increased machinery maintenance	• Reduced the input of nutrients which promote eutrophication • Promote greater biodiversity • Use of natural treatment systems provides incentive for restoration and construction of habitats • Supports and protects areas of biological significance including habitats for threatened and endangered species • Provides high-quality drinking water for disadvantaged communities • Reduces the perceived need for bottled water • Expands and enhances recreational opportunities • Strategies that promote infiltration, such as Low Impact Development help reduce peak flows and flooding • Extends the life of existing infrastructure • Reduces risk to public health • Attracts high-quality industrial developments • Expands opportunities for water recycling • Improves the efficiency of membranes and filters • Expands the range of available technologies	• Possible damage to habitats • Increased energy consumption in association with pumping • Intrusion opportunity for invasive species	• Offsets climate changes stress on water supply by improving water quality overall • Improve the overall perception of the surrounding regions • Enhances value of property which encourages larger population growth • Incentive for high-quality industrial and commercial development • Supports less reliance on imported water supplies • Preparedness to aid surrounding regions from inter-regional drought, natural disaster, or terrorist attacks via the conservation of water supplies • Promotes new and innovative water treatment methods

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
	• Extends the life of fixtures and appliances • Reduces the perceived need for water softeners		
Water Use Efficiency Pillar			
• Increased short-term construction and site-specific impacts • Reduced flow downstream • Negative habitat impacts • Negative water quality impacts	• Reduce carbon footprint associated with transporting and processing water • Reduce carbon footprint associated with water use and consumption • Encourage planting of native plant species • Reduced standing plant biomass associated with fire threat in the riverbed • Promotes water efficient programs through water budget-based rate funds • Encourage maintenance of open spaces and corridors for trails • Reduce salt importation • Encourage water recycling and opportunities for alternate technologies (e.g., gray water systems and cisterns for roof runoff) • Reduced stress on existing infrastructure • Provides opportunity for conservation of local surface and groundwater flows	• Long-term financial impact on local water retailers • As water use efficiency programs become more effective, the funds supporting them decline • Increased concentration of runoff due to decreased frequency of runoff • As water becomes more efficient it may cause a possible reduction of jobs	• Reduce the volume of poor quality runoff from reaching natural systems • Provide increased funding for reduced water demand government programs • Provide support to California constitutional obligations and 20% by Year 2020 compliance • Provide interregional education opportunities through signage and multi-benefit/multi-purpose demonstration projects • Supports less reliance on imported water supplies • Promote water wise methods • Less water requires less overall energy used for transportation (i.e., pumping)
Land Use and Water Planning Pillar			
• Increased short-term construction and site-specific impacts • Possible long-term construction projects to meet Low Impact	• Increased water supply • Improved water quality • Practice resource stewardship • Smart growth through higher density	• Increased short-term construction and site-specific impacts • Projects prove to be very expensive and continued	• Supports less reliance on imported water supplies. • Creates opportunity for multi-agency projects that are

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Development standards • Possible long-term construction through urban areas, which may be detrimental to surrounding businesses	development reduces the carbon footprint associated with transporting and processing water • Helps improve watershed functionality • Preserve and integrate habitat into a built environment • Enhanced habitat connectivity and quality of life • Redevelopment and retrofitting provide opportunities for habitat restoration • Sewer systems protect groundwater quality, reducing the risk of contamination associated with septic system failure • Promotes natural groundwater recharge to reduce storm flow • Improved quality of stormwater runoff • Avoid flood control infrastructure costs • Provides opportunities for public–private partnerships • Reduced cost of regulatory compliance • Integration of recycled water into new development promotes sustainable growth • Higher-density development reduces the cost of recycled water infrastructure • Sustainable development provides	maintenance could create government budget cuts elsewhere	adopted by other regions • Reduced nuisance flow from urban development into surface waters • Provides better local job to housing ratio reducing the carbon footprint associated with commuting • Encourages interregional innovative, low-impact designs and practices • Creates future ideas that prove to be more innovative energy-efficient designs

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
	market for recycled water • Provides prescriptive measures for the efficient use of water and recycled water for irrigation and other non-potables uses • More open space promotes groundwater recharge • Promotes the efficient use of water • Provide market for green products and water-saving devices		
Integrated Stormwater Management Pillar			
• Increased short-term construction and site-specific impacts • Possible damage to habitat areas used as flood zones • Loss of riparian and/or wetland acreage	• Improved flood management • Non-structural flood control channels help preserve natural habitats • Serves as a multi-purpose source for funding habitat-related projects • Prevent channel erosion • Easements provide fire breaks and emergency access • Protect lives and properties • Reduced flood insurance costs • Provide improved water quality for recreational use • Integrated flood strategies enhance the value of developed properties • Reduced risk to infrastructure from debris dams associated	• Could result in a missed allocation of funding due to infrequent flows within the regions	• Large recharge basins help reduce the heat island effect, reducing all surrounding temperatures • Increased groundwater recharge that reduces the need for more energy intensive imported water • Connects neighboring biological communities • Better understanding of risk improves overall safety for state agencies and surrounding regions • Promotes multi-agency projects which provide opportunities to expand high-quality development

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
	with entering flood control systems • Integrated flood strategies improve the quality of surface, ocean, and groundwater • Support regulatory compliance and reduce compliance cost • Provides additional conveyance opportunities • Provides facilities to recharge recycled water • High-quality stormwater dilutes the salt of recycled water and imported water recharge • Increased opportunities for groundwater recharge • Provides temporary storage for other uses • Increased available local water supply • Expanded local recharge reduces the need for irrigation		• Increased emergency flows that create inter-regional disaster planning
Natural Resources Stewardship Pillar			
• Increased short-term construction and site-specific impacts • Loss of any potential urban future development • Possible long-term construction near urban areas, which may be detrimental to surrounding businesses	• Protects natural habitats • Resource stewardship • Environmental services are an important link to public health – clean air, natural treatment of water • Improved stormwater quality • Provides additional flood control system capacity • Promotes groundwater recharge • Protects property from local flood impacts	• Loss of land use and associated inter-regional revenue	• Provides a market for recycled water, decreasing reliance on imported water supplies • Provides environmental education outreach programs with inter-regional agencies • Improved overall aesthetics of surrounding regions • Promotes inter-regional economic

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
	• Redevelopment strategy for blighted areas • Promotes consistency with general strategic plans • Provides large permeable area for storm water infiltration • Wetlands provide enhance water quality • Provides erosion control and reduce accompanying sediment load • Treatment wetlands reduce recycling costs		growth through tourism
Disadvantaged Communities and Tribal Communities Pillar			
• Increased short-term construction and site-specific impacts	• Improved efficiency of water transfers • Improved infrastructure • Reduced GHG • Maximizes water transportation strategies • Cuts down on inefficient water transfer strategies • Increased longevity of tools, machinery, and transportation vehicles • Less maintenance on transportation vehicles and pipelines • Decreased water waste • Reduced energy use • Creates more localized water availability • Cuts down overall maintenance costs • Decreased operational spending (i.e., fuel) • Decreased energy consumption	• Long-term financial impact of inter-regional water retailers and wholesalers • Retrofitting programs requires copious funding from various government entities	• Supports less reliance on imported water supplies • Minimizes emission of GHGs • Reduces overall energy costs associated with pumping/wheeling • Aids emergency flow strategies that support inter-regional disaster planning

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Disadvantaged Communities Pillar			
• Increases energy consumption associated with pumping/wheeling • Increased short-term construction and site-specific impacts	• Assurance of reliable drinking water • Contains projects that address safe drinking water and wastewater treatment needs of disadvantaged communities • Helps meet state policies intended to provide access to safe, clean, and affordable water • Collaboration and access to fund water programs • Projects to better sustain Tribal water and natural resources. • Improved esthetics of lakes and streams • Enhanced value of property • Promotes tourism	• Increase of inter-regional water usage • Increase of GHG emissions	• Creates opportunity for high-quality future development • Proposals that include the development of Tribal consultation • Develop multi-benefit projects with consideration of affected disadvantaged communities and vulnerable populations • Helps address critical water supply or water quality needs of California Native American Tribes • Increased cost associated with additional supplies/water quality
Tribal Communities Pillar			
• Increases energy consumption associated with pumping/wheeling • Increased short-term construction and site-specific impacts	• Assurance of reliable drinking water • Contains projects that address safe drinking water and wastewater treatment needs of disadvantaged communities • Helps meet state policies intended to provide access to safe, clean, and affordable water • Collaboration and access to fund water programs	• Increase of inter-regional water usage • Increase of GHG emissions	• Creates opportunity for high-quality future development • Proposals that include the development of Tribal consultation • Develop multi-benefit projects with consideration of affected disadvantaged communities and vulnerable populations • Helps address critical water supply

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
	• Projects to better sustain Tribal water and natural resources. • Improved esthetics of lakes and streams • Enhanced value of property • Promotes tourism		or water quality needs of California Native American Tribes • Increased cost associated with additional supplies/water quality
Government Partnership Pillar			
• Possible long-term operating cost • Delayed implementation of projects between regional agencies	• Creates partnership with Department of Water Resources (DWR) • Creates partnership with local agencies • Provides opportunity to create multi-agency committees • Possibility to generate more funds • Ease of access to data through government agencies • Increased effective communication throughout the watershed • Long-term implementation of IRWM plan through new relationships • Collaboration implementing plan objectives • Interim changes and formal changes to plans • Updating or amending IRWM Plans easily • Stakeholder involvement • Improved resource integration	• State/federal agency interest inconsistency • Extended delays for agreement on projects • Possible funding allocation disputes	• Facilitates development of inter-regional water management • Sustains development of inter-regional water management • Coordination with agencies surrounding the region • Reduces time between data exchange within inter-regional agencies • Ability to collaborate inter-regional goals • Development of new multipurpose rebate programs • Increase of multipurpose projects • Coordination of IRWM with state and federal agencies

Table 7.2-1. Impacts and Benefits by Pillar Focus

Within IRWM Region		Interregional	
Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Energy and Environmental Impact Response Pillar			
• Increased short-term construction and site-specific impacts • Potential long-term operating cost	• Decreases carbon footprint • Benefits to public health • Increases funding opportunities for community enhancement • Reduction of GHG emissions • Reduction of the heat island effect • Trail usage encourages non-gasoline modes of transportation • Promotes efficient energy use • Provides cheaper, natural treatment for surface water and groundwater recharge • Provides more green rebate program opportunities • Improvements to infrastructure are more energy efficient • Promotes a sense of well-being for the community • Improved surrounding habitats • Lower use of limited resources	• Increased long-term construction may have an economic impact on surrounding areas • Expensive future repair and/or retrofitting costs	• Increase of government green programs • Reduced inter expense of resources • Reduced unnecessary waste • Reduction of GHG emissions • Protects interconnecting natural forests • Maximized energy efficiency • May spur more projects/ideas of reducing carbon footprint

7.3. THE BENEFITS OF ACHIEVING INTEGRATED WATER MANAGEMENT

Implementing the OWOW Plan Update 2018 will take many forms. Clearly, the work supported by the California IRWM implementation grants will support progress towards the goals of the OWOW Plan. However, the work of all members of the watershed can help support achievement of goals and eventually the vision of a sustainable watershed. Annually there are hundreds of millions of dollars, and hundreds of millions of decisions, that help the watershed move forward. It can be the

work of a water agency to maintain groundwater levels using stormwater, or the decision of a dad to shut the faucet while brushing because his grade-schooler insisted. The challenges facing the watershed are as multiple as the solution sets proposed herein, and the path to success is one that includes many parties doing many things.

