Adopted February 4, 2014

One Water One Watershed 2.0 Plan

ONE WATER ONE WATERSHED

Santa Ana River Watershed

Moving into Implementation

SAWPA

FINAL

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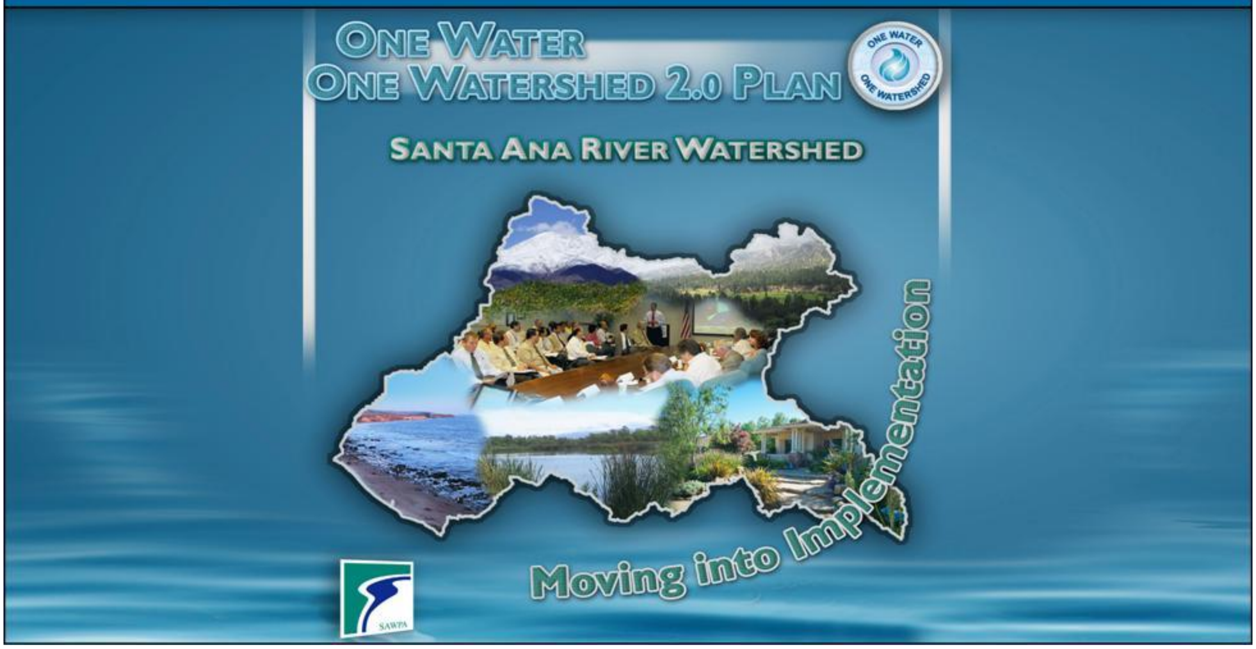
Executive Summary



The Santa Ana River Watershed faces enormous challenges as it strives to adapt 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. Even with its plentiful groundwater resources, several basins now are experiencing declining groundwater levels and overdraft conditions. With the uncertainties of climate change and its impacts, environmental concerns are taking even greater precedence than they ever have in the past, affecting how we manage water for the future.

Most agree that the water management approaches of the past several decades are no longer sustainable in today's environment and economic climate. And most agree that a more integrated and collaborative approach to water resource management will show tremendous promise to water resources everywhere. But 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 Santa Ana Watershed Project Authority (SAWPA) Commission in 1998.

In a nutshell, the goal of yesteryear was affordable water for a growing economy. But over time, the goal has changed to become a more 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. Another way to think about it is that while the drop of water may at different times be characterized by different elements, it is still the same drop of water.

The benefits of this approach are 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 basis has even been recognized by independent review, 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.

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"

The Santa Ana River Watershed continues to progress with many "bright spots" and pilot projects accomplished to date. The use of sophisticated "big data" analytics continues to set us apart, resulting in a more robust watershed and a very competitive position to compete for State and Federal funds.

The "One Water One Watershed" (OWOW) 2.0 Plan is the Santa Ana River Watershed's integrated regional water management (IRWM) plan. This plan reflects a collaborative planning process that addresses all aspects of water resources in a region or watershed, in our case. It includes planning of future water demands and supplies over a 20-year time horizon within the watershed as a hydrologic and interconnected system. The plan represents collaboration across jurisdictions, and political boundaries involving multiple agencies, stakeholders, individuals, and groups; and attempts to address the issues and differing perspectives of all the entities involved through mutually beneficial solutions. The plan reflects a new suite of innovative approaches that instead of relying solely on continued imported water deliveries to meet growing water demands in the region, is leading with a water demand reduction strategy. These approaches include the following:

- Multi-beneficial projects and programs that are linked together for improved synergy
- Proactive innovative, and sustainable solutions
- Integrated regional solutions supporting local reliability and local prioritization
- Watershed based project and programs that effectively leverage limited resources, promote trust and produce a greater bang for the buck
- Integrates water supply, water quality, recycled water, stormwater management, water use efficiency, land use, energy, climate change, habitat, and disadvantaged communities and tribes
- Coordinates resources so that water is used multiple times
    - Manages stormwater for drinking water
    - Treats wastewater for irrigation and groundwater replenishment
    - Builds or modifies parks to support water efficiency, ecosystem habitat, and stormwater capture
    - Improves water quality pollution prevention
    - Addresses energy and water nexus

The OWOW 2.0 Plan was funded by the SAWPA member agencies with grant funding assistance from the California Department of Water Resources (DWR) through the Proposition 84 IRWM Planning Grant program, and a funding partnership from the U.S. Bureau of Reclamation (Reclamation) through their Basin Studies program. Work with Reclamation, the State, local and non-profit organizations provided the OWOW 2.0 Plan with the necessary resources to expand outreach and support that ultimately will create more cost effective integrated water resource management solutions.

In the final analysis, the prescription for success is clear; we need to "double down" on integrated water management, strengthen the alignment among all government agencies, and invest in innovation and infrastructure. For the Santa Ana River Watershed, the road map for this success is our IRWM plan known as the OWOW Plan.

The emphasis of this new OWOW 2.0 Plan is that all people are encouraged to adopt a water ethic that focuses on understanding where their water comes from, how much they use of it, what they put into water, and where it goes after they finish using it. To meet growing water demands in the region, a new suite of approaches to planning are needed now that lead with a water demand reduction strategy.

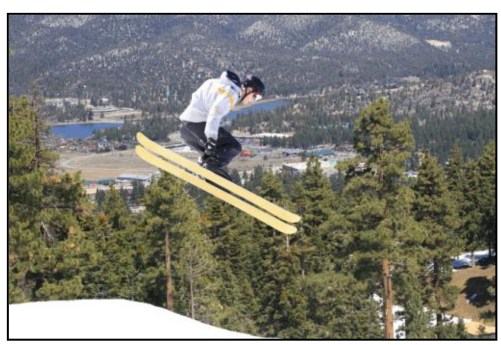
Analysis and Support Tools

To support implementation of the OWOW 2.0 Plan, SAWPA in conjunction with its funding partners, conducted research and analyses on climate change impacts to the watershed, and developed a variety of new computer support tools to support our modern water management goals. Under this Plan, new resource tools and analyses were developed to help water resource managers adapt to changing climate conditions, support project proponents in better integrated solutions, assist analysis of watershed performance over time, and provide the public better access to water quality for beneficial use.

Through the work of Reclamation, an interactive climate change modeling tool was developed to provide water planners with information on potential impacts of climate change within the Santa Ana River Watershed. This tool provides a simplified modeling framework for evaluating climate change impacts, as well as mitigation/adaptation alternatives. The climate change tool enables the user to explore, identify, and download custom climate change data for various scenarios modeled for the Santa Ana River Watershed**.** Some of the results of the climate change analysis for the watershed that address common public concerns are as follows:

Will surface water supply decrease?

- Annual surface water is likely to decrease over future periods.
- Precipitation is projected to show long-term slightly decreasing trends.
- Temperature is projected to increase, which will likely cause increased water demand and reservoir evaporation.
- Snow melt water runoff is projected to decrease.



Will I still be able to go skiing at Big Bear Mountain Resorts?

- The projected warmer temperatures would result in a delayed onset and shortened ski season. Both

Big Bear Mountain Resorts lie below 3,000 meters and are projected to experience declining snowpack that could exceed 70% by 2070.

How many more days over 95°F are expected in Anaheim, Riverside, and Big Bear City?

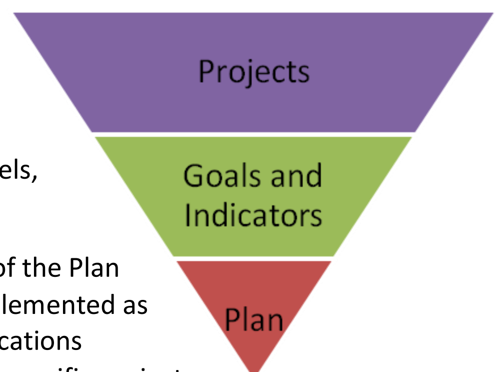
- By 2070, it is projected that the number of days above 95°F will quadruple in Anaheim (4 to 16 days) and nearly double in River*side* (43 to 82 days). The number of days above 95°F at Big Bear City is projected to increase from zero days historically to four days in 2070.

Another powerful tool that Reclamation developed under the OWOW 2.0 Plan is an interactive green house gas (GHG) modeling tool to provide water planners and the public about the impacts of GHG within the Santa Ana River Watershed. This tool enables the user to explore, identify and download custom GHG data for a suite of water technologies modeled for the Santa Ana River Watershed. It also will exhibit energy consumption in the delivery and treatment process with relation to water. In accordance with AB – 32, which requires regions to reduce their overall GHG emissions, the tool also evaluates both water supply and demand in the Santa Ana River Watershed. This tool will prove to be very useful within the watershed because it allows users to calculate different scenarios, which can be used to compare each outcome and result. Further, the tool can be adapted to individual projects and is anticipated for use in future GHG emissions calculations by project proponents.

Santa Ana River Watershed Water Quality Tools

SAWPA, partnering with the Santa Ana Regional Water Quality Control Board and local stakeholders, has developed a suite of tools to provide water planners and the public access to water quality information relating to designated beneficial uses, water quality objectives, and water quality data for water bodies and waterways within the Santa Ana River Watershed.

Watershed Assessment Tool, Plan Performance and Monitoring



In order to track progress, SAWPA has developed a system to monitor the implementation of the OWOW Plan and projects implemented under OWOW. The monitoring takes place at two levels, the plan level and project level, to:

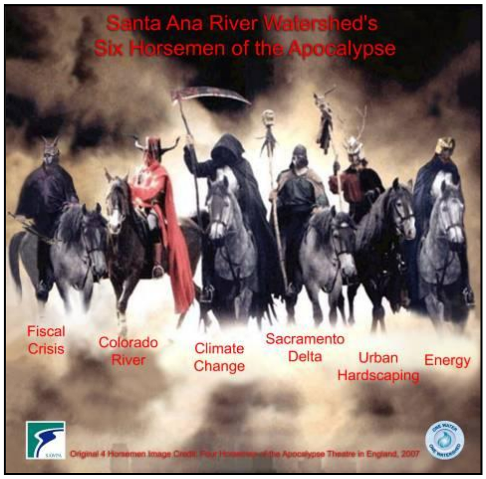
- Ensure progress is being made toward meeting objectives of the Plan
- Ensure specific projects identified in the Plan are being implemented as planned in terms of schedule, budget, and technical specifications
- Identify potential necessary modifications to the Plan or to specific projects, to more efficiently and effectively accomplish the goals and objectives of the Plan
- Provide transparency and accountability regarding the disbursement and use of funds for project implementation

To tie the plan and project monitoring together, SAWPA recognized the need for an interface process of measuring progress on meeting the goals and objectives, as well as the health of the Santa Ana River Watershed. SAWPA engaged the services of the Council for Watershed Health, a nonprofit organization, and Dr. Fraser Shilling of the University of California, Davis to develop a watershed assessment framework for the Santa Ana River Watershed. The Council and Dr. Shilling worked with the OWOW Pillars, workgroups of experts and stakeholders organized generally based on water resource management strategies, to update the watershed management goals, establish planning targets, and utilize data indicators from existing datasets to track progress. With the input of SAWPA staff, a new tracking computer tool was created, incorporating this work that will allow managers to evaluate and assess progress, and assure actionable results for implementation.

Vision, Mission and Challenges

Under OWOW 1.0, the vision for the watershed was developed and continues under the OWOW 2.0 Plan as follows:

1. A watershed that is sustainable, drought-proofed and salt-balanced by 2035, and in which water resources are protected and water is used efficiently
2. A watershed that supports economic and environmental viability
3. A watershed that is adaptable to climate change
4. A watershed in which environmental justice deficiencies are corrected
5. A watershed in which the natural hydrology is protected, restored, and enhanced
6. A water ethic is created at the institutional and personal level



The mission of the OWOW Plan is to create opportunities for smarter collaboration to find sustainable watershed-wide solutions among diverse stakeholders from throughout the watershed. Clinging to the path of yesteryear will place us at greater risk of producing results with limited impact and unintended consequences. Our 21st Century plan creates a blueprint for more effective water resource management by using data and tools to keep us better informed and allowing us to be more productive in using less energy and producing less GHG emissions.

To achieve this vision and mission, stakeholders must address four major threats, which we have dubbed the Four Horsemen of the Apocalypse: 1) Climate Change resulting in reduced water supplies combined with increased water needs in the region; 2) Colorado River Drought Conditions resulting in pressures on imported supply due to upper basin entitlements and continued long-term drought; 3) San Joaquin-Bay Delta Vulnerability resulting in loss of supply due to catastrophic levee failure or changing management practices of the Delta; and 4) Population Growth and Development resulting in interruptions in hydrology and groundwater recharge while increasing water needs.

To implement OWOW 2.0 and adjust to current affairs, SAWPA and stakeholders needed to adapt to address the new challenges, the Energy and Fiscal Crises. The Four Horsemen of the Apocalypse herd has grown to six. The Fiscal Crisis reflects the impacts of the Great Recession commonly marked by a global economic decline that began in December 2007, and took a particularly sharp downward turn in September 2008. Some say the epicenter was the Inland Empire. By late 2013, the recession remains a part of our lives resulting in far fewer State and Federal funds, and State bond funding being deferred each year as the realization that they would not likely be supported by the California electorate.

Recent energy developments such as the closure of the San Onofre Nuclear Generating Station, have forced us to recognize the water-energy nexus and the need to address our energy needs and escalating costs for delivering energy. Energy costs can be reduced by water agencies through energy efficiency measures, while teaching the public that water conservation equates to energy conservation and thus money saved.

Goals, Objectives, Targets and Indicators

As previously stated, in order to achieve the watershed's vision, the Pillars worked with the Council of Watershed Health on updating the goals and objectives for the OWOW 2.0 Plan as part of the new watershed assessment framework.

The Pillars and the Council selected five areas: water supply, hydrology, open spaces, beneficial uses, and effective and efficient management. Using these newly defined goals and objectives, an assessment process was established that will assure actionable results for implementation.

Goals	Objectives
Maintain reliable and resilient water supplies and reduce dependency on imported water	•Decrease water demand •Increase water-use efficiency •Increase use of rainfall and snowpack as a resource •Increase use of recycled water •Sustainably develop local water resources •Maintain sufficient storage to overcome multi-year (3 year) drought over a ten year hydrologic cycle •Reduce green-house-gas emissions and energy consumption from water resource management
Manage at the watershed scale for preservation and enhancement of the natural hydrology to benefit human and natural communities	•Preserve and restore hydrologic function of forested and other lands •Preserve and restore hydrogeomorphic function of streams and water bodies •Safely co-manage flood protection and water conservation •Include ecosystem function in new development planning and construction
Preserve and enhance the ecosystem services provided by open space and habitat within the watershed	•Increase the capacity of open space to provide recreational opportunities without degrading its quality or increasing its consumption of water & energy •Protect existing and restore native habitats •Protect and maintain healthy forests •Manage aquatic and riparian invasive species •Protect estuarine and marine near-shore habitats •Reduce ornamental irrigated landscapes •Improve management support for landscaping that utilizes native and drought tolerant vegetation •Protect and Restore wildlife corridors •Protect endangered and threatened species and species of special concern through improved habitat
Protect beneficial uses to ensure high quality water for human and natural communities	•Attain water quality standards in fresh and marine environments to meet designated beneficial uses •Protect and improve source water quality •Achieve and maintain salt balance in the watershed
Accomplish effective, equitable and collaborative integrated watershed management	•Improve regional integration and coordination •Ensure high quality water for all users •Balance quality of life and social, environmental and economic impacts when implementing projects •Maintain quality of life •Provide economically effective solutions •Engage with disadvantaged communities to eliminate environmental injustices •Engage with Native American tribes to ensure equity •Reduce conflict between water resources and protection of endangered species

Thereafter, the new goals and objectives were shared with the Steering Committee for their acceptance. Planning targets within the watershed along with data indicators were developed to track progress and allow measurement of the extent to which the plan objectives are being met. To achieve the updated goals and objectives, resource and broad management strategies were investigated through work of the Pillars. Quantifiable planning targets were developed in conjunction with the 20-year planning horizon of Year 2035.

The targets and indicators are listed in Chapter 4.3, Planning Targets.

Goals	Performance Targets for 2035
Maintain reliable and resilient water supplies and reduce dependency on imported water	•Conserve an additional 256,500 AFY of water through water use efficiency and conservation measures •Create 58,000 AFY using a combination of additional wells, treatment, conjunctive use storage and desalination of brackish groundwater •Increase production of recycled water by 157,000 AFY •Increase both centralized and distributed stormwater capture and recharge by 132,000 AFY •Develop 54,000 AFY of ocean water desalination
Manage at the watershed scale for preservation and enhancement of the natural hydrology to benefit human and natural communities	•Reduce flood risk in 700 acres using integrated flood management approaches. •Remove 500,000 cubic yards of sediment from debris basins and reservoirs
Preserve and enhance the ecosystem services provided by open space and habitat within the watershed	•Preserve or restore 3,500 acres of terrestrial aquatic habitat •Construct 39.5 miles of additional Santa Ana River Trail and Parkway
Protect beneficial uses to ensure high quality water for human and natural communities	• Reduce non-point source pollution by treating an additional 35 MGD of surface and stormwater flow, emphasizing higher priority TMDL areas • Remove an additional 25,000 tons of salt per year from the watershed
Accomplish effective, equitable and collaborative integrated watershed management	•Engage with 50% (approximately 35) Disadvantaged Communities within the watershed •Engage with 100% of the Non-Federally Recognized Tribes in the watershed

OWOW Planning Process

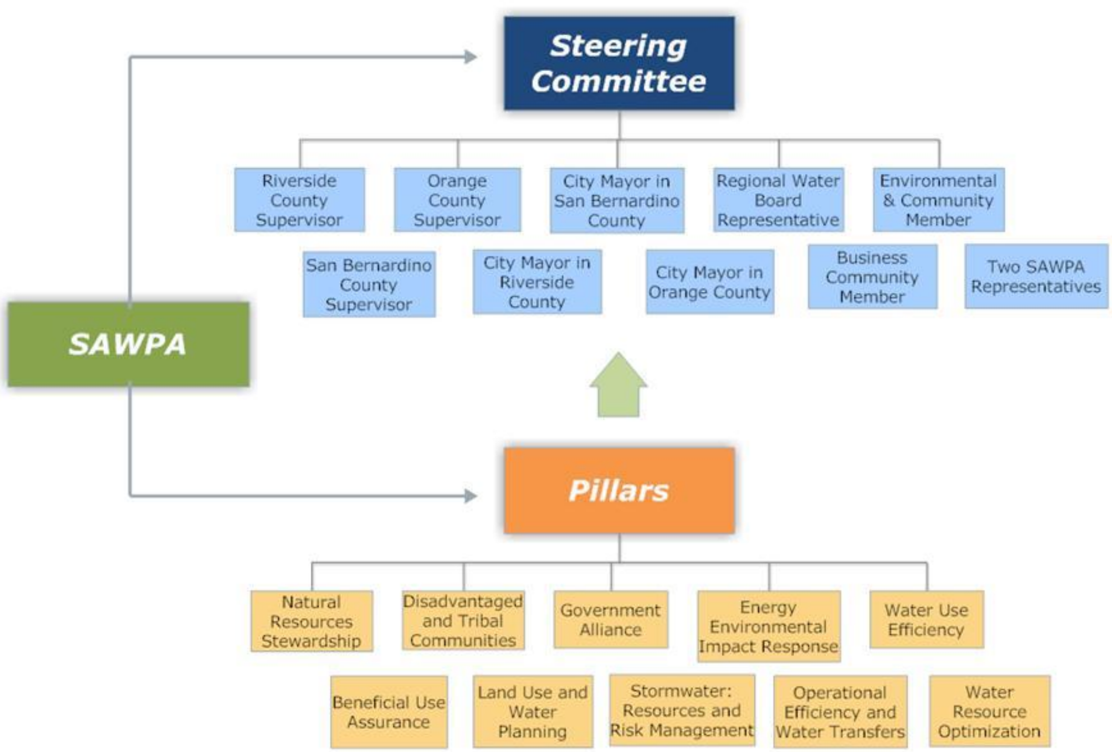
SAWPA officially launched its OWOW 2.0 planning effort on April 20, 2011, with the signing ceremony of the agreement with Reclamation. The work commenced in earnest with the first meeting with the Pillar Co-chairs. Regular workshops throughout the watershed were held with more than 100 agencies and non-profit organizations spanning Riverside, San Bernardino, and Orange counties. From the very beginning, the process has been open to and has received the participation of representatives from all geographic regions and political jurisdictions within the watershed, and from diverse representatives of different sectors of the community (governments, water agencies, the development and environmental community, and the public).

As with the OWOW 1.0 Plan development, the OWOW 2.0 Plan utilized a "bottom up" approach for governance and involvement. Every effort was made to encourage the development of a shared vision and the involvement and participation of all watershed stakeholders in key discussions of major water resource issues, concerns, problems, goals, and objectives, with a particular focus on supporting multi-beneficial system-wide implementation. By expanding the involvement and collaboration to the *on-the-ground* level, greater buy-in and support were realized for this planning development process.

OWOW 2.0 Governance

As with OWOW 1.0, the OWOW 2.0 Plan is led by an 11-member Steering Committee composed of elected officials from counties and cities in the watershed, representatives from the environmental, regulatory, and business communities, and representatives from SAWPA.

The Steering Committee's role is to serve as the developer of integrated regional water management goals and objectives for the watershed, and to act as the oversight body that performs strategic decision making, crafts and adopts programmatic suites of project recommendations, and provides program advocacy necessary to optimize water resource protection for all.

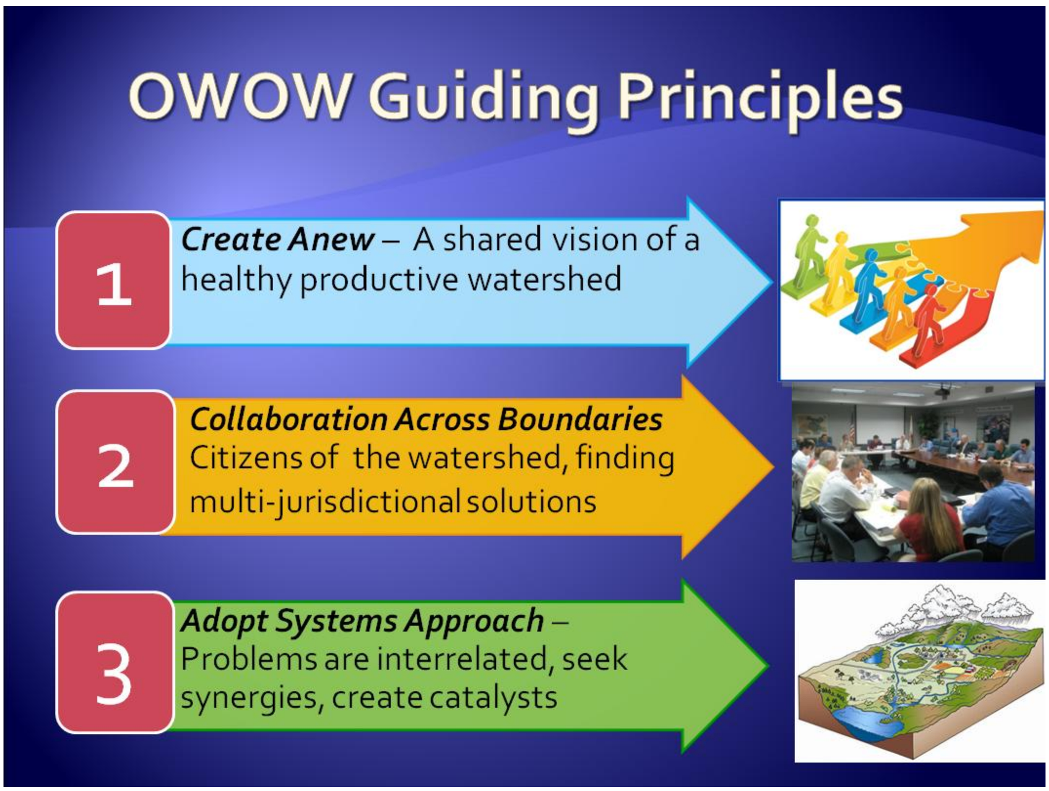


The Steering Committee is supported by technical experts assembled into ten groupings (known as Pillars), generally aligned along major water resource management strategies, but renamed under the OWOW 2.0 Plan to reflect greater integration and synergy.

While SAWPA facilitates the planning process and provides technical input and support through its staff and consultants, the development of the goals and strategies of the Plan, as well as the decision making process, are under the purview of the Steering Committee and the SAWPA Commission, with support of the Pillars and with consideration to comments from the public.

Pillar Work and Key Findings

Under OWOW 2.0, more emphasis is being placed on the watershed scale, and multi-benefit and multi-purpose solutions. Multi-beneficial projects and greater diversification of water management approaches are achieved through greater collaboration and cooperation, building trust among stakeholders, viewing the watershed as a hydrologic whole, working in concert with nature, and seeing each problem as interrelated that provides opportunities for synergy and efficiencies. These OWOW guiding principles were shared with the Pillars and the watershed stakeholders on multiple occasions.



In preparation for the next phase of OWOW 2.0 planning, SAWPA directed that the OWOW 2.0 Plan was not intended to be merely an update of previous planning data from the OWOW 1.0 Plan, but rather would focus on identifying integrated and watershed-wide implementation actions. To achieve this, SAWPA conducted innovative brainstorming processes with the Pillars utilizing the experience and skills of local experts to inspire and promote integrated system-wide implementation actions that address water resource challenges in the Santa Ana River Watershed.

Starting in September of 2011, three well known water resource experts dubbed the "Master Craftsmen", were tasked to develop a list of conceptual project concepts and to describe the spatial, temporal, regulatory, economic, political, and physical barriers that impair the ability to implement watershed-based implementation actions that support the vision articulated in the OWOW Plan. From these Master Craftsmen meetings, a white paper was developed that identifies 13 key examples of watershed-based water resource management concepts that, when implemented, would provide tangible and measurable benefits by removing impairments. These watershed-based concepts are ideas, vetted by the Pillars, and provide significant additional benefits such as habitat restoration and increased habitat connectivity. Two types of concepts were included: (1) those that require implementation of capital projects, and (2) those that are programmatic and focus on establishment of regional management practices or policies that increase sustainability of existing resources.

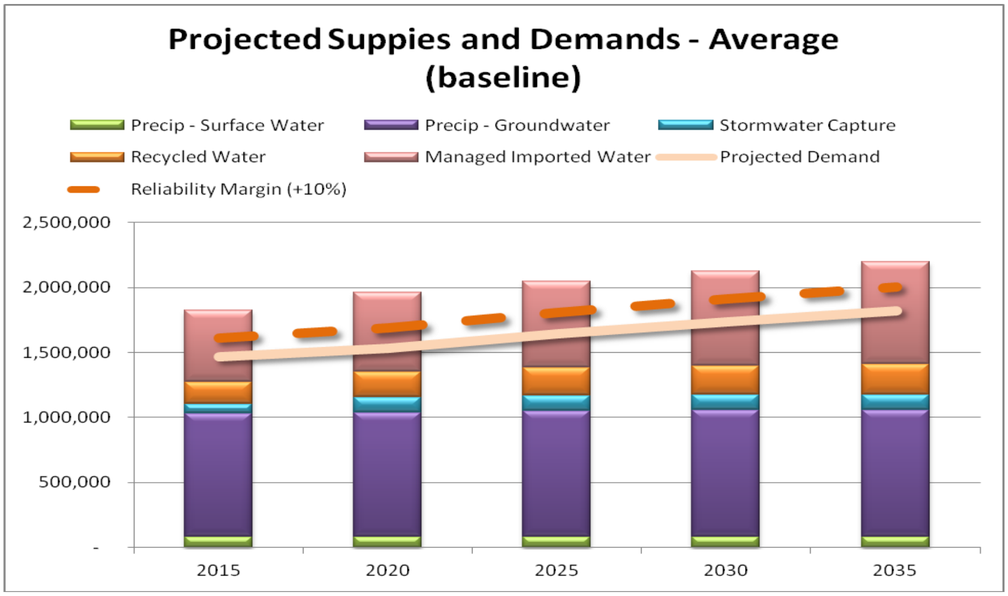
These ideas and concepts were approved by the Steering Committee and the SAWPA Commission. Thereafter, the Pillars commenced their respective meetings over the following 18 months of the OWOW 2.0 planning. They investigated new regional implementation actions within their Pillars that could lead to multiple, integrated benefits that, in turn, could be linked and integrated with other Pillar implementation actions. In addition to conceptual implementation actions, the Pillars developed key findings that will support implementation described as follows:

Water Use Efficiency Pillar – Key Findings

- Water use efficiency practices remain the number one water resource management priority for the watershed.
- Agencies and their partnerships with each other and private industry will continue to collaborate and develop new programs promoting water use efficiency.
- The ultimate goal will be to get water customers to automatically base decisions on what is the most water efficient way to plan, implement, and maintain devices and landscapes. This will require customer education and continued incentives to promote water use efficiency.
- Landscape demonstrates the greatest potential for water savings. Therefore, the Water Use Efficiency Pillar will move forward with collaborative projects that primarily emphasize outdoor efficient use of water.

Water Resource Optimization Pillar - Key Findings

Based on the work of the Water Resource Optimization Pillar, the projected supplies and demands for the average year are as follows:



A key finding from this Pillar's analysis is that with implementation of the 20% water demand reductions by 2020, as well as a reliability margin of 10%, water supplies will be adequate to meet demands through the 20-year planning horizon or Year 2035. This evaluation also was conducted for the single year, the historical year that received the lowest amount of imported water, and the multi-year drought, three- year period that received the lowest amount of imported water. Their findings show that the watershed in the aggregate will be able to meet its demands in a single year drought with a reliability margin of 11% in 2035, and for a multi-year drought of 13% in 2035. The watershed is able to make it through these drought years by relying on the native water, precipitation as surface water and precipitation as groundwater, and imported water storage programs that store water when it is available during wet periods for use during drought periods, and on recycled water that is not impacted by weather.

The Water Resource Optimization Pillar concludes that there is more to be done to ensure water supply reliability for the future. This is particularly true in the face of climate change that may impact local precipitation patterns, the need for intra-basin transfers to maintain groundwater levels, the State-defined mandate for regions to become less dependent on Delta imported water, and a significant funding requirement of water use efficiency and infrastructure to meet future demands.

Beneficial Use Assurance Pillar - Key Findings

- Surface water quality monitoring is not coordinated within the watershed leading to duplicative sampling in some areas and inadequate sampling in others. Work on a plan to improve coordination and development of a regional approach to monitoring that will generate better information and be less expensive.
- New statewide regulations setting biological objectives and nutrient objectives for surface water are being developed and will be a compliance challenge for wastewater agencies. Participate in rule making process to support development of policies and regulations that are effective and efficient.

- A small number of small water systems in operation within the watershed that do not have resources for monitoring and proper operations and maintenance, may result in drinking water provided to customers that is in violation of drinking water standards. Work with California Department of Public Health and county health departments to identify small system water providers, if any, which need assistance with providing safe drinking water. Develop a plan to address any small system water providers that need assistance.
- Sediment deposition in some areas creates water quality impairments, reduces aquatic habitat, and reduces water conservation storage. Reduced sediment flow downstream of dams causes armoring of river/creek beds resulting in reduction in percolation capacity, aquatic habitat, and beach replenishment. Support USACE/OCWD Prado Basin Sediment Management Demonstration Project and Newport Bay Stakeholders to reduce sediment load into Upper Newport Bay.

Land Use and Water Planning Pillar – Key Findings

- Water supply agencies should be consulted early in the land use decision-making process regarding technology, demographics and growth projections.
- City and county officials, the watershed stakeholders**,** Local Agency Formation Commissions, special districts and other stakeholders sharing watersheds should collaborate to take advantage of the benefits and synergies of water resource planning at a watershed level.
- Plans, programs, projects and policies affecting land use and water should be monitored and evaluated to determine if the expected results are achieved and to improve future practices.
- Limited, accessible, and low-cost, outdoor recreational opportunities should be promoted throughout the watershed.

Stormwater: Resource and Risk Management Pillar – Key Findings

- Comprehensive and integrated stormwater management projects driven by a multi-stakeholder project paradigm can more effectively and efficiently address watershed needs. Such projects can assist stakeholders to achieve compliance with the Municipal Stormwater National Pollutant Discharge Elimination System Permits (MS4 Permits), while increasing capture of stormwater and other flows and groundwater recharge using favorable cost benefit approaches.
- Reducing the risk of loss of life and property damage due to flooding remains a high priority within the Santa Ana River Watershed. The completion of the Santa Ana River Mainstem Project will reduce the risk of a catastrophic flood event in the Santa Ana River Watershed. However, there remains significant flood risk related to tributary watercourses within the watershed, compounded by potential impacts of wildfires and earthquakes.

Natural Resources Stewardship Pillar – Key Findings

- 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: Chaparral/forest, Alluvial fan; Riparian, Wetland, and Coastal and their specific ecosystems, require habitat-specific management plans and restoration criteria.
- Creating sustainable wildlife corridors requires 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.

- Consensus among all agencies and organizations with ownership/stewardship over areas of the Santa Ana River Mainstem and tributaries should be sought that provides 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.
- Grant and bond funding in the watershed 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.
- Much of the remaining invasive plant biomass and areas that could benefit from re-establishment 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. These are prime lands for future habitat restoration projects with multi-use and benefit.

Operational Efficiency and Water Transfers Pillar – Key Findings

- Expand compliance with the SBx7-7 and implement projects that reduce per capita water usage by more than 20 percent by the year 2020.
- Create/ expand supply and system reliability during drought, emergency, and peak demand situations.
- Create/expand coordination with other agencies in the area and develop regional water management strategies that would increase conservation and local water supplies.
- Create/expand local recycled water reuse program(s) in the area with an OWOW 2.0 goal of 157,000 acre feet per year.
- Develop/Implement projects that protect groundwater resources, the environment and consider storage and transfers. These projects are important to assure that water is readily availability in the right place when we need it. This can be overcome with storage and transfers.

Disadvantaged and Tribal Communities Pillar – Key Findings

- Engaging Disadvantage Communities (DACs) and Tribes in water and related resources planning through effective outreach is good for both the community and the water sector itself. There are distinct differences due to cultural and historic context. Both need their voices heard during proposed project development.
- Today, DACs and some Tribes face critical and serious water and related resources challenges, such as failing septic systems, isolation, language barriers, flood risk, and lack of funding and or resources. It is imperative that the water sector and its key stakeholders recognize proposed DAC and Tribe water project needs, and engage these communities early in the process. The OWOW 2.0 process recognizes the various funding needs for DACs and Tribes, and the Federal and State funding programs available to them.
- From engaging and speaking with DAC residents and attending Tribal Council meetings, it is evident that there is a need for continuous networking resulting in consensus based development and implementation of project solutions.

Government Alliance Pillar – Key Findings

- Ensure that Federal and State agencies effectively partner in the management of water and other resources within the watershed, and consider other Pillars' perspectives in their support of OWOW goals and objectives.
- Periodically publish updates of the Resource Guide and post them on SAWPA's website.
- Use the Resource Guide's agency contacts, and assure that steps are taken to keep all information current.
- Continue coordination with various governmental agencies, as appropriate, for all proposed projects, initiatives, and integrated water and related resources activities to help identify necessary environmental compliance requirements and or potential areas of conflict.

Energy and Environmental Impact Response Pillar – Key Findings

- Annual surface water is likely to decrease over future periods with precipitation showing somewhat long-term decreasing trends. Temperature will increase, which is likely to cause increased water demand and reservoir evaporation. Projected decreases in precipitation and increases in temperature will decrease natural recharge throughout the basin.
- Management actions such as reducing municipal and industrial water demands or increasing trans-basin water imports within the watershed may be required to maintain current groundwater levels.
- Warmer temperatures likely will cause Jeffrey Pines to move to higher elevations and may decrease their total habitat. Forest health also may be influenced by changes in the magnitude and frequency of wildfires or infestations. Alpine ecosystems are vulnerable to climate change because they have little ability to expand to higher elevations.
- Increasing temperatures will result in a greater number of days above 95°F in the future. The number of days above 95°F gets progressively larger for all cities advancing into the future.
- Simulations indicate a significant increase in flow for 200-year storm events in the future. The likelihood of experiencing what was historically a 200-year event will nearly double (i.e. the 200-year historical event is likely to be closer to a 100-year event in the future). Findings indicate an increased risk of severe floods in the future, although there is large variability between climate simulations.
- Sea level rise is likely to inundate beaches and coastal wetlands and may increase coastal erosion. The effects on local beaches depend upon changes in coastal ocean currents and storm intensity, which are highly uncertain at this time. Sea level rise will increase the area at risk of inundation due to a 100-year flood event.
- Existing barriers are sufficient to deter seawater intrusion at Talbert and Alamitos gaps under a 3-foot rise in sea levels. However, operation of barriers under sea level rise may be constrained by shallow groundwater concerns.

To further enhance the integration and linkages among the recommended conceptual implementation actions suggested by the Pillars, Pillar Integration Workshops were conducted by SAWPA throughout the OWOW 2.0 Plan development period. The integration workshops included discussion of system-wide regional or watershed scale implementation actions, addressing different components of the hydrologic cycle, evaluating linkages among proposed projects/programs, and developing and identifying synergy among projects and programs to create anew.

OWOW 2.0 Plan – Future Implementation

During the last two years, Pillars have been working together to write the next integrated water plan, OWOW 2.0. The Broad Planning/Management Guidance Strategies were distilled from that work and will serve to guide future planning and management in the watershed. The strategies reflect a change in thinking about water resource management. Historically, water activities were organized into different silos, and managers worked to achieve separate and individual goals that were thought to be unrelated. The water supplier's goal was to deliver water for a growing population and economy. The flood control manager's goal was to channelize stormwater to get it out of the community before it could harm people and property. The wastewater manager's goal was to highly treat wastewater before it is discharged into the river or ocean to be carried away. Managing the watershed and water resources as done in the past realized narrow singular goals, but did so with tremendous unintended consequences. The list of endangered species only grew longer, as did the list of impaired water bodies. Societal values have changed, water and funds are scarcer, and together we have realized that the old way is no longer viable.

These Broad Planning/Management Guidance Strategies are not projects or programs themselves. These strategies represent a shift from remediation to protection. It is the opportunity to be proactive rather than reactive. This can facilitate the vision we want, a sustainable and productive watershed, rather than only focusing on solving the problems that past practices have created.

These watershed planning and management strategies are separate and distinct from priorities assigned to evaluate projects for funding that are often dependent on the grant sponsoring agency criteria. These Planning/Management Strategies are meant to guide planning efforts and are *in no particular ranked or priority order* as shown below.

- **Demand Reduction and Water Use Efficiency**

Water use efficiency practices remain a key resource management priority for the watershed and a cost effective tool for reducing the gap between available supplies and projected demand. This is reflected through a reduced per capita water use as well as potentially reduced commercial and industrial water use. Although significant progress is anticipated with mandated reductions through 20% by 2020 legislation, more can be done. Many water use efficiency actions have been implemented locally, but these can be scaled watershed-wide. These include water rates structures that encourage conservation, also known as budget-based water rates, garden friendly landscaping and landscape ordinance application, smart controllers and irrigation nozzles, and turf buy-back programs, to name a few. The last acre foot of water is often the most expensive, reducing that cost goes far to keep water rates stable.

Monitoring data shows wasteful irrigation runs off yards, down streets and culverts collecting pet waste and pollution until it hits the receiving water with a toxic slug causing beach closures and fish kills. At great expense, cities have been tasked to clean up this dry weather urban runoff pollution. This cost can be avoided with successful water use efficiency.

It is understood too that there is a direct link of water use efficiency with energy efficiency and GHG emission reduction.

- **Watershed Hydrology and Ecosystem Protection and Restoration**

Implementing cost effective programs will protect and restore our watershed's ecosystem and hydrologic system so that it will sustainably produce the array of services including water resources. Recognizing that the Santa Ana River Watershed has multiple interrelated parts, a holistic approach to solving issues of supply, quality, flood, and ecosystem management is necessary. This approach recognizes that in order to achieve a healthy productive watershed, improvements starting at the top of the watershed with a healthy and managed forest effectively support downstream stormwater attenuation and runoff capture and water quality improvement. The emphasis is on source control rather than end-of-pipe treatment as a best management practice. Implementation actions under this priority include forest management, pollution prevention, low impact development, stormwater capture and flood management, and MS4 stormwater implementation.

- **Operational Efficiency and Transfers**

Cooperative agreements arising from water transfers, exchanges, and banking can resulted in better use of water resources. With the rich groundwater storage opportunities available in the watershed, expanding the groundwater storage with a variety of available water sources can be more much more cost effective than new surface storage. Such agreements will result in our ability to stretch available supplies and replace the storage lost by a shrinking snowpack. Projects under this category occur by collaboration and cooperation among the multitude of agencies and entities in the watershed, and agencies that import water into the watershed, expanding on the many past successful water agreements within the watershed. New banking agreements can represent both habitat mitigation banking as well as groundwater banking. These agreements only can occur by entities working together and opening doors to improved efficiency and increased water supply reliance.

- **Innovative Supply Alternatives**

This strategy recognizes the need for more progress in a portfolio approach with expansion of innovative and effective 21st Century technology for water production, recycling, pumping, and desalinization. Traditionally these projects serve as an important component to achieving water supply reliability. Moving forward, a broader range of tools is available to us to serve both economic and environmental objectives. Projects under this category provide multiple benefits and thus can be mutually reinforcing. Brackish desalination and salinity management are necessary to sustain local supplies. Salinity management is essential for groundwater basin health in the watershed.

- **Remediation and Clean up**

Another strategy is implementing Total Maximum Daily Loads (TMDLs) and pollution remediation. Projects under this category must reflect projects that have region wide benefit, are integrated and have multiple benefits without a focus only on local or single purpose needs. Under this strategy, the focus is on preventing pollution and dealing with the pollution that has already occurred. This reflects a desire to duplicate the successes already established in the watershed to prevent and remediate pollution.

The Broad Planning/Management Guidance Strategies were presented and discussed with the Pillars and other stakeholders for possible prioritization of the five strategies. The feedback received is that all five strategies are a priority to the watershed. But as stakeholders of the watershed, entities are encouraged to consider the long term watershed planning approach as they consider competing alternatives to meet needs and give more merit or attention to strategies such as water use efficiency that has been traditionally found to be more cost effective in reducing water demands and generating water supply. Further, projects should consider system wide benefits before other alternatives. This applies particularly to pollution prevention at the source rather than having to address a chain of unintended and possibly negative consequences downstream for future generations.

Shown below is a list of Pillar Recommended Implementation Actions that were prepared based on the Pillar's work and other stakeholder input. These regional implementation actions are not listed in priority, nor are they in any particular order. They represent the integrated work of the Pillars that resulted from their collaboration internally and with other Pillars and are the solutions to the challenges that they identified in each of their Pillar chapters. This list does not represent a list of projects that been rated and ranked projects under the more formal Project Review Process defined under the OWOW 2.0 Plan. However, they are recommended implementation actions that reflect an emphasis on integration and system-wide solutions to the watershed challenges and include the 13 watershed-wide framework concepts previously discuss.

Each of the Pillar-recommended watershed-wide implementation actions eventually could become projects once they are more fully investigated and analyzed. Multi-agency project proponents for these implementation actions have not have been identified yet. It is anticipated that these recommended actions may best help fulfill the vision of the OWOW 2.0 Plan.

Pillar Recommended Implementation Actions

(In no particular order)

Title	Description
Water Rate Structures that Encourage Conservation	Create incentive programs for retail water agencies in the watershed to reduce water demand and help meet SBX7-7 required demand reductions.
Water Use Efficiency Incentive Program	Create an incentive program for expanded water use efficiency programs including cash for grass, landscape retrofit support, and California-friendly plant discounts. Utilize IEUA Residential Landscape Transformation Program and MWDOC Comprehensive Landscape Water Use Efficiency Programs as template.
Watershed Exchange Program	- Upper watershed foregoes development of more water recycling and provides future treated wastewater to the lower watershed via the Santa Ana River - Lower watershed provides “replacement” water to upper/middle watershed
Wet Year Imported Water Storage Program	- Upper watershed and MWDSC would implement this strategy - Goal: change MWDSC place of storage from Central Valley to Santa Ana River watershed - Develop MWDSC pricing structure to encourage more storage in watershed - Water stored in wet years for a reduced price. Water pumped in dry years for remaining Tier 1 price
Enhanced Santa Ana River stormwater capture below Seven Oaks Dam	Additional stormwater detained by Seven Oaks Dam could enable the diversion of up to 500 cfs and up to 80,000 acre-feet per year. This may require execution of new water rights agreement among SAR Watermaster parties.
Off River Storage and Supply Credits	Additional stormwater capture along the SAR tributaries could enhance capture/ recharge. Specific locations in the watershed would need to be defined. New recharge projects could allow for purchase of “MS4 Credits” by cities and counties as part of new development as a regional MS4 compliant recharge project.
Re-Operate Flood Control Facilities	Working with flood control agencies re-operate flood control facilities with the goal of increasing stormwater capture increasing flood get away capacity and revising decades old storage curves. Without 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”. This strategy has already been successfully implemented in some portions of the watershed.
Increase Surface Water Storage	Helps offset drought and climate change while also increasing watershed sustainability and less dependence on imported water. This project would supplement but not replace existing or proposed groundwater storage.
Increase Groundwater Storage	Helps offset drought and climate change while also increasing watershed sustainability and less dependence on imported water.

Title	Description
Inland Empire Garden Friendly Demonstration and LID Project	Using the Inland Empire Garden Friendly Program as a template, a demonstration project is proposed to quantify the benefits of installing Inland Empire garden friendly products and further demonstrate Low Impact Development features in a DAC neighborhood. The project would be modeled in part after the successful City of Santa Monica Garden-Friendly Project, as well as the Elmer Ave. Neighborhood Retrofit project in the LA Basin.
DAC Water Supply or Water Quality Improvement Projects	Provide funding support to assure drinking water standards are met such as in the County Water Company of Riverside near Wildomar. Construct new sewer system for the areas that have failing septic systems/undersized treatment facilities like Beaumont Cherry Valley.
Wetlands Expansion Watershed wide	Create new wetlands along the tributaries of Santa Ana River to provide for natural water quality improvement, ecosystem restoration and recreational opportunities. Water supply for such wetlands would be dry weather urban runoff and available recycled water and would be patterned after the Mill Creek Wetlands in Chino Basin.
Watershed wide Multi-Use Corridor Program	Create multi-use corridors along SAR and its tributaries and Upper Newport Bay tributaries in all three counties in watershed to provide for sustainable wildlife corridors, stormwater attenuation and capture, flood control, sediment reduction and erosion restoration, enhanced NPS pollution treatment, removal of non-native species, and creation of recreational trails,. In Riverside County, along Temescal Wash, in San Bernardino in San Timoteo Wash, in Orange County along Borrego Canyon Wash between Irvine Blvd and Town Center Drive.
Multi-Species Habitat Plan for Gap areas of Watershed	Create multi-species habitat plan for San Bernardino County and portions of Orange County. Though work is underway on the Upper Santa Ana Wash Land Management and Habitat Conservation Plan, there is no MSHCP covering the growing areas of southwestern San Bernardino County. Western Orange County is also not covered by an MSHCP.
Water conservation recharge optimization program	Establish a water conservation-recharge optimization plan for existing and potential future flood control facilities, using the example work of the Chino Basin Recharge Master Plan and implementation projects as a template.
Watershed wide geodatabase access	Connect existing county or program-specific geodatabases to create a comprehensive watershed geodatabase that provides access to appropriate stakeholders, and set up a data quality control and maintenance program. The main component County MS4 geodatabases are well under way.
Forest Restoration Projects	Expand forest restoration through fuels reduction, meadow and chaparral restoration projects to strategic areas above major stormwater recharge basins for flood control, water supply and water quality benefits.
Residential Self-Regenerating Water Softener Removal Rebate Program	Removal of self regenerating water softeners has been proven as an effective strategy to reduce TDS levels at WWTP and assure future salt discharge requirements. The project provides watershed-wide rebates and would be a joint program among water agencies in the watershed.
Salt removal projects to achieve Salt Balance	Expand groundwater desalination to key groundwater basins where TDS and Nitrate concentrations are approaching discharge limits. Locations may include Elsinore Basin, Perris Basins in EMWD and Riverside Basins.

Title	Description
Enhanced stormwater capture from the tributaries of the Santa Ana River	Develop additional stormwater capture projects along the SAR tributaries that support key groundwater management zones identified by SB, RV, and OC Geodatabases. Early estimates indicated a capture potential of 12,000 AFY.
Conjunctive Use Storage and Water Transfer Project using Wet Year and Dry Year Allocation	This project concept proposes a purchase by downstream entities of up to 45,000 AF of imported water to be recharged by the upstream agencies during wet years. Water would be purchased at a reduced imported water rate from MWD reflecting the savings of not storing the SWP water at one of MWD's own storage programs such as the Semi-Tropic Water Storage District and/or Kern County Water Bank. In dry years, downstream agencies could request upstream agencies to increase their groundwater production for three years by up to 15,000 AF per year in-lieu of direct deliveries from MWD, while MWD increases deliveries in the downstream area by an equal amount.
Salt Assimilative Capacity Building and Recycled Water Transfer Project	EMWD has the capability to discharge 15,000 AFY of recycled water into Temescal Creek. The recycled water discharge will be dependent on surplus recycled water available and not used within EMWD particularly during wet seasons. With the approval of the SAR Watermaster, this flow can be contractually added to the Santa Ana River base flow allocation at Prado. The water quality of EMWD's discharged recycled water may require some salinity mitigation by downstream parties to meet the RWQCB Basin Plan Objective in Orange County. The GWRS will be used to provide the required mitigation for the discharged water, and EMWD will pay downstream parties for the cost of that mitigation.
Riverside Basin Aquifer Storage and Recovery Project	Riverside Public utilities, in partnership with Valley District and others are developing a design for a rubber dam that would cross the Santa Ana River and be used to divert flows, while mitigating environment impacts. The project is currently anticipated to capture and recharge 15,000 AFY.
Watershed Invasive Plant Removal Project	The Santa Ana Watershed Association, the Front Country District Ranger on the San Bernardino National Forest and Southern California Edison had proposed a major an invasive plant eradication project for the Mill Creek Watershed. This project proposes to expand the San Bernardino Mountains Front Range Invasive Plant Removal Project to an invasive plant removal and restoration project in the Santa Ana River Watershed that has many partners and stakeholders extending from the coast to the headwaters.
Regional BMPs to manage municipal stormwater discharges	Develop regional BMPs including infiltration, harvest & reuse, and biotreatment as proposed under current MS4 Permits. Initial phase would be located in MSAR Pathogen TMDL area and expand into other areas of the watershed under future phases to address pathogen treatment.
Watershed-wide coordinated surface water monitoring program	Surface water quality monitoring is not coordinated within the watershed leading to duplicative sampling in some areas and inadequate sampling in others. In some cases this may lead to 303(d) listings that do not reflect real impairments. A new program to coordinate surface water quality monitoring to enhance efficiency and reduce costs is proposed. Sources of monitoring data would come from MSAR Watershed TMDL, SWQSTF, MS4 Stormwater Permits, and SCCWRP Bioassessment Program.
Watershed Urban Runoff Management	Establishing a Watershed Based Urban Runoff Management Fund to support the implementation of stormwater management programs. Components of this program

Title	Description
Fund	could include the regulatory basis for a watershed based program, the legal basis and authority for the fund, the agreements, and programmatic elements.
Santa Ana River Sediment Transport	Building upon an OCWD demonstration project, implementation of a full scale project that allows for the appropriate transfer of sediment to maximize recharge operations, restore habitat, and reduce operation costs.
Transportation Corridor Stormwater Capture and Treatment	New uses of the current transportation right of ways can be expanded to for capturing rain runoff and replenishing groundwater basins.
Modified Watershed Brine Management System	Optimizing the water used to transport brine so that less water is lost to the ocean through increased concentrating of brine or delivery to the Salton Sea for beneficial use.
Water Industry Energy Use Reduction Incentive Program	Supporting regional purchase and installation programs of water resource related greener energy projects that reduce capital costs and green house gas emissions.
Watershed Land Use Planning Tool Kit	Developing a tool kit that translates water principles to support watershed planning decisions and implements a jurisdictional outreach effort for relevant regional, county and city planning agencies that encourages adoption of the guidance ideology into General Plans and zoning codes at the local level.

OWOW Projects and Benefits

It is the intent of the OWOW planning process to transcend specific funding cycles. Projects are included in the OWOW 2.0 Plan based on the latest rating and ranking criteria and their merit to address the watershed's strategic needs, regardless of available funding opportunities at any given time. (See list in **Appendix K**)

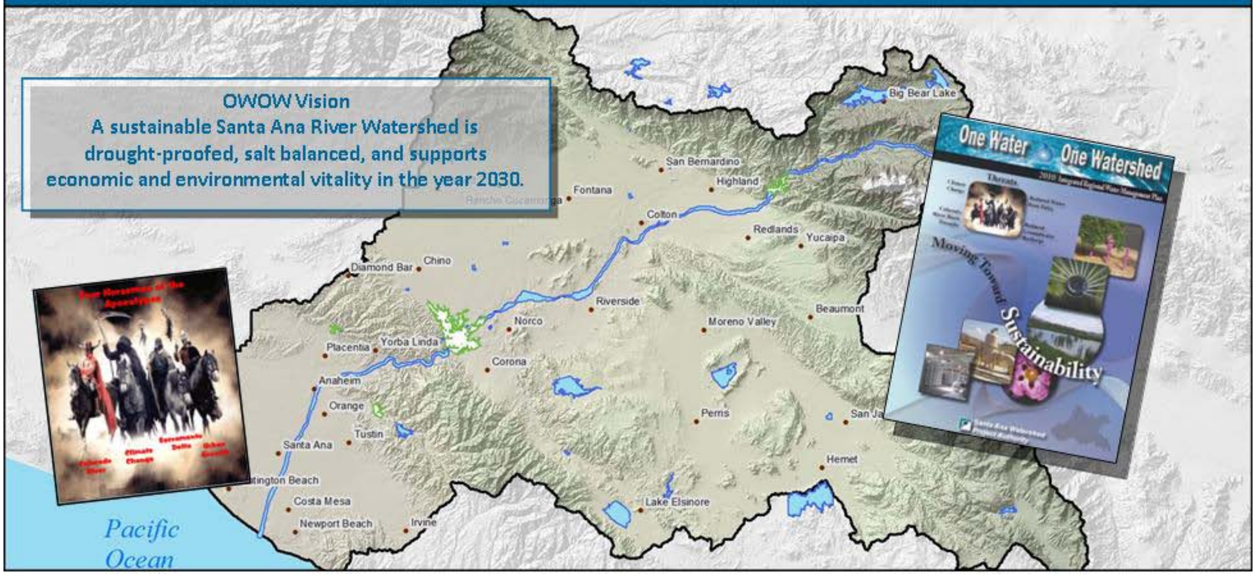
Shown below is a list of the Round 1 Proposition 84 projects and the benefits that ultimately will be realized once all these projects are fully constructed. Round 2 projects submitted by SAWPA are under consideration by DWR for future grant funding with awards anticipated in early 2014.

OWOW Proposition 84, Round 1 Projects

Project	Project Sponsor	Total Local Cost	Grant Amount	Other State Funds Being Used	Total Cost
Groundwater Replenishment System - Flow Equalization	OCWD	$14,399,680	$1,000,000	$0	$15,399,680
Sludge Dewatering, Odor Control, and Primary Sludge Thickening	OCSD	$137,115,600	$1,000,000	$0	$138,115,600
Vireo Monitoring	SAWA	$269,207	$600,000	$0	$869,207
Mill Creek Wetlands	City of Ontario	$14,355,000	$1,000,000	$5,000,000	$20,355,000
Cactus Basin	SBCFCD	$8,250,752	$1,000,000	$0	$9,250,752
Inland Empire Brine Line Rehabilitation and Enhancement	SAWPA	$698,153	$1,000,000	$5,234,576	$6,932,729
Arlington Desalter Interconnection Project	City of Corona	$948,049	$400,000	$0	$1,348,049
Perris II Desalination Facility	EMWD	$1,335,752	$1,000,000	$0	$2,335,752
Perchlorate Wellhead Treatment System Pipelines	WVWD	$419,000	$1,000,000	$0	$1,419,000
Chino Creek Wellfield	WMWD	$5,331,118	$1,000,000	$0	$6,331,118
Impaired Groundwater Recovery	IRWD	$36,321,970	$1,000,000	$0	$37,321,970
Alamitos Barrier Improvement Project	OCWD	$10,571,600	$1,000,000	$0	$11,571,600
Arlington Basin Water Quality Improvement Project	WMWD	$3,443,636	$1,000,000	$0	$4,443,636
Grant Total		$233,459,517	$12,000,000	$10,234,576	$256,354,097

- Reduces water demand by 11,200 AF/YR
- Captures 16,300 AFY of stormwater for recharge
- Produces 28,600 AFY of desalted groundwater while removing 21,600 tons of salt
- Creates 90,400 AFY of new water recycling
- Creates 16,400 AF of new storage
- Improves water quality to 7,800 AFY
- Creates or restores 400 acres of habitat
- Leverages $11.7 million in grants funds with $240 million on local funds
- Creates about 3900 construction related jobs for region

1.1 Overview



Santa Ana River Watershed

The One Water One Watershed (OWOW) Program provides a comprehensive view of the watershed and water issues encompassing all sub-regions, political jurisdictions, water agencies, and non-governmental stakeholders (private sector, environmental groups, and the public at large) in the watershed. It is one in which all types of water (imported, local surface and groundwater, stormwater, and wastewater effluent) are viewed as components of a single water resource, inextricably linked to land use, habitat, and that endeavors to limit impacts to natural hydrology.

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 Authority (SAWPA). The Steering Committee is supported by technical experts and stakeholders grouped into ten disciplines (known as Pillars), ranging from water supply reliability and quality, to climate change, to environmental justice.

SAWPA acts as the Regional Water Management Group for the process. While SAWPA facilitates the planning process, provides technical input and support through its staff and consultants, the development of the goals and strategies of the Plan, as well as the decision making process, are prepared by the Steering Committee with support of the Pillars, and with consideration to comments from the public at large.

The collaborative, transparent, and watershed-wide view embraced by the OWOW planning process from the onset, builds upon previous planning efforts in the watershed, and seeks to change the way that water and other environmental resources are managed, moving from reliance on large centralized infrastructure projects to a systems approach that complements existing centralized infrastructure with decentralized facilities (e.g., groundwater desalination), technology, natural infrastructure and human capital.

In 2011, SAWPA received funding to update the 2010 OWOW Plan to address the new IRWM Program Guidelines, and implement this process of moving from a water supplier to a water resource manager mentality. The resulting 2013 OWOW 2.0 Plan advances a paradigm change from water supply to an integrated water resource management mentality; moving from a mission of providing abundant high-quality water at the lowest cost possible, to one in which water resources are managed in a sustainable manner and with regard for the needs of the environment and those downstream. Rather than investing more or working harder on the ways of the 20th century, OWOW 2.0 seeks a new approach that is lighter on the land, and protects habitat and a sustainable future for a robust economy and healthy environment. This Plan, in keeping with requirements of the Department of Water Resource's Proposition 84 IRWM Planning Grant award, and the November 2012 IRWM Proposition 84 and 1E Program Guidelines, documents the current IRWM program and processes that have evolved through the OWOW planning process, and is organized according to **Table 1.1-1**.

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

DWR IRWM Plan Standard	2013 OWOW 2.0 Plan Chapter
Governance	Chapter 2: Governance, Outreach, and Integration
Region Description	Chapter 3: Watershed Setting
Objectives	Chapter 4: Regional Goals and Objectives
Resource Management Strategies	Chapter 5: Water Management Strategies and Integration
Integration	Chapter 2: Governance, Outreach, and Integration Chapter 5: Water Management Strategies and Integration
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 and Plan Performance/Monitoring
Data Management	Chapter 9: Data Management and Plan Performance/Monitoring
Finance	Chapter 8: Finance
Technical Analysis	Chapter 9: Data Management and Plan Performance/Monitoring
Relation to Local Water Planning	Chapter 5: Water Management Strategies and Integration
Relation to Local Land Use Planning	Chapter 5: Water Management Strategies and Integration
Stakeholder Involvement	Chapter 2: Governance, Outreach, and Integration
Coordination	Chapter 2: Governance, Outreach, and Integration
Climate Change	Chapter 5: Water Management Strategies and Integration

1.2 OWOW Plan 1.0
Moving Towards Sustainability

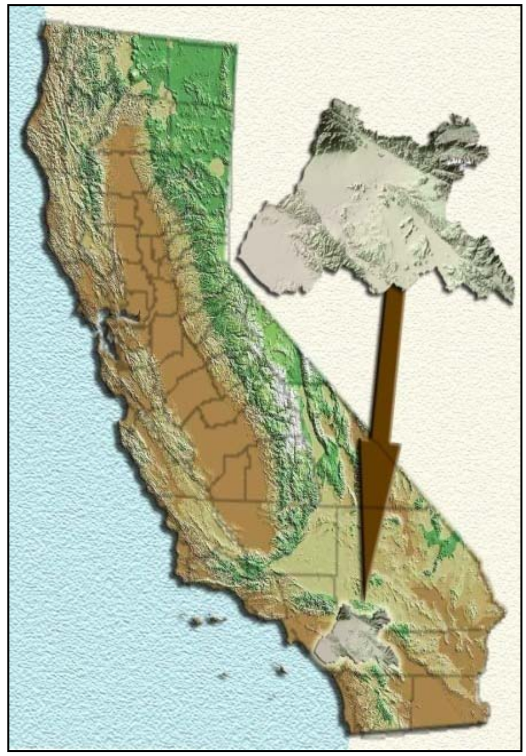
Wild pigs drinking from the Santa Ana River

The Planning Process

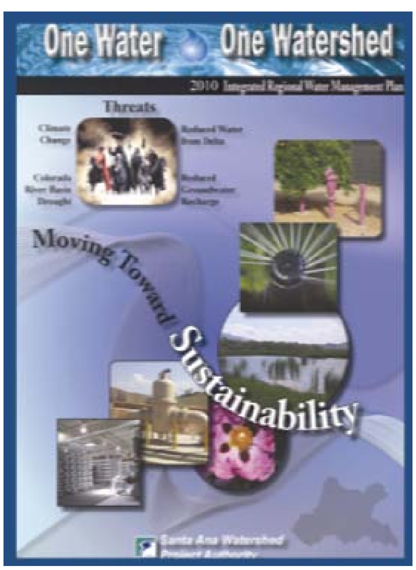
The development of this One Water One Watershed (OWOW) 2.0 Plan is built upon the planning process of the past to address the challenges of the future. The first phase of OWOW, known as *OWOW 1.0*, produced a broad-based, stakeholder-driven assessment of the watershed. Rather than engage a consultant to prepare a plan, SAWPA developed and convened a process whereby all segments of the water community worked in various workgroups called "Pillars" to produce an Integrated Regional Water Management Plan (IRWMP) for the watershed. Over 300 stakeholders described current conditions within the watershed and developed specific strategies and targets to make the watershed sustainable in 2030.

All aspects of water were considered, 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. At the conclusion of OWOW 1.0, the Steering Committee recommended funding several new integrated projects under Proposition 84 Integrated Regional Water Management (IRWM) funding that provide regional benefit. A wide variety of projects was selected 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, leveraging scarce resources for many purposes.

With the development of integrated watershed planning, multi-benefit and multi-purpose projects have moved to the forefront and have become one of the primary goals of the OWOW implementation. Past efforts, with a few notable exceptions, primarily focus on single purpose projects. The additional effort required to develop multi-objective solutions has made true multi-benefit projects relatively uncommon. In California, much of which has been prompted by SAWPA's historical integrated watershed programs, there has been an effort to incentivize collaborative planning through IRWM planning and associated funding sources.



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



Although OWOW planning identifies numerous projects that implement the OWOW vision, the need exists to continually develop high level watershed management concepts, that when implemented, create the opportunity to make significant strides in efforts to make this watershed fully sustainable from a water resource perspective within a 30-year planning horizon. Inherent in this effort is the need to understand where we are today, and identify where we collectively want to be as a watershed in the future. SAWPA began efforts in 2011 to update and refine our IRWMP as the OWOW 2.0 Plan, and take the vision to the next level, encouraging stakeholders to focus on the key water resource management needs in the watershed, and to identify high-level watershed concepts for further development. With this vision in mind, regional stakeholders have been able to work collaboratively, thus improving the process associated with resource planning.

OWOW 1.0 Challenges

Significant water crises have arisen over the past decade, prompting SAWPA and regional stakeholders to collaboratively find solutions. A vision for the watershed was established as a sustainable watershed that is drought-proofed, salt-balanced, and that supports economic and environmental viability. To achieve this vision, stakeholders under the OWOW 1.0 Plan agreed to address four major threats that SAWPA has labeled as the *Four Horsemen of the Apocalypse*. They are:

Climate Change resulting in reduced water supplies combined with increased water needs in the region.

Colorado River Drought Conditions resulting in threats to imported supply due to upper basin entitlements and continued long-term drought.

San Joaquin Delta Vulnerability resulting in reductions or loss of supply due to catastrophic levee failure or changing management practices of the Delta.

Population Growth and Development resulting in interruptions in hydrology and groundwater recharge while increasing water needs.

Further description as to why these crises must be addressed herein follows.

Climate Change

One horseman impacting not just our region or State, but the entire world, is climate change. Climate change is occurring and must be addressed immediately to offset the impacts to water resources and the environment. The International Panel on Climate Change has stated that the world's climate is warming by an average of 1.3 degrees Fahrenheit in the past century. Unless current trends are reversed, global warming is projected to keep increasing and raise temperatures by as much as 11.5 degrees by the end of the century. The California Department of Water Resources' report entitled, *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water*, details how climate change already is affecting the State's water supplies, and sets forth a number of recommendations to help avoid or reduce climate change impacts to water resources. The report indicated that global warming will present significant challenges to future water supply, water quality, ecosystem protection, and flood management.

Assessments on water supply and other impacts from climate change indicate likely reductions in snow pack, earlier and larger peak stream flows, potential reduction in runoff, greater evaporative losses, declining ecosystem health, sea level rise, and more extreme weather events, including flood and droughts. Other management activities affected by climate change include the need to consider energy use and greenhouse emissions of water resource projects, as well as the regional vulnerability of water systems.

Colorado River Drought Conditions

In addition to the statewide drought, another horseman of the Apocalypse that has impacted the Santa Ana River Region is the growing threat of possible future imported water flow decreases to Southern California from the Colorado River. For most of the first decade of the 21st century, the Colorado River Basin experienced some of the driest consecutive years in the history of the basin. If similar drought conditions were to continue, reservoirs along the river, such as Lake Powell and Lake Mead, will continue to drop, and thereby reduce storage releases and energy production.

As reported by N. Christensen in his 2004 Climate Change report, *The Effects of Climate Change on Hydrology and Water Resources of the Colorado River Basin*, projections show that by 2050 the Colorado River flow would decline by 18% with the average Colorado River Basin water storage declining by 32%. Experts conducting studies of tree ring data in the Colorado River Basin have determined that severe and prolonged droughts, lasting up to 60 years or more, have occurred in the past and likely will occur again. As population continues to grow throughout the dry desert southwest, the water levels at Lake Powell and Lake Mead likely will continue to drop, with some projections indicating that the lakes may become dry by 2025.

Metropolitan Water District of Southern California, which serves as the importing water agency for most of Southern California, relies heavily on the flows from the Colorado River Aqueduct to assure that water demands are met. Because the drought conditions, as well as climate change, impact the entire Colorado River Basin, river flows are anticipated to decrease. Although under the Colorado River Compact Agreement, Southern California has senior water rights, and under the Quantification Settlement Agreement, is limited to 4.4 MAF. Greater stress will be upon all the Colorado River Compact Agreement parties to reopen the settlement agreement, as drought conditions exacerbate the ability of all parties to take from the river to meet their continued water demands.

San Joaquin Delta Vulnerability

The San Joaquin Delta is home to over 750 plant and animal species. Out of 29 identified indigenous fish species, 12 of them are threatened either with extinction or already have become extinct. Endangered species include the spring-run and winter-run Chinook salmon and the Delta smelt. Other fish species are threatened as well, including longfin smelt, threadfin shad, and striped bass. Water diversions, urban development, loss of habitat, impaired water quality due to pesticides, and increased competition from invasive species, are all factors thought to be influencing the decline. Many scientists have warned that an ecological crash of the food web and the Delta food web is possible.

The crisis of the Delta centers not just on water pumping issues, but also on the condition of the Delta's levees, many of which were not properly designed. Concerns have arisen that if several key levees should fail, due to increasing sea levels or earthquake conditions, water deliveries could be interrupted again. Looking long-term, rising sea levels caused by climate change also could push additional salt into the Delta, potentially affecting the quality or availability of drinking and irrigation water. Further, climate change also likely will reduce snow pack affecting the volume of water available for export. As a result, public agencies are working together to find a solution to the co-equal Delta goals of reliable water supply deliveries from the Delta and ecosystem restoration, at the same time becoming less dependent on Delta water to meet local water demands for the future.

Population Growth and Development

Most of the precipitation and snowmelt runoff occurs in the northern part of California, but the majority of the population lives in the drier central and southern portions of the State. This imbalance is not expected to change. According to population estimates issued by California's Department of Finance, Southern California counties will add more than five million people between now and 2050, an increase of 25% over the 2010 census numbers. Los Angeles is expected to remain the most populated county in California, followed by Riverside County, San Diego County, San Bernardino County, and Orange County, all of which portions of the most heavily populated areas fall within the watershed. With the projected increases in population growth, efforts to assure adequate water supply for the region will become more difficult. The crisis to water resources is not the growth of development *per se*, but how the water is used in new development that assures sustainability.

Huge areas of land gradually are being paved over in the watershed, which historically captured and recharged natural runoff into the groundwater and provides important replenishment water for pumping. Instead, the runoff from development is directed to storm sewers and channels that discharge to downstream rivers and streams and eventually are lost to the ocean. This tremendous amount of water that is no longer percolating into the ground is picked up along parking lots and streets and further contaminated by oil, grease, trash, bacteria, and fertilizer additives applied to adjacent landscaping. These byproducts represent a major water quality threat to downstream water bodies, many of which have been listed by water quality regulators as impaired, requiring total maximum daily loads. Taken cumulatively, the water lost from the resulting development when sustainable land use and water use practices are not in place, if continued unchecked, will become a major water crisis for the region, and is one of the four horsemen of the Apocalypse impacting water resources. The need for a water ethic for the preciousness of water, increased water capture and percolation, and improved land use practices will be required to handle this looming problem.

1.3 OWOW Plan 2.0
Moving into Implementation

Santa Ana River

Moving into Implementation

Building upon its statewide leadership role in integrated water resources planning since 1998, SAWPA and its stakeholders have worked hard to ensure that the integrated water resources planning for the Santa Ana River Watershed program not only meets the California Department of Water Resources (DWR) Integrated Regional Water Management (IRWM) Guidelines, but also actually raises the bar of what an Integrated Regional Water Management Plan (IRWMP) can achieve. By the OWOW 1.0 Plan and our previously approved and successful salt/nutrient management plan, SAWPA also has expanded its collaboration and stakeholder involvement to a broader and more effective level. The integrated regional water resource management approaches conducted in the past have set the framework to address needs for years to come.

However, as the next OWOW update was contemplated, rather than working harder on the old model, SAWPA resolved to create a new model so that stakeholders were not creating the same problems that we still are working to resolve. Instead, a new level in IRWMP planning was envisioned, whichbrings the process to an even higher and more effective model using a *system-wide approach* that creates a new template for collaboration and water management. Past IRWM plans have focused on the water supply professional, often with a focus on water supply reliability and assuring that additional imported water could be brought to regions to address ever growing demands. However, in light of the ongoing water scarcity challenges facing the State and our watershed, SAWPA recognized the need to establish a new planning approach that creates the catalyst for change that could potentially apply to all regions across the State.

This approach is different in that all sectors of our community (water suppliers, water consumers, stormwater managers, parks and recreation providers, environmental stewards, developers, etc.) would be encouraged to adopt a water ethic that focuses on living within our means and living in the environment that nature has given us. It also is recognizing that excessive irrigation water use and waste creates downstream pollution. Often the problem in achieving solutions is not data gathering, but rather the sharing of existing water information so that water consumers can become the true stewards of water. That information is made available to all levels of the public to better understand where their water comes from, how it is used, what impacts we have on it, and where it goes after it is used. New or expanded existing Web-based tools would be developed to answer this need.

Creating Anew

SAWPA, under OWOW 2.0 planning, sought to expand collaboration across multiple jurisdictional and institutional boundaries so that natural hydrology is restored, aquifers are protected, ecosystems are enhanced and improved, landscapes are developed appropriate to the arid environment in which we reside, and where people are not using water for waste transport downstream. The work addresses and recognizes the upstream and downstream dynamic. Through these efforts, we sought to resolve conflicts that will arise when more and more stormwater and recycled water is captured and stored upstream as a result of low-impact development and recharge and reuse activities, resulting in less water flowing downstream for their capture and reuse. Water quality challenges would be addressed resulting from nonpoint source pollution carried by stormwater, which is often captured and then recharged into our groundwater basins and aquifers for later use as a drinking water supply. Furthermore, this plan would create effective outreach and liaisons with disadvantaged communities, environmental justice communities, Native American Tribes, and land use planning sectors that would be key to implementing this new paradigm in integrated water resource planning.

Highlights of New Model in IRWM Planning

As a first step, SAWPA developed a work plan that proposed to raise the bar so that all IRWM Plan Standards are met, all DWR IRWM program preferences are addressed, and the vision for the region is achieved. To accomplish this end and still achieve the OWOW Plan goals and objectives, a new integrated water management plan for the Santa Ana Region was proposed to focus on the following areas.

Water Demand Reduction Strategies

Developing education and outreach actions that encourage implementation of tier-based allocated water conservation rates for not just some, but all retail water agencies in the watershed. This encourages programs such as “Cash for Grass” and indoor water efficient appliance rebates, outdoor irrigation efficiency measures, and implementation of new programs where landscaping and irrigation experts are hired to educate homeowners, homeowner associations and businesses in better methods. It also provides incentives to retrofit high water use lawns and greenways into California Friendly and Water Smart landscaping. This education process would be supported by the development of new or expanded Web-based interactive tools that reach down not only to the water professional, but also to the public, increasing awareness of the full water cycle and water quality impacts to quality of life issues. These tools also would allow the public to continue to enjoy a high quality of life with less per capita water use.

Water Quality Improvement and Awareness

Creating processes to assure that water sources used to replenish local supplies are safe and clean for public and environmental uses. With increased capture and collection of rainwater with subsequent recharge to local groundwater, assurance must be achieved that nonpoint source pollutants are addressed. Web-based tools would be developed or expanded upon so that the public has full access and an awareness of local water quality conditions of their lakes, streams, and beaches that they may be used for recreation throughout the region.

Targeted and Expanded Community Outreach

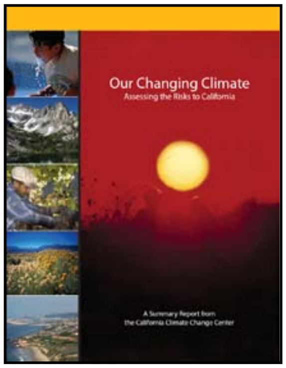
Conducting outreach actions that reach deeply into disadvantaged communities, environmental justice communities, and Native American Tribal communities to support their needs for clean, safe, and reliable water supplies; using trusted facilitators with native language skills that connect with communities rather than relying on surveys or mailers that often are poorly translated and fail to address the water related needs of these communities.

Restore Natural Systems and Hydrology

Establishing systems where hydrology is restored to its natural paths while preserving environmental habitat, parks and recreation opportunities. Exploring opportunities where mutual benefit projects can be identified that capture, store, and infiltrate rainwater with the assurances that the water is clean and safe for people and wildlife. Continuing the planning and removal of non-native, water-thirsty plants will restore the region's habitat and save water as well.

Expand Collaboration

Build upon past successful collaboration models to create bridges to key U.S. and State landholders in the region such as the U.S.D.A. Forest Service, U.S. Bureau of Land Management, March Air Reserve Base, California State Parks, and Natural Resources Conservation Service. As a large percentage of the region and the headwaters are on Federal lands, collaboration with Federal entities is critical to the health of the watershed. Furthermore, with a recent MOU with the Bureau of Reclamation, Federal funding support became available to assist the planning process. Working with these Federal partners, our shared goals could be addressed to attend to water supply and water quality compliance issues, while protecting and enhancing the land.



Climate Change and Energy Impacts

Evaluate complete system impacts of climate change drilling down to the water infrastructure operation and building level to determine greenhouse gas emissions, the sea level rise impacts to Orange County coastal areas, new policies that can assist water managers in providing the flexibility to adapt management actions to respond to changing hydrologic conditions, as well as the chain effects that climate change impacts have on other systems. For example, with less water conveyed to wastewater treatment plants based on water efficiency implementation, the impacts that need to be considered are more highly concentrated wastewater being conveyed to wastewater treatment plants that may result in possible increased treatment processing needs and energy usage. These energy impacts also may translate into other cost impacts associated with water recycling delivery and water quality compliance and protection.

System-Wide Approaches and Leadership

Seeking to encourage water demand reduction for a region covering 2,650 square miles, six million people and over 65 water agencies is a daunting task. SAWPA and its member agencies and other water agencies in the watershed, are steadily making progress in encouraging water to be used wisely, especially outdoors. However, more must be done to achieve our vision of a high-functioning sustainable watershed. Consequently, new methods to spur change and to be the catalyst for new actions are needed on a watershed-wide, system-wide basis. New models must be developed that inspire behavior change to accomplish plan goals, create synergies, and develop inter-jurisdictional solutions. Using new system approaches developed under this plan for the Santa Ana River Region, a new template then can be shared with other Regional Water Management Groups and be incorporated into their IRWM plans. This would provide the leadership for their respective regions, similar to how LEED certification through the U.S. Green Building Council has caught on nationwide becoming synonymous with “green” building. The IRWM plans can and should become the guidepost for the water ethic and meeting “sustainability” goals for regions across the State.

To implement the work plan and adjust to current affairs, SAWPA and stakeholders needed to adapt to even greater challenges recognizing not only the Four Horsemen of the Apocalypse, but that the herd was growing. At the end of the first decade of the new century, Fiscal Crisis and Energy were identified as two additional Horsemen of the Apocalypse.

Fiscal Crisis

Budget limitations are changing how we fulfill our goals. Because of the fiscal crisis faced by the Nation, the State, and the Watershed, funding for large scale projects is much less certain. Federal earmarks largely have vanished and future State Bond funding is shaky. Due to these financial limitations, we increasingly have called upon citizens and stakeholder to help craft responsible, sustainable solutions. Many challenges facing the water community today cannot be solved by technology, infrastructure, or engineering alone. Solutions popular in the 20th Century are too expensive today and have too large of a carbon footprint. We hope to solve our problems and meet our needs through collaboration and cooperative agreements in addition to engineering regional projects.

For the 21st Century, the solutions to water resources lie in developing multi-beneficial and collaborative regional solutions. Such projects allow minimal resources to be leveraged providing more "bang for the buck" and multi-needs are addressed through integration. Moreover, we need to look to our rates to support our investments, and this means we need to include our consumers as key stakeholders. We need to engender a water ethic and by this awareness of the water cycle, residents of the watershed will be more mindful of what they spend on water and seek ways to save water and save money.

Energy

Solar Panels at Western Municipal Water District

Nearly all water resources infrastructure requires energy, from wastewater treatment plants to groundwater wells; we need energy not only to maintain, but also to harvest this valuable resource. Approximately 19% of all energy in California is used to transport, treat, and heat water. It is clear that water infrastructure is highly energy intensive. However, this also is true the other way. Water is a valuable aspect of the energy production process from cooling towers to mining for oil and minerals. In fact, air-cooled energy production actually is less efficient than water-cooled energy production. We cannot have one without the other. We must realize this vital connection and work toward creating sustainable solutions. Many water agencies in the Santa Ana River Watershed have begun to turn to "greener" sustainable energy sources, such as solar arrays and turbines, alongside existing water infrastructure. Several agencies are researching new, innovative sources of alternative energy from mini-turbines in water conveyance pipelines to capturing energy produced during the wastewater treatment process. Moving the water industry in the watershed toward renewable sources of energy will ease the burden of water resource infrastructure.

Early adopters in the watershed include the Inland Empire Utilities Agency (IEUA), which is pursuing a progressive energy management strategy to be self-sufficient or "Gridless" by the year 2020. In 2008, IEUA installed 3.5 megawatts of solar power and a 2.8 MW fuel cell system. In 2012, IEUA installed 1 megawatt of wind energy at their northern water recycling plant. Western Municipal Water District (WMWD), which manages the Western Riverside County Regional Wastewater Authority, has installed more than 5,000 solar panels at their wastewater treatment plant that will provide up to 1 megawatt of energy during peak energy use hours. Eastern Municipal Water District has completed a 500 kilowatt solar photovoltaic renewable energy facility at its Administrative Campus, and has installed digester gas driven fuel cells at two of their water reclamation fuel cells providing energy during peak hours virtually free of charge, with no toxic emissions, and cutting greenhouse gases by more than 10,600 tons annually. San Bernardino Municipal Water District has installed a co-generation facility that uses the methane gas produced during the treatment processes to fuel two 750-watt generators that supply electricity to the San Bernardino Water Reclamation Plant. Solar arrays also have been installed at the

City of Redlands Wastewater Treatment Plant, Irvine Ranch Water District, Cucamonga Valley Water District, and Elsinore Valley Municipal Water District, which are all located in the watershed.

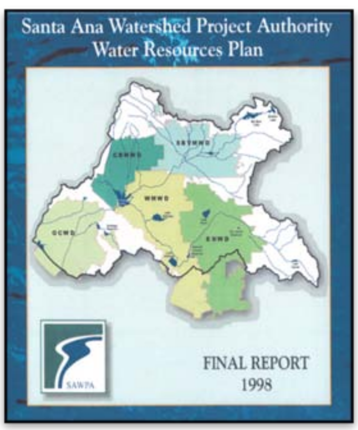
Due to this link between water and energy, to conserve water is to conserve energy. Unfortunately, we generally need a lot of hydro-electrical power and as river flows and dam levels shrink, so does our ability to generate electricity. Thus the path to sustainability not only relies on renewable and innovative energy sources, but also on reducing the amount of water that needs to be treated and pumped throughout the watershed.

With the addition of these two new Horsemen of the Apocalypse and a new workplan in place, OWOW 2.0 kicked off its IRWM planning with the execution of the DWR IRWM Planning Grant in September 2011 and started with the review and collection of past and current local and sub-regional water planning documents.

1.4 Relation to Local Water Planning

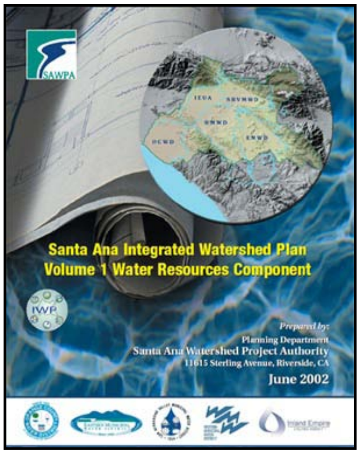
History of Santa Ana River Watershed Planning

Since its formation, SAWPA and it member agencies have been on the forefront of water resource planning for the region. Initially formed as a regional planning agency in 1967, SAWPA undertook 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 Basin Plan. SAWPA since has worked closely with the Regional Board in all Water Quality Basin Plan Updates and watershed planning efforts.

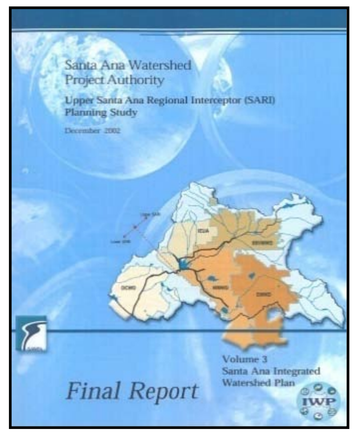


The 1998 SAWPA Water Resources Plan was one of the first watershed-wide water resource plans undertaken by SAWPA to optimize all available water resources in the watershed in an integrated fashion. This plan was initiated after Metropolitan Water District of Southern California (MWDSC) had kicked off their first Integrated Resource Plan in 1995. Because only three of the five SAWPA member agencies were MWDSC 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. With one of the SAWPA member agencies, San Bernardino Valley Municipal Water District, also serving as an additional importing water agency and State Water Project Contractor within the watershed besides MWDSC, new water resource development projects were identified. This 1998 Plan was prepared entirely by SAWPA's planning staff.

In 2002, SAWPA updated and expanded the water resources planning in its Santa Ana Integrated Watershed Plan (IWP), a three-volume planning document that examines water resource management strategies to address regional needs in an integrated fashion. Water resource management strategies identified in this report included water storage, water quality protection and improvement, water recycling, storm and flood water management, and environment and habitat protection.

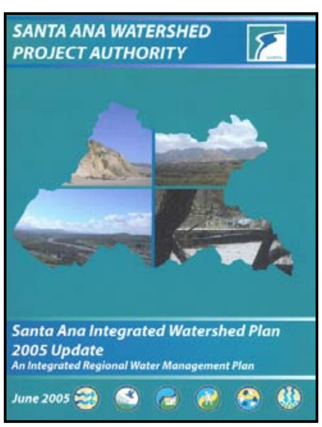


The first volume of the IWP is the Water Resources Component, a planning document that built upon member agency long-term water resource plans and management programs, thus providing a vehicle to ensure effective and concerted planning efforts on a regional basis. This volume also describes the necessary 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.
The second volume of the IWP is the Environmental and Wetlands Component. It describes the watershed-wide wetlands program and watershed plan that integrates wetlands, trails, habitat, open space, education, and invasive species removal.

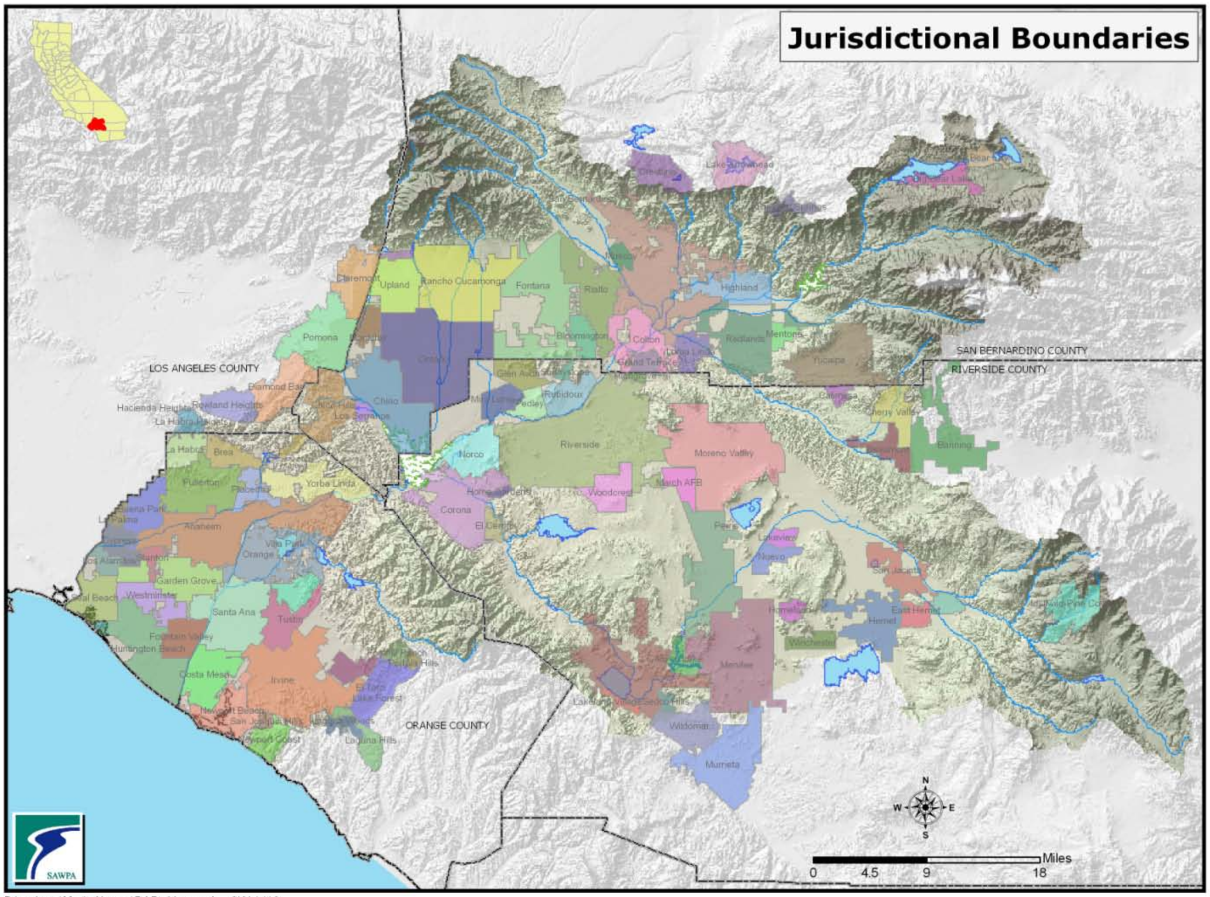


The third volume of the IWP is the Upper Santa Ana Regional Interceptor (SARI) Planning Component, which provides a foundational evaluation of the upper SARI, the watershed brine disposal pipeline, and a future long-term beneficial use of the SARI as the critical facility required to meet the SAWPA goal of transporting highly saline, non-domestic discharges out of the upper watershed to protect its groundwater resources.

The first two volumes of the 2002 Integrated Regional Water Management Plan (IRWMP) were written and prepared by SAWPA planning staff, with the third volume prepared by SAWPA's consultant, CDM Smith. The 2002 three-volume report describes integrated water projects and provides justification for the first IRWMP in the State, described under the State Proposition 13 Water Bond. The success of this effort provided funding totaling $235 million for the watershed.



In 2005, SAWPA prepared the Santa Ana IWP 2005 Update, an IRWMP. 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 projects, as opposed to serving as a detailed technical or scientific water resource evaluation in itself. Because of these efforts, the plan was ranked among the top ten IRWMPs by California Department of Water Resources (DWR) staff, and provided the justification for $25 million from Proposition 50 IRWM implementation grant program.



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Planning from OWOW 1.0 to OWOW 2.0

Integrated Regional and Sub-Regional Water Management Plans

Efforts to obtain improved water quality, sustainability, and other goals represented in the OWOW 2.0 Plan are practiced by water districts and agencies throughout the Santa Ana River Watershed. The IRWMP illustrates the collaboration of different projects, plans, policies, and task forces between SAWPA and other water agencies that strive to reach these goals. For example, in correlation with the Water Use Efficiency Pillar found in the OWOW 2.0 Plan, most water district/agencies administer programs that help reduce water demand through rebate programs on water efficient appliances, and educate the public through water-wise educational programs were described. Under the Water Resource Optimization pillar, several water resource management strategies are encouraged, including the implementation of water recycling programs. The OWOW 2.0 Plan stresses the importance of recycled water to the watershed as a whole, and suggests innovative approaches of recycled water use in a more cost effective systems approach. Through such project and program implementation, the region can support less dependence on imported water, particularly from the California State Water Project (SWP), constituting about 15%- 20% of the region's imported water. Also, SAWPA and its member agencies take initiative in employing water quality improvement and natural resource stewardship by teaming up with multiple task forces established within the region and sub-regions. OWOW 2.0 has worked with many sub-regional areas to provide assistance and improve overall sustainability, such as the case of Lake Elsinore water quality improvements sitting at the downstream end of the San Jacinto River sub-watershed. The Plan proponents also have encouraged the continued support for Best Management Practices (BMPs). BMPs have proven to be very useful when applied to water related projects and construction. These BMPs have been executed by various districts in the effort to achieve higher water quality, reduce water demand, and achieve resource stewardship.

The overall success of the OWOW Plan is dependent upon the valuable input and local water planning documents from resource agencies across the watershed, including sub-regional IRWMs, Groundwater Management Plan's, Urban Management Water Plan's, County Flood Controls and Water Conservation Districts, and regional government agencies throughout the watershed. The OWOW 2.0 Plan does not replace or supersede local planning; rather the OWOW 2.0 Plan as a regional plan appropriately incorporates local planning elements. Most of the following sub-regional IRWPs were all developed and executed prior to the OWOW 1.0 Plan, but still serve as important resources to the current OWOW plan.

San Bernardino Valley Municipal Water District Sub-Regional IRWM

San Bernardino Valley Municipal Water District (SBVMWD), as a sub- regional water agency, agreed to lead a planning effort and received a grant from the DWR to prepare their sub-regional IRWMP using Proposition 50 grant funding. The main benefit of this plan was the development of the process for managing the San Bernardino Basin Area, and also to obtain more detailed evaluation of water resource needs in the area. The plan was finalized in November 2007. Similar to the OWOW 2.0 Plan, this particular plan was carefully developed through the participation of water managers and stakeholders within the sub-region. This is a very important factor, integrating water plans either regionally or sub-regionally to help create a more sustainable watershed. The update for this sub-regional plan by SBVMWD is scheduled for the first part of 2014. For more information regarding the SBVMWD sub-regional IRWM visit www.sbvmwd.com.

Western Municipal Water District Sub-Regional IRWM

The preparation of the IRWMP for Western Municipal Water District (WMWD) fulfills a need to address long range water supply planning in order to meet the future demands in a rapidly growing area, but also to meet the water supply reliability needs now and in the future. This plan was funded by Proposition 50 and was completed in November 2006. The essence of this IRWMP is the identification and evaluation of water management strategies that could increase local water supply, thereby improving water supply reliability. Additional benefits of the IRWMP are to address local and regional water quality issues; this process was started with discussions of WMWD's member agencies and stakeholders. No plans are anticipated at this stage to update this sub-regional plan by WMWD. For more information regarding the WMWD sub-regional IRWM visit www.wmwd.com.

San Jacinto River Watershed Sub-Regional IRWM

The San Jacinto River IRWMP integrates input from a wide variety of organizations and individuals with a stake in water resource management issues. Development of this report was led by the San Jacinto River Watershed Council (SJRWC) with financial and in-kind support from a number of member and partnering agencies such as SAWPA, as well as local, State, and Federal government agencies, water suppliers, environmental groups, trade organizations, businesses, and individuals. Through a collaborative process, the San Jacinto River Watershed stakeholders were able to identify resource management strategies and associated sub-objectives that improved their sub-region. If improvements are made on a sub-regional level, it only makes the process of implementing the OWOW 2.0 Plan more efficient. No plans are anticipated at this stage to update this sub-regional plan by SJRWC. For more information regarding the San Jacinto Watershed sub-regional IRWM visit www.sawpa.org/collaboration/projects/san-jacinto-river-watershedcouncil.

Central Orange County Sub-Regional IRWM

The Central Orange County IRWMP addresses critical water resource management needs for the Newport Bay Watershed and the Newport Coast Watershed. This plan was completed on September 2012. Within this developed area are fragile coastal ecosystems with designated critical coastal areas and areas of special biological significance. The Central Orange County sub-regional IRWMP incorporates the tenets of integrated regional water management planning to address challenging issues related to flood risk management, water quality, water supply, habitat, balanced environmental sustainability, and collaboration. It was developed with stakeholder input from a diverse set of views to develop a common vision of the most urgent resource needs within the watersheds. The purpose of the Central Orange County Plan is to provide a bridge between existing and developing watershed planning efforts, allowing collaboration that is more effective and more opportunities to leverage agency resources across jurisdictions. For more information regarding the Central Orange County sub-regional IRWMP, visit ocwatersheds.com.

Santa Ana Regional Board Basin Plan

The State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards (Regional Boards) are responsible for the protection and, where possible, the enhancement of the quality of California's waters. The State Board sets statewide policy, and together with the Regional Board, implements State and Federal laws and regulations. Each of the nine Regional Boards adopts a Water Quality Control Plan, or Basin Plan, which recognizes and reflects regional differences in existing water quality, the beneficial uses of the region's ground and surface waters, and local water quality conditions and problems. The Santa Ana River Region includes the upper and lower Santa Ana River Watershed, the San Jacinto River Watershed, and several other small drainage areas. The Santa Ana River Region covers parts of southwestern San Bernardino County, western Riverside County, and northwestern Orange County. The Basin Plan for the Santa Ana River Region is more than just a collection of water quality goals and policies, descriptions of conditions, and discussions of solutions. It also is the basis for the Regional Board's regulatory programs. The Basin Plan establishes water quality standards for the ground and surface waters of the region. The term "water quality standards," as used in the Federal Clean Water Act, includes both the beneficial uses of specific water bodies and the levels of quality that must be met and maintained to protect those uses. 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. For more information regarding the Santa Ana River Regional Board Basin Plan visit www.swrcb.ca.gov.

Urban Water Management Plans

The UWMP developed by retail agencies in the watershed have served as a valuable resource to the OWOW planning effort particularly to the Water Resource Optimization Pillar in evaluation of water demands and supplies. The UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves more than 3,000 or more connections, is required to assess the reliability of its water sources over a 20-year planning horizon, considering normal, dry, and multiple dry years. This assessment is to be included in its UWMP, which is to be prepared every five years and submitted to the DWR. SAWPA has gathered all the UWMPs for this region for analysis.

One big difference observed in the 2010 UWMPs used for the OWOW 2.0 plan over previous OWOW planning, was the inclusion of SBX7-7 water conservation requirements. Reporting on agency plans to reduce overall agency water use by 20 percent per capita by the year 2020 was supported by legislation passed in November 2009 as a new requirement. Water demand is very important to urban areas, so it is vital that these areas practice water use efficiency to the fullest extent. In addition, local agencies are encouraged to ensure the reliability of local supplies in any natural event. These practices encompass a broad range from Water Use Efficiency Programs to groundwater desalination plants. The value of these local Water Use Efficiency Programs is the need to transfer BMPs for water use efficiency successfully practiced by one agency over other agencies, so that efficiency in programmatic development and implementation result. OWOW 2.0 has recognized the importance of water use efficiency by acknowledging this as its own Pillar, the Water Use Efficiency Pillar, serving as a roundtable forum to share techniques and procedures to reduce water demand and increase supply. The work from this Pillar is integrated with other pillars, particularly as implementation actions are suggested resulting from the Water Resource Optimization Pillar and the Operational Efficiency and Water Transfer Pillar. Implementation actions can be as simple as checking for leaks throughout a supply line on a regular basis, or implementing more efficient water conveyance strategies through the system. These are only some of the programs and practices encouraged by OWOW.

County Flood Control and Water Conservation Plans

The watershed is home to three different county flood control districts; Riverside County Flood Control and Water Conservation District, San Bernardino County Flood Control District, and Orange County Flood Control District. The OWOW 2.0 Plan has integrated the planning efforts of these different flood control and water conservation districts, as well as offered support in consideration of system-wide projects. Such efforts are discussed in more detail in the Stormwater Resource and Risk Management Pillar of the OWOW 2.0 Plan.

Flood control and water conservation districts and OWOW 2.0 both support implementing a strategy of fully utilizing natural channels and other environmental features within the flood control system, while evaluating opportunities for stormwater recharge as a future drinking water source. Flood control channels and adjoining detention basins can play an important role also in serving as groundwater recharge facilities in the watershed. In turn, fewer negative impacts would be anticipated to the environment, thus protecting surrounding natural habitats. Through the integration of the flood control plans with other local water resource plans, new multi-benefit approaches will continue to be investigated. It is through the implementation of these synergistic solutions that help improve water quality and capture more water for recharge, while meeting the standards in their respective counties. Overall, county flood control and water conservation agencies have a tremendous influence on the sustainability of the watershed by their practices. It is through stakeholder collaboration with these agencies that key system-wide solutions will arise for the future. For more information visit the county flood control websites and **Chapter 5.8 Stormwater: Resource and Risk Management.**

Basin and Ground Water Plans

There are dozens of groundwater basins in the watershed that each require careful planning and monitoring. These groundwater basins play a pivotal role in the sustainability of the Santa Ana River Watershed, and are discussed in more detail under **Chapters 5.4 Water Resource Optimization** and **Chapters 5.10 Operational Efficiency and Water Transfers**.

The West San Jacinto Groundwater Basin Management Plan was adopted in 1995. Annual reports on the status of groundwater and water resources efforts in the area have been published since 1996. The 2007 Annual Report compiled, reviewed, evaluated, and analyzed 2007 groundwater quality and water level monitoring program data, summarized groundwater-related changes, and reported results of an extraction monitoring program and status of previous recommendations.

To the east, the Hemet/San Jacinto Water Management Plan was completed in November 2007 by Eastern Municipal Water District, Lake Hemet Municipal Water District, and the Cities of Hemet and San Jacinto to guide and support responsible water management. The plan's objectives include reducing the historical impact of overdraft caused by past groundwater production, increasing recharge of the groundwater basin, providing for the water rights of the Soboba Tribe, ensuring water supply reliability, providing for planned urban growth, and protecting and enhancing water quality. Options to increase water supply and reliability include developing underutilized sources, particularly recycled water and imported water. To accomplish the plan's objectives, the Hemet/San Jacinto Integrated Recharge and Recovery Program are being implemented. This program includes the construction of numerous water supply and conjunctive use projects such as direct and in-lieu recharge, increased use of recycled water, increased conservation, and improved monitoring.

The Chino Basin Watermaster (CBWM) is the manager of Chino groundwater basin. The CBWM prepared the Optimum Basin Management Plan, which describes the state of the basin in terms of historical groundwater levels, storage, production, water quality, and safe yield. Current and projected water demands and water supply plans are described. The goal of the plan is to develop a groundwater management program that enhances the safe yield and the water quality of the basin, enabling all groundwater users to produce water from the basin in a cost-effective manner. The plan includes a monitoring program for groundwater levels, as well as programs for monitoring well construction, abandonment, and destruction.

The City of Corona prepared a Groundwater Management Plan (GWMP) for the Temescal, Bedford, and Coldwater sub-basins. The conditions of each groundwater basin were described including groundwater levels, production, and quality. Current and projected water demands and supplies were evaluated. Basin management objectives were determined and management strategies were set. The objectives include:

- Managing the groundwater basin in a sustainable manner
- Preventing substantial water level declines in the Channel Aquifer
- Protecting groundwater quality in the unconfined aquifer
- Maintaining required outflow at Prado Dam
- Monitoring groundwater levels, quality, and storage

The Orange County Water District prepared the GWMP 2009 Update for the Orange County Groundwater Basin to identify key issues related to groundwater management. The three major objectives are to protect and enhance groundwater quality, protect and increase the basin's sustainable yield, and increase the efficiency of operations. Recommendations in the report to proactively manage the basin include:

- Monitoring water quality and groundwater levels
- Managing groundwater recharge
- Managing groundwater quality by controlling seawater intrusion, evaluating emerging constituents, and preventing future contamination
- Implementing projects to clean up existing contamination problems
- Preparing an integrated demand and supply program

These plans are important to the entire area because they help promote water storage, water supply and reliability, and improved water quality. This coincides with the OWOW 2.0 Plan that encourages all districts/agencies to create a sustainable watershed through better development of basin and groundwater plans, and is a brief summary of some types of methods, goals, and objectives being implemented in the watershed. More information may be found in **Chapter 5.5 Beneficial Use Assurance**.

Low Impact Development Planning

Low Impact Development (LID) proves to be a very useful tool both regionally and inter-regionally. LID offers many different multi-beneficial gains once properly developed and utilized. OWOW recognizes the importance of LID and encourages it through the Land Use and Water Planning Pillar. Some of the benefits that projects like these could contribute are increased water supply and improved water quality, while practicing resource stewardship. By using water in an effective manner, the Santa Ana River Watershed comes one more step closer to becoming more sustainable. More information may be found in **Chapter 5.7 Land Use and Water Planning**.

Stormwater Management and Watershed Action Plans

Stormwater management is a crucial part to the development of a more sustainable watershed. Planning for high quality stormwater management allows the Santa Ana River Watershed to improve overall flood control. The plans to implement these strategies mostly are found through local flood control and water conservation districts plans, and watershed action plans required in the MS4 permits for each of the counties in the watershed. The watershed action plans further support the need for collaboration between flood control and water conservation agencies with water agencies in the watershed particularly as regional low impact development practices are considered. OWOW 2.0 has implemented strategies that aid the idea of creating more efficient stormwater management through the increase of stormwater utilization. By doing so, the Santa Ana River Watershed grows in becoming more self-efficient. More information may be found in **Chapters 5.4 Water Resource Optimization**, **Chapter 5.5 Beneficial Use Assurance** and **Chapter 5.8 Stormwater: Resource and Risk Management**.

Salt and Salinity Management Plans

Another influence OWOW has on regional and sub-regional areas is salt and salinity management. It is important that the salt within the watershed be regulated accordingly in order to improve water quality. This is described more in detail in **Chapter 5.5 Beneficial Use Assurance**. Essentially, salt always has been an issue since the utilization of the Santa Ana River and imported water. Salt always will remain, which is why the OWOW 2.0 Plan has encouraged the improved management of salt, which has been able to improve the quality of water throughout the Santa Ana River Watershed. SAWPA has been a leader in the State in preparing salt and nutrient management plans with ongoing triennial reporting of groundwater management zone salt and nitrogen monitoring, as well as annual reporting of salt and nutrients in the Santa Ana River. More information may be found in **Chapter 5.5 Beneficial Use Assurance**.

Emergency Response/Disaster Plans

OWOW supports the integration into the current OWOW 2.0 Plan of emergency and disaster planning in relation to water resources. All major water agencies have an Emergency Response Plan or a Disaster Plan that were used as a resource in evaluating a multi-hazard preparation response. The purpose of these plans is to be prepared for any type of possible event, natural or unnatural. These events typically include storms, earthquakes, drought, or terrorist attacks. Being prepared for any of these disasters allows each sub-region to be self sufficient for a period of time. More information may be found in **Chapter 5.8 Stormwater: Resource and Risk Management**.

Forestry Service/Fish and Game Planning

Located within the Santa Ana River Watershed are three national forests: the Angeles National Forest, which covers over 650,000 acres and is located northwest of 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. National forests provide habitat and a safe haven for threatened and endangered plants and animals, as well as provide people with opportunities for recreation in a natural environment. OWOW 2.0 safeguards natural habitats through its Natural Resources Stewardship Pillar. These influences help protect the natural environment and water supplies.

The watershed receives the majority of its local water from rain and snow fall in and around the San Bernardino, San Gorgonio, and the San Jacinto Mountain's forest areas. Precipitation in these areas provides surface water and groundwater basin recharge throughout the region. SAWPA's involvement and implementation of the OWOW 2.0 plan have been able to properly assist in forest planning efforts related to water recharge. These efforts help reduce the risk of any resulting physical, chemical, and biological impacts due to wildfires, which preserves the water that is captured within the forest. In correlation with the Natural Resources Stewardship Pillar, OWOW 2.0 was able to support the California Department of Fish and Wildlife (CDFW), to help protect natural habitats of certain species along the Santa Ana River. OWOW 2.0 also supports TMDL Nutrient Monitoring and Fishery Enhancements, which have given indigenous species vital habitat to call home in the Santa Ana River Watershed.

Through collaborative interests, developers of the OWOW 2.0 Plan, the USDA, the Forest Service San Bernardino National Forest, and Cleveland National Forest were able to create the Forest First Initiative. The purpose of this initiative is to encourage further cooperation among the Forest Service and downstream groundwater management agencies, recharging agencies, flood control and water conservation districts and resources agencies to proactively improve the resilience of the watersheds in the Santa Ana River Watershed that are critical in delivering quality water supplies. This initiative, through involvement of the OWOW 2.0 Plan, was able to offer multi-beneficial results both regionally and inter-regionally by providing high quality water to its constituents. More information may be found in **Chapters 2.3 Collaboration, Coordination and Integration** and **Chapter 5.9 Natural Resources Stewardship**.

Table 1.4 – 1 Plans Supporting OWOW 2.0

Plans Supporting OWOW 2.0	
Santa Ana River Waste-load Allocation Model Report - May 2009	West San Jacinto Groundwater Basin Management Plan 2011
Eastern Municipal Water District Urban Water Management Plan 2010	Hemet/San Jacinto Water Management Plan 2011
Inland Empire Utilities Agency Urban Water Management Plan 2010	RWQCB Water Quality Control Plan for the Santa Ana River Basin 2011
Municipal Water District of Orange County Urban Water Management Plan 2010	North Orange County Watershed Management Area Integrated Regional and Coastal Watershed Management Plan 2011
San Bernardino Valley Municipal Water District Urban Water Management Plan 2010	County of Orange Health Care Agency-Environmental Health Annual Ocean and Bay Water quality Report 2011
Western Municipal Water District Urban Water Management Plan 2010	Eastern Municipal Water District Sewer System Management Plan (SSMP) 2011
San Jacinto River Integrated Regional Water Management Plan 2010	2011-2012 Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District
San Bernardino Valley Municipal Water District Habitat Conservation Plan 2010	2011-2012 Report on Groundwater Recharge in the Orange County Groundwater Basin
Addendum to the 2008 Santa Ana River Waste-load Allocation Model Report Scenario 7 - July 2010	2012 Sampling Report for Emerging Constituents in the Santa Ana Region
Model Water Quality Management Plan Orange County Watershed 2011	Irvine Ranch Water District Energy and Green House Gas Master Plan 2012
Orange County Natural Communities Conservation Plan 2011	Cooperative Agreement to Protect Water Quality and Encourage the Conjunctive Uses of Imported Water in the Santa Ana River Basin Bunker Hill – A, Bunker, Hill – B, Lytle, Rialto, and Colton Management Zones – July 18, 2013
Total Dissolved Solids and Nitrate-Nitrogen Projections for the Beaumont Management Zone prepared by Wildermuth Environmental Inc. - April 29, 2011	Riverside County Watershed Action Plan: Santa Ana Region 2013
Bay Delta Conservation Plan 2011	2012 Annual Report of Santa Ana River Water Quality July 2013
Re-computation of Ambient Water Quality in the Santa Ana Watershed for the Period of 1990 to 2009 - Aug. 2011	NMFS' Southern California Steelhead Recovery Plan (2012) and recovery plans for endangered and threatened species found within the Santa Ana River watershed.

2.1 Governance Structure

OWOW Steering Committee

OWOW Governance

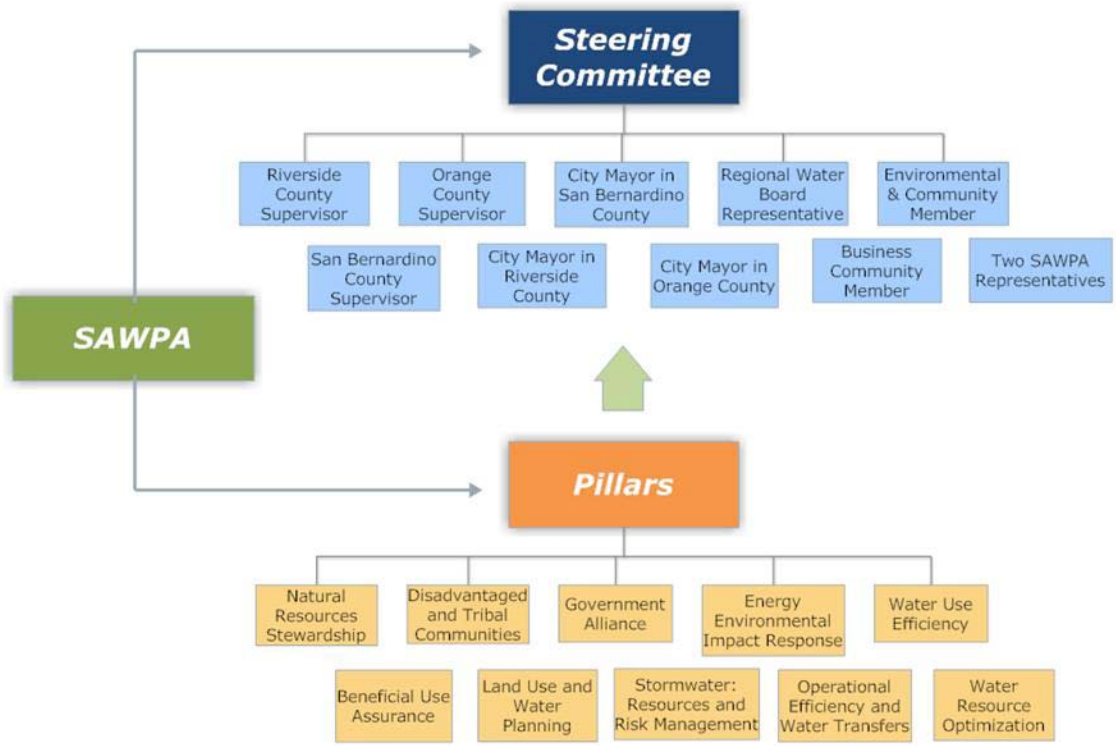
In developing the One Water One Watershed (OWOW) Integrated Regional Water Management (IRWM) plan for the Santa Ana River Watershed, a decided "bottom up" approach was envisioned for governance, as opposed to a "top down" approach. The core of this approach was that unlike previous Santa Ana Watershed Project Authority (SAWPA) IRWM plans or other IRWM planning approaches across the State, every effort was made to allow the key discussions of major water resource issues, concerns, problems, goals and objectives, and potential solutions to originate and be fully vetted at the stakeholder level – the stakeholders being the local agencies, organizations, and other interested parties within the Santa Ana River Watershed. By expanding the involvement and collaboration of stakeholders at the "on-the-ground" level, it was possible to incorporate the deeper understanding of local issues afforded by stakeholders, and generate greater buy-in and support.

Consequently, if one were to ask where the governance for the Santa Ana River Watershed OWOW process originates, we believe it is at the grass-roots level, the foundation of a decentralized and collaborative "big tent" approach. OWOW governance takes place at several levels:

- Involvement from the watershed community at large through the creation of ten working groups (referred to as **Pillars** referencing the foundation of the governance structure) representing different water issues, and in charge of identifying issues, proposing potential solutions, and writing the OWOW Plan
- The Steering Committee, composed of elected officials and representatives from the three counties, municipalities, water districts, the private sector, and the environmental and regulatory communities, were tasked with the development of the goals and objectives of the plan, strategic

decision-making, project prioritization, and issuing recommendations

- The Santa Ana Watershed Project Authority Commission (Commission), a Joint Powers Authority, provides final direction, review, and approval
- SAWPA administration and staff are in charge of facilitating this bottom-up approach to watershed planning



Pillars

In order to manage the technical and planning work, the stakeholders are organized into separate workgroups, or Pillars, centered on specific water resource management areas, issues, or concepts. They are identified, named, and may be dissolved by, the Steering Committee. Some of the areas where the Pillars support and assist SAWPA staff are in offering creative ideas, conducting brainstorming, vetting ideas, assisting with regional coordination, assisting with outreach efforts, gathering or reviewing data or information, or developing or reviewing analysis.

Under the OWOW 1.0 Plan, ten Pillars originally were established and organized along resource management areas, largely aligned with the Resource Management Strategies identified in the DWR Proposition 84 Guidelines.

1.	Water Supply Reliability	2.	Flood Risk Management
3.	Water Quality Improvement	4.	Environment and Habitat Enhancement
5.	Water Recycling	6.	Parks, Recreation, and Open Space
7.	Water Use Efficiency	8.	Climate Change

9.	Water and Land Use	10.	Environmental Justice

The Pillars consist of approximately 10 to 60 volunteers 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. Each Pillar group is led by a volunteer chair and co-chair, if assigned, with expertise in the water issue assigned to each particular group. The Pillar Chairs are responsible for organizing, leading, and facilitating the workgroup process. The Pillar Chairs were selected based on ad-hoc recommendations to SAWPA by stakeholders, and SAWPA contacted each to determine interest in serving in these positions. 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.


OWOW Pillar Kickoff meeting

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 Supply Pillar had to keep into consideration environmental and habitat restoration issues when developing their strategies. Through this process, synergies were developed and multi-benefit programs were identified. For example, through this approach, it was 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 pillar groups 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 overlap enhances the benefits of a unified vision for the watershed.

Pillar work product development is a consensus process. If there are disagreements on specific recommendations, the Steering Committee provides guidance. Pillars are added or subtracted by the Steering Committee as needed to address planning needs. Pillar Co-Chairs, with assistance from SAWPA staff, are responsible for maintaining notification lists of interested stakeholders and notifying them of meetings. SAWPA staff provides lists of interested stakeholders to Pillar Co-Chairs and assists with meeting postings and notifications. Pillar Committee meetings are open to all interested parties.

Another role of the Pillar Co-Chairs is to provide support and input to SAWPA staff as they make recommendations to the Steering Committee about the OWOW goals and objectives. As technical experts in various water resource fields, the Pillar Co-Chairs provide important feedback to the Steering Committee. The Pillar Co-Chairs periodically meet and act, in collaboration with SAWPA staff, as a technical management committee for reviewing and making recommendations to the Steering Committee and to the Commission relative to implementation of the Plan and development of specific proposals for funding. The Pillar Co-Chairs also support SAWPA staff as a technical management committee to provide oversight for OWOW projects.

One of the main functions of the pillar groups is to prepare the water resource management strategy chapters of the OWOW Plan. Under the OWOW 1.0 Plan, each pillar group prepared a chapter of the Plan, documenting current conditions and issues, and describing current and future watershed management strategies. Under OWOW 2.0, the Pillars updated the chapters to reflect recent changes and focused efforts on proposing new regional and integrated projects and programs to address the goals and objectives of the Plan.

It is important to point out that the planning approach taken for the development of this Plan transcends previous integrated regional water resource 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 amongst stakeholders to help meet long-term (2030 time horizon) goals and objectives in an integrated and multi-beneficial manner.

OWOW 2.0 Plan Pillar Updates

In July 2011, as part of the OWOW 2.0 Plan development, SAWPA and the OWOW Steering Committee reviewed the OWOW Plan and made several beneficial revisions to the OWOW 2.0 Pillar structure to promote collaboration between groups for a more well-rounded vision. A listing of the new Pillars with their alignment with the DWR Proposition 84 IRWM Guidelines is as follows:

Pillars	Corresponding DWR Prop 84 Guidelines Resource Management Strategies
Water Resource 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
Disadvantaged and Tribal Communities	Included in Guidelines as part of Impact and Benefit Standard
Government Alliance	Create Partnerships between DWR and Member Agencies
Energy and Environmental Impact Response	Included in Guidelines as a Separate Standard

The Water Recycling Pillar was combined with the Water Resource Optimization Pillar. The Water Quality Improvement Pillar was renamed the Beneficial Use Assurance Pillar to better suit its change in responsibilities. The Climate Change Pillar was changed to the Energy and Environmental Impact Response Pillar to reflect the inclusion of the water-energy nexus. The Environment and Habitat Pillar was renamed the Natural Resources Stewardship Pillar to better fit its responsibilities. The Water and Land Use Pillar was changed to the Low Impact Development Planning Pillar; however, by consensus, the Pillar indicated a preference to be renamed the Water and Land Use Planning Pillar, as the Pillar stakeholders felt that Low Impact Development Planning was not comprehensive enough for their subject matter. The Environmental Justice Pillar was changed to the Disadvantaged and Tribal Communities Pillar to better fit its responsibilities. The Flood Risk Management Pillar was revised to the Stormwater Resource and Risk Management Pillar. The Parks, Recreation and Open Space Pillar was removed and folded under Natural Resources Stewardship Pillar, and both a Government Alliance Pillar and Operational Efficiency and Water Transfer Pillar have been added. These changes better reflect the Pillar goals and objectives of the OWOW 2.0 Plan and are reflected in the table above. In addition to the ten new pillar categories, each Pillar now shares leadership among the co-chairs.

Similar to the original Pillar Chair selection, Co-chairs were selected based on ad-hoc recommendations to SAWPA by stakeholders. SAWPA contacted each to determine interest in serving in these positions. The final list of co-chairs was approved by the OWOW Steering Committee and the SAWPA Commission.

Voluntary participation in any Pillar was encouraged through OWOW workshops, email blasts, and the OWOW annual conference.

In late summer of 2011, the new Pillars started meeting monthly to begin the process of updating their chapters, and they evaluated how their area of resource focus could fulfill the OWOW vision, goals and objectives. A SAWPA staff liaison shared with each of the Pillars that the OWOW 2.0 Plan would not merely be an update of information gathered under the OWOW 1.0 Plan. Rather, emphasis was placed on the need for each Pillar to examine what multi-beneficial, multi-jurisdictional implementation projects and programs could be developed and described to address the regional needs. The Pillars also were encouraged to work with other pillar groups as the need arose to assure integration and to avoid duplication of work.

The time commitment by the Pillar Co-chairs and other volunteers varies based on the intensity of the activity, the phase of work, and the personal initiative of the participant. On average, the time commitment is on the order of 10-15 hours per month.

After the completion of the OWOW 2.0 Plan, the pillar groups and other interested stakeholders likely will continue meeting to advance the system-wide projects and programs and to explore new opportunities for collaboration, particularly as funding opportunities arise.

Steering Committee

The next level of governance up from the foundation of the Pillars is the OWOW Steering Committee. The Steering Committee's role is to serve as the developer of integrated regional water management goals and objectives for the watershed, and to act as the oversight body that performs strategic decision making, crafts and adopts programmatic suites of project recommendations, and provides program advocacy necessary to optimize water resource protection for all. These are described in more detail below.

The OWOW Steering Committee consists of eleven (11) members from the three (3) counties (Orange, Riverside, and San Bernardino) that are within the Santa Ana River Watershed regional planning area. 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 City within the Region of Orange County
- One Mayor or City Council Member from a City within the Region of Riverside County
- One Mayor or City Council Member from a City within the Region of San Bernardino County
- Two SAWPA Commission representatives selected by the SAWPA Commission
- One member of the business community
- One member of the environmental community
- One member of the Regional Water Quality Control Board

In September 2012, the transition of Steering Committee members was clarified with adoption of an amended governance document defining the position terms and transition process. The selection and transition process is as follows:

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

- SAWPA Commission representatives shall be selected by the SAWPA Commission
- County Supervisors shall be selected by their respective Boards
- City representatives shall be selected by a majority vote of the Council of Governments in the respective county:
    - Western Riverside County Council of Governments [WRCOG] – Riverside County
    - San Bernardino Association of Governments [SANBAG] – San Bernardino County
    - Orange County Council of Governments [OCCOG] – Orange County
- Business and environmental community representatives shall be selected by a majority vote of the eight governmental representatives on the Steering Committee, based on an application process conducted during a public meeting
- The Regional Water Quality Control Board representative is selected by the Santa Ana Regional Water Quality Control Board

The time commitment associated with the Steering Committee participation is somewhat dependent upon the development activity of the OWOW planning process, and whether or not a funding opportunity occurs. Generally, the Steering Committee meets quarterly during the OWOW planning process. However, when funding opportunities arise, the OWOW Steering Committee input is more time-intensive with more frequent meetings, usually bi-monthly. The Committee plays a key role in providing direction and input to SAWPA staff in the process of updating the project selection criteria development, rating and ranking, and approval of projects for funding based on the project solicitation package defined by the grant administrator. Overall, from the “Call for Projects” to the approval of project selection for funding rounds under Proposition 84, the process usually takes about ten (10) months. To assure continuity and support for the OWOW Steering Committee, SAWPA provides full administrative support, with participation of the SAWPA General Manager at its meetings.

Functions of the OWOW Steering Committee

The Steering Committee is responsible for the development of the Plan. This includes receiving input from staff of their respective agencies, as well as SAWPA staff, providing direction for the development and long-term maintenance of the Plan, and development of a project prioritization process. The Steering Committee may make recommendations to the SAWPA Commission on proposed amendments to this governance document. Any such proposed amendments do not take effect unless approved by the SAWPA Commission.

In implementing the Steering Committee's Goals and Objectives, the Steering Committee will:

1. Acknowledge that water resources of the Santa Ana River Watershed Region should be put to maximum beneficial use and that water waste must be prevented.
2. Acknowledge water as a public resource and respect existing agreements governing the water resources of the Santa Ana River Watershed Region.
3. Seek regional solutions for regional problems.
4. Encourage collaboration across boundaries and between multiple parties in project development.
5. Consider sub-regional plans and planning efforts.

During the OWOW process the Steering Committee will complete the following functions:

1. Provide incentives for the development of multi-benefit integrated projects through the allocation of State Bond funds.
2. Oversee the development of an integrated watershed management plan.
3. Identify institutional barriers and opportunities for more efficient management that further advance the integration of water management activities.
4. Advocate for policy changes the increase interagency effectiveness and efficiency in integrated water management.

As funding opportunities arise to implement the OWOW plan, the Steering Committee provides the SAWPA Commission an updated Santa Ana River Watershed Region IRWM plan and programmatic portfolio of projects specific to the funding opportunity. The Steering Committee is responsible for the development and implementation of the project selection criteria.

Besides involvement through the OWOW outreach and Pillars, the public also can voice their opinion during the public and noticed meetings held by the Steering Committee. The Steering Committee meetings are held at least annually with the provision that special meetings may be called as needed. All Steering Committee meetings are conducted in accordance with the Ralph M. Brown Act. Meeting minutes are prepared and kept by SAWPA staff and posted on the SAWPA website.

SAWPA Administration

The other arm to the governance of the OWOW process includes the management function conducted by SAWPA. As a regional water agency for the Santa Ana River Watershed, SAWPA has a long history of supporting regional collaborative efforts of this kind. As with previous IRWMP efforts for the Santa Ana River Watershed, SAWPA serves as support in providing administrative and facilitative assistance to the pillar groups and the Steering Committee for the overall OWOW Plan development.

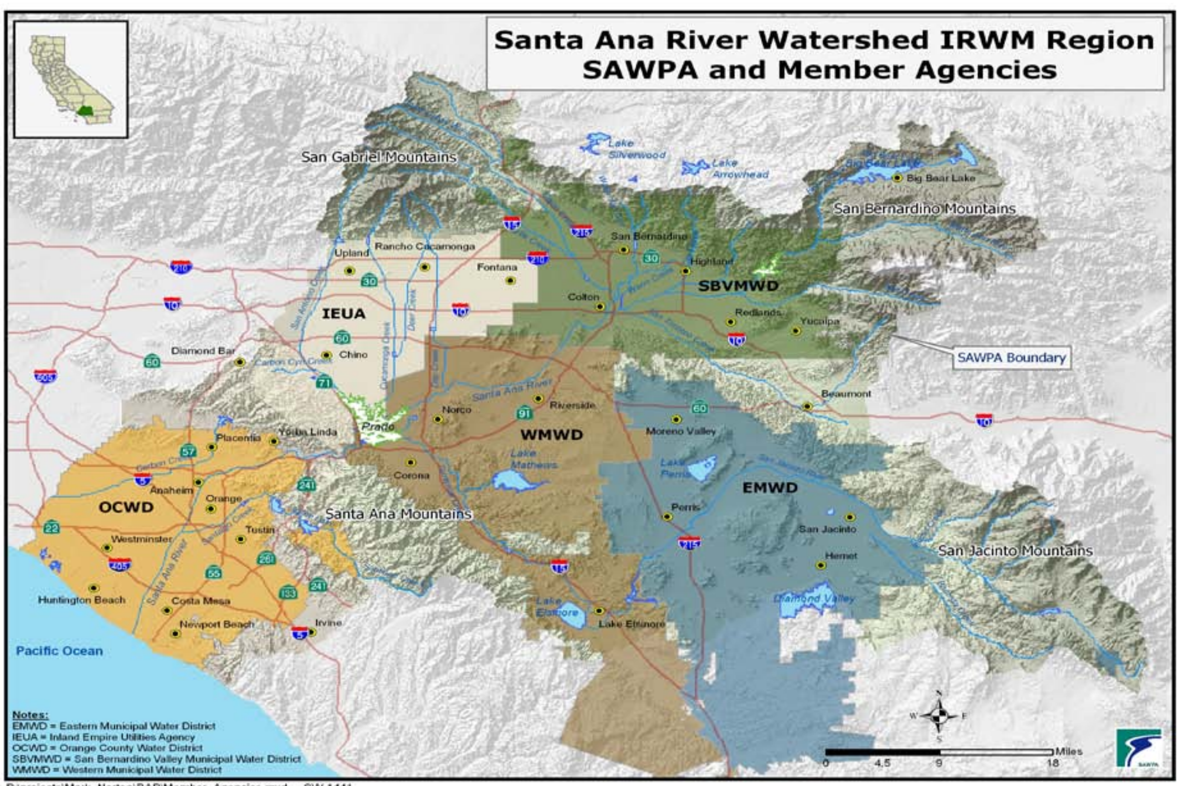
SAWPA and its Member Agencies

SAWPA is the designated Regional Water Management Group (RWMG) for the Santa Ana River Watershed, and the one DWR-recognized IRWM region within the watershed. 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 water resources to 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, with more than two (2) of which has statutory authority over water supply or water management, the RWMG meets the requirements of CWC 10540, 10541 and 10539.

SAWPA consists of twenty three (23) staff members and serves at the direction of the SAWPA Commission that is composed of its five (5) member agencies, all of which have statutory authority over water supply and water management in their service areas. These five (5) agencies represent the majority of the water management authorities and stakeholders within the region boundary.

SAWPA carries out functions useful to its five (5) member agencies: Eastern Municipal Water District (EMWD), Inland Empire Utilities Agency (IEUA), Orange County Water District (OCWD), San Bernardino Valley Municipal Water District (SBVMWD), and Western Municipal Water District (WMWD). The jurisdiction of SAWPA and its member agencies spans approximately 2,800 square miles of the Santa Ana Watershed encompassing much of Orange County, a sliver of Los Angeles County, and the major population centers of western Riverside and southwestern San Bernardino Counties. Each of these agencies plans and executes long-term projects and management programs of their own; however, it primarily is the agencies working through SAWPA that provide the vehicle for effective and concerted planning efforts on a regional basis.

Figure 2.1-1 Santa Ana River Watershed IRWM Region SAWPA and 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. EMWD serves a population of approximately 675,000 in six (6) 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 (EVMWD), and Rancho California Water District.

As a member agency of the Metropolitan Water District of Southern California (MWD), EMWD gained a supply of imported water from the Colorado River Aqueduct (CRA) and ultimately, water from northern California through the State Water Project (SWP), which transports water from northern California via the California Aqueduct. EMWD's initial mission was to deliver imported water to supplement local groundwater supplies. Over time, EMWD'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 serves a population of approximately 800,000. IEUA provides regional wastewater service and imported water deliveries to eight (8) contracting agencies. These include; the City of Chino, City of Chino Hills, Cucamonga Valley Water District (CVWD), City of Fontana, City of Montclair, City of Ontario, City of Upland, and Monte Vista Water District.

As a member agency of MWD, IEUA provides supplemental water, as well as regional wastewater treatment for both domestic and industrial clients, and energy recovery/production facilities. In addition, the Agency has become a recycled water purveyor, 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 and the Orange County Groundwater Basin. The basin provides a water supply to more than 20 cities and water agencies, serving over 2.3 million people. OCWD owns 1,600 acres in and near the Santa Ana River (SAR) in Anaheim and Orange, which it uses to capture flows and recharge the groundwater basin. OCWD also owns 2,400 acres above Prado Dam, which uses it for water conservation and water quality improvement.

OCWD'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 this District's service area. The balance is imported from the Colorado River and from northern California through the Sacramento/San Joaquin Delta SWP by MWD.

San Bernardino Valley Municipal Water District

San Bernardino Valley Municipal Water District's service area covers about 325 square miles, primarily in southwestern San Bernardino County with a very small portion of its service area in Riverside County. The area within SBVMWD includes a population of around 600,000. SBVMWD spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, a portion of the Yucaipa Valley, and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, Grand Terrace, and Yucaipa. SBVMWD's mission is to import water into its service area through participation in the California SWP. SBVMWD also is charged with managing groundwater and surface water within its boundaries through various court judgments.

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 825,000 people. WMWD serves more than 24,000 retail and eight wholesale customers with water from the Colorado River and the SWP. As a member agency of MWD, WMWD provides supplemental water to the cities of Corona, Norco, and Riverside, and the water agencies of Box Springs, Lee Lake, Elsinore Valley, and Rancho California, as well as serving customers in the unincorporated areas of El Sobrante, Eagle Valley, Temescal Creek, Woodcrest, Lake Mathews, and March Air Reserve Base. WMWD also 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 WMWD purchases from the MWD comes from the CRA, and about four-fifths from the SWP, which transports water from Northern California via the California Aqueduct. WMWD 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. WMWD also has several wells for pumping in its Murrieta Division.

Role of SAWPA and member agencies in RWMG process

As a regional water agency for the Santa Ana River Watershed, SAWPA has had a long history of supporting and developing integrated regional water management plans. Over its four decades of existence, SAWPA has assisted with the preparation of the Santa Ana Regional Water Quality Control Board Basin Plan, as well as multiple watershed management plans. Over the last 15 years, integrated watershed plans became an emphasis in regional water planning, 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 wrote and prepared much of the three-volume document and administered consultant services in some support roles. SAWPA staff and its consultants conducted extensive outreach with stakeholders throughout the watershed. Collaborative outreach meetings were held in multiple locations throughout the watershed to assure that input was obtained and included in the Plan. This role was repeated with the June 2005 Update; the report was prepared almost entirely by SAWPA staff with extensive outreach similar to the 2002 effort.

In the current update to the IRWM Plan, the OWOW Plan, SAWPA staff serves in providing administrative and facilitative assistance to water resource management working groups (OWOW Pillars) and the OWOW Steering Committee for the overall OWOW Plan development. This role includes hiring and managing consultant services to support the planning and project selection criteria development process. In addition, SAWPA provides decision support tools to assist the Steering Committee and Pillars in decision-making processes, provides planning documents to allow Pillars to build upon previous existing plans, and performs significant public outreach and education about the integrated planning approach for the Santa Ana River Watershed.

SAWPA RWMG Administrative and Oversight Role

The SAWPA Commission and SAWPA staff is the regional water management group (RWMG) and is responsible for all administrative oversight for the Plan, and for coordinating all on-going administrative responsibilities associated with its implementation. This includes arranging for 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 other related duties. The Commission reviews the Plan for compliance with applicable laws and guidelines. In the event that no issues or inconsistencies are detected with the Plan or project selection process, the Commission approves the Plan and the project prioritization as submitted by the Steering Committee. Should the Commission determine that the Plan or a specific selected portfolio of projects fails to meet applicable laws and guidelines, it will refer the Plan back to the Steering Committee for further revision and subsequent re-submittal to the Commission for reconsideration and ratification.

Additionally, SAWPA provides decision support tools to assist the Steering Committee and Pillars in decision-making processes, provides planning documents to allow Pillars to build upon previous existing plans, and performs significant public outreach and education about the integrated planning approach for the Santa Ana River Watershed.

Another role that SAWPA plays as the administrator of OWOW and the Regional Water Management Group for the Santa Ana River Watershed is to work closely with several sub-regional IRWM planning efforts in the watershed that took place prior to, or concurrent with, the OWOW planning process. Of particular interest was the need to assure that proper coordination and incorporation of the excellent work conducted by the sub-regional IRWM planning groups was included in the OWOW plan. SAWPA staff conducted outreach to all stakeholders of the sub-regional IRWM planning efforts, and invited their stakeholders to participate in the pillar processes. In some cases, SAWPA staff even participated in the sub-regional IRWM planning process. Where sub-regional IRWM plans previously were completed, these plans were shared with the Pillars to serve as background material to their Pillar planning efforts. In all cases, SAWPA took a lead role in coordinating the sub-regional IRWM lead agencies to assure that their planning work would be folded into the OWOW watershed-wide process as seamlessly as possible. It is understood that the Steering Committee will be responsible for the development and implementation of the project selection criteria.

As previously indicated under the Steering Committee role, as funding opportunities arise to implement the OWOW Plan, the Steering Committee will provide to the SAWPA Commission an updated Plan and programmatic portfolio of projects specific to the funding opportunity. The Commission will review the plan and programmatic project portfolio to ensure that these fulfill the intent and requirements of the specific funding mechanism, any legislation authorizing the funding, all legal requirements as defined by the funding administrative agency and equitable application of the benefits of the project portfolio across the entire region. Review of these items and the project selection process is conducted by the Commission in a public meeting open to all interested stakeholders. If the Commission is unable to ratify a specific portfolio of projects, the Commission will send it back to the Steering Committee.

SAWPA serves as the State liaison for the Santa Ana region, on behalf of the OWOW stakeholders, responsible for all final report submittals, plan adoption processes, grant application submittals, and administrative oversight for the Santa Ana OWOW IRMW Plan funding. As lead, SAWPA also works closely to coordinate with neighboring IRWM regions to coordinate water resource planning efforts. In many instances, joint interregional projects have evolved resulting in relationship building and development of common interests. These cooperative activities with neighboring and overlapping IRWM regions undertaken under OWOW 2.0 planning are explained in detail under **Chapter 2.3 Collaboration, Coordination and Integration**.

Another role that SAWPA administration played particularly under the OWOW 2.0 Plan was to establish individual SAWPA staff liaisons for each of the Pillar workgroups. Although conducted largely informally, SAWPA staff was available to aid the volunteer Pillars in ensuring that new DWR IRWM plan standards were conveyed, and overall direction of the planning process was provided. In some cases, where pillar groups struggled with participation, SAWPA staff also aided a few of the Pillars with support material, consultant support for in-depth analysis, development of tables and graphs, meeting notes preparation and meeting scheduling services. This was largely the exception to the general rule, however, with most Pillars effectively running their own meetings, preparing meeting notes and preparing their own OWOW chapter write-ups.

To support an emphasis on implementation and integration, SAWPA arranged multiple meetings with all ten (10) Pillar Chairs and Co-chairs in the development of a watershed framework document to develop templates for integration and multi-beneficial projects and programs. SAWPA hired three (3) leading watershed thinkers to work with the Pillar Chair in crafting a guidance document that each Pillar then could use to assist them in crafting their own new implementation projects and programs for the future. Cross pollination of new projects and programs among the Pillars was encouraged by SAWPA to promote integration and innovation in the development of new implementation solutions for the region.

Governance Structure Evaluation

As part of the OWOW 2.0 Plan, an evaluation was conducted of the OWOW 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 management water resources 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 was considered important to ensure that such governance reflects a jurisdictional framework that integrated 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 inter-jurisdictional dispute resolution mechanisms.

As an initial step, the DWR Plan 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 turn over.

The next step of the examination was to conduct a survey of other similar scale RWMGs in California to evaluate their governance structures and to consider strengths and weaknesses. **Table 2.1-1** shows a comparison of five other RWMGs.

Table 2.1-1 Comparison of Five other RWMGs

Similar IRWM Region	Lead Agency	RWMG Agreement	Governance Structure	Governance Committees	Governance Roles	Governance Members
North Coast	County of Humboldt	MOU. Evaluating formation of North Coast Region Joint Powers Authority, or similar legal entity	Seven counties and six North Coast Tribes comprise the leadership of the North Coast IRWMP.	The NCIRWMP consists of a collaborative partnership between the NCIRWMP Policy Review Panel (PRP), the Technical Peer Review Committee (TPRC), project staff, consultants, and the stakeholders within the North Coast Region.	NCIRWMP Policy Review is supported in their evaluation of projects and plan development by the Technical Peer Review Committee (TPRC). The TPRC is comprised of technical & agency staff appointed from each County Board of Supervisors and Tribal representatives.	With the exception of Modoc County, with one representative, the PRP consists of two representatives appointed by each County's Board of Supervisors and three Tribal Representatives appointed by North Coast Tribes.
Bay Area	Bay Area Water Agencies Coalition	Letters of Mutual Understanding (LOMUs)	Organized into four Functional Areas (FA): (1) Water Supply & Water Quality (BAWAC) (2) Wastewater & Recycled Water (BACWA), (3) Flood Protection & Stormwater Management (BAFPAA), and (4) Watershed Management & Habitat Protection and Restoration (BAWN). The Coordinating Committee (CC) is composed of a Chair and Vice Chair. There are 12 voting reps made up of three reps from each FA, each of which has statutory authority over water resources.	Representatives from agencies that represented the four Functional Areas (FAs) formed and provided oversight for the IRWMP process, called the San Francisco Bay Area IRWMP Coordinating Committee. An additional organization structure was formed based on demographic and geographic divisions for the Bay Area. East, West, South, North.	The CC is responsible, directly or through participating agencies, for decision-making and actions including, but not limited to, establishing IRWMP goals and objectives, prioritizing projects, identifying financing for CC and IRWMP activities, implementing Plan activities, making future revisions to the IRWMP, hiring and managing consultants, coordinating, authorizing and/or approving grant proposals and managing funding agreements.	The CC is composed of representatives from Bay Area water supply agencies, wastewater agencies, flood control agencies, ecosystem management and restoration agencies, regulatory agencies, nongovernmental organizations (NGOs), and members of the public.
Ventura County	Watersheds Coalition of Ventura County, Ventura County Executive Office and Resource Management Agency Planning Division(staff lead)	MOU	Watershed Coalition of Ventura County (WCVC) working with two new watershed committees/councils.	Calleguas Creek Watershed Management Plan Steering Committee, Santa Clara River Watershed Committee, Ventura River Watershed Council. In addition to the watershed committees, a subcommittee was formed under WCVC to review water management strategies and evaluate the effectiveness of certain types of projects and programs in addressing these strategies.	The WCVC, and its three watershed committees, are engaged in a variety of local planning efforts designed to address the objectives developed by the watershed committees.	The Group includes 41 local governmental agencies (Cities, water agencies, County agencies, local, State and Federal agricultural service agencies), non- governmental organizations (environmental organizations, homeowners groups and public interest groups), and consultants. The majority of the Group, 17 members, represented water and sanitation districts with direct retail supply and/or treatment responsibilities.

Table 2.1-1 Comparison of Five other RWMGs (Continued)

Similar IRWM Region	Lead Agency	RWMG Agreement	Governance Structure	Governance Committees	Governance Roles	Governance Members
LA County	Los Angeles County Flood Control District, RWMG Chair	MOU of Leadership Committee	Leadership Committee and five Subregional Steering Committees	Leadership Committee has 16 voting members including LC Chair; Chairs and Vice-Chairs of the five Subregional Steering Committees; and five stakeholder agencies representing the following Water Management Areas: Groundwater, Surface Water, Sanitation, Open Space, and Stormwater.	Each of the ten Subregional SC representatives to the LC is elected by the SCs as Chairs and Vice-Chairs of their SCs. The alternate representatives to the LC for each of the five Subregions also serve as Alternates to the Chairs and Vice-Chairs on the SCs. Both the Subregional Chair and Vice-Chair representatives are elected by a majority vote of each Subregional SC according to the rules defined by each SC. The five Water Management Area LC members are elected from nominations provided by SCs.	The Leadership Committee also includes 5 ex-officio (non-voting members), including: California State, Coastal Conservancy, United States Bureau of Reclamation (USBR), United States Department of Agriculture (USDA) Forest Service: Angeles National Forest, United States Department of the Interior, National Park Service, United States Army Corps of Engineers (USACE): Los Angeles District
San Diego	San Diego County Water Authority, City of San Diego, County of San Diego	MOU among three entities	Regional Policy Committee provides policy-level input to the IRWM Plan and includes subject matter experts representing environmental groups, academic entities, local business, agricultural groups, water suppliers, wastewater agencies, water quality interests, and regulatory agencies.	Water Authority Member Agency Technical Advisory Committee, Project Clean Water, Project Clean Water Watershed Protection Technical Advisory Committee, Stormwater Copermittee Management Committee	The RAC served as the primary organization that provided direction to the RWMG for plan preparation	The RAC includes representatives of public agencies that serve disadvantaged communities. Additionally, disadvantaged community interests are addressed by several non-government organizations within the RAC.
Santa Ana	SAWPA	JPA among five member water resource agencies	Steering Committee and SAWPA Commission	Pillar groups with chair and co chairs based on 10 water resource management strategies	Steering Committee provides policy direction on IRWM Planning. SAWPA reviews and ratifies Steering Committee actions.	Steering Committee is composed of 11 members with 3 county Supervisor and 3 city Mayors from three counties, two water agency reps, development rep, environmental rep, and Regional Board rep

Recognizing that SAWPA originally was formed as a joint powers authority in 1968 with five (5) member water agencies, apparent from the start of the OWOW 1.0 planning process was the need to expand the governance structure to form a Steering Committee composed of a broader spectrum of watershed stakeholders. The OWOW Steering Committee was developed and organized by SAWPA to reflect not strictly a water agency emphasis, but a cross section of many types of stakeholders such as DACs and Tribes as well as water resource sectors such as stormwater and flood control, thus providing equal opportunity and representation throughout the watershed. Through the Steering Committee, better decision making and distribution of power and voice is provided to the stakeholders of the watershed in the planning process as opposed to only involving the five (5) original water resource agencies of SAWPA. This process of adding a diverse stakeholder governance committee layer follows the path taken by most other IRWMs.

In evaluating other RWMG government structures to SAWPA's OWOW governance, one of the most striking differences was how SAWPA utilized the Pillars approach to reflect one of the most comprehensive involvement and grass roots processes in the integrated regional water management planning across the State and is quite unique. Using the Pillars centered on water resource strategies and asking their voluntary involvement even to the scale of composing and authoring sections or chapters of the OWOW 1.0 Plan, as well as the OWOW 2.0 Plan, has helped to ensure strong buy-in and support by all those who have participated. This approach is highly unusual as compared to other IRWM where a single consultant usually is hired to oversee the IRWM plan development and work with stakeholder groups for input, but with the consultant ultimately responsible for writing the plan. Further, it appears that approximately half of all the recognized 48 IRWM regions across the State utilize the same consultant for their IRWM plan development. This uniform and more cookbook approach for plan preparation, though effective in assuring consistency with meeting IRWM guidelines and requirements, may fail to meet the buy-in and support of stakeholders or achieve the synergistic development of integrated regional solutions as observed in the Santa Ana River Watershed, and perhaps a few other IRWM regions.

Another observation in review of governance structure models in comparison to the current OWOW governance is the emphasis on a fair, neutral, and transparent approach in the selection of projects for funding that meet the goals and objectives of the OWOW Plan. A separate body of outside reviewers is asked to review a rated and ranked list of recommended projects to ensure that the projects reflect the selection criteria approved by the Steering Committee and the SAWPA Commission, and are validated for veracity. Rather than parceling out funding based upon the five JPA SAWPA member agency jurisdictions or subwatershed or subregions as observed in many other RWMGs, the best projects are selected that meet the OWOW project selection criteria and OWOW goals. By this process, SAWPA plays a more neutral role as facilitator rather than as judge or sole governance of funding distribution.

A common concern observed in many IRWMs is the challenge of assuring the involvement of the often under-represented Native American Tribes and DACs in the RWMG governance. To improve governance representation to be more effective under OWOW 2.0 planning, SAWPA revised the OWOW Pillars to include Native American Tribes with the DACs as a distinct Pillar on par with other water resource Pillars. Representation of Native Americans' interests also has occurred at the Steering Committee level with the 2012 transition of the San Bernardino County Supervisor on the Steering Committee. The new Supervisor selected by the San Bernardino County Board of Supervisors to serve on the OWOW Steering Committee is also a Native American tribal member from a tribe located within the watershed. Sworn in as a member, James Ramos is the first Native American to be elected to the San Bernardino County Board of Supervisors and the OWOW Steering Committee. Mr. Ramos also serves on the California State Native American Heritage Commission.

Also a concern to be addressed was assuring involvement of Federal and State governments in management of water resources under OWOW planning as evidenced in the previously mentioned publication *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenge.* To remedy this challenge, a separate and new Pillar was established called the Government Alliance Pillar. Chaired by a representative from the U.S. Bureau of Reclamation (Reclamation) and co-chaired by a representative from the regional office of the U.S. Army Corps of Engineers, the Government Alliance Pillar included representatives from multiple Federal, State and local agencies and tribes including Reclamation; Army Corps of Engineers; U.S. Fish and Wildlife; Army Corps of Engineers; U.S. Bureau of Indian Affairs; U.S. Geological Survey; U.S. National Park Service, U.S. National Marine Fisheries; U.S. Forest Service; U.S. EPA; California Fish and Wildlife (formerly California Fish and Game); Santa Ana Regional Board; Calif. Dept of Public Health; CAL-Fire; Calif. Dept of Water Resources; Soboba Native American Tribe; San Manuel Native American Tribe, and the emergency support services of all three counties within the watershed. The Government Resource Guide developed by the Government Alliance Pillar will assist coordination among the Federal, State, and local agencies in the implementation of future projects, and will serve as a valuable resource to all stakeholders for years to come.

Finally, in review of the governance structure, it should be mentioned that of the support to the OWOW planning process from the roughly ten (10) multi-agency task forces that SAWPA currently administers as a regional and watershed facilitator. These task forces range from a focus on surface and groundwater water quality issues, to threatened species preservation and restoration, to establishing park and recreation trail opportunities that are integrated with water resources. Taken together, these task forces constitute over one hundred different agencies and organizations in the watershed. The work coming out of these task forces that often involve retail and wholesale water agencies, groundwater management agencies, wastewater agencies, NGOs, businesses, universities and other organizations have been integrated into the OWOW planning processes expanding the support and involvement of stakeholders throughout the Santa Ana Region.

Planning Updates and Adoption

The OWOW Plan will be a "living document" and will be updated every three to five years in a coordinated manner with local, regional and statewide plans. Plan updates will be adopted formally by the Steering Committee and ratified by the SAWPA Commission. There may be occasions where informal changes that reflect minor process, organizational, or water management changes are conducted by SAWPA staff. 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 the Southern California Association of Governments (SCAG) land use data.

In addition, new water management strategies will be incorporated into future versions of the Plan as additional knowledge is gained on the state of the watershed, new technologies and best practices, and changes in policy and public mindsets. Furthermore, the Plan will be updated as necessary to comply with the requirements of future grant funding opportunities.

One example where subsequent formal action was taken by the Steering Committee after adoption of the plan occurred was the addition of several stormwater projects under Proposition 1E Stormwater program. Since many grant programs include language that projects must be cited in the IRWMP, SAWPA has been approached to add these from time to time. SAWPA typically will update its project priority list as part of the funding round opportunities, and then fold these into the next OWOW plan to be adopted. If SAWPA is solicited to add a significant number of projects after the formal "Call for Projects" deadline has passed or after formal adoption of the OWOW Plan, then amendments to the adopted plan may be necessary, with formal approval by the Steering Committee at publicly noticed Steering Committee meetings. If approved, such amendments then are forwarded to the SAWPA Commission for ratification. Re-adoption of the OWOW Plan by the Commission with formal public hearings for these amendments is not considered necessary, as these are considered fairly insignificant changes to the Plan and affect only the Project List in the last adopted OWOW Plan.

To ensure awareness of ongoing planning and projects, stakeholders have been invited to submit projects to SAWPA, both implementable and conceptual, if they so choose using our on-line project information form. The online project information form requires data about the project similar to what is requested under the previous OWOW "Call for Projects" for funding rounds. As an informal practice, project proponents that complete the on-line project information and submit their project information on-line can be considered as a part of the list of projects under the OWOW Plan for their outside grant submittal needs. However, in order to be considered for future IRWM funding through OWOW, rating and ranking by OWOW Governance must occur. Further, each SAWPA OWOW "Call for Projects" solicitation typically conducted under an IRWM funding round starts anew, inviting collaborative parties to submit both conceptual and proposed projects and programs for consideration and evaluation, and must abide by the deadlines and criteria for project evaluation defined under the OWOW program. If a project proponent does not have access to the on-line project information tool, special arrangements will be made to accommodate project data submittal needs.

The OWOW Plan 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 be helpful input to the Metropolitan Water District of Southern California Integrated Resources Plan, and the State of California DWR Water Plan.

IRWM Plan Adoption

The SAWPA Commission and all its member agencies adopted the SAWPA IRWMP known as the "One Water One Watershed (OWOW)" Plan 1.0 in November of 2010. Since the time of its adoption, the Plan was amended formally in March 2011 to include additional Proposition 1E eligible stormwater projects to the Plan's project list.

In September 2011, an update to the OWOW 1.0 Plan was initiated and is known as the OWOW 2.0 Plan. Prior to commencing work on the update, SAWPA published a formal notice of intention to prepare a plan in September 20, 2011. The emphasis of the OWOW 2.0 Plan is not only to update the planning data, but to emphasize and describe regional implementation projects and programs that meet the OWOW 2.0 goals and objectives. The OWOW 2.0 Plan is anticipated to be adopted by the OWOW Steering Committee and SAWPA Commission in early 2014, with formal notice of intention to adopt the Plan to be published prior to adoption in accordance with Section 6066 of the Government Code.

2.2 Stakeholder Involvement and Outreach

Santa Ana River Watershed Conference 2013

Stakeholder Involvement and Outreach

Engaging stakeholder involvement in a large, diverse watershed is challenging. It is unlikely that any one individual “knows” all of the stakeholders, and as such, the development of mailing lists and notification of workgroup meetings can be daunting. The One Water One Watershed (OWOW) process was designed to be different from other planning processes. One critical difference is that OWOW was designed to be a “bottom-up”, rather than a “top-down” process. By encouraging participation from different groups of people and those holding varying viewpoints from throughout the Watershed, the capacity to reach larger numbers of stakeholders also grew.

Similar to our OWOW 1.0 Plan, many of the same procedures, processes, structures and tools were used for stakeholder outreach. However, in some cases where these tools were not deemed effective in reaching adequate numbers of an interest group, they were not used under OWOW 2.0 planning. Thus an evolving process of determining the most effective means of reaching out to involve stakeholders and groups occurred. For example, three (3) forms of outreach used under OWOW 1.0 planning were discontinued under OWOW 2.0 planning. These included the Podcasts, Beam Blasts, and virtual web-based meetings based on relatively light use. New social media outreach tools were established in place of those tools.

For a full timeline of major OWOW 2.0 milestones, including stakeholder outreach events like the OWOW 2.0 Conferences, see **Appendix M**.

Pillars

The OWOW Pillars represent one of the most effective means to insure public involvement in the planning process. Invites to participate in the Pillar meetings are made through the planning process and are voluntary in nature. 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 subject area expert, and that person receives a list of volunteers, but as a Pillar leader he/she 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. These individuals were invited to the process and were an important addition to the vast mailing list maintained by SAWPA. Each Pillar Co-chair is responsible for maintaining a list of contacts interested in their particular Pillars, and SAWPA provides names of additional contacts. The knowledge and contacts of the Pillars provide an important link to watershed stakeholders.

Most of the Pillars were based on water resource strategies similar to the water resource strategies defined in the California Water Plan Update. However, in some cases, special Pillars were established to expand outreach and involvement, such as the Disadvantaged and Tribal Communities Pillar and the Government Alliance Pillar. The Disadvantaged and Tribal Communities Pillar is addressed under **Chapter 5.11 Disadvantaged and Tribal Community**. The work of the Government Alliance Pillar is addressed under **Chapter 5.12 Government Alliance**.

Outreach Audience

The list of stakeholders involved in our most recent integrated regional water management planning is one of the most extensive ever taken by any regional water management group. The master contacts database includes a rather diverse base of over **4,000 stakeholders**. The focus of the database is to include those entities having an interest in water and representatives from cities located within the watershed. It includes representatives from **120 agencies** associated with water, including flood control, 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.

Also included are representatives from County, State, and Federal government; Indian Tribes, the real estate community, members of the environment and environmental justice, agricultural and development communities, consultants, trade associations, academia, non-profit organizations, and others simply interested in water.

The working relationship in the development of the IRWM plan was very positive overall, collaborative, and in many cases, long term. Through SAWPA's history of administering collaborative working groups and task forces, strong working relationships were built with the many entities listed below. The collaborative efforts through workgroup or task forces, also known as SAWPA's Roundtable or Task Forces, are described in detail under **Chapter 2.3 Collaboration, Coordination and Integration**.

With so many organizations and agencies, overlap to some extent 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 have been minimal among the members that affect integrated water planning and management.

1	**Wholesale and retail water purveyors; including a local agency, mutual water company, or a water corporation as defined by Section 241 of the Public Utilities Code:**	
	Banning Heights Mutual Water Company	Municipal Water District of Orange County
	Bear Valley Mutual Water Company	Muscoy Mutual Water Company
	Beaumont Cherry Valley Water District	Nuevo Water Company
	Big Bear Municipal Water District	Orange County Water District
	Box Springs Mutual Water Company	Orange Park Acres Mutual Water District
	Cucamonga Valley Water District	Pine Cove Water District
	Eagle Valley Mutual Water Company	Rancho California Water District
	East Orange County Water District	Rancho Santa Margarita Water District
	East Valley Water District	Riverside Highlands Water Company
	Eastern Municipal Water District	Running Springs Water District
	El Toro Water District	San Antonio Water Company
	Elsinore Valley Municipal Water District	San Bernardino Valley Municipal Water District
	Fern Valley Water District	San Gorgonio Pass Water Agency
	Fontana Water Company	Santa Ana River Water Company
	Gage Canal Company	Santiago County Water District
	Home Gardens County Water District	Serrano Water District
	Idyllwild Water District	Southern California Water Company
	Inland Empire Utilities Agency	Terrace Water Company
	Irvine Ranch Water District	Trabuco Canyon Water District
	Lake Hemet Municipal Water District	West Valley Water District
	Lee Lake Water District	Western Heights Mutual Water Company
	Marygold Mutual Water Company	Western Municipal Water District
	Meeks & Daly Water Company	Yorba Linda Water District
	Mesa Consolidated Water District	Yucaipa Valley Water District
	Monte Vista Water District	

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

2	**Wastewater Agencies:**
	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 the wastewater agencies through the Santa Ana River Dischargers Associations and on several task force efforts, such as the Santa Ana River Use Attainability Analysis, the TIN TDS Task Force, and the Basin Monitoring Program Task Force. The wastewater agencies were particularly active in the water quality pillar and the water recycling pillar efforts of OWOW.

3	**Flood Management Agencies:**
	Riverside County Flood Control & Water Conservation District
	San Bernardino County Public Works
	Orange County Flood Control Division

SAWPA has a strong and positive working relationship with all three (3) flood control agencies through their involvement in the Flood Risk Management Pillar, the Stormwater Quality Standards Task Force, the various TMDL task forces administered by SAWPA, the brine line improvement coordination, and through low impact development projects and other forums.

Release at Prado Dam

4	Municipal and County Governments and Special Districts:	
	City of Anaheim	City of Orange
	City of Banning	City of Perris
	City of Beaumont	City of Placentia
	City of Big Bear Lake	City of Pomona
	City of Brea	City of Rancho Cucamonga
	City of Buena Park	City of Redlands
	City of Calimesa	City of Rialto
	City of Canyon Lake	City of Riverside
	City of Cerritos	City of Running Springs
	City of Chino	City of San Bernardino
	City of Chino Hills	City of San Jacinto
	City of Claremont	City of Santa Ana
	City of Colton	City of Seal Beach
	City of Corona	City of Stanton
	City of Costa Mesa	City of Temecula
	City of Cypress	City of Tustin
	City of Diamond Bar	City of Upland
	City of Eastvale	City of Villa Park
	City of Fontana	City of Wildomar
	City of Fountain Valley	City of Westminster
	City of Fullerton	City of Yorba Linda
	City of Garden Grove	City of Yucaipa
	City of Grand Terrace	Riverside County
	City of Hemet	County of San Bernardino
	City of Highland	Orange County Board of Supervisors
	City of Huntington Beach	Orange County Public Facilities & Resources Department
	City of Irvine	Orange County Resources & Development Management Department
	City of Jurupa Valley	Riverside County Department of Waste Management
	City of La Habra	Riverside County Park & Open Space District
	City of Lake Elsinore	San Bernardino County Board of Supervisors
	City of Lake Forest	Big Bear Lake Department of Water & Power
	City of Lakewood	Big Bear City Community Services District
	City of Loma Linda	Edgewater Community Services District
	City of Los Alamitos	Jurupa Community Services District
	City of Menifee	Rubidoux Community Services District
	City of Montclair	Riverside County Economic Development Agency
	City of Moreno Valley	Chino Basin Water Conservation District
	City of Murrieta	San Bernardino Valley Water Conservation District
	City of Newport Beach	San Timoteo Watershed Management Authority
	City of Norco	Chino Desalter Authority
	City of Ontario	Lake Elsinore and San Jacinto Watersheds Authority

SAWPA has conducted extensive outreach to these entities including presentations to City Councils, Boards of Supervisors, and involved cities and counties in the OWOW governance, and worked with many under various workgroups and task forces and in some cases, even served on the these organizations' boards.

5	**Electrical Corporation, as defined in Section 218 of the Public Utilities Code:**
	Southern California Public Power Authority
	So Cal Edison
	Power Sol Energy
	Colmac Energy Inc.

SAWPA has been a strong supporter of the American Society of Civil Engineers Inland Empire Infrastructure Report Card, serving as Chair of the Report Card prepared in 2005. In 2008, an update to the Report Card was prepared, which included the involvement of the electrical corporations listed above. Briefings about the OWOW planning process were shared with the Report Card committee and the results were incorporated into the OWOW Plan. For the OWOW 2.0 Plan, a new pillar was formed to specifically address the water-energy nexus. See **Chapter 5.13 Energy and Environmental Impact Response** for more details.

6	**Native American Tribes that have Lands within the Region:**
	Morongo Band of Mission Indians
	San Manuel Band of Mission Indians
	Santa Rosa Band of Mission Indians
	Soboba Band of Luiseño Indians
	Temecula Band of Luiseno Mission Indians

Since OWOW 1.0, significant progress has been made with outreach and involvement of the native American tribes with the establishment of the Disadvantaged and Tribal Pillars, and participation of a tribal member on the OWOW Steering Committee.

7	**Self-supplied Water users, including Agricultural, Industrial, Residential and Park Districts, School Districts, Colleges and Universities, and Others:**
	March Air Reserve Base

SAWPA has worked with the March Air Reserve Base through the Lake Elsinore/Canyon Lake Nutrient TMDL Task Force, which receives briefings on the OWOW process.

8	Environmental Stewardship Organizations Including Watershed Groups, Fishing Groups, Land Conservancies, and Environmental Groups
	Audubon Society
	Endangered Habitats League
	Sierra Club, San Gorgonio Chapter
	Newport Bay Naturalists & Friends
	Santa Ana River Watershed Alliance
	Santa Ana Watershed Association
	Coastal Coalition
	Southern California Wetlands Restoration Project
	Friends of the Northern San Jacinto Valley
	Friends of the Santa Ana River
	San Jacinto River Watershed Council
	Inland Empire WaterKeeper
	Orange County CoastKeeper
	Western Riverside Regional Conservation Authority
	Redlands Conservancy
	California Coastal Conservancy
	Riverside Land Conservancy
	San Gabriel & Lower Los Angeles Rivers & Mountains Conservancy
	The Nature Conservancy
	The Wildlands Conservancy
	San Jacinto Basin Resource Conservation District
	Inland Empire Resource Conservation District
	Riverside Corona Resource Conservation District

Recognizing the importance of the relationship of water and the environment, SAWPA has worked actively to involve the environmental community under the Natural Resources Stewardship Pillars, and in the many collaborative workgroups and task forces. Examples include the Santa Ana Fish Conservation group, the Emerging Constituents Workgroup, the Arundo Removal Programs, and Mitigation Banks. In some cases, SAWPA serves on the boards of these organizations.

9	Community Organizations, Including Land Owner Organizations, Taxpayer Groups, and Recreational Interests:
	Trails 4 All
	Jurupa Area Recreation & Park District
	Santa Ana River Trail & Parkway Partnership
	Orange County Conservation Corps
	March Joint Powers Authority
	Canyon Lake Property Owners Association

10	Industry Organizations Representing Agriculture, Developers, and other Industries Appropriate to the Region:
	American Society of Civil Engineers
	Building Industry Association of Riverside County
	Building Industry Association: Baldy View Chapter

Inland Action Group
Valley Group
Green Valley Initiative
Raincross Group
Riverside County Farm Bureau
San Bernardino County Farm Bureau
Milk Producers Council
Western Riverside County Agricultural Coalition

SAWPA has worked actively to involve several recreational communities in the OWOW planning process and in the many collaborative workgroups and task forces. Examples include the Santa Ana Fish Conservation group, the Emerging Constituents Workgroup, the Santa Ana River Trails group, the Arundo Removal Programs, and Mitigation Banks. In some cases, SAWPA serves on the boards of these organizations.

The feedback and involvement of the building and agricultural industry are important components to the development of the OWOW Plan. Representatives from these organizations have actively participated in various OWOW conferences and outreach meetings. A representative from the Farm Bureau served as Co-chair on the Natural Resources Stewardship Pillar. A strong relationship has developed with the Western Riverside County Agricultural Coalition and various farm bureaus, through SAWPA facilitation of TMDL task forces and other collaborative efforts.

11	**State, Federal, and Regional Agencies or Universities that have Specific Responsibilities or Knowledge within the Region:**	
	Association of California Water Agencies	California Department of Water Resources
	South Coast Air Quality Management District	Caltrans
	Southern California Association of Governments	Santa Ana Regional Water Quality Control Board
	Western Governors Association	U.S. National Park Service
	University of California Riverside	USDA Forest Service, PSW
	University of California Irvine	U.S. Bureau of Reclamation
	California Baptist University	U.S. Army Corps of Engineers
	Cal State University, Fullerton	U.S. National Marine Fisheries Service
	California Department of Fish and Game	

The four universities have worked as consultants and participants in many multi-agency efforts with SAWPA, including the ASCE 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. The working relationship with State agencies is very strong particularly with the Santa Ana Regional Water Quality Control Board through their participation in just about every workgroup and task force effort, as well as OWOW planning. The importance of working closely with State and Federal agencies was deemed so vital that a Pillar known as the Government Alliance was formed under OWOW 2.0. Details of their involvement are described under **Chapter 5.12 Government Alliance**.

12	DAC Members and Representatives, Including Environmental Justice Organizations, Neighborhood Councils, and Social Justice Organizations:
	Latino Health Network
	Rialto Singe Center
	Latino Health Access
	Riverside County Housing Authority
	California Latino Water Coalition

Of the many agencies and stakeholders involved in the process, particular emphasis was placed on conducting outreach to Disadvantaged Communities and Environment Justice interests. As part of the planning process, it became apparent that in order to fulfill the goal of direct involvement in the environmental justice community, it would be necessary to go directly to communities within disadvantaged census tracts and engage residents directly. It appeared implausible that adequate, unbiased information could be collected from meetings structured like those in the usual water resources planning process. It also became apparent that outreach would need to be conducted in a bilingual setting, as many residents were Spanish speaking and uncomfortable providing information in English.

In order to get the widest possible assessment of the concerns of the residents in minority and/or low income communities in the three counties, the Disadvantaged and Tribal Communities Pillar conducted significant outreach. Details of these efforts are described under **Chapter 5.11 Disadvantaged and Tribal Communities**.

13	Other Interested Groups Appropriate to the Region:	
	Chino Basin Watermaster	SE Corporation
	Basin Technical Group of San Bernardino Valley	Stantec
	Inland Empire Utilities Agency Chino Creek Planning Group	The Irvine Company
	Newport Bay Watershed Executive Committee	Southern California Water Committee
	San Antonio Canyon Stakeholders Committee	Inland Empire Economic Partnership
	Santa Ana River Dischargers Association	Canyon Lake Chamber of Commerce
	California Foundation on Environment and the Economy	Chino Valley Chamber of Commerce
	National Water Research Institute	Corona Chamber of Commerce
	Urban Water Institute	Greater Riverside Chamber of Commerce
	Water Education Foundation	Lake Elsinore Chamber of Commerce
	Brown and Caldwell	Ontario Chamber of Commerce
	CDM	San Bernardino Area Chamber of Commerce
	David Taussig & Associates	Temecula Valley Chamber of Commerce
	Ferguson Group	Cities of Murrieta and Temecula Business Group
	Iger & Associates	Western Riverside Council of Governments
	Kennedy Jenks	Western Riverside Council of Governments
	RBF	

SAWPA Email Blasts

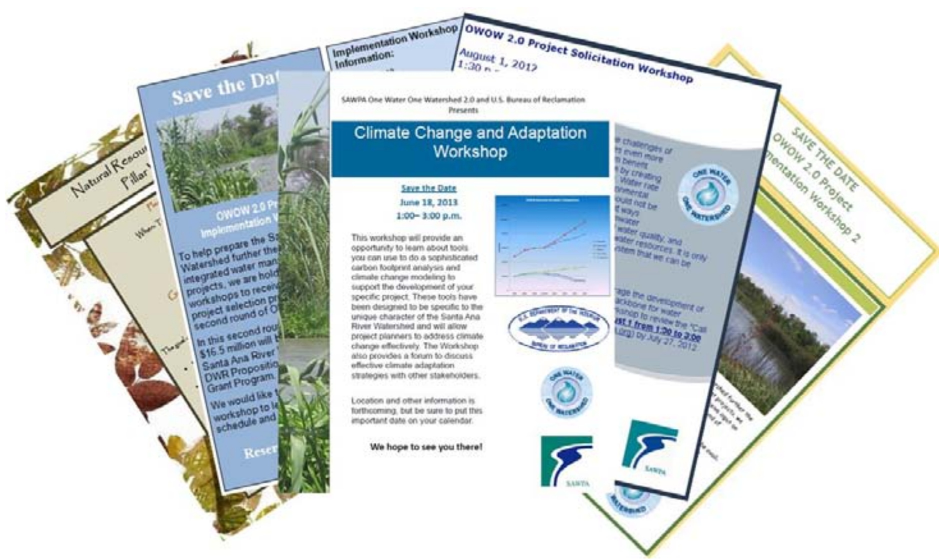
SAWPA primarily provided communication to stakeholders based on an extensive electronic mailing list maintained on by SAWPA. The list is updated regularly, and anyone requesting information is added to the list using software known as “Constant Contact”. Email contact allows regular communication with a broad group of stakeholders throughout the watershed. The mailing list also includes stakeholders outside the watershed who are interested in the watershed issues.

The master contacts database includes a rather diverse base of approximately 4,000 stakeholders. The focus of the database is those having an interest in water and representatives from cities located within the watershed. It includes representatives from 121 agencies associated with water; from flood control, water conservation districts, and 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. The database also includes an up-to-date list of members of the California legislature.

Also included are representatives from County, State, and Federal governments, Indian 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.

Public Meetings, Conferences and Presentations

The core of any public outreach program is the direct contact with interested stakeholder groups. As part of the OWOW process, SAWPA staff has made over 50 presentations to specific stakeholder groups to both inform and to invite participation. Since September 2011, 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. Emphasis was placed on the next generation of OWOW planning with the kick off of OWOW 2.0 as not simply an update, but the “Implementation” phase of the OWOW plan. The OWOW 1.0 Plan adopted by the SAWPA Commission in November of 2011 was posted on the SAWPA website for reference as stakeholders kicked off the planning work on the OWOW 2.0 Plan.



Since September 2011, SAWPA has hosted its third and fourth annual OWOW watershed conferences on April 25, 2012, at the National Orange Show Events Center in San Bernardino, CA, and on April 11, 2013, at the Westin South Coast Plaza Hotel, Costa Mesa, CA. These events were well attended, each with over 400 attendees. The conferences serve as a very effective opportunity to invite the public to become involved in OWOW, to discuss the OWOW plan development to date, and the new DWR IRWM Plan standards and IRWM Proposal Solicitation Packages under Proposition 84. The conferences also serve to reinforce the OWOW plan goals to encourage a watershed focus, and encourage collaboration in developing multi-benefit projects. Participants identified greater operational efficiencies and reduced environmental impacts as benefits of these kinds of projects.

SAWPA staff also has provided briefings and presentations to a number of specific groups. The presentations included a review of the OWOW program and an invitation to participate in the process. Representative presentations to specific groups are summarized below.

- Cities
- Agricultural Groups
- Business/Economic Development Groups
- Watershed Councils and Groups
- Presentations to Organizations

Expanded Stakeholder Outreach – Social Media

Under OWOW 2.0, stakeholder outreach expanded in the watershed to more interaction with universities/colleges, the business community, and the public, with the development of new tools and outreach materials. One of the growing sets of tools is the use of social media. Social networking and the tools used to reach out increase the avenue for communicating OWOW goals and encourage involvement and collaboration to broad and diverse audiences. Consequently, SAWPA has folded in social media as a component of its overall public outreach for its strategic plan, as well as support of OWOW outreach.

In the design of an OWOW social media program, SAWPA has built upon the public outreach vehicles used in the past under OWOW 1.0 Plan, such as SAWPA e-newsletter and e-blasts to create additional traffic to the SAWPA website. Further, based on the linkages that exist between social media tools such as websites, Facebook, Twitter, YouTube, and blogs, viewership has increased resulting in more stakeholder interest and participation in the development of the Plan, and consideration of increased integration of future projects and programs that will meet the goals of the Plan.

In the development of social media tools, one of our first steps was to define the goals, strategy, and audience for these tools. In recognition of the multiple roles of SAWPA, new social media tools sought to support mutual goals of the organization, as well as to support the outreach and collaboration necessary for OWOW 2.0 planning. The establishment of strategic goals for public outreach area was a necessary first step. They are listed as follows:

1. Balanced access and opportunity for participation.
2. Effective communication, both internal and external to the IRWM region.
3. Publish information demonstrating the economic value to the watershed of sustainable water resources practices and regional collaboration.
4. Establish a repository of information on water quality to assist agencies in analysis and decision-making.
5. Implement the brand of One Water One Watershed (OWOW) as a unique Santa Ana River Watershed identity.

The goals listed above are supported through traditional SAWPA communication efforts and through social media. Particular outreach activities are well suited to social media tools. For example, providing clear, understandable and valuable information to the public is effectively accomplished through social media.

What is our Message?

SAWPA provides leadership and information to all stakeholders in reaching the goal of a sustainable Santa Ana River Watershed. The following key message points describe SAWPA's role in accomplishing this OWOW vision and serves as a guide that is consistently weaved into our outreach.

1. SAWPA is a collaborator/facilitator emphasizing a watershed focus and as such, can provide tools and models useful for addressing watershed issues.
2. Water Ethic is crucial for implementing an integrated watershed vision - every stakeholder should know:
   a. Where does your water come from?
   b. How much of it do you use?
   c. What do you put into the water before it leaves?

    d. Where does it go after you use it?
3. SAWPA is a "go to" place, providing valuable information to our stakeholders useful for the implementation of creative solutions to watershed issues.
4. SAWPA is a State model for leadership in watershed planning and can provide a forum and tools for development of integrated solutions.
5. SAWPA is a leader in developing new ways to see and to respond to problems, and we share this information and insight with our stakeholders.
6. Multi-function, multi-beneficial projects are the most cost effective ways of working, and SAWPA provides facilitation/information to support these projects.
7. SAWPA's collaborative models are "WIN-WIN" and adaptable to multiple problems.
8. The world is changing and SAWPA can help manage the change in the way we do business, especially as we face;
    a. Climate change
    b. Increased stress on resources
    c. Reduced financial resources for single purpose projects
9. SAWPA emphasizes the use of local resources as it provides more reliability and sustainability.
10. Sustainability makes good economic and resource sense, and SAWPA serves as a resource to model sustainability.
11. SAWPA continues to develop and share new models for working in response to changing conditions.

Who is our Target Audience(s)?

One of the most important aspects of developing a social media outreach plan is to identify SAWPA's audience. With over six million residents in the Santa Ana River Watershed and in the IRWM region, our audience is diverse in age and communication style. Social media outreach can reach an audience that is diverse in both of these categories. As much as information is distributed to stakeholders via email, it is important to note that email is not the preferred mode of communication of younger stakeholders. Through social media, SAWPA has the ability to immediately connect to a much broader geographic audience by providing valuable information, creating and expanding the value of a water ethic for the 21st Century, and encouraging resource stewardship.

SAWPA's audiences include:

- **All residents of the Santa Ana River Watershed:** For example, the young mom/family concerned about the quality of their drinking water, or the retired resident on a fixed income, or the political advocate. An effort using social media would be particularly effective in these circumstances. SAWPA currently is partnering with its member agencies to provide all watershed residents with unbiased, fact-based information regarding "Emerging Constituents".

- **Decision leaders and elected officials: SAWPA is a leader in providing information and cooperative models for decision leaders** from water and general government, senior management and technical staffs from agencies engaged in water and resource management, the regulatory community, and NGOs. For example, the OWOW Planning effort provides information to all those interested in the management of water and in some cases, provides general stakeholder information to those interested in water. In other cases, the OWOW planning process provides focused technical information to water resource practitioners. In each case, the appropriateness of communication outreach needs to be considered. In the case of more technical or detailed information, email or other means of communication may be more effective.

- **Stakeholders Engaged in the SAWPA Roundtable Process**: SAWPA convenes a number of roundtable efforts focused on discrete problems or issues within the watershed. The content is often technical in nature and is best communicated through other means such as email, but the actions of these groups often have results of interest to broader audiences. In these cases, social media may be used to provide updates to the broader audience (e.g., emerging constituents' task force group).

SAWPA typically has engaged in a "business to business" (B2B) outreach model; however, by establishing a strong social media presence, SAWPA reaches out to a wider variety of audiences than we traditionally have reached.

Through social media presence, SAWPA provides a virtual venue to invite collaboration and encourage interaction from others, to inspire and educate watershed residents, and provide Web-based information. Under OWOW 2.0 and the use of social media, SAWPA has driven even more visitor traffic to its website, promoting itself as the State's role model for integrated regional watershed management planning, sharing its expertise and knowledge with others, and becoming known as a trendsetter for innovation and collaboration, as well as establishing a brand of a sustainable Santa Ana River Watershed.

SAWPA's website is considered as "home base":

1. By using appropriate social media tools such as Linked In, Facebook, YouTube and Twitter, SAWPA drives more visitor traffic to its website.
2. Through Linked In, Twitter, YouTube and Facebook, SAWPA expands its outreach efforts for events and services provided by SAWPA. For example, Twitter is used to provide real time messaging of conferences and events watershed-wide.
3. Social media provides powerful tools to network and engage in the political process. Many of SAWPA's stakeholders are key decision leaders in water resource management, and SAWPA's integrated approach helps engender a unified voice for political action in a regional manner.
4. With such a large geographic area in the Santa Ana River Watershed, 2,650 square miles and stretching across three counties – Orange, Riverside, and San Bernardino, social media allows SAWPA to provide outreach to a diverse population in an economical and resource-saving manner.
5. SAWPA's website provides links inviting visitors to join us on Facebook, Twitter, YouTube, and LinkedIn.

Twitter: https://twitter.com/sawpa_owow

SAWPA currently uses Twitter as a social media tool for providing updates and timely information of interest to watershed stakeholders. Frequency of stakeholder contact occurs at least weekly.

YouTube: http://www.youtube.com/user/SAWPATUBE

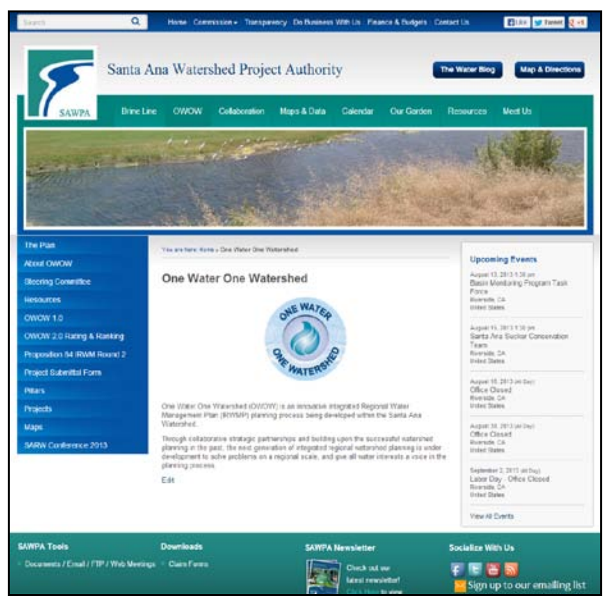
In efforts to increase SAWPA's social media presence, videos are uploaded to YouTube. Videos are used to promote OWOW events.

Constant Contact

SAWPA, as the regional IRWM group for the OWOW 2.0 Update, held numerous workshops and speaking engagements about OWOW, sent out numerous email blasts announcing OWOW related events and actions, and distributed OWOW newsletters by email blasts. The email blasts are sent by an email marketing company called Constant Contact that reaches over 3,000 stakeholders throughout the watershed.

Website Update

To support the OWOW planning process, SAWPA has made improvements to its website, including the dedication of resources to an OWOW webpage. The OWOW webpage created in 2010 provides watershed stakeholders and the public with various information and updates relating to SAWPA's integrated regional watershed management program.



Upcoming Events http://www.sawpa.org/events/

The SAWPA website events calendar's versatile options allow viewers to choose the type of events they want to see. By selecting the OWOW option, viewers are shown an up-to-date calendar of upcoming OWOW events such as workshops, pillar meetings, and releases from DWR. When opening an event, the viewer has access to agendas and any other documents pertaining to that event.

Web Links

The webpage provides viewers access to a number of links to the OWOW plan, as well as program background information, tools, forms, and data.

About OWOW http://www.sawpa.org/owow/about-owow/	**OWOW Plan (IRWMP)** http://www.sawpa.org/owow/the-plan/	**How do I get involved?** http://www.sawpa.org/owow/how-do-i-get-involved/	**Governance** http://www.sawpa.org/owow/steering-committee/
Viewers are provided with the history of OWOW. From the "Four Horsemen of the Apocalypse" concept to the importance of collaboration in future projects, the "About OWOW" page allows the viewer to understand the many purposes of OWOW.	Viewers have access to the current OWOW plan. Each chapter is linked separately in order to facilitate the downloading process of the plan.	This page engages the viewer's involvement in SAWPA's various ways of staying connected to the OWOW process. This is done by encouraging viewers to sign up to SAWPA's emailing list, joining an OWOW pillar workgroup, and allowing viewers to obtain past workshop's agendas, meeting notes, and presentations.	This page gives the viewer an opportunity to get to know the OWOW Steering Committee by providing a brief background on the elected officials. Viewers also can download the Steering Committee agenda packets. Current OWOW Pillars are also listed by Pillar names with their respective SAWPA staff contacts.
Project Database http://www.sawpa.org/owow/project-submittal-form/	**OWOW Tools** http://www.sawpa.org/owow/owow_tools/	**Resources** http://www.sawpa.org/owow/resources/	
SAWPA allows agencies to submit their projects for consideration to be included in the OWOW Plan. A list of submitted projects also is available.	This page allows viewers to obtain access to computer support tools that support our modern water management goals. Viewer will find the Greenhouse Gas Emissions Calculator, Climate Change Analysis, and, soon to come, Watershed Report Card.	Viewers are provided with materials that will allow them to be better informed about OWOW.	

2.3 Collaboration, Coordination and Integration

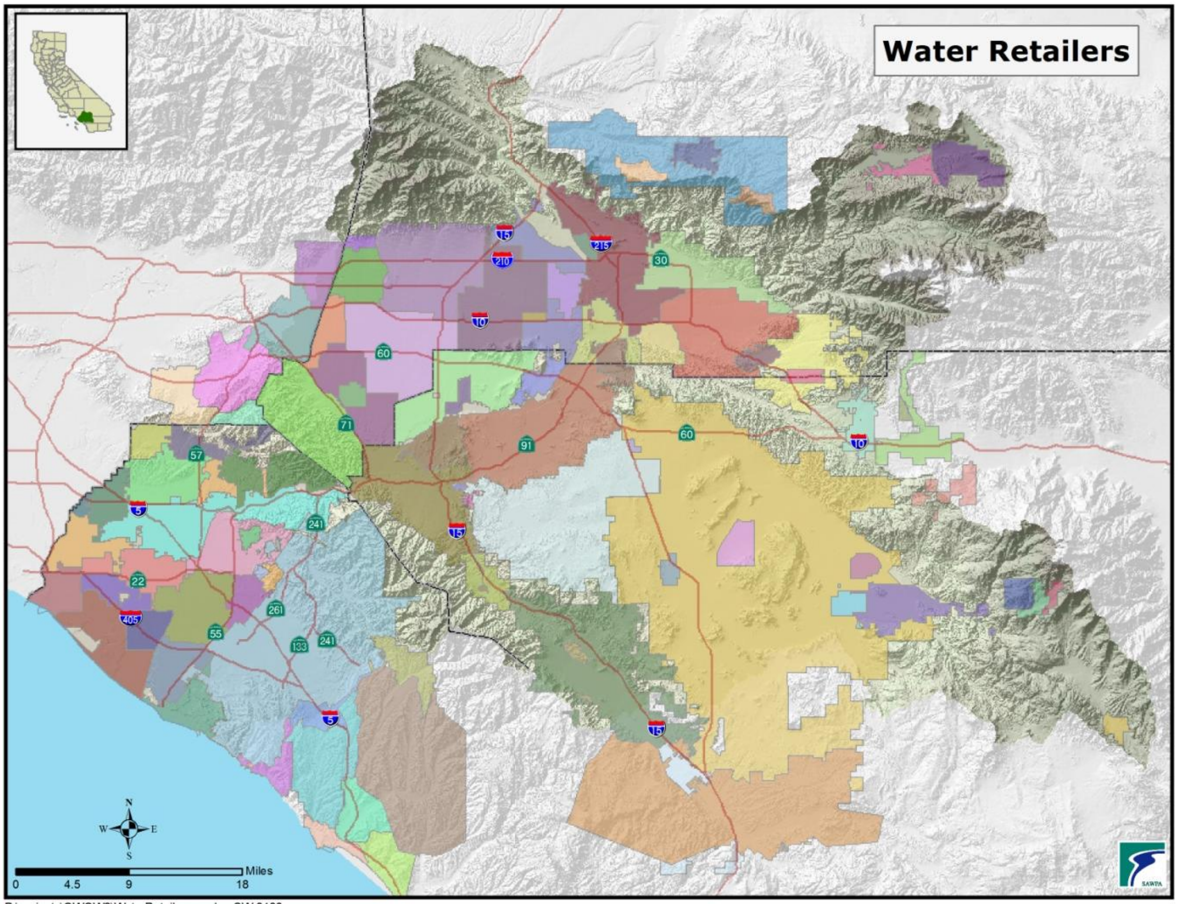
OWOW Call For Projects Workshop

As is likely to occur within any watershed, sometimes conflicting goals or priorities of various watershed agencies can hinder progress towards collaboration and coordination. Within the Santa Ana River Watershed there are over 100 large and small water districts (**Figure 2.3-1** on page 2), local, regional, State and Federal agencies, and public/private stakeholder groups. The Santa Ana Watershed Project Authority (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 One Water One Watershed (OWOW) 2.0 planning 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 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



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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, 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 Elements 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, 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, it is important to not only coordinate efforts with other planning agencies within the region, but it is equally important to coordinate across regional boundaries. During the preparation of the OWOW 2.0 Plan, 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, Upper Santa Margarita, Mojave and Coachella Valley regions.

Collaborative Efforts within the Santa Ana River Watershed

SAWPA, as the leading regional water resource agency for the Santa Ana River Watershed and region, plays a major role in administering, participating, coordinating, and facilitating efforts to address regional water management issues. In fact, since its formation, this has been one of the major purposes of SAWPA in supporting the 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, the need for a way to resolve regional differences and conflicts in a cooperative approach was suggested and realized by the creation of SAWPA. The cooperative approach exists today by the regular meetings among the SAWPA member districts but also among the many multi-agency and multi-organizations that SAWPA supports through what is described as the "SAWPA Roundtable".

The results of the Nitrogen and TDS Task Force, the Emerging Constituents Program Task Force and many others serves as an outstanding template for collaboration and was sighted by resolution of the Regional Water Quality Control Board and the State Water Resource Control Board Strategic Plan as an outstanding example of collaborative efforts to resolve water quality issues.

Utilizing the capable skills of SAWPA staff, multi-agency agreements are developed, consultant contracts are managed, and discussion meetings are administered. The end products of these efforts are successful programs and projects that represent the best in collaboration and facilitation support services. In addition, by the positive and cooperative relationship that SAWPA has with the Santa Ana

Regional Water Quality Control Board, SAWPA has served as an effective liaison between the regulators and regulated community in producing effective partnerships and working relationships.

The following task forces and workgroups are examples of watershed partnerships that SAWPA has administered and formed often with the Santa Ana Regional Board and represent positive steps toward integrated and collaborative solutions.

Overview of Governing Laws, Judgments and Agreements

This section lists mostof the governing laws, judgments, and agreements in place that have had significant influence on water management and addressed conflicts in the watershed.

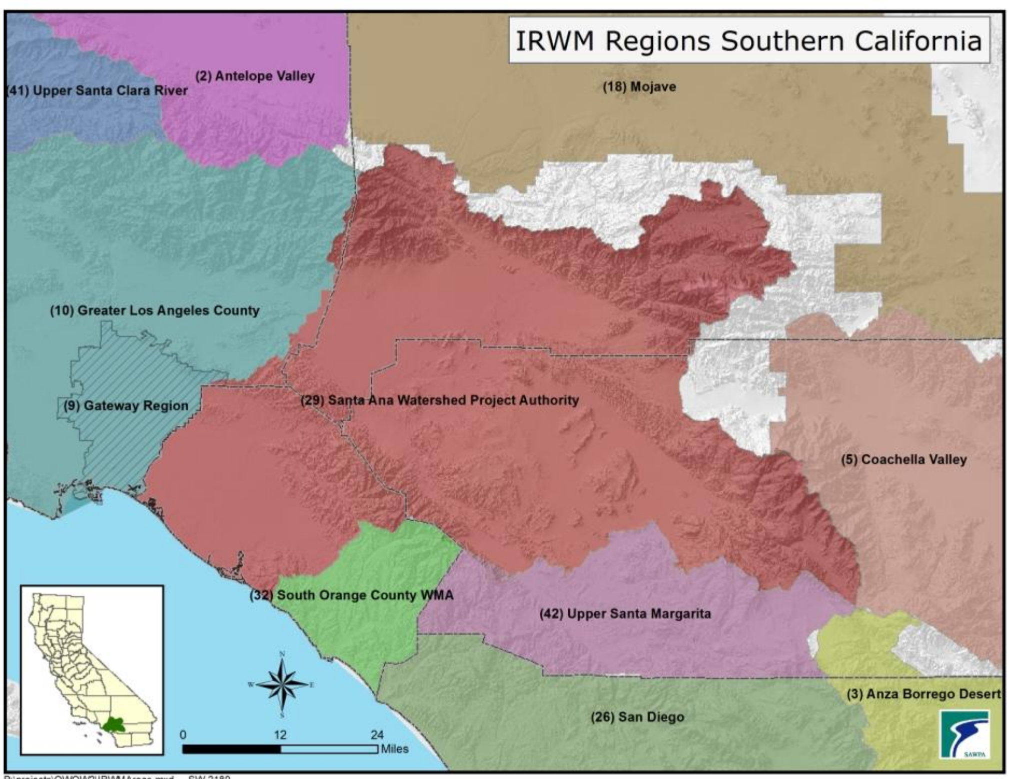
- Settlement Agreement between City of San Bernardino and City of Riverside and Riverside Water Company, 1922
- Colorado River Compact, 1922
- Seven-Party Agreement, 1931
- Rialto Basin Judgment, 1961
- Chino Basin-City of Pomona Agreement, 1968
- Orange County/Chino Judgment, 1969
- Western/San Bernardino Judgment, 1969
- Western, Chino Basin, County of Riverside, Riverside County Flood Control and Water Conservation District Agreement, 1969
- Chino Basin-Western Agreement, 1970
- Endangered Species Act, 1973
- Santa Ana River-Mill Creek Cooperative Water Project Agreement, 1976
- Big Bear Municipal Water District/North Fork Water Co. Judgment, 1977
- Chino Basin Judgment, 1978
- San Bernardino-City of San Bernardino, City of Riverside Agreement, 1981
- San Bernardino-Western Agreement, 1981
- San Bernardino-Western, Orange County, Riverside, and San Bernardino City Agreement, 1985
- Monterey Agreement, 1994
- Big Bear Municipal and Valley District Agreement, 1996
- Chino Basin Peace Agreement, 2000
- Integrated Regional Water Management Planning Act, 2002
- Groundwater Management Planning Act, 2002
- Seven Oaks Accord, 2004
- Beaumont Basin Judgment, 2004
- Settlement Agreement with San Bernardino Valley Water Conservation District, 2005
- Memorandum of Understanding with the City of Riverside, 2005
- Chino Basin Peace II Agreement, 2008
- Soboba Water Rights Settlement Act, 2008
- Institutional Controls and Settlement Agreement (ICSA), 2004
- Agreement Relating to the Diversion of Water from the SAR System among WMWD, Valley District, and City of Riverside, 2004
- Cooperative Agreement to Protect Water Quality and Encourage the Conjunctive Uses of Imported Water in the SAR Basin, 2007
- Southern California Steelhead Recovery Plan, 2012

Collaborative Efforts with Adjacent or Overlapping Areas to Watershed

The Santa Ana IRWM region is surrounded by six other IRWM regions, as shown in the map below, including: South Orange County Watershed Management Area, Upper Santa Margarita, Greater Los Angeles County, Gateway Region, Coachella Valley and Mojave.

SAWPA proactively seeks meeting with neighboring regions to share and stay abreast of critical issues, ongoing efforts, and opportunities for collaboration in the region. Under OWOW 2.0, SAWPA worked closely with the Upper Santa Margarita RWMG serving on their review panel for selecting a consultant to support their IRWM plan development. Through SAWPA staff's involvement on the Water Advisory Committee of Orange County, the Southern California Water Committee, Southern California Water Dialogue, and various other water resource forums, communication and collaboration about water resource planning has been conducted with all six other IRWM regions. When SAWPA conducted multiple climate change workshops working closely with the U.S. Bureau of Reclamation, invites were sent out to all neighboring IRWM regions as well as State and Federal agencies all impacted by the climate change and are currently conducting analysis on their own respective impacts. Feedback received from these surrounding and involved regions was that these workshops were extremely beneficial particularly as each continued development on their respective climate change adaptation plans under the IRWM planning.

Another forum in which SAWPA plays a significant role in promoting cooperation and coordination with other neighboring regions as well as IRWM regions across the State is through the Roundtable of Regions organization. This coalition of IRWMs allows all the regions to voice and discuss common issues and concerns and have worked closely with the CA Dept of Water Resources on many occasions.



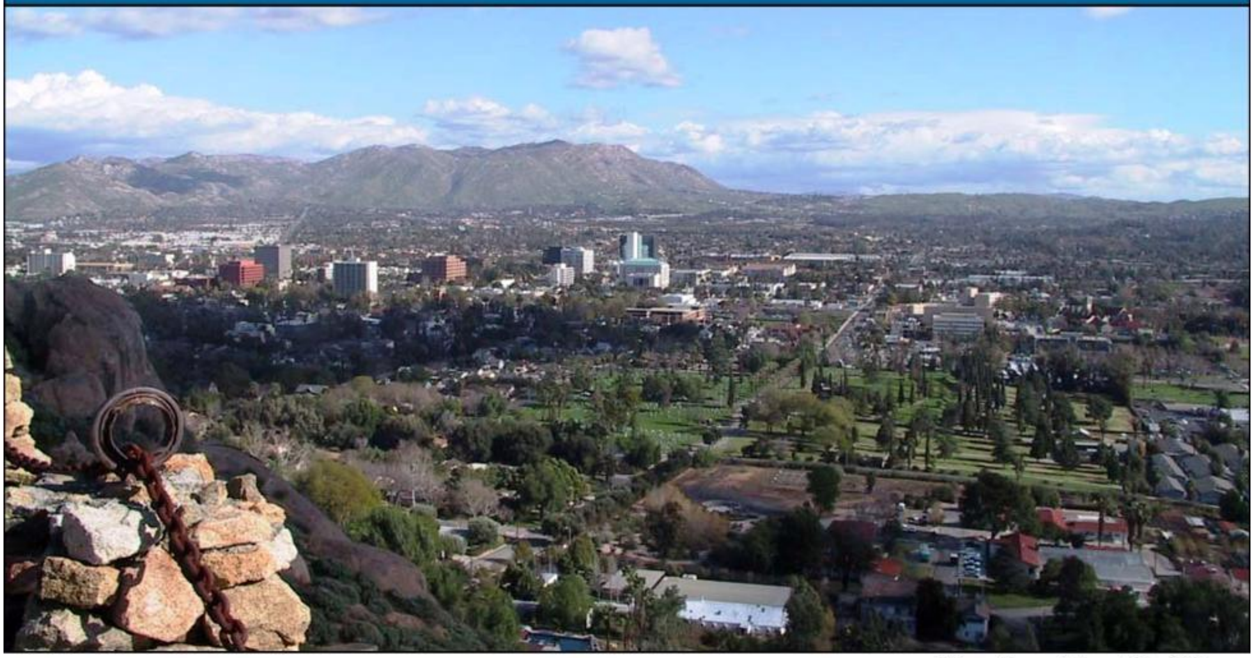
The Roundtable of Regions has conducted informational surveys, conducted collaborative workshops and conferences and provided important input to DWR on grant applications and other legislative issues affecting IRWMs. At the IRWM conferences, SAWPA has been very involved in the sponsoring, planning and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

At the State level, SAWPA has also taken a prominent leadership role in assisting the visioning and strategic planning of IRWM for the State through its participation on a select focus group called the IRWM Strategic Plan Focus Group. Selected by his peers along with four other IRWM region staff, Mark Norton, Water Resources and Planning Manager for SAWPA, represents the 48 IRWM regions' voice at the meetings of the focus group. The focus group is designed to review and comment on DWR's planning approach for stakeholder outreach and engagement, validate DWR's efforts to collect, document and assimilate stakeholder input and provide preliminary review and feedback on strategic plan documents to ensure input is appropriately portrayed and addressed. The focus group is expected to serve in this role in 2013-2014.

Finally, the collaboration among neighboring regions has also on occasion led to interregional projects as in the case of the "Brine line to the Salton Sea". This conceptual project was conceived as an opportunity to transfer brine flow that is ordinarily sent to the ocean for disposal as a resource to the inland water body, the Salton Sea located in the Coachella Valley and outside the Santa Ana River Watershed. This brine flow could be delivered to the Salton Sea to help stabilize water levels at the sea and provide water for playa dust abatement. With brine flow concentrations coming out of the Santa Ana River Watershed at 5000-6000 mg/L TDS, these concentrations are far lower than the ambient salt levels of the Salton Sea at 55,000 mg/L and could actually be viewed as a benefit. In discussions of this conceptual project, several meetings were held by SAWPA with the US Bureau of Reclamation, Colorado River Regional Water Quality Control Board, the Salton Sea Authority and representatives from the Coachella Valley IRWM region who are also working to update their IRWM plan. The brine line to the Salton Sea project would involve the construction of a brine disposal pipeline heading east out of the Santa Ana River Watershed and would traverse portions of the Coachella Valley IRWM region to the Salton Sea. In addition to Salton Sea water level stabilization, potential benefit of a new brine disposal pipeline to help dispose of brine from future groundwater desalination from Coachella Valley groundwater basins was also discussed. An appraisal level analysis is described and included under **Chapter 5.5.1 Brine Line to the Salton Sea**.

Though the project at this stage still needs much further study and evaluation, the project serves as an effective demonstration of an inter-regional cooperative project among two neighboring IRWM regions initiated by SAWPA that could enhance efficiencies and help solve salt issues facing both regions.

3.0 Watershed Setting



View from Mount Rubidoux
City of Riverside

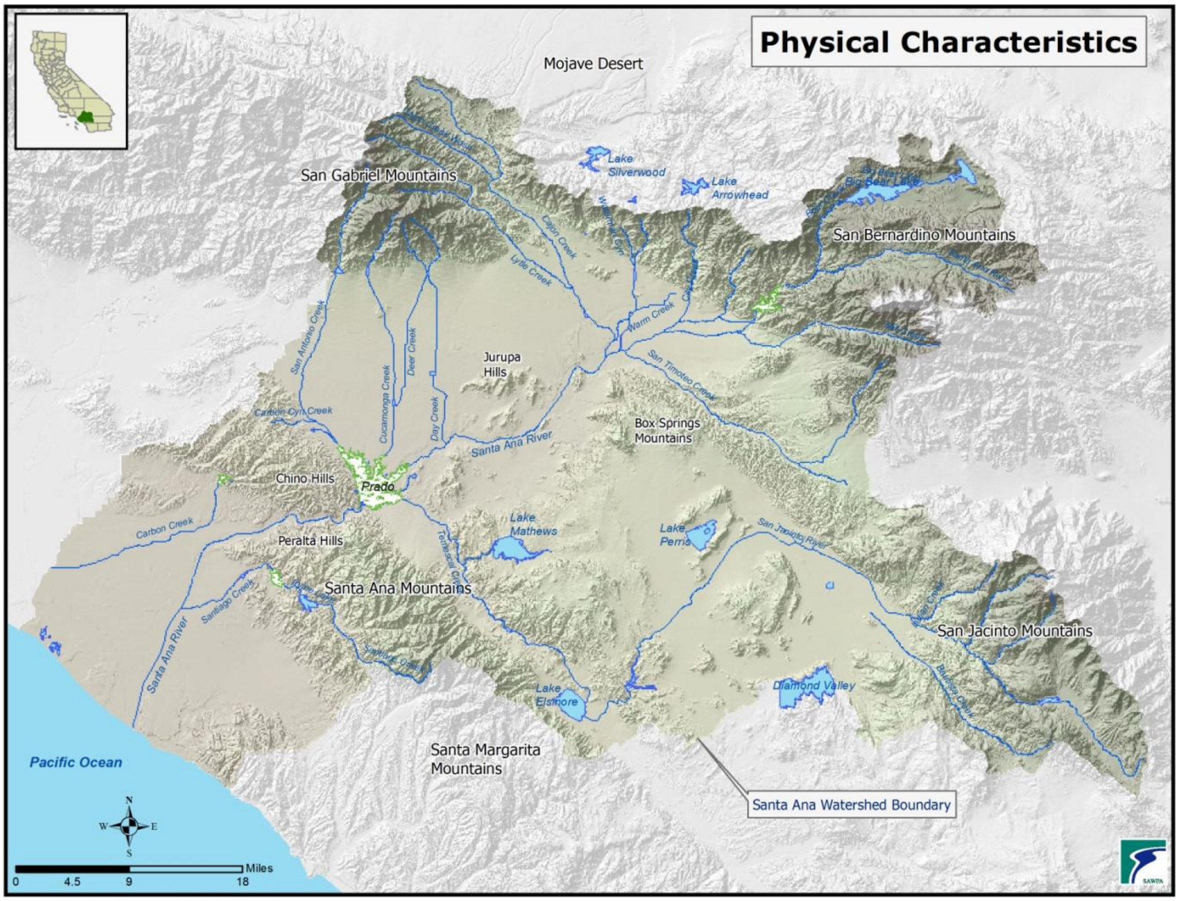
Physical Setting

Dunne and Leopold (1978) define a watershed as an area of land that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel.

The Santa Ana River (SAR) Watershed, depicted in **Figure 3-1**, drains a 2,650 square-mile area. The watershed is home to over 6 million people and includes the major population centers of parts of Orange, Riverside, and San Bernardino Counties, as well as a sliver of 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 length of the SAR and its major tributaries is about 700 miles.

Figure 3-1 Santa Ana Integrated Regional Water Management Region



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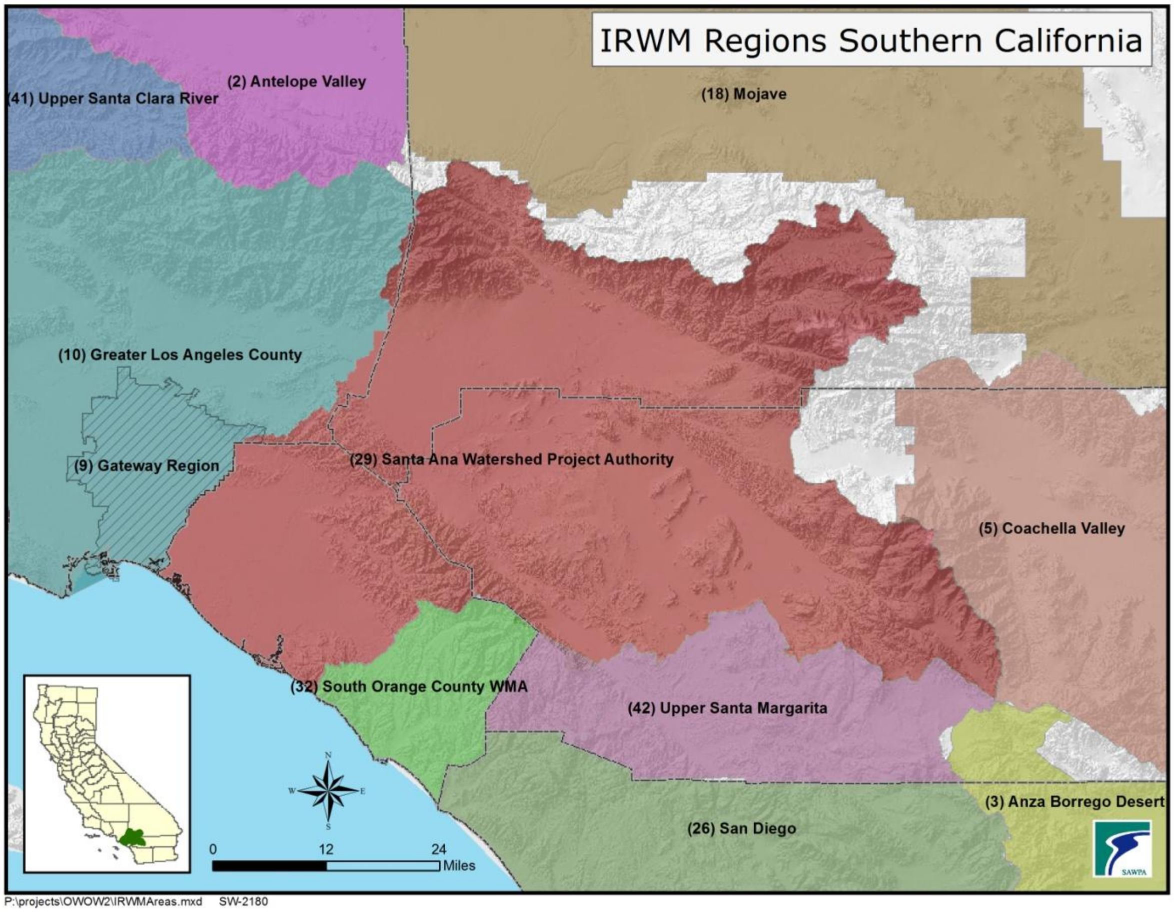
The watershed boundaries nearly match the boundaries of the Santa Ana Regional Water Quality Control Board, an organization with whom the Santa Ana Watershed Project Authority (SAWPA) has worked closely with for many years. In addition, its boundaries match the Integrated Regional Water Management (IRWM) region and the recognized Santa Ana Funding Area, as defined by the Proposition 84 IRWM program. Although there are many sub-watershed planning efforts, One Water One Watershed 2.0 (OWOW) attempts to bring all these efforts, as well as all different jurisdictions in the watershed, into a single watershed-wide vision. Over the years, SAWPA has participated in the development of sub-regional IRWM plans, with the understanding that such plans would be complementary to OWOW.

In addition, SAWPA proactively seeks meeting with neighboring regions, shown in **Figure 3-2** to share and stay abreast of critical issues, ongoing efforts, and opportunities for collaboration in the region.

Figure 3-2 Santa Ana IRWM Neighboring Regions

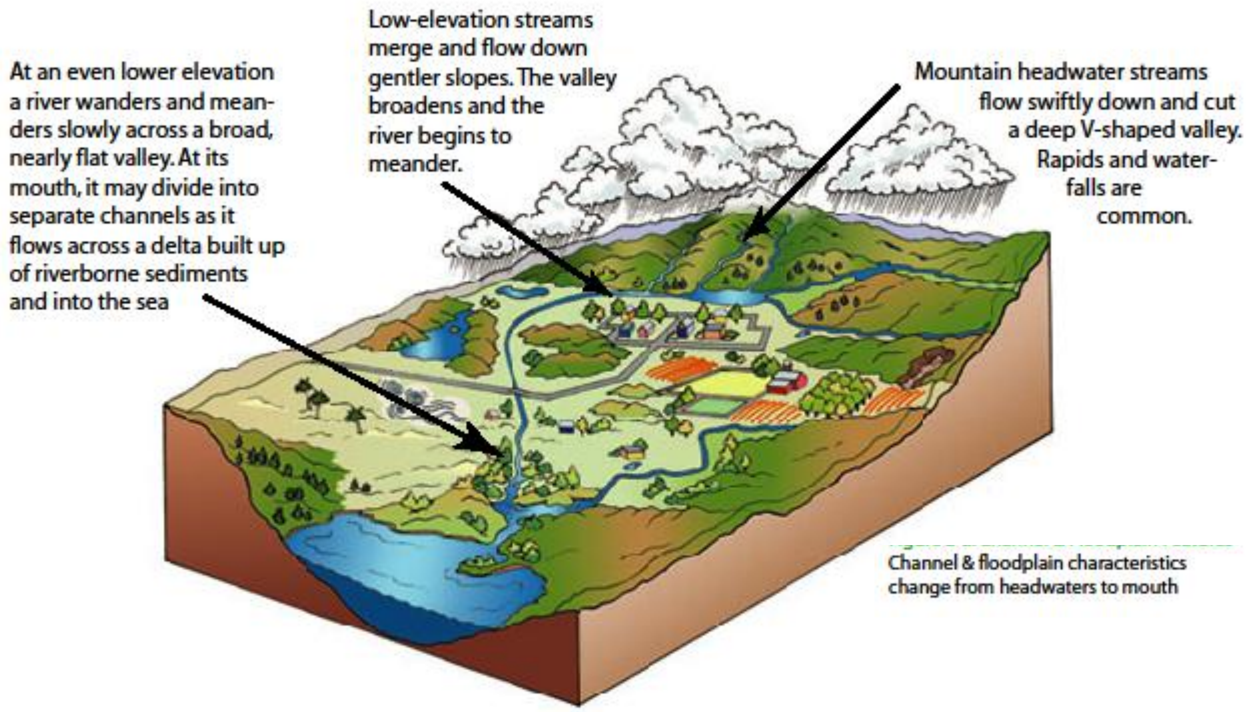


A more detailed write up on regional collaboration is included in **Chapter 2 Governance, Outreach and Integration.**

Hydrology, and Geomorphologic Features of the Watershed

Much of the movement of materials, energy, and organisms associated with the channel environment and adjoining upland environment depend on the movement of water within the Watershed. To the extent that this movement is altered, so does the potential exist for the system to become "dysfunctional" for species that depend on it. That is, alteration of water movement via damming or channelization can reduce ecosystem functionality. Refer to **Figure 3-3** for an illustration of water and sediment transport throughout a watershed.

Figure 3-3 Water and Sediment Transport through the Watershed



Today, only 20% of the SAR is a concrete channel, the majority being near the mouth of the river. Discharge from publicly owned treatment works (POTWs) have changed natural surface flows and provides base flow in many parts of the Santa Ana River's drainage network. This treated wastewater has altered the natural system by providing year-round river flow. As populations have increased, urban runoff and wastewater flows have increased. Between 1970 and 2000, the total average volume rose from less than 50,000 to over 146,000 acre-feet per year (AFY), as measured at the Prado Dam. Base flow is expected to rise to 370,000 AFY by 2025, a projected increase of 153 percent since 1990.

The geologic and hydrologic features of the watershed or geomorphology – the study of the classification, description, nature, origin, and development of present landforms and their relationships to underlying structures – and of the history of geologic changes as recorded by these surface features includes the following features. 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. Over this ridgeline lies the Mojave Desert, which is part of the Lahontan Basin. This upper "erosion" zone of the watershed has the highest gradient, highest erosion level of new sediment to the system, and fastest stormwater runoff. As flows consist mainly of snowmelt and storm runoff from the undeveloped land in the San Bernardino National Forest, water quality tends to be high, with low concentrations of total dissolved solids (TDS), nitrates, and other pollutants. In this zone, the SAR channel is confined in its lateral movement, contained by the slope of the high, mountainous terrain. Within the upper watershed, the SAR and its tributaries travel around large boulders and over sand and gravel bars punctuated by pools and riffles reaching depths of about six feet.

In addition to the SAR, several other important watersheds make up the Santa Ana River basin. The Newport Bay sub-watershed encompasses an area of approximately 154 square miles. The sub-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 major portion of this watershed. The Newport Bay sub-watershed is within the United States Geological Survey (USGS) hydrologic unit no. 18070204. The Newport Bay sub-watershed is composed of the San Diego Creek sub-watershed, 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 are divided among several small sub-watersheds that discharge into lower Newport Bay.

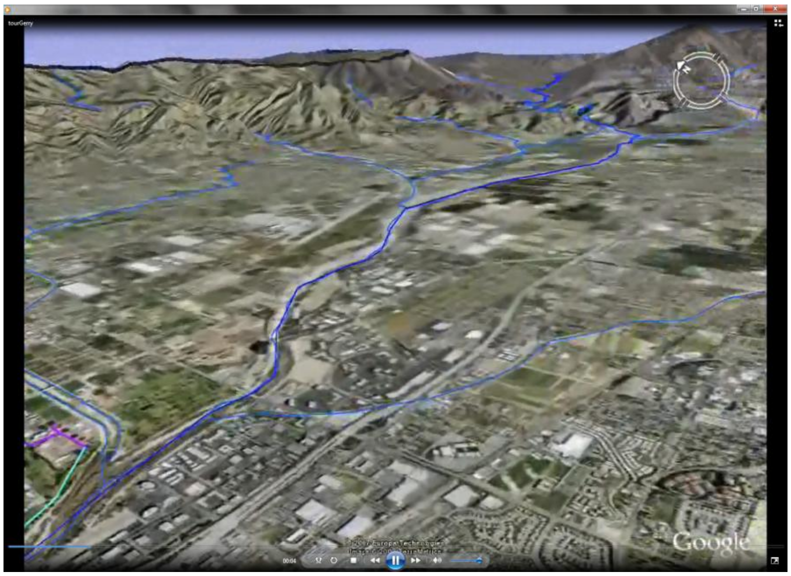
Two other important watersheds in the Santa Ana region include the Anaheim-Bay Huntington Harbor (AB-HH) and Lower San Gabriel River/Coyote Creek. The AB-HH watershed encompasses an area of 81 square miles. The main surface water systems that provide drainage in this watershed are the Bolsa Chica Channel that provides drainage to the Anaheim Bay-Huntington Harbor Complex; and the East Garden Grove-Wintersburg Channel that carries flow to Bolsa Bay and ultimately to Huntington Harbor. The Coyote Creek Watershed encompasses an area of 85 square miles within the Santa Ana region. This watershed is located in the northernmost portion of the County of Orange. This watershed straddles the Los Angeles and Orange County border in its upper reaches and then continues through Orange County until it discharges into the San Gabriel River in Long Beach.

Sedimentary and crystalline materials from the upper watershed move down slope through a process fed by storm pulses; therefore, sediment does not move at a continuous speed. River flow from Seven Oaks Dam to the City of San Bernardino consists mainly of storm flows, flows from the 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. 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, Cajon Creeks, and University Wash from the San Bernardino Mountains; and Lone Pine, Lytle, Day, Cucamonga, Chino, and San Antonio Creeks from the San Gabriel Mountains.

From the City of Riverside to the recharge basins below Imperial Highway, river flow in Orange County consists of highly treated POTW effluent, urban runoff, irrigation runoff water, imported water applied for groundwater recharge, and groundwater forced to the surface by underground barriers (SAWPA, March 2004). Near Corona, the SAR 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 SAR 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. Floodplains are strewn with boulders and characterized by sand and gravel washes. Within this valley floor, the transport and depositional processes are less confined by higher terrain as water, dissolved material and sediment move toward the sea. Over time, aquatic and terrestrial wildlife have adapted to this dynamic process and channel form. However, rapid urbanization has artificially increased the rate of sedimentation and loss of habitat in this part of the watershed, negatively affecting water quality and wildlife habitat.

A visual "fly-through" of the Santa Ana Watershed is available here: http://www.youtube.com/watch?v=HXDQCXKP6lM

Figure 3-4 Watershed Flythrough



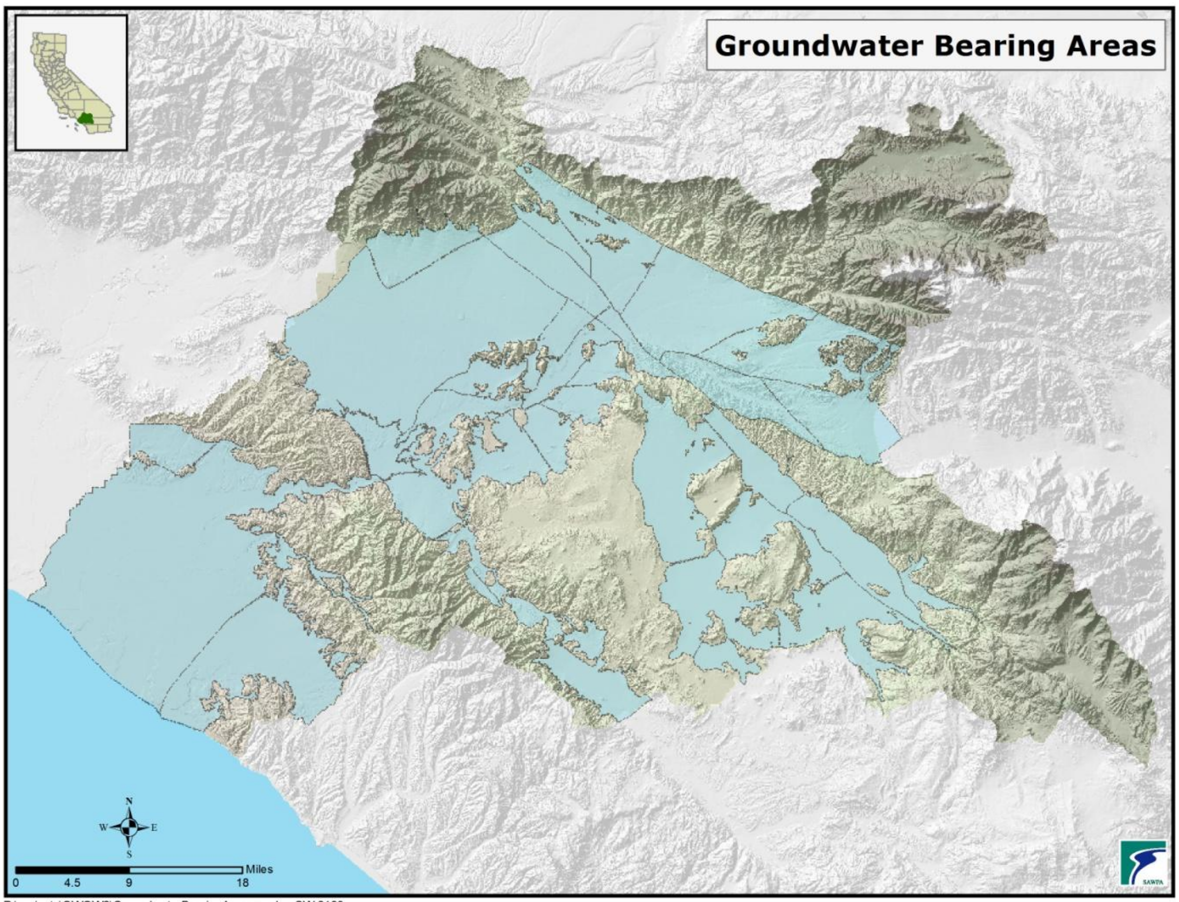
In the southern portion of the watershed, the regional boundary divides the Santa Margarita River drainage area, which is not part of the watershed, from that of the San Jacinto River. The San Jacinto River, which is part of the Watershed, starts in the San Jacinto Mountains, runs westerly through Canyon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

The Orange County coastal plain is composed of alluvium derived from the mountains. Upstream from the Santa Ana Canyon lay Prado Dam and Prado Wetlands; SAR flows are passed through the Prado Wetlands to improve water quality and remove nitrates before being used for Orange County Groundwater Basin recharge. Santiago Creek, the only major tributary to the lower SAR, joins the SAR in the City of Santa Ana. The lower limit of both the groundwater recharge area and the SAR's ordinary flows is 17^{th} Street in the City of Santa Ana. Prior to channelization of the lower part of the SAR, the channel used to meander slowly across broad flood plains. Currently, the SAR is a concrete channel from 17^{th} Street in the City of Santa Ana to Adams Avenue in Huntington Beach. The riverbed is ordinarily dry from 17^{th} 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 SAR. Discharge from the Greenville-Banning Channel combines with tidal flow from the Pacific Ocean and the SAR is wet from the Victoria Street Bridge to the mouth of the SAR.

Groundwater

Groundwater in the watershed is highly controlled by the geology of the area, in both the configuration of bedrock and by the extensive faulting. Most groundwater basins are unconfined, much like a bowl full of sand that has water poured in halfway, see **Figure 3-5**. However, the variable depth to bedrock, and the presence of faults cause pressure zones where water flows towards (or to) the ground surface. In general, groundwater flows 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 (depending on how they are defined and boundaries are drawn); many are inter-related. 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.

Figure 3-5 Groundwater Basins



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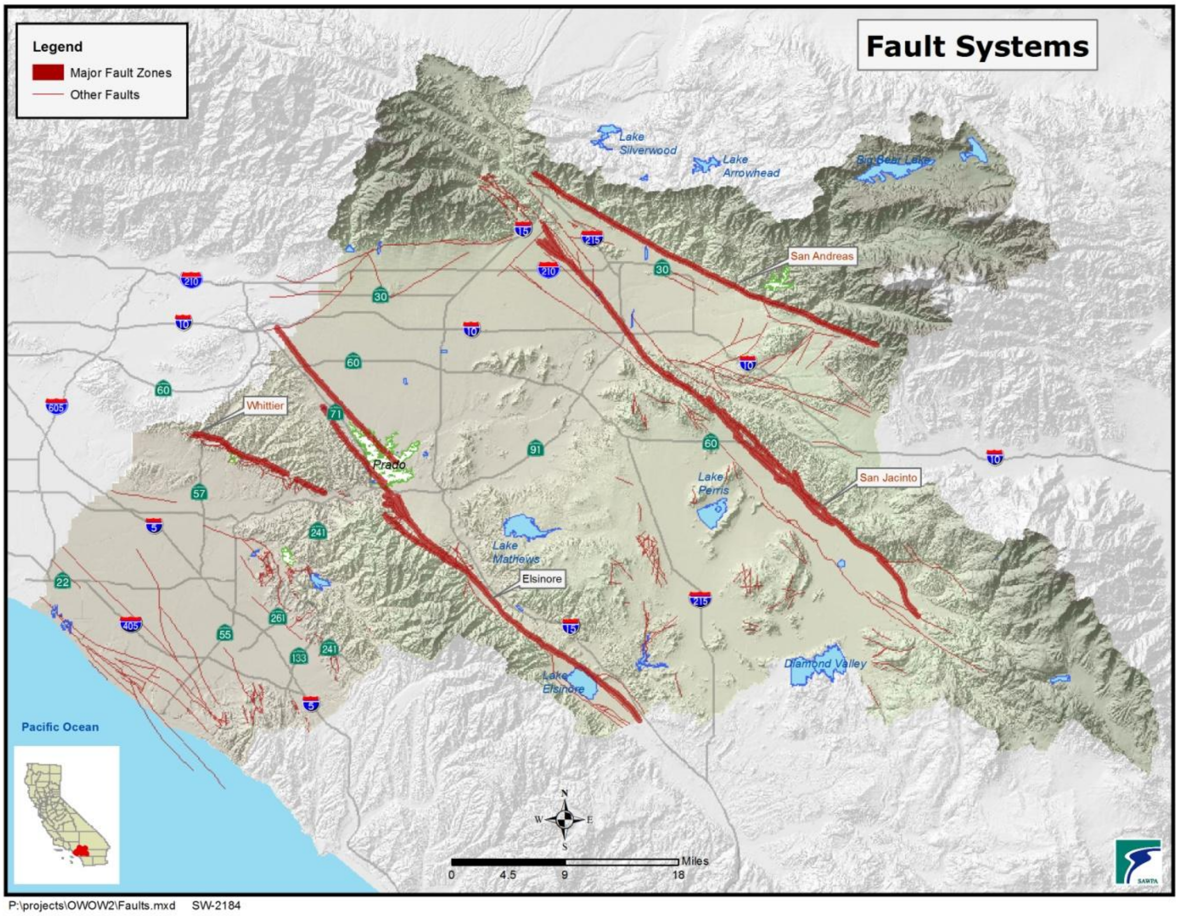
Four primary faults transverse the watershed, with other minor faults either branching off of, or running parallel to, the major faults **(Figure 3-6)**. Within the upper watershed, the San Andreas Fault divides the San Bernardino Mountains from the San Gabriel Mountains and branches off into the San 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 SAR, 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.

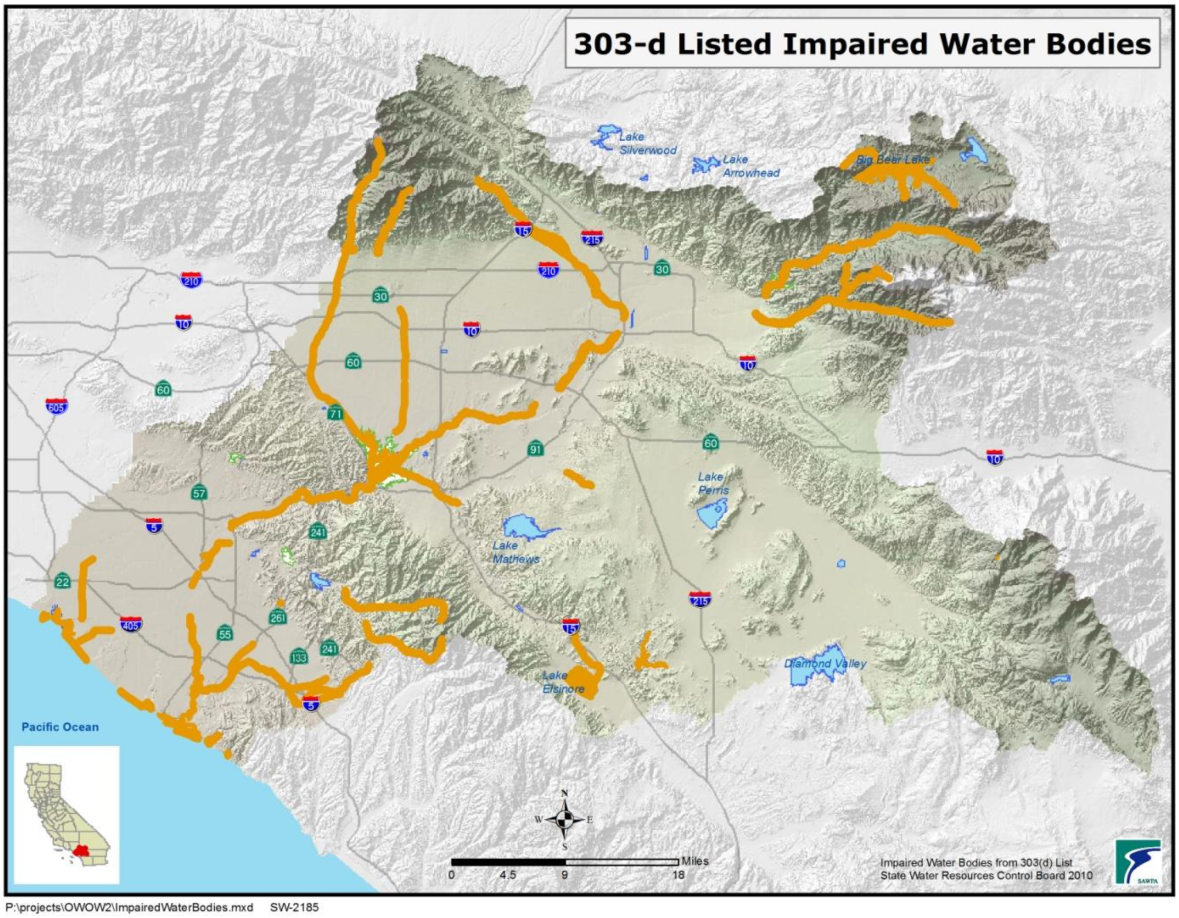
Figure 3-6 Fault Systems



Water Quality

Fortunately, water quality in the SAR 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. While fish kills, due to the spill of toxic substances into streams, are dramatic examples of the effects of pollution, these instances are acute, or short-term, rather than chronic. More insidious, however, are the chronic effects on aquatic resources of non-lethal forms of pollution that decrease growth, inhibit reproduction, or impair movement. Chronic elevated water temperatures or high sediment loads are an example 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 (DO). Because most of the remaining native freshwater fishes live, at some time, in treated wastewater, the issue of chronic, low-level pollution is of great concern, although the quality of wastewater has increased markedly in past years. Impaired water bodies can be seen in **Figure 3-7**.

Figure 3-7 Impaired Waterbodies

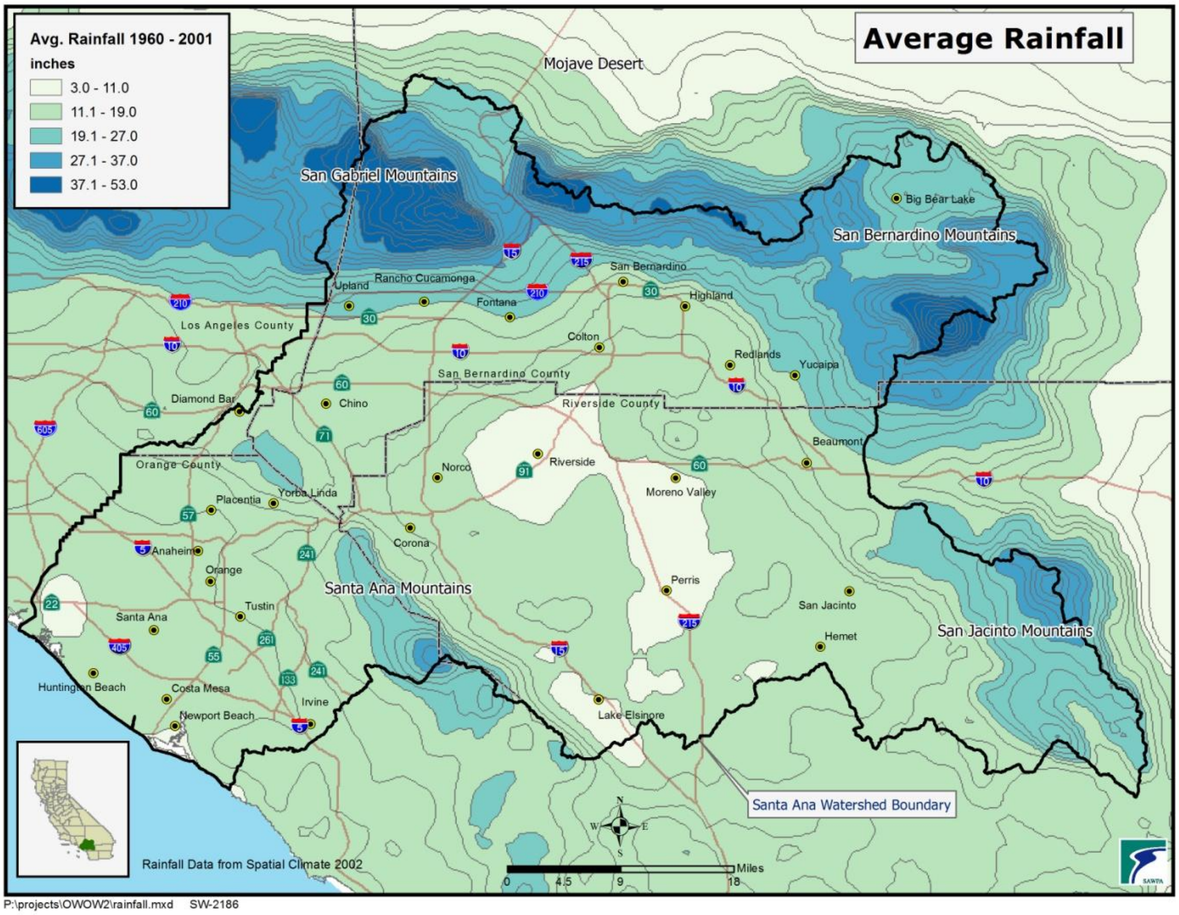


A more detailed write up on water quality issues in the Santa Ana Watershed is included in **Chapter 5.5 Beneficial Use Assurance**.

Climate

The climate of the Watershed is considered Mediterranean with hot, dry summers, and cooler, wetter winters. Average annual precipitation ranges from 12 inches per year in the coastal plain to 18 inches per year in the inland alluvial valleys, reaching 40 inches or more per year in the San Bernardino Mountains (**Figure 3-8**). 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 climatological 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 precipitation 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.

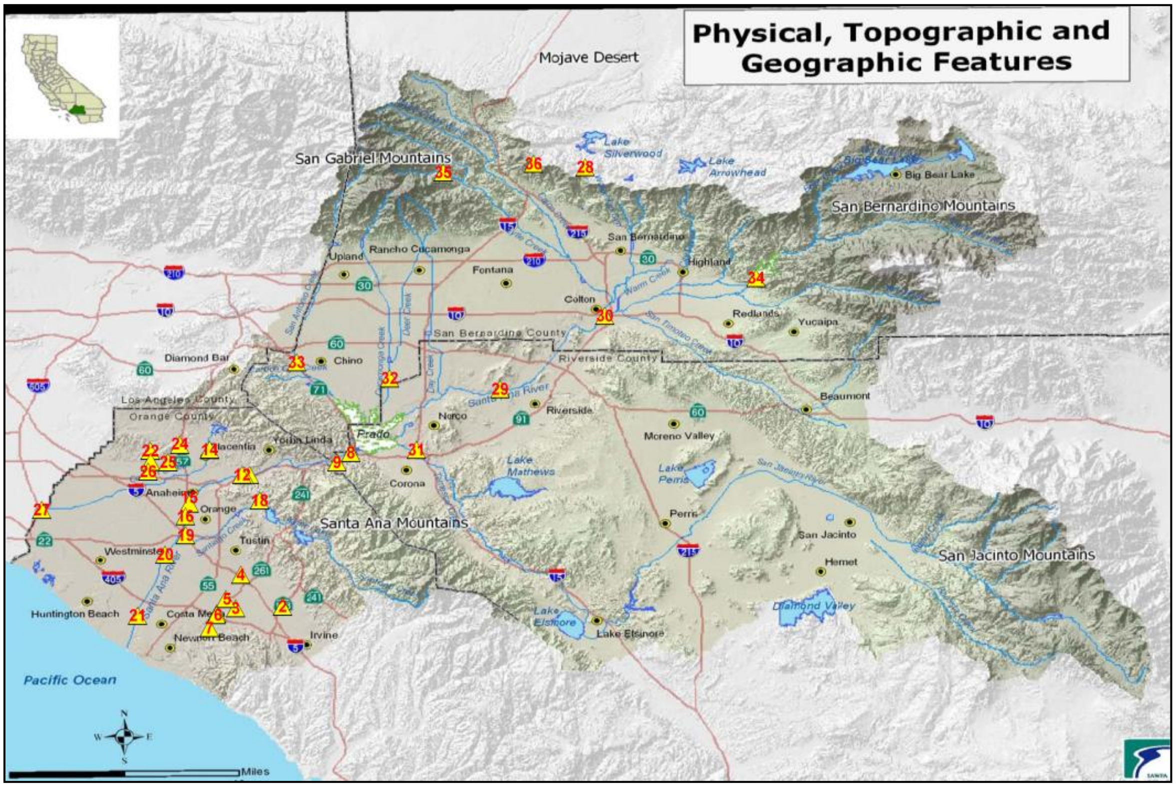
Figure 3-8 Average Rainfall



Climate Impacts

Climate change-related impacts already have taken place in California, and are having an effect within the watershed. According to the Department of Water Resources (DWR), historic hydrologic patterns can no longer be relied upon to forecast the water future. As such, the reliability of the system of imported water that provides significant supply to the region has been lessened. 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 by about ten percent during the last century, representing a loss of 1.5 million AF of snowpack storage. During the same period, the sea level rose seven inches along California's coast. The state's temperature also has risen 1 degree Fahrenheit. Most of the increased temperature readings are at night and during the winter season, with higher elevations showing the greatest increase. Rainfall has become increasingly variable, with Southern California experiencing both its driest and wettest years on record within the past decade.

Figure 3-9 Climate Model Monitoring Locations



A more detailed write up on the impacts of Climate Change in the Santa Ana Watershed is included in **Chapter 5.13 Energy and Environmental Impact Response**.

Habitat and Native Species

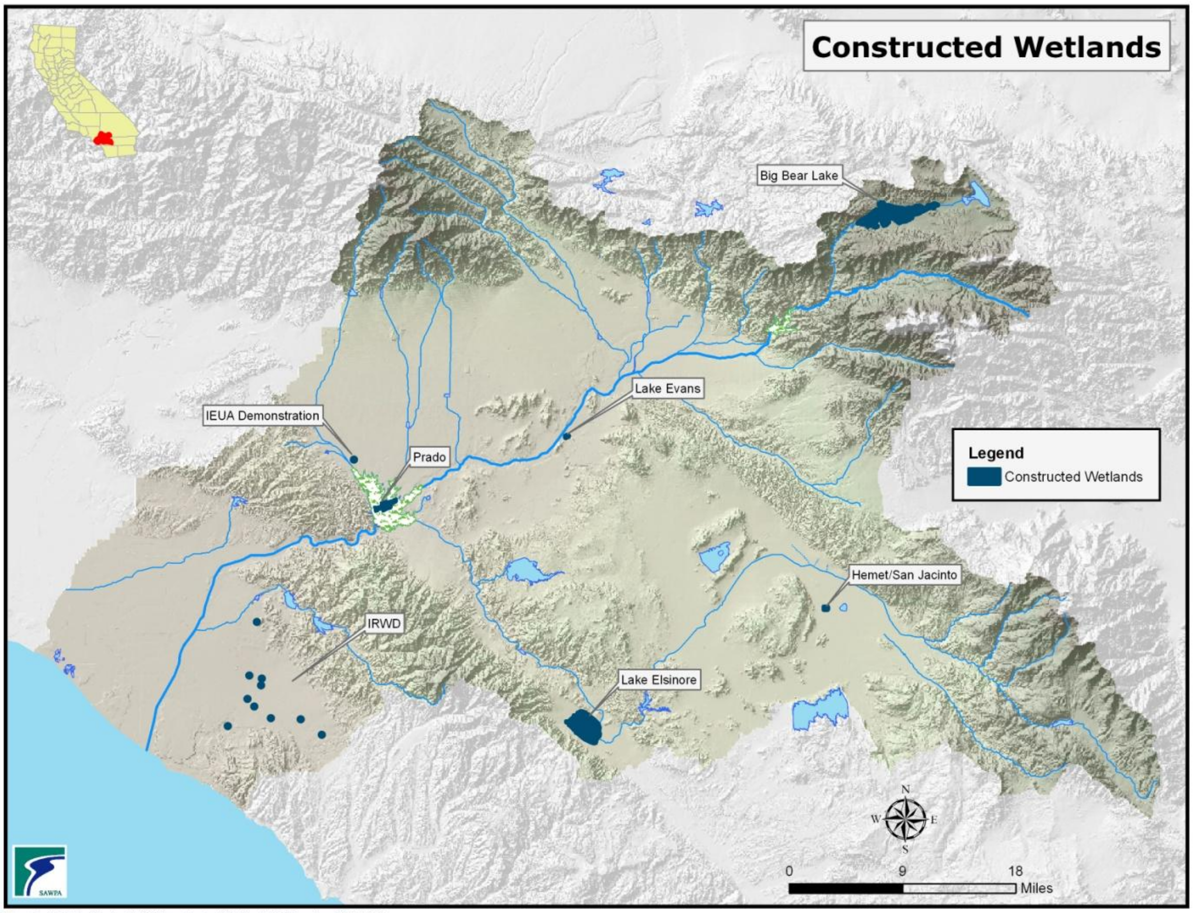
Habitat

OWOW attempts to catalog the locations of many water-oriented habitats within the watershed. While there are several types of habitat within the watershed boundary that are not directly water-oriented (e.g., chaparral, pine forest, oak woodland, grassland), the primary focus is on water-oriented habitat types (e.g., alluvial fans, riparian woodland, emergent wetlands, vernal pools, lakes, streams, estuaries, tidelands, open ocean). These water-oriented habitats tend to show up on maps as the “corridors” that connect the larger, non-water-oriented habitats. Water-oriented habitats locations that are candidates for protection or enhancement are of particular interest.

Wetlands

Constructed wetlands have a wide range of benefits, including surface water protection . Constructed wetlands designed to treat secondary effluent will 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. Located along the Pacific Flyway, the critical migratory corridor connecting Alaska and Canada to Latin America, Southern California wetlands provide vital habitat for migratory waterfowl. Opportunities for wildlife enhancement were considered in the construction/preservation of many of the following wetlands with environmental features that increase habitat diversity and wildlife productivity.

Figure 3-10 Constructed Wetlands



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Impacts to the Natural System

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 SAR 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 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

A more detailed write up on issues relating to natural systems in the Santa Ana Watershed are included in **Chapter 5.9 Natural Resources Stewardship**.

Forest

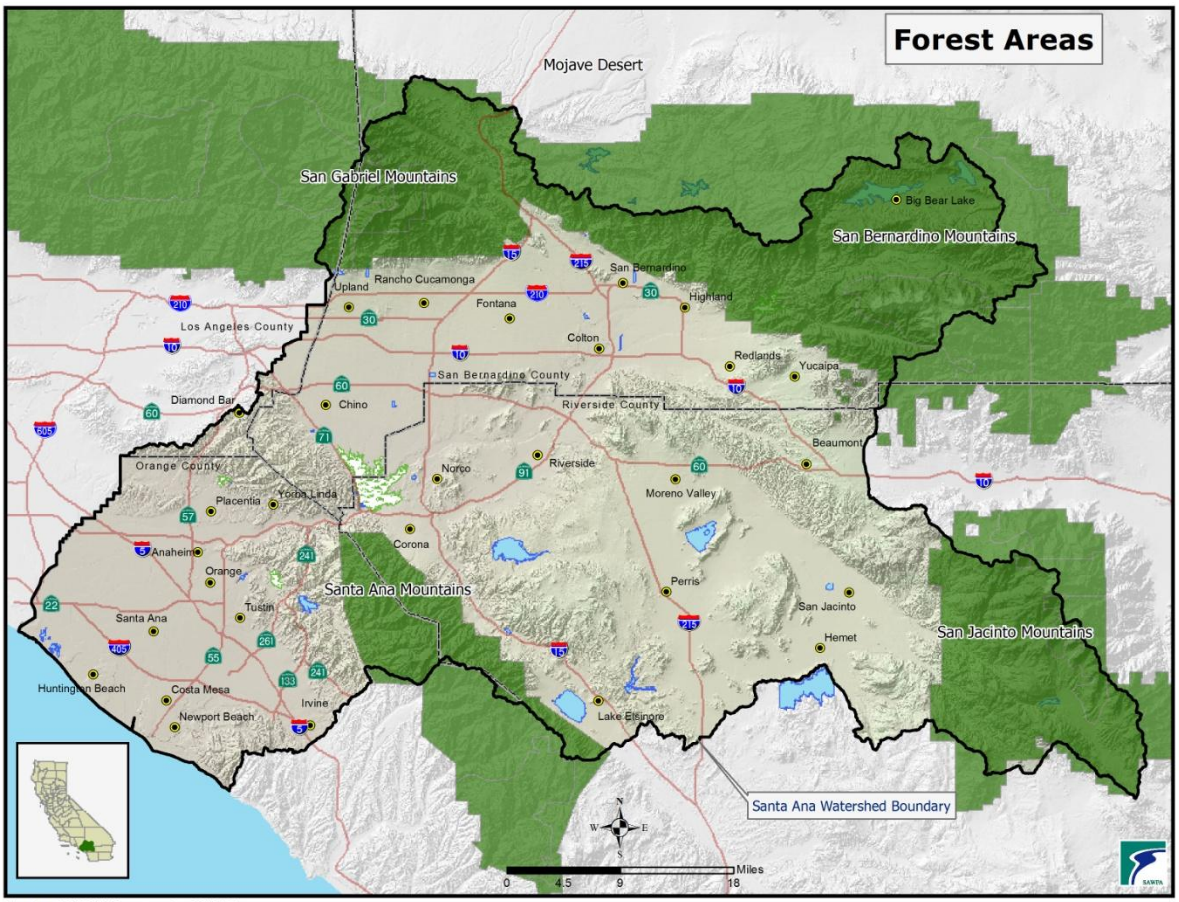
As home to the headwaters of the Santa Ana River, the San Bernardino and Cleveland national forests encompass approximately 29% of the Santa Ana watershed's land mass. These forest areas also receive 90% of annual precipitation. Runoff on that land directly affects the amount and quality of water received downstream**.** If there are too many trees, the water supply is reduced by their thirst and the amount of fire fuel is increased resulting in more intense fires which are more difficult to control and have a greater potential for incurring loss of property or life. Meadows, which act as nature's sponge retaining water for groundwater recharge, can dry up due to natural and manmade channelization prohibiting the potential benefit of this resource. Restoration of impaired meadows could restore their beneficial function. The benefit of chaparral has mixed perception, having good benefits for erosion control and water dispersion contrasted by negativity when viewed as excessive fire fuel, therefore a clear method of management has been elusive.

There are two forests under the management of the U.S. Forest Service within the Santa Ana River Watershed; San Bernardino National Forest and Cleveland National Forest. The combined area of these forests is approximately 1.1 million acres. The U.S. Forest Service is challenged with managing this vast area while striving to address the multiple goals of conserving habitat for sensitive and endangered species, hazardous fuels reduction and the restoration of meadows. However, their resources have been limited to proactive measures aimed at protecting urbanized areas in and adjacent to national forest land leaving a substantial quantity of land vulnerable to overgrowth and increased fire risks and intensity.

Fire is an ongoing risk faced by the U.S. Forest Service due to man's encroachment into forested areas as evidenced by the nearly 2,300 special use permits issued each year by the U.S. Forest Service. The variables in weather such as drought seasons and wind also contribute to fire risk. The combinations of variables that contribute to fire risk make predictions and planning for fire events problematic. Hard lessons were learned after the forests experienced devastating fires in the early 2000's and the aftermath of those fires directly impacted the quality of water downstream of the burn areas and it took between three and five years to recover.

A partnership is being pursed among downstream groundwater management agencies, flood control and water conservation districts, water supply agencies, resource agencies and the U.S. Forest Service to find amicable projects that can be executed in specific areas within the forest that will have a direct effect in preserving the quality and quantity of water resources from the source or headwaters, contributing to the overall health of the watershed. Evidence of a quantitative cost/benefit analysis is being sought to validate investment in projects that when implemented will help the U.S. Forest Service to keep the forest healthy which will in turn promote a gain in both the quantity and quality of available water resources.

Figure 3-11 Forested Areas in the Santa Ana River Watershed



A more detailed discussion relating to the partnership between water agencies and the U.S. Forest Service are included in **Chapter 5.12 Government Alliance**.

Native Riparian Species

Fish

The SAR historically provided habitat for eight species of native fish (species have multiple forms). Only four native non-game freshwater fishes are currently found in non-estuarine waters: arroyo chub, Santa Ana Speckled Dace, Santa Ana Sucker, and Threespine Stickleback. All of these remaining fishes have limited distributions and face possible extirpation. As previously mentioned, the Santa Ana Sucker is listed by the Federal government as a “threatened” species pursuant to the Endangered Species Act. Currently, the Western Brook Lamprey, Steelhead, and Unarmored Threespine Stickleback are known to be extirpated from the watershed. The Pacific Lamprey has been observed once in the past 47 years and it likely is extirpated as well. Introduced forms of the rainbow trout have been extensively stocked in the watershed for sport fishing for over 100 years, and it is unknown if any genetically pure rainbow trout stocks endemic to the watershed remain. The partially Armored Threespine Stickleback was widely planted in the watershed for mosquito control in the early 1900s and is now found out of its natural historical range, e.g., Big Bear Lake. In contrast, at least 33 fishes have been introduced into the watershed and are currently present. New species can be expected to be found at any time due to inter-basin water transfers, ship ballast water hitchhikers, bait bucket introductions, and hobbyists disposing of unwanted fishes. Many of the introduced fishes are widespread, while a few are restricted to specific locations or habitats. Of the current inventory of introduced fishes, most were introduced by government agencies to serve as a food resource, for insect control, for sport fishing, or to serve as forage for sport fishes. A smaller number of fish have become established after arriving inadvertently via inter-basin water transfers or in ships’ ballast water. For a detailed discussion of the introduction of fishes to California, the reader is directed to Dill and Cordone (1997). Additional information about introductions of fishes to Southern California is presented by Swift *et al*. (1993). Supplemental records can be found in Moyle (2002).

The Santa Ana sucker is a federally listed fish native to the Santa Ana River

Amphibians

During the last 50 years, population growth and urban development in Southern California has displaced many amphibian species, and encroached upon much of former amphibian habitat. Several species are thought to be extinct, and many others have fragmented populations, which are at risk of extirpation. Amphibians especially are sensitive to environmental changes that alter the hydrology, ecology, and geology of a region because they have evolved, highly specialized adaptations that have allowed them to exist in these relatively arid regions. Introduced species also have been a major contributor to the decline in amphibian populations in Southern California. These non-native species increase competition for food sources, as well as prey upon many of the native amphibians.

Reptiles

The California Department of Fish and Wildlife (CDFW) considers the Southwestern Pond Turtle (*Clemmys marmorata*) a species of “special concern”. Recent reports on *C. marmorata* in Southern California indicates that a few viable populations remain in the regions (see also Brattstrom 1988).

Approximately six to eight viable populations of the turtle remain south of the Santa Clara River system in California. Droughts have exacerbated the negative effects of habitat alteration accumulated over many years over much of this region from changes in land and water use, and abusive grazing practices. In particular, most western pond turtle populations examined in this region appear to show an age structure increasingly biased towards adults, indicating little or no recruitment is taking place. Recent surveys indicate that the southwestern pond turtle also is seriously threatened throughout most of its range outside of California.

Birds

Riparian ecosystems harbor the highest number of bird species in the arid and semi-arid parts of the southwestern United States. Riparian habitat provides productive breeding grounds and offers vital over-wintering and migration stop-over areas for migrating birds. Loss and degradation of riparian habitat have negatively impacted bird populations throughout the watershed. Other factors affecting bird populations are brood parasitism by the brown-headed cowbird, and disruption of natural hydrological regimes from dams and levees.

Least Bell's Vireo, a federally listed bird species

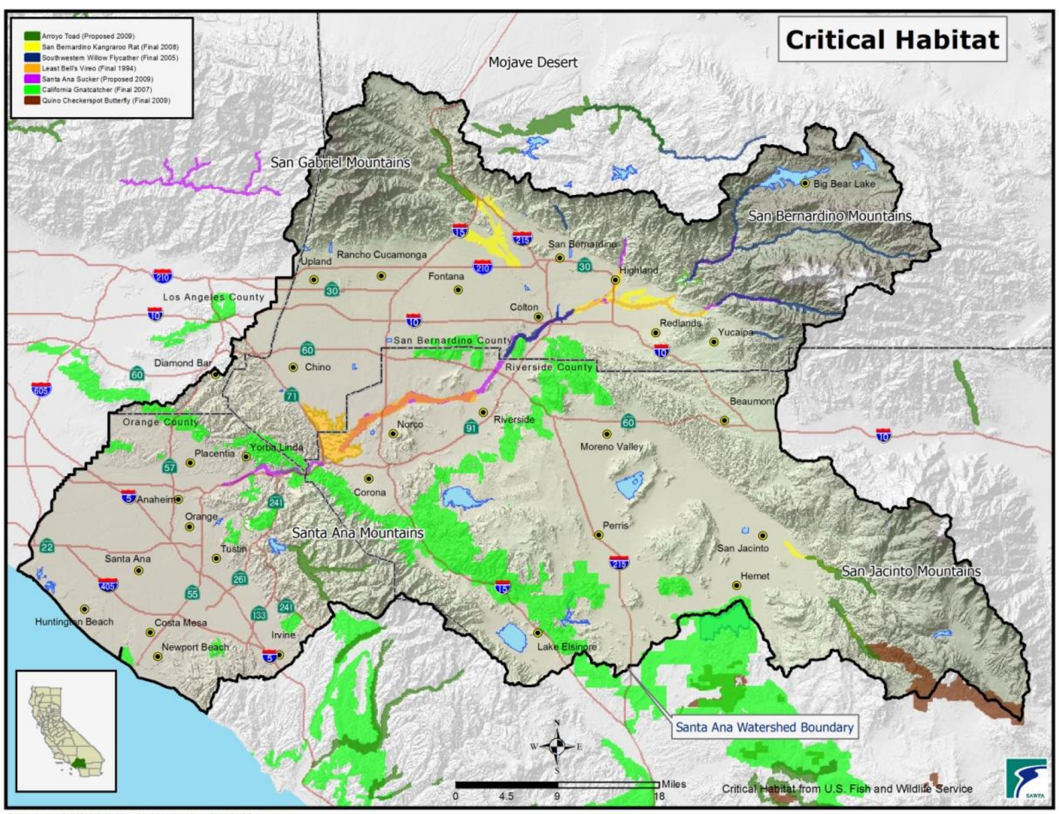
The Federally endangered Least Bell's Vireo has experienced recent population growth within the watershed due to aggressive management activities within Prado Basin and on adjacent lands. Within the basin, the population rose from 19 nesting pairs in 1986 to 123 nesting pairs in 1993. By the end of 1996, the count stood at 195 nesting pairs. This stunning recovery is due to the provision of a high quality habitat for the bird species, in part, due to invasive species removal, a project in place to control populations of the predatory cowbird, and efforts on the part of the U.S. Fish and Wildlife Service (USFWS) , Orange County Water District (OCWD), a number of Resource Conservation Districts (RCDs), and others.

The Federally endangered southwestern willow flycatcher also is affected by cowbird brood parasitism. The implementation of cowbird management programs in addition to preservation and restoration of riparian deciduous shrub habitat is needed to reduce current populations. The bald eagle, listed by the USFWS as endangered in 1978 has experienced population growth over the past two decades. The bald eagle could be considered a USFWS success story: reclassified as "threatened" in 1995 and first proposed for delisting in 2000. Delisting of a species is the USFWS's ultimate goal and only happens when specific recovery goals have been met for a species. Unfortunately, delisting is an infrequent occurrence. In the case of the bald eagle, delisting has been delayed while the USFWS determines how the species would be managed once it is no longer classified as threatened.

Special Status Species

Second only to Hawaii, the State of California is home to the highest number of endangered species in the United States. As defined within the Federal Endangered Species Act of 1973, an endangered species is any animal or plant listed by regulation as being in danger of extinction throughout all or a significant portion of its geographical range. A threatened species is any animal or plant that is likely to become endangered within the foreseeable future throughout all or a significant portion of its geographical range. Federal law prohibits the "take" of any individuals or habitat of federally listed species without a special permit. In addition to federal laws, the State of California has its own California Endangered Species Act, with a separate listing of species and separate laws governing take of listed species. Enforcement of the Federal Endangered Species Act is administered by the USFWS and the National Marine Fisheries Service, while the CDFW enforces the California Endangered Species Act.

Figure 3-12 Critical Habitat within the Watershed



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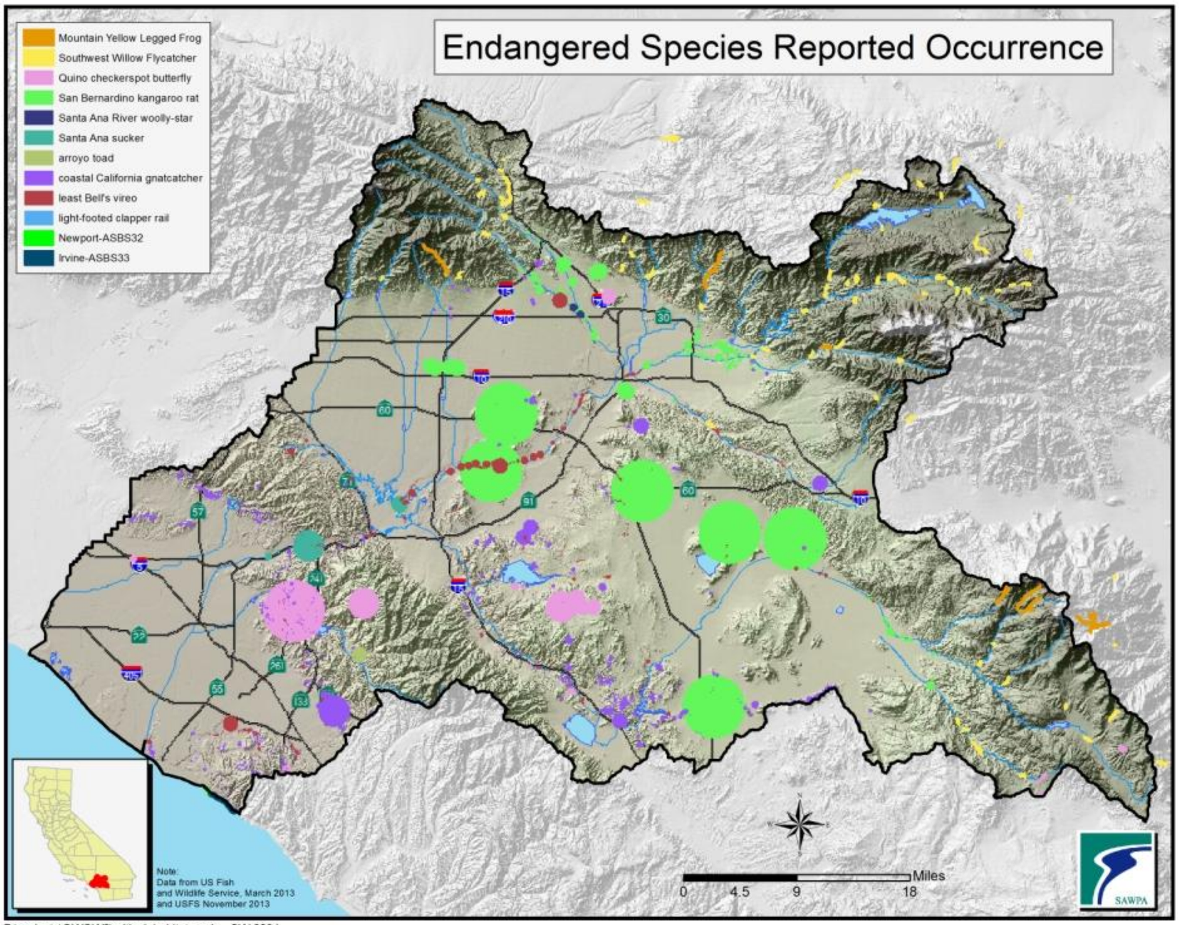
The varied geography and natural features of the Watershed provide habitat for a number of Federally and/or state-listed species. As OWOW 2.0 focuses on the resources in and around the SAR, listed species of concern herein are those that occupy aquatic, wetland, riparian, or riparian adjacent areas. Of these, two are plants – the Santa Ana River Woolly Star (*Eriastrum densifolium*) and the slender-horned spine flower (*Dodecahema leptoceras*); one fish – the Santa Ana River Sucker (*Catostomus santaanae*); one amphibian – the Arroyo Toad (*Bufo californicus*); three birds – the Least Bell's Vireo (*Vireo bellii pusillus*), the Southwestern Willow Flycatcher (*Empidonax traillii*), and the Bald Eagle (*Haliaeetus leucocephalus*);

two mammals – the San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*) and Stephen's Kangaroo Rat (*Dipodomys panamintinus*); and one insect – the Delhi Sands Flower-loving Fly (*Rhaphiomidas terminatus abdominalis*). Any project or policy recommended by the Santa Ana IWP will need to assess potential impacts to listed species, and incorporate measures to avoid impacts to these species.

Figure 3-13 Endangered Species Reported Occurrence



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Factors Affecting Native Species

Introduced Species

The 33 species of introduced fishes greatly outnumber the four remaining native fish species. The number of species, *per se*, is not the problem but, rather, 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. The manner in which introduced fishes can affect the aquatic resources of the watershed are:

- 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

Exploitation

Over-exploitation of rainbow trout/steelhead, primarily by angling, was a major factor in driving the native populations to low levels, and perhaps to extinction. Over-fishing, in turn, led to the stocking of hatchery fish and the introduction of various exotic species as angling alternatives to the native trout. The intensity of over-exploitation is illustrated by a report in the July 17, 1892 edition of the *Citrograph*, a Redlands newspaper, which reported that three boys fishing in Bear Creek, a tributary to the SAR in San Bernardino County, had caught 592 trout in three hours. Similar reports are common in the historical press.

It was not until 1872 that the California Legislature banned the use of nets, weirs, baskets, traps, explosives, and poisons as acceptable means of harvesting trout. Unfortunately, there was no one to enforce this statute, nor was there any limit on the number of fish that could be harvested by legal means. The over-exploitation of trout became such a problem in the watershed that in 1894, San Bernardino County, on its own authority, finally took action and limited the number of trout a person could catch to 50 per day. The State of California did not take similar action until 1905, when the harvest was limited to 50 trout per day and 25 total pounds. By then, the native stocks already had become depleted in the watershed.

Each of the aforementioned factors has acted in concert over a long period of time to reduce the native fish community of the Watershed to that which remains today. OWOW 2.0 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.

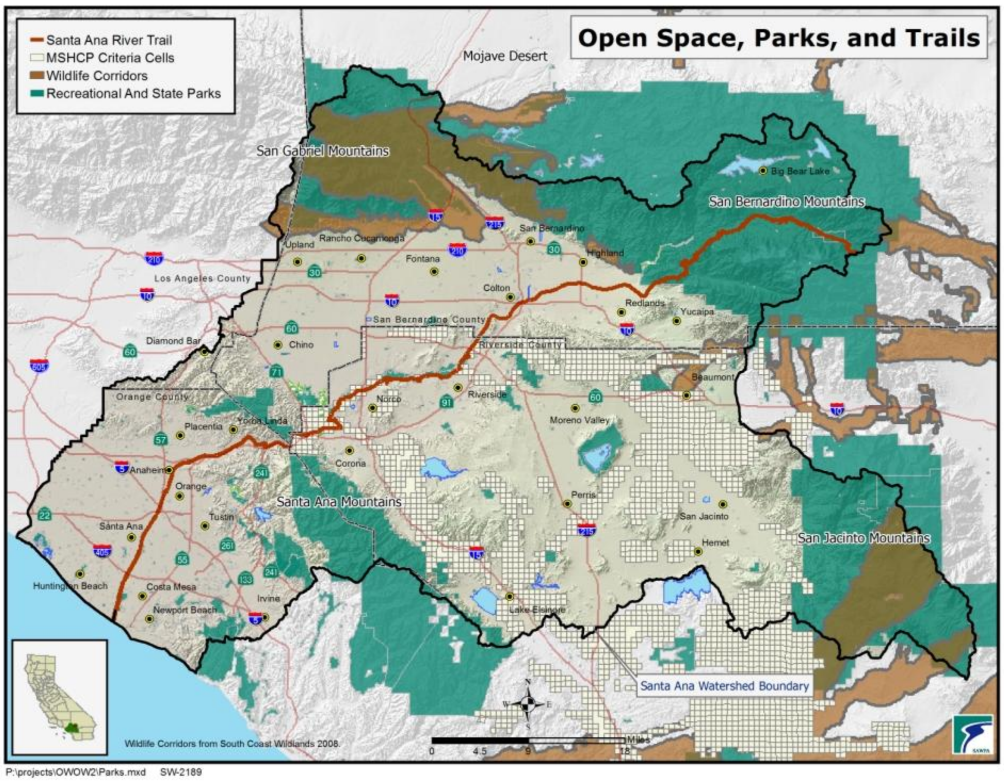
Open Space and Recreation

The Santa Ana River Watershed is a stunning location with a wide variety of scenery and natural resources. It is a unique location, situated between the desert, mountains, and the sea. The watershed combines a complex arrangement of terrain, climates, and habitats that extend from the San Bernardino Mountains down to the Pacific Ocean.

Taking advantage of the watershed's beautiful landscape, the Santa Ana River Trail, highlighted in **Figure 3-14** links open space areas throughout the Watershed. Building the SART has been a highly successful collaborative effort and should be used as a model for other recreation projects in the future. The

SART's achievements only could have been accomplished through a variety of partnerships, combining the expertise and resources of multiple counties, cities and other groups.

Figure 3-14 Recreational Opportunities within the Santa Ana River Watershed



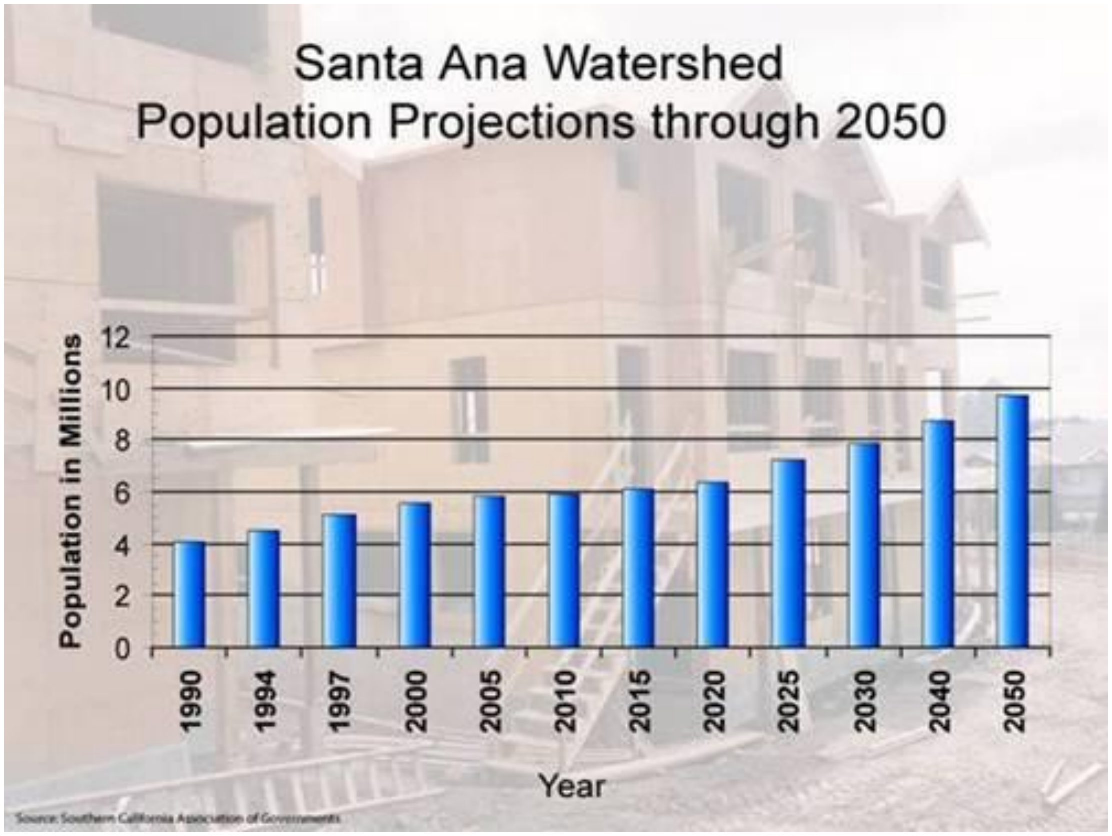
A more detailed write up on issues relating to recreational opportunities in the Santa Ana Watershed are included in **Chapter 5.9 Natural Resources Stewardship**.

Watershed Demographics

Population and Population Projections

The Santa Ana River Watershed has experienced 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 percent (**Figure 3-15**). The recent recession most likely will slow this growth rate substantially. Although recent Southern California Association of Governments (SCAG) reports show that the Santa Ana 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.

Figure 3-15 Population Projections



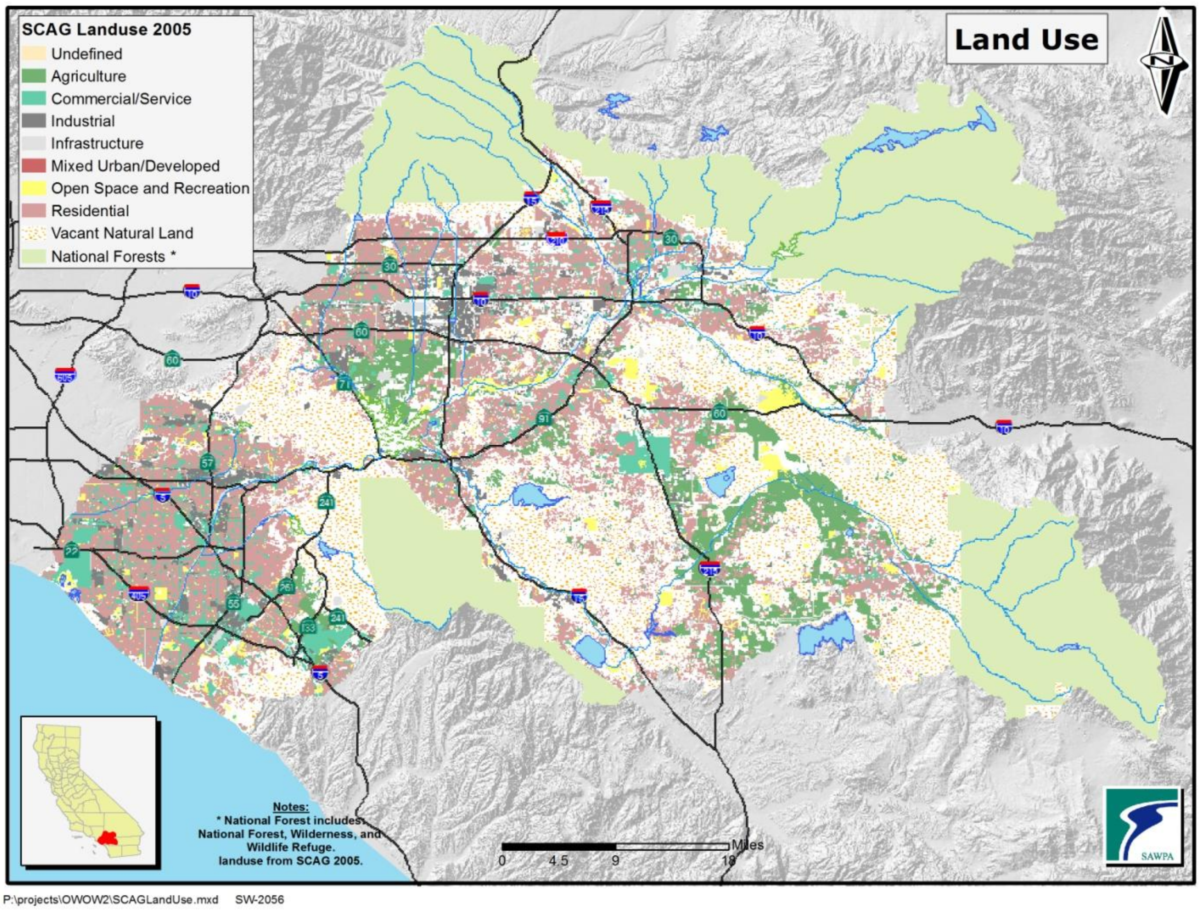
Demographic estimates for the watershed indicate that much of future population growth will take place in Riverside and San Bernardino counties, as Orange County is fairly built out. According to the U.S. Census Bureau, Riverside County grew by 37.5% between 2000 and 2010 (or an annual average of 3.6%), 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, below the State average. Population growth will exacerbate some of the issues previously described for the watershed if no action is taken. In particular, population growth could result in more habitat fragmentation, increased impervious surfaces, modification of natural hydrology, increased water demand, and increased waste generation. The types of multi-benefit and multi-jurisdictional or watershed-wide projects promoted by the OWOW plans could help reverse this trend.

Land Use

The watershed is substantially urbanized; about 32 percent of the land use is residential, commercial, or industrial. Agricultural land, once accounting for virtually all of the use of the watershed during the days of the ranchos, now accounts for a mere ten percent. Instead of a scattered population of indigenous peoples, the watershed now supports over 5 million people. **Figure 3-16** presents a breakdown of the major land use categories of the watershed obtained from the SCAG 2005 land use dataset.

Figure 3-16 Land Use

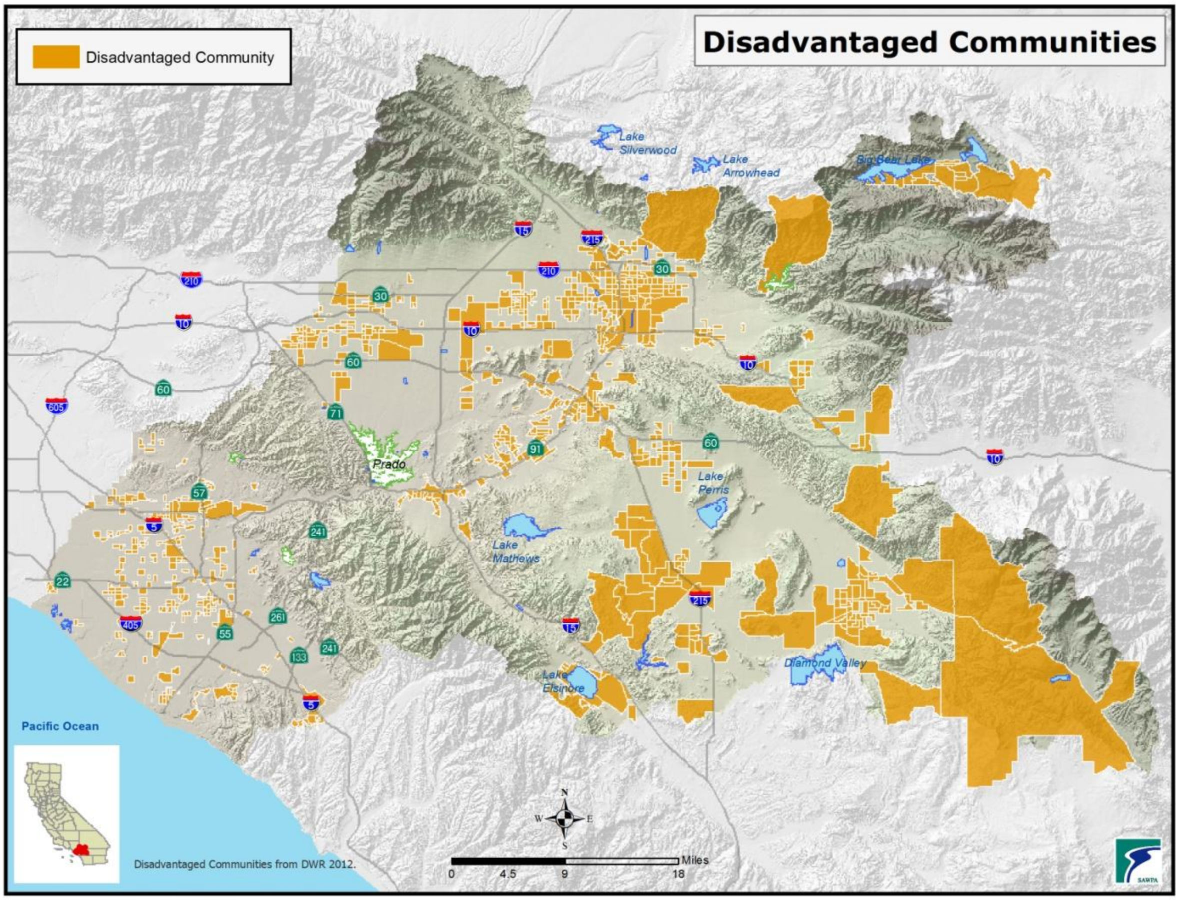


A more detailed write up on issues relating to land use planning in the Santa Ana Watershed are included in **Chapter 5.7 Land Use and Water Planning**.

Disadvantaged Communities

The SAR Watershed contains one of the fastest growing regions in California and also 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 (Schreiber, 2003). **Figure 3-17** depicts watershed income in the SAR Watershed by census tract, based on 2007 incomes as collected by the Claritas division of Nielson Company in 2008. This disparity in income is exacerbated by the recent economic downturn which has had a detrimental effect on the region in general and specifically impacted laborers in disadvantaged communities with limited job skills.

Figure 3-17 Disadvantaged Communities in the Santa Ana River Watershed



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A more detailed write up on issues relating to disadvantaged and tribal communities in the Santa Ana Watershed are included in **Chapter 5.9 Natural Resources Stewardship**.

Water Infrastructure Systems

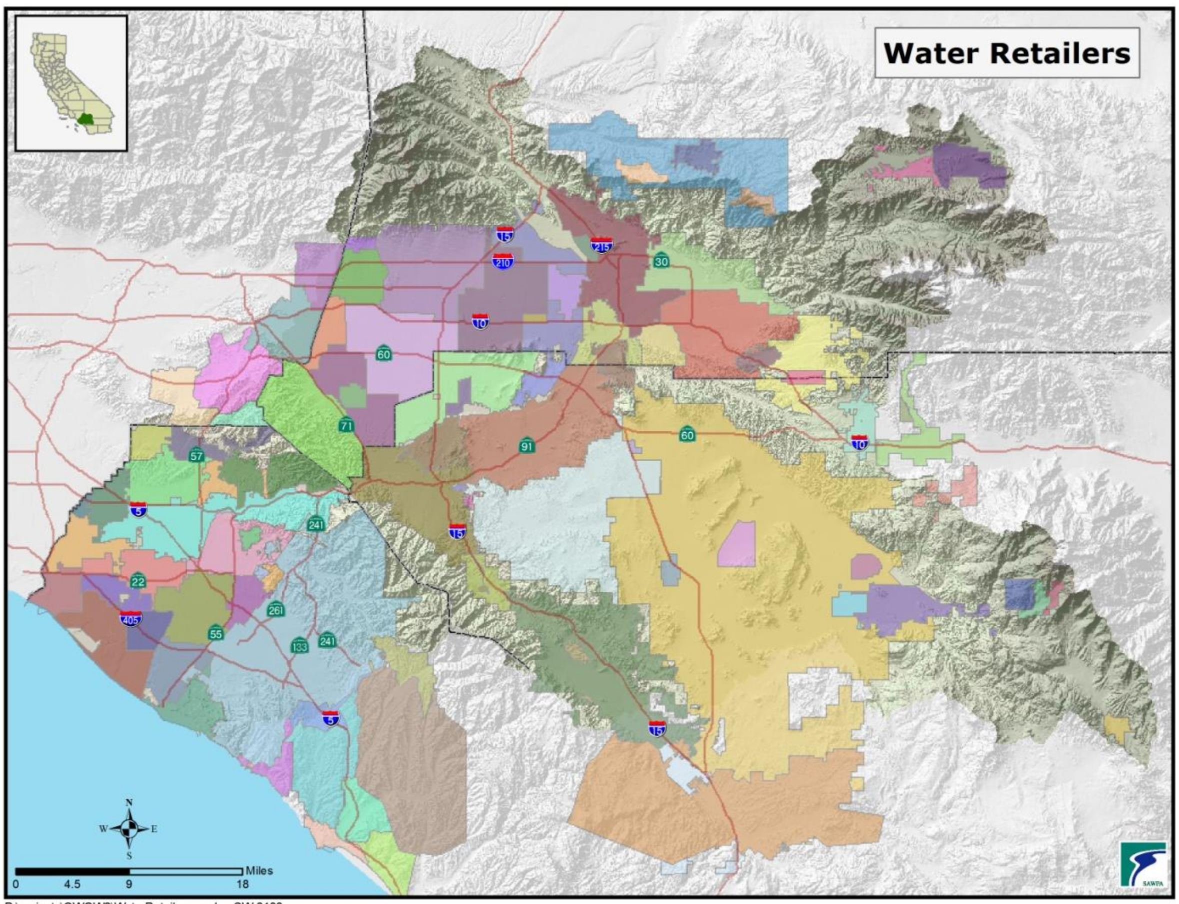
In order to suggest ways to improve water reliability for the future, the existing water infrastructure system must be considered as the foundation to build upon. Particularly in this watershed, when we describe water infrastructure, we are describing not just the large-scale systems, services, and facilities that are necessary to support the collection, storage, treatment and delivery of water to customers in the region, but also many other systems, service and facilities, such as trails, parks, and land use that may use or have a nexus with water. In addition, since water demands and supplies are interrelated to a variety of other natural and man-made 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 understated. Evaluations of the infrastructure in the watershed were conducted by the American Society of Civil Engineers in 2010 as conveyed in two separate infrastructure report cards, one for the San Bernardino and Riverside

Counties and one for the Orange County. These infrastructure report cards evaluated the condition, capacity, operations and security as criteria for assigning grades to the systems. In the San Bernardino and Riverside counties, the most populated and developed areas of the counties lie within the western portions (Inland Empire) and within the SAR Region.

In review of the water-related infrastructure grades for the Inland Empire, room for improvement clearly exists, particularly as this area struggles to maintain and provide water-related infrastructure for two counties, as reflected in **Figure 3-18**, which shows the various water retail service areas within the SAR region.

Figure 3-18 Water Retail Service Areas in the Santa Ana River Watershed



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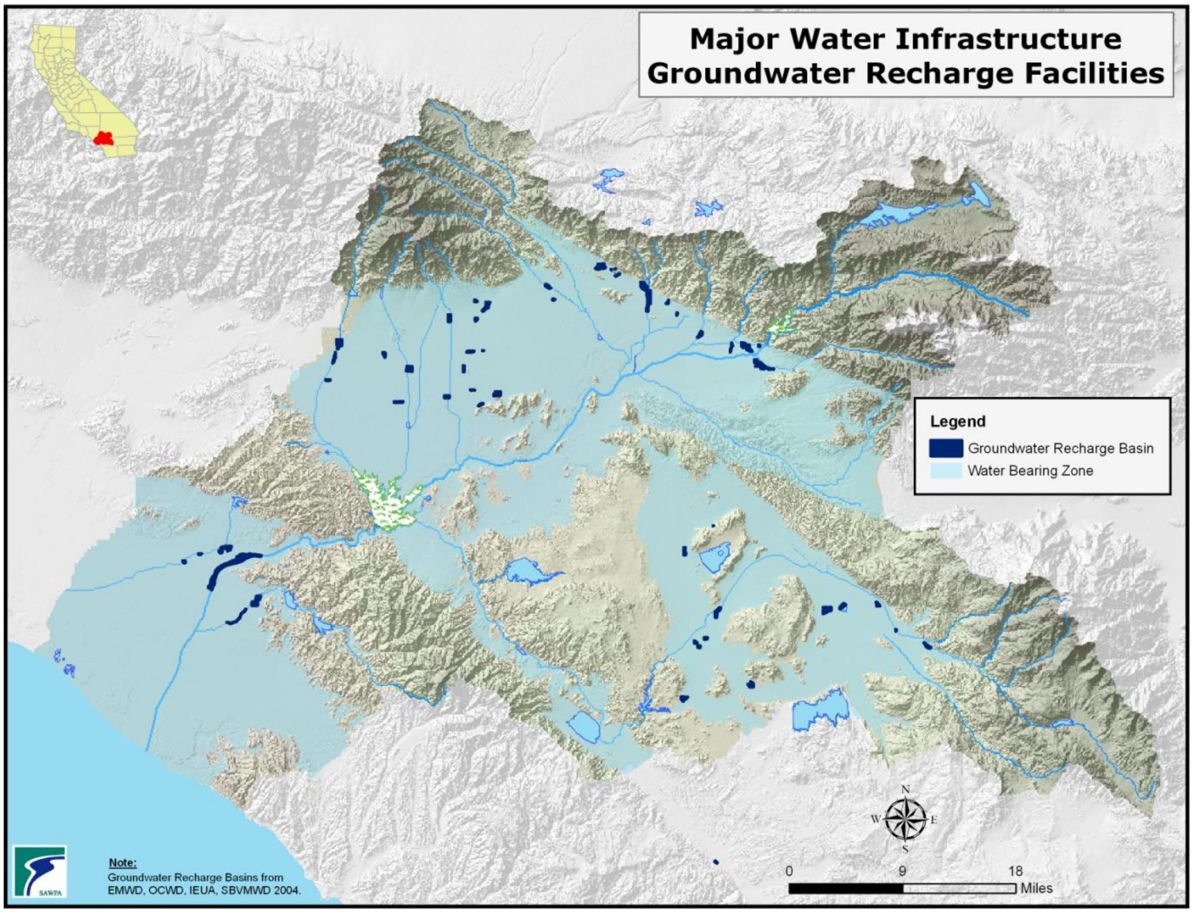
In Orange County, the strains of an increasingly built-out area with a population base of 2,846,289 (2000 census), the second most populous county in the State of California, have resulted in both surface quality and groundwater recharge concerns to meet the needs in this area. New infrastructure is required to clean up urban runoff, increase groundwater recharge, treat increasing wastewater flows for recycled use, and expand capture of upper watershed flows to recharge the groundwater supply. **Figure 3-19** displays groundwater recharge facilities within the Santa Ana River Watershed.

Figure 3-19 Groundwater Recharge Facilities in the Santa Ana River Watershed (overlying GW basins)



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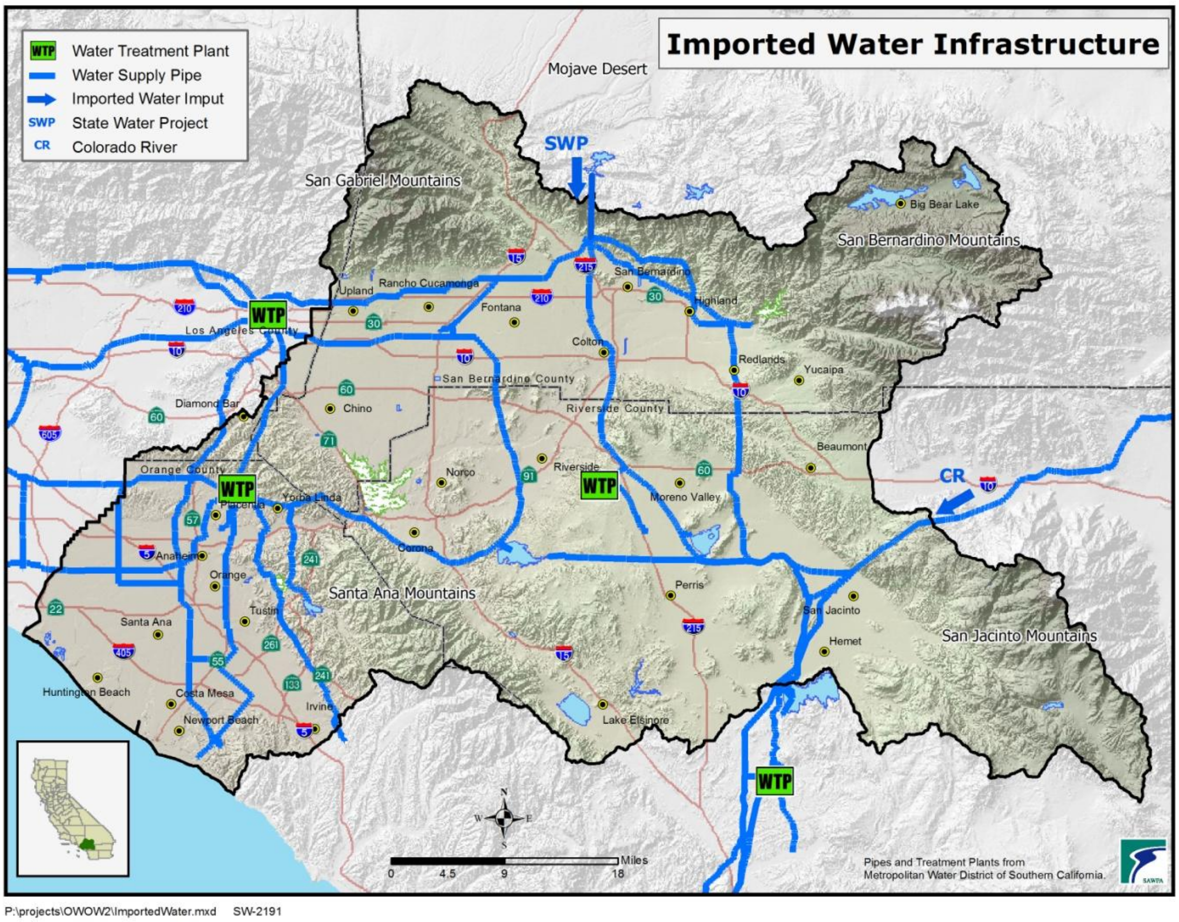
To best understand the water-related infrastructure in the Watershed, some sense of the water development history of the region is appropriate. Prior to the Mission and Rancho periods of the 1800s, the primary land use in the Watershed consisted of grazing cattle and horses. With the advent of Mormon settlements, agricultural lands began to be developed, utilizing the readily available surface springs as a dependable source of irrigation water. As more and more settlers arrived and communities sprang up demanding more water supplies, issue of water rights arose along with competition for the best diversion points. Gradually, a system of water rights was established and shares in a 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. Gradually over time with increasing urbanization, the dominant land use of the region, agriculture, was subsumed by residential, commercial and industrial areas to serve a burgeoning population drawn to the semi-arid warm climate of this region (see Year 1933-2000 Land Use Transition Maps).

In the late 1920s, to assure 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 LA Aqueduct in the early 1910s, efforts commenced to raise money to import water from other places. Metropolitan Water

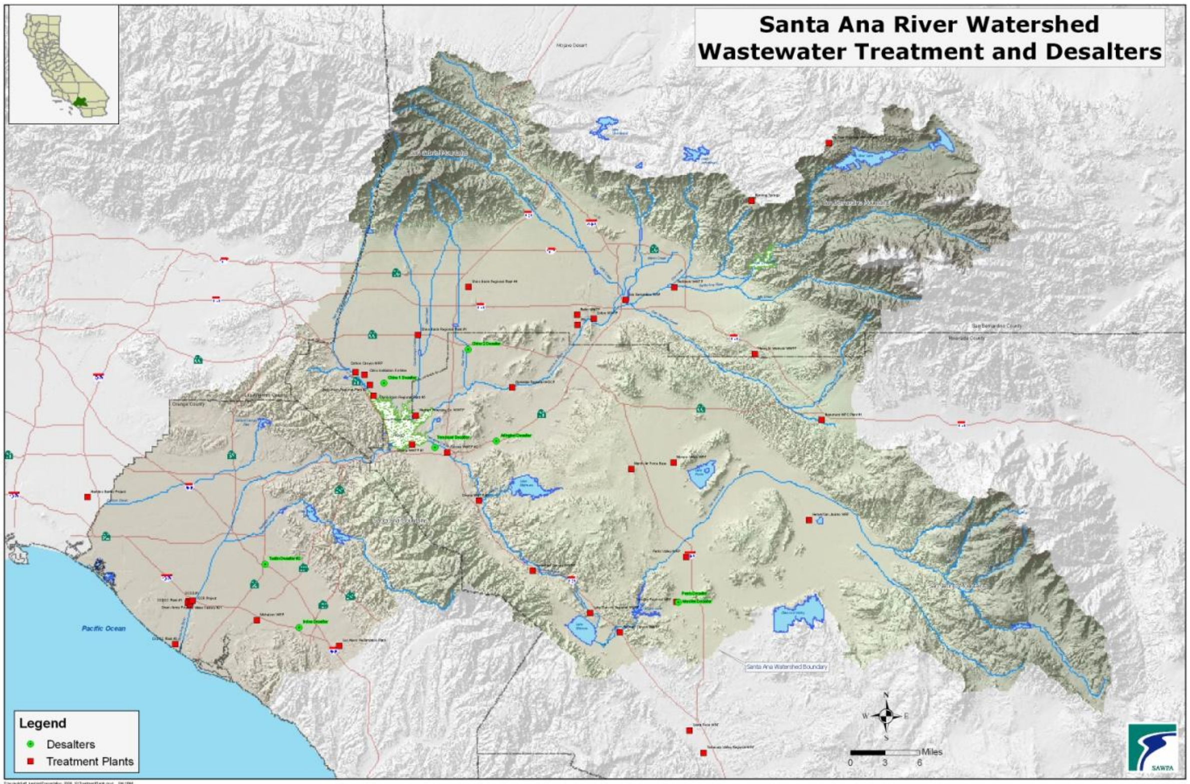
District (MWD) built and still operates the Colorado River Aqueduct, which each year imports millions of AF of water westward across the Mojave Desert and into the SAR Region. After SWP facilities were extended into the region in the early 1970s, State Water Contractors received deliveries from northern 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 SAR Region by four State Water Contractors: MWD, Valley District, San Gorgonio Pass Water Agency (SGPWA), and the San Gabriel Valley Municipal Water District as shown in **Figure 3-20**.

Figure 3-20 Imported Water Infrastructure in the Santa Ana River Watershed



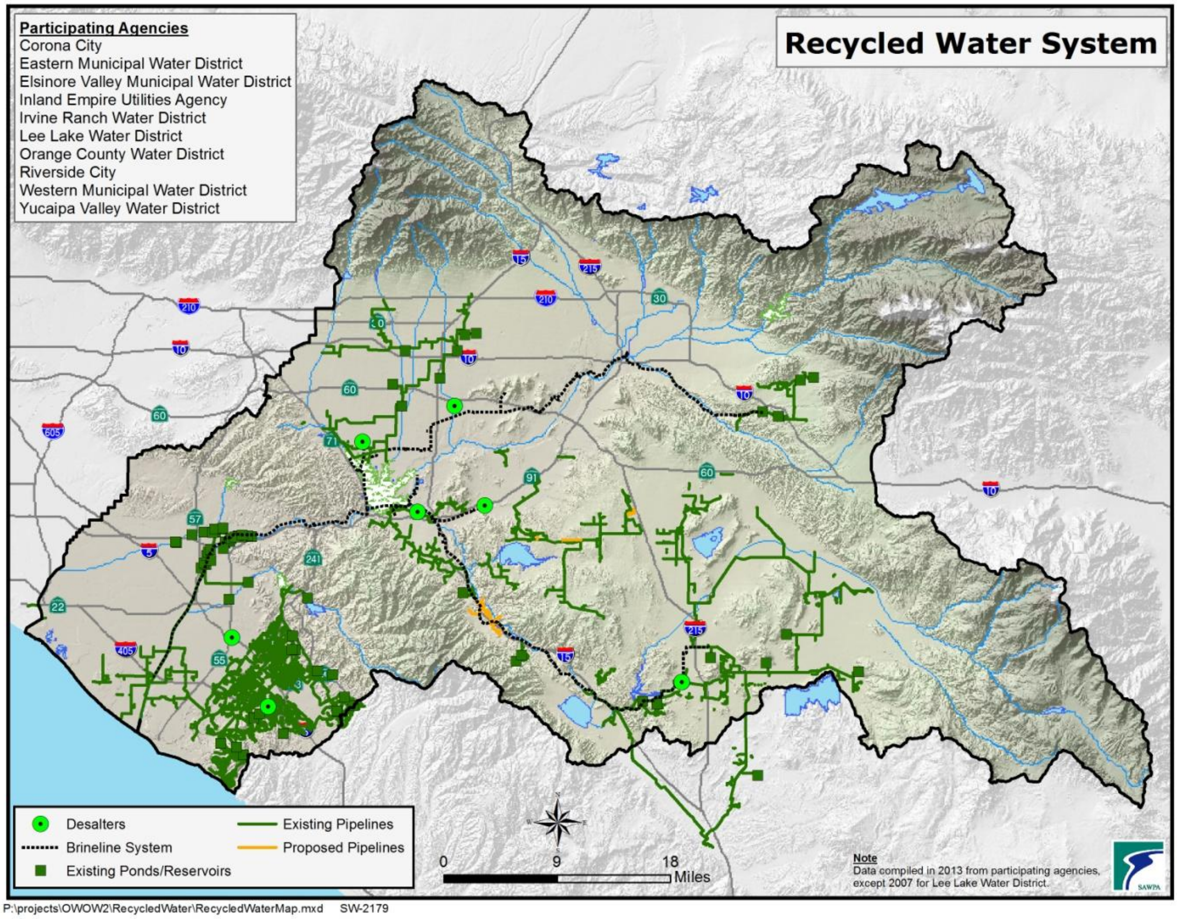
After use of available local and imported water by urban populations, wastewater treatment infrastructure collects and treats the effluent at locations, shown in **Figure 3-21**, but with the majority located near the SAR due to their proximity to a discharge location.

Figure 3-21 Wastewater Treatment Facilities in the Santa Ana River Watershed



Gradually over time, the once perennial flows of the SAR, which often dwindled to a near trickle during the summer months in the late 1800s, were replaced 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 in **Figure 3-22**.

Figure 3-22 Major Recycled Water Infrastructure in the Santa Ana River Watershed



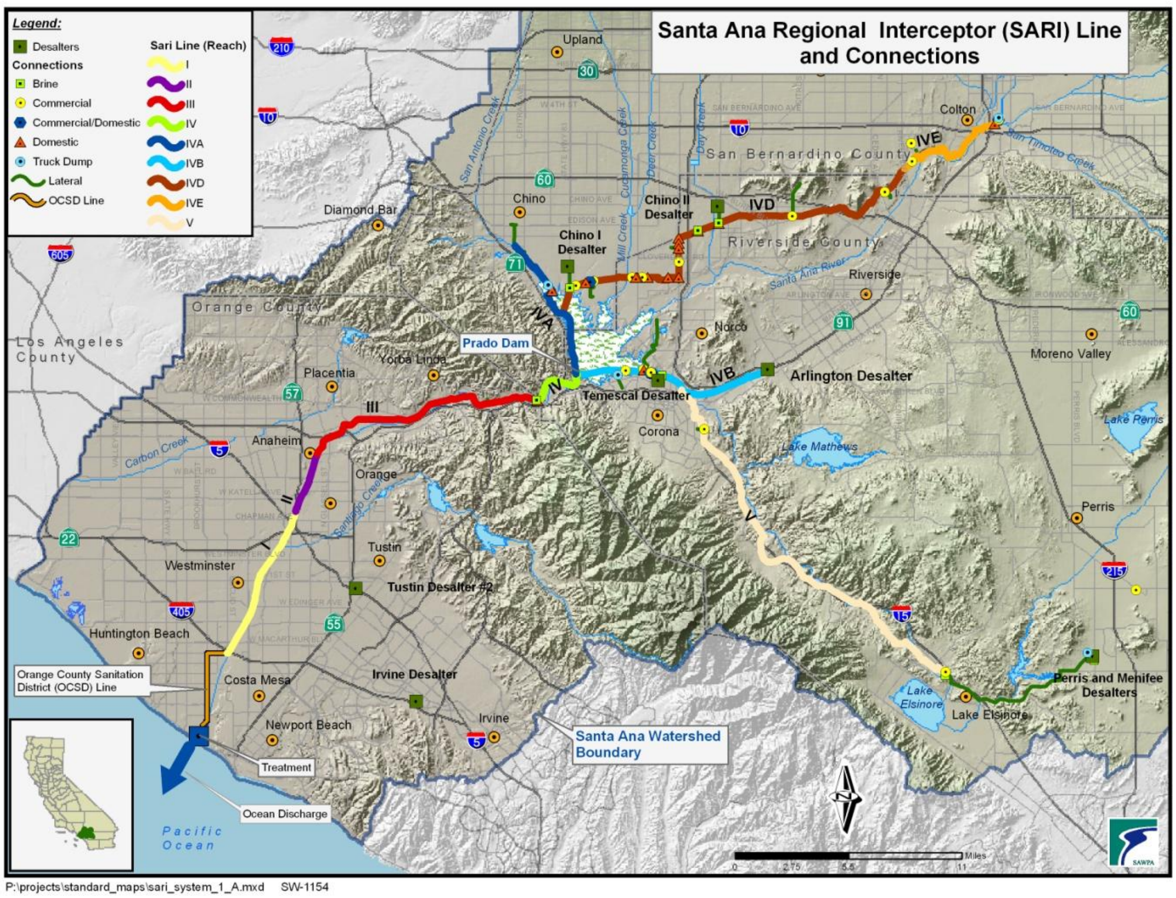
A more detailed write up on issues relating to water supply and demand relating to water resources in the Santa Ana Watershed are included in **Chapter 5.4 Water Resource Optimization**.

Salt Management

One of the most predominant concerns arising from the heavy use of the watershed for past agricultural practices, and now from the imported water and use of water, is the buildup of salts. 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. As the watershed continues to grow, cities encroach ever closer in proximity to dairies and other agricultural operations. To counter this added stress to the stream and groundwater supplies, producers have developed advanced methods of reducing potential conflicts. Technologically advanced wastewater control infrastructure has been rigorously employed, and negative impacts from agricultural runoff continue to be minimized. Nevertheless, the existing salts and contaminants present in the watershed from past practices still need to be removed, as improving water quality is inextricably linked to improving water supplies and implementing a comprehensive groundwater storage program.

As part of the solution to the TDS issues within the Watershed, SAWPA constructed approximately 93 miles of the 16- inch to 84-inch Inland Empire Brine Line to convey non reclaimable high saline brine out of the Watershed, as shown in **Figure 3-23**. These brine flows are collected throughout the upper Watershed and sent to Orange County Sanitation District (OCSD) wastewater treatment facilities before final discharge to the ocean. SAWPA owns capacity rights in 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 100-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 SAR Basin. Therefore, maintaining the integrity of the brine line and optimizing its future use are of utmost importance.

Figure 3-23 Inland Empire Brine Line and Connections



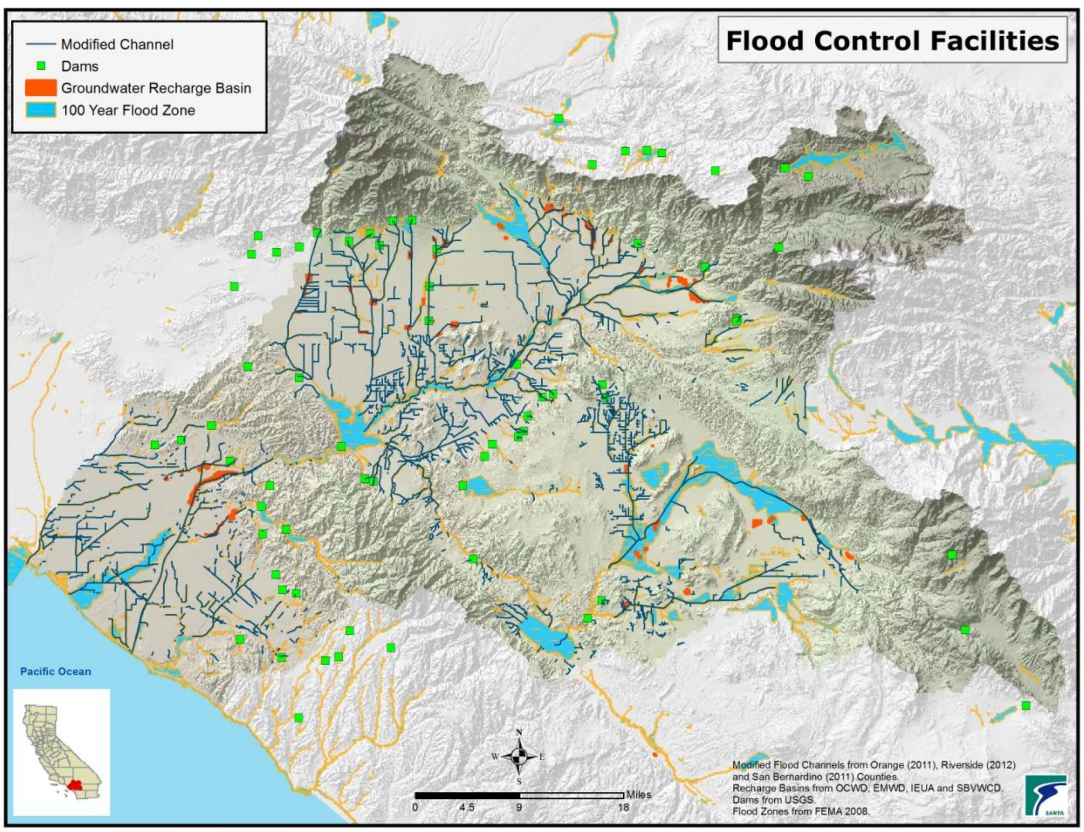
Flood Control

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 percent of the watershed lies above it. 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 Army Corps of Engineers (Corps) initiated study of the Santa Ana River Main Stem Project (SARP) in 1964. Construction of the SARP was initiated in 1989.

The SARP is located along a 75-mile reach of the Santa Ana River in Orange, Riverside and San Bernardino Counties. 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 3-24 Built Flood Control Systems and 100-Year Flood Zones in the Santa Ana River Watershed



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A more detailed write up on issues relating to stormwater and flood risks in the Santa Ana River Watershed are included in **Chapter 5.8 Stormwater: Resource and Risk Management.**

Conservation and Reducing Dependence on Delta Supply Regionally

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 Bay 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 (WUE) is the most cost-effective way to maximize diminishing water supplies, which makes it one of the most important components for diversifying the region's water portfolio in the coming years.

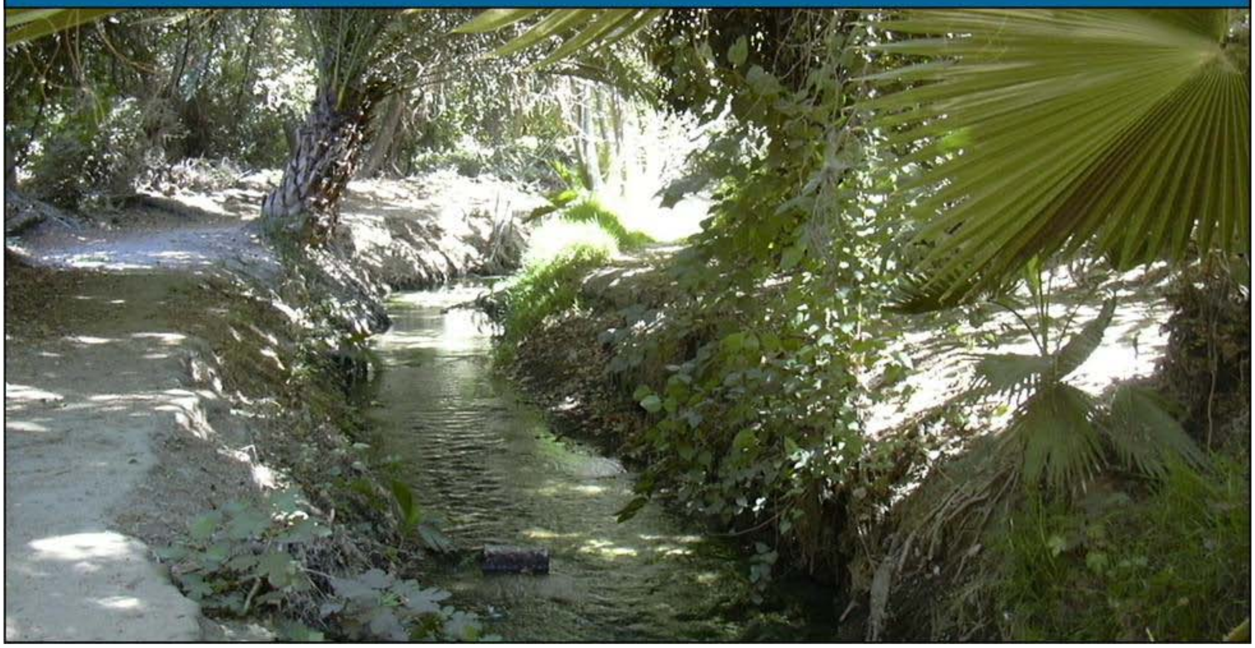
Over the past decade, significant WUE measures have been implemented by Southern California water agencies. These programs include the large-scale replacement of old inefficient water fixtures and the upgrade of building and plumbing codes in the state requiring low-flow toilets and showerheads in all new development. It is anticipated that these types of regulatory mandates will continue to be enhanced as emerging technologies become available. Through these programs, the amount of water imported into much of Southern California has remained fairly constant, sufficiently meeting demands despite significant development and population increases. However, with the water supply outlook continuing to worsen, WUE will be a critical resource management strategy that this region will need to embrace.

With implementation of expanded water use efficiency practices as well as other integrated local water resource development, the OWOW 2.0 Plan will help reduce dependence on Delta supply regionally. A more detailed write up on issues relating to water conservation and water use efficiency practice that are proposed for the Santa Ana River Watershed are included in **Chapter 5.6 Water Use Efficiency**

Future

As we in the watershed move forward with an eye on sustainability, future water infrastructure improvements will be key to achieving a sustainable balance. Keeping these systems, on which we depend so completely, in a good state of repair, is not a luxury, but prudent self-interest. Without a continued and reliable flow of infrastructure services, the viability of the region, as defined by our quality of life and economic well being, is put at risk. It is up to us now to assure that adequate infrastructure is in place to meet the needs of the region for tomorrow.

4.1 Vision



In order to guide the development of the One Water One Watershed (OWOW) 1.0 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 watershed that would allow a holistic approach to resource management. Since the adoption of the OWOW 1.0 Plan and the kick off of the OWOW 2.0 Plan, a process began to reevaluate the goals and objectives again in order to fine tune them based on additional information and to ensure that OWOW goals and objectives could be monitored for progress in watershed improvement. Much of this reevaluation was prompted by the development of a new tool discussed later in **Chapter 9 Data Management and Plan Performance/ Monitoring**, known as the Santa Ana River Watershed Assessment.

Vision

Prior to embarking on any major regional planning effort involving multiple stakeholders, the stakeholder values and principles needed to be established to serve as a foundation to the work ahead. With a firm foundation in place, a vision of the future could be defined with steps to accomplish that vision defined in a plan mission, goals and objectives. For the initial OWOW Plan, this work was conducted in late 2007 as the first step in the development of the OWOW 1.0 Plan. To define these parameters, SAWPA, with the consulting support of Bob Ohland of Stantec, led a two-day eco-charette workshop with the OWOW Steering Committee and the Pillar Leader group to create a holistic approach to resource management. This event provided an interactive and thought-provoking forum to discuss ideas and priorities in the pursuit of sustainable water resources and to discuss and take a first step toward developing goals and objectives for the watershed. In depth discussions were held regarding the values and principles that would be used as guiding principles for the Pillars to follow in the development the OWOW IRWMP. Further, the eco-charette format served to provide a consensus of the OWOW leadership values and principles, challenges, and strategies via group input and voting mechanisms to refine and enhance the overall vision of the group.

The results of that initial foundational workshop continue today and remain largely unchanged as the foundation to our current watershed planning under the OWOW 2.0 Plan. It is recognized that as new watershed challenges arise, fiscal and energy crises, dubbed the 5th and 6th Horsemen of the Apocalypse under **Chapter 1.0 One Water One Watershed Program**, SAWPA governance must adapt and reevaluate the specific goals and objectives of the watershed plan to fine tune and focus regional efforts to affect positive change. Further, with improved tools and tracking systems to monitor progress in attaining watershed goals, we now have the capability to establish indicators of change so that the performance can be assessed. With development of the indicators, the language of the goals and objectives for the OWOW 2.0 Plan were redefined and clarified.

OWOW Vision and Mission

The vision of the OWOW Plan is:

1. A watershed that is sustainable, drought-proofed and salt-balanced by 2035, and in which water resources are protected and water is used efficiently
2. A watershed that supports economic and environmental viability
3. A watershed that is adaptable to climate change
4. A watershed in which environmental justice deficiencies are corrected
5. A watershed in which interruptions to natural hydrology are minimized
6. A water ethic is created at the institutional and personal level

Listed below is a summary of the issues that rose to the top as priorities at the eco-charette.

Values

- Sustainability
- Comprehensive Water Strategy
- Smart Growth/Urban Centers Communities
- Maintain Quality of Life

With an established values, vision and mission, the OWOW Steering Committee conveyed a sense of urgency that moderately aggressive to aggressive planning was needed. Furthermore, they were effective in conveying direction to produce a plan that is more aggressive in taking steps to plan for major changes in how developing, protecting, and conserving water is approached. At the end of the eco-charette, the general direction was as follows:

- There was a shared understanding that all water within the Santa Ana River Watershed is a precious resource. Climate change, continuing Colorado River drought, questions about the 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 very own successful growth and development will stress our ability to provide sufficient water to supply to our Watershed for economic and environmental sustainability.
- There was an expressed commitment to invest time and resources for high quality planning, both long-range and short-range, to ensure the best possible outcome and to achieve the stated mission of making the Santa Ana River Watershed drought-proofed, salt-balanced, and to continue its economic and environmental vitality.
- As major paradigm 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.
- The group indicated through voting that in order to meet these challenges, the leadership in the watershed would need to consider significant review of current practices and expectations. The best solutions would likely engender new ways of thinking about water use and its value.
- There was acknowledgment that while many advances would need to be made in conservation and water use efficiency, the planning process should consider if agricultural water conservation measures could free up water for urban use, or if water could be purchased from agriculture for urban use.
- There was a commitment to employ emerging technologies to further urban water efficiencies and to develop new water supplies.

The next step was the establishment of a set of principles to guide the watershed planning. These principles serve as the guiding rules or qualities that most people can support and reflect the essential elements for planning of water resources in the Santa Ana River Watershed.

Principles for Watershed Planning

- The planning process must be watershed-wide and bottom-up in order to allow for a holistic and systematic approach to watershed management.
- It is necessary to 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 beyond political boundaries.
- The OWOW Plan and the projects included therein must pursue multiple objectives beyond the "traditional" objective of providing reliable water, and include 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 disadvantaged communities), providing economically effective solutions, and improving regional integration and coordination.
- The OWOW Plan must continue the paradigm change already in play from water supply to an integral water management mentality: moving from a mission of providing abundant high-quality water at the lowest cost possible, to one in which water resources are managed in a sustainable manner and with regard for the needs of the environment.

- Watershed-wide planning must transcend specific funding opportunities (e.g. State grants).
- The implementation of the Plan must result in agreements among the Watershed stakeholders on how to manage and operate the watershed.
- The Plan must improve life conditions throughout the watershed, ensuring that an improvement in the welfare of one area is not at the expense of others.

Generally, the consensus is that the OWOW effort needs to be bold and innovative to meet the watershed's vision.

4.2 Goals and Objectives

Goals and Objectives

As a result of the two-day eco-charette for One Water One Watershed (OWOW) 1.0 back in 2007, the Steering Committee, as well as the Pillar leaders, met on several occasions to develop goals and objectives based on the eco-charette exercises. There also was interest in matching the quality of water delivered to the water quality needed for a specific purpose. For example, highly treated drinking water is not needed for agriculture or landscaping use. The Steering Committee members and Pillar Co-Chairs discussed the impacts of land use decisions on water quality and the quantity of water available. There was a desire for better communication and coordination between the water industry and those charged with land use planning. Furthermore, Steering Committee members and Pillar Co-chairs also discussed how much public open space is dedicated to grass and how much of residential personal outdoor space can be maintained in grass verses other plantings that would be less water dependent. They acknowledged the need for grass play areas while seeing opportunities for water savings by replacing grass with drought tolerant plantings in other areas. The Steering Committee and Pillar Co-chairs suggested that the price paid for water by the consumer versus the actual cost of water, including environmental, wheeling, and infrastructure replacement costs, be reconciled.

With this guidance in mind, a draft set of Goals and Objectives was established after extensive stakeholder outreach and review. The final 2007 product of their efforts is shown below in **Table 4.2-1**, which summarizes the goals and objectives developed in consensus by the group.

Table 4.2-1 OWOW 1.0 Goals and Objectives

Goals	Objectives
Provide reliable water supply	Reduce dependency on imported water Meet current and future water demands during all hydrologic conditions Meet water demands during emergency or catastrophic conditions Maximize water use efficiency Increase use of recycled water
Preserve and enhance the environment	Protect and enhance the ecological function of open-space Protect and enhance water-related habits Reduce or eliminate invasive riparian and aquatic species Protect sensitive marine and estuarine environments Consider ecological functionality in new development
Promote sustainable water solutions	Promote strategies that link land and water use Reduce greenhouse gas emissions Reduce energy consumption and promote urban greening projects Develop partnerships for planning and implementation of economically, environmentally, and socially sustainable watershed projects
Ensure high quality water for all users	Attain water quality standards in fresh and marine environments Match water quality with intended uses Protect and improve source water Manage salinity
Provide economically effective solutions	Leverage existing financial and infrastructure assets Minimize capital, O&M, and life-cycle cost Promote aggressive pursuit of grants and loans Pursue innovative, non-traditional revenue-generating concepts Protect and value green infrastructure
Improve regional integration and coordination	Engage stakeholders in planning and implementation of watershed projects Increase communication and coordination Search for projects that meet multiple goals across geographic and water resource services
Manage rainfall as a resource	Provide appropriate flood control capacity and other benefits to the community Maximize beneficial use of rain water
Preserve open-space and recreational opportunities	Increase opportunities for recreation and open-space Provide useable open-space for all residents of the watershed
Maintain quality of life	Balance quality of life, and social, environmental, and economic impacts when implementing projects Consider the needs of disadvantaged communities

These goals and objectives were created with the Department of Water Resources (DWR) Program Preferences and the California Water Plan in mind. These goals and objectives are at the core of the OWOW 1.0 Plan and the Pillar groups. Additionally, **Table 4.2-2** shows how the OWOW Plan complies with the CWC§10540(C) Objectives. These goals were not prioritized based on the need for OWOW governance to have the flexibility to weight the objectives in accordance with funding opportunities or current water resource challenges that may change over time.

Table 4.2-2 OWOW Plan Goals and CWC§10540(C) Objectives

CWC§10540(C) Objectives	Corresponding OWOW Plan Goals
Protection and improvement of water supply reliability, including identification of feasible agricultural and urban water use efficiency strategies	Provide reliable water supply Promote sustainable water solutions Provide economically effective solutions Improve regional integration and coordination Manage rainfall as a resource
Identification and consideration of the drinking water quality of communities within the area of the Plan	Ensure high quality water for all users
Protection and improvement of water quality within the area of the Plan consistent with relevant basin plan	Ensure high quality water for all users
Identification of any significant threats to groundwater resources from over-drafting	Provide reliable water supply Promote sustainable water solutions Manage rainfall as a resource
Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region	Preserve and enhance the environment Promote sustainable water solutions Improve regional integration and coordination Preserve open-space and recreational opportunities
Protection of groundwater resources from contamination	Ensure high quality water for all users Promote sustainable water solutions
Identification and consideration of water-related needs of disadvantaged communities in the area within boundaries of the Plan	Provide reliable water supply Provide economically effective solutions Improve regional integration and coordination Maintain quality of life

OWOW 2.0 Goals and Objectives Update

While all of the goals and objectives under OWOW 1.0 pave the way to a sustainable watershed, SAWPA recognized the need for a common method of measuring progress on meeting the goals and objectives, as well as the health of the Santa Ana River Watershed. As a first step, SAWPA engaged the services of the Council for Watershed Health, formerly known as the Los Angeles and San Gabriel Watersheds Council, a 501(c) 3 nonprofit organization that helped develop a methodology for the California Watershed Assessment Framework (WAF), a derivative of a U.S. Environmental Protection Agency (EPA) Science Advisory Board framework (EPA 2002). The techniques and technology of the Framework developed by the Council are well accepted by DWR and also play a role in the development of the California Water Plan 2013 Update. The value of the assessment is particularly important to the OWOW 2.0 process, as the current guidelines from DWR require inclusion of performance monitoring in all Integrated Regional Water Management (IRWM) planning efforts.

The use of the framework initially was applied by the Council for Watershed Health in 2010 to a watershed located in Los Angeles County called the Aroyo Seco watershed, and provided a template for an assessment process. Under OWOW 2.0, the development and analysis of a framework for indicator assessment was kicked off as a collaborative process among SAWPA, the Pillars, the Council for Watershed Health, and Dr. Fraser Shilling of UC Davis.

One of the key strengths of the Framework is that it uses existing watershed management goals as the focus of the assessment. This allows a variety of managers to participate in creation of the assessment, and assures actionable results for implementation. The watershed management goals drive the selection of indicators and metrics that often can be drawn from existing datasets or data collection efforts.

The process included presentations of the Framework and its application in working sessions orchestrated by SAWPA for stakeholders. This learning process included both small-group meetings with SAWPA staff, as well as larger-scale stakeholder sessions with the Pillars.

Under the facilitation and guidance of the Council for Watershed Health, goals and objectives from the original OWOW Plan were compared to the OWOW 2.0 Framework to identify and fill gaps. The Pillars selected five areas for which to update goal definition for OWOW 2.0: water supply, hydrology, open spaces, beneficial uses, and effective & efficient management. The goals and objectives for each of these five areas are detailed in this section.

Water Supply

Goal: Maintain reliable and resilient water supplies and reduce dependency on imported water

Objectives:

- Decrease water demand
- Increase water-use efficiency
- Increase use of rainfall and snowpack as a resource
- Increase use of recycled water
- Sustainably develop local water resources
- Maintain sufficient storage to overcome multi-year (3 year) drought over a ten year hydrologic cycle
- Reduce green-house-gas emissions and energy consumption from water resource management

The Santa Ana River Watershed, among all the services it provides, is the source of a great deal of the water used by human communities, and virtually all of the non-human communities. In fact, approximately 70% of the supply is of local origin coming from local groundwater, local precipitation and surface flows, and recycled water. The supply of water to communities is foremost in the management effort of the watershed, and this goal seeks to understand the effectiveness and efficiency of the water supply system.

Hydrology

Goal: Manage at the watershed scale for preservation and enhancement of the natural hydrology to benefit human and natural communities.

Objectives:

- Preserve and restore hydrologic function of forested and other lands
- Preserve and restore hydrogeomorphic function of streams and water bodies
- Safely co-manage flood protection and water conservation
- Include ecosystem function in new development planning and construction

The physical processes of the watershed exist on the land and in the water. This goal highlights how managers of water and land (and the relationship between the two) are striving to protect and restore natural processes that benefit other goals within the watershed, like supply or habitat augmentation.

Open Spaces

Goal: Preserve and enhance the ecosystem services provided by open space and habitat within the watershed.

Objectives:

- Increase the capacity of open space to provide recreational opportunities without degrading its quality or increasing its consumption of water and energy
- Protect existing and restore native habitats
- Protect and maintain healthy forests
- Manage aquatic and riparian invasive species
- Protect estuarine and marine near-shore habitats
- Reduce ornamental irrigated landscapes
- Improve management support for landscaping that utilizes native and drought tolerant vegetation
- Protect and Restore wildlife corridors
- Protect endangered and threatened species and species of special concern through improved habitat

Like the Hydrology goal, the desire to protect open spaces reveals efforts to maintain land in a natural condition. Here, however, the focus is more on the habitat and recreational value of the open space. Changing the ethic for managing developed open space, even at the household scale, also is included here, found in the objectives to diminish irrigation and water-intensive ornamental landscapes.

Beneficial Uses

Goal: Protect beneficial uses to ensure high quality water for human and natural communities

Objectives:

- Attain water quality standards in fresh and marine environments to meet designated beneficial uses
- Protect and improve source water quality
- Achieve and maintain salt balance in the watershed

Strong Federal and State regulatory authority drives water quality management. This goal acknowledges the need for water quality on the surface and in the ground to be improved through management changes.

Effective & Efficient Management

Goal: Accomplish effective, equitable and collaborative integrated watershed management

Objectives:

- Improve regional integration and coordination
- Ensure high quality water for all users
- Balance quality of life and social, environmental, and economic impacts when implementing projects
- Maintain quality of life
- Provide economically effective solutions
- Engage with disadvantaged communities to eliminate environmental injustices
- Engage with Native American tribes to ensure equity
- Reduce conflict between water resources and protection of endangered species

This goal is at the heart of the OWOW process, saying that only through inclusive collaborative processes can the necessary unity of purpose be achieved. Managing the Santa Ana watershed requires actors at multiple scales and with vastly different authorities and responsibilities. Through an adaptive management process OWOW seeks to achieve the correct organization of decision-makers for the decisions that must be made.

The watershed assessment and the indicators for the updated goals and objectives under OWOW 2.0 are explained in detail under **Chapter 9.0 Data Management and Plan Performance Monitoring**. The assessment is an effective tool that can be repeated in a time interval to include a set of metrics that express trends. The assessment conducted in this exercise is a snapshot of the current day in the Santa Ana River Watershed, and many of the goals are specifically designed to encourage progress. In five years, perhaps sooner, this assessment can be repeated to uncover laudable progress and spots where efforts should be redoubled.

4.3 Planning Targets

Planning Targets

Based on the new watershed assessment previously discussed, the Santa Ana Watershed Project Authority (SAWPA) now has improved planning targets, described as “wanted conditions” or “metrics” and indicators, that will allow stakeholders to track progress in achieving the planning targets associated with each goal. The metrics and indicators are discussed in more detail under **Appendix A**. **Figure 4.3-1** reflects an overview of the One Water One Watershed (OWOW) Plan Guiding Principles, Goals, Objectives, Targets, and Indicators. The lists below reflect that the OWOW governance chose not to prioritize the OWOW goals, objectives, or targets with the understanding that each objective is equally important relative to the others, given that the OWOW Plan is intended to be a truly integrated plan. The OWOW governance may choose, however, to prioritize these objectives relative to grant requirements to enhance project prioritization and selection. In those cases, the type of funding program will dictate which target should be emphasized.

In addition to the watershed assessment tool, planning targets were developed for many of the quantifiable objectives based on the work of the Pillars to provide additional metrics to gage the watershed’s progress toward meeting the goals over a 25-year time period (2010 through 2035). The objective relating to the greenhouse gas emission reduction uses a longer 40-year time horizon to reflect the current science of climate change time scales and impact estimates that use the year 2050. The targets, summarized in **Table 4.3-1**, will help the Santa Ana River Watershed to define projects that will help it to address its water-related issues.

One planning target of particular interest for tracking progress in water demand reduction within the watershed is the level of water use efficiency. Water use efficiency measures will help reduce water demand and free up water supplies for other uses. Retail water suppliers within the watershed, as with the rest of the State, are required to report and meet water conservation targets in compliance with regulations set forth in the Water Conservation Act of 2009, also known as 20x2020 or SBX7-7. 20x2020 seeks a reduction in State-wide daily per person potable water use of 20 percent by the year 2020, and uses Urban Water Management Plans (UWMPs) as the compliance reporting vehicle. The first UWMPs completed with 20x2020 requirements were due to DWR in 2011. Each retail water supplier was required to include a calculation of the demand reduction target to meet 20x2020 as part of its 2010 UWMP.

The target reflects what can be achieved if the watershed's municipal water providers are able to meet the targets identified for 20x2020. The OWOW watershed target of 256,500 AFY by 2035 was developed based on a compilation of UWMPs through 2020, Water Resource Optimization Pillar demand projections data, and assumptions of continued 20% reduction per decade from (2020-2035). Through 2020, significant progress is anticipated in the watershed with a total 34,100 AFY increase in water savings by 2015, and 91,000 AFY by 2020 compared to Year 2010 levels as reported by the retail water agencies in their UWMPs.

Figure 4.3-1 OWOW Plan Guiding Principles, Goals, Objectives and Targets

Goals	Objectives	Targets	Indicators
Maintain reliable and resilient water supplies and reduce dependency on imported water	• Decrease water demand • Increase water-use efficiency • Increase use of rainfall and snowpack as a resource • Increase use of recycled water • Sustainably develop local water resources • Maintain sufficient storage to overcome multi-year (3 year) drought over a ten year hydrologic cycle • Reduce green-house-gas emissions and energy consumption from water resource management	• Increase reliance on native water • 20% by 2020 • Sufficient supply available during local multi-year drought • Energy use lower than the five year average • All retailers that encourage conservation	• Water Supply Source • Per Capita Water Use • Local Water Supply resources • Carbon footprint of energy in water • Water rate structures that encourage conservation
Manage at the watershed scale for preservation and enhancement of the natural hydrology to benefit human and natural communities	• Preserve and restore hydrologic function of forested and other lands • Preserve and restore hydrogeomorphic function of streams and water bodies • Safely co-manage flood protection and water conservation • Include ecosystem function in new development planning and construction	• All natural stream bed • Less than 5% effective impervious land cover in watershed • A coastline prepared for variable sea level increases • All HUC 12 watersheds 0% fragmented	• Natural stream characteristics • Imperviousness of watershed • Resiliency to Coastal Impacts of Sea Level Rise • Connected Aquatic Habitat
Preserve and enhance the ecosystem services provided by open space and habitat within the watershed	• Increase the capacity of open space to provide recreational opportunities without degrading its quality or increasing its consumption of water & energy • Protect existing and restore native habitats • Protect and maintain healthy forests • Manage aquatic and riparian invasive species • Protect estuarine and marine near-shore habitats • Reduce ornamental irrigated landscapes • Improve management support for landscaping that utilizes native and drought tolerant vegetation • Protect and Restore wildlife corridors • Protect endangered and threatened species and species of special concern through improved habitat	• All residents within 1/2 mile of open space • Invasive assessed and being treated • All remaining native habitat protected from development	• Access to open space per capita • Invasive species management • Protected lands

Goals	Objectives	Targets	Indicators
Protect beneficial uses to ensure high quality water for human and natural communities	• Attain water quality standards in fresh and marine environments to meet designated beneficial uses • Protect and improve source water quality • Achieve and maintain salt balance in the watershed	• All reaches in compliance with Basin Plan • No gw management zones with exeedences • No exceedences at monitored outfalls • No samples showing eceedences • All streams with CSCI scores between 0.72 & 1.21 (max)	• Watershed-wide water quality • Groundwater salinity • Discharge water quality • Recreational water quality • Biological condition in streams
Accomplish effective, equitable and collaborative integrated watershed management	• Improve regional integration and coordination • Ensure high quality water for all users • Balance quality of life and social, environmental and economic impacts when implementing projects • Maintain quality of life • Provide economically effective solutions • Engage with disadvantaged communities to eliminate environmental injustices • Engage with Native American tribes to ensure equity • Reduce conflict between water resources and protection of endangered species	• All sectors, areas, and communities represented • All OWOW 1.0 selected projects meeting stated goals	• OWOW participation statistics • Performance of OWOW 1.0 Projects

Table 4.3-1 Performance Targets for 2035

Goals	Performance Targets for 2035
Maintain reliable and resilient water supplies and reduce dependency on imported water	•Conserve an additional 256,500 AFY of water through water use efficiency and conservation measures •Create 58,000 AFY using a combination of additional wells, treatment, conjunctive use storage and desalination of brackish groundwater •Increase production of recycled water by 157,000 AFY •Increase both centralized and distributed stormwater capture and recharge by 132,000 AFY •Develop 54,000 AFY of ocean water desalination
Manage at the watershed scale for preservation and enhancement of the natural hydrology to benefit human and natural communities	•Reduce flood risk in 700 acres using integrated flood management approaches •Remove 500,000 cubic yards of sediment from debris basins and reservoirs
Preserve and enhance the ecosystem services provided by open space and habitat within the watershed	•Preserve or restore 3,500 acres of terrestrial aquatic habitat •Construct 39.5 miles of additional Santa Ana River Trail and Parkway
Protect beneficial uses to ensure high quality water for human and natural communities	• Reduce non-point source pollution by treating an additional 35 MGD of surface and stormwater flow, emphasizing higher priority TMDL areas • Remove an additional 25,000 tons of salt per year from the watershed
Accomplish effective, equitable and collaborative integrated watershed management	•Engage with 50% (approximately 35) Disadvantaged Communities within the watershed •Engage with 100% of the Non-Federally Recognized Tribes in the watershed

5.1 Introduction

In the early stages of the One Water One Watershed 2.0 (OWOW) planning process, various resource management strategies were evaluated. In 2000, as reflected in the Santa Ana Watershed Project Authority's (SAWPA) early integrated water resource plans, six resource management strategies were developed that covered a broad spectrum of water resource planning. At the time, the integration of these six strategies 1) Groundwater Cleanup and Purification, 2) Water Storage, 3) Flood Protection, 4) Wetlands, Habitat, and the Environment, 5) Water Recycling and 6) Recreation and Conservation was considered innovative in proposing a new way to support the needs of water resources in a region. Past water resource management practices focused primarily on water supply functions without considering the more expansive and integrated benefits of integrating other resource management strategies.

To further emphasize the importance of integrated regional water management planning, the State incorporated the integrated resource management approach into its California Water Plan Update 2005 and again in its 2009 Update. This latest plan emphasizes the value of an integrated regional water management approach using multiple resource management strategies as defined in California Water Plan.

In 2006, in light of new threats to water resources in the Santa Ana River Watershed and to the State overall such as climate change, fiscal crises and the energy crises, SAWPA reviewed its past resource management strategies to update. New resource management strategies defined in the California Water Plan, previous Department of Water Resources (DWR) guidelines for Integrated Regional Water Management Plan (IRWMP) development, and local water resource needs were considered. For the

OWOW 1.0 Plan, the following resource management strategies were defined and aligned along ten major areas of focus, or Pillars:

Pillar	Corresponding Proposition 84 Guidelines Resource Management Strategies
Land Use and Water	Increase water supply
Water Supply Reliability	Reduce water demand
Water Recycling	Increase water supply
Water Use Efficiency	Reduce water demand
Water Quality	Improve water quality
Environmental and Habitat Restoration	Practice resource stewardship
Stormwater Risk Assessment	Improve flood management
Environmental Justice	Included in Guidelines as part of Impact and Beneficial
Parks and Open Space	Not explicitly mentioned in Guidelines
Climate Change	Included in Guidelines as separate standard

In 2011 with the commencement of OWOW 2.0 Plan and the focus on implementation, the water resource management strategies and OWOW Pillars were again reevaluated. To assure that these OWOW Plan resource management strategies are comprehensive and fully reflect the resource management strategies as defined in the California Water Plan Update 2009, the following new OWOW 2.0 Plan resource management strategies or Pillars were established, many of which continued from the previous Pillars, but with new “implementation oriented” titles.

Pillar	Corresponding DWR Prop 84 Guidelines Resource Management Strategies
Water Resource 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

Disadvantaged and Tribal Communities	Included in Guidelines as part of Impact and Benefit Standard
Government Alliance	Create partnerships between DWR and member agencies
Energy and Environmental Impact Response	Included in Guidelines as separate standard

In order to manage the initial planning work, the stakeholders were organized into ten workgroups, or Pillars, centered on a specific water resource management issue. Discussion of the formation of the Pillars and their work approach is previously described in **Chapter 2.1 Governance Structure**.

Pillar Chapter Development

The following chapters of this report have been written and prepared by the respective OWOW water management strategy committees (Pillars), and represent the culmination of work by the Pillar Chair and the Pillar members (local stakeholders). Unlike a single agency or consultant-prepared report, SAWPA did not significantly modify the following Pillar chapters, other than minor editing, in order to ensure that the work developed through the grassroots stakeholder-driven OWOW process was genuinely conveyed intact, and best reflects the interests, issues, and potential solutions of interested stakeholders in the Watershed.

Each Pillar was led by a recognized expert in their subject area, and was selected by the SAWPA Commission. A list of Pillar Leaders is shown as follows:

Pillar	Pillar Co-Chairs
Water Resource Optimization	Robert Tincher Mark Tettemer
Beneficial Use Assurance	Greg Woodside Mark Adelson
Water Use Efficiency	Pam Pavela Gail Covey
Land Use and Water Planning	Susan Lien-Longville Jerry Blum
Stormwater: Resource and Risk Management	Maryanne Skorpanich Stuart McKibben
Natural Resources Stewardship	Lee Reeder Nancy Gardner
Operational Efficiency and Water Transfer	Behrooz Mortazavi Craig Miller
Disadvantaged and Tribal Communities	Maria Elena Kennedy

	Leslie Cleveland
Government Alliance	Eileen Takata Jack Simes
Energy and Environmental Impact Response	Roy Herndon Craig Perkin

Local stakeholders participated in a number of Pillar or subject area meetings held in person throughout the watershed. The number of meetings scheduled for each particular group was determined by the individual Pillar leaders with support and guidelines provided by SAWPA staff. Additional stakeholders with an interest in particular subject areas were referred to Pillar leaders for inclusion into the process.

Each of the following sections to this chapter reflects the direction given to each Pillar by SAWPA to update their Pillar write-ups from OWOW 1.0, and then consider and identify regional implementation projects and programs. These conceptual implementation projects and programs were developed using the updated goals and objectives, review of Proposition 84 IRWM Plan standards, past suggested strategies by their Pillars, or by integration of their Pillars with other Pillars. The results of the collaboration are described in Chapters 5.4 – 5.13. **Chapter 5.14 Integration and Implementation** reflects even further integration of the Pillars output through integration workshops with the Pillars to improve implementation synergy and linkages.

5.2 California Water Plan Resource Management Strategies

With the development of integrated watershed planning, multi-benefit, multi-purpose projects have moved to the forefront and have become one of the primary goals of the One Water One Watershed (OWOW) progression. The idea of meeting a number of community necessities with a single project is not new; however, specialization within agencies that deal with water has often moved these project types to the backburner. Efforts in the past primarily focused on single purpose projects; the additional effort required to develop multi-objective solutions have made true multi-benefit projects relatively uncommon. The best way to create multi-beneficial projects and to encourage diversification of water management approaches to mitigate uncertain future circumstances is the application of Resource Management Strategies (RMS).

RMS are set standards that encourage the diversification of water management approach as a way to mitigate for uncertain future circumstances. Integrated regional strategies were encouraged for the management of water resources and to provide funding, through competitive grants, for projects that protect communities from drought, protect and improve water quality, and improve local water security by reducing dependence on imported water. These standards are met through the application of the OWOW 2.0 Plan with the creation and implementation of the Pillars. Listed below are the RMSs defined by the California Water Plan Update 2009.