The OWOW Plan Update 2018 contains specific recommendations in support of members of disadvantaged and Tribal communities. This was the first time those two different types of communities were handled separately by the OWOW Plan, an overdue acknowledgment that the opportunities and challenges facing them are more different than similar.

For Tribal communities in the watershed, as is made clear in the Pillar section (Section 5.3), engagement in the process of water management will be one of the strongest results of implementation of this OWOW Plan. Meetings held during the production of the OWOW Plan Update 2018 were lauded by Tribal and non-Tribal participants alike and will become a model for more to come. Important partnerships exist between Tribes and water agencies in this watershed, which also will be a model for the future. Changes brought in Proposition 1 will permit Tribes to directly apply for IRWM implementation grants, and the OWOW Program will support those applications.

For overburdened communities of the watershed, the OWOW Plan Update 2018 brings forward many examples of small-scale projects that can solve discrete problems and big ideas that speak to needed broad policy changes. For instance, the Disadvantaged Communities Pillar section (Section 5.5) includes suggestions to work to minimize displacement and gentrification from water projects, to engage with ensuring the Human Right to Water, and to find and repair unsafe routes to schools.

The ongoing Disadvantaged Communities Involvement Program is gathering information from community members across the watershed, developing a Strengths and Needs Assessment. A report, called the *Community Water Ethnography of the Santa Ana River Watershed*, is planned for release in the winter of 2018–2019. This document will be a companion to the OWOW Plan Update 2018 and will support the implementation of projects and programs that reinforce strengths and overcome challenges in low-income communities in the watershed.

A focus on overcoming environmental injustices has always been a strong part of the OWOW Program, marked perhaps most significantly by the OWOW 2.0 Plan having an Environmental Justice Pillar. The Santa Ana River Watershed is heavily populated, with low-income and overburdened communities scattered throughout. Much of the regional water management work that does take place supports reliability and affordability for all communities, whether it be groundwater sustainability or flood risk management. This is not to say there remains no environmental injustices to overcome; rather, the nature of regional-scale management means that it often cannot easily differentiate between the community members it serves.

Serving members of disadvantaged communities is strongly a part of the ethic embedded in the OWOW Program. An anecdote to show this comes from a Pillar Chairs meeting, which had gathered to help develop the rating and ranking system. During that meeting, there was broad agreement when one of the chairs said "We want to put more than 10% of the implementation funds to support disadvantaged communities!" Of course, 10% is state policy, but in a watershed where about 25% of the population is low-income and overburdened, it is powerful that the decision makers recognize that doing the minimum is not sufficient.

7.4. REGULATORY ALIGNMENT

Among the subjects discussed most often around the IRWM Program is that of "regulatory alignment." Used this way, these words connote an effort asked of the regulatory agencies to ensure that their requirements on projects are not contradictory. Here, like elsewhere, this remains an important topic for future projects, particularly for the innovative and multi-benefit projects that are implemented to further the goals of the OWOW Plan Update 2018.

Fortunately, the Santa Ana River Watershed has a long legacy of collaborative relationships between regulators and regulated agencies. In the OWOW Program, federal, state, and regional regulatory bodies frequently have participating staff who help develop strategies and partnerships.

Leveraging these strong relationships will support the implementation of the sustainable, multi-benefit, and climate-adaptive projects that OWOW Plan Update 2018 calls for. Maintaining these relationships and working collaboratively towards multi-benefit solutions will be key to the success of the OWOW Plan Update 2018.

7.5. CONCLUSION

Implementation of the OWOW Plan Update 2018 will place the watershed on the path to the 2040 vision of a sustainable watershed that is droughtproof and salt balanced. Doing so will involve everyone, working together and separately, focusing sufficient support for communities without equal access and respecting community experience, autonomy, and sovereignty. The California IRWM implementation grant funding is one small piece of the overall puzzle. Those projects, once executed, will reinforce the value of our collaborative work, and provide a guiding star for our shared path forward.

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8. FINANCE

This discussion of financing alternatives for implementing the recommendations of the OWOW Plan Update 2018 draws from and builds upon a financial analysis completed by David Taussig and Associates Inc. (DTA) for the OWOW 2.0 Plan. Ensuring that sufficient resources are available for planning, implementation, operations and maintenance, and ongoing community engagement is a critical component of sustainable and integrated water resources management and watershed coordination. Regional/interagency coordination and transparency can and will improved financing and design efficiencies.

The primary objective of this chapter is to present feasible and realistic funding alternatives for regional water projects and integrated water infrastructure planning, with an emphasis on new and innovative approaches. A secondary objective of this chapter is to ensure that public financing policies are appropriately addressed, and that the integrated planning required to construct regional water and water quality improvements is adequately funded.

Specific financing objectives for the OWOW Program are as follows:

- Adequate funding and timely implementation of public facilities and programs developed through the OWOW planning process, including sufficient funding for the planning and coordination for these types of integrated projects
- Maximization of the availability of public debt financing (and the use of federal and state grants and loans) for regional infrastructure or programmatic needs and minimization of the financial burden on the individual agencies and/or property owners, through the actions of the Santa Ana Watershed Project Authority (SAWPA) or its Steering Committee
- Public financing for regional programs or infrastructure that is equitable, financially feasible, efficiently used, and consistent with each agency's goals, and that meets all relevant cost–benefit link criteria
- Public financing mechanisms that avoid creating a financial and administrative burden to the public agency and that develop cost savings through increased efficiency in the public arena

In the Santa Ana Funding Area, SAWPA administers, coordinates, and facilitates efforts to address regional water management issues. To date, these efforts have been funded primarily by the SAWPA member agencies with occasional Integrated Regional Water Management (IRWM) planning grants from the California Department of Water Resources (DWR) (including for OWOW Plan Update 2018). Particularly noteworthy is that the SAWPA member agencies together fund annual work by SAWPA staff in support of the ongoing OWOW Program. The OWOW Program provides support to SAWPA member agencies, but is much broader than that, benefitting all stakeholders that include over 97 water-related agencies, 4 counties, and 59 cities, as well as various state water, environmental, and regulatory agencies; federal agencies; other special

districts; and other groups. Ultimately, more than 6 million residents and uncounted visitors benefit from the programs and projects encouraged by the OWOW Program.

Highly respected industrywide as a leading IRWM region in California, SAWPA administers funding in each round of IRWM general obligation bond funding. The OWOW Program supported $12.0 million in funding for Round 1 implementation of 13 projects with a DWR–SAWPA contract executed in June 2012. Round 2 funding supported 18 projects with $14.5 million. Round three, called the Drought Round because of how it was repurposed by the state in support of the drought emergency, funded two projects with $12 million. The fourth round, called locally the 2015 Round, brought in $61 million in support of three projects, including the $100+ million Santa Ana River Conservation and Conjunctive Use Program (SARCCUP), the largest IRWM grant ever awarded by DWR. Below is a table sharing these data and the local match, showing that the $100 million in IRWM grants drew over $600 million in local funding, for an investment just under three-quarters of a billion dollars.

Table 8-1. Proposition 84 IRWM Funding for SAWPA

Funding Rounds	OWOW Program Projects Supported	Grant Amount	Local Match	Total Cost
Round 1	13	$12.0M	$248M	$260M
Round 2	18	$14.5M	$137.5M	$152M
Drought Round	2	$12.0M	$11M	$23M
2015 Round	3	$61.0M	$241M	$302M
Total	**36**	**$99.5M**	**$637.5M**	**$737M**

SAWPA and its regional planning efforts are critical for the future of the watershed, and the ongoing work of OWOW Program featuring a bottom-up, broad-based approach demands the time and resources coordination, support, and facilitation. To date, these efforts have been largely funded by the SAWPA member agencies and to a lesser extent state planning grants. With California's uncertain future economic climate, grant funding through water bonds is no longer a secure funding source.

SAWPA is not the only agency struggling to find a way to fund the coordination and facilitation of regional planning efforts. As part of DTA's assessment, it investigated funding sources used by other IRWM regions. DWR and others encourage an integrated approach to infrastructure planning; however, until a long-term, stable funding source is identified, it will be difficult to fully achieve the desired benefits.

The OWOW Program must review its funding options and develop plans today to ensure a long-term, stable funding source for the future. In June 2012, SAWPA completed a detailed evaluation of its funding challenges and summarized its findings in the 2012 OWOW Funding Options study, which during OWOW 2.0 Plan development was reviewed by DTA, whose financial analysis found the study to be comprehensive, creative, and reasonable in its recommendations and conclusions.

8.1. IMPLEMENTATION FUNDING OPTIONS

The OWOW Plan Update 2018 contains a wide variety of public improvements to be constructed by multiple public agencies, including water supply and water quality projects, as well as projects that address the habitat restoration, flood control, recreational, and open space needs of the watershed. This section summarizes financing methods that may provide funding beyond the California IRWM Program general obligation bond grant funding.

8.1.1. STATE AND FEDERAL FUNDING

In the past, SAWPA, its member agencies, and other local agencies in the watershed have been successful in obtaining state and federal funding to build projects. However, the primary emphasis of this facility funding section is on local funding sources.

Although state and federal grants and loans can be useful in funding one-time projects or coping with shortfalls, the consistent availability of such funding cannot be ensured and is often beyond the control of local public agencies. In addition, such grant programs typically require local matching funds, while loan programs require a local revenue source for repayment. In its financial analysis, DTA strongly recommended that public agencies continue to seek out and apply for available grants and loans. To the extent that projects can receive such funding, the need to undertake the local mechanisms cited in Section 8.1.3 is diminished.

State Funding

Proposition 1

Though Proposition 1 passed in 2014 and the funding is now rolling out, since there has not been another measure to create implementation grants through the IRWM Program. That said, the legislature and voters continue to approve new spending on water, land, and climate sustainability, which can without doubt help support implementation of the OWOW Program and the projects proposed to achieve its goals.

Prior Bond Measures

Recent successful state bond measures that funded water quality and water supply improvements include Proposition 13, Proposition 50, and Proposition 84.

Proposition 13

In March 2000, California voters approved Proposition 13 (2000 Water Bond), which authorized the State of California to sell $1.97 billion in general obligation (G.O.) bonds to support safe drinking

water, water quality, flood protection, and water reliability projects throughout the state. SAWPA successfully implemented Proposition 13 funding to construct $1 billion in infrastructure projects.

Proposition 50

Passed by voters in 2002, Proposition 50 authorized $3.44 billion in G.O. bonds to fund a variety of water projects, including the following:

- Specified CALFED Bay Delta Program projects (now administered by the Delta Stewardship Council), including urban and agricultural water use efficiency projects
- Grants and loans to reduce Colorado River water use
- Purchasing, protecting, and restoring coastal wetlands near urban areas
- Competitive grants for water management and quality improvement projects
- Development of river parkways
- Improved security for state, local, and regional water systems
- Grants for desalination and drinking water disinfection

Proposition 84

Passed by voters in 2006, the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84) authorized $5.388 billion in G.O. bonds to fund safe drinking water, water quality and supply, flood control, waterway and natural resource protection, water pollution and contamination control, state and local park improvements, public access to natural resources, and water conservation efforts.