Table 5.2-1 CA Water Plan Update 2009 Resource Management Strategies

CA Water Plan Update 2009 Resource Management Strategies	
• Agricultural Water Use Efficiency • Urban Water Use Efficiency • Crop Idling for Water Transfers • Irrigated Land Retirement • Conveyance – Delta • Conveyance – Regional/Local • System Reoperation • Water Transfers • Flood Risk Management • Agricultural Lands Stewardship • Economic Incentives (Loans, Grants and Water Pricing) • Ecosystem Restoration • Forest Management • Recharge Area Protection • Watershed Management	• Conjunctive Management & Groundwater Storage • Desalination • Precipitation Enhancement • Recycled Municipal Water • Surface Storage – CALFED • Surface Storage – Regional/Local • Drinking Water Treatment and Distribution • Groundwater Remediation/Aquifer Remediation • Land Use Planning and Management • Matching Quality to Use • Pollution Prevention • Salt and Salinity Management • Urban Runoff Management • Water-Dependent Recreation

Consideration when Implementing RMS

For the development of the OWOW 2.0 Plan, multiple RMS were considered relative to the new IRWM Plan 2013 objectives and the RMS listed in the California Water Plan Update 2009 (DWR, 2009). The purpose of reviewing these management strategies was to identify which ones will help achieve the OWOW 2.0 Plan objectives through project or program implementation within the Santa Ana River Watershed. When choosing specific RMS that are met by the OWOW 2.0 Plan, it is important to remain cognitive of contributing factors that may be problematic. As defined by the California Water Plan 2013 updates, climate change tends to be a reoccurring problematic factor. Climate change is expected to impact water use, as rising temperatures will result in higher evapotranspiration and higher water use requirements. The effects of climate change must be evaluated when implementing specific RMSs (Listed on **Table 5.2-1**); with particular note of the following:

- Concerns over groundwater impacts, overdraft, and loss of recharge
- Increase in the vulnerability of trees and vegetation and burn area susceptibility
- Unpredictability of changing climate

All of these issues were taken into consideration when developing the OWOW 2.0 and yet the Integrated Regional Water Management (IRWM) is still capable of implementing RMS defined by the guidelines.

Implementation of RMS

Implementation of RMS is an important objective met and influenced by the OWOW Plan. Within the OWOW 2.0 Plan, these RMS, as defined by the guidelines of Proposition 84 and 1E, meet the standard of a project, program, or policy that help local and government agencies involved in water management. The OWOW 2.0 Plan was developed for the implementation of multi-beneficial projects, programs, and policies throughout the watershed.

This implementation of the CWP 2009 Update RMS has encouraged water agencies within the watershed to adopt new strategies for a sustainable watershed. To assure that these RMS for the OWOW Plan are comprehensive and fully reflect as many of the resource management strategies as possible, as defined in the California Water Plan Update 2009 and guidelines, the OWOW Plan Pillars are largely aligned with the resource management strategies identified in the Proposition 84 Guidelines.

The following California Water Plan Update 2009 Resource Management Strategies are met in the OWOW Plan and can be seen in **Table 5.2-2**.

Table 5.2-2 RMS and Pillar Group Relationship

Pillar	Resource Management Strategy	Management Goal
Natural Stewardship	Agricultural Lands Stewardship Ecosystem Restoration Recharge Area Protection Water-Dependent Recreation Forest Management	Practice Resource Stewardship
Water Use Efficiency	Agricultural Water Use Efficiency Urban Water Use Efficiency	Reduce Water Demand
Water Resource Optimization	Conjunctive Management and Groundwater Storage Recycled Municipal Water Conveyance – Regional/Local System Reoperation Water Transfers	Increase Water Supply
Beneficial Use Assurance	Desalination	Increase Water Supply
	Groundwater Remediation/Aquifer Remediation Matching Water Quality to Use Pollution Prevention Salt and Salinity Management Urban Runoff Management	Improve Water Quality
Stormwater: Resource and Risk Management	Flood Risk Management	Improve Flood Management
	Recharge Area Protection	Practice Resource

		Stewardship
Government Partnership	Economic Incentives	Fund Procurement
Energy and Environmental Impact	Ecosystem Restoration Pollution Prevention	Reduce Pollutants
Land Use and Water Planning	Agricultural Water Use Efficiency Pollution Prevention Recharge Area Protection Land Use Planning and Management	Increase Water Supply Improve Water Quality Practice Resource Stewardship

The following RMSs were not applicable to the Santa Ana River Watershed or were not considered as effective practices within our watershed:

CA Water Plan Update 2009 Resource Management Strategies	
• Crop Idling for Water Transfers • Irrigated Land Retirement • Conveyance – Delta	• Precipitation Enhancement • Surface Storage – CALFED • Surface Storage – Regional/Local • Drinking Water Treatment and Distribution

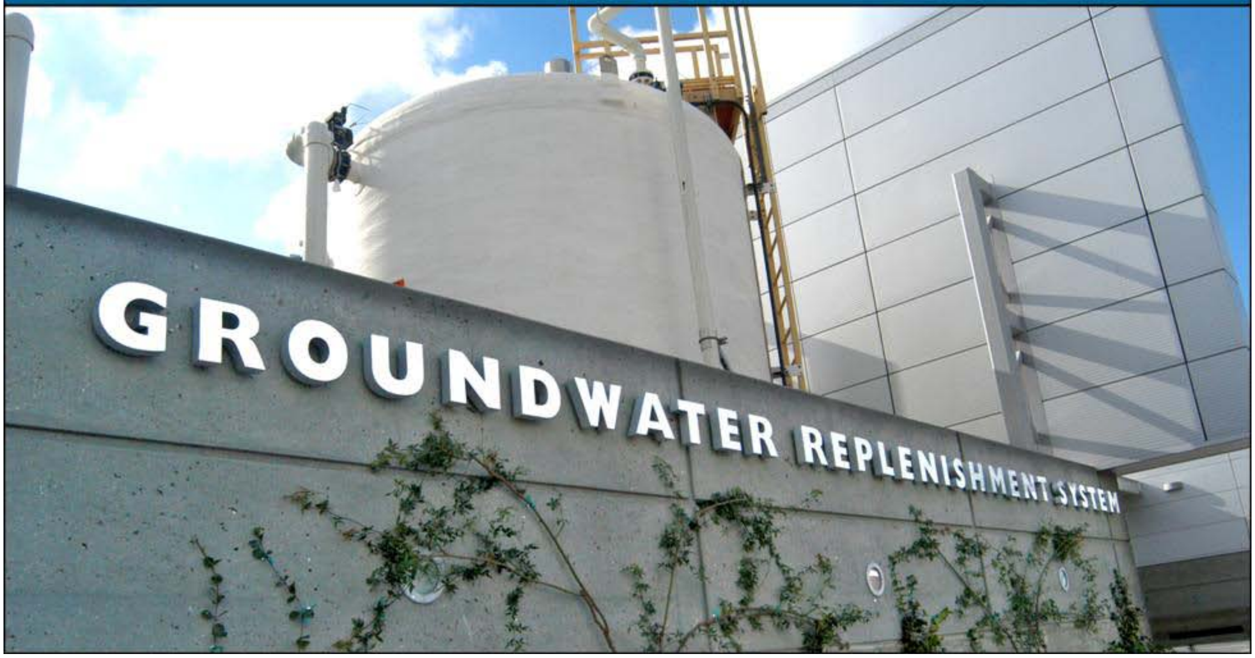
Integration of RMS

As shown in the table above, it is apparent that the relationship between the Pillars described in OWOW 2.0 and the RMS in the guidelines, correlate with each other to accomplish set OWOW 2.0 objectives. These objectives benefit both local and government agencies located within the watershed. Integration is a key aspect of this relationship; obtaining strategies and putting them together produce multi-beneficial results throughout the watershed.

It is the intent of OWOW 2.0 to facilitate the formation of multi-agency partnerships of local and governmental agencies; this is described in more detail within **Chapter 5.12 Government Alliance**.

The development of multi-benefit projects, through the implementation of resource management strategies, will remain challenging and require sustained effort by agencies that manage water. There are approximately 100 agencies that manage water in some way, and OWOW 2.0 endeavors to bring them all together to create and achieve regional and inter-regional goals. Agencies and non-profits organizations in the watershed through the OWOW will need to eventually prioritize collaborative projects and provide the staff resources to ensure that such projects are implemented in order to achieve the implementation of resource management strategies.

5.3 Preliminary Integration and Systems Approach



As indicated in Department of Water Resources (DWR) Integrated Regional Water Management Plan (IRWMP) Guidelines, one of the primary purposes of the inclusion of an integration standard is to ensure that the region intentionally creates a system where integration can occur. Integration is at the heart of Santa Ana Watershed Project Authority's (SAWPA) IRWM as reflected in the genesis of its regional plan name, One Water One Watershed Plan (OWOW Plan) where stakeholders across the watershed work collaboratively to develop an integrated water resource plan, where all types of water (local surface and groundwater, imported water, stormwater, and treated wastewater effluent) are viewed in a comprehensive, integrated manner as a "single" water resource.

The achievements of a "grass roots" but integrated regional planning approach as defined under the previous OWOW 1.0 Plan were a testament to innovation. In fact, on May 2, 2011, Harvard University's Kennedy School of Government selected the program as one of the 25 most innovative programs in the country representing the best in creative problem solving of local, state, and federal municipalities around the Country.

Building upon the framework of integration from the OWOW 1.0 plan, SAWPA under OWOW 2.0 planning sought to raise the bar further with an emphasis on integration and implementation at a regional and holistic scale. To promote this concept of watershed based and integrated approach under OWOW, SAWPA conducted innovative brainstorming processes utilizing the experience and skills of local experts to inspire and promote integrated system-wide projects and programs that address water resource challenges in the Santa Ana River Watershed. The first brainstorming process conducted under OWOW 1.0 planning involved gathering a group of 11 watershed experts that SAWPA termed the "Dream Team." The second brainstorming group convened under OWOW 2.0 planning was termed the

“Master Craftsmen.” These two groups consisted of some of the best and brightest experts in the water resources field, who were familiar with the Santa Ana River watershed and willing to set aside their local agency thinking to brainstorm ideas and describe new regional projects and programs.

Some of the regional projects and programs proposed by the Dream Team and Master Craftsmen are not entirely new, but may not have been ready to be implemented in the past due to historical regulatory, institutional, or financial barriers. As with any project or program, timing plays a key role toward implementation. After these ideas and concepts were shared by the experts and recorded, they were shared with the Pillar co-chairs, the Steering Committee, and the SAWPA Commission to serve as sounding boards and contributors to these early visioning and brainstorming meetings. The purpose of these early screening processes was to provide templates and examples of integrated regional solutions for the Pillars to consider as they developed more specific regional implementation projects and programs affecting their respective water resource, or a combination of other water resources in the watershed.

Dream Team

In early 2010, SAWPA recognized the need to encourage a stronger systems approach and motivate development of new multi-jurisdiction, multi-benefit solutions that weren’t as readily apparent in the previous Proposition 84 Round 1 OWOW Call for Projects. Thus, SAWPA assembled a “Dream Team” of high level water resource visionaries to brainstorm new cross-jurisdictional proposals to achieve a shared vision of a multi-benefit, integrated, multipurpose, highly-functioning Santa Ana River Watershed. The Dream Team included the following individuals:

- Joe Grindstaff, Past Executive Director, Delta Stewardship Council and CA Bay Delta Authority
- Wyatt Troxel, Past IEUA Director and SAWPA Director
- Mark Wildermuth, President Wildermuth Environmental, Inc.
- Gerard Thibeault, Past Exec. Officer, Santa Ana RWQCB
- Tim Moore, Risk Sciences
- Jerry King, Vice President , Michael Brandman Associates
- Larry McKenney, Past Vice President, RBF
- Don Schroeder, Vice President, CDM Smith
- Steve PonTell, Past Board member, Santa Ana RWQCB
- Pete Dangermond, Dangermond Group President
- Jeff Mosher, Exec. Director National Water Research Institute; Dream Team Chair

The Dream Team was convened in a one-day workshop with the direction to think big and broadly. Water resources maps were made available to the Team to reference as they considered conceptual projects. The first half of the workshop focused on background issues and discussion of watershed sustainability goals from the OWOW 1.0 plan, and then subgroups were formed generally based on multiple water resource strategies. The latter part of the day reconvened the subgroups for reporting to the combined larger group.

The following is a listing of the early results.

Stormwater is a local supply
- Water District and Flood District projects key
- Rubber dams, retrofit of basins, alluvial fan park projects
- Local control needed for system of dams

Recycled water is underutilized
- Develop storage in-ground
- Serve water down-gradient

Existing storage under-used
- Lake Perris
- Connection system between reservoirs and recycled plants needed (includes Met to OC connection)
- Ground water basins have capacity

Local water is dependent on Federal Lands
- Comprehensive overhaul of management needed
- Forest First program

Regional entity needed for support
- Expand SAWPA Commission to include County Supervisors
- Develop "marketplace" to link groundwater recharge with MS-4 compliance

IE Brine Line (SARI) is source of new water
- Can provide 32,000 AF to OC basins by gravity
- Recycling and groundwater desalting will depend on IE Brine Line for foreseeable future

State Water Project is important, but somewhat unreliable
- Dependent on decisions in Delta
- Link SWP entitlements to conservation compliance multipliers
- Infiltrate water when available, including from alternate sources

Connect the "waste water" system to the supply system
- GWRS prime example
- Additional groundwater injection, desalting of waste water, development of storage capacity for recycled water needed
- Desalting can support basin clean up and regional salt management across the watershed
- IE Brine Line (SARI) critical infrastructure link

Better connect flood control system to groundwater system
- Alluvial fan recharge to improve groundwater quality
- Re-purpose retention and detention basins
- Recharge within system requires revised management strategies
- MS-4 Permit compliance may encourage increased stormwater capture

Overall, the Dream Team encouraged researching processes, such as sponsorship of key agencies in the watershed that may spur large scale actions, leverage available resources and reflect major institutional and/or behavioral changes.

The second exercise implemented by SAWPA under OWOW 2.0 planning to inspire and motivate system-wide solutions, was the creation of a three-person group of well-respected experts in water policy and project implementation. These experts were affectionately labeled the "Master Craftsmen", continuing the theme of constructing better 21st century solutions. Brief biographies of each of the Master Craftsmen are listed as follows:

Jerry A. King

Former Vice President, Michael Brandman Associates (MBA)

Jerry King brings over 25 years of professional experience in water resources planning, management, and regulation with an emphasis on water quality, wetlands treatments and urban runoff management. Mr. King has drafted guidelines for Storm Water Pollution Prevention Plans and developed a number of basin master plans. Mr. King's expertise includes governmental relations, planning coordination, land use analysis, land development processing, project management, and public utility policy development. He also is well versed in agricultural regulations and permitting, wetlands creation and restoration, development of storm water regulations, and regulatory policy oversight and permitting.

Richard Meyerhoff

Associate at CDM Smith- Greater Denver

Richard Meyerhoff has more than 19 years of experience involving developing, evaluating and implementing programs for the protection of surface water resources. Mr. Meyerhoff assisted numerous clients with federal and state Clean Water Act -related activities, including development and/or implementation of water quality studies, TMDL implementation plans, and the technical basis of water quality standards regulations, bio-assessments, and water quality permitting.

Wyatt Troxel

Former Vice Chair, Santa Ana Watershed Project Authority

Wyatt Troxel was a former vice chair of the Santa Ana Watershed Project Authority and is former president of the board of directors of the Inland Empire Utilities Agency, representing the City of Rancho Cucamonga since 1992. Mr. Troxel has more than 36 years of experience in municipal water and wastewater activities in both the public and private sectors, and is an independent consultant in the field of wastewater treatment. Mr. Troxel has the highest certifications in wastewater treatment plant operations in both California and Hawaii, and holds a lifetime teaching credential from the California Board of Education.

The Master Craftsmen acted as facilitators and worked closely with the OWOW Pillar co-chairs to describe the spatial, temporal, regulatory, economic, political, and physical barriers that impair the ability to implement watershed-based concepts supporting a regional approach to water resource management that support the vision articulated in the OWOW Plan. These impairments are well known and acknowledged by water resource practitioners. The OWOW process provides a mechanism to overcome these barriers when stakeholders in a watershed-based project can clearly identify the tangible benefits that will be received through participation in such a project. Pillar leader engagement was critical to the success of any project. Thereafter, efforts began to take this vision to the next level by initiating a series of meetings that provided opportunity for the Pillar Leaders to focus in on the key water resource management needs in the watershed, and to identify high-level watershed concepts for further development. This effort started with identification of six watershed-based or system-wide strategies as follows:

- Increase Water Use Efficiency
- Regional Water Quality Enhancement
- Water Banking and Intra-Regional Transfer
- Salt Export & Groundwater Management
- Stormwater Capture and Off-River Storage
- Disadvantaged Community Infrastructure Enhancement
- Water Recycling
- Land Use Practice

From these Master Craftsmen meetings, a white paper was developed that identifies key examples of watershed-based water resource management concepts that, when implemented throughout the watershed as a single project or series of interconnected projects, can provide tangible and measurable benefits by removing impairments. These watershed-based concepts are ideas vetted by the Pillar groups that target a particular water resource management need, and in addressing that need, provide significant additional benefits, e.g. habitat restoration and increased habitat connectivity, and improvements to the environment. Two types of concepts were included: (1) those that require implementation of capital projects, and (2) those that are programmatic and focus on establishment of regional management practices or policies that increase sustainability of existing resources.

The product of the Master Craftsmen's work is reflected in the document "OWOW Santa Ana River Watershed Planning Framework" as shown in **Appendix B**. This document includes 13 concepts that target a particular water resource management need, and at the same time provides significant corollary benefits, e.g., water supply, water quality, stormwater attenuation, habitat restoration, increased habitat connectivity, increased open/green space, and provides an improved quality of life for citizens in the watershed. A brief description of each of the 13 watershed-wide concepts is shown on the following pages.

Water Budget Based Rate - Incentive to our water retailers to implement sustainable water rate systems resulting in a stable revenue stream to the water agency, a significant water demand reduction by all water users, and reduced runoff pollution in TMDLs.

Efficient Water Use Guidebook - Developing an outreach tool or guidebook that is a well-designed, appealing, and easy to understand that provides information on how to use landscape water more efficiently and landscape appropriately for the Santa Ana River Watershed with simple easy –to-use tools, and establishes a water ethic that becomes the new norm for the next generation.

Forest First Program Incentives - Working with the U.S. Forest Service to support programs and projects that provide downstream water supply and water quality benefits including: Hazardous Fuels Reduction; 2) Meadow Restoration; 3) Chaparral Restoration on the front country above recharge areas; 4) Run-off reduction on roads that cross forest lands; and 5) Removal of invasive vegetative species.

Watershed Land Use Planning Tool Kit - Developing a tool kit that translates water principles to support watershed planning decisions and implements a jurisdictional outreach effort for relevant regional, county , and city planning agencies that encourages adoption of the guidance ideology into General Plans and zoning codes at the local level.

Multi-Use Flood Control Corridor - Expanding the use of existing flood control retention or detention facilities along, streams and tributaries of the Santa Ana River for water supply augmentation through stormwater capture and recharge while maintaining greenways, habitat, and recreational use.

Water Banking and Transfer - Constructing facilities and developing agreements to allow water to be stored in one part of the watershed in groundwater basins for later use and purchase by water agencies in other locations.

Off-River Storage and Supply Credits - Under a capture and replenishment program, a city or county could provide a "water credit" as part of new development that allows reconstituted or restored wetlands off river, providing opportunities to capture storm runoff and valued natural habitat.

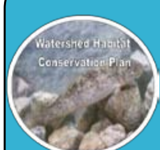
Watershed Urban Runoff Management Fund - Establishing a watershed-based Urban Runoff Fund to support implementation of stormwater management programs. Components of this program could include the regulatory basis for a watershed-based program, the legal basis and authority for the fund, the agreements, and programmatic elements.

Transportation Corridor Stormwater Capture and Treatment - New uses of wide transportation right-of-way areas can be expanded for capturing rain runoff and replenishing groundwater basins.

Santa Ana River Sediment Transport - Implementing measures to assure that sediment is appropriately transferred along the entire Santa Ana River system to maximize recharge operations, restore habitat, and reduce operation costs.

Modified Watershed Brine Management System - Optimizing the water used to transport brine so that less water is lost to the ocean through increased concentrating of brine or delivery to the Salton Sea for beneficial use.

Water Industry Energy Use Reduction Incentive Program - Supporting regional purchase and installation programs of water resource related greener energy projects that reduce capital costs and reduce greenhouse gas emissions.



Watershed Habitat Conservation Gap Planning - Developing regional habitat conservation planning that covers areas that are not currently covered by existing conservation programs, and that allows implementation of land use decisions consistent with a plan without project-by-project review and permitting by the resource agencies, that also results in greater economic development certainty and provides for and maintains biological diversity by creating a network of interconnected Conservation Areas.

With the OWOW Santa Ana River Watershed Planning Framework document release in April 2012, the Pillars commenced their respective meetings over the following 18 months of the OWOW 2.0 planning. They investigated new regional implementation projects/programs that could lead to multiple, integrated benefits that in turn support other projects/programs concepts.

The following chapters represent the work of each stakeholder pillar as written by the Pillars, centered on a water resource strategy or need. The implementation projects and programs of each Pillar typically are shown at the end of each chapter. In many situations, the Pillars held joint meetings with other Pillars to improve synergy and integration, and to reflect a better final regional implementation project or program. **Chapter 5.14 Integration and Implementation** covers integration and implementation support to the Pillars under multiple workshops.

5.4 Water Resource Optimization

Arlington Desalter (WMWD)
Riverside, CA

Recommendations

Based on the data from 2010 Urban Water Management Plans (UWMPs), the Santa Ana River Watershed is able to 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 unknowns. The UWMPs assume that:

1. Future local precipitation patterns will be the same as past precipitation patterns (possible effects of climate change addressed later in the Chapter)
2. The predicted reliability of the State Water Project as taken from the Department of Water Resources (DWR) *The State Water Project Delivery Reliability Report 2009* (August 2010) is accurate
3. Imported water projections include possible effects of climate change
4. Imported water will be managed to store wet year supply for use during dry years
5. Future demands will match the estimated demand
6. The watershed will invest over $4 billion in water conservation and infrastructure projects
7. Significant investments will be made to improve the reliability of imported water supplies as detailed in Metropolitan Water District of Southern California's (MWDSC) 2010 Regional UWMP

Given the uncertainty in these assumptions, it is recommended that the Santa Ana River Watershed focus on the implementation of water management concepts marked with a ☑ over the next five years to achieve water supply reliability over the broadest area of the watershed at the most reasonable cost. Each of these concepts is described in more detail in the **Water Management Strategies and Watershed-wide Project/Program Concepts to Improve Water Supply Reliability** section of the Chapter.

Summary of Water Management Strategies and Watershed-wide Project/Program Concepts to Improve Water Supply Reliability

(☑ indicates a concept recommended for focus during the next planning cycle)

	Strategy Concept (in no particular order)	Status	Estimated Benefit
REDUCE DEMAND			
☑	Water rate structures that encourage conservation	Widely implemented	Help meet SBX7-7 required demand reductions
☑	Public education to encourage water conservation	Widely implemented	Help meet SBX7-7 required demand reductions
	Outdoor conservation	Widely implemented	Help meet SBX7-7 required demand reductions
	Reduce evapotranspiration	Conceptual	More investigation required
OPTIMIZE IMPORTED WATER			
	Wet year storage program	In process	Increases storage in watershed
☑	Bay Delta Conservation Plan[1]	In process	$730{,}000 \times 0.18 = 131{,}400$ Acre Feet per Year (AFY) and improved water quality
	Imported water banking	Widely implemented	Water in dry years
	Prevent invasive species from clogging infrastructure	In process	Consistent deliveries
STORMWATER CAPTURE			
☑	Enhanced Santa Ana River stormwater	In process	12,000 AFY
☑	Enhanced stormwater capture from tributaries of Santa Ana River	In process	28,000 AFY
☑	Riverside North Aquifer Storage and Recovery Project	In process	12,800 AFY
☑	Enhanced Santa Ana River stormwater capture at Prado Dam	Conceptual	10,000 AFY
☑	MS4 Credits	Conceptual	Increased stormwater capture
☑	Re-operate flood control facilities	In process	More investigation required
☑	Size flood control facilities for stormwater capture	Conceptual	Increased stormwater capture
☑	Forest First: Forest management for increased downstream stormwater capture	In process	Increased stormwater capture

[1] Assume average maximum entitlement for the State Water Project (SWP) increases from 60% to 78%.

	Development Standards that enhance stormwater capture	Conceptual	Increased stormwater capture
RECYCLE WATER			
☑	Recycled water exchange	Conceptual	Capital and energy savings ($100s millions), improved water quality
☑	Recycled water for potable use	Conceptual	More investigation required
	Recycle wastewater flowing to the ocean	In process	157,000 AFY
	Import recycled water from outside the watershed	Conceptual	More investigation
	Ocean Desalination[2]		54,000 AFY
	Recycled water use to offset potable demand	In process	This is widely implemented by several agencies and part of the projected water supply portfolio
INCREASE STORAGE			
☑	Surface Water Storage	In process	Helps offset drought and climate change
☑	Groundwater storage	In process	Helps offset drought and climate change
IMPLEMENT EMERGENCY MEASURES			
	Emergency Measures	In process	Preparation for catastrophic event
	Total		**405,200 AFY**

The climate and geography of the State of California present a unique challenge to the management and delivery of water. While most of the precipitation falls on the northern portion of the State, most of California's population resides in the semi-arid, southern portion of the State. Water is diverted, stored, and then transferred from the water-rich north when needed to the more arid central and southern sections of the state through the California State Water Project (SWP), the Central Valley Project (CVP), and the Los Angeles Aqueduct.

In addition to the projects that transport water from the north to the south, the southern coastal area relies on water imported through MWDSC's Colorado River Aqueduct (CRA). The U.S. Bureau of Reclamation and seven basin states manage the Colorado River (CR) system under the authority of the Secretary of the Interior and for the benefit of seven "basin states". California's share of the CR Supply is 4.4 million acre-feet (maf).

During most years the supply available to the region has been adequate for its needs. The region has gotten through the drier years by using water that was stored during wetter years.

[2] Poseidon Huntington Beach Ocean Water Desalination, 50 million gallons per day.

Even though the State's water supply is more than adequate for its population and economic needs, the laws of the State and Federal governments have allocated the majority of that supply for environmental purposes and made building new surface storage increasingly difficult and expensive. This has forced Californians to seek more creative and sustainable and often more expensive solutions to water resource management wherever possible.

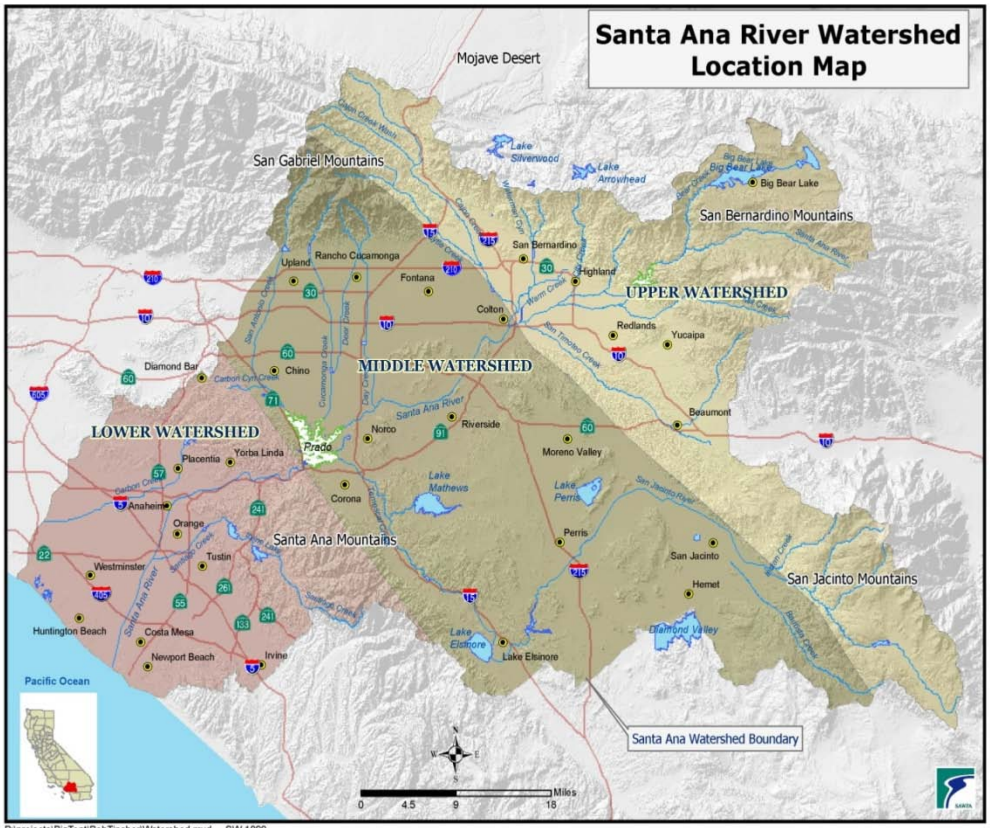
The Santa Ana River Watershed lies in semi-arid Southern California. Like many other areas, the watershed is carefully evaluating water supplies and demands and seeking creative, cost-effective strategies to provide a reliable water supply into the future. Water supply reliability in Southern California will be challenged by multi-year droughts, droughts on the CR, limited local water resources, the vulnerability of the Sacramento-San Joaquin River Bay-Delta, and the threat of climate change. In addition, vulnerabilities in regional and statewide infrastructure could increase due to major seismic events. Designing a diverse and flexible water resource management system that can meet these challenges will help to ensure water reliability and a sustainable and vibrant economy for the Watershed.

The One Water One Watershed (OWOW) collaborative process has facilitated the discussion of water management and sustainability throughout the Watershed. The key objective for water supply reliability is a cost-effective and 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 inter-connections and redundancy; and optimizes water storage for use during drought periods. This section of the plan focuses on how to maintain a robust and reliable water supply within the watershed.

Current Conditions

There are five principal wholesale agencies that form the Santa Ana Watershed Project Authority (SAWPA) and manage most of the water supplies within the watershed, both local and imported. In addition to these regional water agencies, the watershed also contains portions of four counties represented, as well as retail and wholesale water agencies. For purposes of this report, the analysis has been organized by three general areas: upper watershed, middle watershed, and lower watershed. These areas are subsets of the Santa Ana River Watershed (**Figure 5.4-1**). The regional water agencies within each general area are described below.

Figure 5.4-1 Watershed Areas



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Upper Watershed

San Bernardino Valley Municipal Water District (Valley District) is a State Water Contractor and provides imported water from the SWP to local retail agencies in its 325 square mile service area to supplement and enhance groundwater resources. Valley District's service area generally includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, Grand Terrace, and Yucaipa. Valley District is a member agency of SAWPA.

San Gorgonio Pass Water Agency (SGPWA) is a State Water Contractor, and provides imported water from the SWP to local retail agencies in its 225 square mile service area to supplement and enhance groundwater resources. SGPWA's Service area includes Calimesa, Beaumont, Banning, Cherry Valley, Cabazon, and Morongo Indian Reservation. The SGPWA service area straddles the Watershed, with its western two-thirds in the watershed and eastern one-third in the Whitewater River watershed.

Middle Watershed

Eastern Municipal Water District (EMWD) is a member agency of MWDSC and provides both water and sewer service throughout its 555 square mile service area. Major communities include Moreno Valley, Hemet, San Jacinto, Perris, Sun City, Menifee, Winchester, and parts of Temecula, and Murrieta. In addition to retail customers, EMWD wholesales water through seven local water agencies. EMWD is a member agency of SAWPA.

Western Municipal Water District (WMWD) is a member agency of MWDSC and provides water service throughout its 510 square mile service area in western Riverside County. Within its boundaries lie the communities of Jurupa, Rubidoux, Riverside, Norco, Corona, Elsinore Valley, and parts of Temecula. WMWD serves imported water directly to customers who are located in the unincorporated and non-water bearing areas around Lake Mathews and portions of the City of Riverside. Ten wholesale customers are served by WMWD with both CR and SWP water. WMWD is a member agency of SAWPA.

Inland Empire Utilities Agency (IEUA) is a member agency of MWDSC and provides water and sewer services to a 242 square mile area in the western portion of San Bernardino County. Within its boundaries lie the Cities of Chino, Chino Hills, Fontana, Montclair, Ontario, Rancho Cucamonga, and Upland. IEUA is a member agency of SAWPA. Also, the majority of the IEUA service area overlies the Chino Basin Watermaster boundary.

Chino Basin Watermaster (Watermaster) is a consensus-based organization facilitating the development and utilization of the Chino Groundwater Basin. The Watermaster consists of various entities pumping water from the Basin including cities, water districts, water companies, agricultural, commercial, and other private concerns. The Watermaster's mission is "to manage the Chino Groundwater Basin in the most beneficial manner and to equitably administer and enforce the provisions of the Chino Basin Watermaster Judgment", Case No. RCV 51010 (formerly Case No. SCV 164327).

Lower Watershed

Orange County Water District (OCWD) manages groundwater within its 355 square mile service area. Within its boundaries lie the Cities of Anaheim, Buena Park, Costa Mesa, Fountain Valley, Fullerton, Garden Grove, Huntington Beach, Irvine, La Palma, Los Alamitos, Newport Beach, Orange, Placentia, Santa Ana, Seal Beach, Stanton, Tustin, Villa Park, Westminster, and Yorba Linda. OCWD recharges the groundwater basin with surface water flows from the Santa Ana River and Santiago Creek, recycled water from the OCWD Groundwater Replenishment System (GWRS), and imported water which is purchased from the Municipal Water District of Orange County. OCWD is a member agency of SAWPA.

Municipal Water District of Orange County (MWDOC) is a member agency of MWDSC and sells imported water to 29 retail water agencies and cities in north and south Orange County. MWDOC also sells water to OCWD. MWDOC also straddles the Watershed, with its northernmost portion being in the Watershed and its southern portion being outside of the watershed.

Within each of these regional agencies, there are a number of retail water agencies. For purposes of brevity, these local agencies have not been individually listed in this report. However, these agencies did provide invaluable input into the OWOW process.

Water Sources

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 30% of its water from the SWP and Colorado

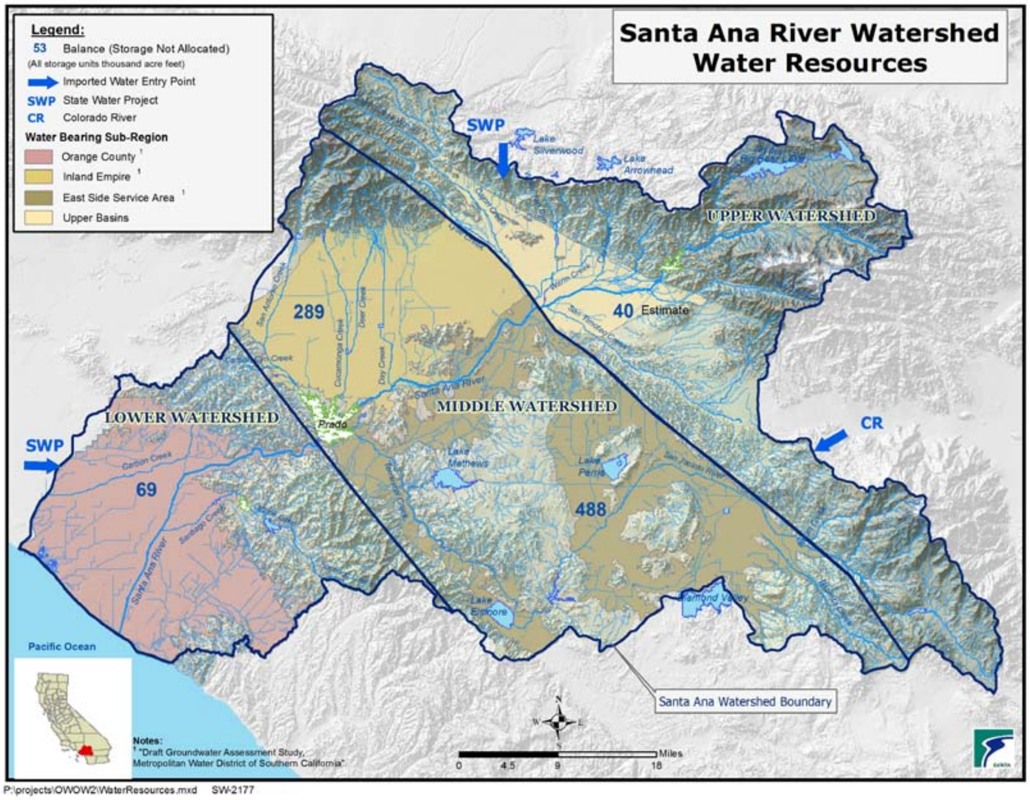
River. The remaining 20% of the Watershed's water supply is recycled water. Each of these sources are explored below.

Precipitation Stored as Groundwater

The underground pore space between soil granules provides a location to store water, referred to as groundwater, which can be later extracted using wells. To avoid double-counting water supplies, OWOW 2.0 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 essentially 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. Yields of nearly all of the basins within the watershed have been estimated using past hydrology and, for planning purposes, agencies have assumed that this past hydrology will continue to repeat itself and does not include any possible effects from climate change. Possible water resource effects from climate change are addressed later in this chapter and the possible overall effects of climate change are addressed in **Chapter 5.13 Energy and Environmental Impact Response**. Recognizing that hydrological patterns are expected to be altered due to climate change with subsequent impacts to demand and supplies, climate change impacts are discussed and addressed later in this chapter. Basin's safe yield is the amount of water that can be annually pumped from a basin on a permanent basis without emptying the basin.

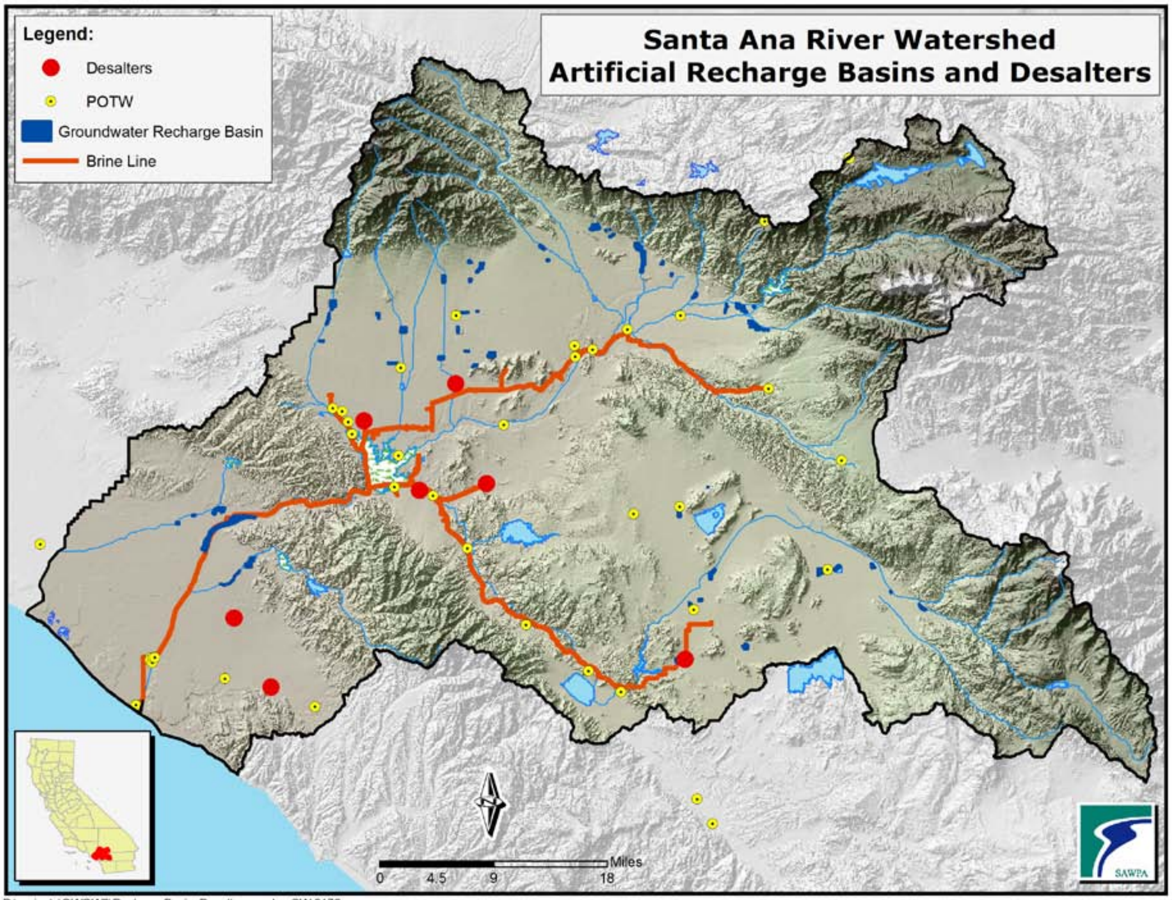
In general, the watershed relies on precipitation stored as groundwater to provide about 50% of the water supply. **Figure 5.4-2** generally shows the larger groundwater basins within the watershed along with any available storage capacity (individual basins and sub-basins have been omitted for clarity). 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 eight out of ten years.

Figure 5.4-2 Groundwater Resources within the Watershed (Thousand acre-feet)



Artificial replenishment involves storing additional water in the basin(s), over and above 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 groundwater with another source of water. This corresponding reduction in groundwater pumping results in less water being removed from the basin which effectively acts to replenish the groundwater supply. Finally, the most costly method of artificial replenishment is to inject the water into the basin using an injection well(s). Of the various methods available, artificial recharge the most common throughout the Watershed. **Figure 5.4-3** shows the locations of spreading basins in the watershed.

Figure 5.4-3 Artificial Recharge Basins and Desalters



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One challenge to groundwater supplies in the watershed is poor water quality, typically due to total dissolved solids (TDS or salinity) 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, there are numerous forms of contamination found in the watershed, such as; TCE, PCE (commonly used solvents) and Perchlorate (fertilizer, fireworks and explosives). All these forms of contamination must be removed using various treatment methods before it can be introduced into the water supply system.

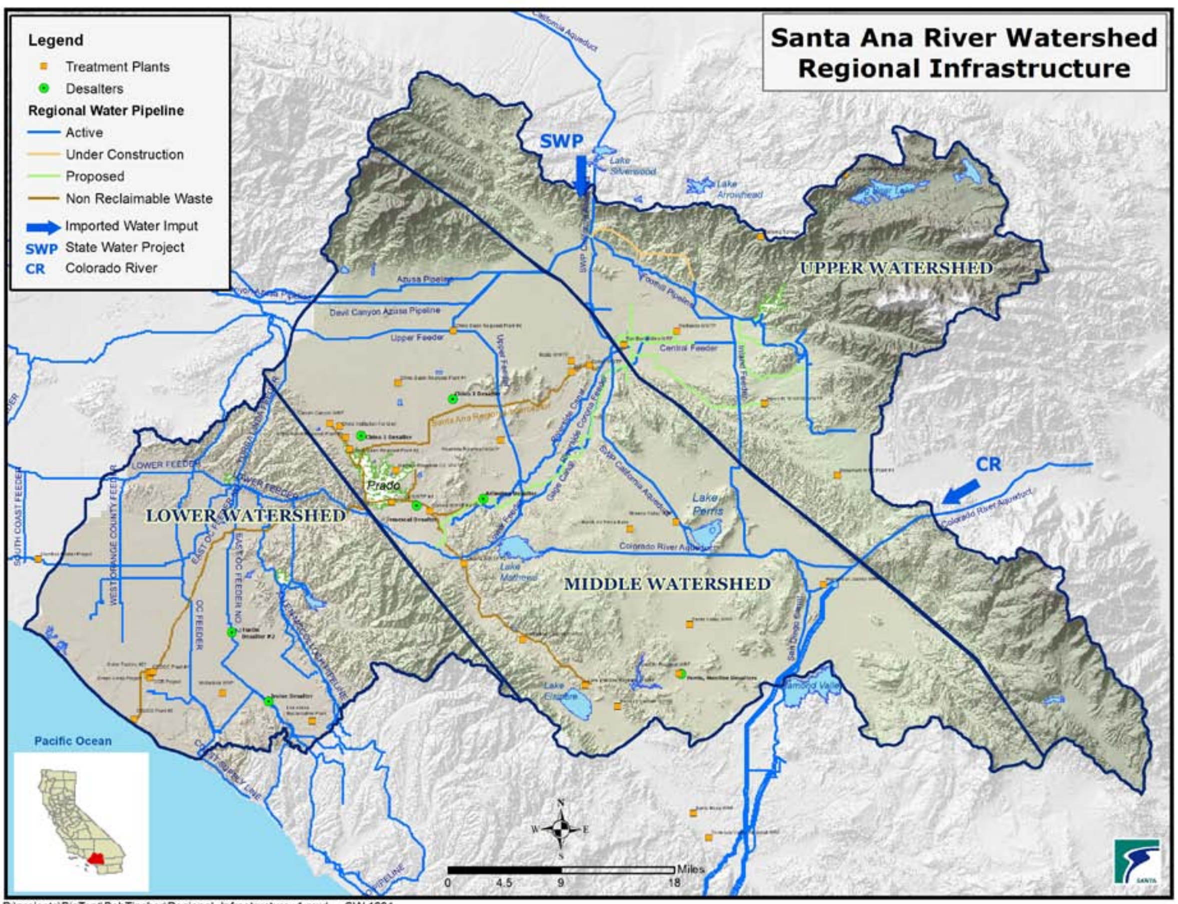
Precipitation as Surface Water

In 2005, the amount of precipitation that flowed from rivers and streams that was diverted and used accounted for approximately 5% of the total water supply. Local surface water is largely seasonal, meaning that 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. In other portions of the watershed, the exact opposite is true. Much of the runoff from the upper and middle watershed is captured by the U.S. Army Corps of Engineers' Prado Dam and later is used by the Lower Watershed. A similar opportunity is available in the upper watershed at the U.S. Army Corps of Engineers Seven Oaks Dam and other dams in the watershed.

Imported Water

The watershed relies upon imported water for about 1/3 of its water supply. Water is imported into the area by MWDSC (SWP and CR), SGPWA (SWP) and Valley District (SWP). Current and predicted reliability of the SWP was taken from DWR's *The State Water Project Delivery Reliability Report 2009* (August 2010). **Figure 5.4-4** shows the regional infrastructure and the entry points for the SWP and the CR.

Figure 5.4-4 Regional Infrastructure within the Watershed



As shown on **Figure 5.4-4**, there are significant regional pipelines (48 inch diameter and larger) and surface storage reservoirs in the watershed. These pipelines provide opportunities for water transfers, especially in an emergency situation. **Table 5.4-1** provides a list of surface water reservoirs in the watershed and their capacities.

Table 5.4-1 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
Prado Dam	Flood control and conservation
Seven Oaks Dam	Flood control (conservation pending)
Lake Silverwood	74,970
Irvine Lake	25,000

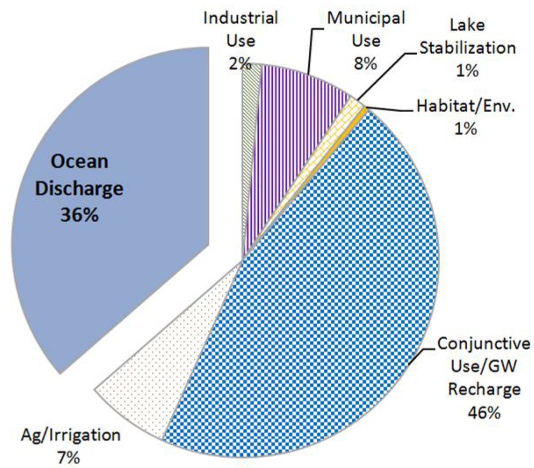
Recycled Water

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.

Statewide, over 669,000 (AF) of wastewater is recycled each year according to the State Water Resources Control Board (SWRCB). 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 sea water intrusion into freshwater groundwater basins. It is also increasingly used by industry in cooling processes, in new home and other 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.

Current Conditions in the Watershed

Figure 5.4-5 Current Rate of Recycled Water Use within the Watershed



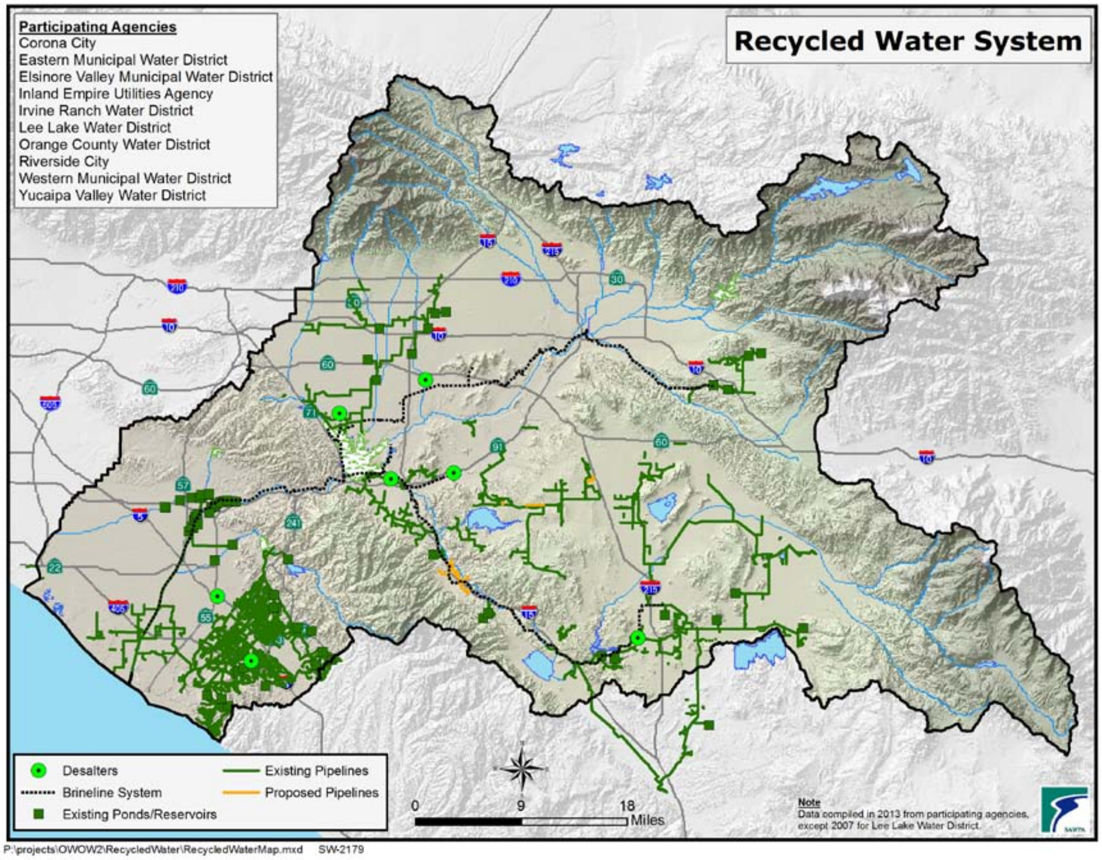
Recycled water has been used in the watershed for many years to supplement local and imported potable supplies. Water reclamation involves treating wastewater to State standards so that the water is safe for State-approved applications. Currently, over 285,000 AFY of recycled water is being used to meet groundwater recharge (72%), municipal (12%), agricultural irrigation (11%), lake stabilization (2%) , industrial (2%), and habitat and environmental (1%) water needs within the Santa Ana River Watershed (see **Figure 5.4-5**). The 285,000 AFY includes approximately 100,000 AFY of tertiary treated wastewater that flows down the Santa Ana River from San Bernardino and Riverside Counties that is recharged by OCWD in surface recharge basins in Anaheim and Orange. OCWD generally captures all of the river flows, except during periods of high storm flow. As seen in in **Figure 5.4-5** only 36% of recycled water in the watershed, or 157,000 AF is currenlty being discharged to the ocean.

The 100,000 AFY is considerably more than the 42,000 AF at Prado Dam required by the 1969 Orange County Judgment. As demands continue to increase and other supplies become less reliable, the upper and middle watershed have plans to increase recycling. Over time, any reduction in treated wastewater flow in the river would have to be replaced by OCWD recycling more of the wastewater that flows into the ocean, importing more water, desalting the ocean, or some other new source of supply. Tables 5a.8 through 5a.11 of **Appendix C** show the proposed increase in recycled water use in the upper watershed from 2015 through 2035.

Overall recycled water currently represents the third largest water supply source to the watershed, accounting for approximately 20% of total water demands. **Appendix C** includes information about existing and proposed treatment facilities, plant flow and recycled water use.

Figure 5.4-6 shows the recycled water systems in the watershed. Included in the display are existing and proposed recycled water pipelines, existing and proposed wastewater treatment plants, existing and proposed storage tanks, existing storage ponds, and the Inland Empire Brine Line. Agencies that provided map information include Big Bear Area Regional Wastewater Agency, City of Corona, City of Riverside, EMWD, EVMWD, IEUA, Irvine Ranch Water District, Lee Lake Water District (LLWD), Orange County Sanitation District (OCSD), OCWD, WMWD, and Yucaipa Valley Water District (YVWD).

Figure 5.4-6 Recycled Water Systems

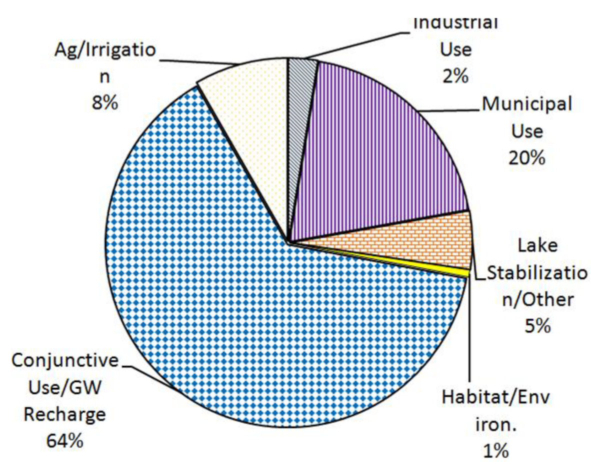


Proposed Recycled Use

As urban and suburban growth and development in the watershed continue, an increasing amount of recycled water will be available while the traditional demand by agricultural customers will decrease. This creates a challenge to establish a growing recycled water market for groundwater recharge, commercial, industrial, and institutional customers as well as developing innovative and creative markets elsewhere.

Current projections for 2035 indicate 432,000 AFY of water treatment plant flows will be recycled in the watershed, and 205,000 AFY discharged into the ocean. **Figure 5.4-7** depicts the estimated distribution of the recycled water in 2035.

Figure 5.4-6 Projected 2035 Rate of Recycle Water Use within the Watershed



Current Management Strategies

Current management strategies include the planned and conceptual recycled water projects as described below.

EMWD has completed a Recycled Water Strategic Plan to identify the preferred strategy to be pursued in developing its recycled water system through the year 2030. The principal goal of the Strategic Plan was to develop a preferred long term strategy for highest beneficial reuse of recycled water. EMWD's Recycled Water Strategic Plan recommended the Indirect Potable Reuse (IPR) Project, using advanced treated water for recharge of basins in the Hemet/San Jacinto Water Management Plan area. Currently, EMWD is working on a phase I planning study. This next step in the planning process consists of determining blending water strategy, brine disposal alternatives, salt balance considerations, regulatory requirements, facilities needs assessment & constraints analysis and program cost analysis. This phase will produce 5,000 AFY, and is scheduled to be completed in 2020.

City of Riverside - The SWRCB approved the City of Riverside's wastewater change petition on May 20, 2008. The primary condition of the Order requires that the City of Riverside discharge not less than 25,000 AFY of treated wastewater from its Regional Water Quality Control Plant to the Santa Ana River. The Order also modified the purpose of recycle water use to include municipal, industrial, and agricultural purposes and expanded the place of use to included areas within the City's limits, the City's water service area boundary, and within the boundary of the Jurupa Area Plan to reflect diversion of treated wastewater to recycled water use sites. To be able to meet these future projected needs without increasing the City of Riverside's reliance upon imported State Water purchases, it will be critical for the City of Riverside to significantly expand its use of the recycled water recently made available.

In addition to the description of the City of Riverside's recycled water efforts, the City of Riverside Public Utilities also received a master reclamation permit from the Regional Water Quality Control Board.

IEUA recently developed a Three Year Business Plan to rapidly expand the recycled water distribution system and increase recycled water use by 35,000 AFY. The capital program emphasizes increased system storage as well as distribution system piping and piping to reach high capacity recharge sites. The business strategy, while regional in nature, is founded on the principle of partnerships with IEUA member agencies, both from a water marketing standpoint and a capital facilities standpoint. The partnerships are having the effect of "supercharging" the capital program through conversion of member agency owned local potable water facilities to regional recycled water facilities.

LLWD has completed a recycled water master plan that will allow for the connection of the local parks and schools in the near future. They also have partnered with the City of Corona in its Ground Water Management Plan for the basins underlying LLWD's boundaries. LLWD currently is investigating potential groundwater recharge options.

OCWD and OCSD jointly developed the GWRS. In 2011, the GWRS produced 72,000 AF of recycled water. OCWD is constructing the Initial Expansion of the GWRS. This project will increase the amount of water produced by 31,000 AFY. When construction is completed in 2014, the total amount of water produced by the GWRS will be 103,000 AFY. OCWD is also evaluating an additional expansion of the

GWRS. Implementation of additional expansion of the GWRS would further reduce the amount of effluent discharged into the ocean. Because they reduce the amount of water discharged into the ocean, expansions of the GWRS are a new regional water source that would increase the net overall supply of water to the watershed.

City of Riverside in May 2013, the Regional Water Quality Control Board adopted Order No. R8-2013-0028 granting the City of Riverside Public Utilities a waste discharge requirements and master reclamation permit for distributing recycled water.

Valley District does not own or operate a wastewater treatment plant within its service area. However, recycled water is part of the region's water budget as they move toward the future. The City of San Bernardino Municipal Water Department is planning a "clean water factory" that may produce up to 14,000 AFY in the future.

WMWD expanded its recycled water portfolio with the expansion of the Western Water Recycling Facility (WWRF) in 2011. The plant is capable of producing up to three Million Gallons per Day (MGD) of tertiary-treated recycled water. Plans call for eventually expanding to five MGD.

WMWD possesses an extensive non-potable distribution system that includes both storage and pumping capabilities. This system functions as the backbone distribution system to expand use of recycled water (for irrigation) within its service area. One major commercial area (Meridian Business Center) and one large residential community already are dual-piped for recycled water use and a new Riverside Unified School District (RUSD) high school has been retrofitted to allow recycled water use. Two new large residential projects (including a golf course development) will be conditioned to install dual plumbing. WMWD also will work with RUSD to dual plumb new campuses, including a new middle school west of the Orangecrest area.

The City of Riverside is still working with WMWD to conduct joint planning for recycled water use. At this time, the City does not plan to deliver recycled water to Riverside's greenbelt. The system also will distribute non-potable groundwater through the legacy canal system thereby maximizing use of local water resources.

WMWD is working with the Riverside County Ben Clark Training Center to site a large recycled water storage impoundment on their facility located just south of Van Buren Boulevard and west of I-215. This proposed 600 AF impoundment would serve the County as a dive/water training facility while providing wet weather storage for recycled water produced by the WWRF, a truly unique and innovative use of recycled water.

Finally, WMWD is in the early stages of evaluating the use of recycled water to recharge local groundwater basins as a new source of supply. As total summer irrigation demands likely will exceed recycled water supply, recharge will probably be limited to winter months. Close coordination with the Regional Board and California Department of Public Health (CDPH) will be required.

YVWD adopted a Strategic Plan in August 2008, which outlines the methods used to maximize the use of recycled water to meet future water demands. This policy requires new homes to install dual water meters to provide potable water and non-potable water to each property. The use of recycled water delivered to residential and commercial properties for irrigation is expected to reduce future potable water demands by 50%-60% per equivalent dwelling unit. This policy will require YVWD to implement a salinity control program which will provide extremely high quality recycled water to new neighborhoods providing a sustainable water supply for the future.

Other reclamation projects in the watershed include innovative uses such as toilet and urinal flushing in high-rise buildings and schools as well as residential landscaping irrigation, as evidenced by recycled water programs in IRWD.

Barriers and Constraints

Challenges related to recycling projects include: regulatory requirements, brine line constraints, storage/seasonal constraints, financial constraints, water quality management, and public perception. They are discussed below.

Regulatory Requirements

An important component of maximizing local supplies is the ability to safely and efficiently regulate and permit recycled water use. California's laws governing the permitting of recycled water were established more than 20 years ago, and are in need of updating to communicate that recycled water is a valued commodity, not a waste. Additionally, the current permitting framework establishes multiple recycled water permitting paths and overlapping jurisdictions overseeing the process which has resulted in confusing, costly delays and often inconsistent requirements.

To address some of these concerns, the Recycled Water Act of 2013 is currently making its way through the legislative process with the support of many water agencies and water reuse proponents. This bill will address barrier to recycled water use. It will align recycled water spill reporting and incidental runoff in codes, and authorize SWRCB permitting of advanced treated water. Clear, comprehensive legislation is required to maximize the use of recycled water in the future and to further reduce reliance on imported water.

In November 2011, the CDPH released draft regulations regarding recycling water for public comment. These draft regulations pertain to groundwater replenishment with recycled water. CDPH reviewed the public comments and released another draft in March of 2013. The final proposed version will proceed through the formal regulation adoption process and will be subject to public review and comment as part of that process.

Storage/Seasonal Constraints

The recycled water supply is not dependent on weather patterns; supply is fairly constant throughout the year. For these reasons, recycled water is viewed as one of the most reliable sources of water in the Watershed. However, because recycled water is used primarily for irrigation purposes and associated seasonal demands, recycled water demands can be variable and are often affected by weather and the season. In some areas, demands increase in dry years. However, wet years generally pose a greater operational challenge as customer demand decreases and storage facilities fill. Storage during periods of low demand is necessary to meet high demand during other times of the year. The amount of available recycled water storage varies greatly between agencies. Some have little or no storage and others have thousands of AF of storage. Each agency's existing and proposed recycled water storage facility capacities, excluding groundwater basins, are shown in **Appendix C**.

Financial Constraints

The cost of infrastructure to produce, store, and distribute recycled water is expensive. Given that demands for recycled water are more scattered throughout communities, recycled water distribution pipelines are built only where demands justify the expense and where customers agree to use recycled water. This is especially true where sites need to be retrofitted to use recycled water as opposed to newly constructed sites where rules may dictate its use. Other issues include the cost of recycled water use to the customers as well as administration of the recycled water system by both the distributor and user. Because of the cost, there are sites where there may be willing customers but no infrastructure to serve them. Grant funds and other forms of financial aid can help make some projects viable, but other projects still may not be financially viable.

Other issues include the cost of recycled water use to the customers as well as administration of the recycled water system by both the distributor and user. Many agencies are unable to charge the true cost to produce this high quality water due to the stigma attached.

Costs associated with recycled water use could include retrofitting of existing systems, required inspections and cross-connection shutdown testing, employee training, and use site maintenance. Administrative requirements include extensive permitting, recordkeeping, and reporting requirements.

Each use area also must have a Site Supervisor knowledgeable of the use area system and recycled water use restrictions. The Site Supervisor must be available at all times to correct any condition that does not conform to use area requirements specified by regulations and the recycled water distributor.

Water Quality Management

Higher TDS source water, such as the Colorado River (up to 650 mg/l average) adds cost because TDS removal, or demineralization, requires energy intensive reverse osmosis. Residential use of water typically adds 200 to 300 mg/L of TDS to the wastewater stream, and self-regenerating water softeners can add another 60 to 100 mg/L. If an area receives CR water with a TDS of 650 mg/L, and residents add 300 mg/L through normal use, the recycling facility will produce water with a TDS concentration of 950 mg/L. This would not meet basin plan objectives anywhere in the watershed. It is also problematic for industrial customers and virtually unusable for many agricultural customers which limit the marketability. Nutrients such as nitrate present similar issues as TDS.

Public Perception

Public perception of recycled water is changing! One successful example of this is OCWD's GWRS project that undergoes an advanced treatment process including two membrane filtration systems – microfiltration and reverse osmosis, and treatment by ultraviolet light and hydrogen peroxide. Once purified, the water is sent to recharge basins where it seeps into the ground, like rain, and blends with groundwater. The GWRS provides a new drought-proof water source for northern and central Orange County, reducing reliance on imported water. Additionally, the GWRS will save additional funds in the future by improving the quality of the water in the Orange County groundwater basin. This successful effort utilized widespread public outreach activities involving the scientific, political, and other communities to assist in informing the public and addressing potential public perception issues.

Evaluate Water Supply Reliability

Water supply reliability for the Watershed was evaluated using the scenarios given in the Urban Water Management Planning Act (**Table 5.4-2**) and using some additional scenarios developed by the Water Resource Optimization Pillar (**Table 5.4-3**).

Table 5.4-2 Water Supply Reliability Scenarios Provided in the Act

Scenario	Description
Average conditions*	What are the water supply reliability vulnerabilities given average supplies to the region?
Single year drought*[1]	What are the water supply reliability vulnerabilities given a single year of drought?
Multi-year drought*[1]	What are the water supply reliability vulnerabilities given a multi-year drought?
50% reduction in imported water supplies*[1]	What are the water supply reliability vulnerabilities if the Watershed loses 50% of imported water supplies?
Natural Disaster	What are the water supply reliability vulnerabilities if a catastrophic interruption occurs due to an earthquake or other disaster?

Table 5.4-3 Additional Water Supply Reliability Scenarios Evaluated as part of the OWOW Process

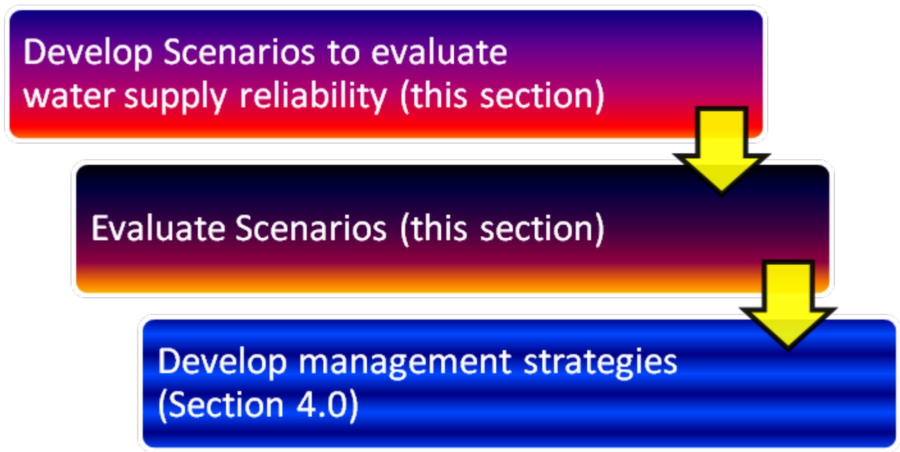
Scenario	Description
Climate Change	What are the water supply reliability vulnerabilities given the assumed effects of climate change as presented in the Draft 2007 State Water
Zebra and/or Quagga Mussels	What are the water supply reliability vulnerabilities of the Zebra Mussel and/or the Quagga Mussel were to infiltrate the SWP?
Sediment Transport	How does sediment transport at Seven Oaks Dam and/or Prado Dam affect water supply reliability?
Wildfire	How does the threat of wildfire affect water supply reliability?
Channel Armoring	How does channel armoring in the Santa Ana River affect water supply reliability?
Water quality degradation	How does water quality degradation affect water supply reliability?
Terrorism	How does terrorism affect water supply reliability?

*Scenario presented in the Catastrophic Interruption, Urban Water Management Planning Act.

Collectively, **Tables 5.4-2** and **5.4-3** provide a complete list of the evaluated scenarios.

All of the scenarios pose a threat to water supply reliability. The evaluation consisted of analyzing anticipated water supplies for each of these scenarios to determine if they are adequate to meet the anticipated demands. If anticipated demands are less than anticipated supplies, the system is deemed reliable. If anticipated demands are greater than anticipated supplies, water management strategies will need to be developed to offset these deficits. **Figure 5.4-8** provides an overview of the evaluation process.

Figure 5.4-7. Overview of the Water Supply Reliability Evaluation Process



The scenarios analyzed in this document represent a "snapshot" in time. As new challenges and constraints to water supply reliability are identified, they will require evaluation.

Evaluation of Water Supply Reliability Scenarios

Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves more than 3,000 or more connections is required to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, multiple dry years and other scenarios. The scenarios evaluated in OWOW are summarized in **Table 5.4-4**. The assessment of water sources is reported in an UWMP, which is to be prepared every 5 years and submitted to DWR. DWR reviews the UWMPs to ensure they have completed the requirements from the Urban Water Management Planning Act (Division 6 Part 2.6 of the Water Code §10610 - 10656). Current and predicted reliability of the State Water Project used in the UWMPs was taken from the Department of Water Resources *The State Water Project Delivery Reliability Report 2009* (August 2010).

In November 2009, SB X7-7 (Steinberg) was passed requiring urban water suppliers to reduce per capita use 10% by 2015 and 20% by 2020. This required reduction in per capita consumption is reflected in the 2010 UWMPs which were used to evaluate water supply reliability for the watershed. This legislation results in a significant reduction in demand since OWOW 1.0 which eliminated the deficit between supplies and demands shown in OWOW 1.0. In each of the UWMP scenarios, the watershed is able to meet its projected demands plus the 10% Reliability Margin with the projected supplies. However, it is important to recognize that both the reduced demand and anticipated supplies are dependent upon a significant public investment. In the Proposition 84 process, the total estimated cost for projects that reduce demand and improve supply is over $4 billion and that does not include ongoing operations and maintenance costs.

To eliminate the potential for "double-counting", OWOW supplies are characterized by their source. For example, imported water recharged into a groundwater basin would be labeled "imported water" rather than "groundwater".

Table 5.4-4 Summary of Water Supply Reliability Scenarios

Short-term Impacts	Long-term Impacts
Catastrophic Interruption	Average Hydrologic Conditions
Earthquake[1]	
Power outage[1]	Single-year Drought Hydrologic Conditions
Mussels[1]	
Wildfire[1]	Multi-year Drought Hydrologic Conditions
Water quality degradation	
Terrorism[1]	Climate Change[1]
	Sediment Transport[1]

1 Actual effects uncertain.

Reliability Margin

There are many hydrologic uncertainties including future weather patterns, the effects of climate change and possible legal restrictions that could be placed on water supplies such as past restrictions placed on the SWP. To help prepare for these and any other uncertainties, it is recommended that supplies exceed demands thereby providing a buffer, or "reliability margin". For the OWOW process, this reliability margin was established at 10% to be consistent with other water budgets in the watershed.

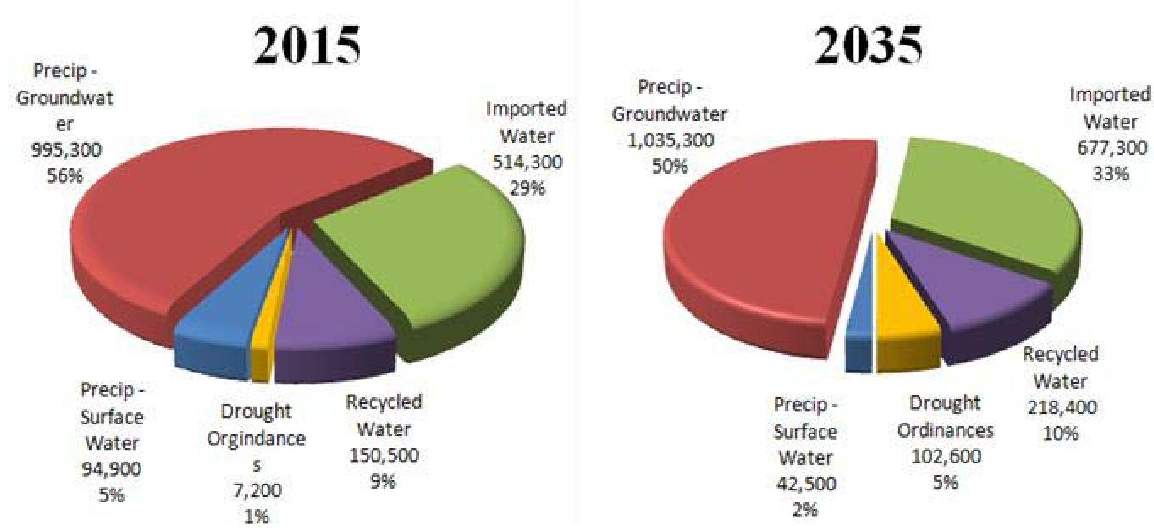
Average Year (Baseline)

Evaluating average water supplies provides a "baseline" for comparison purposes. **Figure 5.4-9** summarizes the data for 2010 and 2035, which is based upon the UWMPs but also includes the following proposed stormwater capture projects that were not included in the UWMPs:

Table 5.4-5 Stormwater Capture Projects Not Included in UWMPs but Included in OWOW Water Budget

Project	Amount (AF/Y)		
	IEUA	SBVMWD	WMWD/RPU
Chino Basin Recharge Master Plan	5,000		
Stormwater capture along the tributaries of the Santa Ana River (Active Recharge Project)		20,000	8,000
Riverside North [Basin] Aquifer Storage and Recovery Project	5,000	5,000	5,000
Total	10,000	25,000	13,000

Figure 5.4-8 Summary of Water Supply Estimated from UWMP Data for 2015 and 2035



Local precipitation presently meets about 60% of the demand and, due to increasing demand over time, is projected to meet about 50% of the demand in 2035. Other sources of supply and/or conservation measures are needed to meet the remaining 40% and 50% of demands, respectively. Although "drought ordinances" result in a reduction in demand, they have been presented as a supply to add emphasis and ensure they are not overlooked.

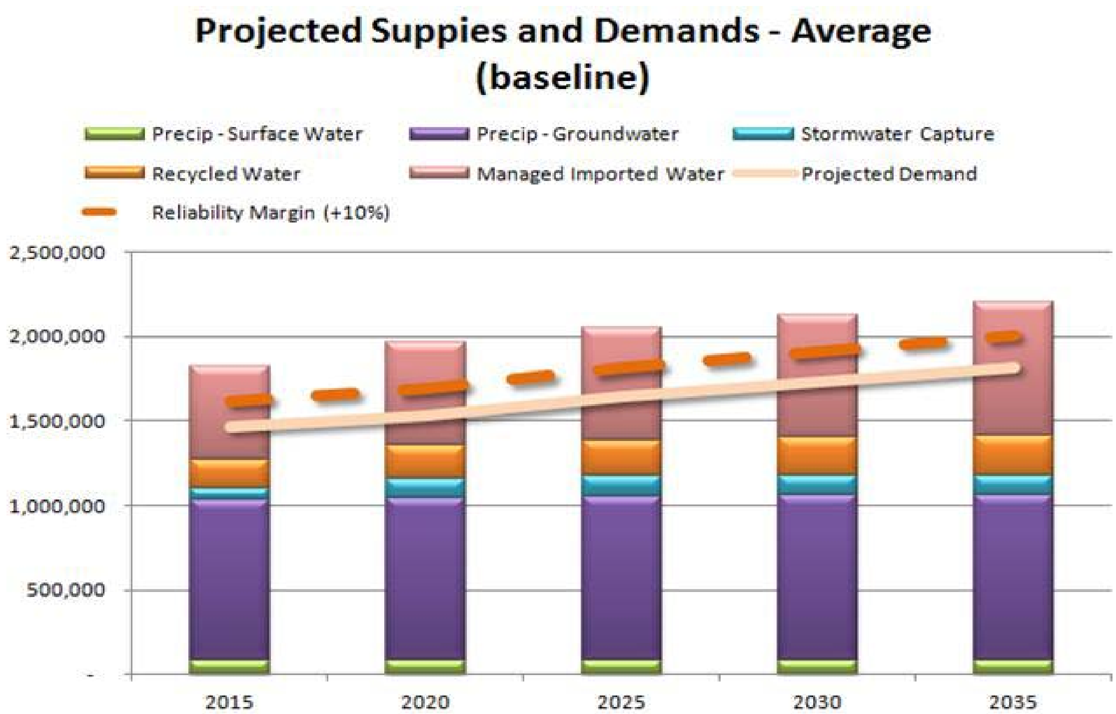
Given average hydrologic conditions, **Figure 5.4-10** shows that the watershed will be able to meet its needs through 2035 with a reliability margin of 15% in 2035. However, although the watershed, as a whole, will be able to meet demands, the SGPWA is projecting a 16,500 AF deficit. So, the watershed will need to work together to help overcome this deficit. The overall projections based on the UWMP data are positive and are generally based on the following assumptions:

1. Future local precipitation patterns will be the same as past precipitation patterns (possible effects of climate change addressed later in the chapter)

2. The predicted reliability of the State Water Project as taken from the Department of Water Resources *The State Water Project Delivery Reliability Report 2009* (August 2010) is accurate
3. Imported water projections include possible effects of climate change
4. Imported water will be managed to store wet year supply for use during dry years
5. Future demands will match the estimated demand
6. The watershed will invest over $4 billion in water conservation and infrastructure projects
7. Significant investments will be made to improve the reliability of imported water supplies as detailed in MWDSC's 2010 Regional UWMP

Given these unknowns, the watershed should continue to strive toward efficiency and toward projects that provide redundancy in case hydrologic projections are incorrect.

Figure 5.4-9 Comparison of Total Supply (by source) versus the Projected Demand

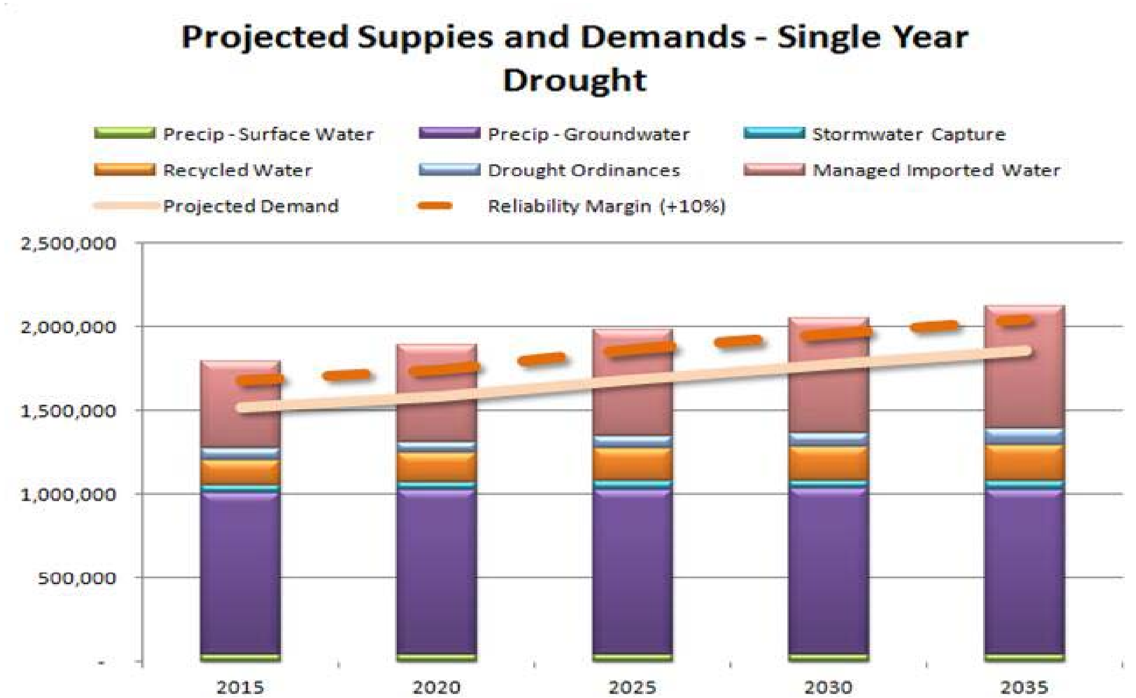


Single-Year Drought

Figure 5.4-11 summarizes the UWMP data for a single year drought. Nearly all of the water agencies defined the single-year drought as the year that they historically received the lowest amount of imported water. The watershed will be able to meet its demands in a single year drought with a reliability margin of 11% in 2035. The watershed is able to make it through a single year drought by relying on the various imported water storage programs that store water when it is available during wet periods for use during drought periods and on recycled water which is not impacted by weather. Although the watershed, as a whole, has enough supply to meet demand during a single year drought, the SGPWA projects a shortage of 27,000 AF in a single year of drought. Much of this deficit would be met by taking groundwater out of storage in the SGPWA service area. The overall projections based on the UWMP data are positive and are generally based on the same seven assumptions listed above.

Given these unknowns, the watershed should continue to strive toward efficiency and toward projects that provide redundancy in case hydrologic projections are incorrect.

Figure 5.4-10 Anticipated Supply (by source) versus Projected Demand for a Single Year of Drought



Multi-Year Drought

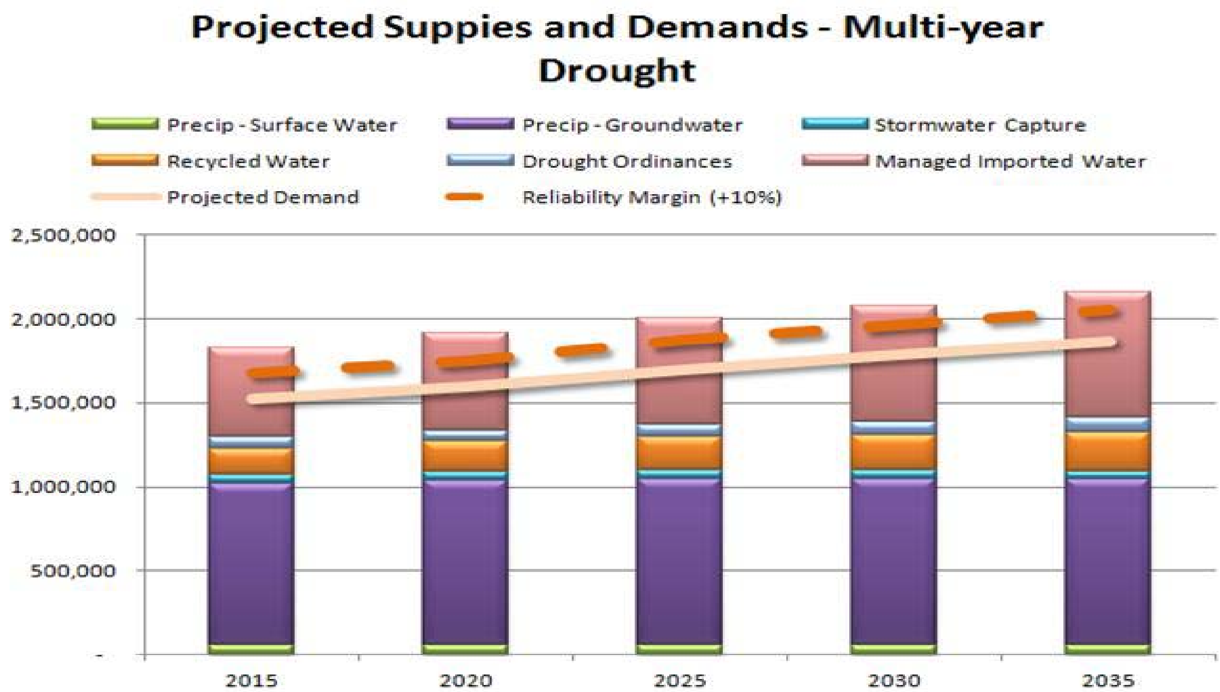
This scenario evaluates the water supply reliability for the Watershed assuming a multi-year (3 year) drought. Nearly all of the water agencies chose a3 year period that had the lowest, historic delivery of imported water.

Figure 5.4-12 summarizes the UWMP data for a multi-year drought and shows that the watershed will be able to meet demands with a reliability margin of 13% in 2035, higher than a single year drought. Although a 3 year drought lasts longer, the average entitlement available during multi-year drought is slightly higher than the entitlement available during a single year drought. The watershed is able to meet its needs during a multi-year drought due mostly to the storage programs implemented by MWDSC, Valley District, SGPWA, and others. However, despite the overall ability to meet demand, SGPWA is expecting a deficit of about 23,000 AF during a multi-year drought. Much of this would be met by withdrawing groundwater from storage in the SGPWA service area.[3] The overall projections based on the UWMP data are positive and are generally based on the seven assumptions listed above.

[3] Upper Santa Ana River Watershed Integrated Regional Water Management Plan, Table 3-12, November 2007, pg. 3-20.

Given these unknowns, the watershed should continue to strive toward efficiency and toward projects that provide redundancy in case hydrologic projections are incorrect.

Figure 5.4-11 Projected Supply (by source) versus Projected Demand during a Multi-Year Drought



Evaluate a Short-term 50% Reduction in Imported Water Supplies

One of the scenarios water agencies must evaluate as part of their UWMP is a 50% reduction in supplies. To maintain consistency with this requirement, it was decided to evaluate a 50% reduction in imported water supplies for the watershed. However, both a single year drought and multi-year drought result in greater reductions in imported water supplies than 50%. Since both the single-year drought and multi-year drought scenarios reduce imported water supplies more than 50%, this scenario is less conservative and, therefore, did not warrant detailed evaluation.

Evaluate a Catastrophic Interruption in Water Supplies

The water system that serves both local and imported water to the watershed is made up of a variety of facilities including pipes, canals, and levees that are all susceptible to damage or failure from a catastrophic event. The catastrophic events that were evaluated as part of the OWOW process are earthquake, Delta levee failure, power failure, wildfire, and terrorism. While catastrophic events may not be avoided entirely, measures can be developed and set in place to minimize the interruption to water service following a catastrophic event. These measures include: assessing the vulnerability of systems, quantifying available resources, determining optimal use of resources, increasing the flexibility of distribution systems, increasing regional coordination and establishing repair priorities.

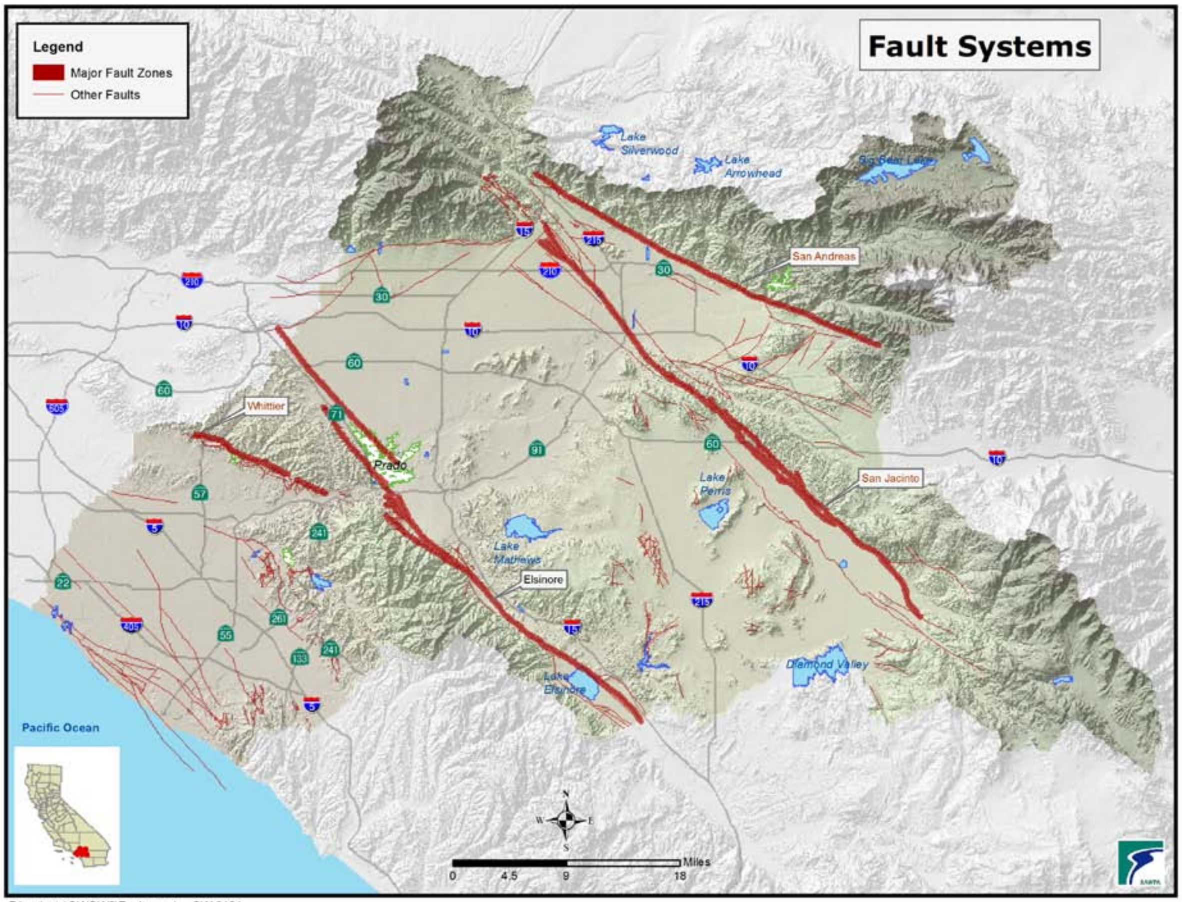
Evaluate the Effect of an Earthquake on Water Supplies

The watershed is located within a seismically active region of Southern California. As shown on **Figure 5.4-13**, six active major earthquake faults and a number of smaller faults extend through the Watershed. As shown on **Table 5.4-6**, a seismic event along one of the major active faults within the Watershed could result in an earthquake in the range of magnitude 6.0 to 8.0 on the Richter Scale.

Table 5.4-6 Estimated Maximum Richter Magnitude for Various Faults in the Watershed

Fault	Maximum Magnitude
San Andreas	8.0
San Jacinto	7.5
Elsinore	6.8
Chino	6.5
Whittier	6.8
Peralta Hills	6.6
Puente Hills	7.5
Newport/Inglewood	6.9

Figure 5.4-12 Major Earthquake Faults in the Watershed



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Depending on the intensity of the earthquake and location of the epicenter, catastrophic damage and interruptions of water service could occur throughout the watershed. Regional water conveyance systems, including the CRA; the Upper, Lower and Coastal Feeder Systems; as well as the East Branch of the California Aqueduct (also known as Foothill Pipeline) could sustain significant damage from a major earthquake that would interrupt the delivery of imported water supplies to the watershed. It also would make it difficult to transport water regionally within the watershed. Additionally, damage could occur to local water transmission systems operated by retail water agencies within the watershed, such as the Gage Transmission Main, Waterman Transmission Main, and the Riverside Canal. In addition to the potential damage to transmission facilities, damage also could occur to groundwater pumping facilities, water storage facilities, and water treatment plants as a result of seismic shaking impacts and/or from liquefaction impacts in areas that have high groundwater tables.

Based upon past seismic events, it is assumed that the impacts of a seismic event will be short-term. Due to the uncertainty tied to seismic events (magnitude, epicenter, etc.), it is not possible to determine the exact impact of a seismic event on water supply. However, the watershed can implement strategies that will better prepare the watershed for such an event. These strategies are provided in the *Management Strategies to Improve Water Supply Reliability* section.

Evaluate a Delta Levee Failure on Water Supplies

The Sacramento-San Joaquin Delta is a region where two of California's largest rivers, the Sacramento River and the San Joaquin River meet. It is the hub of the State's water supply system. About two-thirds of all California residents and millions of acres of irrigated farmland rely on the Delta for water from the SWP and the Federal Central Valley Project. The structural integrity of the delta levee system is vital to maintain water supplies to southern California. However, the Delta levee system is aging and a considerable amount of the land along the Delta levee system has subsided below sea level. The earthen levees are subject to risk from earthquakes, flooding and salt water intrusion. Catastrophic damage sustained by the levees would result in interruptions to SWP supplies to the Watershed due mostly to saltwater intrusion. The New Orleans levee failures resulting from Hurricane Katrina on August 29, 2005 particularly prompted awareness of the severe consequences and export outages that would occur with catastrophic multi-island levee failures resulting from a severe earthquake in the Sacramento-San Joaquin Delta region.

A severe earthquake in the Delta region of a frequency similar to a Hurricane Katrina would result in multiple levee breaches and slumping causing multi-island failures. There would be extensive levee slumping and overtopping resulting from liquefaction of levee foundations, severely hampering levee restoration efforts. This failure scenario would allow excessive salinity to enter the central and south Delta increasing salinity at the export pumps significantly beyond levels for municipal and agricultural uses. The difficulty in restoring water quality at the pumps is driven by the inability to displace saline water out of that region.

For example, a June 2005 report by Jack Benjamin and Associates in association with Resource Management Associates and Economic Insights (Preliminary Seismic Risk Analysis Associated with Levee Failures in the Sacramento – San Joaquin Delta June 2005) indicates a 6.5 earthquake in the western Delta would generate a 21-island failure and a 28-month duration water supply disruption in the Delta to restore levees in their current state. There is a 66% probability that a 6.5 magnitude earthquake will occur in the Delta region by 2032 or within the next 20 years (United States Geological Survey Delta Seismic Risk Report 2005). Further, one or more dry years immediately before or within the disruption period would substantially increase economic impacts and may lengthen the disruption period due to less availability of fresh waters within the Delta.

Determining the length of time water supplies will be shut down by severe earthquakes is influenced by a combination of complicated hydrodynamic, emergency response, water operations, and water treatment and geotechnical factors. In 2005, DWR released a study that estimated Delta levee failure resulting from a 6.5 magnitude earthquake would eliminate deliveries on the SWP for 28 months[4]. Assuming a 28 month repair period, the effects of this catastrophic interruption would be very similar to a multi-year drought. Thus, the strategies that are implemented to offset the effects of a multi-year

[4] Jack R. Benjamin & Associates, Inc. in association withResource Management Associates and Economic Insights, Preliminary Seismic Risk Analysis Associated with Levee Failures in the Sacramento – San Joaquin Delta, June 2005, Page 18.

drought also would be helpful to offset this event. Should the levee failure(s) occur after a drought period when stored water supplies are severely depleted, other emergency strategies would need to be implemented, such as extreme conservation and mandatory rationing.

In 2011, an independent analysis of impacts to levees along the Middle River emergency freshwater pathway have been performed by URS under contract to MWDSC considering all seismic hazards relevant to the central Delta pathway region (Estimated Levee Displacement Pathway Alignment, Sacramento - San Joaquin Delta, California July 2011). The analyses indicates that levee slumping in excess of ten feet can occur from an earthquake with a frequency of a hurricane Katrina resulting from liquefaction of loose sand levee foundations, placing the levees below high tide elevation and severely hampering restoration efforts. More recent RMA analyses supporting the preparation of the 2012 DWR Delta Flood Emergency Preparedness, Response and Recovery plan studies suggest that, depending on hydrologic conditions, several years would be required for a catastrophic multi-island levee failure to restore salinity concentrations necessary for municipal water quality needs at the export pumps. RMA analyses contained in the February 2007 Moffat & Nichol report (Delta Emergency Preparedness, A Feasibility Plan for Protecting the State's Water Supplies during a Catastrophic Collapse of Multiple Delta Islands) indicate that reservoir releases alone could not restore water quality at the export pumps adequate for municipal use.

The MWDSC Board has sought a comprehensive emergency preparedness and response strategy to safeguard water exports from the Delta. On April 10, 2007 the Board approved a strategy to respond to a plausible multiple-island failure scenario by restoring an emergency freshwater pathway through the Delta generally along Middle River to water export facilities in the south Delta in approximately 6-months. This strategy has been accepted by DWR in their preparation of a Delta Flood Emergency Preparedness and Response Plan (EPRRP) due for publishing in 2012 in coordination with the U.S. Army Corps of Engineers. This Plan covers a wide range of emergency response strategies ranging from isolated levee failures, up to and including catastrophic multiple-island failures causing severe water export disruptions. MWDSC has also promoted levee improvements on pathway levees to reduce levee slumping and breaches, as well as advance placement of redundant materials stockpiles such as rock and sheet pile for the reliable closure of breaches to ensure freshwater pathway restoration. Both pathway levee improvements and preparedness stockpiles have been initiated and will continue to completion in the next several years.

Evaluate a Power Failure on Water Supplies

Power failure can occur as isolated incidents or as part of larger event such as a regional power grid failure caused by a catastrophic event. During a large-scale power failure, water conveyance systems, water treatments plants, and ground water pumping wells could cease to operate.

Most power officials believe that under a scenario when only a portion of the regional power grid fails, the loss of power should not extend beyond 24 hours. However, under a scenario where all three grids of the North American Grid fail, the loss of power could extend for days. Depending on how much of the grid is lost and the length of time it takes to repair, the loss of power could have a profound impact on water delivery.

Power failure likely would have a short-term impact on water supply reliability. Due to the uncertainty of this scenario, it is not possible to determine the exact impact. However, the same strategies that will help to prepare for an earthquake will help prepare for such an event. These strategies are provided in the *Management Strategies to Improve Water Supply Reliability* section.

Evaluate Wildfire on Water Supplies

Wildfire can damage water delivery facilities or the power infrastructure used by water facilities. In addition, the loss of vegetation resulting from a wildfire can change runoff patterns, increase sediment, and reduce water storage. There also are potential water quality concerns associated with ash falling into surface reservoirs, which could overwhelm filtration plants as turbidities increase by orders of magnitude.

The effects of wildfire likely will have a short-term impact on water supply. Possible effects are loss of vegetation, change in runoff patterns, increased sedimentation, reduced natural water storage, and ash falling into surface reservoirs. Due to the uncertainty of this scenario, it is not possible to determine the exact impacts. However, the same strategies that will help to prepare for an earthquake will help prepare for such an event. These strategies are provided in the *Management Strategies to Improve Water Supply Reliability* section.

Evaluate the Effects of Terrorism on Water Supplies

There is always a possibility that water infrastructure could be targeted by terrorists. Water agencies have responded to this potential threat by reducing public access to water infrastructure or even the information about infrastructure. They have also responded by increasing security measures at their facilities.

The effects of a terrorist attack likely will cause short-term reduction in water supply reliability. Due to the uncertainty of this scenario, it is not possible to determine the exact impacts. However, the same strategies that will help to prepare for an earthquake will help prepare for such an event. These strategies are provided in Management *Strategies to Improve Water Supply Reliability.*

Evaluate Delta Flow Restrictions on Water Supplies

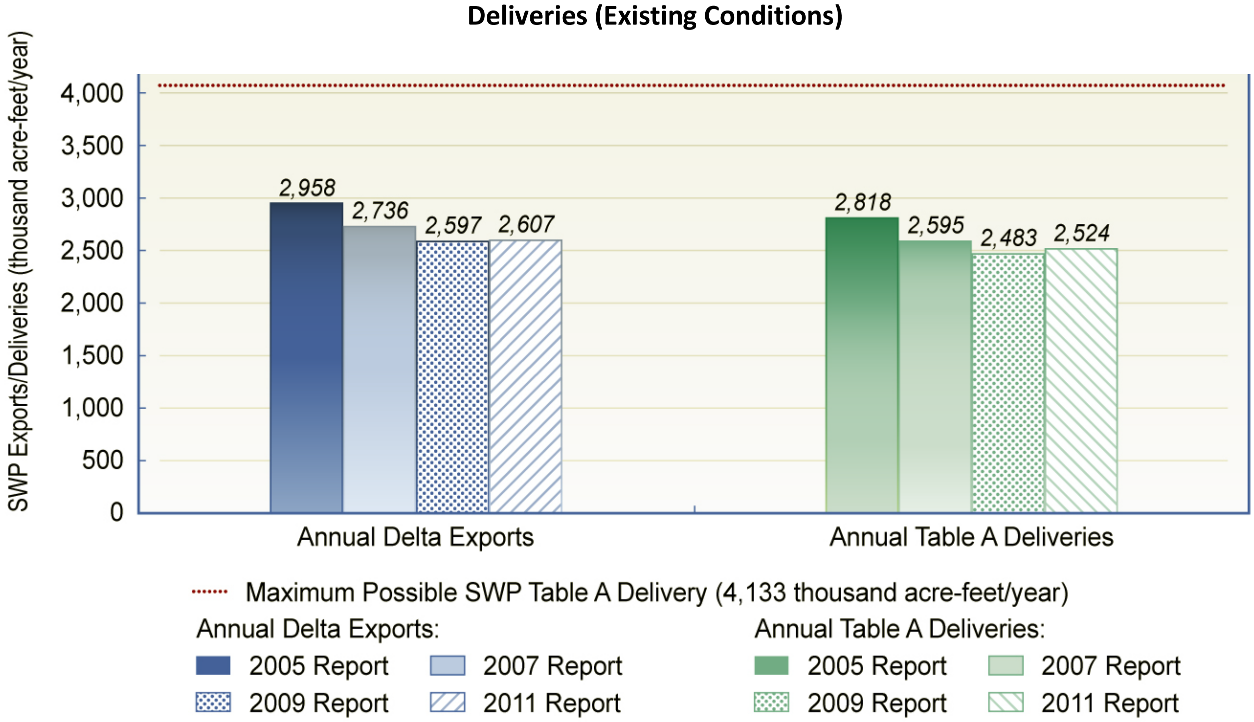
On December 14, 2007, U.S. District Judge Oliver Wanger issued an Interim Remedial Order to protect the threatened Delta smelt, which restricted water exports from the Delta to agricultural and urban customers of the SWP and CVP. In December 2008, the U.S. Fish and Wildlife Service issued a biological opinion covering Project effects on Delta smelt. In June 2009, the National Marine Fisheries Service issued a biological opinion covering Project effects on winter-run and spring-run Chinook salmon, steelhead, green sturgeon, and killer whales. The biological opinions replaced opinions issued earlier by the federal agencies.

The 2008 and 2009 biological opinions were issued shortly before and shortly after the Governor proclaimed a statewide water shortage state of emergency in February 2009, amid the threat of a third consecutive dry year. Both opinions have been subject to considerable litigation. Recent Court decisions and settlements have changed specific operational rules in 2011-12, and both opinions have been remanded to the agencies for further review and analysis.

The impacts of the above decisions were analyzed by DWR in The State Water Project Delivery Reliability Report 2009 which was used in the 2010 UWMPs.

DWR has also released a draft update titled "The State Water Project DRAFT Delivery Reliability Report 2011". As shown in the **Figure 5.4-14**, estimated average annual Delta exports and SWP Table A water deliveries have generally decreased since 2005 but are slightly up as compared with 2009. Under existing conditions, average annual Delta exports have decreased since 2005 from 2,960 thousand acre-feet per year (taf/year) to 2,610 taf/year in 2011, a decrease of 350 taf or 12%. Similarly, average annual Table A deliveries have decreased since 2005 from 2,820 taf/year to 2,520 taf/year in 2011, a decrease of 300 taf or 10%.

Figure 5.4-13 Trends in Estimated Average Annual Delta Exports and SWP Table A Water Deliveries (Existing Conditions)



A number of water agencies, federal and state resources agencies and non-governmental organizations are currently engaged in the development of a Bay Delta Conservation Plan (BDCP). An explanation of the BDCP is provided later in this chapter.

Evaluate Climate Change on Water Supplies

Temperature data suggest that California's climate is getting warmer. This phenomenon is being referred to as "climate change". Climate change could have an impact on water supply reliability. In a recent report, the U.S. Bureau of Reclamation provides potential impacts including reduction in snow pack, changes in the timing and amount of runoff, changes in the frequency and magnitude of extreme storm events, increased watershed vegetation demands due to higher evapotranspiration rates, changes in future agriculture and urban water demands, changes in sea level rise, and increased potential for salt water intrusion to the Sacramento-San Joaquin Delta and groundwater basins near the coast.

From a water management perspective, the strategies that increase reliability without climate change will also increase reliability with climate change. As a result, there are no specific strategies targeting climate change. To plan for this and other unknowns, the Watershed has implemented a "reliability margin" of 10%. More discussion about climate change impacts are included in the Energy and Environmental Impact Response pillar chapter later in this OWOW 2.0 report.

Evaluate the Impact of Quagga and/or Zebra Mussels on Water Supplies

Quagga mussels (*Dreissenabugensis*) were discovered in Lake Mead in January 2007 and rapidly spread throughout the lower Colorado River and Metropolitan's CRA system. Quagga mussels are indigenous to the Ukraine and are a related species to the better-known zebra mussels (*Dreissenapolymorpha*). Similar to the zebra mussel, which was most likely introduced to the Great Lakes in the late 1980s via ship ballast water, Quagga mussels were introduced to Lake Mead most probably through the translocation of boats. Although the introduction of these two species into drinking water supplies does not typically result in violation of drinking water standards, invasive mussel infestations can adversely impact aquatic environments. Two areas of relevance for aquatic environments used as sources of drinking water are the potential for clogging of intakes and raw water conveyance systems via attachment of high numbers of mussels to surfaces and a long-term potential for rendering lakes more susceptible to deleterious algae blooms. Control of mussel infestations can cost water conveyance systems millions of dollars annually in facility improvements and/or maintenance. Quagga mussels have infested water conveyance systems linked to the lower Colorado River. There is concern that Quagga mussels could become more widespread and infest the State Water Project System and other watersheds by boats and watercraft vehicles. Preventive measures implemented include boat inspections prior to entering un-infested water bodies and decontamination (clean, drain and dry) of vessels departed infested water bodies.

Evaluate the Effects of Santa Ana River Channel Armoring and Sediment Transport

The Santa Ana River is a productive recharge "facility" that helps replenish the Watershed's groundwater basins. The transport and deposition of sediment along the Santa Ana River is critical to maintaining existing groundwater recharge capacity. A sandy river bottom allows surface water to percolate easily into the groundwater basin and maximizes recharge rates. If this process is interrupted, the amount of recharge can be reduced.

The transport and disposition of sand within the Santa Ana River is interrupted when it is trapped by both the Seven Oaks Dam and Prado Dam. Seven Oaks Dam traps sediment at the base of the San Bernardino Mountains while Prado Dam traps sediment just upstream of Orange County. This entrapment of the sand causes negative impacts on the recharge capacity of the riverbed.

In addition, as the sand washes away and no longer is being replaced by sand from upstream, the river bottom gradually transitions from a “soft” bottom to a coarser bottom that includes heavier material such as gravel and cobbles. The gravel and cobbles eventually interlock with fine sediments and form an “armored” layer. This process is referred to as “channel armoring,” which can reduce the recharge rate of the river. A Groundwater Recharge Study prepared by OCWD estimates that the armoring of the Santa Ana River has resulted in a loss of percolation of about 1% per year. With a long-term degradation of recharge rates, longer stretches of the river would be needed to recharge the same amount of water that is recharged today or some other kind of mitigation would be required.

Additionally, sediment loading behind the two dams can reduce surface water storage volumes. The continued build up of sediment behind the dams will reduce the overall storage capacity of the dams, which will, in turn, reduce the amount of storm flow that can be temporarily stored and released for groundwater recharge.

Channel armoring could reduce recharge rates along the Santa Ana River. Sediment transport could reduce storage volumes behind Prado Dam and Seven Oaks Dam thereby reducing the amount of stormwater that can be captured and used.

Evaluate the Effects of Water Quality Degradation on Water Supplies

Water supply reliability in the Watershed can be improved by reinstating local water resources that have been avoided due to poor water quality. For example, some groundwater basins in the Watershed have been impacted by high concentrations of salts. In the past, rather than pump and treat this poorer quality water, many groundwater producers chose to replace it with another source(s) of water that did not require treatment. This same approach also has been used in groundwater basins that were polluted by volatile, organic compounds and other contaminants. If, instead, these local resources were to be treated and used, they effectively would become “new” sources of water within the watershed which would act to increase water supply reliability. Water supply reliability can be increased if water resources that were avoided in the past due to poorer water quality are, instead, treated and utilized.

Summary of Evaluation Results

The water supply reliability scenarios that were evaluated as part of this analysis can be divided into two general categories, short-term impacts and long-term impacts. **Table 5.4-4** summarizes the two general categories. Those in the short-term category are difficult to quantify. Those in the long-term category are more easily quantified with the exception of climate change, sediment transport and channel armoring which are still under investigation. However, all of the recommended water management strategies to help the watershed overcome the long-term impacts will also help the watershed endure the short-term impacts.

Based on the data from 2010 UWMPs, the watershed is able to 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 unknowns. These results assume that:

8. Planned infrastructure will be constructed
9. Demand projections are correct
10. It will rain locally the same in the future as it did in the past
11. The watershed will continue to manage imported supplies by storing water in wet years for later use during droughts

Given the uncertainty in these assumptions, it is recommended that the watershed continue to invest in planned infrastructure projects and that it implement a broad range of management strategies to diversify supplies thereby enhancing water supply reliability.

Water Management Strategies and Watershed-wide Project/Program Concepts to Improve Water Supply Reliability

To increase reliability, the following water management strategies are recommended:

Reduce Demand
Stormwater Capture
Optimize Imported Water
Recycle Water
Increase storage
Implement emergency measures

Each of these strategies enhances reliability to offset unknowns.

Water agencies throughout the watershed are implementing one, or more, of these strategies for their individual service areas. The goal of OWOW 2.0 was to develop watershed-wide project/program concepts, based on these strategies, which would increase water supply reliability throughout the watershed while reducing costs. The following sections discuss a number of watershed-wide project/program concepts organized by water management strategy. Some of the concepts build on OWOW 1.0 and some are new for OWOW 2.0. The concepts marked with a ☑ are recommended for focus over the next five years.

Reduce Demand

One of the ways the watershed can increase water supply reliability is to reduce demand, wherever possible, by using water more efficiently. The following concepts are recommended for the watershed:

☑*Water Rate structures that encourage conservation*

Estimated benefit: Help achieve a 20% demand reduction by 2020.

Water rates that increase as consumption 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 have this type of rate structure.

☑*Public education to encourage water conservation*

Estimated benefit: Help achieve a 20% demand reduction by 2020.

Educating the public on the State and watershed's water supply system is a crucial component to implementing permanent change in water use habits. If the public understands the water supply situation, they will understand the need to raise rates, change water use habits permanently and continue investing in the Watershed's water supplies.

Outdoor conservation

Estimated benefit: Help achieve a 20% demand reduction by 2020.

The upper and middle watershed uses 60 – 70% of its water outdoors. A significant number of outdoor water use efficiency programs are already in place. The watershed has made considerable progress in this area through the Inland Empire Garden Friendly, and other, programs. More details about this and other suggested water conservations measures are discussed in the Water Use Efficiency Pillar chapter later in the OWOW 2.0 Plan.

Reduce evapotranspiration

Estimated benefit: More investigation required

One of the only measurable "losses" in the Watershed is evapotranspiration. Evapotranspiration is the combined water loss associated with evaporation and transpiration. Evaporation is the movement of water to the air from the land surface and water bodies. Transpiration is the movement of water into plants and the subsequent loss of water as vapor through its leaves. The losses associated with evaporation might be reduced by developing and implementing specific programs to increase the amount of shaded area such as planting trees or constructing shade structures. 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 and middle Watershed.

Optimize Imported Water

The Watershed is dependent upon imported water to meet approximately one-third of its needs into the future. However, the reliability of this source of water has proven to be less certain, at times, due to unforeseen circumstances such as the "Delta Smelt Decision" in 2007. This historic decision resulted in one of the single largest court-ordered SWP delivery reductions in state history to protect the endangered Sacramento/San Joaquin Delta smelt (fish). As a result of this and other problems in the

Delta, the SWP operates below its delivery capacity. 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.

☑*Wet Year Imported Water Storage Program*

Estimated benefit: Improved reliability and reduced cost by storing water locally.

This concept was introduced in OWOW 1.0 as “Base Load Off of Imported Water” and involves storing imported water (primarily SWP water) in wet years for later use in dry years. This 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 State Water Contractor for the watershed, MWDSC, has had a wet year storage program for many years that stores water in surface reservoirs and groundwater basins including the Central Valley during wet years for later use in dry years. San Bernardino Valley Municipal Water District, the State Water Contractor serving the upper watershed, has stored over 100,000 acre-feet of imported water in the San Bernardino Basin Area since 2008.

The Pillar explored the possibility of improving this concept by changing the MWDSC storage location from the Central Valley to the watershed. The most likely and effective way to change the storage location would be for the MWDSC member agencies (4 of the 5 SAWPA agencies) in the watershed to purchase more imported water during wet years when they typically purchase less, if any, imported water due to its higher cost. The Pillar worked on a possible MWDSC payment structure that would lower member agencies costs during wet years but result in full compensation to MWDSC in the dry year when the water is used. MWDSC currently offers a similar groundwater storage program titled “Conjunctive Use Program (CUP)”.

The proposed payment structure was compared to the existing CUP program. The evaluation assumed a 120,000 AF storage program (imported water and storage capacity of approximately 60,000 AFY and 40,000 AFY of groundwater pumping capacity) and was based on a 10 year cycle consisting of 2 wet years, 3 dry years and 5 normal years. **Table 5.4-7** below compares the MWDSC CUP program to the proposed Program (key differences are bolded).

Table 5.4-7 Term Comparison between MWD’s CUP Program and Proposed Program

Component	MWD CUP	Proposed Program
“Put” Capacity	60,000 AFY	60,000 AFY
“Take” Capacity	40,000 AFY	40,000 AFY
Program Storage Capacity	120,000 AF	120,000 AF
Storage/Extraction Capital Cost	None	Paid by member agency

Annual Administration Costs	None	None
Program Term	25 years	25 years
Storage Losses	Varies by basin	Varies by basin
Total Payment at Time of "Put"	None	• MWDSC Variable Supply Cost • MWDSC Variable Treatment Cost • Watershed Incentive
Total Payment at Time of "Take"	• MWDSC Tier 1 (at time of extraction)	• MWDSC Tier 1 (at delivery) less "Put" Payment

A preliminary economic analysis suggested that the revenue from the proposed program was comparable to the existing MWD CUP program. However, the proposed program would result in water being stored in the watershed which could increase participation and thereby increase the amount of water in storage within the watershed.

☑*Bay Delta Conservation Plan*

Estimated benefit: Would restore the reliability of the SWP to 78% from 60% which equates to about 131,400 acre-feet per year for the watershed.

The proposed BDCP offers a solution that would restore reliability to the SWP. Nearly all of the reduction of imported water deliveries through the SWP is due to environmental and other problems in the Delta. The proposed solution which will achieve the "coequal goals" of improving the health of the ecological system as a whole while also protecting SWP deliveries (SWP deliveries are less than 20% of the total flow through the Delta) is to transport SWP deliveries "around" or "under" the Delta in some sort of "Delta conveyance facility." Not only would this "Delta conveyance facility" increase the reliability of deliveries, but it would also improve SWP water quality in the form of lower Total Dissolved Solids (TDS). The decrease in TDS will reduce water recycling costs. The BDCP which is being prepared by a group of local water agencies, environmental and conservation organizations, state and federal agencies, and other interest groups includes such a facility. When complete, the BDCP will provide the basis for the issuance of endangered species permits for the operation of the state and federal water projects. Implementation of the plan will occur over a 50 year time frame.

Imported Water Banking

Estimated benefit: Dry year supply.

Although the watershed has significant groundwater storage, it is not easily accessible to the entire watershed. In some cases, it may be more efficient to participate in a groundwater storage opportunity outside the watershed. These storage opportunities are often referred to as “water banks” and are located throughout the State.

The wholesale water agency that covers 80% of the watershed, MWDSC, already has significant water banking throughout the state. Since OWOW 1.0, the upper watershed has participated in a water bank in the central valley and in Big Bear Lake to help keep surface water treatment plants operational during drought periods. The watershed has made significant progress in this area.

Prevent Invasive Species from Clogging Infrastructure

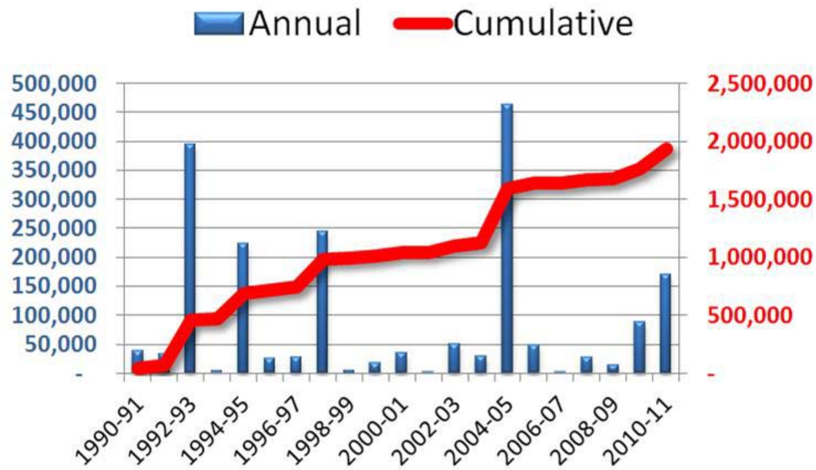
Estimated benefit: Consistent deliveries.

Quagga Mussels and the closely related Zebra Mussels are small shellfish, usually less than half inch in size. Once only found in the Great Lakes, the Quagga Mussel has now been discovered in Lake Mead, the CRA, and a local reservoir in San Diego County. They will 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 MWDSC, which target the prevention of these species from entering water infrastructure.

Stormwater Capture

Capturing stormwater runoff within the Watershed is challenging due to the “flashy” hydrology. The watershed tends to be either extremely wet or extremely dry. **Figure 5.4-15** shows how much stormwater has gone to the Pacific Ocean since 1990. As the figure shows, most of the un-captured flow came during “flood” years when it was nearly impossible to capture. However, even if these flood years are removed, there is still an opportunity to capture more stormwater throughout the watershed.

Figure 5.4-15 Stormwater Flow Lost to the Ocean since 1990



Because stormwater originates in the mountains, it can be diverted at high elevation enabling it to be delivered by gravity thereby saving energy costs. Diverting it higher in the watershed also provides the opportunity to use the water more than once before it reaches the ocean. In addition to the low energy cost, 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. More details on many of these projects, though briefly described below, are covered in greater detail **Chapter 5.8 Stormwater: Resource and Risk Management** later in the OWOW 2.0 Plan report.

☑*Enhanced Santa Ana River stormwater capture below Seven Oaks Dam*

Estimated benefit: 12,000 acre-feet per year.

The upper watershed has obtained a water right for the additional stormwater detained by Seven Oaks Dam and is presently designing facilities that will enable the diversion of up to 500 cfs and up to 80,000 acre-feet per year.

☑*Enhanced stormwater capture from the tributaries of the Santa Ana River*

Estimated benefit: 28,000 acre-feet per year.

The upper watershed has completed the conceptual design of improvements and operational changes that result in additional stormwater capture from the tributaries of the Santa Ana River.

☑*Riverside Basin Aquifer Storage and Recovery Project*

Estimated benefit: 28,000 acre-feet per year.

Riverside Public utilities, in partnership with Valley 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.

☑*Enhanced Santa Ana River stormwater capture at Prado Dam*

Estimated benefit: 10,000 acre-feet per year.

The lower watershed is evaluating the feasibility of increasing the Prado flood season water storage elevation from 498 MSL to 505. After the Santa Ana River Mainstem flood control project is completed in approximately 2022, it may be possible to store water to higher elevations in Prado Dam for water conservation. A preliminary economic analysis of storing water to elevation 510 feet and 514 feet is summarized in **Table 5.4-8** below.

Table 5.4-8 Preliminary Economic Analysis - Enhanced Stormwater Capture at Prado Dam

Category	Storage to 510 feet	Storage to 514 feet
Estimated capital cost[1]	\$54M	\$125M
Estimated annual operations and maintenance cost	\$300,000	\$400,000
Estimated water yield (acre-feet per year)[2]	5,000	10,000
Estimated cost per acre-feet[3]	\$600	\$700

[1] Includes environmental mitigation

[2] Estimated water yield in comparison to year-round 505 ft storage

[3] Based on capital cost repayment over 30 years at 5% interest

☑*MS4 Credits*

Estimated benefit: Increased reliability by utilizing more local stormwater.

The Municipal Separate Storm Sewer Systems (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 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-operate flood control facilities*

Estimated benefit: More investigation required.

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”. This strategy has already been successfully implemented in some portions of the watershed.

☑*Size flood control facilities for stormwater capture*

Estimated benefit: Increased reliability by utilizing more local stormwater.

Another way to increase stormwater capture would be to work with flood control agencies to increase the size of existing, or new, detention basins. Larger detention basins would slow the flow and increase the recharge area, which would increase the amount of stormwater that is artificially recharged. In addition to this increased recharge, the larger basins also would provide greater flood protection. A related strategy would be to construct additional surface water reservoirs within the watershed. Unlike detention basins, which need to be drained every year before the flood season, surface water reservoirs provide the added flexibility of allowing the water to be stored until it is needed. In addition, surface water reservoirs also provide a storage location(s) for other sources of water such as imported water. Although effective, both of these strategies would be viable only in areas of the watershed that have vacant land.

☑*Forest First: Forest management for increased downstream stormwater capture*

Estimated benefit: Increased reliability by utilizing more local stormwater.

Another way to increase stormwater capture would be to work under the Forest First MOU with SAWPA to support collaborative projects among the U.S. Forest Service and downstream flood control and groundwater management agencies to support forest management including a) fuels reduction, b) chaparral restoration, c) 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 resulting in increased recharge. This will also result in less sediment transport particularly after forest burn events and water quality improvement downstream.

☑*Development Standards that enhance stormwater capture*

Estimated benefit: Increased reliability by utilizing more local stormwater.

Another strategy to increase stormwater capture would be to implement new development standards that promote the construction of infrastructure that increases 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.

Recycle 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 and middle watershed is being discharged into the Santa Ana River and is being reused at various locations downstream. In the future, the upper and middle watershed plan to develop enhanced recycling programs that could change the place of use for much of this resource. Should enhanced recycling occur in the upper and middle 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 the ocean and/or purchasing more imported water. There may also be an opportunity for the upper, middle and lower 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 and middle watershed. This concept was first introduced in OWOW 1.0 and has been further developed in OWOW 2.0 as "Recycled Water Exchange".

☑*Recycled Water Exchange*

Estimated benefit: Although many details would need to be worked out, this type of concept could potentially save the watershed nearly $1/2 billion in capital costs and, perhaps even more, in energy costs not to mention the potential to reduce the amount of salt imported into the watershed.

This concept was first introduced in OWOW 1.0 and could save the watershed nearly $1 billion in facilities and, perhaps even more, in energy costs. The upper watershed currently delivers nearly all of its treated wastewater effluent to the lower watershed via the Santa Ana River. The Lower Watershed uses the effluent to recharge its groundwater basin and reduce the need for imported water.

This concept would exchange treated wastewater from the upper watershed for a like amount of imported water delivered to the upper watershed. The following summarizes this concept:

- *Treated wastewater flows remain in the river for 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 concept seems most feasible in areas without mature recycled water programs).
- *Lower watershed provides imported water Upper Watershed* – The Lower Watershed would essentially change the place of delivery for some of the imported water they are already planning to

import to the Upper Watershed which would replace the treated wastewater flowing from the Upper Watershed.

- *Comparable reliability* – Recycled water is 100% reliable and imported water is about 60% reliable. This concept would mitigate the reduced in reliability to the upper watershed by <u>storing imported water in the upper watershed, or some other water bank, during wet years for later use in dry years.</u>

A preliminary evaluation of this concept identified the following benefits as compared to current plans:

- *Less salt* – under this Program, the lower watershed would provide imported water to the upper watershed. The only source of imported water available to the upper watershed is SWP which is higher quality than Colorado River and many of the existing groundwater basins in the Watershed. To the extent that SWP water delivered to the upper watershed replaces CR 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.
- *1/3 Return on investment*– under this program, the lower watershed essentially changes the place of delivery for imported water from the lower watershed to the upper watershed. Since approximately 1/3 of every acre-foot delivered to the upper watershed ends up as treated wastewater and back in the river, the lower watershed essentially receives 1 - 1/3 acre-feet for every acre-foot delivered, a 33% return on investment!
- *Lower cost – less energy* – The energy required to produce recycled water and to pump it up to higher elevation where it can be used 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 is no increase in energy associated with this component of the concept.
- *Dry Year Reliability* – Recycled water is 100% reliable which benefits the lower watershed. Although imported water is only about 60% reliable, it can be stored in wet years so that it is available in dry years to improve the reliability. Thus, both the Upper and the lower watershed end up with a reliable supply.

☑*Recycled Water for Potable Use*

Estimated benefit: Improved reliability by increasing the amount of times water can be used

Legislation will be required to allow recycled water to be used for potable use. The watershed should work together to promote such legislation.

☑*Recycle sewage effluent from Orange County Sanitation District Plants No. 1 and No. 2 that is currently flowing to the ocean*

Estimated benefit: 157,000 acre-feet per year

As presented in the Recycled Water section of this chapter, OCSD expects to “dispose” of effluent into the ocean each year from its Plant No. 1. 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 and middle watersheds.

As presented in the Recycled Water section of this chapter, by 2030 the Orange County Sanitation District expects to "dispose" of effluent into the ocean each year from its Plant No. 2. However, based on current Department of Public Health (DPH) requirements, this water cannot be recycled because it includes the effluent from the Inland Empire Brine Line which contains discharges from the String fellow Hazardous Waste Site, and other sources that would require further characterization by DPH. The Watershed should consider working with DPH on a strategy that would allow this effluent to be recycled.

Importation of recycled water from outside the Watershed

There may be opportunities to import recycled water from outside the Watershed. Any recycled water imported into the watershed would be viewed as a new supply.

Recycled water use to offset potable demand

This is widely implemented by several agencies and part of the projected water supply portfolio

Desalt the Pacific Ocean

Estimated benefit: 54,000 acre-feet per year

The lower watershed borders the Pacific Ocean and while ocean desalination generally is considered technically and institutionally feasible, it is also expensive both in capital and operational costs and is subject to significant regulatory scrutiny depending upon the environmental impact of the specific project. It also requires significant base loaded energy that is costly. Over the last five years, a number of water agencies have been investing significant effort and funds in ocean desalination program development work. There are currently two sites along coastal Orange County that have completed extensive exploratory work and permit approvals to construct desalination facilities but to date neither completely permitted or successful in securing contracts for the supply.

The cost of this water is significantly more expensive than any other current source of supply. For this reason, the watershed should focus on the other strategies.

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 the groundwater basins within the watershed.

☑*Surface Water Storage*

Estimated benefit: Helps offset the effects of drought, climate change and emergencies

As shown in **Table 5.4-1**, the watershed is fortunate to have a number of surface water reservoirs. However, additional surface storage space would allow the capture of additional stormwater and "unused" imported water. Not only do surface water reservoirs provide a location to store water when it is available, but they also enhance reliability during a disaster. Therefore, the Watershed should work toward increasing surface water storage both inside and outside the region. Due to the fast development within the watershed, the number of potential reservoir sites inside the watershed continues to diminish every year. Potential surface storage opportunities outside of the watershed would include any additional reservoirs constructed as part of the SWP and/or the CRA.

☑*Groundwater Storage*

Estimated benefit: Helps offset the effects of drought and climate change

In addition to additional surface water storage, the watershed also should pursue the utilization of any unused groundwater storage in the watershed. Like a surface water reservoir, these underground reservoirs provide a place to store wet year supplies for later use during extended drought periods.

Some groundwater basins in the middle and lower watershed have been abandoned or have not been fully utilized due to high salt content, contamination, color, odor or some other concern. Projects to pump and treat water in these basins, or portions thereof, provide restoration of groundwater storage that may not have been historically available for municipal use. In addition to recovering the storage space, it could also result in new yield.

Emergency Measures Strategies

Estimated benefit: Improved recovery time following a disaster

Despite careful planning, there will still be catastrophic events and unforeseen circumstances. Although the timing and extent of such events or circumstances are unknown, the following strategies will help the watershed prepare for the unknown.

Local Emergency Plans

Each of the water agencies within the Watershed must have an emergency plan that complies with both the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).

Mutual Aid and Coordination

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 (Cal

WARN), 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: 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.

System Interconnections

Wherever possible, water agencies should pursue interconnections to increase redundancy and provide aid during an emergency situation.

Extraordinary Conservation

"Extraordinary" conservation would be required following an extreme catastrophic event such as an earthquake. 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. Thus, this type of extreme conservation could reduce demands in the upper watershed by the same amount.

Optimize Outside Funding Opportunities

The watershed is encouraged to work together to maximize outside funding opportunities that provide the greatest overall benefit to the watershed.

References

EMWD 20010 Urban Water Management Plan
IEUA 2010 Urban Water Management Plan
MWDOC 2010 Urban Water Management Plan
2010 San Bernardino Valley Regional Urban Water Management Plan
WMWD 2010 Urban Water Management Plan
SAWPA – Maps from Various Documents
SAWPA 2002 IRP, One Water One Watershed

Contributors

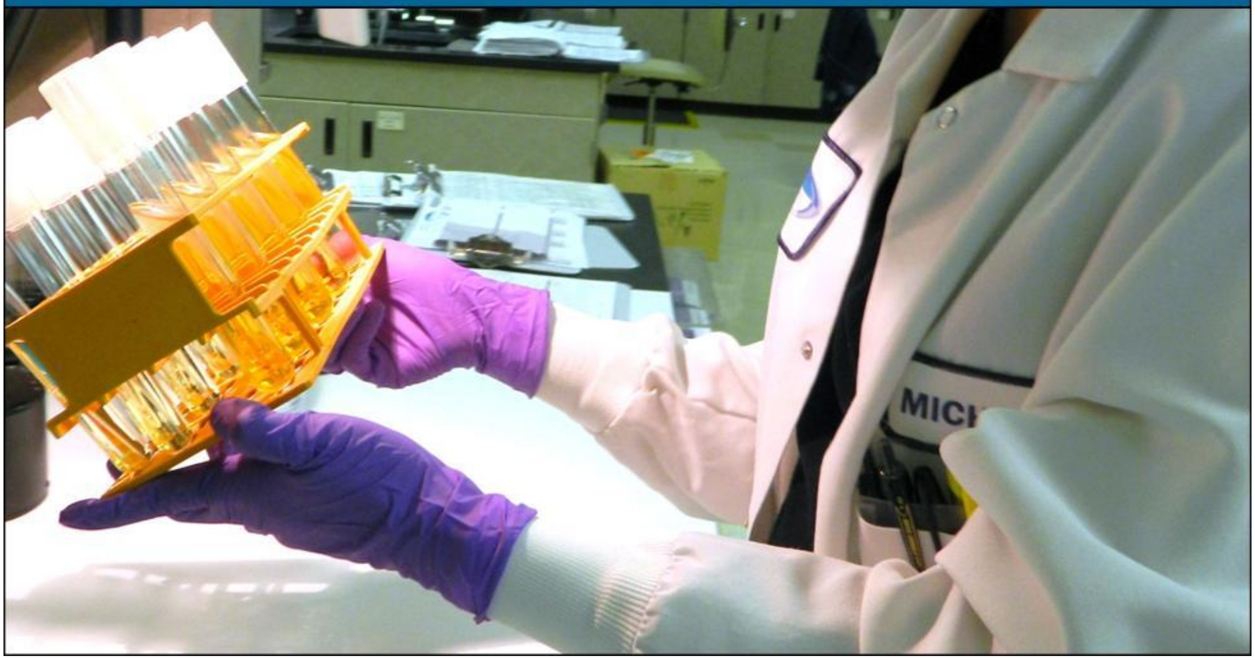
The following list of water professionals volunteered to take responsibility for writing a portion of the Chapter (alphabetical order):

Dan Bott, OCWD
Grace Chan, MWDSC
Jeff Davis, SGPWA
Elizabeth Lovsted, EMWD
Fakhri Manghi, WMWD
Ryan Shaw, IEUA
Bob Tincher, SBVWMD

The following list of water professionals participated in the Pillar meetings:

Dan Bott, OCWD
Grace Chan, MWDSC
Fakhri Manghi, WMWD
Mark Norton-SAWPA
Jack Safely, WMWD
Ryan Shaw, IEUA
Peer Swan, IRWD
Bob Tincher- SBVMWD
Rick Whetsel, SAWPA

5.5 Beneficial Use Assurance



This chapter presents a general overview of water quality issues in the Santa Ana River Watershed (SARW) and programs to improve water quality. The change in name from "Water Quality Improvement" from the One Water One Watershed (OWOW) 1.0 Plan to "Beneficial Use Protection" reflects a focus on striving to meet water quality objectives for all waterbodies in the SARW. Collaboration of stakeholders with the Santa Ana Regional Water Quality Control Board (Regional Board) is essential to achieve this goal. To expand outreach with Regional Board staff, the Chief of Regional Planning Programs served as the Co-Chair of the Beneficial Use Protection Pillar Group.

The three focus areas of this chapter, surface water, groundwater, and ocean water quality, are described from the top of the watershed downstream to the ocean. This discussion includes the significant impact of imported water supplies and stormwater runoff on water quality.

Surface water discharges to the ocean impact ocean water quality. Ocean water, defined as the zone from the beach to three miles offshore, and bays and estuaries near the coast, are included in this report, reflecting the comprehensive, integrated approach utilized in the development of the new Integrated Regional Water Management Plan (IRWMP).

This chapter also includes coastal watersheds such as Anaheim Bay-Huntington Harbor, Newport Bay, and Newport Coastal streams, as well as, Coyote Creek and Carbon Creek in the San Gabriel River Watershed in the northern part of the watershed. Although outside the Santa Ana River Watershed boundaries, these areas are within the jurisdiction of the Regional Board Region 8.

Brief History of Santa Ana River Watershed

The Santa Ana River (SAR), its tributary streams, and the groundwater basins provided adequate water for early inhabitants of the watershed. By the late nineteenth century, the region had developed a successful agricultural economy. By the early twentieth century, expanding farms and orchards along with increased population began to outgrow available water supplies. The Colorado River Aqueduct (CRA) was the first facility to bring imported water into the region, followed by the State Water Project (SWP).

By the time of passage of the California Porter-Cologne Water Quality Act in 1969, population growth, agriculture, and industry already had created a legacy of water quality problems. Agricultural irrigation, fertilizer use, and dairy operations added nutrients and salts to groundwater supplies. Use of pesticides contributed to the contamination of soils and groundwater. In some areas, 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 included stormwater runoff from urban areas, non-storm nuisance flows from landscape irrigation, increased salt concentrations, and elevated levels of nutrients.

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. Challenges still remain.

Regulatory Framework

Drinking Water Regulations

The California Safe Drinking Water Act (Health and Safety Code, Section 116270 et seq.) directs the California Department of Public Health (CDPH) Division of Drinking Water and Environmental Management 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.

Water Quality Control Plan, Santa Ana River Basin

The State Water Resources Control Board (State Board) and the Regional Board are responsible for implementing California's Porter-Cologne Water Quality Control Act and the Federal Clean Water Act. These State and Federal laws, and associated regulations and policies, 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.

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 (WQOs), and implementation plans to achieve the standards.

Beneficial uses as listed in the Basin Plan for waterbodies within the SARW include:

- Municipal and domestic supply
- Agricultural supply
- Industrial service supply
- Industrial process supply
- Groundwater recharge; navigation
- Hydropower generation
- Water contact recreation
- Non-contract water recreation
- Commercial and sport fishing
- Warm freshwater habitat
- Cold freshwater habitat
- Preservation of biological habitats of special significance
- Wildlife habitat
- Rare, threatened, or endangered species
- Spawning, reproduction and development
- Marine habitat
- Shellfish harvesting.

WQOs are set to establish reasonable protection of the beneficial uses. WQOs and beneficial uses are specified according to water body type: ocean waters, enclosed bays and estuaries, inland surface waters, and groundwater.

Since its last major revision in 1995, the Basin Plan has been amended eleven times. Amendments added Total Maximum Daily Loads (TMDLs) in 1998, 1999, and 2003through 2006; made provisions for and included time schedules in waste discharge requirements (2000); revised bacterial objectives in ocean waters (1997); and incorporated a revised Nitrogen/Total Dissolved Solids (N/TDS) management plan (2004). To implement the N/TDS plan, stakeholders and the Regional Board formed the Basin Monitoring Program Task Force (BMPTF). The Task Force is developing and implementing a monitoring program for nitrate and TDS in both groundwater and surface water in the watershed.

Basin Plan amendments are adopted through a public basin planning process. The process requires approval by the Regional Board, State Board, California Office of Administrative Law, and United States Environmental Protection Agency (EPA). The Regional Board establishes priorities for Basin Plan revisions approximately every three years; the latest of these triennial reviews was conducted in 2006. Clearly, the schedule for triennial reviews has slipped reflecting a lack of resources and staff at the Regional Board to be able to conduct these reviews as planned. Updating the 2006 triennial review would be the first step in an effort to determine water quality project preferences in the watershed and to integrate with other regional needs to define integrated management strategies that meet water quality and water supply goals.

The primary methods of enforcing water quality regulations are through the issuance of the (Federal) National Pollutant Discharge Elimination System (NPDES) Permits and State Waste Discharge Requirements.In California, both permit programs are administered by the State Board and the Regional Boards. These permits regulate discharges to surface waterbodies of both wastewater and urban runoff from municipal and industrial systems, and stormwater runoff from municipal separate storm sewer systems, industrial sources, and construction sites. Permit requirements are based on technology-based limits for wastewater and maximum extent practicable standard for stormwater intended to meet water quality standards.

Several monitoring programs in the watershed involve the collection of data on the water quality of surface waterbodies and groundwater basins. The BMPTF is responsible for collecting and analyzing data in order to calculate the ambient TDS and nitrate concentrations in the region's groundwater basins. The Regional Board requires a re-calculation of ambient concentration every three years. The Imported Water Recharge Workgroup is tasked with the responsibility of documenting the TDS and nitrate load to groundwater basins from the use of imported water for groundwater recharge. The Emerging Constituents Workgroup conducts a program to sample and analyze surface waterbodies in the watershed to test for a selected group of emerging constituents. The Middle SAR TMDL Task Force developed and is implementing a Comprehensive Bacteria Reduction Plan for Riverside and San Bernardino Counties, which includes sampling selected surface water sites to be analyzed for fecal bacteria indicators. The Stormwater Quality Standards Task Force conducted a comprehensive evaluation of surface waterbodies to assess conditions for and existing use of sites for water-contact recreation.

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 Clean Water Act Section 303(d) List of Water Quality Limited Segments, which initiates a process to develop TMDLs. A TMDL is considered to be adopted when approved by the Regional Board, the State Board, the California Office of Administrative Law, and the EPA.

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:

- discharges from wastewater treatment facilities
- non-point source pollutants in runoff from residential areas
- forested lands
- agriculture
- streets or highways, etc.
- soils/sediments polluted with legacy contaminants such as DDT and PCBs
- on-site disposal systems (septic systems); and deposits from the air

Projected growth that could increase pollutant levels may be considered. TMDLs allocate allowable pollutant loads for each source and identify management measures that, when implemented, will assure that water quality standards are attained.

California Toxics Rule

The California Toxic Rule was promulgated by the EPA 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 prepared by the State Board as required by the Clean Water Act. The plan is implemented by State Board and the coastal Regional Boards. It lists beneficial uses for marine waters, including protection of Areas of Special

Biological Significance (ASBS), rare and endangered species, marine habitat, fish migration, recreation, fishing, aesthetic enjoyment, and others. Narrative and numerical WQOs are set to protect designated beneficial uses. The objectives are implemented through a program that sets waste discharge limitations, monitoring, and enforcement. Through a triennial review process, the plan sets priorities for actions over the next three-year period.

Ocean Water-Contact Standards- AB 411

In 1996, AB 411 (Wayne) required the establishment of bacteriological ocean water quality standards to protect public health (CCR Sections 7956-7962). Contaminated runoff and untreated sewage spills are two of the most common factors that negatively impact ocean water quality. 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 is known or suspected, access to the affected waters is restricted.

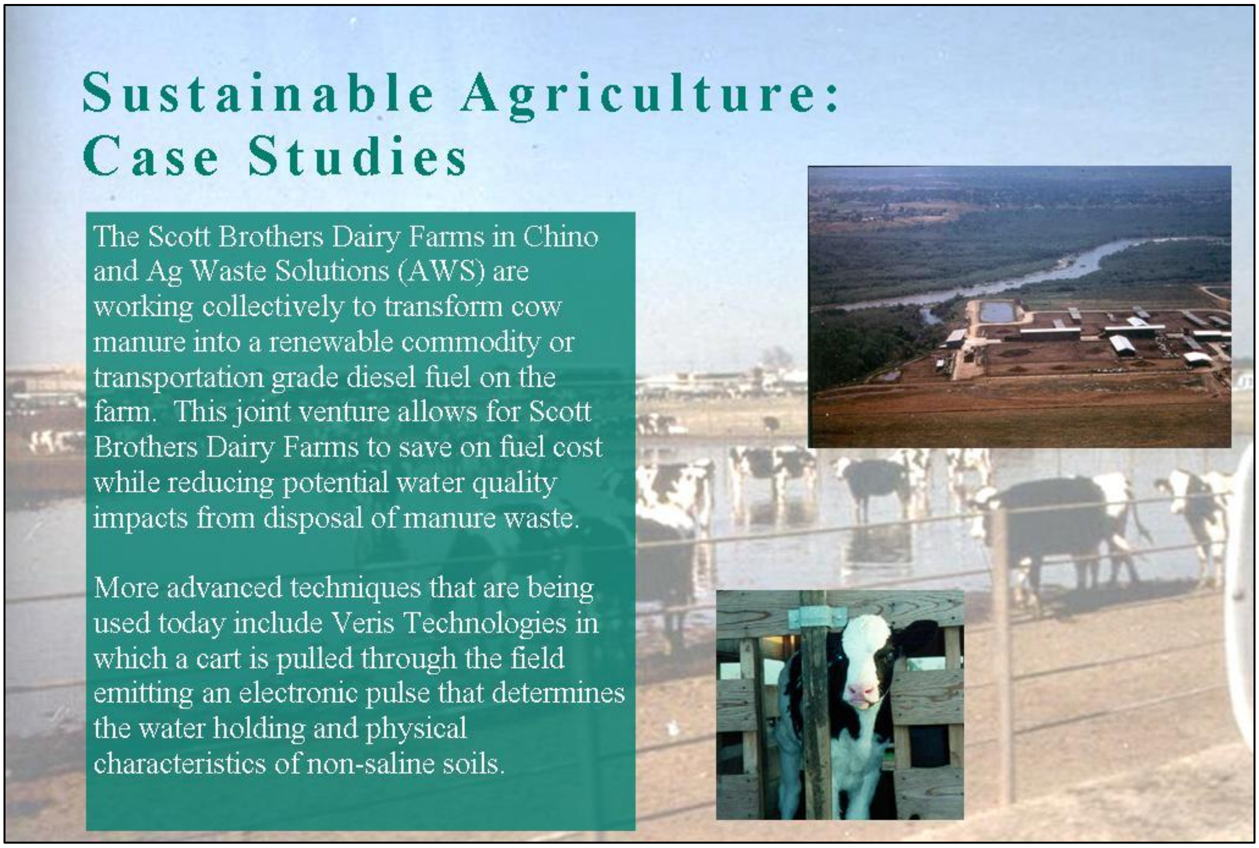
Agriculture and Dairies: Water Quality Protection

Regulatory agencies in the watershed have taken a number of regulatory actions to address water quality impacts related to agricultural and dairy practices in the region, including impacts to both surface water and groundwater due to runoff from manure in dairy farm corrals, spreading of manure for fertilizer in agricultural fields, and use of pesticides.

In 2007 the Regional Board issued R8-2007-0001 *(NPDES No. CAG018001): General Waste Discharge Requirements for Concentrated Animal Feeding Operations (Dairies and Related Facilities) within the Santa Ana Region (Santa Ana RWQCB, 2007)* prohibiting all dairies in the watershed from discharging process wastewater or stormwater runoff up to a 25-year, 24-hour rainfall event and requiring each facility to develop a Engineered Waste Management Plan. This permit was amended with adoption of R8-2013-0001, which directed dairies in the San Jacinto Watershed to collaborate with Eastern Municipal Water District’s Salinity Management Program.

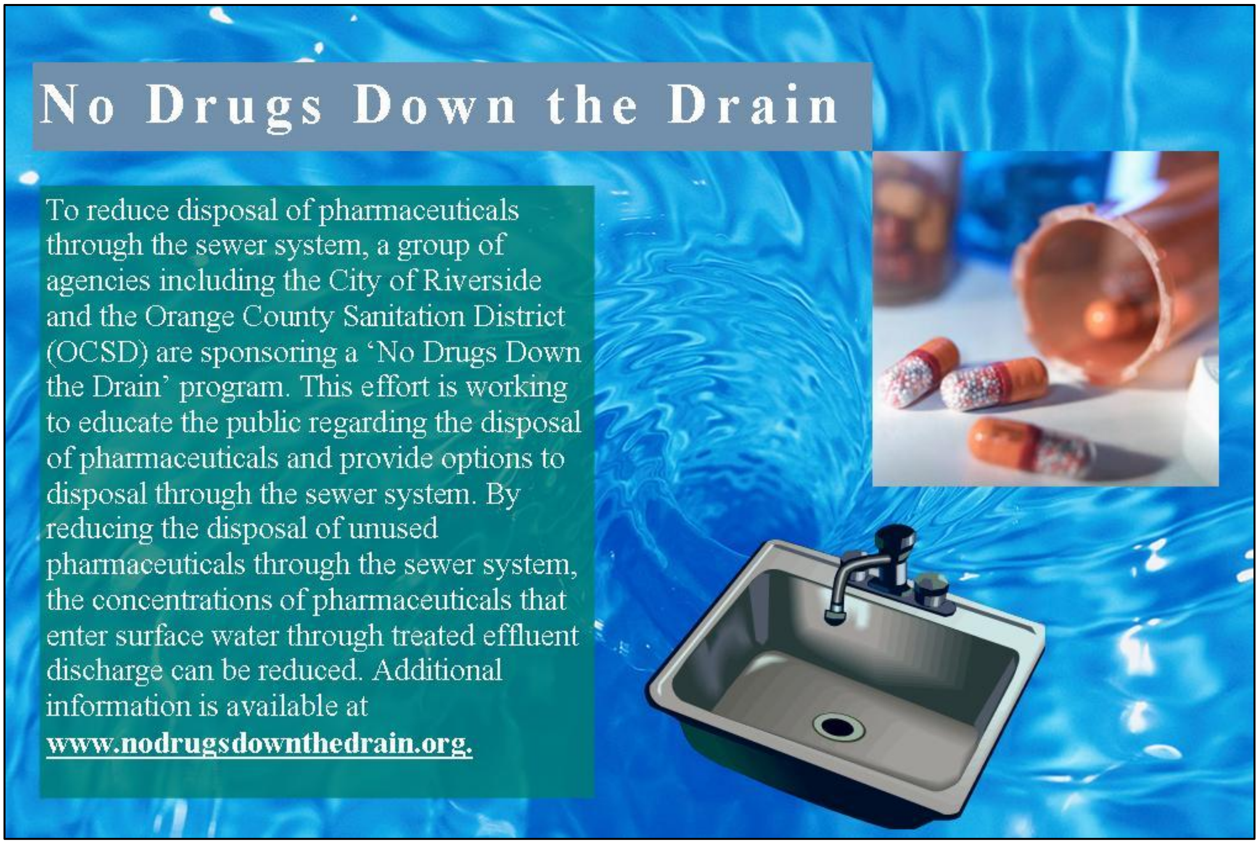
The Riverside County Ordinance 427.2, passed by the Riverside Board of Supervisors, regulates safe transportation and application of manure in certain county districts by requiring operators and/or landowners to report manure application. The purpose of the ordinance is to minimize impacts to neighboring 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 (MMS) as part of the Integrated Regional Dairy Management Plan (IRDMP). The IRDMP addresses dairy issues of concern on a regional basis. The MMS addresses nutrient and salt loadings by specifying that manure be applied to land at rates consistent with cropping practices and groundwater conditions. The MMS will prohibit over-application at sites where potential impacts to groundwater basins are a concern. Excerpts of the MMS have been adopted by the RWQCB in the new manifest forms under the new 2013 permit.



Constituents of Emerging Concern

The potential impact of trace levels of constituents of emerging concern in water supplies has become an increasing concern for water and wastewater agencies, regulators, and the public.



These constituents, also referred to as 'emerging constituents', include a wide range of chemical constituents, including pharmaceuticals, personal care products, pesticides, and other synthetic organic compounds. Potential constituents may include thousands of chemicals in consumer and health-related products such as drugs, food supplements, fragrances, sun-screen agents, deodorants, and insect repellants. Typically, these constituents of emerging concern are found at very low concentrations (*i.e.*, parts per trillion) in waterbodies. Some of these chemicals enter surface water through the discharge of treated effluent when the public disposes of unused pharmaceuticals through the sewer system or the pharmaceuticals that are consumed are not entirely broken down in the human body.

Constituents of emerging concern currently are not regulated by Federal or State agencies and very few have regulatory levels or California Notification Levels. In general, when detected, the chemicals occur at low concentrations in surface water. Although ecological impacts to fish and other wildlife have been shown for some of these trace contaminants in waterbodies, less is known about potential human health effects. However, some of these constituents are known or suspected to have endocrine disrupting effects, if present at a sufficiently high concentration. In addition, concerns are being raised about the potential reproductive and developmental effects of these compounds. There is a significant amount of research being done in the area of ecological and human health effects and new information continues to be developed on the significance of this issue.

A major driver in characterizing these constituents in water supplies is the use of newly developed analytical methods. As laboratory methods improve, new tests can detect substances at lower and lower concentrations. As many of these methods are not standard, they are considered research methods with development still ongoing. As part of the methods development process, issues such as method detection limits and intra- and inter-laboratory comparisons are being evaluated.

Emerging Constituents Program Task Force

As part of the issuance of a tentative Waste Discharge Requirement General Order in 2006, the Regional Board requested that a program be developed to study and evaluate the potential water quality impacts of emerging constituents in imported water. A study group was convened with recharging agencies that were party to the cooperative agreement for water recharge as well as wastewater treatment agencies in the Santa Ana Region. The group, known as the SAWPA Emerging Constituents Program Task Force, is charged with surveying current water quality monitoring programs, regulatory issues, stakeholder concerns, analytical methods and the state-of-the-science with respect to potential public health and environmental impacts of emerging constituents. In the absence of formal regulatory guidance or requirements, the workgroup developed a water quality characterization program designed to address the concerns raised by regulatory agencies and other stakeholders throughout the Watershed.

The program involves an annual sampling program, the results of which are documented in an annual report the Regional Board. Annual sampling was conducted and documented in calendar years 2010-2012, with similar activity scheduled for 2013 and every three years thereafter. Modifications to the sampling program have been made each year in order to respond to analytical, regulatory, and public health developments. In mid-2010, a Science Advisory Panel convened by the State Board issued their final report on monitoring strategies for constituents of emerging concern in recycled water. The Panel's recommendations were the basis for the 2013 amendment to the State Board's Recycled Water Policy that added emerging constituent monitoring requirements for permitted recycled water projects, with a primary focus on groundwater recharge.

Additional research is needed on the public health significance of low level concentrations of these constituents, especially when they occur as mixtures. Knowledge of the potential human health effects at low concentrations is limited for compounds other than pharmaceuticals, and data gaps exist in trying to establish levels of human health risk or regulatory limits. However, public concern is a significant issue and will need to be addressed before complete scientific-based health information is available.

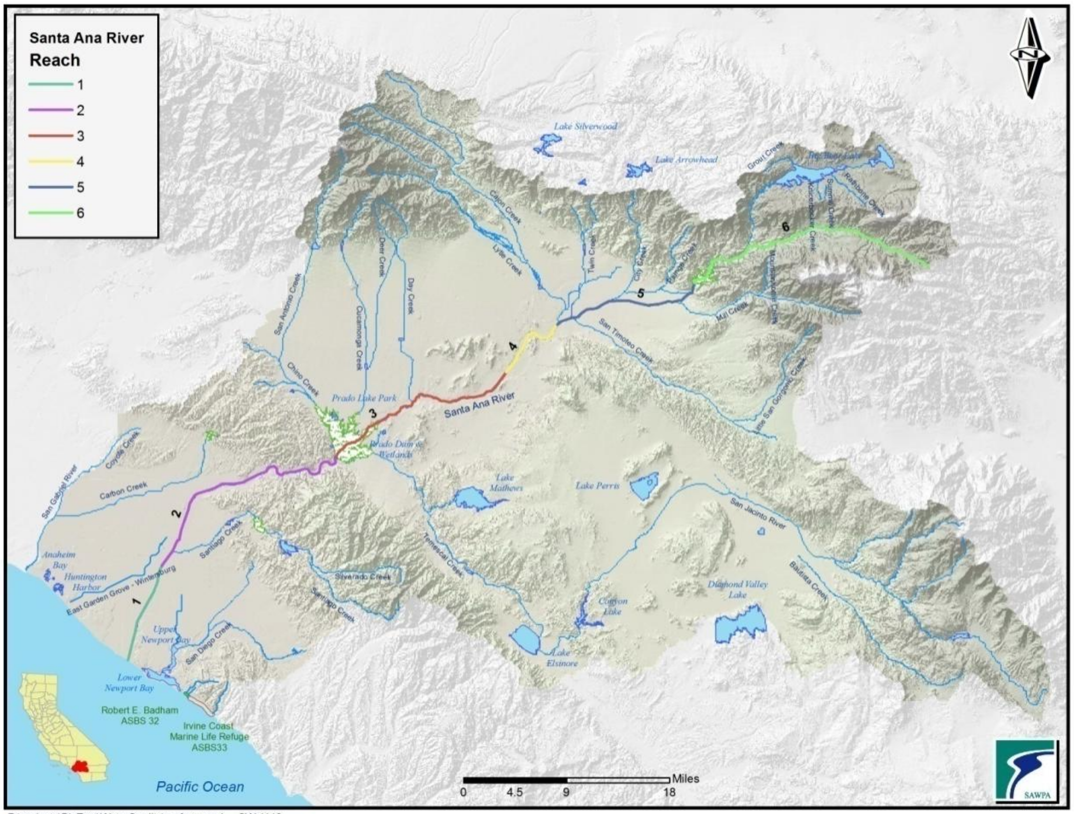
Surface Water

Surface water in this chapter includes rivers, streams, creeks, lakes, and bays and estuaries. These waters provide many benefits to the watershed, including water supply, habitat, and recreation.

Current Conditions

Water in less developed and non-agricultural areas of the watershed is typically the highest quality water in the watershed. Agricultural, industrial, commercial, and residential developments over the last, approximately, 150 years have degraded surface water quality. Pollutants include nutrients, sediment, pesticides and microbial contaminants, such as bacteria. Concentrations of soluble mineral substances commonly referred to as 'salinity' or 'TDS', also impact surface water quality. In developed areas and agricultural areas, stormwater carries pollutants from roads, parking lots, and other sources, degrading the quality of water as it flows downstream. The following sections describe surface water conditions in each reach of the Santa Ana River Watershed as defined by the Basin Plan and shown in **Figure 5.5-1**.

Figure 5.5-1 Santa Ana River Watershed, Surface Waters



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Waterbodies that do not meet water quality standards are identified as impaired and are placed on the 303(d) List of Water Quality Limited Segments. A water body remains on the list until a TMDL is adopted and the water quality standards are attained or there are sufficient data to demonstrate that water quality standards have been met and delisting should take place.

Figure 5.5-2 shows the locations of impaired waterbodies where the Regional Board has yet to begin the process of developing TMDLs. Surface waterbodies where TMDL projects are in the process of development, as shown on the Regional Board's TMDL project list, are shown in **Figure 5.5-3**.

Figure 5.5-2 Santa Ana River Watershed, Impaired Waterbodies

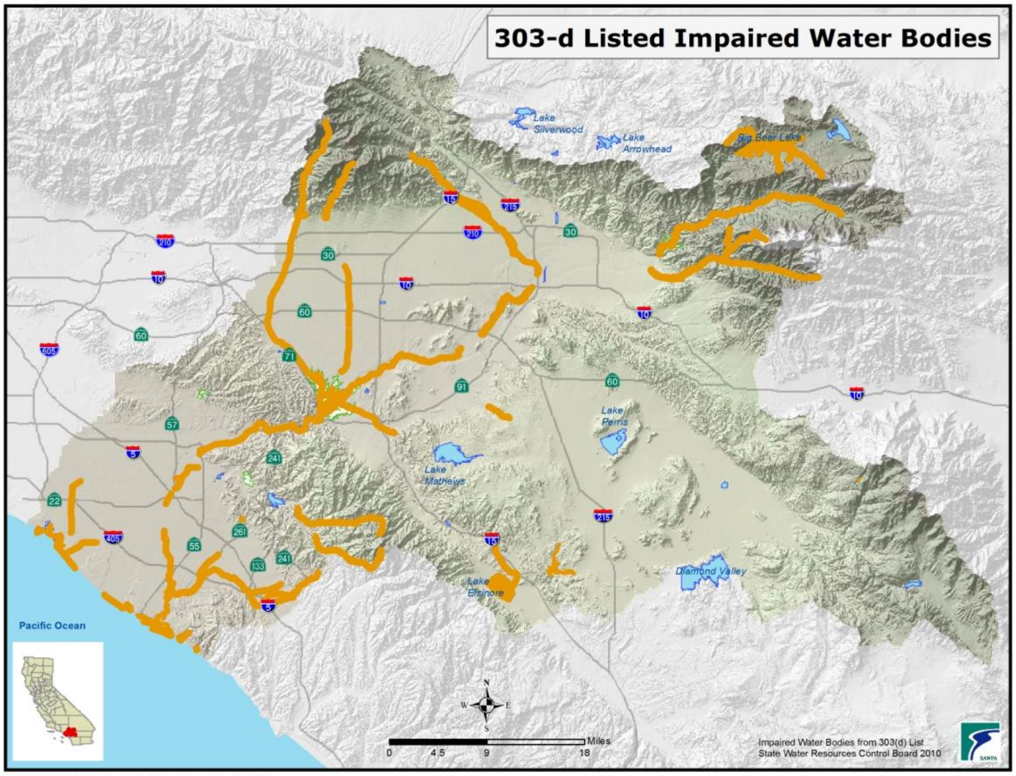

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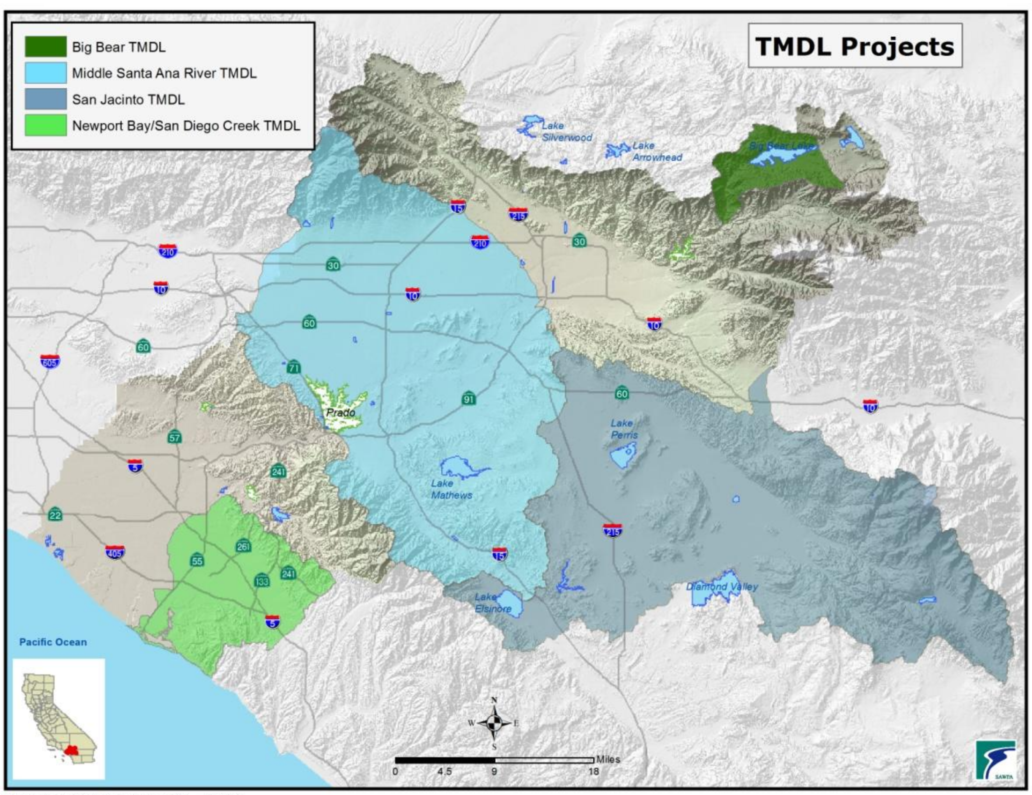
Figure 5.5-3 Santa Ana River Watershed, TMDL Projects



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SAR Reach 6

Past and present land use practices have negatively impacted water quality in Big Bear Lake and the SAR, Reach 6. Impairments and current TMDL projects are shown in **Table5.5-1** and **Table5.5-2.**

Table 5.5-1 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – Big Bear Lake Watershed

Water Body	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Big Bear Lake	Mercury	Resource extraction	2007
	PCBs	Unknown	2019
	Noxious Aquatic Plants	Construction/Land Development and Unknown Nonpoint Source	2007
	Nutrients	Construction/Land Development and Snow Skiing Activities	2007

Table 5.5-2 TMDL Projects – Big Bear Lake Watershed

Water Body	Pollutant (s)	TMDL Project	Status
Big Bear Lake	Noxious aquatic plants Nutrients	Nutrient TMDL for Dry Hydrological Conditions for Big Bear Lake	Implementation Phase

Shay Creek, Shay Meadows, and Baldwin Lake are relatively undeveloped areas that contain natural resources highly valued by stakeholders. Shay Creek and Baldwin Lake have threatened and endangered plant species, as well as the endangered, unarmored three-spine stickleback fish and a unique wetlands system. The U.S. Fish and Wildlife Service, U.S. Forest Service, and the California Department of Fish and Wildlife are interested in restoring the quality of these waters.

Grout, Knickerbocker, Summit, and Rathbone (Rathbun) Creeks, tributaries to Big Bear Lake, are listed as impaired, as shown in **Table 5.5-3**.

Table 5.5-3 TMDL Projects in the Big Bear Lake Watershed

Impaired Water Body	Pollutant (s)	TMDL Project	Status
Grout Creek	Nutrients	Nutrient TMDLs for Big Bear Lake Tributaries	Under development
Knickerbocker Creek	Pathogens	Knickerbocker Creek Bacterial Indicators	USEPA Action
Rathbone Creek	Nutrients	Nutrient TMDLs for Big Bear Lake Tributaries	Under development
	Sedimentation/ siltation	Sediment TMDLs for Big Bear Lake and Rathbone Creek	Other Action
	Cadmium	Cadmium TMDLs for Rathbone Creek	TMDL Required
	Copper	Copper TMDLs for Rathbone Creek	TMDL Required
Summit Creek	Nutrients	Nutrient TMDLs for Big Bear Lake Tributaries	TMDL Required

Mountain Home Creek and mountain reaches of Mill Creek and Lytle Creek are impacted by high seasonal recreational use and/or flow through remote residential communities. Impairments are shown in **Table 5.5-4.** Although the potential sources on the official 2010 303(d) list for pathogens is "unknown nonpoint source", sources are likely from sewage spills, recreational activities, and residential development.

Table 5.5-4 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs

Water Body	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Lytle Creek, Mountain Home Creek, Mountain Home Creek-East Fork, Mill Creek-Reaches 1 and 2	Pathogens	Unknown nonpoint source	2019
Santa Ana River Reach 6	Cadmium. Copper, Lead	Source Unknown	2021
San Antonio Creek	pH	Source Unknown	2021

The water quality of Reach 6 (the SAR upstream of the Seven Oaks Dam) and Reach 5 (the Seven Oaks Dam to the San Jacinto Fault) and their tributaries is generally very good, with low to very low levels of TDS, indicator bacteria, or other pollutants. Impounding water behind the Seven Oaks Dam reduces water quality because of sediment entrapment and algae growth. This may render some of the impounded water unsuitable for use unless additional treatment is provided. The U.S. Army Corps of Engineers is studying this problem.

Many of the mountain reaches of these streams support self-sustaining populations of trout and other indigenous aquatic species. Several rare, threatened, and endangered species inhabit these areas including the unarmored three spine stickleback, the San Bernardino kangaroo rat, the yellow-legged mountain frog, the speckled dace, the Santa Ana woolly star, the least Bell's vireo, and the Southwest Willow Flycatcher.

Santa Ana River Reach 5

Reach 5 and its primary tributaries are believed to meet the Basin Plan's water quality standards. However, this may be due to the lack of recent or rigorous water quality assessments rather than a true indication of water quality. Segments of many of these streams support or have the potential to support a wide range of beneficial uses.

Santa Ana River Reach 4

Reach 4 includes the river from the San Jacinto Fault down to Mission Boulevard Bridge in Riverside. In this reach, all the WQOs are being met except for fecal coliform. **Table 5.5-5** summarizes the 303(d) listing for pathogens for Reach 4.

Table 5.5-5 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs

Water Body	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Santa Ana River-Reach 4	Pathogens	Nonpoint source	2019

Santa Ana River Reach 3 and Chino Basin Surface Waterbodies

Reach 3 includes the portion of the river from Mission Boulevard Bridge to Prado Dam. Rising groundwater feeds small creeks tributary to Reach 3 that are important breeding and nursery areas for native fish. Excessive nutrient loading in Reach 3 was addressed by amendments to the Basin Plan as recommended by the N/TDS Task Force. Watershed partners are working closely with regulators to improve the quality of impaired waterbodies and to develop TMDLs as shown in **Tables 5.5-6** and **5.5-7**.

Table 5.5-6 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – Santa Ana River, Reach 3

Water Body	Pollutant/ Stressor	Potential Sources	Proposed TMDL Completion
Chino Creek-Reach 1 and Mill Creek (Prado Area)	Nutrients	Agriculture, dairies	2019
Mill Creek (Prado Area)	TSS	Dairies	2019
Prado Park Lake	Nutrients	Nonpoint source	2019
SAR Reach 3	Lead	Source Unknown	2021
	Copper	Source Unknown	2021
Chino Creek Reach 2	pH	Source Unknown	2021
Cucamonga Creek – Valley Reach	Cadmium	Source Unknown	2021
	Copper	Source Unknown	2021
	Lead	Source Unknown	2021
	Zinc	Source Unknown	2021
Cucamonga Creek – Mountain Reach	pH	Source Unknown	2021
Chino Creek Reach 1B	COD	Source Unknown	2021
	Nutrients	Agriculture	2019
Temescal Creek Reach 1	pH	Source Unknown	2021
Temescal Creek, Reach 6	Indicator Bacteria	Source Unknown	2021

Table 5.5-7 TMDL Projects-Santa Ana River Watershed, Reach 3

Impaired Water Body	Pollutant(s)	TMDL Project	Status
Chino Creek-Reach 1, Mill Creek (Prado Area); SAR-Reach 3, Prado Park Lake	Pathogens	Bacterial Indicator TMDLs for the Middle SARWWaterbodies	Implementation Phase
Chino Creek-Reach 2;Cucamonga Creek-Valley Reach	High coliform count		
SAR – Reach 3	Nitrate	SAR, Reach 3 Nitrate TMDL	Implementation Phase

Prado Wetlands

The Orange County Water District (OCWD) operates the Prado Wetlands in Riverside County to remove nitrogen from SAR water. During non-storm conditions, the river flow upstream of the Prado Wetlands consists predominately of tertiary-treated effluent discharged from wastewater treatment plants. Before reaching the Prado Dam, river water is diverted through 465 acres of constructed wetlands with more than 50 engineered ponds. Following wetland treatment, the water is then discharged into Chino Creek, and then back to the SAR. The wetlands serve as a natural, cost-effective treatment to reduce nitrate levels before the water flows to Orange County, where it is used for groundwater recharge. The Prado Basin is home to several rare and endangered bird and waterfowl species. More than 124 acres are set aside as protective habitat for the endangered least Bell's vireo and Southwestern Willow Flycatcher.

Middle Santa Ana River TMDL Task Force

In 2007, in support of local stakeholders, SAWPA formed a multi-agency task force to address the pathogen TMDLs in the Santa Ana River Reach 3 and its tributaries. This area was named the Middle SAR by the Regional Board. This task force includes county agencies, cities, dairies, and agricultural operators. The MSAR Bacteria TMDL requires implementation of a watershed-wide compliance monitoring program for bacterial indicators. The first water quality assessment was submitted to the Regional Board for sampling conducted from 2007-08. The Counties of Riverside and San Bernardino have completed and are implementing Comprehensive Bacteria Reduction Plans. The agricultural community is developing an Agricultural Source Management plan.

Temescal Creek

Temescal Creek, also called Temescal Wash, stretches approximately 25 miles from Lake Elsinore to Prado Basin. However, water overflows from the lake to the creek only during very wet periods. For most of the year, portions of the creek are dry, and flow in Temescal Creek originates downstream of Lake Elsinore. Water quality in the creek is impacted by non-point source pollution. Recycled water produced at Eastern Municipal Water District's (EMWD) Regional Water Reclamation Facilities, Elsinore Valley Municipal Water District's Regional Water Reclamation Facility, City of Corona's Wastewater Treatment Plant IB, and Lee Lake Water District's Wastewater Treatment Plant is discharged to Temescal Creek.

Lake Mathews

Lake Mathews, located in Riverside County, is the terminal reservoir for the Colorado River Aqueduct. Metropolitan Water District of Southern California (MWDSC) owns and operates the 182,000 acre-foot reservoir to supply Colorado River water to its member agencies. The Lake Mathews Watershed is drained primarily by Cajalco Creek which has intermittent flows during storm events or in the presence of urban or agricultural runoff.