State Revolving Funds

The State of California has established two State Revolving Funds (SRFs) that allow local agencies to have access to low-interest loans to finance projects. The Clean Water SRF is a loan program that provides low-cost financing to eligible entities within state and Tribal lands for water quality projects, including all types of nonpoint-source pollution reduction, watershed protection or restoration, and estuary management projects, as well as more traditional municipal wastewater treatment projects. The Drinking Water SRF is a loan program that provides low-cost financing to eligible entities within state and Tribal lands for public and private water system infrastructure projects needed to achieve or to maintain compliance with safe drinking water requirements and to protect public health. Small water systems, disadvantaged communities, and Tribal communities receive higher funding priority. Both SRFs are managed by the state and funded by the federal Environmental Protection Agency (EPA).

Other State Funding

Other state funding programs include the following:

- California Department of Fish and Wildlife Pacific Coast Salmon Restoration Fund (Fisheries Restoration Grant Program)

- California Coastal Conservancy Proposition 1 Funds
- California Coastal Conservancy Southern California Wetlands Recovery Project
- Community Wetland Restoration Grants
- California Wildlife Conservation Board
- California State Water Resources Control Board and Regional Water Quality Control Boards Clean Water Grant Program
- California Integrated Watershed Management Grant Program Proposition 50 Funds
- California Department of Parks and Recreation Habitat Conservation Fund
- California Department of Transportation (Caltrans) Environmental Enhancement and Mitigation Program
- University of California, San Diego, Scripps Institution of Oceanography/National Oceanic and Atmospheric Administration (NOAA) California Sea Grant College Program

Federal Funding

2013 Water Resources Development Act

On March 20, 2013, the Senate Environment and Public Works Committee unanimously approved S.601, the Water Resources Development Act of 2013. The bill provides critical flood protection for communities across the country, maintains the flow of commerce, and will create up to 500,000 new jobs. The bill seeks to get more value out of government funds for water infrastructure projects through an innovative financing pilot project program—referred to as the Water Infrastructure Finance and Innovation Act (WIFIA)—which can help our nation meet its infrastructure improvement needs. The WIFIA, based on a popular program in the transportation sector, takes the dollars appropriated to it, leverages them in the market, and takes that total available assistance and lends it from the federal government directly to a project.

Title X of the Water Resources Development Act has $250 million authorized for the WIFIA program ($50 million per year for 5 years, 2014–2018) with eligibility for both water resources projects (for example, flood control, levees, and dams) and water/wastewater infrastructure. Projects that are eligible for SRF funding are eligible for funding from this WIFIA, as are energy-efficiency upgrades, desalination, and acquisition of real property. Projects carried out by a non-public entity are eligible, provided that they have a public sponsor. There is a $20 million minimum for eligibility, and repayment of the loan must be from a dedicated revenue source.

Other Federal Options

Other federal funding programs and options include the following:

- NOAA Fisheries Restoration Center Community-Based Restoration Program
- NOAA Fisheries Restoration Center Open Rivers Initiative

- NOAA Fisheries Proactive Species of Concern Grant Program
- NOAA National Sea Grant College Program
- NOAA Coastal and Estuarine Land Conservation Program
- NOAA/U.S. Army Corps of Engineers/U.S. Fish and Wildlife Service (USFWS)/EPA/Natural Resources Conservation Service Estuary Habitat Restoration Program
- EPA Wetlands Protection Grants and Near Coastal Waters Programs
- U.S. Department of Transportation Highway Bridge Rehabilitation and Replacement Program
- USFWS National Coastal Wetlands Conservation Grant Program
- USFWS Coastal Program
- USFWS Partners for Fish and Wildlife Program
- USFWS North American Wetlands Conservation Act
- National Resource Conservation Service
- Federal Highway Administration – Road Aquatic Species Passage Funding

In 2016, the Congressional Research Service prepared a report entitled "Legislative Options for Financing Water Infrastructure" that describes several water infrastructure financing alternatives under consideration at the federal level. The following six key actions are under consideration, some of which may benefit SAWPA and other local agencies.

- Increase funding for SRF programs.
- Create WIFIA.
- Create a federal infrastructure trust fund.
- Create a national infrastructure bank.
- Lift private activity bond restrictions.
- Reinstate Build America Bonds.

Increase in Funding for SRF Programs

Typical SRF programs are funded by an initial capital injection and possibly periodic subsequent injections by the federal government and managed by individual states. Annual capital appropriations by the federal government fund the SRFs. The SRFs essentially function as banks, lending at low interest rates for specific water projects. Loan repayments are then recycled back to individual SRF programs. SRF programs are governed by eligible project rules in addition to funding management constraints. States only make loans, purchase local debt, or issue financial guarantees and are not allowed to deplete the capital of the fund. Thus, the fund operates as a revolving source of financing.

Water Infrastructure Finance Innovation Act

In 1998, Congress created the Transportation Infrastructure Finance Innovation Act (TIFIA). TIFIA provides federal credit assistance of up to one-third of project costs, with a minimum project cost-eligibility requirement of $50 million. Eligible projects must have a dedicated revenue stream (typically, tolls). TIFIA is supported by $122 million in federal money annually, administered by the U.S. Department of Transportation.

A WIFIA program would be similar to the TIFIA and would potentially be administered by the EPA. The Water Resources and Environment Subcommittee has circulated a draft WIFIA bill (H.R. 3145) and held two hearings on the topic in 2012. One of the main benefits of the proposed program would be to provide low-cost capital to infrastructure projects. Under the TIFIA program, loan repayment does not begin until 5 years after "substantial completion" of the project, with payments ending after 35 years. This structure allows projects to be built and benefits to be realized before loan repayment starts, which would be a significant benefit to water management projects if adopted as part of the WIFIA program. However, a drawback is that the program requires a revenue stream. For water infrastructure projects, this would limit eligible projects to those that collect user fees based on water use.

WIFIA is a part of the Water Resources Development Act. In a rare display of bipartisanship on major legislation, the U.S. Senate passed Senator Boxer's water resources bill on May 15, 2013. The $12.5 billion bill, which includes a long-sought authorization for levee improvements in Sacramento, drew overwhelming support from both Democrats and Republicans. The Water Resources Development Act would authorize a variety of U.S. Army Corps of Engineers projects across the country, including flood control efforts, port improvements, wetlands restoration, and coastal storm protection. The bill included language that would expedite the environmental review process that many critics say leads to unnecessary delays and added costs in such projects.

Federal Infrastructure Trust Fund

Federal trust funds currently exist to provide financing for airport and highway infrastructure but do not exist for water infrastructure. In contrast to an SRF, a federal trust fund is supported by a fixed annual revenue stream (for example, federal fuel taxes). The revenues are then collected by the federal government and earmarked for specific purposes.

National Infrastructure Bank

In general, an infrastructure bank is an entity that manages capital and provides loans for infrastructure development. Both current federal and state administrations ran on a political platform that includes increased infrastructure funding, and an infrastructure bank has been considered by Congress on several occasions. An infrastructure bank could provide funding for a range of infrastructure projects, with water projects as just a single component.

Lifting Private Activity Bond Restrictions

Private activity bonds are tax-exempt bonds that are available for privately owned water facilities that either are operated by a government unit or charge water rates that are approved by a political subdivision of a community. Most private activity bonds, including those for water furnishing and water treatment facilities, are subject to a state volume limit. Congress is considering changing requirements to allow more access to tax-exempt bonds for water infrastructure.

Reinstatement of Build America Bonds

As part of the American Recovery and Reinvestment Act, Congress created Build America Bonds to encourage job creation through infrastructure projects. These bonds could be issued for any governmental purpose for which tax-exempt governmental bonds (excluding private activity bonds) can be issued, including capital expenditures and working capital. The authority to issue Build America Bonds expired in December 2010.

8.1.2. PRIVATE NATIONAL, REGIONAL, AND LOCAL FUNDING

In addition to federal and state funding sources, there are also numerous private national, regional, and local funding sources for Southern California habitat restoration projects, such as the National Fish and Wildlife Foundation.

Proposition 218

One of the key funding considerations in this chapter is Proposition 218, which was approved by California voters in 1996. This constitutional amendment, which is also called the "Right to Vote on Taxes Act," may well be the most significant obstacle to adequate local infrastructure funding since the adoption of Proposition 13 in 1978. Proposition 218 was a successful effort by the state's voters to restrict local governments from levying any taxes, assessments, or user fees on property owners without the express consent of the voters in the community where such charges would be levied. Specifically, all general taxes (i.e., charges imposed by the government to pay for general governmental purposes) need to be approved by at least one-half of the electorate and all special taxes (i.e., charges imposed by the government to pay for specific governmental purposes) need to be approved by at least two-thirds of the electorate. All special assessments and property-related fees must be approved by at least half of the impacted property owners or, at the option of the legislative body, by at least two-thirds of the registered voters. Any fee that is property related, or that arises as a consequence of property ownership, falls under the scrutiny of Proposition 218. Furthermore, the initiative power of the electorate was confirmed by Proposition 218 to ensure that local taxes, assessments, and fees can be reduced at any time by the electorate, with the only exception being when such revenues are required to satisfy an existing contractual obligation. The only exceptions to these voter requirements are fees for sewer, water, and refuse collection. However, based on precedent set by the California Supreme Court's decision in *Bighorn–Desert View Water Agency v. Verjil*, these types of fees are subject to Proposition 218 noticing and hearing requirements.

Although the distinction between fees, taxes, and assessments may sometimes seem blurred and overlapping, the following discussion provides the general definition of the various local governments' charges. A fee is a charge imposed to recover the costs of a government service or to mitigate the impacts of the fee payer's activity on the community. User fees recover the costs of service and include, for example, utility rates (enterprise fees) and facility usage (park fees). Regulatory fees are related not only to mitigation (development impact fees (DIFs), capacity fees), but also to the recovery of costs to regulate fee payer activities (plan check fees, building permit fees).

Assessments are not taxes; instead, they are charges related to special benefits that a property or business derives from the improvements or services paid for by these charges.

The significance of Proposition 218 to the funding of the local infrastructure cannot be overstated. Most sources of local funding, with the exception of sewer, water, and refuse collection fees, are now effectively off limits without an election. The ability for general funds to pay for public infrastructure is also limited due to competition for such funds from other uses, and the requirement that any additional bond funds must be approved by two-thirds of the electorate. Unless the electorate or the property owners in an area vote in favor of a general tax, special tax, assessment, or fee, none of these funding sources can be implemented.

Salinas Decision

The far-reaching impacts of Proposition 218 are probably most clearly evidenced by the case of the *Howard Jarvis Taxpayers Association v. City of Salinas*. In that case, the City of Salinas went to great efforts to design a stormwater management utility fee that it thought was not property related, to avoid the necessity of holding an election. The proposed fee was not put to a vote of the property owners or the registered voters, but instead was enacted by the City Council through the adoption of two ordinances. The first ordinance imposed a stormwater management utility fee within the City, while the second established fee levels. Fee levels were assigned to assessor's parcels according to the land use types located on each parcel, with the fees themselves based on the relative amounts of impervious area typically associated with each land use type. To avoid the fee's being considered property related, the City exempted undeveloped parcels and those developed parcels that were not expected to access the City's storm management system. The Howard Jarvis Taxpayers Association challenged the fee, and the Trial Court ruled in favor of the City because it concluded that (1) the fee was not property related and (2) the fee was exempt from the voter requirement as a result of the sewer and water fee exemptions under Proposition 218.

In June 2002 the Court of Appeal, Sixth District, California reversed the Trial Court finding, deciding that a fee to manage stormwater flowing from parcels was in fact property related. In 2014, Assembly Bill 2403 (Rendon) was approved by the Governor, which revised language within Proposition 218 partially in response to the findings of the Court of Appeal. The changes, described broadly, revised the meaning of *water system* and *sewer system* under the law, allowing storm

sewer systems to be considered water systems, and therefore held to the less stringent standards within Proposition 218.

Santa Clara County Decision

On July 14, 2008, the Supreme Court of California decided two key points relating to Proposition 218 in the case of *Silicon Valley Taxpayers Association v. Santa Clara County Open Space Authority*. First, the California Supreme Court held that legal challenges to special assessments are subject to independent judicial review, reversing a number of pre-Proposition 218 cases that gave more deference to the public agency that established the Assessment District (AD). Second, the California Supreme Court held that the assessments in the Santa Clara case did not meet the substantive requirements of Proposition 218 because the Santa Clara County Open Space Authority did not demonstrate the special benefit to the assessed property and the amounts assessed were not proportional to the benefit received by each parcel.

In 2001, the Santa Clara County Open Space Authority conducted proceedings to establish a countywide AD to acquire, improve, and maintain regional open space. As a part of the proceedings, an Engineer's Report was prepared and a ballot protest procedure was conducted. The Engineer's Report claimed that all property within the district received special benefit from the proposed land acquisitions and set the assessment at $20 per single-family parcel (and provided a formula to determine the rates for other types of property). However, the land proposed for acquisition was not identified. Following a mailed ballot procedure, the assessment passed by more than 50% of the ballots returned (weighted by level of assessment). The assessments were later challenged on the basis that the Santa Clara County Open Space Authority failed to satisfy the special benefit and proportionality requirements of Proposition 218.

Although this case involves an open space assessment and many of the court's comments are related to assessments rather than fees, this case needs to be carefully reviewed and considered for its implications for any proposed assessment or property-related fee. In its decision, the California Supreme Court stated that Proposition 218 requires courts to make an independent review of local agency decisions regarding assessments and property-related fees and charges. In addition, while property-related fees do not have the same special benefit restrictions (see Section III.C.3 of Proposition 218 for further discussion) that apply to assessments, Proposition 218 states that a fee or charge imposed upon any parcel or person as an incident of property ownership shall not exceed the proportional cost of the service attributable to that parcel. The State Supreme Court found that the Santa Clara County Open Space Authority failed to meet the proportionality tests because the Engineer's Report did not (1) identify the improvements to be funded, (2) estimate the cost of such improvements, or (3) connect the proportionate costs of the benefits received from the public improvements to the assessed parcels.

Subsequent to the Santa Clara County decision, there have been additional court cases that have continued to scrutinize assessments as they pertain to the requirements of Proposition 218.

Summary of Proposition 218 Cost–Benefit Link Requirements

Under Proposition 218, a fee or a charge shall not be imposed unless it meets all of the following requirements (Proposition 218, Section 5b):

(1) Revenues derived from the fee or charge shall not exceed the funds required to provide the property related service.

(2) Revenues derived from the fee or charge shall not be used for any purpose other than that for which the fee or charge was imposed.

(3) The amount of a fee or charge imposed upon any parcel or person as an incident of property ownership shall not exceed the proportional cost of the service attributable to the parcel.

(4) No fee or charge may be imposed for a service unless that service is actually used by, or immediately available to, the owner of the property in question. Fees or charges based on potential or future use of a service are not permitted. Standby charges, whether characterized as charges or assessments, shall be classified as assessments and shall not be imposed without compliance with Section 4.

(5) No fee or charge may be imposed for general governmental services including, but not limited to, police, fire, ambulance or library services where the service is available to the public at large in substantially the same manner as it is to property owners.

8.1.3. LOCAL REVENUE SOURCES

This section contains brief summaries of several mechanisms that may provide funding for local agencies. The findings in these sections are based on a review of relevant literature and DTA's infrastructure public financing experience.

This section is focused on possible local revenue sources. Federal and state funding are discussed in earlier sections and can be very useful in funding one-time projects or coping with shortfalls, but consistent availability of such funding cannot be ensured and is often beyond the control of local public agencies. In addition, federal and state programs often involve loans that require some type of collateral and a local stream of revenue to repay them. Local agencies should search and apply for any available grants and loans; if projects are able to receive such funding, this will diminish the need to undertake the local mechanisms cited below. This section summarizes financing mechanisms that may be used by local agencies in place of general fund revenues.

Longevity and Certainty of Funding

In an effort to clarify the DWR requirement for an explanation of the certainty and longevity of known or potential funding for an IRWM Plan and projects that implement the plan, DTA contacted

DWR IRWM Grants and Funding Branch. The director explained DWR's perspective in great detail. While a matrix showing the specific funding sources and their certainty and longevity is appropriate for individual projects when such information is available, a more qualitative approach is acceptable when identifying potential funding mechanisms.

An analysis of the certainty and longevity of known or potential funding sources is most appropriately addressed when looking at specific infrastructure projects. For example, the IRWM projects that were submitted to SAWPA as part of the OWOW 2.0 Plan process were ranked, and in general the higher-ranking projects have a greater certainty or probability of being financed than the lower-ranked submittals.

In addition, those financing mechanisms that have been approved and are included in current federal, state, or local budgets have a greater level of certainty than those that require future voter or legislative approvals.

The longevity of a funding source is customarily stated in the law creating or approving the mechanism. For example, many bonds are issued for 30-year terms, while certain tax measures may sunset after 5 or 10 years. In addition, pay-as-you-go programs may not generate sufficient revenues up front, and may require interim revenue sources to build facilities in a timely manner. Therefore, it is important to match the time constraints of various funding programs to specific projects to ensure project completion.

In addition to funding for new infrastructure projects, local agencies are also concerned about funding the ongoing operations and maintenance of such facilities. Therefore, as a part of the discussion of local funding options in the sections below, we have indicated where such funds can also be used to pay for ongoing operations and maintenance.

The local financing methodologies described below have been grouped into (1) traditional, customarily used approaches and (2) new, creative, and innovative financing structures.

Traditional Public Finance Measures

Sales Tax Measure

A sales tax is a funding option that places a consumption tax on certain goods and services. Most sales taxes are collected by the seller, who pays the tax to the public entity that is charging the tax. Under state law, a local agency may only increase the sales tax within its jurisdiction in increments of 0.125%. According to Section 7251.1 of California Transactions and Use Tax Law, the combined rate of all sales taxes imposed shall not exceed 200 basis points above the base tax rate for the state.

Sales tax revenues may be used to fund any facilities or services specified in the ballot materials. Therefore, this type of funding could be used to fund a broad array of capital, operations and maintenance (O&M), and planning costs. The legislative body of a local government or district

must place the sales tax increase on a special, primary, or general election ballot. As a special purpose tax, it would require a two-thirds majority vote. To be successful, a local agency would need to make an effective public outreach effort to demonstrate to voters the benefits to that will be achieved through this additional tax.

Stormwater Utility Fee

A municipal stormwater utility fee can be adopted under California Health and Safety Code Section 5471 ("Section 5471"). Section 5471 allows certain public agencies to collect fees or charges from property owners (including standby charges from owners of undeveloped properties) to pay for capital improvements and O&M for their storm drainage, water, and sewer systems. The public agencies authorized to levy these charges include counties, cities, sanitary districts, sewer maintenance districts, and other districts authorized to acquire, construct, maintain, and operate sanitary sewers and sewer systems.

Revenues from the fees levied under Section 5471 can be used for the acquisition, construction, reconstruction, maintenance, and operation of storm drainage, water, and sewer systems, as well as the repayment of principal and interest on bonds issued for the construction or reconstruction of these storm drainage, water, and sewer systems.

As a parcel-related fee, a stormwater utility fee must be calculated according to Proposition 218, Section III.C.3, guidelines.

Water, Sewer, Trash Fees

While Proposition 218 does not require voter approval for sewer, water, and refuse collection user fees, it does require a clear link between costs and benefits, as well as a clear separation between existing development and future development. Therefore, to implement fees of this nature, a link must be demonstrated between the public facilities and services being funded and the demand of a household or business for water, sewer, and refuse collection services. Because most local utilities already charge these types of fees to pay for their costs of service, rates would need to be increased to cover the cost of additional public facilities.

The exemptions for water, sewer, and refuse collection user fees from the restrictions of Proposition 218 apply only to the voter approval requirements. As parcel-related fees, these user fees must still be calculated according to Proposition 218 guidelines for fees, as previously discussed. Written notice must still be provided to property owners of record. Also, the proposed fees are subject to a public hearing prior to receiving legislative approval. The submittal of written protests prior to the public hearing by a majority of the property owners impacted by a user fee is sufficient to prevent the imposition of that fee. However, it is DTA's experience that the protest provision has little impact on a large-scale financing program (e.g., an entire city or water district) because it is so difficult to contact at least 50% of a large area's property owners and persuade them to mail in their protest ballots. The only exception to this rule is when a few landowners own 50% of the acreage.

Public Enterprise Revenue Bonds

Public enterprise revenue bonds are debt instruments payable from a special fund—a limited-source pledge that secures debt service payments of the bonds. As such, these bonds usually finance facilities related to a revenue-generating enterprise and are payable from the revenues of that enterprise. There are a number of state statutes authorizing the issuance of revenue bonds. The most commonly used statute is the Revenue Bond Law of 1941.

The Revenue Bond Law of 1941 allows cities, counties, and certain special districts to issue revenue bonds to finance, among other things, water and sewer collection, supply, and treatment facilities. The law requires a majority vote to authorize the size and purpose of the bond issue. Because these bonds are secured by a pledge of revenues and not an agency's general fund, they typically carry a higher interest rate than G.O. bonds, but a lower rate than the land-secured bonds (Community Facilities District (CFD) or AD). In addition, there is usually a requirement that revenues generated from an enterprise exceed debt service on bonds by 25%. This coverage protects the bond holders from minor delinquencies and defaults that may occur.

Development Impact Fees

DIFs are monetary exactions (other than taxes or special assessments) that are charged by local agencies in conjunction with approval of a development project and are usually collected when building permits or occupancy permits are issued. DIFs are levied for the purpose of defraying all or a portion of the costs of any public facility, improvement, or amenity that benefits the development required to pay the fee. However, DIFs cannot be used to pay for public services. Most cities and counties currently impose DIFs for a broad range of public facilities.

Assembly Bill 1600, which promulgated Section 66000 and other sections of the California Government Code, was enacted by the State of California in 1987 to regulate the imposition of DIFs within the state. Assembly Bill 1600 requires that all public agencies satisfy a number of requirements when establishing, increasing, or imposing a fee as a condition of approval for a development project. These requirements include identifying the facilities to which the collected fee would be applied and determining that there is a reasonable relationship between the facilities to be financed, the benefit received by the development paying the fees, and the amount of the fees being imposed. Water and sewer agencies can impose connection fees or capacity charges, which are similar to DIFs, as specified in California Government Code Section 66013.

While DIFs and connection fees cannot typically be used to provide security for bonds or other debt instruments (i.e., leveraged), they can be used in conjunction with debt financing to help retire bonds secured by other means (e.g., a CFD or AD). Development fees can also be used to generate reimbursement revenues to property owners or public agencies that have previously paid more than their fair share of public improvement costs. To the extent that regional water improvements are required for future development, DIFs could be used to cover these costs for such

development. However, DIFs cannot finance any improvements required by existing development, nor can they fund O&M costs for either new or existing development.