The Lake Mathews Drainage Water Quality Management Plan (DWQMP) was completed in the early 1990's through a partnership between Metropolitan, County of Riverside, and Riverside County Flood Control and Water Conservation District (RCFCandWCD) to protect water quality in Lake Mathews from runoff pollution. Under the DWQMP, runoff would be managed and mitigated by the implementation of BMPs throughout the watershed, including several regional stormwater treatment facilities. As recommended in the DWQMP, the Cajalco Creek Dam and Detention Basin and multiple sediment basins have been constructed to detain runoff flows and allow sediment to settle. In 2012, Metropolitan, County of Riverside, and RCFCandWCD completed the Lake Mathews Watershed Study and developed a watershed model for Lake Mathews to assess the effects of future development on runoff pollution. The study evaluated and prioritized stormwater management options that would be pursued, as watershed development conditions warrant, to ensure long-term protection of Lake Mathews.

San Jacinto Watershed

The San Jacinto River (SJR) originates in the San Jacinto Mountains and flows through the San Jacinto Valley. The valley, although undergoing considerable development, still contains citrus orchards, dairy farms, and other agricultural operations.

The SJR passes through Railroad Canyon to Canyon Lake before draining into Lake Elsinore. Lake Elsinore is a natural endpoint for its tributaries, and has no natural outlet. Historically, the lake was known to dry completely; imported and recycled water are now used to maintain the water level. To provide a water outlet during heavy rains, Lake Elsinore was modified to allow overflow into Temescal Creek, which drains into the SAR. Nutrients from sources such as septic systems, farming, reclaimed water, and poor land use practices can cause significant algae growth in the lake, thereby impairing recreational use and degrading aesthetic values. Moreover, excessive algae growth in the lake depletes dissolved oxygen resulting in occasional fish kills.

Lake Elsinore and Canyon Lake Nutrient TMDL Task Force.

In 2006, Lake Elsinore and San Jacinto Watersheds Authority (LESJWA) administered the formation of a multi-agency task force to address nutrient TMDLs for Lake Elsinore and Canyon Lake. Over 20 agencies joined the task force to work with the Regional Board to implement studies, monitoring and water quality improvements necessary to achieve TMDL targets for 2015 and 2020 at both lakes. Many water quality improvements at Lake Elsinore implemented by LESJWA from 2005-2012 that produced significant improvements and progress toward TMDL compliance. With TMDL interim targets approaching, greater focus has been place on water quality improvements at Canyon Lake, upstream of Lake Elsinore.

To assist the Task Force, the Regional Board agreed to defer lake monitoring at Canyon Lake and Lake Elsinore from 2013-2015 to allow funding resources to directed for implementation measures at Canyon Lake. Canyon Lake improvements include chemical addition, alum application, a common nutrient flocculating agent used in water treatment and possible an oxygenation injection system dependent on the results of alum application. The improvements at both lakes will also be supplemented by ongoing BMP measures implemented in the upper watershed by the municipal stormwater permittees and agricultural operators. This Task Force established one of the first TMDL agreements signed by Federal, State, and local parties in the State. The cooperative effort has enabled agencies to combine efforts, economically address water quality challenges, and pursue additional grant funding for this process.

Lake Elsinore

Lake Elsinore is on the 303(d) list as impaired for Polychlorinated Biphenyls (PCBs) and unknown toxicity. Nutrient TMDLs for Lake Elsinore and Canyon Lake have been developed as shown in **Table5.5-8** and **Table5.5-9**. A Nutrient Source Assessment, a Nutrient Management Plan, and a Bacteria Source Assessment have been completed on Canyon Lake. The bacterial indicator TMDL for Canyon Lake may be revised by the Regional Board if the Stormwater Quality Standards Task Force's recommended change of the REC-1 Pathogen Standards from fecal coliform to E. coli is adopted into the Basin Plan. Should this change occur, Canyon Lake is likely to be in compliance with REC-1 standards and taken off the 303(d) list.

Table 5.5-8 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – San Jacinto Watershed

Water Body	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Lake Fulmor	Pathogens	Unknown nonpoint source	2019
Lake Elsinore	PCBs	Source unknown	2019
	Unknown toxicity	Unknown nonpoint source	2007

Table 5.5-9 TMDL Projects – San Jacinto Watershed

Impaired Water Body	Pollutant(s)	TMDL Project	Status
Canyon Lake (Railroad Canyon Reservoir)	Nutrients	Nutrient TMDLs for Lake Elsinore and	Implementation Phase
	Pathogens	Bacterial Indicator TMDLs for Canyon Lake	Other Action
Lake Elsinore	Nutrients	Nutrient TMDLs for Lake Elsinore and Canyon Lake	Implementation Phase
	Organic Enrichment/ Low Dissolved Oxygen		

Conditional Waiver of Waste Discharge Requirements in the San Jacinto River Watershed

In the San Jacinto River Watershed, waste discharges from a variety of sources (urban, agriculture, transportation, and other) are contributing to pollution in Canyon Lake and Lake Elsinore. In response, the Regional Board adopted nutrient TMDLs for the two lakes. The TMDLs include a variety of tasks that need to be completed by watershed stakeholders to achieve the objectives of restoring water quality in the watershed.

Whereas dairy operators are already contributing to the TMDL program, many other agriculture operators are not. To include all operators of irrigated and other agricultural or livestock operations the Regional Board is developing the Conditional Waiver (of waste discharge requirements) for Agricultural Discharges (CWAD, or “quad”) program. This program will allow for the waiving of waste discharge requirements provided that certain conditions, established by the regional board, are met. The CWAD program will also satisfy the State’s policy for “Implementation and Enforcement of the Non-Point Source Pollution Control Program.”

With stakeholder involvement, Regional Board staff is developing conditions that will be incorporated in a draft conditional waiver that will be considered by the Regional Board. Once the conditional waiver of caste discharge requirements is adopted affected agricultural operators will be required to enroll in the CWAD program or to obtain individual waste discharge requirements.

Lake Perris

Lake Perris, located in western Riverside County, is owned and operated by the California Department of Water Resources (DWR) and is the 2,000-acre terminal reservoir of the East Branch of the California Aqueduct (State Water Project). The lake is a source of water for the MWDSC Water quality concerns, including pathogens, taste and odors, algal toxins, and anoxia within the lake's bottom layer, have limited its use for water supplies.

Recreational activities at the lake include body-contact recreation such as, swimming and water skiing and non-body contact activities such as, boating, fishing, camping, and hiking. Over a million people visit each year, with an estimated 50 percent of the peak season visitors involved in body-contact recreation. Beach closures occur in spite of implementation of several BMPs aimed at reducing coliform levels.

The State Board provided funding to MWDSC to study microbial contamination at the lake. The studies concluded that body-contact recreation was a key source of fecal contamination and recommended voluntary alternatives to swimming in the lake, such as swim lagoons, water play areas and other water features. Modeling and risk analysis suggest that such alternatives would reduce the consumer health risk by one-half (to approximately a 5 percent probability of exceeding the EPA maximum risk level). A CALFED Science Panel in March 2005 concurred with the main findings of the report.

Santa Ana River Reaches 2 and 1 and Santiago Creek Watershed

Reach 2 extends from Prado Dam to 17th Street in the City of Santa Ana. In this reach, the OCWD recharges as much of the river water as possible into the Orange County groundwater basin. Reach 1 extends from 17th Street in the City of Santa Ana to the ocean. In Reach 1, the Talbert and Huntington Beach Channels drain urban and stormwater runoff from the western side of the watershed carrying flow to the Talbert Marsh along the coast. The Greenville-Banning Channel drains the southeast side of the watershed and carries flows to the SAR. This area also includes Huntington Beach State Park.

SAR, Reach 2 is listed as impaired for indicator bacteria. The river's main tributary in Orange County, Santiago Creek, has several impairments as does its tributary, Silverado Creek. Water quality impairments in this area are shown in **Table 5.5-10**.

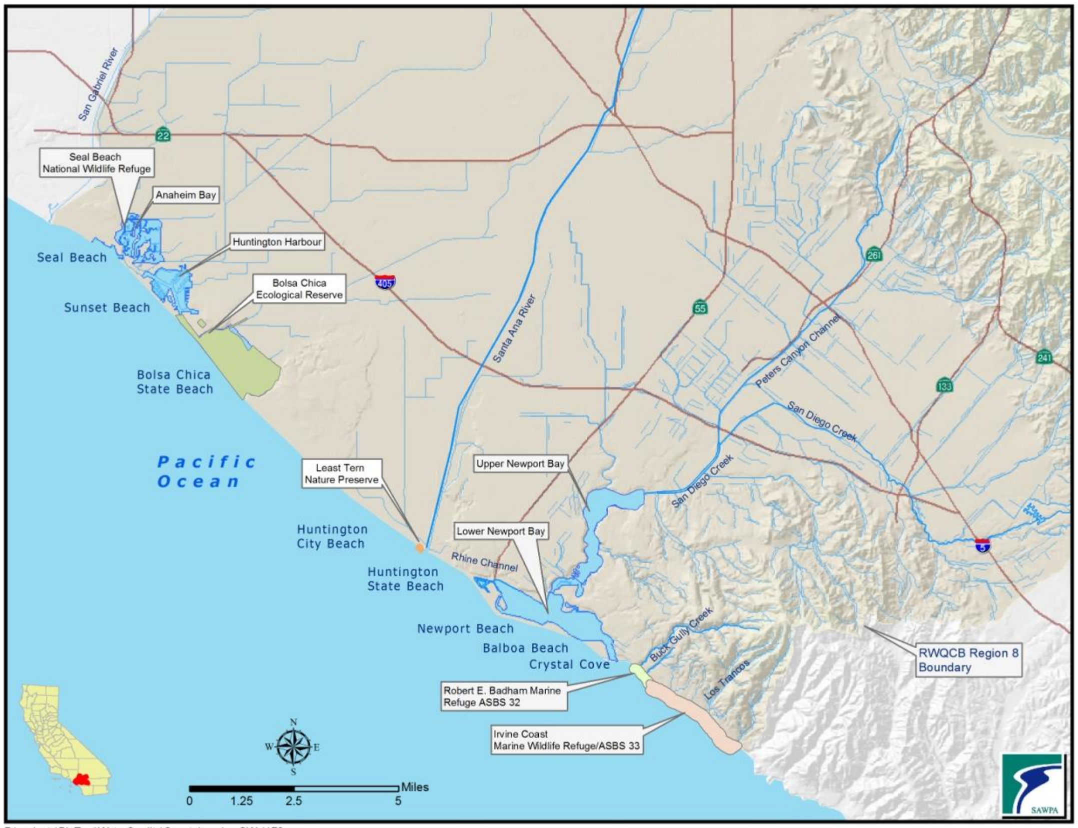
Table 5.5-10 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – Santa Ana River Watershed, Reaches 1 and 2

Water Body	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
SAR, Reach 2	Indicator bacteria		2021
Santiago Creek Reach 4	Salinity, TDS, chlorides	Source unknown	2019
Silverado Creek	Pathogens, Salinity/TDS/ Chlorides	Unknown nonpoint source	2019
Huntington Beach State Park	PCBs	Source unknown	2019
Morning Canyon Creek	Indicator Bacteria	Source Unknown	2021
Serrano Creek	Ammonia (Unionized)/Indicator Bacteria/pH	Source Unknown	2021

West Orange County and Coastal Watersheds

This section discusses the water quality challenges facing coastal bays and harbors and coastal area tributary streams, as shown in **Figure 5.5-4**.

Figure 5.5-4 Coastal Area



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San Gabriel River Watershed- Coyote Creek

The San Gabriel River Hydrologic Unit lies within Los Angeles and Orange Counties. Approximately 86 square miles are within Orange County. The area is drained by a number of tributaries to the San Gabriel River, including Coyote Creek and Carbon Creek that originate in the foothills of northern Orange County. This area is highly urbanized and dry weather urban runoff and wet weather stormwater runoff discharge 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. TMDLs for Coyote Creek are listed in **Table 5.5-11**.

Table 5.5-11 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – San Gabriel Watershed

Water Body	Pollutant/Stressor	Potential sources	Proposed TMDL Completion
Coyote Creek	Lead	Major Municipal Point Source-wet weather discharge	TMDL Approval in 2007
	Toxicity	Point source	2008
	Diazinon, pH	Point, nonpoint source	2019
	Indicator Bacteria	Source Unknown	2009
	Copper, Dissolved	Source Unknown	TMDL Approved in 2007
	Ammonia	Point Source	2019
Seal Beach	Enterococcus, PCBs	Source unknown	2019
Coyote Creek	Lead	Major Municipal Point Source-wet weather discharge	San Gabriel River Metals (39)
	Copper, Dissolved	Source Unknown	San Gabriel River Metals (39)

Note: Dissolved Copper and Lead is being addressed by a EPA approved TMDL (San Gabriel River Metals (39)) and is being considered for removal under sections 2.2 and 4.1 of the Listing Policy.

Anaheim Bay and Huntington Harbour Watershed

The Anaheim Bay and Huntington Harbour Watershed covers approximately 80 square miles in northwestern Orange County. One of its three tributaries, the Los Alamitos Channel, drains into the San Gabriel River. The Bolsa Chica Channel empties into the Anaheim Bay and Huntington Harbor complex. The East Garden Grove-Wintersburg Channel drains through Bolsa Bay into Huntington Harbor.
The Anaheim Bay and Huntington Harbor complex is located at the northwestern edge of 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. Impairments in Anaheim Bay and Huntington Harbor are shown in **Table 5.5-12**.

Table 5.5-12 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – Anaheim Bay and Huntington Harbor Watershed

Name	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Anaheim Bay	Dieldrin (tissue), nickel, PCBs, sediment toxicity	Source unknown	2019
Huntington Harbor	Chlordane, copper, lead, nickel, PCBs, sediment toxicity	Source unknown	2019
	Pathogens	Urban runoff, storm sewers	2019
Bolsa Chica State Beach	Copper, nickel	Source unknown	2019
East Garden Grove Wintersburg Channel	Ammonia (Unionized)	Source Unknown	2021
Bolsa Chica Channel	Ammonia (Unionized)	Other Urban Runoff/Surface Runoff/Storm Sewers/Unknown Nonpoint	2021
	Indicator Bacteria	Source Unknown	2021
	pH	Source Unknown	2021

Newport Bay Watershed

The Newport Bay Watershed covers approximately 152 square miles in central Orange County, draining into upper Newport Bay. San Diego Creek drains 80 percent of the watershed, with Santa Ana Delhi Channel draining 15 percent.

San Diego Creek

San Diego Creek Reach 1 and Reach 2 impairments and TMDL projects are listed in **Tables 5.5-13** and **5.5-14**. The TMDLs include all San Diego Creek tributaries.

Table 5.5-13 TMDL Projects - Newport Bay/San Diego Creek Watershed

Impaired Water Body	Pollutant	TMDL Project	Status
San Diego Creek-Reach 1	Nutrients	Nutrient TMDL for the Newport Bay-San Diego Creek Watershed	Implementation Phase
	Pesticides	San Diego Creek-Newport Bay Organochlorine Compounds TMDLs	Technical TMDLs
		Diazinon and Chlorpyrifos TMDL for San Diego Creek and upper Newport Bay	Implementation Phase
	Siltation	Sediment TMDL for the Newport Bay-San Diego Creek Watershed	Implementation Phase
San Diego Creek-Reach 2	Nutrients	Nutrient TMDL for the Newport Bay-San Diego Creek Watershed	Implementation Phase
	Siltation	TMDL for Sediment in the Newport Bay-San Diego Creek Watershed	Implementation Phase
	Unknown toxicity	Addressed by metals and organochlorine TMDLs	Implementation Phase (Being addressed by EPA Approved TMDL)

Table 5.5-14 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – Newport Bay/San Diego Creek Watershed

Name	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
San Diego Creek- Reach 1	Selenium	Source unknown	2007
	Fecal coliform	Urban runoff, storm sewers, other urban runoff	2019
	Toxaphene	Source unknown	2019
San Diego Creek- Reach 2			
	Indicator Bacteria	Source Unknown	2021
Peters Canyon- Channel	DDT, Toxaphene,	Source unknown	2019
	pH	Unknown Point Source, Urban Runoff/Storm Sewers	2021
	Indicator Bacteria	Source Unknown	2021
Borrego Creek	Ammonia (Unionized)	Other Urban Runoff/Unknown Nonpoint Source/Surface Runoff/Storm Sewers	2021
	Indicator Bacteria	Source Unknown	2021

Newport Bay

San Diego Creek flows into Upper Newport Bay. The bay is a unique area containing a fragile coastal ecosystem that is designated as a State Ecological Reserve. Newport Bay is divided into two distinct areas. The 750-acre **U**pper Bay begins at the Pacific Coast Highway Bridge and extends five miles inland. The Lower Bay encompasses the area below the bridge and includes the Rhine Channel; it is separated from the ocean by Balboa Peninsula.

Upper Newport Bay (CCA No. 69)

Upper Newport Bay, a Critical Coastal Area (CCA) with a significant ecosystem, is the receiving waters for impaired flows emanating from the San Diego Creek Watershed. It supports seven diverse estuarine habitats with several hundred species of marine and terrestrial flora and fauna including six federal and state listed, threatened, and endangered species (five bird species, 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, such as California halibut, sand bass, gobies, topsmelt, and anchovy. Impairments and TMDL projects for upper Newport Bay are listed in **Table 5.5-15** and **Table 5.5-16**.

Table 5.5-15 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs – Newport Bay/San Diego Creek Watershed

Name	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Newport Bay, Lower	Copper	Source unknown	2007
	Chlordane, DDT, PCBs, sediment toxicity	Source unknown	2019
Newport Bay, Upper (Ecological Reserve)	Copper	Source unknown	2007
	Chlordane, DDT, metals, PCBs, sediment toxicity	Source unknown	2019
Rhine Channel	Copper, lead, mercury, PCBs, sediment toxicity,	Source unknown	2019
Balboa Beach	DDT, dieldrin, PCBs	Source unknown	2019
Santa Ana Dehli Channel	Indicator Bacteria	Source Unknown	2021
Newport Slough	Enterococcus/Fecal Coliform/Total Coliform	Source Unknown	2021

Table 5.5-16 TMDL Projects - Newport Bay Watershed

Name	Pollutant/ Stressor	Potential Sources	Status
Newport Bay, Lower	Nutrients	Nutrient TMDL for the Newport Bay-San Diego Creek Watershed	Implementation Phase
	Pathogens	TMDL for Fecal Coliform Bacteria in Newport Bay	Implementation Phase
	Pesticides/Priority Organics	San Diego Creek-Newport Bay Organochlorine Compounds TMDLs	Technical TMDLs
		Organochlorine Compounds and Metals TMDL, Lower Newport Bay: Rhine Channel	
	Siltation	TMDL for Sediment in the Newport Bay-San Diego Creek Watershed	Implementation Phase
Newport Bay, Upper (Ecological Reserve)	Metals	San Diego Creek and Newport Bay Metals TMDLs	Technical TMDLs
		Newport Bay-San Diego Creek Selenium TMDL	
	Nutrients	Nutrient TMDL for the Newport Bay/San Diego Creek Watershed	Implementation Phase
	Pathogens	TMDL for Fecal Coliform Bacteria in Newport Bay	Implementation Phase
	Pesticides	Diazinon and Chlorpyrifos TMDL for San Diego Creek and upper Newport Bay	Implementation Phase
		San Diego Creek-Newport Bay Organochlorine Compounds TMDLs	Technical TMDLs
	Siltation	TMDL for Sediment in the Newport Bay-San Diego Creek Watershed	Implementation Phase

Lower Newport Bay and Rhine Channel

The Lower Newport Bay with two main channels is a small boat harbor berthing 9,000 boats. The Rhine Channel is located at the western end of lower Newport Bay. It has been designated by the Regional Board as one of Orange County's hot spots for toxic sediments. Years of operating canneries, metal plating companies, and shipyards deposited PCBs, mercury, and other pollutants in the channel. Several studies have documented contamination in the channel. Impairments and TMDL projects in the Lower Bay and Balboa Beach are listed in **Table 5.5-17** and **Table 5.5-18.**

Newport Bay Watershed Toxics TMDLs

In addition to State Board TMDLs, the EPA has also promulgated Toxics TMDLs in the Newport Bay Watershed. EPA established technical TMDLs (without implementation plans) for toxic pollutants in San Diego Creek and Newport Bay on June 14, 2002. Regional Board staff is developing the State required Basin Plan amendments, including implementation plans. These TMDLs are listed in **Table 5.5-17**.

Table 5.5-17 Newport Bay Watershed Toxics TMDLs

Water Body	Element/Metal	Organic Compound
San Diego Creek	Cd, Cu, Pb, Se, Zn	Chlorpyrifos, Diazinon, Chlordane, Dieldrin, DDT, PCBs, Toxaphene
Upper Newport Bay	Cd, Cu, Pb, Se, Zn	Chlorpyrifos, Chlordane, DDT, PCBs
Lower Newport Bay	Cu, Pb, Se, Zn	Chlordane, Dieldrin, DDT, PCBs
Rhine Channel	Cu, Pb, Se, Zn, Cr, Hg	Chlordane, Dieldrin, DDT, PCBs

Newport Coastal Streams Watershed

The Newport Coastal Streams Watershed encompasses approximately eight square miles south of the Newport Bay Watershed. Several coastal canyons drain this area directly into the ocean, into two ASBS. Both Buck Gully and Los Trancos Creeks are listed as impaired for fecal coliform and total coliform, as shown in **Table 5.5-18**. The City of Newport Beach conducted a study of the water quality of eight coastal canyon creeks (Newport Coast Flow and Water Quality Assessment Final Report, January 2007) to determine if conditions protect beneficial uses and to investigate sources of water quality impairments.

Table 5.5-18 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs

Name	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Buck Gully Creek and Los Trancos (Crystal Cove Creek)	Fecal coliform, total coliform (downstream of Pacific Coast Highway)	Source unknown	2019

Nitrogen and Selenium Management Plan

Nitrogen is an essential nutrient that causes algal blooms when present in excessive quantities. Selenium is a naturally occurring trace element that is found in ancient marine sediments in the foothills of Newport Bay Watershed. When selenium is released to surface waterbodies, such as via passive groundwater seepage and groundwater cleanup/dewatering operations, it accumulates in the food chain to levels that can be harmful to fish and birds.

In renewing the region-wide permit for discharges that pose an insignificant (de minimus) threat in 2004, the Regional Board issued a separate permit for the Newport Bay Watershed for short term groundwater-related discharges. The concern was that high levels of nitrogen and selenium in groundwater discharges would violate established TMDLs. The Regional Board recognized that numerical effluent limits for selenium would be difficult, if not impossible, to meet as there is no technically feasible and economically practical treatment technology available for selenium. As an alternative, the permit allowed for the formation of a working group to develop a comprehensive understanding of and a management plan for controlling levels of selenium and nitrogen in groundwater discharges. In 2005, the participating watershed stakeholders formed the Nitrogen and Selenium Management Program (NSMP) and agreed to fund and implement the NSMP Workplan, which was scheduled to be completed in 2009.

The NSMP Work Plan tasks include monitoring, testing and evaluation of best management practice (BMP), development of an offset and trading program, total maximum daily loads (TMDL) and site-specific water quality objective, among others. Since 2005, the NSMP Working Group has made significant progress and completed essentially all Work Plan tasks. However, achieving the numerical selenium limitations before the 2009 deadline was infeasible. On December 10, 2009, the Regional Board adopted the Time Schedule Order (TSO) No. R8-2009-0069 that extended the compliance deadline to December 9, 2014. Currently, watershed stakeholders are implementing the tasks outlined in the TSO.

Current Management Strategies for Surface Water

As described in the previous sections, regulatory efforts aimed at maintaining and improving surface water quality and cleaning up poor quality water are based on implementing the Basin Plan. Non-regulatory approaches are also being implemented to protect and improve water quality.
Attaining water quality standards is a framework identified in the Federal Clean Water Act and its associated regulations, and includes four components:

- Protecting beneficial uses
- Attaining water quality objectives to protect beneficial uses
- Implementing the State and Federal anti-degradation policies
- Executing the Implementation Plan

The approaches available to manage surface water quality include managing urban runoff through municipal National Pollutant Discharge Elimination System (NPDES) permits, developing Drainage Area Management Plans (DAMP) and water quality management plans for new development and redevelopment, and encouraging low impact development. Protection of surface waters also can be achieved through construction of wetlands, implementing BMPs, using brine lines, and building and operating appropriate wastewater treatment facilities. These tactics are listed in **Table 5.5-19**.

Table 5.5-19 Surface Water Quality Goals, Strategies, and Tactics

Goal	Strategies	Tactics
• Water Quality Standards attained (includes California Toxics Rule)	• Protect good surface water quality • Clean up poor quality surface water • Re-evaluate water quality standards where appropriate	• Monitoring water quality • Protecting source water • Wastewater treatment by Publicly Owned Treatment Works (POTWs): source control, tertiary treatment, and nutrient removal • Urban runoff management • NPDES permits for other dischargers such as dewatering operations • TMDLs • Brine lines • BMPs that include constructed wetlands • Research • Public outreach

Future Water Quality Issues

In addition to addressing present water quality problems in the Santa Ana River Watershed, regulators and stakeholders will likely face new challenges. Below is a list of new challenges followed by a brief discussion of several of these issues.

- Establishing new pathogen indicators
- Reevaluating water quality standards to assure that limited resources are allocated appropriately
- Amending the Basin Plan, including additions to the 303(d) list
- Revising the Lake Elsinore/Canyon Lake TMDL
- Setting new residual chlorine objectives
- Establishing nutrient objectives
- Setting new statewide sediment toxicity standards
- Managing sediment loading
- Encouraging appropriate low-impact development
- Evaluating the effects of water use efficiency on wastewater treatment plants and recycled water

- Remediating pollution from septic systems

Recreational Water Quality Standards Basin Plan Amendment

As a follow up to the 2002 triennial review of the Basin Plan, the Stormwater Quality Standards Task Force was convened with representatives from major water, wastewater, and stormwater management agencies, environmental groups, the Regional Board and the EPA. Funding for the effort was provided by the stormwater programs of Orange, Riverside, and San Bernardino Counties, and by SAWPA and Orange County Sanitation District. The Task Force's approach was to work within the existing law, to understand the science underlying the standards, and to agree upon an approach to standards that is appropriate, enforceable, achievable, and that focuses effort on reducing the actual risk of illness.

The Task Force met regularly from 2003 to 2011 to evaluate key issues related to beneficial use designations and appropriate water quality objectives for water contact recreation, including definitions of body contact recreation and non-contact recreation, science underlying the use of bacteria as pathogen indicators, statistical risk bases for setting indicator objectives, channel characteristics associated with recreational uses, and the actual recreational uses that are occurring in the watershed. This deliberation was the most thorough consideration of recreational use standards ever undertaken in California. As part of the Task Force's evaluation to measure the frequency and nature of activity associated with specific waterbodies, digital cameras were installed to record images of the waterbodies at 15-minute intervals. The resulting 275,000 images provided an unprecedented record of the incidence of water contact recreation in a number of representative waterbodies. This information, together with water quality data and a GIS-based assessment of channel characteristics, supported the submission of use attainability analyses justifying the re-designation of beneficial uses in four channels.

The Task Force's recommendations included changing the appropriate indicator to *E.coli* with new geometric mean objectives for that indicator, an agreement on how to address single sample data, and the protection of water designated for non-contact recreation, and a consensus on defining and implementing a strategy for a high-flow suspension of recreational uses during dangerous flood conditions. In addition, the amendments expressly acknowledge the continuing requirement to protect beneficial uses not only at a particular location, but downstream from that location. The amendments address only fresh water and therefore do not affect the standards that apply at ocean beaches.

The amendments will allow local agencies responsible for protecting public health to focus their attention on those areas where recreation actually occurs, thus being more efficient with public resources and likely reducing public health risks. It will be feasible for municipalities to use treatment technologies where needed to protect swimmers without remaining technically out of compliance with basin plan standards.

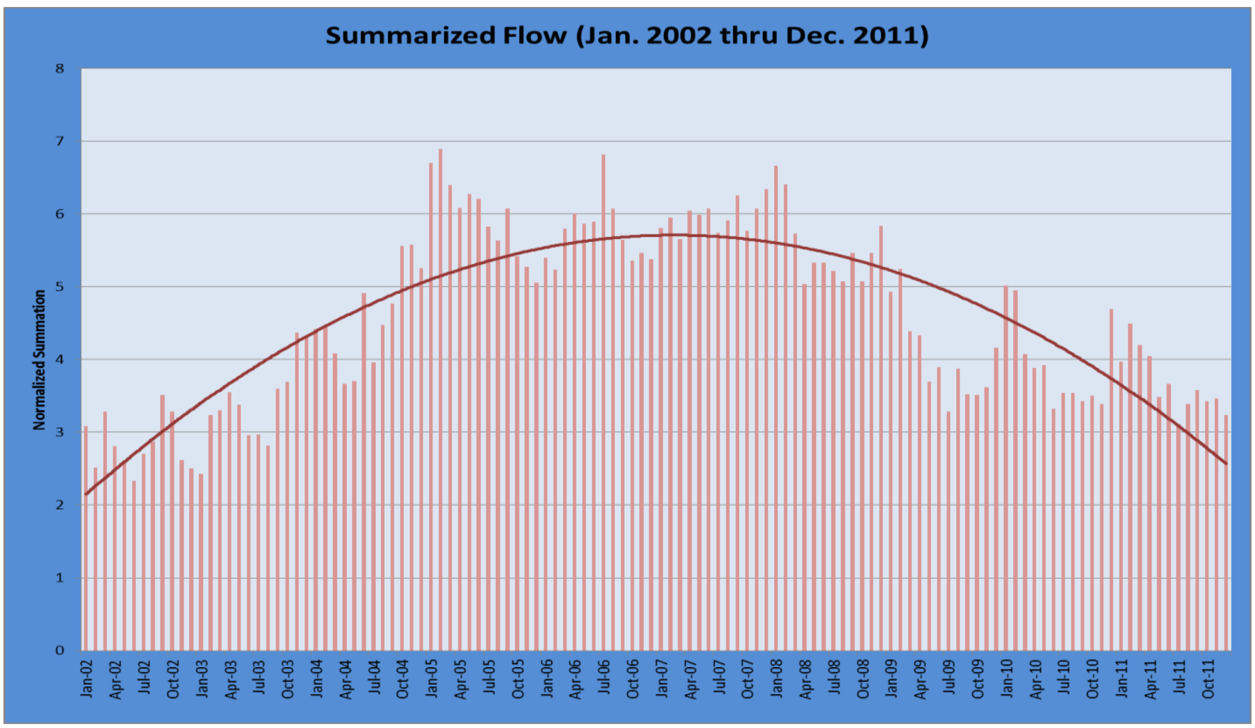
During the long process, the Task Force was adamant about seeking consensus so as to avoid any opposition for its ultimate recommendations and actively sought the involvement of staff from the State Board and the EPA. By the end of 2012, the basin plan amendments recommended by the Task Force were approved by the Regional Board. The Task Force continues to work with the State Board and the EPA to incorporate language changes requested by the EPA.

Changes in Wastewater Characteristics

The water reclamation facilities located in the Santa Ana River Watershed are experiencing changes in the influent flows to their facilities due to the depressed economy and heightened focus on water use efficiencies. Because of these changes, the Santa Ana River Dischargers Association (SARDA) compiled their respective wastewater quality data to determine if there have been any changes in the wastewater quality influents. The preliminary evaluations of the wastewater quality have indicated an increase of total suspended solids (TSS) and biological oxygen demand (BOD) in the influent quality. Though not yet conclusive, the data presented below indicates that flows are decreasing and wastewater quality is changing.

Influent flow data from the water reclamation facilities indicate flow rates increased until approximately 2007, then declined. **Figure 5.5-5** shows a normalized summation of the total flow from 16 facilities located in the watershed. The figure is a normalized set of values for each month data point with each facility having the same weighted value no matter the volume of flow. As shown, the summarized influent flow displays a bell-shaped curve with the peak around January 2007.

Figure 5.5-5 Normalized Summation of Total Flow from Sixteen Facilities Located in the Watershed



A hypothesis was considered that water use efficiency efforts would cause an increase in influent TSS and BOD. Ten years of data from eight water reclamation plants was compiled and graphed for trending purposes. **Figure 5.5-6** and **Figure 5.5-7** represent the influent water quality results for TSS and BOD, respectively. Both figures indicate an increasing trend in concentration of TSS and BOD for the Santa Ana River Watershed water reclamation facilities since 2002. The influent BOD concentrations displayed more consistent increases than TSS, and thus appear amenable to linear interpretation. In comparison to the influent flow data in **Figure 5.5-5** for the same facilities, both the influent TSS and BOD appear to be uninfluenced by the influent flow. That is, the influent flow data presented a "bell" shaped curve, while the TSS and BOD displayed a more increasing linear line over the same time period. The hypothesis that water use efficiency strategies may increase influent TSS and BOD is a plausible conclusion.

Figure 5.5-6 Influent Water Quality Results for TSS

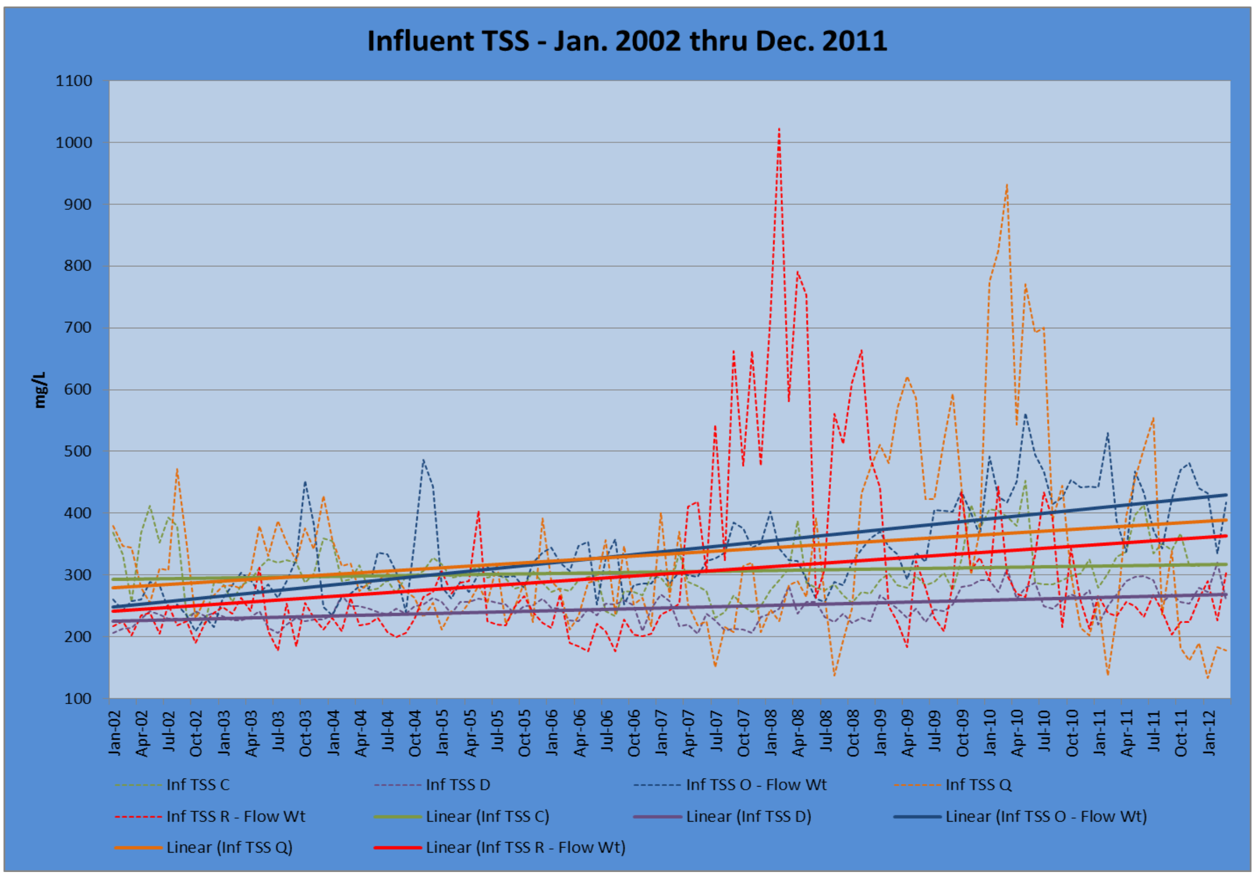
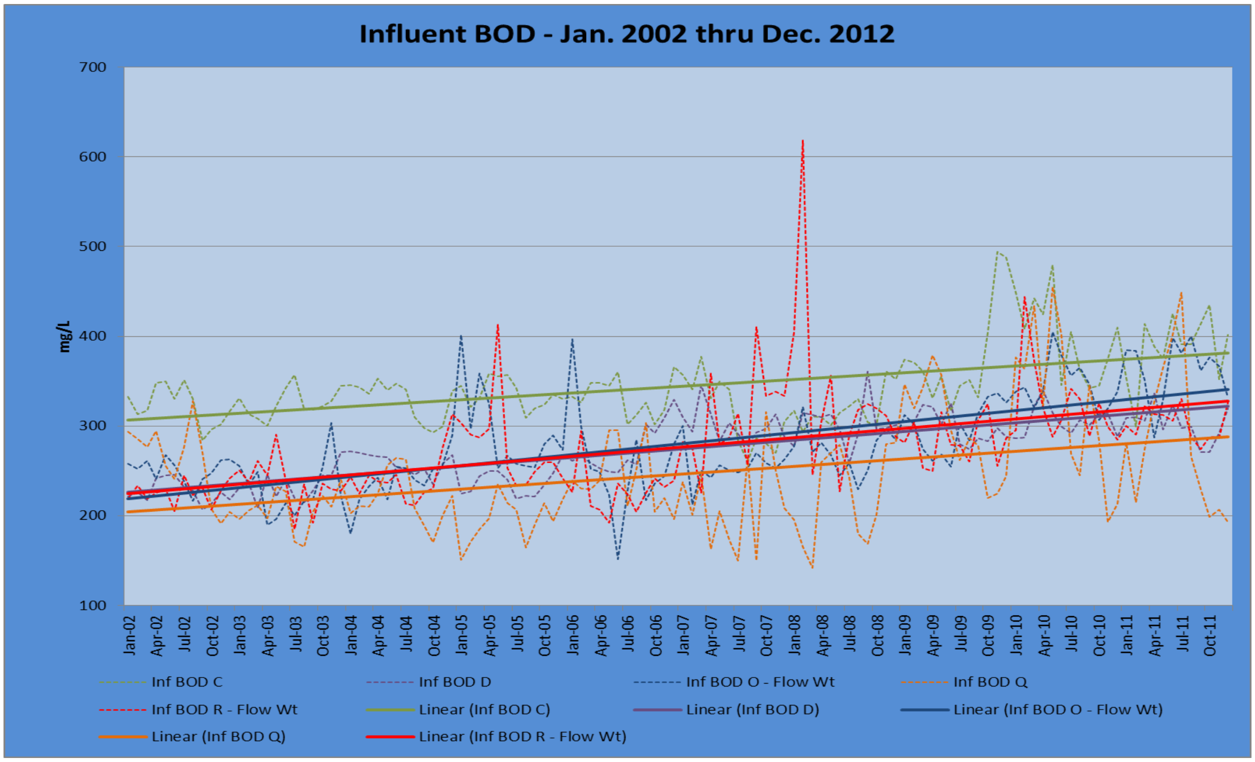


Figure 5.5-7 Influent Water Quality Results for BOD



Based on these preliminary results showing a consistent trend in wastewater quality for the SARDA facilities, further evaluations may need to be done. BOD and TSS are only two of the key constituents to measure the strength of the influent. There are other constituents that may also be upward trending such as total dissolved solids (TDS) and nutrients. TDS is a concern because the wastewater plants do not effectively reduce TDS, and these changes may affect compliance with the discharge permits. Further evaluation will help agencies to better understand any potential impact to their facilities and these findings can be incorporated into water reclamation facility design and management.

Proposed New Water Quality Criteria for Nutrients and Biological Objectives

There are two efforts led by the State Board to develop new water quality criteria for nutrients and biological objectives. The intent of the water quality criteria is to protect aquatic systems. Presently, the State Board uses either narrative or numeric standards that have been identified in the Regional Board's Basin Plan for these aquatic systems. These standards then become NPDES permit limitations. The regulators recognize the complexity of aquatic systems and are attempting to include other indicators of adverse impacts rather than exclusively using chemical, physical, and toxicological thresholds. To add to this complexity it is understood that aquatic systems do not behave similarly. Therefore, site specific indicators may be required. The outcome of the State Board's effort will translate into revised NPDES permit limits and therefore these regulations need to be followed closely to ensure that the proposed criteria will be practicable. Brief descriptions of the two efforts underway are described in the following page.

Nutrient Criteria

EPA has committed to the development of nutrient criteria and knowing the complexity of the aquatic systems and that they vary significantly across the country, EPA has delegated this effort to the States. California has been evaluating nutrient criteria models for several years. The State Board determined that the nutrient criteria framework needs to contain, in addition, to nutrient concentrations, targeting information on secondary biological indicators such as benthic algal biomass, planktonic chlorophyll, dissolved oxygen, dissolved organic carbon, macrophyte cover, and clarity. These secondary indicators provide a more direct risk-based linkage to beneficial uses than the nutrient concentrations alone.

The State Board has evaluated a model called the California Numeric Nutrient Endpoint (NNE) approach. This approach classifies the waterbodies based on three beneficial use risk categories, where Category I is not expected to exhibit impairment, Category II is in an intermediate range, where additional information and analysis may be needed to determine if a use is supported, threatened, or impaired, and Category III has a probable risk of impairment due to the presence of nutrients. Based on the site specific characteristics and secondary indicators, the NNE model will calculate a nutrient water quality objective for the water body. The State Board has pilot tested this approach and has learned that the development of nutrient criteria suggests that no one approach will be suitable for all diverse waterbodies within California. However, the State Board further recognizes that the NNE and its risk based approach will provide solutions to many of the issues that need to be addressed in setting numeric nutrient endpoints in California.

Biological Objectives

The State Board is proposing a statewide biological objectives policy for perennial wadeable streams. The policy will address the need for statewide consistent, enforceable, and scientifically rigorous tools for evaluating aquatic life use attainment in these waterbodies. Most of the State Board's waterbodies have one or more aquatic beneficial uses assigned to them, therefore this policy will affect the streams with beneficial use designations of warm water habitat, cold water habitat, marine or estuarine habitat, migration, spawning, wetland habitat, wildlife habitat, and preservation of rare, threatened, or endangered species. Currently, the biological indicators in most of the Regional Board Basin Plans are narrative and are therefore not enforceable.

The State Board is writing a policy and developing the tools to assess aquatic life uses in the perennial wadeable streams. In addition, the State Board will supply consistent, statewide guidance for establishing biological targets for restorations, permits, and other regulatory actions. The State Board believes that this policy will maximize the efficiency of the extensive pool of bio-assessment data now available in California by producing objectives that are applicable to the greatest number of waterbodies possible in the State. And it reduces the expenditures of time and resources that are necessary to evaluate aquatic life uses on a case by case basis.

Regional Solutions for MS4 Stormwater Management

Regulators and watershed stakeholders agree that stormwater is a valuable resource for the region and that increased capture of stormwater will be an increasingly important component of the region's local water supply. Currently, MS4 permit compliance[1] is focused on integrating BMPs such as vegetated swales, meandering linear parks, and rain gardens into local permits. Two alternative compliance provisions, regional infiltration facilities and in-lieu fee programs, can complement BMPs and offer greater opportunities to transform stormwater into long-term, sustainable groundwater supplies. Interestingly, some of the obstacles to developing regional infiltration projects and in-lieu programs lie within the MS4 permits. For example, one of the requirements is that a regional facility, which may be on a separate construction timeline, must be fully operational once the development is completed. Another challenge is that some projects require costly evaluations to determine that a site is not suitable for infiltration so that alternative approaches can be incorporated into the project. And, although in-lieu payments are included as an option, a preliminary program has yet to be developed.

However, the greatest benefits will be realized when regulations and programs strike a balance between requiring on-site BMPs and utilizing alternative compliance approaches, which improve surface water quality, maximize beneficial use of stormwater for water supply, and protect groundwater quality;progress is being made in these areas. Riverside and San Bernardino Counties have completed the first phase of their Watershed Action Plans. These are interactive online programs that will provide tools to locate an individual parcel, outline potential site constraints that may limit use of certain BMPs, and identify potential future sites for regional infiltration facilities. A similar program has been developed by the County of Orange, the *Coyote Creek Watershed Infiltration and Hydromodification Management Plan*, and is the first in a series of sub-watershed plans that has been finalized.

Existing Management Plans

A variety of water quality management plans have been prepared within the watershed. This section discusses existing plans.

Upper Santa Ana River Watershed Sub-Regional IRWMP (November 2007)

The upper Santa Ana River Water Resources Association members, lead by the San Bernardino Valley Municipal Water District (Valley District), prepared the upper Santa Ana River Watershed IRWMP to address water management issues in the upper Santa Ana River Watershed. This plan aims to evaluate water management opportunities, improve water supply reliability, reduce dependence on and optimize the use of imported water, and assist local agencies to optimize management and protection of water resources in the region. This plan's objectives include improving surface and groundwater management, water supply reliability, the quality of surface water and groundwater resources, and ecosystem and environmental restoration. This plan was funded in part by the State of California Proposition 50 IRWMP Planning Grant and by local funding sources.

[1] MS4 permits: Municipal Separate Storm and Sewer System permits issued by Regional Water Quality Control Boards to municipalities. The permits regulate the discharge of stormwater into county and municipal storm drains and other surface waters.

Western Municipal Water District Sub-Regional IRWMP (October 2006)

Western Municipal Water District prepared their IRWMP to evaluate water management alternatives, address long range water supply planning to meet future demands, and increase system reliability as the amount of available supply of imported water becomes less certain. This plan was funded in part by the State of California Proposition 50 IRWMP Planning Grant and by local funding sources.

This IRWMP identifies and evaluates management strategies that aim to increase local water supplies and to address local and regional water quality concerns. The report focuses predominately on projects that result in an increase in available local water supplies. Projects were ranked with an emphasis on those with regional benefits and based on total percent of demand met. A plan for water conservation also was included.

San Jacinto River Sub-Regional IRWMP (December 2007)

Water resources in the SJR Watershed are particularly important due to high demand from urban, agricultural, and recreational users. The nutrient TMDL for Canyon Lake and Lake Elsinore, as well as NPDES stormwater permits are regulatory drivers for improved management of water resources. The IRWMP area consists of the SJR Hydrologic Unit. Most of the watershed falls within Riverside County; with only a small portion extending into Orange County. The SJR, Salt Creek, Perris Valley Storm Drain, Mystic Lake, Perris Reservoir, Canyon Lake, and Lake Elsinore are the dominant hydrologic features in the watershed. Through a collaborative process, the SJR IRWMP was developed and led by the San Jacinto River Watershed Council (SJRWC) with financial assistance from the State of California Proposition 50 Grant and in-kind support and input from a number of member and partnering agencies.

Chino Creek Integrated Plan (2006)

The Chino Creek Integrated Plan was prepared by a broad stakeholder group and administered by the Inland Empire Utilities Agency (IEUA). This plan focuses attention on the lower Chino Creek area as a step in the process of preserving and restoring the Prado Basin. IEUA, with a grant from State Board, technical support from OCWD, and funding from the City of Chino, worked with stakeholders over the course of four years to prepare the plan.

Integrated Plan goals were identified as implementable, multi-barrier strategies aimed at reducing pollutants and providing multi-purpose opportunities such as constructing treatment wetlands and natural flood control technologies. Recommended projects identified in the Integrated Plan aim to create recreational linkages, provide public education, develop sustainable development projects for the built environment, preserve habitat, and environmental restoration.

North Orange County Watershed Management Area Sub-Regional IRWMP

With a wide range of stakeholders, the County of Orange has completed the North Orange County Watershed Management Area (WMA) IRWMP. This IRWMP will be used to guide watershed management programs and support the region in pursuing funding opportunities. The plan's objectives will include:

- Protecting and enhancing water quality in the region, including current and planned TMDLs
- Enhancing local water supplies
- Promoting flood management

- Enhancing wetlands
- Addressing runoff and its related impacts from existing and future and uses
- Enhancing public education programs
- Reducing invasive species and enhance habitat
- Promoting environmental justice

Coyote Creek Watershed Management Plan (January 2007)

The Coyote Creek Watershed Management Plan provides a blueprint for improving the health of the watershed through multi-objective projects, policies, and site design guidelines. Rather than focusing on the ecological problems that have resulted from piecemeal management of land and water resources, it serves as a user guide on how to improve the management of the watershed for maximum social, economic, and environmental benefit.

Central Orange County Sub-Regional IRWMP (COC IRWMP)

The County of Orange led the first IRWM effort for the Central Orange County Watershed Management Area (WMA), which culminated in the production of the Phase I Central Orange County IRWM Plan (IRWMP). The Phase I IRWMP was undertaken to provide a bridge between existing and developing watershed planning efforts, allowing for more effective collaboration and greater opportunity to leverage agency resources across jurisdictions. It had a strong emphasis on the sensitive coastal resources, ASBS and Critical Coastal Areas (CCAs) that are located within the Central Orange County WMA. The Phase I IRWMP was also developed to meet Proposition 50 priorities. The Phase I IRWMP was integral to subsequent watershed planning efforts led by the City of Newport Beach.

In January 2006, the City of Newport Beach was awarded a planning grant by the State Board through Proposition 40 for preparation of an Integrated Coastal Watershed Management Plan (ICWMP) to address area of biological significance (ASBS) and CCA issues along Newport Coast. Much of the material in the Phase I Central Orange County IRWMP was used during the preparation of the ICWMP. In May 2006, the City of Newport Beach was awarded a second planning grant by the DWR through Proposition 50 for the preparation of an IRWMP for the Newport Bay Watershed including data collection, analysis, and formulation of policy and guidelines. Though building on some new elements, this Phase II effort incorporated the Phase I Central Orange County IRWMP.

The County of Orange completed Phase III of the Central Orange County IRWMP. Phase III is a compilation and revision of the first two IRWMPs; the information contained in the Phase I and Phase II was used to form the basis of the Phase III plan. The purpose of the Central Orange County IRWM Plan is to provide a local plan that bridges the gap between existing and developing watershed planning efforts, allowing for more effective collaboration and greater opportunity to leverage agency resources across jurisdictions.

Extensive water resource program development and implementation has occurred in this region over the past three decades, with agency partnerships, agreements, and the formation of a formal stakeholder involvement structure. The water quality issues are daunting; within this region there are eight waterbody segments listed on the State Board 2010 Section 303(d) list and there are five TMDLs for nutrients, fecal coliform, sediment, toxics, and organophosphate pesticides, with more TMDLs pending. Water quality has been the overarching issue that has brought the water resource and land use agencies, environmental groups, and other stakeholders within the region together in the spirit of collaboration. Public agencies and private interests have entered into numerous cooperative agreements to leverage financial resources for the development of programs that implement studies, best management practices (BMPs), and other control measures consistent with regulatory requirements and regional goals for watershed conditions. These water quality-related projects and programs have not been undertaken with a narrow focus or single purpose; the stakeholders within this region, both public and private, understand the nexus between growth, land use decisions, water resource management, and watershed impacts.

This region has experienced significant population growth over the past 20 years, with development of former agricultural lands and expansion in the established urban areas. In addition to addressing water quality issues, the water and wastewater agencies have established partnerships to develop local resources, including groundwater and recycled water, to ensure a reliable source of water supply and to minimize the need for imported water. Public agencies and private entities have implemented a broad range of multi-purpose projects and programs to protect and enhance watershed conditions. The IRWMPbuilds on this history of successful collaboration and furthers the interests of the stakeholders through this integrated planning approach.

Groundwater

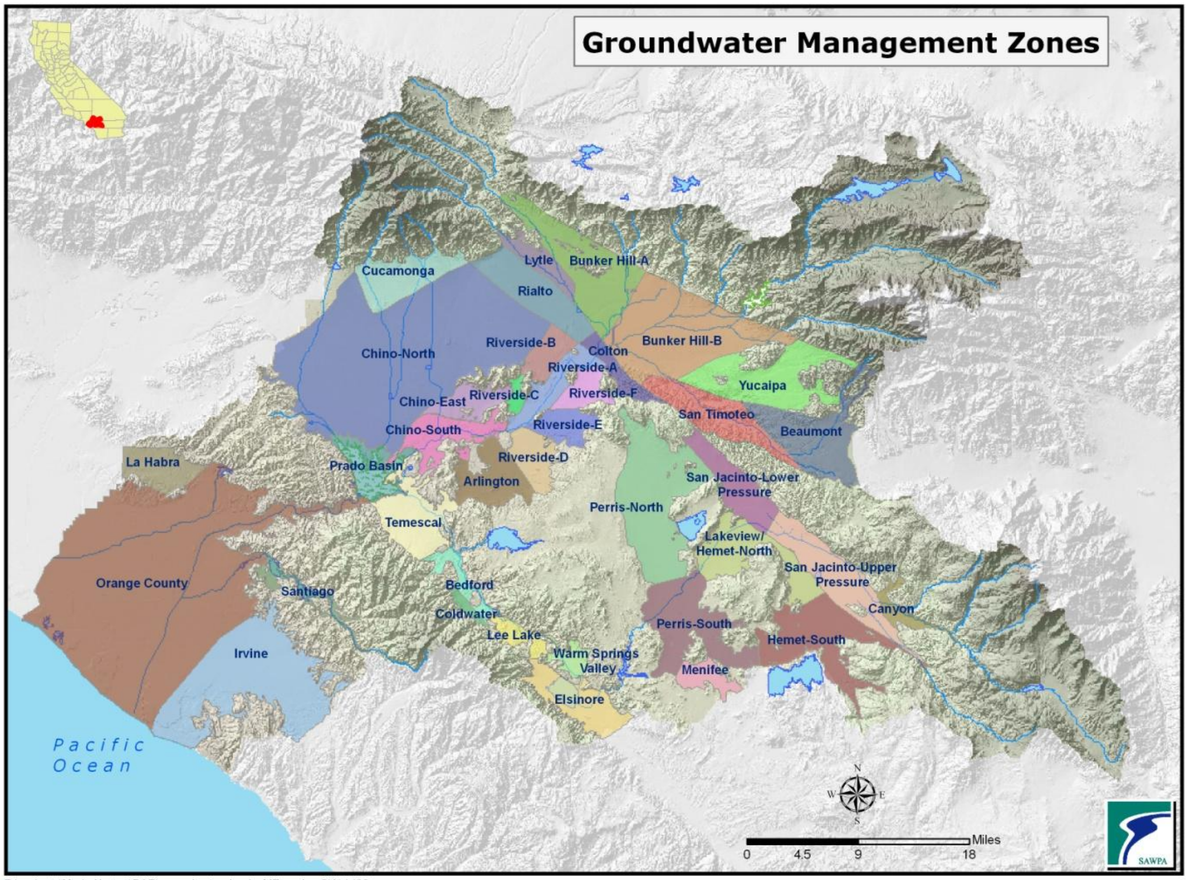
Groundwater is a major source of water supply in the watershed. Protection of this source is critical to maintain the viability of local water supplies. The Basin Plan identifies 39 groundwater management zones in the Santa Ana River Watershed as shown in **Figure 5.5-8**.
Basin Plan amendments that were approved by the Regional Board in 2004, provide a comprehensive, watershed approach to controlling nitrogen and TDS in the watershed, while also encouraging water recycling and reuse.

This section describes the TDS and nitrate-nitrogen WQOs and current ambient water quality. Ambient water quality, as defined here, is based on the 20-year period ending in 2009. Where the ambient water quality is better than the WQO, this increment is referred to as the assimilative capacity.

All but five groundwater management zones in the watershed have TDS and nitrate WQOs identified in the Basin Plan. The five that were not identified had insufficient data to establish TDS and nitrate WQOs. In this discussion, the groundwater management zones are grouped as follows:

- Upper Santa Ana River Basin
- Chino Basin
- Middle Santa Ana River Basin
- San Jacinto River Basin
- Lower Santa Ana River Basin
- San Jacinto River Basin
- Lower Santa Ana River Basin

Figure 5.5-8 Santa Ana River Watershed: Groundwater Management Zones



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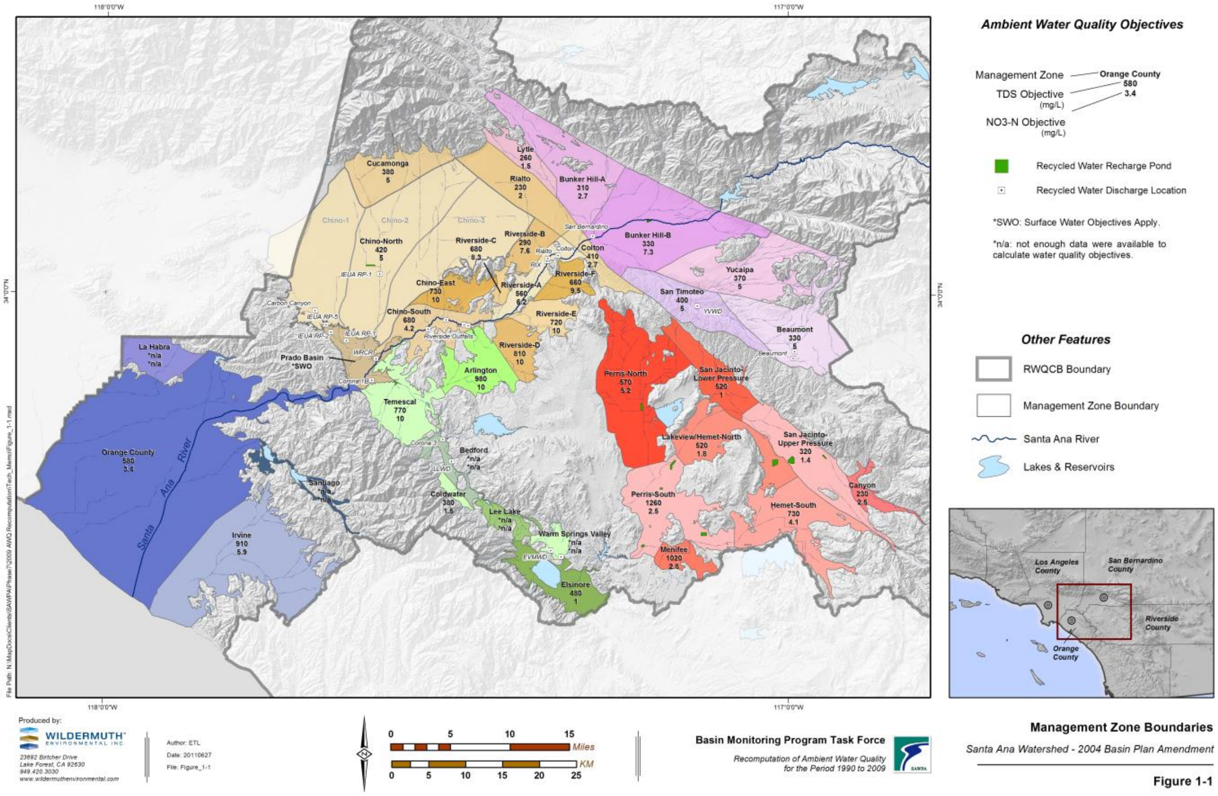
The Basin Plan requires that concentrations of TDS and nitrate in each groundwater management zone be estimated every three years. These ambient conditions are compared to the WQOs to determine the amount of assimilative capacity in each zone. In areas where there is no assimilative capacity, the Regional Board will not permit waste discharges that degrade water quality. **Figure 5.5-9** shows the ambient WQOs for TDS and nitrates in groundwater management zones. Ambient water quality for the years 1990-2009 for nitrates is shown in **Figure 5.5-10** and for TDS in **Figure 5.5-11**.

Figure 5.5-9 Ambient Water Quality Objectives



Current Conditions

High salt and nitrate concentrations are two long-standing groundwater quality issues in the SARW. Sources of elevated levels include mineral content in the sediments, recharge and drainage patterns, source water quality, irrigation, wastewater discharges, and historic land use. Managing levels of TDS in groundwater basins is a significant challenge as the recycling of waste water increases in the watershed. Each cycle of residential water use typically adds approximately 200 mg/L of salt to the water. Industrial and commercial operations may contribute higher levels. Construction and use of salinity management facilities, such as brine lines and desalters, are being used to prevent salt-build up and to remediate high TDS groundwater basins.

Figure 5.5-10 Ambient Water Quality Objectives 1990-2009 - Nitrates

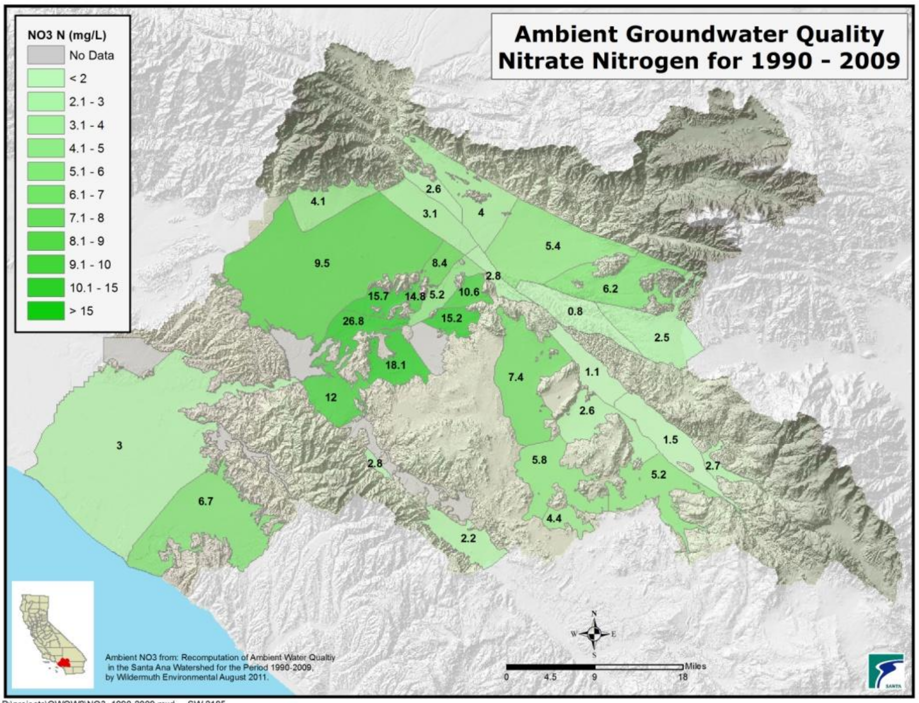


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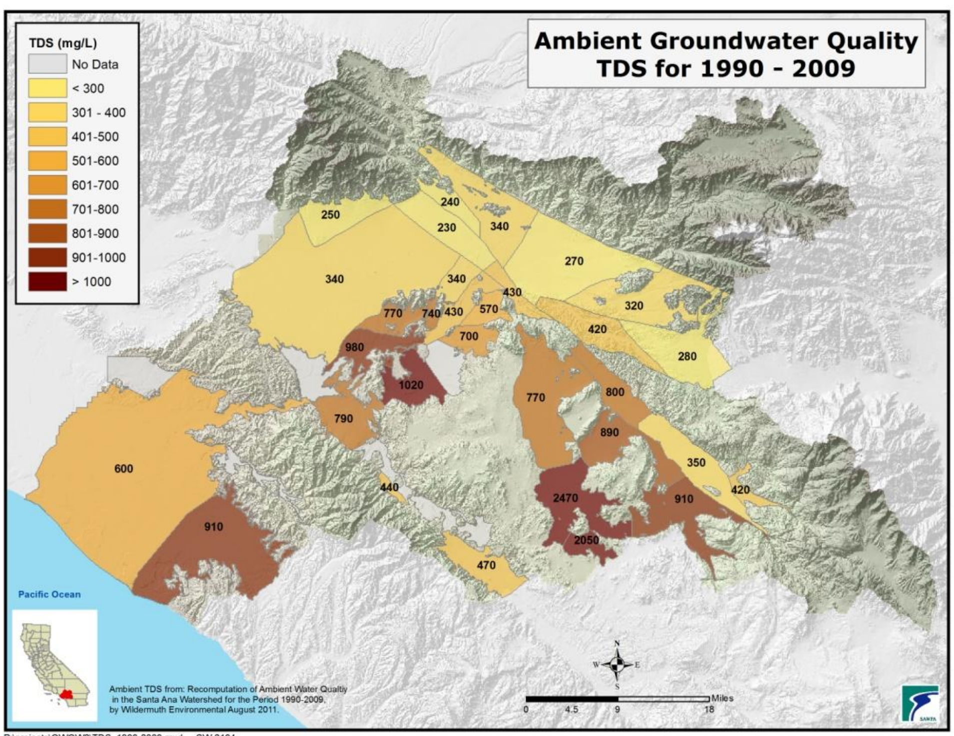
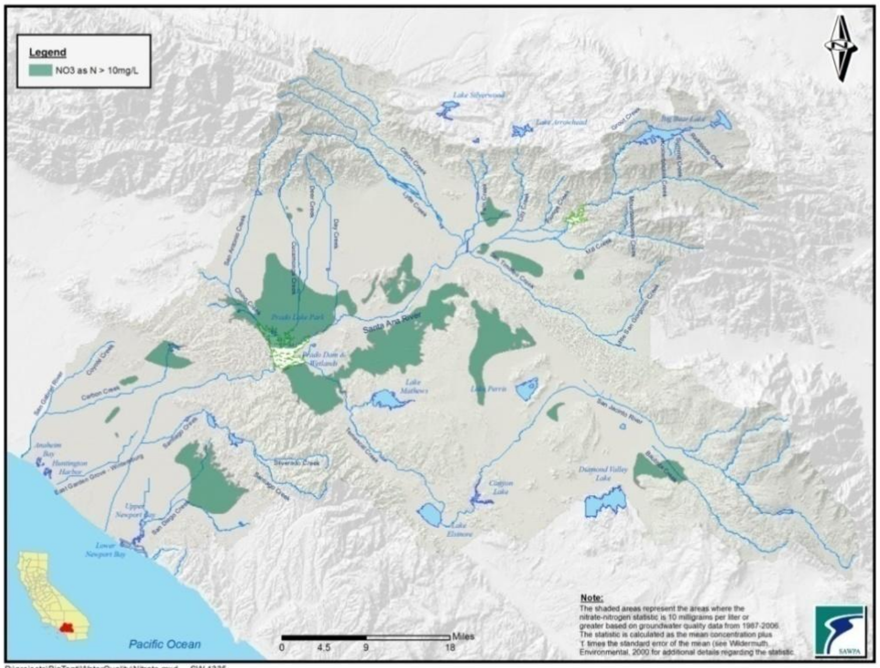
Figure 5.5-11 Ambient Water Quality Objectives 1990-2009 – TDS



P:\projects\OWOW2\TDS_1990-2009.mxd SW-2194

Elevated levels of nitrates in groundwater originate primarily from use of fertilizers, confined animal feedlots, and waste water treatment facilities. Areas with elevated nitrates (nitrate-nitrogen greater than the Maximum Contaminant Levels (MCL) of 10 mg/L, using the ambient water quality statistics) in groundwater are shown in **Figure 5.5-12**.

Figure 5.5-12 Groundwater with Elevated Nitrate Levels



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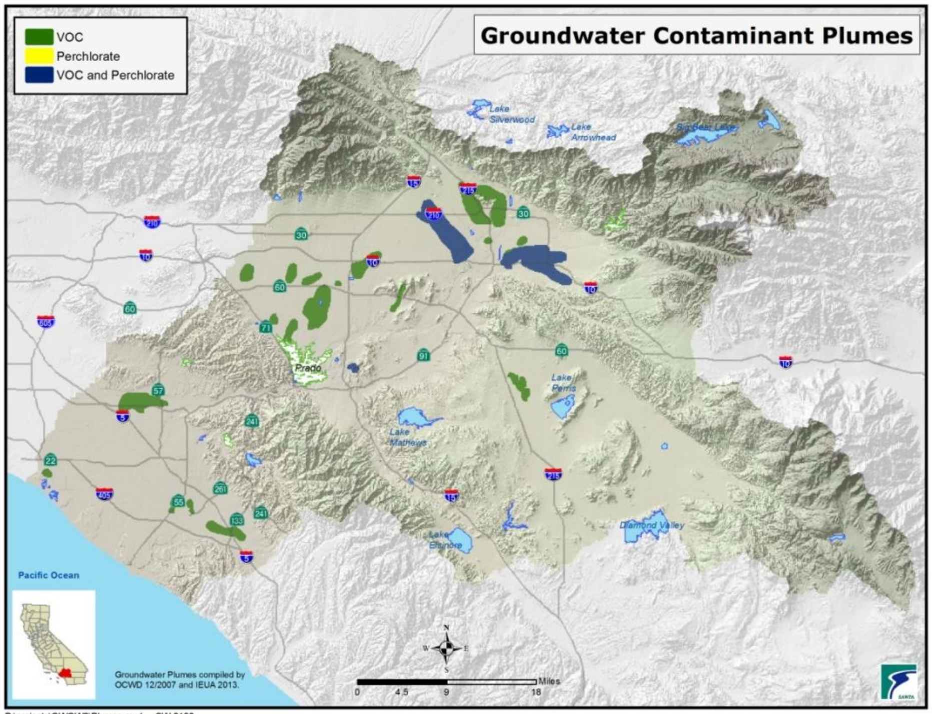
Approximately 25 years ago, volatile organic compounds (VOCs) were discovered in groundwater in some areas. More recently, contamination due to perchlorate has become a major concern in some portions of the watershed. Areas with groundwater contamination above the primary MCLs for VOCs and perchlorate are shown in **Figure 5.5-13**.

Figure 5.5-13 Groundwater Contamination Plumes



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Upper Santa Ana River Basin

The upper Santa Ana River Basin is divided into seven management zones. TDS and nitrate WQOs and current ambient water quality levels are summarized in **Table 5.5-20**.

In the Bunker Hill management zones, the largest area of groundwater contamination is the Newmark Superfund Site. Treatment plants are operating to remove VOC contamination. A total of 13 extraction wells produce on average approximately 26,000 AFY, which is treated at the four treatment plants.

In the Bunker Hill B management zone, a six-mile long plume of VOC and ammonium perchlorate contamination, known as the Crafton-Redlands Plume, was first detected in the early 1980's. Approximately 46 drinking water wells have been affected. A number of well head treatment units and treatment plants to remove these contaminants are being operated by the Cities of Redlands, Loma Linda and Riverside.

Cherry Valley is an unincorporated area located northeast of the City of Beaumont, in the Beaumont management zone. The community is not served by a sanitary sewer system. The only source of drinking water for the community is the groundwater. A study commissioned by the San Timoteo Watershed Management Authority indicated an ongoing degradation of the quality of the groundwater due to nitrate. The source of the nitrate was attributed to the onsite waste treatment systems, *i.e.*, septic systems.

Table 5.5-20 Water Quality Objectives for Upper Santa Ana River Basins

Management Zone	TDS		Nitrate-nitrogen	
	Water Quality Objective (mg/L)	Ambient Quality (mg/L)	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Big Bear Valley	300	NA	5.0	NA
Beaumont	330	280	5.0	2.5
Bunker Hill A	310	340	2.7	4.0
Bunker Hill B	330	270	7.3	5.4
Lytle	260	240	1.5	2.6
San Timoteo	400	*420*	5.0	0.8
Yucaipa	370	320	5.0	6.2

Source: Wildermuth Environmental (2011)

Note: Current ambient water quality computations for the San Timoteo management zone were not made during this study. These values were published in *Preliminary Assessment of Assimilative Capacity*

The County of Riverside has adopted three ordinances to ban new septic systems unless the systems are designed to remove 50 percent of the nitrogen in the discharged wastewater. Beaumont Cherry Valley Water District is in the process of providing sewer service to a major portion of the area and has applied for State Revolving Fund loans for the project.

Chino Basin, Cucamonga, and Rialto Management Zones

The Chino Basin is divided into three management zones. This section covers these three zones, and the adjacent Cucamonga, Colton, and Rialto management zones. The Basin Plan established "maximum benefit" and "anti-degradation" TDS and TIN water quality for the Chino and Cucamonga management zones as summarized in **Table 5.5-21**.

Table 5.5-21 Water Quality Objectives for Chino Basin and Rialto

Management Zone	TDS		Nitrate-nitrogen	
	Water Quality Objective (mg/L)	Ambient Quality (mg/L)	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Chino North	420	340	5.0	9.5
Chino East	730	770	10.0	15.7
Chino South	680	980	4.2	26.8
Colton	410	430	2.7	2.8
Cucamonga	380	250	5.0	4.1
Rialto	230	230	2.0	3.1

Source: Wildermuth Environmental (2011)

The Chino Basin is experiencing rapid commercial and residential development. The groundwater quality in the basin is generally good, with better groundwater quality found in the northern portion where recharge occurs. Salinity (TDS) and nitrate concentrations increase in the southern portion of the Basin. Between 2001 and 2006, about 80 percent of the private wells south of Highway 60 had nitrate concentrations greater than the MCL. Pollution from point sources and emerging contaminants are concerns for the overall groundwater quality in Chino Basin. Constituents that have the potential to impact groundwater quality include VOCs, arsenic, nitrates, and perchlorate.

Groundwater in several areas is impacted by elevated levels of perchlorate. Sources of perchlorate include the Stringfellow Acid Pits, Chilean nitrate fertilizer that was imported in the early 1900s for the citrus industry, and other manmade sources such as ammunition manufacturing.

Newmark Cleanup Restores Groundwater Supplies

In 1980, the California Department of Health Services discovered the chlorinated solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) in several municipal water supply wells in the northern San Bernardino/Muscoy region. Investigations into the extent of contamination led the EPA to place the area on the National Priorities List in 1989. This Superfund site was determined to contain two plumes originating from the same source near the site of a closed World War II Army site: an approximately eight-mile Newmark plume and an approximately six-mile Muscoy plume.

Contamination impacted 25 percent of the municipal water supplies for the City of San Bernardino. In addition, 75 percent of the water supplies for the City of Riverside downgradient of the contamination plume were threatened as were water supplies for the Cities of Colton, Loma Linda, Fontana, and Rialto.

The San Bernardino Municipal Water Department, in cooperation with the EPA, constructed 13 extraction wells to contain the plume and treat the contaminated groundwater. As a result, 12 of the 20 contaminated wells were brought back into operation; clean up operations continue.

Pictured below is a façade house built around one of the extraction wells.

EPA Well 111 with façade house.

In the Rialto management zone, at least 20 wells providing 40,135 gallons per minute (gpm) of domestic water supply capacity to the Cities of Rialto and Colton, West Valley Water District and Fontana Water Company have been contaminated by perchlorate. Well head treatment is operating on 11 of these wells.

Arsenic at levels above the MCL appears to be limited to the deeper aquifer zone near the City of Chino Hills. Total chromium and hexavalent chromium, while currently not a groundwater issue for Chino Basin, may become so depending on the promulgation of future standards.

Maximum Benefit Demonstrations in Santa Ana River Watershed

A successful template for groundwater quality management is the maximum benefit demonstration utilized in the Chino, Beaumont/Yucaipa, and San Jacinto basins. Stakeholders collaborated with the Regional Board to demonstrate that groundwater quality can be protected not solely based on historical quality (the “antidegradation” objectives). Instead, the Regional Board agreed to “maximum benefit” objectives to protect groundwater quality for the “maximum benefit to the people of the State”.

In the Chino, Beaumont/Yucaipa, and San Jacinto basins, local stakeholders proposed programs to implement local cooperative projects, such as groundwater desalination plants, expanded stormwater capture and recharge basins, and comprehensive groundwater management plans in order to protect groundwater basin quality and meet existing and downstream beneficial uses. Through an aggressive series of monitoring requirements, the State will be able to assure that water quality is protected. The antidegradation objectives are defined as the default condition if the commitments made to protect water quality are not attained. The success of this multi-agency approach to maximize the use of water resources while protecting water quality as defined by the State Board serves as a progressive water management and water quality protection example for other regions in the state, according to the State Board.

Middle Santa Ana River Basin

The management zones for the Middle Santa Ana River Basin are listed in **Table 5.5-22** and **Table 5.5-23**. Agriculture and dairy activities are suspected to be partially responsible for elevated salt and nitrate concentrations in the groundwater. As the population within the Riverside Basins continues to grow, homes, commercial centers, new industry, and warehouses are replacing agriculture and open space.

Several areas in the Riverside basin are impacted by the presence of nitrate, dibromochloropropane (DBCP), and perchlorate. As such, the City of Riverside has increased monitoring schedules at select production well sites and has implemented blending plans and provided treatment for DBCP removal at its Palmyrita GAC plant.

Table 5.5-22 Water Quality Objectives for Riverside Basin

Management Zone	TDS		Nitrate-nitrogen	
	Water Quality Objective (mg/L)	Ambient Quality (mg/L)	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Riverside-A	560	430	6.2	5.2
Riverside-B	290	340	7.6	8.4
Riverside-C	680	740	8.3	14.8
Riverside-D	810	NA	10.0	NA
Riverside-E	720	700	10.0	15.2
Riverside-F	660	570	9.5	10.6

Source: Wildermuth Environmental (2011)

Table 5.5-23 Water Quality Objectives for Arlington, Elsinore, Corona Area Groundwater Management Zones

Groundwater Management Zone	TDS		Nitrate-nitrogen	
	Water Quality Objective (mg/L)	Ambient Quality (mg/L)	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Arlington	980	1020	10	18.1
Bedford	NA	NA	NA	NA
Coldwater	380	440	1.5	2.8
Elsinore	480	470	1.0	2.2
Lee Lake	NA	NA	NA	NA
Temescal	770	790	10.0	12.0

Source: Wildermuth Environmental (2011)

San Jacinto River Basin

Agricultural activities in the San Jacinto River Basin are suspected to be partially responsible for elevated salt and nitrate concentrations in the groundwater. Septic tank discharges are creating significant water quality problems that have triggered local agency and the Regional Board's regulatory response in the unincorporated areas of Quail Valley (north of Canyon Lake) and Enchanted Heights (west 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 RCFCWCD.

A Groundwater Salinity Management Program, developed by EMWD, addresses several water quality issues in this area. 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. Due to the unavailability of imported water, blending to improve water quality is not an option. 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. WQOs are shown in **Table 5.5-24**.

Table 5.5-24 Water Quality Objectives for San Jacinto River Basins

Management Zone	TDS		Nitrate-nitrogen	
	Water Quality Objective (mg/L)	Ambient Quality (mg/L)	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Canyon	230	420	2.5	2.7
Hemet – South	730	910	4.1	5.2
Lakeview/Hemet-North	520	890	1.8	2.6
Menifee	1020	2050	2.8	4.4
Perris – South	1260	2470	5.2	5.8
Perris – North	570	770	2.5	7.4
San Jacinto – Lower	520	800	1.0	1.1
San Jacinto – Upper	320 500*	350	1.4 7.0*	1.5

*Maximum Benefit Objectives
Source: Wildermuth Environmental (2008)

Lower Santa Ana River Basin

The Lower Santa Ana River Basin contains four groundwater management zones: Orange County, Irvine, La Habra, and Santiago. The La Habra and Santiago Management Zones have minimal pumping and TDS and nitrate WQOs have not been established due to the scarcity of data. This section focuses on the Orange County and Irvine Management Zones, which are important sources of water in Orange County.

Orange County Groundwater Basin

The Orange County Groundwater Basin is the source of approximately 70 percent of the water supply for 2.4 million people. Of this total production, about 90 percent meets drinking water standards without treatment. The remaining 10 percent requires treatment for VOCs, salts, or other constituents. WQOs for nitrates and TIN/TDS are listed in **Table 5.5-25**.

A shallow VOC plume exists in the Anaheim/Fullerton area where VOC concentrations exceed MCLs over approximately six square miles. To address this plume, the North Basin Groundwater Protection Project is being constructed to extract and treat VOC contaminated groundwater and recharge treated water back into the groundwater basin. Other VOC plumes exist in Orange, Santa Ana, the Seal Beach Naval Weapons Station, and the now closed Tustin Marine Corps Air Station. Various other sites have generally shallow VOC contamination or other contaminants. The Tustin desalters, using reverse osmosis and ion exchange, treat high TDS, nitrate, and perchlorate levels in a section of Tustin. Areas in Garden Grove have groundwater with high nitrate concentrations that are likely the result of historic agricultural practices.

Table 5.5-25 Water Quality Objectives for Lower Santa Ana River Basin Management Zones

Management Zone	TDS		Nitrate-nitrogen	
	Water Quality Objective (mg/L)	Ambient Quality (mg/L)	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Orange County	580	600	3.4	3.0
Irvine	910	910	5.9	6.7
La Habra	NA	NA	NA	NA
Santiago	NA	NA	NA	NA

Source: Wildermuth Environmental (2008)

Irvine Management Zone

The Irvine Management Zone is a sub-basin of the Orange County Groundwater Basin. Water naturally flows between the boundaries, but the operation of the Irvine Desalter limits movement of water between the two management zones.

Groundwater contaminated with VOCs exceeding MCLs from the now closed El Toro Marine Corps Air Station, also contains high TDS and nitrate concentrations. The Irvine Desalter, using reverse osmosis, air stripping, and carbon absorption, was built to treat the contaminated water. Water treated for VOC contamination is distributed after treatment through the Irvine Ranch Water District non-potable system (irrigation and other non-potable uses); water treated for high TDS and nitrate is distributed through the potable system.

Current Management Strategies for Groundwater

Three goals are defined for groundwater quality. These goals are:

- Attaining water quality standards
- Meeting drinking water standards
- Achieving salt and nutrient balances

Attaining water standards is a framework identified in the Federal Clean Water Act and its associated regulations, and includes four components:

- Protecting beneficial uses
- Attaining water quality objectives to protect beneficial uses
- Implementing the State and Federal anti-degradation policies
- Executing the Implementation Plan

Table 5.5-26 Groundwater Quality Goals, Strategies, and Tactics

Goals	Strategies	Tactics
• Water Quality Standards attained • Drinking water standards (DWS) met • Salt and nutrient balance achieved	• Protect good quality groundwater • Clean up poor quality groundwater • Re-evaluate water quality standards where appropriate	• Monitoring, assessment and reporting • Source water protection programs • Pollutant source identification and control • Groundwater treatment Pump and treat for local plumes Wellhead treatment (e.g., for arsenic and perchlorate) Desalters • Brine lines • Recharge of recycled, stormwater and imported water • Research • Public outreach

Meeting drinking water standards will require the attainment of both maximum contaminant levels for primary drinking water contaminants and secondary drinking water standards. Goals for improving groundwater quality and protecting groundwater supplies also include achieving a salt and nutrient balance. Strategies and tactics to achieve these goals are listed in **Table 5.5-26**. A summary of two of these issues is as follows:

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. Groundwater may have slightly elevated salinity or nutrient levels or, at the other extreme, may be contaminated with high levels of VOCs, pesticides, and/or perchlorate. 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.

Supplies unsuitable for drinking water that are used for irrigation and carefully managed to allow for infiltration may naturally be purified of some contamination, such as low levels of VOCs and nitrates. Some contaminates also would be absorbed by vegetation. Over time as the water percolates back into aquifers, contamination levels may be reduced naturally.

One example of an approach utilizing groundwater contaminated by nitrates is a cooperative project by the City of Corona and the community of Home Gardens. Home Gardens ceased pumping of nitrate contaminated groundwater because of lack of treatment options. Construction of a pipeline will allow for groundwater, pumped by Home Gardens, to be conveyed to Corona's Temescal Desalter for treatment and blending. The resulting potable supply will be shared by the two agencies.

A potential new water supply may be to utilize shallow groundwater in Orange County for irrigation. In areas where slightly elevated nitrate levels or low concentrations of VOCs in the shallow aquifer preclude utilizing that supply, development of a clean-up strategy could consider irrigation use as a means to reduce contaminant concentrations and prevent spread of contamination into deeper drinking water aquifers.

Certainly, these projects must be carefully considered for unintended, negative impacts. One such consideration must be the likely increase in TDS of percolated water that would result from using pumped groundwater for irrigation.

Hindrances to Groundwater Cleanup Projects

When it occurs, groundwater contamination is ideally cleaned up by the entity that caused it. In cases where this does not occur, regulatory agencies may be required to force the responsible party to remedy the contamination.

In some situations, the regulatory agencies may not have the resources to investigate contaminated areas and oversee and enforce investigation and cleanup actions, particularly for contamination that has migrated beyond the property where the contamination originally occurred. In these situations, the local water district may desire to implement a cleanup or remediation project to protect local water supplies. The water district may do this at the district's expense and seek cost recovery from the entities that caused the contamination.

Local agencies seeking to cleanup groundwater contamination encounter many hurdles. For example, a groundwater cleanup project proposed by a water district has experienced opposition by potentially responsible parties through legal challenges to California Environmental Quality Act (CEQA) documentation. Additionally, existing laws may not provide adequate legal authority for recovery of the cleanup costs from the entities that caused the contamination.

The issue considered here is the extent to which CEQA challenges can be used to discourage, hinder, and slow down a groundwater cleanup project. Arguably, the groundwater cleanup project is beneficial to the environment, since it benefits water quality and protects drinking water supplies. If the project is not implemented, contamination will continue to spread in the aquifer and the environment would continue to be degraded by continued migration of contamination.

An agency in the watershed received CEQA legal challenge by entities believed to have caused the contamination the project was intended to address. In brief, the project consists of extraction wells, pipelines, a treatment plant, and injection wells to recharge the treated water. The challenge was unsuccessful in court. However, the agency had to expend substantial public funds to defend itself in court. Additionally, the legal challenge can delay project implementation.

Legal challenges have also been a reason for the delay in the implementation of projects. For example, an event occurred in which an agency within the SARW had received a CEQA legal challenge by entities who believed to have caused the contamination of a project that they originally intended to address.

If progress on implementing cleanup projects is hindered, this allows contamination to spread further, threatening even more drinking water supplies. Even if the project is ultimately constructed after legal challenges are addressed, the delays are harmful to the environment.

Consideration should be given to streamlining CEQA to facilitate groundwater cleanup projects implemented by public agencies with powers to manage groundwater. For example, a Statutory Exemption for groundwater cleanup projects, or a streamlined approach to comply with CEQA could be proposed. There is an existing Categorical Exemption that may apply to certain relatively small projects. This Categorical Exemption should be evaluated and the type and size of projects covered under the exemption should be expanded, if appropriate.

Existing Groundwater Management Plans

2005 Regional Groundwater Management Plan

A Regional Groundwater Management Plan was prepared by SAWPA in 2005. SAWPA is not directly responsible for managing groundwater basins in the watershed. However, the agency coordinates numerous groundwater management planning efforts within the watershed. This plan describes the water and groundwater management plans in the Santa Ana River Watershed.

Upper Santa Ana Basin Plans

In 2005, the Upper Santa Ana Water Resources Association developed an Integrated Regional Groundwater Management Plan (IRGM Plan) to address major water management issues for the communities of the Upper Santa Ana River Watershed. Valley District led the planning effort. The plan developed a process for managing the San Bernardino Basin Area and identified proposed regional projects. The two management objectives were to improve water reliability during drought periods and reduce liquefaction, and to protect water quality and maximize conjunctive use opportunities. Computer models were used to evaluate the various water management strategies.

San Jacinto Basin Plans

The West San Jacinto Groundwater Basin Management Plan was adopted in 1995. Annual reports on the status of groundwater and water resources efforts in the area have been published since 1996. The 2007 Annual Report compiled, reviewed, evaluated, and analyzed 2007 groundwater quality and water level monitoring program data; summarized groundwater-related changes; and reported results of an extraction monitoring program and on the status of previous recommendations.

To the east, the Hemet/San Jacinto Water Management Plan was completed in November 2007 by EMWD, Lake Hemet Municipal Water District, and the Cities of Hemet and San Jacinto to guide and support responsible water management. The plan’s objectives include, reducing the historical impact of overdraft caused by past groundwater production, increasing recharge of the groundwater basin, providing for the water rights of the Soboba Tribe, ensuring water supply reliability, providing for planned urban growth, and protecting and enhancing water quality. Options to increase water supply and reliability include developing underutilized sources particularly recycled water and imported water. To accomplish the plan’s objectives, the Hemet/San Jacinto Integrated Recharge and Recovery Program is being implemented. This program includes the construction of numerous water supply and conjunctive use projects such as direct and in-lieu recharge, increased use of recycled water, increased conservation, and improved monitoring.

Elsinore Valley Municipal Water District, Elsinore Basin Groundwater Management Plan (March 2005)

The objective of this Groundwater Management Plan (GWMP) is to provide an evaluation of the groundwater basin and develop a reliable groundwater supply to meet drought and dry season demands through the year 2020. This plan addresses the hydrogeologic understanding of the basin, the evaluation of baseline conditions, identification of management issues and strategies, and the definition and evaluation of four alternatives. This document concludes with an implementation plan of the recommended plan. This GWMP was adopted by the Elsinore Valley Municipal Water District Board of Directors on March 24, 2005 under the authority of the Groundwater Management Planning Act (California Water Code Part 2.75, §10753) as amended.

Chino Basin Watermaster, Optimum Basin Management Plan, State of the Basin Report 2006 (June 2007)

The Chino Basin Watermaster (CBWM) is the manager of Chino Groundwater Basin. CBWM prepared the Optimum Basin Management Plan which describes the state of the basin in terms of historical groundwater levels, storage, production, water quality, and safe yield. Current and projected water demands and water supply plans are described. The goal of the plan is to develop a groundwater management program that enhances the safe yield and the water quality of the basin, enabling all groundwater users to produce water from the basin in a cost-effective manner. The plan includes a monitoring program for groundwater levels, as well as programs for monitoring well construction, abandonment, and destruction.

City of Corona, Department of Water and Power, Groundwater Management Plan (June 2008)

The City of Corona prepared a Groundwater Management Plan for the Temescal, Bedford, and Coldwater sub-basins. The conditions of each groundwater basin were described including groundwater levels, production, and quality. Current and projected water demands and supplies were evaluated. Basin management objectives were determined and management strategies were set. Objectives include to:

- Manage the groundwater basin in a sustainable manner
- Prevent substantial water level declines in the Channel Aquifer
- Protect groundwater quality in the unconfined aquifer
- Maintain required outflow at Prado Dam
- Monitor groundwater levels, quality, and storage

OCWD Groundwater Management Plan (2009 Update)

The OCWD prepared the Groundwater Management Plan 2009 Update for the Orange County Groundwater Basin to identify key issues related to groundwater management. The three major objectives are to protect and enhance groundwater quality, to protect and increase the Basin's sustainable yield, and to increase the efficiency of operations. Recommendations in the report to proactively manage the Basin include:

- Monitoring water quality and groundwater levels
- Managing groundwater recharge
- Managing groundwater quality by controlling seawater intrusion, evaluating emerging constituents, and preventing future contamination
- Implementing projects to clean up existing contamination problems
- Preparing an integrated demand and supply program

WMWD Arlington Basin Groundwater Management Plan (September 2012)

The goal of this Groundwater Management Plan (GWMP) is to provide a planning framework to operate and manage the groundwater basin in a sustainable manner to ensure a long-term reliable supply for beneficial uses among all stakeholders in the basin.

The purpose of this GWMP, including development of the plan and the plan document itself, is to inform the public of the importance of groundwater to the Arlington Basin and the challenges and opportunities it presents; develop consensus among stakeholders on issues and solutions related to groundwater; build relationships among stakeholders within the Arlington Basin and with local, State, and Federal agencies; and define actions for developing project and management programs to ensure the long-term sustainability of groundwater resources in the Arlington Basin. This GWMP provides action items that, when implemented, are designed to optimize groundwater levels, enhance water quality, and minimize land subsidence.

RPU Riverside Basin Groundwater Management Plan (October 2012)

The goal of the Riverside Basin Groundwater Management Plan (GWMP) is to provide a planning framework to operate and manage the groundwater basin in a sustainable manner to ensure a long term reliable supply for beneficial uses among all stakeholders in the basin.

The purpose of this Riverside Basin GWMP, including the development of the plan and the plan document itself, is to inform the public of the importance of groundwater to the Riverside Basin and the challenges and opportunities it presents; develop consensus among stakeholders on issues and solutions related to groundwater; build relationships among stakeholders within the basin and between local, State, and Federal agencies; and define actions for developing project and management programs to ensure the long term sustainability of groundwater resources in the Riverside Basin. This GWMP provides action items that, when implemented, are intended to optimize groundwater levels, enhance water quality, and minimize land subsidence.

Imported Water Quality

Water agencies in the Santa Ana River Watershed receive imported water from the CRA and the SWP. The majority of this imported supply used by local agencies is received from the Metropolitan. The San Bernardino Valley Municipal Water District and the San Gorgonio Pass Water Agency also provide imported water from the SWP to local agencies within their service areas. The quality of imported water that is used for recharging groundwater directly affects groundwater quality. Since imported water is a significant source of potable water in the region, it affects the quality of discharges from wastewater treatment plants for certain constituents, such as salinity.

CRA and SWP source water is of high quality. This section provides a summary of key water quality constituents within the imported water systems. Source water protection activities aimed at maintaining a safe and reliable imported water supply are described.

Colorado River

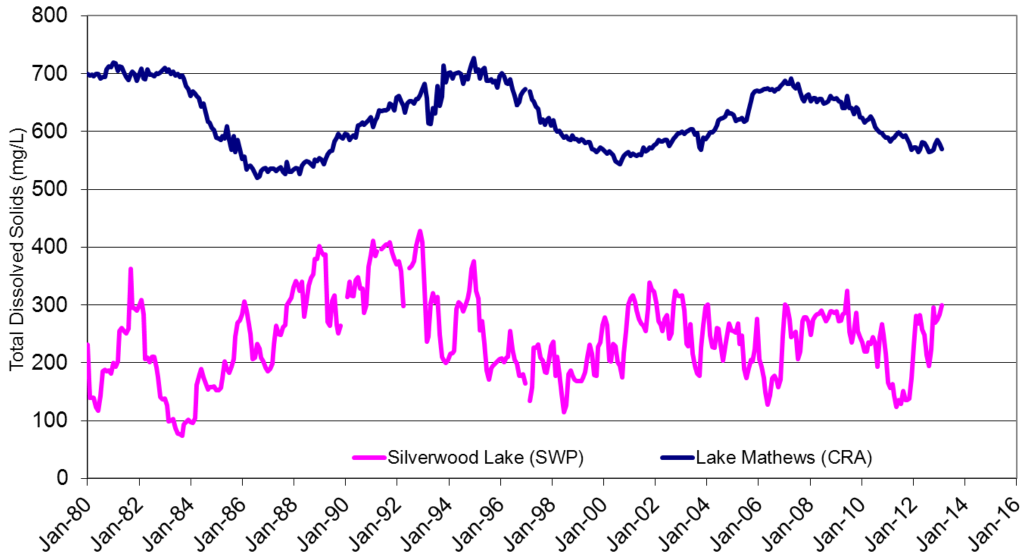
The Colorado River travels approximately 1,400 miles from the Rocky Mountains to its outlet into the Gulf of California in Mexico. The Colorado River Watershed encompasses 242,000 square miles, including portions of seven states–Wyoming, Utah, Colorado, Nevada, New Mexico, Arizona, and California–and portions of Mexico. Several dams and reservoirs along the Colorado River control river flows and Lake Havasu, formed by Parker Dam, serves as the Forebay for Metropolitan's CRA. The CRA, which has a flow capacity of 1,800 cubic feet per second (cfs), spans 242 miles between Whitsett Intake on Lake Havasu and Lake Mathews in Riverside County. The CRA system consists of pumping plants, reservoirs, conveyance infrastructure (i.e., canals, conduits, siphons and tunnels), and an extensive power transmission system. This section describes water quality in the CRA system.

Salinity

Colorado River salinity averages 630 mg/L, with cycles up and down over multiple years based on hydrologic conditions. Salinity changes are gradual over time due to large storage reservoirs along the river such as Lake Mead and Lake Powell. **Figure 5.5-14** shows historical TDS levels at Lake Mathews, the terminal reservoir on the CRA system.

Salinity in the basin is due to both natural sources and anthropogenic activities. Metropolitan's goal is to achieve an annual average salinity concentration of 500 mg/L for treated waters in order to reduce financial impacts to water consumers, impediments to recycling projects, and salt buildup in groundwater basins. This goal has been met primarily by blending Colorado River water with SWP supplies. It is anticipated that there may be periods when this goal cannot be achieved.

Figure 5.5-14 Imported Water TDS Levels



Nutrients

Phosphorus is the limiting nutrient for algal growth in the CRA system. Currently there is no regulatory limit for total phosphorus in drinking water. 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, organic carbon, and toxins.

Increasing wastewater discharges from the Las Vegas area to Lake Mead may increase nutrient loads in the lower Colorado River system. Metropolitan and other stakeholders work closely with Las Vegas area wastewater agencies who have taken steps to optimize treatment and reduce phosphorus loading.

A large number of septic systems are located near Lake Havasu, the intake for the CRA, and nearby communities have recorded some groundwater well sites with nitrate values well above the MCL. As a result of elevated nitrate levels in groundwater, many communities are converting to centralized wastewater treatment systems. Nitrate levels in recent years at the intake of the CRA have averaged <0.5 mg/L as nitrogen, well below the nitrate MCL of 10 mg/L measured as nitrogen.

Perchlorate

Perchlorate has been detected at low levels in Metropolitan's CRA water supply. In 1997, perchlorate contamination in the Colorado River was traced to Las Vegas Wash, originating from two chemical manufacturing sites in Henderson, Nevada. Under the oversight of the Nevada Division of Environmental Protection, remediation systems were put in place in the late 1990's and since then perchlorate levels in the river have declined. Since 2006, monitoring has typically indicated non-detectable levels (less than 2 µg/L) entering Metropolitan's conveyance system.

Uranium

Uranium is a naturally occurring radioactive element found at low levels in rock, soil, and water. 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 the CRA intake at Lake Havasu. Although uranium levels at the intake are much lower than the MCL of 20 pCi/L, averaging 3.2-3.4 pCi/L, there continues to be a looming threat of the tailings being washed directly into the Colorado River during a significant flood or earthquake. This threatens downstream consumers and harms the public's confidence in the safety of this critical water supply. In 2009, the United States Department of Energy began removing the tailings via rail to an engineered disposal cell located 30 miles northwest of the mill tailings pile site. As of April 2013, approximately 5.9 million tons of uranium mill tailings have been removed.

Chromium VI

There is a contaminated groundwater plume located adjacent to the Colorado River near Needles, CA. This plume contains hexavalent chromium (chromium VI), a form of chromium used as an anti-corrosive agent. The chromium VI groundwater plume exists from past waste disposal practices at the Topock Pacific Gas and Electric gas-compressor station. The California Department of Toxic Substances Control is the lead regulatory agency responsible for the investigation and cleanup activities for the site. The project is currently in the design phase and construction is anticipated for completion in 2016. Chromium VI levels in the river downstream of the site have been mostly non-detect (<0.03 µg/L) with an occasional low background level (0.03-0.04 µg/L).

State Water Project

SWP water originates at Lake Oroville, located on the Feather River, and flows into the Sacramento-San Joaquin Delta from where it is transported through the California Aqueduct to water users in Central and Southern California. The two major sources of freshwater inflow to the Delta are the Sacramento and San Joaquin Rivers which during wet years can exceed flows of 100,000 cfs and 50,000 cfs, respectively. The SWP vastly encompasses the 27,000-square-mile Sacramento River and the 13,000-square-mile San Joaquin River watersheds. Overall, the SWP, which terminates at Lake Perris in Riverside County, consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants operated by the DWR. This section describes water quality in the SWP system.

Organic Carbon and Bromide

Total organic carbon (TOC) can originate from decayed plant material and organics from wastewater and urban and agricultural runoff. Seawater intrusion is the primary source of bromide in the Delta and SWP. TOC and bromide in SWP water react with disinfectants during the water treatment process. Some disinfection byproducts are considered carcinogenic and may cause adverse reproductive or developmental effects in animals at very high doses. During the period of record through 2010, TOC levels ranged from <0.1 to 8.4 mg/L and bromide levels ranged from 0.03 to 0.64 mg/L at the intake to the California Aqueduct. Ozone treatment has been added to three of Metropolitan's water treatment plants to reduce the formation of chlorine disinfection byproducts. Metropolitan's other two plants are expected to have ozone treatment online in 2014 and 2016, respectively.

Salinity

Salt in the Sacramento and San Joaquin Rivers originates from natural sources, agricultural discharges, urban runoff and seawater intrusion. Although TDS concentrations in the East Branch of the California Aqueduct averages 250 mg/L, concentrations can vary significantly in response to hydrologic conditions in the Delta watersheds. SWP supplies, significantly lower in TDS concentrations than the Colorado River, are blended with CRA water to reduce the salinity of delivered water. Historical TDS levels at Silverwood Lake, a reservoir along the East Branch of the SWP system, are shown in **Figure 5.5-14**.

Nutrients

Wastewater discharges and agricultural drainage in the Delta are two primary sources of nutrient loading to the SWP. During the reporting period through 2010, nitrate levels along the California Aqueduct ranged from 0.2 to 7.1 mg/L as nitrate and total phosphorus levels ranged from 0.06 to 0.21 mg/L. Although nitrate levels are well below the MCL of 45 mg/L measured as nitrate, they are higher than those found in the Colorado River. Total phosphorus levels in the SWP are also higher than in the Colorado River.

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 SWP supplies. Groundwater in the Central Valley which can contain higher arsenic concentrations enters the California Aqueduct through water exchange and banking programs. These programs are managed to protect downstream water quality while also meeting supply targets. Routine monitoring between 1997 and 2010 at key SWP locations recorded maximum concentrations of 6 µg/L. 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.

Salinity and Nutrient Management

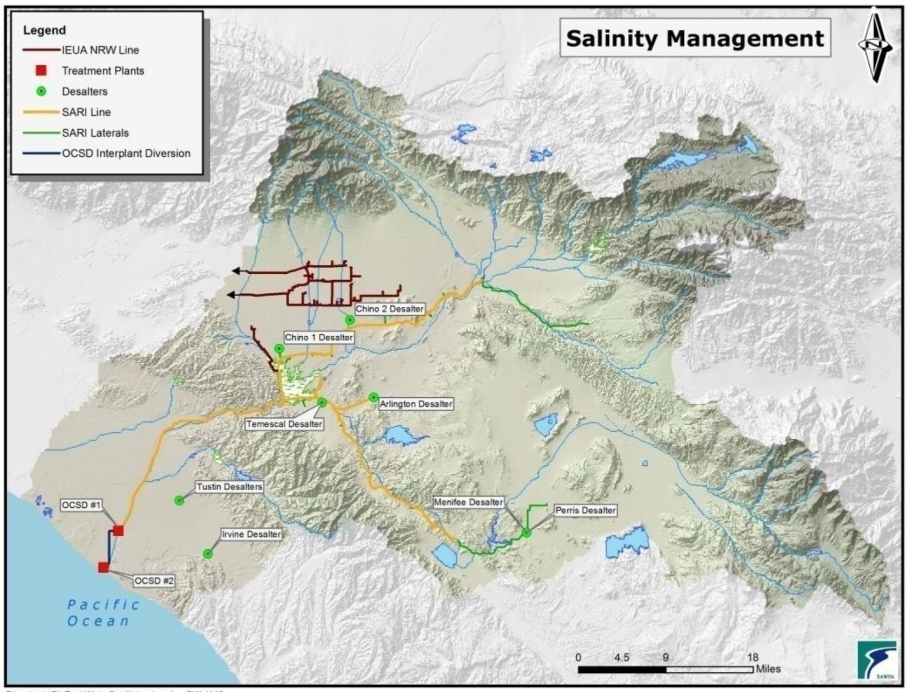
As stated earlier in this report, two of the most serious water quality problems in the Santa Ana River Watershed are the buildup of TDS in surface and groundwater and nitrogen levels. Consideration of potential changes to climate, as discussed in **Appendix F2**, includes prediction of an increase in drought conditions in the watershed. One of the most important impacts this may have to the watershed would be an increase in salinity of water resources. This section discusses on-going efforts aimed at achieving and maintaining a salt balance in the watershed, and efforts to manage nitrogen.

Salinity Management Facilities

The Inland Empire Brine Line (Brine Line), formally known as the Santa Ana Regional Interceptor, was built by SAWPA over a period of 25 years (1975-2000) to collect and transport industrial brine that could not be treated at local (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. In Orange County, the Brine Line (Reaches I, II, and III) is owned by OCSD.

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 treatment plant in Huntington Beach prior to discharge to the ocean. Additional brine lines have been constructed by IEUA and the IRWD. Salinity management facilities in the watershed are shown in **Figure 5.5-15**. These facilities are vital to on-going protection of water quality in the watershed.

Figure 5.5-15   Santa Ana Region Salinity Management Facilities



In January 2010, SAWPA completed the Phase 1 Salinity Management Plan Technical Memorandum (CDM 2010), which identifies a significant long-term salt imbalance in the watershed (see **Table 5.5-27**). Despite progress made over the years, through the implementation and operation of the Brine Line, groundwater desalters, and other projects and activities with salt reduction have been a primary goal. Much of the discussion in this section is taken from the Phase 1 Salinity Management Plan Technical Memorandum.

Salinity problems are anticipated to exacerbate if no action is taken, as the import of surface water continues, particularly from the Colorado River Aqueduct, which historically has a TDS concentration of 650 mg/L or more; water reuse increases, effectively increasing the salinity of the recycled water supply if demineralization is not provided; and as industrial and commercial growth continues.

In fact, the Salinity Management Plan projects that the seven groundwater management zones in the watershed modeled will exceed Basin Plan TDS standards in the future, as groundwater extraction and saltier water import continues. 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).

Future salt removal needs in the Watershed will be driven by four main regulatory limits:

- TDS objectives in the Basin Plan
- EPA secondary MCL for TDS in the potable water supply
- TDS discharge limits in the NPDES permits of POTWs
- TDS concentrations in recycled water that exceed the Basin Plan water quality objectives, thus preventing its use for irrigation or recharge in zones with no assimilative capacity

TDS Objectives in Basin Plan: As previously mentioned, two of seven management zones in the watershed have no assimilative capacity, and are already in excess of Basin Plan TDS criteria. For the remaining five, it is anticipated that desalination or other mitigation will be required if and when TDS concentration is within 10 mg/L of the standard. It is anticipated that this condition would occur by 2028 for Beaumont, 2016 for Yucaipa, and 2023 for Chino-North.

EPA Secondary MCL: The 500 mg/L secondary MCL may be exceeded in the future if mitigation measures are not taken. Potential measures include desalting, blending, importing lower-salinity water, and capturing and recharging more stormwater upstream of supply wells. According to the Salinity Management Plan, at least eight of 59 management zones in the watershed are anticipated to exceed potable water TDS standards and will require action in the future.

TDS Discharge from POTWs: Similar to potable water, the Salinity Management Plan estimates likely exceedances of TDS effluent discharge limits by wastewater treatment plants in the Watershed. Plants exceeding NPDES limits, with TDS effluent concentrations in the 490 to 700 mg/L range, will require actions such as desalinating all or a portion of the effluent. According to these estimates, eight out of 12, POTWs in the region will require action at some point over the next 30 years.

TDS concentrations in recycled water: TDS concentration in recycled water is a function of the salinity in the original potable water supply (*i.e.*, imported water and/or groundwater), which drives the salinity of effluent and in any salt reduction actions being taken. As described above, salinity issues are anticipated for groundwater basins, potable water supplies, and eventually wastewater effluent. Desalination of all or a portion of effluent may be required in the future in some areas to allow water recycling.

The Salinity Management Plan describes a number of projects planned or ongoing in the watershed that will address salinity issues. These projects include:

- 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

- Eastern Municipal Water District groundwater desalter expansion and wastewater desalting and reuse

Even with the implementation of these projects, a gap for salt removal remains. The Salinity Management Plan identifies potential long-term options to address the need for additional salt removal, including:

- Best Management Practices (BMPs)
- Desalters for water supply
- Desalters for wastewater
- Zero liquid discharge/evaporative ponds
- Sanitation Districts of Los Angeles (LACSD) Non-reclaimable wastewater system

Best management practices: BMP's include source control measures aimed at reducing salt mass balances that would otherwise be discharged to ground or surface waters, or introduced into the wastewater stream. Examples of BMPs include: eliminating salt-based domestic water softening devices, promoting the use of low-salt detergents, addressing salt runoff, and implementing pre-treatment programs.

Desalters for water supply: As previously mentioned, there are some agencies whose blended water supply could slightly exceed the 500 mg/L secondary MCL. Agencies potentially could add additional source water desalination because it is cost effective, or because there are limited alternative supplies.

Desalters for wastewater: Similar to potable water, some agencies potentially will exceed TDS effluent discharge limits. Agencies could reduce TDS in their effluent by implementing additional source control programs; reducing TDS of source water, as mentioned above; or adding desalination to all or a portion of their effluent stream. Providing advanced treatment to secondary effluent would also increase the possibility of reusing the effluent, including indirect potable water reuse via groundwater recharge or surface storage augmentation.

Zero liquid discharge: Some agencies in the watershed are exploring brine concentration projects to reduce the quantity of flows to the Brine Line, while exporting the same amount of salt but at a higher concentration.

LACSD non-reclaimable wastewater system: IEUA owns 60 miles of pipelines used to convey high TDS water to an interceptor owned by LACSD for treatment at Carson Treatment Plant and ocean discharge. Capacity is available (approximately six MGD) for additional brine disposal through this system.

The Salinity Management Plan projects a need for future brine exports in the amount of 35.5 MGD, which is approximately 23 percent greater than the nominal capacity of the SARI. This is equivalent to nearly 271,000 tons of salt per year. This amount does not include 2.27 MGD of domestic wastewater discharges that could potentially be eliminated from the SARI.

Table 5.5-27 Summary Potential Future Brine Export Needs

Project	Salt load (tons/yr) Current/ near term	Future	Total	Brine flow (mgd) Current/ near term	2010-2015 increase	2015-2025 increase	Beyond 2025 increase	Total
Water supply	131,392	38,144	169,536	10.08	0.32	5.00	--	15.40
Wastewater and recycled water	8,760	69,170	77,930	1.20	0.80	11.55	0.00	13.55
Unspecified desalting (1)	--	24,006	24,006	--	--	--	3.74	3.74
Other								
Domestic wastewater	--	Remove	0	2.27	0.00	Remove (-2.27)	0.00	0.00
Direct industrial connection and waste haulers	--	--	0	0.69	0.50	1.00	0.60	2.79
Total	**140,152**	**131,320**	**271,472**	**14.24**	**1.62**	**15.28**	**4.34**	**35.48**

The Phase 2 SARI Planning Technical Memorandum (CDM, May 10, 2010), complements the Salinity Management Plan, as well as identified strategies and their associated cost to address the anticipated deficit in the capacity of the Brine Line. Six potential reconfigurations of the Brine Line system were considered:

1. *Baseline*: Continue use of current configuration in which the Brine Line flows to OCSD POTWs prior to ocean discharge.

2a. *Centralized in-line brine minimization*: All water flows are diverted from the Brine Line to a centralized facility with biological treatment and desalination. Concentrate will flow back to the Brine Line, and in turn to OCSD and the ocean.

2b. *Decentralized brine minimization*: Groundwater desalters implement further concentrate management via secondary RO process, thus reducing flows to the Brine Line.

3a. *Direct ocean discharge with brine minimization*: Groundwater desalters implement further concentrate management via secondary RO process, and discharge directly to a new parallel pipeline to the ocean. Pretreatment will be required for some discharges to keep BOD concentrations below 30 mg/L.

3b. *Direct ocean discharge without brine minimization*: Groundwater desalters discharge brine without further concentration directly to a new parallel pipeline to the ocean. Pretreatment will be required for some discharges to keep BOD concentrations below 30 mg/L.

4. *Salton Sea discharge*: A new 125-mile pipeline from south of Prado Dam to the Salton Sea is built to transport all Brine Line flows, with no treatment at OCSD.

SAWPA prepared the Brine Line Market Analysis (EEC August, 2009) to gain an understanding of how the use of the Brine Line by industry and other brine dischargers could be increased to increase revenue and reduce cost to all users. Several factors impacting the use of the Brine Line were identified, along with potential solutions. SAWPA believes that a stronger marketing effort is needed to convey to potential users the value they will receive from discharging brine to the Brine Line when compared to other alternatives, SAWPA estimates that waste disposal to the Brine Line costs approximately $0.05 per gallon, compared to a cost of $0.25 per gallon of discharging to other alternatives in the Los Angeles basin.

Colorado River Basin Salinity Control Forum

The Colorado River Basin Salinity Control Forum, established by the Colorado River Basin states in 1973, has developed projects to meet agreed-upon numeric criteria along the lower Colorado River. The Salinity Control Program projects include improving agricultural irrigation practices in the upper Colorado River Basin and reducing salinity from natural sources. The Federal government and Colorado River Basin states, contribute approximately $50 million annually for this effort.

Basin Monitoring Program Task Force

On January 22, 2004, the Regional Board approved the Basin Plan Amendment for Nitrogen and TDS. Approximately 20 specific agencies throughout the watershed were charged with the responsibility to conduct several monitoring and analyses programs for nitrogen and TDS. These requirements included the preparation of an annual water quality report for the SAR and a triennial report to determine the ambient water quality (Nitrogen and TDS) in each groundwater management zone. To cost-effectively prepare these reports, a task force, which included the Regional Board, was convened in 2004 with SAWPA as the administrator to conduct the data gathering, consultant support and river analyses programs.

In 2009, the State Board adopted a “Policy for Water Quality Control for Recycled Water” that required the development of salt and nutrient management plans for all groundwater basins in the State. The basin monitoring program approved by the Santa Board in 2004 satisfies the requirements in the State Recycled Water Policy and as such as been determined to be in conformance with that policy.

Southern California Salinity Coalition

The Southern California Salinity Coalition (SCSC; www.socalsalinity.org) was formed in 2002 to address the critical need to control salinity in water supplies and to protect the water resources in California from increasing salinity. SCSC's purpose is to coordinate salinity management strategies and programs, including research projects, with water and wastewater agencies throughout Southern California. Members of the coalition include major water and sewer districts in San Bernardino, Riverside, Orange, Los Angeles, and San Diego Counties; the National Water Research Institute; and SAWPA. SCSC's objectives are to:

- Establish proactive programs to address the critical need to remove salts from water supplies
- Preserve, sustain, and enhance the quality of source water supplies
- Support economic development
- Help drought-proof the community
- Reach out to the general public on salinity problems

Future Issues

Due to increased water usage, irrigation and agricultural use, and other activities, the control of salinity will continue to be a challenge for the region. Inland desalination studies of brackish water must be funded as well as construction of facilities for concentrate disposal and management to help address salinity issues. The use of high quality imported water and region-wide planning to promote BMPs for reducing runoff impacts will continue to be essential. Managing salinity inputs to wastewater collections from water softeners also is an important factor in protecting water quality and maintaining the ability to use recycled water.

Control of salinity will continue to be a challenge. Desalinization studies must be funded and additional facilities for brine disposal are needed. From a salinity standpoint, it is preferable for the watershed to use SWP supplies compared to CRA supplies. Shortages of SWP supplies, due to regulatory issues in the Sacramento-San Joaquin Delta or other factors, can significantly impact the TDS concentrations in surface water and groundwater in the watershed. When SWP supplies are decreased, the percentage of the imported supply that comes from the CRA is increased, resulting in increased salinity in the imported supply. As water is used, discharged, and used again downstream, this increase in salinity affects downstream users in addition to the area that first used the water.

Nutrient Management

Elevated nitrogen and phosphorus concentrations come from municipal and industrial wastewater, septic tanks, animal wastes, and agricultural and lawn fertilizers. Nitrogen-containing and phosphorus-containing compounds act as nutrients in streams and rivers. Nitrate in freshwater can cause oxygen depletion. Desalination facilities or desalters, in operation in Chino, San Jacinto, and Orange County basins reduce nutrient concentrations in groundwater. Brine lines also are being used to export high nutrient water to the OCSD for treatment and disposal to the ocean.

Imported Water Recharge Cooperative Agreement

The Santa Ana Region was the first in the State to develop a comprehensive management plan for nitrogen and total dissolved solids (collectively referred to as "salinity"). The Regional Board adopted the *Total Dissolved Solids/Nitrogen Management Plan* as an amendment to the Santa Ana Region Basin Plan in 2004. The plan was developed in collaboration with stakeholders to address salt management in the watershed.

Concentrations of salinity in some surface water supplies and some groundwater basins are elevated due in part to past agricultural and dairy operations. Besides the historical legacy of salinity contamination, there is an additional salt load to the water basins associated with importing water into the region and recycling and reusing local and imported water supplies. Some of the groundwater basins in the Santa Ana River Watershed have a higher water quality than imported water. As a result, one of the concerns, which emerged from the Regional Board, was that by replenishing groundwater with imported supplies basin quality would deteriorate, violating state anti-degradation policies.

The 2004 Basin Plan amendment provided a framework for regulating recycled water discharges to surface water or groundwater in order to meet groundwater salinity objectives and beneficial uses. However; the Basin Plan did not directly address the potential salinity impacts of using imported water for groundwater recharge. The Regional Board and the State Legislature recognized that conjunctive use of imported water was necessary to facilitate the long-term sustainability of water supplies. Therefore, to avoid the necessity of regulating imported water salinity as a waste, the Regional Board worked with water supply agencies to develop a cooperative means of achieving compliance with salinity objectives without issuing waste discharge requirements.

In January of 2008, the Regional Board and water supply entities in the Santa Ana Region signed a "Cooperative Agreement to Protect Water Quality and Encourage the Conjunctive Uses of Imported Water in the Santa Ana River Basin." It states that:

> *"The Parties that intentionally recharge imported water within the Santa Ana Region (the "Recharging Parties") agree voluntarily to collect, compile and analyze the N/TDS water quality data necessary to determine whether the intentional recharge of imported water in the Region may have a significant adverse impact on compliance with the Salinity Objectives with the Region."*

The Cooperative Agreement was signed by the Regional Board and eight agencies in the watershed that import water to the region, import or export water between basins in the region, recharge groundwater basins with imported water, or treat or recharge wastewater in the region that includes imported water. The Cooperative Agreement directs the eight water agencies to prepare a summary of the amount of imported water recharged in each groundwater management zone, analyze the impact of such recharge on salinity levels in those zones, and compare projected water quality to historical ambient water quality. Specifically the agencies agreed to:

- Prepare a report every three years documenting the amount and quality of imported water recharged in each groundwater management zone during the previous three-year period

- Prepare a report every six years that projects ambient water quality in each groundwater management zone for the subsequent 20 years based on modeling that accounts for salt inputs from surface waters and reflects the effects of all existing and reasonably foreseeable recharge projects

TDS and Nitrate Management in the Chino Basin

For many years, the Chino Basin was home to one of the highest concentrations of dairies in the world. Waste discharges from years of dairy operations, as well as discharges from other commercial operations, left the southern portion of Chino Basin with a serious salt-imbalance. While the water quality in the northern portion of the basin remained high, increasing TDS and nitrate levels degraded groundwater in the south, threatening the quality of Chino Basin's groundwater supplies and SAR water that was flowing into Orange County's groundwater recharge basins.

The Regional Board addressed the impacts of salt loads from dairy operations by adopting waste discharges requirements, which included the requirements for dairies to adopt engineered waste management programs and manure control programs. The Chino Basin Desalter Authority, composed of IEUA and other local agencies, operates two desalters to pump out and remove contaminants in the groundwater. OCWD operates wetlands in the Prado Basin to naturally filter out nitrates. In addition, economic changes have led to a decline in number of dairies located in the Chino Basin.

These efforts have begun to reduce levels of TDS and nitrate in the basin. Plans are underway by IEUA and the CBWM as part of their maximum benefit agreement with the Regional Board for construction of an additional desalter and to expand other programs to improve groundwater quality in this area.

Each of the agencies importing water for groundwater recharge has completed these requirements. The first round of monitoring and modeling indicates that water quality impacts are minimal. The second round of the six-year reports is now in progress and will be completed by year 2015. Staffs from the agencies continue to meet regularly to discuss modeling approaches and coordinate the modeling efforts.

Ocean Water

This section focuses on issues related to ocean water quality. The primary emphasis with ocean water is maintaining water quality in order to protect marine resources and public health. Furthermore, the quality of ocean water may become a concern for drinking water, if seawater desalination facilities are built to create new water supplies.

Current Condition

Ocean water quality is evaluated using a number of different parameters and constituents related to beneficial uses. In the Basin Plan, one of the key beneficial uses is full body contact recreation, known as REC-1.

The California Health and Safety Code requires ocean waters adjacent to public beaches be tested for indicator bacteria to ensure public safety. This program, created by AB 411, establishes uniform and consistent water quality monitoring, response, and public notification requirements for the entire California coastline. The water quality standards established by AB 411 have been incorporated into the State Board's Ocean Plan and by reference into the Basin Plan. In addition to recreation, the ocean waters also support important habitat areas, including two ASBS and their related onshore Critical Coastal Areas (CCAs).

Compliance with California Health and Safety Code Standards

The County of Orange Health Care Agency implements AB 411 for Orange County's beaches, harbors, and bays shown in **Figure 5.5-4**.

Regulatory compliance is determined from the percentage the time standards were met. Beach Mile Days (BMDs) are calculated from the number of days and the linear area of ocean or bay front that is in violation of the AB 411 standards. BMD represents the loss of beneficial use of ocean recreational waters. **Table 5.5-28** lists total number of BMDs posted for beaches due to violation of AB411 standards. Orange County beaches on the CWA 303 (d) list are shown in **Table 5.5-29**.

Table 5.5-28 Total Number of Beach Mile Days Posted for Open Coastal Ocean Water Areas Due to Violation of AB 411

Year	Seal/Surfside/Sunset	Bolsa Chica	Huntington City	Huntington State	Newport Beach	Crystal Cove
2000	3.7	5.4	10.1	67.6	2.2	1.3
2001	0.4	0.1	1.4	14.8	0.7	0.3
2002	1.2	0.9	1.2	23.8	1.2	0.1
2003	0.3	0.8	0.8	41.9	1.4	0.2
2004	2.4	0.1	0.5	10.6	1.2	0.1
2005	0.1	0.4	0.4	12.1	6.0	0.0
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	2.4	2.2	0.0	0.1

Table 5.5-29 2010 CWA 303(d) List of Water Quality Limited Segments Requiring TMDLs

Name	Pollutant/Stressor	Potential Sources	Proposed TMDL Completion
Balboa Beach	DDT, Dieldrin, PCBs	Source unknown	2019
Bolsa Chica State Beach	Copper, nickel	Source unknown	2019
Huntington Beach State Park	PCBs	Source unknown	2019
Seal Beach	Enterococcus, PCBs	Source unknown	2019

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 westerly 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, 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 waterborne 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 despite educational efforts to discourage taking of tide pool species

Southern California Coastal Water Research Project (SCCWRP)

SCCWRP was formed in 1969 as a JPA to conduct research about the effects of wastewater and other discharges to the Southern California coastal marine environment. Its mission is to contribute to the scientific understanding of linkages among human activities, natural events, and the health of the Southern California coastal environment; communicate this understanding to decision makers and other stakeholders; and recommend strategies for protecting the coastal environment for this and future generations.

SCCWRP's 14 member agencies include representatives of city, county, State, and Federal government agencies responsible for monitoring and protecting the marine environment. SCCWRP brings together a multidisciplinary team of scientists to address complex environmental problems; recommend protection strategies; and foster communication and cooperation between scientists, the regulated community, and regulators.

SCCWRP is a recognized leader in environmental research. Accomplishments include developing new environmental monitoring methods, and defining the mechanisms by which biota are potentially affected by anthropogenic stressors. SCCWRP has participated in some of the most significant scientific discoveries, methodology developments, and environmental policy decisions of the past 40 years.

In the 2013-2014 Research Plan, SCCWRP scientists address topics such as, ocean acidification and hypoxia, beach bacteria, nutrients and eutrophication, freshwater and marine bioassessment, emerging contaminants, molecular method development, and regional monitoring, as well as environmental data acquisition, sharing, processing, and visualization technology.

Additional information may be found at www.sccwrp.org.

Current Management Strategies for Ocean Water

The major goal for ocean water quality improvement is to achieve water quality standards, which includes meeting beneficial uses and WQOs, preventing anti-degradation and meeting California's Ocean Plan and AB 411 standards. Goals, management strategies, and tactics are summarized in **Table 5.5-30**.

Table 5.5-30 Ocean Water Quality (including Bays, Estuaries, and Tidal Prisms) Goals, Strategies, and Tactics

Goals	Strategies	Tactics
Water Quality Standards attained (includes Ocean Plan and AB 411 standards)	• Protect good quality ocean water • Clean up poor quality ocean water	• Monitoring • Source water protection • POTWs implement source control and treatment • Urban runoff managed through NPDES/DAMP • NPDES permits for other dischargers • Implement State Non-Point Source (NPS) Plan • TMDLs • Constructed wetlands • Localized urban runoff treatment systems • Surface water diversions to POTWs or other treatment systems • Research • Public outreach

The Newport Coast Watershed Management Program works on water quality issues from Buck Gully in Corona del Mar to El Morro Canyon. These concerns include canyon stability, impacts to sensitive marine life areas, water quality impacts due to dry-weather nuisance flows, and invasive plants. This watershed program, organized by the City of Newport Beach, coordinates efforts between city staff, community members, property owners, jurisdictional agencies, Orange County Coastkeeper and other interested parties.

Orange County Coastkeeper

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 waterbodies and restore them to healthy, fully functioning systems that will protect recreational uses and aquatic life.

Seawater Desalination

In previous integrated water resource planning, potable water arising from seawater desalination had not appeared to be a viable or economic water supply alternative for the foreseeable future for Southern California. However, on November 29, 2012, this scenario changed. With the approval by the

San Diego County Water Authority (Authority), a 30 year water purchase agreement, with Poseidon Resources, for the purchase of up to 56,000 acre-feet of desalinated seawater per year from a new Carlsbad Desalination Project, which is projected to begin soon. The seawater desalination facility takes advantage of an existing seawater intake operated by the Encina Power Station in Carlsbad. This unique operations and management agreement will result in a purchase price by the Authority of desalted seawater at $1,897-$2,097 per acre-foot in 2012 dollars. The Authority estimates that water produced by the project will account for about one-third of all locally generated water in San Diego County by the Year 2020.

Though the Carlsbad seawater desalination project is outside the Santa Ana River Watershed, planning efforts are underway for a similar type of project to be located at the Huntington Beach. In February 2012 the Santa Ana Regional Board approved a permit for a large-scale desalination plant at Huntington Beach that would turn ocean water into drinking water. Similar to the Carlsbad plant, Poseidon Resources, a private investment firm that specializes in seawater desalination, will develop and manage the proposed Huntington Beach seawater facility on a 12-acre site next to a coastal power plant. According to the company, it would be the largest such facility in the western hemisphere and supply 50 million gallons of drinking water a day, which is enough to supply 300,000 people.

While local water agencies, lawmakers and the business community generally support building the plant, water quality concerns remain. The ocean water intake system would discharge extra salty water, known as “brine”, and would release water tainted with iron and cleaning fluids that could impact or kill fish, plankton larvae and other sea creatures.

A State policy adopted in 2010 will phase out the use of seawater to cool coastal power plants, a process that may harm fish, larvae, eggs, seals, sea lions, turtles and other creatures, when they get trapped against screens or sucked into the plant and are exposed to heated water.

The new policy by the State Board would end seawater cooling by ocean beach power plants similar to the Huntington Beach plant as early as 2020. The Huntington Beach project, which has been in the works for more than 12 years, still needs approval from the State Coastal Commission to move forward. State water regulators are collecting scientific and technical data in order to draft new policies on seawater intake that will be specific to desalination plants that could be adopted in the next year. Environmental groups said they would appeal the decision to the State Board. The earliest the Huntington Beach plant could start operating is 2016.

CHALLENGE: Identification and Solutions

Table 5.5-31 identifies current challenges for water quality management. The challenges were identified by members of the Beneficial Use Assurance Pillar. Because of the broad scope of issues, the diversity of challenges is significant. A range of potential solutions for each challenge are identified and categorized by the type of water body affected and the nature of the challenge (institutional/political, financial, regulatory, or insufficient data). Each item listed in the table is discussed in more detail on the following page.

Table 5.5-31 Water Management Challenges

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Regional Board's resources insufficient for Basin Planning; priorities in most recent triennial review conducted in 2006 have yet to be completed	• Secure additional resources for Basin Planning	• No new funding for Basin Planning • 2006 Triennial Review issues still incomplete • Revisions needed for Lake Elsinore/Canyon Lake TMDL not being addressed	• Work with Regional Board staff to develop potential options to address funding challenges • Evaluate potential for watershed stakeholder resources to be utilized to supplement work of Regional Board staff • Identify top Basin Plan priorities in need of review • Develop funding mechanism for Regional Board to develop revisions to the Lake Elsinore/Canyon Lake TMDL
Lack of prioritization in addressing water quality problems and limited resources make it difficult to solve the most pressing water quality issues in the watershed	• Create process to determine water quality problems presenting greatest human health and environmental risk • Allocate funding and staff resources to identified priorities	• Stormwater Quality Standards Task Force (SWQSTF) developed proposed Basin Plan amendments addressing water quality impacts related to recreational water use and providing method for prioritizing regulatory efforts. Basin Plan was approved by the Regional Board and State Boardas of Jan. 21, 2014.	• Support adoption of SWQSTF proposed Basin Plan amendments • Encourage development of additional programs that prioritize water quality improvements. • Identify top Basin Plan priorities in need of review
Solving water quality challenges by developing multi-agency, multi-benefit projects has advantages, but this is difficult to achieve as agencies have traditionally worked independently at the local level	• Increase regional dialogue • Foster pooling of resources and cost sharing • ID areas where regional efforts likely to have greatest impact and chance of success; target those areas for	• State grant programs have facilitated development of multi-agency, multi-benefit projects and have provided funding for such projects	• Continue working toward development of regional solutions for water quality problems

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
	regional projects		
Regulatory barriers make it difficult to develop regional BMPs to manage municipal stormwater discharges	• Work to overcome regulatory barriers	• Stakeholders continue to discuss methods/options to addressing regulatory barriers	• Regulators and stakeholders should address regulatory barriers in next phase of MS4 permits scheduled for adoption in 2014 • Permits should allow for regional BMPs as co-equal to infiltration, harvest and reuse, and bio-treatment BMPs • Assign watershed stakeholder task force to develop these options
Fecal bacterial contamination in stormwater remains a problem	• Conduct research • Assess health impacts from human vs. nonhuman sources and relationship between fecal indicators and health risks • Develop sanitary survey criteria to assess urban and non-urban environments	• Middle Santa Ana River (MSAR) TMDL Task Force completed development and implementation of Comprehensive Bacteria Reduction Plans for Counties of Riverside and San Bernardino	• Continue work of the MSAR TMDL Task Force
Floatable debris in stormwater hard to control	• Financial incentives to develop outreach and source control programs • Develop and implement trash and litter control municipal ordinances • Coordinate with the State Board's Marine Debris Steering Committee	• Control of floatable debris continues to be a problem in the watershed	• Continue efforts to address floatable debris and trash in stormwater • Apportion funding from future stormwater funding and grant programs

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Problems with septic system impacts to groundwater difficult and expensive to solve	• ID lead agency for expanding sewers to areas outside local agency jurisdictions • Extend sewers to areas without them • Amend laws to simplify annexations of areas without sewer providers • Provide source protection to reduce emerging contaminants • Increase minimum lot size for septic systems	• EMWD extended sewer system to community of Enchanted Heights; service extension to Quail Valley in progress. • Diamond Park Mutual Water Company customers in Santa Ana connected to municipal supply • Review of water quality data from small system water providers in Orange County completed • Municipal stormwater permits required permittees to develop septic system inventories by 2012	• As first step to working on remediating water quality problems from septic systems, produce an inventory map locating areas within the watershed that remain on septic systems • Work to develop plan to extend sewer systems to these areas
WUE and conservation increases pollutant concentrations in influent water to wastewater treatment plants challenging discharge permit compliance (i.e. TDS limits)	• Promote use of containers for food waste, pharmaceuticals, and household chemicals disposal • Promote use of detergents and products with low salt levels • Include higher loading levels in new treatment plant design and during CEQA and permit processes for new reclamation projects		• New section added to OWOW 2.0 discussing challenge of influent water quality • Promote source control efforts throughout watershed

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Salt balance not achieved in watershed	• Regional efforts for reducing salt impacts in runoff • Establish mitigation plans for recycled water projects • Ensure long-term viability of existing brine lines • Expand existing brine lines • Financial incentives for desalination studies and facilities • Encourage regulators to recognize exporting certain brines and constituents as regulatory relief/offsets for wastewater permitting requirements • Support elimination of water softeners • Address long-term need for increased brine disposal capacity	• IEUA's water softener program has removed over 600 salt-based softeners in the Chino Basin since 2008 • Water softener ordinances preventing the future installation of salt-based softeners have been passed in the cities of Montclair, Upland, and Fontana • Throughout the Inland Empire, public agencies have joined the "No Drugs Down the Drain" program, installing drop off boxes in public locations and participating in the National Drug Take-Back Day • Mitigation plans are required by Regional Board for recycled water projects where appropriate • Mitigation plans approved for recycled water use by IEUA and EMWD • SAWPA working on plans to ensure viability of and expansion of the Inland Empire Brine Line	• Work toward adoption of the Delta Plan in order to promote reliability of low-TDS imported water supplies for use in the watershed • Consider brine concentration alternatives to reduce discharges to brine line and/or zero discharge projects • Increase outreach, promotion, and awareness of National Drug Take-Back Day and "No Drugs Down the Drain" programs by posting prominently on websites, etc • Implement salt and nutrient management plans consistent with the statewide Recycled Water Policy • Identify regional strategies to support salinity control for imported water sources

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Public agencies must comply with new regulations without ability to increase revenues	• Federal and State funds for infrastructure banks • Amend Proposition 218 • Prepare strategies to address legal decisions adverse to public agencies setting/increasing fees for improvements • Increase effectiveness of new regulations by encouraging ID of goals and implementation plans for those regulations • Build public support for funds to address challenging water supply needs	• Public agencies continue to struggle to keep up with rising costs	• Work toward implementation of recommendations from OWOW 1.0
Emerging constituents detected at low levels without understanding of human health and toxicological effects Standard lab methods not available for emerging contaminants	• Outreach to agencies and Regional Board on status of studies and research • Evaluate joint opportunities to conduct studies • Encourage development of human health and ecological risk levels for specific compounds • Develop list of appropriate surrogates and indicators of water quality for monitoring constituents • Develop monitoring plan for waterbodies and facilities and test for appropriate set of constituents • Support creation of Blue Ribbon Commission to recommend monitoring of emerging contaminants in recycled water • Collaborate on public information outreach • Create collaborative efforts to develop new analytical methods • Regulators and dischargers coordinate with California Department of Publlic Health (CDPH) to ensure analytical methods developed and approved • Promote collection facilities and programs for unused pharmaceuticals and distribute smaller amounts to patients when possible	• State Blue Ribbon Commission completed report on monitoring of emerging constituents • Emerging Constituents (EC) Program Task Force completed four years of annual EC sampling in watershed • EC Task Force created a Water Quality Program Public Relations Work Group to collaborate on outreach • Standard methodology is under development	• Continue to support work of the Emerging Constituents Work Group • Work with CA Office of Environmental Health Hazard Assessment and CA Department of Public Health on development of Public Health Goals and water quality standards

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Land for new water treatment facilities in urban areas difficult to obtain	• Financial incentives for property owners to make land available for cleanup facilities	• Land availability continues to be a challenge	• Continue working to implement recommendations from OWOW 1.0
Finding parties responsible for groundwater contamination is difficult Typical response to well contamination is to shut down well, but pump and treat may be most effective means to cleanup	• Work with State and Federal agencies to obtain grants, including U.S. Dept. of Agriculture for perchlorate cleanup • Set up an orphan share fund • Develop incentives for groundwater producers to treat for wells producing contaminated water • Change existing local rules and regulations that act as barriers to cleaning up water contamination	• Groundwater contamination clean-up efforts continue to be slowed • In some cases potentially responsible parties are using CEQA or other means to delay clean-up	• Support efforts of water districts and other agencies to investigate parties responsible for groundwater contamination and collect funds from those parties to clean up contamination • Evaluate methods to streamline groundwater cleanup projects • Explore arrangements where multiple public agencies with grant funding form an MOU with non-public potential responsible parties to share cost and provide regional water supply solutions
Local agencies limited in amount of fines and penalties able to assess and have limited regulatory jurisdiction over some agencies (i.e. school districts)	• Consolidate enforcement authority to the regulating agency • Expand local agencies' enforcement authority • Develop panel to discuss current regulatory environment, interagency impacts, and impacts to business and residents, such as groundwater discharge permitting requirements	• Limitations on local agencies remain a problem	• Continue to work on providing local agencies authority to properly enforce regulations protecting water quality • Utilize part of future stormwater funding to pay for cost of enforcement

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Solving 1 problem may cause new one, i.e. infiltrating runoff improves surface water but may cause ground-water problem	• Increase communication, planning and cooperation among stakeholders • Collect data on infiltration BMPs at selected sites to evaluate potential impacts to groundwater quality	• RCFCWCD LID Testing and Demonstration Facility will collect water quality data on LID BMP performance • County of Orange is implementing Glassell Yard Campus Stormwater LID Retrofit Project • Business Industries of America completed study evaluating cost effectiveness of variety of LID BMPs	• Continue evaluation of LID BMPs to document long-term performance and water quality benefits. • Promote and increase the profile of BMP examples within communities (e.g. RCFCWCD campus)
Changing public behavior is difficult	• Develop, pilot, and evaluate effectiveness of strategies to change public behavior • Foster watershed sustainability by encouraging behavior aimed at reducing runoff and preventing pollution • Increase public perception of value of water.	• No Drugs Down the Drain website – http://www.nodrugsdownthedrain.org	• Continue efforts to educate public on water quality issues in the watershed • Expand efforts to change public behavior
Planning for complex growth impacts difficult in rapidly urbanizing areas Potential water quality impacts hard to ID	• Educate local officials so water quality concerns become core issues • Conduct studies to identify water quality challenges in rapidly developing areas	• Approaches used in Stormwater MS4 permits continue to be evaluated • Managing growth impacts continues to be difficult	• Implement recommendations from OWOW 1.0 • Work with Regional Board in development of next Stormwater MS4 permit

OWOW 1.0 Challenge	OWOW 1.0 Recommendations	Status of Addressing Challenge	OWOW 2.0 Suggested Implementation Activities
Urbanization and concrete-channelization have seriously reduced groundwater recharge leading to water quality impairments and reduced water supplies	• Promote LID principles • Recognize in regulatory and funding frameworks that using design and retrofit technology to minimize runoff and increase infiltration is beneficial for water quality and TMDL goals	• Chino Basin stakeholders preparing the Recharge Master Plan Update for the basin to monitor MS4 compliance and quantify benefits to basin	• Continue to work toward recognition in regulatory and funding frameworks that using design and retrofit technology to minimize runoff and increase infiltration is beneficial for water quality and TMDL goals

Table 5.5-32 OWOW 2.0 Recommendations

Challenges	Recommendations
Fracking for oil or gas development, if conducted within the watershed, could cause groundwater contamination	• Support development of statewide regulations that protect water quality
New statewide regulations setting biological objectives for surface water are being developed and will be compliance challenge for wastewater agencies	• Participate in rule making process to support development of policies and regulations that are effective and efficient and do not place an undue burden on dischargers
New statewide regulations setting nutrient objectives for surface water are being developed that will be compliance challenge for wastewater agencies	• Participate in rule making process to support development of policies and regulations that are effective and efficient and do not place an undue burden on dischargers
Surface water quality monitoring is not coordinated within the watershed leading to duplicative sampling in some areas and inadequate sampling in others. In some cases this may lead to 303(d) listings that do not reflect real impairments	• Assess surface water quality monitoring in watershed. Work on plan to improve coordination and development of regional approach to monitoring • Use monitoring developed by MSAR Watershed Pathogen TMDL Task Force, SWQSTF, SCCWRP's Regional Bio-assessment program, and SWAMP as models
A small number of small water systems may be in operation within the watershed that do not have resources for monitoring and proper operations and maintenance, which may result in drinking water provided to customers that are in violation of drinking water standards. (25 people or more, or 15 or more connections is a public water system in CA; State Small Water Systems are at least 5 connections, but less than 15 and are regulated by county health departments)	• Work with CDPH and county health departments to identify small system water providers, if any, which need assistance with providing safe drinking water • Develop plan to address any small system water providers that need assistance
Sediment deposition in some areas creates water quality impairments, reduces aquatic habitat, and reduces water conservation storage. Reduced sediment flow downstream of dams causes armoring of river/creek beds resulting in reduction in percolation capacity, aquatic habitat, and beach replenishment	• Support USACE/OCWD Prado Basin Sediment Management Demonstration Project • Support efforts of Newport Bay Stakeholders to reduce sediment load into Upper Newport Bay

Description of Data Collection Process

Greg Woodside of the OCWD and Mark Adelson of the Regional Board co- chaired the Beneficial Use Assurance Pillar Committee and coordinated the preparation of this report. Committee members, listed below, provided direction and assisted in collecting the information contained in this report and reviewed and commented on draft versions. The committee met in person and also held conference calls on a number of occasions.

References

California Environmental Protection Agency, State Water Resources Control Board, Division of Water Quality, Oceans Standards Unit, California Ocean Plan, Triennial Review and Workplan, 2005-2008, November 16, 2005

California Regional Water Quality Control Board, Santa Ana Region. Water Quality Control Plan for Santa Ana River Basin.1995 (as amended).

California State Water Resources Control Board, 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report, http://www.swrcb.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

CH2M Hill. 2006. Chino Creek Integrated Plan. Prepared for the Inland Empire Utility Agency/Orange County Water District. September 2006.

Chino Basin Watermaster. Chino Basin Optimum Basin Management Program, State of the Basin Report 2006, July 2007. (Downloaded from www.cbwm.org)

County of Orange. Central Orange County Integrated Regional and Coastal Watershed Management Plan. August 2007.

----- North Orange County Watershed Management Area Integrated Regional Water Management Plan (IRWMP). Draft Report 2008.

----- Coyote Creek Watershed Management Plan. 2007

County of Orange Health Care Agency-Environmental Health. Annual Ocean and Bay Water Quality Report. 2006

Eastern Municipal Water District. West San Jacinto Groundwater Management Plan. 1995.

----- West San Jacinto Groundwater Basin Management Plan.2006 Annual Report.

Newport Coast Flow and Water Quality Assessment, Final Report. City of Newport Beach. January 2007.

Orange County Coastkeeper.www.coastkeeper.org

Orange County Water District. Groundwater Management Plan. 2009 Update.

----- Unpublished data, 2007.

Riverside County Board of Supervisors. No date. Ordinance No. 427.3: An Ordinance of the County of Riverside Amending Ordinance No. 427.2 Regulating the Land Application of Manure http://www.boardofsupervisors.co.riverside.ca.us/ords/400/427.htm

San Timoteo Watershed Management Authority. 2005. Integrated Regional Watershed Management Plan for the San Timoteo Watershed, Final Draft Report. June 2005.

Santa Ana Regional Water Quality Control Board (8).Watershed Management Initiative Chapter. Revised November 2004

----- Total Maximum Daily Load (TMDL) Program. www.waterboards.ca.gov/santaana/html/tmdls.html.

Santa Ana RWQCB. 2007. General Waste Discharge Requirements for Concentrated Animal Feeding Operations (Dairies and Related Facilities) within the Santa Ana Region. Adopted September 7, 2007 http://www.swrcb.ca.gov/rwqcb8/board_decisions/adopted_orders/orders/2007/07_001_gen_wdr_cafo_09072007.pdf

Santa Ana Watershed Project Authority.2005 Regional Groundwater Management Plan. May 2005.

----- Santa Ana Integrated Watershed Plan 2005 Update: An Integrated Regional Water Management Plan. June 2005.

San Bernardino Valley Municipal Water District. 2005. Integrated Regional Groundwater Management Plan.

----- 2007. Upper Santa Ana River Watershed Regional Water Management Plan. November 2007.

San Jacinto River Watershed Council. Integrated Regional Watershed Management Plan for the San Jacinto Watershed. December 31, 2007.

Tetra Tech, Inc, .San Jacinto Basin Resource Conservation District. *Analysis and Development of a Manure Manifest System for the San Jacinto River Watershed*. Golden, CO: , 2008. Print.

Tetra Tech, Inc, .San Jacinto Basin Resource Conservation District. *San Jacinto Watershed Integrated Regional Dairy Management Plan*. Golden, CO: , 2009. Print.

Todd Engineers. 2008. AB 3030, Groundwater Management Plan. Prepared for the City of Corona Department of Water and Power. June 2008.

U.S. Environmental Protection Agency, Region 9. Total Maximum Daily Loads for Toxic Pollutants, San Diego Creek and Newport Bay, California. June 2002.

Western Municipal Water District, Integrated Regional Water Management Plan Report, October 2006.

Wildermuth Environmental, Inc. 2000.TIN/TDS Phase 2A: Tasks 1 through 5. TIN/TDS Study of the Santa Ana Watershed. Technical Memorandum. July 2000.

----- 2008. Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1987 to 2006, Final Technical Memorandum. Prepared for the Basin Monitoring Task Force. August 2008.

List of Contributors

Contributors to the OWOW 2.0 Beneficial Use Protection Chapter include:

Mark Adelson, Santa Ana Regional Water Quality Control Board

Pat Boldt

Art Diaz, Riverside County Flood Control and Water Conservation District

Rebecca Franklin, City of San Bernardino Water Department

Michael Gold, Orange County Sanitation District

LeAnne Hamilton, Inland Empire Utilities Agency

Elizabeth Hurst, Inland Empire Utilities Agency

Al Javiar, Eastern Municipal Water District

Jayne Joy, Eastern Municipal Water District

Jerry A. King, J.A. King and Associates

Joe LeClaire, Wildermuth Environmental Inc.

Maria Lopez, Metropolitan Water District of Southern California

Mark Matsumoto, University of California: Riverside

Larry McKenney, SAWPA

Beatrice Musacchia, OC Watersheds

Mark Norton, SAWPA

Lee Reeder, Santa Ana Watershed Association

Lisa Rothbart, Orange County Sanitation District

Jennifer Shepardson, City of San Bernardino Water Department

Marsha Westropp, Orange County Water District

Rick Whetsel, SAWPA

Greg Woodside, Orange County Water District

Matt Yeager, Yeager Environmental Associates

5.5.1 Brine Line to the Salton Sea

Introduction

In support of the One Water One Watershed (OWOW) 2.0 Plan, the Bureau of Reclamation (Reclamation) conducted an appraisal-level analysis of the connection of the Inland Empire Brine Line (Brine Line), formerly known as the Santa Ana Regional Interceptor (SARI), to the Salton Sea. It is one of several salt management alternatives involving brine delivery that the Santa Ana Watershed Project Authority (SAWPA) examined within the basin. One alternative option explores direct brine discharge to the Sea. Reclamation's appraisal analysis of the Brine Line are found in a four-volume set of technical memoranda that address the SARI history; engineering, brine and flow data; various options and strategies; projected cost information; and recommendations. Those points are captured in Reclamation's *Inland Empire Interceptor Appraisal: Technical Manuals 1-4* and the associated *Executive Summary*, attached as OWOW 2.0 **Appendix D1-D5**.

The Brine Line was constructed to help manage the basin's water quality by exporting highly saline waters from the Inland Empire to a wastewater plant in Orange County for ocean discharge. Like nearly all watersheds in arid climates, salt management is essential for water resource managers to ensure populations and ecosystems continue to thrive.

SAWPA's Brine Line, an important tool in managing inland groundwater basins, has allowed businesses with industrial processes that produce brine to move into and expand in the Inland Empire. Orange County also benefits from the Brine Line through the removal of salinity from the Santa Ana River, providing a reliable level of protection for its water quality and reducing the area's dependence upon imported water.

A study entitled Santa Ana Watershed Salinity Management Program (Salinity Management Program) was completed in 2010, by a team of consultants led by Camp, Dresser & McKee Smith (CDM Smith), which addressed the Brine Line capacity limitations. The Salinity Management Program identified and evaluated several alternatives for managing flows in the Brine Line system.

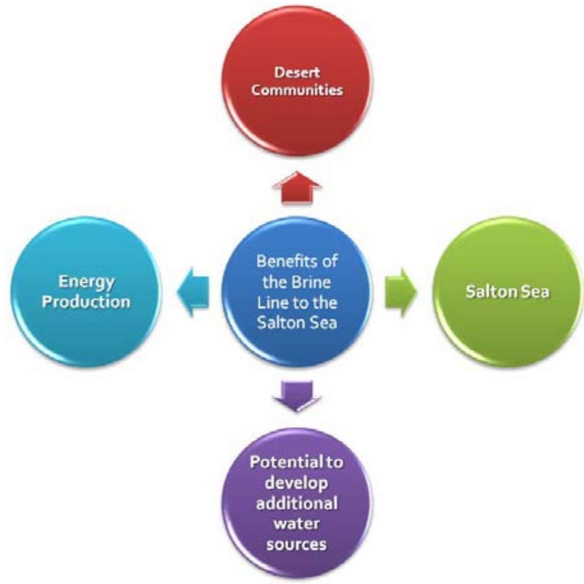
Some alternatives have been considered for improved salt management involving the Brine Line within the Santa Ana River Watershed (SARW). The first was a Brine Line flow reduction through a centralized treatment facility. Here the brine would undergo biological treatment, followed by chemical softening, then high recovery reverse osmosis treatment and disinfection concludes the process. The treated water is then available for use while the reject water continues downstream for further treatment and discharge to the ocean. A variation of this option would be to further treat and concentrate brine at individual desalters or facilities, but the benefits of scale for a single facility would be lost. Another salt management alternative includes providing incentives to commercial users to encourage use of the existing Brine Line. Brine disposal can be maximized and the cost can be minimized by directly discharging brine to the ocean. Currently, brine in the Brine Line is several times less salty than ocean water and with sufficient pretreatment at the source stream the brine could be discharged directly to the ocean without any negative impact to the environment, avoiding downstream treatment costs. Pretreatment is only required of system users with high BOD/TSS waste, but the cost of pretreatment may provide an incentive for the highest valued use of the Brine Line, salt disposal. In addition, the permit requirements for direct ocean discharge are onerous and time-consuming, so making use of the existing brine line is advantageous to these industries.

The final salt management alternative assumes all the flows in the Brine Line would be collected just below Prado Dam, the lowest elevation in the upper watershed, and that a separate pipeline would be constructed to transport that flow directly to the Salton Sea. The Salton Sea, California's largest inland lake, is a shallow, highly saline basin with no outfall to external water bodies. It is 14,000 parts per million saltier than ocean water.

After delivery of the Santa Ana Watershed Salinity Management Program report by CDM Smith, SAWPA staff prepared a report entitled *Inland Empire Brine Line Disposal Option Concept Investigation* (SAWPA Investigation) in which four alternative conceptual designs for the Brine Line to the Salton Sea alternative were developed and evaluated. Such a pipeline could accommodate additional saline flows which would be treated to some extent prior to discharge into the Salton Sea. A list of potential benefits including bringing in 30-40 thousand acre -feet of water every year to the Salton Sea were indentified that would significantly assist in the following:

- Dilute salt concentrations
- Help stabilize lake levels
- Enhance water reliability
- Protect fish and wildlife that are dependent on the Salton Sea ecosystem

- Restore the long-term stable aquatic and shoreline habitat for fish and wildlife that depend on the Sea
- Mitigate air quality impacts from exposed playas
- Maintain the Salton Sea as a vital link along the Pacific Flyway
- Minimize noxious odors and other water and air quality problems
- Enhance economic development opportunities that will provide sustainable financial improvements
- Improve the economic quality of life for communities around the Salton Sea
- Improve aquifer water quality
- Increase water production



Reclamation's engineering analysis and recommendations are attached as a separate report, which is an **Appendix D5** in OWOW 2.0. Based on that analysis, SAWPA remains hopeful that as new partnerships are developed with potential brine customers throughout the Basin and other parts of the state, the viability of this salt management alternative will become a truly system-wide solution. An economic analysis was recommended to help examine the potential for this proposed undertaking.

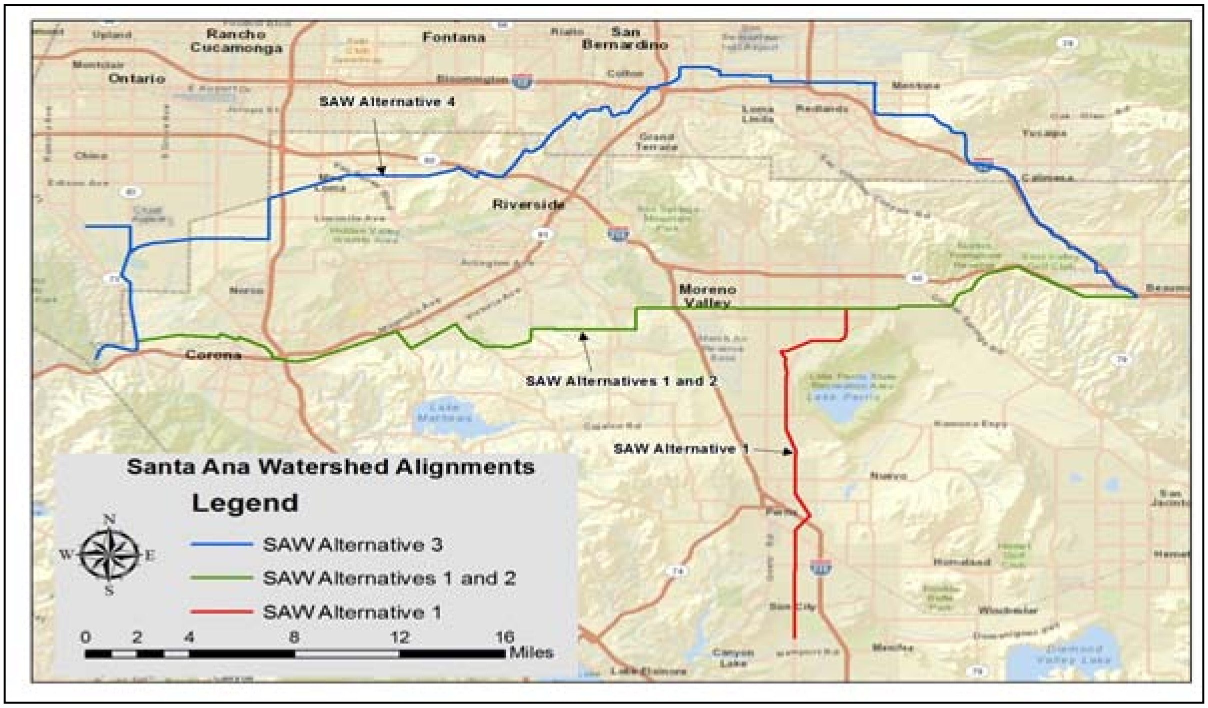
Appraisal Analysis Objectives

As mentioned above, the Brine Line to the Salton Sea alternative was the subject of the Appraisal Analysis and is identified as the Inland Empire Interceptor (IEI).

The purpose of this Appraisal Analysis is to help determine whether more detailed investigations of the proposed IEI are justified. Under Reclamation criteria set forth in *Reclamation Manual, Directives and Standards, FAC 09-01: Cost Estimating* (Reclamation Manual), appraisal analyses "are intended to be used as an aid in selecting the most economical plan by comparing alternative features". Several alternative conceptual designs for the proposed IEI will be developed and evaluated in this Appraisal Analysis for the purpose of comparison.

Three of the four alternative conceptual designs for the portion of the proposed IEI in the Santa Ana Watershed addressed in the SAWPA Investigation described above were considered in this Appraisal Analysis.

Figure 5.5.1-1 Santa Ana Watershed Alignments for the Proposed IEI



Additionally, two alternative alignments were developed and evaluated in this Appraisal Analysis for the portion in the San Gorgonio Pass and Coachella Valley. The route of the proposed IEI through the San Gorgonio Pass and Coachella Valley areas in eastern Riverside County represents an opportunity for SAWPA to expand the Brine Line service area.

Figure 5.5.1-2 Coachella Valley Alignments for the Proposed IEI

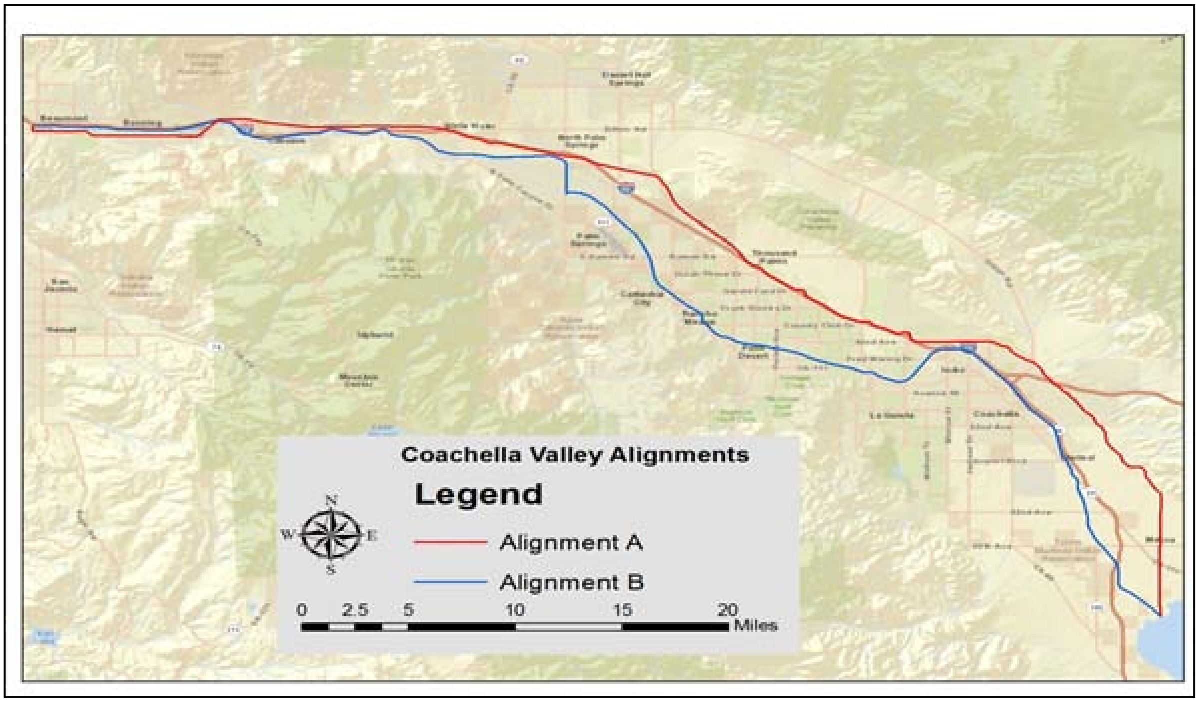
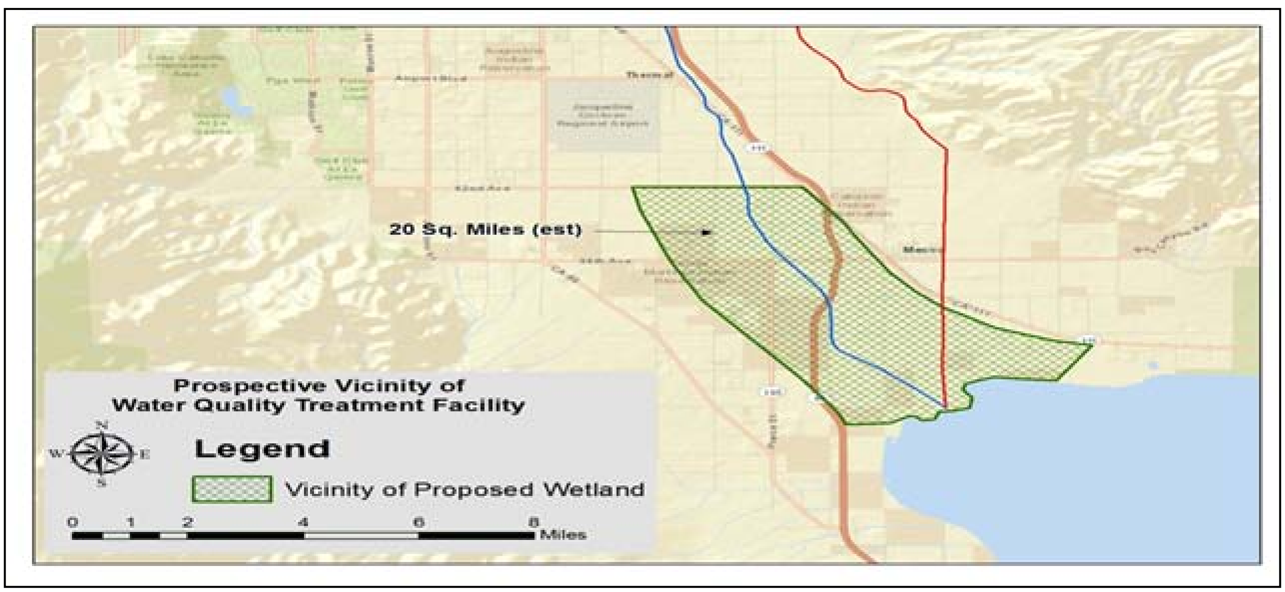


Figure 5.5.1-3 Water Quality Treatment Facility Location for Proposed IEI



Feasibility Analysis and Benefit-Cost Analysis

As discussed above, the purpose of an Appraisal Analysis is to help determine whether more detailed investigations of a proposed project are justified, the criteria for which are set forth in the Reclamation Manual. The *Reclamation Manual* also describes criteria for "a project Feasibility Study and Feasibility-level cost estimate, which are intended to support funding authorization for new construction" and "cannot be conducted without authorization and appropriation of funds by the Congress".

Also, as a Federal agency, Reclamation must perform benefit-cost analyses (BCA) for proposed water resources projects at the appropriate stage of project planning. The main set of guidelines for a BCA is the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, U. S. Water Resources Council, 1983 (P&Gs). For Reclamation projects, BCAs are typically performed at the Feasibility level of study.

The purpose of a BCA is to compare the benefits of a proposed project to its costs. The total costs of the project are subtracted from the total benefits to measure net benefits. If the net benefits are positive (benefits exceed costs), then the project could be considered economically justified. Conversely, if net benefits are negative (costs exceed benefits), then the project would not be economically justified. When multiple alternatives are being considered for a project, the alternative with the greatest positive net benefit would be preferred from an economic perspective.

A BCA is comprised of four "accounts" identified as the National Economic Development (NED) account, the Regional Economic Development (RED) account, the Environmental Quality (EQ) account, and the Social Effects (OSE) account. The NED and RED accounts are used to evaluate the economic effects of proposed alternative plans.

A RED analysis focuses on economic impacts to the region in which the project is located. The RED analysis recognizes the NED benefits accruing to the local region plus the transfers of income into the region.

A NED analysis focuses on economic impacts to the entire Nation. The *P&Gs* require Reclamation to analyze the NED effects so as not to favor one area of the country over another. Economic justification is determined solely by the benefit-cost analysis and must be demonstrated on the basis of NED benefits exceeding NED costs.

Conclusions and Recommendations

The results of the present worth analyses of the estimated costs for the proposed IEI are presented in Technical Memorandum No.4 (TM4). A simple comparison of those results with the present worth analyses for the other Options presented in the Salinity Management Program indicates that the costs of the proposed IEI are greater than the costs of other Options. However, certain aspects of the proposed IEI distinguish this Option 4 from the other options considered in the Salinity Management Program, and further investigation and analysis of the proposed IEI warrants consideration.

Significant opportunities are available for refinement of the conceptual designs for the proposed IEI presented in this Appraisal Analysis. Further investigation and analysis of these opportunities could help refine the estimated costs, reduce the multiplier applied to estimated costs for contingencies, and evaluate the benefits associated with the project. These refinements could lead to a more favorable present worth comparison of the proposed IEI with the other Options.

Opportunities to refine the scope, conceptual designs, estimated costs, and benefits associated with the proposed IEI are identified and discussed in TM4. In general, these Opportunities represent the Conclusions of this Appraisal Analysis. Suggested Optimization Strategies for the proposed IEI are also identified and discussed in TM4. These suggested Optimization Strategies describe recommended next steps (or Recommendations) for further investigation and analysis of the proposed IEI.

As discussed above, a Feasibility level of study "cannot be conducted without authorization and appropriation of funds by the Congress" and represents a substantial commitment to a project. These recommendations are suggested as interim stages of investigation and analysis of the proposed IEI. A Feasibility study and benefit-cost analysis of the proposed IEI would be warranted only if these additional investigations and analyses produce favorable results.

Conclusions

The Conclusions from this Appraisal Analysis are summarized as follows:

C1. Economic Development: The economic development potential associated with the proposed IEI is significant and unique to this option. If implemented, the proposed IEI would make brine management infrastructure available to prospective employers located in the San Gorgonio Pass and Coachella Valley areas.

C2. Net Impact: The proposed IEI would impact the Salton Sea in various ways, some of which may be considered beneficial and others negative. Further investigation and analysis of these aspects would help determine design criteria for associated components of the proposed IEI.

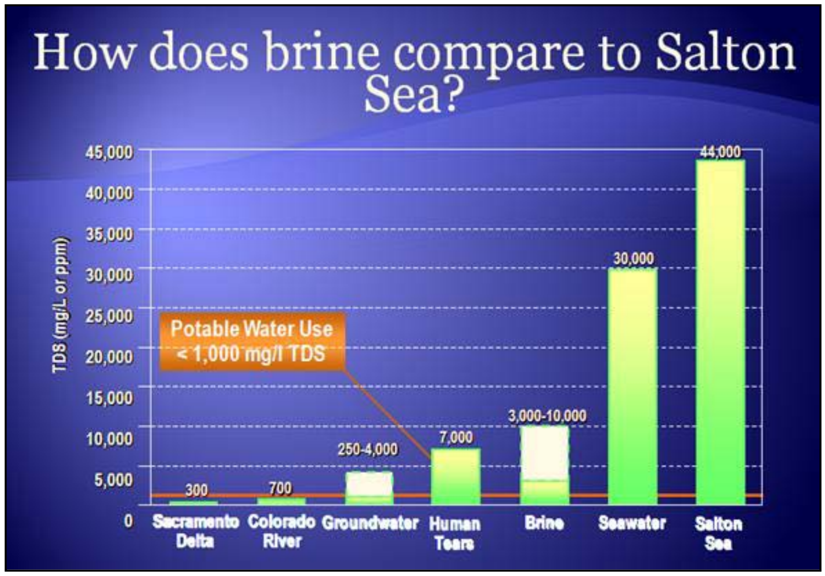
C3. Salton Sea Restoration: Delays to implementation of a restoration plan for the Salton Sea have contributed to uncertainties regarding salinity and water quality aspects of the proposed IEI. Improved understanding of progress toward restoration of the Sea would help determine appropriate project design criteria for the affected components of the proposed IEI.

C4. Basin Plan: Uncertainties regarding Salton Sea salinity and water quality regulatory requirements contribute to uncertainties regarding planning and design of associated components of the proposed IEI and the associated costs.

C5. Stakeholder Partnering: The standards established in the Basin Plan for salinity and water quality in the Salton Sea are a deterrent to potential new sources of water supply to the Sea.

Community and stakeholder support would enhance the likelihood of adoption of changes to those standards.

C6. Salton Sea Salinity: The salts in the IEI flows would add to the existing rate of accumulation of salts in the Sea. Whether those salts would cause total dissolved solids (TDS) concentrations in the Sea to increase will depend on such factors as the magnitude of the Salton Sea water budget imbalance over time and progress toward implementation of a Salton Sea restoration plan.



C7. Salton Sea Water Quality: Similar to salinity, whether the total suspended solids (TSS) and biochemical oxygen demand (BOD) in the IEI flows would cause an adverse impact on the water quality in the Salton Sea will depend on such factors as the magnitude of the Salton Sea water budget imbalance over time and progress toward implementation of a Salton Sea restoration plan. The estimated cost of the proposed Water Quality Treatment Facility (TF) represents a substantial portion of the total estimated costs for the project, which calls for careful scrutiny of the design criteria for this facility.

C8. Brine Pretreatment and Treatment Strategies: The proposed TF could function in place of the Brine Pretreatment and Treatment Strategies presented in the Salinity Management Program, or it could function as part of a hybrid design in combination with a Strategy from the Salinity Management Program.

C9. Management of Surplus Energy: The large estimated costs of the proposed IEI Turbine Generator Stations and associated electric transmission facilities indicate that the time period necessary to recover that investment in would be long. The estimated cost of the proposed IEI could likely be significantly reduced by using an alternative approach to remove surplus energy from flows in the system.

C10. Other Opportunities: Examples of other opportunities to refine, reduce and/or eliminate estimated costs identified in this Appraisal Analysis include but are not limited to the following:

- Synthetic Membrane Liner - The synthetic membrane liner under the TF is the largest single component of the estimated cost of that facility; use of an alternative approach to soil permeability could likely significantly reduce that cost.
- Tunneling – Tunneling in lieu of direct bury of the proposed pipeline through the Badlands west of the City of Beaumont along the Gas Main Alignment may reduce impacts associated with construction of the project.
- Phasing - Phasing of certain project components could allow some project costs to be deferred.

Recommendations

The results of this Appraisal Analysis and the Conclusions listed above suggest appropriate recommended next steps for further investigation and analysis of the proposed IEI to refine the scope, conceptual designs, estimated costs and anticipated benefits of the proposed IEI. These recommendations are summarized as follows:

R1. Economic Impact Analysis: In response to Conclusion C1 (Economic Development), perform an economic impact analysis for the proposed IEI to quantify the economic development and other benefits of the proposed IEI.

R2. Salton Sea Water Budget: In response to Conclusions C2, C3, C6 and C7, develop water budgets for the Salton Sea and for the planned Salton Sea restoration, or update available existing water budgets.