General Obligation Bonds

The issuance of G.O. bonds by a public agency issuer represents a pledge on the issuer's part to levy a uniform ad valorem property tax (i.e., a tax based on the assessed value of the property) on all taxable properties within the issuer's jurisdiction in order to annually repay principal and interest due. The bonds are a general obligation of the issuer; that is, bondholders have recourse to the "full faith and credit" of the issuer (i.e., unlimited property taxation) to ensure that annual debt service requirements are met. G.O. bonds may be used to acquire, construct, and improve real property. However, they may not be used to purchase furniture or equipment, or to pay for O&M.

Prior to 1978, G.O. bonds were by far the most popular vehicle for debt financing of infrastructure and public facilities in California. The approval of state Proposition 13 in 1978 quickly brought that era to a close. It was not until 1986, with the passage of state Proposition 46, that a resurgence in G.O. bond authorization was seen. Proposition 46 reinstated the ability of local public agencies to incur new bonded indebtedness and secure it through the imposition of an ad valorem property tax. Consistent with Proposition 13, however, it was required that two-thirds of the registered voters in the affected territory approve any such measure. In some cases, particularly with certain types of water districts, Improvement Districts may be established that limit the tax levying capability of the issuer and the election regarding the bond issuances to only those properties located within the Improvement District.

Because G.O. bonds are one of the most secure debt financing instruments available to local public agencies, they generally carry lower interest rates than the other local financing mechanisms being reviewed in this chapter. In addition, the dispersion of debt service costs throughout a jurisdiction helps minimize the taxes to each property owner, as opposed to levying a tax on a special district consisting of a much smaller area. However, the requirement of a two-thirds approval by voters throughout the issuer's jurisdiction makes it difficult to obtain authorization to sell G.O. bonds.

Special Assessment Districts

There are a number of types of ADs that can be used to fund water supply improvements and maintenance services. Public works improvements are eligible for AD financing to the extent that properties within the AD receive a special, measurable, local, and direct benefit from such improvements. Traditionally, improvements to be financed using an AD under the Municipal Improvement Act of 1913 and the Improvement Bond Act of 1915 include, but are not limited to, streets and roads; water, sewer, and flood control facilities; utility lines; and landscaping. Other types of public improvements that have a regional significance (for example, major roads, bridges, flood control facilities) are only partially eligible, based on the proportion of benefit from the improvements that can be assigned to parcels within the AD. Traditionally, items of general benefit

to a community, such as schools, fire stations, and parks, have not been eligible for AD financing. An AD can also provide funding to operate and maintain improvements financed by the AD itself.

The Benefit Assessment Act of 1982 provides more flexibility in providing public services because road, drainage, flood control, and street lighting maintenance services can be funded under this act, whether not the improvements themselves are funded through the AD. ADs are subject to specific benefit requirements as a result of both their enabling legislation and Proposition 218. As previously discussed, under their enabling legislation, public works improvements and services are eligible for AD financing to the extent that properties within the AD receive a special, measurable, local, and direct benefit from such improvements and services. Proposition 218, Section 4, further emphasized this benefit requirement by requiring that:

> An agency which proposes to levy an assessment shall identify all parcels which will have a special benefit conferred upon them and upon which an assessment will be imposed. The proportionate special benefit derived by each identified parcel shall be determined in relationship to the entirety of the capital cost of a public improvement or for the cost of the property related service being provided. No assessment shall be imposed on any parcel which exceeds the reasonable cost of the proportional special benefit conferred on that parcel. Only special benefits are assessable, and an agency must separate the general benefits from the special benefits conferred on a parcel. Parcels within a district that are owned or used by any agency, the State of California or the United States shall not be exempt from assessment unless the agency can demonstrate by clear and convincing evidence that such publicly owned parcels in fact receive no special benefit.

Proposition 218 defines "special benefit" as "a particular and distinct benefit over and above general benefits conferred on real property located in the district or to the public at large. General enhancement of property value does not constitute special benefit." It also places the burden of proof on the public agency in any legal action challenging the validity of an assessment:

> In any legal action contesting the validity of any assessment, the burden shall be on the agency to demonstrate that the property or properties in question receive a special benefit over and above the benefits conferred on the public at large and that the amount of any contested assessment is proportional to, and no greater than, the benefits conferred on the property or properties in question.

Recent court cases discussed in Section 8.1.2 reinforce the special benefit requirements of Proposition 218, making an AD less attractive for funding regional water supply and water quality improvements than many other funding mechanisms.

Mello-Roos Community Facilities District

A CFD is a funding option that can be used to pay for public infrastructure and services for future development. While a two-thirds vote of the qualified electors is required to establish a CFD, the boundaries of a potential CFD could be set so that fewer than 12 registered voters initially reside within the CFD. In this case, the "qualified electors" would be the property owners (not the registered voters), and if a property owner were conditioned to form or annex to a CFD in order to develop his or her property, he or she would need to agree to include his property in the CFD. While this type of financing would not generate funds to pay for public infrastructure and services for existing development, it could cover a substantial portion of the cost of such facilities and services related to future development and redevelopment.

The Mello-Roos Community Facilities Act (Mello-Roos) was enacted by the California State Legislature in 1982 (California Government Code, Section 53311 et seq.) to provide an alternate means of financing public infrastructure and services subsequent to the passage of Proposition 13 in 1978. Mello-Roos complies with Proposition 13, which permits cities, counties, and special districts to create defined areas within their jurisdiction and, by a two-thirds vote within the defined area, impose special taxes to pay for the public improvements and services needed to serve that area. Mello-Roos defines the area subject to a special tax as a CFD. If fewer than 12 registered voters reside within a proposed CFD, the property owners within the CFD are defined as the qualified electors. Therefore, if new development and significant redevelopment are required to join a CFD in order to gain entitlements, pull building permits, or record a final map or parcel map, the cooperation of a property owner who wishes to develop a parcel can be ensured. Mello-Roos provides a simple and inexpensive annexation process whereby vacant parcels can annex to a CFD on a parcel-by-parcel basis as they become developed.

A CFD may provide for the purchase, construction, expansion, or rehabilitation of any real or other tangible property (including land) with an estimated useful life of at least 5 years. It may also finance the costs of planning, design, engineering, and consultants involved in the construction of improvements or formation of the CFD. The facilities or real property financed by the CFD do not have to be physically located within the CFD. Any facilities that will be publicly owned and will have a useful life of 5 years or more would qualify for this financing.

Further, a CFD may also pay for certain types of public services, including police, fire, and ambulance services; landscape and park maintenance; street and road maintenance; flood and storm protection services; library and recreational services; and school facilities maintenance. However, a CFD may only finance these services to the extent that they are in addition to those provided within the area of the CFD before the CFD was created and may not supplant services already available within that area.

Formation of a CFD authorizes the public agency establishing the CFD to levy a special tax on all taxable property within the CFD, as defined in the formation documents. Property owned or

irrevocably offered to a public agency may be exempted from the special tax. Mello-Roos special taxes are collected at the same time and in the same manner as regular property taxes, unless otherwise specified by the agency. Special tax revenues may be used to pay the debt service on bonds that have been sold to fund the construction or acquisition of public capital facilities, or to pay directly for facilities or public services.

Certificates of Participation and Lease Revenue Bonds

Two long-term funding alternatives that could potentially be used to fund regional water supply and water quality improvements are Certificates of Participation (COPs) and Lease-Revenue Bonds (LRBs). These funding mechanisms provide long-term financing for public improvements via a lease or installment sales structure, as opposed to requiring debt service payments. By establishing a lease obligation, COPs and LRBs avoid being designated as debt, and therefore avoid the election requirement (and the two-thirds vote requirement) mandated by Proposition 13 for all bond sales. Because no voter election is required to sell these instruments, a county board of supervisors or a city council could approve a bond sale with a simple majority vote of the legislative body.

In brief, the principal parties to COP or LRB financing include a public agency, a nonprofit corporation, and a trustee. The nonprofit corporation may be formed specifically to construct and own the necessary improvements, the funds for which are generated from the proceeds of the COP or LRB sale. The nonprofit corporation may also be an existing agency, such as a joint powers authority or an economic development corporation. However, the actual responsibilities for managing the construction are generally delegated to the public agency. The nonprofit corporation then leases or sells the land and facilities back to the public agency in return for lease or installment sales payments.

The investors who purchase the COPs or LRBs receive a specified portion of the public agency's payments to cover the principal and interest due on their COPs. The COPs or LRBs are secured by the public agency's pledge to make payments to cover its lease or installment sales payments, although there is no requirement that the public agency commit its general fund to making these payments. The trustee is responsible for accepting these payments and then disbursing them to the COP or LRB holders.

There are two major problems associated with COPs and LRBs. First, these instruments can only be used to fund public improvements, not O&M costs. Second, and more significantly, a source of revenues is required to repay the COPs and LRBs, so these mechanisms could not be used without monies being generated by some other source. COPs are generally secured by the covenant of the public agency to make annual appropriations in an amount sufficient to service the COPs. The appropriations may come from the public agency general fund or from a designated special fund, such as the enterprise fund user fees or a CFD. Due to Gann Amendment limitations on general fund spending, the use of general fund monies to make payments on COPs or LRBs would be detrimental to other recipients of general fund monies.

However, to the extent that one or a combination of the available funding mechanisms provide a reliable and secure ongoing revenue stream, a public agency can issue COPs or LRBs that are not financially dependent on its general fund.

Sewer and water improvements, parking facilities, and other revenue-generating public uses can be financed with LRBs. Debt service on these LRBs may be paid through monthly utility bills, parking fees, and other revenues. LRBs are not sold until sufficient revenues are available to provide a level of debt service coverage that is acceptable to the municipal bond market. Because water rates are already used to fund the ongoing cost of providing water, financing new water facilities through the use of public enterprise LRBs will often require an increase in water rates.

Traditional Finance Measures Summary

Table 8.1-1 compares the advantages and disadvantages of the financing mechanisms discussed in this section.

Table 8.1-1. Traditional Finance Measures

Financing Mechanism	Advantages	Disadvantages
Sales Tax Measure	• Can provide a fairly consistent source of funding • Can fund any facilities or services specified in ballot materials	• Requires a 2/3 vote; can be regressive in nature when calculated as a function of income
Stormwater Utility Fee	• Can apply to every parcel in the area adopting the fee • Can pay O&M or capital costs • Can be implemented on municipality, watershed, or watershed management area basis	• Will require property owner or registered voter election
Water, Sewer, and Trash Fees	• No election requirement under Proposition 218; but ballot protest process is recommended • No legal constraints on raising funds other than cost-benefit link • Can pay O&M or capital costs	• Public agencies can only control rates charged to users through negotiation with private entities
Public Enterprise Revenue Bonds	• Customarily finance water and sewer systems • Lower interest rate than land-secured bonds	• Requires stable revenue stream that exceeds debt service by 25%
Development Impact Fees	• No voter approval required • Can be used to reimburse public agencies and developers for over sizing capital improvements	• Can only pay for capital improvements needed for new development

Table 8.1-1. Traditional Finance Measures

Financing Mechanism	Advantages	Disadvantages
General Obligation Bonds	• Carry lower interest rates than the other local financing alternatives • Greater dispersion of debt service costs throughout a jurisdiction helps minimize the taxes to each property owner, as opposed to levying a tax on a special district consisting of a much smaller area	
Special Assessment Districts	• Spreads costs equitably • Can finance certain facility and O&M costs	• Public agencies can only control rates charged to users through negotiation with private entities
Mello-Roos CFD	• Can pay O&M or capital costs • Can pay capital costs anywhere within the jurisdiction forming the CFD	• Requires 2/3 vote of qualified electors so would probably only apply to new development and redevelopment • Can only be used to fund increased services (not existing services) that benefit the parcels within the CFD
Certificates of Participation and Lease Revenue Bonds	• Can be adopted by legislative body; no voter approval required • Can be used to pay for capital improvements	• Need to find source of reliable revenues to pay interest and principal; interest rates charged tend to be higher if repayment revenues are not predictable • Statutory and constitutional limitations on the size of municipal debt may apply

O&M = operations and maintenance; CFD = Community Facilities District.

Creative Funding Mechanisms

Local Infrastructure Bank

In general, an infrastructure bank is an entity that manages capital and provides loans for infrastructure development. Similar to a state or federal infrastructure bank, a local infrastructure bank run by SAWPA could potentially provide funding for a range of water supply and water quality projects. In theory, SAWPA member agencies and other stakeholders could invest funds in a pool managed by SAWPA. SAWPA could then loan these funds back to certain local agencies to fund regional infrastructure. Further investigation of this option is needed.

Water–Energy Link

Since the California Energy Commission issued its landmark finding in 2005—that water-related energy uses account for about 19% of all electricity and 30% of non-power-plant natural gas used within the state—California's water and energy sectors have been collaborating on strategies for achieving the incremental resource, economic, and environmental benefits that can be found at the intersection of water, energy, and climate. In 2006, a multi-agency Water–Energy Team was established to assist the Governor's Climate Action Team in identifying and promulgating statewide strategies for reducing water--sector greenhouse gases. About the same time, the California Energy Commission commenced development of its first water–energy research program. The California Public Utilities Commission conducted workshops to explore whether and how the water–energy link should be included in the state's regulated energy programs. Concurrently, the DWR commenced investigations as to how the linkages among water, energy, and climate should be included in the state's water planning processes. In addition, the federal EPA has a Sustainable Infrastructure Program that is intended to help water and wastewater utilities conserve water, be more energy efficient, and adapt to the impacts of climate change.

The water sector has unique capabilities for substantially changing the amount, time, and place of its consumption of electricity. Because energy is the single largest ongoing expense for water system operations and maintenance, if energy usage is made more efficient, water agencies will see significant savings. These savings will free up money that can be used for water supply and water quality improvements.

Public–Private Partnerships

A Public–Private Partnership (PPP) customarily involves a contract between a public sector organization and a private party, in which the private party provides a public service or project and assumes substantial financial, technical, and operational risk on the project. In some types of PPP, the cost of using the service is borne exclusively by the users of the service and not by the taxpayer. In other types (in particular, privately financed initiatives), capital investment is made by the private sector on the basis of a contract with government to provide agreed-on services and the cost of providing the service is borne wholly or in part by the government. Government contributions to a PPP may also be in kind (notably, the transfer of existing assets). In projects that are aimed at creating public improvements, like projects in the infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, to make the project more attractive to the private investors. In other cases, the government may support the project by providing revenue subsidies, including tax breaks, or by removing guaranteed annual revenues for a fixed period.

Typically, a public-sector consortium forms a special company, called a special-purpose vehicle, to develop, build, maintain, and operate the asset for the contracted period. In cases where the government has invested in the project, it is typically (but not always) allotted an equity share in the special-purpose vehicle. It is the special-purpose vehicle that signs the contract with the

government and with subcontractors to build the facility and then maintain it. In the infrastructure sector, complex arrangements and contracts that guarantee and secure the cash flows make PPP projects prime candidates for project financing.

Government Legislation

California Government Code, Section 5956 et seq., allows local governmental agencies (including cities, counties, and special districts) to use design-build to construct "fee producing infrastructure facilities." The legislation expressly allows facilities that provide water supply, treatment, and distribution. This authority is limited to privatization transactions where the private entity will operate and maintain the facility.

Crowdfunding

Crowdfunding, also referred to as crowd financing or crowd-sourced capital, is the practice of developing an online group-based investment campaign to generate financing for a specific project. This practice leverages dedicated internet fundraising websites to spur community support and financing for an assortment of ventures, including architectural, through numerous small-dollar investors. The campaign owner is provided the opportunity to petition a wide variety of potential investors as opposed to solely relying on angel investors or venture capitalists. The investing public is protected from outsized losses through the nature of the small dollar contributions, with the risk spread across a larger population.

Crowdfunding refers to any kind of capital formation where both funding needs and funding purposes are communicated broadly via an open call in a forum where the call can be evaluated by a large group of individuals, the "crowd." The outreach is referred to as a *crowdfunding campaign* and the person or company in charge of the campaign is referred to as the *campaign owner*.

Donation-Based Crowdfunding

The type of crowdfunding that comes closest to our traditional understanding of online fundraising is donation-based crowdfunding. With this model, tangible returns are not the reason for individual contributions; therefore, the success of the campaign is solely determined by the crowd's identification with or emotional attachment to the campaign's cause. A common example is a community project that would otherwise require municipal or other government funding. In a report released in May 2012, Massolution's Crowdfunding Industry Report estimated the aggregate crowdfunding volume throughout 2011 was close to $1.5 billion, of which almost half was raised via donation-based crowdfunding as described above. The main benefit of donation-based crowdfunding is that the campaign owner does not need to compensate the crowd once the funding is secured. The challenge, however, is that the crowd needs to identify or have an emotional connection with the campaign cause itself. Donation-based crowdfunding is ideal for projects that do not have something tangible to offer in return for the funds raised. In order to activate the accessible crowd it is important to communicate why no other means of funding is

available. On top of that, the project itself needs to appeal through either identification or emotion in order to get individuals to contribute but also to get them to spread the word of the project to likeminded crowdfunders. In a crowdfunding ecosystem it is crucial to make the purpose of the call for capital as clear as possible, because raising funds for vague purposes can make it difficult for the individual crowdfunders to truly identify with the campaign. Donation-based crowdfunding is therefore the model that will require the most carefully thought-out communication strategy, and the most persistent communication effort.

Although donations are granted due to either identification or an emotional attachment to the project's cause and/or urgency, rewards have to be interesting in themselves. This means the campaign has to offer a set of rewards that are economically sound or in some way relevant to the campaign.

Recreational walking/biking trails along river trails (which actually are stormwater flood control channels) are potential candidates for crowdfunding. Think of the signs along freeways acknowledging contributions for maintenance—SAWPA may use a similar sign-based program to reward donors with advertising. This concept appears to work best in funding operations and maintenance.

The concept may also be applied to infrastructure funding. The most familiar application is schools and universities establishing building-fund campaigns for new sports facilities. Religious organizations often have campaigns to raise funding to build new churches or repair old ones. However, public appetite for funding water infrastructure through crowdsourcing may be limited.

Energy Service Company and Energy Saving Performance Contract

An energy service company (ESCO) is a business that develops, installs, and arranges financing for projects designed to improve the energy efficiency and maintenance costs for facilities over a 7- to 20-year period. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Typically, they offer the following services:

- Developing, designing, and arranging financing for energy efficiency projects
- Installing and maintaining the energy-efficient equipment involved
- Measuring, monitoring, and verifying the project's energy savings
- Assuming the risk that the project will save the amount of energy guaranteed

These services are bundled into the project's cost and are repaid through the dollar savings generated.

What sets ESCOs apart from other firms that offer energy efficiency, like consulting firms and equipment contractors, is the concept of performance-based contracting. When an ESCO undertakes a project, the company's compensation, and often the project's financing, is directly linked to the amount of energy that is actually saved.

Typically, the comprehensive energy efficiency retrofits inherent in ESCO projects require a large initial capital investment and offer a relatively long payback period. The customer's debt payments are tied to the energy savings offered under the project: the customer pays for the capital improvement with the money that comes out of the difference between pre-installation and post-installation energy use and other costs. For this reason, ESCOs have led the effort to verify, rather than estimate, energy savings. One of the most accurate means of measurement is the relatively new practice of metering, which is direct tracking of energy savings according to sanctioned engineering protocols.

Most performance-based energy efficiency projects include the maintenance of all or some portion of the new high-energy equipment over the life of the contract. The cost of this ongoing maintenance is folded into the overall cost of the project. Therefore, during the life of the contract, the customer receives the benefit of reduced maintenance costs, in addition to reduced energy costs. As an additional service in most contracts, the ESCO provides any specialized training needed so that the customer's maintenance staff can take over at the end of the contract period.

Energy-saving performance contracts (ESPCs) (also known as energy performance contracts), are an alternative financing mechanism authorized by the U.S. Congress designed to accelerate investment in cost-effective energy conservation measures in existing federal buildings.

ESPCs allow federal agencies to accomplish energy-saving projects without up-front capital costs and without special congressional appropriations. The Energy Policy Act of 1992 authorized federal agencies to use private-sector financing to implement energy conservation methods and energy efficiency technologies. An ESPC is a partnership between a federal agency and an ESCO. The ESCO conducts a comprehensive energy audit for the federal facility and identifies improvements to save energy. In consultation with the federal agency, the ESCO designs and constructs a project that meets the agency's needs and arranges the necessary financing. The ESCO guarantees that the improvements will generate energy cost savings sufficient to pay for the project over the term of the contract. After the contract ends, all additional cost savings accrue to the agency.

The savings must be guaranteed and the federal agencies may enter into a multiyear contract for a period not to exceed 25 years. ESPCs are regulations created by the Federal Energy Management Program of the U.S. Department of Energy as required by the Energy Policy Act of 1992. The final U.S. Department of Energy ruling came into effect on May 10, 1995. The use of ESPCs by federal agencies was reauthorized in the Energy Policy Act of 2005 through the end of Fiscal Year 2016 and permanently reauthorized in the Energy Independence and Security Act of 2007.

Regional General Obligation Bond

With a traditional G.O. bond, as discussed previously, bonds are issued by a public agency, based on a pledge of the property taxes for all (or a portion) of the properties within the issuer's jurisdiction This would avoid the time-consuming and expensive federal and state

processes to compete for funds. A regional G.O. bond program would be administered locally for greater local control and would require regional partners to work together closely in developing regional solutions.

It is unclear whether a regional G.O. bond could be implemented without modifications to the existing enabling legislation. In addition, there would be many challenges for such a program, including defining boundaries and achieving the two-thirds vote necessary to establish such a program.

8.1.4. CONCLUSIONS

As stated in the introduction to Section 8.1, SAWPA engaged DTA to investigate financing alternatives for public facilities and regional planning. In addition to its many years of success regarding all facets of financing public infrastructure, DTA has furthered its expertise by recently working with other significant public agencies, including the DWR, to research current state-of-the-art financing methodologies.