R3. Salton Sea Salinity and Water Quality Models: In response to Conclusions C2, C3, C6 and C7, develop models for salinity and water quality in the Salton Sea and for the planned Salton Sea restoration, or update available existing models.

R4. IEI Influence on Salton Sea Salinity: In response to Conclusions C2, C3 and C6, use the water budgets and the salinity models for the Salton Sea to evaluate the impact of proposed IEI flows on TDS concentrations in the Salton Sea, to evaluate the influence of those impacts on the IEI design, and to refine estimated costs for the proposed IEI.

R5. IEI Influence on Salton Sea Water Quality: In response to Conclusions C2, C3 and C7, use the water budgets and the water quality models for the Salton Sea to evaluate the impact of the proposed IEI flows on TSS and BOD concentrations in the Salton Sea, to evaluate the influence of those impacts on the IEI design, and to refine estimated costs for associated components of the proposed IEI.

R6. Salton Sea Restoration Influence on IEI Design: In response to Conclusion C2, C3, C6 and C7, use the water budgets and the salinity and water quality models for the Salton Sea restoration to evaluate the impact of the proposed IEI flows on the planned restoration, to evaluate the influence of the planned restoration on the IEI design, and to refine estimated costs for the proposed IEI.

R7. Basin Plan Amendment Process: In response to Conclusion C4 (Basin Plan), evaluate the process and technical requirements for a Basin Plan Amendment to modify Salton Sea salinity and water quality regulatory requirements for the proposed IEI.

R8. Identify, Investigate & Initiate Partnerships: In response to Conclusion C5 (Stakeholder Partnering), seek opportunities to partner with other Salton Sea stakeholders in support of regulatory changes to encourage new sources of water supply to the Salton Sea in support of restoration efforts. This effort may include:

- Establish a dialogue with other organizations serving the San Gorgonio Pass, Coachella Valley areas, and/or other areas adjacent to the Salton Sea,
- Investigate community support for changes to the regulatory approach to Salton Sea salinity and water quality standards to encourage new sources of water supply for the Salton Sea, and
- Develop specific proposals for suggested regulatory changes and identify benefits. Communicate the suggested regulatory changes and associated benefits to the community.

R9. Hybrid Strategies for Brine Treatment: In response to Conclusion C8 (Brine Pretreatment and Treatment Strategies), identify and evaluate alternative strategies for treatment of the IEI flows, which may include hybrid designs incorporating Salinity Management Program brine pretreatment strategies in combination with alternative configurations of the wastewater treatment ponds and/or constructed wetlands that comprise the TF considered in this Appraisal Analysis.

R10. Alternative Designs for Surplus Energy: In response to Conclusion C9 (Management of Surplus Energy), develop and evaluate alternative strategies for management of surplus energy in IEI flows such as low-head in-line turbine generators and pressure reducing valves.

R11. Alternative Liner Materials: In response to Conclusion C10 (Other Opportunities), investigate alternatives to the proposed synthetic membrane liner under the TF, including site-specific soil investigations to determine actual soil permeability to facilitate investigation of alternatives such as soil treatment using clay and suitability of a “leaky wetland”.

R12. Tunneling: In response to Conclusion C10 (Other Opportunities), investigate the constructability of and the impacts associated with direct-bury of the proposed pipeline through the Badlands west of the City of Beaumont along the Gas Main Alignment and the feasibility of tunneling in lieu of direct bury in that area.

R13. Phasing of Improvements: In response to Conclusion C10 (Other Opportunities), investigate opportunities for phasing of selected project components (e.g. use of dual pipelines in Coachella Valley) to defer costs until warranted by system flows, including a Present Worth analysis of the phased project costs.

Summary

The Conclusions (Opportunities) and the associated Recommendations (Optimization Strategies) identified above are summarized in **Table 5.5.1-1**. Priority rankings are assigned the table to those recommendations, which are loosely based on the potential influence on the estimated project costs and/or the value of anticipated benefits.

Table 5.5.1-1 Summary of Conclusions and Recommendations

CONCLUSIONS (OPPORTUNITIES)		RECOMMENDATIONS (OPTIMIZATION STRATEGIES)												
		R1 - Economic Impact Analysis	R2 - Salton Sea Water Budget	R3 - Salton Sea Salinity & Water Quality Model	R4 - IEI Influence on Salton Sea Salinity	R5 - IEI Influence on Salton Sea Water Quality	R6 - Influence of Salton Sea on IEI Design	R7 - Basin Plan Amendment Process	R8 - Identify, Investigate, & Initiate Partnerships	R9 - Hybrid Strategies for Brine Treatment	R10 - Alternative Designs for Surplus Energy	R11 - Alternative Liner Materials	R12 - Tunneling in Lieu of Direct Bury	R13 - Phasing of Improvements
	PRIORITY	1	2	2	2	2	2	3	4	5	6	7	7	7
C1 - Economic Development	1	x												
C2 - Net Impact	2		x	x	x	x	x							
C3 - Salton Sea Restoration	2		x	x	x	x	x							
C4 - Basin Plan	3							x						
C5 - Stakeholder Partnering	4								x					
C6 - Salton Sea Salinity	2		x	x	x		x							
C7 - Salton Sea Water Quality	2		x	x		x	x							
C8 - Brine Pretreatment and Treatment	5									x				
C9 - Management of Surplus Energy	6										x			
C10 - Other Opportunities	7											x	x	x

5.6 Water Use Efficiency

SAWPA's Demonstration Garden
Riverside, CA

Background

Of the many broad watershed management strategies proposed under One Water One Watershed (OWOW) 2.0, the highest priority strategy to meet future water demands, as well as the most cost efficient, is water use efficiency. The OWOW Pillars and OWOW Governance support the importance of this strategy and need for changing current irrigation behavior and move forward with implementation of water use efficiency measures necessary to meet future water resource needs. The Water Use Efficiency (WUE) Pillar has worked closely with the other OWOW Pillars to recognize WUE is an absolutely necessary and key integration component of the overall watershed portfolio of existing, and planned water supply strategies to ensure a sustainable watershed for future generations.

The WUE element of the Integrated Regional Water Management Plan (IRWMP) is the product of a growing regional effort to diversify our portfolio of water supplies, drought-proof the watershed, and ensure a reliable water supply into 2030. The terminology "water use efficiency" implies and supports efficient use of all water resources at all times. To begin identifying how to support existing water conservation strategies, enhance existing programs and measures, develop new WUE efforts, and be a model for others in this arena, a comprehensive long-term WUE plan needs to be envisioned and developed.

Assessing the current and existing WUE conditions and resources will identify opportunities for agencies in the Santa Ana River Watershed and partnering agencies outside the purview of the watershed to work together to maximize expertise, share resources, apply for various WUE program funding sources, collaborate on regional public awareness initiatives, and expand implementation of WUE programs.

The reader will notice that the term “water use efficiency” has been used in place of “water conservation” in this chapter. In the past, “water conservation” was used in many state and local water planning documents to mean the effective and appropriate use of water by consumers. However, it is the consensus of the WUE pillar that this effective and appropriate use of water is more accurately described by the term “water use efficiency.” Furthermore, the phrase “water conservation” usually is associated with water-saving programs that are implemented when water supplies are compromised due to drought or a water shortage brought on by an emergency situation, thereby implying a water “diet.” By using the phrase “water use efficiency” in future program implementation activities, and in educational and outreach efforts, the WUE team intends to convey and emphasize year-round, long-term improvements in how we use water while maintaining quality of life standards.

Current Conditions

Description of Resource Management

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, 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 WUE is the most cost-effective way to maximize 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, significant WUE measures have been implemented by Southern California water agencies. These programs include the large-scale replacement of old inefficient water fixtures and the upgrade of building and plumbing codes in the State 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. Through these programs, the amount of water imported into much of Southern California has remained fairly constant, sufficiently meeting demands despite significant development and population increases. However, with the water supply outlook continuing to worsen, WUE will be a critical resource management strategy that this region 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. Currently, the majority of WUE water savings is achieved through passive measures. Active WUE measures, however, will provide for a more holistic approach to watershed planning, and help usher a social transformation in water consumption attitudes and standards among the public and water industry. Through a combination of active and passive measures, it is estimated that over 20% of forecasted water demand in the Santa Ana River Watershed can be met through the implementation of aggressive WUE programs.

This subsection describes the current urban water resources available to the Santa Ana River Watershed. It also describes resource management programs currently implemented or participated in by the Santa Ana Watershed Project Authority (SAWPA) member agencies, and other partners within the watershed. These programs include: the OWOW initiative, programs offered by the California Department of Water Resources (DWR) Office of Water Use Efficiency and Transfers, the California Urban Water Conservation Council's (CUWCC) Memorandum of Understanding Regarding Urban Water Conservation; Metropolitan Water District of Southern California (MWDSC) Conservation Measure Funding, the United States Bureau of Reclamation (USBR) programs, other current resource management programs; and trends in WUE legislation.

DWR Office of Water Use Efficiency and Transfers


Courtesy of MWDSC

The DWR Office of Water Use Efficiency and Transfers offers several WUE programs that are utilized by water agencies in the Santa Ana River Watershed. These programs include funding from the WUE Grant Program that was established by Propositions 50 and 84; The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002; providing and updating the State Model Local Water Efficient Landscape Ordinance; and consulting with the State Energy Commission to develop performance standards and labeling requirements for water-efficient landscape irrigation equipment.

The Office of Water Use Efficiency and Transfers also offers an urban planning assistance program to assist urban water suppliers in meeting the requirements of the Urban Water Management Planning (UWMP) 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 UWMP.

California Urban Water Conservation Council

The CUWCC is a partnership of water suppliers, environmental groups, and others interested in conserving California's greatest natural resource – Water. The CUWCC was created in 1991 to increase efficient water use statewide through partnerships among urban water agencies, public interest organizations, and private entities. A significant number of agencies within the Santa Ana River Watershed are signatories to their "Memorandum of Understanding Regarding Urban Water Conservation in California" (MOU), which is the foundation of the CUWCC. The MOU created a negotiated framework between water agencies and environmental groups to facilitate expedited implementation of reasonable water conservation measures. The agencies that are signatories to the

MOU have agreed to implement comprehensive urban water conservation best management practices (BMPs) intended to reduce long-term urban water demands, and to consider water conservation on an equal basis with other water resource management options.

The BMPs established in the MOU are listed in **Table 5.6-1** below. Many of these BMPs are significant to the future success of WUE programs and planning efforts in the state of California. However, with close to 400 MOU signatories, differences exist between how each agency implements and tracks the BMPs. For instance, public outreach methods and marketing strategies vary among agencies in the SARW due to differences in each agency's size and resources.

Some of the agencies within the SARW who are signatories to the CUWCC's MOU are pursuing regional and collaborative WUE planning efforts and funding programs, yet because these agencies are geographically located outside of MWDSC's service territory, they are finding it difficult to implement the CUWCC's BMP programs in the same robust fashion as their MWDSC counterparts.

Table 5.6-1 CUWCC's BMPs

Foundational BMP's		
1	Utility Operations Programs	
	1.1	Operations Practices
	1.2	Water Loss Control
	1.3	Metering with Commodity Rates
	1.4	Retail Conservation Pricing
2	Education Programs	
	2.1	Public Information Programs
	2.2	School Education Programs
Programmatic BMP's		
3	Residential	
4	Commercial, Industrial, Institutional	
5	Landscape	

In addition to the BMP list, the CUWCC has developed two options: a Flex Track Options and a gallon per capita day Compliance Option. These options can be implemented by participating agencies to help them meet their savings goals for a particular BMP measure. Agencies choosing either of these options are responsible for achieving water savings greater than or equal to that which they would have achieved using only the BMP list items. Through this type of innovative approach, smaller agencies, as well as those that are implementing extraordinary conservation measures will be able to better demonstrate their efforts to achieve water savings.

MWDSC WUE Measure Funding

Through a water conservation commitment to its member agencies, MWDSC provides incentive funding for a wide variety of WUE programs, devices, and measures throughout its service area. These programs are offered to residential, commercial and industrial, agricultural, and public sector entities.

In 2008, MWDSC issued a call for extraordinary conservation measures and outlined some of the tools that they would develop to help their member agencies achieve its call for increased water savings. MWDSC launched a region-wide residential rebate program to help make it simpler for the over 18 million people in their service territory to take advantage of rebates through a one-stop shop concept. The program, known as SoCal Water$mart, is proving to be very effective, and has increased the convenience factor for the average Southern California consumer.

To help defray the criticism of those that would point the finger at public agencies as some of the largest water wasters, MWDSC created the Accelerated Public Sector Program to provide funding opportunities to public agencies to help them implement WUE programs and practices. The program has proved to be a tremendous success, especially with cities and school districts across the southland.

MWDSC hosts a monthly WUE meeting for conservation coordinators to share information and learn about important changes in the field. Certain entities (including Pillar participants, San Bernardino Valley Municipal Water District (Valley District) and the City of Yucaipa), are within the SARW but lie outside of MWDSC's boundaries, and are therefore not eligible to participate in MWDSC's programs. It is crucial that watershed planners find ways to encourage the development of similar WUE programs and funding opportunities for these communities, especially since many of these areas fall within the auspices of the Disadvantaged and Tribal Communities Pillar and are home to disadvantaged stakeholders.

Resource Management Programs

A variety of WUE management programs, pilot programs, and outreach efforts have been implemented by SAWPA member agencies, MWDSC, cities and counties, and other entities from within the watershed. These programs include:

- California Friendly Homes
- Targeted Water Conservation Programs
- Water-wise Ordinances and Design Guidelines for New and Existing Developments
- Green Building and LEED Standards
- Development Mitigation Credits for New WUE Programs
- Weather-Based Irrigation Controller (WBIC) Programs and rebates
- Agricultural and High Water Use Residential and Commercial Audits and Evaluations
- Landscape Irrigation Budgets
- Rotating Sprinkler Nozzles for Sprinkler Heads Rebates
- High-Efficiency Nozzles for Large Landscape Heads
- Turf Reduction Rebate Programs (Cash for Grass)

- Synthetic Turf Rebate Programs
- Residential and Professional Landscape Classes (California Friendly)
- Landscape Audit Programs
- Regional Landscape Alliances
- Variable Flow Pumping Systems for Homeowners Association (HOAs), Municipalities, etc.
- Custom-Sized, Pressure-Specific Pump and WBIC Packages
- US Environmental Protection Agency (EPA) WaterSense Certification Programs
- High-Efficiency Toilet (HET) Rebates, Direct-install and Distribution Programs
- Multi-Family High-Efficiency Toilet – Direct Install
- High-Efficiency Clothes Washer (HECW) Rebates and Added Incentives
- Industrial Water Use Reduction Audits and Incentive Programs
- Swimming Pool Cover and Rain Barrel Rebates
- Public Sector Incentive Programs
- CII Water Use Surveys & Rebate Program
- Hotel and Tourism Industry Programs
- HOA Outreach and Training Programs (Changes to CCRs)
- Industrial Process Performance Improvements Programs
- Allocated Budgeted (Tiered)Water Rates
- University Sponsored Water Institutes
- Fundraising Projects with Water-wise Plant Palettes
- Community Outreach Programs and Water Festivals
- Public Awareness and Communications Campaigns
- School Education Programs
- Water Conservation Demonstration Gardens
- Water-wise Landscape Contests, Gardening Guides and CDs

Various water agencies and other water related organizations in the watershed will implement WUE programs on a regional basis deemed to have a high probability of success and are cost-effective but will not duplicate MWDSC's conservation efforts. SAWPA, on behalf of the OWOW stakeholders and participants, will apply for grant funding to complement and expand on existing efforts.

WUE Policy and Legislation

The California Legislature has been active in creating and passing legislation regarding WUE. Legislation passed by the California Legislature, such as AB566, AB 662, AB 715, AB 1420, AB 1560, and AB 1881, are guiding and shaping the way for WUE. AB 566 requires, rather than permits, the model landscape ordinance (per the Water Conservation Act) to include climate information for irrigation scheduling based on the California Irrigation Management Information System (CIMIS) system. AB 662 requires the minimum standards for operating efficiency of water-using devices/appliances be based on those efficiencies that will reduce the energy and water consumption rates, and that do not result in any added total costs over the designed life of the appliances concerned. AB 715 requires that all toilets sold or installed in California use no more than an average of 1.6 gallons per flush, and that all urinals sold or installed in California use no more than an average of one gallon per flush. It also requires that, on and after January 1, 2014, all toilets and all urinals, other than blow-out urinals, sold or installed in California are high-efficiency toilets (1.28 gallons per flush or less) and urinals. AB 1420 requires eligibility for any grant or loan to an urban water supplier awarded or administered by DWR, State Water Resources Control Board (State Board) or the Bay-Delta Authority to be conditioned on the implementation of the water demand management measures described in the UWMP. DWR is required to convene an independent panel to provide recommendations to the legislature relating to adoption, implementation, and reporting of demand management measures. The DWR also must identify demand management measures that achieve a standard of excellence. AB 1560 requires the Energy Commission to prescribe, by regulation, water conservation design standards for new residential and new nonresidential buildings. Additionally, the DWR prepared a Water Efficient Landscape Model Ordinance as part of the implementation of AB 1881.

On November 6, 2009, the State Legislature approved Senate Bill X7-7 – Statewide Water Conservation as part of the State Comprehensive Water Package. This legislation establishes one of the most progressive mandates to establish statewide water use efficiency standards in the State's history. The bill includes the following:

SB X7-7 creates a framework for future planning and actions by urban and agricultural water suppliers to reduce California's water use. This bill requires the development of agricultural water management plans and requires urban water agencies to reduce statewide per capita water consumption 20 percent by 2020. Specifically, this bill:

- Establishes multiple pathways for urban water suppliers to achieve the statewide goal of a 20 percent reduction in urban water use
- Specifically, urban water suppliers may:
    - Set a conservation target of 80 percent of their baseline daily per capita water use
    - Utilize performance standards for water uses that are specific to indoor, landscape, and commercial, industrial and institutional uses
    - Meet the per capita water use goal for their specific hydrologic region as identified by DWR and other state agencies in the 20 percent by 2020 Water Conservation Plan
    - Reduce from a 10-year or 15-year baseline daily per capita water use, a specific amount for different water sectors: indoor residential, unmetered uses, commercial, and landscape
- Requires urban water suppliers to set an interim urban water use target and meet that target by December 31, 2015 and meet the overall target by December 31, 2020
- Requires DWR to cooperatively work with the CUWCC to establish a task force that shall identify BMPs to assist the commercial, industrial, and institutional sector in meeting the water conservation goal
- Requires agricultural water suppliers to measure water deliveries and adopt a pricing structure for water customers based at least in part on quantity delivered, and, where technically and economically feasible, implement additional measures to improve efficiency
- Requires agricultural water suppliers to submit Agricultural Water Management Plans beginning December 31, 2012, and include in those plans information relating to the water efficiency measures they have undertaken and are planning to undertake

- Makes ineligible for State grant funding any urban or agricultural water supplier who is not incompliance with the requirements of this bill relating to water conservation and efficient water management
- Requires DWR to report to the Legislature in 2013, 2016 and 2021, on agricultural efficient water management practices being undertaken and reported in agricultural water management plans
- Requires the DWR, the State Board, and other state agencies to develop a standardized water information reporting system to streamline water reporting required under the law

Regional WUE Strengths, Weaknesses, Opportunities and Threats

As part of the process of evaluating the region's overall WUE performance and future WUE planning efforts, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was conducted to determine best strategies and the most effective course of action. The identified Strengths, Weaknesses, Opportunities and Threats, which are further categorized as physical, institutional, and customer-related are summarized in the SWOT analysis described below.

Strengths

The regional WUE strengths lie primarily in the activities and experience of the regional water agencies and their sub-agencies. SAWPA consists of five major water and wastewater agencies: Valley District, Inland Empire Utilities Agency, Western Municipal Water District, Eastern Municipal Water District, and Orange County Water District. Many of these agencies also serve as the primary wholesale water agency for sub-agencies within their service area.

Through SAWPA, multi-agency forums or roundtables are held among member agencies to provide interagency communication, communication with the public, and communication with regulating bodies. It is also through these forums that agencies can share their technical and practical expertise in WUE program implementation. By meeting together to discuss issues and concerns, a unified message and response is continually refined and implemented by agencies for important issues such as the water crisis and future policy initiatives. Additionally, other organizations including non-profit entities, coalitions, and environmental interest groups, as well as larger institutions such as MWDSC and USBR, have been instrumental in helping to create and maintain the region's vision for a sustainable watershed.

Weaknesses

The regional WUE weaknesses lie generally in the differences in implementation of WUE programs, available agency resources for those programs, and in customer awareness and attitudes toward WUE.

With so many water agencies participating in regional processes, there are sometimes conflicting goals or priorities that can hinder progress. There also seems to be a gap in the distribution and implementation of conservation programs in various portions of the region. One reason is the ineligibility for conservation funding of those agencies that do not fall within the MWDSC boundaries. Public outreach and marketing methods vary due to the differences in the size and resources of agencies, budgets, and number of agency staff dedicated to WUE programs. This variance translates into customers within the same region not being similarly informed, and thereby not attuned to local water usage issues and regional water conservation measures.

Additionally, the Santa Ana River Watershed is limited in the number of landscaping professionals, contractors, and other trade staff members who are knowledgeable about WUE, water-efficient techniques, and technologies; and who can serve as resources for water customers looking to implement WUE measures. It will be important to forge partnerships with industry groups and large retailers to help bring about a transformation in the marketplace by making it easier for consumers to purchase new water efficient irrigation devices.

Opportunities

One of the key opportunities that can be implemented is the use and reiteration of the term "water use efficiency" instead of "water conservation" in any education or outreach to the stakeholders and the community. As explained previously, the word "conservation" usually conjures negative image of a water "diet", which is generally associated with times when water supplies are compromised due to drought. By using the phrase "water use efficiency," agencies convey the importance of efficient use of water resources at all times and encourage water-wise behaviors as an integral part of customers' lifestyles.

The weaknesses noted earlier are also opportunities to build new strengths. By using the OWOW WUE Pillar forum, agencies can collaborate on projects that will provide regional benefits by maximizing shared resources and developing new relationships and programs.

Other opportunities available to the regional WUE effort are mainly customer-oriented: changing expectations and behaviors; inspiring and motivating WUE; and providing information, training, and support programs regarding WUE and technologies. The opportunity for increased solution-oriented collaboration among water agencies and professionals is also a key opportunity.

There are many opportunities for WUE measures in the region. With the continuation of regional marketing measures, WUE issues can reach a broader audience throughout the region. SAWPA and local agencies will have an enhanced role to advance WUE by embracing emerging technologies, and creating grant-funded technical assistance for the region. Other WUE opportunities include new programs such as EPA's WaterSense, training classes for landscapers and the public, and the possibility of developing a contractor certification program. Better coordination with water agencies and cities will help promote new WUE ordinances based on AB 1881, the California Model.

Local Water Efficient Landscape Ordinance, such as the Riverside County Water Efficient Landscape Requirements Ordinance, County Ordinance 859; new water-efficient development; and the use of allocated tiered water rates. There also is an opportunity for SAWPA and local agencies to partner with the area's energy utilities on marketing and incentive programs for California's commercial, industrial, and institutional (CII) water users that target water use and water-related energy use. All of these opportunities will be designed to motivate customers to increase their WUE.

As implementation measures are enacted to comply with AB 32, California Global Water Solutions Act of 2006, to control greenhouse emissions, the advantages in reduced energy use of WUE applications become readily apparent. As indicated in **Figure 5.6-1**, on the following page, WUE is ranked as the most energy efficient of water supply source per kWh/AF in Southern California based on research conducted by Dr. Robert Wilkinson, Director Water Policy Program, University of California, Santa Barbara.

Figure 5.6-1 Energy Intensity of Selected Water Supply Sources in Southern California

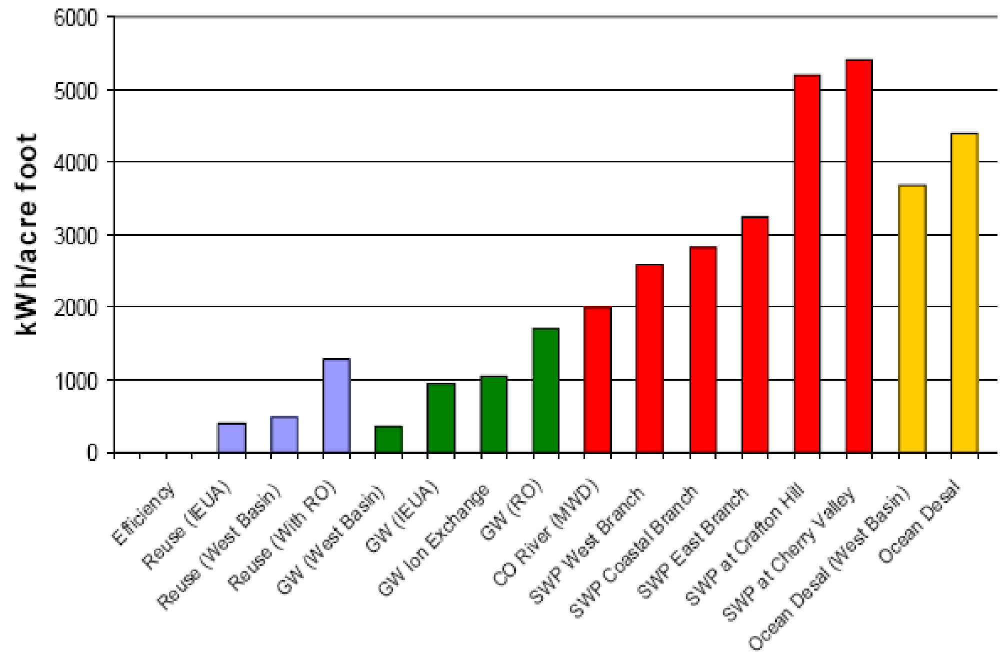
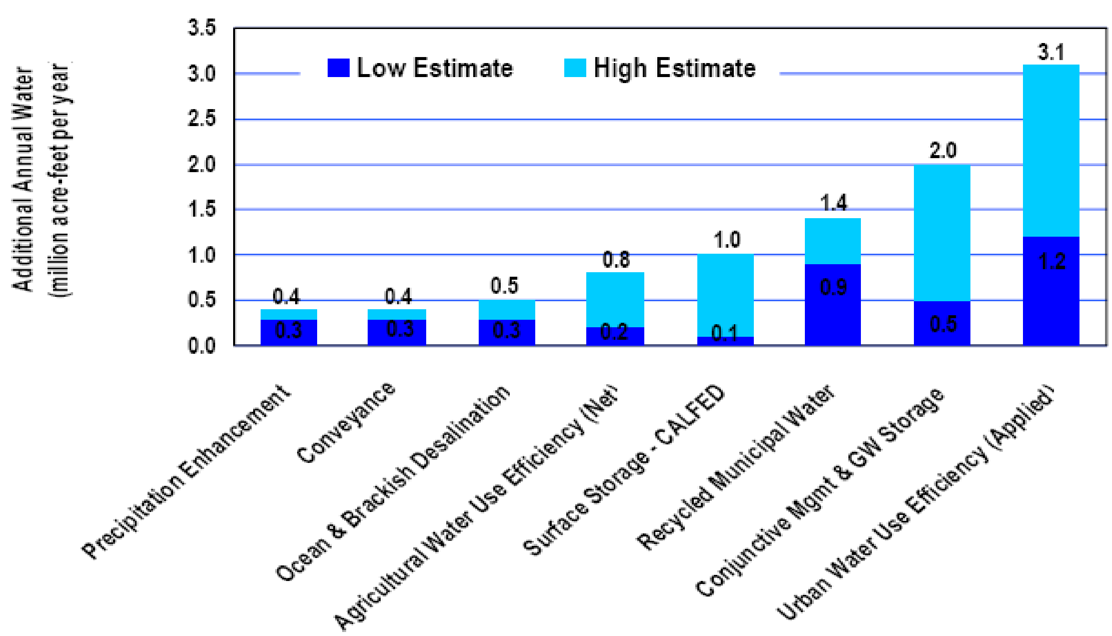


Figure 5.6-2 California Water Supply



Further, under **Figure 5.6-2**, of the many California water supply options available, urban WUE offers the largest supply available under low and high estimates statewide.

Threats

Funding, population growth, water infrastructure maintenance, and legislation are several main issues that could inhibit the regional WUE programs. The region is in need of programs to promote efficient use of its water supply, while facing a possible cutback on grant funding. Other issues include political pressures, the need for agencies to remain cost-effective and recent legislation requiring compliance with UWMPs.

Several of these threats are embodied in AB 1420, a bill signed by Governor Schwarzenegger in October 2007 regarding water demand management measures and water management grant or loan funds. This legislation states that eligibility for any grant or loan to an urban water supplier awarded or administered by DWR, the State Board, or the Bay-Delta Authority is to be conditioned on the implementation of the water demand management measures (DMMs) described in the supplier's UWMP. If the supplier is not in compliance with any of the DMMs in its UWMP, it will not be eligible for state funding grants or loans.

Agencies will have to work together to examine these potential threats and create a plan for moving forward if faced with any of these challenges.

Identification & Implementation of Strategies to Improve Resources

With their key goal to reduce demand for imported supplies received from the State Water Project and Colorado River, SAWPA, its member agencies, and other retail agencies in the watershed are developing water-efficient strategies to become more self-reliant and sustainable. To identify opportunities for using water more efficiently, existing conditions and regional resources were identified and analyzed by the Pillar members.

Water Use Efficiency Measures

The WUE Pillar meetings gathered information and ideas on potential new conservation opportunities, programs, and emerging technologies that could be implemented in the SARW. The WUE team developed two primary points of agreement: 1) the main focus of WUE's current and future efforts should shift from indoor residential water use to landscape and CII water use, and 2) regionally standardized WUE programs should be implemented throughout the watershed.

To develop a plan and outline strategies to accomplish these items, the WUE Pillar members held quarterly meetings to exchange information and ideas, partner and support each other's efforts, and coordinate with SAWPA staff. Through these meetings, a comprehensive list was created to summarize existing and potential new opportunities for WUE efforts. The WUE list was created by the Pillar. It lists several conservation measures by the following categories: Regional Programs and Incentives, Landscape, CII, Financial and Policy Initiatives (also refer to *Current Conditions* section), and Partnerships and Outreach. Pillar members were invited to check off the WUE measures they currently were implementing, and measures they wanted to pursue. Using this information, the Pillar was able to review everyone's efforts and validate their agreed vision to focus on landscape and CII water use, and regionally standardized WUE programs.

The following is the list of the WUE Pillar's list of programs determined to be the most effective in the categories listed above:

Regional Programs and Incentives

- ***Promulgate HETs and High Efficiency Clothes Washer (HECWs)***
  Toilets and clothes washers typically account for 27% and 22%, respectively of residential indoor use, representing the most significant remaining savings potential for indoor use. (Note: Aggressive showerhead replacement programs in the early 1990's, in addition to plumbing code changes, have resulted in high saturation levels for low-flow showerheads). By replacing a toilet that uses 3.0 gallons or more per flush with one that uses 1.28 gallons per flush or less, a resident may receive $100, depending on the toilet selected and the incentive offered by the local water provider.

  Incentives also exist for residents who want to buy a new HECW that uses less water and energy than conventional washers. These incentives encourage residents to invest in and install WUE devices that will be used frequently in their households.

  Building upon the success of indoor WUE programs provides the groundwork to now shift the focus to outdoor and landscape water conservation measures. Out of all of the topics in the WUE matrix, the landscape category had the most conservation measures identified by the Pillar. The irrigation system improvements (audits and equipment) and the CII large-scale and key account audits and Implementation measures were the ones that were ranked the highest in the landscape category, which reinforces the Pillar's focus on landscape and CII water use.

- ***Utilize MWD's Regional Support for WUE Rebate Incentive Programs***
  MWDSC has implemented a program that allows water agencies to customize their rebates by adding additional incentives. The program also allows agencies to target markets, analyze data, and implement new approaches. MWDSC rolled out SoCal Water$mart, a regional residential rebate program where any resident within MWDSC's general service area will be eligible to apply for rebates on water efficient purchases for the home directly from MWDSC, thereby eliminating the ineligibility of customers who live in non-participating MWDSC areas. The landscape water use efficiency statewide market survey conducted by the Water Resources Institute at California State University, San Bernardino, shows that rebates would provide motivation for a significant percentage of decision-makers for residential and managed properties to invest in landscape water efficiency technologies.

Landscape

- ***Irrigation System Improvements (Audits and Equipment)***

Irrigation of residential and certain types of commercial landscapes currently is one of the largest uses of water. Landscape water use can be reduced by up to 30% by simply repairing broken or damaged irrigation components, adjusting pressure, retrofitting with more efficient components, and scheduling irrigation properly. A simple system improvement is retrofitting spray head sprinkler nozzles with rotating sprinkler nozzles. The rotating sprinkler nozzles apply water at one-third the rate of spray heads, thereby allowing the sprinklers to run for longer periods of time before runoff occurs.

A significant system improvement that can be accomplished in combination with other irrigation improvements to reduce landscape water use by 20% or more is the installation of a "smart" irrigation controller. It estimates or measures depletion of available plant and soil moisture, and replenishes water as needed while minimizing excess water use. It adjusts water application throughout the irrigation season without human intervention. There are two types of smart controllers: 1) sensor-based controllers, which use historical weather data, plus temperature and precipitation monitoring, or information provided by an on-site weather station; and 2) signal-based controllers that use localized weather data provided by the California Irrigation Management Information System or an equivalent. The benefits of encouraging and promoting the use of smart controllers include reduction of outdoor water use, healthy and attractive landscaping, reduction of runoff and non-point source pollution, and improved water quality.

Commercial, Industrial, Institutional

- ***CII Large Scale and Key Account Audits and Implementation***

  Large-scale CII customers use water in unique ways that must be examined for opportunities to save water on an industry-wide or individual basis. To assist with this, MWDSC has the Water Savings Performance Program that provides audits and retrofits to large industrial water users. Financial assistance is provided for documented water savings derived from projects implemented under the program that meet the qualifying criteria.

  Equipment for the proposed improvements may be purchased or leased. Typical process improvements that qualify include installation of equipment to capture, treat, and reuse water that otherwise would be discharged to the sewer, and replacement of existing equipment with more efficient process improvements resulting in reduced water demand.

  On a smaller scale, many local water agencies have obtained grant funding to implement local programs to assist commercial users in retrofitting to more efficient devices.

- ***SoCal WaterSmart Program***

  MWDSC's SoCal WaterSmart Rebate Program, in which three of the four eligible SAWPA member agencies participate, is tailored specifically for the CII and residential sectors. Rebates are available for numerous water efficient devices and technologies to help lower water and sewer bills, reduce energy costs, and address environmental impacts. The program also allows regional marketing to key strategic partners, including device vendors. The lifetime water savings for devices and technologies installed to date in Southern California through the SoCal WaterSmart program is anticipated to be over 20 billion gallons.

The growing population in this semi-arid region puts an ever-increasing strain on the limited water supply. The dramatic anticipated water savings resulting from the SoCal WaterSmart program show that one of the best ways to meet this demand is for Metropolitan and its member agencies to help customers become more aware of water-saving technologies, and to provide the necessary financial incentives to encourage their implementation.

Other Inferences from the WUE Matrix

The other categories of financial and policy initiatives, and partnerships and outreach, are important in strategizing, designing, and implementing WUE efforts. Each is a category that directly affects and influences the direction and development of future WUE programs.

Financial and Policy Initiatives

Water budgets and allocated tiered water rates offers individualized allocated water budgets for each water customer. This creates a structure that encourages people to stay within their water budget, and may be used at the discretion of local retail water agencies to penalize those who are careless or excessive with their water use. The money generated from overuse penalties is used as a funding source to implement new local WUE programs. AB 2882 supports this strategy by allowing wholesale and retail water suppliers to adopt allocation-based conservation water pricing.

Partnerships and Outreach

Partnering and outreach is an integral part in building consensus, sharing resources, and unifying the message for WUE efforts. There were numerous responses from WUE Pillar members on the ideas for how to partner with Resource Conservation Districts and Pollution Prevention/Water Quality efforts.

- ***Partner with Resource Conservation Districts***

  Conservation districts emerged during the 1930s as a way to prevent the soil erosion problems of the Dust Bowl from recurring. Formed as independent local liaisons between the Federal government and landowners, conservation districts have worked closely with the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service).

  In California, conservation districts are called Resource Conservation Districts (RCD), and are independent "special districts" organized under the state Public Resources Code, Division 9. Each RCD has a volunteer Board of Directors made up of five to nine district landowners who are elected locally or appointed. Currently, 103 RCDs in California work to address a wide variety of conservation issues including forest fuel management, water and air quality, wildlife habitat restoration, soil erosion control, and conservation education.

  Because RCDs are grassroots, nongovernmental organizations, they have no regulatory power and must meet their goals for the natural resources in their community through voluntary approaches, i.e., neighbors asking neighbors to cooperate. Opportunities exist for agencies in the watershed to work with local RCDs on cooperative efforts to improve the natural environment, in this case, through WUE.

- ***Partner with Pollution Prevention/Water Quality Efforts and Vector Control***
  A major source of water pollution is "non-point source" pollution, or pollution that comes from an indirect source. Storm runoff and excess irrigation are primary sources of non-point source water pollution. Irrigation runoff can contain fertilizers and pesticides that can harm habitat, flora, and fauna. Contamination of streams and rivers, as well as groundwater can result from storm and irrigation runoff if they carry pollution loads that are high. Reduction of non-point source water pollution is especially critical in areas that drain directly into the watershed. Reducing the use of irrigation and scheduling irrigation correctly to avoid runoff can accomplish this. Similarly, the majority of mosquito and vector activity is in and around storm drains, so reducing runoff will help alleviate this problem and reduce the threat of vector-based diseases such as West Nile Virus. There also are opportunities to share public outreach messaging among the various regulating agencies.

- ***Partnership and Collaboration***
  Many agencies on their own have contributed to the current WUE programs and these efforts do not go unnoted. The existing programs are the foundation for our next steps, which include maintaining as well as expanding existing partnerships and collaborations with water wholesalers, sub-wholesalers, retailers, and municipalities.

  Another potential opportunity is to create new and innovative partnerships with customers that are large water users, such as schools, parks, businesses, irrigation companies, HOAs/property managers, gardeners, landscape architects, and contractors. Some of these partnerships could correspond with other CII programs.

  Collaborations with energy utilities could lead to improved outreach, cost-savings and opportunities for increased (combined) financial incentives that will further motivate participation. Energy utilities already are partnering with key water agencies, including MWDSC, on the pilot water-energy programs outlined in the California Public Utilities Commission’s ruling regarding water-related energy use.

  Other possible partnerships and collaboration efforts include co-marketing between water agencies and product vendors. Examples include the WUE device certification with the EPA’s “WaterSense” certification and labeling program, or WUE device training sessions sponsored by water agencies and led by a representative from the device’s manufacturer.

  The WUE Pillar also can support partnerships and collaboration among water agencies by serving as a forum to share ideas on what works or does not work for an agency. Collaboration between SAWPA member agencies in and outside of the MWDSC service area on WUE programs will allow those agencies and their customers outside of the MWDSC Metropolitan area to participate.

- ***Public Outreach: Emphasis on Outdoor Landscaping and Irrigation Efficiency***

With up to 70% percent of household water consumption going toward outdoor use, there is a growing need to provide water efficient programs targeting outdoor landscaping. There are various ways to increase water efficiency of outdoor landscaping. The outdoor efficiency program topics identified by the WUE team include:

Marketing programs:

- Changing landscape design elements: increase pervious hard surfaces, pavers and bioswales
- Creating sample landscape plan templates
- Using captured rainwater, recycled wastewater, gray water, or treated water for non-potable uses including irrigation
- Positioning water-efficient gardens as in style and “hip”
- Utilizing marketing suggestions from the Water Resource Institute (WRI) Landscape Water Use Efficiency statewide market survey: positives of water smart landscapes, the cost of doing nothing, children’s involvement, and responsibility for the environment
- Targeting marketing efforts to various demographic communities

Technology/training programs:

- Advancing emerging technologies such as, smart irrigation controllers, high-efficiency nozzles, and new irrigation device technology
- Creating a comprehensive package for consumers to promote use of smart irrigation controllers (e.g. rebates, stores, installers, training, and check-ups)
- Advocating use of climate-appropriate plants and functional warm season turf throughout the region
- Developing a “one-stop shop” that offers accessible and comprehensive water-efficient landscape planning programs

- ***Public Outreach: Community-Based Social Marketing***

  Community-based social marketing is a behavior-change tool that can supplement traditional information-intensive marketing campaigns. Previously utilized as a strategy in health care initiatives such as smoking cessation, it now is being utilized for other causes, including natural resource management, to achieve the adoption of environmentally sustainable behaviors by the members of our communities.

  Community-based social marketing involves four steps: 1) identifying the barriers and benefits to a sustainable behavior through a combination of literature reviews, focus groups, and survey research; 2) developing a strategy to promote the sustainable behavior that utilizes “tools” that have been shown to be effective in removing barriers and changing behavior; 3) piloting the strategy; and 4) evaluating the strategy once it has been implemented across a community. These steps result in a community outreach campaign that will successfully foster the desired sustainable behavior, which in the WUE Pillar’s case, is water-efficient behavior.

  There are several typical reasons why people do not engage in a particular sustainable behavior. One reason is that people are unaware of the activity and/or its benefits. Another reason is that the activity may be perceived as having significant difficulties and barriers associated with adopting it. For example, people may believe that switching their traditional garden to a California-friendly landscape is a daunting task that requires expertise and money. A third reason why people do not engage in a sustainable activity is that they feel that there are no significant barriers that discourage their current behavior. For example, irrigation schedules are left the same throughout the entire year because it is easier to leave it alone rather than have to adjust it due to weather conditions or the time of year.

To better influence what people do, community-based social marketing helps public outreach campaigns to identify perceived barriers and benefits to an action, and promote specific changes to overcome those obstacles. People naturally tend to gravitate to actions that have the most benefit and that have the fewest barriers to overcome. Additionally, perceived barriers and benefits vary from individuals and groups. What may work for one neighborhood may not work for another, or what may work for residents may not work for businesses. Behaviors also compete with each other; as one adopts a new behavior, the previous behavior is being rejected. For example, the behavior of capturing cold water in a bucket before the shower water gets warm replaces the behavior of letting the unused water run down the drain.

Because of this diversity of motivations, the perceived barriers and benefits to the desired sustainable behavior have to be understood so that the available behavior change tools can be prioritized by the benefits they offer and barriers they remove. From this analysis, effective community-based social marketing strategies can be developed. For future community-based social marketing efforts by the WUE Pillar, the WRI Landscape Water Use Efficiency Statewide Market Survey will be a good starting point as it identifies several residential and managed properties incentives and barriers to increased landscape WUE.

Once a sustainable behavior-specific marketing strategy has been developed, the piloting and post-pilot evaluation of the behavior change strategy ensure that a project is effective at achieving the desired result before it is implemented on a large scale. By careful research and planning, pilot testing, and pilot results evaluation, community-based social marketing strategies that promote sustainable behaviors, can successfully become and remain a part of people's lifestyles.

Other WUE Strategies Discussed in WUE Meetings

The following is a brief summary of additional measures prioritized by the WUE Pillar that were not included in the Table of WUE Measures, but highly discussed in WUE meetings.

- ***UWMP***
  In the area of WUE planning, water agencies in California must perform certain minimum planning processes required by the California Water Code. The most informative of these planning tools is the UWMP. Agencies that either have more than 3,000 service connections or deliver more than 3,000 acre-feet annually must complete a UWMP, at least every five years. The UWMP incorporates requirements for describing how the agency will implement WUE demand management measures, which are equivalent to the CUWCC BMPs. In the Santa Ana River Watershed, there are many

overlapping water agency jurisdictions and their respective UWMPs, creating a large amount of information about WUE. BMP implementation information is also available, much of it from the CUWCC.

- ***20 x 2020***
  The Water Conservation Bill of 2009 (SB X7-7) provides the regulatory framework to support the statewide reduction in urban per capita water use described in the *20 by 2020 Water Conservation Plan*. Consistent with the Bill, each urban water supplier must determine and report its existing baseline water consumption and establish future water use targets in gallons per capita per day. The first report began with the 2010 UWMP.

  An urban water supplier must set a 2020 water use target and an interim target for 2015. There are four methods or options for compliance: 1.) establish a conservation target of 80% of their baseline daily per capita water use; 2.) utilize performance standards for water uses that are specific to indoor, landscape, commercial, industrial and institutional uses; 3.) meet the per capita water use goal for the appropriate hydrologic region; 4.) reduce from a 10 year or 15-year baseline daily per capita water use, a specific amount for different water sectors. Option 4 is subject to revision by the DWR prior to 2015.

- ***Evaporation and Transpiration Correlation***
  Significant water loss can be attributed to evaporation and transpiration. Evaporation accounts for surface water that enters the air as vapor due to the heat of the sun. Transpiration accounts for the use of water by plants. By promoting climate-appropriate plant species instead of turf grass, transpiration is reduced. By planting more trees, the amount of shade area is increased, which reduces evaporation and the heat island effect.

  There will be opportunities for water agencies within a watershed to partner with other public and private entities that share the same goal of increasing the amount of climate-appropriate plants in the watershed. The goal of reducing evaporation and transpiration should be incorporated into the plant palette idea, where landscape contractors can recommend a palette of plants that are climate-appropriate to a resident, business, or industry. Additional evaporation reductions can be accomplished by providing incentives or voucher programs for swimming pool and spa covers, and banning outdoor misting systems.

Collaboration and Integration with other OWOW Pillars

The nine other OWOW Pillars are developing programs, resources, and strategies for addressing challenges in their areas of expertise, similar to the WUE Pillar. By integrating strategies from multiple OWOW Pillars into planned water resource management programs, and by increasing program planning and implementation coordination among Pillars, efficiencies and benefits are generated that yield program results greater than those achieved through the efforts of a single agency or Pillar. Additionally, collaboration that produces consensus among the OWOW Pillars creates a stronger, more unified voice to communicate regional water management goals, strategies, and messages to stakeholders. Described below are the three reasons that collaboration and planning integration with other OWOW Pillars is crucial to the fulfillment of the WUE vision.

Leveraging Expertise

The WUE Pillar aims to maximize the benefits of the work of the other Pillars and water agencies by incorporating their expertise in future WUE programs. Among others, the Water Resource Optimization, Stormwater: Resource and Risk Management, Energy and Environmental Impact Response, and Land Use and Water Planning Pillars share common ground with the WUE Pillar. For example, WUE is a response to the region's dependence on imported water supplies, which is a water supply reliability and climate change concern, and WUE targets behaviors that create dry weather run-off that carries non-point source pollution. Collaboration and information sharing between these Pillars and the WUE Pillar will create consistency among programs and services, establishing a norm that is recognized within and beyond the region.

The more connections that can be made between Pillars in the design of a project, the more the project can be deemed valuable and successfully prioritized for funding and implementation due to its ability to provide multiple benefits. On another level, publicity and marketing strategies can be maximized through the dissemination and repetition of the message across different Pillars and diverse audiences.

Additionally, as WUE is a watershed-wide goal shared by many Pillar areas, the potential exists for the WUE Pillar to become a clearinghouse for WUE programs and resources, which could be made available through a Website for easy access. The WUE Pillar also could take on the role of a regional coordination planning body for WUE experts, including irrigation repair services, landscape design firms, and landscape contractors. Putting the public in touch with these experts through the clearinghouse would demonstrate a grassroots and social marketing approach to the implementation of WUE measures.

Leveraging Resources

Water resources are vital to the Santa Ana River Watershed, and resources including time and funding are vital to the successful implementation of WUE projects and programs. As the Santa Ana River Watershed's water resources cannot meet unlimited demands, and the WUE Pillar members' time and funding do not allow an unlimited number of WUE programs to be implemented, leveraging available resources to achieve the most benefit is critical.

In terms of water resources, the water agencies in the Santa Ana River Watershed currently rely on varying degrees of imported water supply to meet customer needs. Through the identification of existing local resources such as groundwater and recycled water, water agencies will be able to better leverage water supply resources. One of those available local water supply resources is water saved through WUE measures.

Especially now, as the State Water Plan and the SB X7-7- Statewide Water Conservation is in full swing along with current legislative initiatives of AB 1420 (access to water conservation funding), AB 1881 (water efficient landscapes and land use planning), focus on water efficiency, increased engagement by, and resources from, the WUE Pillar will be necessary to meet these new requirements.

One way to leverage time and funding resources is to group together WUE projects and programs by similar geographic areas. By collaborating on work activities, timelines, and stakeholder outreach, the sponsors of these projects and programs can reduce project costs, lessen community impact by decreasing completion time for capital projects, and achieve greater success in community outreach and stakeholder behavior change for education and marketing programs.

Having multiple Pillars come together to combine various water management strategies within a single project or program, is another way to leverage time and funding resources. For example, the Water Resource Optimization, Stormwater: Resource and Risk Management, Energy and Environmental Impact Response, Disadvantaged and Tribal Communities, and Land Use and Water Planning Pillars could integrate WUE into all resource-based planning efforts (*i.e.*, treating WUE as a supply source and as a means to offset climate change impacts, while mitigating land use impacts). WUE provides opportunities to increase demand for recycled water use. Landscape water conservation programs have a secondary benefit of reducing runoff and non-point source water pollution, as well as reducing the proliferation of vector-based diseases.

As available staff and funding resources are not uniform among member agencies, leveraging resources and programs across geographical areas and Pillars can address equity and fair distribution of resources while maximizing results. WUE programs and WUE ads can be spread across geographic areas and Pillars to leverage resources and maximize benefits. Using region-wide communications outlets obtains the greatest benefit for the funding resources available by allowing the ads' messages to reach the widest audience possible, and can result in earned media, better ad rates, and extra airtime.

Employing WUE staff expertise and funding resources on a regional basis using the IRWMP process ensures that smaller agencies and agencies outside of the MWDSC service area have access to the available resources. Pursuing regional 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 regional WUE programs. These programs will then be available to the customers of smaller agencies, and regional programs will be able to employ new implementation formats and access new funding. The region's water agencies will benefit from more consistent messaging and improved reliability of regional WUE programs.

Leveraging the available resources to implement WUE programs that benefit those with sufficient means and those in need of resources is a proactive approach that will maximize the WUE benefits throughout the region.

Leveraging Funds

Integration of water management strategies across geographies, within the project implementation process, and through partnerships between agencies can result in significant financial efficiencies. Collaborative projects that are widely supported can be more far-reaching and implemented more quickly, effectively, and efficiently than could be accomplished by one agency focused on a single water management strategy.

Spreading WUE funding throughout a watershed results in cost benefits through the integration of multiple strategies or messages and through regional marketing efficiencies. For example, Valley District and the Yucaipa Valley Water District (YVWD) are within the SARW, but are not MWDSC member agencies, making them ineligible for MWDSC efficiency funding. However, collaborative projects with regional benefits facilitated by the OWOW effort, such as a regional conservation incentive funding program that would overlap with efforts by MWDSC Metropolitan member agencies, SAWPA agencies, and Pillars, would be a way to enable Valley District, YVWD, and other agencies outside of MWDSC's boundaries to receive funding and to maximize WUE benefits and results.

Funds also can be leveraged to achieve goals through regional partnerships and projects that use matching funds, such as MWDSC's conservation credits program. Created in 1988 and regularly updated, this conservation credits program provides funds to MWDSC's Metropolitan's member agencies to advance their individual demand management strategies. Additionally, Federal government funds could be used to leverage State and local funding.

Focusing in particular on the Water Resource Optimization, Energy and Environmental Impact Response, and Disadvantaged and Tribal Communities Pillars, Santa Ana River Watershed water agencies should incorporate WUE funding into their planning portfolios to ensure a constant funding stream for WUE programs and efficiency measure implementation.

Description of Data Collection and Compilation Process

Stakeholder Identification

The WUE Pillar is comprised of over 40 stakeholders from all three counties (Orange, Riverside, and San Bernardino), consisting of WUE experts, consultants, business leaders, and other industry leaders. Members were solicited during several outreach events held by SAWPA in the early stages of the planning process. A fish bowl type public involvement approach (participants placed their business card in a "fish bowl" for each Pillar group of interest to them) was used to gather interest and collect contact information from potential participants. SAWPA also sent numerous email outreach blasts that invited and encouraged involvement and participation. Some members volunteered and others were assigned by their respective agencies.

Strategies Deployed to Involve and Motivate Stakeholders

Strategies used to involve and motivate the WUE members were establishing meeting dates early, creating an advisory committee within the larger pillar group, structuring meetings to constructively gather input, committing attendance for half-day brainstorming sessions, providing refreshments and lunch at workshops, making chapter drafts available electronically for review and comment, and continually reaching out to potential new participants.

Event Coordination

A chapter outline was developed by compiling input from a total of three large-scale meetings, PowerPoint presentations, and other resources, and organizing them into the categories developed by SAWPA. An interactive workshop was developed as a way to review the outline and gather more information. Participants were assigned to a group that worked on a particular section of this chapter. Within these groups, participants discussed and refined the key message of the section. Each group answered the question: "What should be the key message of this section of the WUE Chapter?" Participants were asked to develop key messages that relate to the mission statement of WUE discussed in the last meeting, and to determine if keywords, such as "future vision" and "proactive" needed to be part of the mission statement.

Another assignment for each group was to review a section of the WUE chapter. Participants read through their chapter section outline and discussed what information was missing or needed to be further developed. Each group thought about:

- What information is missing that is needed to support the section's key message?
- Can this section be organized or structured differently?
- Are there examples that can be placed in this section?
- Is there a program or resource that needs to be described in more detail in this section?
- What resources can be researched and cited?
- What supporting graphics/photos can communicate ideas in this chapter section?
- Are there statistics that need to be included in this chapter section? If so, where can this information be extrapolated?

Each group then presented their ideas of their key message and chapter section to the rest of the team. Afterwards, each participant was able to comment and add information to other sections of the chapter. Additionally, two matrices were provided to the stakeholders: Table of WUE Measures, and Table of BMPs. These matrices will serve as comprehensive databases to summarize efforts in the SAWPA OWOW region. Participants were asked to fill out these matrices marking the existing and future efforts of their organization in terms of WUE and the CUWCC's BMPs. With over 100 agencies listed in the matrix, these working databases identify and track areas of overlap, areas of collaboration, areas in need of development or improvement, and levels of prioritization.

Data Collection Methodology

Some of the SAWPA member agencies serve disadvantaged communities that have not yet had the opportunity to access grant funding to implement WUE programs. Other agencies have been promoting WUE for years, or have not begun at all. Thus, within the Santa Ana River Watershed, there are varying levels of familiarity with, and implementation of, WUE programs. It is this “uneven playing field” that the WUE Pillar has attempted to address by devising mechanisms to allow the Santa Ana River Watershed as a whole to achieve water demand reduction. Key questions regarding implementation of WUE programs in the Santa Ana River Watershed include:

- Should an approach to WUE be broad and non-specific so that agencies within the region have local flexibility, or should there be a list of specific measures and projects that have high potential for multiple regional benefits that are to be implemented by all agencies?
- If a conservation measure or project is locally cost-effective, should it be implemented regardless of the availability of grant funding?

Because each agency has its own set of ongoing circumstances, customers, and funding, agencies have differing preferences about the answers to these questions.

As a way to envision the greater picture of how to design a plan of action, the WUE Pillar members have expressed a desire to hold quarterly meetings to exchange information and ideas, partner by supporting each other’s efforts, and coordinate with SAWPA staff. By coming together regularly, members can prioritize next steps, coordinate grant funding opportunities, and continually evaluate each WUE strategy to confirm its cost-effectiveness and benefits to the region.

Under the OWOW Plan, comprehensive databases were compiled to summarize two large efforts in the SAWPA OWOW region: 1) List of WUE measures: existing and potential new opportunities for WUE efforts, and 2) Table of BMPs: implementation coverage of the CUWCC BMP. With over 100 agencies listed, these working databases identify and track:

- Areas of overlap
- Areas of collaboration
- Areas in need of development or improvement
- Levels of prioritization

The WUE “opportunities” matrix was developed under this Plan that identifies existing and potential new programs as a result of a Pillar brainstorming effort. The programs are categorized as Regional Programs and Incentives, Landscape, CII, Financial and Policy Initiatives, and Partnerships and Outreach. Each SAWPA member agency has indicated which programs are of most interest to their service area.

This Plan demonstrated that water efficiency measures could have significant beneficial impacts on future water supplies in the region and how they are managed. As the major regional wholesalers, MWDSC and Valley District have compiled water demand and supply data. MWDSC also has provided water conservation savings data. The data is based on the 2005 UWMPs and the OWOW 1.0 plan, as well as MWDSC's internal planning processes with data gathered from its member agencies. These datasets were discussed and analyzed in the WUE Pillar to determine the potential level of savings that will be targeted in the IRWMP.

One challenge is obtaining conservation savings data from those retail water suppliers within the Santa Ana River Watershed that are not MWDSC member agencies or sub-agencies, or that have not signed the urban CUWCC MOU. Most of them will likely have supply and demand data, but they may not necessarily have conservation savings data. Agencies that have this full set of information should be contacted to make sure the data is integrated into the data set.

The Future of Water Use Efficiency

Agencies and their partnerships with each other and private industry will continue to collaborate and develop new programs promoting water use efficiency. The ultimate goal will be to get water customers to automatically base decisions on what is the most water efficient way to plan, implement, and maintain devices and landscapes. This will require customer education and continued incentives to promote water use efficiency. The sector that demonstrates the greatest potential for water savings is the landscape. Therefore, the WUE Pillar will move forward with collaborative projects that primarily emphasize outdoor efficient use of water.

Customer Handbook for Using Water Efficiently Outdoors

When it comes to using water outdoors, particularly when using water to irrigate, most water customers do not know how to be efficient. The WUE pillar plans to create and promote an engaging customer handbook to promote the use of, and assist customers with, using landscape water efficiently. The handbook will be specific to the SARW, authored by University of California Cooperative Extension researchers and others, and will be available to anyone in the watershed. The handbook will inform the public about the importance of knowing some basic soil science, as well as landscape and irrigation design, implementation, and maintenance to prevent inefficient water use. Up to 30% of a landscape's water use can be eliminated by simply repairing and adjusting irrigation, and using an appropriate plant palette. However, most people do not know how to fix irrigation problems, properly schedule their irrigation, or select appropriate plants. This guide will entice people to educate themselves on specific methods and materials that will assist them in becoming water-efficient in their landscape.

Inland Empire Garden Friendly

Most of the Santa Ana River Watershed lies within what is locally known as the Inland Empire. This area consists of the greater basin that lies within western San Bernardino and Riverside counties. Public agencies, California State University, San Bernardino, and Rancho Santa Ana Botanic Garden formed the Inland Empire Garden Friendly Program to expose the public to a recognizable branding that identifies with using water efficiently in the landscape. Agencies have partnered with The Home Depot and local nurseries to successfully promote climate-appropriate plants. The program has a website that contains information on local workshops, plant sales, botanical gardens, a plant list, and other related resources (http://www.iegardenfriendly.com/). Increased promotion, events, and a greatly expanded plant database are planned for the future.

Agricultural Water Use

Within the watershed, there are over 157 million acres in production consisting of nursery stock, fruit and nut crops, field crops, and vegetable crops with a value of over $388 million dollars. Almost all of these crops would not be possible without irrigation.
Resource conservation districts and water districts are expanding their role in conducting irrigation audits. MWDSC recently opened its water saving performance program to include agricultural customers. This program provides financial incentives, up to 50% of eligible project costs, for customized water efficiency improvements. The WUE Pillar will be working on irrigation management strategies, and making new technologies available to farmers.

References

American Water Works Association. *Water Conservation Programs – A Planning Manual.* American Water Works Association, Denver, CO: 2006.

AWWA Research Foundation (AWWARF).*Communicating the Value of Water: An Introductory Guide for Water Utilities.* American Water Works Association, Denver, CO: 2008

California Urban Water Conservation Council. *Memorandum of Understanding Regarding Urban Water Conservation in California*. Amended June 13, 2007.

EIP Associates. *Santa Ana Integrated Water Plan, Volume 2 Environmental and Wetlands Component.* January 2003.

Mohr, Doug McKenzie, and Smith, William. *Fostering Sustainable Behavior.* New Society Publishers, Gabriola Island, Canada: 1999.

Pacific Institute, *Waste Not, Want Not: The Potential for Urban Water Conservation in California*.
Santa Ana Watershed Project Authority. *Planning Dept. Santa Ana Integrated Watershed Plan Update,*

An Integrated Regional Water Management Plan. June 2005.
Vickers, Amy. *Handbook of Water Use and Conservation.* Water Plow Press, Amherst, Massachusetts: 2002.

Water Resources Institute at California State University San Bernardino, *Landscape Water Use Efficiency Statewide Market Survey*, 2007.

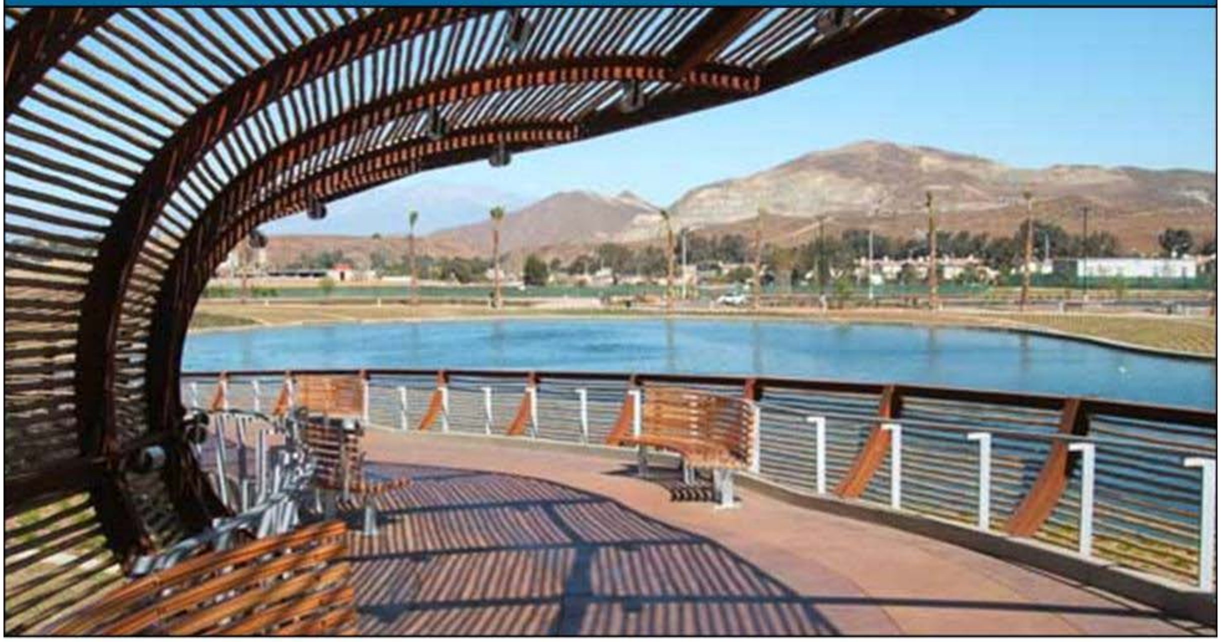
List of Contributors (2008)

The Water Use Efficiency Pillar consisted of:

Eric Anderson	Valley Soil, Inc.
Jennifer Ares	Inland Empire Resource Conservation District
Joe Berg	Municipal Water District of Orange County
Rick Bishop	Western Riverside Council of Governments
Dr. Bille Blair	Leading & Learning, Inc.
Cordell Chavez	Corona Department of Water & Power
Andy Coady	City of San Bernardino Municipal Water Dept.
Justin Scott-Coe	Monte Vista Water District
Mary Lou Cotton	Kennedy/Jenks Consultants
Ed Demesa	U.S. Army Corps of Engineers Los Angeles District
Gail Egenes	Riverside Land Conservancy
Gerry Foote	Chino Basin Water Conservation District
Rodd Greene	Yucaipa Valley Water District
Dr. Mark Grey	Building Industry Association (BIA) of Southern California
Janet Hartin	University of California Cooperative Extension
Douglas Headrick	San Bernardino Valley Municipal Water District
Mike Henry	University of California Cooperative Extension
Tony Hetherman	City of Moreno Valley
Andy Hui	Metropolitan Water District of Southern California
Zack Isnasious	Boyle Engineering Corporation
Tedi Jackson	Western Municipal Water District
Maria Elena Kennedy	Kennedy Communications
Destree Lazo Bascos	Collaborative Services
Duncan Lee	City of Huntington Beach, Public Works Dept.
Dave Lopez	Rubidoux Community Services District
Kristi Lovelady	County of Riverside Planning Department
Beth Lovsted	Eastern Municipal Water District
Mario Martinez	Fontana Water Company

Jo McAndrews	McAndrews and Boyd
Mary Ann Melleby	Monte Vista Water District
Andrea Miller	Laguna Beach CWD
Flo Mowrer	Riverside County Flood Control District
Mark Norton	Santa Ana Watershed Project Authority
Pam Pavela	Western Municipal Water District
Lisa Perales	Inland Empire Utilities Agency
Lee Reeder	Inland Empire Waterkeeper
Christopher Regan	Laguna Beach CWD
Carlos Rodriguez	Building Industry Association, (BIA) Baldy View Chapter
Paul Rugge	Western Municipal Water District
Jack Safely	Western Municipal Water District
Elizabeth Sanchez	Riverside Public Utilities
Fiona Sanchez	Irvine Ranch Water District
David Schroeder	Chino Basin Water Conservation District
Jeff Simonetti	Building Industry Association, (BIA) Baldy View Chapter
SarinaSriboonlue	Malcolm Pirnie, Inc.
Matthew Stone	Municipal Water District of Orange County
Helen Stratton	Eastern Municipal Water District
Gordon Treweek	Chino Basin Water Master
Roger Turner	Roger Turner & Associates, Inc.
Dean Unger	Santa Ana Watershed Project Authority
Julie Vandermost	Native Grow Nursery
Eudell Vis	California State Polytechnic Univ., Pomona
Rob Whipple	Elsinore Valley Municipal Water District
Deb Whitney	United States Bureau of Reclamation
John Wiedmann	Metropolitan Water District of Southern California
Shelby Wimberly	Riverside Public Utilities

5.7 Land Use and Water Planning



The Shops at Dos Lagos
Corona, CA

Introduction

The Land Use and Water Planning Pillar for One Water One Watershed 2.0 (OWOW) was re-formed in early 2012 and was co-chaired by Jerry Blum, City of Ontario Planning Director and Susan Lien-Longville, Santa Ana Regional Water Quality Control Board (RWQCB) Board Member (formerly Water Resources Institute: CSU, San Bernardino). The Pillar conducted ten meetings at the Santa Ana Watershed Project Authority (SAWPA) between July 2012 and August 2013, which were regularly attended by staff from water and utility agencies, Caltrans, the development community, resource conservation groups, and interested consultants.

Land use decisions are arguably the primary underlying cause of, and potential solution for, the existing water supply, water quality, and natural resource challenges in the Santa Ana River (SAR) Watershed. Similarly, relative energy use and greenhouse gas emission levels result from the level of efficiency produced by land use patterns. 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. We must avoid land use decisions that allow net degradation of watershed conditions.

The Land Use and Water Planning Pillar reviewed the guidance of the Department of Water Resources (DWR) Integrated Regional Water Management (IRWM) Guidelines, Relation to Land Use Planning Standard to assist the development of this chapter and actions to support their efforts. This section encouraged an exchange of knowledge and expertise between land use and water resource managers;

examining how Regional Watershed Management Groups (RWMG) and land use planning agencies currently communicate; and identifying how to improve planning efforts between the RWMGs and land use planning agencies.

This Chapter: 1) describes the history of development and watershed planning efforts in the Santa Ana River Watershed; 2) identifies key watershed sustainability needs; 3) evaluates how watershed priorities can be addressed by improved collaboration between water and land use agencies; and 4) recommends the strategies and implementation actions expected to be effective to ensure watershed sustainability priorities are a primary consideration in the land use decision process. Finally, this OWOW 2.0 Plan (Plan) updates and revises the OWOW 1.0 Plan.

Chapter 1.2 of the OWOW 1.0 Plan, Moving Towards Sustainability, summarized the history of land use patterns and practices in the Santa Ana River Watershed and some of the impacts of land use decisions on water resources and lessons learned. An objective analysis of the strengths, threats and weaknesses of land use patterns and practices is followed by strategies that address land use and water management producing mutually beneficial and cost effective results. The chapter closes with suggestions of collaborative partnerships between regional water management agencies and local governments, and private sector developers and environmental organizations to address the sustainability of prior and future land use decisions. The authors of this chapter are confident that solutions to the challenges we face in the watershed are limited only by our determination to solve complex land use and watershed sustainability problems by working together.

The way in which we manage water resources is inextricably linked to our land use patterns. 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 energy consumption for transport. This problem can be stopped and even reversed if local governments and their planning and water agencies, 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 standard building practices. Embracing a sustainable development ethic steers the Watershed in a direction to meet human needs, while preserving the environment so that these needs can be met now, as well as in the indefinite future. Furthermore, ignoring the opportunities to curb the impacts of land use will result in only greater impacts tomorrow.

Implementation Principles[1]

1. Water supply agencies should be consulted early in the land use decision-making process regarding technology, demographics and growth projections
2. City and county officials, the watershed stakeholders, Local Agency Formation Commission (LAFCO), special districts and other stakeholders sharing watersheds should collaborate to take advantage of the benefits and synergies of water resource planning at a watershed level
3. The best, multi-benefit and integrated strategies and projects should be identified and implemented before less integrated proposals, unless urgency demands otherwise
4. From start to finish, projects and programs should involve the public, build relationships, and increase the sharing of and access to information. The participatory process should focus on ensuring that all residents have access to clean, reliable and affordable water for drinking and recreation
5. Plans, programs, projects and policies should be monitored and evaluated to determine if the expected results are achieved and to improve future practices
6. Limited, accessible, low-cost, outdoor recreational opportunities

Current Priorities and Approaches for Watershed Sustainability—OWOW 2.0

Main objectives for the Land Use and Water Planning Pillar:

- Identify implementation actions to conduct collaboration between water and land use communities
- Prepare (as appropriate): updates to conditions of land use and resource management; implementation measures to support water savings through land use practices including low impact development; implementation of Ahwahnee Water Principles for Resource Efficient Land Use, new green building programs and onsite and offsite conservation land use practices
- Determine new opportunities to improve collaboration between water managers and land use decision makers and interaction with the land use community
- Determine what forums, policies and projects could be instituted to improve water management efforts with the land use community
- Describe how improved interaction between water managers and land use planners could advance the Plan implementation and the planning process

Despite over a decade of Integrated Regional Watershed Management planning within the SAR Watershed and numerous similar plans designed to address watershed challenges from the watershed perspective, the core challenges of population growth and expanding urbanization remain. Innovative ideas and projects have been implemented and water quality and water supplies are better managed as a result. However, key challenges remain—the integration of watershed stakeholders and an

[1] Local Government Commission, 2005. Ahwahnee Water Principles. http://www.lgc.org/ahwahnee/h2o_principles.html

overwhelming need to develop unbiased cooperative watershed implementation processes. Competing individual agency priorities can limit the level of cooperation and the resulting assemblage of feasible projects. Watershed sustainability priorities should be given greater weighting in the project conceptualization and implementation process.

Relationship to other OWOW Pillars

Land Use Links All Pillars

Water use is dictated by land use. Likewise, water supply is a function of location, and groundwater recharge is impacted by land uses—agriculture uses water and adds nutrients, urbanization demands water for residents and businesses, and historically reduces groundwater recharge by the use of impervious cover. Wastewater treatment is designed to accommodate the needs of the watershed, which are largely a function of population and resulting development. Water quality is also directly impacted by land uses. Natural hazard risks are exacerbated by development in fault zones, flood plains, and fire-prone areas—these scenarios are made better or worse by land use decisions. Natural resources and habitat are exploited, managed, or preserved based on the allowed development, which is controlled by land use decisions. Energy use is a function of land use characteristics and the infrastructure required to support the developed areas—suburban sprawl leads to more land used for roadways and imported water requires transport systems. These choices lead to relative levels of energy use, limit energy efficiency for the watershed, and determine greenhouse gas emissions from the watershed that drive climate change. Finally, government oversight tries to reduce undue environmental degradation and minimize health risks, but works within a context of existing land uses and ongoing land use demands. Economically disadvantaged communities are a consequence of ongoing land use decisions and policies.

Current Land Development Planning, Design, and Approval Processes

Historical and Current Conditions of Land Use

Historical documents describe years of sustainable land use practices in the SAR Watershed by native tribes, followed by the California missions that established the first significant rangelands and the first agricultural production in the region. A steady wave of migration from other regions of the country and abroad continued, and accelerated during the construction of the railroads in the years between 1861 and 1900, following the path of available water supplies needed to operate the steam engines. From the top to the bottom of the watershed, the history of small towns that became respectably sized cities is linked to the arrival of thousands of permanent railroad jobs. Readily available water supplies then fueled the development of a vibrant agricultural community, including a large citrus industry, dependent on irrigation.

Growth throughout the watershed stagnated during the Great Depression, but World War II caused military installations and industrial war suppliers to move further inland, along with a major wave of migration. Residential and commercial development were greatly expanded in the watershed by the soldiers returning from the Pacific Theater of World War II-they relocated throughout the nation including Southern California where they had trained or been stationed at military bases.

Demographic patterns clearly reflect an internal migration pattern from west to east in the Watershed that began when coastal property become too expensive for many prospective buyers, driving population further inland in search of affordable homes and land. The construction of the freeway system was enthusiastically welcomed in Riverside and San Bernardino Counties where the new link to robust job markets on the coast and in Los Angeles triggered the growth of suburbs that primarily served as bedroom communities for commuters.

Land use patterns show the expansion from locations with direct access to surface water to places that could be served by gravity-fed irrigation ditches and canals. Land use intensified in areas where drilling a private well was affordable until the critical mass of urban and agriculture water users prompted the establishment of private water companies, irrigation districts, and municipal water districts that could tap the groundwater and build systems to deliver the water directly to customers.

Concerns over reliable water supplies to sustain future land uses led to decades of water rights disputes in the courts between downstream and upstream water agencies in the watershed. By the time the State and Federal environmental protection regulations were established in the 1970's, consumptive land use patterns in the Watershed had dramatically decreased the quality and quantity of open space, and surface waters and groundwater had been severely impaired by practices of the time.

Management of Land Resource

The sole authority of cities and counties to regulate land use in their own jurisdiction is deeply anchored in California history and cherished by local communities. Local governments have focused on sustaining a robust economy through land use decisions that contribute to construction of infrastructure, and generating local government revenues that cover the costs of city and county services that protect the lives and property of their constituents.

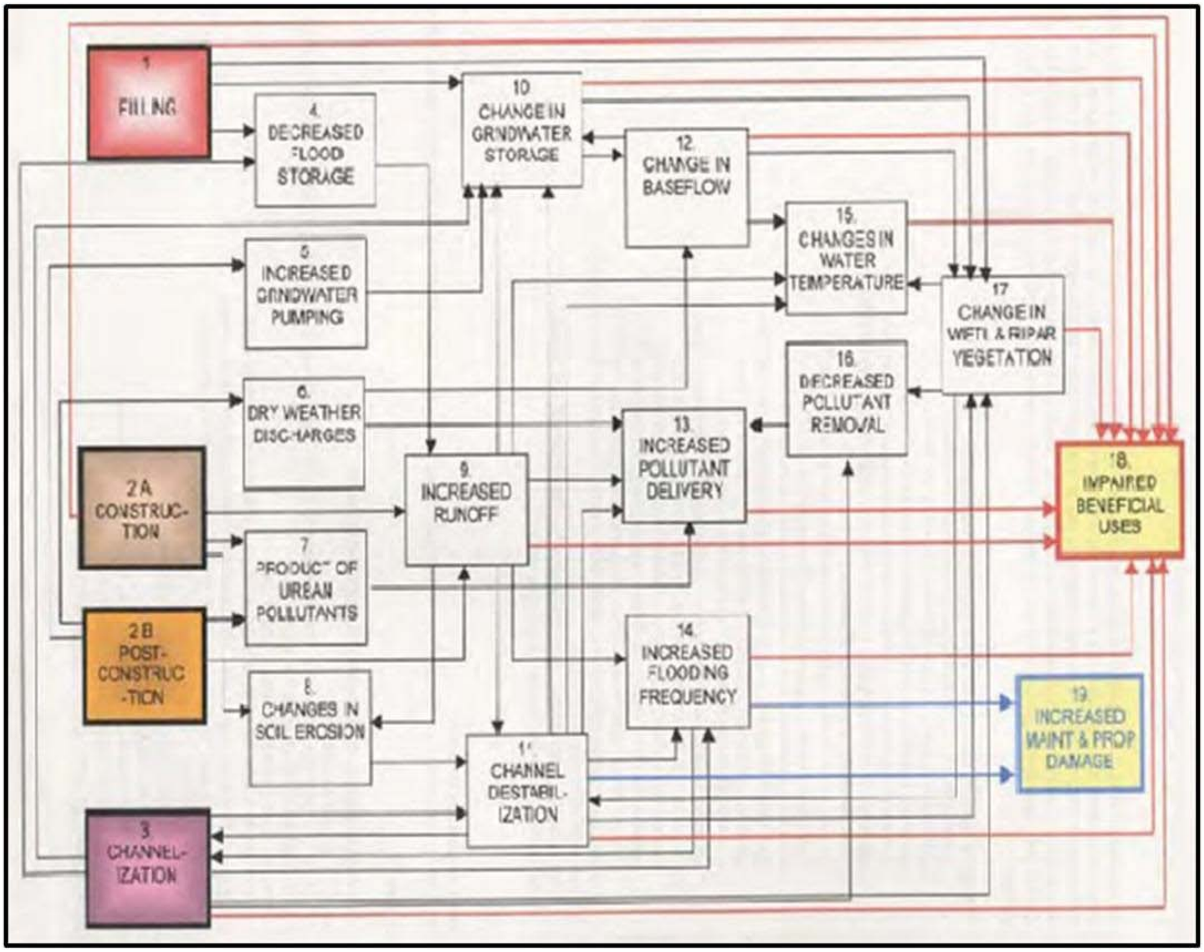
Regional Strengths, Threats, and Weaknesses of Land Use

The increase in hard surfacing and flood control over decades of land use practices in the watershed has changed stormwater runoff patterns resulting in a threat to the sustainability of regional groundwater basins losing historical recharge capacity. For example, the Chino Basin Watermaster estimates that over 40,000 acre-feet/year (AFY) of groundwater recharge have been lost on average since land use practices began increasing impervious surfaces.

Various studies have demonstrated a strong correlation between the impervious cover in a watershed and reductions in water supply sustainability. When impervious cover exceeds 10% of total watershed area, there is typically a decrease in groundwater recharge and an increase in 1-2 year frequency flood events, decreased baseflow, and increased pollutant discharges into surface waters.

Figure 5.7-1, developed by the State Water Resources Control Board (SWRCB), illustrates the potential effects of development on the beneficial uses of water from a science-based perspective. All of these effects are present in varying degrees throughout the developed watershed.

Figure 5.7-1 Potential Effects of Development of Beneficial Uses
(Source: State Water Resources Control Board)



Drawing on the most recent land use maps available from the Southern California Association of Governments (SCAG), **Figure 5.7-2** reflects the collective outcome of land use planning and decisions in the Watershed that, over time, has shrunk the footprint of agriculture, open space and recreation, while the areas consumed by new residential, commercial, and industrial developments have expanded. **Figure 5.7-3** projects specific areas of population increase from 2008 to 2035 and pinpoints locations where future land use decisions will need to address a robust economy with new jobs and housing for residents, as well as a sustainable water supply over a long-term planning horizon.

Figure 5.7-2 Land Uses in the Santa Ana River

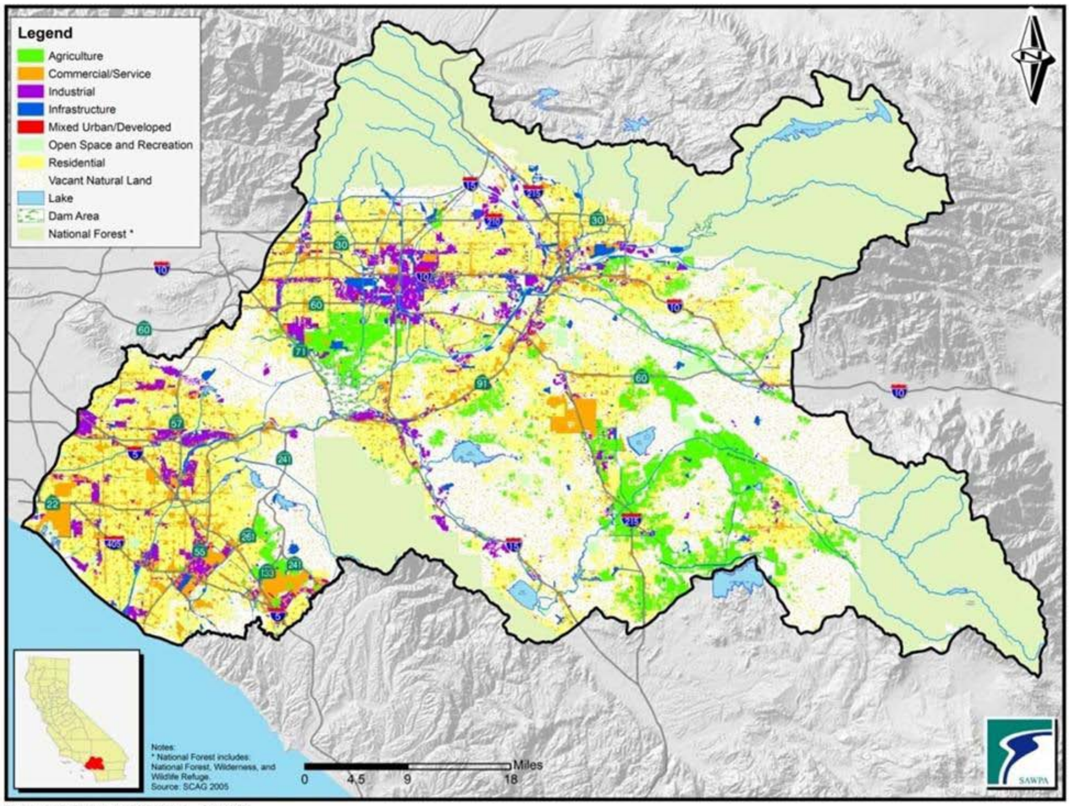


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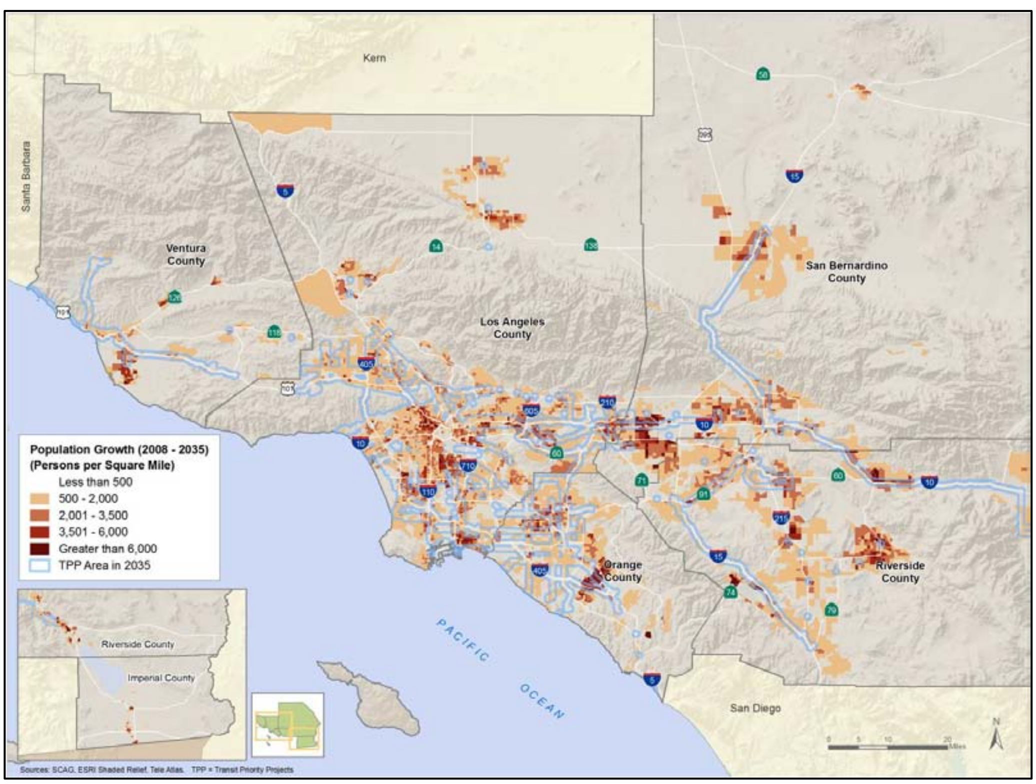
Figure 5.7-3 Projected Population Growth 2008-2035 (SCAG RTP 2012)



Regional Planning and Implementation of Land Use Strategies

Compass Blueprint

The Compass Blueprint was developed by SCAG in companionship with the 2003 Regional Transportation Plan (RTP) and it continued as a companion to the 2008 RTP. The 2008 RTP recognized "The centrifugal force of growth that continues to push the development footprint of the urbanized area outward. At the same time, pushing back on dispersed development are natural barriers, financial constraints to pay for outward expansion, and public resistance to unsustainable 'leap frog' growth into green fields and sensitive habitat areas. Nearly all natural locations for urban development have been consumed, leaving us with hard choices about how we are to grow and change to meet the demands of the future."

The Compass Blueprint recommended implementation of integrated land use and transportation planning in the local communities of the Southern California region to accommodate the growth forecasted over the next 25 years in an environmentally sustainable manner.

Working with stakeholders in each county, the regional planning agencies that serve as Council of Governments for Orange, Riverside, and San Bernardino Counties developed the Compass Blueprint. The Compass Blueprint 2% strategy envisions the direction of future development in strategic opportunity areas (SACs) that do not exceed 2% of the region's land resources. The Compass effort also educated stakeholders regarding alternative development that is more compact and more sustainable. A series of maps identified SACs in each county (**Figure 5.7-4A** to **Figure 5.7-4C**). The Opportunity Areas are shown as colored areas within a blue perimeter line. Substantial future development is anticipated to happen around transit hubs, railway stations, major bus stations, and along transit corridors. The maps point to modest changes in current land use and transportation trends on only 2% of the land area of the region. Efforts already are underway to reduce the quantity of low-density development in a number of the Opportunity Areas.

Figure 5.7-4a SCAG Compass Blueprint Strategic Opportunity Areas – SANBAG

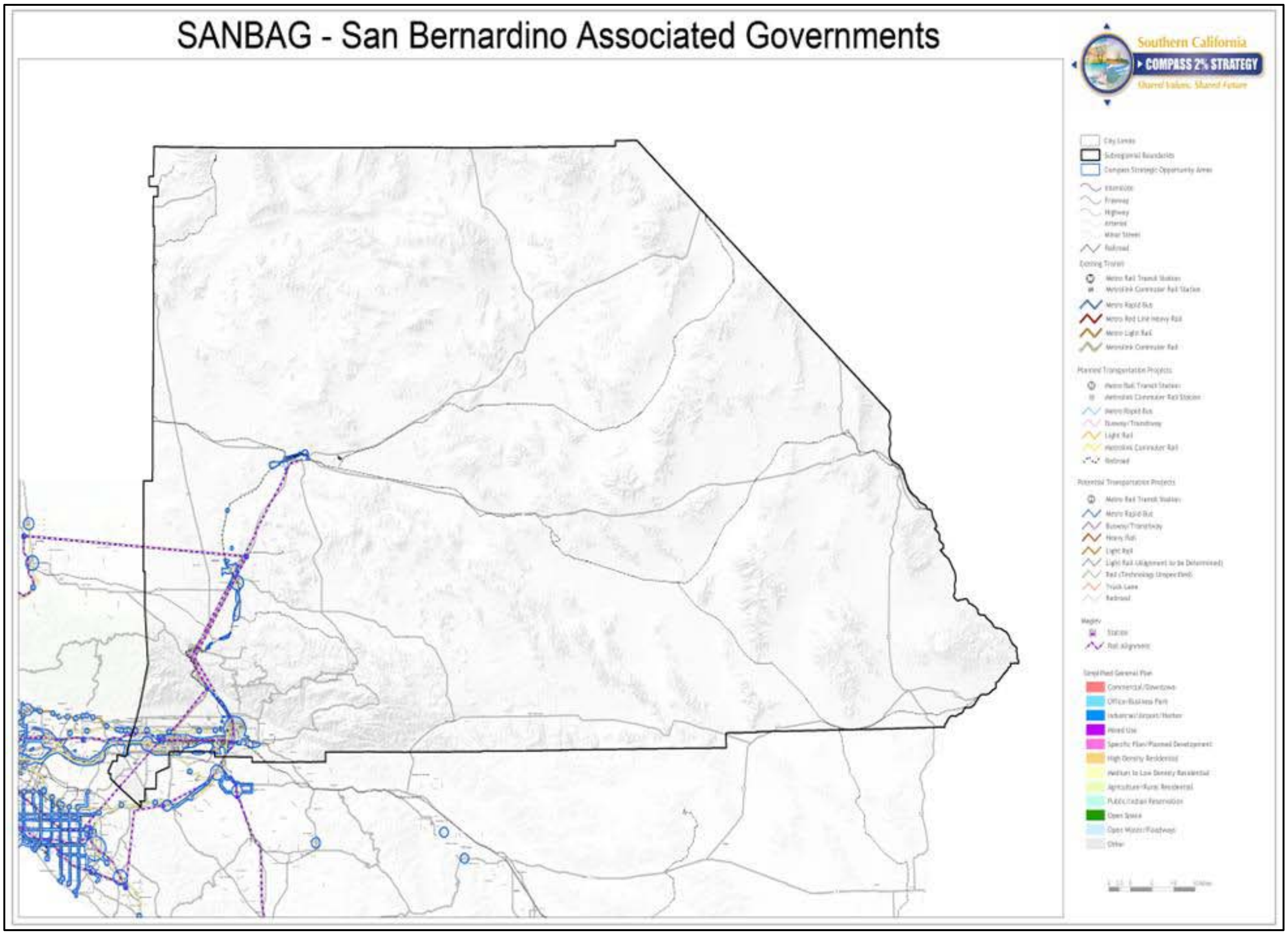


Figure 5.7-4b SCAG Compass Blueprint Strategic Opportunity Areas - OCCOG

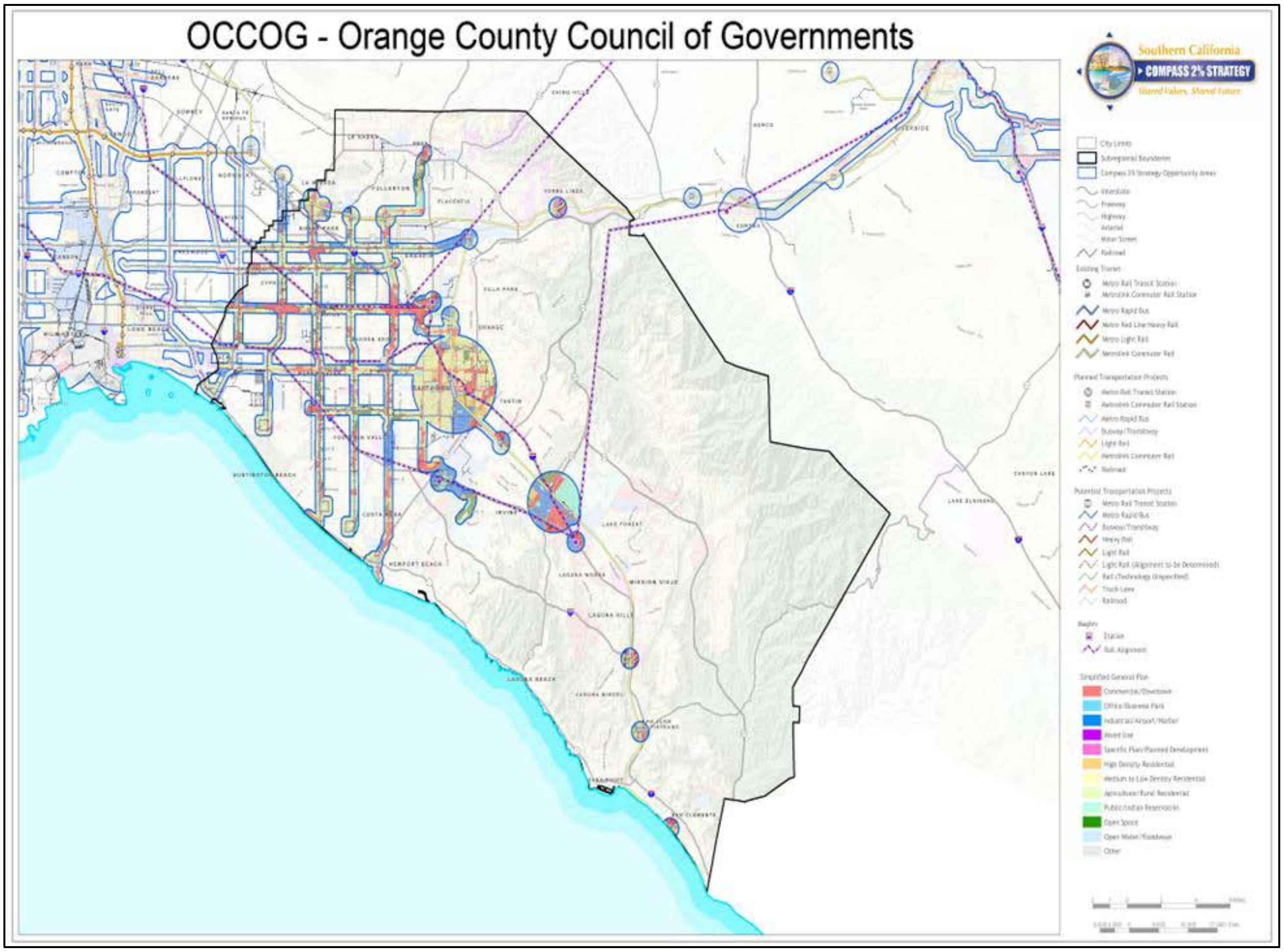
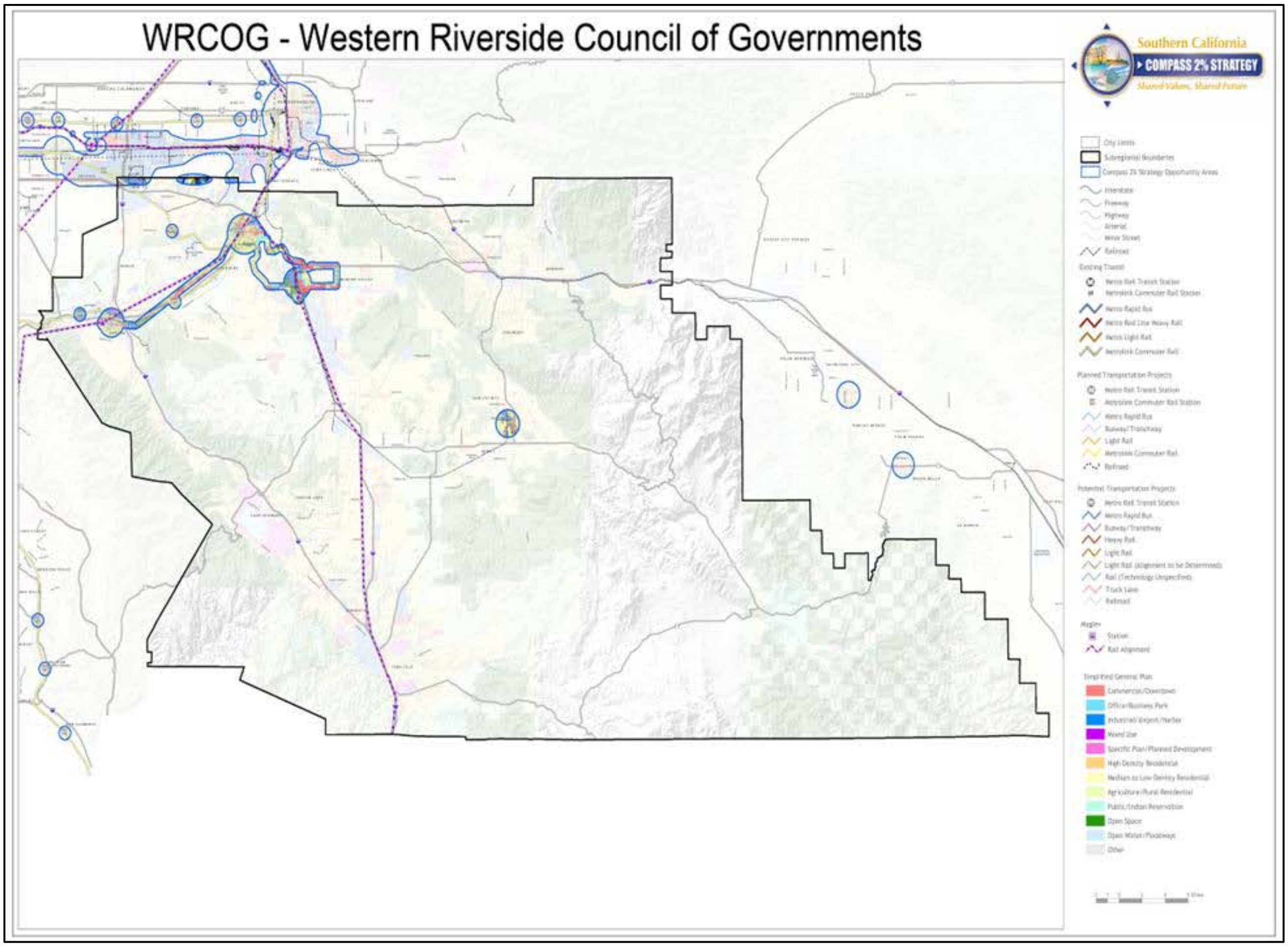


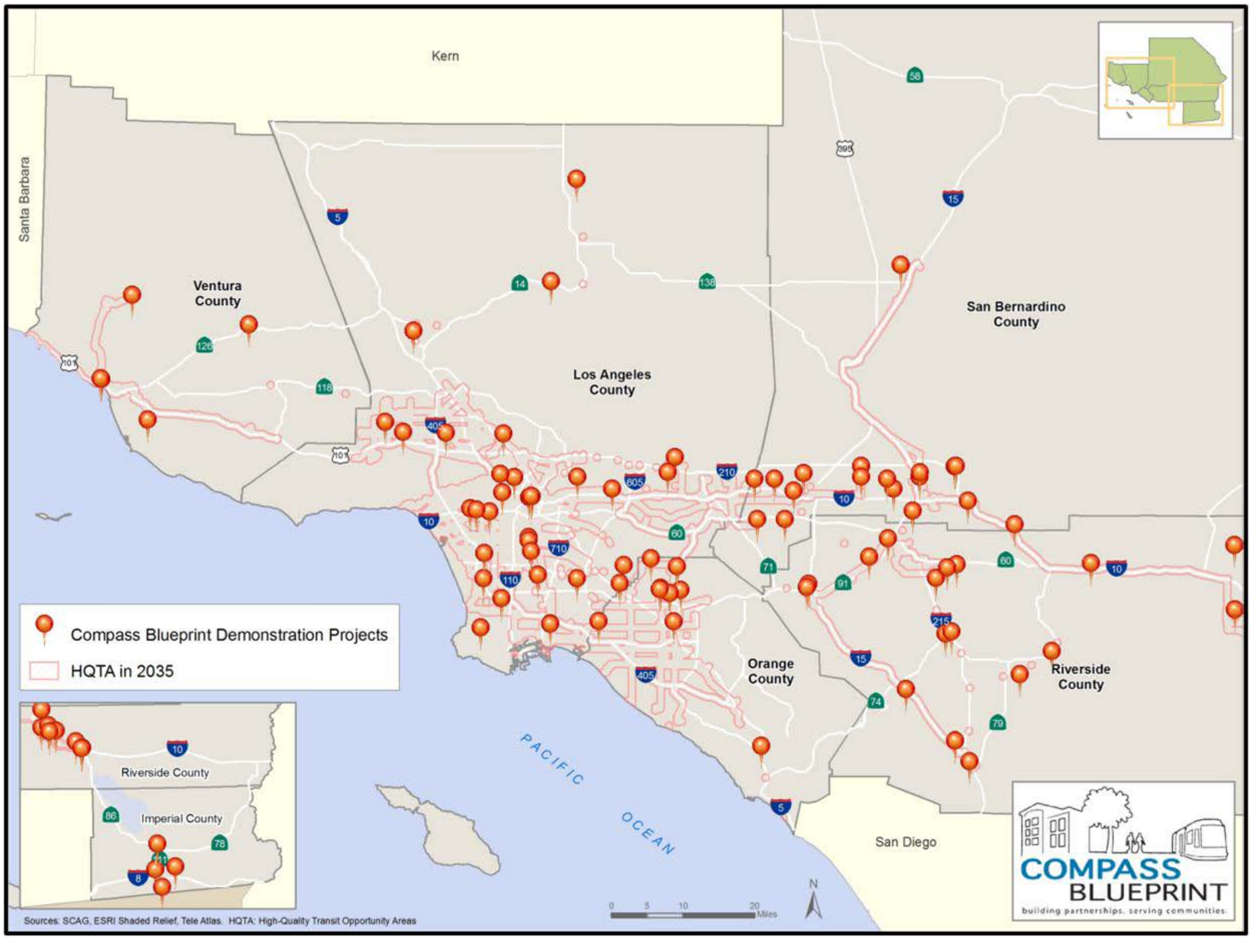
Figure 5.7-4c SCAG Compass Blueprint Strategic Opportunity Areas – WRCOG



Higher density development that is compact, mixed use, walkable, and transit-oriented not only preserves open lands that absorb water to the maximum extent possible, but minimizes automobile generated urban runoff pollutants that degrade both surface and ground water quality.

The Compass Blueprint used four (4) guiding principles: "Mobility, Livability, Prosperity and Sustainability." Since 2004, Compass Blueprint has supported integrated land use and transportation planning through incentive funding of over $10.5 million for 132 demonstration projects in the SCAG Region. These are voluntary SCAG/local government partnerships that use innovative approaches to work with local plans and implement regional priorities. Projects include transit-oriented development plans, downtown revitalization efforts, low-income community visioning, and other projects that support local and regional goals. **Figure 5.7-5** shows all completed Compass Blueprint Demonstration Projects, including thirty projects located within the SAR Watershed. (See 2012 SCAG RTP, Appendix: SCS Background Documentation for project list. Also see interactive project map at: http://maps.scag.ca.gov/cbp/

Figure 5.7-5 SCAG Compass Blueprint Demonstration Projects and HQTA Projected for 2035



Future Demonstration Projects throughout the region will encourage implementation of sustainability principles by focusing on regionally-significant local plans that directly implement the Sustainable Communities Strategy (SCS) and its goal of translating policy to on-the-ground land use changes and multi-modal transportation improvements. Concurrently, Compass Blueprint will further incentivize local implementation of the SCS through the Compass Blueprint Awards Program, and through the "Toolbox Tuesdays" program offering free, monthly, professional training events for local planners.

Local Sustainability Planning Tool

The SCAG 2012 RTP was developed with support from the Local Sustainability Planning Tool (LSPT), a GIS tool that allows users to evaluate various development scenarios and potential impacts **(Figure 5.7-6A and 6B).** The LSPT is a sketch planning tool that can be used by local jurisdictions and members of the public to analyze the impact of different land use scenarios on vehicle ownership, vehicle miles traveled, mode-use, and their associated effects on GHG emissions. (See http://rtpscs.scag.ca.gov/Pages/Local-Sustainability-Planning-Tool.aspx for more information or to access the LSPT.)

Figure 5.7-6a SCAG RTP Workshop Scenario Elements

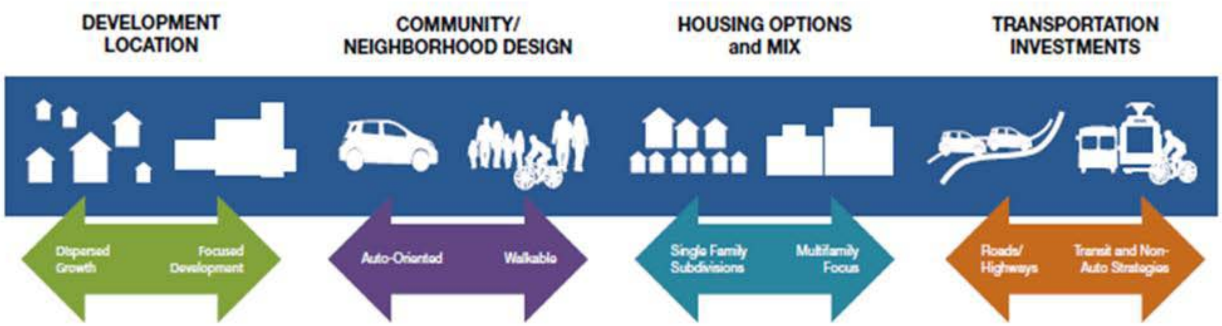
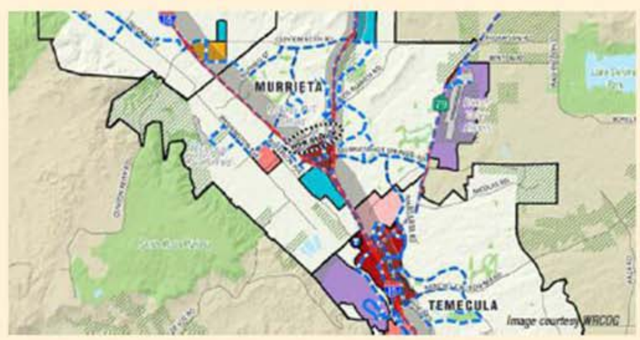


Figure 5.7-6b SCAG Local Sustainability Planning Tool (SCAG 21012 RTP)

Local Sustainability Planning Tool

As part of the SCS process, SCAG developed the Local Sustainability Planning Tool (LSPT), a GIS-based sketch planning tool that allows users to create land use scenarios and analyze their impacts. SCAG made the LSPT available to each of its jurisdictions, trained hundreds of users, and worked one-on-one with planners to assist in their use of the tool. Provided with preliminary scenarios of their planning areas for the years 2008, 2020 and 2035, local planners were then able to create, modify and compare a variety of scenarios, and their subsequent impacts on vehicle ownership, vehicle miles traveled, mode-use, and GHG emissions. This allowed the local government participation in the development of the SCS to be far more meaningful than it otherwise would have been.



The implementation of land planning relies on three primary tools authorized in California Government Code (CA Code): the General Plan (Section 65300 et seq.) and Specific Plans; the zoning ordinance (Section 65850 et seq.); and the Subdivision Map Act (Section 66410 et seq.)[2].

General Plans

General Plans include development goals and policies and lay the foundation for land use decisions made by planning commissions, city councils, or board of supervisors. General Plans must contain text sections and maps or diagrams illustrating the general distribution of land uses, circulation systems,

[2] Fulton, William, 1999. Guide to California Planning, Second Edition. Point Arena, California, Solano Press Books.

open space, environmental hazard areas, and other policy statements that can be illustrated. General Plans must contain seven mandatory elements: circulation, conservation, housing, land use, noise, open-space, and safety. Cities and counties could adopt an optional water element in their general plans, but few have done so. Instead, water has typically been addressed in the mandatory conservation element or in optional natural resources or public facilities elements. Commonly, water is addressed only in terms of water supply and/or water conservation.[3] CA Code (65302.2) requires General Plans adopted or revised after January 1, 1996, to consider any applicable Urban Water Management Plans.

General Plans can be amended four times per year, and multiple individual changes can comprise each amendment. Although not required, guidance is available for preparing a Water Element[4]. Few jurisdictions in California have prepared Water Elements for their general plan (see Merced County for one example).[5] Also, "The Department of Water Resources or the Central Valley Flood Protection Board, as appropriate, and the Department of Fish and Game may develop site design and planning policies to assist local agencies which request help in implementing the general plan guidelines for meeting flood control objectives and other land management needs." (CA Code 65303.4)

Discussions with the Land Use and Water Planning Pillar noted that there are contrary attitudes about the effectiveness of General Plans among the watershed stakeholders. Local governments, who approve the plans, tend to view them favorably as dynamic tools for planning land use because city councils or board of supervisors have the capacity to approve General Plan Amendments as deemed appropriate. On the other hand, local residents and environmental organizations voice frustration with General Plans that in practice are not routinely "implemented over time for the physical development of the communities", but rather serve as convenient placeholder planning documents for processing routine General Plan Amendments that expand land use.

Specific Plans[6]

Specific plans are flexible and scalable by design and can be used in different ways to implement LID and watershed protection priorities. If adopted by resolution, a specific plan is a policy document. If adopted by ordinance, a specific plan can be a regulatory document. An overlay specific plan could be adopted either by resolution or ordinance to address only the watershed protection issues. Alternatively, a specific plan could be adopted to address the comprehensive development or redevelopment of a defined area and include watershed protection requirements among the standards

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[3] Low Impact Development Manual for Southern California, 2010. Low Impact Development Center; https://www.casqa.org/LinkClick.aspx?fileticket=zA3DaxiwHtE%3d&tabid=242

[4] State of California General Plan Guidelines 2003. http://opr.ca.gov/docs/General_Plan_Guidelines_2003.pdf

[5] Merced County Water Element draft: June 2011: http://www.co.merced.ca.us/pdfs/planning/generalplan/2030sections/mcgpu_2030gp_part_ii_12_water_pcrd_2011_06_14.pdf

[6] Appendix B: California Planning and Regulatory Framework for LID. Low Impact Development Manual for Southern California, 2010. Low Impact Development Center; https://www.casqa.org/LinkClick.aspx?fileticket=zA3DaxiwHtE%3d&tabid=242

and implementation measures applicable to the area. The Land Use and Water Planning Pillar stakeholders support the expanded use of Specific Plans as Watershed Planning Tools.

Zoning Ordinances

CA Code Section 65850 authorizes zoning as a regulatory mechanism to implement general plans. Zoning is adopted by ordinances and must be consistent with general plans. Zoning requires compliance on a lot-by-lot basis with specific enforceable standards. Zoning ordinances specify categories of land use and associated standards such as minimum lot size, maximum building heights, and minimum building setbacks. Zoning ordinances can include overlay zones that provide additional standards for specified areas such as historic districts, wetlands, and other areas deemed to require extra protection. [2] AB 1881 required California cities to adopt landscaping ordinances to improve water conservation through drought-tolerant landscaping and effective irrigation control systems.

Subdivision Map Act

Any subdivision of land for sale or financing requires local government approval through adopted subdivision regulations required by state law. Subdivision approvals can be granted by local Planning Commissions or may also require approval by local government councils or boards. Such approvals offer an opportunity for local government to require conditions of approval for land development, including water supply, water quality, habitat conservation, or other watershed-based requirements.

CEQA

The California Environmental Quality Act (CEQA), is not a planning law as such, but has significantly influenced land use since it was passed in 1970. "By law CEQA has four functions:

1. To inform decision-makers about significant environmental impacts;
2. To identify ways environmental damage can be avoided;
3. To prevent avoidable environmental damage;
4. To disclose to the public why a project is approved even if it leads to environmental damage."[7]

The ideal timeframe for CEQA implementation is as early in the planning process as possible to "enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment" [CA Code §15004(b)]. Since the earliest planning stage is the development of the applicable General Plan, Water and Land Use considerations should be incorporated into general plans in California. Any subsequent municipal planning must be consistent with a municipality's general plan. Therefore, incorporation of water and land use issues into general plans would provide support at the foundational level of development planning, and would serve to link LID with CEQA Guidelines.[2] The requirements of the National Environmental Policy Act (NEPA) were patterned after CEQA, and only apply to projects with federal involvement. Therefore, compliance with CEQA is typically sufficient in substance to comply with NEPA, although NEPA compliance may require a longer timeline.

[7] Fulton, William, 1999. Guide to California Planning, Second Edition. Point Arena, California, Solano Press Books. Chapter 9.

CEQA Incentive[8]

SB 375 provides incentives in the form of CEQA streamlining to encourage community design that supports reduction in per capita GHG emissions. Generally, two types of projects are eligible for streamlined CEQA review once a compliant RTP/SCS has been adopted: (1) residential/mixed use projects (consistent with the SCS) or (2) a Transit Priority Project (TPP). See Appendix: SCS Background Documentation for more information on CEQA streamlining incentives through SB 375.

Development codes

Development codes typically combine zoning ordinances, subdivision regulations, design review guidelines, and related planning requirements.[1] Recently developed CalGreen building codes are now required.

As of January 1, 2011, "California requires new buildings to reduce water consumption, employ building commissioning to increase building system efficiencies, divert construction waste from landfills, and install low pollutant emitting finish materials. CALGreen's mandatory measures establish a minimum for green construction practices, and incorporate environmentally responsible buildings into California cities without significantly driving up construction costs in a slow economy.

CALGreen has approximately 52 nonresidential mandatory measures and an additional 130 provisions that have been placed in the appendix for optional use. Some key mandatory measures for commercial occupancies include specified parking for clean air vehicles, a 20% reduction of potable water use within buildings, a 50% construction waste diversion from landfills, use of building finish materials that emit low levels of volatile organic compounds, and commissioning for new, nonresidential buildings over 10,000 square feet."[9]

OWOW and Land Use Planning Interaction

There are a variety of innovative collaborations that already exist between water supply agencies and other public agencies that are producing mutually-beneficial and cost-effective results, as demonstrated in the Plan. However, opportunities remain for water agencies to develop more effective partnerships with local governments, developers and environmental organizations that will leverage funds, resources and expertise.

As previously described, the OWOW Plan was developed in an open, multi-jurisdictional and multidisciplinary process in which the interests of all stakeholders in the watershed were considered. The Steering Committee and the Pillars included representatives not only from water agencies, but from cities and counties, the development community, and a host of non-governmental organizations. The resulting Plan: (1) links the need for sufficient and clean water with land use, environmental protection, and the need for economic development; (2) and increases understanding of the link between water resources and land use for both land use planning and water agencies. More comprehensive

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[8] SCAG 2012. Regional Transportation Plan 2012-2035: Sustainable Communities Strategy. http://www.scagrtp.net/

[9] The 2010 California Green Building Standards Code. http://www.bsc.ca.gov/Home/CALGreen.aspx

understanding creates a perspective of land use planning that includes new development, open space for parks, recreation and environmental services, such as habitat and water filtration and natural treatment. Furthermore, the OWOW process strengthens interactions between water agencies and land use planning entities into the future.

Incorporating water use considerations into land use planning will be required to meet the requirements on Senate Bill (SB) 7, which requires urban water agencies to reduce per capita consumption 20% by 2020. Considering that outdoor use (i.e. landscaping) accounts for at least half of typical water use, land use decisions will have tremendous impact on future water conservation efforts.

The following sections describe ongoing efforts in the region to simultaneously address land use and water planning:

Working with Residential, Commercial and Industrial Developers

Water supply agencies, including the Metropolitan Water District of Southern California (MWDSC), have been investing in landscape water use efficiency projects with homebuilders for several years.

As of January 2010, Assembly Bill (AB) 1881 required local governments to adopt the State's Model Water Efficient Landscape Ordinance or equivalent ordinance, and required public and private development projects to submit water efficient landscape plans for areas equal or greater than 2,500 square feet. AB1881 institutionalizes the incorporation of water efficient landscaping into new development at the State level. Stakeholders in the Chino Basin developed an AB1881-equivalent landscape ordinance prior to the 2010 deadline as a locally-tailored alternative.

In addition to the accomplishments to be provided by AB1881, residential, commercial, and industrial developers have been working to support critical aspects of integrated regional water management, such as:

- Supporting LID site designs that reverse the conventional concept of stormwater runoff as a waste needed to be conveyed offsite as rapidly as possible, to recognizing stormwater as an essential resource to be captured for groundwater recharge or other use. Implementation of LID techniques also reduces pollutants in stormwater, including metals, nutrients, pesticides, total dissolved solids, petroleum hydrocarbons, and bacterial contaminants.
- Reducing the proportion of impervious surfaces in new developments by installing green roofs or rainfall-capturing roofs, and pervious pavement for parking lots, sidewalks, plazas and other similar uses.

Working with Local Governments

Water supply agencies, such as MWDSC, continue to expand investment of resources in water-efficient, highly visible public landscaping projects in cooperation with local governments in the watershed. Unfortunately, investments to date have yet to create the critical mass of water-use efficient landscapes necessary to prompt the public toward a dramatic paradigm shift. Considerable additional investment is necessary to reduce unreasonable water waste and meet SB 7 requirement of 20% reduction in per capita water use by 2020.

Obsolete land use practices present in visible public places that employ wasteful water use practices should be prioritized for investment to be retrofitted and transformed into examples of water use efficiency and livability.

The outcome of investing resources in this manner offers the benefits of:

- Increasing the conservation of potable water supplies that are currently dedicated to irrigating public landscapes that lack water use efficiencies
- Reducing the portfolio of negative images of public agencies wasting water
- Educating the public using visible public places with signage that explains the smart controllers and irrigation systems that are supporting attractive water-use-efficient landscape designs that the public would find desirable in their own homes and businesses
- Replacing impervious surfaces in public projects where flashy urban runoff is a chronic problem with attractive permeable paving illustrated with signage for the public
- Natural resources, such as wetlands, floodplains, recharge zones, riparian area preservation and restoration, open space, and native habitats, should be identified, preserved and restored as valued assets for flood protection, water quality improvement, groundwater recharge, habitat, and overall long-term water resource sustainability
- Reducing development in high risk areas prone to wildfires and post-fire debris flows that reduce the efficiency of water supply programs when foreseeable disasters do occur
- Sewering disadvantaged communities with failing septic systems that are proximate to available sewer lines where residents lack financial resources and political will

Working with Environmental Organizations

Agencies and stakeholders in the Watershed have partnered with the environmental community in restoring over 3,000 acres of riparian habitat**.** These projects have increased surface water flow, replacing water hungry invasive species with native plants, and increased habitat suitability for endangered riparian species. However, water supply agencies have insufficiently invested resources working with environmental organizations in low-income communities that disproportionately lack sufficient land surfaces for the capture of stormwater from urban runoff that also can serve as open space for recreation.

The outcome of investing resources in this manner reduces stormwater pollutant loads, and serves the needs of Disadvantaged Communities.

Regional and Watershed Examples

University of California, Irvine Cooperative Extension LID Test Site[10]

The University of California, Irvine Cooperative Extension (UCCE) Low Impact Development (LID) Test Facility (UCCE Facility), located in Irvine, California, consists of three model residential landscapes each with a mock residence, and a fourth, undisturbed landscape **(Figure 5.7-7).** The residential landscapes were constructed with various levels of LID BMP implementation. The volume and pollutant concentration of discharges, and the percentage of runoff from various BMPs and LID systems have been monitored, and the soil type reviewed.

Figure 5.7-7 UCCE LID Site

The mock residences are used for equipment storage and occasionally as meeting rooms or classrooms during demonstrations of the facility. Pesticides and fertilizers were applied according to package directions, and irrigation was applied as needed to maintain the residential landscapes. The plots are each 90 feet by 45 feet, totaling 4,050 square feet. The mock residences have footprints of 576 square feet. The LID features at the four sites are described below.

[10] San Bernardino County Flood Control District Lid Guidance Manual and Training Program Monitoring Technical Memorandum Revised July 2011. Prepared by Mactec Engineering, Inc.

- Landscape A: Typical Landscape – The typical landscape was designed to represent a single-family residence in a modern development with no LID techniques implemented. This landscape was developed with a concrete driveway, landscaped grass and flowers, concrete walkways, standard roof drains, and landscape drains running to the street. Landscape A is approximately 37 percent impervious.
- Landscape B: Retrofit Landscape – The retrofit landscape consists of LID techniques that a homeowner could install on an existing residential development such as Landscape A. The driveway and walkway were constructed with pervious stone pavers, and a positive sub-drain/infiltration system was installed under the driveway. A dry-well infiltration pit, rain gutter cisterns, and minor landscaping modifications including native plant materials are additional features of the retrofit landscape. Landscape B is approximately 14-percent impervious and 23-percent semi-pervious (stone pavers).
- Landscape C: Full Implementation or Sustainable Landscape – The full implementation landscape consists of LID features such as interlocking pavers for the driveway and walkways, landscape infiltration trenches, and landscaping with low water use and native plants. Roof drains are directly connected to dry wells. This landscape was designed with the goal of minimizing runoff from irrigation and storms. Landscape C is approximately 14-percent impervious and 23-percent semipervious (stone pavers).
- Landscape D: Undisturbed Landscape – The graded lot consists of an empty, undeveloped landscape adjacent to the three residential landscape sites. This area is surrounded by a berm and is absent a driveway, walkways, a housing structure, landscape vegetation, and any LID features of the residential sites. This site was established in March 2009 and is used to represent the characteristics of pre-development land.

Drainage for the four landscapes has been designed to direct all runoff into concrete collection boxes located at the west corner of each lot. Each of the collection boxes has a sump pump connected to a flow meter. A data logger inside each mock residence records the volume of all discharges. Grab samples have been collected from the three residential landscapes and analyzed for pesticides during both dry weather and wet weather events between early 2007, late 2008, and in early 2010 for a separate perimeter study.

Multi-Objective Stormwater Management Projects in the Chino Creek Watershed[11]

Chino Creek Wetlands and Educational Park

This project, conceptually modeled after the Sepulveda Basin in Los Angeles, where a public park is a part of the flood control system, had two main objectives. The first objective was to detain, infiltrate and treat stormwater from the upper, off-site watershed and tributary areas; and the second was to be a demonstration site for different types of constructed wetlands so that developers in the area would understand the most cost-effective wetland type for their projects. Developers were very interested to learn whether there was a wetland type that had a small footprint, reasonable capital and O&M cost,

[11] SCWC, 2012. Stormwater Capture: Opportunities to Increase Water Supplies in Southern California. http://socalwater.org/images/SCWC_Stormwater_White_Paper__Case_Studies.Smaller.pdf

and was reliable over time so that regulations were met consistently. Different types of wetlands operating in parallel provided comparable treatment data.

The 22-acre wetlands and educational park serves as a demonstration area and has incorporated educational features for improving water supply, stormwater treatment and water efficiency. Educational tours are provided through a partnership between IEUA and the Santa Ana Watershed Association (SAWA) (see: http://www.ieua.org/education/docs/ChinoCreekParkBrochure.pdf) **(Figure 5.7-8).**

Figure 5.7-8 Chino Creek Wetlands

Narrow-Leaved Milkweed (foreground) and Bulrush at Pond 5 (photo by Eric Lesser)

Eastern view of the cottonwood willow woodland habitat surrounding Pond 4

Mulefat framing Great Blue Heron at north end of Pond 2 (photo by Eric Lesser)

Lower Bridge Crossing 'Intermittent Stream' in Cottonwood-Willow Woodland Habitat (photo by Eric Lesser)

The park was designed to capture and infiltrate flows generated from up to a 25-year frequency design storm as well as to attenuate flows from the 100-year storm event (395 cubic feet per second (cfs)) from the upper tributary area of 700 acres.

Stormwater flow from the upper tributary area enters the Park from two reinforced concrete boxes on the north and northwest of the site. Currently, a 3 ft. x 10 ft. box culvert transports this flow under Kimball Avenue in the north location into an unlined channel and then a detention pond before entering the park for treatment.

The detention basin was designed to divide the flow into three types of wetlands:

- Subsurface flow
- Surface emergent marsh/pond habitat
- Cottonwood/Native Willow riparian channel

The park design also included small surface bioswales, in order to provide further water quality improvement and create habitat for native flora and fauna.

Both the subsurface flow and surface type of wetlands were expected to provide water quality improvement and to retain storm flows on-site. The subsurface wetlands were designed based on a pilot project that was completed at a local dairy previous to the design of the park. The Cottonwood/Native Willow riparian channel was designed to mimic natural wetlands typically found in Southern California and in this region.

The wetland basins were all designed so that grab sampling could occur and to provide electrical outlets for automatic sampling if desired. Key operations and maintenance personnel were involved in the design to promote ease of maintenance. While the site looks very organic, the entire site allows easy re-routing of flow from one basin and/or wetland to another, to facilitate maintenance.

The upland park areas have trails, habitat and open space, and were designed for detention and sheet flow of stormwater. Open areas were planted with native vegetation and mulched with compost. After traversing through the wetlands and the habitat, flow is discharged under El Prado Road and discharges as surface flow in an existing flow pattern to Chino Creek.

Inland Empire Utilities Agency (IEUA) Headquarters

The IEUA Headquarters (HQ), a Leadership Energy & Environmental Design (LEED) Platinum facility, was designed to meet all LEED requirements for both site and water, including stormwater, and became a demonstration of on-site BMPs. This site is aesthetically pleasing, with outdoor opportunities for staff, including picnicking. It has provided extensive opportunities for education and public outreach, including numerous tours and demonstration visits.

The four main goals of the HQ site were determined by IEUA and by LEED Platinum certification criteria, and included:

- Maximize open space, native plants, and habitat
- Reduce stormwater
- Treat stormwater
- Use of recycled water

Maximizing open space involved conserving existing natural areas, restoring damaged areas (dairy farm activities), providing habitat and promoting biodiversity within the vicinity. The Agency reduced the development of its footprint (site area, building footprint, future building expansion, parking lot, water feature and pavement) to exceed the local zoning open space requirement for the site by 25%. Reducing stormwater flow involved eliminating runoff and contamination and increasing on-site infiltration by limiting the disruption of natural water flows. The site was graded in such a way as to create an on-site retention basin with a capacity of 75.9 acre-feet. This was in addition to the infiltration capacity of the site itself and the parking lot. Reuse of stormwater was not done at the site, as it was seen as not cost-effective and potentially maintenance intensive.

The treatment of stormwater was accomplished by focusing on both suspended solids and phosphorus by limiting disruption of natural water flows by eliminating stormwater runoff, increasing on-site infiltration and using vegetation and the natural biota in soil to treat stormwater contaminants.

Infiltration and retention basins were used to estimate the removal of pollutants (Total Suspended Solids [TSS] and Total Phosphorus [TP]) from on-site storm runoff produced from an 85th percentile 24-hour storm event ("first flush" storm runoff). Bio-filters and bio-swales are included as pre-treatment for the infiltration/retention basins. The large wet pond is also used as a BMP facility. The majority of the parking areas have permeable surfaces which provide additional stormwater treatment, thus improving water quality.

Recycled water from the adjacent Regional Wastewater Treatment Plant No. 5 (RP-5) was considered to be a critical component for reducing water consumption and demonstrating water conservation practices. Recycled water is an important product of the Agency. Demonstrating the use of this water on grass lawns and native and California adaptive plants is still seen today as important in overcoming barriers to its use.

Cucamonga Creek Watershed Regional Water Quality Project[12]

This is a unique multi-jurisdictional project to create and restore the region's native ecosystems while enhancing recreational and educational uses as part of a regional watershed management plan. Spearheaded by the City of Ontario and supported by the City of Chino, the County of San Bernardino, the Inland Empire Utilities Agencies (IEUA), the Orange County Water District (OCWD), and the United States Army Corps of Engineers (USACE), the project transforms a fallow and underutilized area within the Prado Basin to provide regional environmental and recreational benefits. The project's unique regional approach is also supported by the State Water Resources Control Board through grant funding and is an integral part of the Santa Ana Watershed Project Authority's (SAWPA) Integrated Regional Water Management Plan, "One Water, One Watershed" (OWOW).

Prado Dam was originally constructed as a flood protection project and was completed in 1941 (see Chapter 5.8, Pages 10-11 for more complete description). Although there are many benefits associated with having the dam in place and valuable habitat being developed behind the dam, it is a physical

[12] Text from City of Ontario 2013.

barrier in the Santa Ana River Channel. As such, the dam creates habitat blockage for a variety of species that rely, now or historically, on the Santa Ana River as a migratory corridor[13].

Water Quality Benefits

The Prado Basin contains some of the best and largest riparian habitat in all of Southern California. Included are threatened and endangered species such as the least Bell's vireo, arroyo chub, and Santa Ana sucker. In addition, groundwater pumped from the basin is the primary source of drinking water consumed and used in Orange County. The Santa Ana Regional Water Quality Control Board (RWQCB) has designated Cucamonga Creek/Mill Creek as impaired pursuant to Section 303(d) of the Clean Water Act. The project provides a regional approach to enhancing water quality in Prado Basin, protecting the viability of native habitat while improving groundwater quality for downstream water users.

The Cucamonga Creek Watershed encompasses approximately 77 square miles, comprised of portions of the cities of Ontario, Chino, Rancho Cucamonga, and Upland. Pollutants such as pathogens, nutrients, salinity/total dissolved solids/chlorides, and suspended solids are known to occur in these water bodies. Active and former agricultural uses and urban runoff from developed areas represent the primary contributors to the pollutants found in the watershed.

The project, proposed for completion in 2014, diverts flows from Cucamonga Creek into a series of natural water quality treatment ponds that include areas of open water and wetland vegetation. The system is designed to first remove trash and debris as water flows through a de-silting basin, then remove pollutants through natural settlement, ultraviolet light treatment, and biological activity as it travels through native wetland vegetation. The system is designed to be entirely gravity fed, requiring no manmade energy sources, thus promoting progressive water quality alternatives that advance the use of renewable, sustainable, and environmentally sensitive designs, materials and practices **(Figure 5.7-9).**

[13] Source: Comments from Anthony Spina, National Marine Fisheries Service, West Coast Region.

Figure 5.7-9 Cucamonga Creek Wetlands

The project is a regional natural treatment facility designed to hold and treat 160 acre-feet of water. This volume translates into treatment of 10 – 18% of all wet-weather runoff in the Cucamonga Channel watershed. In contrast, a single-function water quality project of the same size in an upstream tributary could effectively capture approximately 6% of the total wet-weather runoff from the watershed. Thus, the project is an effective means of leveraging water quality benefits for the region.

Recreational Benefits

The project's recreational plan provides for additional passive recreation opportunities in the Prado Basin by incorporating approximately 3.5 miles of hiking and equestrian trails, forming a looped trail system around vegetated and open water ponds **(Figure 5.7-10).** The proposed trail system includes benches in locations that offer vistas of the wetland ponds and the surrounding environment, providing wildlife viewing opportunities with interpretative signage. Planting will be coordinated around the benches to provide shade and increase the aesthetic character of the views. The surrounding native plantings and open water wetlands will attract numerous wildlife species, offering excellent wildlife viewing opportunities.

Figure 5.7-10 Cucamonga Creek Time Series

Interpretive signage is proposed at the trailheads as well as throughout the trail system to provide park users with a better understanding of the history of the area; local wildlife that might be viewed; information on native vegetation, including plant communities and individual species; and an explanation on water quality and natural treatment systems.

Consistent with the needs identified by the USACE Prado Basin Master Plan and the San Bernardino County Parks Department, the trail system will provide future trail connections for the inter-county trail system as well as the Coast to Crest Trail System intended to connect the Santa Ana River Trail from its outfall in Orange County to the mountains in San Bernardino. The new trail system will also connect to the City of Chino Urban Buffer linear park/open space (The Preserve Specific Plan, City of Chino – March 2003, Amended – January 2008).

Native Habitat Creation and Restoration Benefits

The Prado Basin currently protects 4,400 acres of native habitat. The Prado Basin also contains some of the best and largest riparian habitat in all of Southern California with more than 300 species of plants, 13 species of reptiles, 47 species of breeding birds, 11 raptor species, and 23 mammal species. Included are threatened and endangered species such as the least Bell's vireo, arroyo chub, and Santa Ana sucker.

The Project will create 32 acres of native habitat through the use of native planting in the wetland ponds and slopes in addition to replacing non-native vegetation, agricultural lands, and disturbed areas with high quality native vegetation. The Native Habitat Plan creates several habitat types that will benefit local wildlife, including endangered species, by utilizing species that promote nesting, breeding and foraging. The Native Habitat Plan also supports the Recreation Plan by providing shade, wildlife viewing opportunities, and aesthetics.

Low Impact Development Guidance and Training for Southern California

This project, funded under Proposition 40 and cooperatively conducted with local governments and regulatory agencies from six counties (Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura; and RWQCBs from Los Angeles, Santa Ana, and San Diego regions), began in 2006. It was led by the San Bernardino County Flood Control District with guidance from the Southern California Stormwater Monitoring Coalition (SMC), and a stakeholder-comprised Technical Advisory Committee (TAC). The project developed the Low Impact Development Manual for Southern California, which facilitates the implementation of LID techniques for projects in Southern California. It also provides guidance for municipalities, land developers, consultants and other design professionals who prepare stormwater engineering plans and specifications in Regional Water Quality Control Board Districts 4, 8 and 9 of Southern California.

The LID GTPSC also conducted several training workshops in 2007 and 2008, and transferred the final LID Manual to the California Stormwater Quality Association (CASQA) for statewide access via the World Wide Web and to steward updates and revisions to the manual over time. CASQA now hosts an LID web portal and will be developing this portal under a 2012 Proposition 84 Stormwater Grant.

Finally, the project included a monitoring element designed to evaluate the effectiveness of LID BMPs in reducing stormwater impacts. Monitoring has been underway at selected sites, although precipitation has generally been less than average, so few events have been captured. The monitoring program is currently under review by the SMC, and is expected to be refined and continued. The objective is to adaptively update the LID Manual based on actual performance of LID in the field.

Riverside County Flood Control & Water Conservation District LID Retrofit Project

The RCFCWCD retrofitted their 15-acre headquarters near downtown Riverside with LID BMPs from their LID BMP Design Manual to showcase, learn, and gather local, real-world data of constructible LID BMPs. The Project was supported through a partnership with SAWPA and funded in part by Proposition 13 Water Bond funding administered by the SWRCB. The Project entailed construction and installation of selected LID BMPs, including porous pavers, porous concrete pavement, porous asphalt pavement, biofiltration basins, and a vegetated infiltration swale. The Project also replaced turfed landscaped areas with drought tolerant and California-friendly landscaping **(Figure 5.7-11).** The total construction cost of the Project was $ 2,557,634.36.

Figure 5.7-11 Riverside County FC and WCD LID Testing and Demonstration Facility

A dedicated website was developed during the project to educate the public about LID practices. The website also served as an avenue to show construction progression of the different LID BMPs. Since construction completion in 2012, the facility has welcomed and educated visitors through signs, markers, and a walking guide. The facility has also garnered several awards, including the ASCE's (Region 9, Los Angeles Section) 2012 Civil Engineering Project Improvement Award, ASCE Region 9 2012 Outstanding Stormwater Management Project, and the Southern California APWA 2012 Project of the Year in Stormwater Quality.

The project also constructed and installed a monitoring center which will allow future water quality monitoring of LID BMP influent and effluent that aims to enumerate LID BMP performance in the semi-arid Southern California climate.

San Bernardino County Vision Water Element[14, 15]

This project is an effort to "improve countywide efforts to plan and manage water resources in San Bernardino County." The Vision: "Develop a Countywide strategy that encourages collaboration among business, residents, and water agencies that will:

- Address multiple watersheds and water agencies
- Build institutional and organizational capacity for future countywide networking efforts
- Create mutually beneficial investment opportunities to ensure adequate water supplies and quality for the future"

"Leaders from public and private water agencies, regulators, planners, education and business formed the Countywide Vision Water Element group in January 2012 and have been meeting regularly to discuss the challenges faced by the county community as it strives to meet the water needs of an ever -growing region."

"The Water Element Group recognized the need for a high -level, comprehensive look at countywide water management. With participation from water agencies throughout the County, the Water Element Group prepared an inventory of current and planned water needs and available water resources. The inventory found that more than ***enough water will exist to meet the needs of San Bernardino County residents and businesses through 2035 only if water users step-up conservation efforts and the public and local government leaders are willing to invest in projects that will store and protect additional water supplies***."

"The County Vision Water Element group will use the information contained in the inventory to promote partnerships among water agencies and other stakeholders within the county, improve water management and efficiency, protect and conserve water resources, and identify the most important next steps the group should take to further these goals."

City of Ontario New Model Colony General Plan[16]

Since 1998, the City of Ontario has been developing a bold vision for its future growth, including the adoption of its general plan and adding 3,303 acres of former agricultural land into its sphere of influence. The City's recent plans call for 13,000 new housing units across a broad range of housing types and a mix of business spaces oriented towards three mixed-use centers that are served by pedestrian-friendly roadways and a large central park. Emphasizing connections to corridors and transit, the City is creating a major regional center for Southern California.

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[14] San Bernardino County Countywide Water Inventory Executive Summary September 5, 2012
http://www.sbcounty.gov/Uploads/CAO/Vision/Water_Inventory_Executive_Summary_9_6_2012_v01.pdf

[15] http://www.sbcounty.gov/Uploads/CAO/Vision/FINAL-Water-Conference-Presentation.pdf

[16] SCAG 2012. Regional Transportation Plan 2012-2035: Sustainable Communities Strategy, Page 149.
http://www.scagrtp.net/

Existing Forums to Address Watershed Planning

SCAG is the Regional Transportation Planning Authority. As such, SCAG has been evaluating regional growth problems and developing guidance and approaches to implement community sustainability principles in collaboration with local governments and County Transportation Commissions (CTCs). Water quality and water supply are key sustainability considerations and are given high priority in the SCAG efforts. The Water Chapter of SCAG's 2008 Regional Comprehensive Plan (RCP)[17] (Pages 48-63) evaluates water priorities and climate change, and provides comprehensive recommendations for addressing these issues in the immediate future as related to regional growth needs.

The SCAG recommendations are entirely consistent with the OWOW Mission to develop a sustainable and adaptable watershed. For example the 2008 RCP provides the following Water Goals:

- "Develop sufficient water supplies through environmentally sustainable imports, local conservation and conjunctive use, reclamation and reuse to meet the water demands created by continuing regional growth
- Achieve water quality improvements through implementation of land use and transportation policies and programs that promote water stewardship and eliminate water impairments and waste in the region
- Foster comprehensive and collaborative watershed planning within the region that produces waterwise programs and projects with multiple benefits and ecosystem protections, integrating local government planning efforts with those of special districts, environmental advocate and other watershed stakeholders"

Transportation Planning[18]

Since 2000, SCAG has worked with Southern California stakeholders to create a dynamic regional growth vision. "Charged by federal law with preparing a Regional Transportation Plan every four years, SCAG has traditionally focused most on the mobility aspects of the region's growth. Under state law, SCAG is also charged with working with its member local governments on planning for an adequate regional housing supply."

The 2012 RTP land use mitigation program includes the following types of measures:

- Encourage cities and counties to update their general plans and provide the most recent plans to SCAG
- Work with member cities to ensure that transportation projects are consistent with the RTP and general plans
- Work with cities and counties to ensure general plans reflect RTP policies

Water Resources in the RTP

[17] SCAG 2008. Regional Comprehensive Plan. http://www.scag.ca.gov/rcp/pdf/finalrcp/f2008RCP_Water.pdf

[18] SCAG 2012. Regional Transportation Plan 2012-2035: Sustainable Communities Strategy. http://www.scagrtp.net/

Cumulative impacts to water resources from the growth projected in the 2012 RTP include potential water quality impairment from increased impervious surfaces; increased development in alluvial fan floodplains; and increased water demand and associated impacts. Increased greenhouse gas emissions from the transportation system impact the security and reliability of the imported water supply.
The water resources mitigation program from the 2012 RTP includes the following types of measures:

- Utilizing advanced water capture and filtration techniques, showing a preference for naturalized systems and designs, to control stormwater at the source
- Avoiding any new construction of impervious surfaces in non-urbanized areas, such as wetlands, habitat areas, parks, and near river systems
- Avoiding any new construction that provides access to flood-prone areas, such as in alluvial fans and slide zones
- Protection and preservation of existing natural flood control systems, such as wetlands and riparian buffers, and expansion of such systems in areas where they do not currently exist
- Constructing projects according to Best Management Practices for water quality protection and water conservation, including low-impact development and green building standards
- Coordinating project development and construction efforts across jurisdictional, agency, and departmental boundaries, to increase project benefits

Orange County Sustainable Communities Strategy (SCS)[19]

The Orange County Council of Governments (OCCOG) developed their own SCS and entered into a *Memorandum of Understanding with SCAG specifying submission* schedules and standards for each component of the subregional SCS. While OCCOG conducted their own research and outreach to develop their SCS, they worked closely with SCAG through workshop preparation **(Figure 5.7-6a),** data and information sharing, and regular meetings. SCAG's Local Sustainability Planning Tool was also made available along with trainings and one-on-one working sessions to assist in the review and revision of the preliminary scenarios.

Riverside County and City Arroyo-Watershed Project

The Riverside Arroyo/Watershed Policy Study, completed in November 2006, was a joint effort between the City of Riverside and the County of Riverside to establish a broad plan for the protection of the arroyos and other watercourses that traverse the boundary between the City and County. The study also made recommendations intended to facilitate the protection of water quality, and the augmentation of water supply for the City-County area. The study applies to a large portion of the Santa Ana Watershed area, offers a comprehensive program of water protective policies and land use/riparian and water interface design concepts, and involves two closely coordinated neighboring jurisdictions, and thus can provide a model for other jurisdictions within the OWOW Plan area, both in terms of policies and design concepts, as well as inter-jurisdictional cooperation in implementing them. The study was prepared by the County-City Arroyo/Watershed Committee (CCAC), an interdisciplinary group whose members were appointed by the Riverside City Council and the Riverside County Board of Supervisors.

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[19] Orange County Sustainable Communities Strategy, June 2011. http://www.occog.com/pdf/OCSCS20110614.PDF

Many organizations contributed to the work of the CCAC, especially SAWPA, the California Department of Fish and Game, the Riverside-Corona Resource Conservation District, the Riverside County Flood Control and Water Conservation District, SAWA, Riverside Land Conservancy, UCR (logistical research), and Mt. San Jacinto College.

The recommendations of the CCAC in the Riverside Arroyo/Watershed Policy Study were intended to result in implementing amendments to both the City's and County's General Plans, their zoning ordinances, grading ordinances, and other ordinances and policies under the charge of the those jurisdictions' Planning, Transportation, Flood Control, Health, Agricultural Commissioner, and Parks offices/departments. Study recommendations have been incorporated into the City's General Plan and ordinances, and are in the process of being similarly adopted by the County as part of a major, comprehensive General Plan update.

The Study's policies address a wide variety of land use and watershed issues, including (but not limited to): building/graded area setbacks from arroyos; illegal grading policies; a GIS tool for mapping watercourse features requiring protection; golf course setbacks from arroyos; a model policy associating slope, setbacks from arroyos, and lot size; requirements for septic tanks; policies for bridging, rather than grading road (with culverts) arroyo crossings; water quality protection policies that emphasize multiple, compatible uses, using storm water management and runoff as design elements; requirements for domestic and farm animals and livestock grazing in and near arroyos; restrictions on nurseries in and near arroyos; and restrictions on the location of utility facilities in and near arroyos. The CCAC GIS Watercourse Layer Map of arroyos and watercourses in the project area was accompanied by 19 specific recommendations for proactive and sensitive development that occurs near watercourses and arroyos[20].

The Study identifies several "next" steps to carry forth the benefits of its approach, including:

- Ensure the incorporation of the study's concepts on a long-term basis into local general plans and zoning ordinances
- Thorough, adequate assessments of at-risk land use conversions in and near arroyos;
- The establishment of various levels of governance and coordination on a watershed-wide basis; and public education about the study and the public's role in assisting in its implementation
- Conduct an objective evaluation of the effectiveness of existing protection measures and their implementation

[20] Riverside Arroyo Watershed Policy Study: Recommendations, 2006. Prepared by the County/City Arroyo-Watershed Committee. http://www.rctlma.org/planning/content/geninfo/ccacpolicystudy.pdf

Benefits to implementing the recommended actions included:

1. ***Create dynamic scenarios*** for protecting watercourses and other watershed values described in General Plan vision statements by applying policy recommendations in combination with the new GIS Watercourse Protection Map
2. ***Reduce the occurrence of code violations*** due to consistent and clear rules across boundaries for developers, land owners, staff, and land use decision-makers
3. ***Lessen potential for citizen complaints, litigation, and development delays*** over code violations due to consistent and clear rules across boundaries and an approach that is integrative in nature
4. ***Enhance public safety*** through incorporation of BMPs that reduce downstream flooding, landslides and erosion, and water quality impacts from new and existing development
5. ***Lower flood management and water quality management costs*** through controlling runoff and water quality at the source while providing multiple benefits that include habitat protection, recreation enhancement, aesthetic improvements, and high quality development
6. ***Improve neighborhood and community quality of life*** through increased opportunities for recreation, significant protection and enhancement of the aesthetic quality of Riverside, and high quality development
7. ***Enhance funding opportunities*** for acquiring State and Federal funds, including the recently passed Proposition 84 water bond funds, to make flood management and water quality protection improvements that are consistent with the CCAC policy recommendations and design guidelines

Newport Bay Conservancy

The Newport Bay Conservancy is developing a Concept Book for the Newport Bay Watershed that is intended to inform land use planning in the region and inform how it could be used to support water resource restoration goals. The project will first identify the ecological and water resource infrastructure goals that enable cross-agency buy in. It will then look for land use design opportunities throughout the watershed for implementing those goals in their entirety. The idea is to paint a picture for what complete resource integration and restoration would look like in the urban landscape and demonstrate how it could be integrated into other urban planning objectives such as transportation planning, community beautification and economic development. In this way, water resource restoration can become a part of the bigger picture of creating and enhancing community identity while also achieving technical environmental goals.

OWOW Influence on Planning Commissions

The OWOW Plan can influence local Planning Commissions indirectly, through project consideration and selection for funding and outreach from OWOW Pillar participants. Projects identified and recommended by the Plan could be communicated to local Planning agencies for consideration through brochures or other outreach. The SAWPA Commission and OWOW Steering Committee include local decision makers and elevate the level of awareness of watershed priorities.

General Plan Water Element

Current CA Code does not require General Plans to include a "water element." A water element has been strongly recommended as a fundamental approach to incorporate water issues into the planning process. Therefore, the 2003 General Plan Guidelines from the California Office of Planning Research the included guidelines for an optional water element (Page 128) and a flood management element (Page 116) (OPR General Plan Guideline are currently in the process of being updated. See: http://opr.ca.gov/docs/GPG_2013_One_Pager.pdf).

Model Ordinance Governing Planning for Watershed Sustainability

Local government ordinances and implementing codes are more directly implemented than higher-level planning documents. Many local governments have adopted ordinances to address specific environmental concerns, including water supply and conservation, water quality, and sustainable development practices. MS4 Permits in the watershed require all Permittees to "maintain adequate legal authority to control the discharge of pollutants to their MS4s through ordinance… and enforce these authorities." MS4 Permittees in the watershed have complied by adopting ordinances based on regionally developed model stormwater ordinances. All watershed cities were required by AB1881 to adopt a landscape ordinance by January 2010—most cities complied through the use of the DWR model ordinance or regional model ordinances.

Los Angeles County Ordinance Example[21]

"The County of Los Angeles added a chapter to the Title 12 Environmental Protection of the Los Angeles County Code. This chapter is entitled Low Impact Development Standards; its stated purpose is to require the use of LID principles in development projects. The chapter states, *"LID builds on conventional design strategies by utilizing every softscape and hardscape surface in the development to perform a beneficial hydrologic function by retaining, detaining, storing, changing the timing of, or filtering stormwater and urban runoff."* The ordinance requires comprehensive LID plans that demonstrate compliance with an LID Standards Manual to be submitted for review and approval by the Department of Public Works. It also specifies that urban and stormwater runoff quantity and quality control standards will be established in the LID Standards Manual that is to be updated and maintained by the Department of Public Works. For subdivisions, the LID plans must be approved prior to tentative map approval. For all other development, an LID plan must be approved prior to issuance of a grading permit or, where a grading permit is not required, prior to issuance of a building permit.

The Subdivision and Planning Zoning Titles of the Los Angeles County Code were amended to add reference to the Low Impact Development Title. In addition, the County adopted ordinances for green building and drought-tolerant landscaping. All three ordinances apply to all administrative and all discretionary projects."

[21] Low Impact Development Manual for Southern California, 2010. Low Impact Development Center, Appendix B, Page 203.; https://www.casqa.org/LinkClick.aspx?fileticket=zA3DaxiwHtE%3d&tabid=242

Therefore, the Land Use and Water Pillar recommends the development of a model ordinance that would facilitate the consistent implementation of Watershed Sustainability Planning Procedures. Such a model ordinance could be readily adapted from existing ordinance examples, such as the "Model Ordinance Governing Planning and Development on Alluvial Fans" that was recommended by stakeholders appointed to DWR's Alluvial Fan Task Force (AFTF). (See: http://aftf.csusb.edu/documents/DRAFT_MODEL_ORDINANCE.pdf).

The AFTF Model Ordinance was designed to provide a platform for pre-project level discussion and evaluation of sustainability issues related to individual development projects being proposed in alluvial fan areas. The sole purpose of the Model Ordinance was to facilitate better informed land use decisions. The Model Ordinance procedures are intended provide project proponents with as much information about sustainability issues before any project planning expenditures take place.

It is important that OWOW 2.0 stakeholders also note that AFTF Model Ordinance (MO), crafted by attorneys and vetted by legal stakeholders, **was designed specifically not expand or conflict with any existing land use regulatory processes in any way**. To that end, the MO merely sets forth procedures to be followed, and substantive factors to be considered, for these particular types local land use decisions. The ultimate goal is for local communities to utilize the best available scientific information to ensure that land use planning and development adequately consider watershed sustainability issues.

OWOW Governance and OWOW Project Selection

The OWOW 2.0 Plan will guide the selection of projects to be awarded California Proposition 84 funds and other future water resource implementation funding in the SAR Watershed. However, to maximize project benefits and ultimately optimize watershed sustainability, project concepts and designs need to be influenced before project selection process begins. Projects created to serve single or very limited entity interests may not have considered the cumulative watershed impact and demand close scrutiny. Comprehensive watershed planning should include project conceptualization that maximizes benefits from the holistic watershed perspective.

To further more holistic project concepts, the plan binds watershed stakeholders through trust and relationship building. The plan will be most effective if successfully communicated to the local and regional agency decision-makers.

Relevant policies

- General Plans have conservation elements that can serve watershed sustainability requirements
- Local Ordinances—such as AB 1881 Landscape Ordinance
- Master Drainage Plans
- MS4 Permit Requirements for development, redevelopment, and roads
- MS4 Permits require Permittees to review the watershed protection principles and policies, specifically addressing urban and stormwater runoff, in its planning procedures, including CEQA preparation, review and approval processes; General Plan and related documents

including, but not limited to its Development Standards, Zoning Codes, Conditions of Approval, Development Project Guidance; and WQMP development and approval processes[22]

Drivers for Land Use and Water Planning Collaboration

Implementation of land development provisions of MS4 Permits

The U.S. Environmental Protection Agency (EPA) requires Municipal Separate Storm Sewer Systems (MS4) permits to address new development and significant redevelopment projects through implementation of post-construction controls to reduce pollutants in stormwater discharges, and ensure long-term operation and maintenance of these controls.[23]

Hydrologic modifications from urbanization increase the quantity of stormwater discharges, and cause excessive erosion and stream channel degradation. Frequently the volume, duration, and velocity of stormwater discharges cause degradation to aquatic systems. Protecting and restoring the physical, chemical and biological integrity of receiving waters must be a central issue in stormwater permits. The National Research Council[24] recommends that the NPDES stormwater program examine the impacts of stormwater flow, treat flow as a surrogate for other pollutants, and includes recommended control requirements in stormwater permits. The report recommends that the volume retention practices of infiltration, evapotranspiration and rainwater harvesting be used as primary stormwater management mechanisms. For this reason, EPA recommends use of a permit condition that is based on maintaining or restoring predevelopment hydrology although other forms of this permit condition maybe appropriate as well.

MS4 Tasks (WQMPs, LID, General Plan, Codes, CEQA, hydromodification, habitat)

As part of the development program, the MS4 Permits include several requirements aimed at linking water quality and watershed protection with land use planning processes. These requirements include the "consideration of watershed protection principles in…CEQA and planning processes" (San Bernardino County MS4 Permit, Section XI.B.3.b.4; Page 77). These principles include specific consideration of the impacts of stormwater runoff, discharge of pollutants, and physical impacts which could affect downstream receiving waters and beneficial uses. The permittees must also coordinate with the Santa Ana RWQCB when projects require a Clean Water Act Section 401 Water Quality Certification. The MS4 Permit also specifies development of "common principles and policies necessary for watershed protection," which must include seven specific considerations (SB County MS4; Section XI.C.3.a – g; Page 78). These required considerations are very similar to the Ahwahnee Water Principles. The three

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[22] CRWQCB, Santa Ana Region, January 29, 2010. Waste Discharge Requirements for the County of San Bernardino and the Incorporated Cities of San Bernardino County, Order No. R8-2010-0036, NPDES No. Cas618036, Areawide Urban Storm Water Runoff.

[23] USEPA, 2010. MS4 Permit Improvement Guide. **EPA 833-R-10-001**

[24] *Urban Stormwater Management in the United States*, National Academies Press, 2008 www.epa.gov/npdes/pubs/nrc_stormwaterreport.pdf

county MS4 Programs are each developing watershed geodatabases intended to integrate watershed data and facilitate better planning. These are being developed within Watershed Action Plans (WAPs) (San Bernardino and Riverside County MS4s) and Watershed Infiltration and Hydromodification Master Plans (WIHMPs) (in Orange County). These are described in more detail in the **Chapter 5.8 Stormwater: Resource and Risk Management** "MS4 Permits as a driver for Plan implementation," and table 5.8-1.

Water Quality Management Plans (WQMPs) contain the requirements for implementation of post-construction BMPs for development projects subject to approval by the Permittees. The most recent WQMPs require the implementation of LID principles at all sites, with infiltration BMPs preferred wherever feasible. WQMPs are required for most projects that disturb 5,000 square feet or more, all auto repair facility projects, and projects 2,500 square feet or more that discharging environmentally sensitive areas (SB County MS4 Permit, Section XI.D.4; Page 79).

The WQMPs include specific requirements for projects that have a downstream Hydrologic Condition of Concern (HCOC). HCOCs are locations where water quality or habitat will be adversely affected by increased flow volumes, velocities, or by changes in the timing or duration of stormwater runoff. Protection of areas with HCOCs is a developing science and the MS4 Permits encourage watershed and stream-specific evaluations and require monitoring to ensure appropriate protection is devised and implemented.

The MS4 Permits require the development and/or revision of Local Implementation Plans (LIPs) for each Permittee. The LIPs describe each individual Permittee's detailed processes and identifies departments responsible for implementing all MS4 Permit requirements as specified in the Drainage Area Management Plans (DAMPs) and Municipal Storm Water Management Plans (MSWMPs). LIPs are an enforceable extension of the MS4 Permit. Individual LIPs are reviewable by the Regional Board and lack of implementation of LID provisions constitutes non-compliance with the MS4 Permit.

The MS4 Permits also require the implementation of LID or "greenstreet" techniques for applicable road construction projects. These requirements have been incorporated into the WQMPs and Technical Guidance Documents (TGDs).

Alternative compliance approaches

Alternative approaches for compliance with the MS4 Permit development requirements are described in **Chapter 5.8 Stormwater: Resource and Risk Management** in this plan. However, additional description and project applications are included below from the land use perspective.

Alternative land development compliance under MS4 Permits

Urban Runoff Fund, Water Quality Credit System, Regional Treatment BMPs

(These are described in more detail in the **Chapter 5.8 Stormwater: Resource and Risk Management** "MS4 Permits as a driver for Plan implementation," pages 26-27 and Table 5.8-1**)** Alternative stormwater compliance elements for development projects in the Santa Ana Region MS4 Permits.)

The MS4 Permits allow the development and significant redevelopment requirements of the WQMPs to be met through the use of: regional treatment BMPs, and urban runoff fund, or a water quality credit system. Regional treatment BMPs include sediment basins, infiltration basins or water quality wetlands that would receive storm runoff from upstream project sites. Potentially, regional facilities could be funded in part by contributing development projects, and be maintained by a public agency. Properly implemented regional BMPs could protect water quality and provide groundwater recharge, while providing a cost-effective means for MS4 WQMP compliance.

An urban runoff fund (URF) would be established to develop water quality projects using contributions from development projects where LID and infiltration are not feasible, or where greater benefits could be derived from off-site project implementation. Challenges to use of the URF include administration of the fund, assessing the value of projects and appropriate fund contributions, and scheduling constraints written into the MS4 Permits.

A water quality credit system would be established to allow projects to trade water quality or LID/infiltration credits. Projects unable to provide adequate runoff BMPs onsite could purchase credits for BMPs implemented elsewhere. Sites that are able to provide water quality or infiltration BMPs that exceed the required design standards would be allowed to sell credits for the net additional treatment capacity.

Design and approval of development project occurs within a complicated process involving regulations, permits, water supply determinations, and guidance. Regulatory agencies technically do not have land use authority, but influence land use through permit requirements. **Figure 5.7-12** shows schematically the linkages between regulations, permits, local government authority, water agency responsibilities, and where watershed protection priorities are incorporated. State and federal authorities are imposed by state and federal agencies on projects through permits. MS4 Permits specifically require incorporation of watershed protection "principles and policies" into local government General Plans, CEQA documents and the overall development process. Stream channel dredge and fill (USACE Section 404 Permits) RWQCB and SWRCB 401 Water Quality Certifications, and stream alteration permits (CDFW Section 1600 Permits) are typically issued directly to individual projects. Local jurisdictions must verify and facilitate these permits before approving project plans. Water suppliers are responsible to provide water supply assurance before projects can be approved by the local government **(See Figure 5.7-13**). Finally, OWOW Plan priorities inform the permitting process and are indirectly incorporated into local development approval processes and into individual projects.

Figure 5.7-12 Local Land Use Authority, Regulatory Authority and Permitting Requirements

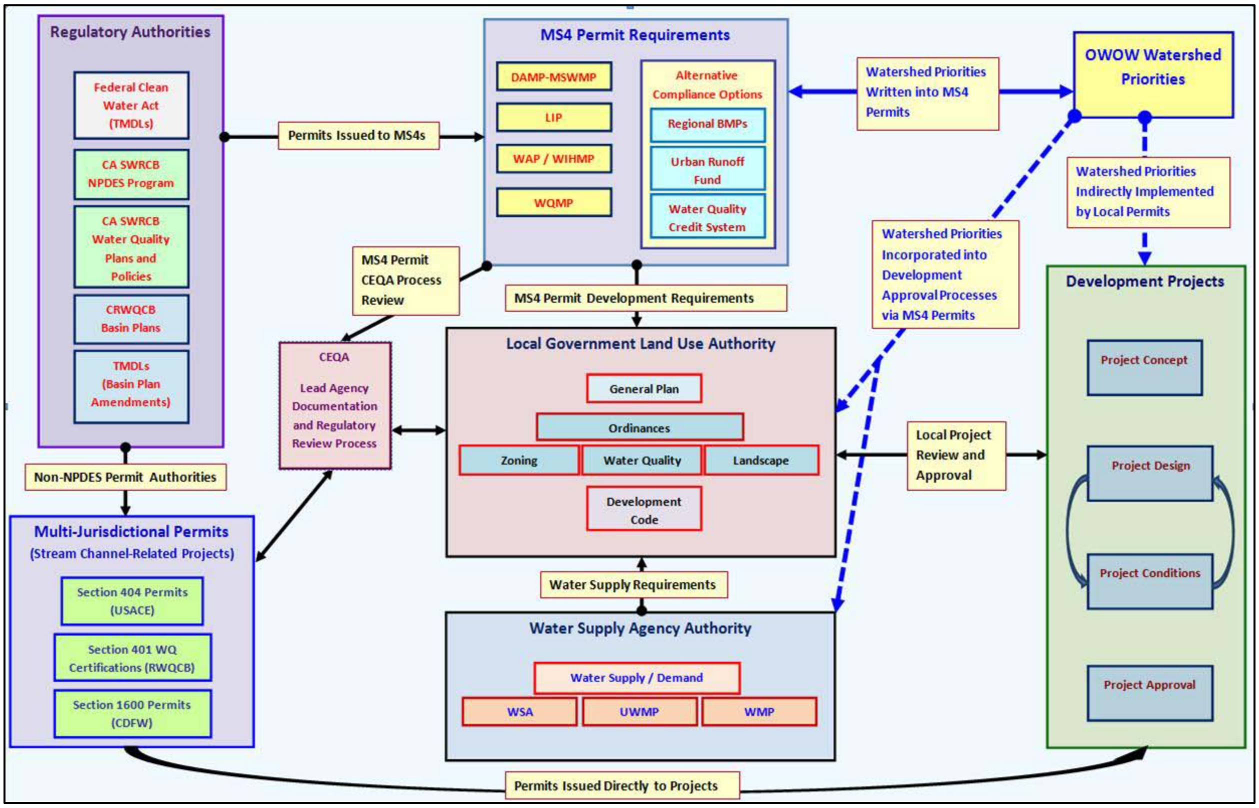
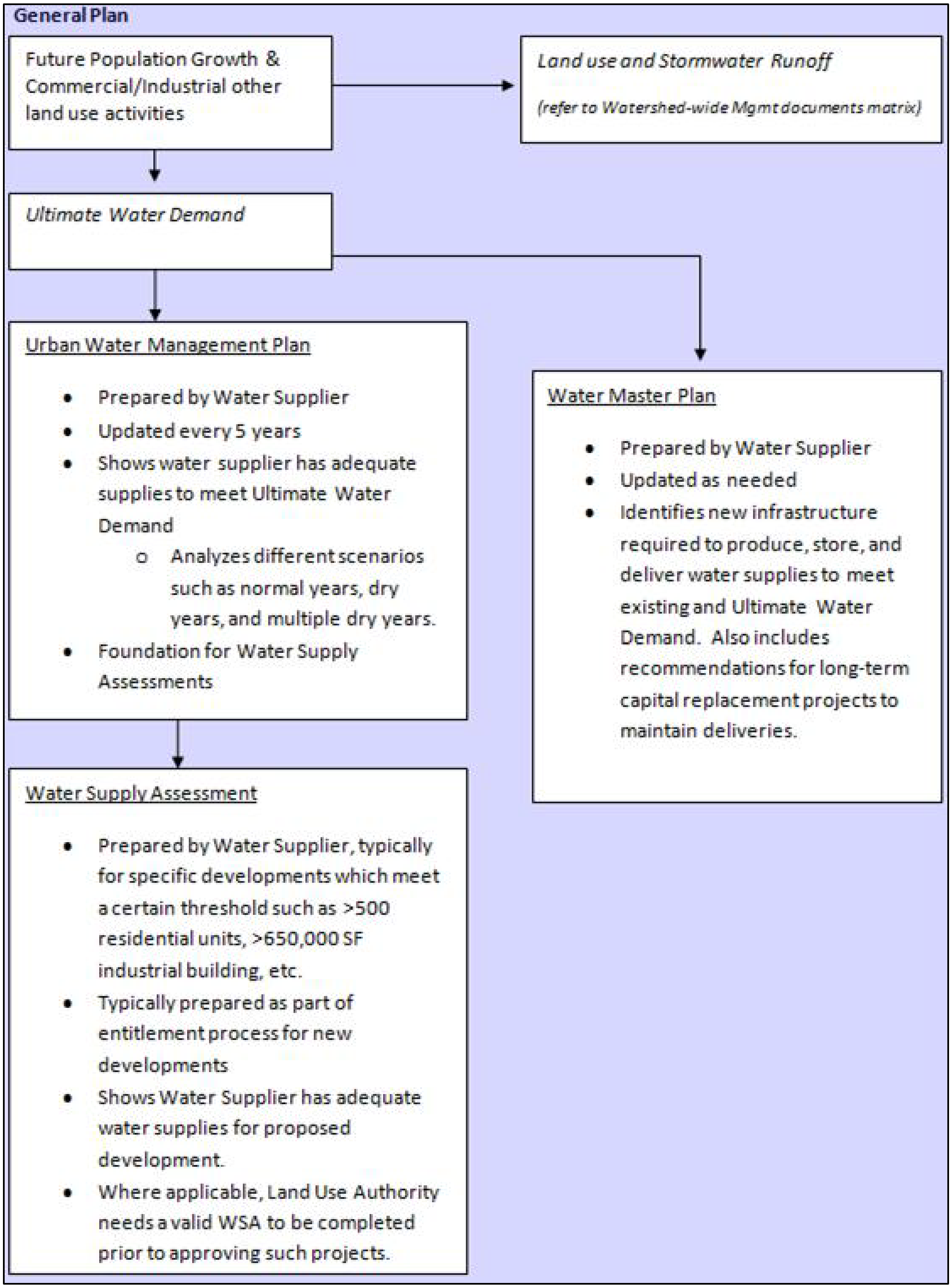


Figure 5.7-13 General Plan-Water Supply Requirements



Incentives for OWOW stakeholders to partner on MS4 Development projects

Ground water yield increase from LID implementation

A primary goal of LID implementation is to maintain or restore natural hydrologic conditions at project sites. A key aspect of hydrology is enhancing infiltration to compensate for installation of impervious surfaces. LID implementation can incrementally increase the recharge of groundwater basins, whether at individual, distributed sites in the watershed, or at larger scale catchment or regional infiltration sites. This increases the local groundwater supply and improves watershed sustainability.

Quantification (estimates) of groundwater recharge from site-based or regional LID—value of water supply

As stated by the Southern California Water Committee (SCWC): "Not all development will occur in areas where on-site capture and infiltration results in augmentation of groundwater basins used as drinking water supplies…"[25] Although LID techniques will increase groundwater recharge, it is difficult to determine the actual quantity of new available supply due to variable soil and subsurface characteristics. Larger scale infiltration facilities are more quantifiable and more likely to be maintained and monitored. Valuation of increased recharge and new supply is needed to understand cost benefit factors and to incentivize such projects to encourage broader project support. The Chino Basin Water Master has evaluated the volume of recharged and potentially accessible water from LID implementation in the Chino Basin. The challenge is to demonstrate cost-benefits for the stakeholders under various implementation scenarios, especially distributed, individual site based infiltration BMPs v. larger scale catchment or subwatershed regional infiltration basins. Larger scale basins would most likely be maintained by water agencies and their effectiveness would be monitored and maximized, whereas individual privately maintained BMPs will have less scrutiny and less effective maintenance on average. Water agencies will need demonstrated long-term supply increases to justify cost sharing on such projects, while MS4 partners need to show pollutant reduction and mitigation of hydromodification.

Development community perspective and partnering

The development community in the SAR Watershed has demonstrated a willingness to adapt projects to meet watershed needs and to lead innovative projects (See examples in the **Chapter 5.8 Stormwater: Resource and Risk Management,** "Stormwater as an Essential Resource for the SAR Watershed" and "Regional and Watershed Examples" described earlier in this chapter) Building Industry Association and the Construction Industry Coalition on Water Quality have partnered in research and implementation projects to advance understanding of costs and benefits of LID and sustainable community designs. Developers will design and build the projects that serve watershed priorities as a result of ongoing collaboration.

Legislated Water Supply or Conservation Goals

Water Supply Legislation

In 1983, the State legislature enacted the Urban Water Management Planning Act which requires urban water suppliers that provide water to 3,000 or more customers, or that provides over 3,000 acre-feet of

[25] SCWC, 2012. Stormwater Capture: Opportunities to Increase Water Supplies in Southern California.

water annually, to prepare an Urban Water Management Plan (UWMP) and update it every 5 years. The UWMP describes the supplier's efforts to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its customers during normal, single dry, and multiple dry years. UWMPs and General Plans are linked and interdependent as the assumptions for land use, population growth, etc., must be consistent. UWMPs are a critical source document for cities and counties as they update General Plans. Similarly, General Plans are a source document as water suppliers update their UWMPs. Continuing land use changes and population growth have resulted in additional water demand on water systems. In 2002, the State legislature enacted Senate Bills 610 and 221 as companion measures, to further promote more collaborative planning between local water suppliers and land use authorities and to ensure the increased demands are adequately addressed, and a firm source of water supply is available prior to approval of certain developments. *Water Supply Assessments* pursuant to SB 610 and *Written Verifications of Water Supply* pursuant to SB 221 are prepared by the water supplier for applicable projects and typically rely on UWMPs as a foundational document.

SB 610 (Water Supply Assessment) requires an urban water supplier to include a description of all water supply projects and programs that may be undertaken to meet total projected water use over the next 20 years. SB 221 (Written Verification of Water Supply) prohibits approval of a tentative map, or a parcel map for which a tentative map was not required, or a development agreement for a subdivision of property of more than 500 dwelling units, including the design of the subdivision or the type of improvement, unless the legislative body of a city or county provides written verification from the applicable water supplier that sufficient water supplies are, or will be available prior to completion of the project.

In 2009, the State legislature enacted Senate Bill 7x-7 (20x2020 Plan) to set forth a statewide road map to maximize urban water use efficiency and conservation and establish a requirement to reduce per capita water consumption by 20% by 2020. To ensure progress in meeting the goal, water suppliers were mandated to develop water use targets and document such compliance in their UWMPs.

Water supply, needed for population growth, is a significant limiting factor for development projects. UWMPs and Water Supply Assessments link water resource constraints with local project planning, design and approval process. Water supply is a critical sustainability factor and should be recognized as a high priority feasibility factor in project concept development. Projects that enhance water supply, such as LID capture and use BMPs and infiltration BMPs on various scales (that recharge supply aquifers) should merit stronger acceptance with the regulatory programs.

Sustainable Communities Legislation[26]

The purpose of SB 375 (Sustainable Communities and Climate Protection Act of 2008) is to implement the state's greenhouse gas emissions (GHG) reduction goals in the sector of cars and light trucks. This mandate requires the California Air Resources Board to determine per-capita GHG emission reduction

[26] SCAG 2012. Regional Transportation Plan 2012-2035: Sustainable Communities Strategy. http://www.scagrtp.net/

targets for each Metropolitan Planning Organization (MPO) in the state for years 2020 and 2035. SCAG and California's 17 other MPOs must address GHG reduction in a "Sustainable Communities Strategy" that is part of the respective MPO's Regional Transportation Plan. In accordance with Govt. Code section 65080(b)(2)(B)(vii), the 2012 Regional Transportation Plan (RTP) and incorporated SCS are expected to achieve GHG emission reductions of 8 percent per capita in 2020 and 16 percent per capita in 2035.

Transportation strategies contained in the RTP—managing transportation demand and making key transportation system improvements – are major components of the SCS. However, the SCS also focuses on the general land use growth pattern for the region, because geographical relationships between land uses—including density and intensity—help determine the need for travel in the first place. Therefore, SCAG's SCS includes not only projections about the transportation network but also about land use. Under SB 375, a SCS must, in summary:

- Identify existing and future land use patterns
- Consider statutory housing goals and objectives
- Identify areas to accommodate long-term housing need
- Identify areas to accommodate 8-year housing need
- Consider resource areas and farmland
- Identify transportation needs and the planned transportation network
- Set forth a future land use pattern to meet GHG emission reduction targets
- Comply with federal law for developing an RTP

The SCS does not create a mandate for land use policies at the local level. In fact, SB 375 specifically states that the SCS cannot dictate local General Plan policies (see, Government Code Section 65080(b)(2) (J)). However, the SCS is intended to provide a regional policy foundation for local governments to build upon and includes quantitative growth projections from each city and county in the region. In addition, some projects consistent with the SCS are eligible for streamlined environmental review.

One aspect of SB 375 unique to the SCAG region is that subregions within SCAG have the option of creating their own subregional SCS. Of SCAG's 15 subregions, two accepted this option: the Gateway Cities Council of Governments (Gateway COG) and the Orange County Council of Governments (OCCOG). These subregional SCS documents are incorporated into the regional SCS.

Optimize Watershed Supply and Quality

The Ahwahnee Water Principles for Resource Efficient Land Use describe values that a community should consider to maximize the sustainability of a watershed or region. These are grouped into nine basic principles that link community development with sustainable approaches for land use, water supply, water quality protection, flooding, and natural resource conservation.

The plan describes opportunities and constraints in the SAR Watershed that must be managed to ensure increased sustainability while accommodating population growth. The goal is to achieve optimal resource use and to adapt to changing conditions over time.

Constraints that limit Land Use & Water Planning Collaboration

Collaboration pros and cons:

Pros:

- Collaboration can pool or leverage resources of multiple agencies
- Provides a more multi-disciplinary, multi-agency perspective, and increased experience and expertise
- Avoids unnecessary duplication of efforts
- Helps ensure all related priorities and projects are considered
- Collaborative projects can be more competitive for grant funding

Cons:

- Differing multi-jurisdictional priorities may be difficult to address adequately
- Collaborative projects may be slower to develop and implement
- Multi-jurisdictional permitting requires more effort

Process and regulatory constraints

- Existing plans and codes may preclude LID designs (e.g. curb requirements)
- Right-of-way, safety and design requirements may limit adaptability of road retrofit or improvement projects
- Regional BMPs are generally favored by stakeholders, including regulators. However, regulations and permits contain potentially conflicting limitations such as the transport of waste in waters of the US and habitat protection requirements that limit BMP maintenance opportunities
- MS4 Permit WQMPs require BMP selection and implementation based on a strict hierarchy that limits the possible configurations that can be approved

Relevant constraints identified by other Pillars

- Watershed locations with non-infiltrating soils and geology
- Areas with groundwater contaminant plumes
- Concern regarding infiltration of stormwater from industrial land uses, or from BMPs that are poorly designed, installed, and/or maintained
- Project site may not be the most effective location to recharge a water-supply aquifer
- Watershed priorities are not part of the WQMP site feasibility analysis

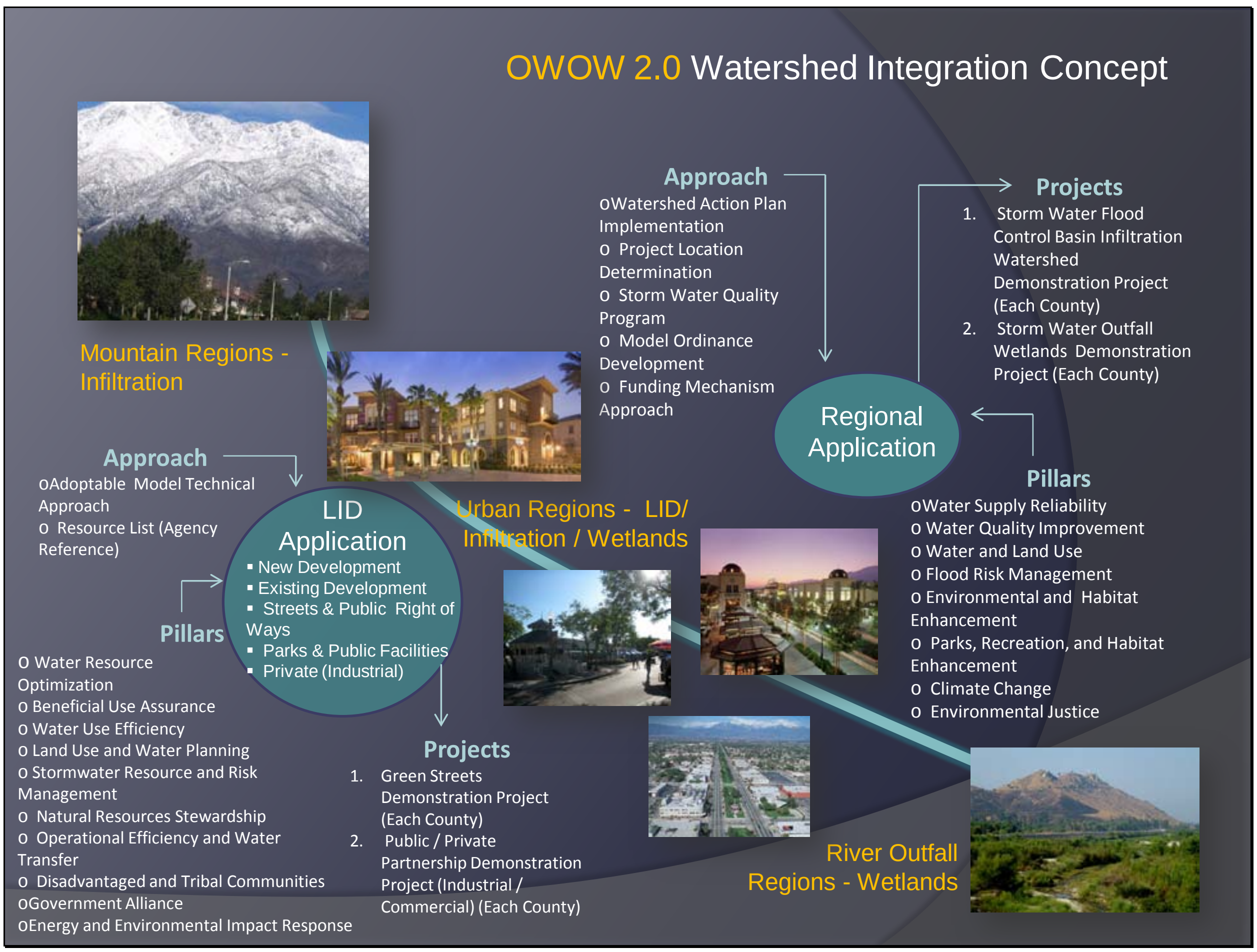
Funding options to support collaboration

- OWOW supports collaborative projects
- An URF or Water Quality Credit System could become a funding source based on cooperation
- Seek state/federal funding to develop regional funding mechanisms for collaborative projects
- Partner with SCAG or Councils of Government for incentive funding for demonstration projects
- USDA Grants to partner with agricultural stakeholders

Strategies for Improved Interaction Between Water Managers and Land Use Planners

The OWOW Plan and process has significantly expanded the breadth and level of stakeholder involvement in understanding watershed problems and in developing strategies to address these problems and improve the watershed over previous IRWMP efforts. However, to effectively integrate watershed sustainability into the land use planning and development concept, design, and approval process, additional stakeholders and higher management and executive level staff within stakeholder organizations must become fully participating members of the OWOW effort. Watershed sustainability priorities must be integrated into decisions driven by the priorities of economic development. An alternative is to have OWOW integrated into economic development processes. A diagram of the OWOW land use and water planning process is shown in **Figure 5.7-14** below.

Figure 5.7-14 OWOW 2.0 Watershed Integration Concept



OWOW Outreach Committee

The OWOW Pillars held several Pillar Integration meetings during the development of the Plan. These meetings provided a unique forum to develop and evaluate potential watershed priorities and projects to address watershed sustainability. We recommend a continued series of periodic meetings to further the ideas and continue to develop new ideas. Outreach efforts should also be periodically held to update other stakeholder forums, such as Regional Board meetings, Boards of Supervisors, and other watershed groups.

OWOW /FCD Partnership Development or Enhancement

Stakeholders in the Chino Basin have successfully completed several multi-stakeholder projects that address stormwater, water supply and habitat. One of the most significant is the Chino Basin Facility Improvement Project. This project is a partnership between the Chino Basin Watermaster, the Inland Empire Utilities Agency, The San Bernardino County Flood Control District and the Chino Basin Water Conservation District. This project has retrofitted approximately two-dozen offline flood control basins with remotely operable control valves to allow capture and recharge of stormwater and dry weather flows. The project is supported by a four-party Agreement and received funding support from Proposition 13 Water Bond through SAWPA. Although this project has increased the capture and recharge of stormwater in the basin, it has not been coordinated with the MS4 Program and does not provide any MS4 compliance benefits.

Revisions to the Land Planning Process to Address Constraints

Basic land planning tools can be revised or amended to incorporate watershed sustainability priorities. General Plans can incorporate a specific water element, or can include watershed requirements in the conservation element. Specific Plans can also be used to implement watershed and/or sustainability considerations. Different local governments will have specific preferences and concerns regarding general plan revisions.

Model sustainability ordinances (LID implementation, alluvial fans, water conservation, or sustainable communities) can be used to implement watershed priorities. Model ordinances have been developed for such purposes, such as the Model Ordinance Governing Planning and Development on Alluvial Fans[27], and the LID, Green Streets, and Drought-Tolerant Landscaping Ordinance adopted by the County of Los Angeles.

Early Consideration of Project Concepts and Designs

Planning processes should encourage the earliest possible consideration or watershed priorities. Project concepts should serve watershed needs and be designed and implemented to optimize watershed sustainability. Once a project has been conceived, it is subject only to process-based modifications. Fundamental choices regarding allowable projects should be informed by the plan.

[27] Alluvial Fan Task Force: Findings and Recommendations Report, July 2010. Appendix D: Model Ordinance Governing Planning and Development on Alluvial Fans.
http://aftf.csusb.edu/documents/FINDINGS_Final_Oct2010_10-29-10_web.pdf

General Plan, Specific Plan, and Ordinance Changes

General Plans and Specific Plans could be revised to require projects to demonstrate early consideration of Plan priorities and recommendations. Ordinances can specify the process to implement early project planning practices.

Training Needs—Various Target Audiences

Implementation of the cooperative and multi-benefit project concepts will be supported by education. Training and outreach have been a part of the OWOW process, and should be enhanced for OWOW 2.0. It is especially important to provide education for the high-level decision makers, including elected officials, the RWQCB, and other local and regional stakeholders. Outreach can build trust and acceptance of new approaches.

Consider How Water Agency "Will Serve" Letters May Be Used to Support Land Use Planning

Current requirements for water supply assessments limit their applicability to relatively large-scale projects. Requiring water supply assurances for all projects could help ensure implementation of water conservation measures (landscaping, water recycling, stormwater capture and use) for a wider range of projects. A watershed scale supply assessment could provide an incentive for water agencies to collaborate—and develop guidelines for water supply requirements.

Incorporate Recommendations of Alluvial Fan Task Force in Land Use Planning[28]

Alluvial fans are gently sloping fan-shaped landforms commonly seen at the base of semi-arid mountain ranges in the SAR Watershed and serve as natural buffers between fire-prone mountain ranges and flooding. Paths of flooding and debris flows on alluvial fans may be uncertain, making development challenging.

The Integrated Approach (IA) for development on alluvial fans consists of a suite of local planning tools for preproject screening designed to assist local communities that need to plan for and evaluate future development proposals on alluvial fans **(Figure 5.7-15**)[29].

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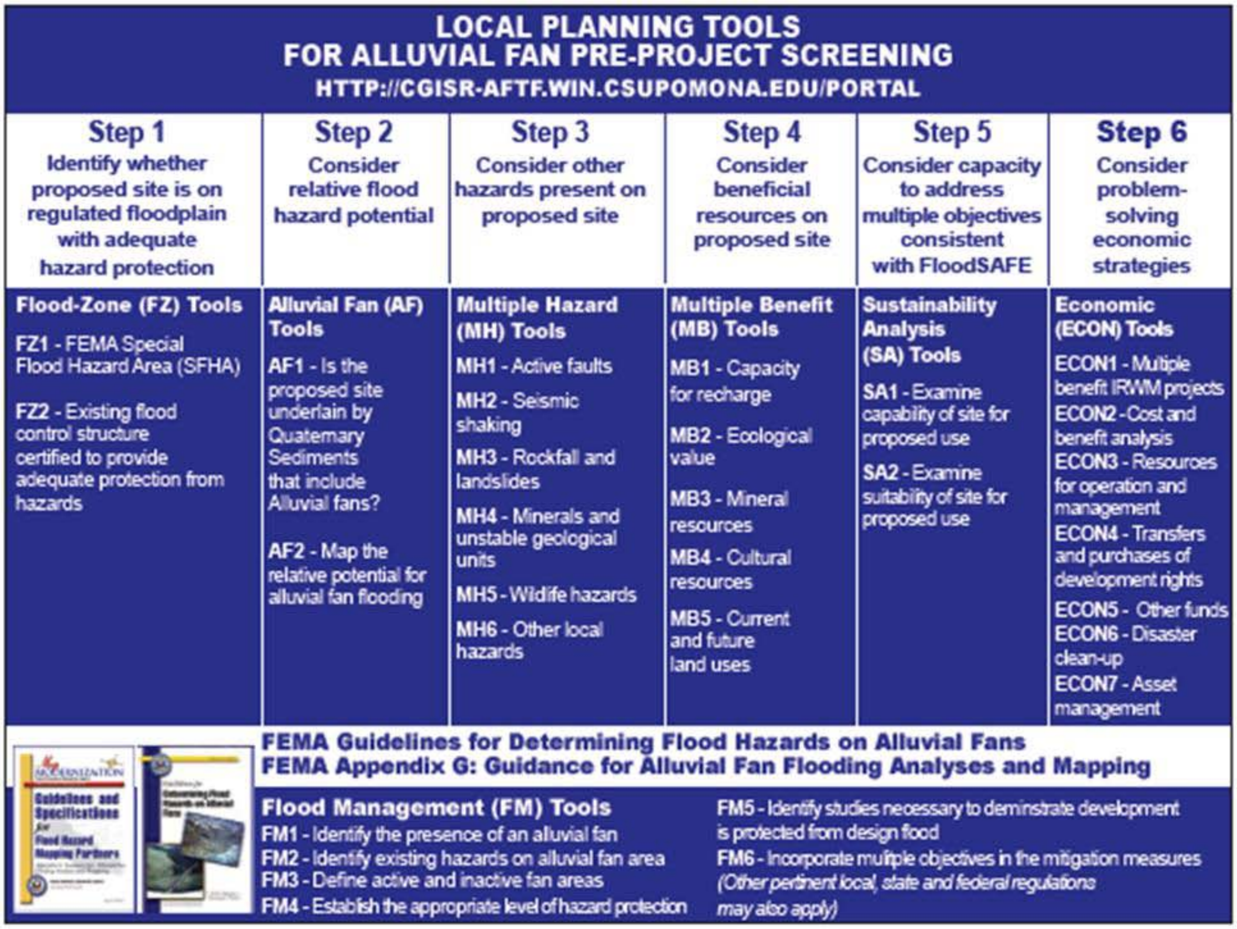
[28] Alluvial Fan Task Force Fact Sheet 2010.
http://aftf.csusb.edu/documents/AFTF_FACTS_Final_Oct2010_web[1].pdf

[29] AFTF, 2010. Integrated Approach for Sustainable Development On Alluvial Fans.
http://aftf.csusb.edu/documents/IA_Final_Oct2010_web.pdf

Figure 5.7-15 Local Planning Tools and FEMA



LOCAL PLANNING TOOLS
FOR ALLUVIAL FAN PRE-PROJECT SCREENING
HTTP://CGISR-AFTF.WIN.CSUPOMONA.EDU/PORTAL

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Identify whether proposed site is on regulated floodplain with adequate hazard protection	Consider relative flood hazard potential	Consider other hazards present on proposed site	Consider beneficial resources on proposed site	Consider capacity to address multiple objectives consistent with FloodSAFE	Consider problem-solving economic strategies
Flood-Zone (FZ) Tools	**Alluvial Fan (AF) Tools**	**Multiple Hazard (MH) Tools**	**Multiple Benefit (MB) Tools**	**Sustainability Analysis (SA) Tools**	**Economic (ECON) Tools**
FZ1 - FEMA Special Flood Hazard Area (SFHA) FZ2 - Existing flood control structure certified to provide adequate protection from hazards	AF1 - Is the proposed site underlain by Quaternary Sediments that include Alluvial fans? AF2 - Map the relative potential for alluvial fan flooding	MH1 - Active faults MH2 - Seismic shaking MH3 - Rockfall and landslides MH4 - Minerals and unstable geological units MH5 - Widlife hazards MH6 - Other local hazards	MB1 - Capacity for recharge MB2 - Ecological value MB3 - Mineral resources MB4 - Cultural resources MB5 - Current and future land uses	SA1 - Examine capability of site for proposed use SA2 - Examine suitability of site for proposed use	ECON1 - Multiple benefit IRWM projects ECON2 - Cost and benefit analysis ECON3 - Resources for operation and management ECON4 - Transfers and purchases of development rights ECON5 - Other funds ECON6 - Disaster clean-up ECON7 - Asset management

FEMA Guidelines for Determining Flood Hazards on Alluvial Fans
FEMA Appendix G: Guidance for Alluvial Fan Flooding Analyses and Mapping

Flood Management (FM) Tools
FM1 - Identify the presence of an alluvial fan
FM2 - Identify existing hazards on alluvial fan area
FM3 - Define active and inactive fan areas
FM4 - Establish the appropriate level of hazard protection
FM5 - Identify studies necessary to deminstrate development is protected from design flood
FM6 - Incorporate multiple objectives in the mitigation measures
(Other pertinent local, state and federal regulations may also apply)

The tools provide a method for planners to evaluate hazards, resources, and site-specific issues in alluvial fan areas that are proposed for development. This evaluation helps determine, in the pre-project phase, whether new development can be designed to promote flood management sustainability, by avoiding the most hazardous areas and conserving the most valuable resources. Flood management tools are included that are consistent with FEMA guidelines to analyze alluvial fan flood hazards and to formulate flood hazard protection.

As directed by Assembly Bill 2141, the findings and recommendations of the Task Force will be submitted to DWR and the State legislature for possible future action.

Implementation Recommendations to Support Water and Land Use Planning Collaboration

Watershed Integration: Watershed Identity Development and Implementation Project

This comprehensive project includes an assemblage of component projects designed to overcome existing limitations on watershed-based planning and project development to accelerate progress toward a sustainable watershed. SAWPA OWOW would lead and steer this project assemblage, including:

Local land use authority process enhancement

This element will provide education, guidance, and ready-to-use tools for local jurisdictions to align all aspects of their land planning and approval processes to reinvent communities over time, based on watershed sustainability priorities. This effort can benefit from coordination with the ongoing San Bernardino County Vision Water Element, and should incorporate innovative methods and findings. The approach should start with efforts to engage the Councils of Government in the watershed, and work to influence and integrate the elected officials, Boards, and other high-level decision makers. This project would provide workshops, training materials, case examples, and focused outreach and training. Products of this project would include:

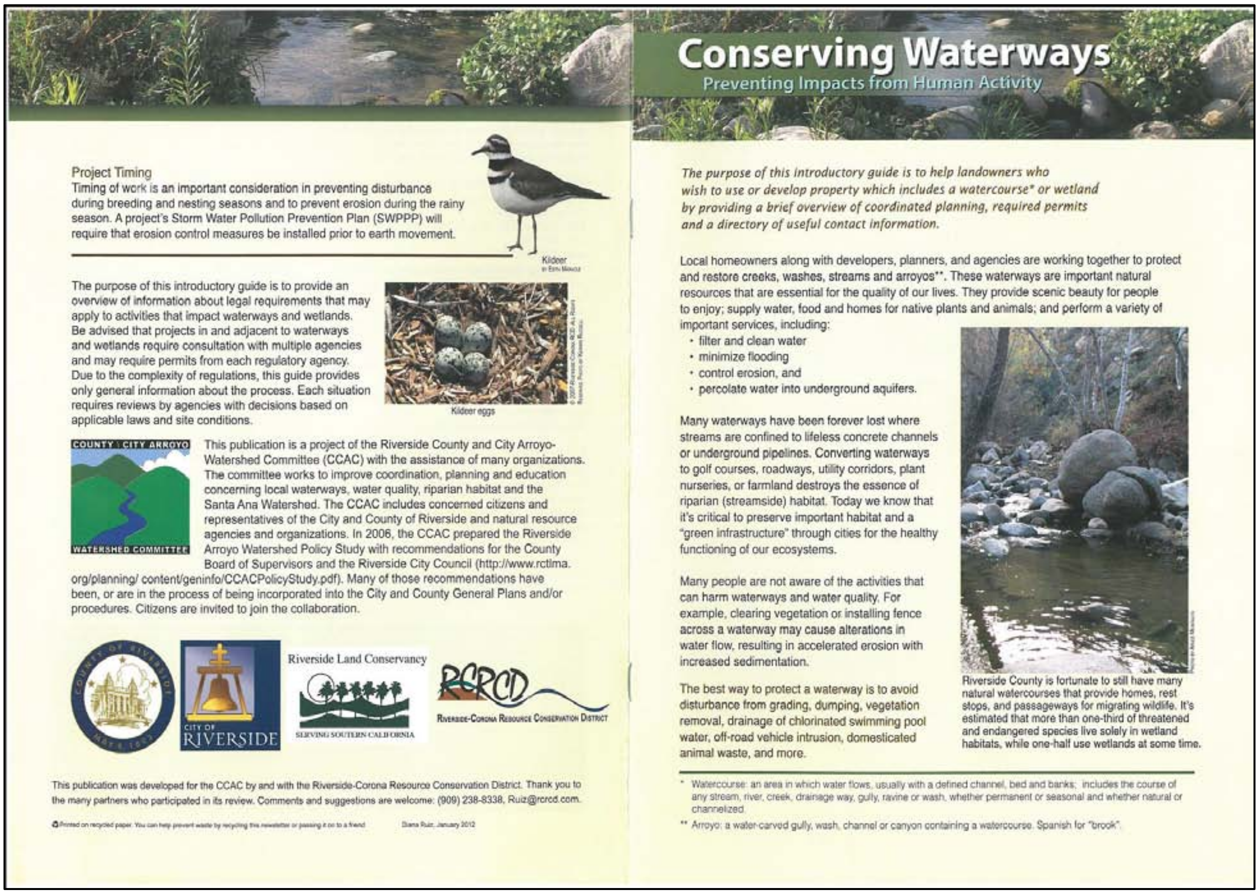
- Watershed-wide land use planning guidelines manual(s)
- Model ordinance governing planning for watershed sustainability
- Model general plan water element for the SAR Watershed
- Watershed coordination forums and training workshops
- Planning Commission education and outreach

Three pilot programs can implement these enhancements:

<u>The Riverside City/County Arroyo-Watershed Program</u>

This program provides the initial concepts and tools, and has experience working through local jurisdictions and building cooperation. The Riverside City-County Arroyo/Watershed Policy study and subsequent coordination efforts developed a methodology to achieve local government implementation of General Plan, ordinance, and policy amendments that address watershed protection priorities. This methodology can be implemented throughout the SAR Watershed to align local government plans and procedures with OWOW Plan priorities. The original project focused on preserving stream and arroyo areas and habitat, and needs to more fully incorporate water supply and overall sustainability principles. These can be readily incorporated into the method.

Figure 5.7-16 Riverside City/County Arroyo-Watershed Program



Conserving Waterways

Preventing Impacts from Human Activity

Project Timing

Timing of work is an important consideration in preventing disturbance during breeding and nesting seasons and to prevent erosion during the rainy season. A project's Storm Water Pollution Prevention Plan (SWPPP) will require that erosion control measures be installed prior to earth movement.

Kildeer

The purpose of this introductory guide is to provide an overview of information about legal requirements that may apply to activities that impact waterways and wetlands. Be advised that projects in and adjacent to waterways and wetlands require consultation with multiple agencies and may require permits from each regulatory agency. Due to the complexity of regulations, this guide provides only general information about the process. Each situation requires reviews by agencies with decisions based on applicable laws and site conditions.

Kildeer eggs

COUNTY | CITY ARROYO WATERSHED COMMITTEE

This publication is a project of the Riverside County and City Arroyo-Watershed Committee (CCAC) with the assistance of many organizations. The committee works to improve coordination, planning and education concerning local waterways, water quality, riparian habitat and the Santa Ana Watershed. The CCAC includes concerned citizens and representatives of the City and County of Riverside and natural resource agencies and organizations. In 2006, the CCAC prepared the Riverside Arroyo Watershed Policy Study with recommendations for the County Board of Supervisors and the Riverside City Council (http://www.rctlma.org/planning/ content/geninfo/CCACPolicyStudy.pdf). Many of those recommendations have been, or are in the process of being incorporated into the City and County General Plans and/or procedures. Citizens are invited to join the collaboration.

City of Riverside | Riverside Land Conservancy, Serving Southern California | RCRCD, Riverside-Corona Resource Conservation District

This publication was developed for the CCAC by and with the Riverside-Corona Resource Conservation District. Thank you to the many partners who participated in its review. Comments and suggestions are welcome: (909) 238-8338, Ruiz@rcrcd.com.

Printed on recycled paper. You can help prevent waste by recycling this newsletter or passing it on to a friend. Diana Ruiz, January 2012

The purpose of this introductory guide is to help landowners who wish to use or develop property which includes a watercourse or wetland by providing a brief overview of coordinated planning, required permits and a directory of useful contact information.*

Local homeowners along with developers, planners, and agencies are working together to protect and restore creeks, washes, streams and arroyos**. These waterways are important natural resources that are essential for the quality of our lives. They provide scenic beauty for people to enjoy; supply water, food and homes for native plants and animals; and perform a variety of important services, including:

- filter and clean water
- minimize flooding
- control erosion, and
- percolate water into underground aquifers.

Many waterways have been forever lost where streams are confined to lifeless concrete channels or underground pipelines. Converting waterways to golf courses, roadways, utility corridors, plant nurseries, or farmland destroys the essence of riparian (streamside) habitat. Today we know that it's critical to preserve important habitat and a "green infrastructure" through cities for the healthy functioning of our ecosystems.

Many people are not aware of the activities that can harm waterways and water quality. For example, clearing vegetation or installing fence across a waterway may cause alterations in water flow, resulting in accelerated erosion with increased sedimentation.

The best way to protect a waterway is to avoid disturbance from grading, dumping, vegetation removal, drainage of chlorinated swimming pool water, off-road vehicle intrusion, domesticated animal waste, and more.

Riverside County is fortunate to still have many natural watercourses that provide homes, rest stops, and passageways for migrating wildlife. It's estimated that more than one-third of threatened and endangered species live solely in wetland habitats, while one-half use wetlands at some time.

* Watercourse: an area in which water flows, usually with a defined channel, bed and banks; includes the course of any stream, river, creek, drainage way, gully, ravine or wash, whether permanent or seasonal and whether natural or channelized.

** Arroyo: a water-carved gully, wash, channel or canyon containing a watercourse. Spanish for "brook".

The Newport Bay Conservancy Concept Book

The Newport Bay Conservancy Concept Book for the Newport Bay Watershed is intended to inform land use planning in the region and inform how it could be used to support water resource restoration goals. This project can pilot the local government enhancement approach within the Newport Bay Watershed and influence adjacent jurisdictions.

City of Ontario – New Model Colony

The City of Ontario has implemented innovative land use planning approaches and can provide a pilot project area for local government enhancement in urbanized San Bernardino County. The City's recent plans call for 13,000 new housing units across a broad range of housing types and a mix of business spaces oriented towards three mixed-use centers that are served by pedestrian-friendly roadways and a large central park. Emphasizing connections to corridors and transit, the City is creating a major regional center for Southern California.

Coordinate and integrate with other regional planning efforts to build-in key watershed sustainability priorities into plans that apply to the SAR Watershed.

This element would engage the regional transportation planning agencies (SCAG, SANBAG, WRCOG, RCTC, and OCCOG) and other planning agencies as partners in OWOW. This would coordinate closely with (1) above.

Regional transportation planning efforts have successfully reached local, regional, and state decision-makers, and enlisted significant stakeholder participation and support. The OWOW Plan should integrate, or be integrated into the transportation planning world. Transportation planning should incorporate the OWOW watershed sustainability priorities as co-equal with the other RTP elements. Although sustainability is a key consideration, mandated by legislation, water quality and water supply are inadequately weighted in the RTPs. Reinvent these elements into a comprehensive sustainability effort, including all stakeholders and decision-makers and a plan for the watershed. Partner with the SCWC, ASCE, Urban Land Institute, and other groups for technical support.

SCAG has funded transportation demonstration projects in the Region and at least 30 projects in the SAR Watershed. Conduct an evaluation of these projects and their linkages to water and sustainability.

Coordinate and host a symposium to describe the ecology, hydrology, and natural history of the SAR Watershed. This is needed to inform stakeholders regarding how the watershed is naturally integrated, and how urbanization has disrupted the integration and how to reintegrate to maximize functions and sustainability.

Watershed-wide geodatabase alignment and connection, access portal, and planning and evaluation tool development.

County-based geodatabases have been recently prepared by San Bernardino and Riverside County Watershed Action Plans, and Orange County hydromodification mapping and Watershed Master Plans. This includes evaluation of existing watershed planning tools and a search for other existing applicable tools.

- Develop GIS layer of "community improvement areas" based on local government economic development needs—street rebuilding, drainage improvements, utility rehabilitation in conjunction with streets
- Workshop with planners
    - Layer of transportation opportunity areas
    - overlay with WQ project sites
    - Economic development areas
    - Failed street areas
    - DAC layer
- Identify project types—example
- DAC Greenstreets
- FCD Recharge Basins

- Transportation Agency Data (Rail/Caltrans)
    - Locate joint project areas (Trans/Water)
    - Locate joint Ag/water project areas
- Integrate Land Use Decision Support Tools Developed Elsewhere
- Coordinate geodatabase development with the development of applicable tools that include areas outside the SAR Watershed to enhance functionality. Several relevant tools and mapping efforts are of particular interest.
    - EcoAtlas
    - The San Francisco Estuary Institute developed a statewide geodatabase designed to track riparian and wetland resources under the State Wetland and Riparian Monitoring Program. The EcoAtlas includes interactive base layers, including streams, wetlands, riparian areas, and special habitats, and provides maps and other spatial information. This tool was developed by the Wetland and Riparian Monitoring Workgroup and provides detailed statewide information on wetland and riparian restoration projects. This is an active online tool and is viewable at http://www.ecoatlas.org/. The project team continues to maintain and improve the EcoAtlas.
    - DWR Integrated Water and Land Smart Planning Tool
    - DWR, in partnership with Sonoma State University Center for Sustainable Communities, is developing a decision support tool that integrates land use with water supply, water quality, energy and water/energy use and impacts including GHGs, and project cost factors. The tool was "designed for local decision makers who are considering land use and project design decisions, based on economic development needs and consistency with general and specific plans."[30] This tool can be customized with local condition inputs and will soon be tested by local governments in California. The tool will quantify costs associated with different development and design scenarios, and is intended to:
        - "Create an open, locally-modifiable and user-friendly tool to help guide land use and land cover decisions
        - Quantify relationships between land use alternatives and key water supply benefits, including water supply reliability, flood management, water quality, habitat value, Climate Action Mitigation
        - Quantify the monetary costs of implementing LID and traditional development strategies, including long term costs
        - Compare and contrast different development styles exemplified in four case study sites."
- USBR online climate change model for the SAR Watershed.
- Water/Energy use and impact data and resources (see **Chapter 5.13 Energy and Environmental Impact Response**, "Water-Energy Projects" and the Energy Network)

[30] Draft Report, April 2013: Integrating Land and Water Management: A Suburban Case Study and User-Friendly, Locally Adaptable Tool. California Department of Water Resources and Sonoma State University. (http://www.waterplan.water.ca.gov/docs/meeting_materials/caucus/2013.05.09/DRAFT_DWR-Report_4_30_13.pdf)

Regulatory assessment and integration to support watershed sustainability project concepts and implementation.

Regulatory Boards and staff support the OWOW Plan. However, varying interpretations of regulations and permit requirements may impede the development of concepts and projects that provide overall cumulative and long-term watershed sustainability improvements. This project element would engage the regulators (RWQCB and SWRCB, DWR, CDFW, USACE, etc.) and proactive stakeholders (including NGOs) to develop approaches to implement projects and ensure compliance with relevant regulations and permits.

Demonstration project site identification, project design, coordinated planning, construction and maintenance.

These are multi-benefit, multi-jurisdictional projects that address watershed sustainability priorities. Projects should Identify project partners and costs/benefits, and develop incentives to encourage continued implementation. The project should consider developing model implementation tools such as a model MOU or Agreement for multi-agency projects or watershed-wide projects.

Two proposed project categories:

<u>Green street/parking lot projects</u>

Retrofits or new projects that create new functions of stormwater treatment and capture, groundwater recharge if feasible, flood risk reduction, enhanced aesthetics and/or walkable/recreation spaces, and incrementally improve water quality and maximize water use efficiency. Projects can integrate with other projects or include elements such as public parks.

This project would coordinate the three SAR Watershed county Public Works Departments, interested cities, water agencies, and other stakeholders to identify locations and designs for multi-use green street or parking lot related projects that address stormwater runoff and improve existing developed areas. The project would also develop funding strategies for maintenance and additional projects, will include water quality credit and regulatory compliance evaluation, and recommend provisions for permit compliance credit. Completed projects will serve as models to increase understanding and acceptance of similar projects in the watershed.

Specific considerations should include:

- Commercial and “clean” industrial areas for parking lot retrofit
- Street use safety and design constraints
- Existing design manuals (e.g. San Mateo Street Design Manual)
- Needs to link economic development, Planning, and Public Works departments of local government
    - o Locate and prioritize streets already in need of upgrade or replacement
        - Such as ”failed” streets in City of LA

- coordinate with utility infrastructure replacement—in street corridors
- sell as a community redevelopment project

Example Projects:

- Monte Vista Avenue Grade Separation (http://www.cityofmontclair.org/depts/pw/engineering/projects/upcoming_projects.asp

A railroad grade separation project in the City of Montclair on Monte Vista Avenue at the Union Pacific Railroad tracks is planned over the next few years. Rail traffic has been increasing on this stretch of busy rail line known as the Alameda Corridor East. The traffic is expected to increase significantly as trade traffic continues to grow at the ports of Los Angeles and Long Beach. Montclair has begun acquiring a right-of-way for the project. Funding for this project is coming from a variety of sources. The 30 million dollar project is expected to begin construction in 2014.

- City of Riverside "parklets" policy projects and small street retrofits by private entities
- Elmer Ave Neighborhood Retrofit – Council for Watershed Health

http://www.watershedhealth.org/programsandprojects/was.aspx?search=elmer

Figure 5.7 -17 Elmer Avenue Neighborhood Retrofit

Regional treatment for surface and stormwater runoff

Sites to be selected, optimally one per county, that can accept and treat/infiltrate stormwater, nuisance runoff, and other surface flows. Projects will be multi-benefit and multi-agency collaborations. These sites can be identified based on previous evaluations of opportunities within the county flood control systems and the geodatabases, combined with evaluation and recommendations from other watershed stakeholders, especially the water and regulatory agencies. Water supply, habitat conservation, creation or mitigation, and long-term maintenance must be addressed. These sites would develop mechanisms to account for water quality benefits and provide MS4 Permit compliance capacity. This project element would collaborate with the regulatory assessment effort (No. 4, above) to develop a model regional treatment/retention BMP implementation guidance document.

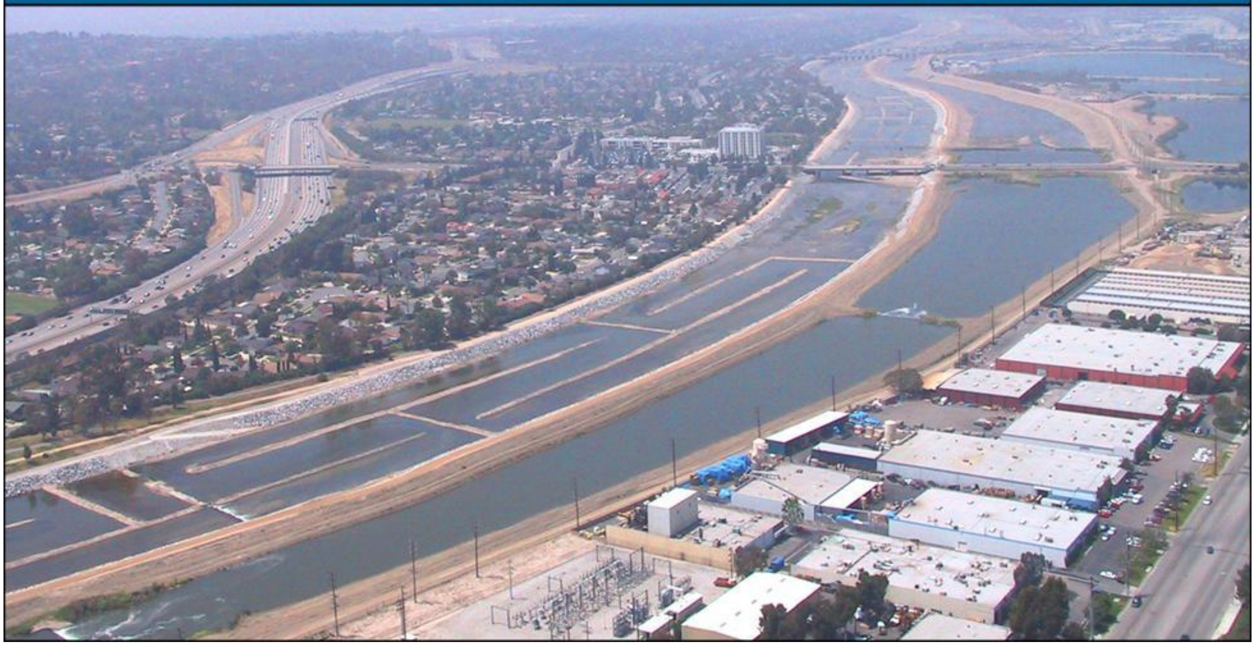
Potential project locations:

- The City and County of Riverside are partnering to develop increased groundwater recharge in the Kansas, Marlborough, and Columbia basins
- Geodatabases provide initial list of project sites, collaborate with Water Agencies to prioritize sites
- Evaluate existing multi-use projects to determine their effectiveness in achieving stated benefits (e.g. Big League Dreams—Cucamonga-Mill Creek Wetlands)

List of Contributors

Matt Yeager	Yeager Environmental Associates
Jerry Blum	City of Ontario
Susan Lien-Longville	CSUSB WRI
Jane Block	Endangered Habitats League
Elizabeth Hurst	IEUA
Andrew Kanzler	IEUA
Jerry Joliffe	Consultant
Lindsey Stuvik	UC Irvine
Cynthia Gabaldon	URS Corporation
Omar Dandashi	Lewis Corporation
Daniel Apt	RBF
Steve Bein	RBF
Bruce Davis	Albert A. Webb Associates
Dennis Mejia	City of Ontario
Daniel Kopulsky	Caltrans
Krista Sloniowski	Connective Issue
Rick Thomas	California Resource Connections
Mark Norton	SAWPA
Larry McKenney	SAWPA
Rick Whetsel	SAWPA

5.8 Stormwater: Resource and Risk Management



Chapter Findings and Recommendations Summary

The purpose of this Chapter is to 1) describe the mission, facilities, and operations of Flood Control Management agencies in the Santa Ana River Watershed; 2) identify past, current, and emerging key watershed priorities; 3) evaluate how key priorities have been, and potentially can be, addressed by Flood Control Districts/Divisions (FCDs) using a range of strategies; and 4) recommend the strategies and projects most likely to be effective to ensure watershed sustainability over a range of timescales. Finally, this OWOW 2.0 Plan (Plan) updates and revises the 2010 Plan.

Priority Issues

- Water supply is challenged by increased demand due to population growth in the watershed; reductions in imported water supplies; reduced groundwater recharge from expansion of urbanization and impervious surfaces placed over viable recharge areas; loss of riparian habitat; losses to the ocean due to concrete channelization and lost recharge in the channels themselves, seawater intrusion due to decreased groundwater recharge in coastal areas, and uncertain, but expected, long-term reductions in average annual precipitation due to climate change.
- High priority water quality problems include maintaining the salt balance in the watershed (see **Chapter 5.5 Beneficial Use Assurance**), reducing anthropogenic pollutants in surface water runoff to optimize beneficial uses, preventing pollutants from contaminating groundwater; and cleanup and management of existing contaminated groundwater sites (**Chapter 5.5 Beneficial Use Assurance**).

- Watershed management efforts of past decades were driven largely by individual entity priorities or programs. However, more comprehensive and integrated projects driven by a multi-stakeholder project paradigm can more effectively and more efficiently address watershed needs. Such projects can assist stakeholders to achieve compliance with the increasingly complex Municipal Stormwater NPDES Permits (MS4 Permits), while providing increased stormwater capture and groundwater recharge using favorable cost benefit approaches. Cooperative projects also unite various watershed jurisdictions and information, and more readily adapt to future conditions—and adaptability will be essential to effectively manage uncertain future conditions such as climate change.
- Reducing the risk of loss of life and property damage due to flooding remains a high priority within the Santa Ana River Watershed. The completion of the Santa Ana River Mainstem Project will reduce the risk of a catastrophic flood event in the Santa Ana River Watershed. However, there remains significant flood risk related to tributary watercourses within the watershed, compounded by potential impacts of wildfires and earthquakes.

Policy and Procedure Recommendations

1. Describe a process to link public and private project development processes among stakeholders that promotes consideration of watershed priorities and stakeholder priorities very early in the planning process;
2. Preserve floodplain functions through stricter management of development in floodplains—limit project construction in areas subject to flooding, preserve and restore riparian habitat functions, and enhance groundwater recharge;
3. Where appropriate, FCDs, and all watershed stakeholders, should develop procedures and guidelines to ensure consideration of IRWM goals and watershed protection principles and priorities, consistent with the MS4 Permits, when planning and designing CIP or other projects, and during development or revisions of Master Drainage Plans (MDPs) and planning of projects that implement the MDPs;
4. Create a lead watershed-wide Plan coordinating advisory and facilitation group that brings stakeholders together for decision making, partnership formation, and resource allocation to achieve Plan goals;
5. Create a source of funds targeted at multi-agency Plan projects.

Implementation Recommendations

1. Develop a water conservation-recharge optimization plan for existing and potential future flood control facilities, using the example work of the Chino Basin Recharge Master Plan and implementation projects as a template.
2. Connect existing county or program-specific geodatabases to create a comprehensive watershed geodatabase that provides access to appropriate stakeholders, and set up a data quality control and maintenance program. The main component County MS4 geodatabases are well under way as described under “Map-Based Watershed Plans” in Section 6.

3. Develop adaptable mechanisms to implement regional BMPs and alternative compliance options (see **Table 5.8-1**) under the MS4 Permits where appropriate (see example concept project in **Appendix F2**).
4. Describe role of a lead watershed-wide Plan coordinating advisory group with facilitation to ensure coordination of project partners.
5. Preserving and restoring riparian habitat areas in conjunction with the comprehensive and integrated project recommendations within the 2.0 Plan.

Table 5.8-1 Alternative Stormwater Compliance Elements for Development Projects in the Santa Ana Region MS4 Permits

<table>
<tr><th colspan="2">Alternative Compliance Options
(MS4 Permits: San Bernardino Co.--Section XI.G; Riverside Co.—Section XII.G; Orange Co.—Section XII.E)</th></tr>
<tr><td>1</td><td>If a preferred BMP is not technically feasible, other BMPs should be implemented to mitigate the project impacts, or if the cost of BMP implementation greatly outweighs the pollution control benefits, the Permittees may grant a waiver of the BMPs. All waivers, along with waiver justification documentation, must be submitted to the Executive Officer at least 30 days prior to Permittee approval of the WQMP. Only those projects that have completed a feasibility analysis as specified in the WQMP Guidance and Template (see Section XI.E.7) and approved by the Executive Officer shall be considered for alternatives and in-lieu programs. If a waiver is granted, the Permittees shall ensure that project proponents participate in one of the in-lieu programs discussed in this section.</td></tr>
<tr><td>2</td><td>The permittees may collectively or individually propose to establish an urban runoff fund to be used for urban water quality improvement projects within the same watershed that is funded by contributions from developers granted waivers.

The contributions should be at least equivalent to the cost savings for waived projects and the urban runoff fund shall be expended for water quality improvement or other related projects approved by the Executive Officer within two years of receipt of the funds. If a waiver is granted and an urban runoff fund is established, the annual report for the year should include the following information with respect to the urban runoff fund:
• Total amount deposited into the funds and the party responsible for managing the urban runoff fund;
• Projects funded or proposed to be funded with monies from the urban runoff fund;
• Party or parties responsible for design, construction, operation and maintenance of urban runoff funded projects; and
• Current status and a schedule for project completion.</td></tr>
</table>

<table>
<tr><td>3</td><td>The obligation to install structural treatment control BMPs at a new development is met if, for a common plan of development, BMPs are constructed with the requisite capacity to serve the entire common project, even if certain phases of the common project may not have BMP capacity located on that phase in accordance with the requirements specified above.

This goal may be achieved through watershed-based structural treatment controls, in combination with site-specific BMPs. All treatment control BMPs should be located as close as possible to the pollutant sources, should not be located within waters of the US, and pollutant removal should be accomplished prior to discharge to waters of the US. Regional treatment control BMPs shall be operational prior to occupation of any of the priority project sites tributary to the regional treatment BMP.</td></tr>
<tr><td>4</td><td>The permittees may establish a water quality credit system for alternatives to infiltration, harvesting and reuse, evapotranspiration, and other LID BMPs and hydromodification requirements specified above.

Any credit system that the permittees establish should be submitted to the Executive Officer for review and approval. The following types of projects may be considered for the credit system:
Redevelopment projects that reduce the overall impervious footprint
Brownfield redevelopment
High density developments (>7 units per acre)
Mixed use and transit-oriented development (within ½ mile of transit)
Dedication of undeveloped portions of the project to parks, preservation areas and other pervious uses
Regional treatment systems with a capacity to treat flows from all upstream developments
Contribution to an urban runoff fund (see 2, above)
Offsite mitigation or dedications within the same watershed
City Center area
Historic Districts and Historic Preservation areas
Live-work developments
In-fill projects
Riverside County Only
Projects that enhance the transport of coarse sediment to the coast for beach replenishment.</td></tr>
<tr><td>5*</td><td>The water quality credit system should not result in a net impact on water quality.</td></tr>
<tr><td>6*</td><td>A summary of waivers of LID (along with a short description of the Section XII.G.2 through XII.G4 In-Lieu program selected), Hydromodification and Treatment Control BMPs along with any water quality credit granted, in-lieu projects, or urban runoff fund contribution required by each Co-Permittee shall be included in the Annual Report.</td></tr>
<tr><td colspan="2">*Not specified in the Orange County MS4 Permit.</td></tr>
</table>

Evolution of OWOW Plan Flood Risk Management Pillar from 1.0 to 2.0

The Plan has evolved in the past few years as water supply and water quality problems, and flood, fire, and earthquake risks have been further evaluated and better understood. The linkage to FCD agency activities, as described in the Plan, version 1.0 and 2.0, are summarized below.

OWOW 1.0

1. Evaluate how to achieve the goal to "manage rainfall as a resource," thereby maximizing beneficial use of rainwater and providing adequate flood control capacity and other community benefits; and,
2. Develop potential improved metrics for the expression of risk that are more understandable and more universal, to facilitate the establishment of better flood protection standards.
3. The 1.0 Plan objectives are reflected in its "vision of flood risk management in 2030":
4. Each person in the watershed feels secure that there is a less than one in one hundred chance in any given year that their home will be flooded.
5. There is no loss of life and no uninsured property damage in the watershed due to flooding.
6. Stormwater is managed with the understanding that it is both a potential risk and a valuable resource.
7. The 1.0 Plan, Chapter 5.6, describes the watershed's physical geography, basic hydrology, land uses, and the history of the region's floods and flood response. Regional flood response culminated in the ongoing Santa Ana River Project, and management strategies focused on hardening and straightening stream channels to maximize drainage efficiency, and buffering peak flows by providing large flood storage facilities.

Chapter Findings

1. Very early land use decisions have preceded implementation of flood management strategies, severely limiting feasible flood control alternatives. Significant urban encroachment has occurred in most regional floodplain areas, where regional storage and hardened, straightened, and levied channels may be the only feasible and effective flood protection approaches.
2. If flood management strategies were developed during the original (earliest) planning for development of the region, and implemented in a proactive, rather than reactive, manner, flood risk management could be balanced with other watershed priorities, and overall benefits could be optimized.
3. To address the current regional priorities, given the existing systems, the Flood Risk Management Pillar and the Water and Land Use Pillar will need to collaborate to develop more effective new approaches going forward.

Challenges for the Future

1. Watershed Coordination: To improve upon the results of traditional approaches to flood risk management, more collaborative and comprehensive planning and implementation needs to be coordinated at the watershed scale.
2. Water Conservation: Develop additional ways to modify our infrastructure, or build new infrastructure components with more effective designs, to maximize the capture of local water while maintaining the required level of flood protection. Water conservation is part of the missions of the watershed FCDs (see Section 5.b, below). Probably the greatest opportunities for increased

capture and recharge of stormwater are in the Inland Empire (generally San Bernardino and Riverside Counties and the incorporated cities in the SAR Watershed), where geology and open space allow enhanced recharge to reduce downstream flood magnitudes.

3. Stormwater Quality Management and Flood Risk Management: MS4 Permits adopted in 2009 and 2010 for the watershed include explicit requirements to limit changes in runoff volume and velocity of runoff from new development and significant redevelopment projects using "low impact development" (LID) design concepts. These include minimizing impervious surface area, including pervious areas to interrupt flows across impervious areas, and maximizing stormwater infiltration. However, LID concepts and other methods used to avoid changes to the hydrograph will not address flood management issues. The LID requirements apply predominantly to new development projects so will not provide short-term solutions for existing developed areas, and a large proportion of the suitable watershed areas are already mostly built-out.
4. Ecological Impacts: Construction of flood control conveyance facilities and dams for flood detention have a direct effect on riparian and wetland habitats. New projects of this type have become increasingly unacceptable to the public and environmental groups, and when approved, incur major costs for environmental mitigation. This Plan should develop a regional consensus on how to balance habitat protection and restoration priorities with flood protection and regulatory requirements.
5. Money and Advocacy: Flood control projects and water supply projects are expensive. Public investment for such projects has typically been spread over a large population, and required as a condition of project approvals, leading to the expectation that infrastructure improvements depended on growth to be affordable. The Watershed needs to find alternatives to relying on future development to fund infrastructure.

Flood control infrastructure project construction often depends on State and Federal subsidies. This approach necessitates a sustained commitment to advocacy in Sacramento and Washington, DC, that is expensive and has not always been well coordinated. A comprehensive, watershed-wide plan for flood management, integrated with other water resources programs, would be the foundation for focused advocacy efforts of all stakeholders and the entire delegation of legislators in the Watershed.

1. Decision Making: Historical land development and land planning decisions have occurred before flood protection planning and implementation. Therefore, land development has pre-empted flood control and constrained the available flood management approaches, thus limiting the ability of FCDs to fully achieve their flood control missions and address the economic and environmental impacts of those actions.
2. Quantification of Risk (to prioritize): Flood risk needs to be clearly communicated to elected officials, and to compare that risk to other priority community needs, including water resources. It is important for the public to understand what 100-year flood protection means. Currently, the average citizen is concerned mainly whether flood insurance premiums are required, and whether the local FCD is doing its job.

Conclusions (OWOW 1.0)

1. Environmental Review requirements have increased the complexity of FCD infrastructure management.
2. FCD Management priorities should be integrated into the earliest stages of land use planning and decision/approval processes.

OWOW 2.0

1. Build on the work of OWOW 1.0 to identify implementation actions to address strategies for flood risk and stormwater management.
2. Define any new opportunities to address flood protection and integrate storm water management and water conservation with reduction of risk to property from flood events.
3. Explore feasibility of automated rainwater harvesting systems and networks that could provide water conservation and flood control, as well as water quality benefits.
4. Examine the framework and potential development of regional mitigation banks.
5. Evaluate "alternative compliance," options provided by MS4 Permits include regional BMPs, retention credits, in lieu BMP implementation, and an urban runoff fund.
6. Identify approaches and processes to partner with FCDs on projects.

These objectives and recommendations for the 2.0 Plan are discussed further in the following sections.

Relation to other OWOW Pillars

FCD Jurisdictions cross virtually all other jurisdictional areas in the watershed, and almost all surface water infrastructures are managed by the FCDs, some in partnership with the U.S. Army Corps of Engineers (USACE), the U.S. Bureau of Reclamation USBR, the California Department of Water Resources (DWR), water districts, cities, or other agencies. Projects requiring surface water conveyance or storage will typically require permits from the FCDs and other agencies. Therefore, FCDs are mandatory project stakeholders and partners in the vast majority of existing and potential projects to enhance stormwater capture and groundwater recharge. FCD legislative authorities included water conservation, but the highest mission priority is flood protection. Any cooperative project with a FCD as a partner must ensure that project design and operation does not compromise flood protection priorities.

In California, most MS4 Permits designate FCDs as Principal Permittees. In the Santa Ana River (SAR) Watershed, the Principal Permittees are the San Bernardino County Flood Control District (SBCFCD), the Riverside County Flood Control & Water Conservation District (RCFCWCD), and the County of Orange. SBCFCD, RCFCWCD, and OCFCD (OC/OCFCD)[1] are collectively referred to herein as the FCDs. Principal Permittees lead the development of required implementation documents and programs and coordinate

[1]The Orange County Flood Control District, administered by the Orange County OC Public Works (OC Public Works), is governed by the Orange County Board of Supervisors. OCFCD is a political entity that has no employees, but owns land, and assesses an annual benefit on all taxable real property in Orange County. Because OCFCD has no specific employees, the District and its property are administered, maintained, and operated by OC Public Works staff, who are in turn employed by the County of Orange. (http://ocflood.com/about/history)

implementation of the MS4 Permits among all of their co-permittees (cities and counties). Therefore, the Principal Permittees and FCDs are a primary source of information and guidance for the co-permittees and other stakeholders in the watershed. These MS4 Permit requirements include:

1. WQMPs—Water Quality Management Plans are enforceable guidance that specifies the requirements for stormwater quality and hydromodification mitigation project designs and BMPs.
2. Watershed Plans—Detailed plans to address watershed management within specific subwatersheds with the SAR Watershed and within specified jurisdictional or hydrologically defined areas. These include plans to address specific water quality problems (such as TMDLs), and/or hydromodification management, specific habitats, or other subwatershed-specific concerns.
3. Tools: MS4 programs are required to develop a variety of tools to address urban runoff impacts, including public outreach materials and programs, technical guidance for development project design and conditioning, mapping and GIS, hydrology manuals, water quality and biological monitoring programs, and various special studies to address specific concerns.

Therefore, the Principal Permittees and FCDs (and their co-permittees) are the direct link to compliance with the MS4 Permits. These permits require consideration of water quality, changes in runoff hydrology, integration of runoff water quality issues into land use planning and development project approval, preservation and improvement of habitat, and compliance with all related state and federal regulations (USACE 404 Dredge and Fill permits; CDFW stream alteration agreements; USFW species and habitat concerns; RWQCB Section 401 Water Quality Certifications, and others) as well as local ordinances and codes. The broad scope of the MS4 Permits and the watershed-wide jurisdiction of the Principal Permittees link the FCDs to all the other OWOW Pillars.

Background

Santa Ana Watershed Physical Characteristics[2]

The Santa Ana River watershed covers about 2,650 square miles. Maximum elevations in the Watershed exceed 11,000 feet, and more than one-third of the watershed area lies within three steep mountain ranges. Most of the rest occurs in lower-sloped valleys formed by a series of broad alluvial fans that extend from the base of the mountain front. The SBCFCD has jurisdiction over the largest and most upgradient areas in the watershed, RCFCWCD manages the intermediate and lower eastern section, and OC/OCFCD manages the lower, more coastal portion.

The watershed comprises three main sub-watersheds: 1) The Santa Ana River above Prado Dam (upper SAR Watershed) which drains of about 62% of the watershed, 2) the San Jacinto River which drains about 30% of the watershed into Lake Elsinore--flows from the San Jacinto River only reach Prado Dam when Lake Elsinore spills over into Temescal Wash (last spillover occurred in 1980), and 3) the S A R Watershed below Prado Dam which drains about 8% of the watershed and includes the Santa Ana Mountains, Chino Hills and the broad coastal plain.

[2] This section follows very closely with only some ammendation (and where elsewhere referenced) the hydrology section of the *Review Report on the Santa Ana River Main Stem---including Santiago Creek and Oak Street Drain for flood control and allied purposes*, US Army Corps of Engineers, Los Angeles District, December 1975

Physiographic differences between the three areas result in significant differences in the design and operation of FCD facilities. The upper SAR Watershed includes three significant tributaries, Mill Creek, Bear Creek, and Lytle Creek. The Upper SAR Watershed has areas of extreme slopes and elevations, the average gradient of the Mountain reaches of the upper SAR average 240 ft. /mile, and 30 ft. /mile near Prado Dam. The gradients of the main tributaries average 700 ft. /mile in the mountains and 30 ft. /mi in the valley reaches[3]. Storm and runoff events in the upper SAR Watershed can be extremely dynamic and subject to high levels of sediment and debris delivery in very short timelines. One large rainfall season, or event (or fire) can cause impacts to the FCD system that takes all available resources to recover from—thus delaying work on other planned projects for up to several years.

The San Jacinto River flows from headwaters in the San Jacinto Mountains. Mountains and foothills account for 471 square miles while 288 square miles are considered valley floor (SWRB, 1955). Elevations range from less than 1,250 feet above sea level at Lake Elsinore to approximately 1,400 to 1,700 feet on the valley floor to 10,834 feet at Mt. San Jacinto in the San Jacinto Mountains[4]. More than 90 percent of the San Jacinto River Watershed drains to Lake Elsinore (McKibbin, Stuart 2013). Runoff from as far as Moreno Valley, San Jacinto, Hemet, and Perris contribute to surface flows that reach Lake Elsinore during rainfall events. During normal to dry periods, when the San Jacinto River and the surrounding tributaries are essentially dry, little or no flow enters Lake Elsinore.[3]

Approximately 60% of the drainage area for the SAR Watershed below Prado Dam lies within the Santa Ana Mountains and the Chino Hills. Most of the remaining area lies within the broad coastal plain that extends southwestward to the Pacific Ocean. Numerous tributaries contribute to the Santa Ana River within this reach. The principal tributary is Santiago Creek with a drainage area of approximately 102 square miles. Lesser tributaries include Wardlow Canyon, Aliso Canyon, Gypsum Canyon, Blue Mud Canyon, Walnut Canyon, and Carbon Canyon Creek. The average gradient of these tributaries is about 300 feet/mile, while the average slope of the Santa Ana River from Prado Dam to the ocean is about 15 feet/mile[2].

The climate is generally mild, but both temperature and precipitation vary considerably with distance from the ocean, elevation, and topography. Most precipitation occurs as rain from December through March, although some falls as snow at higher elevations. The average annual rainfall varies from ten inches per year south of Riverside, to about 45 inches per year in the higher mountains.

Winter storms usually move in from the Pacific Ocean bringing widespread rain, and snow at the higher elevations. Such storms often last several days. More localized episodic storms associated with frontal systems can occur at any time of the year, and can produce high-intensity precipitation over a comparatively small area for up to six hours.

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[3] USACE, 1988. Design Memorandum No. 1 **PHASE II GDM ON THE SANTA ANA RIVER MAINSTEM including Santiago Creek**

[4] Tetra Tech, WRIME, Inc., for the San Jacinto Watershed Council, 2007. **San Jacinto River Integrated Regional Watershed Management Plan**

Stream flow is perennial in the canyons of the Santa Ana River and in the headwaters of most of its tributaries, but is generally ephemeral in most valley segments. Stream flow increases rapidly in response to precipitation. High-intensity precipitation, especially following wildfire, may result in intense sediment-laden floods, with some debris load in the form of shrubs and trees.

There are several large lakes and reservoirs within the watershed that help regulate flood flows; the largest being Prado Dam, Seven Oaks Dam, Lake Elsinore, Big Bear Lake, Lake Hemet Reservoir, and Santiago Reservoir.

Historical Flooding

The SAR 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 SAR 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.

Missions

The FCDs' highest priority is to ensure flood protection of life and property and comes directly from legislative authority (CWC Section 8100). However, FCDs also have parallel missions to provide water conservation, and recreational and irrigation use of impounded waters within their jurisdictions, while preserving flood protection effectiveness (see Section 5.a, below).[5]

Flood Control Improvements

Santa Ana River

The Santa Ana River has been the focus of USACE 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 percent of the watershed lies above it. 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 it.

Prado Dam originally was 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 having capacity for only a 50-year event. To address these deficiencies the USACE initiated study of the Santa Ana River Main Stem Project (SARP) in 1964. Construction of the SARP was initiated in 1989.
The SARP is located along a 75-mile reach of the Santa Ana River in Orange, Riverside and San Bernardino Counties. The project's objective is to provide the developed and developing areas in the

[5] Public Law 534, 78th Congress, 1944, and specific projects referenced therein and as updated since.

watershed with approximately 100-year flood protection through the end of the project life. The plan for flood control improvements included three principal features:

1. Lower river channel modification for flood control along the 30.5 miles of the Santa Ana River from Prado Dam to the Pacific Ocean. Construction of a retarding basin and channel improvements on Santiago Creek are also planned. (Ongoing, estimated completion date: 2016)[6]
2. Enlargement of Prado Dam to increase reservoir storage capacity from 217,000 acre-feet to 362,000 acre-feet. (Ongoing, projected completion date 2024.)
3. Construction of Seven Oaks Dam (about 35 miles upstream of the existing Prado Dam) with gross reservoir storage of 145,600 acre-feet. (Completed in 1999.)
4. The drainage area behind Seven Oaks Dam comprises 177 square miles, excluding 32 square miles that drains internally to Baldwin Lake. The principal tributary is Bear Creek, which drains 55 square miles, and has an average gradient of 460 feet/ mile. The only existing structure that would affect flood flows in this sub-watershed is Big Bear Lake, which is a water conservation reservoir. It collects water from a 38-square-mile drainage area, and has a surcharge storage capacity of about 8600 AF between the top of the conservation pool and the top of the dam.

San Jacinto River

The San Jacinto River Watershed Council (SJRWC) developed an Integrated Regional Water Management Plan (IRWMP) for that 770-square-mile sub-watershed (now incorporated into the Plan). The San Jacinto IRWMP, addressed water supply, water quality, drought-proofing, and critical habitat protection. The plan also addresses flood risk concerns, and recognizing that the issue is risk management and not purely a matter of engineering, the SJRWC approach frames the issue as "providing]flood protection to existing disadvantaged communities." The plan acknowledges a number of flood risk management strategies as alternatives to channelization.

In 1960 the USACE constructed the San Jacinto River Levee to protect the city of San Jacinto. The levee was rehabilitated by the USACE in 1980 after the levee was breached by a 30-year return frequency flood event. Another major USACE project was the Lake Elsinore Management Project constructed in 1995; the project allows for better management of the lake water levels and provides a safe outlet for the lake when it spills.

Improvements to Tributaries

Other flood control improvements exist along some of the smaller tributaries: San Antonio, Chino, Cucamonga, Deer, Lytle, San Sevaine, Day, San Timoteo, City, and Cajon Creeks, above Prado Dam; Carbon Canyon Dam and Villa Park Dam in Orange County; and Perris Valley Storm Drain and Salt Creek above Lake Elsinore. These improvements include channelization, debris basins, storm drains, levees, stone and wire-mesh fencing, stone walls or rip-rap along the banks of stream channels, concrete side slope protection, and drop structures.

[6] Orange County Public Works, Flood Control Division: http://ocflood.com/sarp/lower

Other improvements not aimed mainly at flood control include spreading grounds, recharge basins, and water conservation reservoirs. There are more than 100 water conservation and recreational reservoirs in the watershed, with storage volumes ranging from 5 AF to 182,000 AF in Lake Mathews. These improvements affect the regimen of lesser flood flows, but do not appreciably affect major flood flows. Below Prado Dam in Orange County, local and tributary projects include: improvements to Fullerton Creek Channel, Greenville-Banning Channel, Bolsa Chica Channel, East Garden Grove-Wintersburg Channel, Huntington Beach Channel, Talbert Channel, Peters Canyon Channel, Aliso Creek Channel, Serrano Creek Channel, San Juan Creek Channel, Westminster Channel, and Atwood Channel.

Flood Risk

Risk is the product of the likelihood of the flood control facility failing, the amount of damage that might occur for given depths of flooding and the likelihood of a flood discharge. For example, a levee made from sand is much more likely to fail than one made of concrete and the risk for residents behind it is higher. Or if an area is flooded to a depth of 1-foot but all the buildings in the area are elevated 2-feet above the ground the risk from flooding is dramatically reduced.

Flood discharges can be estimated. One way to estimate flood discharges is the Probable Maximum Flood (PMF) which is the most severe combination of critical meteorological and hydrological conditions that are reasonably *possible* in the region. Application of PMF is mostly confined to determination of spillway requirements of high dams in order to give virtually complete security against potential floods catastrophes.

The USACE has chosen to design many flood control structures in the region to the Standard Project Flood (SPF), which represents the discharge that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably *characteristic* of the geographical region involved, including extremely rare combinations. SPF is selected where some small degree of risk can be accepted but an unusually high degree of protection is justified by hazards to life and high property values within the area to be protected. It is estimated that the SPF discharges are generally equal to 40-60 percent of the MPF discharges for the same basin. For example the Prado Dam and Seven Oaks Dam storage areas and the Santa Ana levees were designed for the SP F.

Today, the discharge most commonly used by local jurisdictions for planning and design is the 100-year flood, a hypothetical event that is defined as having a 1 in 100 (1%) chance of occurring in any given year. This standard came about through the National Flood Insurance Act of 1968 which created the National Flood Insurance Program (NFIP). At the outset of the program, a national standard was needed to enable all properties to be treated similarly. The 100-year or base flood was selected as a trade-off between two possible extremes. At one end of the spectrum, the program could have sought to protect everyone from almost all floods, no matter how large or rare, which would have placed economic improvement restrictions on very large areas. At the other end, the program could have provided protection only for the smaller floods, which would have left many buildings exposed to damage. The 100-year standard was the balance point between the pros and cons of both extremes.[7]

In order to take advantage of the federal government's offer of affordable flood insurance, communities that participate in the NFIP must manage their floodplains by applying land use regulation and construction standards in an effort to reduce future flood losses. Local communities adopted the 100-year standard to be consistent with the NFIP, although some critical flood facilities are designed to higher standards. For example, the California State Legislature adopted SB5 in 2005 which established that levees and floodwalls in the Sacramento-San Joaquin Valley provide protection against a flood that has a 1-in-200 chance of occurring any given year.

The California Department of Water Resources and the USACE have developed a program called "California's Flood Future."[8] They found that millions of Californians live in areas exposed to flood risk, and believe there is an unacceptable level of flood threat to public safety and the economy. They evaluated risk in 100-yr and 500-yr flood zones as defined by FEMA and statewide county sources. They found an expectedly larger population would be affected by a 500-yr flood with concomitant economic losses. They also found that the South Coast Region has the greatest population exposed to floods, with the majority in the Orange and Los Angeles Counties: 250,000 in the 100-yr floodplain, and over 3 million in the 500-yr flood plain. The results of this work will influence flood risk management approaches in the future, and explicitly suggests use of integrated water management and IRWMs to address this challenge.

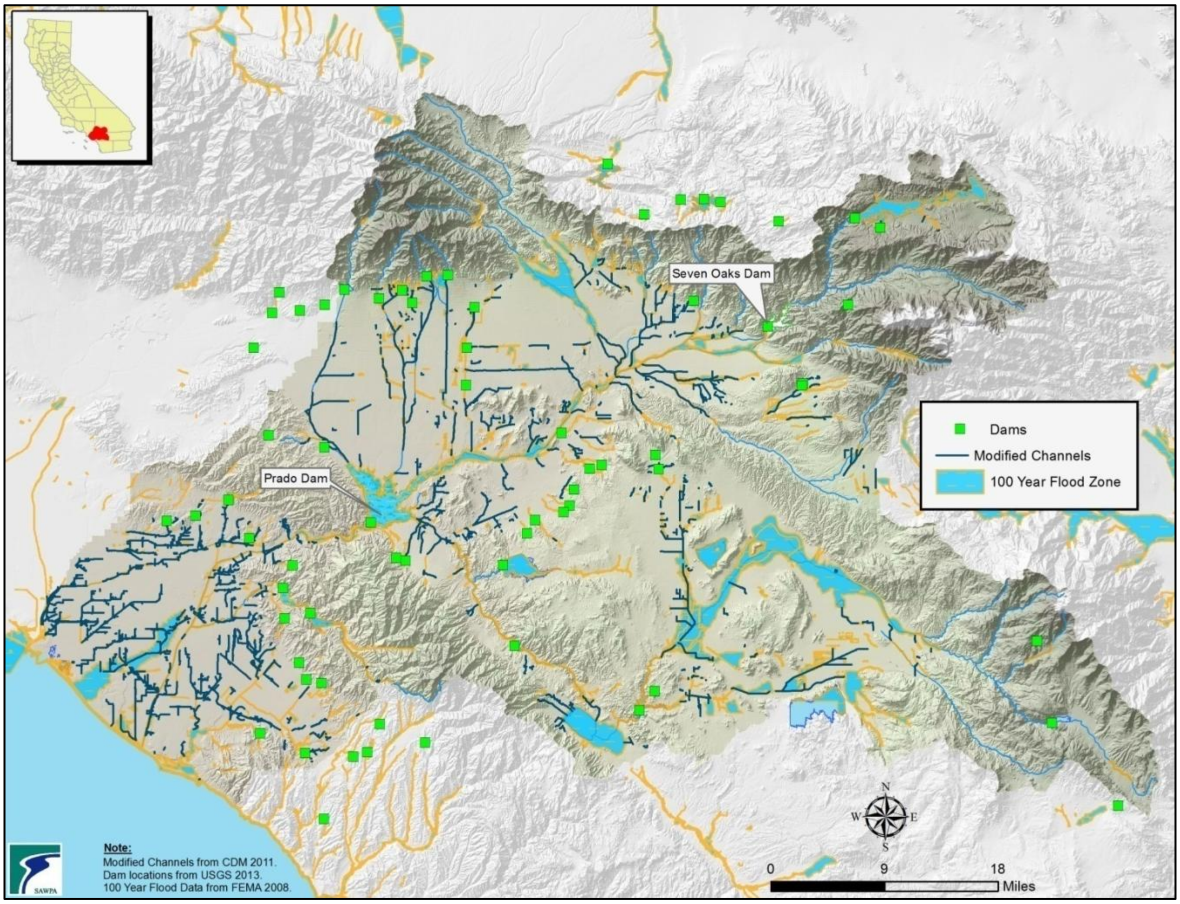
The NFIP has mapped 100-year floodplains for the major tributaries throughout the watershed. The Table below shows the scope of the existing flood hazard within the Santa Ana River Watershed.

Table 5.8-2 Square Mileage of 100-Year Floodplain

County	100-year floodplain (sq. mi)	Number of structures	Value of structures
Orange	46		
Riverside	90	7200	$2.4 Billion
San Bernardino	191		

[7] See: NFIP Website at: http://www.floodsmart.gov/floodsmart/; and High Risk definition at: http://www.floodsmart.gov/toolkits/flood/downloads/FloodInsuranceFloodMaps-11%2019%2010.pdf
[8] http://www.water.ca.gov/sfmp/flood-future-report.cfm, and http://www.water.ca.gov/sfmp/resources/PRD_AttachF_Exposure_4-3-13.pdf

Figure 5.8-1 Flood Channels and 100-Year Flood Zones in the Santa Ana River



Sediment management (sediment as a resource)[9]

1. There are many benefits associated with managing sediment within the Watershed. With Seven Oaks and Prado Dams, sediment transfer could provide a longer usable life of the dams for flood control purposes. The costs of raising the elevation of a dam in the future have large economic and social implications. Some of the impacts include the cost of construction, purchase of property that will lie within the new flood zone and the relocation of infrastructure. Sediment-filled reservoirs behind dams have been addressed elsewhere by plans to remove the dams (e.g. Matilija Dam in Ventura County: http://www.matilijadam.org/).
2. Removing sediment from behind our dams would also preserve and create valuable storage volume for water conservation efforts. Water conservation is limited based on storing water at elevations that minimally impact flood control efforts and natural resources. As sediment accumulates behind a dam it reduces the available volume for water conservation. Active management of sediment at the Prado Dam is being investigated by the USACE's Prado Basin, California Feasibility Study and the

[9] Sediment management section adapted from the OWOW Santa Ana River Watershed Planning Framework white paper, Sediment Transfer Section, p. 10-11, April 17, 2012.

Proposition 84-funded Prado Basin Sediment Management Demonstration Project (Project ID #2098, Table SW-2a and b).

3. Sediment released below a dam is carried further downstream and provides replenishment sediment that could replace eroded areas that have compromised critical infrastructure. Two examples in the SAR Watershed include the CA 91 Freeway and the current location of the Inland Empire Brine Line. This replenishment sediment would also preserve stream embankments and critical flood control levees. As the river incises due to reduced sediment loads, it erodes the embankments and adversely impacts wildlife habitat for protected riparian species. This adverse impact is termed “hydromodification” in the MS4 Permits.
4. Sediment is needed in the Santa Ana River for groundwater recharge operations between Imperial Highway and the CA 57 Freeway. Coarsening, and subsequent armoring, occurs when the natural sands in the river are washed downstream and not replaced by new sediment deposition. Over time the accumulation of these fine sediments create an impermeable layer in the river bottom thereby reducing percolation rates.
5. The Santa Ana River is also a major source of sediment for beach sand. While anthropogenic beach replenishment is a regular activity, the full effects of sediment impoundment by Prado Dam have yet to be felt by Orange County coastal communities. Consequences of reduced sediment at the coast will affect private and public properties, infrastructure, and adverse environmental impacts.
6. Effective sediment management requires a watershed-wide approach. Sediment originates from erosion in the local mountains and foothills and is transported through and stored within the jurisdictions of numerous agencies on its way to the ocean.

Floating Debris

Floating debris and trash can cause clogging and slow drainage of flood facilities and water quality BMPs. If such facilities are not adequately maintained, these materials can become a source for mosquitos, and other disease vectors and nuisance pests. Accumulated trash and debris are also remobilized to downstream areas with successive storm events, and blown by strong winds.

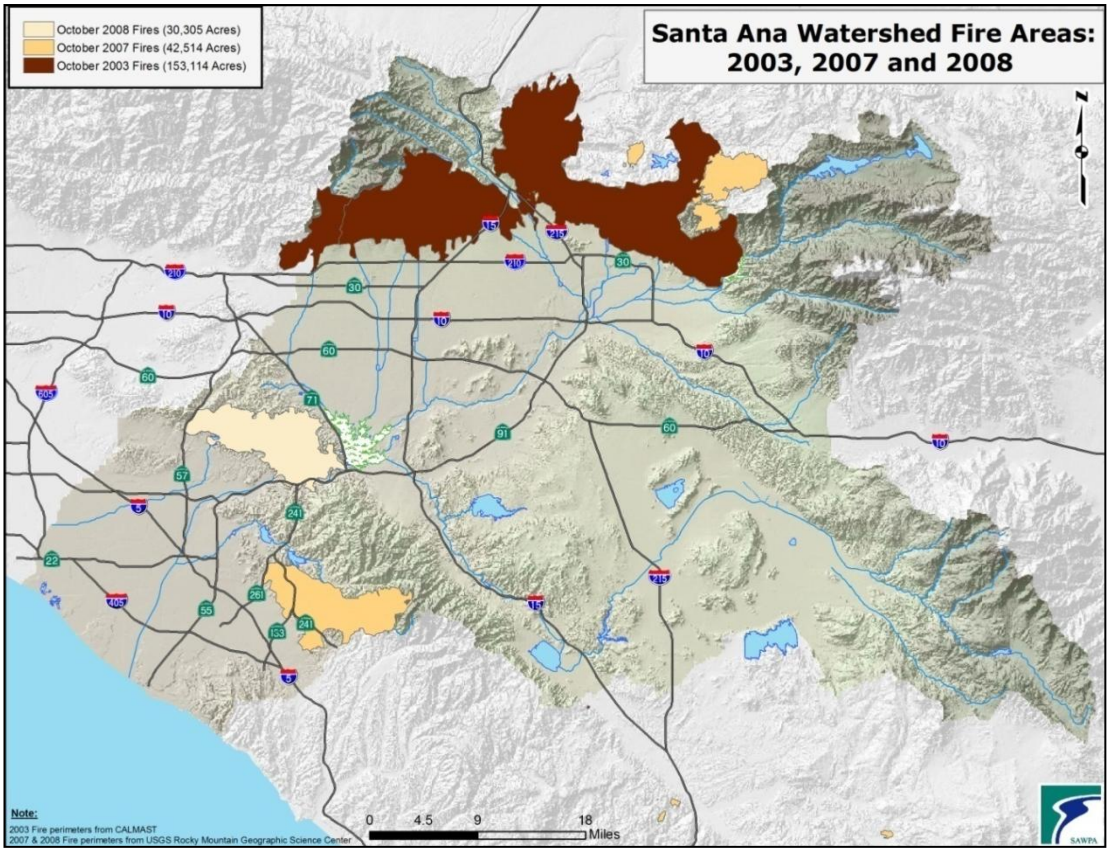
Fire

Episodic wildfires are natural occurring events in southern California landscapes. However, fire suppression practices in the past decades have altered the character of natural landscapes and plant communities, and urban expansion and encroachment into natural areas has resulted in an increased frequency of wildfires (**Figure 5.8-2**).[10] Increases in runoff, erosion, and sediment loading during storm events have been well documented. Flood facilities can be overwhelmed and uncontrolled debris flows and floods can occur. Long-term slope stability is compromised by intense wildfire events, and post-fire runoff contains increased levels of pollutants that can cause severe impacts to receiving waters. These impacts are not fully understood, but may be best managed by prevention. Anthropogenically-intensified wildfires also cause longer-lasting landscape impacts, and habitat recovery may be delayed.

[10] Stein and Brown, 2009. Effects of post-fire runoff on surface water quality: Development of a southern California regional monitoring program with management questions and implementation recommendations. Southern California Coastal Water Research Project, Technical Report 598.

The “Forest-First” programs under development between SAWPA and the USFS should provide proactive management actions to reduce wildfire impacts over time.[11]

Figure 5.8-2 Major Wildfire Areas in the Santa Ana River Watershed in 2003, 2007, and 2008



Earthquake

The Santa Ana River Watershed very seismically active, being affected by three major fault systems, the San Andreas, San Jacinto, and Elsinore faults (**Figure 5.8-3**). Although FCD facilities and dams have been engineered and constructed to meet all applicable seismic hazard requirements (e.g. Seven Oaks dam is designed to withstand an 8.0 magnitude earthquake), actual infrastructure damage from earthquakes remains uncertain.

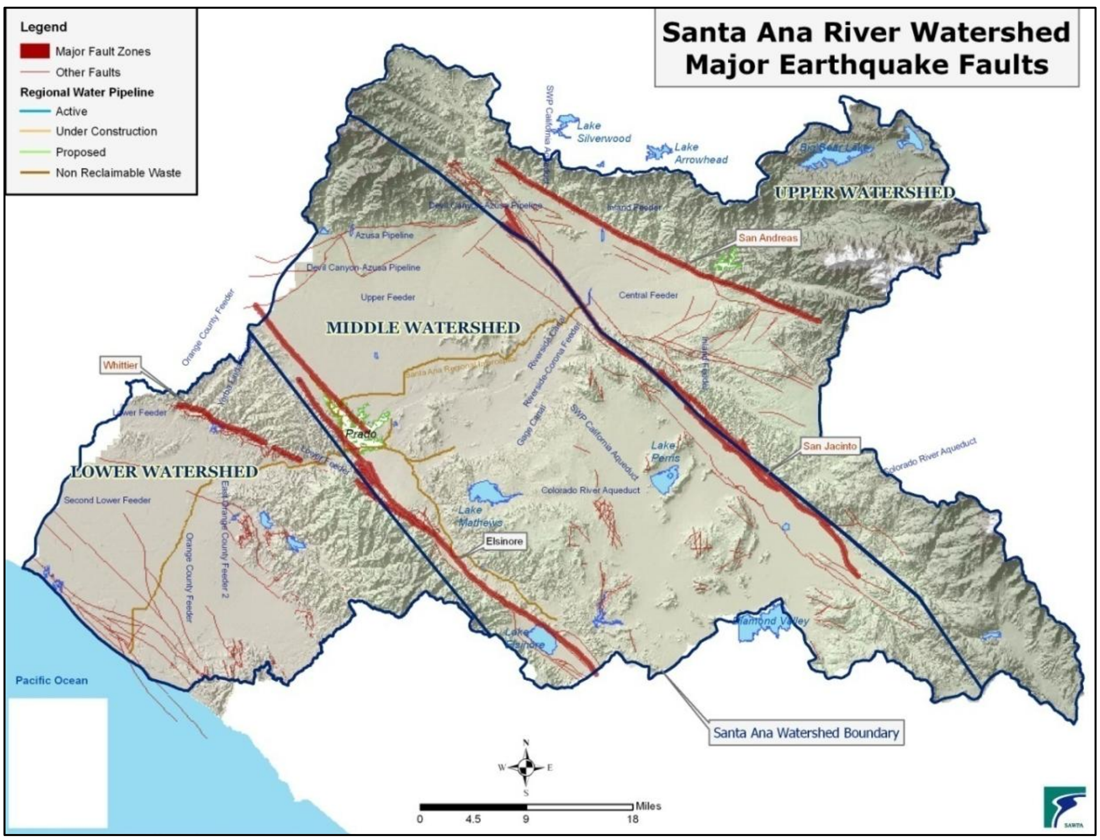
The USGS has developed a theoretical, yet plausible, San Andreas Fault earthquake scenario called The Great California Shakeout[12]. The Great California Shakeout scenario depicts the impacts from a 7.8 magnitude earthquake on the San Andreas Fault in Southern California. On average, such an earthquake occurs south of the San Gabriel Mountains every 150 years; the most recent was 300 years ago. A 7.8 magnitude earthquake is expected to affect 7.5 million people. An estimated 200,000 people commute over the San Andreas Fault for work and would potentially be separated from their homes. Ground

[11] OWOW Santa Ana River Watershed Planning Framework white paper, Forest First Program Projects Section, p. 11-13, April 17, 2012.
[12] USGS, Great Shake Out, updated 2013. http://earthquake.usgs.gov/regional/nca/simulations/shakeout/

shaking would last as long as 2 minutes and some areas will experience ground level displacement of up to 10 feet. Thousands of aftershocks would be expected in the following months. There would be an estimated 1,800 deaths and 53,000 injuries in the first minutes of the event. As many as 1,500 buildings would collapse and 300,000 structures would be severely damaged causing $213 billion in damages. 255,000 people would be homeless. In the minutes following the earthquake Southern California would expect up to 1,600 fires due to severely reduced fire-fighting capability from damaged infrastructure, and a lack of running water and/or electricity for weeks or months.

The SAR Watershed would be significantly affected, especially by interruptions in the supply of imported water. Such an earthquake event could cause extensive levee failure along the State Water Project, resulting in significant imported water loss and flooding of surrounding areas.

Figure 5.8-3 Major Geologic Fault Zones in the Santa Ana River Watershed



Climate Change

The OWOW Plan includes evaluation of climate change impacts and recommendations to the watershed through mitigation and adaptation to a changing climate. Details of the watershed's evaluation can be found in the Bureau of Reclamation's Technical Memorandum: 86-68210-2013-02: Climate Change Analysis for the Santa Ana River Watershed, dated August 2013. It is located at **[Appendix F2]** in the OWOW 2.0 Plan. Some of the highlights of the watershed's climate change analysis reveal that in the next 50-years and beyond, average annual temperatures will increase, total annual precipitation will probably decrease, and winter snowpack will melt sooner, causing more runoff in the winter rather than in the spring.

In the Santa Ana River Watershed, nearly 95% of the average annual rainfall occurs in about a 4.5 day period. Collecting a substantial portion of large runoff volumes in the short timeframes characteristic of intense, short duration events in such a short timeframe in detention or recharge basins is difficult. Given the same average annual rainfall, runoff from more frequent and less intense storms could be captured more effectively by typical basins. However, changing weather conditions resulting from climate change are expected to increase the intensity of storms in the SAR Watershed while decreasing their frequency, which would decrease the expected volume captured by existing approaches.
FCDs are not expected to make significant changes to facilities in the near future, but should evaluate their systems to address variable runoff scenarios in partnership with other stakeholders. It may be possible to modify the runoff capture facilities to optimize groundwater recharge for shorter duration, larger magnitude, and higher intensity storm events. Collaborative projects with water supply and groundwater management agencies as partners would provide a multi-perspective approach, and higher likelihood for success for climate change adaptation projects, than FCDs conducting such projects in isolation. Successful flood control and stormwater capture/groundwater recharge projects will likely require adaptive management approaches for long-term optimization.

Intersection of IRWM (OWOW) and Flood Control District Missions

California's Flood Future (2013)[13] identified the following problems currently facing FCDs:

- Land use decisions may not adequately prioritize public safety;
- Differing methodologies and inadequate data make risk assessment complex and costly;
- Flood management projects are not prioritized from a system wide perspective;
- Emergency preparedness may not receive necessary funding;
- Delayed permit approvals and complex permit requirements are obstacles to flood risk reduction; and,
- Lack of reliable, sustained funding puts Californians at significant risk.
- This section links these and other problems, from the perspective of FCDs, with the purpose of the Plan and efforts to improve compatibility and how to partner with FCDs.

FCD Missions

The missions of FCDs hold flood protection as their highest priority. FCDs are natural partners for many projects due to their broad jurisdictional areas, and parallel missions of water conservation and water quality improvement. However, FCD funding is generated from property assessments which may limit the applicability of FCD funds to the areas from which fees are derived (FCD Zone areas). Mission statements for the SAR Watershed FCDs:

[13] California's Flood Future Highlights: Recommendations for managing the State's Flood Risk. Public Review Draft March 2013, California Department of Water Resources and the USACE.

RFCWCD

"The objects and 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 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.[14]

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."[15]

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."[16]

Right of Way

FCDs are also constrained by right-of-way and easements. Master Plans of Drainage (MPDs) typically develop a conceptual conveyance system for a plan area, with the intention to preserve adequate right-of-way for FCD facilities to be built when needed. However, many MPDs were developed without due consideration for enhanced stormwater capture, or for soft-bottom or more ecological alternatives to standard hardened and concrete facilities. Therefore, existing right-of-way for FCD facilities may be inadequate to accommodate multi-use facility designs.

Environmental permitting requirements

Construction of most FCD facilities requires environmental permitting, including CEQA documents and permits from the USACE (404 Dredge and Fill Permits), RWQCBs (401 Water Quality Certifications), and CDFW (1601 Streambed Alteration Agreements). Increasing concern over the environmental impacts of the construction of hardened and concrete-lined facilities has resulted in increased environmental mitigation requirements for such facilities. Permitting for more ecologically benign designs and multi-

[14] Riverside County Flood Control Act, 1944.
[15] SBCFCD Flood Control Act of 1938.
[16] Orange County Flood Control Act, Chapter 723 of the State of California Statutes of 1927

benefit facilities can be less costly and more streamlined. This provides an incentive for FCDs to incorporate such project concepts and designs into their CIP plans, and enhances their benefits as partners in cooperative projects.

Challenges for collaboration

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 USACE.

Each FCD (SBCFCD, RCFCWCD, and OC/OCFCD) has differing challenges based on their physiography (as described in Section 4), 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 OC/OCFCD, and has added constraints associated with a large existing Multi-Species Habitat Conservation Plan. San Bernardino County has the highest gradient areas and the Seven Oaks Dam, has significant sediment and debris removal needs, and has several large groundwater basins and potential for increased storage, somewhat more developable area, yet 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.

With the adoption of the environmental regulations in the late 1960s and early 1970s (Porter-Cologne Water Quality Act; reauthorized and amended Federal CWA; CEQA; NEPA; and the ESA), regulatory permitting has impacted the planning, design operations, and maintenance activities of the FCDs. In more recent decades, the environmental impacts of FCD facilities and activities have been observed and criticized by environmental protection advocacy groups. FCD facility planning, design, and permitting, and maintenance has become more complex and costly as a result of this layer of regulation and scrutiny, while the flood protection and water conservation directives have continued as highest priorities.

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, sewering agencies, local land development authorities, and the USACE and the USFS. 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 IRWMP implementation and is more competitive in the quest for grant funding. This was recognized by the Board of Supervisors of the RCFCWCD when they approved Resolution Number F2004-18 in June 2004. This resolution directs RCFCWCD and Western Municipal Water District (WMWD) to jointly plan and develop water conservation projects in western Riverside County, including a conjunctive use program for Colton and Riverside groundwater basins; the Riverside-Corona Feeder Project; and joint participation in new conservation at Seven Oaks Dam. RCFC also investigated with WMWD whether an existing detention basin in the City of Riverside would function for water conservation. However, high groundwater in the area precluded an increase in infiltration at the site.

In San Bernardino County, the SBCFCD and the San Bernardino Valley Municipal Water District first entered into a cooperative agreement to recharge groundwater using SBCFCD basins in 1972. Several projects have been developed since this first agreement. Most recently, the SBCFCD and the SBVMWD have approved a MOU for the purpose of evaluating SBCFCD facilities for dual purposing to provide increased groundwater recharge while maintaining flood protection as the highest priority. Current work is focused on the Cactus FC/Recharge Basins in Rialto. Here, the SBCFCD, in cooperation with SBVMWD, obtained $1 million from a Proposition 84 Grant to enhance Cactus Basins 3/3A for flood control and groundwater recharge purposes.

However, 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.

Compliance with the MS4 Permits may provide significantly increased incentives for FCDs to collaborate on watershed projects that address MS4 Permit requirements (see discussions in Sections 3 and 6).

Stormwater as an Essential Resource for the SAR Watershed

This section builds on the work of OWOW 1.0 to provide examples of three projects successfully implemented in the SAR Watershed to achieve IRWM goals. Each project includes multiple component projects, and are either ongoing or are planning future implementation actions. This is, or course, not an exhaustive project list. These particular projects are presented as examples of how several of the "challenges for the future" (as listed in Section 2, above) can and have already been met in parts of the SAR Watershed—some were achieved decades earlier. The approaches, tools, and partnerships developed during these projects will help guide and improve future implementation projects for flood risk and stormwater management.

Successful Implementation Projects

The Santa Ana River Mainstem Project (SARP)[17]

This ongoing project is designed to provide flood protection to the growing urban communities in Orange, Riverside and San Bernardino Counties. The proposed improvements to the system cover 75 miles, from the headwaters of Santa Ana River east of the city of San Bernardino to the mouth of the river at the Pacific Ocean between the cities of Newport Beach and Huntington Beach. This project is perhaps the most significant successful project in the SAR Watershed. Although it began with a flood protection priority as a driver that leveraged state and federal funding, it has incorporated a wide range of water quality and water conservation components over several decades—and is managed by a multi-agency entity. It is a model for adaptive infrastructure management with changing priorities.

All three counties, collectively, work closely with the USACE to design and construct the project elements. The project approach has been significantly improved through use of facilities on the SAR to increase groundwater recharge, especially in the lower SAR. The project pioneered the reoperation of Prado Dam and the use of Seven Oaks Dam to allow more use of storage capacity for water conservation, without unacceptably diminishing flood protection.
Project success factors:

1. Overriding flood threat mitigation priority initiated the project.
2. Legislative mandates drove project implementation and funding.
3. Strong and long-term ongoing cooperation among federal, state, and local project partners with a multi-party Agreement.
4. Demonstrable short and long-term benefits.

Chino Basin Facility Improvement Project

In the Chino Basin, over 25 flood control retention basins were retrofitted to allow infiltration of stormwater, and to infiltrate imported water and recycled water when seasonal storm control functions were not needed. Funding for these improvements was provided by SAWPA under the Year 2000 Proposition 13 Water Bond, Southern California Integrated Watershed Program.

[17] Santa Ana River Project Website: http://cms.ocgov.com/gov/pw/flood/sarp/default.asp

Enhanced imported and stormwater infiltration in the Chino Basin has been studied and implemented since the adjudicated basin yield was defined by the Court in 1978 (Case No. 164237). The adjudication found that the "safe yield" of 145,000 AFY (acre-feet/year) had been routinely exceeded in previous years. Corrective action was identified as augmenting the recharge of imported and natural flows by the use of offline recharge basins.[18] Following the adjudication, the Chino Basin Watermaster began replenishing groundwater with imported water. This plan recognized that impervious surfaces of flood control facilities and urbanization reduced groundwater recharge and that offline recharge basins should compensate by additional recharge to the extent feasible. It also recognized the advantage of infiltration of natural runoff due to the higher relative concentration of total dissolved solids present in imported water. So, the CBWM and the SBCFCD began a water conservation and stormwater capture project in the early 1980's that continues to the current day. Improvements include monitoring wells and SCADA (computer controlled operating system) for the basins.

The project determined that flood control facilities can be successfully augmented for stormwater recharge, that stormwater infiltration/ recharge and flood protection objectives are often compatible, and that communication among project partners was critically important.[19]
Project success factors:

1. Hydrologic studies were ongoing to develop groundwater and surface water data acceptable by all parties—estimated conservable runoff were almost 11,000 AFY (acre-feet/year) for Day Creek, and 31,000 AFY for San Sevaine; The most efficient recharge areas were identified based on soils and geology; The Inland Empire Utilities Agency reported that these improvements have captured approximately 100,000 AFY each year of operation;
2. Flood protection must be the highest priority and has been incorporated into the operating plans for the system by all parties;
3. Facility operation and maintenance responsibilities were to be shared among the parties;
4. Stakeholder trust, backed up by formal Four-Party Agreement for the project (Agreement for Operation and Maintenance of Facilities to Implement the Chino Basin Recharge Master Plan). See related update report on these efforts.[20]
5. SAWPA/State grant funding assistance (Proposition 13) for construction.

The Hemet-San Jacinto Integrated Recharge and Recovery Program.[21]

The Hemet-San Jacinto Basins are located within the San Jacinto River Watershed in Western Riverside County, and consist of the Hemet South, Hemet North, Canyon, and San Jacinto Upper Pressure sub basins or management zones. These sub basins underlie Eastern Municipal Water District's (Eastern

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[18] Bill Mann and Associates, 1983. Day, Etiwanda, and San Sevaine Creeks Drainage Plan, Water Conservation Report

[19] Campbell, 2011. Planning and Operations Experiences with the Chino Basin Groundwater Recharge Program. Managed Aquifer Recharge Symposium January 25-26, 2011 Irvine, California. www.nwri-usa.org/rechargesymposium2011.htm

[20] Wildermuth Environmental, 2008.Chino Basin Optimum Basin Management Program, 2008 State of the Basin Report.

[21] Eastern Municipal Water District 2000.State of the Hemet/San Jacinto basins. http://www.emwd.org/modules/showdocument.aspx?documentid=93

MWD) service area and are utilized for groundwater supply for the cities of San Jacinto and Hemet, as well as unincorporated areas of Riverside County.

This project involves 100 acres of ponds, eight recovery wells, and a 60-inch diameter pipeline from Eastern MWD's EM-14 connection to the ponds. The objectives of the project include: providing Tribal Settlement Water (long-term average of 7,500 AFY), elimination of groundwater overdraft (10,000 AFY) and additional long-term supply (15,000 AFY). The project includes 20 acres of wet pond recharge area in the San Jacinto River channel, and has captured and recharged over 10,000 acre-feet since June 2012. A Stipulated Judgment (including the Soboba Tribe, EMWD, MWD, and LHMWD) has been filed as a collaborative solution to promote the efficient and coordinated management of surface water and groundwater, to avoid problems from overdraft, to assist in protecting the rights of the Tribe, to sustain and enhance water resources, and to resolve competing claims to surface water and groundwater[22]. Project success factors:

1. Currently, Eastern MWD has a Planning Department that pursues efforts to work with other agencies and private groundwater producers to establish cooperative groundwater management programs including groundwater storage and conjunctive use programs[23].
2. The project was guided by a unique committee that included construction oversight staff, attorneys, and managers (the CAM committee). Although impetus to initiate the project came from a water rights decision, the project has been a successful multi-agency recharge project.
3. The project team recommends that future projects should conduct thorough early planning, identify and secure funding from multiple sources, and involve regulatory permitting agencies early in the project development process. The San Jacinto Upper Pressure Groundwater Basin has a large remaining capacity for storage.[20]

Riverside City/FCD/WVMWD basin retrofit projects

These are in various stages of implementation—planning, design, and contract procurement.

Key Project Success Factors

1. Partnering with FCDs requires adoption of flood protection as the highest priority.
2. Thorough early planning and feasibility studies will streamline project design and implementation.
3. Long-term strong project leadership and management.
4. Strong and long-term ongoing trust and cooperation among all project partners, supported by a multi-party Agreement.
5. Adequate funding sources to plan, design, construct, and maintain the project must be identified, and be available.
6. Collaborative projects benefit from multiple stakeholder expertise and resources, and improve the cost-benefit balance.

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[22] EVWD 2013. Hemet/San Jacinto Groundwater Basin Management: The Stipulated Judgment—PowerPoint Presentation. **http://www.emwd.org/modules/showdocument.aspx?documentid=5593**

[23] Daverin, John. Personal communication May 30, 2013.

7. Regulatory, judicial, or legislative mandates can rapidly initiate project development and implementation.
8. Participation in the OWOW Plan.

Stormwater Recharge Projects awarded under OWOW 1.0 and 2.0

Tables 5.8-3a and 3b list the projects recently funded and currently under varying phases of implementation, which were awarded funding under Phases 1.0 and 2.0 of Proposition 84 per the Plan. The FCDs expect to have further discussions with all stakeholders to Identify potential site-specific opportunities for flood damage reduction and stormwater capture projects in partnership with stakeholders, using the map-based Watershed Geodatabase tools .

Table 5.8-3a Implementation Projects Funded by Proposition 84 Round 1

Agency	Project	Benefits
City of Ontario	Cucamonga Creek Watershed Regional Water Quality Project (Mill Creek Wetlands)	• New storage of 160 AF • 14 acres of preservation restored
Western Municipal Water District	Arlington Basin Water Quality Improvement Project	• Stormwater capture storage increase of 1,300 AFY • 16 acres of preservation restored

Table 5.8-3b Implementation Projects Funded by Proposition 84 Round 2

Agency	Project	Benefits
San Bernardino Valley Municipal Water District	Enhanced Stormwater Capture and Recharge along the Santa Ana River	• Stormwater capture storage increase of 14,600 AFY
Inland Empire Utilities Agency	San Sevaine Ground Water Recharge Basin	• Stormwater capture storage increase of 2,000 AFY • 26 acres of preservation restored
City of Fontana	Vulcan Pit Flood Control and Aquifer Recharge Project	• Stormwater capture storage increase of 2,000 AFY • 60 acres of preservation restored
City of Yucaipa	Wilson III Basins Project and Wilson Basins/Spreading Grounds	• Stormwater capture storage increase of 1,300 AFY •
San Bernardino Valley Water Conservation District	Plunge Creek Water Recharge and Habitat Improvement	• Stormwater capture storage increase of 1,250 AFY • 50 acres of preservation restored
Orange County Water District	Prado Basin Sediment Management Demonstration Project	• Stormwater capture storage increase of 450 AFY

Planned Project Site[24]

The City of Santa Ana in association with the Cities of Newport Beach and Costa Mesa, is developing conceptual engineering for a proposed urban discharge diversion facility. The proposed facility will be located in the downstream portions of the Santa Ana Delhi Channel near the intersection of Mesa Drive and Irvine Avenue. The proposed project is intended to capture and divert urban discharge low-flow into the sanitary sewer system to address urban surface water quality in accordance with the Orange County MS4 Permit and the Total Maximum Daily Load (TMDL) for selenium discharge to the Upper Newport Bay. The Selenium TMDL includes waste load allocations for MS4 Dischargers in the Upper Newport Bay watershed, including discharges from the Santa Ana Delhi Channel watershed and facilities owned and operated by the Cities of Santa Ana, Costa Mesa and Newport Beach and the Orange County Flood Control District. The primary impetus of developing the proposed Urban Discharge Diversion System is to address the current Selenium TMDL, but also to address potential future TMDL's including bacteria, trash, toxics, metals and nutrients. The proposed diversion system has the ability to essentially eliminate discharges to the Upper Newport Bay and, therefore, eliminate the threat of pollutants entering the Backbay.

Three design concepts have been developed for discharging the treated flows. One concept would allow the treated water to be harvested for irrigation by the Newport Beach Golf Course.

MS4 Permits as a driver for Plan implementation

Renewed MS4 Permits for Orange, Riverside, and San Bernardino Counties in the Santa Ana River Watershed were adopted in 2009 and 2010. These permits contain broad and specific requirements to implement programs and conduct projects that are consistent with the objectives of the Plan and this Chapter. The requirements for New Development and Significant Redevelopment emphasize the implementation of LID principles. The default requirement is for development projects to be designed and built so that stormwater is infiltrated to the extent feasible. Infiltration of stormwater from these projects should benefit groundwater recharge in areas suitable for recharge. However, the water quality volume to be captured is the runoff from the 24-hour 85th percentile storm event (generally varying from 0.5 – 1.25 inches per 24 hours). This capture volume is small compared to flood protection design storms (10-yr, 50-yr, or 100-yr frequency event) so flood protection infrastructure will likely still be required for the foreseeable future, in spite of LID implementation.

The MS4 Permits also require projects to implement BMPs to maintain the predevelopment hydrograph for the 2-yr 24-hour storm event. Similarly, the control of runoff from this small storm event size will not provide the required flood protection.

However, the MS4 Permits provide several requirements to incentivize the development of watershed-based compliance alternatives to meet MS4 Permit requirements for sites where LID implementation is not feasible. **Table 5.8-4** excerpts the specific requirements from the MS4 Permits. Despite the

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[24] Excerpted and paraphrased from Santa Ana Delhi Channel Diversion Project: Preliminary Design Report. September 2012 Revision.

potential benefits, the MS4 Permit alternative compliance options have been proposed and evaluated to some degree, but have yet to be widely implemented in the SAR Watershed. Note that the successful projects summarized earlier were initiated without specific intent to comply with MS4 Permits, and some component projects predate the MS4 Permits.

Another study that has been proposed by the Inland Empire Utilities Agency[25] will evaluate the feasibility to increase stormwater capture and improve water quality by diverting and recharging up to 100% of the urban dry weather flow, and first-flush wet weather flow from a 303-d listed waterbody segment with a TMDL for pathogens. The project will investigate the feasibility of retrofitting existing recharge basins as part of the regional strategy to augment groundwater resources, and comply with urban stream TMDLs and MS4 permits.

Examples of recent projects that were developed with MS4 Permit compliance in mind include: the New Model Colonies offline treatment wetlands in the Chino Basin (see **Chapter 5.7 Land Use and Water Planning**). These wetlands are being construction downstream and are separate from the development project site. However, it has not been designed or approved as an acceptable alternative BMP for any other development projects to exploit; and the County of Orange is conducting a feasibility study for the creation of a retention credit system using an existing site where a basin has been filled in. This project was submitted for funding under Proposition 84, but was not funded (see project description in **Appendix K**).

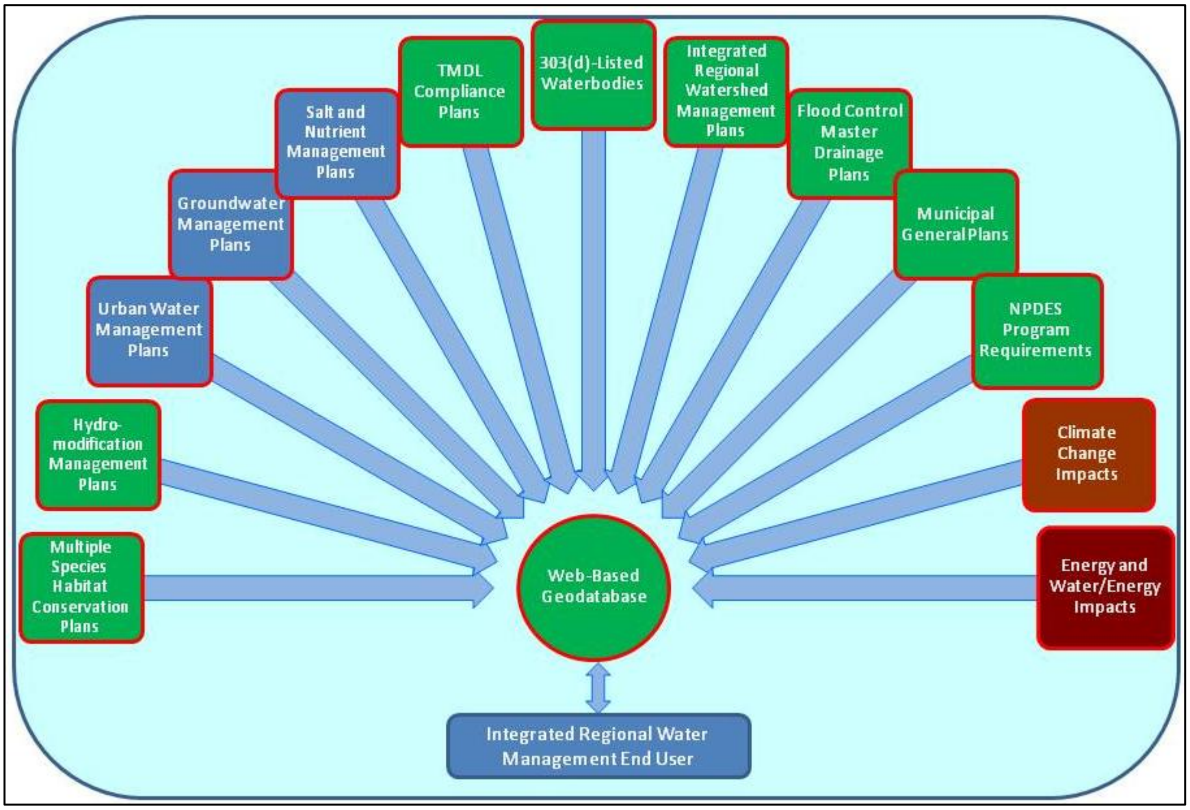
Alternative watershed-or sub-watershed based compliance options include:

- Establishment of an urban runoff fund—development projects could contribute funding that would be pooled with funds from other projects and used to fund water quality projects elsewhere in the watershed.
- Off-site or Regional BMPs—BMPs may be implemented downstream from the project site, or are watershed-based structural BMPs.
- Establish a water quality credit system—certain project types can comply with water quality BMPs requirements through credits produced by alternative environmentally beneficial actions (brownfields, in-fill projects, redevelopment and transit –oriented projects, credit for urban runoff fund contribution, etc.).

[25] Urban Runoff Capture Retrofits at Recharge Sites--Feasibility and Case Study. Inland Empire Utilities Agency, January 2012 Proposition 84 Concept Proposal, PIN 24000.

Map Based Watershed Plans (GIS-based or geodatabase development)

Figure 5.8-4 Web-Enabled Watershed Geodatabase Components (adapted from RCFC&WCD slide)



Planning Tools

The geodatabases described below were designed as a resource for long-term land planning as well as for project siting and design evaluations. The planning aspects are described in the **Chapter 5.7 Land use and Water Planning**. Development of planning tools is recommended to include significant outreach to and participation from Planning Departments and Commissions.

Development tools

San Bernardino County (Watershed Action Plan)

MS4 Permittees (cities and counties) must develop an integrated watershed approach to integrate planning and approvals for water quality and water quantity control measures. The requirements include revising the General Plan and CEQA documents to incorporate the water quality and watershed management principles. The Watershed Action Plan (WAP) is required to "improve integration of water quality, stream protection, storm water management, water conservation and re-use, and flood protection, with land use planning and development processes."

Phase 2 of the WAP requires the development and implementation of a Hydromodification Monitoring Plan, and a Hydromodification Management Plan. It also requires the development of "recommendations for streamlining regulatory approval of Regional Treatment Control BMPs."
In support of the San Bernardino MS4 Permit Watershed Geodatabase and the Watershed Action Plan, SAWPA participated in monthly meetings led by the San Bernardino MS4 Permit staff and other interested agencies from Jan. 2010 through Jan. 2011. Outreach meetings in conformance with watershed linkages to the OWOW process and SAWPA task forces were conducted on Dec. 15, 2010. San Bernardino Flood Control District hired RBF to develop the Watershed Geodatabase and provided demonstrations of the tool periodically throughout its development with input provided by stakeholders. The tool was submitted to the Regional Board as part of the Phase I deliverables under the MS4 Permit in Jan. 2011.

Status: WAP Phase 1 has been submitted and approved, Phase 2 tasks are ongoing.

Riverside County (Watershed Action Plan)
The Permittees must develop a Watershed Action Plan that describes and implements the Permittees' stated approach to coordinated watershed management. The WAP should address watershed scale water quality impacts of urbanization in the Permit Area associated with Urban TMDL WLAs, stream system vulnerability to Hydromodification from Urban Runoff, cumulative impacts of development on vulnerable streams, preservation of Beneficial Uses of streams in the Permit Area, and protection of water resources, including groundwater recharge areas.

Within two years from Permit adoption, the Permittees shall identify existing unarmored or soft-armored stream channels in the Permit Area that are vulnerable to Hydromodification.
Within three years the Permittees must submit the WAP that includes proposed regional approaches to meet urban TMDL WLAs, recommendations for retrofit studies of public facilities to address TMDLs, hydromodification, and LID implementation. They must also describe regional collaborative efforts (e.g. Task Forces) that benefit water quality and how the Permittees should link these to their Urban Runoff Programs.

Further requirements include developing a hydromodification management plan and a schedule to develop a watershed geodatabase available via the World Wide Web, and to provide training regarding implementation of the WAP and associated tools to all appropriate personnel.

In support of the Riverside MS4 Permit Watershed Geodatabase development, SAWPA held a joint meeting of the Stormwater: Resource and Risk Management Pillar and the Land Use and Water Planning Pillar on October 5, 2012. The Riverside County Flood Control and Water Conservation District provided an overview of the Watershed Geodatabase tool purpose and future use. Data for the tool was requested from the audience. SAWPA received a formal request for specific data from the RCFCWD in Sept. 2012 and available data was provided to them in Oct. 2012.

Status: Draft WAP was submitted for review January 29, 2013; the RWQCB provided comments on March 26, 2013; the revised draft WAP is due for submittal by June 24, 2013. RCFCWCD made a formal request for GIS and other data to water districts in their county area in January 2013.

<u>Orange County (Watershed Master Plan)</u>
The Permittees are allowed a compliance approach for mitigating impacts from hydromodification using mapping, modeling and reconnaissance methods. These tools are to be integrated into Watershed Master Plans (WMPs) that are an alternative means to comply with site-by-site implementation of hydromodification BMPs. WMPs are limited in scope by the MS4 Permit to apply only for alternative hydromodification compliance. The WMPs are similar in approach to the WAPs, but less comprehensive.

In the Orange County MS4 permit, though not specifically required, a geodatabase tool has been developed to support the MS4 compliance described as the Watershed Characteristic/ Mapping Tools under the Watershed Infiltration and Hydromodification Management Plan (WIHMP). This work was prepared by PACE Advanced Water Engineering Inc. under contract with the Orange County Watershed and Coastal Resources Division.

Status: The County of Orange is currently developing WIHMPs for the regional drainage areas in the SAR Watershed. The WIHMPs incorporate more comprehensive watershed data.

Since the three county MS4 permits were not approved at the same time, the schedule to implement the tools is staggered with the first efforts in the development of a support tool having occurred in Orange County with approval of their permit on May 22, 2009 and the San Bernardino permit and the Riverside County permit approval in Jan. 29, 2010.

Policy and Procedure Opportunities and Recommendations

- Develop procedures and guidelines to ensure consideration of IRWM goals at project concept, planning, and design stages
- Collaborate with Land Use and Water Planning Pillar on development of geodatabase and other planning tools.
- Create a lead watershed advisory and facilitation group as forum for stakeholder planning and project development
- Preserve floodplain functions through stricter management of development in floodplains. Consider development of Model General Plan Language to implement this priority.
- Where appropriate, FCDs, and all watershed stakeholders, should develop procedures and guidelines to ensure consideration of IRWM goals and watershed protection principles and priorities, consistent with the MS4 Permits, when planning and designing CIP or other projects, and during development or revisions of Master Drainage Plans (MDPs) and planning of projects that implement the MDPs.
- Create a watershed-wide IRWM coordinating advisory group that continues the work of the OWOW Stormwater: Resource and Risk Management Pillar that brings FCDs, groundwater managers, and

other stakeholders together for decision making, partnership formation, and resource allocation to achieve IRWM goals.

- Water Agencies and Flood Control Districts should partner together via site specific agreements and general memorandums of understanding to develop multi-use facilities and optimize existing facilities for flood control, water conservation and water quality purposes. These agencies should work together to develop funding mechanisms to compensate the constituencies of the FCDs for the use of the facilities in re-charge activities, and preserve existing water rights.
- Evaluate impacts of 500 year flood management standard.

Implementation Recommendations

Develop Watershed Geodatabase Tools

Align and connect the San Bernardino, Riverside, and Orange County Watershed Geodatabase tools to create a system-wide or true watershed-wide tool supporting the entire Santa Ana River Watershed, coinciding with the Santa Ana Regional Board jurisdiction. This would enhance development and implementation of system-wide and watershed-wide solutions under the next round of MS4 Permits, due for renewal in 2014 and 2015. Connecting these geodatabase tools would greatly aid the development of an optimization and prioritization plan for the capture and recharge of stormwater, imported water, and low flow urban runoff to enhance water availability and reliability for the future of the watershed. Some additional data layers will be needed, particularly consideration of the impacts of climate change and energy, and energy/water use in watershed evaluations and planning. See integration of multiple watershed inputs in [**Figure 5.8-4.**]Coordinate and host geodatabase for the SAR Watershed (from WAPs and HCOC Maps): compile, coordinate, and provide hosting/access to GIS/geodatabase resources for the entire SAR Watershed. The comprehensive tool would achieve the following:

- Accessible by all stakeholders, with data quality assurance and maintenance program
- Maps developed to support development project conditions and acceptable BMPs
- Infiltration emphasized in MS4s
- Connecting 3 county geodatabase layers will support watershed project concepts, and identify likely project partners
- Includes FCD facility analyses for retrofit opportunities
- Have been and will be reviewed by regulatory agencies
- Set up a data quality control and long-term maintenance program
- Provide user-friendly access to these tools from a single portal
- Geodatabase tools provide preliminary project sites and priorities
- Site lists have been developed by FCDs
- Must prioritize flood protection
- Ideally, must address MS4 Permit compliance
- Ensure full participation of FCDs in early planning and project siting and design
- Costs/benefits need to be spread over FCD constituency
- Identify top three sites for demonstration project

Develop tools for analysis and pre-populated standard form templates related to development projects:

Map layers will include the following (and many others as are relevant):

- Recharge areas
- Preservation areas
- Multi-jurisdictional contacts for project sites
- Water supply areas by agency; imported water dependent sites, imported water infrastructure
- Water sources—groundwater wells, recycling plants, desalters
- Links to on-line climate change models
- Links to energy use and water/energy use data
- Include Regional Transportation Plan data and project concepts and potential partnering on transportation/water resource projects
- Include Utility data and evaluate coordination and cooperation with Utility Company sites and right-of-way

Coordinate/collaborate with EcoAtlas and/or other relevant map or model efforts, such as the DWR Integrated Water and Land Smart Planning Tool [See **Chapter 5.7 Land Use and Water Planning**]

Implementation-Specific Tools

- WQMP Templates
- Regional BMP sites
- Feasibility determinations—e.g. does the site provide more benefit as a regional BMP?
- Pollutants of concern

Identify top three sites for multi-benefit regional BMP demonstration projects, initiate partner relationships, and develop background needed to prepare funding applications:

Riverside County potential project example sites:

- Kansas Basin
- Marlborough Basin
- Columbia Basin
- Arlington Basin Projects (depending on status)

Develop ground water recharge optimization and prioritization

Develop optimization and prioritization plan for existing and potential future flood control facilities for the capture and recharge of stormwater, imported water, and low flows in the SAR Watershed. Use Geodatabases and facility evaluation lists and prioritize top three basins for each County for feasibility study and further work as warranted. Identify pilot/demonstration projects for FCD Basin retrofits in partnership with Water Agencies and other stakeholders.

Considerations to Include:

- Groundwater basin recharge area optimization and prioritization: FCDs collaborate with groundwater management agencies to develop GIS/geodatabase of groundwater basin recharge potential; develop and execute an optimization methodology and prioritize watershed areas for stormwater capture recharge project planning.
- Consider where and how to maximize water supply and minimize waste.
- Existing FCD basin and facility retrofit evaluation and implementation studies (MS4 Permit requirement): Determine stormwater capture and groundwater recharge potential, concomitant with continued flood protection requirements, for FCD facilities throughout the SAR Watershed. Develop list of priorities for implementation, and consult with potential project partners.
- Use existing county or program-specific geodatabases, and/or the recommended comprehensive watershed geodatabase (Recommendation (a), above) that provides access to appropriate stakeholders.
- Develop guidance for development of WQMPs for Flood Control CIPs that recognizes the flexibility in the MS4 Permits and goals of the Plan.

Develop Watershed-Based Tools for Alternative MS4 Stormwater Compliance the Serves Regional Priorities

This project involves creating a Task Force that includes the county FCDs, the water agencies, regulators, environmental NGOs, and interested stakeholders in parallel with demonstration projects and upcoming MS4 Permit renewals. Watershed-based and optimized BMPs also will provide compliance with MS4 Permit compliance where applicable. Alternative compliance approaches (see **Table 5.8-4**) will include:

- Identification of regional water quality and/or infiltration sites for watershed-based compliance
  - Pilot sites for off-site or Regional BMPs—BMPs will typically be implemented downstream from the project site. Identify 3 pilot sites for watershed-wide applicability
- Water quality and/or water quantity credit system, and/or an Urban Runoff Fund
  - Build on Orange County's retention credit pilot project [see **Appendix E**]
  - Development projects contribute funds used for water quality/recharge/habitat projects elsewhere in the watershed.
  - Current MS4 permits list project types which can comply via credits produced by alternative environmentally beneficial actions.
- Assessment of regulatory constraints and flexibility regarding alternative compliance approaches.

Table 5.8-4 Watershed Action Plan, Watershed Master Plan, and Hydromodification Requirements in the Santa Ana River Watershed MS4 Permits.

Watershed Action Plan and Watershed Master Plan Requirements (Excerpted from the San Bernardino County MS4 Permit Section XI.B; similar requirements excerpted from the Riverside County MS4 Section XII.B. The WAPs in the Orange County MS4 Section XVIII are focused on TMDL implementation; relevant OC MS4 requirements for Watershed Master Plans excerpted from Hydromodification Requirements Section XII.D.5)
San Bernardino County MS4 Section XI.B
B. **Watershed Action Plan** 1. The Permittees shall develop an integrated watershed management approach to improve integration of planning and approval processes with water quality and quantity control measures. Management of the water quality and hydrologic impacts of urbanization will be more effective whether managed on a per site, sub-regional or regional basis, if coordinated within the Watershed Action Plan. Pending completion of a Watershed Action Plan, management of the impacts of urbanization shall be accomplished using existing programs. 2. Within twelve months of adoption of this Order, each Permittee shall review the watershed protection principles and policies, specifically addressing urban and stormwater runoff, in its planning procedures, including CEQA preparation, review and approval processes; General Plan and related documents including, but not limited to its Development Standards, Zoning Codes, Conditions of Approval, Development Project Guidance; and WQMP development and approval processes. 3. The Principal Permittee, in collaboration with the Co-Permittees, shall develop a Watershed Action Plan (WAP) that describes and implements the Permittees' approach to coordinated watershed management. The WAP shall improve coordination of existing programs and identify new and/or enhanced program elements as applicable. The objective of the WAP is to improve integration of water quality, stream protection, storm water management, water conservation and re-use, and flood protection, with land use planning and development processes. The WAP shall be developed in two phases:
a. Phase 1: within 12 months of adoption of this Order, the Principal Permittee, in coordination with the Co-Permittees shall: i. Identify program-specific objectives for the WAP; the objectives will include consideration of: 1. The watershed protection principles specified in Section XI.C.3.a - g, below; 2. The Permittee's planning and procedure review required in XI.B.2, above; 3. Potential impediments to implementing watershed protection principles during the planning and development processes, including but not limited to LID principles and management of the impacts of hydromodification; 4. Impaired waters [CWA § 303(d) listed] with and without approved TMDLs, pollutants causing impairment, monitoring programs for these pollutants, control measures, including any BMPs that the Permittees are currently implementing, and any BMPs the Permittees are proposing to implement. In addition, if a TMDL has been developed and an implementation plan is yet to be developed, the WAP shall specify that the responsible Permittees should develop constituent-specific source control measures, conduct additional monitoring and/or cooperate with the development of an implementation plan, where feasible, and consistent with the MEP standard. ii. Develop a structure for the WAP that emphasizes coordination of watershed priorities with the

Permittees' LIPs via the areawide model LIP;

iii. Identify linkages between the WAP and the SWQSTF, MSWMP, WQMP, the implementation of LID, and the TMDL Implementation Plans;

iv. Identify other relevant existing watershed efforts (Chino Basin Master Plan, SAWPA's IRWMP, etc., and their role in the WAP;

v. Ensure that the HCOC Map/Watershed Geodatabase is available to watershed stakeholders via the World Wide Web, and has incorporated the following information:

1. Delineation of existing unarmored or soft-armored drainages in the permitted area that are vulnerable to geomorphological changes due to hydromodification and those channels and streams that are engineered, hardened, and maintained.

2. GIS layers for known sensitive species, protected habitat areas, drainage boundaries, and potential storm water recharge areas and/or reservoirs;

3. 303(d)-listed waterbodies and associated pollutants;

4. Available and relevant regulatory and technical documents accessible via hyperlinks;

b. Phase 2: within 12 months of the approval by the Executive Officer of the Report from Phase 1, above, the Principal Permittee, in coordination with the CoPermittees, shall:

i. Contingent upon consensus with Regional Board staff and other resource agencies as described in XI.B.3.a.vii, above, specify procedures and a schedule to integrate the use of the Watershed Geodatabase into the implementation of the MSWMP, WQMP, and TMDLs;

ii. Develop and implement a Hydromodification Monitoring Plan (HMP) to evaluate hydromodification impacts for the drainage channels deemed most susceptible to degradation. The HMP will Identify sites to be monitored, include an assessment methodology, and required follow-up actions based on monitoring results. Where applicable, monitoring sites may be used to evaluate the effectiveness of BMPs in preventing or reducing impacts from hydromodification.

iii. Develop and implement a Hydromodification Management Plan prioritized based on drainage feature/susceptibilitylrisk assessments and opportunities for restoration.

iv. Conduct training workshops in the use of the Watershed Geodatabase. Each Permittee must ensure that their planning and engineering staffs attend a workshop.

v. Conduct demonstration workshops for the Watershed Geodatabase to be attended by appropriate upper-level managers and directors from each Permittee.

vi. Develop recommendations for streamlining regulatory agency approval of regional treatment control BMPs. The recommendations should include information needed to be submitted to the Regional Board for approval of regional treatment control BMPs. At a minimum, this information should include: BMP location; type and effectiveness in removing pollutants of concern; projects tributary to the regional treatment system; engineering design details; funding sources for construction, operation and maintenance; and parties responsible for monitoring effectiveness, operation and maintenance. The Permittees are encouraged to collaborate and work with other counties to facilitate and coordinate these recommendations.

vii. Implement applicable retrofit or regional treatment recommendations from the evaluation conducted in Section B.3.a.ix, above.

viii. Submit the Phase 2 components in a report to the Executive Officer. The submitted report shall be deemed acceptable to the Regional Board if the Executive Officer raises no written objections within 30 days of submittal.

XI.B.3.a.

ix: Conduct a system-wide evaluation to identify opportunities to retrofit existing storm water conveyance systems, parks, and other recreational areas with water quality protection measures, and

develop recommendations for specific retrofit studies that incorporates opportunities for addressing applicable TMDL implementation plans, hydromodification management, and/or LID implementation within the permitted area. (Orange County Section XIV.10) x. Conduct a system wide evaluation to identify opportunities for joint or coordinated development planning to address stream segments vulnerable to hydromodification and coordinated re-development planning to identify restoration opportunities for hardened and engineered streams and channels. The WAP shall identify contributing jurisdictions and the stream segments that will benefit from this coordination.
XI.B.3.a.xi: Invite participation and comments from resource conservation districts, water and utility agencies, state and federal agencies, non-governmental agencies and other interested parties in the development and use of the Watershed Geodatabase;
Riverside County MS4 Section XII.B.
B. WATERSHED ACTION PLAN
1. An integrated watershed management approach may facilitate integration of planning and project approval processes with water quality and quantity control measures. Management of the impacts of Permit Area urbanization on water quality and stream stability is more effectively done on a per-site, neighborhood and municipal basis based on an overall watershed plan. Pending completion of the Watershed Action Plan consistent with this section, management of the impacts of urbanization shall be accomplished using existing programs. The Permittees shall develop a Watershed Action Plan to address the entire Permit Area. The Permittees may choose to develop sub-watershed action plans based on the overall Watershed Action Plan in the future based on new 303(d) impairments, TMDL requirements, or other factors. 2. The Permittees shall develop and submit to the Executive Officer for approval a Watershed Action Plan that describes and implements the Permittees' approach to coordinated watershed management. The objective of the Watershed Action Plan is to address watershed scale water quality impacts of urbanization in the Permit Area associated with Urban TMDL WLAs, stream system vulnerability to Hydromodification from Urban Runoff, cumulative impacts of development on vulnerable streams, preservation of Beneficial Uses of streams in the Permit Area, and protection of water resources, including groundwater recharge areas.
3. Within three years of Permit adoption, the Co-Permittees shall develop the Watershed Action Plan and implementation tools to address impacts of urbanization in a holistic manner. At a minimum, the Watershed Action Plan shall include the following: a. Describe proposed Regional BMP approaches that will be used to address Urban TMDL WLAs. b. Develop recommendations for specific retrofit studies of MS4, parks and recreational areas that incorporate opportunities for addressing TMDL Implementation Plans, Hydromodification from Urban Runoff and LID implementation. c. Description of regional efforts that benefit water quality (e.g. Western Riverside County Multiple Species Habitat Conservation Plan, TMDL Task Forces, Water Conservation Task Forces, Integrated Regional Watershed Management Plans) and their role in the Watershed Action Plan. The Permittees shall describe how these efforts link to their Urban Runoff Programs and identify any further coordination that should be promoted to address Urban WLA or Hydromodification from Urban Runoff to the MEP.
4. Within two years of adoption of this Order, the Permittees shall delineate existing unarmored or soft-armored stream channels in the Permit Area that are vulnerable to Hydromodification from New Development and Significant Redevelopment projects.
5. Within two years of completion of the delineation in Section XII,B.4 above, develop a

Hydromodification management plan (HMP) describing how the delineation will be used on a per project, sub-watershed, and watershed basis to manage Hydromodification caused by urban runoff. The HMP shall prioritize actions based on drainage feature/susceptibility/risk assessments and opportunities for restoration.

a. The HMP shall identify potential causes of identified stream degradation including a consideration of sediment yield and balance on a watershed or subwatershed basis.

b. Develop and implement a HMP to evaluate Hydromodification impacts for the drainage channels deemed most susceptible to degradation. The HMP will identify sites to be monitored, include an assessment methodology, and required follow-up actions based on monitoring results. Where applicable, monitoring sites may be used to evaluate the effectiveness of BMPs in preventing or reducing impacts from Hydromodification.

6. Identify Impaired Waters [CWA § 303(d) listed] with identified Urban Runoff Pollutant sources causing impairment, existing monitoring programs addressing those Pollutants, any BMPs that the Permittees are currently implementing, and any BMPs the Permittees are proposing to implement consistent with the other requirements of this Order. Upon completion of XII.B.4, develop a schedule to implement an integrated, world-wide-web available, regional geodatabase of the impaired waters [CWA § 303(d) listed], MS4 facilities, critical habitat preserves defined in the Multiple Species Habitat Conservation Plan and stream channels in the Permit Area that are vulnerable to Hydromodification from Urban Runoff.

7. Develop a schedule to maintain the geodatabase required in Section XII.B.4 and other available and relevant regulatory and technical documents associated with the Watershed Action Plan.

8. Within three years of adoption of this Order, the Watershed Action Plan shall be submitted to the Executive Officer for approval and incorporation into the DAMP. Within six months of approval, each Permittee shall implement applicable provisions of the approved revised DAMP and incorporate applicable provisions of the revised DAMP into the LIPs for watershed wide coordination of the Watershed Action Plan.

9. The Permittees shall also incorporate Watershed Action Plan training, as appropriate, including training for upper-level managers and directors into the training programs described in Section XV. The Co-Permittees shall also provide outreach and education to the development community regarding the availability and function of appropriate web-enabled components of the Watershed Action Plan.

10. Invite participation and comments from resource conservation districts, water and utility agencies, state and federal agencies, non-governmental agencies and other interested parties in the development and use of the Watershed Geodatabase;

Orange County MS4 Section XII.D.

Section XII.D.5 provides a compliance approach for mitigating impacts from hydromodification using mapping and reconnaissance methods.

5. The permittees shall address the hydrologic conditions of concern on a watershed basis by preparing a Watershed Master Plan as described below:

The Watershed Master Plans shall integrate water quality, hydromodification, water supply, and habitat for the following watersheds: Coyote Creek-San Gabriel River; Anaheim Bay-Huntington Harbour; Santa Ana River; and Newport Bay-Newport Coast. Components of the Plan shall include: (1) maps to identify areas susceptible to hydromodification including downstream erosion, impacts on physical structure, impacts on riparian and aquatic habitats and areas where storm water and urban runoff infiltration is possible and appropriate; and, (2) a hydromodification model to make available as a tool to enable proponents of land development projects to readily select storm water preventive and mitigative site BMP measures.

The maps and a model Plan for one watershed shall be prepared by May 22, 2011. The model Plan should specify hydromodification management standards for each sub-watershed and provide assessment tools. In the preparation of the model Plan, the permittees are encouraged to use currently available information from other sources such as: (1) Orange County Flood Control Master Plan; (2) Irvine Ranch Water District's Natural Treatment System Master Plan; (3) Orange County Watershed Plans; (4) Nutrient and Selenium Management Program; (5) TMDL and 303(d) Listing information from the U.S. EPA and/or the Regional Board, and (6) and water districts.
The model Watershed Master Plan shall be submitted to the Executive Officer for approval. Watershed Master Plans shall be completed for all watersheds 24 months after approval of the model Watershed Master Plan.
The Watershed Master Plans shall be designed to meet applicable water quality standards and the Federal Clean Water Act.

Possible Approaches and Products of the Task Force:

- Develop approaches for streamlined regulatory approval of off-site, regional BMPs, or other alternative compliance options.
    - Develop a draft Regional Board Resolution regarding alternative compliance options
- Develop a model administration program for a water quality/quantity credit system
- Clarify MS4 permit language, applicable to permit renewals coming up
- Identify lead agency (involve Southern California Monitoring Coalition)
- Develop model for mechanism to initiate and manage a Regional Urban Runoff Management Fund in a pilot area of the watershed.

Development Process and Watershed Planning Coordination Group

To support important coordination and collaboration among the development and planners, it is recommended that the OWOW Steering Committee, supported by SAWPA staff, serve as the lead organization to ensure coordination of project partners (e.g. Chino Basin Groundwater Recharge Coordinating Committee) tasked with coordinating and persuading through coordinated meetings to cooperatively discuss mission and goals of the agencies, resources available among agencies, understand economic and technical constraints, and discuss opportunities for cooperative efforts to promote watershed sustainability priorities. The OWOW Steering Committee is uniquely situated to perform this function with representation on the Committee by cities, counties, environment, Regional Board and sustainable land development interests.

- Needs to transcend Proposition 84 or other funding decisions
- Should include the Regional Board
- Evaluates project ideas using the geodatabase
- Recommends necessary elements of training programs

Specific Agency/Committee Tasks:

- Develop a process to link project development processes for various watershed stakeholders with each other, and align project plans and designs with watershed sustainability priorities
- Develop an approach to coordinate agencies' processes for project planning and design
    - Increased flood control system and management capacity and reliability
    - Projects and efforts that attenuate peak storm flows resulting from urbanization
    - Projects and efforts that increase recharge of stormwater
    - Projects that allow the region to meet nonpoint pollution control goals
    - Projects and efforts for groundwater clean-up by infiltrating high quality water into the groundwater basins
    - Improved habitat and facility maintainability.
- Proposed Participants:
    - US Army Corps of Engineers
    - Santa Ana Regional Water Quality Control Board
    - San Bernardino County Public Facilities and Flood Control District
    - Riverside County Flood Control and Water Conservation District
    - Orange County Flood Control District, OC Public Works
    - Eastern Municipal Water District
    - Inland Empire Utilities Agency
    - Orange County Water District
    - San Bernardino Valley Municipal Water District
    - Western Municipal Water District
    - Chino Basin Watermaster
    - San Bernardino Valley Water Conservation District
    - Santa Ana Watershed Project Authority
    - Cucamonga Valley Water District
    - Other parties of interest and affected agencies
- Outline project development and implementation processes of watershed stakeholders
- Identify decision/influence points in each process
    - Determine approach to incorporate watershed optimization priorities into project concepts and designs
    - Develop mechanisms or procedures to ensure watershed priorities are adequately incorporated or considered
- Identify and coordinate with regulatory project permitting processes
    a. Watershed optimization priorities inform permit processes and qualifiers
    b. Evaluate the role of CEQA

Conduct further study of the 500-year flood impacts

Develop recommendations regarding appropriate changes to local policies based on the 500-year storm frequency standard for flood protection.

List of Contributors

Contributors to the OWOW 2.0 Stormwater: Resource and Risk Management Pillar Chapter include:

Matt Yeager	Yeager Environmental Associates
Mary Ann Skorpanich	Orange County Public Works
Stuart McKibben	Riverside County Flood Control and Water Conservation District
Kevin Blakeslee	San Bernardino County Flood Control District
Marc Rodabaugh	San Bernardino County Flood Control District
Marsha Westropp	Orange County Water District
Daniel Kopulsky	Caltrans
Larry McKenney	SAWPA
Rick Whetsel	SAWPA

5.9 Natural Resources Stewardship

Introduction

The Santa Ana River Watershed historically contained an abundance of natural resources, including water captured from snowmelt in the local mountains, diverse wildlife populations, abundant aquatic life in streams and coastal waters, geological resources for building materials, and a wide range of plant communities from coastal sage, to wetlands, to evergreen forests. These assets were first utilized by Native Americans and then by European settlers, who began to change the land use in the watershed with irrigation and farming.

Over the past 200 years, human population has increased greatly in the Santa Ana River Watershed. Since the 1930s, controlling floods and providing a reliable water supply have taken precedence over other critical watershed issues. These priorities have changed the natural hydrology of the Santa Ana Watershed, diminishing the once abundant natural water resources in the region. This strain on water resources and associated urbanization has left only remnants of isolated habitat in highly populated areas. Other factors including invasive plant species, frequent local fires and rogue recreational uses also have contributed to a reduction or complete loss of available habitat in some areas.

The natural resources and habitat in the Santa Ana River Watershed are now a fraction of their historical values. Therefore, efforts must be made to sustain and conserve the remaining resources for the benefit of future generations of life in the ecosystems of the watershed, and even expand them where possible. The purpose of this chapter is to detail the current status of these natural resources, including their benefits as both habitat and recreational assets, and to identify opportunities to promote and implement sustainability followed by recommendations for solutions that maintain ecological balance and economic health.

Resources of the Santa Ana River

Surface Water

Water is the key life-sustaining resource within the Santa Ana River Watershed. The river begins high in the San Bernardino Mountains, where it flows westward for approximately 18 miles and then picks up additional flows from Bear Creek, a major tributary. The river then runs southward and meets up with Seven Oaks Dam, which provides capacity for flood control and also serves as a reservoir, with a total capacity of 145,600 acre-feet. The released flows from the Seven Oaks Dam continue westward with additional flows into the river contributed by Mill Creek, City Creek, San Timoteo Creek, Warm Creek, Twin Creek, Cajon Creek, and Lytle Creek before reaching the reservoir at Prado Dam. The Prado Basin also is fed by Chino Creek and another stream named Mill Creek, and occasionally by Temescal Creek in wetter years.

Water released from Prado Dam continues westward into Orange County, where the river then is diverted into spreading grounds for groundwater recharge in the north Orange County aquifer. Any remaining flows are confined to concrete channels between earthen levees, and additional flows are received from Santiago Creek, located near the city of Anaheim. The flows continue in a concrete flood control channel until crossing Interstate 5 near the city of Santa Ana, where the river again flows through a soft-bottom channel before reaching its mouth between Huntington Beach and Newport Beach.

Much of the river's historical flows have been diverted for local use along its path. The majority of water that currently flows in the Santa Ana River during the non-rainy season now comes from effluent from wastewater treatment plants.

The Santa Ana River Watershed has one natural and several manmade lakes that retain water for use as drinking water, irrigation, recreation, and habitat for aquatic species. Big Bear Lake is manmade and resulted from the construction of a dam along Bear Creek to hold back the runoff and snowmelt for the purpose of providing a reliable source of irrigation water for citrus growers near Redlands. Recreational boating and fishing are also beneficial uses of Big Bear Lake. Lake Perris, located in the eastern side of the Santa Ana River Watershed, is also manmade. Completed in 1973, Lake Perris is the terminus of the State Water Project and is used as a recreational amenity for the region. Lake Mathews, also manmade, is located in the foothills of the Santa Ana Mountains and functions strictly as a drinking water reservoir. It is the terminus of the Colorado River Aqueduct.

Lake Elsinore is a natural lake that offers recreational boating and fishing. In recent years, the lake has been replenished with recycled water. Mystic Lake, in the San Jacinto Basin, is an ephemeral lake that appears in wetter years, receiving waters from overflows from the San Jacinto River.

Minerals

The geological composition in the Santa Ana Watershed has developed over a long period of time by the forces of natural seismic events and climate changes that affected the course and volume of the Santa Ana River. As flows from tributaries carried and deposited sediment along its varied alignments, areas referred to as alluvial fans were created. Most of the watershed from the base of the San Bernardino Mountains and north of the Santa Ana River are comprised of marine and non-marine sedimentary rocks. On the south, in the area of the Cleveland National Forest, shale, sandstone, limestone and slate dominate the geology. The San Bernardino Mountains' geology consists largely of a composite of Precambrian igneous and metamorphic rocks and Mesozoic granite.

The greatest mineral economic resource in the region is in aggregate, which can be in the form of natural sand and gravel, or produced by crushing rock. It is valued for its many uses in construction such as in Portland cement concrete, asphaltic concrete, road base, railroad ballast, and rip-rap. The California Geological Survey estimates that current permitted mining for this resource in the Santa Ana River Watershed region will meet only 25 percent of the estimated local demand. Importing this resource from other than local sources will result in higher project costs for all types of construction and have negative environmental impacts. Mining, however, also has been associated with negative environmental impacts including noise, dust, and habitat destruction. Mitigation of these impacts results in a lengthy process of five to ten years to acquire permits, which has greatly reduced the amount of aggregate mined in the region despite its abundance.

Vegetation in Habitat Areas

Habitat classifications can be very complex, and while complex information is available for interested parties, this document will refer to several generalized groups, including alluvial fan, riparian, wetland, coastal, chaparral, and forested habitats.

Alluvial fans are located where stream flows that originate in mountainous areas flatten and spread out. Fan-shaped deposits of sand and gravel sediment, brought down from higher elevations, are left in the wake of storm and flood events, building up over time. They also can be found in desert areas that are prone to flash floods. Alluvial fan areas create a unique habitat in the Santa Ana River Watershed, but most significantly, they are home to both endangered and threatened plants and animals. They also are in areas where historical groundwater recharge has occurred, increasing the importance for conservation of alluvial fan areas.

Riparian habitats are those areas that transition between land and rivers or streams, and sometimes are referred to as buffer zones. These riparian zones provide valuable wildlife habitat and serve as wildlife corridors, allowing for increased biodiversity by enabling wildlife, including aquatic life, to move freely along river systems. Keeping this connectivity intact is vital in avoiding development of isolated communities.

According to the Clean Water Act, wetlands are defined as: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands serve as vital habitats for a wide range of birds and aquatic creatures. Coastal habitats consist of a combination of beaches and intertidal wetlands, which meet the definition of wetlands above.

Chaparral is comprised of hard-leafed evergreen shrubs that grow two to four meters tall with deep roots. An understory layer rarely exists. Chaparral habitat occurs in different types of terrain including plains, rocky hills, and mountain slopes. Forested habitats exist mainly in the higher elevations of the watershed.

Wildlife

Birds

Riparian ecosystems harbor the highest number of bird species in the watershed. Riparian habitat provides productive breeding grounds and offers vital over-wintering and migration stop-over areas for migrating birds. Loss and degradation of riparian habitat have negatively impacted bird populations throughout the watershed. Other factors affecting bird populations are brood parasitism by the brown-headed cowbird, and disruption of natural hydrological regimes from dams and levees.

The federally endangered least Bell's vireo has experienced recent population growth within the watershed due to aggressive management activities that started within Prado Basin and spread to other riparian areas throughout the watershed. In 1986 there were only 16 pairs of vireos reported breeding in the Prado Basin. With the management and restoration provided by the Santa Ana Watershed Association (SAWA) and its constituent agencies, there were more than 1,200 vireo territories throughout the Santa Ana River Watershed in 2012.

This stunning recovery is due to the provision of a high quality habitat for the bird species, in part, due to invasive species removal, a project in place to control populations of the predatory cowbird, and other efforts on the part of the U.S. Fish and Wildlife Service (USFWS), Orange County Water District (OCWD), several resource conservation districts (RCDs), and SAWA. The Coastal California Gnatcatcher (*Polioptila californica*) is a focal species under California's Natural Communities Conservation Planning (NCCP) program and is listed as a Species of Special Concern in California. The USFWS listed it as threatened in 1993. Critical Habitat for the species was designated in 2000, but court-ordered review of the economic effects of this designation is under way. *(Mock 2004)*

Both the least Bell's vireo and the federally endangered southwestern willow flycatcher are affected by cowbird brood parasitism. The implementation of cowbird management programs, in addition to preservation and restoration of riparian deciduous shrub habitat are needed to reduce current populations. The bald eagle, listed by the USFWS as endangered in 1978, has experienced population growth over the past two decades. The bald eagle could be considered a USFWS success story: reclassified as "threatened" in 1995 and first proposed for delisting in 2000. Delisting of a species is the USFWS's ultimate goal and only happens when specific recovery goals have been met for a species. Unfortunately, delisting is an infrequent occurrence. In the case of the bald eagle, delisting has been delayed while the USFWS determines how the species would be managed once it is no longer classified as threatened.

Aquatic Life

Fishes

The Santa Ana River and its tributaries historically provided habitat for eight species of native fish (species have multiple forms). Only four native non-game freshwater fishes currently are found in non-estuarine waters: arroyo chub, Santa Ana speckled dace, Santa Ana sucker, and threespine stickleback. All of these remaining fishes have limited distributions and face possible extirpation.

As previously mentioned, the Santa Ana sucker is listed by the federal government as a “threatened” species pursuant to the Endangered Species Act. Currently, the western brook lamprey is known to be extirpated from the watershed. The Pacific lamprey has been observed once in the past 47 years and it likely is extirpated as well. Introduced forms of the rainbow trout have been extensively stocked in the watershed for sport fishing for over 100 years, and it is unknown if any genetically pure rainbow trout stocks endemic to the watershed remain. The partially armored threespine stickleback was widely planted in the watershed for mosquito control in the early 1900s and now is found out of its natural historical range, e.g., Big Bear Lake. There are three current known occurrences of threespine stickleback: in Shay Pond, Juniper Springs Pond, and Sugarloaf Meadow Pond. During high water conditions, Shay Creek and Baldwin Lake also are occupied. Historically, they extended up Caribou Creek (Van Dusen Canyon), but water diversions and re-routing of drainages currently have made that unlikely. Juniper Springs drains to Arrastre Creek, which drains to the Mojave Desert. Shay Pond and Shay Creek drain to Baldwin Lake. Baldwin is considered a mountain playa lake and historically didn’t have an outlet. The connection to Big Bear Lake is an artificial man-made connection for flood control purposes, so now Baldwin Lake will drain to Big Bear Lake in an extreme flood event.

In contrast, at least 33 fishes have been introduced into the watershed and currently are present. New species can be expected to be found at any time due to inter-basin water transfers, ship ballast water hitchhikers, bait bucket introductions, and hobbyists disposing of unwanted fishes. Many of the introduced fishes are widespread, while a few are restricted to specific locations or habitats. Of the current inventory of introduced fishes, most were introduced by government agencies to serve as a food resource, for insect control, for sport fishing, or to serve as forage for sport fishes. A smaller number of fish have become established after arriving inadvertently via inter-basin water transfers or in ships’ ballast water. For a detailed discussion of the introduction of fishes to California, the reader is directed to Dill and Cordone (1997). Additional information about introductions of fishes to Southern California is presented by Swift *et al*. (1993). Supplemental records can be found in Moyle (2002).

Oncorhynchus mykiss is one of six Pacific salmon in the genus *Oncorhynchus* that are native to the North American coast. O*. mykiss*, along with other species of Pacific salmon exhibit an anadromous life history, which means that juveniles of the species undergo a change that allows them to migrate from freshwater to mature in salt water before returning to their natal rivers or streams (*i.e.,* streams where they were spawned) to reproduce.

Historically, these fish were the only abundant salmonid species that occurred naturally within the coast ranges of Southern California. Steelhead entered the rivers and streams draining the Coast Ranges from Point Sal to the U.S. Mexican Border during the winter and spring, when storms produced sufficient runoff to breach the sandbars at the rivers' mouths, and provided fish passage to upstream spawning and rearing habitats. These fish and their progeny were sought out by recreational anglers during the winter, spring and summer fishing seasons.

Steelhead are a highly migratory species. Adult steelhead spawn in coastal watersheds; their progeny rear in freshwater or estuarine habitats prior to migrating to the sea. Within this basic life history pattern, the species exhibits a greater variation in the time and location spent at each life history stage than other Pacific salmon within the genus *Oncorhynchus.*

The life cycle of steelhead generally involves rearing in freshwater for one to three years before migrating to the ocean, and spending from one to four years maturing in the marine environment before returning to spawn in freshwater. Adult steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more times. It is rare for steelhead to spawn more than twice before dying, and most that do so are females.

This species may also display a non-anadromous life history pattern (*i.e.*, a "freshwater-resident" strategy); non-anadromous individuals that complete their entire life history cycle (incubating, hatching, rearing, maturing, reproducing, and dying) in freshwater commonly are referred to as rainbow trout. However, this terminology does not capture the complexity of the life history cycles exhibited by native *O. mykiss*. "Rainbow trout", which have completed their life history cycle entirely in freshwater, sometimes produce progeny that become anadromous and emigrate to the ocean and return as adults to spawn in freshwater. Conversely, it has also been shown that steelhead may produce progeny that complete their entire life cycle in freshwater.

There is a third type of life history strategy displayed by *O. mykiss* fish that is referred to as "lagoonanadromous", which may spend a majority of the freshwater phase of their life moving back and forth between the estuary or lagoon at a river's mouth and upstream freshwater habitats before emigrating to the ocean. Steelhead populations in Southern California have not been investigated to determine whether or to what extent they may exhibit this life history strategy; however, steelhead smolts have been documented rearing in Southern California estuaries.

Within each of the three basic life history strategies (fluvial-anadromous, freshwater-resident, and lagoon-anadromous), there is additional variation, including examples of finer-scale habitat switching, such as multiple movements between lagoon and freshwater habitats in the course of a single summer in response to fluctuating habitat conditions; and also so-called "adfluvial" populations that inhabit freshwater reservoirs but spawn in tributary creeks.

Closely related to these various life history strategies is the use by steelhead of a wide variety of habitats over their lifespan, including river mainstems, small montane tributaries, estuaries, and the ocean. Steelhead move between these habitats because each habitat supports only certain aspects of what the fish require to complete their life cycle. Different populations frequently differ in the details of the times and habitats that they utilize while pursuing the general pattern of the anadromous life cycle. These differences can reflect the evolutionary response of populations to environmental opportunities, subject to a variety of biological constraints that are also a product of evolution.

See the National Marine Fisheries Services Southern California Steelhead Recovery Plan (2012) for more details, and supporting references, particularly Chapter 1 "Introduction", and Chapter 2 "Steelhead Biology and Ecology".

For the other native fish species, see C. C. Swift, T. R. Haglund, M. Ruiz, and R. N. Fisher "The Status and Distribution of Freshwater Fishes of Southern California" (1993).

The decline of indigenous steelhead/rainbow trout (*Oncorhynchus mykiss*) populations in the Santa Ana River watershed is the result of a multitude of anthropogenic activities that have degraded riverine and estuarine habitats, and fragmented riverine habitats through the construction of instream barriers such as dams, diversions, road-crossing, and flood control structures. The threats analysis conducted by NMFS as part of the recovery planning for the Southern California steelhead populations, identified "Dams and Surface Water Diversions", "Flood Control", "Groundwater Extraction", "Levees and Channelization", and "Urban Development" as the highest threats to the native trout/steelhead populations in the Santa Ana River Watershed.

Over-exploitation of rainbow trout/steelhead by recreational angling was not identified as a principal factor for the decline of this species in the Santa Ana River, or in Southern California generally. Stocking of *O. mykiss* to supplement an existing native freshwater recreational fishery was initiated and subsequently increased over the years in response to a variety of factors, including human population growth, increased accessibility to angling areas, expansion of leisure time, and to support expanding outdoor recreational activities as an important component in a developing tourist industry. The reported catches of large number of trout by anglers in local media (*e.g.,* the July 17, 1982 report in the *Citrograph*, a Redlands newspaper, of three individuals taking 592 trout in three hours from Bear Creek, a tributary to the Santa Ana River in San Bernardino County) provide an indication of the natural productivity of the native fishery of the watershed.

The California Legislature began regulating recreational angling (along with other forms of angling) in 1861, when the Southern California human population was a small fraction of its current levels. The increasing restrictions on recreational angling were prompted by the increasing human pressures on the indigenous fishery resources, but were not intended to address the underlying cause of the decline of the populations, nor to safeguard native fish populations or maintain natural ecosystem functions. While both the anadromous form and the freshwater resident forms of *O. mykiss* now have been reduced to critically low levels, residualized populations persist in the headwater tributaries above and below impassible barriers, and the lower reaches remain accessible to the anadromous form when hydrologic conditions permit upstream migration from the ocean.

In February 2012, the City of Riverside, showing community support for steelhead restoration, adopted Resolution 22351, "A Resolution of the City Council …Supporting Restoration Efforts for the Southern California Steelhead in the Santa Ana River." This resolution supports recommendations for restoring the Santa Ana River steelhead population through mitigation actions identified in the U.S. National Marine Fisheries Service Southern California Steelhead Recover Plan.

See the National Marine Fisheries Services Southern California Steelhead Recovery Plan (2012) for more details, and supporting references, particularly Chapter 2 “Steelhead Biology and Ecology”, and Chapter 12 “Mojave Rim Biogeographic Population Group”.

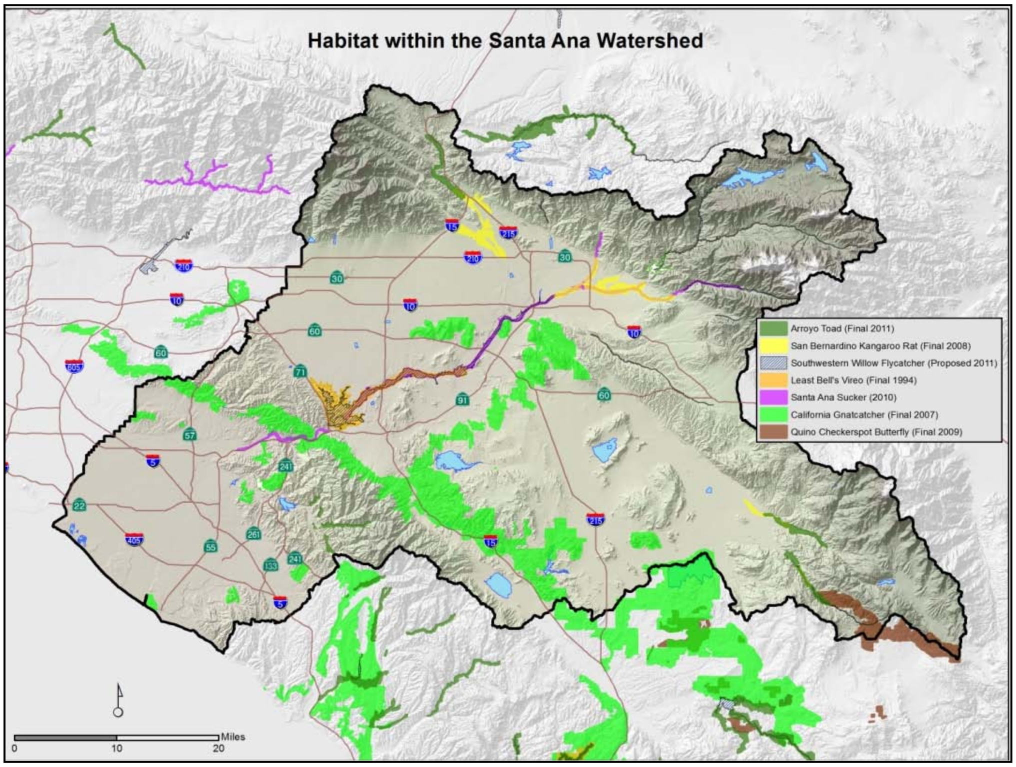
Amphibians

During the past 50 years, population growth and urban development in Southern California have displaced many amphibian species, and encroached upon much of the former amphibian habitat. These include the federally listed endangered arroyo toad (*Bufo californicus*) and mountain yellow-legged frog, (Rana muscosa), and the federally-listed threatened California red-legged frog (Rana aurora draytonii). Several species are thought to be extinct, and many others have fragmented populations that are at risk of extirpation. Amphibians are especially sensitive to environmental changes that alter the hydrology, ecology, and geology of a region because they have evolved, highly specialized adaptations that have allowed them to exist in these relatively arid regions. Introduced species also have been a major contributor to the decline in amphibian populations in Southern California. These non-native species increase competition for food sources, as well as prey upon many of the native amphibians.

Reptiles

The California Department of Fish and Wildlife (CDFW) considers the Southwestern pond turtle (*Clemmys marmorata*) a species of “special concern”. Recent reports on *C. marmorata* in Southern California indicate that a few viable populations remain in the regions (see also Brattstrom 1988). Approximately six to eight viable populations of the turtle remain south of the Santa Clara River system in California. Droughts have exacerbated the negative effects of habitat alteration accumulated over many years in much of this region from changes in land and water use, and abusive grazing practices. In particular, most western pond turtle populations examined in this region appear to show an age structure increasingly biased toward adults, indicating little or no recruitment is taking place. Recent surveys indicate that the southwestern pond turtle also is seriously threatened throughout most of its range outside of California.

Figure 5.9-1 Map of Critical Habitat within the Santa Ana River Watershed



Current Status of Resources

Water Quality and Quantity

Water quality in the mountain portion of the watershed is good overall, with low concentrations of total dissolved solids, nitrates, and other pollutants. Although elevated levels of total coliform and silt have been identified with storm flows, water quality exceeds the State standards set for the identified beneficial uses of the water. The water quality generally decreases, and turbidity increases with distance from the mountains. Multiple water reuse becomes a more dominant factor. The river courses through a large dairy preserve. Treated municipal wastewater is discharged into the river at many points between Riverside and the Prado Basin.

Fortunately, water quality in the SAR 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. While fish kills that are due to the spill of toxic substances into streams are dramatic examples of the effects of pollution, these instances are acute, or short-term, rather than chronic. More insidious, however, are the chronic effects on aquatic resources of non-lethal forms of pollution that decrease growth, inhibit reproduction, or impair movement. Chronic elevated water temperatures or 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 (DO). Because most of the remaining native freshwater fishes live, at

some time, in treated wastewater, the issue of chronic, low-level pollution is of great concern, although the quality of wastewater has increased markedly in past years.
The base flow of the Santa Ana River continues to increase because of continuing urbanization. A minimum base flow of 42,000 acre-feet per year was adjudicated in 1969 as a result of litigation between OCWD and Chino. This flow rate is measured at Prado Dam and was based upon historical averages. However, rapid urbanization has resulted in increasing discharges of high-quality tertiary treated water from the many treatment plants located along the river. In 1999, the base flow had increased to 140,000 acre-feet and was once projected to rise to 230,000 acre-feet by 2020. However, increasing conservation measures and re-use, along with development standards that require water to be retained on site, put the future base flow of the river in question. Decreases in flow would result in diminishing supplies of water to maintain habitat restoration, especially along the river mainstem and its tributaries.

The flow through the alluvial scrub is seasonal. Between the cities of San Bernardino and Riverside, the river picks up enough urban discharge to support perennial flow and productive riparian habitat dominated by willows. The quality of the fish habitat also increases greatly and there are recent records for the occurrence of native fishes including the federally listed, threatened Santa Ana River sucker (*Catostomus santaanae*). The other native species recorded from several, scattered localities are the arroyo chub (*Gila orcutti*) and more rarely, the speckled dace (*Rhinichthys osculus*). Fish habitat will be particularly affected if flows are reduced because of less runoff and less water being discharged from treatment facilities.

Spotty Conservation Areas

Without a comprehensive, regional plan for water-oriented habitat conservation, independent efforts by various planners, regulators, and landowners can lead to fragmented habitat areas and fragmented management of those areas. In addition, a parcel-by-parcel, or piecemeal planning approach can lead to inconsistent, inequitable regulation of land development and unnecessary costs and delays. Broader planning and management approaches would benefit both the environment and development.

In general, the larger a habitat area, the healthier it is, with ample breeding, feeding and shelter opportunities for its inhabitants. Fragmented, small habitat areas can pose a threat to species diversity and the overall health of ecosystems.

Habitat fragmentation frequently is caused when native vegetation is cleared for activities such as agriculture or urbanization. Habitats, which were once continuous, become divided into separate fragments or islands. When habitat is fragmented, plants and animals lose their protective buffers around the fringes and access to each other, food, and water. Eventually the fragments become unable to support their natural diversity and species disappear.

The Army Corps of Engineers promotes a watershed approach to placement of compensatory mitigation in implementing its 2008 Mitigation Rule. The following is its definition of that approach: “Watershed Approach means an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and location of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resources when determining compensatory mitigation requirements for Corps permits."

However, compensatory mitigation and its restrictions can result in fragmented management, especially when mitigation providers are required by regulatory agencies to assign long-term real estate instruments, conservation easements, or other restrictive covenants to land before funding for compensatory mitigation can be directed to the mitigation provider. In many areas of the Santa Ana Watershed where habitat has been significantly degraded, especially along the mainstem where most of the invasive plants thrive, providing long-term protection through such instruments is not feasible. Much of this land is owned by cities, counties, flood control districts, water districts, park districts and by the Army Corps itself. These entities historically have not been willing to grant easements or other restrictive covenants to third parties, such as non-profit environmental organizations and resource conservation districts.

Fragmented management refers to piecemeal approaches to conservation and restoration of water-oriented habitat. When management is approached in a collective, comprehensive manner, overall costs can be reduced, funding can be pooled, and wasteful or harmful practices can be minimized or eliminated. When management is fragmented, there is a potential for duplication of effort, conflicting practices, and excessive costs.

Special Status Species

Second only to Hawaii, the State of California is home to the highest number of endangered species in the United States. As defined within the Federal Endangered Species Act of 1973, an endangered species is any animal or plant listed by regulation as being in danger of extinction throughout all or a significant portion of its geographical range. A threatened species is any animal or plant that is likely to become endangered within the foreseeable future throughout all or a significant portion of its geographical range. Federal law prohibits the "take" of any individuals or habitat of federally-listed species without a special permit.

In addition to Federal laws, the State of California has its own California Endangered Species Act, with a separate listing of species and separate laws governing take of listed species. Enforcement of the Federal Endangered Species Act is administered by the USFWS and the National Marine Fisheries Service, while the CDFW enforces the California Endangered Species Act. Refer to **Figure 5.9-1** above for a map of critical habitat within the watershed.

The varied geography and natural features of the watershed provide habitat for a number of Federal and/or State-listed species. As the Santa Ana Integrated Regional Watershed Plan focuses on the resources in and around the Santa Ana River, listed species of concern herein are those that occupy aquatic, wetland, riparian, or riparian-adjacent areas. Of these, two are plants – the Santa Ana River woolly star (*Eriastrum densifolium*) and the slender-horned spine flower (*Dodecahema leptoceras*); one fish – the Santa Ana River sucker (*Catostomus santaanae*); three amphibians – the arroyo toad (*Bufo californicus*), Mountain Yellow-legged frog, (Rana muscosa), and the California red-legged frog (Rana aurora draytonii); three birds – the least Bell's vireo (*Vireo bellii pusillus*), the southwestern willow flycatcher (*Empidonax traillii*), and the bald eagle (*Haliaeetus leucocephalus*); two mammals – the San Bernardino kangaroo rat (*Dipodomys merriami parvus*) and Stephen's kangaroo rat (*Dipodomys panamintinus*); one insect – the Delhi Sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*) and one invertebrate - Riverside Fairy shrimp, (Streptocephalus woottoni). Reaches 4 and 5 of the Santa Ana River are federally-designated critical habitat for the Santa Ana sucker. Reach 5 also is federally-designated critical habitat for the San Bernardino kangaroo rat. Any project or policy recommended by the Santa Ana Integrated Watershed Plan will need to assess potential impacts to listed species, and incorporate measures to avoid impacts to these species.

Coastal Conditions

Essential Fish Habitat areas exist in the coastal waters off Orange County. The Magnusen Stevens Act defines Essential Fish Habitat as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." To clarify this definition, "waters" is defined as aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish. Substrate means "sediment, hard bottom, structures underlying the waters, and associated biological communities"; necessary means "the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem"; and spawning, breeding, feeding, or growth to maturity covers the full life cycle of a species.

An additional coastal resource is in the form of sea-grasses, including eelgrass. They have great economic benefits by providing habitat, nursery grounds, and refuge that is essential for the continued replenishment of fish, a vital economic resource in the form of food. The economic value of sea-grass also is seen in its ability to filter nutrients such as phosphates and nitrates that come from fertilizers used in gardens and lawns. According to a recent study, a value in the form of global nutrient cycling by the world's sea-grasses is an estimated $1.9 trillion per year. (Waycott 2009) Documented decline in the amount of sea-grass areas globally has made their preservation a priority. Sea-grasses are now federally-protected under the Clean Water Act.

Marine habitat, in the form of eelgrass habitat, also is affected by human activity because of its location in the shallow sub-tidal zones of coastal areas. Coastal development, boating, aquaculture and fishing, and urban runoff are all contributing factors that have the potential for causing damage due to pollution. The health of this habitat is important as nursery grounds and refuge from predation for many species of fish and invertebrates including juvenile halibut, lobster, sharks, scallops, and oysters. It also provides protective shade to prevent overheating, and there are many species that actually lay eggs on the blades for protection until they hatch. Eelgrass is also a food source to both aquatic and waterfowl species.

Agriculture and Dairies: Water Quality Protection

Regulatory agencies in the watershed have taken a number of regulatory actions to address water quality impacts related to agricultural and dairy practices in the region, including impacts to both surface

water and groundwater due to runoff from manure in dairy farm corrals, spreading of manure for fertilizer in agricultural fields, and use of pesticides.
In 2007, the Santa Ana Regional Water Quality Control Board (RWQCB) issued R8-2007-0001 (NPDES No. CAG018001): General Waste Discharge Requirements for Concentrated Animal Feeding Operations (Dairies and Related Facilities) within the Santa Ana Region (Santa Ana RWQCB, 2007), prohibiting all dairies in the watershed 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 directed dairies in the San Jacinto Watershed to collaborate with Eastern Municipal Water District's Salinity Management Program.

The Riverside County Ordinance 427.2 passed by the Riverside Board of Supervisors in 2001, regulates safe transportation and application of manure in certain county districts by requiring operators and/or landowners to report manure application. The purpose of the ordinance is to minimize impacts to neighboring properties, local waterways, underground water supplies, and soil resources.

The San Jacinto Basin Resource Conservation District (SJBRCD) and the Western Riverside County Agriculture Coalition (WRCAC) developed a multi-phased process for establishing and running a Manure Manifest System (MMS). The MMS addresses nutrient and salt loadings by specifying that manure be applied to land at rates consistent with cropping practices and groundwater conditions. This will prohibit over-application at sites where potential impacts to groundwater basins are a concern.

Santa Ana Watershed Agricultural Report

The objective of this report is to provide an overview of agriculture in the Santa Ana Watershed. This report includes information on types of commodities produced in the watershed, value of these commodities, information on whether agriculture is shrinking, percentage of irrigated land and percentage of region covered by Confined Animal Feeding Operations (CAFO). The focus of this report is especially on regions in San Bernardino, Riverside, and Orange County, which is a part of the Santa Ana Watershed. One of the other objectives of this report also is to shed some light on the impacts of agricultural pattern or CAFO in the Santa Ana Watershed on the overall water quality of the region.

San Bernardino County

Livestock and poultry contribute to the highest value in the San Bernardino County region; this is followed by nursery and miscellaneous crops. Next, vegetables, fruit and nuts constitute the third and fourth most valuable crops within the region. Livestock and poultry cover the most amounts of acres compared to the any other type of crop that is produced in the region. Nursery and miscellaneous crops utilize the least amount of land compared to all other crop types, although it is of the second highest value in the region. All of the agriculture in the Santa Ana Watershed is irrigated and CAFO operations in the watershed include numerous dairies and chicken farms.

Riverside County

In Riverside County, nursery is the highest value crop followed by vegetable crop; the third most valuable crop is fruit and nuts. According to the Riverside County Agricultural Commissioner, everything in the Riverside area of the Santa Ana Watershed is irrigated with the exception of "Range" and "Grain" acreage. Although there are dairies in Riverside and San Jacinto districts, the Riverside County

Agricultural Commissioner could not provide any statistics on the CAFO as they do not regulate CAFO in the region.

Orange County

In Orange County the highest value crops are nursery and miscellaneous, followed by fruit and nut crops, and then by vegetable crops. As suggested by the County Agricultural Commissioner, agriculture is shrinking and operators are moving to high value crops in this region. The field crops in this region are grown without irrigation without any CAFO.

The Value of Understanding

The urban watersheds of the California coast provide a unique opportunity to explore the value of historical ecology research for developing contemporary wetland and riparian restoration plans. Studies have demonstrated that restoration and mitigation planning would be greatly improved if done within the context of ecosystem function (Kentula 1997, 2007; Kershner 1997; National Research Council [NRC] 2001; White and Fennessy 2005). Unfortunately, in the urban environments of California, much of the current understanding of wetland and riparian ecology is derived from systems highly modified by human activities. Thus, identifying appropriate functional reference conditions or distinguishing natural processes from anthropogenic effects can be difficult. Recent historical ecology studies in California have provided new and surprising evidence of wetland resources previously not recognized, particularly in Southern California where evidence suggests wetland ecosystems were larger and more diverse than previously thought (Stein et al. 2010; Grossinger et al. 2011; San Dieguito River Park 2010). This suggests that historical ecology not only provides important information about functional reference conditions but also sheds light on previous misconceptions about the historical environment.

The value of historical ecology has been questioned in the urban coastal regions of Southern California where natural hydrologic processes are unlikely to be fully recoverable. Arguably, historical ecology may provide confusion in the face of a systematic incapability to return wetland ecosystems to their pre-development condition, often due to the permanent loss of natural hydrodynamic processes that were present prior to human contact. Understanding the historical template is as important as understanding the contemporary condition. Knowledge of historical ecosystem components is key to creating management and restoration plans that make sense relative to the contemporary landscape. The historical perspective provides an understanding of the relationship between physical settings that support natural wetland functions, the driving forces behind ecosystem degradation, and perhaps most important, the value of wetland ecosystems that remain intact (Stein et al. 2010). Considerable evidence supporting the importance of historical ecology in contemporary wetland management, even in highly urbanized areas, now exists (Kentula 1997; White & Fennessy 2005; Stein et al. 2010). In addition, new technical tools provide shared access to data collected for historical ecology projects, creating an opportunity for cross-disciplinary collaboration and ongoing discovery of historical reference conditions beyond traditional reports.