The following are DTA's general observations, recommendations, and conclusions regarding this review of financing methodologies for SAWPA:

- Throughout this assignment, DTA conducted many interviews with recognized leading public finance experts and reviewed the body of current, available industry documents and communications. DTA's research showed that the OWOW Program is universally regarded as one of the most highly regarded IRWMs in California. SAWPA has outstanding leadership, is staffed by practitioners who are recognized industry-wide for their expertise in their assigned specialties, and most noteworthy, SAWPA has a dynamic organizational structure that is focused on continual improvement, flexibility, and creativity in seeking solutions to both SAWPA's and the water industry's challenges.
- This document presents feasible and realistic funding alternatives for regional water projects and integrated water infrastructure planning, highlighting innovative new approaches and the effect of current public financing policies, and summarizing industry "best practices" to fund the integrated planning required to construct regional water and water quality improvements.
- There exists a structural incongruity between current legislation, watersheds, and the systemic structure in which watersheds are managed. Watersheds are rarely, if ever, regulated by, served by, or under the responsibility of a single governmental entity. Literally dependent on the lay of the land, the topography of a broad region determines a watershed's boundaries. In most cases, watersheds span multiple counties. Current legislation does not provide a means of assigning the functional and financial responsibility for managing this valuable natural resource as a complete integrated system. This piecemeal management system engenders philosophical conflicts and inconsistent management protocols and is inherently inefficient.

- Even though a few progressive and thoughtful ad hoc cooperative alliances exist between some counties, regional governmental entities with responsibility, authority, and funding to manage significant watersheds do not currently exist. With the current funding alternatives and their respective requirements (voter approval thresholds, etc.), regional funding is not feasible. Without funding, responsible administration with backbone is impossible.

9. DATA MANAGEMENT EFFORTS AND TOOLS

Managing water resources data at a watershed-wide level in a consistent manner and providing access to this information to key stakeholders and the public at large is critical to the success of watershed management. Beyond the strategies for improvement revealed in Section 5.10, Data Management and Monitoring, this chapter reports on a number of methods and tools developed by One Water One Watershed (OWOW) stakeholders and the Santa Ana Watershed Project Authority (SAWPA) to manage data and provide tools to support the implementation of the OWOW Plan Update 2018.

Properly managed data helps SAWPA, other agencies, and stakeholders in the watershed identify water quantity and quality issues, assess and develop potential solutions, quantify the anticipated impacts of these solutions, and measure the extent to which anticipated impacts materialize. In addition, having a single depository of data with a consistent format allows the sharing of information among stakeholders and the integration of watershed data with other databases at the state level.

As was described earlier, the OWOW Plan Update 2018 process included a partnership between SAWPA and the California Department of Water Resources (DWR) to pilot the use of the California Water Plan Update 2018 Sustainability Outlook. This work resulted in an assessment tool for the OWOW Program that will annually analyze and indicate progress towards (or away from) the goals of the OWOW Plan Update 2018. A fuller description of this tool can be found in Appendix D and in the white papers associated with the California Water Plan Update 2018.

9.1. PLAN PERFORMANCE AND PROJECT MONITORING

The evaluation (rating and ranking) of projects that receive funding through the IRWM implementation grant rounds, detailed in Chapter 6 (Project/Program Review, Evaluation, and Prioritization), is conducted through a multistep process under the direction of the OWOW Program's governance structure. This process helps identify projects that are of high value in achieving OWOW Program goals to move forward for implementation and monitoring. The availability of funding for projects influences how often this process for updating project ratings and rankings is conducted. Projects implemented through the OWOW Program are monitored through a data management system maintained by SAWPA, which is used to review and update the impacts and benefits that are achieved by implemented projects. This monitoring also ensures compliance with all applicable rules, laws, and permit requirements that may relate to any of the implementation projects.

The SAWPA data management system is designed to ensure that lessons learned from project-specific monitoring efforts will be used to improve SAWPA's ability to implement future projects in the OWOW

Program. SAWPA has established a data mart with the State Water Resources Control Board to link directly to the California Environmental Data Exchange Network (CEDEN) database to download data available for the watershed on a regular basis and intends to expand this capability of other state databases as the opportunity becomes available. Additional tools to support the SAWPA data management system are described in detail in Section 9.2, Data Management Approach.

SAWPA provides oversight on projects that are implemented through DWR funding programs and require that project performance monitoring be developed and results reported as part of project implementation. The project's proponents are responsible for data that is collected and provided to SAWPA and DWR as part of the regular reporting process. The project monitoring plans developed by the project proponents must include the following information:

- Parameter or constituent being monitored
- Measures to remedy or react to problems encountered during monitoring
- Location of monitoring
- Monitoring frequency
- Monitoring protocols and methodologies and responsible parties
- Data management process for tracking what is monitored
- Procedures to ensure that monitoring schedule and processes can be maintained

9.2. DATA MANAGEMENT APPROACH

For the OWOW Program, a key requirement of the general obligation bond funding is specific monitoring of financial and project performance of each grant. Therefore, the focus is on collecting the data already being provided by project proponents funded through the IRWM Program (and therefore already meeting DWR data requirements) and use that data for the purposes of determining the performance of the grant-funded work. The OWOW Program, however, does not consider the projects that receive IRWM implementation grant funding as the only efforts that implement the OWOW Plan Update 2018. Collecting data about those projects is required, and is useful, but it is inadequate as a measurement of progress towards the goals of the OWOW Plan Update 2018.

The watershed includes over a hundred municipalities and public agencies which are each responsible for monitoring a wide range of parameters for many varied programs, much of which is already reported to California through multiple programs. As is seen in Section 5.10, Data Management and Monitoring, there is keen interest in California and in this watershed to improve the interoperability of the state-gathered data, to make it more usable for decision making. Coupling efforts to federate the storage and availability of data while lowering the burden of those required to collect and share data is a focus in the watershed and statewide. The OWOW Program is engaged in these efforts; however, because they are only in formative and planning stages, those systems are not described in this chapter.

The OWOW Program, however, has long recognized that a great deal of valuable data is collected from studies and projects that could benefit the region and the state if made accessible. This has led to the creation of several tools at SAWPA, and elsewhere in the watershed, to provide regional data and analysis. Several examples can be found in the Lake Elsinore and Canyon Lake TMDL Task Force and the Middle Santa Ana River Watershed TMDL Task Force, and are described below.

Projects funded by IRWM implementation grants managed by the OWOW Program often direct proponents to input data into appropriate state database. Data that was not required to be submitted to state database but that is deemed important is stewarded by SAWPA using a variety of data storage and sharing techniques and is accessible through web tools, maps, and tables. These databases are maintained by SAWPA staff and are routinely backed up. Data quality is corrected through the use of spatial queries and then the data is displayed in maps and tables. Anomalies are easily spotted and corrected by data submitters and SAWPA staff. Outside consultants, often added for their expertise on a particular project, add another set of eyes to the data.

The data that is submitted to the state through databases such as CEDEN, as well as the SAWPA database, is available through web tools and data requests. These web tools combine data in table format with spatial data (e.g., maps and graphics) and allow the user to view the information on a map of the watershed. Many of the tools provide a quick method of analysis by providing a map with features that may be colored by a value or a chart on top of the map showing a value over time. Data that has been uploaded to the state database per contract is available through a number of tools that use a weekly connection to the CEDEN database through a datamart to provide a local up-to-date view of the data. Data compatibility with state databases is exceptionally high due to the feedback loop caused by using web-based tools displaying near-real-time submitted data.

Data relevant to the OWOW Program that can be shared publicly is hosted by SAWPA across its webpage and web-facing tool sets. The Data Management Systems developed by SAWPA and others support the distribution of relevant data to all water management agencies within the region. The ethic of making information available is embedded in the OWOW Program, and as described above, the Data Management and Monitoring Pillar has recommended that additional collaborative efforts be undertaken to expand the openness and usability of water data in the watershed.

9.3. WATERSHED MONITORING

Ongoing monitoring programs that are collecting data in the watershed that are relevant to the goals of the OWOW Program are described in this section.

9.3.1. LAKE ELSINORE AND CANYON LAKE TMDL

The Lake Elsinore and Canyon Lake TMDL Task Force is composed of local stakeholders seeking to address the nutrient total maximum daily loads (TMDLs) defined by the Regional Water Quality Control Board (Regional Board) for two impaired water bodies in the San Jacinto River Watershed – Canyon Lake and Lake Elsinore. This task force was organized and formed by SAWPA and the Lake

Elsinore and San Jacinto Watersheds Authority to address water quality targets in a cost-effective manner among over 20 agencies and coalitions, including federal, state, and local agencies. The task force meets monthly and includes representatives from local cities, Riverside County, agriculture and dairy operations, and environmental groups, as well as the regulatory community. At the request of the Regional Board, SAWPA served as a neutral facilitator for the early TMDL development process for Lake Elsinore and Canyon Lake.

9.3.2. MIDDLE SANTA ANA RIVER WATERSHED TMDL TASK FORCE

The Middle Santa Ana River Watershed TMDL Task Force is a collaborative effort of public- and private-sector agencies and interests focused on the development of pathogen TMDLs for Santa Ana River Reach 3, its tributaries, and other water bodies in the Chino Basin area. Formed in 2007, the task force has been working on several pathogen-related activities and studies for the Chino Basin. The objectives of this task force are to implement a number of tasks identified by the Regional Board in their 2005 Amendment to the water quality control plan (Basin Plan). These include the implementation of a watershed-wide monitoring program to assess compliance with water contact recreation (REC-1) beneficial use water quality objectives for fecal coliform, evaluate numeric targets established for E. coli, and identify and implement measures to control sources of impairment. The task force works with the Regional Board in the formulation of pathogen TMDL allocation and implementation strategies. SAWPA serves as the neutral facilitator and administrator of the task force.

9.3.3. URBAN WATER MANAGEMENT PLANS

The Urban Water Management Planning Act requires that planning projections be evaluated over at least 20 years. Most of the agencies within the watershed projected their demands for a 25-year period ending in 2030. This report provides the actual water demands for 2005 along with the water demand projections through 2030. Water demands within the watershed are met through a combination of local and imported water supplies. Local resources include precipitation in the form of snowpack, surface flow, and groundwater. Imported resources for the watershed are primarily from the Colorado River Aqueduct and the State Water Project. Urban water management plans evaluate scenarios that help prepare for water supply reliability in the watershed in the event of a multiyear drought.

9.4. TECHNICAL ANALYSIS

A vast amount of data was used in the creation of the OWOW Plan Update 2018 that was not directly reported to the state. This data and technical information was used to develop the water management needs in the OWOW Plan Update 2018. The data collected is considered adequate for the needs of developing the OWOW Plan Update 2018 in representing current conditions, the scope of historical highs and lows, and future forecasts and projections. Table 9.3-1 identifies the studies, models, and other data sets used to create tables, charts, and graphics throughout the OWOW Plan Update 2018.