Current Threats to Resources

Primary threats to aquatic resources within the Santa Ana River Watershed include past and ongoing loss and degradation of native habitat—approximately 90 percent of the wetland habitat in the Santa Ana River Watershed has been lost. Non-native invasive plants have taken over approximately half of the remaining wetlands, resulting in greatly increased threat of fire, greatly reduced wildlife values, and increased flooding issues, particularly from the arundo 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 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 mainstem near its emergence from the San Bernardino Mountains, and captures about 7.2 percent of the total watershed. Prado Dam is located near the middle of the mainstem, capturing 52 percent 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 percent 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 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 donax,* 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 giant reed. Other weedy species are major local issues including perennial pepperweed (*Lepidium latifolium*), tamarisk (*Tamarix* spp.), castor bean (*Ricinus molle*), and tree of heaven (*Ailanthus* altissima), among others, but Arundo is pervasive. Giant reed provides no redeeming wildlife value— it carries fire, causes obstruction to flood flows and results in damages to bridges and other structures, and results in expensive beach clean-ups. 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 acre-feet of water annually from the Santa Ana River alone—enough for more than 100,000 households.

Achieving total eradication of Arundo in some parts of the Santa Ana River 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 mainstem 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 been nearly eliminated also 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 Carbon Canyon, Modjeska Canyon, Santiago Creek and Blackstar Canyon areas. All of these areas are being kept under control. This leaves the mainstem areas from Mission Bridge downstream, and then through the Prado Basin and the lower reaches in the Santa Ana Canyon. There are still thousands of acres of Arundo in these areas. Mitigation providers need to be given access to these lands and develop long-term agreements with the public and private landowners to complete the task of eradicating Arundo from the Santa Ana Watershed.

Certain species of non-native vertebrates like the brown-headed cowbird are extremely harmful to native species and are managed in association with endangered species monitoring to ensure no harmful effects to listed species. More than 100,000 cowbirds have been removed from the Santa Ana River Watershed since 1986.

In coastal regions, an invasive algae nicknamed “killer algae” or the alien seaweed *Caulerpa taxifolia* was found, according to NOAA, in Southern California’s coastal waters located 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, sea grasses, reefs, and other communities, and economic devastation by harming tourism, pleasure boating, and recreational diving, and had a costly impact on commercial fishing. The dense carpet that this species can form on the 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 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* 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, California halibut, and sand basses. Eradication methods have been undertaken in Huntington Harbour, however, constant monitoring is necessary to insure that this threat is eliminated. (NOAA)

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 but, rather, 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, bass, African clawed frogs, and red-eared sliders.

The manner 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

Each of the aforementioned factors has acted in concert over a long period of time to reduce the native fish community of the watershed to that which remains today. The Santa Ana Integrated Regional Watershed Management Plan 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 as 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 desolate 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 now 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. 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.

Current major efforts to preserve habitat connections in the Santa Ana River Watershed focus on the high country ringing the watershed and facilitating movement in and out of the watershed from outside areas, including the San Gabriel River Watershed, the Santa Barbara 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 (see Current Conservation Measures below).

Several efforts in the Santa Ana River 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." For this reason, preservation of sensitive alluvial fan areas should be considered in all development plans.

Population increases in the Santa Ana 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 Santa Ana Watershed is affected by natural occurring droughts, seasonal floods and fires resulting from both natural occurring lightning and human activities. Climate change is an additional uncertain variable that can influence the intensity of these natural events and the resulting damage to habitat.

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 mainstem (except in the San Bernardino National Forest) 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 hydrology of the stream flow.

Sensitive habitat also is at risk from all terrain vehicle recreation. Continued use can result in the development of ruts in which rainfall can find its way into, 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 Trail
- Motor vehicles are prohibited
- Possession of alcoholic beverages is prohibited
- No overnight camping is allowed along the 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 (PAG) and Technical Advisory Committee (TAC) for the Trail. Comprised of eight elected representatives from county and city government, these groups are responsible for policy creation and modification.

Recreational Opportunities of Natural Resources

Most park and open space areas are local amenities, so the implementation of projects to develop them becomes a local decision intended to serve a focused, local population often residing within a few miles of a given developed park or open space area.

On the other hand, regional parks and open space areas tend to be larger, and provide more diverse amenities than those found in locally operated park facilities, and are managed to attract visitors from a wider area. Visitors come from within the Santa Ana River Watershed or from adjoining areas. The diversity of available facilities may enhance the region's attractiveness to visitors, and thereby provide economic growth through increased tourism. Most notably, parkland containing exceptional natural resources may attract eco-tourists looking for an opportunity to experience outdoor activities unavailable in their own areas. The wide variety of topography and natural resources within the watershed provide excellent opportunities for the development of this type of tourism.

Regional park facilities also may serve an important role in the continued economic development of the region. Businesses interested in attracting highly-skilled workers often use the proximity to well-developed recreational resources in attracting and retaining talent. Among the amenities often considered by skilled professionals are culture and the arts, nightlife, and the availability of outdoor recreation opportunities. From the ocean to the mountains, the watershed provides numerous opportunities for such a population.

Running through the watershed is the Santa Ana River Trail and Parkway (SART), a regional recreational amenity linking open space areas throughout the watershed. Models, such as the SART, could be developed in other parts of the watershed, such as in San Timoteo Canyon, along Lytle Creek, and within the San Jacinto Watershed. Completion of these linear park amenities and their connection with the existing trail backbone could create a world-class recreation system available to millions of residents and visitors.

Funding for recreational projects vary on location and type of project. Typically, projects are funded by various grants from agencies within the benefiting area. Other sources of funding include the California Department of Parks and Recreation, and additional grants available through the federal government.

Anaheim Park Projects

OCWD and the City of Anaheim have forged a creative partnership to address the lack of open space and resources. On November 15, 2011, Anaheim opened a 14-acre nature park and a 1-½ mile bike path on public lands owned by OCWD near the City's urban core.

In the early 2000s, it was apparent that the City of Anaheim needed to find open space to provide an opportunity for nature and exercise. However, due to the built-out environment, lack of land, and high land prices, the City had few opportunities for large-scale nature parks. So The City forged a relationship with the largest landowner in Anaheim, the OCWD. The OCWD's Burris Basin is a 116-acre ground water replenishment facility on the west bank of the Santa Ana River. It is located only one-half mile north of the Platinum Triangle, Honda Center, Angel Stadium, and the Anaheim Regional Intermodal Transportation Center (ARTIC) that currently is under construction.

In 2005, the OCWD granted a 25-year lease to the City of Anaheim to open 14 acres of land for a public trail and nature park for an annual payment of $1. The agreement required the City to pay for the construction, maintenance, and security of the public park area. The City immediately began an intense public input process and funding campaign. The City of Anaheim received $6.3 million in grants from the Rivers and Mountains Conservancy, California River Parkway Grant, and the Recreational Trails Program.

Anaheim Coves at Burris Basin offers a resting spot for Santa Ana River Trail users and nearby neighborhoods. There are two parking lots and restrooms, along with ample seating and opportunities for bird watching. Integrated public art interprets the natural environment with bird images embedded in the concrete seating, and metal pelican shapes in the gates that welcome patrons. This is a place for people (including the elderly and young children) to exercise, socialize, commute, and enjoy nature at the same time. There also has been a drastic reduction in calls for service and crime within the area.

The signage interprets OCWD's mission of groundwater recharge and the importance of water conservation; it also presents local history and the native flora and fauna. All landscaping is comprised of plants and trees indigenous to the Santa Ana River Watershed.

On April 30, 2013, a Memorandum of Understanding was ratified between OCWD and the City for the extension of the bike path almost one mile north and an eleven-acre nature park on the OCWD 5 Coves facility. Anaheim Coves at Burris Basin represents a great example of how cities and local water agencies can partner to further meet the needs of the community.

Parks, Recreation and Open Space

The former Parks, Recreation and Open Space Pillar (now integrated in to the Natural Resources Stewardship Pillar) brought together park, recreation, and open space advocates from the three counties, including cities, other governmental agencies, and citizens who are interested in public access relative to water resources in the watershed. This group focused attention on the larger "picture" of opportunities. However, they consider the SART as a model for the development of additional regional amenities where close cooperation across many areas and jurisdictions is necessary.

The general findings included a survey of current Regional Park and open space offerings and conditions. While there have been many accomplishments, especially with regard to river access, more planning, management and coordination are needed. Urban development patterns, high land prices, and low availability of land for recreation make expansion of opportunities difficult. Also, new parks or trails may impact habitat with limited land remaining for public access and recreation.

Possible future threats include availability of funding for new trails and parks within the watershed, a shortage of ongoing maintenance funds, and the ability to maintain a high level of security and care for the parks and trails.

Strategies for addressing existing threats include: 1) seeking more stable funding through assessments; 2) increasing public awareness of park, recreation and open space issues; 3) developing a plan to leverage existing resources and expertise; 4) forging and maintaining partnerships; 5) improving resource mapping; 6) curtailing vandalism by increased patrol presence; and 7) ensuring regional park master plans include proper trail and open space protections. One of the most important regional strategies is to fund and complete the SART. It also is imperative to help local agencies find support for their recreation needs radiating from the SART backbone. The model developed on the mainstem of the Santa Ana River (SAR) to develop the SART can be adapted to tributaries such as San Timoteo Creek and the San Jacinto River.

Current recreation opportunities in the watershed include bicycling, hiking, walking, skiing, snowboarding, rock climbing, geocaching, bird watching, swimming, horseback riding, and organized team and individual sports. The availability and level of participation in such activities is dictated by terrain, the location within the watershed, and degree of urbanization. For example, approximately 18 percent of the Watershed is within the San Bernardino National Forest. Recreational opportunities in this area are much different than in highly urbanized areas such as the cities of San Bernardino and Huntington Beach. In the upper watershed, hiking, rock climbing, and mountain biking are very popular on national forest lands. In the lower, more urbanized areas in the watershed, jogging and cycling are more common, as well as organized sports such as soccer and baseball. Sports fields are located adjacent to the river along its length.

The centerpiece of recreation in the watershed is the SART, a 100-mile trail currently under development, extending from the crest of the San Bernardino Mountains to the coast of the Pacific Ocean. The trail runs through three counties, 15 cities, and multiple jurisdictions. The trail is approximately 65-percent complete with plans to complete the remaining portions over the next five years (**Table 5.9-1**).

Table 5.9-1 Status of Santa Ana River Trail and Parkway

County	Completed (miles)	In Construction (miles*)	Planned (miles*)
San Bernardino	7	0	14.0
Riverside	12	0	21.0
Orange	24	0	4.5
Total Miles	**43**	**0**	**39.5**
*Mileages are approximate and do not include earthen trail in San Bernardino National Forest.			

The SART, shown in **Figure 5.9-2**, is a common thread through each county, and **Figure 5.9-3** lists the recreational opportunities available in the Watershed. **Table 5.9-2** describes each county's unique set of recreational resources.

Figure 5.9-2 Santa Ana River Trail Parkway

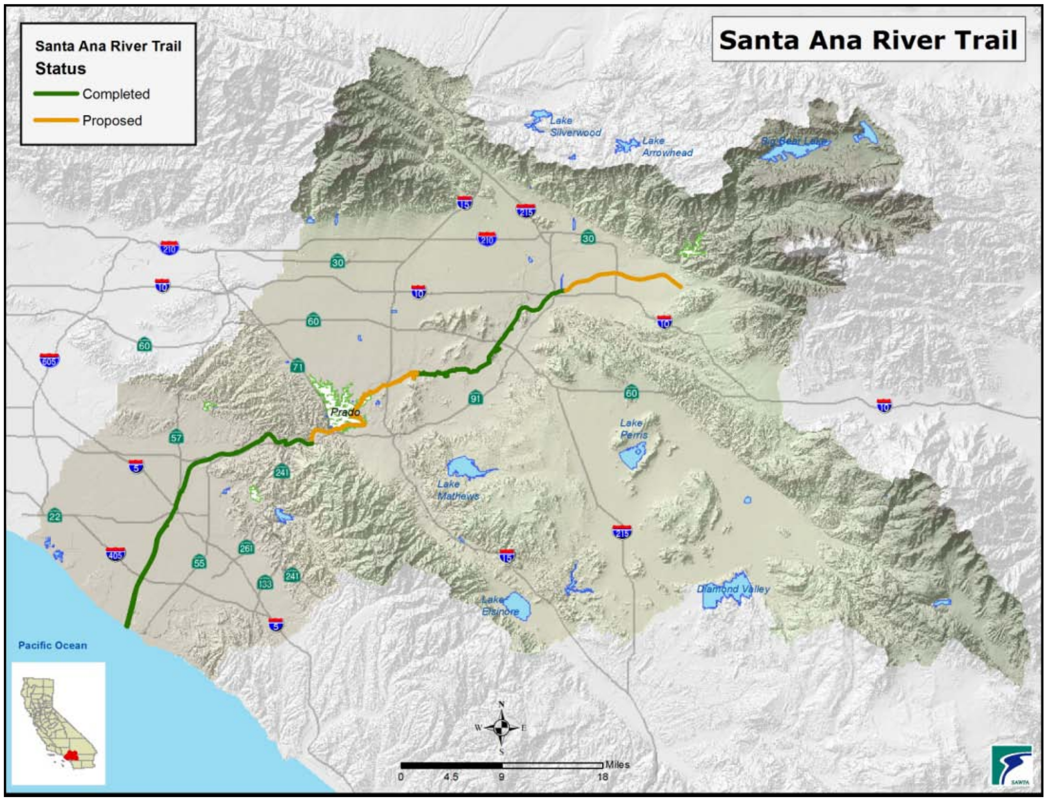


Figure 5.9-3 Recreational Opportunities within the Watershed

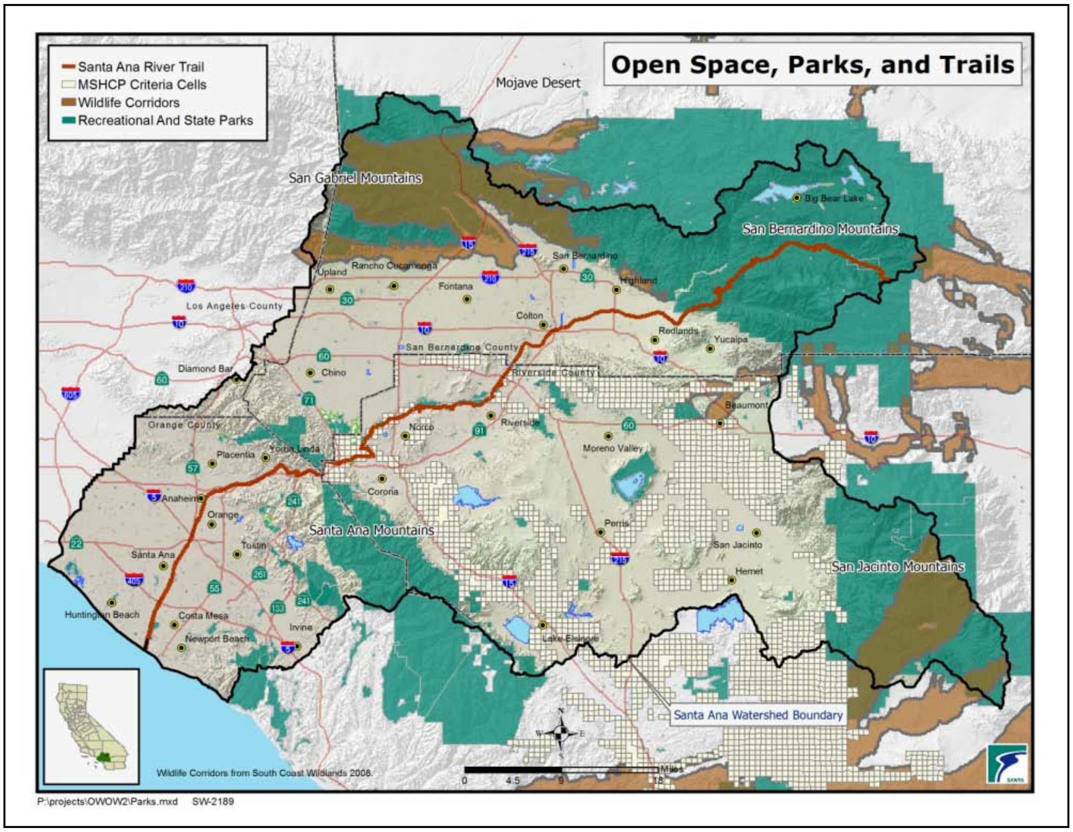


Table 5.9-2 Regional Recreational Resources by County

County	Name and Location of Recreational Resource	Description of Resource and Available Activities
San Bernardino County	San Bernardino National Forest	Approximately 672,000 acres 352 miles of trails Camping, fishing, hiking, equestrian, skiing, outdoor education, biking, target shooting and motorized sports
	Chino Hills State Park Chino Hills	6,000 acre park Mostly open space Hiking, bird watching, mountain biking
	Wildwood Canyon State Park Yucaipa	Under development 1,200 acres currently; plans to expand to 5,000 acres and to develop trails and campgrounds
	County Parks: Glen Helen, Prado Basin, Cucamonga Guasti, and Yucaipa	Approximately 4,500 acres total Camping, fishing, swimming and general day use
	City Parks: Cities of Chino, Chino Hills, Redlands, San Bernardino, Colton, Highland and Loma Linda	Various locations, facilities and acreages with mostly urban uses
	Rails to Trails Upland and Fontana	
	Wildlands Conservancy Los Rios Rancho, Oak Glen	6,000 acres of open space with hiking and outdoor educational facilities
Riverside County	County Parks: Hidden Valley Wildlife Area, Martha McLean-Anza Narrows, Rancho Jurupa, and Louis Rubidoux Nature Center	Hiking, bird watching, equestrian, camping, and outdoor education
	City Parks: City of Riverside, Norco River Trails, Mt. Rubidoux Park, Fairmount Park, and Butterfield	Various locations, facilities and acreages with mostly urban uses

Table 5.9-2 Regional Recreational Resources by County (continued…)

County	Name and Location of Recreational Resource	Description of Resource and Available Activities
Orange County	County Parks: 3 regional parks along SART	
	City Parks: 9 City parks along SART	
	Burris Basin currently under development	
	Existing equestrian facilities: Rancho Del Rio and Singletree Farms	
	SART bikeway: 27 miles complete Riding and hiking trail: 23 miles complete	
	Talbert Marsh	Multi-purpose trail on 25 acres. Bird watching
	Upper Newport Bay State Ecological Reserve/Interpretive Center	Bird watching, outdoor education, biking, and walking
	Irvine Ranch Wildlands and Parks	Hiking, equestrian, outdoor education, and mountain biking
	Bolsa Chica Ecological Reserve Bolsa Chica State Beach	300 acres Outdoor education, hiking, biking, bird watching, and camping

Regional Strengths, Threats and Weaknesses in Recreation

Physical

One of the great strengths of the region is that each county is geographically distinct, providing a variety of recreational opportunities. However, this diversity in topography also creates some threats and challenges. The biggest threat to recreation in the region is arguably patterns of urban development. The upper portion of the watershed, in San Bernardino County, is mountainous and relatively less populated than other areas in the watershed. The lower valleys are more urban with a discernible pattern of higher density near the coast. However, recently, relatively lower land values inland have resulted in increasing urbanization in these areas. Open space is being converted at a rapid pace, reducing opportunities to establish large parks and natural recreational amenities. The result most likely will be the development of more urban parks, which will support more urban recreational activities.

The upper portion of the watershed, being mountainous, results in a diversity of activities associated with forested environments. These include skiing, camping, hiking, rock climbing, and fishing. The middle portion of the watershed is relatively flat, valley terrain and is more densely urbanized. Activities in these areas include walking, jogging, bike riding, and horseback riding. Also, activities associated with more urban environments such as organized team sports played on developed fields, are more common in these areas.

The proximity of the ocean in the lower parts of the watershed is a draw for outdoor recreation in Orange County. The beach provides recreational opportunities found nowhere else in the watershed.

This is a strength, in that unique activities are available, but also a weakness in that the area is heavily used and requires additional maintenance and management. Facilities require greater upkeep and the potential for conflicts among users is higher here than elsewhere.

The presence of the Prado Dam in the center of the watershed also creates some unique challenges and opportunities. The area behind the dam is a largely undisturbed wetland, habitat to a number of threatened and endangered bird species. Bird watching is popular in this area, but access is challenging. Additionally, the river below the dam has water year round, providing recreational opportunities such as boating and fishing. The river upstream of the dam is more intermittent and does not offer these same opportunities in the same way.

The presence of the SART and various State and regional parks adjacent to the river along its course provide a ready-made infrastructure on which to build future trail linkages. There are few recreational trails adjacent to water in Riverside and San Bernardino counties, but opportunities exist to develop recreational amenities at flood control facilities.

Institutional

All counties and cities in the watershed have some type of park and recreation management agency in place. These agencies provide an existing framework from which to plan and implement future projects. Several working groups currently exist to address specific issues that also provide forums from which to collaborate. Additionally, many agencies have developed management plans for various parks and resources under their purview. For example, most cities have master plans that reference recreation along the river. A major institutional strength is that most of the agencies currently cooperate and maintain good working relationships with one another as they endeavor to build trails. Most cities in the watershed have completed or are in the process of completing some type of vision document for the Santa Ana River Trail within their jurisdictions. Sponsored mainly by the Wildlands Conservancy, these “blue ribbon” committees have assembled stakeholders in each city to craft a vision for recreation adjacent to the river. Each city will have a document that can be used to guide future recreational development.

Private institutions, such as the Wildlands Conservancy, located in San Bernardino County, provide key private support and involvement. The Wildlands Conservancy has provided critical and substantial funding and works effectively with government agencies to further outdoor recreational and educational programs. Other groups, such as the Crafton Hills, Yucaipa Valley, San Bernardino Mountains, and Riverside land conservancies are working with their own contacts and partners to acquire lands, build connecting trails, and encourage elected officials to make recreation and open space a priority. The SART Partnership, a relatively new collaboration between public and private entities in the watershed also has been effective in bringing about funding and planning in the watershed. In 2006, the three counties, SAWPA, and the Wildlands Conservancy signed a Memorandum of Understanding to form the SART Collaborative Partnership. This group brings political will to bear, and directs the agencies under its umbrella to coordinate, seek funding, and leverage resources to finish building the SART. This group has developed the first regionally adopted plan for completing the unfinished segments of the trail.

Many of the group's participants felt that lack of funding to implement management plans was a widespread problem. Much of the funding focused on non-native species removal, such as Arundo donax (giant cane). The group also expressed that funding was available for new park development, but not for maintenance and operations. Many expressed the need for acquiring lands to expand or build new facilities.

Current Conservation Measures

There are several active, proposed and inactive conservation plans in the Santa Ana River Watershed. The following is a list of some of the current plans. There are large gaps between these plans in the watershed, including in Western Orange County and in San Bernardino County.

Upper Santa Ana River Wash Land Management and Habitat Conservation Plan

The project is located in the eastern valley portion of San Bernardino County, mostly within the cities of Highland and Redlands, but also partially within county jurisdiction. The plan area is bounded by Greenspot Road to the north and east, Alabama street to the west, and the SAR Wash to the south. The purpose of the proposed project is to allow the continued use of land and mineral resources while maintaining the biological and hydrological resources of the planning area in an environmentally sensitive manner. The Wash Plan is intended to coordinate and manage the present and future activities in the wash that are part of multiple jurisdictions, each with different needs. The goal of the project is to balance the ground-disturbing activities of aggregate mining, recreational activities, water conservation, and other public services with quality, natural habitat for endangered, threatened and sensitive species (San Bernardino Valley, 2007).

Western Riverside County Multiple Species Habitat Conservation Plan

The Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) is a comprehensive, multi-jurisdictional Habitat Conservation Plan (HCP) focusing on the conservation of species and their associated habitats in Western Riverside County. The MSHCP is one of several large, multi-jurisdictional habitat-planning efforts in Southern California with the overall goal of maintaining biological and ecological diversity within a rapidly urbanizing region. Large-scale HCP planning efforts have been completed in San Diego and Orange Counties, and a similar effort is under way in the Coachella Valley. The MSHCP will allow Riverside County and its cities to better control local land use decisions and maintain a strong economic climate in the region, while addressing the requirements of the State and Federal Endangered Species Acts.

Riverside County's population in 2000 was approximately 1.5 million people. Its population is expected to double by 2020, to reach approximately 3.5 million by 2030, and be approximately 4.5 million by 2040, according to forecasts by SCAG. This is nearly a 400% increase over the next 40 years. Most of Southern California's growth over the next 40 years is expected to occur in the Inland Empire (San Bernardino and Riverside Counties) (SCAG 2001).

Accommodating an increase in population of this magnitude will involve urbanizing thousands of acres of undeveloped land and result in significant conflicts with regulations protecting species and their habitats. Conflicts and delays will escalate costs for all development projects, uncoordinated mitigation efforts will fragment habitats, the region will miss opportunities to improve the quality of life, and economic development opportunities for the current and future residents of Riverside County also will not be realized.

The MSHCP plan area encompasses approximately 1.26 million acres (1,966 square miles). It includes all unincorporated Riverside County land west of the crest of the San Jacinto Mountains to the Orange County line, as well as the jurisdictional areas of the cities of Temecula, Murrieta, Lake Elsinore, Canyon Lake, Norco, Corona, Riverside, Moreno Valley, Banning, Beaumont, Calimesa, Perris, Hemet, and San Jacinto. This HCP is one of the largest plans ever attempted. It covers multiple species and multiple habitats within a diverse landscape, from urban centers to undeveloped foothills and montane forests, all under multiple jurisdictions. It extends across many bioregions as well, including the Santa Ana Mountains, Riverside Lowlands, San Jacinto Foothills, San Jacinto Mountains, Agua Tibia Mountains, Desert Transition, and San Bernardino Mountains. It will provide a coordinated MSHCP Conservation Area and implementation program to preserve biological diversity and maintain the region's quality of life.

Existing Reserves within the Western Riverside County MSHCP

- Box Springs Reserve
- Bureau of Land Management Lands
- Cleveland National Forest
- Emerson Oaks Reserve
- Harford Springs Reserve
- Kabian Park
- Lake Mathews-Estelle Mountain Reserve
- Lake Perris Recreation Area
- Lake Skinner Recreation Area
- March Air Reserve Base Reserve Lands
- Metropolitan Water District Lands
- Mount San Jacinto Wilderness State Park
- Norton Younglove Reserve
- Orange County Water District Lands
- Prado Basin
- Riverside County Flood Control and Water
- Conservation District Lands
- San Bernardino National Forest
- San Diego Gas and Electric Lands
- San Jacinto Wildlife Refuge
- San Timoteo Creek State Park
- Santa Margarita Ecological Reserve
- Santa Rosa Plateau Nature Reserve
- Southern California Edison Lands
- Southwestern Riverside County Multi Species Reserve
- Sycamore Canyon Wilderness Park
- UC James San Jacinto Mountain Reserve

Orange County Natural Communities Conservation Plan

The purpose of this project is to create a sub-regional multi-habitat-based HCP that balances resource protection with reasonable economic growth. This effort provided an opportunity to preserve coastal sage scrub and oak woodland habitats that have nearly disappeared from Southern California. The remote canyons of the 13,000-acre northern boundary, east of the City of Orange, are notable for "The

Sinks" area of Limestone Canyon, a huge, steep-walled sandstone ravine that resembles a mini-Grand Canyon. The land harbors some of Orange County's richest oak and sycamore woodlands, as well as

streams and springs laced with blackberries and monkey flowers and shared by animals of all sizes – from mountain lions to rare lizards. The ranch's 12,000-acre Weir, Gypsum and Fremont Canyons, adjacent to the Cleveland National Forest, are home to many native animals and plants. These include the rare Tecate cypress, found only in three other areas of California. The 14,000-acre southern boundary, with its hills, meadows, wooded canyons and sweeping views of the Pacific, connects Crystal Cove State Park and the Laguna Coast Wilderness Park. The Irvine Ranch Wildlands and Parks are home to bobcats, red-tailed hawks, coyotes, mule deer, meadowlarks, and an abundance of other wildlife (Nature Conservancy, 2008).

The Irvine Ranch Conservancy was established in 2005. It is a non-profit, non-advocacy organization, created to help care for the 50,000 acres of permanently protected wildlands and parks on the historic Irvine Ranch. The organization works with its partners to enhance the public's appreciation, understanding and connection to the land, while helping other landowners and managers with all aspects of stewardship. The Irvine Ranch Conservancy contributes its resources, expertise and energy to achieve the best possible balance of preservation and public participation. Nearly 50,000 acres of wildlands and parks have been designated as permanent open space on The Irvine Ranch. However, protecting the land is only the first step. Mediterranean ecosystems like these need extremely attentive stewardship. The rare plants, animals, and habitats found here are adapted to specialized conditions and need our long-term management to survive. The mission of the Irvine Ranch Conservancy is to make sure that these lands are cared for and enjoyed to the highest possible standards.

The wildlands of the North Ranch are connected to the Cleveland National Forest and are one of the few places where natural habitat ranges relatively unbroken from lowland scrub, grassland and oak woodlands up to higher altitude montane chaparral and conifers. The Venturan and Diegan associations of coastal sage scrub and native grasslands of Southern California are all critically endangered, and the Irvine Ranch Wildlands and Parks and adjacent wildlands offer one of the last, best places to protect these ecosystems and many of the species associated with them.

This area also is sufficiently large and continuous to support native ecosystems that still benefit from the presence of large predators such as mountain lion, coyote, golden eagle and bobcat. Their ecological role as top carnivores helps maintain a healthy and resilient ecosystem. The wildlands are some of the last and most extensive lower elevation habitat for these important predators. For all of these reasons, The Irvine Ranch Wildlands and Parks have been identified by The Nature Conservancy as one of the top 50 priority conservation landscapes in California.

Not only are these natural areas a globally important conservation priority, they are remarkably close to one of the world's largest urban regions. This offers an unparalleled opportunity for people to experience and enjoy these extraordinary native ecosystems in their own backyard, while enhancing understanding and support for their protection and stewardship (Irvine Ranch Conservancy, 2008).

Existing Conservation Plans Western Riverside County MSHCP

Plan	Agency	Acres	Status
WRC MSHCP	WRC RCA		Underway
Cleveland NF	USFS		Completed
San Bernardino NF	USFS		Completed
Prado Basin	OCWD		Completed
Bureau of Land Management Lands	BLM		Fluctuates
Lake Perris SRA	CA State Parks		Completed
San Jacinto WR	CA State Parks		Underway
San Timoteo Creek SP	CA State Parks		Underway
Mt San Jacinto Wilderness SP	CA State Parks	10,000	Completed
Santa Margarita Ecological Reserve			Completed
Santa Rosa Plateau Nature Reserve		8,300	Completed
Motte Rimrock Reserve	UC NRS		Completed
Box Springs Reserve	UC NRS	1,155	Completed
Emerson Oaks Reserve	UC NRS		Completed
James San Jacinto Mountain Reserve	UC NRS	160	Completed
Kabian Park	RC Parks	640	Completed
Norton Younglove/De Anza Reserve			Completed
Harford Springs Reserve	RC		Completed
Lake Skinner Recreation Area	RC Parks		Completed
Lake Mathews-Estelle Mountain Reserve	MWD		Completed
SW Riverside County Multi Species Reserve	RCHCA		Completed
Metropolitan Water District Lands	MWD		Completed
March ARB Reserve Lands	USAF		Completed
Southern California Edison Lands	SCE		Completed
San Diego Gas and Electric Lands	SDGE		Completed
	Total Acres:	500,000	

San Bernardino County MSHCP

PLAN	AGENCY	ACRES	STATUS
San Bernardino National Forest	USFS		
San Bernardino County MSHCP	SB County		Hiatus
Upper Santa Ana River Land Management & Habitat Conservation Plan	SBVWCD		Draft

Orange County MSHCP

PLAN	AGENCY	ACRES	STATUS
Cleveland National Forest	USFS		Completed
Irvine Ranch Wildlands	Nature Conservancy	50,000	Under way
Irvine Open Space Preserve - South	City of Irvine	4,000	Under way
	Total Acres:	54,000	

Innovative Conservation Arrangements

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. EPA receives, administers, and has distributed funds earmarked for this program through the efforts of Congressman Calvert and others. The CDFW permits the wetland activities under Section 1601 of the Fish and Game Code, has directed mitigation funds to SAWA, and contributes expertise to deal with some of the resource issues. The USFWS oversees and must approve activities that could affect wetland resources and endangered species. The RWQCB approves activities that could affect water quality and provides oversight of the recognized beneficial uses of the wetland resources. OCWD, which is responsible for managing water resources and providing water to more than two million Orange County residents, has provided major funding, provides personnel to manage wetlands and endangered species, and manages 2,400 acres near the middle of the river in the Prado Basin, attempting to maximize wildlife resources. The county flood control agencies maintain sections of the river for flood conveyance, cooperate toward achieving mutual goals, and issue entry permits.

Other programs include the Federal Safe Harbor Policy, which protects the ability of landowners to use their land responsibly in exchange for the setting aside of large land parcels for conservation of specific threatened or endangered species.

Opportunities for Improvement

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.

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.

Potential Approaches:

- Develop a map of the watershed reflecting all the water-oriented habitat areas as described in this chapter
- 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

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 Plan recommends that the development community consider water-oriented habitats early in the development planning process. 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 build-out 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

Create 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.

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 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 MSHCP and other similar efforts to expand conservation opportunities

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 HCPs. 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 mainstem 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 Army Corps itself. 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 Army Corps of Engineers, the California Department of Fish and Wildlife, the US Fish and Wildlife Service, and the Regional Water Quality Control Board.

The Integrated Regional Watershed Management Plan should include consensus among all agencies and organizations with ownership/stewardship over areas of the Santa Ana River mainstem 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.

Potential Approaches:

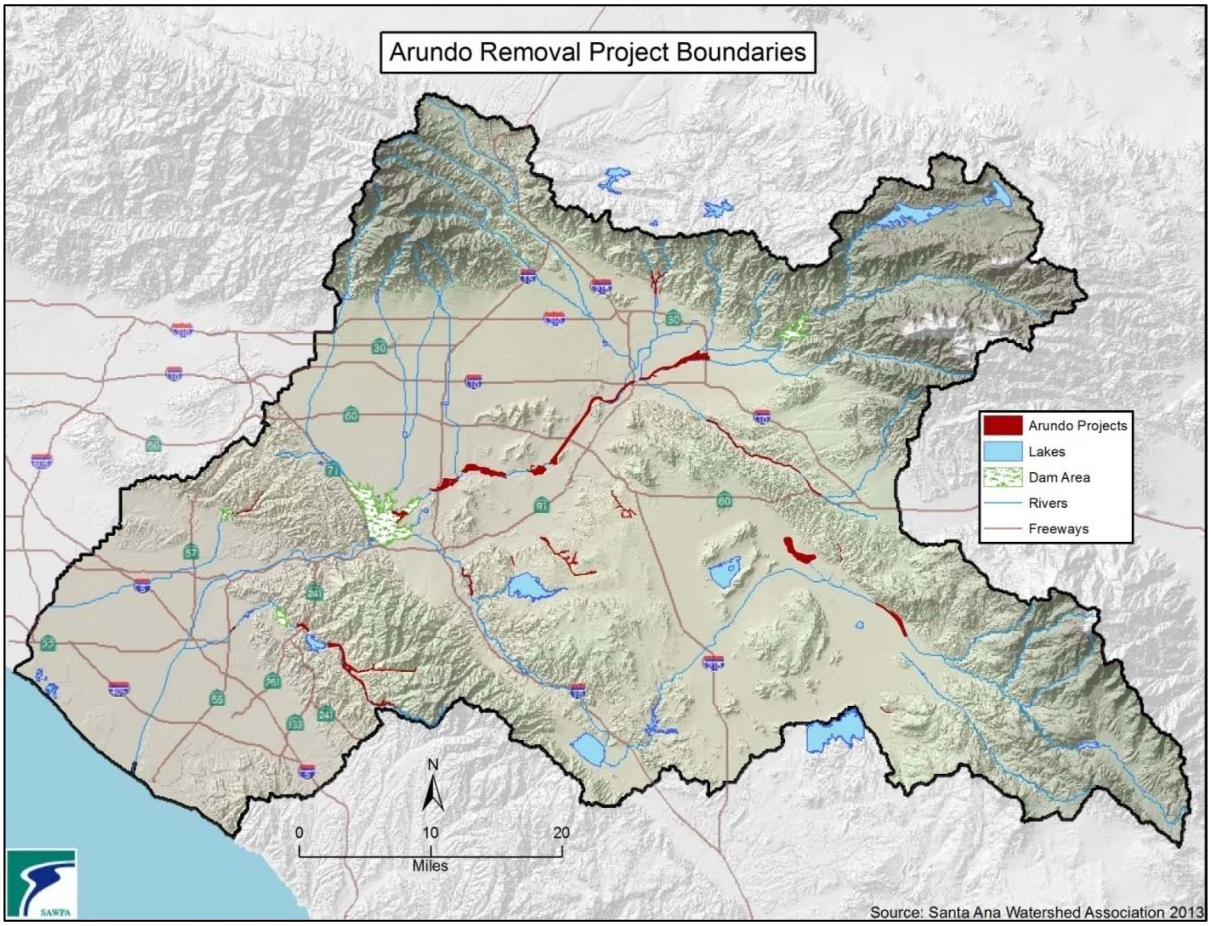
- Research and develop innovative funding arrangements to buy high priority, water-oriented conservation lands, construct needed improvements for appropriate public access, and fund on-going operation and maintenance of those lands
- Create cooperative agreements among public landowners and organizations that conduct long-term maintenance of habitat areas that provide reasonable protections in perpetuity for ongoing restoration

Invasive species eradication and maintenance funding

Restoring the river requires many partners, agencies and landowners. Some of the key agencies include the following. The Army Corps of engineers has provided major funding through mitigation requirements and permits the wetland activities under Section 404 of the Clean Water Act. EPA receives, administers, and has distributed funds earmarked for habitat program. The 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 USFWS oversees and must approve activities that could affect wetland resources and endangered species. The RWQCB 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 water resources and providing water to 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 near the middle of the river in the Prado Basin, attempting to maximize wildlife resources.

The historical and current sources of habitat restoration funding include developer fees directed by the Army Corps to in-lieu fee mitigation providers. Outside of in-lieu fee mitigation, the CDFW and the RWQCB 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. The image below, **Figure 5.9-4,** illustrates the multiple areas affected by the Arundo Donax.

Figure 5.9-4 Arundo Donax Removal 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.

Potential Approaches:

- Create and update watershed-wide, public contact list of mitigation and conservation organization organizations, 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.

Habitat Restoration Projects

Much of the remaining invasive plant biomass and areas that could benefit from Re-establishment 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.

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

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. Potential Approach:

- Develop formal pollutant trading programs that facilitate pooling of funds to construct wetlands

Create 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 water courses.

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 local "ownership" of these habitats could benefit both the habitat and the community.
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/”friend” 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

Sediment restored downstream of dams

Sediment buildup behind Prado Dam is a problem for this Army 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 replenish sediments are 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 has proposed its “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 basin. The Corps is also currently engaged in development in a feasibility study for ecosystem restoration throughout the Prado Basin.

Creating MSHCPs and RCDs 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 multi-species habitat conservation plan 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 (RCDs) 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 RCD, in conjunction with 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 an RCD to serve the area.

Project Proposals

Two of the most immediate needs in the Santa Ana River watershed in natural resources preservation and protection are Arundo removal and wildlife connections. **Table 5.9-3** shows two concepts from the Natural Resources Stewardship Pillar Implementation Concept Projects table.

Table 5.9-3 Natural Resources Stewardship Pillar Implementation Concept Project

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 mainstem 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 Santa Ana River 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 n 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," 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." 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 2003)

The 91 Freeway in the Santa Ana Canyon provides a significant barrier to wildlife movement, especially large mammals, including carnivores such as bobcats, coyotes and mountain lions. 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 MSCHP's major habitat areas—Existing Core A (Prado Basin/Santa Ana River) and Existing Core B (Cleveland National Forest). In the Plan, this is known as Constrained Linkage 1. The Plan 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.

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 re-vegetating 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 even 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 Army Corps of Engineers, Caltrans, Riverside County Transportation Commission, Santa Ana Watershed Association, 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-removal and maintenance operations in Norco, Eastvale, and in the Prado Basin. These downstream projects are in constant danger of re-infestation because of scattered, large Arundo infestations on the Riverside area of the mainstem in the area between the Mission Bridge and the Goose Creek Golf Course.

Within this stretch of the mainstem, there are significant "gaps" where Arundo is present and presents a threat of re-infesting downstream areas that have been cleared by the Army Corps, SAWA, the resource conservation districts and OCWD. However, the area also contains several large eradication and restoration projects managed by the Santa Ana Watershed Association and 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 has occurred on some of the more bare areas of the project. 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 mainstem 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, the southwestern willow flycatcher, and the Santa Ana sucker.

Potential partners in this project could include Riverside County Flood Control and Water Conservation District, Riverside County Parks and Open Space District, California Department of Fish and Wildlife, the Inland Empire Resource Conservation District, Riverside-Corona Resource Conservation District, the City of Riverside, and the City of Jurupa Valley.

Summary

One of the greatest questions for the future of habitat restoration in the Santa Ana River Watershed is future hydrology. As conservation and reclamation efforts grow within water and sanitation districts and the Regional Water Quality Control Board seeks to eliminate urban runoff, areas that currently experience year-round flows may become dry. This will have an adverse effect on native vegetation and native fishes, birds and other wildlife. 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 Santa Ana 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. One Water, One Watershed is an example of the kind of effort that is needed to bring all of the elements and organizations together.

References

Dill, W.A., and A.J. Cordone. 1997. History and status of introduced fishes in California, 1871-1996. California Department of Fish and Game. Fish Bulletin 178.

Grossinger, R. M., Stein, E.D. Cayce ; Askevold, K. R.; Dark, S.; Whipple, A. 2011. Historical Wetlands of the Southern California Coast: An Atlas of US Coast Survey T-sheets, 1851-1889.Technical Report 589. Southern California Coastal Water Research Project. Costa Mesa and Oakland, CA: San Francisco Estuary Institute.

Kentula, M.E. 1997. A comparison of approaches to prioritizing sites for riparian restoration. *Restoration Ecology* 5(4S):69-74.

Kentula M.E. 2007. Monitoring wetlands at the watershed scale. *Wetlands* 27:412—415

Kerschner, J.L. 1997. Setting riparian/aquatic objectives within a watershed context. Restoration Ecology. 5 (4S):2-3.

Mock, P. 2004. California Gnatcatcher (*Polioptila californica*). *In* The Coastal Scrub and Chaparral Bird Conservation Plan: a strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California. California Partners in Flight.

Moyle, P. B. 2002. Inland Fishes of California Berkeley: University of California Press 502 pp. Matern, S. A., P. B. Moyle, and L. C. Pierce. 2002.

Ng, S. J.; Dole, J. W.; Sauvajot, R. M.; Riley, S. P. D.; Valone, T.J., 2004. Use of highway undercrossings by wildlife in southern California. Biological Conservation (115)

Stein E. D.; Dark, S.; Longcore, T.; Grossinger, R.; Hall, N.; Beland, M. 2010. Historical ecology as a tool for assessing landscape change and informing wetland restoration priorities. *Wetlands* 30:589-601.

Swift, C. C., T. R. Haglund, M. Ruiz, and R. N. Fisher. 1993. The status and distribution of the freshwater fishes of Southern California. *Bulletin of the Southern California Academy of Science* 92(3):101-167.

Waycott, M. , Duarte, CM; Carruthers, J.B; Orth, R. J.; Dennison, W.C.; Olyarnik, S; .Calladine, A; Fourqurean, J. W.; Heck, Jr. K. L.; Hughes, A. R. ; Kendrick, G. A.; Kenworthy, W. J.; Short, F. T.; Williams, S. L. 2009. Accelerating loss of seagrasses across the globe threatens coastal ecosystems. *Proceedings of the National Academy of Sciences* 106:12377-12381.

White, D.; Fennessey S. 2005. Modeling the suitability of wetland restoration potential at the watershed scale. Ecological Engineering. 24:359-377

List of Contributors

Contributors to the OWOW 2.0 Natural Resources Stewardship Pillar Chapter include:

Lee Reeder	Santa Ana Watershed Association
Nancy Gardner	City of Newport Beach
Dr. Eric Stein	Southern California Water Research Project
Eric Rudd	Cucamonga Valley Water District
Dick Zembal	Orange County Water District
Dave Woefel	SARWQCB
Brett Mills	Santa Ana Watershed Association
Shani Pynn	Riverside County Resource Conservation District
Arlee Montalvo	Riverside County Resource Conservation District
Gary Greene	Chino Basin Water Master
Keith Fletcher	USFS Cleveland National Forest
Diana Ruiz	Riverside County Resource Conservation District
Dan Horan	TVMWD
Dr. Kammansky	
Jeff Beehler	SAWPA
Rick Whetsel	SAWPA

5.10 Operational Efficiency and Water Transfer

Introduction

The water management in California has always been a critical element for the State's economic growth over the last two decades. California Department of Water Resources (DWR) has worked extensively on the concept of Integrated Regional Water Management (IRWM) planning to encourage the development of comprehensive water resources management plans throughout the state. Using water efficiently, improving water quality and reliability, and integrating environmental stewardship are not new concepts to the regional water agencies within the Santa Ana River (SAR) Watershed and the Santa Ana Watershed Project Authority (SAWPA). Within the SAR Watershed there are over 100 large and small water districts: local, regional, state and federal agencies, and public/private stakeholders. These agencies have developed strategies such as water use efficiency, water recycling, groundwater storage and conjunctive use, urban runoff management, and water budget based rate billing structures to enhance their comprehensive water resources management plans. Through One Water One Watershed (OWOW) planning process, the Operational Efficiency and Water Transfers Pillar worked together to discuss the integrated regional projects that could be implemented for the future.

The purpose of this report is to explore the strategies that have already been defined within the SAR watershed, and ascertain potential region-wide operational efficiency and water transfer concepts that can be developed by cooperative strategic planning effort among different agencies. Such concepts can benefit from integration of different resources, facilities, and capabilities that currently exist to achieve a higher operational efficiency within the SAR Watershed. The goal of the report is to provide operational efficiency and water transfer concepts that can be developed utilizing elements within different water resources plans prepared by various agencies and others in support of the OWOW program. To achieve this goal, the report provides an overview of water resources conditions at the State and regional level and offers assessment matrixes based on different strategic documents prepared by stakeholders within different geographical regions of the SAR Watershed. In addition, the report provides preliminary water transfer concepts, and potential implementation procedures that can be used to enhance the water resources reliability and operational efficiency within the SAR Watershed.

The report provides a common foundation that frames the potential imbalances that may be faced in the future and potential concepts that may be considered to resolve those imbalances.

Water Resources Management Activities at the State Level

This section reviews major planning activities and goals that are being implemented and/or considered at the state level. These goals play an important role in the objectives set by the regional and local water resources leaders in the SAR Watershed area.

California Water Plan

The California Water Plan (CWP) has always been a valuable source of information for water planners since 1957. In the early years, these plans were primarily produced by DWR. However, for the 2009 CWP Update the DWR formed an interagency steering committee representing over 20 agencies and a 45-member advisory committee to better integrate regional water management activities into the State water and flood management planning.

By law, the CWP documents are required to be published every five years. The purpose of the CWP is to provide regional, local, tribal, state, and federal governments and organizations a strategic planning forum to collaboratively identify short-term and long-term actions that would help sustain California's water resources, and to prepare response plans for catastrophic events that would threaten the livelihood of the people of California.

These reports have evolved from statistical summaries of water supply and demand to expert analyses of complex hydrology, water use, conservation, and emerging trends issues in water resource management, flood safety and climate change adaptation. The CWP provides strategic recommendations to guide future state investments and the direction of resource management policies.

The 2009 Water Plan Update implementation plan identifies 13 objectives that could provide more sustainable water and flood systems given the changing climate and other uncertainties and risks throughout the state. Some of these objectives such as setting co-equal goals for the ecosystem and reliable water supply by managing a sustainable California Delta are site specific, but many of the objectives mentioned requiring regional implementation for their success. The following implementation objectives mentioned by the CWP are also considered by several regional agencies within the SAR watershed as part of their strategy for a more adaptive and resilient water resources management system.

- Integrated Regional Water Management – improve and expand IRWM to create and build on partnerships that are essential for sustainable watershed management, and would increase regional self-sufficiency
- Use Water More Efficiently – use greater water conservation, recycling, and reuse to help meet future water demands and adapt to climate change
- Expand Conjunctive Management of Multiple Supplies –use existing and new surface and import water with groundwater storage to prepare for droughts, and climate change
- Protect Surface Water and Groundwater Quality – protect and restore water quality for public health and beneficial use of state's water supplies
- Reduce Energy Consumption of Water Systems and Uses – reduce the energy consumption of water and wastewater systems by implementing water related strategies

The 2009 CP Update was published in March 2009 right before passage of a historic water legislation package by the California State Legislature in November of 2009. The SAWPA member agencies strategies focusing on the above mentioned objectives are reviewed in Section 4 of this report.

Climate Change

In December 2009, the U.S. Environmental Protection Agency (EPA) issued findings that greenhouse gas (GHG) emissions is a threat to public health. As a result, responding to climate change remains a priority in both Houses and Senate; and increases the likelihood of federal regulatory action. Legislative and regulatory actions will exacerbate the existing water management challenges confronting regional agencies in the watershed. Possible consequences of climate change include:

- More frequent drought periods
- Changes in runoff patterns from the Sierra Nevada
- Increased flooding intensity, as well as impacts to the operations of the State's surface water storage facilities

Higher temperatures in the Sierras will result in earlier and more rapid runoff of snowmelt and less storage ability. The DWR is projecting that the California snowpack will decline by 25 to 40 percent by 2050 and significantly reduce the amount of water that is stored for use during the summer and fall. Decreased energy production through hydropower is also a concern. In addition, population growth will result in an increased demand for water in California. Inadequate storage and increased growth will significantly impact water supply reliability within the State, and the Santa Ana River Watershed.

Regional temperature increases and precipitation variability would likely reduce flows in local streams which would reduce groundwater recharge and impact sources of water supply; increase storm intensity and flooding; increase erosion and related water quality problems; and impact on wildlife habitat. Furthermore, the implications of global sea level rise would increase sea-water intrusion into groundwater supplies and infrastructure damage in the coastal communities. In general, the watershed should plan for reduced water supply availability, higher costs for water, and lower environmental quality.

While climate change projections at regional scale are undergoing constant refinement, the science, the causes, and extent of climate change will continue to be debated, water agencies within the watershed must position themselves to protect and promote their constituents' interests. SAWPA highlighted the water supply reliability challenges by state droughts, droughts on the Colorado River, and the threat of climate change in its OWOW planning process and helped the regional agencies to work together to address these challenges.

Bay-Delta Conservation Plan

The Bay-Delta Conservation Plan (BDCP) is being prepared through a collaboration of state, federal, and local water agencies, environmental organizations, and other interested parties. These organizations have formed the BDCP Steering Committee. The BDCP will identify a set of water flow reliability and habitat restoration actions that could contribute to the recovery of endangered and sensitive species and their habitats. The goal of the BDCP is to provide for the Sacramento-San Joaquin River Bay-Delta (Delta) species/habitat protection and to improve reliability of water supplies.

As the BDCP evaluates habitat, physical and operational alternatives necessary to restore the Delta ecosystem while providing water supply reliability, state and federal agencies are developing a joint Environmental Impact Report/Statement (EIR/EIS) under the Delta Habitat Conservation and Conveyance Program (DHCCP). The EIR/EIS will determine the potential environmental impacts of the proposed BDCP.

Lead agencies for the EIR/EIS are the California Department of Water Resources, the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and National Oceanic and Atmospheric Administration's National Marine Fisheries Service, in cooperation with the California Department of Fish and Game, the EPA and the U.S. Army Corps of Engineers (ACoE).

The BDCP is being developed in compliance with the Federal Endangered Species Act (ESA) and the California Natural Communities Conservation Planning Act (NCCPA). When completed, the BDCP would provide the basis for the issuance of endangered species permits for the operation of the state and federal water projects. The BDCP would be implemented over the next 50 years.

The OWOW planning effort highlighted the vulnerability of the Delta and helped the regional agencies to address some of the challenges related to this threat.

Urban Water Management Planning

The State of California requires urban water suppliers that either provide over 3,000 acre-feet of water annually or have more than 3,000 connections to prepare Urban Water Management Plans (UWMP) in support of their long-term resource planning. The UWMP identifies different water supply sources that are available to meet existing and future water demands over a 20-year planning horizon considering normal, dry, and multiple dry years. The UWMPs are prepared every 5 years and submitted to DWR to make sure the plans meet the requirements identified in the Urban Water Management Planning Act (Division 6 Part 2.6 of the Water Code §10610 - 10656). The Act requires the urban water supply agencies to describe their Demand Management Measures (DMM) in their UWMPs. These DMMs are the same as the California Urban Water Conservation Council (CUWCC) Best Management Practices (described in Section 2.5).

The requirement that all urban retail water suppliers quantify per capita baseline water use, set water use targets, and then show actual reductions in 2015 and 2020 has caused suppliers throughout the watershed to pay particularly close attention to the effectiveness of their water conservation programs.

The water suppliers within the Santa Ana River Watershed prepare UWMPs in support of long-term resource planning in their respective geographic area. Also, as part of the OWOW process, SAWPA took the initiative to highlight the challenges of population growth in the watershed and how this growth can be sustained based on the UWMPs prepared by the water suppliers in the region.

Water Use Efficiency

The CCUWCC was created to increase efficient water use throughout the state by forming partnerships among urban water agencies, public interest organizations, and private industry. Some 400 water agencies and environmental groups have signed a Memorandum of Understanding (MOU) voluntarily pledging to implement a series of Best Management Practices (BMP) within a reasonable time frame. Water agencies that became signatories to the CUWCC MOU pledge to implement the BMPs to specified levels and to report progress on their BMP implementation biannually to the CUWCC.

In order to be eligible for grant or loan funding from the State of California, an urban water supplier, whether a signatory to the CUWCC MOU or not, must demonstrate that it’s efforts in implementing each DMM or BMP will be implemented at the coverage level determined by the CUWCC MOU.

Only the BMPs that are cost-effective for the water supplier need to be implemented; and successful implementation of all BMPs and credit for actively participating in the CUWCC process need not be a “complete” implementation of all BMPs.

The CUWCC maintains a self-reporting database on the status of BMP implementation by MOU participants. This information includes results of each BMP, the money invested in each BMP, and the estimated water savings for each of those measures by each participant.

The Water Conservation Act of 2009 (Senate Bill Number 7 of the 7th Extraordinary session - SBX 7-7) was enacted by the California legislature in November 2009. This Act sets an overall goal of reducing per capita urban water use statewide by 20 percent by December 31, 2020 and requires the urban water suppliers to report the 20 percent by 2020 water use reduction goals in their UWMPs. The UWMP documents were one of the most pertinent documents reviewed and used to develop the matrix in Section 5.

The SBX 7-7 legislation also directed DWR to address the following urban water use efficiency issues:

- Convene a task force to investigate alternative best management practices for the commercial, industrial and institutional sectors
- Establish a standardized water use reporting form
- Promote regional water resource management through increased incentives and decreased barriers
- Develop statewide targets for regional water management practices like recycled water, brackish groundwater, desalination and urban stormwater infiltration and direct use

Increasing the supply of water has the same effect on water availability as decreasing the demand for water (through increased efficiency). However, engineered methods for increasing supply, such as building new dams for surface storage, or increasing water exports from the Delta, are becoming less certain as California moves into the future. Many water suppliers are turning to other strategies, such as improving efficiency, to meet increasing demand. As the costs for engineered water supply options go up, even the most expensive conservation strategies are becoming economically viable.

The 2020 state population is expected to be in the range of 44 million people and a decrease in per capita water use of 20 percent will equate to an annual demand reduction of 2 million acre-feet of water.

Many of the water suppliers within the Santa Ana River Watershed are signatories to the CUWCC MOU and evaluate their BMPs when developing their water resources strategies. Need for a collaborative approach amongst the watershed stakeholders to help meet long term goals of water use efficiency is part of the OWOW process.

Regional Water Resources Management Activities

This section reviews major operational efficiencies and water transfer activities in support of the state goals that are being implemented and/or considered at the regional level by Metropolitan Water District of Southern California (MWD), and SAWPA. These integrated activities play an important role in the objectives set by SAWPA member agencies in their respective region, and local water resources leaders in their respective regions/areas.

MWD Integrated Resources Plan

The MWD Integrated Resources Plan (IRP) is the long-term water resources strategy for MWD's six-county service area. The MWD IRP is the blueprint that guides MWD's efforts to increase water supplies and lower demands through 2035. MWD's first IRP was developed in 1996 and updated in 2004.

The MWD's 2009 IRP was prepared as part of MWD's normal five-year planning cycle. The major update on this IRP is addressing changing water supply conditions and the unprecedented series of challenges and uncertainties facing the Southern California region. These uncertainties include Delta and Colorado River water supply restrictions, climate change, continued population growth, emerging water quality issues and rising energy costs. These challenges require new approaches by MWD, its member agencies, and other regional stakeholders.

MWD member agencies, including the regional stakeholders in the SAR Watershed actively participated in the preparation of the 2009 IRP through Regional Workshops, Technical Oversight Committee and Technical Workgroups. The MWD IRP provided recommendations with respect to six resource areas: groundwater, recycled water, conservation, stormwater/urban runoff, graywater and seawater desalination.

MWD Water Supply Allocation Plan

In 2007, MWD was concerned about many water supply challenges in its service area as a result of:

- Critically dry conditions in the State Water Project (SWP) systems
- A ruling in the Federal Courts in August 2007 provided protective measures for the Delta Smelt in the Sacramento-San Joaquin River Delta

These challenges brought uncertainty about future pumping operations from the SWP and raised the possibility that MWD would not have access to the supplies necessary to meet total demands in Southern California, and would have to allocate shortages in supplies to its member agencies. It is important to note that MWD's SWP supply contract with DWR prohibits importing SWP water into MWD's service area without MWD's consent; therefore, transfers of SWP water originating outside of MWD's service area are subject to approval and agreement with MWD.

In preparing for any potential shortages, MWD developed a Water Supply Allocation Plan (WSAP). The WSAP calculates each of the MWD’s member agency supply allocations and identifies the key implementation elements needed for administering an allocation should a shortage occur. The WSAP is used by the MWD’s member agencies for the urban water shortage contingency analysis that is required under Water Code Section 10632 and is incorporated into MWD’s Regional Urban Water Management Plan (RUWMP).

In February of 2009 Governor Schwarzenegger proclaimed a statewide water shortage emergency when California was in its third consecutive year of drought. At the time, the SWP Table A allocation was at 20 percent and the MWD Board saw it appropriate to implement the WSAP and allocated water to its member agencies effective July 1, 2009. Because of the supply impacts from the recent drought conditions and Bay-Delta operational constraints, deliveries of the discounted water at the replenishment rate were suspended in 2007. MWD is currently working with its member agencies on potential long-term revisions of the Replenishment Water Program. The biggest issue causing MWD's rate increases is the loss of sales. Water sales are at record low as a result of many factors, including unemployment, foreclosures, extraordinary conservation, and the response to water rate increases. MWD water sales are at 1.73 MAF, compared to the usual sale of 2.3 MAF. Since 2007, MWD Tier 1 and Tier 2 rates have increased 69 percent and 86 percent, respectively. The Tier 2 water rate in 2013 is $997/AF.

The proclamation of the water shortage emergency by the Governor, the WSAP, discontinuation of the replenishment water program, and increased MWD water rates, were catalysts for the regional agencies within the SAR Watershed to take a closer look at their water supply reliability.

Planning Work Group Effort within the Santa Ana Watershed

Since the early 1970's, SAWPA has played a key role in the development and update of the Basin Plan for the SAR Watershed. Several task forces have been formed to address complex technical and regulatory issues and resolve inter-Agency conflicts. These task forces generally include staff of the Santa Ana Regional Water Quality Control Board (RWQCB) as active members or advisors and other stakeholders.

SAWPA's Nitrogen/Total Dissolved Solids Task Force, which met between 1996 and 2003,included some 22 water supply and wastewater management agencies and RWQCB. SAWPA has led different Task Force activities and has completed multi-million dollar studies to review groundwater quality, groundwater sub-basin boundaries, waste load allocations, and other related studies within the SAR Watershed. Different Task Force efforts usually include development of more scientifically defensible data and acceptable projects for a sustainable Watershed.

SAWPA's Basin Monitoring Program Task Force (BMPTF) is another effort tasked with executing some of the monitoring and reporting commitments within the Watershed, such as a triennial compilation of ambient groundwater quality data and an annual report of Santa Ana River water quality. The BMPTF also updates the Santa Ana River Wasteload Allocation model used to evaluate different discharge scenarios and the impacts of the Santa Ana River flows on the Orange County groundwater.

Another SAWPA work group is the Emerging Constituents (EC) Task Force. In 2007, a workgroup of water agencies and Publicly Owned Treatment Works (POTWs) was formed to develop a characterization program for emerging constituents. In the early years of its formation, the work group evaluated water quality monitoring programs, regulatory issues, stakeholder concerns, analytical methods, and potential public health and environmental impacts. Later, the workgroup developed an EC Investigative Work Plan based on ongoing characterization studies and other related evaluations. This Work Plan was submitted to and approved by the RWQCB in December 2009 (Resolution No. R8-2009-0071). Thereafter, the workgroup was formalized as a task force of multiple agencies under a task force agreement and renamed the EC Program Task Force.

The Work Plan originally had identified nine ECs, increasing to 13 ECs in 2012 to be sampled, and required each participating POTW agency to sample and pay for its own analyses of these constituents. In 2013, the list was reduced to just the ECs mandated by the SWRCB Water Recycled Water Policy and transitioned to a triennial sampling program.

Integrated Watershed Programming in the Santa Ana Watershed

Since its formation in 1968, SAWPA has been a leader in water resource planning for the SAR Watershed. SAWPA coordinated development of the first Santa Ana Integrated Watershed Program (IWP) document in 2002. This planning document identified seven major elements for a sustainable Watershed:

- Drought-proofing of the watershed by storing up to 1.3 million acre-feet (MAF) of new water
- Mitigating water quality impacts from the past activities
- Use water recycling as a major supply to reduce the area's overall need for imported water
- Develop flood protection along the main stem of the Santa Ana River
- Enhance wetlands and habitat to restore the Pacific Flyway
- Bring additional recreational opportunities and increase public awareness of the environmental needs
- Protect the long-term beneficial uses of the groundwater basins by using the Inland Empire Brine Line (IEBL) to carry saline wastes to the ocean

SAWPA has pursued the above elements based on the needs of its member agencies and other stakeholders within the watershed. The success of the SAWPA's planning efforts have provided the watershed with $389 million of different grant funding, including $250 million of Proposition 13, $25 million of Proposition 50, and $114 million of Proposition 84 grant funding. In 2005, SAWPA updated the IWP to include a summary of the many planning processes underway and priority projects of the stakeholders within the watershed. In early 2009, SAWPA completed a new integrated water management plan for the region known as OWOW. The vision of the OWOW Plan is a sustainable drought proofed and salt-balanced watershed with economic and environmental viability.

As part of OWOW process, SAWPA placed emphasis on building a collaborative approach amongst stakeholders to help meet long-term goals and objectives of the watershed in an integrated and multi-beneficial manner. Hence, the OWOW process includes a ten-member Steering Committee representing different interests throughout the Watershed. The Committee includes two representatives from the SAWPA Commission; three County Supervisors (one from each county); three mayors (one from each county); a business representative from the development community, and a representative from the environmental community. The Steering Committee developed the following working goals and objectives:

- Provide Reliable Water Supply
- Preserve and Enhance the Environment
- Promote Sustainable Water Solutions
- Ensure High Quality Water
- Provide Economically Effective Solutions
- Improve Regional Integration and Coordination
- Use Rainfall as a Resource
- Provide Recreational Opportunities

- Maintain Quality of Life

During the OWOW process, it was recognized that additional projects implemented as a result of different grant funding has closed the gap between supply and demand and increasing emphasis should be placed on water use efficiency and development of local supplies.

With as much as 60 percent of household water consumption going toward outdoor usage, there is a growing need to provide effective programs targeting outdoor landscaping.

While water recycling is an important local supply for the watershed's sustainable future, challenges related to recycled water projects are varied and range from regulatory issues, ability to handle storage/seasonal variability, water quality impacts, salinity management to public acceptance, perception, and other policy issues.

The OWOW planning process has created greater partnerships, funding opportunities, connectivity, and increased awareness of planning projects in all the communities within the watershed. A collaborative process that results in multifunction, multi-benefit projects will ultimately reduce the cost to the taxpayer and increase the efficiency of local agencies. The idea of meeting a number of community needs with a single project is not new; however, specialization within regional agencies has often moved these project types to the backburner. Hence, efforts primarily have focused on a single purpose projects, and efforts required to develop multi-objective solutions have made true multi-benefit projects relatively uncommon.

SAWPA recognizes that the OWOW process is not complete. All solid plans require constant refinement, and the OWOW Plan is no different.

Water Resources Management Activities within the Santa Ana Watershed Regions

This section reviews major planning activities being implemented and/or considered within the SAR Watershed. These planning activities were evaluated as part of the OWOW process and did set the basis for the integrated resources planning objectives set by the OWOW Steering Committee. The water resources management activities are evaluated within five geographic areas of the SAR Watershed, starting from Big Bear Lake to the Pacific Ocean. The watershed is divided into five geographical areas. These management activities, concepts, and concerns are based on a summary of existing conditions as observed by the SAWPA member agencies.

Management Activities in the Upper Santa Ana River Portion of the Watershed

The main regional agency in this area is San Bernardino Valley Municipal Water District (SBVMWD) covers about 353 square miles of southwestern San Bernardino County. The projected demand in the Upper SAR region is expected to increase by about 50 percent from 349,200 AF in 2005 to 519,700 AF in 2030 (2007 Upper Santa Ana River Watershed Integrated Regional Management Plan).

SBVMWD is the fifth largest of the 29 water contractors in the state with an annual maximum Table A entitlement of 102,600 AFY. SBVMWD imports SWP water into its service area and manages groundwater storage within the San Bernardino Valley area. Based on the Department of Water Resources State Water Project Delivery Reliability Report, the long-term average supply for SBVMWD by 2030 is estimated to be 60 percent of their Table A allocation unless the pumping restrictions in the Delta are lifted. To optimize its imported water supply, SBVMWD is attempting to increase the amount of water it imports during wet years for direct delivery and artificial recharge. This stored wet year water can then be pumped during the dry years.

SBVMWD is developing a storage program to help meet direct delivery demands during SWP shortages. The current storage program includes the DWR Carryover Storage Program, the Yuba Accord, the DWR Dry Year Water Transfer Program, storage in the Kern-Delta water bank, and storage in Big Bear Lake.

Development and reuse of recycled water is at its infancy in this region and is projected to increase steadily over the next two decades (2010 Regional UWMP - SBVMWD).

The Cities of San Bernardino and Colton joined together and developed the 41 MGD Rapid Infiltration/Extraction (RIX) process to treat un-chlorinated secondary effluent prior to ultraviolet (UV) light disinfection for tertiary treatment and discharge to SAR. Currently, RIX discharges all of its product water (approximately 33 MGD) to the SAR. RIX is obligated to provide 16,000 AFY for downstream purposes to meet the 15,250 AFY SAR "base flow" obligations. However, there is local interest to use RIX discharge for direct groundwater recharge and non-potable demands.

Yucaipa Valley Water District (YVWD) has an 8 MGD recycled water plant which has microfiltration filters and ultraviolet (UV) light for disinfection. YWVD Regional Water Recycling Facility discharges about 1,000 AFY of recycled water into the San Timoteo Creek. YVWD is considering construction of reverse osmosis membrane treatment at its Yucaipa Valley Regional Water Filtration Facility for the treatment of imported water supplies in compliance with the basin plan objectives set by the RWQCB. In order to dispose of the brine flow, YVWD constructed a 15-mile brineline to connect to the existing IEBL pipeline in San Bernardino. YVWD has adopted planning guidelines requiring the use of recycled water for front and rear yard irrigation of new development in its service area, and has developed a dual distribution system of potable and recycled water to convey recycled water (2010 Regional UWMP - SBVMWD).

The City of Redlands supplies recycled water to Southern California Edison's Mountain View Power Plant for its cooling water. City of Redlands expects to produce 8,015 AFY of recycled water by 2030 and is evaluating the potential of providing recycled water to the City of Loma Linda (2010 Regional UWMP - SBVMWD). Recycled water facilities are not currently available in the City of Colton's service area; construction of such facilities is cost prohibitive and the City has no plans to reuse recycled water in the area at this time (2010 Regional UWMP - SBVMWD). The City of Rialto is updating its Recycled Water Master Plan and is investigating the expansion of its existing tertiary treatment plant and reclaimed water system as a way to supplement the City's water supply. Beaumont-Cherry Valley Water District is upgrading its Waste Water Treatment Plant from 2 MGD to 4 MGD. The District is currently discharging this water to Cooper Creek, but is planning to use a portion of its recycled water in the future. Fontana Water Company and City of Fontana are planning the construction of a facility that will produce 5,000 AFY of recycled water for distribution; while Big Bear Valley Recycled Water Master Plan emphasizes on groundwater recharge (2007 Upper Santa Ana River Watershed Integrated Regional Management Plan).

Approximately 60 percent of this region's supply is from groundwater, 70 percent of which is from the San Bernardino Basin Area (SBBA). The SBBA was adjudicated by the 1969 Judgment. This Judgment established a natural safe yield of 232,100 AFY; SBVMWD agencies are allowed 167,238 AFY and Riverside County agencies receive 64,862 AFY of the safe yield (2010 Regional UWMP - SBVMWD).

SBVMWD and WMWD share a long history of working together on water supply issues; both agencies are members of the Watermaster Committee for the OC Judgment and they are the two-member Watermaster Committee for the 1969 Judgment.

Liquefaction in the Pressure Zone remains a major threat. The City of San Bernardino has a very high water table and experiences high pressure; at times wells have become artesian and damaged property in the area. An agreement among groundwater producers in the Pressure Zone to maximize production from this area during high groundwater level conditions is desirable. Additional facilities may be required to produce and convey large quantities of groundwater from the Pressure Zone for use outside of this area (2007 Upper Santa Ana River Watershed Integrated Regional Management Plan).

SBVMWD and San Bernardino Valley Water Conservation District (SBVWCD) are primarily the agencies in charge of groundwater recharge. Conjunctive use projects may be feasible with construction of additional recharge basins, wells, pipeline facilities; so long as the projects comply with terms and conditions of the 1969 Judgments, and various decrees and agreements (2010 Regional UWMP - SBVMWD).

Bunker Hill groundwater basin is estimated to have 6 million AF of storage capacity; with a recharge efficiency rate of 95 percent (2007 Upper Santa Ana River Watershed Integrated Regional Management Plan).

In 2010, SBVMWD and Western Municipal Water District (WMWD) received two permits from the State Water Resources Control Board (SWRCB) to divert Santa Ana River water downstream from Seven Oaks Dam. The yield from these two permits is estimated to be up to 200,000 AF in wet years, with an average annual yield of 10,800-27,000 AF. Additional infrastructure for capturing and utilizing this local stormwater is required. SBVMWD has completed CEQA and 60 percent design for the first phase of these facilities.

The City of Redlands has surface water rights to approximately 15,000 AFY from the Mill Creek and SAR. The current use of this water by the City is limited to its treatment capacity. Fontana Water Company as an agent for Fontana Union Water Company diverts water from Lytle Creek. During normal years, West Valley Water District (WVWD) uses up to 5,500 AFY from Lytle Creek surface flows and projects using a minimum of 2,130 AFY during extended drought periods. East Valley Water District (EVWD) has water rights for 4,500 AFY of SAR water, with the ability to expand to 7,300 AFY through the conversion of remaining agricultural properties and water shares of stock through the North Fork Mutual Water Company (2010 Regional UWMP - SBVMWD).

Nine agencies in the area have an "exchange agreement" that allows them to exchange SWP, SAR, and Mill Creek water through simultaneous and deferred exchanges for the benefit of each party (2010 Regional UWMP - SBVMWD).

The San Gorgonio Pass Water Agency (SGPWA) may have a shortage of about 17,500 AFY by 2030. During multi-year drought periods, this shortage could increase to 26,700 AFY. This shortfall can be overcome by reducing demands and/or purchasing additional water supplies (2007 Upper Santa Ana River Watershed Integrated Regional Management Plan).

The agencies in the San Bernardino County have difficulty achieving adequate local funding. A major constraint in implementing many of the projects in this region is lack of financial capacity and funding availability. Many of the local communities are economically disadvantaged and may not be able to finance costly projects.

The water agencies in this region are concerned about expansion of the critical habitat area for the Santa Ana Sucker fish, which could impact water allocation, water use, and recharge efforts along the SAR. In October 2012, several water agencies in this region lost a court battle when the federal district judge allowed for the expansion of the critical habitat of the Santa Ana Sucker in upstream areas of the SAR. The agencies are appealing this court decision.

Management Activities Between Colton and Prado Dam

The main stem of the SAR extends between the cities of Colton and Corona. Temescal Creek also flows into the Prado dam in Corona. The main regional water agency in this area is Western Municipal Water District (WMWD) serves the western portion of Riverside County (**Figure 5.10-1**) including nine water purveyors in its jurisdiction 1) Box Springs Mutual Water Company, 2) City of Corona, 3) City of Norco, 4) City of Riverside, 5) Eagle Valley Mutual Water Company, 6) Elsinore Valley Municipal Water District, 7) Lee Lake Water District, 8) Rancho California Water District, and 9) Jurupa Community Services District.

WMWD receives treated imported water through MWD's Mills and Skinner Water Filtration Plants (WFPs); the untreated imported water is delivered through MWD's Lower Feeder. Demand for imported water within the WMWD area is expected to increase from 104,000 AFY in 2010 to 208,000 AFY by the year 2040 (2008 Updated IRWM Plan - WMWD).

Imported water from MWD accounts for 33 percent of total water demands in the WMWD area and is expected to comprise 35 percent of total water demand by 2030 (2008 Updated IRWM Plan - WMWD). WMWD recognizes the importance of a collaborative relationship with MWD and expects to receive 100 percent of its imported water needs from MWD. Even though WMWD is counting on the imported water from MWD, there are concerns over salinity, bromide, and organic carbon concentration levels of the imported water (2008 Updated IRWM Plan - WMWD).

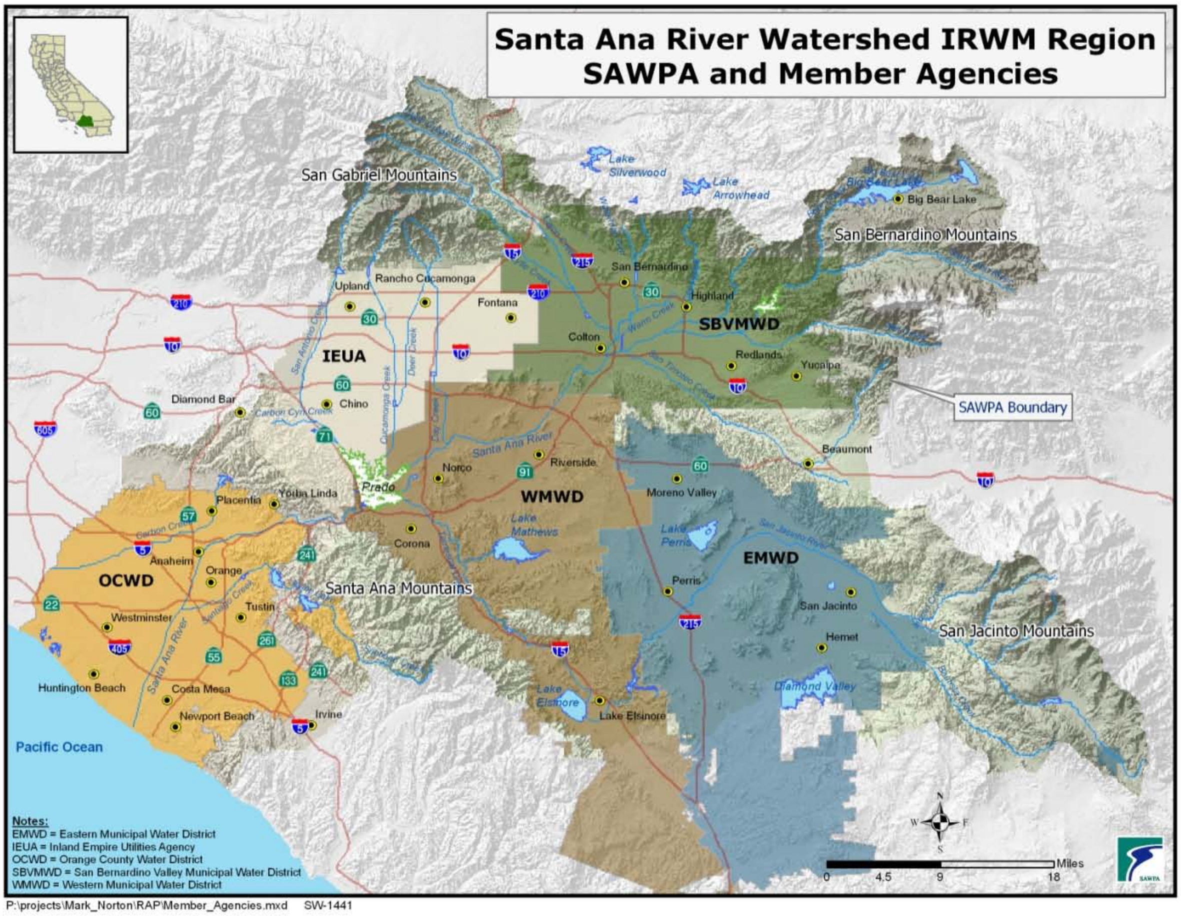
WMWD's Ordinance 377 requires customers to use recycled water where this resource is available and can be properly used (2010 UWMP Update - WMWD). Recycled water use in 2005 accounted for 9,100 AFY (3 percent of total water demands in 2005) within the WMWD area. The use of recycled water is expected to increase to 59,600 AFY by 2030, which represents about 12 percent of the total demands in 2030 (2008 Updated IRWM Plan - WMWD). WMWD is interested in expanding the current recycled water treatment capacities and reuse this resource for recharge into the groundwater basins (2010 UWMP Update - WMWD).

Groundwater continues to be the primary water supply source available to WMWD and agencies within its jurisdiction. The largest city in this region is the City of Riverside, which receives less than 5 percent of its supply from WMWD (2010 UWMP Update - WMWD), and its remaining supply from Bunker Hill, Riverside North, and Riverside South groundwater basins (2010 UWMP - City of Riverside). Groundwater is expected to meet 252,000 AFY of demands by 2025 which is approximately 54 percent of the 2025 total water supply (2008 Updated IRWM Plan - WMWD). WMWD is interested in expanding its groundwater production capacity in the vicinity of the March Air Reserve Base (2010 UWMP Update - WMWD). WMWD is a member of the Chino Desalter Authority, and this membership gives WMWD access to treated Chino Basin groundwater (2010 UWMP Update - WMWD). Future expansion and use of the groundwater resources may require additional treatment and/or desalination which are subject to availability of brine disposal facilities (2008 Updated IRWM Plan - WMWD).

In 2010, WMWD and SBVMWD received two permits from SWRCB to withdraw water from the SAR. These permits are issued based on the surface water that can be made available from the Seven Oaks Dam facilities (2010 UWMP Update - WMWD). WMWD is interested in storing excess stormwater runoff, SAR water, and SWP water in the San Bernardino Groundwater basin (2010 UWMP Update - WMWD).

WMWD has been proactive in developing its regional water shortage contingency plan and has a Water Conservation and Supply Shortage Program. WMWD has implemented a tiered-rate billing system and Staff is focused on reducing land use irrigation water consumption through the District's Water Use Efficiency Master Plan (2010 UWMP Update - WMWD).

Figure 5.10-1 Different Geographical Regions within the Santa Ana River Watershed



Management Activities within the San Jacinto Watershed

San Jacinto Watershed extends from San Jacinto Mountains to Canyon Lake. The water from San Jacinto River flows into Canyon Lake and to Temescal Creek. The main regional agency serving the San Jacinto Watershed is Eastern Municipal Water District (EMWD). This region includes four water purveyors 1) Lake Hemet Municipal Water District, 2) City of Hemet, 3) City of San Jacinto, and 4) City of Perris. Population in the EMWD service area is expected to grow by 75 percent in the next 25 years (2011 IRP - EMWD).

EMWD receives treated imported water through MWD's Mills and Skinner WFPs; the untreated imported water is delivered though several MWD connections with EMWD. EMWD receives approximately 80 percent of its potable water supply from MWD (2011 IRP - EMWD). EMWD is concerned about its imported water supply because MWD's reliability buffer for retailers is predicated on finding a solution to the Delta issues within the next ten to fifteen years. Other imported water concerns include persistence of drought in the Colorado River system, and water quality issues such as salinity, uranium, perchlorate, chromium VI, nutrients, N-Nitrosodimethylamine, and pharmaceuticals in the water supply from the Colorado River Aqueduct. MWD is making significant investments to its infrastructure to improve supply and system reliability, and EMWD is concerned about the cost increases to the MWD member agencies as a result of these improvements (2011 IRP - EMWD).

MWD is facing regional treatment capacity shortages in the future. In 2007, MWD in cooperation with EMWD and WMWD completed an Integrated Area Study (IAS) and identified the need for a new filtration plant in the area. In addition, Mills WFP conveyance capacity for delivery of treated water to EMWD is limited, which requires significant transmission infrastructure upgrades (2011 IRP - EMWD).

To address some of the imported water concerns, EMWD has expanded local treatment of untreated MWD water, and with the cooperation of three of its purveyors has developed a groundwater replenishment program to reduce reliance on treated MWD water in its area (2011 IRP - EMWD)/ (2010 UWMP - EMWD).

EMWD is responsible for all wastewater collection and treatment in its service area and treated 46,500 AF of water in 2010. All of the wastewater collected in the EMWD service area is treated to tertiary standards, and EMWD has an extensive recycled water system for the use of its recycled water. EMWD's recycled water system includes four Regional Water Reclamation Facilities (RWRF), several recycled water unlined surface storage ponds, above ground storage tanks, and a distribution system that connects all of its RWRF's. EMWD has a mandatory recycled water use ordinance, which requires new and existing customers to use recycled water for appropriate permitted uses when available (2010 UWMP - EMWD).

EMWD reuses all of its produced recycled water during peak demand months (June-September). The demand during these months is higher than the recycled water that is produced, and supply is supplemented by recycled water that is stored during cooler, wetter parts of the year (October –May). During these months surplus recycled water is stored in unlined surface storage ponds, resulting in extensive groundwater recharge. Any surplus water that cannot be stored due to storage limitations is disposed through a regional outfall pipeline to Temescal Creek and Santa Ana River (2010 UWMP - EMWD).

EMWD intends to capture and reuse all of its future growth generated recycled water by constructing an Advanced Water Treatment Facility (AWTF) and recharging the product water into the San Jacinto groundwater basin (2011 IRP - EMWD). Such a project requires significant capital investment, a significant outreach program to overcome regulatory and local acceptance hurdles, and additional capacity in the brine disposal facilities.

EMWD produces potable groundwater from two management plan areas in the San Jacinto Watershed, the West San Jacinto Groundwater Basin Management (WSJGM) area, and the Hemet/San Jacinto Water Management (HSJWM) area. The groundwater produced from the WSJGM area is brackish and requires treatment. EMWD operates two desalination plants in the WSJGM area to convert brackish groundwater into potable water (2010 UWMP - EMWD).

The groundwater from the HSJWM area is of potable quality, but the basins are overdrafted. The overdrafted conditions caused a prolonged litigation against EMWD and MWD, by the Soboba Band of Luiseño Indians, and a settlement that was signed in 2006. Under this settlement, the local purveyors in the HSJWM area are required to develop a management plan for the HSJWM area; and for thirty years MWD is obligated to deliver 7,500 AFY for groundwater replenishment. The HSJWM Plan activities will be coordinated by a Watermaster who is responsible to overcome the chronic groundwater overdrafts in the HSJWM area (2010 UWMP - EMWD). The Watermaster in collaboration with EMWD will be responsible for operating the HSJWM groundwater basins within their safe yield limits; recharge groundwater basins with imported water; and use EMWD's San Jacinto River flow diversion rights of 5,760 AFY for recharge of the HSJWM groundwater basins.

As part of compliance with SBX7-7 legislation, EMWD implemented a budget based tiered rate program for its retail residential and landscape customers. Each customer account has a monthly budget based on the number of persons in the household and the irrigation landscape area. The conservation programs being implemented by EMWD are expected to conserve 19,200 AFY of water by 2035 (2010 UWMP - EMWD).

High reliance on imported water and its associated challenges have caused EMWD to pay particular attention to improving water supply reliability within its service area. EMWD is continuously looking at programs such as conservation, desalination, budget based tiered rate billing structure, recycled water use, urban stormwater runoff harvesting, groundwater recharge, and water transfers to improve its water supply reliability.

Management Activities within the Chino Basin Area

This region extends from San Gabriel Mountains to Prado Dam. The two main regional agencies serving this area are Chino Basin Watermaster (CBWM) and Inland Empire Utility Agency (IEUA).

Activities Within The Chino Basin Watermaster Area

The Optimum Basin Management Plan (OBMP) for the Chino Basin is a major strategic planning in the CBWM area which was prepared by the IEUA and CBWM to address groundwater quality problems and identify groundwater management opportunities. The OBMP objective is to develop cost-effective, reliable, potable water supplies, enhance and protect the yield and quality of the Chino groundwater basins; while minimizing demand for imported water and encouraging the use of the large available storage space in the aquifer system. The OBMP provides the framework for cooperative groundwater management program development among agencies in the Chino groundwater basins. To facilitate implementation of the OBMP, an agreement (the "Peace Agreement") was signed by Watermaster, Inland Empire Utility Agency (IEUA), Western Municipal Water District (WMWD), and various other stakeholders in June of 2000. The OBMP does address the urban water management planning needs within the Chino groundwater basins through water quality treatment, groundwater recharge, groundwater desalination, and water recycling programs. In 2007, the original Peace Agreement was updated (Peace II Agreement) to redefine the future programs and actions required to implement the OBMP. In 2010, IEUA completed a Peace II subsequent Environmental Impact Report (SEIR) for the OBMP update.

The Peace II Agreement includes groundwater desalination which creates “Hydraulic Control” in the Chino groundwater basin. The Hydraulic Control ensures that the water management activities in the Chino groundwater basins will not impair the beneficial uses of the Santa Ana River downstream of Prado Dam.

Activities Within the Inland Empire Utility Agency Area

IEUA was originally formed in 1950 as the Chino Basin Municipal Water District and officially changed its name to IEUA on July 1, 1998, to reflect the change in the District’s mission. IEUA provides imported water, wastewater management, and energy recovery/production services to a 242 square mile area in the southwest corner of San Bernardino County (see **Figure 5.10-1**). IEUA provides water and wastewater services to ten contracting agencies in its jurisdiction 1) City of Chino, 2) City of Chino Hills, 3) Cucamonga Valley Water District (CVWD), 4) City of Fontana, 5) San Antonio Water Company, 6) City of Ontario, 7) City of Upland, 8) Monte Vista Water District, 9) Fontana Water Company, and 10) City of Montclair. The IEUA service area population is expected to grow from 830,000 to 1,200,000 by 2035.

MWD has invested $2.7 million in a 100,000 AF Chino Basin groundwater conjunctive use program. MWD and IEUA are working together to expand this program by a minimum of 50,000 AF. This strategy will provide dry year water supplies for the Chino Basin and the SAR watershed (2010 UWMP - IEUA). In December 2012, the MWD Board eliminated their groundwater replenishment program.

Although IEUA has worked to reduce its reliance on imported water, due to increased demand, in six of the past ten years IEUA was required to purchase imported water at a higher cost (MWD’s Tier 2 rate) (2010 UWMP - IEUA).

Since 2007, MWD Tier 1 and Tier 2 rates have increased 69 percent and 86 percent, respectively. Increasing rates in conjunction with the elimination of the replenishment program has caused IEUA and its member agencies to re-evaluate how the Chino Basin is operating. As a result, it is no longer economical for the groundwater users to overproduce the basin during dry years, and it is less expensive to purchase MWD’s imported water at the Tier 1 rate as a direct import (2012-13 Operating and Capital Budget - IEUA).

Currently, IEUA produces about 60,000 AFY of recycled water from four recycled water plants IEUA reuses about 54 percent of its recycled water and discharges the remaining 36 percent of its recycled water into the SAR.

The Inland Empire Regional Composting Facility is a joint venture between IEUA and Los Angeles County Sanitation District. This facility uses biosolids from IEUA’s anaerobic digesters (2010 UWMP - IEUA). IEUA’s ultimate recycled water plan is for delivery of 93,000 AFY of recycled water from all four of its plants. As of 2012, the recycled water distribution pipeline network has been constructed at a cost of $250 million, and is expected to deliver 62,000 AFY for direct use and replenishment by 2035 (2010 UWMP - IEUA). Currently IEUA recharges 10,000 AFY into the Chino Basin; with plans to double the recycled water recharge within the next ten years.

Available recycled water supplies are projected to reach 83,000 AFY by 2035. The SAR judgment requires IEUA to discharge 17,000 AFY into the SAR. This leaves approximately 66,000 AFY of recycled water available for beneficial use within the IEUA service area by 2035 (2010 UWMP - IEUA).

The Chino Basin is the largest groundwater basin in the Upper Santa Ana Watershed. In 2010, Chino Basin groundwater provided the IEUA service area with 105,000 AFY of supply (60-70 percent of its water supply). Development and maintenance of the Chino Basin are critical for the supply reliability in the region. Chino Basin groundwater production is expected to reach 170,000 AFY by 2035(2010 UWMP - IEUA).

The 1978 Chino Basin Judgment adjudicated water rights in the Chino Basin and formed the Chino Basin Watermaster (CBWM). The Judgment set the safe-yield at 145,000 AFY, but an additional 40,000 AFY of desalted groundwater can be produced via three desalters under the CBWM's OBMP. These desalters use a combination of reverse osmosis and ion exchange technology to treat the pumped groundwater. Salt balance is a major issue for the Chino Basin and the SAR Watershed as a whole. Depletion of groundwater reserves, undesired water quality, contravention of existing water rights, excessive increases in production costs, streamflow depletion, and subsidence are other factors that affect the Chino Basin water supplies. In 2005, CBWM, IEUA, OCWD, and the RWQCB developed a hydraulic control monitoring program to characterize the relationship of the SAR and the Chino Basin. Information from this program is used to adaptively manage the Chino Basin's storage and recovery activities (2010 UWMP - IEUA). The Chino Basin is a valuable resource for water transfers in the SAR Basin because of its ability to store vast quantities of water, and has storage capability of up to 6 million AF (2010 UWMP - IEUA).

In 2002, CBWM, Chino Basin Water Conservation District (CBWCD), San Bernardino County Flood Control District (SBCFCD), and IEUA formed a joint committee to implement the Chino Basin Facilities Improvement Project (CBFIP). Improvements to the Chino Basin groundwater recharge will substantially increase the replenishment of the groundwater basin through a combination of storm water, recycled water, and imported water. This project is designed to maximize the use of uninterruptible supplies when available (2010 UWMP - IEUA). IEUA is the lead agency for implementation of the CBFIP which has constructed and improved 19 recharge sites with a total potential recharge capacity of 110,000 AFY(2012-13 Operating and Capital Budget - IEUA).

Changes in the environmental regulations, the GHG emission legislation, and other legislations can significantly impact energy programs and costs. As a result, IEUA has adopted a "Gridless by 2020" campaign, in which IEUA will meet 100 percent of its2020 energy needs with renewable energy sources (2012-13 Operating and Capital Budget - IEUA).

Population increase, combined with uncertain effects from climate change, have prompted IEUA management to alert its Board of Directors to the significant water management challenges that the area will be facing in the future (2010 UWMP - IEUA).

Management Activities within the Orange County Area

The SAR below Prado dam flows through Orange County and discharges into the Pacific Ocean. The main regional groundwater agency serving this area of the SAR Watershed is Orange County Water District (OCWD). The OCWD was formed in 1933 to manage and protect the Orange County groundwater basin (**Figure 5.10-1**). OCWD encompasses 350 square miles in the lower SAR Watershed serving more than 2.4 million people and providing water supply to thirteen cities and six water districts.

Total water demand within OCWD's boundary is about 480,000 AFY (2009 Update GWM Plan - OCWD). Total demand includes the use of groundwater, surface water from Santiago Creek and Irvine Lake, recycled water, and imported water (2009 Long-Term Facilities Plan - OCWD). The groundwater basin managed by OCWD provides up to 75 percent of the water needed within OCWD's boundary. Municipal Water District of Orange County (MWDOC) has estimated total water demands within OCWD's boundary in 2035 to be 558,000 AFY (2010 UWMP - MWDOC).

MWDOC and the cities of Anaheim, Fullerton, and Santa Ana are members of MWD and can import water directly from MWD. Since 2004, OCWD, MWDOC, and participating producers in the region have participated in MWD's Conjunctive Use Program. The existing MWD storage program provides for MWD to store up to 66,000 AF of water in the basin in exchange of MWD's contribution to improvements in basin management facilities (2010 UWMP - MWDOC).

Water managers in Orange County are very concerned about the increasing cost of the imported water due to endangered/threatened species in the Delta, drought along the Colorado River, and reduced water sales by MWD.

The Orange County Sanitation District (OCSD) is the regional wastewater management agency for 21 cities, three special districts, and a portion of the unincorporated county areas. The OCSD treats 210 MGD of wastewater at its two treatment facilities in Huntington Beach and Fountain Valley. OCWD receives secondary treated wastewater from OCSD and treats it to a pristine level at the Groundwater Replenishment System (GWRS) before recharging it into the groundwater basin. GWRS can currently produce up to 72,000 AFY (2009 Update GWM Plan - OCWD). The system can be expanded to a total of 120,000 AFY in two phases (2009 Long-Term Facilities Plan - OCWD).

Since 1965, Los Angeles County Flood Control District (LACFCD) and OCWD have been jointly operating injection wells in the Alamitos and Talbert Barriers to control the seawater intrusion into the Orange and Los Angeles Counties. Controlling seawater intrusion into the groundwater basin is critical to protecting the water quality of groundwater in the region. GWRS provides water for the Talbert Barrier injection wells in addition to recharge water for the Anaheim surface water recharge facilities. Approximately 34,000 AFY (30 MGD) of injection is used at the Talbert Barrier to substantially raise water levels, an amount sufficient to fully prevent seawater intrusion. Talbert Barrier may require up to 45 MGD of injection to meet the projected 2020 conditions (2009 Update GWM Plan - OCWD).

OCWD owns and operates a network of recharge facilities that cover over 1,500 acres in addition to the 2,150 acres that it owns above Prado Dam (used for conservation and water quality improvement).

OCWD has two diversion permits from the SWRCB for diversion and use of up to 362,000 of SAR water, and collection and storage of 33,560 AFY from Santiago Creek. OCWD utilizes the permitted diversions from the SAR and Santiago Creek to maximize recharge of the groundwater basin. SWRCB has also agreed to hold an additional 143,000 AFY in abeyance for OCWD for possible future projects. This provides an opportunity for OCWD to pursue long-term projects and complete environmental analysis and planning of those projects by 2023.In its Long-Term Facilities Plan (2009 Long-Term Facilities Plan - OCWD) OCWD identified potential projects for recharge enhancement, including sediment removal from SAR; new injection wells to recharge GWRS water in the basin; subsurface recharge galleries to recharge more GWRS water; and cooperation with the County of Orange to recharge at Fletcher Basin-area.

The groundwater basin's primary source of water is the OCWD recharge activities in and adjacent to the SAR and Santiago Creek. The SAR bed percolation rate has been declining by approximately one percent per year for the last 20 years due to the coarsening of the riverbed. In addition, invasive and pervasive plant species, such as Arundo Donax, prohibit maximize flow in the SAR and Prado dam areas. OCWD is able to recharge essentially all non-storm flow in the SAR that enters the OC through Prado Dam; however, stormflows exceed the diversion capacity during years of heavy precipitation. During wet years, there is a significant loss of water to the ocean. Maximum percolation at the recharge facilities is estimated at 500 cubic-feet per second (cfs), while the rate of stormflow can reach 3,000 cfs. In 1997-98 alone, approximately 270,000 AF of SAR stormflow were lost to the ocean (2009 Update GWM Plan - OCWD).

OCWD has legal rights to a minimum of 42,000 AFY of SAR baseflow (defined as “perennial flows from the upper watershed” in SAR which is predominantly treated wastewater). Over the last 10 years, the SAR provided approximately 200,000 AFY of water to Orange County (150,000 AFY of baseflow and 50,000 AFY of stormflow) to recharge the groundwater basin (2009 Long-Term Facilities Plan - OCWD).

OCWD has developed an extensive groundwater modeling, monitoring, and tracking system; and has comprehensive sub-surface geology, and water quality data for the region. OCWD estimates the entire groundwater storage capacity in the region to be 66,000,000 AF. In 2009, OCWD estimated the inflows to the groundwater to be approximately 341,000 AF (with 235,000 AF at the Forebay recharge facility, 35,000 AF at Talbert Gap, 2,500 AF at Alamitos Gap, and 69,000 AF of other recharge). This inflow is balanced with groundwater production of 335,000 AF and subsurface outflow of 8,000 AF (2009 Update GWM Plan - OCWD).

The GWRS provides a dependable supply of water and is expected to remove approximately 47,000 tons of salt per year. In addition, Tustin and Irvine desalters remove and treat impaired groundwater in the region (2009 Update GWM Plan - OCWD). MWDOC has identified several projects in the area that would double impaired groundwater production. However, these projects will require additional replenishment water for their implementation (2010 UWMP - MWDOC).

To control nitrate levels, OCWD operates 350 acres of wetlands in the Prado Basin to naturally remove nitrates before they enter recharge facilities. In addition, OCWD is interested in developing more wetlands above the Prado Dam at Chino Creek (Prado Basin area), River Road (to treat SAR baseflow that is not diverted to the existing Prado wetlands), Temescal Creek, and Mill Creek (proposed by the City of Ontario) (2009 Long-Term Facilities Plan - OCWD).

Development and implementation of water use efficiency programs to assure 20 x 2020 compliance and establishing water use efficiency is considered as a main source for water resources mix in Orange County by the MWDOC Strategic plan. One of the key strategies identified by MWDOC is increasing Orange County's water supply from non-local sources. MWDOC plans to assist member agencies with water transfers and exchanges and would like to be proactive in identifying and screening innovative, non-local water supply. Irvine Ranch Water District (IRWD) worked with MWD and MWDOC to develop the IRWD Strand Ranch Integrated Banking Project that allows for recharge, storage and recovery of 50,000 AF of SWP water in Kern County. Another MWDOC objective is to build coalitions in support of developing ocean desalination as a component of the water resources strategy for Orange County.

Concerns within this region includes:

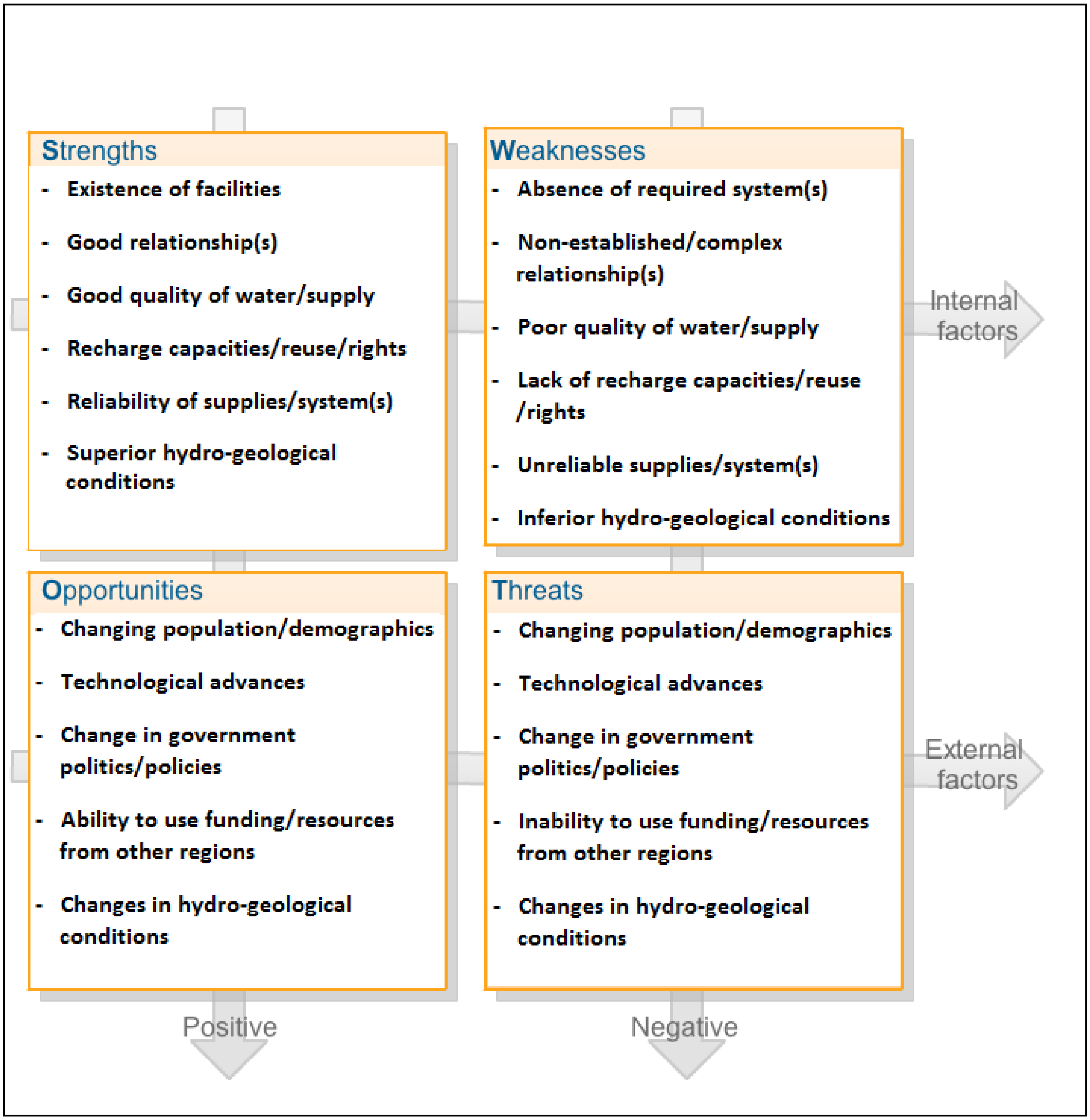
- Decreases in baseflows reaching Prado Dam caused by several factors including increased recycling in the upper SAR basin
- Protecting groundwater quality from industrial contamination and other potential sources of contamination
- Declining flows in the SAR and tributaries to the SAR impacting natural resources in the watershed
- Changes in the amount of inflow to OCSD that could affect supplies for the GWRS
- Continuation of drought conditions impacting the MWD supply reliability
- Availability of imported water to replenish the groundwater basin
- Maintaining the quality of water in the SAR that is the source water for recharging the Orange County groundwater basin

Water agencies within the Orange County recognize the importance of a collaborative relationship with the agencies in the upper SAR watershed and have historically entered into agreements with these agencies for excess water that the agencies pump into the SAR and reaches Prado dam (2009 Update GWM Plan - OCWD).

Watershed Integration Nexus Analysis

By definition, Strengths (S) and Weaknesses (W) in a geographic area are considered to be internal factors over which water supply agencies have some measure of control. Also, by definition, Opportunities (O) and Threats (T) are considered to be external factors over which the agencies in a geographic region have essentially no control. SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats, and SWOT Analysis is the most renowned tool for analysis of the overall strategic position of a business and its environment. The key purpose of a SWOT analysis is to identify the strategies that will create a specific business model that will best align resources and capabilities to the requirements of the environment in which the business operates. Basic guidelines were set to categorize Strengths, Weaknesses, Opportunities, and Threats for each geographical area. These guidelines (shown in **Figure 5.10-2**) provide a standardized approach in preparation of SWOT analysis for the entire watershed. A SWOT analysis, also called situational analysis, is usually used to evaluate the internal strengths and weaknesses of an organization and the external opportunities and threats to that organization.

Figure 5.10-2 SWOT Analysis Guidelines



However, in this report, a SWOT analysis is conducted to explore the strategies that have already been defined by SAR watershed stakeholders, in particular SAWPA member agencies, and identify the strengths and opportunities that can be developed by a cooperative planning effort amongst SAWPA member agencies. Such cooperative concepts can benefit from the integration of different resources, facilities, and capabilities that currently exist within the watershed. The SWOT analysis used for this WIN study began with an examination of strengths and concerns identified in different geographical areas by SAR watershed agencies in their strategic documents, and the opportunities and threats are based on information gathered from the regional planning documents. The goal of the report is to provide a Watershed Integration Nexus (WIN) concept by utilizing SWOT analysis elements within different geographical regions of the SAR watershed in support of the OWOW program.

Using the SWOT analysis presented in this report, water managers can help the SAR watershed increase its internal strengths and reduce its internal weaknesses while augmenting external opportunities and reducing external threats.

The accuracy of a SWOT analysis is dependent upon the amount and source of data that are available. Any analysis with a lack of data may suffer from a biased viewpoint, and an incorrect hypothesis may be formulated that would corrupt the sole purpose of the analysis. In order to validate the accuracy of data and information related to a particular geographical area, several meetings with the SAWPA member agencies' strategic planners were conducted. **Table 5.10-1** through **Table 5.10-5** summarizes the SWOT analysis results for different geographical areas. These summary tables were prepared based on information provided in Section 4 of the report, which were validated by SAWPA member agencies' strategic planners.

The SWOT analysis is instrumental in strategy formulation and is a strong tool, but it involves a great subjective element. The analysis provided in this report is intended as a guideline and not as a prescription. Regional water managers in different geographical regions can use the SWOT analysis summaries in **Table 5.10-1** through **Table 5.10-5** capitalize on their regional strengths, and collaborate with agencies in other geographical regions to overcome weakness and external threats to their specific region.

Table 5.10-1 SWOT Analysis Summary for the Upper Santa Ana River Portion of the Watershed

Strengths	Weaknesses	Opportunities	Threats
SBVMWD permits to divert Santa Ana River Water	Lack of a mature recycled water reuse program in the region	Construct additional recharge facilities to capture recently permitted diversions	Liquefaction threat if groundwater levels rise within 50 feet of land surface
Most of the watershed's runoff flows through this region	Conjunctive use opportunities limited to around 40,000 acre-feet due to potential for high groundwater in San Bernardino	Increase stormwater capture through "Active Recharge" and "Rubber Dam" projects	Many of the local communities are economically disadvantaged and unattractive to potential companies for economic growth
Stored water in Kern-Delta and Big Bear Lake to supplement direct delivery needs in dry years	Good quality groundwater preservation requires expensive AWTF of recycled water for groundwater recharge	Optimize the effectiveness of existing recharge operations and build additional recharge facilities so that SBVMWD can import SWP in wet years	Expansion of the critical habitat area for the Santa Ana Sucker, and its interference with regional water management efforts
The region has an estimated groundwater capacity of 5 million acre-feet	Projected supply shortage in the SGPWA area	Regional access to the Inland Empire Brine Line (IEBL)	Environmental needs in the Delta impacting imported supplies to the SAR watershed
SBVMWD is the fifth largest of the 29 water contractors in the state		Dewatering plan should high groundwater return	Meeting demands during droughts
Maximizing imported water during wet years through Cooperative Recharge Program		Improve the local economy by attracting pharmaceutical and other businesses that need a brine line	
Collaborative water management through the Basin Technical Advisory Committee (BTAC)			
Having the Rapid Infiltration/Extraction (RIX) project permits/process.			

Table 5.10-2 SWOT Analysis Summary for Area Between City of Colton and Prado Dam

Strengths	Weaknesses	Opportunities	Threats
WMWD collaborative relationship with MWD and its involvement in the IRP Process	Expansion and use of the groundwater requires additional treatment and/or desalination	Planning for expansion of recycled water use in the area	Significant future demand increase in the region due to rapid population growth and urban development
Participation in different Task Force activities to resolve regulatory issues with RWQCB		Ability to store excess stormwater runoff, SAR water, and SWP water, in the San Bernardino Groundwater basin	Climate change altering hydrologic conditions impacting imported supplies to the SAR watershed
Ability to address concerns within the SAR Watershed through collaborative approach amongst stakeholders (Members of SAWPA)		WMWD has a temporary permit from SWRCB to receive surface water from Seven Oaks Dam	Concerns over salinity, bromide, and organic carbon concentration levels of the imported water
Ability to receive treated imported water from two WFP (MWD's Mills and Skinner WFP)		Access to the IEBL for brine disposal	Restrictions on SWP and Colorado River operation
Reliance on imported water limited to 33 percent of total water demand in the WMWD area			Extensive MWD imported water rate increases in recent years
WMWD is a member of the Chino Desalter Authority with access to treated Chino Basin groundwater			
Long history of working relationship between WMWD and SBVMWD on water supply issues			
WMWD has implemented a tiered-rate water rate structure to improve water use efficiency in the area			

Table 5.10-3 SWOT Analysis Summary for the San Jacinto River Sub-watershed Area

Strengths	Weaknesses	Opportunities	Threats
Collaborative relationship with MWD and its involvement in the IRP Process	Reliance on imported water exceeds 80 percent of total potable water demand in the EMWD area	Development of a stipulated judgment to address the over drafted groundwater issues	Climate change altering hydrologic conditions impacting imported supplies to the SAR watershed
Participation in different Task Force activities to resolve regulatory issues with RWQCB	Reuse all of future generated recycled water requires construction of AWTF	Existence of a comprehensive conservation program in the area	Significant future demand increase in the region due to rapid population growth and urban development
Ability to address concerns within the SAR Watershed through collaborative approach amongst stakeholders	Need for significant transmission infrastructure upgrades, and future regional treatment capacity shortages at the Mills WFP	Regional access to the Inland Empire Brine Line (IEBL)	Restrictions on SWP (finding a solution to the Delta issues within the next ten to fifteen years) and persistence of drought in the Colorado River system
Ability to receive treated imported water from two WFP (MWD's Mills and Skinner WFP)	Over drafted groundwater basins in the area		Extensive MWD imported water rate increases in recent years
Existence of a groundwater replenishment program to reduce reliance on treated MWD water			
Having a budget based tiered rate program			
Existence of an extensive recycled water system in the area			
Existence of desalination plants to treat and use the brackish groundwater in the area			
Expanded local treatment of untreated MWD water			
Availability of tertiary treated recycled water in the area			

Table 5.10-4 SWOT Analysis Summary for the Chino Basin Area

Strengths	Weaknesses	Opportunities	Threats
Collaborative relationship with MWD and its involvement in the IRP Process	Operational, capacity and permitting limitations to the recycled water recharge program	The SAR judgment requiring discharge of 17,000 AFY into the SAR (another 66,000 AFY of recycled water is available by 2035)	Climate change altering hydrologic conditions impacting imported supplies to the SAR watershed
Participation in different Task Force activities to resolve regulatory issues with RWQCB	Groundwater contamination	Regional access to the Inland Empire Brine Line (IEBL)	Extensive MWD imported water rate increases in recent years
Ability to address concerns within the SAR Watershed through collaborative approach amongst stakeholders	Procedural and legal constraints due to the Adjudication	Having CBWM and a framework (OBMP) for cooperative groundwater management development	Significant future demand increase in the region due to rapid population growth and urban development
Implementing the OBMP to ensure the water management activities will not impair the beneficial uses downstream of Prado Dam		IEUA's "Gridless by 2020" campaign to meet 100 percent of its2020 energy needs with renewable energy sources	No longer economical for the groundwater users to overproduce the Chino Basin during dry years after the elimination of MWD's replenishment rates
Ability to use recycled water for irrigation, agriculture, commercial/industrial and groundwater recharge instead of imported water		Further expansion of conjunctive use type programs, to further manage imported and groundwater resources during wet and dry periods	Increase in groundwater production costs, streamflow depletion, groundwater contamination, and subsidence effect on the Chino Basin
Extensive investment in a major conjunctive use program			Restrictions on SWP and droughts in the Colorado River system
Chino Basin having up to 6 million AF of storage capability			Changes in the environmental regulations, the GHG Emission legislation, and other legislations

Table 5.10-5 SWOT Analysis Summary for the Orange County Area

Strengths	Weaknesses	Opportunities	Threats
Having good collaborative relationships with agencies in the upper SAR region	Need to control seawater intrusion into the groundwater basin, and using GWRS water for the Talbert Barrier	Groundwater production in 2035 will only be 7.5 percent more than the current production	Future demand increase in the region due to population growth and urban development
Ability to address concerns within the SAR Watershed through collaborative approach amongst stakeholders	Diversion capacity along the SAR is less than wet year stormflows (flow rates up to 3,000 cfs)	GWRS can be expanded to a total of 120,000 AFY	Restrictions on SWP and drought in the Colorado River system
Participation in different Task Force activities to resolve regulatory issues with RWQCB	Lack of sufficient replenishment water	OCWD has two diversion permits from the SWRCB (up to 362,000 of SAR water, and 33,560 AFY from Santiago Creek)	Climate change altering hydrologic conditions impacting imported supplies to the SAR watershed
OCWD has legal rights to 42,000 AFY of perennial flows from the upper watershed (this is predominantly treated wastewater)		Extensive increase of recycled water reuse in the region from current 85,000 AFY to 135,000AFY by 2035	Increased use of recycled water in the upper SAR basin (decreases base flows reaching Prado Dam)
GWRS provides a dependable supply of water and treats up to 72,000 AFY for recharge into the groundwater basin		SWRCB has agreed to hold 143,000 AFY in abeyance for OCWD for possible future projects	Decline in baseflow due to upper basin recycling projects and other factors
450 acres of wetlands naturally remove nitrates before SAR flows enter OC		Developing additional recharge capability (recharge basins; new injection wells; and recharge galleries)	SAR bed percolation declining one percent per year for the last 20 years
OCWD owns and operates a network of recharge facilities that cover over 1,500 acre		Ability to develop ocean desalination as a component of the water resources strategy in the region	Arundo Donax prohibits maximum flows in the SAR to reach OC

(Continuation of Table 5.10-5 SWOT Analysis Summary for the Orange County Area)

Strengths	Weaknesses	Opportunities	Threats
GWRS removes up to 47,000 tons of salt per year		Potential for USACE/OCWD agreement to increase water conservation behind Prado Dam	Increased water demands within the region due to population growth
Cooperative relationship with other agencies in the region		Ability to recharge all non-storm SAR flows (max. percolation capacity is at 500 cfs)	USACE Prado stormwater releases at rates exceeding the region recharge capacity
Ability to use groundwater for more than 2/3 of the water needs in the area			The increasing cost of the imported water
IRWD Strand Ranch Integrated Banking Project allows for recharge, storage and recovery of 50,000 AF of SWP water in Kern County			Sediment accumulation behind Prado Dam reducing storage capacity
SAR provides approximately160,000 AFY (to groundwater basin in the region(110,000 AFY of baseflow and 50,000 AFY of stormflow)			Legal constraints affecting groundwater contamination remediation
OCWD has extensive knowledge of the groundwater basins in the region (groundwater modeling, monitoring, and tracking system; comprehensive sub-surface geology, and water quality data)			
The groundwater storage capacity in the region is estimated to be 66,000,000 AF			

Conclusions and Recommendations

The stakeholders within the Santa Ana River Watershed were asked how they would distribute future strategic planning funds in their geographical area using a standardized questionnaire. **Table 5.10-6** shows the different funding categories that were listed on the questionnaire, and **Figure 5.10-3** shows the responses received for four out of the five agencies participating in the process. The numbers shown on **Figure 5.10-3** correspond to categories list on **Table 5.10-6**.

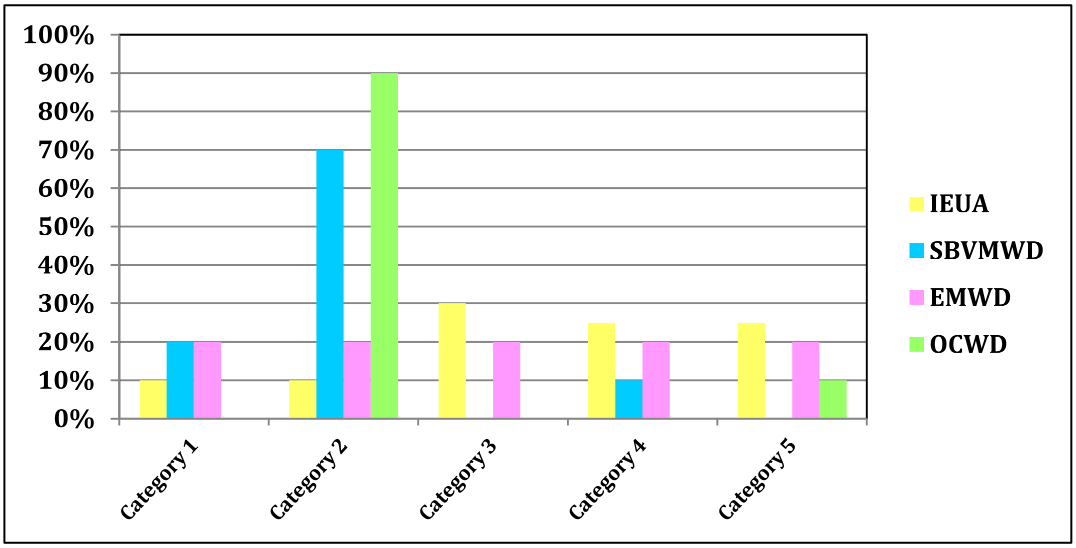
Table 5.10-6 Questionnaire Identifying Different Strategic Planning Funding Categories

Strategic Funding Categories	Category Nos. Used on Figure 5.10-3
Expand compliance with the SBx7-7 and implement projects that reduce per capita water usage by more than 20 percent by the year 2020.	**1**
Create/ Expand supply and system reliability during drought, emergency, and peak demand situations.	**2**
Create/Expand coordination with other agencies in the area and develop regional water management strategies that would increase conservation and local water supplies.	**3**
Create/Expand local recycled water reuse program(s) in the area.	**4**
Develop/Implement projects that protect groundwater resources and the environment.	**5**

It is interesting to note that the agencies at the most upstream and most downstream geographical areas of the watershed are more focused on creating and expanding supply and system reliability during drought, emergency, and peak demand situations (Category 2), whereas the interest of the agencies in the middle of the watershed is more distributed amongst the other categories listed on **Table 5.10-6**. The conceptual recommendations offered in this report are based on information presented.

The sections below provide brief discussion for these recommendations.

Figure 5.10-3 Future Strategic Planning Funding Priorities within Different Santa Ana River Watershed Geographic Area



Recommended Water Transfer Concepts

Based on the feedback received from strategic planners in different geographical regions, it is concluded that Watershed Integration Nexus (WIN) can be developed for two different water transfer concepts to improve operational efficiency in the watershed:

- Imported Water Transfer
- Recycled Water Transfer

Imported Water Transfer Concept

This concept allows an agency to take MWD imported water during wet years and store it in the groundwater basins within (or outside) its own geographic area. This concept requires an agency with groundwater storage rights (Storing Agency) to work with another agency looking at improving its water supply reliability (Consuming Agency) and coordinate their supply and demand activities within their respective geographical areas.

During the years that MWD stores water in its storage accounts such as the Semitropic Water Storage District and Kern County Water Bank, the Storing Agency receives imported water from MWD in-lieu of groundwater production; and the Consuming Agency pays MWD for the water delivered to the Storing Agency at the time of delivery.

During the years that MWD Board implements the Water Supply Allocation Plan (see section 3.2 for more detail on MWD's WSAP) and MWD withdraws water from its storage accounts, the Consuming Agency will receive additional imported water from MWD above its WSAP allotment while the Storing Agency receives a reduced WSAP allotment and increases its groundwater production to offset the reduced WSAP allotment. In addition, during the Dry Year period the Consuming Agency pays the Storing Agency a storage fee for the additional water it receives above its WSAP allotment from MWD.

At the present time, MWD staff is working with its member agencies to develop a Local Storage Program that is complementary with other storage programs and provide:

- Regional water management benefits
- Equity for MWD member agencies
- Financial integrity (program should not reduce the full service purchases in the year when the water is stored)
- Operational flexibility for MWD

Therefore, it is important for MWD to participate in further development of the imported water transfer concept in the SAR watershed, and MWD's willingness to allow for allotment exchange between the Storing and Consuming Agencies at a revenue neutral price to MWD.

This section quantifies a proposed imported water transfer project based on the imported water transfer concept.

Recycled Water Transfer Concept

This concept allows a geographical region to receive revenue for discharge of recycled water into SAR in-lieu of developing costly AWTF for treatment and use of recycled water in the same geographical region that the recycled water is generated. This concept requires the agency that discharges recycled water into the SAR (Discharging Agency) to coordinate with an agency with existing water purification facilities downstream of the discharge point (Consuming Agency). A good Consuming Agency candidate would be OCWD with its existing GWRS.

In this concept, the Discharging Agency will handle any salinity management regulatory requirements through mitigation at the Consuming Agency's geographical area. This would require the Discharging Agency to pay the Consuming Agency for the cost of any salinity mitigation at the point of treatment. In return, the Consuming Agency will pay for the water provided by the Discharging Agency. The revenues received by the Discharging Agency can be used to purchase imported water from MWD during Wet Years for recharge in the Discharging Agency's groundwater basins. This concept will improve operational efficiency and water supply reliability at both Discharging and Consuming Agencies' geographical areas. It is important for the SAR Watermaster to be involved in the development of this concept.

The section below quantifies a proposed recycled water transfer project based on the above described concept.

Recommended Water Transfer Projects

Defining the institutional, technical, legal, and financial aspects of the concepts outlined the sections below can be very complex and would require close coordination between different stakeholders involved in a particular project benefiting from a particular concept.

The implementation of such projects requires economic studies to define benefits for specific agencies that can participate in each concept, and cooperation between agencies in different geographical areas to jointly prepare project specific implementation plans.

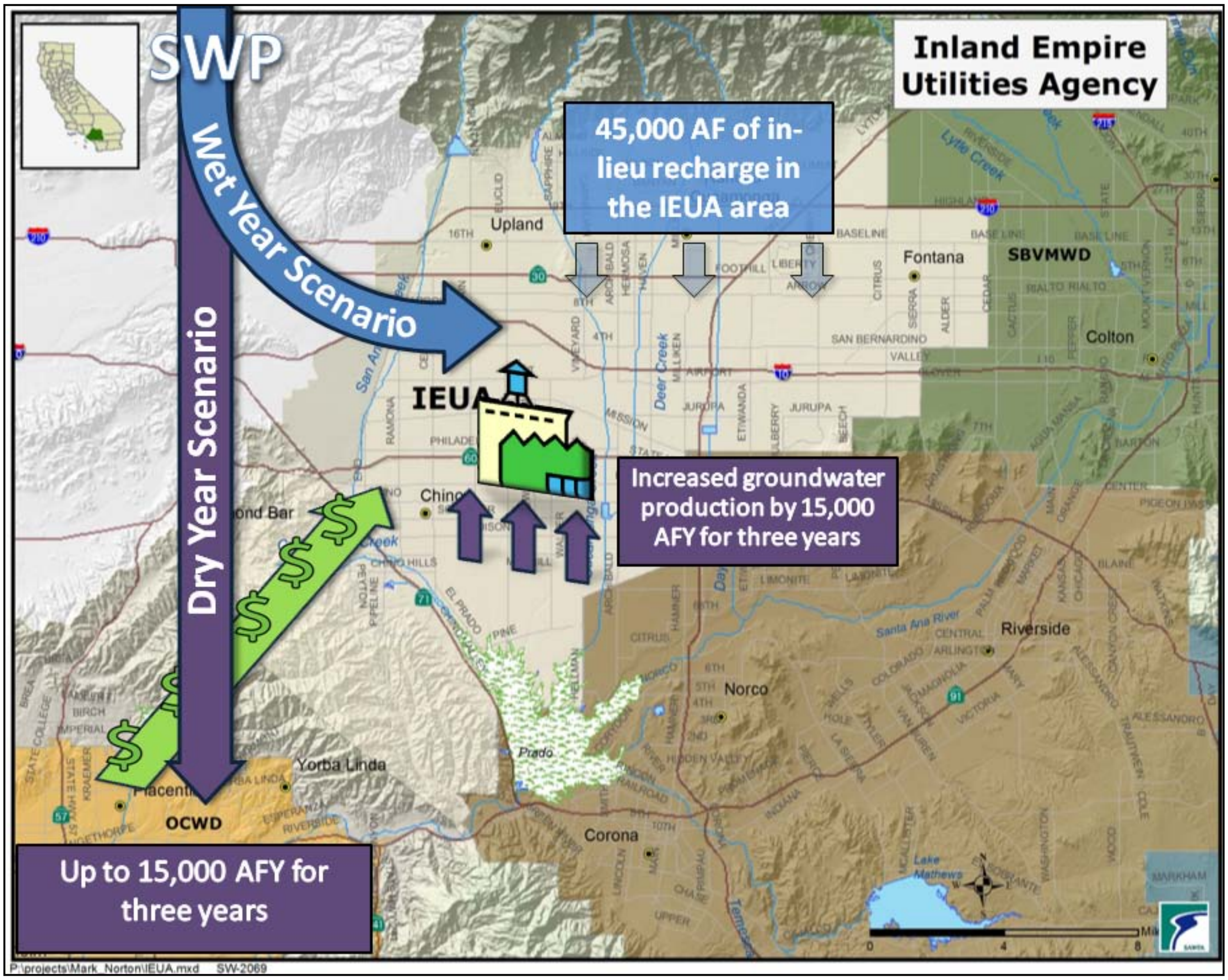
The sections below provide basic quantification for two potential projects that can be implemented based on the concepts outlined in this section.

Recommended Imported Water Transfer Project

Using Chino Basin storage capabilities as a resource to improve water supply reliability in Orange County is the basis for this recommended project. Inland Empire Utility Agency (IEUA) staff has indicated ability to use 45,000 AF of the Chino Basin storage during wet years, and groundwater production capacity of agencies within the Chino Basin to extract up to 15,000 AFY of additional groundwater during dry years. In addition, Orange County Water District (OCWD) is willing to discuss this potential project in more detail with IEUA.

This project concept would require OCWD member agencies to provide some (or all) funding for the purchase of up to 45,000 AF of imported water by the IEUA member agencies during wet years. It is important for MWD to provide the imported water at a rate that recognizes the benefits of MWD not storing the SWP water at one of MWD's own storage programs such as the Semitropic Water Storage District and/or Kern County Water Bank. During dry years, OCWD member agencies can request IEUA member agencies to increase their groundwater production for three years by up to 15,000 AF per year in-lieu of direct deliveries from MWD, while MWD increases deliveries in the Orange County area by an equal amount. Under this scenario, the net MWD deliveries during dry years (years that Water Supply Allocation Plan is implemented) will remain unchanged, without the need for MWD to produce water from its own storage accounts. At the same time, having the imported water stored in the SAR watershed will increase local supply reliability, and provide some financial incentive to both IEUA and OCWD member agencies. **Figure 5.10-4** shows the schematics for this project. Institutional, technical, legal, and financial details for this project need to be developed by interested agencies within the Chino Basin and Orange County areas.

Figure 5.10-4 Recommended Imported Water Transfer Project



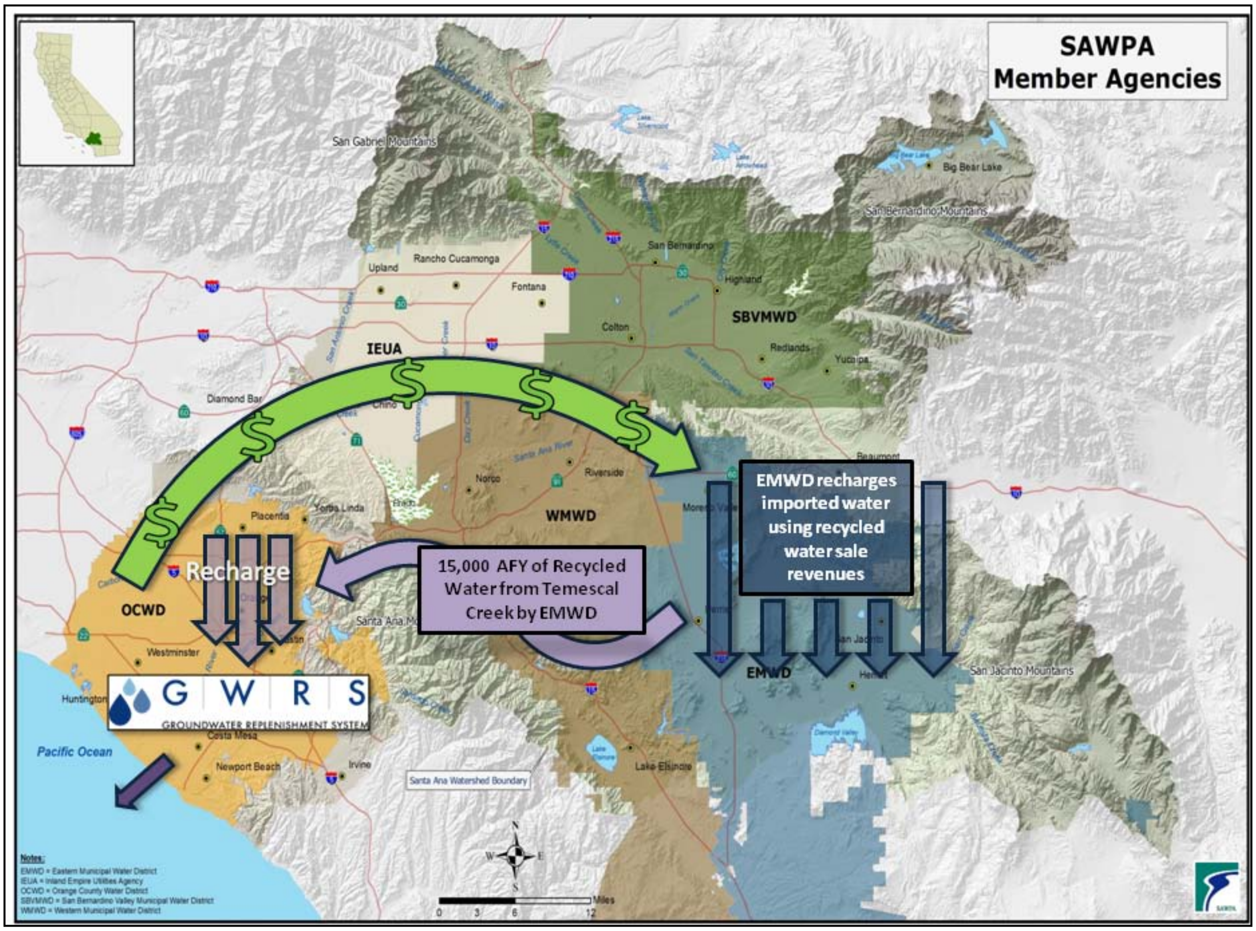
Recommended Recycled Water Transfer Project

EMWD has the capability to discharge 15,000 AFY of recycled water into Temescal Creek. The discharge will be mostly in the winter months of the year for the benefit of OCWD member agencies. With the approval of the SAR Watermaster, this flow can be contractually added to OCWD's SAR base flow allocation at Prado.

The water quality of EMWD's discharged recycled water may require some salinity mitigation by OCWD to meet the RWQCB Basin Plan Objective in basins downstream of Temescal Creek and Orange County. The details of the required mitigation shall be defined and negotiated with the RWQCB. There is a potential to use GWRS for the required mitigation. EMWD will be responsible to pay for the cost of that mitigation.

As part of this project, OCWD will credit EMWD for the purified water that is recharged into the Orange County groundwater basin, and compensate EMWD when that water is produced by OCWD member agencies. To increase water supply reliability in the SAR Watershed, it is important for EMWD to use the revenues from this water transfer project for imported water banking during wet years in the San Jacinto Watershed groundwater basins. **Figure 5.10-5** shows the schematics for this project. Institutional, technical, legal, and financial details for this project need to be developed by EMWD and OCWD.

Figure 5.10-5 Recommended Recycled Water Transfer Project



Bibliography

2006 Facilities Master Plan. County of Orange.
2007 (Amended 2012) San Bernardino County General Plan. URS Corporation.
2007 Strategic Plan. EMWD.
2007 Upper Santa Ana River Watershed Integrated Regional Management Plan. SBVMWD.
2008 Updated IRWM Plan - WMWD. WMWD.
2009 Long-Term Facilities Plan - OCWD. OCWD.
2009 Update GWM Plan - OCWD. OCWD.
2010 Orange County Business Plan. Orange County Public Works.

2010 Recharge Master Plan Update Revision - Report to the Court. CBWM.
2010 Regional UWMP - SBVMWD. Kennedy/Jenks Consultants.
2010 Ten Year Capital Improvement Plan. IEUA.
2010 UWMP - City of Riverside. City of Riverside.
2010 UWMP - EMWD. EMWD.
2010 UWMP - IEUA. IEUA.
2010 UWMP - MWDOC. Malcolm Pirnie.
2010 UWMP Update - WMWD. Kennedy/Jenks Consultants.
2011 IRP - EMWD. CDM.
2012 - 5 Year Strategic Plan. OCSD.
2012 Strategic Plan. WMWD.
2012-13 Operating and Capital Budget - IEUA. IEUA.

List of Contributors

Behrooz Mortazavi	Consultant (formerly EMWD)
Craig Miller	WMWD (formerly IEUA)
Bill Mills	Consultant (formerly OCWD)
Peer Swan	Irvine Ranch Water District
Andy Schlange	Consultant (formerly EMWD/SAWPA)
Bill Dendy	Consultant (formerly SWRCB/SAWPA)
Randy Van Gelder	Consultant (formerly SBVMWD)
Gerard Thilbeault	Consultant (formerly SARWQCB)
Mark Norton	SAWPA
Joseph Sanchez	SAWPA

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5.11 Disadvantaged and Tribal Communities

Soboba Band of Luiseño Indians
Indian Water Rights Signing Ceremony

Introduction

This Chapter provides a brief description of Disadvantaged Communities (DACs) and Native American Indian Tribes (Tribes) located in or near the Santa Ana River Watershed (SARW). A summary of water and related resource opportunities and challenges facing these entities can be found in the Bureau of Reclamation (Reclamation) report *Overview of Disadvantaged Communities & Native American Indian Tribes in the Santa Ana River Watershed*, located at **Appendix G**. This Chapter of the OWOW 2.0 Plan updates the OWOW 1.0 report's **Chapter 5.10: Environmental Justice**.

Environmental Justice, as defined by the U.S. Environmental Protection Agency (EPA), is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." With coordinated efforts by local, state and federal governments, such justice can be achieved in communities throughout the SARW, ensuring that all residents can enjoy the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

Information for Reclamation's report was gathered from several sources including personal interviews, web research, documentation review, and publically available information. This report addresses DACs and Tribes separately, as they each have very different and distinctive demographics and economic bases. The report is not meant to be an exhaustive analysis of their unique factors, but rather an introduction and, in some cases, an overview of these populations and their unique water resources requirements.

There are legitimate water quality issues that impact low income and Tribal communities throughout the SARW, but some perceptions of unsafe water where water supplies are clearly safe for public consumption identify another problem. The solution to these issues is to ensure that all communities have the information, 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.

One of the key provisions found through the research that could assist DACs is the 1996 Safe Drinking Water Act (SDWA) Amendments and the 2006 Safe Drinking Water State Revolving Fund (DWSRF) program. Through the DWSRF, states can provide below-market interest rate loans to publicly and privately owned community water systems and nonprofit non-community water systems for necessary infrastructure improvements. States may also establish separate eligibility criteria and special funding options for economically disadvantaged communities through this program.

Section 1452 of the SDWA defines a disadvantaged community as “the service area of a public water system that meets affordability criteria established after public review and comment by the State in which the public water system is located.” Under this section, states may provide additional subsidies (including forgiveness of principal) to communities that meet the established criteria, or that are expected to meet these criteria as a result of a proposed project.

Though no special provision was found related to Tribes, the EPA supports “Tribal Assumption of Federal Environmental Laws” under federal statutes, stating, among other things, that “[t]he Agency will recognize tribal governments as the primary parties for setting standards, making environmental policy decisions, and managing programs for reservations, consistent with Agency standards and regulations.” Three Federal environmental statutes - the SDWA, the Clean Water Act, and the Clean Air Act - explicitly authorize EPA to “treat tribes in the same manner as states” for purposes of implementing various EPA environmental programs that may be of benefit to these communities.

Background

This Chapter and the Reclamation report address DACs and Tribes separately. The water and related resources opportunities and challenges for these entities vary widely based on their locations and community compositions. This diversity is captured in compilation tables are found in Table 1 (for DACs), and Table 3 (for Tribes) in Reclamation’s report.

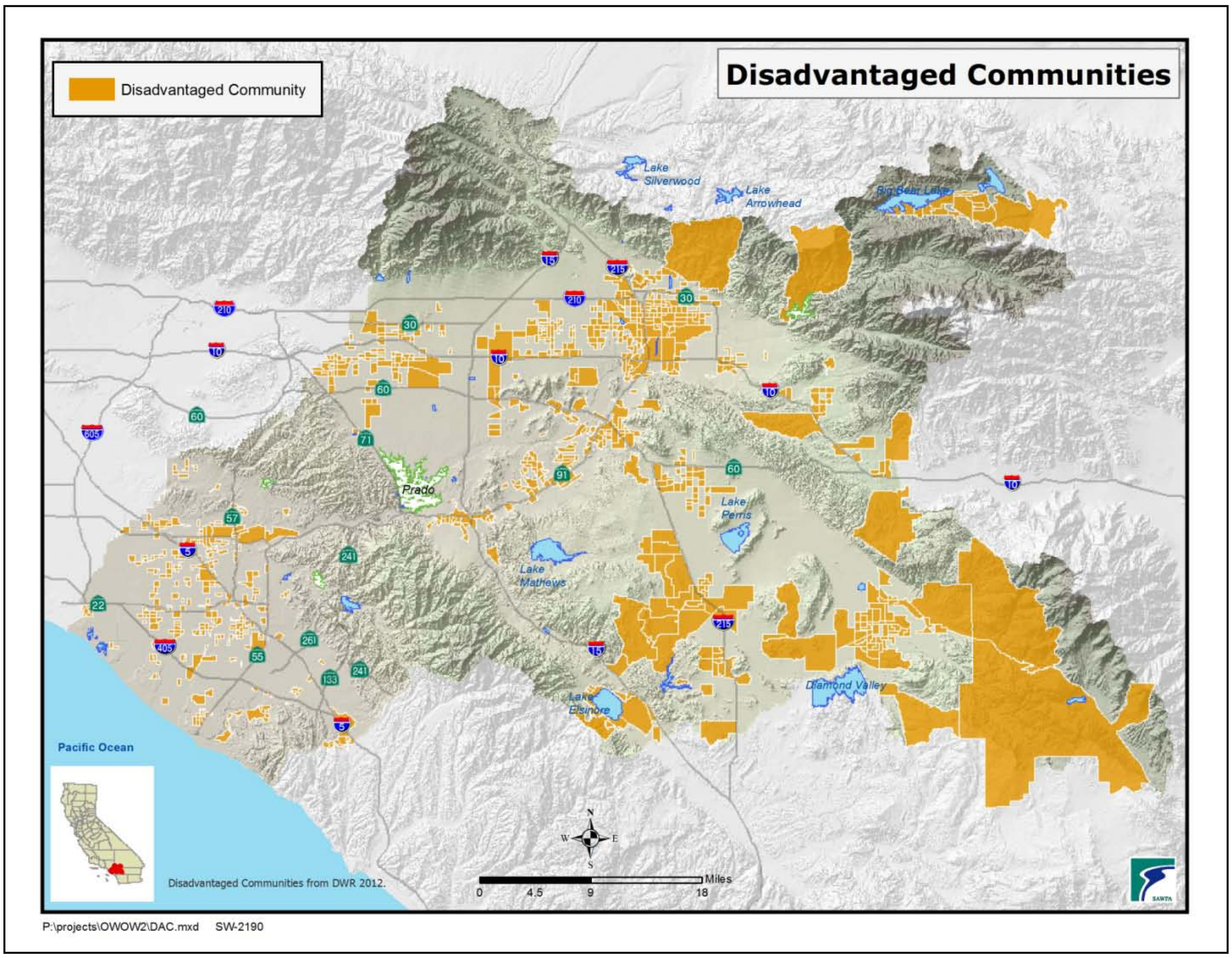
The conclusion in the report summarizes the information to offer SAWPA water resources planners a means to examine future opportunities, and topics for consideration as the OWOW plan is updated. It also provides recommendations to engage DACs and Tribes in future Proposition 84 grant programs and others grant programs as they arise. Though SARW was considered on the fastest growing regions in California prior to the 2008 recession, it still has some of the poorest residents in the state.

Disadvantaged Communities

The California Department of Water Resources defines a DAC as "a community with a median household income less than 80% of the state-wide average. A Medium Household Income (MHI) of $48,706 is the DAC threshold (80% of the statewide MHI). " **Figure 5.11-1** notes the general area of the DACs located in SARW (provided by Proposition 84 and 1E Integrated Regional Water Management Guidelines, dated August 2010).

During the OWOW 1.0 planning process, DAC outreach was conducted in strategic areas throughout the watershed, including the following communities: Lake Elsinore and Pedley in Riverside County, Rialto and Colton in San Bernardino County, and Santa Ana in Orange County. OWOW 2.0 DAC outreach expanded on that initial effort and also classified DACs into regions. Each region has distinct characteristics and roughly follows the Santa Ana River as it flows from its headwaters in the San Bernardino Mountains to the outfall/estuary at Huntington Beach, a journey of 96 miles. These regions are not "officially" recognized, but they serve as a tool in guiding future DAC/Tribal outreach in the watershed.

Figure 5.11-1 Disadvantaged Communities in SARW



Methodology for Assessing the DACs

The SARW covers approximately 2,650 square miles and is home to 5.4 million residents. Approximately 69 percent of the cities/communities within the watershed are considered disadvantaged or contain disadvantaged communities. In terms of population, approximately 26 percent (1.4 million residents) of the total watershed population is considered disadvantaged.

As previously noted above, the watershed was separated into regions for investigation. To assist in identifying DACs in each region, meetings were held with the California Department of Public Health and the Santa Ana Regional Water Quality Control Board. Once a DAC was identified, meetings were held with local public agencies to gain detailed knowledge about the unique characteristics of each region. Meetings were also held with the residents of these communities to help gain an understanding of their water quality and supply concerns. **Figure 5.11-2** lists known Disadvantaged Communities or Partially Disadvantaged Communities in the SARW.

Figure 5.11-2 Disadvantaged or Partially Disadvantaged Communities in SARW

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

DAC Challenges and Opportunities

The SARW is rich in diversity and, as like many arid regions in the West, faces numerous water and related resources challenges. There are distinct regional differences throughout the watershed with much variability due to economic factors. Numerous economic resources are concentrated along the Orange County coast, and many natural resources are concentrated in the San Bernardino Mountains and its headwaters. The Santa Ana River is the watershed’s unifying element.

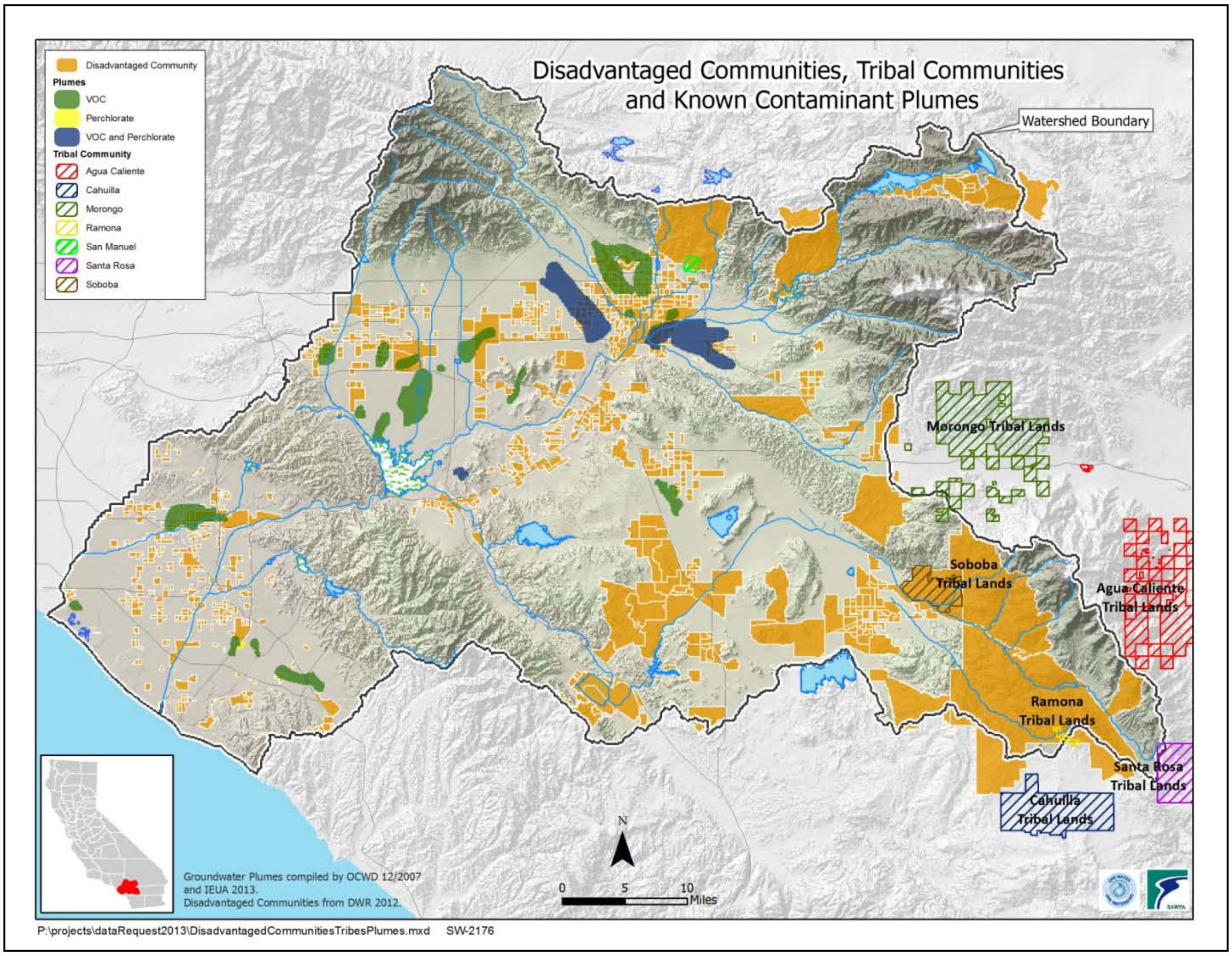
Through the OWOW planning process, significant outreach has been conducted to communicate with DACs within its service area; however, more needs to be done. These small and/or disadvantaged communities are often located in sparsely populated, rural areas and cannot provide the economies of scale necessary 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 wastewater projects more feasible, and often do not have the technical expertise to determine the best project alternative to appropriately plan and manage long-term operations and maintenance needs. Thus, as SAWPA moves forward with its Integrated Regional Watershed Management Planning, best practices to help with DAC assessments and stakeholder engagement will be critical.

DACs also face many of the same challenges as their neighboring communities, including:

- 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

Groundwater is highly used throughout the state of California and in SARW. DACs in particular tap this vital resource as their primary drinking water source. **Figure 5.11-3** depicts the various groundwater contaminant plumes (volatile organic compounds (VOC), perchlorate, and VOC and perchlorate) in or near these disadvantaged or Tribal communities within the SARW.

Figure 5.11-3 DACs, Tribal Communities and Known Groundwater Contaminant Plumes



Future DAC Support and Implementation

The 'Quail Valley Subarea 9, Phase 1 Sewer System Project' and 'Home Gardens Well Rehabilitation, Corona - Multi-jurisdictional Transmission Line Project' were approved for Round 2 Proposition 84 funding and will have significant value-added benefits not only for the DAC areas involved, but for the surrounding communities and water agencies that work with these entities. The early engagement process with DACs can't be overstated.

These proposed projects were scored, ranked and proposed for funding under OWOW Proposition 84 Round 2 Implementation. OWOW 2.0 calls for all of SARW to see the links between stormwater management and local water supply, land use and water quality, and accommodation of a growing population with finite water resources. It is only through a view of the watershed as an integrated system that SAWPA and its member agencies can successfully develop operational efficiencies system-wide. These DAC projects as well as future ones will help achieve that objective.

Best Practices for DAC Engagement and Participation

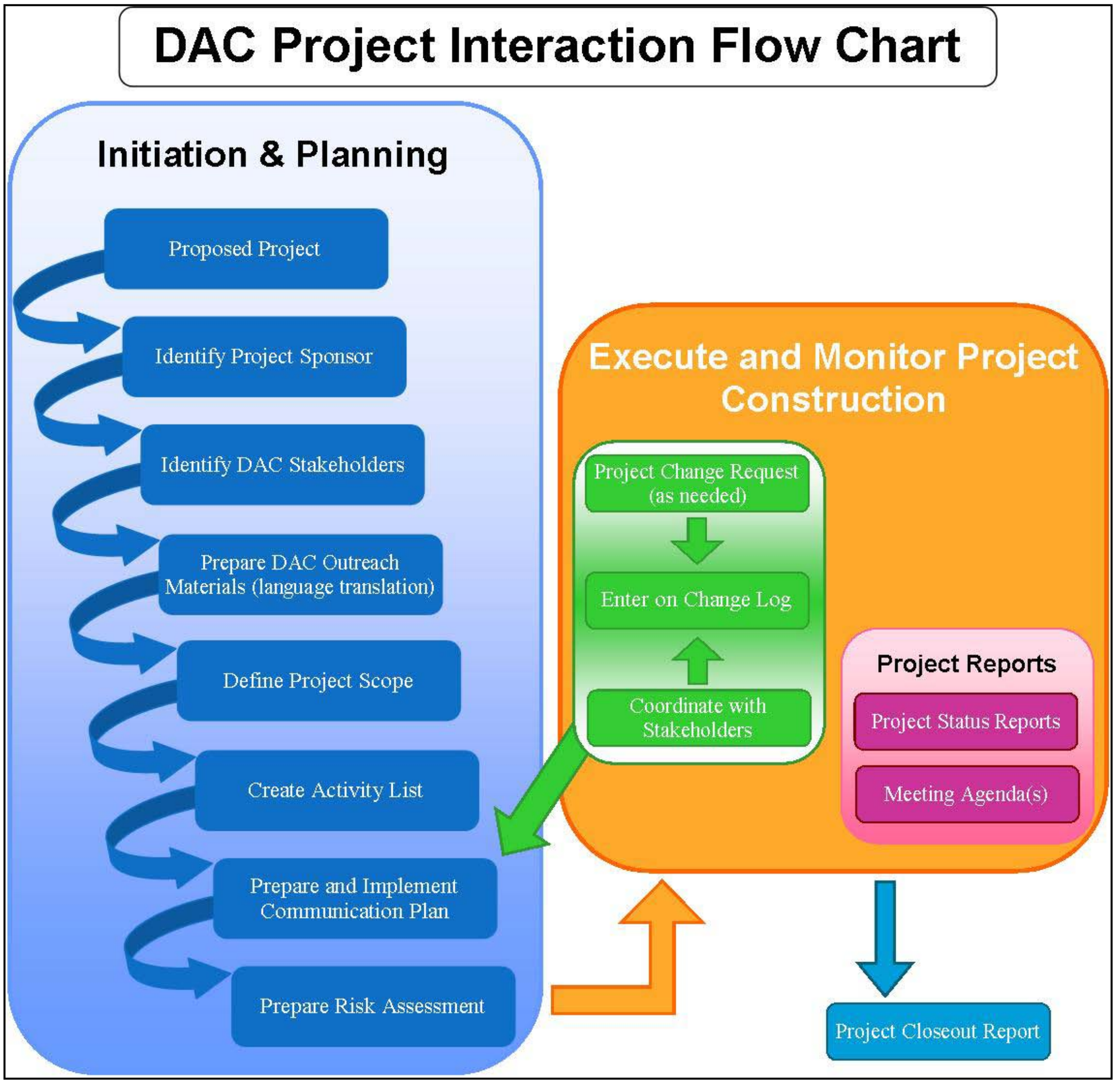
At times, community outreach is seen as a cursory notification for an upcoming event. For many water agencies, it may be conducted by sending a billing notice with an insert, or using an email blast or a website posting. However, these outreach methods should be modified to effectively work with DACs. It may be possible that English is not a DAC population's first language, and substantial cultural differences may also affect message reception. To effectively communicate the impact of a potential project, water and other public service agencies should create diverse lines of communication with their stakeholders and customers.

A participatory planning process - one in which all the stakeholders are involved - is often the most effective and inclusive way to work with DAC residents. 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 DACs' unique needs.

Through direct assistance to DAC drinking water and wastewater treatment facility managers, many systems can begin to achieve compliance with health and safety regulations. Or the solution may lie in consolidating with adjacent systems so as to gain an economy of scale that assures fiscal sustainability. Either way, the goal of a safe, reliable, and sustainable water system is essential to securing protection to the public health, economy, and environment of California's rural and economically disadvantaged communities.

Figure 5.11-4 lists some of the activities that should be considered and/or implemented when conducting outreach with DACs.

Figure 5.11-4 SARW Disadvantaged Communities Engagement Flow Chart



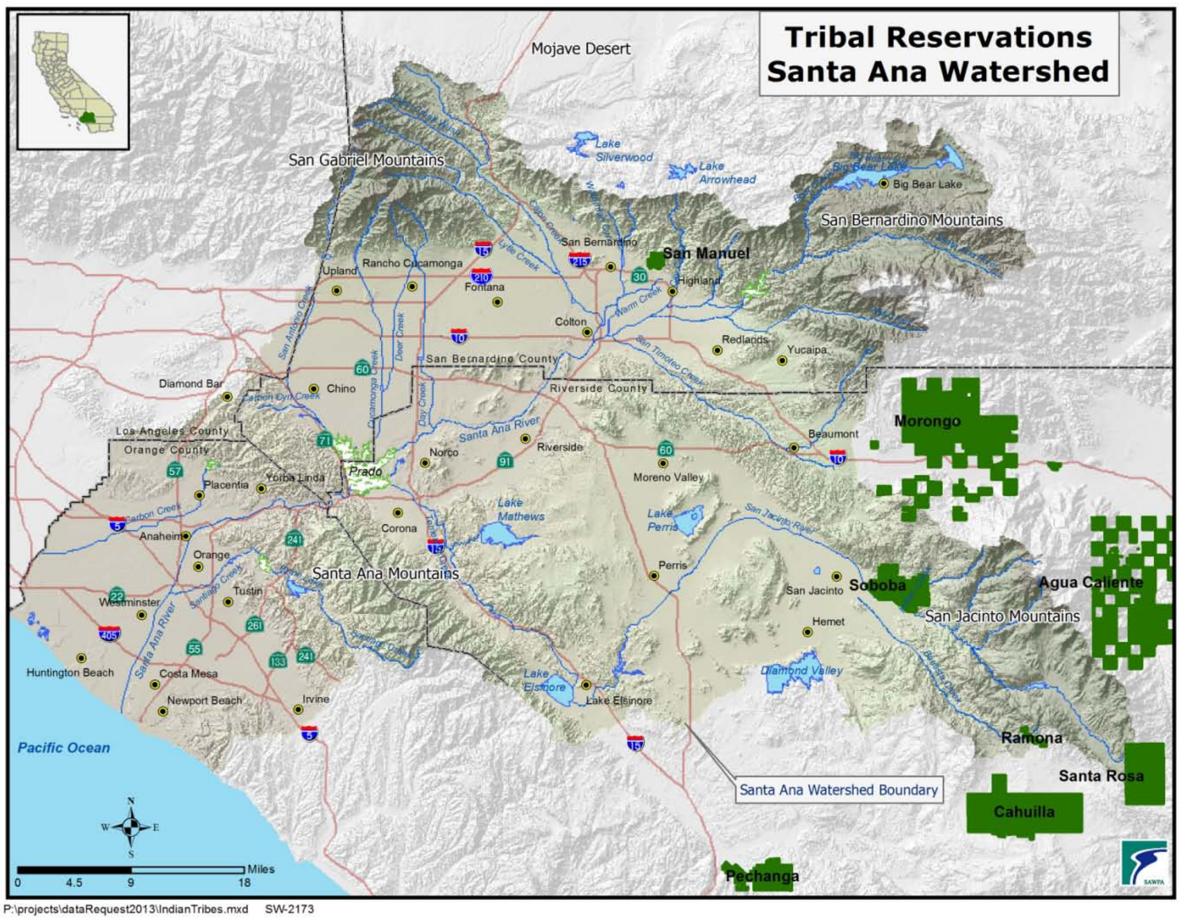
Native American Indian Tribes

Definitions

Federally Recognized Tribe: As identified in CFR Section 900.6 an Indian Tribe "means any Indian tribe, band, nation or other organized group or community, including pueblos, Rancherias, colonies and any Alaska Native Village, or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, which recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians."

Non-Federally Recognized Tribe: According to the U.S. Department of the Interior, a non-recognized tribe has no relationship with the United States. Congress, not the Department of the Interior, has the final word as to whether a tribe should be federally recognized and whether a non-recognized tribe may nevertheless receive certain federal benefits. All of this information is represented in **Figure 5.11-5.**

Figure 5.11-5 SARW Native American Tribal Communities



Methodology for Assessing the Tribes

The OWOW 2.0 update process ensures Tribes have a voice and provides a means for these cultures to be equal and active participants with other stakeholders, encouraging early participation in the actions taken within the watershed that could impact them. The region's Tribes believe that the past is the foundation of their future. To ensure the culture and traditions of these Tribes are embraced in the process, it is important to provide a means to educate the stakeholders early on, as well. As part of the outreach process, the four Santa Ana Watershed Tribes were contacted, although not all provided input to this document. Outreach was extended to neighboring Tribes, as well.

Santa Ana River Watershed Tribes

The Soboba Band of Luiseno 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 SARW boundary. Just outside the 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 Luiseno Indians. For purposes of this Chapter and the Reclamation report, contact was made with all these Tribes.

Tribal Challenges and Opportunities

Water resources in the Santa Ana River Watershed consist of local surface water and groundwater, imported surface water, and reclaimed water. In many cases, the water challenges Tribes encounter are no different than local, state, or federal challenges. A decision to use water for a particular purpose can have far-reaching impacts which can affect not only state and local communities, but the Tribal communities as well. Early in the planning process, it is particularly important to include Tribes to ensure their possibly unique requirements may be recognized.

Listed below are potential water management issues on tribal lands:

- Groundwater overdraft
- Insufficient groundwater supply
- Growing water demands
- Habitat conservation planning requirements
- County groundwater ordinances (if applicable)
- Impact of neighboring communities
- Inadequate water recycling facilities
- Adverse impact of groundwater depletion on water quality
- Increased runoff from newly developed impervious surfaces
- High cost of imported water
- Chlorine sediments
- Inadequate flood protection infrastructure
- Tribal lands in flood inundation areas
- California Environmental Quality Act compliance

Future Tribal Support and Implementation

Similar to approaches with DACs, the importance of an early engagement and effective outreach with Tribes cannot be overstated. Though only four Tribes are within the SARW, they have important roles in their neighboring communities as well as the region's economy. Additionally, more work and coordination is needed to isolate water and related resources issues in these communities, and make SAWPA and its member agencies aware of requirements for unique Tribal activities. Consultation protocols with Tribes should be used by senior Santa Ana Watershed Project Authority and District staff. Improving coordination with regulating agencies like the Santa Ana Regional Water Quality Control Board and EPA will also help characterize issues and solutions.

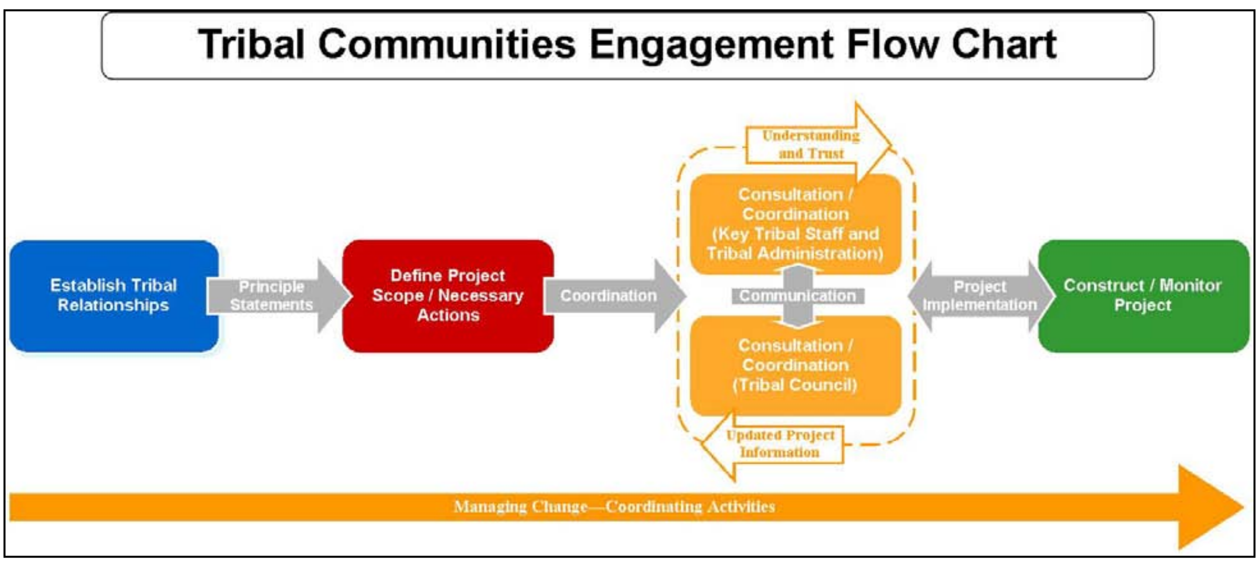
Soboba Band of Luiseño Indians Wastewater Treatment Project

One success story is already in the making. The Soboba Band of Luiseño Indians joined forces with Eastern Municipal Water District, Lake Hemet Municipal Water District, and the federal Bureau of Indian Affairs to propose a Wastewater Treatment Plan project for Round 2 Proposition 84 funding. After review by the Project Selection Committee, it was ranked and prioritized and recommended for funding. This $15 million wastewater treatment plant on the Soboba Indian Reservation will improve the health and welfare of Soboba tribal members, and extend local water supplies by reclaiming previously unused low-quality water. Also, under an historic agreement among the Tribe and two local water agencies – Eastern and Lake Hemet Municipal Water Districts – the partners will cooperatively restore and protect the health of the San Jacinto River groundwater basin, part of the SARW that provides valuable water resources to the region. The Soboba wastewater treatment plant will address much needed water and sewer improvements on the reservation, positively impacting tribal members for generations to come, and will improve the quality of life for non-Tribal citizens residing near the reservation.

Best Practices for Tribal Engagement and Participation

A variety of goals and actions for tribal involvement are in the Reclamation report, but **Figure 5.11-6** offers a step-by-step process to successfully engage Tribes in decision-making related to water resources programs.

Figure 5.11-6 Tribal Engagement Process



Conclusion

Engaging DACs and Tribes in water and related resources planning through effective outreach is good for both the community and the water sector itself. There are distinct differences due to cultural and historic context; however, the two groups have more in common. Both need their voices heard during proposed project development.

Today, DACs and Tribes face critical and serious water and related resources challenges, such as failing septic systems, isolation, language barriers, flood risk, and lack of funding and or resources to name a few. It is imperative that the water sector and its key stakeholders recognize proposed DAC and Tribe water project needs, and engage these communities early in the process. The OWOW 2.0 process recognizes the various funding needs for DACs and Tribes, and the Federal and State funding programs available to them.

Water sector outreach and engagement should include speaking with DAC residents, listening to their issues, attending Tribal Council meetings, participating on DAC and or Tribal-related committees, and conducting continuous networking. These actions could lead to consensus-based development and implementation project solutions for these groups, and the sooner that approach is under taken by the water sector, the better for everyone within the SARW.

Prepared by:

Bureau of Reclamation, Santa Ana Watershed Project Authority, and Kennedy Communications

Project Contacts:

Jack Simes, Bureau of Reclamation Project Manager
Mark Norton, Santa Ana Watershed Project Authority Project Manager
Jeff Beehler, (formerly Santa Ana Watershed Project Authority)
Leslie Cleveland, Disadvantaged Communities / Tribal Pillar Co-Lead, Bureau of Reclamation
Maria Elena Kennedy, Disadvantaged Communities / Tribal Pillar Co-Lead/Consultant, Kennedy Communications

5.12 Government Alliance

Introduction

The One Water One Watershed (OWOW) Government Alliance Pillar (Pillar) was established under the Santa Ana Watershed Project Authority's (SAWPA) update of their Integrated Regional Water Management (IRWM) Plan, also known as the OWOW 2.0 Plan.

From May 2011 through June 2013, the Pillar met 14 times. Collectively, it had 29 active participants from 10 Federal agencies, two Tribal Nations, eight State agencies, and four local government agencies which are listed below.

Federal Agencies
- Department of the Defense
  - Army Corps of Engineers
- Department of the Interior
  - Bureau of Indian Affairs
  - Bureau of Reclamation
  - U.S. Fish and Wildlife Service
  - U.S. Geological Survey
  - National Park Service
- Department of Commerce
  - National Marine Fisheries Service
- U.S. Department of Agriculture
  - Natural Resources and Conservation Service
  - Rural Development
  - U.S. Forest Service

Tribal Nations
- San Manuel Band of Mission Indians Tribe
- Soboba Band of Luiseño Indians Tribe

State Agencies
- Natural Resources Agency
- Department of Water Resources
- State Parks
- Department of Public Health
- Department of Fish and Wildlife
- Department of Transportation
- Department of Forestry and Fire Protection
- Santa Ana Regional Water Quality Control Board

Local Government Agencies
- Santa Ana Watershed Project Authority
- Riverside County Emergency Services
- Riverside County Flood Control and Water Conservation District
- Santa Ana Regional Water Quality Control Board

It's noteworthy to also point out that the U.S. Federal Emergency Management Agency and the U.S. Environmental Protection Agency both requested ongoing information updates on the Pillar's activities; meeting notes and notices were provided to those designated agency representatives.

In the beginning of the OWOW 2.0 water resource planning process, the Pillar met for a brainstorming session. SAWPA staff provided planning guidance, while group discussions focused on regional and integrated projects and programs concepts that could benefit the watershed as a whole. The Pillar also forged potential long-term alliances, and addressed each agency's involvement in existing or planned programs throughout the watershed. Proposed projects and programs that resulted from past proposals submitted by watershed stakeholders were also addressed.

Two key goals of this Pillar are: 1) leverage watershed information and potential resources from governmental agencies and seek out synergistic opportunities; and 2) consider large-scale ideas for implementation.

As part of the Government Partnerships Pillar planning process, a *Resource Guide* (**Appendix H**) was developed that lists contact information for governmental agencies within and outside the watershed that support the OWOW efforts. It provides a compilation of all the governmental organization contacts with ties to the Watershed including Federal, Tribal, and State agencies, and the local water agencies from the three counties within the Watershed's boundary. The Guide also contains key resources from documents like the *California Climate Adaptation Strategy* and the *California Water Plan Update*; tools for users like the *Water Energy Relationship Report and Water Equivalents Table*; key websites; applicable Federal and State laws for the water sector; and an A-to-Z list of key terms, acronyms and concepts. The *Resource Guide* contains valuable information that the Pillar members hope that SAWPA and its member agencies and stakeholders will find useful in promoting collaboration with agencies on future regional integrated projects and programs.

Luna Leopold, an early pioneer of water science, proclaimed: "The health of our waters is the principal measure how we live on the land." The Pillar hopes that the *Resource Guide's* useful information is measured by its frequent use and will ensure that periodic updates are conducted to help maintain its value.

A Pillar's Path to Success

Every plan and the supporting processes to help enhance or refine a strategy must connect with its key components. But identifying these components can be challenging. This Pillar's path to develop a "planned" approach for OWOW 2.0 process success began with a simple seven step outline (**Table 5.12-1**) to document all the steps necessary for an "integrated planning" blueprint.