Table 9.3-1. Source Material Used for OWOW Plan Update 2018 Technical Analyses

Data or Study	Analysis Method	Results	Use in IRWM Plan	Source
Tribal communities	Spatial analysis	Percentage of Tribal communities in the watershed	Map of tribal communities	Southern California Association of Governments (SCAG)
Disadvantaged communities	Spatial analysis	Percentage of disadvantaged communities in the watershed	Map of disadvantaged communities	SCAG
Groundwater management zones	Groundwater supply/quality/storage	Groundwater management zone, water quality, and available storage mapping	Map of groundwater management zones	Santa Ana Regional Water Quality Control Board's water quality control plan (Basin Plan)
Watershed land use	Spatial analysis/land use trends	Spatial representation of available regions for groundwater recharge	Map of land use in the Santa Ana River Watershed (watershed)	SCAG
Critical habitat	Habitat/spatial analysis	Spatial representation of critical habitat	Map of critical habitat in the watershed	Various agencies
Population	Population projections	Projected populations for the watershed until 2035	Map of population density in the watershed	SCAG
Flood control facilities	Spatial/stormwater capture analysis	Stormwater capture mapping	Map of flood control infrastructure in the watershed	Various agencies
Groundwater recharge facilities	Recharge opportunities/spatial analysis	Groundwater recharge mapping	Map of groundwater recharge facilities and opportunities in the watershed	Various agencies
Constructed wetlands	Habitat/stormwater recharge analysis	Habitat area/stormwater recharge opportunities	Map of Constructed Wetlands in the watershed	Various agencies
Recycled water facilities	Spatial/water quality/water supply analysis	Locations and dischargers along the Santa Ana River	Map of recycled water facilities in the watershed	Various agencies

Table 9.3-1. Source Material Used for OWOW Plan Update 2018 Technical Analyses

Data or Study	Analysis Method	Results	Use in IRWM Plan	Source
Agency service area	Spatial analysis/population projections	Mapping of agency service areas and boundaries	Map of agency service areas in the watershed and surrounding areas	Urban water management plan/ retail agencies
Watershed delineations	Spatial analysis	Subwatershed delineations within the Santa Ana River	Used in evaluation of more focused planning	Various agencies
Desalination plants	Spatial analysis/desalination capacities/quality	Mapping of desalination plants	Map of desalination plants in the watershed	Various agencies
Regional infrastructure	Spatial analysis/water supply analysis	Mapping of regional water infrastructure and supply opportunities	Map of regional infrastructure and the outlets in the watershed	Member agencies
Surface water	Water quality/spatial analysis	Mapping of surface water	Mapping of surface water sources in the watershed	Basin Plan
Imported water infrastructure	Spatial analysis/economic impacts	Mapping of Metropolitan Water District of Southern California (Metropolitan) imported water infrastructure	Mapping of Metropolitan imported water infrastructure in the watershed	Metropolitan Regional Plans
Fault lines	Spatial analysis/ infrastructure risk analysis	Mapping of fault lines with water infrastructure	Mapping of fault lines and water infrastructure	U.S. Geological Survey
Impaired water bodies (303-D List)	Water quality analysis	Mapping of impaired water bodies in the watershed	Mapping the impaired water bodies in the watershed	303-D List
Total maximum daily load (TMDL) projects	Water quality analysis	Mapping of TMDL projects in the watershed	Map of TMDL projects in the watershed	Various agencies
Invasive species	Habitat/spatial analysis	Mapping of areas affected by invasive species	Map and analysis of the effects of invasive species	Santa Ana Watershed Association
Water quality objectives	Water quality analysis	Mapping of water quality objectives in the watershed	Map and analysis of water quality objectives	Basin Plan

Table 9.3-1. Source Material Used for OWOW Plan Update 2018 Technical Analyses

Data or Study	Analysis Method	Results	Use in IRWM Plan	Source
Seawater intrusion zones	Water quality/ spatial/water supply/ projections	Mapping of basins in danger of seawater intrusion and the effects on supply	Map and analysis of potential seawater intrusion zones	Orange County Water District
Dam locations	Spatial analysis	Mapping of dams and weirs	Maps and sediment loading potential regarding dams	Various agencies
Santa Ana River Trail	Habitat/recreational spatial analysis	Mapping of recreation opportunities along the Santa Ana River	Map of the Santa Ana River Trail	Various agencies
Temperature	Climate analysis	Mapping of temperature zones throughout the watershed	Map and analysis of temperature data throughout the watershed	U.S. Department of the Interior Bureau of Reclamation
Groundwater plume maps	Spatial analysis/water quality analysis	Mapping of contaminated groundwater due contamination plumes	Map and analysis of contaminated groundwater basins/plumes	Various agencies

9.5. OWOW PLAN UPDATE 2018 PROJECT SUBMITTAL TOOL

The OWOW Plan Update 2018 invited all stakeholders to submit projects for inclusion in the plan. This is not the same as the competitions that will be managed for available IRWM implementation grant funding. These two processes are distinct because there are many reasons to have a project listed in the OWOW Plan Update 2018, only one of which is competing for IRWM grants.

The project submittal tool was developed as an online tool that is relatively simple to complete and asks each project proponent to describe how the submitted project will help achieve the goals of the OWOW Plan Update 2018. All projects, once submitted, are included in the plan by an act of the OWOW Steering Committee (in bulk when needed, at routine every-other-month meetings.) An online map and table show all projects that are submitted, supporting a broad understanding where overlaps and partnerships can be formed, or where gaps may exist that demand attention.

The same project submittal tool is the basis for those seeking grants, when available. Beyond the basic information gathered on all projects, those wishing to compete for grants have additional data entry demands in the tool to ensure that their project is eligible for the funding, and the OWOW Program can rate, rank, and select projects for submittal to the state for grant funding.

Access to this tool is via the SAWPA website for the OWOW Program (www.SAWPA.org/OWOW.) When calls for projects to be included in the OWOW Plan and for projects seeking grants are made, SAWPA ensures wide distribution via email, meeting agenda, and word-of-mouth through stakeholders. A handout (Appendix K) is available to all stakeholders about this tool to make it easier to use.

9.6. SANTA ANA RIVER WATERSHED WATER QUALITY TOOLS

SAWPA, the Santa Ana Regional Board, and local stakeholders have developed a suite of tools to provide water planners and the public access to Basin Plan information relating to designated beneficial uses, water quality objectives, and water quality data for water bodies within the watershed.

9.6.1. WATER BODY BENEFICIAL USES AND WATER QUALITY OBJECTIVES

SAWPA and the Santa Ana Regional Board have developed an interactive web application to explore hydrologic features and regulatory criteria established for water bodies within the Santa Ana Basin Plan. This tool is located at http://www.sawpa.net/benuse/benuse.htm.

This tool gives the user the ability to search a map of the watershed to identify a particular water body, beneficial use, or street address through a series of searchable menus or by clicking on a particular map feature.

Searching by water body type activates a set of pull-down menus. The first pull-down menu lists water body types, including bays, lakes, rivers, wetlands, and groundwater management zones. The second includes a list of each named water body of that type identified in the Basin Plan. When the user selects a water body, a pop-up window displays applicable beneficial uses and water quality objectives.

Searching by beneficial use activates a pull-down menu of beneficial use types identified in the Basin Plan. When the user selects a beneficial use, each water body with that particular beneficial use is activated throughout the watershed. Selecting a water body activates a pop-up window displaying applicable beneficial uses and water quality objectives.

Additional features of this application include multiple map backgrounds (including street map, satellite imagery, and U.S. Geological Survey quadrangle) and the ability to turn on/off water body features, save water body data as a PDF file, and capture information from the screen and print it to a PDF file.

9.6.2. WATER QUALITY MONITORING DATA TOOL

SAWPA, partnering with the Santa Ana Regional Board, has developed an interactive web application to examine surface water quality data for TMDL monitoring locations within the Santa Ana Basin Plan.

This tool allows the user to search monitoring locations by regulatory program through a series of searchable menus or by clicking on a particular monitoring location within the watershed. Current data available includes watershed-wide monitoring data collected through the Lake Elsinore and Canyon Lake TMDL program and the Middle Santa Ana River Watershed TMDL program. Data available in this application is updated on a weekly basis and accessed through a datamart established with the CEDEN database and managed by the State Water Resources Control Board.

Searching by project activates a pull-down menu listing regularly monitored stations. Selecting a particular monitoring station zooms the map to the selected location and activates a pop-up window with a series of tabs with data summaries and chart tools.

Additional features of this application include multiple map backgrounds and the ability to save water body data as a PDF file or capture information from the screen and print it to a PDF file.

9.6.3. CUSTOMER PARCEL WATER BUDGET TOOL

SAWPA, partnering with Esri, has developed an interactive web application to examine parcel level landscape and water budget data. This tool, dubbed the Customer Parcel Water Budget Tool, provides water managers easy access to over 14 terabytes of GIS spatial data without needing GIS software, having internal GIS expertise, or using internal server storage space. This tool is located at https://sawpa22.maps.arcgis.com/home/index.html.

The purpose of this tool is to provide retail agencies access to detailed parcel level landscape measurements and monthly water budgets estimated using evapotranspiration data from Spatial CIMIS over the backdrop of 2015 high resolution aerial imagery for the Santa Ana River Watershed. Through this tool the user has the ability to view, search, and identify individual parcel data for over one million parcels within the urbanized Santa Ana River Watershed. Additionally, the user has access to a summary rollup of this data for over 70 retail water agencies.

The search feature is activated by a pull-down menu, whereby the user has the ability to search by Parcel Number (APN), Parcel Address, Agency Name, and Esri Geocoder. Selecting a particular address zooms the map to the selected location and activates a pop-up window providing a summary of landscape statistics and monthly water budget data.

Additional features of this application include a number of interactive tools to allow users to spatially interact with the data in the map. You can add multiple map backgrounds, charts, and graphs; query and export data to Microsoft Excel; and capture information from the screen and print it to a PDF file. Each of these features is described in detail in an accompanying User Guide.

9.6.4. CLIMATE CHANGE MODEL

A partnership between SAWPA and the U.S. Department of the Interior Bureau of Reclamation (Reclamation) has produced an interactive climate change modeling tool to provide water planners with information on potential impacts of climate change within the watershed. The main objective of

this particular tool is to develop a simplified modeling framework for evaluating climate change impacts on surface flows, temperature, snowmelt, storm flow, and groundwater levels and to apply this framework to evaluate potential impacts of climate change as well as mitigation/adaptation alternatives. The climate change tool allows the user to explore, identify, and download custom climate change data for various scenarios modeled for the watershed. Recognizing the importance of potential impacts of climate change in the future, SAWPA and Reclamation have designed the tool to allow planners to foresee possible issues, helping them to allocate resources and funds appropriately.

9.6.5. GREENHOUSE GAS MODELING TOOL

Reclamation, working with SAWPA, developed an interactive greenhouse gas (GHG) emissions modeling tool to provide water planners and the public with information about GHG impacts on water resources within the watershed. This tool enables the user to explore, identify, and download custom GHG data for a suite of water technologies modeled for the watershed. The GHG emissions modeling tool can also exhibit energy consumption in the delivery and treatment process with relation to water. In accordance with Assembly Bill 32, which requires regions within California to reduce their overall GHG emissions, the tool also evaluates both the supply and demand of water in the watershed. This tool has been very useful within the watershed because it allows agencies and SAWPA to use the calculator for different types of scenarios, which can be used to compare each outcome and result. Further, the tool can be adapted to individual projects and it is anticipated that project proponents will use it for future GHG emissions calculations.

9.6.6. GROUNDWATER BASINS WATER QUALITY MODELING TOOL

SAWPA and Reclamation have partnered to develop an interactive groundwater modeling tool that allows planners and other entities to identify potential impacts of climate change on groundwater resources in the watershed. The tool lets the user explore, identify, and download groundwater data for various climate change scenarios modeled for the watershed. This data includes but is not limited to groundwater elevation, basin-average precipitation and potential evapotranspiration, stream flows, manufacturing and industrial demand, agricultural demand, and augmented supplies. Using this tool provides many different types of benefits, allowing the user to apply any necessary project information to account for any future climate change scenarios. This is an important part of the project process, because with this tool, an agency or a member of the public is able to identify potentially problematic situations now so they will be able to avoid or effectively deal with them in the future. At this time, the tool reflects four general groundwater management regions as defined by DWR for the watershed.