Table 5.12-1 Seven Step Outline for Integrated Planning

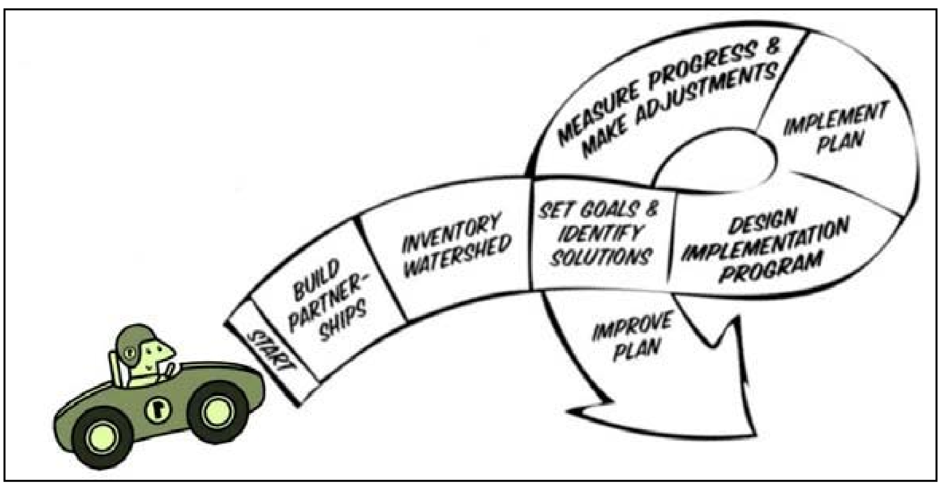
1	Build Partnerships
2	Characterize the Watershed
3	Set Goals and Identify Solutions
4	Design an Implementation Program
5	Develop Watershed Plan Outline
6	Implement the Watershed Plan
7	Measure Progress and Make Adjustments

Through Pillar meetings, relationships were built and partnerships were formed as the participants shared critical information and developed collaborative ideas. Over time, a new outline was created which reflected the increasing sophistication of the process.

The Road Less Traveled

A roadmap metaphor (**Figure 5.12-1**) helped the Pillar further address the planning process and approach, and reflected both short and long-term Pillar goals to complement OWOW 2.0 goals. It also helped the Pillar reach consensus about the priorities of Pillar members, and recognized that a mechanism was needed to help forecast proposed projects for development. The roadmap, as a framework, helped the Pillar plan and coordinate information on the development of a proposed project or activity.

Figure 5.12-1 Pillar Roadmap



OWOW 1.0 Phase…and Beyond

The Government Partnerships Pillar was established in 2011 as part of SAWPA's initial OWOW planning effort. It was formed based on a desire to forge improved working relationships among the various governmental agencies in the watershed, and support interaction among watershed stakeholders and governmental agencies as new integrated projects and programs were advanced.

The two Pillar co-leads were selected from the U.S. Army Corps of Engineers and the Bureau of Reclamation. Several additional Federal, Tribal, State, and Local governmental agency representatives helped forge several key alliances to foster collaboration within the watershed. The multi-agency engagement in this Pillar's activities helped pave the way to enhance communications among the agencies and close any coordination gaps that may have existed.

Today, the OWOW 2.0 vision is for a sustainable watershed that is drought-proof, salt-balanced, and supports economic and environmental viability. SAWPA and its member agencies and stakeholders will be able to achieve that mission with continued coordination and communication with the various Federal, Tribal, State, and local government agencies that support and/or regulate planning and proposed project development in the watershed. Long-term collaboration among the many participating agencies, new synergies, and multi-beneficial projects must be developed to help maintain the Watershed's sustainability, now and into the future.

Key Pillar Success Stories

Fourteen meetings over two years

Nine 'Themed' Presentations:

- EPA's Web-based Watershed Planning Tools
- Community Collaborative Rain, Hail, & Snow Network
- Riverside County's Water & Dam Emergency Response and Army Corps of Engineers Dam Emergency Management Program Overview
- Caltrans Planning
- Regional Advanced Mitigation Planning
- Riparian Habitat Joint Venture
- Forest First
- EPA Climate Change Indicators

Seven 'Big Ideas' Brainstormed:

- Group Purchasing: leveraging member agencies' buying power for supplies and services
- Energy Savings: engaging member agencies in collaborative partnerships to reduce carbon footprints and save energy
- Site/Facility Security: sharing security expertise among the member agencies to protect personnel, equipment and facilities
- Climate Change/Adaptation: exploring improved joint agency planning through adaptive development and implementation strategies

- Water Conservation: collaborating and partnering among member agencies and other entities to save water through outreach and education
- Sustainability: promoting the goals of OWOW through member agencies promoting wise use of water and energy
- Right-of-Way Dual-Use: working with Caltrans and local governments to use land right-of-ways to collect and store more water in the watershed

Four Video Reviews:

- **Watershed** - http://www.youtube.com/watch?v=3mcHrzOImoY – a James Redford production that explores creating a water ethic in the West
- **Last Call at the Oasis** - http://www.youtube.com/watch?v=fLE3i92LkQk – a Jessica Yu production that addresses our world's growing water crisis
- **Climate change video series** - http://www.water.ca.gov/climatechange/video.cfm – a California Department of Water Resources series that addresses planning and adapting to effects of climate change
- **The Next Frontier: Engineering the Golden Age of Green** - http://www.thenextfrontiermovie.com/ – an award-winning documentary that addresses the use of fossil fuels and their impacts on our growing greenhouse gas emissions and possible mitigation strategies

Next Steps for the Pillar

The Government Alliance Pillar will continue to ensure that Federal and State agencies effectively partner in the management of water and other resources within the watershed, and consider other Pillar's perspectives in their support of OWOW 2.0 goals and objectives. The Pillar will:

- Periodically publish updates of the *Resource Guide* and post them on SAWPA's website
- Conduct an email blast to continue contact with Pillar members
- Encourage active networking with SAWPA's planning team
- Ensure reminders are sent out well in advance of proposed future meetings

The Pillar should continue to meet at a minimum annually and preferably bi-annually. There are many dynamic regulatory and governmental activities in the watershed, so the need to continue and maintain vital program and activity communication is critical. To maintain these lines of communication, the Pillar will:

- Periodically develop agendas and host Pillar meetings to keep lines of communication open and relationships strong
- Leverage the *Resource Guide's* agency contacts, and assure that steps are taken to keep all information current

- Continue coordination with various governmental agencies, as appropriate, for all proposed projects, initiatives, and integrated water and related resources activities to help identify necessary environmental compliance requirements and or potential areas of conflict

Prepared by:

Bureau of Reclamation, Santa Ana Watershed Project Authority

Project Contacts:

Jack Simes, Bureau of Reclamation Project Manager
Eileen Takata, Army Corps of Engineers, Los Angeles District
Mark Norton, Santa Ana Watershed Project Authority Project Manager
Jeff Beehler, (formerly Santa Ana Watershed Project Authority)
Other Government Contacts are included in Resource Guide shown in the **Appendix H**.

5.13 Energy and Environmental Impact Response

Inland Empire Utilities Agency

In 2005, the California Energy Commission investigated statewide energy use and found that water-related energy uses account for about 19 percent of all electricity and 30 percent of non-powerplant natural gas used within California. Since that finding, some progress has been made in identifying strategies for achieving benefits found at the nexus of water, energy and climate. In 2006, the California Public Utilities Commission (CPUC) conducted a number of workshops to explore whether – and how – the water-energy nexus should be included in the state's regulated energy programs. Concurrently, the California Department of Water Resources (DWR) began investigating how the linkages among water, energy and climate should be included in the state's water planning processes. Since that time, DWR has required consideration of the water-energy nexus in competition for Integrated Regional Water Management (IRWM) planning grants, and has also included elements of the state's water-energy-climate nexus in the California Water Plan.

In examining the water-energy nexus in greater detail, an important white paper was published in September 2012 by GEI Consultants entitled "California's Water Energy Nexus: Pathways to Implementation." The white paper was funded by the Water-Energy Team of the Governor's Climate Action Team (WET-CAT) for the purpose of facilitating the on-going dialogue among policymakers and regulators as to the types of actions that can be taken by California's water sector to help achieve the state's aggressive resource efficiency, economic and environmental goals.

GEI summarized key findings and recommendations that suggest that water and wastewater agencies have unique characteristics that could be leveraged through appropriate partnerships to provide significant benefits to the state's electric system. As a result of the sizeable energy impact by water and wastewater agencies, the GEI report indicates that Santa Ana Watershed Project Authority (SAWPA), as a water resources management agency, is uniquely positioned to collaborate with and help California attain its energy efficiency, renewable energy and greenhouse gas reduction goals. Many areas of the state, water and wastewater agencies may have the capacity through their lands, facilities and professional staff to generate significant new amounts of renewable energy through solar, biogas, wind and other sources. Other agencies have the flexibility to consider feasible changes for when and how they use energy that are consistent with maintaining reliable water deliveries and public safety.

The two overarching conclusions from GEI's white paper are:

- *The choices that the water and wastewater agency sector make to invest in energy efficiency and renewable energy generation, matter to California*
- *It is rare to have so much opportunity for making such a positive and powerful impact – improvements in energy efficiency, renewable energy generation and reduction in greenhouse gases – concentrated into one sector. It is an opportunity that cannot be ignored*

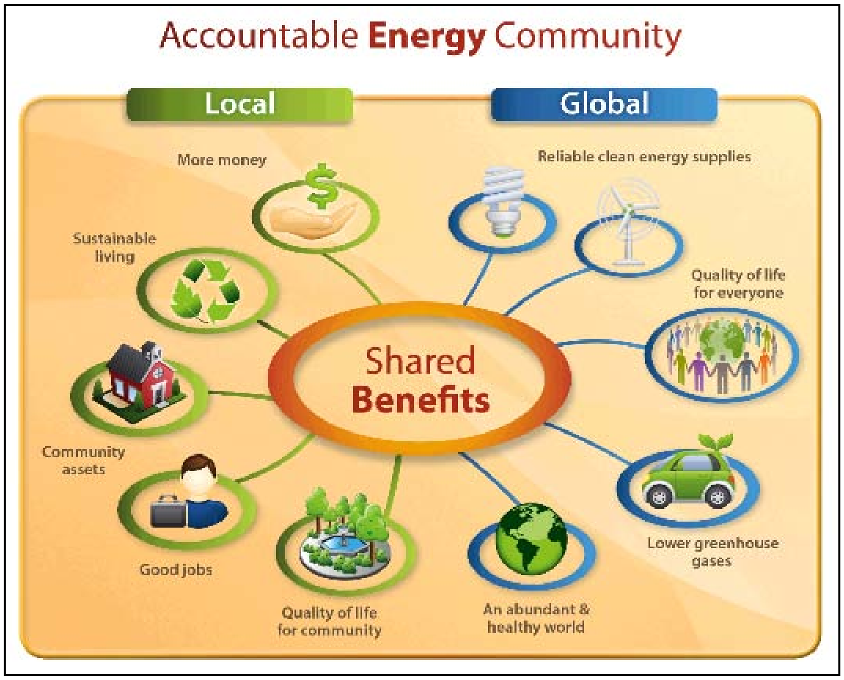
Under OWOW 1.0, a chapter was prepared by the Climate Change Pillar describing the impacts of climate change on the water resources-related projects. That chapter described the climate change impacts and various broad-based implementation strategies that the watershed should take to mitigate and adapt to these impacts. Under the OWOW 2.0 Plan, SAWPA reformed the Pillar as the "Energy and Environmental Impact Response" Pillar recognizing that each IRWM region needs to not only address climate change, but must also recognize and mobilize implementation actions to reduce energy demand and improve energy efficiencies in the water and wastewater industries in their areas. Craig Perkins, executive director of The Energy Coalition, a non-profit organization based in Irvine, California was named Co-chair of the new Energy and Environmental Response Pillar. Roy Herndon from Orange County Water District (OCWD) was named co-chair. The Pillar's work focused on: 1) energy outreach to the water and wastewater industries, and 2) development of new and updated climate change models and forecasting tools as supported by the U.S. Department of the Interior's Bureau of Reclamation (Reclamation).

Water-Energy Projects

The Energy Coalition

The Energy Coalition is a non-profit organization formed to develop and implement energy blueprints – the plans and strategies that integrate these energy efficiency practices to help schools, businesses, and governments. The Energy Coalition created The Energy Network, a program funded by the CPUC to provide a suite of services that increase participation in energy efficiency projects. The Energy Network's services are available to public agencies in the Southern California Edison and Southern California Gas service territories. A team of professionals is working through The Energy Network to develop a regional model for local government collaboration statewide to support accountable energy communities.

Figure 5.13-1 Shared Benefits of an Accountable Energy Community
(source: The Energy Coalition)



One specific area of focus for The Network is engaging water and wastewater agencies in energy efficiency projects through the development of aggressive energy management programs. While including the retrofit of aging infrastructure equipment, an ideal efficiency project will complete a system-wide optimization designed to reduce energy inputs throughout facility operations (see **Table 5.13-1**). With funding through the CPUC, the services offered to water districts and other public agencies are free of charge, and utilize an expedited project delivery model, cutting the time to construct in half for many projects and significantly reducing the completion costs. Technical, engineering, and project management services are also available to public agencies enrolled in The Energy Network program.

Table 5.13-1 Energy Efficiency Measures for Water Management Facilities

Wastewater Facility Sample Measures	
Design and Control of Aeration Systems	Peak flow storage and/or intermittent aeration
	Dual impeller aerator (mechanical mixing)
	Integrated airflow control
	Automated SRT/DO Control (Solids Retention Time and Dissolved Oxygen)
	Respirometry for aeration control
	Off-gas monitoring and control
	Online monitoring and control of nitrification using nicotinamide adenine dinucleotide (NADH)
	Proprietary control systems
Blower and Diffuser Technology for Aeration Systems	High-speed gearless (turbo) blowers
	Single-stage centrifugal blowers with inlet guide vanes and variable diffuser vanes
	Ultra-fine bubble diffusers
	New diffuser cleaning technology
Innovative and Emerging Energy Conservation Measures for Selected Treatment Processes	Low-pressure high-output lamps for UV disinfection
	Automated channel routing for UV disinfection
	Membrane air scour alternatives
	Hyperbolic mixers
	Pulsed large bubble mixing
Energy Conservation Measures for Solids Processing	Vertical linear motion mixer
	Upgrade of multiple hearth furnaces to incorporate waste heat recovery/combustion air pre-heating
	Solar drying

Water Distribution System Sample Measures	
Supply and Conveyance	Install high efficiency pumps
	Shift distribution pumping to off-peak hours and utilize reservoirs when possible
	Shift water pumping from the summer months to other months
Water Treatment	Install high efficiency pumps
	Develop lower energy intensity water treatment methods
	Shift water treatment to off-peak and partial peak times
Distribution	Install high efficiency pumps
	Shift water pumping to off-peak and partial peak times
End-Use	Increase energy efficiency of water heating and pumping devices
	Reduce the use of once-through cooling, thereby slowing reliance on treated water supplies
	Save energy by conserving water

By providing unbiased expertise and premium engineering services, The Energy Network addresses the common barriers that prevent many local governments and public agencies with limited resources from adopting energy saving measures. These new services will complement and support services provided by existing programs offered by the electric and gas utilities.

Under the first phase of a program specifically designed to work with water and wastewater agencies, The Energy Network is providing free technical, project management, financing and rebate information to cities, municipalities, and water agencies looking to pursue energy efficiency projects to improve facilities' performance and streamline capital improvement processes. The Network's technical staff, in close collaboration with SAWPA, is conducting a number of outreach meetings to explain the program and engage water and wastewater agencies throughout the Santa Ana River Watershed (SARW).

The Energy Network will provide energy resources, expertise and technical assistance to multiple water and wastewater agencies to develop strategic energy management plans for municipal energy efficiency projects. The Network also offers assistance with securing an energy project master lease option to help agencies pay for projects that are beyond their current budget capacities. This private sector financing will enable participating agencies to pay for retrofits without up-front funding. The Energy Network will serve as a model for energy efficiency retrofit implementation and financing statewide. The following resources to the water and wastewater agencies in the SARW are being made available:

- Technical and project management support
- Competitive private sector funding
- Construction management support, including procurement and contractor coordination
- Aggregated procurement of equipment and construction services
- A data management platform that supports energy management and permitting
- Evaluation and assessment of energy efficiency opportunities to reduce operating costs

Multiple meetings among water and wastewater agencies throughout the SARW SARW were held with The Energy Network Project Manager James Ferro, with support of SAWPA staff, to explain these services and to explore opportunities to reduce energy consumption by water agencies within the watershed.

Water-Energy Innovation Projects

A majority of public utility departments in the SARW encourage the implementation of projects that capture renewable sources of energy. These renewable energy projects are often recommended to businesses and homeowners through the use of financial incentives. However, water and wastewater agencies, both public and private, share the same benefits of renewable energy. Due to energy-intensive water infrastructure, such as pump stations and treatment facilities, water agencies implementing renewable energy collection systems benefit from considerable cost savings. These collection systems also assist in stabilizing the California Energy Grid by “giving back” to the grid.

Of those water agencies implementing a form of renewable energy, the most common water-energy innovation projects currently envisioned and being implemented are forms of solar and wind energy collection systems. These projects often range from modifications of wastewater treatment plant processes to installing windmills to utilizing solar panels that also provide shaded parking spaces. A few agencies are also exploring innovative, less conventional sources of renewable energy such as using food-waste to create energy to power their wastewater treatment plants, or mini-turbines installed in their water pipelines to create electricity. These renewable water-energy innovation projects not only cut energy costs for municipal agencies, but are better for the environment. An overview of water-energy projects within the SARW are described in detail below.

Inland Empire Utilities Agency 'Go Gridless by 2020'

The Inland Empire Utilities Agency (IEUA) is committed to building a better environment through better business practices. In addition to its LEED Platinum-level design administrative headquarters, IEUA is pursuing a progressive energy management strategy to be self-sufficient or 'gridless' by the year 2020. In 2008, IEUA installed 3.5 megawatts of solar power at its water recycling facilities and at the Inland Empire Regional Composting Facility. The solar energy saves IEUA hundreds of thousands of dollars a year on energy costs. In 2010 IEUA signed a 20-year Power Purchase Agreement with Anaergia Services to install, operate and maintain a 2.8-megawatt (MW) fuel cell system at the IEUA RP-1 Water Recycling Facility. Under the agreement, Anaergia is responsible for funding, design, construction, operation and maintenance of the system. IEUA will purchase power generated from the fuel cell plant at the agreed-upon price over the next 20 years, and use the heat generated from the process to heat the anaerobic digesters. The fuel cell plant will be fueled primarily with renewable biogas, making it the largest unit of its kind in the world. In 2012, IEUA installed 1 MW of wind energy at its northern water recycling plant. The treatment plant is located where a persistent wind source is available to drive a wind turbine, generating enough electricity to power the plant and provide an annual savings of more than $100,000 in electricity costs. Together, the existing and planned projects will generate 10+ megawatts of renewable energy for the agency.

Western Municipal Water District - Solar Power System

The Western Riverside County Regional Wastewater Authority (WRCRWA), which is managed by Western Municipal Water District (WMWD), has more than 5,000 solar panels covering nine acres at the WRCRWA's wastewater treatment plant. This system can provide up to 1 MW of energy during peak energy use hours. WRCRWA is committed to utilizing renewable energy sources to help lower the amount of greenhouse gases released into the atmosphere.

The solar panels track the sun, increasing sunlight capture by up to 30 percent more than conventional fixed-tilt systems. At its peak, the solar panels provide 25 percent of the power needed to operate the wastewater treatment plant.

This will help reduce WRCRWA's energy costs as the price of electricity increases in the years to come. It also increases the reliability of the plant and protects the region against power outages by reducing the burden on the California electrical grid during peak demand.

The Metropolitan Water District of Southern California – Skinner Solar Array

As part of an ongoing district-wide sustainability initiative, The Metropolitan Water District of Southern California activated a 10-acre solar power facility at its Robert A. Skinner Water Treatment Plant in Riverside County. The one-megawatt solar installation generates about 2.4 million kilowatt-hours (kWh) of clean, renewable energy a year.

Eastern Municipal Water District Solar Photovoltaic Renewable Energy Project

A 500-kilowatt (kW) solar photovoltaic renewable energy facility was constructed at Eastern Municipal Water District's (EMWD) Administrative Campus to provide approximately 1 to 1.2 MWs for its Administrative Campus in the City of Perris. The site, adjacent to the I-215 freeway, provides high visibility for the project to the public. The panels are ground-mounted, with underground electrical transmission conduits, instrumentation conduits, and other related appurtenances.

EMWD Digester Gas Driven Fuel Cells

These fuel cells allow EMWD to run some of its Moreno Valley and Perris Valley Regional Water Reclamation facilities during peak hours virtually free of charge, with no toxic emissions, cutting greenhouse gases by more than 10,600 tons annually—the equivalent of taking approximately 1,000 cars off the road for one year. The fuel cells use an electrochemical process that generates significantly less pollution than combustion technologies by converting the chemical energy in fuel (hydrogen) into electricity through a non-combustion process that is virtually emissions free. The conversion produces heat that can be used for cogeneration (cogen) or other processes and operates on a variety of fuels – including digester gas. The cogen process in a wastewater treatment plant is the simultaneous generation of electricity and recovery of usable heat from engines, fuel cells, microturbines, or other generation technologies. Recovered heat is often used to heat anaerobic digesters, which enhance the production of digester gas. This may then be used as a renewable fuel source within an EMWD wastewater treatment plant to power equipment or to generate electricity.

Elsinore Valley Municipal Water District Solar Project

With increasing energy costs and California's requirement to become more reliant on renewable energy sources, Elsinore Valley Municipal Water District's (EVMWD) solar power project supplies enough energy – more than 1 million kWh of electricity a year – to run the District's Administration building, saving money, resources, and reducing carbon emissions. This project is part of the District's long-term plan to reduce overhead costs and, in turn, reduce costs for EVMWD customers.

Riverside Public Utilities Spherical and Steam-Powered Turbines

Riverside Public Utilities (RPU) was selected by the California-Nevada Section of the American Water Works Association to receive its 2011 Outstanding Energy Management Award, for its in-system study of a water pipe that generates electricity. The award recognizes top water utilities whose energy management in operation of potable water supplies provides cost savings attributed to innovative, significant, and transferable techniques.

Developed through a partnership with Lucid Energy Technologies of Portland, Oregon, and Northwest Pipe Company of Vancouver, Washington, a portion of a gravity-fed water pipe is fitted with a vertical axis spherical turbine, which spins as water passes it, generating electricity. The world's first prototype unit was installed inside a 48-inch water pipe in Riverside in February 2010. Riverside was chosen as the pilot project city for this new technology based on RPU's progressive quest to find new renewable energy resources and the City's ongoing commitments to create a more sustainable and environmentally stable community.

The first generation system of the in-line power pipe produced a maximum of 7 kW of electricity at full flow on a continuous basis. Through monitoring, redesign, and installing prototypes, Northwest Pipe Co. and Lucid Energy have been able to increase that output to 20 kW with the third generation turbine that is currently in place. The third generation unit alone has already produced more than 23 megawatt-hours of energy.

RPU's newly acquired Clearwater Cogeneration Power Plant (Clearwater) was purchased from the City of Corona in 2010. Clearwater produces approximately 22 MWs from a natural gas-fired single combustion turbine generator, which is similar to those that RPU operates at its facilities. Additionally, Clearwater cogenerates an additional 8 MW of power by utilizing the heat produced by the gas-fired generator in boilers, which in turn create the steam that is needed to power a steam turbine generator on site. In addition to producing environmentally friendly power, Clearwater helps reduce energy procurement costs for RPU, which helps the agency provide high quality, reliable power to its customers at the lowest rates possible.

The City Council authorized RPU to move forward with an agreement with Shoshone Renaissance LLC that provides 64 MW of renewable geothermal power resources for the city, increasing its renewable resources portfolio to 33 percent in 2011. Geothermal power plants utilize super-heated fluid from the Earth to create pressurized steam, which is used to turn the blades of a turbine that creates electricity. Compared to solar or wind generation sources (which don't produce energy at night or when there is no wind), geothermal plants provide reliable sources of energy for utilities to use for baseload needs. At full capacity, the 64 MW received through the new facility will provide 20 percent of Riverside's baseload.

San Bernardino Municipal Water District Methane Gas Generators

The San Bernardino Municipal Water Reclamation Plant (WRP) reuses resources generated during the wastewater treatment processes. Since 2000, methane gas has been used as a renewable energy source to power two pump stations operated by San Bernardino Municipal Water District. In 2010, a co-generation facility was installed at the WRP which uses the methane gas produced during the treatment processes as a source of energy. This highly valuable energy source is used to fuel two 750-watt generators, which supply electricity to the WRP, minimizing the amount of electricity required to be purchased for WRP operations.

Irvine Ranch Water District Food Waste to Energy / Solar Project

The Irvine Ranch Water District (IRWD) is evaluating several potential projects for renewable energy sources to be implemented as early as 2014. The IRWD Food Waste Energy Project evaluates the collection and use of pre-processed and liquefied food waste to increase digester gas production to be used to generate electricity. Equipment would include a food waste receiving station and microturbine generators. The IRWD Solar Program evaluates the potential for future solar projects, and various purchase structures including: IRWD-owned and -operated, a power purchase agreement, and a land lease to a solar developer at Jackson Ranch.

Cucamonga Valley Water District Solar Project

The Cucamonga Valley Water District (CVWD) joined with SolarWorld California to construct a new ground-mounted solar energy system and Environmental Learning Center in 2006. Designed to augment the energy needs of CVWD particularly during peak summer demand periods, the system also serves as an on-site example of clean energy production for the students who visit the Environmental Learning Center. It is innovatively designed to teach children from grades K-12 about their role in preserving the environment.

The solar system was designed in response to CVWD's visionary approach to satisfy long-term energy needs, provide a hedge against rising electricity rates, and proactively preserve and protect the environment. Consisting of 1,416 modules, the 274 kW system annually generates 380,000 kWh. The system also eliminates the production of 240 metric tons of carbon dioxide per year, or the pollution an average car emits over 10,132 days. SolarWorld's proprietary panelization process, consisting of a factory-assembled design, allows for more efficient installation and virtually eliminates packaging.

CVWD has indicated that the project will ultimately reduce the required power load by 27 percent. As part of the Self-Gen Program, Southern California Edison defrayed a significant portion of the installation cost with a $720,000 rebate to CVWD.

City of Redlands Wastewater Treatment Plant Photovoltaic Array

In 2011, the City of Redlands implemented a project to install a photovoltaic array on property located at the city's wastewater treatment plant (WWTP). The WWTP is a city-owned facility that operates 24 hours per day, 365 days per the year. It is a high-energy user, and can use as much as 239,000 kWh during a 32-day billing cycle. An Energy Efficiency and Conservation Block Grant project will contribute to other efforts designed to make this high-energy-use facility into a greener, leaner operation. Under this renewable energy project, the city would develop a scope of work and construction documents for competitive bid. The scope of work includes installation of a photovoltaic array on a piece of property referred to as the brine pond, which has a surface area of roughly 42,124 square feet on which to perform the installation. Project components of this installation are: 627 solar panels at 175 watts each; a 100-kW power inverter with AC/DC current disconnects; and other integration parts such as combiner boxes and MC connectors. The solar panel installation will yield an estimated system size of 113 kilowatts with an estimated output of 14,416 kWh per month. The city estimates the cost of the project to be $678,400 for the equipment and installation. This project will contribute to an overall improvement in energy efficiency of the WWTP.

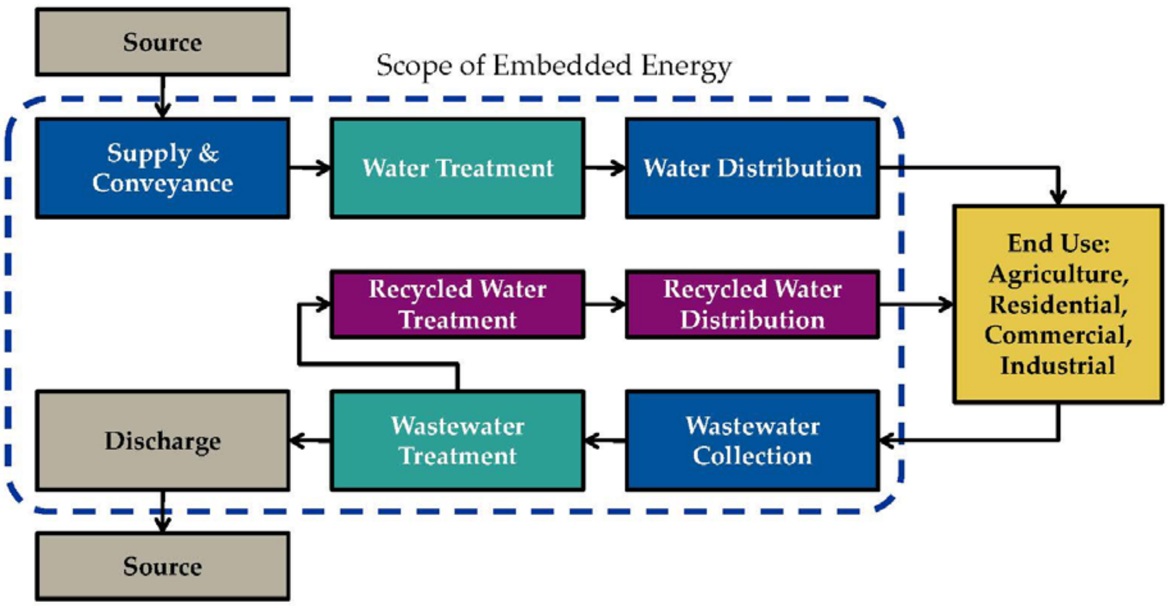
Future Opportunities

The Energy Network is also leading a water/energy nexus pilot project designed to facilitate the implementation of water efficiency projects that capture embedded energy savings. Many discussions on how to quantify embedded energy in water savings have occurred at the statewide level, yet little has been done to move forward on identifying the lost opportunities of doing nothing. The pilot project has brought together a team of experts from academia, the private sector, and the government throughout California to apply a scientifically robust energy intensity factor to a portfolio of water supplies at the watershed level. Using historical data collected from SAWPA member agencies, this metric will be applied to completed water efficiency measures and rebates issued within the watershed from SAWPA member agencies from 2010-2012. This data will be compiled and presented in the form of a report to the CPUC and other interested state agencies to support the inclusion of embedded energy rebates for water efficiency projects in the next program cycle.

The second phase of this project will integrate high energy intensity water efficiency measures into The Energy Network's offerings for public agencies to implement as part of their energy efficiency strategies through the Network's comprehensive project delivery method. The third and final phase of the pilot will result in the publication of a 'how-to guide' for public agencies looking to broaden their energy and water efficiency programs, including the identification of high energy intensity water efficiency projects that can result in significant energy savings for the state.

The Energy Coalition, in coordination with SAWPA, is also developing a white paper describing the increased opportunities that are available by capturing the embedded energy in the water use cycle.

Figure 5.13-2 Scope of Embedded Energy (Source: Navigant Consulting, Inc.)



In June 2013, the importance of this program came to light as news was announced that one of the major power generating facilities serving Southern California, the San Onofre Nuclear Generating Site (SONGS), would be decommissioned due to safety concerns. In late June 2013, SAWPA conducted an outreach and education program for retail water agency public information officers in SARW. With the assistance of the Governor's Office of Research, public message points and outreach graphics on the water-energy nexus were prepared, which focused on the message of "saving energy could be accomplished by saving water." The outcome of the meetings was the understanding that, while most Californians know about the importance of conserving water, many require a greater awareness of the importance of saving energy, and few know about the direct connection between saving both.

Saving water could help water and wastewater providers save energy which, in turn, saves consumers money. As a result, message points and graphics for outreach material were shared among the water retail agencies in SARW to mobilize for important summer requirements associated with the SONGS shutdown. This timely messaging by the water retail agencies in the watershed reflects an excellent example of collaboration and integration of water-energy nexus outreach messaging.

Also, in the past decade renewable energy projects have become increasingly efficient and popular sources of energy. Many wastewater treatment plants in the SARW are using fuel cells as a way to store energy and recycle the heat produced. Solar panels are being considered to provide energy to reduce operations costs have now become the norm. Windmills have not become as popular as solar or fuel cell technology, but have been implemented at a limited scale. This is primarily due to the limited reliable wind patterns in developed areas and possible concern with aesthetics. With several agencies researching and developing innovative sources of renewable energy, such as the mini-turbines placed in water pipelines and collecting energy produced during the wastewater treatment process, as well as local energy rebates being offered by federal and state government, the probability of increased levels of reliable and renewable sources of energy is very likely. In the near future, one can expect to see more water agencies moving to be "gridless" through renewable energy projects.

Climate Change Assessment

Introduction

In 2009, the newly published OWOW Plan addressed the impacts of climate change on the SARW on a very broad scale based on the available science at the time. Climate change science has and continues to evolve; however, incontrovertible evidence suggests that changing weather patterns can have a profound impact on California and within the SARW. To help assess possible long-term effects, SAWPA and the Reclamation entered into a partnership in the Spring of 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 to help conduct a thorough climate change analysis for SARW.

In updating OWOW 1.0, SAWPA identified several tasks related to climate change that could benefit from Reclamation technical assistance. Results from Reclamation's climate change analysis addressed SARW's water supply and demand projections and can help identify necessary adaptation strategies in light of projected effects from climate change. Key findings in Reclamation's *Technical Memorandum (TM) No. 86-68210-2013-02: Climate Change Analysis for the Santa Ana River Watershed* (**Appendix F2**) were used to update OWOW 1.0's Chapter 5.9: Climate Change, and to evaluate new research information on climate change implications for SARW. That information was also used to help assess increased energy demand to comply with the state's mandated Assembly Bill (AB) 32, Global Warming Solutions Act, and to help ensure SARW's future water supply and demand needs are met.

SAWPA, its five member agencies, and key water sector stakeholders know that warmer temperatures, altered patterns of precipitation and runoff, and rising sea levels are, in all likelihood, going to continue to increase and may potentially compromise local and imported water supplies and SARW's environmental resources, and challenge sustainability of SARW communities. SARW's water sector awareness to these unfolding events and development of associated adaptation strategies will help water agencies assess impacts on local water supply, infrastructure, and imported water sources, including the State Water Project (SWP).

Responding to climate change within the SARW presents significant challenges. Climate change impacts and vulnerabilities will vary in each SARW sub-region, and the resources available to each water agency to effectively respond to climate change will also vary.

Regional solutions and integrated projects, such as those proposed through the OWOW 1.0 and 2.0 Call for Projects, are vital to SARW's future and key to addressing and developing necessary adaptation strategies to help combat effects of climate change.

The basis for this Chapter update is **Appendix F2**, as noted above, and the key findings extracted to help frame this update. Reclamation's TM explains the methods used to analyze potential implications of changing climate, and how those implications might affect issues of importance to SAWPA and the SARW.

Chapter 1 of **Appendix F2** provides an introduction to the project and the study area, along with a summary of relevant previous studies. The development of climate projections and hydrology models can be found in Chapter 2. Chapter 3 provides projections for SARW's water supply and demand for water years 1951- 2009. These projections are summarized and highlighted below. An impact analysis was also conducted that focused on key areas of importance in SARW, and these results can be found in Chapter 4 of **Appendix F2**. Also, a tool to help SAWPA evaluate its water demand management is presented in Chapter 5, along with a case study of potential adaptation strategies. Finally in Chapter 6, uncertainties are addressed relative to SARW's climate change analysis. A SARW vulnerability assessment is included.

In light of climate change, prolonged drought conditions, potential economic growth, and population projections, a strong concern exists to ensure an adequate water supply will be available to meet SARW's future water demands. The goals from this analysis include: incorporating existing regional and local planning studies within the watershed; sustaining the innovative "bottom up" approach to regional water resources management planning; ensuring an integrated, collaborative approach; using science and technology to assess climate change and greenhouse emissions effects; facilitating watershed adaptation planning; and expanding outreach to all major water uses and stakeholders.

Projections for the Watershed

Global climate models (GCMs) used in this **Appendix F2** were downscaled to 12-kilometer grids to make them relevant for regional analysis. The downscaled GCM projections are produced by internationally recognized climate modeling centers around the world and make use of greenhouse gas (GHG) emissions scenarios, which include assumptions of projected population growth and economic activity.

Future water supply was analyzed for the SARW using the downscaled GCMs and a hydrologic model to project streamflow using 112 different projections of future climate. Projected climate variables, including daily precipitation, minimum temperature, maximum temperature, and wind speed were included, as well as historical model simulations over the period 1950-1999. Final products include data sets at key locations for precipitation, temperature, evapotranspiration, April 1 Snow Water Equivalent (SWE), and streamflow.

These data sets were used to answer the following frequently asked questions regarding impacts of climate change on the watershed:

Will surface water supply decrease?

- Annual surface water is likely to decrease over future periods.
- Precipitation shows somewhat long-term decreasing trends.
- Temperature will increase, which is likely to cause increased water demand and reservoir evaporation.
- April 1st SWE will decrease.

Will groundwater availability be reduced?

- Groundwater currently provides approximately 54 percent of total water supply in an average year, and groundwater use is projected to increase over the next 20 years.
- Projected decreases in precipitation and increases in temperature will decrease natural recharge throughout the basin.
- Management actions such as reducing municipal and industrial water demands or increasing trans-basin water imports and recharge will be required to maintain current groundwater levels.
- A basin-scale groundwater screening tool was developed to facilitate analysis of basin-scale effects of conservation, increasing imported supply, changing agricultural land use, and other factors on basin-scale groundwater conditions.

Is Lake Elsinore in danger of drying up?

- Lake Elsinore has less than a 10 percent chance of drying up by 2099.
- In the 2000-2049 period, Lake Elsinore has a greater than 75 percent chance of meeting the minimum elevation goal of 1,240 feet (ft).
- In the future period 2050-2099, Lake Elsinore has less than a 50 percent chance of meeting the minimum elevation goal of 1,240 ft.
- There is less than a 25 percent chance that Lake Elsinore will drop below low lake levels (1,234 ft) in either period.
- The EVMWD project does aid in stabilizing lake levels; however, for the period 2050-2099, additional measures will likely be required to help meet the minimum elevation goal of 1,240 ft.

Will the region continue to support an alpine climate and how will the Jeffrey Pine ecosystem be impacted?

- Warmer temperatures will likely cause Jeffrey pines to move to higher elevations and may decrease their total habitat.
- Forest health may also be influenced by changes in the magnitude and frequency of wildfires or infestations.
- Alpine ecosystems are vulnerable to climate change because they have little ability to expand to higher elevations.
- Across the State, it is projected that alpine forests will decrease in area by 50 to 70 percent by 2100.

Will skiing at Big Bear Mountain Resorts be sustained?

- Simulations indicate significant decreases in April 1st snowpack that amplify throughout the 21st century.
- Warmer temperatures will also result in a delayed onset and shortened ski season.

- Lower elevations are most vulnerable to increasing temperatures.
- Both Big Bear Mountain Resorts lie below 3,000 meters and are projected to experience declining snowpack that could exceed 70 percent by 2070.

How many additional days over 95°F are expected in Anaheim, Riverside and Big Bear City?

- All the climate projections demonstrate clear increasing temperature trends.
- Increasing temperatures will result in a greater number of days above 95°F in the future.
- The number of days above 95°F gets progressively larger for all cities advancing into the future.
- By 2070 it is projected that the number of days above 95°F will quadruple in Anaheim (4 to 16 days) and nearly double in Riverside (43 to 82 days). The number of days above 95°F at Big Bear City is projected to increase from 0 days historically to 4 days in 2070.

Will floods become more severe and threaten flood infrastructure?

- Simulations indicate a significant increase in flow for 200-year storm events in the future.
- The likelihood of experiencing what was historically a 200-year event will nearly double (i.e. the 200-year historical event is likely to be closer to a 100-year event in the future).
- Findings indicate an increased risk of severe floods in the future, though there is large variability between climate simulations.

How will climate change and sea level rise affect coastal communities and beaches?

- Climate change will contribute to global sea level rise (SLR) through melting of glaciers and ice caps and thermal expansion of ocean waters, both of which increase the volume of ocean water.
- Regional SLR may be higher or lower than global SLR due to effects of regional ocean and atmospheric circulation.
- Average sea levels along the Southern California coast are projected to rise by 5 to 24 inches by 2050 and 16 to 66 inches by 2100.
- SLR is likely to inundate beaches and coastal wetlands and may increase coastal erosion. Effects on local beaches depend on changes in coastal ocean currents and storm intensity, which are highly uncertain at this time.
- SLR will increase the area at risk of inundation due to a 100-year flood event.
- Existing barriers are sufficient to deter seawater intrusion at Talbert and Alamitos gaps under a 3-foot rise in sea levels. However, operation of barriers under SLR may be constrained by shallow groundwater concerns.

All these Frequently Asked Questions and their answers were documented in a series of fact sheets that supplement this analysis; they are presented as **Appendix F1** to this chapter.

Climate Change Analysis Methodology

Reclamation conducted an extensive literature review relevant to SARW, and also consulted with IEUA about their 2006 work with the RAND Corporation and the National Science Foundation that was used to prepare the Climate Change chapter for the SARW's 2010 OWOW 1.0 Plan. The RAND report evaluated case studies addressing water management decision-making under conditions of abrupt climate change.

Under the OWOW 1.0 Plan's Climate Change chapter, the IEUA's 2005 Urban Water Management Plan (UWMP) was used to create a baseline case for water management. That plan emphasized development of local supplies and a reduced dependence on imported water supplies.

Under base-year conditions, approximately 70 percent of the water supplies come from local sources (e.g., groundwater, recycled water, and desalted groundwater supplies). These ratios of potential water supply sources are relatively common throughout SARW, but in some regions are less so, and some are more dependent on imported water. The UWMP projected that IEUA would be able meet nearly 80 percent of its service area water demand by 2025.

The RAND study showed that IEUA's 2005 UWMP performed well under many potential climate change scenarios. Still, after four years of research, SARW faces significant risk to its water supply sources if nothing more is done now or in the future, especially to develop additional local supplies.

The core vulnerability identified from the UWMP model run was the region's continued reliance on imported water supply; climate change scenarios show that imported supply is likely to be severely impacted by declines in statewide precipitation. The most cost-effective scenarios were those which included significant improvements in local water use efficiency along with the development of additional conjunctive use and recycled water programs.

For the OWOW 2.0 Plan Climate Change evaluation, **Appendix F2**, Reclamation reviewed a large body of research that has been conducted over the past ten or more years on climate change and how the western United States might be affected. Most of this research has focused on large-scale implications (for example, over the western United States), while providing limited regional scale information. The following section summarizes research that is relevant to the SARW, and shows that although these results are applicable, additional research was required – through this Basin Study – to evaluate smaller scale, site specific, climate change impacts.

Reclamation also used a combined physical and statistical modeling approach for the climate change research. Specific details on these approaches can be found in the report.

Observed trends in hydroclimatology over the western United States will likely have significant impacts on water resources planning and management. There have been preliminary efforts by agencies managing California's water resources to incorporate climate change research into their planning and management tools, including preliminary modeling studies of potential impacts of climate change to operations of the SWP and Central Valley Project, Delta water quality and water levels, flood forecasting and evapotranspiration rates.

Weather projections for SARW, reflective of climate changes predicted by the scientific community's global climate models, were developed. That data was used with a water management model to evaluate how various water management scenarios for the region would perform under different scenarios of climate and other management options.

The probable scenarios affecting water supplies in SARW included increased temperature but variable precipitation levels. It also was recognized and confirmed by Reclamation's analysis that the statewide climate trends would likely result in reduced snowpack and runoff amounts, which would, in turn, reduce the amount of water that is likely to be available for water imports to the region.

Water Supply and Demand Summary

Table 5.13-2 shows a summary of the projected effects of climate change on a variety of hydroclimate metrics for three future periods (above the most downstream location, Santa Ana River at Adams St. Bridge). **Table 5.13-3** shows a summary of projected water demands out to 2050.

Table 5.13-2 Summary of Effects of Climate Change on Supply

Hydroclimate Metric (change from 1990's)	2020's	2050's	2070's
Precipitation (%)	0.67	-5.41	- 8.09
Mean Temperature (%)	1.22	3.11	4.1
April 1st SWE (%)	-39.93	-80.4	-93.07
Annual Runoff (%)	2.6	- 10.08	-14.61
December-March Runoff (%)	9.82	- 3.01	-6.38
April-July Runoff (%)	-6.35	- 25.24	-31.39

Table 5.13-3 Summary of Water Demand for the Santa Ana River Watershed

	1990	2000	2010	Present	2020	2030	2040	2050
Demand (MAFY)	**.0924**	**1.121**	**1.298**	**1.339**	**1.503**	**1.723**	**1.958**	**2.178**

Imported water for the SARW will also likely be affected by the changing climate. The 2011 SWP Reliability report projects a temperature increase of 1.3° to 4.0° F by mid-century and 2.7° to 8.1° F by the end of the 21st century. It predicts that increased temperatures will lead to less snowfall at lower elevations and decreased snowpack. By mid-century it predicts that Sierra Nevada snowpack will reduce by 25 to 40 percent of its historical average. Decreased snowpack is projected to be greater in the northern Sierra Nevada, closer to the origin of SWP water, than in the southern Sierra Nevada. Furthermore, an increase in “rain on snow” events may lead to earlier runoff.

Given these changes, 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. Also, warmer temperatures might lead to increased demand. This factor, combined with declining flows, will likely lead to decreased carryover storage from year to year. Alternative water supply options, such as recycled water, rainwater harvesting, and desalination may need to be relied upon in order to meet the continually growing demand.

Sea Level Rise Impacts

Climate change will contribute to global SLR through melting of glaciers and ice caps and thermal expansion of ocean waters, both of which increase the volume of water in the oceans. Regional SLR may be higher or lower than global SLR due to effects of regional ocean and atmospheric circulation.

California’s 2,000 miles of coastline has experienced just under eight inches of sea level rise over the past decade, a number that is likely to increase drastically as the climate continues to change. Critical infrastructure, such as roads, hospitals, schools, emergency facilities, wastewater treatment plants, power plants, and more will also be at increased risk of inundation, as would vast areas of wetlands and other natural ecosystems.

Flooding and erosion already pose a threat to communities along the California coast and there is compelling evidence that these risks will increase in the future. In areas where the coast erodes easily, SLR will likely accelerate shoreline recession due to erosion. Erosion of some barrier dunes may expose previously protected areas to flooding.

OCWD conducted a study to evaluate the potential effects of projected sea level rise on coastal Orange County groundwater conditions. Two locations were selected near the Talbert and Alamitos seawater intrusion injection barriers 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.

The results showed that increasing temperatures will melt ice sheets and glaciers and cause thermal expansion of ocean water, both of which will increase the volume of water in the oceans and thus contribute to global mean SLR. Regional SLR may be higher or lower than global mean SLR due to regional changes in atmospheric and ocean circulation patterns. 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.

Inundation due to SLR is likely to reduce the area of beaches and wetlands along the Southern California coast. In addition, SLR is likely to increase erosion of sea cliffs, bluffs, sand bars, dunes, and beaches along the California coast. However, the overall effects of climate change on local beaches will depend on changes in coastal ocean currents and storm intensities, which are less certain at this time.

SLR is likely to increase the coastal area vulnerable to flooding during storm events. Also, detailed analysis carried out by OCWD found that the Talbert Barrier would be effective at preventing seawater intrusions through the Talbert Gap under a 3-foot sea level rise. 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 under rising sea levels.

Addressing Climate Change

Addressing climate change in OWOW 2.0 provides SAWPA staff, the OWOW Steering Committee, OWOW Pillars, and SARW's water sector stakeholders with specific information necessary to plan, assess, and rank proposed IRWM projects. These proposed projects must address reductions to greenhouse gas (GHG) emissions within their water management activities. Projects are given a performance measure to help determine how effectively criteria are addressed, which helps with the ranking process.

Proposed projects that could be funded under the DWR IRWM Proposition 84 grant program and other funding programs can help adapt or mitigate effects from climate change, as they are required to track the effectiveness and performance of GHG emissions during and after implementation and construction.

SAWPA is a member in good standing with the California Climate Action Registry, and encourages SAWPA's member agencies and water sector partners to also do the same. SAWPA also continuously tracks legislative developments at the Federal and State level that deal with climate change, especially as it relates to IRWM planning.

SAWPA and key watershed stakeholders continuously analyze current, past, and or proposed legislation and policies relative to the water sector, and the context of Executive Orders (EO), such as EO S-3-05, the California Global Warming Solutions Act of 2006 (AB 32); Senate Bill 97, the California Environmental Quality Act (CEQA) and GHG Emissions; and EO S-13-18, Climate Adaptation Strategy. The following list of publications, updates, and presentations, relative to California and climate change, have been reviewed and are continuously being monitored.

- Update to the Climate Change Scoping Plan, California Air Resources Board (2013)
- California Climate Adaptation Strategy, California Natural Resources Agency (2013 Update)
- Preparing for New Risks: Addressing Climate Change in California's Urban Water Management Plans, University of California - Berkeley and DWR (June 2013)
- Sea-Level Rise for Coasts of California, Oregon, and Washington: Past, Present, and Future, The National Academies Press (June 2012)
- Atmospheric Rivers, Floods, and Climate Change, DWR (January 2012)

- Climate Change and Integrated Regional Water Management in California, University of California - Berkeley and DWR (June 2012)
- Climate Change, Extreme Weather, and Southern California Floods, DWR (January 2012)
- Draft Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan, DWR (March 2012)
- Proposition 84 and 1E Guidelines Update, DWR (November 2012)
- California Adaptation Planning Guide, California Emergency Management Agency and Natural Resources Agency (July 2012)
- Climate Change Handbook for Regional Water Planning, DWR (November 2011)
- Water & Climate Change Adaptation Symposium: From the Sierra to the Ocean, DWR (October 2011)
- Annual Climate Change Reports, DWR (2008, 2009, 2010, & 2011).

The following table shows additional portions of the OWOW 2.0 planning efforts that address climate change.

Table 5.13-4 Climate Change Information Included in OWOW Plan

OWOW Plan Section	Climate Change Information Included
SARW Description	Describes likely climate change impacts in SARW, determined by a vulnerability assessment.
OWOW Objectives	Adaptation to climate change: • Addresses adapting to changes in the amount, intensity, timing, quality and variability of precipitation, runoff, and recharge. • Considers SLR effects on water supply and other water resource conditions (e.g., recreation, habitat) and identify suitable adaptation measures. Consider the Ocean Protection Council's SLR Policy. Reducing emissions (mitigation of GHG): • Reduces carbon consumption, embedded energy in water, and GHG emissions. • Strategies adopted by California Air Resources Board in its AB32 Scoping Plan, including innovative applications. • Options for carbon sequestration where options are integrally (directly or indirectly) tied to OWOW objectives.
Resource Management Strategies	Identifies and implements adaptation strategies that address SARW specific or local climate change contributions or impacts.

Project Review Process	Includes these factors: • Contributes to adapting to climate change; and • Contribution to reducing GHGs, compared to the alternative.
Local Water Planning to OWOW	Considers and incorporates water management issues and climate change adaptation and mitigation strategies from local plans into OWOW.
Relation to Local Land Use Planning	Demonstrates information sharing and collaboration, with regional land use planning in order to manage multiple water demands through the state (as described in CWP Update 2009), adapts water management systems to climate change, and potentially offsets climate change impacts to water supply.
Plan Performance and Monitoring	Contains policies and procedures that promote adaptive management.
Coordination	Considers the following: • Stay involved in the Natural Resources Agency's California Adaptation Strategy process, and • Join The California Registry (www.theclimateregistry.org)

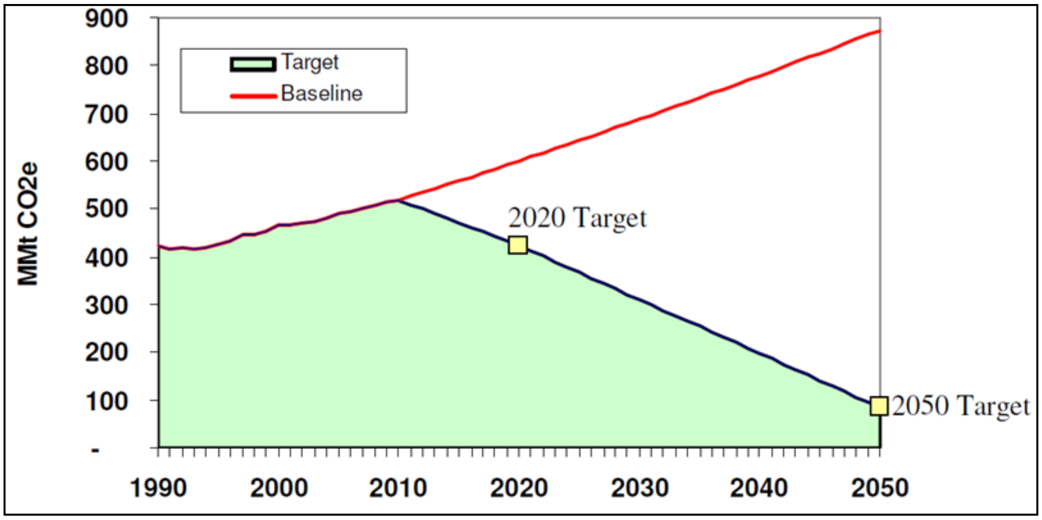
Source: DWR's 2012 Prop 84 and Prop 1E IRWM Guidelines, Table 7

Greenhouse Gas Reduction

Climate change threatens California's natural environment, economic prosperity, public health, and quality of life. Recognizing the need for action, California has put in place ambitious emission reduction goals in the form of AB 32. By requiring in law a reduction in GHG emissions, California has set the stage to transition to a sustainable, clean energy future, and has put climate change mitigation on the national agenda, spurring action by many other states. AB 32 directly links anthropogenic GHG emissions and climate change, provides a timeline for statewide GHG emissions reduction, requires quantitative accounting of GHG emissions, and enforces disclosure of GHG emissions from every major sector in the state.

AB 32 requires that every major sector in California reduce its GHG emissions to the 1990 levels by 2020, and to 80 percent below the 1990 levels by 2050, shown in **Figure 5.13-3**. These targets were developed from the levels of reduction climate scientists agree is required to stabilize our climate. The red line represents the projected GHG emissions out to 2050, if no action is taken. In order to reach the GHG emissions target set by AB 32 for 2020, a reduction of approximately 30 percent is required from the 'no action' scenario.

Figure 5.13-3 AB 32 GHG Emission Reduction Targets



Each water agency must address its carbon footprint to help the region meet the compliance requirements spelled out in AB 32. GHG emissions related to water consumption in the region must be continually measured and reported. A GHG Emissions Calculator developed by Reclamation will help the water sector meet these mandated requirements that drive compliance with projected GHG targets out to 2050. The Calculator allows users within the SARW to easily and quickly evaluate how their water management decisions affect their water demand, energy use, and GHG emissions. A TM on the GHG Emissions Calculator is included as an **Appendix J** to this report.

The TM explains the methods used to develop the calculator and provides instructions on how to use it by introducing examples. The examples focus on the SARW and demonstrate how to develop a GHG emissions baseline, evaluate what actions are required to meet specific GHG emission reduction goals, and illustrate how the GHG Emissions Calculator can be used to analyze projects.

The GHG analysis was designed to take advantage of best available datasets and modeling tools and to follow methodologies documented in peer-reviewed literature. However, there are a number of analytical uncertainties that are not reflected in Reclamation's study results, including uncertainties associated with analytical areas that can be grouped under two categories—climate projection information, and assessing hydrologic impacts that inform many of the Basin Study FAQs.

OWOW 2.0 has taken steps in planning for climate change by examining current climate change projections to determine potential impacts, assessing water resource vulnerabilities, and developing a series of strategies that can be used in projects to adapt to climate change and mitigate GHGs.

The table below lists suggested implementation actions for SARW stakeholders to apply that can help reduce energy consumption and ensure AB 32 Global Warming Solutions Act compliance.

Table 5.13-5 Implementation Actions to Reduce Energy Consumption

Action	Ways and Means
Inventory the Water Sector	Calculate the watershed's carbon footprint
Promote Energy Conservation	Use appliances and vehicles that are efficient; weatherization; implement temperature controls (on A/C and heating units); turn off lights; install CFP bulbs; install LCD computer screens; and use natural light.
Promote Water Conservation	Reduce urban and ag water demands; build resilient communities; and integrate water resources management practices; and promote project collaboration and partnerships.
Promote Alternative Energy Use	Install solar, wind, geothermal, tidal, and biomass fuel capacity; and implement any hydropower capabilities.
Implement Offsets	Purchase carbon offsets; plant trees; promote innovative approaches and solutions that foster community vitality, environmental quality, and economic prosperity.
Review or Implement Effective Policies	Conduct a gap analysis on the watershed's policies on dealing with GHG emissions; create an energy solutions campaign - save energy, reduce carbon footprint; review applicable laws and ordinances; and promote and implement energy efficiencies and sound conservation practices.

Source: Climate Adaptation Knowledge Exchange, see: www.cakex.org

Vulnerabilities

To help determine potential watershed vulnerabilities, the Energy and Environmental Impact Response Pillar assessed the Reclamation Climate Change Analysis and all applicable climate change technical data compiled about the SARW and its projected outlook through the year 2099. Reclamation used existing or new climate change models and other resources to help look beyond what was described in OWOW

1.0 and evaluate the amount, intensity, quality, variability of runoff, recharge, and imported water deliveries to the watershed that will potentially result from climate change.

Climate change is projected to affect many aspects of water resources management in the SARW. A critical first step to help prevent and/or mitigate those impacts is identifying key water sector vulnerabilities. Below is a summary of key vulnerabilities relative to the SARW:

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

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 SLR

Direct coordination with OCWD on SLR modeling in Orange County was also conducted to help assess potential impacts to their seawater intrusion barrier infrastructure and groundwater basins. Another part of critical criteria in addressing SARW's vulnerabilities is dealing with GHG emissions from operations of construction equipment, passenger vehicle trips during construction and operation, transportation of construction materials and equipment, transportation of material inputs and output for operations and maintenance activities, generation of electricity used for project operations, and waste generation and disposal of materials during construction and operations.

Climate Change Adaptation Strategies

OWOW Implementation Activities

Identifying SARW's vulnerabilities helps establish a foundation for SAWPA staff, its member agencies and key stakeholders to implement actions and employ resource management strategies necessary to address, adapt to, and mitigate the projected effects of climate change. OWOW's Resource Management Strategies, as identified in the OWOW 1.0 Plan and the follow-up implementation activities under the OWOW 2.0 Plan, are detailed in the two tables below.

Table 5.13-6 OWOW 1.0 Resource Management Strategies

OWOW 1.0 Strategy	Description
Understand that the past is not the future	Planning within the SARW must include consideration of the potential impacts of climate change, such as reduced precipitation, more intense storm patterns, increased flooding, reduced snow pack decreasing the reliability of imported water, great evaporation of surface water, sea level rise and associated impacts of coastal groundwater basins, and increased stress on natural habitats.
Develop watershed-wide programs	Time, money and water can be saved though coordinated program implementation with the SARW.
Incorporate climate considerations into land use planning	The development of SmartGrowth Communities, the implementation of Low Impact Development, and improved water efficiency standards will play a significant role in helping the watershed adapt to climate change impacts.
Factor in flood and fire management in planning decisions	The steep mountains and alluvial flood plans of the watershed, combined with its historical proclivity towards intense storm events, makes the region more vulnerable to climate change induced flooding and fires, as the intensity of flood and fire events may increase further.
Protect and restore aquatic ecosystems	The watershed has a rich array of biological resources that are critical to the quality of life in the region, Healthy ecosystems are more resistant to climate impacts, and enhancement of these systems provide other benefits including water quality, recreation, and flood protection.
Make water use efficiency and local water supply development a top priority	Increase investment in water use efficiency, recycled water, stormwater capture, and groundwater storage are vital to the long-term reliability of water supplies for the Watershed.
Promote investment in renewable energy, building efficiency, and vehicle efficiency	Transportation, power generation, and heating are primary sources of controllable carbon emissions, and constitute early implementation opportunities for the reduction of greenhouse gases. Wind and solar energy implementation could become significant sources of renewable energy.

Recognize the energy intensity of water supplies	Development of local supplies is acknowledged by the California Air Resources Board as a core adaptation strategy, as well as a way to reduce greenhouse gas emissions under California's AB 32 Scoping Plan.

The following climate adaptation strategies were developed through a consultative process among Reclamation, SAWPA staff, and three members of the Energy and Environmental Impact Response Pillar. By identifying SARW's vulnerabilities (listed as a 'checklist' in **Appendix F3**), SAWPA staff, its member agencies, and key water sector stakeholders developed the adaptation strategies listed below that will be addressed in OWOW 2.0 Plan activities.

Table 5.13-7 OWOW 2.0 Implementation Activities

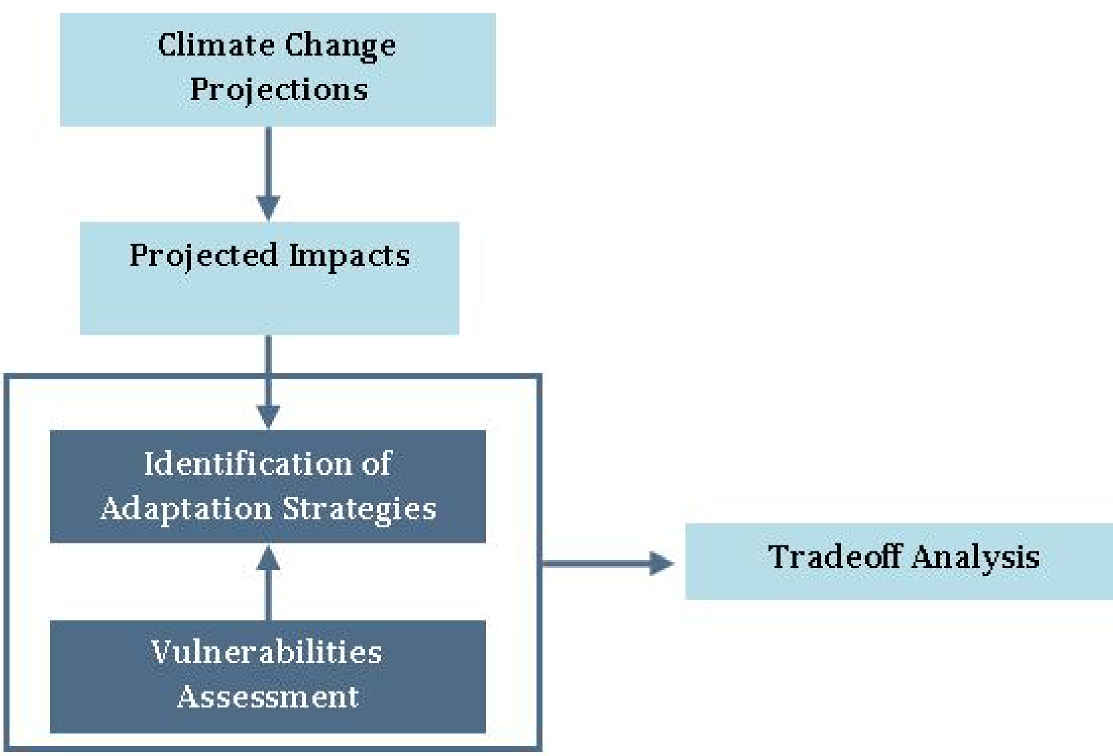
OWOW 2.0 Implementation Activities	Description
Reduce demand	Promote the State's 20 x 2020 Water Conservation Plan in the watershed.
Improve operational efficiency	Promote systems reoperations, water transfers, improved local and regional water conveyance projects, reduction in energy consumption, and water transfers.
Increase water supply	Promote conjunctive management and groundwater storage; consider brackish and ocean desalination opportunities and more recycled water use, and local and regional surface storage opportunities. Identify watershed supply sources and increase storage capacity, and improve surface water operating efficiencies.
Land fallowing	Implement land-use policies that address and reduce agriculture and urban water use; improve flood and fire risk management; identify ecosystems vulnerabilities, and ways/means to improve water quality. Reduce agriculture and landscape water demand, promote xeriscape, and improve water supply reliability.
Reduce coastal infrastructure threats	Plan for SLR; optimize coastal infrastructure operations; maintain and improve infrastructure; and reduce flooding impacts on habitat and water quality.
Resource stewardship	Improve management of watershed lands, wildlife, and water resources

	through conservation, preservation, and ecosystem restoration.
Improve water quality	Improve drinking water treatment, distribution, and groundwater use. Improve stormwater capture practices; address urban landscape improvements and urban runoff management; improve salinity management practices; implement groundwater remediation and pollution prevention practices.
AB 32 compliance	Develop methodology for quantifying energy intensity of SARW water supplies and uses. Perform carbon footprint assessment and use the GHG Calculator Tool to identify additional opportunities for reducing carbon emissions.
Public education	Increase public outreach and education through the OWOW process

Tradeoff Analysis

Based on the OWOW 2.0 Plan Energy and Environmental Impact Response Pillar's review and analysis of Reclamation's Climate Change Analysis TM, the SARW is potentially highly sensitive to climate change, with a particular vulnerability to changes in precipitation, temperature, evapotranspiration, snow water equivalent, and streamflow. A Tradeoff Analysis (seen below) was employed to assess the various climate change adaptation strategies noted in the OWOW 2.0 Plan update.

Figure 5.13-4 Tradeoff Analysis Methodology



Adaptation strategies (listed in **Table 5.13-8**) were cross-referenced with the vulnerability issues, discussed above, to determine the number and type of climate change vulnerabilities that can be addressed. This interaction is shown in the table below.

Table 5.13-8 Adaptation Strategies to Address Climate Change Vulnerabilities

		Vulnerability			
		Water Supply	Water Quality	Flood	Ecosystem
Adaptation Strategies	Reduce Demand	✓	✓	-	✓
	Improve Operational Efficiency	✓	✓	✓	✓
	Increase Water Supply	✓	✓	-	✓
	Land Fallowing	✓	✓	-	✓
	Reduce Coastal Infrastructure Threat	-	✓	✓	✓
	Resource Stewardship	✓	✓	✓	✓
	Improve Water Quality	✓	✓	-	✓
	AB32 Compliance	✓	✓	✓	✓
	Public Education	✓	✓	✓	✓

In this table, the adaptation strategy addresses vulnerability by marking with a checkmark '✓ '. Analysis of this table demonstrates that four adaptation strategies – improve operational efficiency, resource stewardship, AB32 compliance, and public education – would address the four key vulnerabilities in the watershed.

These four adaptation strategies collectively form what is referred to as the 'no regrets strategy,' a strategy which argues that energy-saving measures should be undertaken immediately to help reduce climate change impacts. Such a strategy is one that would provide benefits in the present while also reducing vulnerability to future climate change impacts. If immediately implemented, such a strategy may provide some benefit even under the uncertainty of climate change projections. Specific actions under the 'no regrets strategy' are listed below.

Table 5.13-9 Proposed Actions Under a 'No Regrets Strategy'

	Proposed Action			
	Improve Operational Efficiency	Resource Stewardship	AB32 Compliance	Public Education
Urban Water Use Efficiency	✓	✓	✓	✓
Improved Conveyance System	✓	✓	✓	✓
GW Management	✓	✓	✓	✓
Pollution Prevention	✓	✓	✓	✓
Stormwater BMP	✓	✓	✓	✓
Forestry Management	✓	✓	✓	✓

Description of individual proposed actions under the 'no regrets strategy' is given below.

Urban Water Use Efficiency

Conservation of existing water supplies is of utmost importance to a growing population in the SARW. A representative analysis from Orange County shows that per capita water use will need to be reduced from the current value of about 175 gallons per day (gpd) to about 98 gpd by 2030.

Improved Conveyance Systems

By increasing the efficiency of local and regional conveyance systems, water can be moved at a decreased cost. This is particularly important in the context of being compliant with the AB32 legislation, and is related to urban water use efficiency. With reduced per capita water use, GHG emissions can be reduced from the current level of about 120,000 GHG emissions to about 75,000 GHG emissions by 2030.

Groundwater Management

By taking into account the balance between groundwater and surface water, managers can improve long-term viability of each resource. Reclamation's Groundwater Screening Tool evaluates impacts to groundwater from a changing climate, and evaluates effective conjunctive surface water groundwater management. The groundwater screening tool was applied to four groundwater basins (Orange County, Upper Santa Ana Valley, San Jacinto, and Elsinore) within the watershed. As an example, potential actions to avoid projected water level declines in Orange County are listed below. Each alternative listed will protect against groundwater declines through 2060.

- Reduce municipal and industrial demand with a gradual reduction of approximately 15 percent by 2020 (i.e., reduce per capita use from ~175 gpd in 2010 to ~150 gpd by 2020 to ~98 gpd by 2030).
- Increase local water supplies by ~75,000 acre-feet (af) per year through recycled water treatment capacity and development of seawater desalination capacity, and increase stormwater capture efficiency.
- Increase imports from the Colorado River Aqueduct and SWP gradually from ~30,000 af per year to ~105,000 af per year (this may not be feasible due to cost, greenhouse gas emissions, or availability).
- Reduce summertime groundwater pumping.

Pollution Prevention

Preventing and remediating polluted water resources improves quality for users and improves long-term viability of local resources. This includes improved salt management in brackish desalinization and water reuse systems in the SARW. Specific alternatives analyzed include:

- Modify the existing Brine Line system.
- Salton Sea considerations including, restoration plans, salt load and increased water supply to the sea.
- Brine pre-treatment strategies.
- Alternative pipeline alignments including easement, right of way, and designs.
- Remediate polluted groundwater to reduce treatment of larger quantities of migrating water (future avoided costs).

Stormwater Best Management Practices

Implementing stormwater best management practices (BMP) reduces storm runoff and pollution, improves groundwater recharge, improves air quality, reduces heat island effect, and decreases sun exposure to asphalt. BMPs will continue to be required in the SARW. SAWPA member agencies, flood control districts, and the Regional Water Quality Control Board will continue to enforce BMPs.

Forestry Management

Create plans to restore, sustain and enhance forest health and watershed functions within forests. As part of forest management, SAWPA has initiated a Forest First initiative in collaboration with the U.S. Forest Service. As home to the headwaters of the Santa Ana River, the National Forests encompass approximately 30 percent of the SARW's land mass. These forest areas also receive 90 percent of the SARW annual precipitation. Forest management practices have direct effects on both water quality and quantity, particularly relative to forest fires and the consequential effects of soil erosion and water storage.

The collaborative efforts in the Forest First initiative include four main watershed restoration strategies that would provide significant benefits to downstream water supply and quality. The first of these strategies includes 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. The second strategy involves 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. The third strategy is 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. The last strategy involves retrofitting roads in order to reduce water conveyance, reduce fire risk, and increase the number of fire breaks. Further details on this initiative are available at: http://www.sawpa.org/collaboration/projects/forest-first/.

This analysis of the 'no regrets strategy' allows SAWPA, its member agencies, and key stakeholders an opportunity to assess proposed Proposition 84 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 regret strategies' will, however, tend to encourage incremental adaptation responses as opposed to more expansive adaptation responses.

Additional Strategies

Beyond 'no regrets strategies', a group of actions, under what could be referred to as 'low regrets strategies,' can be formulated. 'Low regrets strategies' are designed to facilitate adaptation with respect to climate change predictions. These strategies are marginally more costly than 'no regrets strategies' and have a stronger reliance upon climate change predictions, especially for more severe scenario predictions. As such, they provide a scientifically conservative approach to public health and safety in terms of water supply.

‘Low regret strategies’ are important to consider in terms of a planning horizon. For example, such strategies for SAWPA might include changing the design of infrastructure that is intended to last many years to a design that, despite an incremental cost increase, will serve its intended purpose even under an increased risk climate change model.

Table 5.13-10 Summary of Actions Under ‘Low Regrets’ Strategies

Low Regrets Strategy	Description
Emissions targets	Conduct a survey of emissions generated from all water-related operations and plan for a specific reduction in carbon emissions.
Expanded flood control infrastructure	Climate change projections call for an increase in the intensity of storms, and existing infrastructure may not be effective.
Solar projects for water conveyance systems	Using solar power as part of a renewable energy portfolio helps water districts control variable costs, as well as decrease carbon emissions.
Consider high SLR Model predictions and build new infrastructure accordingly	When in the planning process for building new water-related infrastructure, deliberately plan for SLR and design the project accordingly.
Expansion of wetlands	By expanding natural wetlands project areas, SLR will not inundate existing wetlands. In addition, wetlands provide carbon reduction benefits, water filtration benefits, heat island reduction and habitat benefits.

System Reliability and Risk Assessment

The impetus for integrated water and related resources management is the recognition that the following factors threaten the future of water resources in the SARW:

- Drought conditions in the Colorado River Watershed, a primary source of imported water to the SARW
- Unpredictability of future water imports from the San Joaquin-Bay Delta and Colorado River Watershed due to uncertainties in water availability, and changing water management requirements

- Continued population growth and development, which puts further stress on the natural hydrology of the watershed and increases the need for additional assured water supplies
- Uncertainties of climate change and its associated hydrologic variability

OWOW 2.0 is this watershed's preliminary answer to these threats. The OWOW 2.0 Plan envisions a region where its stakeholders take an active role in creating a watershed that:

- Is sustainable, drought-proofed, and salt balanced by 2035
- Protects its water resources and uses water efficiently
- Supports economic and environmental viability
- Mitigates and adapts to a changing climate
- Corrects environmental justice deficiencies
- Minimizes interruptions to natural hydrology
- Creates a water ethic at both institutional and personal levels

Next Steps

Several tools are available for SAWPA, its member agencies, and key water sector stakeholders to help address the effects of climate change and plan ways to adapt to or mitigate those potential impacts. Adaptation is the key component in the toolbox to help water resources planners and water sector decision-makers thoroughly understand and evaluate potential vulnerabilities from climate change impacts.

Research on climate change impacts is still evolving and as new findings are developed, they are shared throughout the SARW and California. SAWPA will continue to explore innovative quantitative tools to help assess vulnerabilities and conduct decision support analysis to help progress toward addressing climate change impacts in SARW. Actions that have been productive, and will continue to be in working toward this goal include:

- Aggregation of climate change knowledge from State and Federal research
- Further assess No and Low Regret strategies
- Develop a centralized and clearinghouse of information and lessons-learned for member agencies
- Offer web-based and workshop-delivered information on climate change impacts for the SARW
- Create adaptation strategies and share that information with the water sector

- Conduct webinars to further collaboration among water agencies
- Develop regional case studies to discuss implementation actions
- Bring additional agencies and officials into the discussion
- Encourage innovative projects and search for flexibility
- Seek to use evaluation studies/economic analysis as part of the message
- Examine co-benefits to gain more support
- Ensure disadvantaged and tribal communities have roles in the planning
- Continue to involve key watershed stakeholders
- Explore supportive resources/connections: Water Research Foundation, Water Environment Federation, Climate Ready Estuaries
- Collaborate whenever possible

Implications of Climate Change

The SARW and its water sector leaders are preparing to meet the uncertainty associated with climate change, tackling its challenges head-on with various adaptation strategies and decision support tools from the latest climate science available. The region continues to see population and business growth and development. With unreliable imported water supply sources from the SWP and Colorado River, which could help sustain this growth and development, addressing the region's water supply and demand management balance within finite water resources, will be equally challenging.

Additionally, the region's increased construction and development patterns invite more hardscape surfaces, reduce natural water infiltration into groundwater basins, and impede groundwater recharge opportunities. The call for urban communities to employ more "green" development standards should be increased region-wide for all new and existing homes. These communities and the water sector should also embrace the Ahwahnee Water Principles (Principles) developed by California's Local Government Commission. The Principles provide the communities of California a broader, more coordinated and more flexible water management system that tackles water quality, supply and flood risks together. In support of the Principles, several proposed Proposition 84 projects will help address potential water shortfalls once they are complete. They are: WMWD's Customer Handbook for Using Water Efficiently in the Landscape, and its commercial, industrial, and institutional performance-based Water Use Efficiency Program; and the Inland Empire Utility Agency's (IEUA) Regional Residential Landscape Retrofit Program.

Coupled with all this uncertainty is a growing concern of the basin's water quality and the cost of water from various (imported and local) supply sources. SAWPA, its member agencies, and watershed stakeholders, continue to explore alternative means to augment and convey imported water supplies, especially if they were to be interrupted on a large-scale from a major earthquake. Some additional options being addressed include developing more brackish desalination, increasing water recycling with advanced water treatment technologies, and cleaning up contaminated water plumes with advanced water treatment in SARW's groundwater basins. None of these options are inexpensive, but investing in today's technology may prove to be less costly in comparison to the future price of water. Investing in local resources now buys down risk to future key water vulnerabilities. Some projects that are proposed for funding under OWOW and DWR's Proposition 84 Round 2 IRWM Implementation grant program include EMWD's Perris Desalination Program - Brackish Water Wells 94, 95, & 96; the City of Irvine's Peters Canyon Channel Water Capture and Reuse Pipeline; WMWD's Arlington Basin Water Quality Improvement Program; and Lake Elsinore and San Jacinto Watersheds Authority's Canyon Lake Hybrid Treatment Process.

Projected increases in the region's temperature over time will increase water demand (and increase evapotranspiration) in urban communities and the environment. The heat island effect will also become more prominent, especially during summer months, as will the impacts to the region's wildlife habitat and air quality. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and GHG emissions, heat-related illness and mortality.

Less snowpack, which feeds SARW's creeks, streams, and rivers, is projected in the future. Less runoff from snowmelt will negatively impact local water supply. Potential increases in storm intensity or extreme weather events will also increase the likelihood of impact and effects from flooding. Some of the proposed projects supported by OWOW will help abate that impact through more stormwater capture that would otherwise be lost to the sea. Stormwater runoff helps groundwater replenishment, and smarter management practices of that precious resource will help further basin-wide recharge efforts. Proposed projects supported by OWOW and DWR's Proposition 84 IRWM Implementation program include the City of Yucaipa's Wilson III Basin Project and Wilson Basins/Spreading Grounds; the City of Fontana's Vulcan Pit Flood Control and Aquifer Recharge Project; the City of Ontario's Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project; San Bernardino Valley Municipal Water District's Enhanced Stormwater Capture and Recharge along the Santa Ana River project; and the IEUA's San Sevaine Groundwater Recharge Basin.

SLR will impact Orange County coastal communities and some of their essential infrastructure and coastal habitat. SLR leads to flooding of low-lying areas, loss of coastal wetlands, erosion of coastal beaches, saltwater contamination of groundwater aquifers and impacts on roads, sewage treatment plants and other coastal infrastructure. It also increases sea water intrusion opportunities to coastal groundwater basins and impairs the available fresh water supplies, which, if affected, would require the use of advanced water treatment systems. That would raise the cost of water produced and delivered to the end-user. Orange County Water District's Alamitos Barrier Improvement Project recommended by OWOW for funding under DWR's Proposition 84 Round 2 IRWM Implementation grant program would help curtail potential seawater intrusion of their freshwater aquifer.

All these implications of climate change have a direct result on SARW's socio-economics. Future predictions of development affect estimates of future climate change impacts. In some instances, different estimates of development trends can lead to a reversal from a predicted positive to a predicted negative impact, or vice versa. Climate change in the region will create inequalities between the counties that make up SARW, its communities, and within the watershed as a whole. The future level of adaptive capacity of SARW's residents, businesses, and the natural systems to climate change will affect how our society will be impacted by climate change.

Future Considerations

The SARW and our world, as we know it, will change over time, requiring that the strategies implemented to avoid, adapt, or mitigate the most severe impacts of climate change must be flexible enough to change too. The imminence and severity of the problems posed by the accelerating changes in the global climate are becoming increasingly evident: global surface temperatures are rising, heat waves and droughts are becoming more severe, storm events are becoming more frequent and more intense, land and sea ice cover is shrinking, sea level is rising, and the pH of the ocean is changing with the potential to disrupt healthy and functional ocean ecosystems. Our environment and the communities dependent on it are facing a global crisis with real, local impacts.

What is needed in these ever-changing times are ways to help identify research needs that can support scientifically-based regulations to minimize effects of climate change on our forests, aquatic resources, and fish and wildlife populations. Much of the most innovative work on climate change is occurring at the State and local levels, but this work must be coordinated with efforts around the globe to ensure reliability and consistency of approaches. Wherever you look in the SARW, it is not difficult to find at a city council, county board, or planning and zoning meeting where a concerned citizen is raising an energy policy or climate change concern and demanding action from their leaders.

SARW's water sector leaders are also engaged in those discussions and, with respect to climate change and implementing an adaptation strategy, they are committed to helping reduce agency carbon footprint by reaching the mandated AB 32 compliance by 2020. SAWPA, its member agencies, and key watershed stakeholders, recognize that the reality of climate change is that human activity is contributing significantly to altering or damaging our environment, and that it has the potential to create significant social and economic impacts. Hence, climate change management strategies can help reduce the significance of the projected impacts.

The impacts of climate change span many issues, including: combined sewer overflows, inundation of treatment water and wastewater facilities, and shifts in the timing of the rainfall that recharges groundwater basins and provides much needed surface water supply to sustain the region's drinking water supply and prevents saltwater intrusion in coastal aquifers. The new climate reality in SARW must incorporate land-use decisions across the watershed into regional water management strategies. This will be challenging because land-use decisions are often made at the local level, and the role for State or Federal agency engagement is not very clear.

Preserving the function of valuable ecosystem services is critical in the battle to combat the impacts of climate change in the region. One of the best things that can be done to prevent flooding is to preserve wetlands. Regulators and planners need to consider adaptation strategies when making decisions about preserving or filling local wetlands. Another land-use concern is building structures in the water or up to the water's edge. Based on past data and the intensity of storms, such structures are vulnerable to damage and are unlikely to be rebuilt quickly given today's economic situation. This type of thinking brings the conversation about building resilience to a watershed level.

Some of the greatest impacts related to local effects of climate change are highly variable and uncertain. SLR is the only factor in the climate equation that has durability and simplicity, and the observation that more frequent extreme events likely will occur at the local level is among the few that can be made with confidence. The need for resilience—that is, flexibility in thinking about a potential change and the ability to learn and adjust with the realities of that change—is very clear.

In developing management strategies that address climate change, SAWPA can serve as a catalyst throughout the watershed to help address human activity and instigate the necessary behavior changes to bring about meaningful desired effects. A plan of action detailing how SARW stakeholders can make a difference must be developed and periodically updated. External factors, such as weather changes, will prompt the need for watershed stakeholders to consider changes in technology, human behavior, and water sector investments to help address the uncertainty associated with climate change.

To that end, the SARW's climate change analysis helps identify necessary adaptation strategies. These strategies focus on flood risk, stormwater management, and water use efficiency optimization. In this arid region of the state, every drop of water counts, and SAWPA and its member agencies and stakeholders need to nurture the resilience of the watershed.

Regional water resources planners must continue to address the watershed's flood protection and stormwater capture opportunities, and must also promote more project integration with regional benefits. By implementing adaptation strategies that help optimize our finite water resources, realize greater water and energy conservation practices, and identify rain harvesting opportunities while implementing flood control measures, managers of SARW water resources can help reduce risk to property and lives.

To manage unavoidable impacts from a changing climate, water managers should consider changes to their infrastructure and storage reservoir operations, funding tools and incentives, and flood control approaches. Traditional approaches of the past are not adequate because they underestimate the severity and speed of climate change and overestimate the ability of natural systems to respond. Moreover, the impacts of climate change will have greater variability across our region than has been seen before. The water and energy resource management strategies described throughout this chapter should be implemented on a regional scale to harness process efficiencies and conservation savings.

OWOW 2.0 addresses this by developing an IRWM plan that is flexible, forward looking, and integrates environmental and societal constraints, considerations, and opportunities across stakeholder groups.

The science is available to water managers and decision makers and is relevant to the choices that policymakers must make. Decision-making inherently relies on forecasting, and accepts a certain amount of risk that the decision being made is less than optimal. Economists explain that risk equals probability multiplied by impact. However, risk is difficult to conceptualize when the probabilities and impacts are uncertain or unknown. Serious thought also is needed to consider the advantages of different decision-making models.

SARW's stakeholders need to create a climate risk management team that will ensure integration of proposed Proposition 84 projects and build a bridge to include climate change adaptation strategies within member agency water management practices. Those practices should include risk and disaster management response, and any current and future land-use planning exercises and decisions that can promote sustainable watershed development and reduce vulnerabilities associated with climate risk. The team's central focus should be on maximizing the positive and minimizing the negative outcomes in SARW's communities with respect to climate change and agricultural and water and related resources interests.

List of Contributors

Contributors to the Chapter include:

Bureau of Reclamation

Jack Simes	Project Manager
Kristine Blickenstaff	Hydraulic Engineer
Subhrendu Gangopadhyay	Hydrologic Engineer
Ian Ferguson	Hydrologic Engineer
Laura Condon	Hydrologic Engineer
Tom Pruitt	Civil Engineer
Marketa Elsner	Hydrologic Engineer
Laura Condon	Hydrologic Engineer

Others

James Ferro	The Energy Coalition
Craig Perkins	The Energy Coalition
Roy Herndon	Orange County Water District

5.14 Integration and Implementation

Integration and Implementation

Concurrent with the preparation and development of integrated regional implementation actions conducted by the Pillars, SAWPA conducted several integration workshops throughout the OWOW 2.0 plan development to encourage collaboration and integration between the Pillars. These workshops served to promote further integration held among the Pillars with discussions of the linkages and integration. A shared vision for the watershed was discussed as described below:

1. A Watershed that is sustainable, drought-proofed and salt-balanced by 2030, and in which water resources are protected and water is used efficiently.
2. A Watershed that supports economic and environmental viability.
3. A Watershed that is adaptable to climate change.
4. A Watershed in which environmental justice deficiencies are corrected.
5. A Watershed in which interruptions to natural hydrology are minimized.
6. A water ethic is created at the institutional and personal level.

The integration of projects considered partnerships among different organizations, employing multiple water resource management strategies, supporting multiple beneficial uses, considering system-wide regional or watershed wide scales, and addressing different components of the hydrologic cycle.

The workshop meetings sought to promote integration, to investigate linkages and consider additional synergistic solutions. The workshops were facilitated by SAWPA and were held with the Pillar Co-chairs and several additional Pillar members. The goals of the workshop were shared with the group as follows:

- Inform – Increase awareness of proposed pillar implementation
- Evaluate – Linkages among proposed projects/programs
- Develop – Identify synergy and refine existing projects/programs to create anew

In discussion of integration, the benefits of an integrated system approach were reviewed with all participants. One of the advantages of the OWOW 2.0 planning process 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.

SAWPA has stressed this strategy of a system's approach to all stakeholders in outreach material, workshops and conferences associated with OWOW 2.0. Examples are shown below in **Figure 5.14-1**.

Figure 5.14-1 Strategy of a Systems Approach Examples

Traditional Silo Approach

- Single purpose, single problem project
- Little collaboration
- Unintended downstream environmental consequences
- Sectoral isolation of water resources
- Lack of coordination of resources:
    - ◊ Stormwater shunted out of the watershed
    - ◊ Wastewater treated to increasingly high standards is dumped
    - ◊ Clean water imported from faraway

21st Century Approach

Integrated Regional Water Management (IRWM)

- Multi-beneficial projects and programs linked together for improved synergy
- Provides "Biggest Bang for the Buck"
- Proactive innovative, and sustainable solutions
- Watershed systems based approach
- Promotes collaboration cross-sectoral integration among diverse water related agencies
- Focuses on integrated regional solutions supporting local reliability and local prioritization
- Integrates water supply, water quality, recycled water, stormwater management, water use efficiency, land use, energy, climate change, habitat, and disadvantage communities and tribes
- Coordinates resources so that water is used multiple times
    - ◊ Manages stormwater for drinking water
    - ◊ Treats wastewater for irrigation and groundwater replenishment
    - ◊ Builds or modify parks to support water efficiency, ecosystem habitat, and stormwater capture
    - ◊ Improves water quality pollution prevention
    - ◊ Addresses energy and water nexus

Pillar Recommended Implementation Actions

The OWOW 2.0 Plan reflects the interconnected needs of the Region, examines linkages and develops synergy and does not limit solutions to just the needs of specific entities in the watershed. Opportunities for examining true integration were regular topics of discussion at OWOW pillar integration meetings. As the draft OWOW 2.0 plan was nearing completion, an increased focus was placed on sharing the pillar recommended implementation actions by each pillar and integration of these actions. This process of supporting implementation will continue even after the adoption of the OWOW 2.0 Plan as a new "Call for Projects" approach is contemplated in mid- 2014 in anticipation of Round 3 Prop 84 IRWM Implementation funding.

Shown below is the list of benefit elements that support a multi-benefit approach. The benefit acronym is listed alongside each of the recommended pillar implementation actions described further below.

1. WUE - Water supply reliability, water conservation, and water use efficiency
2. SCT - Stormwater capture, storage, clean-up, treatment, and management
3. RWE- Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands
4. NPS -Non-point source pollution reduction, management, and monitoring
5. GWR -Groundwater recharge and management projects
6. CRR- Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users
7. WQB-Water banking, exchange, reclamation, and improvement of water quality
8. FMP -Planning and implementation of multipurpose flood management programs
9. WPM-Watershed protection and management
10. DWT -Drinking water treatment and distribution
11. EFR- Ecosystem and fisheries restoration and protection
12. DAC – Disadvantaged community critical water supply and/or water quality improvements
13. CC – Climate change adaptation and mitigation

Details of each implementation actions are described in each pillar chapter and in **Table 5.14-1** through **Table 5.14-10**.

Table 5.14-1 Water Resource Optimization Pillar Implementation Actions

Title	Summary Description	Benefits
Water Rates that Encourage Conservation	Create incentive programs for retail water agencies in the watershed to reduce water demand and help meet SBX7-7 required demand reductions.	WUE
Water Conservation Public Education	Promote more public education of water use efficiency practices both indoor and outdoor.	WUE
Outdoor Conservation	Promote increased California friendly outdoor landscaping through incentives to reduce irrigation, currently at 60%-80%.	WUE
Reduce Evapotranspiration	Evapotranspiration might be reduced by developing and implementing programs to increase the amount of shaded area such as planting trees or constructing shade structures watershed-wide or strategic locations in the watershed.	WUE
Watershed Exchange Program	Upper Watershed foregoes development of more water recycling and provides future treated wastewater to the Lower Watershed via SAR. Lower watershed provides "replacement" water to upper/middle watershed	GWR, WUE, WQB
Wet Year Imported Water Storage Program	Upper watershed and MWDSC would implement this strategy. Goal: Change MWDSC place of storage from Central Valley to Santa Ana River Watershed Develop: MWDSC pricing structure to encourage more storage in watershed. Concept: Water stored in wet years for a reduced price. Water pumped in dry years for remaining Tier 1 price.	GWR, WUE, WQB

Enhanced Water Conservation at Prado Dam	- Corps & OCWD currently studying 505 ft year-round
	- Enhanced Project
	  - Cannot start until Mainstem project complete
	  - Would increase water storage elevation to: 510 ft or 514 ft
	  - Benefit: ~10,000 AF
		SCT, WUE

Enhanced Santa Ana River Stormwater Capture below Seven Oaks Dam	Additional stormwater detained by Seven Oaks Dam could enable the diversion of up to 500 cfs and up to 80,000 acre-feet per year. This may require execution of new water rights agreement among SAR Watermaster parties.	SCT, FMP, GWR
Enhanced Stormwater Capture from the Tributaries of the Santa Ana River	Additional stormwater capture along the SAR tributaries could enhance capture of 28,000 AFY Specific locations in the watershed would need to be defined.	SCT, GWR

Table 5.14-1 Water Resource Optimization Pillar Implementation Actions (Continued)

Title	Summary Description	Benefits
Riverside Basin Aquifer Storage and Recovery Project	Riverside Public Utilities, is in partnership with Valley District and others are developing a design for a rubber dam that would cross the Santa Ana River and be used to divert flows, 12,800 AFY into off-stream recharge basins.	SCT, GWR
MS4 Credits	Under MS4, increase the amount of stormwater captured and recharged in the watershed by allowing owners to purchase “MS4 Credits” that could be applied to recharge projects in the watershed.	SCT, NPS
Re-Operate Flood Control Facilities	Working with flood control agencies re-operate flood control facilities with the goal of increasing stormwater capture increasing flood get away capacity and revising decades old storage curves. Without 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”. This strategy has already been successfully implemented in some portions of the watershed	SCT, FMP
Size Flood Control Facilities for Stormwater Capture	Increase the size of existing, or new, detention basins. Larger detention basins would slow the flow and increase the recharge area, which would increase the amount of stormwater that is artificially recharged. In addition to this increased recharge, the larger basins also would provide greater flood protection.	SCT, FMP

Table 5.14-1 Water Resource Optimization Pillar Implementation Actions (Continued)

Title	Summary Description	Benefits
Increase Surface Water Storage	Helps offset drought and climate change while also increasing watershed sustainability and less dependence on imported water. This project would supplement but not replace existing or proposed groundwater storage.	WUE, WQB
Increase Groundwater Storage	Helps offset drought and climate change while also increasing watershed sustainability and less dependence on imported water.	WUE, WQB

Table 5.14-2 Beneficial Use Assurance Pillar Implementation Actions

Title	Summary Description	Benefits
Develop Regional BMPs to Manage Municipal Stormwater Discharges	Develop regional BMPs, infiltration and harvest & reuse projects to support efficiency and effective stormwater quality improvement.	SCT, NPS
Salt Removal Projects to Achieve Salt Balance	• Expand groundwater desalination to key groundwater basins where TDS and Nitrate concentrations are approaching discharge limits. Locations may include Elsinore Basin, Perris Basins in EMWD and Riverside Basins. • Support adoption of the Bay Delta Conservation Plan in order to promote reliability of low-TDS imported water supplies for use in the watershed.	CRR, WUE
Coordinate Surface Water Quality Monitoring Program	Assess surface water quality monitoring in watershed for overlap. Align proposed SAR Watershed stormwater regional monitoring program, MS4 stormwater monitoring, TMDL monitoring, and POTW monitoring for cost efficiencies and reduction of redundancies.	WQB
Support Small Water Systems that do not have Resources for Monitoring and Proper Operations and Maintenance	Work with CDPH and county health departments to identify small system water providers which need assistance with providing safe drinking water. Preliminary investigations indicate needs and support for both San Bernardino and Riverside Counties.	DAC, DWT

Table 5.14-3 Water Use Efficiency Pillar Implementation Actions

Title	Summary Description	Benefits
Educational and Marketing Programs for Water Use Efficiency	• Video modules of simplified demonstrations and instructions • Contractor education programs • Alliances with private industry (Professional orgs, manufacturers, distributors) • Expanded marketing of Customer Handbook • Regional information and marketing such as Inland Empire Garden Friendly and similar • A truly simple irrigation scheduling tool	WUE, CC
Technology and Training Programs for Water Use Efficiency	• Advancing emerging technologies such as smart irrigation controllers, high-efficiency nozzles, and new irrigation device technology • Creating a comprehensive package for consumers to promote use of smart irrigation controllers (e.g. rebates, stores, installers, training, and check-ups) • Advocating use of climate-appropriate plants and functional warm season turf throughout the region • Developing a "one-stop shop" that offers accessible and comprehensive water-efficient landscape planning programs	WUE, CC
Incentive Programs for Water Use Efficiency	Implement programs that allow water agencies to customize their rebates by adding additional incentives like MWDSC's programs. Support programs that allow agencies to target markets, analyze data, and implement new approaches. Rebates have been proven to motivate residential and managed properties decision makers to invest in landscape water efficiency technologies.	WUE, CC
Market Transformation for Water Use Efficiency	• Changing landscape design elements: increase pervious hard surfaces, pavers, and bioswales • Creating sample landscape plan templates • Using captured rainwater, recycled wastewater, graywater, or treated water for non-potable uses including irrigation • Positioning water-efficient gardens as in style and "hip" • Utilizing marketing suggestions from the WRI Landscape Water Use Efficiency statewide market survey: positives of water smart landscapes, the cost of doing nothing, children's involvement, and responsibility for the environment	WUE, CC

Table 5.14-4 Land Use and Water Pillar Implementation Actions

Title	Summary Description	Benefits
Programs to Integrate Water Resource Management into Land Use Planning	• Improve Interaction Between Water Resource Managers and Land Use Planners o Effectively incorporate proposed water supply protection and use factors into land use planning • OWOW /FCD partnership development or enhancement (links to Stormwater Pillar) • Land planning process enhancements o Early consideration of project concepts and designs • Focused training for Land Use Planners and Land Development Engineering Community • Incorporate recommendations of Alluvial Fan Task Force in land use planning	WPM, NPS
Programs that Support Watershed Integration, Identity Development and Implementation	• Local land use authority process enhancement • Coordinate regional transportation planning to build-in key watershed sustainability priorities into plans that apply to the SAR Watershed. • Watershed-wide geodatabase integration, access portal, and planning and evaluation tool development. • Regulatory assessment and integration to support watershed sustainability project concepts and implementation. • Demonstration project site identification, project design, coordinated planning, construction, and maintenance. • Develop alternative compliance programs for MS4 Permit land development requirements	WPM, NPS
Program to Enhance Local Land Use Authority Process	• In each SAR Watershed County o The Riverside City/County Arroyo-Watershed Program o The Newport Bay Conservancy Pilot Project o City of Ontario--New Model Colonies • Products of this project would include: o Watershed-Wide Land Use/ Water Resource Planning Guidelines Manual(s) o Model General Plan Water Element for the SAR Watershed o Watershed Coordination Forums and Training Workshops o Planning Commission Education and Outreach	WPM, NPS
Connect Watershed-wide Geodatabase Integration, Access Portal, and Planning and Evaluation Tools	• Develop “Community Improvement Area” layer • Groundwater recharge areas (optimization with FCDs and Water Agencies) • Overlay with Water Quality/Resource/Habitat characteristics • Transportation Planning collaboration potential	WPM, NPS

Table 5.14-4 Land Use and Water Pillar Implementation Actions (Continued)

Title	Summary Description	Benefits

Demonstration Projects Including Site Identification, Design, Coordinated Planning, Construction, and Maintenance	• One in each county
	• Green street/parking lot projects
	  o Possible: Monte Vista Ave in the City of Montclair
	• Regional treatment/recharge for surface and stormwater runoff (follow example of Chino Basin)—Possible locations include Gibson, Victoria, and Metrolink Basins projects with City and County of Riverside and Western MWD
	  o Joint projects with SBCFCD and SBVMWD
	  o Additional SBFCD/IEUA projects in Chino Basin
		WPM, NPS, CC

Table 5.14-5 Stormwater: Resource and Risk Management Pillar Implementation Actions

Title	Summary Description	Benefits
Stormwater Policy/Procedure Recommendations	• Develop procedures and guidelines to ensure consideration of IRWM goals at project concept, planning, and design stages using OWOW Stormwater Resource and Risk Management Pillar to implement • Provide stricter land management in floodplains o Evaluate impacts of 500 year flood management standard	WPM, NPS,

Align County Geodatabases Into a Comprehensive Watershed Geodatabase	• Accessible by all stakeholders, with data quality assurance and maintenance program
	• Maps developed to support development project conditions and acceptable BMPs
	  o Infiltration emphasized in MS4s
	• Maps include all watershed data parameters
	• Aligning or connecting the three county geodatabase layers will support watershed project concepts, and identify likely project partners even across county lines
	  o Includes FCD facility analyses for retrofit opportunities
	  o Have been and will be reviewed by regulatory agencies
	  o Provide access and develop user tools
	  o Planning Tools
	  o Outreach to Planning Departments
	• Implementation Tools
	  o WQMP Templates
	  o Regional BMP sites
	  o Feasibility issues
	  o Prioritize top three basins for potential recharge retrofit demonstration projects for each county in partnership with stakeholders
		SCT, GWR

Table 5.14-5 Stormwater Resource and Risk Management Pillar Implementation Actions (Continued)

Title	Summary Description	Benefits
Develop a Groundwater Recharge Optimization Plan for Existing and Potential Future Flood Control Facilities	• Chino Basin Watermaster Optimization Plan as a guide • Geodatabase tools provide preliminary project sites and priorities o Site lists have been developed by FCDs • Supports multi-benefits approach of recharge and flood protection while addressing MS4 Permit requirements • Costs/benefits need to be spread over FCD constituency • Identify top three sites for demonstration projects	GWR, FMP
Develop Watershed-Based Tools for MS4 Stormwater Compliance	• Task Force approach with regulators in parallel with demonstration projects and MS4 Permit renewals • Regional water quality and/or infiltration sites o Off-site or Regional BMPs—BMPs will typically be implemented downstream from the project site • Water quality and/or water quantity credit system • Build on Orange County's retention credit pilot project o Development projects contribute funds used for water quality/recharge/ habitat projects elsewhere in the watershed. o Current MS4 permits list project types which can comply via credits produced by alternative environmentally beneficial actions. • Identify pilot sites for watershed-based compliance	SCT, GWR, WPM

Table 5.14-6 Natural Resources Stewardship Pillar Implementation Actions

Title	Summary Description	Benefits
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.	EFR, RWE
Establish Sustainable Wildlife Corridors and Expansion of Restored Areas	Using Riverside County Multi-Species Habitat Plan as a template, create sustainable wildlife corridors conduct across jurisdictional boundaries in San Bernardino and Orange County for watershed connectivity Coordinate among all of the current regional conservation plans, mitigation providers, resource conservation districts and non-profit conservation organizations.	EFR, RWE
Provide Sustainable Funding Sources for Ongoing Maintenance of Conservation Areas	Create a permanent funding program to assure funding 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.	EFR
Project that Provides Invasive Vegetative Species Eradication and Maintenance Funding	Establish watershed wide non-native vegetation removal program to support habitat restoration and water savings. Removal program would address arundo removal of areas not currently addressed in the watershed as well as tamarisk removal.	EFR, WUE, CC, FMP
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.	WPM, EFR
Create Programs for Community Involvement in Habitat Conservation and Restoration	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 local "stewardship" of these habitats could benefit both the habitat and the community.	EFR, RWE

Table 5.14-7 Operational Efficiency and Water Transfers Pillar Implementation Actions

Title	Summary Description	Benefits
Water Transfer Project between IEUA and OCWD: Wet Year and Dry Year Allocation	This project concept proposes a purchase by OCWD of up to 45,000 AF of imported water to be recharged by the IEUA member agencies during wet years. Water would be purchased at a reduced imported water rate from MWD reflecting the savings of not storing the SWP water at one of MWD's own storage programs such as the Semitropic Water Storage District and/or Kern County Water Bank. During dry years, OCWD member agencies could request IEUA member agencies to increase their groundwater production for three years by up to 15,000 AF per year in-lieu of direct deliveries from MWD, while MWD increases deliveries in the Orange County area by an equal amount. Under this scenario, the net MWD deliveries during dry years (years that Water Supply Allocation Plan is implemented) will remain unchanged, without the need for MWD to produce water from its own storage accounts. At the same time, having the imported water stored in the SAR watershed will increase local supply reliability, and provide some financial incentive to both IEUA and OCWD member agencies.	WQB, WUE, GWR, CC
Water Recycling Project between EMWD and OCWD	EMWD has the capability to discharge 15,000 AFY of recycled water into Temescal Creek. The discharge will be provided in wet years when local use cannot occur for the benefit of OCWD member agencies. With the approval of the SAR Watermaster, this flow can be contractually added to OCWD's SAR base flow allocation at Prado. The water quality of EMWD's discharged recycled water may require some salinity mitigation by OCWD to meet the RWQCB Basin Plan Objective in Orange County. The GWRS will be used to provide the required mitigation for the discharged water, and EMWD will pay OCWD for the cost of that mitigation. As part of this project, OCWD will credit EMWD for the purified water that is recharged into the Orange County groundwater basin, and compensate EMWD when that water is produced by OCWD member agencies. To increase water supply reliability in the SAR Watershed, EMWD could use the revenues from this water transfer project for imported water banking during wet years in the San Jacinto Watershed groundwater basins.	WQB, WUE, GWR, CRR, CC

Table 5.14-8 Disadvantaged and Tribal Communities Pillar Implementation Actions

Title	Summary Description	Benefits
DAC Water Supply or Water Quality Improvement Projects	• Address poor water quality for the Edgemont Water District and County Water of Riverside District. • Construct new sewer systems to address failing septic systems/undersized treatment facilities in Beaumont Cherry Valley.	DAC, DWT
Tribal Water Management Projects	• Provide funding support to water recycling facilities; that share mutual benefit to tribes and surrounding regions. Based on cooperative efforts among tribes and adjoining water agencies.	DWT

Table 5.14-9 Government Alliance Pillar Implementation Actions

Title	Summary Description	Benefits
Government Alliance Coordination:	• Provide resource guide to all government entities and publish updates of the Resource Guide and post them on SAWPA's website.	WPM

Table 5.14-10 Energy and Environmental Impact Response Pillar Implementation Actions

Title	Summary Description	Benefits
GHG Inventory of the Water Sector	Calculate the Watershed's Carbon Footprint	CC
Promote Water Use Efficiency	Reduce Urban and Ag water demands; Build Resilient Communities; and Integrate water resources management practices; and Promote project collaboration and partnerships.	WUE, CC
Promote Alternative Energy Use to Reduce Embedded Water Use	Install Solar; Wind, Geothermal, Tidal, and Biomass Fuel capacity; and Implement any hydropower capabilities.	WUE, CC
Implement GHG Emission Offsets	Purchase Carbon Offsets; Plant Trees; Promote innovative approaches and solutions that foster community vitality, environmental quality, and economic prosperity.	WUE, CC, EFR
Review or Implement Effective Energy Efficiency Policies	Conduct a gap analysis on the watershed's policies on dealing with Greenhouse Gas Emissions; Create an energy solutions campaign - save energy, reduce your carbon footprint; Review applicable laws and ordinances; and Promote and implement energy efficiencies and sound conservation practices.	CC, WPM
Inventory the Water Sector	Calculate the Watershed's Carbon Footprint	WPM
Promote Electricity Conservation to Address Embedded Water Use	Region-wide Use Appliances and Vehicles that are efficient; Weatherization; Implement Temperature Controls (on A/C and Heating units; Install CFP Bulbs; Install LCD computer screens; and Use natural light.	CC, WPM

Regional Implementation Action Linkages

Upon review of the recommended pillar implementation actions, the participants in the workshops were asked to discuss linkages, overlaps and similarities among the actions.

The following questions were proposed:

1. Are any actions that are similar to one another overlap?
2. Is the action better if we combine overlapping aspects?
3. Are any actions dependent on another action, recommended here or separately, to be implemented?
4. Can we link or integrate any of the actions proposed?
5. Any new synergistic ideas for regional implementation actions?
6. Any areas of the watershed that need more attention where a regional implementation action would be desirable?

These questions were posed particularly mindful of DWR IRWM Implementation requirements to develop work plans that identify linkages between and among actions that are critical to the success of the regional effort. From the discussions, a list of Pillar recommended implementation actions that best represent watershed-wide and system-wide solutions was defined. These are discussed in the next section. However, the Pillar Integration Workshop also covered a number of suggestions that would assist and support implementation as well as shown below.

- Support PUC rebates to implement for sustainability and water conservation in outreach to customers (PUC rebates for water conservation).
- Geodatabase concept affects a number of the Pillars so that it could be part of the Basin Plan.
- Add layers to the Geodatabase that shows the following:
    - Utility company information
    - Climate change scenarios
    - Layers of natural resources areas
    - Layers of Potential restoration areas
    - Layer of highly economical land to stay away from and BMP opportunities
    - Status of ongoing planning activities by agencies
- Promote Geographical integration
    - Scale up ideas for watershed wide basis
    - Example: Water softener ordinance IEUA
    - Program could scale up to stormwater capture
    - Increase rate of return in recycled water if this program would be watershed wide
- Tool that allows everyone to see what agencies are working on beneficial use and water quality
    - If a project will transfer water or use less water, using the new GHG emission calculation tools to save water and reduce GHG
        - San Bernardino County has a GHG emission calculation tool for developers, for water and energy reduction
    - Sea Level Rise can effect water quality – coordination between agencies must be done
- LID should be looking at a regional perspective (streets and landscape areas)
- The impacts of recharge to groundwater basins with contaminant plumes must be considered. IEUA did ordinance on controlling water softeners and everyone in the watershed can benefit from it

- Creating sustainable jobs should not be excluded from the discussion – (Habitat for Birds and Bees).
- WMWD has surf and turf program though it's very labor intensive and they help subsidize retrofit to residential properties, up to 6,000 sq ft
- Sea level rise is an issue that will affect other types of land use and costs
- Pillar meetings should keep going on a monthly basis
- The key to unwind the 303 (d) impaired water body listing dilemmas is to address problems at a sub-watershed scale
- A regional monitoring plan could save time and money
- Climate change is relevant to beneficial use (habitat and water quality)
- How do we go back and recapture conservation and industrial commercial? Innovative Mitigation!
- Work with regulatory agencies from the beginning of a project
  - Need to incorporate a forward vision
  - Begin a plan by integrating all water resource issues first
  - Bring in all agencies and other regional project proponents for innovative mitigation
- Legislation
  - Consider needs for changing legislation
  - Stormwater should not considered wastewater
    - Change "Water used" to "Water consumed"
    - Upstream water user and downstream water user – how do we give them credit for keeping water in the river?
    - Assimilative capacity with salt – How to get credit?

OWOW 2.0 Plan – Future Implementation

In preparing the OWOW 2.0 Plan, a series of Broad Planning/Management Guidance Strategies were distilled from that work and will serve to guide future planning and management in the watershed. The Strategies reflect a change in thinking about water resource management. Historically, water activities were organized into different silos and managers worked to achieve separate and individual goals that were thought to be unrelated. The water supplier's goal was to divert water for a growing population and economy without regard its impact on the environment. The flood control manager's goal was to channelize stormwater to get it out of the community before it could harm people and property or sink into the ground. The waste water manager's goal was to highly treat and dump waste into the river or ocean to be carried away. The environmentalists were isolated and recreation was left to its own devises. Managing the watershed and water resources as done in the past realized narrow singular goals but did so with tremendous unintended consequences. The list of endangered species only grew longer, as did the list of impaired water bodies. Societal values have changed, water and funds are scarcer, and together we have realized that the old way is no longer viable. SAWPA adopted its first Integrated Water Plan in 1998 and has been committed to this kind of watershed or system thinking ever since. **Figure 5.14-2** shows this relationship.

Figure 5.14-2 Depiction of Planning/Management Strategies

These Broad Planning/Management Guidance Strategies are not projects or programs themselves and are separate and distinct from priorities assigned to evaluate projects for funding that are often dependent on the grant sponsoring agency criteria. These Planning/Management Strategies are meant to guide planning efforts and are listed *in no particular ranked order or priority as shown below*.

Demand Reduction and Water Use Efficiency

Water use efficiency practices remain a key resource management priority for the watershed and a cost effective tool for reducing the gap between available supplies and projected demand. This is reflected through a reduced per capita water use as well as potentially reduced commercial and industrial water use. Though significant progress is anticipated with mandated reductions through 20% by 2020 legislation, more can be done. Many water use efficiency actions have been implemented locally but these can be scaled watershed-wide. These include water conservation rates that encourage budged based rates, Garden Friendly landscaping and landscape ordinance application, smart controllers and irrigation nozzles, and turf buy-back programs, to name a few. The last acre foot of water is often the most expensive, reducing that cost goes far to keep water rates stable.

Monitoring data shows wasteful irrigation runs off yards down streets and culverts collecting pet waste and pollution until it hits the receiving water with a toxic slug causing beach closures and fish kills. At great expense cities have been tasked to clean up this dry weather urban runoff pollution. This cost can be avoided with successful water use efficiency.

It is understood too that there is a direct link of water use efficiency with energy efficiency and GHG emission reduction.

Watershed Hydrology and Ecosystem Protection and Restoration

Implement cost-effective programs that will protect and restore our watershed's ecosystem and hydrologic system so that it will sustainably produce the array of services including water resources. Recognizing that the SAR Watershed has multiple interrelated parts, a holistic approach to solving issues of supply, quality, flood and ecosystem management is necessary. This approach recognizes that in order to achieve a healthy productive watershed, improvements starting at the top of the watershed with a healthy and managed forest effectively support downstream stormwater attenuation and runoff capture and water quality improvement. The emphasis is on source control rather than end-of-pipe treatment as a best management practice. Implementation actions under this priority include forest management, pollution prevention, low impact development, stormwater capture and flood management, and MS4 stormwater implementation.

Operational Efficiency and Transfers

Cooperative agreements that result in water transfers, exchanges, and banking have resulted in better use of water resources. With the rich groundwater storage opportunities available in the SAR Watershed, expanding the groundwater storage with a variety of available water sources can be more much more cost effective than new surface storage. Such agreements will result in our ability to stretch available supplies and replace the storage lost by a shrinking snowpack. Projects under this category occur by collaboration and cooperation among the multitude of agencies and entities in the watershed, and agencies that import water into the watershed. New banking agreements can represent both habitat mitigation banking as well as groundwater banking. These agreements can only occur by entities working together and opening doors to improved efficiency and increased water supply reliance.

Innovative Supply Alternatives

This strategy recognizes the need for more progress in a portfolio approach with expansion of innovative and effective 21st Century technology for water production, recycling, pumping, and desalinization. Traditionally, these projects serve as an important component to achieving water supply reliability. Moving forward, a broader range of tools are now available to us to serve both economic and environmental objectives. Projects under this category provide multiple benefits and thus can be mutually reinforcing. Brackish desalination and salinity management are necessary to sustain local supplies. Salinity management is essential for groundwater basin health in the watershed.

Remediation and Clean up.

Another strategy is implementing TMDLs and pollution remediation. Projects under this category must reflect projects that have region wide benefit, are integrated and have multiple benefits without a focus only on local or single purpose needs. Under this strategy, the focus is on preventing pollution and also dealing with the pollution that has already occurred. This reflects a desire to duplicate the success already established in the watershed to prevent pollution and then to remediate pollution. If we continue operating in ways that cause pollution, degrading the watershed, the list of TMDLs will continue to grow.

The Broad Planning/Management Guidance Strategies were presented and discussed with the Pillars and other stakeholders to possibly prioritize the five (5) strategies. The feedback received is that all five (5) strategies are a priority to the watershed. Depending on locality and progress made by entities within the watershed. However, each local entity should evaluate the water resources strategies that make the most sense at the higher watershed level over multiple decades as opposed to immediate or parochial needs. It is true that factors such as of cost effectiveness, water supplies generated versus demand, environmental benefit, feasibility, and practicality must be considered. But as stakeholder of the watershed, entities are encouraged to consider the long term watershed planning approach as they consider competing alternatives to meet needs and give more merit or attention to strategies such as water use efficiency that has been traditionally found to be more cost effective in reducing water demands and generating water supply with additional benefits of dry weather urban runoff pollution reduction before other alternatives. Further projects should consider system wide benefits before other alternatives that can have multiple benefits downstream. This applies particularly to pollution prevention at the source rather than having to address a chain of unintended and possibly negative consequences downstream for future generations.

Shown below is a list of Pillar Recommended Implementation Actions that were prepared based on the Pillar work, Master Craftsmen work, and other stakeholder input. These regional implementation actions are not listed in priority or are in any particular order. They represent the integrated work of the Pillars that resulted from their collaboration internally and with other Pillars and are the solutions to the challenges that they identified in each of their Pillar chapters. This list does not represent a list of projects that been rated and ranked projects under the more formal Project Review Process defined under the OWOW 2.0 Plan. However, they are recommended implementation actions that reflect an emphasis on integration and system-wide solutions to the watershed challenges and include the 13 watershed-wide framework concepts previously discuss.

Each of the Pillars recommended watershed-wide implementation actions that could eventually become projects once they are more fully investigated and analyzed. Multi-agency project proponents for these implementation actions have not been identified yet. It is anticipated that these recommended actions may best help fulfill the vision of OWOW 2.0 Plan.

Appendix K shows projects submitted to SAWPA under the Round 2 “Call for Projects” conducted in 2012, and are rated and ranked based on the project criteria defined for OWOW Round 2. The process undertaken for project review for the OWOW Round 2 projects is discussed in **Chapter 6 Project/Program Review, Evaluation and Prioritization**.

Each of the pillars recommended implementation actions shown below, and must be further investigated and analyzed to fulfill future grant funding requirements. Further, multi-agency project proponents for these actions may not have been identified yet. It is anticipated that this list of Pillar recommended actions, shown in **Table 5.14-11**, will serve as planning guidance for possible watershed-wide implementation projects to be encouraged for funding under Proposition 84 Round 3, and can best help fulfill the vision of OWOW 2.0 Plan.

Table 5.14-11 Pillar Recommended Implementation Actions
(In no particular order)

Title	Summary Description
Water Budget Based Tiered Water Rates	Create incentive programs for retail water agencies in the watershed to adopt water budget-based tiered water rates.
Water Use Efficiency Incentive Program	Create an incentive program for expanded water use efficiency programs including cash for grass, landscape retrofit support, and California-friendly plant discounts. Utilize IEUA Residential Landscape Transformation Program and MWDOC Comprehensive Landscape Water Use Efficiency Programs as template.
Watershed Exchange Program	• Upper Watershed foregoes development of more water recycling and provides future treated wastewater to their Lower Watershed via SAR • Lower watershed provides "replacement" water to upper/middle watershed
Wet Year Imported Water Storage Program	• Upper watershed and MWDSC would implement this strategy • Goal: change MWDSC place of storage from Central Valley to Santa Ana River Watershed • Develop MWDSC pricing structure to encourage more storage in the watershed • Water stored in wet years for a reduced price. Water pumped in dry years for remaining Tier 1 price

Enhanced Water Conservation at Prado Dam	• Corps & OCWD currently studying 505 ft year-round
	• Enhanced Project
	  o Cannot start until Mainstem project complete
	  o Would increase water storage elevation to: 510 ft or 514 ft
	  Benefit: ~10,000 AF

Enhanced Santa Ana River Stormwater Capture Below Seven Oaks Dam	Additional stormwater detained by Seven Oaks Dam could enable the diversion of up to 500 cfs and up to 80,000 acre-feet per year. This may require execution of new water rights agreement among SAR Watermaster parties.
Off River Storage and Supply Credits	Additional stormwater capture along the SAR tributaries could enhance capture/ recharge. Specific locations in the watershed would need to be defined. New recharge projects could allow for purchase of "MS4 Credits" by cities and counties as part of new development as a regional MS4 compliant recharge project.

Title	Summary Description
Re-Operate Flood Control Facilities	Working with flood control agencies re-operate flood control facilities with the goal of increasing stormwater capture increasing flood get away capacity and revising decades old storage curves. Without 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". This strategy has already been successfully implemented in some portions of the watershed.
Increase Surface Water Storage	Helps offset drought and climate change while also increasing watershed sustainability and less dependence on imported water. This project would supplement but not replace existing or proposed groundwater storage.
Increase Groundwater Storage	Helps offset drought and climate change while also increasing watershed sustainability and less dependence on imported water.
Inland Empire Garden Friendly Demonstration and LID Project	Using the Inland Empire Garden Friendly Program as a template, a demonstration project is proposed to quantify the benefits of installing Inland Empire garden friendly products and further demonstrate Low Impact Development features in a DAC neighborhood. The project would be modeled in part after the successful City of Santa Monica Garden-Friendly Project, as well as the Elmer Avenue Neighborhood Retrofit project in the LA Basin.
DAC Water Supply or Water Quality Improvement Projects	Provide funding support to assure drinking water standards are met such as in the County Water Company of Riverside near Wildomar. Construct new sewer system for the areas that have failing septic systems/undersized treatment facilities like Beaumont Cherry Valley.
Wetlands Expansion Watershed wide	Create new wetlands along the tributaries of Santa Ana River to provide for natural water quality improvement, ecosystem restoration and recreational opportunities. Water supply for such wetlands would be dry weather urban runoff and available recycled water and would be patterned after the Mill Creek Wetlands in Chino Basin.
Title	**Summary Description**
Watershed-wide Multi-Use Corridor Program	Create multi-use corridors along SAR and its tributaries and Upper Newport Bay tributaries in all three counties in the watershed to provide for sustainable wildlife corridors, stormwater attenuation and capture, flood control, sediment reduction and erosion restoration, enhanced NPS pollution treatment, removal of non-native species, and creation of recreational trails,. In Riverside County, along Temescal Wash, San Bernardino, San Timoteo Wash, Orange County along Borrego Canyon Wash between Irvine Blvd., and Town Center Drive.

Multi-Species Habitat Plan for Gap Areas of Watershed	Create multi-species habitat plan for San Bernardino County and portions of Orange County. Though work is underway on the Upper Santa Ana Wash Land Management and Habitat Conservation Plan, there is no MSHCP covering the growing areas of southwestern San Bernardino County. Western Orange County is also not covered by an MSHCP.
Water Conservation Recharge Optimization Program	Establish a water conservation-recharge optimization plan for existing and potential future flood control facilities, using the example work of the Chino Basin Recharge Master Plan and implementation projects as a template.
Watershed-wide Geodatabase Access	Connect existing county or program-specific geodatabases to create a comprehensive watershed geodatabase that provides access to appropriate stakeholders, and set up a data quality control and maintenance program. The main component County MS4 geodatabases are well under way.
Forest Restoration Projects	Expand forest restoration through fuels reduction, meadow and chaparral restoration projects to strategic areas above major stormwater recharge basins for flood control, water supply and water quality benefits.
Residential Self-Regenerating Water Softener Removal Rebate Program	Removal of self regenerating water softeners has been proven as an effective strategy to reduce TDS levels at WWTP and assure future salt discharge requirements. The project provides watershed-wide rebates and would be a joint program among water agencies in the watershed.
Salt Removal Projects to Achieve Salt Balance	Expand groundwater desalination to key groundwater basins where TDS and Nitrate concentrations are approaching discharge limits. Locations may include Elsinore Basin, Perris Basins in EMWD and Riverside Basins.
Enhanced Stormwater Capture from the Tributaries of the Santa Ana River	Develop additional stormwater capture projects along the SAR tributaries that support key groundwater management zones identified by San Bernardino, Riverside, and Orange County Geodatabases. Early estimates indicated a capture potential of 12,000 AFY.
Title	**Summary Description**
Conjunctive Use Storage and Water Transfer Project using Wet Year and Dry Year Allocation	This project concept proposes a purchase by OCWD of up to 45,000 AF of imported water to be recharged by the IEUA member agencies during wet years. Water would be purchased at a reduced imported water rate from MWD reflecting the savings of not storing the SWP water at one of MWD's own storage programs such as the Semi-Tropic Water Storage District and/or Kern County Water Bank. In dry years, OCWD member agencies could request IEUA member agencies to increase their groundwater production for three years by up to 15,000 AF per year in-lieu of direct deliveries from MWD, while MWD increases deliveries in the Orange County area by an equal amount. Under this scenario, the net MWD deliveries during dry years (years that Water Supply Allocation Plan is

	implemented) will remain unchanged, without the need for MWD to produce water from its storage accounts. At the same time, having the imported water stored in the SAR watershed will increase local supply reliability, and provide some financial incentive to both IEUA and OCWD member agencies.
Salt Assimilative Capacity Building and Recycled Water Transfer Project	EMWD has the capability to discharge 15,000 AFY of recycled water into Temescal Creek. The recycled water discharge will be dependent on surplus recycled water available and not used within EMWD particularly during wet seasons. With the approval of the SAR Watermaster, this flow can be contractually added to OCWD's SAR base flow allocation at Prado. The water quality of EMWD's discharged recycled water may require some salinity mitigation by OCWD to meet the RWQCB Basin Plan Objective in Orange County. The GWRS will be used to provide the required mitigation for the discharged water, and EMWD will pay OCWD for the cost of that mitigation. As part of this project, OCWD will credit EMWD for the purified water that is recharged into the Orange County groundwater basin, and compensate EMWD when that water is produced by OCWD member agencies. To increase water supply reliability in the SAR Watershed, EMWD could use the revenues from this water transfer project for imported water banking during wet years in the San Jacinto Watershed groundwater basins.
Riverside Basin Aquifer Storage and Recovery Project	Riverside Public Utilities, in partnership with Valley District and others, are developing a design for a rubber dam that would cross the Santa Ana River and be used to divert flows while mitigating environment impacts. Creates, 28,000 AFY into off-stream recharge basins.
Watershed Invasive Plant Removal Project	The Santa Ana Watershed Association, the Front Country District Ranger on the San Bernardino National Forest and Southern California Edison had proposed a major an invasive plant eradication project for the Mill Creek Watershed. This project area covers the front (southern slopes) of the San Bernardino Mountains from Highway 18 through Waterman Canyon on the west to Highway 38 from the Mill Creek Ranger Station to Angelus Oaks, an area of approximately 172,773 acres. The proposed future 3-year work area in this proposal covers the Mill Creek Watershed from the Forest boundary to the headwaters. This project proposes to expand the San Bernardino Mountains Front Range Invasive Plant Removal Project to an invasive plant removal and restoration project in the Santa Ana River Watershed that has many partners and stakeholders extending from the coast to the headwaters.
Title	**Summary Description**
Regional BMPs to Manage Municipal Stormwater Discharges	Develop regional BMPs including infiltration, harvest & reuse, and biotreatment as proposed under current MS4 Permits. Initial phase would be located in MSAR Pathogen TMDL area and expand into other areas of the watershed under future phases to address pathogen treatment.
Watershed-wide coordinated surface water monitoring program	Surface water quality monitoring is not coordinated within the watershed leading to duplicative sampling in some areas and inadequate sampling in others. In some cases this may lead to 303(d) listings that do not reflect real impairments. A new program to coordinate surface water quality monitoring to enhance efficiency and reduce costs is proposed. Sources of monitoring

	data would come from MSAR Watershed TMDL, SWQSTF, MS4 Stormwater Permits, and SCCWRP Bio-assessment Program.
Watershed Urban Runoff Management Fund	Establishing a Watershed Based Urban Runoff Management Fund to support the implementation of stormwater management programs. Components of this program could include the regulatory basis for a watershed based program, the legal basis and authority for the fund, the agreements, and programmatic elements.
Santa Ana River Sediment Transport	Building upon an OCWD demonstration project, implementation of a full scale project that allows for the appropriate transfer of sediment to maximize recharge operations, restore habitat, and reduce operation costs.
Transportation Corridor Stormwater Capture and Treatment	New uses of the current transportation right-of-ways can be expanded for capturing rain runoff and replenishing groundwater basins.
Modified Watershed Brine Management System	Optimizing the water used to transport brine so that less water is lost to the ocean through increased concentrating of brine or delivery to the Salton Sea for beneficial use.
Water Industry Energy Use Reduction Incentive Program	Supporting regional purchase and installation programs of water resource related greener energy projects that reduce capital costs and green house gas emissions.
Watershed Land Use Planning Tool Kit	Developing a tool kit that translates water principles to support watershed planning decisions and implements a jurisdictional outreach effort for relevant regional, county and city planning agencies that encourages adoption of the guidance ideology into General Plans and zoning codes at the local level.

From Concept to Reality – Next Steps for OWOW Implementation

Implementation of the Watershed-based Implementation Concepts just described requires a collaborative multi-jurisdictional effort to be successful. Two types of efforts are envisioned: (1) implementation of Water Resources Infrastructural Conceptual Projects; and (2) Watershed Sustainability Guidance and Programs. Implementation of infrastructural conceptual projects have both institutional (regulatory, jurisdictional, economic) and technical (planning, design and construction) elements. The biggest challenge to successful implementation is not the technical issues; it is the institutional issues that will be associated with any project. We have the technical skills to build the infrastructure; however, developing the institutional support across the watershed, which is required to actually build the infrastructure, requires substantial work. Developments of Watershed-based Guidance and Programs have similar challenges. From a technical standpoint, we have numerous experts throughout the watershed that have the skills and knowledge to develop the projects and programs. On the ground, implementation of the guidance will require a significant focus on the institutional issues.

With these distinctions (technical vs. institutional) in mind, the following recommendations are made to move forward particularly as the future grant funding opportunities arise:

- Identify a champion(s) for each conceptual implementation action or project, one who has the time and resources to commit to the effort.

- Form teams that are responsible for the various project elements, but led by the project champion(s). Recommended teams and examples of their potential responsibilities could include:

    - Financial – This team develops either the means to finance a project (including state/federal grant development) or develops economically sound programs to support watershed management activities, e.g., establishment and operation of an Urban Mitigation Fund to support regional stormwater treatment.
    - Regulatory – This team's job is to eliminate or minimize regulatory barriers or steer projects in a manner to work around such barriers. They would identify regulatory issues associated with implementation of an infrastructure project or implementation of elements of a guidance document. This team would work directly with the regulatory agencies to resolve conflicts and overcome barriers; they would also lead the effort to develop regulatory documents, e.g., prepare permit applications or complete CEQA requirements for the implementation of an infrastructure project.
    - Legal – Experts can provide critical information regarding legal issues such as making sure existing legally binding agreements, e.g., water rights, are not impacted by a project. If they are impacted, they would develop options and provide means for working around such barriers.
    - Marketing – Outreach is a key to success of any watershed project. The marketing team would be responsible for developing stakeholder support, preparing outreach materials, and coordinating outreach activities, including arranging for experts from the other teams to attend outreach events to share their knowledge.
    - Technical – The technical team includes the skill sets needed to design the project or develop the technical aspects of a guidance document. For infrastructure projects, the team would begin with a 10% planning level design, which then would be used by the other teams to initiate their efforts. Once agreement is reached on the planning level concept, the various financial, regulatory, legal and marketing needs can be defined,

and the other teams can go to work while the technical team moves forward with design. Similarly, for guidance development, the technical team would first develop the technical framework, methods, or ideas that will comprise the guidance. With that understanding developed, the other teams would go to work to lay the groundwork, where needed, to increase the likelihood of implementation across the watershed.

- Empower the teams to work autonomously with oversight by the champion. The project champion(s) would ensure the work of the various teams is shared as needed.

- Decision makers need to be at the table leading the teams. The staff of the decision makers can certainly do the heavy lifting, but decision makers are needed to drive the process forward, especially when the inevitable speed bumps arise. A commitment to work to the 30% design level will develop project and program concepts that can engage and encourage the input from other potential partners and encourage project development beyond the single purpose project.

- Investing in 30% level design (preliminary design) is helpful to the permitting process as the 10-15% design concepts sometimes leave many unanswered questions for regulators resulting in lower commitment to the project initially due to uncertainty.

Preliminary design and feasibility analysis of the projects will improve eligibility for future IRWM grant funding rounds. As project development occurs and regional multi-benefits are more clearly defined, it is likely such projects will be highly rated under future funding rounds through Prop 84 IRWM grant program. With the lion's share of Prop 84 **Chapter 2 Governance, Outreach, and Integration** called out for the Santa Ana River Watershed occurring under the next and final round of Prop 84 amounting to $73.5 million; greater funding support will be available to support regional implementation projects and projects that benefit larger geographic areas of the watershed. Disadvantaged communities and Native American Tribes will be provided special consideration and attention particularly to find adjoining agencies, cities, counties or NGOs that may serve as the sponsoring entity for new water supply or water quality improvement projects.

6.0 Project/Program Review, Evaluation and Prioritization

Eligibility Gates

Project Prioritization

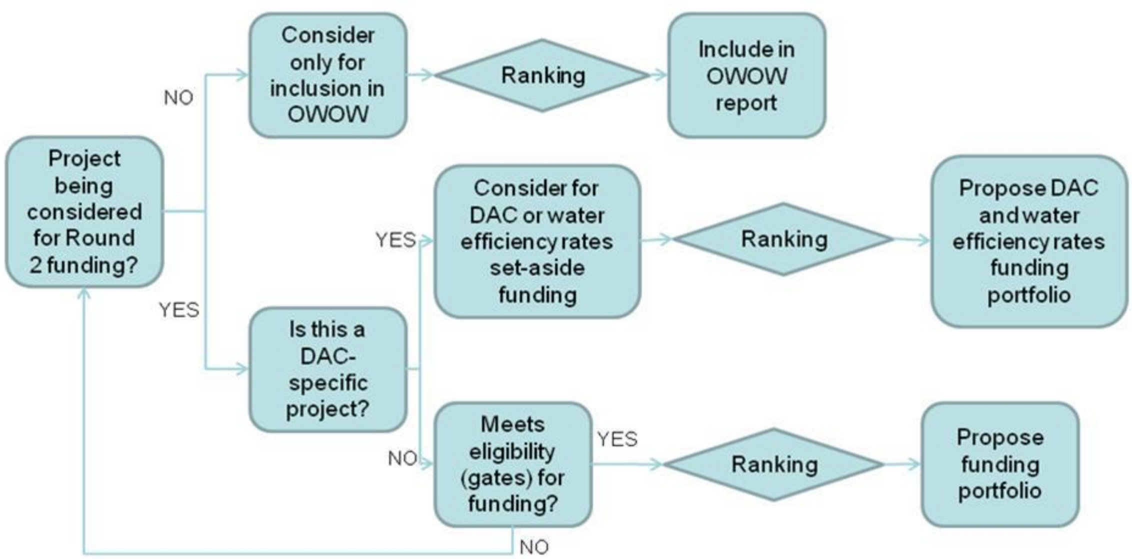
The Santa Ana Watershed Project Authority (SAWPA), as the regional watershed planning group for the Santa Ana River Watershed, has been facilitating efforts to implement a watershed planning framework to guide water resource managers for the immediate future through the year 2035. To date, this has resulted in the development of the *One Water One Watershed 2.0 Plan* (OWOW Plan). The goal of this process is to develop the tools and strategies necessary to define an integrated water resource plan where all types of water (local surface and groundwater, imported water, stormwater and treated wastewater effluent) are viewed in a comprehensive, integrated manner as a single water resource with water use efficiency as the number one goal.

To assure that the OWOW plan included a list of prioritized implementation projects sufficiently developed and demonstrating appropriate needs that can be funded through the Integrated Regional Water Management (IRWM) Grant programs or other funding opportunities. Under OWOW 1.0, SAWPA issued its first Call for Projects to be included in the OWOW Plan from any public agency or non-profit organization in the Santa Ana River Watershed. The period for the preparation of project application was from May 17 to June 30, 2010. During this initial Call for Projects, project applications were evaluated in a two-step process to: 1) determine their eligibility to be included in the OWOW Plan, and, 2) prioritize projects for potential Proposition 84 funding based on their merits to address the watershed goals and objectives. The selection process was developed with goal of transparency, objectivity and deliberation. With the first round of project funding made available from the Department of Water Resource's (DWR) Proposition 84 Integrated Regional Water Management (IRWM) grant program, agencies in the watershed were asked to collaborate ensuring that their constituencies received multiple benefits that were regional in nature

Under Round 1 of Proposition 84 IRWM program, SAWPA awarded $12 million to 13 integrated projects in the Santa Ana River Watershed in 2011 using a project evaluation and rating and ranking process that incentivized integration and collaboration for watershed management,

In the second round of Proposition 84 project funding conducted in 2012, SAWPA sought to further expand the power of multi-agency cooperation as a means for more holistic, integrated program/project implementation. The primary difference and focus for this second funding round was to encourage projects that reflect a watershed approach that that could create opportunities for local agencies to help shape the implementation of actions that restore hydraulic functionality, solve problems, and provide long-term sustainability. To achieve this end, a new project solicitation was conducted by SAWPA in the summer of 2012. In this project/program solicitation, there were 136 projects submitted for rating and ranking. The adopted rating and ranking process used in OWOW 2.0 is depicted in **Figure 6-1**. Of these projects, 52 requested funding in this round. Others provided project information for planning/ partnership development purposes and to be eligible for other funding sources, such as Proposition 1E.

Figure 6-1 Adopted Rating and Ranking Process



Project Prioritization Criteria

Candidate projects included in the OWOW Plan were evaluated and prioritized based on the degree to which they comply with Evaluation Criteria developed by SAWPA staff. These were based on the goals and objectives, strategies and targets established by the Steering Committee and the Pillars. The achievement of goals and objectives by a project is directly related to the projects ability to obtain Proposition 84, Chapter 2 funding. Chapter 6 Project/Program Review, Evaluation and Prioritization describes the process followed to develop and weight the criteria.

Evaluation criteria were the basis for ranking projects in a reproducible way, using numerical scores for quantitative and qualitative criteria, and applying a consistent scoring and ranking process, described below. A performance measure was created for each criterion to numerically establish the degree to which a project meets each criterion. In some cases, more than one performance measure was used for a given criterion.

The evaluation criteria and performance measures for project prioritization had the following attributes:

Non-redundant: each criterion needs to measure something not measured by others to avoid a bias decision.

Specific: each criterion is described in detail, clearly specifying what is being measured and the rationale for it.

Relevant: criteria and, particularly, performance measures need to help discriminate between "better" and "worse" projects in terms of matching with goals and objectives. If a performance measure value does not vary between projects (if the score for all projects is the same for a given performance measure) the performance measure is unnecessary or inadequate.

Evaluation criteria and their respective performance measures employed in OWOW 2.0 are presented below in **Table 6-1 Ranking Criteria and Performance Measures**.

Table 6-1 Ranking Criteria and Performance Measures

Project Evaluation Criteria	Criteria Weights	Performance Measures	Performance Measure Weights	Performance Measure Units
1. Improve Water Reliability	20%	Water Use Efficiency	20%	AFY
		Stormwater Capture/Storage	20%	AFY
		Recycling/Reuse	20%	AFY
		Groundwater Desalination	20%	AFY
		Other	20%	AFY
2. Improve Water Quality and Salt Balance in the Watershed	20%	Non-Point Source Reduction	33%	MGD
		Reduction of TMDLs and Other	33%	kg/year
		Salt Removal	33%	tons/year
3. Manage Flood Waters Through Preservation and	20%	Acres of habitat created	60%	acres
		Natural hydrology restoration and connectivity	20%	-na-

Project Evaluation Criteria	Criteria Weights	Performance Measures	Performance Measure Weights	Performance Measure Units
Restoration of Natural Hydrology		LID or resource efficient land use practices	20%	-na-
4. Reduce Greenhouse Gas Emissions from Water Management Activities	20%	GHG Reduction (CO2 equivalent)	100%	metric tons
5. Cost Effectiveness	20%	Cost per AFY	20%	-na-
		Cost per Acre of Habitat	20%	-na-
		Cost per Tons of Salt Removed	20%	-na-
		Cost per MGD of Water Treated	20%	-na-
		Cost per kg of TMDL or Other Pollutants Removed	20%	-na-

Call for Projects

After the criteria was established by the OWOW governance, SAWPA conducted a Call For Projects to all stakeholders in the watershed and solicited candidate projects from agencies and non-profit organizations in the watershed for inclusion in the OWOW 2.0 plan. The on-line form required specific information that assured that all the Project Review Process requirements could be met (**Appendix L**). These included the following:

- Description of how project contributes to OWOW Goals and Objectives
- Description of how project relates to Resource Management Strategies
- Description of how project is technical feasible
- Description of specific benefits to Disadvantaged Community issues
- Description of Environmental Justice considerations
- Description of project cost and financing
- Description of economic feasibility and economic analysis
- Description of project status
- Description of project merit, benefits and application to OWOW plan
- Description of climate change impacts in region
- Description of how project will reduce greenhouse gas emission compared to project alternatives

Multiple outreach flyers, email notices and workshops were implemented by SAWPA prior to and during the Call for Project Application period of two months. Procedures for submitting projects online and in hard copy for those who were unable to submit online were also made available to stakeholders.

Project Eligibility Requirements

The first step of the prioritization process was to determine those projects specifically eligible for funding from full OWOW Project List that included conceptual projects and projects seeking grant funding. For the OWOW Round 2 Call for Projects, the Steering Committee established a number of eligibility gates as minimum requirements to compete for available Proposition 84 Implementation grant funding. The eligibility gates were not limited just to the Proposition 84 statutory requirements but also include eligibility gates that would emphasize the need for integration, collaboration and meeting the OWOW Plan Goals and Objectives. These included Proposition 84 Statutory Requirements, Multi-jurisdictional Collaboration, Cost-Match Commitment and Completion Commitment.

Proposition 84 Statutory Requirements – Project Eligibility for Proposition 84 Funding:

Through this eligibility gate project proponents are required to address Proposition 84 eligibility requirements in relation to the DWR Prop 84 IRWM Proposal Solicitation Package (PSP) requirements including funding match, urban water suppliers, groundwater projects, agricultural water suppliers, and surface water diverters.

Multi-jurisdictional Collaboration – Number of Partners, Partners Role and Level of Participation:

This eligibility gate requires that project proponents have local partners and to identify each partner identify the role(s) of the partnership (e.g., planning coordination, funding partner, etc). A mere letter of support was considered insufficient to reflect multi-jurisdictional collaboration.

Cost-Match Commitment – Minimum Percent of Project Cost Funded Locally:

This eligibility gate requires that project proponents provide a minimum 25% match.

Completion Commitment - Secured Funding:

This eligibility gate requires that project proponents provide documentation of the availability of local funds to complete the project.

Initial Review

After the deadline for the Call for Projects was reached, all projects were evaluated by SAWPA staff to determine their eligibility to be part of the OWOW Plan. Since the projects received were in different stages of development, projects beyond the conceptual level, largely with feasibility studies in place, were parsed out to be considered for possible Proposition 84 IRWM Implementation funding. It is important to reiterate that initial ranking was based on self-reported project data.

The first review step occurred internally by SAWPA staff to assure quality control and catch any data input errors. With so many project information forms representing over a hundred projects from across the watershed, QA/QC was important to confirm any data outliers and verify with the project proponents whether the data was accurate. The process was conducted to ensure a sense of fairness and completeness before commencing the prioritization process. If errors based on SAWPA's review were encountered largely based on unrealistic data entry errors, the project proponent was contacted and encouraged to correct the error by re-submittal of the corrected project information form.

Thereafter, review by SAWPA included more in depth evaluation and confirmation of the costs, benefits and overall economic feasibility analysis. Quantification and accuracy of claimed benefits were also double checked.

Project Scoring

The next step of the prioritization process was to score each project. Scoring is the process by which the information provided by the project sponsors is converted to a numerical value for each sub-criterion using the performance measures presented in **Table 6-1** above. In many instances, the information provided in the nomination forms need to be processed or combined to establish the numerical value of each performance measure. Relevant methodological notes on the scoring of each performance measures are presented above. The Project Form is located in **Appendix L**.

Each project submitted to SAWPA for inclusion in the OWOW 2.0 ranking process was scored and evaluated using the five criteria established by the OWOW Steering Committee. Each criteria was equally weighted at 20%. Each project was scored based on the effective benefit that would be realized at the conclusion of the project as described within the scope in the application. For each criterion, a scale was developed such that it would be used as the basis for analysis utilizing a commercially available software package developed by Infoharvest, Inc., called Criterium DecisionPlus (CDP).

Criterion 1 – Improve Water Reliability and Reduce Reliance on Imported Water

Scores were developed for Criterion 1 by using the acre-foot per year (AFY) yields provided by applicants for the water use efficiency, stormwater capture and storage, recycled reuse, groundwater desalination, and other categories. The score for this criterion was developed using the following steps:

- The total AFY were summed up for each project for all the categories
- A scale was developed to account for the full range of benefits
- The projects were scored based on this scale
- The values were entered into CDP

Criterion 2 – Improve Water Quality and Salt Balance

Scores were developed for Criterion 2 for each of three categories: Non-Point Source Reduction (mgd), Reduction of Total Maximum Daily Loads (TMDL) Listed Pollutants and other Pollutants (KG/year), and Salt Removal (tons/year). To develop the scores, the following steps were taken:

- Data for each category was normalized on a scale of 1 to 5, 1 being the worst and 5 the best
    - To develop the normalization, the data for each category with a value greater than 0 was divided into quartiles to facilitate developing ranges. Scores were assigned using the scale.

- Normalized data was then summed together for the three categories for each project to value the multi-benefit of multiple categories.
- Summed data was adjusted to display a 1 to 5 scoring.
- The values were entered into CDP.

Criterion 3 – Manage Flood Waters through Preservation and Restoration of Natural Hydrology

Criterion 3 was evaluated using three performance measures: Acres of Habitat Created (3a), Natural Hydrology Restoration and Connectivity (3b), and Low Impact Development or Resources Efficient Land Use Practices (3c). The performance measures were weighted with the following percentages 60%, 20%, and 20%, respectively. Performance measure 3a was weighted higher as it provides the greatest benefit to the criteria.

Performance Measure 3a

Scores were developed for performance measure 3a using the following steps:
Develop a scale that would best convey the benefit for each project.

- Each project was scored
- Scores were entered into CDP

Performance Measures 3b and 3c

Performance measures 3b and 3c consist of 2 components: a yes/no answer to whether the project provides the applicable benefit and a description of the benefit. Values for each component were developed based on the following factors:

- Project had no applicable benefit
- Project had benefits but had little or no quantification of such benefits
- Project had quantified and clear benefits
- Values were then entered into CDP

Criterion 4 – Reduce Greenhouse Gas Emissions from Water Management Activities

Scores were developed for Criteria 4 using the following steps:

- Data was normalized on a scale of 1 to 5, 1 being the worst and 5 the best (any project that provided more than 10,000 metric tons of CO_2e reduction were scored a 5)
- The values were entered into CDP

Criterion 5 – Cost Effectiveness

Criteria 5 is composed of five components evaluating the cost-effectiveness on a per unit basis per year for each benefit identified by the applicant: Cost per AFY of Water (5a), Cost per Acre of Habitat (5b), Cost per Tons of Salt Removed (5c), Cost per MGD of Water Treated (5d), Cost per KG of TMDL listed or Other Pollutants Removed (5e). Values for each component were calculated using the following steps:

- Data was normalized on a scale of 1 to 5, 1 being the worst and 5 the best
- The normalized values for each project and for all components were summed together and averaged to arrive at the cost effectiveness value
- The values were entered into CDP

OWOW Project Ranking

The project scores for each performance measure were used for the ranking of the projects using a multi-criteria ranking method. The method is known as Multi-Attribute Rating Technique (MART). The method consists of applying the weights for each criterion to the criteria scores, and adding the weighted criteria scores to obtain an overall weighted and final score to use in ranking. For the ranking process, the commercial software used was CDP. CDP uses MART for ranking projects or planning alternatives.

One of the steps in the MART consists of normalizing the scores. The *normalization* of a score is necessary to eliminate the units of the scores and to be able to add, average, or compare scores from different performance measures. *Normalization* basically means converting any dimensional or dimensionless quantity to a common scale.

Normalization of scores was done at two levels in this prioritization process. The first level of normalization was done within the scoring (i.e., before the application of CDP) where a criterion required addition or averaging of performance measures. In OWOW 2.0 the following performance measures were normalized to a scale of 1-5:

For the criterion “Improve Water Quality and Salt Balance in the Watershed” the performance measures:

- Non-Point Source Reduction [MGD]
- Reduction of TMDLs and Other [KG/year]
- Salt Removal [tons/year]

Once these three performance measures were normalized, they were combined in a composite score of 1-5 to be used for prioritization. For the criterion “Reduce Greenhouse Gas Emissions from Water Management Activities” the Data normalized to 1-5 scale for CO2equivalent.

- Data > 10,000 co2e metric tons capped at 5
- Data with value less 10,000 co2e divided into quartiles to develop ranges for scale

For the criterion “Cost effectiveness” the performance measures:

- Cost per AFY of Water [$/AFY]

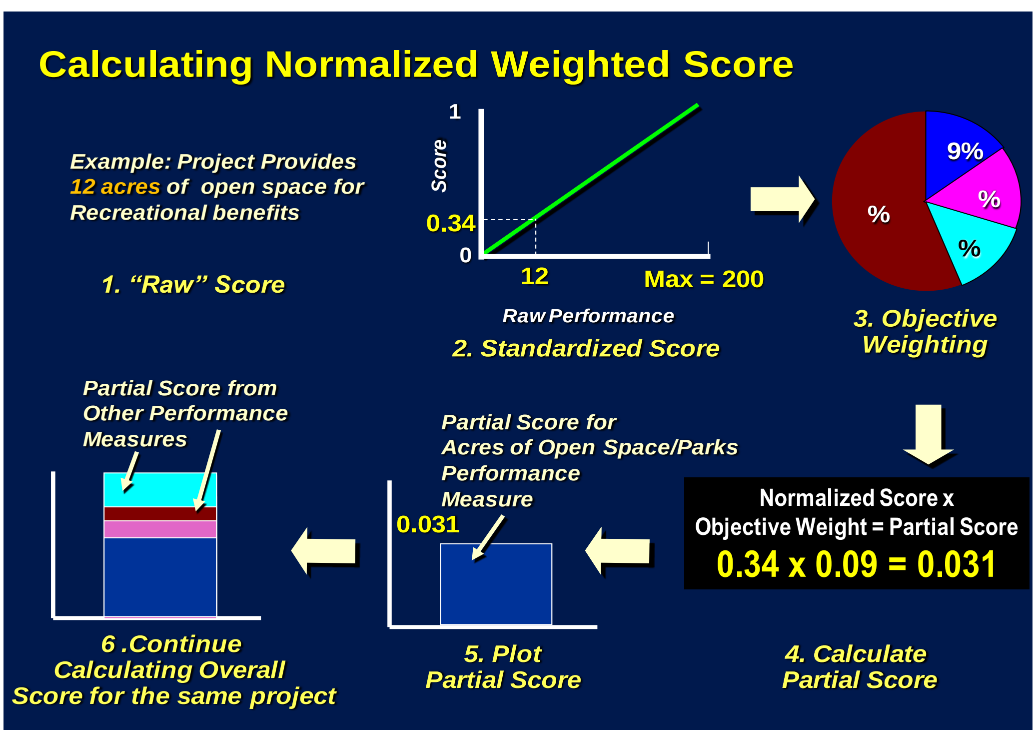
- Cost per Acre of Habitat [$/acre]
- Cost per Tons of Salt Removed [$/(tons/year)]
- Cost per MGD of Water Treated [$/MGD]
- Cost per Kg of TMDL listed or Other Pollutants Removed [$/(KG/year)]

The normalized scores in the scale of 1 to 5 then were combined in an average as a composite score of cost effectiveness to be used in prioritization.

The second case in which *normalization* was conducted was within the ranking process, for all of the scores. This step always is performed in MART and it's a step performed within CDP. CDP normalizes all scores using a scale of 0 to 1.

In addition to the normalization score in CDP, there are five other basic steps in MART (**Figure 6-2**). The first step is the scoring of the project against each sub-criteria as described in the earlier sections. In the example described in **Figure 6-2**, the project has a score of 12 acres (raw performance measure) for recreational benefits. As different criteria have different units of measurement (for example salt removal is measured in tons/year, water treatment benefits are measured in MGD, etc.) normalization is used, as mentioned above. In the example depicted in **Figure 6-2**, the recreational benefits score is converted with a scale between 0 and 1, using a linear scale. The raw performance of 12 acres translates into a normalized score of 0.34 (where the score of 0 indicates the worst performance, i.e. no acres for open space, and the score of 1.0 indicates the best performance, i.e. largest recreational and open space area provided by any project).

Figure 6-2 Multi-Attribute Rating Technique to Rank Any Type of Alternatives or Projects

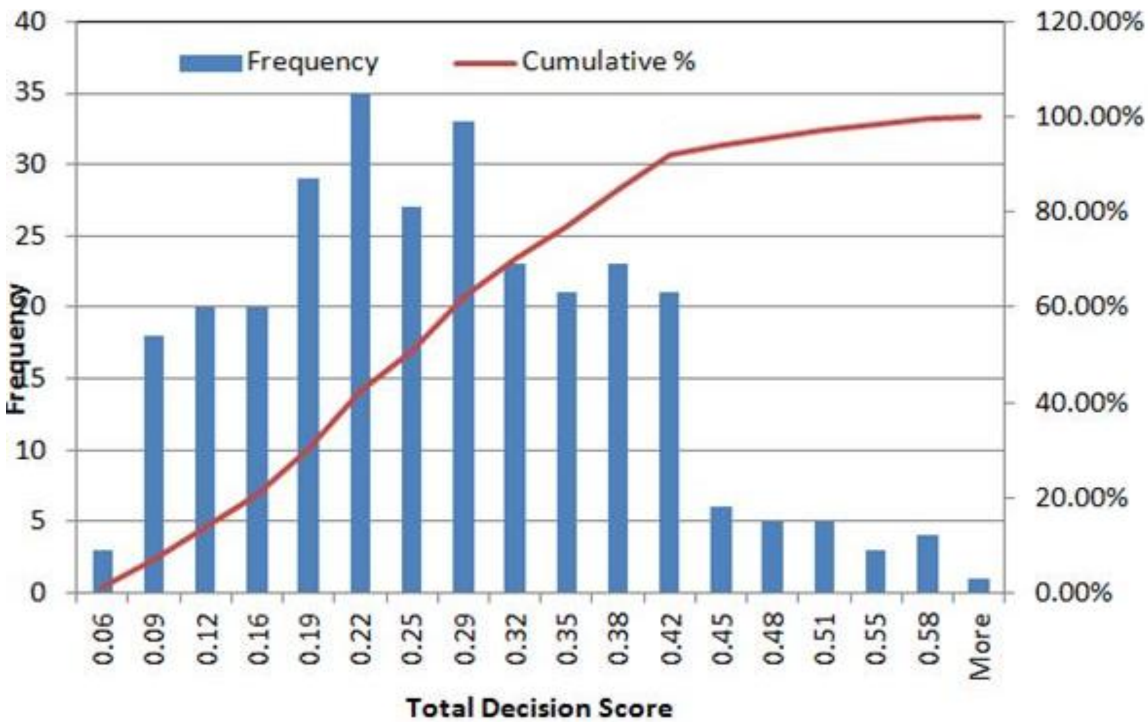


Step 3 on **Figure 6-2** shows the weighting of the criteria. In OWOW 2.0 all criteria were weighted equally. In Step 4 in **Figure 6-2**, the normalized score is multiplied by the weight of the criterion. In the example in **Figure 6-2**, the open space criterion received a weight of 9 percent (out of a possible 100 percent). The normalized score (0.34) is multiplied by its weight of 9 percent in order to get a partial score of 0.031 for the project.

The partial score of 0.031 then is plotted on a graph for that project [Step 5 in **Figure 6-2**]. This procedure is repeated for all of the other criteria (or performance measures) for the same project until a total decision score for the alternative is calculated [Step 6 in **Figure 6-2**]. Finally, after all projects receive a total score, they can be compared to the rest of the projects and ranked according to the overall CDP score, also called *decision score*.

Figure 6-3 shows the example of a linear scale for normalization of scores in Step 2. In the process of normalizing scores for the OWOW projects, however, some of the normalization scales were defined as non-linear scales. This was necessary to avoid an effect called "shadowing" by which a few projects with significantly higher raw scores can generate low scores for the rest of the projects when a linear scale is used. For example, in a situation in which 95 percent of projects have benefits under 100 acres, but one or two percent of projects have benefits over 5,000 acres, a linear scale could result in the lowest score for the 95 percent of projects under 100 acres. The shadowing of those high performing projects could render the performance measure irrelevant since the normalized score would not serve as a discriminator for 95 percent of projects.

Figure 6-3 Distribution of Total Decision Scores for all OWOW



In the OWOW ranking process, the scales for “Improve Water Reliability and Reduce Reliance on Imported Water”, “Improve Water Quality and Salt Balance”, “Manage Flood Waters through Preservation and Restoration of Natural Hydrology” and “Cost Effectiveness” scales for these benefits each required non-linear normalization scales.

Project Prioritizations Results

All 136 projects included in the OWOW 2.0 plan were ranked using MART. The complete ranked list of projects is presented in **Appendix K**.

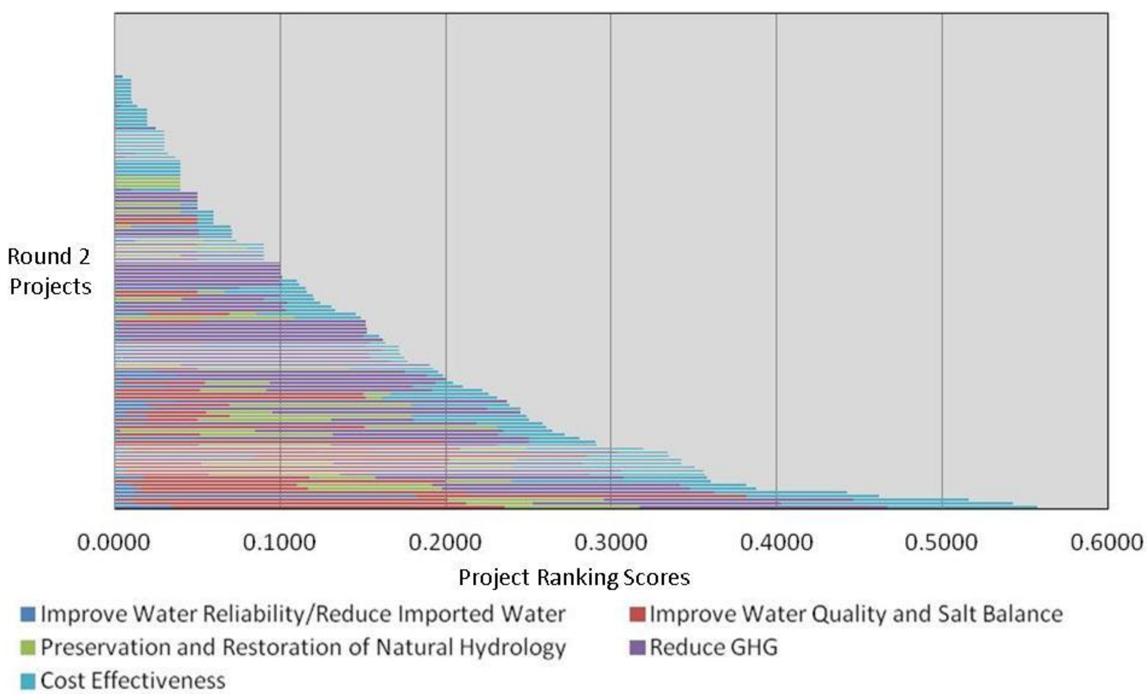
Figure 6-4 presents the spread of decision scores (ranking scores) in a horizontal bar chart. The figure shows an inflection point around 90 percent of projects. This means that about ten percent of the projects (between 25 and 20 projects) distinguish from the rest obtaining scores that would indicate that they provide more benefits and/or perform significantly better than the rest of the projects for most of the criteria.

In order to test the robustness of the ranking method used (including the qualitative scales and the non-linear normalization scales), a series of sensitivity analyses were run on the model.

Additionally the sensitivity of the ranking to the weights of the sub criteria also was tested. Results of the sensitivity analysis showed that the ranking is not sensitive to the qualitative scales (such as the greenhouse gas scale of 1 to 5). The model is not sensitive to the actual shape of the non-linear scales used for normalization of some criteria, as long as the scale remains non linear (to avoid the "shadowing" effect). Similarly, the ranking generally is not sensitive to reasonable changes in the weights of the criteria (changes of ten percentage points). The ranking, however, does show a sensitivity to the actual raw scores (numbers reported in the project nomination forms) mainly for water supply and water quality benefits. For a ranking of projects to determine the actual Proposition 84 funding, the information provided in the nomination form would have to be vetted to avoid biases in decision scores due to inaccurate information.

The final prioritized OWOW project implementation list is presented in **Appendix K**. Projects are ranked from highest CDP decision score to lowest CDP decision score. Scores range from about 0.06 for the lowest ranked projects to above 0.60 for the highest ranked projects (shown in **Figure 6-4**). The "perfect" theoretical score is 1.0. The results of the ranking with the highest ranked project around 0.61 are not unexpected given the great number and diversity of sub-criteria. Generally, in any multi-criteria ranking process, the greater the number of criteria the lower the decision scores tend to be, as it becomes increasingly less likely that the best project will score well for all criteria.

Figure 6-4 Distribution and Magnitude of Total Decisions Scores for all OWOW 2.0 Projects



Based on project numeric score from established criteria approved by the OWOW Steering Committee, projects were assigned to one of three tiers to reflect natural breaks in the results on the project rankings. Identification of these breaks and placement in a specific tier was based on an analysis of score distributions by an independent consultant for all ranked projects. The tiers represent how well a specific project meets the OWOW benefit criteria.

Project Review Committee

The next step in this process was to assure the veracity of information submitted by project proponents. To evaluate projects, SAWPA formed a three person Project Review Committee (PRC) to provide an independent and expert review of the top ranked submissions including disadvantaged community assistance and water use efficiency rate funding. The three committee members were selected for their knowledge of water, both technically and at a policy level, their understanding and leadership in developing integrated approaches to problem solving and their knowledge of the Santa Ana River Watershed. The PRC included Joe Grindstaff, former Executive Officer of the Delta Stewardship Council and former SAWPA General Manager; Pete Silva, former State Water Resources Control Board member and former US EPA's Assistant Administrator for the Office of Water; and Gerry Thibeault, former Executive Officer of the California Regional Water Quality Control Board, Santa Ana Region. Over the last week of November of 2012, the PRC interviewed project proponents from the top 32 projects.

Prior to the interview process, the PRC were asked to focus on finding projects that were not only technologically feasible, but projects that were integrated and provided regional benefit. In the review process, the PRC first vetted the claims made by the project proponents on their on-line application. Secondly, they focused on the projects in the context of the goals and objectives of OWOW. Projects that provided single benefits, were not regional in scope and impact or were not representative of significant collaboration were not considered for funding. The PRC sought to identify and move projects forward that exemplified the integrated planning concept and provided the most benefit to the OWOW planning region.

A portfolio of 22 projects and programs was recommended by the PRC, two of which were subsequently accelerated into Round 1, due to the availability of additional Round 1 funding. These projects combined provide water use efficiency, enhanced groundwater recharge, integrated flood control/ habitat benefits, non-point source pollution reduction, salt removal from local aquifers, and assistance to disadvantaged communities. Funding from Round 2 is expected to provide about $17 million to support the 22 projects. In addition to the grant funding, local funding in the amount of $193 million has also been committed by project proponents to implement the projects.

The recommended projects were approved by OWOW Steering Committee and SAWPA Commission in December 2012. Thereafter, the approved Round 2 project proponents from the Santa Ana Region were asked to prepare the DWR application with compilation of the project solicitation package by SAWPA staff and submittal to the State by March 29, 2013. DWR announced their recommended projects under Round 2 released on Sept. 25, 2013. The implementation of Round 2 IRWM Implementation projects will serve to augment the important initial implementation of OWOW projects from Round 1 in moving the watershed closer to meeting the OWOW vision of a Watershed that is sustainable, drought proofed and salt balanced by 2030, and in which water resources are protected and water is used efficiently.

OWOW Prop 84 Round 2 Recommended Project list is as follows:

Project Name	Lead Agency	Recommended Grant
Wineville Recycled Water	Inland Empire Utilities Agency (IEUA)	$1,000,000
San Sevaine Recharge	IEUA	$750,000
Vulcan Pit Flood Control	City of Fontana	$1,000,000
Wilson Basins Project	City of Yucaipa	$750,000
Francis St/Ely Basin Project	City of Ontario	$750,000
Plunge Creek Recharge	San Bernardino Valley Municipal Water District (SBVMWD)	$500,000
Enhanced SAR Recharge	SBVWCD	$1,000,000
14th St. Recharge	City of Upland	$500,000
Arlington-Central Ave. Phase I	City of Riverside	$1,000,000
Perris Desalter Wells	Eastern Municipal Water District (EMWD)	$1,000,000
Alamitos Barrier Project	Orange County Water District (OCWD)	$500,000^
Peters Canyon Capture	City of Irvine	$1,000,000
Corona/Home Gardens Well	City of Corona Department of Water and Power	$1,300,000
Prado Basin Sediment Demo	OCWD	$750,000
Wastewater Project	Soboba Tribe	$150,000
Canyon Lake Hybrid Project	Lake Elsinore and San Jacinto Watersheds Authority	$500,000
Arlington Basin WQ Project	Western Municipal Water District (WMWD)	$500,000^
Forest First Project	US Forest Service	$1,000,000
Com/Ind/Inst. Water Efficiency	Municipal Water District of Orange County	$500,000
Regional Landscape Retrofit	IEUA	$500,000
Customer WUE Handbook	WMWD	$120,000
Quail Valley Sewer System	EMWD	$1,930,000

SAWPA staff worked closely with each project proponent to ensure that their Proposition 84 IRWM Implementation Grant applications were completed appropriately. Upon announcement and approval of the recommended Round 2 project list by SAWPA Governance, weekly workshops were held with the 20 project proponents to support application preparation and submittal to SAWPA to compilation.

As part of this process, each project proponent had to adopt the OWOW 1.0 plan. Additionally, due to new State legislation, a description of how the projects would reduce dependence on the Delta Supply was included as part of the overall application submitted by SAWPA to DWR.

Future Review Processes

It is anticipated that the project review and prioritization process will be reviewed and refined to support greater integration and collaboration, to comply with any new DWR IRWM Guidelines and PSP requirements, and improve the streamlining and efficiency of project submittal. Further, based on public workshop feedback the process will be refined to better serve the stakeholders and support the overall goals and objectives of the OWOW plan.

7.0 Impacts and Benefits Of Sustainable Integrated Solutions

With the development of integrated watershed planning, multi-benefit and multi-purpose projects have moved to the forefront and have become one of the primary goals of the One Water One Watershed (OWOW) process. The idea of meeting a number of community needs with a multi-benefit project is not new; however, specialization within agencies that deal with water has often moved these project types to the backburner. Past efforts primarily have focused on single purpose projects, and the additional effort required to develop multi-objective solutions has made true multi-benefit projects relatively uncommon. In California, there has been an effort to incentivize collaborative planning through Integrated Regional Watershed Management (IRWM) Planning and associated funding sources.

This reliance on single-purpose projects is not unique to water. An interesting analogy can be drawn with the field of 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 others professionals to address problems, often with great results. The development of more specialization in public health practice, in many cases, has been correlated with the resurgence of some diseases, such as malaria. Recently, scientists have become concerned that the “Balkanization of Science” has resulted in specialists with narrow training focusing only on a single aspect of a broader problem. Effective solutions often are missed by this approach (Moore, 2008). Similar statements could be made about water management. If water is considered in the broadest sense as a resource that benefits a wide group of interests, including those represented by the ten Pillar groups of the OWOW process, the projects that address as many of those interests as possible should be encouraged.

Some of the earliest multi-benefit water projects were done through a partnership between those interested in flood and groundwater management. Spreading grounds along the front slopes of local mountains have attenuated flood flows and recharged groundwater basins for nearly 100 years. OCWD partnered early with Orange County Flood Control District to provide recharge basins within flood control basins. More recently, Inland Empire Utilities Agency (IEUA) has worked with San Bernardino County Flood Control to modify the operation of the flood control system to maximize recharge opportunities. IRWD has partnered with the Orange County Flood Control District to store recycled water in some flood control basins. All of these projects primarily were facilitated by operational changes rather than the construction of new infrastructure, although in some cases the flood system was upgraded. Operational changes could occur only when both parties understood the needs and assets of the other.

The development of multi-benefit projects will remain challenging and require sustained effort by agencies that manage water. In the watershed alone, there are approximately 100 agencies that manage water in some way. This situation is not unique to this watershed. The Federal government has 12 agencies and eight separate committees all doing water-related work (Udall and Averyt, 2009). Agencies need to prioritize collaborative projects and provide the staff resources to ensure that such projects are developed.

The purpose of integrated watershed planning is to consider other disciplines or functional areas when planning and implementing projects. Benefits of this approach far exceed the immediate benefit of reducing controversy surrounding a particular project. The Pillars developed a list of potential benefits in a workshop to identify incentives associated with the development of multi-benefit programs and projects. They are listed below:

Solving Problems using a multi-benefit approach prevents the creation of other problems. Often when a single-function project is developed, it has an impact on other water-related areas, often unanticipated. The truth of this statement is often born out in a CEQA or NEPA analysis, where numerous problem areas can be identified.

Mult-benefit problem solving results in no missed opportunities. In a multi-benefit type of approach, a careful exploration of all aspects of a particular project often results in the identification of incremental project changes that can result in large benefits in other areas.

Cost and resource savings for the public can be achieved. 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 and provide more public benefit.

Developing projects that provide multiple benefits develops trust. As groups develop multi-benefit projects, trust is developed among different constituencies, each interested in a different aspect of water. These groups are more likely to work toward similar solutions in the future if they have successfully developed multi-benefit projects.

Multi-benefit projects are focused on building successful projects, not dispute resolutions. Groups focused on problem solving rather than dispute resolution or litigation save public resources and implement solutions to regional problems faster than they would had they disputed each other's single-function project.

Development of multi-purpose projects can develop better communication. Through the development of a project, groups that span geography or area of interest develop better communication and trust.

Multi-purpose 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 would 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.

Pillar Co-chairs met several times to develop matrices that demonstrated the potential benefits of multi-benefit projects undertaken between Pillar groups. In other words, how would a multi-benefit project conducted by one Pillar group benefit another group? The purpose of this exercise was to encourage the Pillars to begin to focus on how implementing projects to benefit their constituency can be designed to benefit others.

Drafts of these matrices were taken to three public workshops held in Orange, Riverside, and San Bernardino Counties. At these sessions, stakeholders were invited to comment on the work of the Pillars, as well as suggest their own benefits. Again, the primary purpose of these workshops was to encourage discussion around the concept of designing projects for more than one purpose. As the Pillar leaders completed their final drafts, they developed a list of project types that would benefit more than one Pillar and were worthy of further consideration and implementation.

Under OWOW 2.0 Plan, as some Pillars were folded into others and new ones arose as compared to the OWOW 1.0 Plan, new tables were developed that catalog the potential impacts and benefits at the region level and inter-region levels. A project that fulfills a particular watershed need can be designed to provide other benefits to several other Pillars and to surrounding regions. Maximizing these benefits provides for better projects and better use of public money.

Implementation Benefits of Prop 84 Round 1 and Round 2

Since the development of the OWOW Plan, there have been many multi-beneficial projects proposed and funded for the improvement of communities and water agencies alike. These projects have been financed by Proposition 84 Chapter 2 Round 1, and Proposition 84 Round 2, implementation of these developments has provided both regional and inter-regional benefits. Shown below in **Table 7-1** is a list of all the projects and their associated benefits. These projects were able to target key improvement areas within the watershed such as:

- Water Use Efficiency
- Stormwater Capture Storage
- Groundwater Desalination
- Recycling Reuse
- New Storage
- Non-point Source Reduction
- Salt Removal
- Preservation Restoration
- Reduction of TMDL's and other Pollutants

Also part of Round 2, another sequence of proposed and funded projects proved to be multi-beneficial to the watershed. Listed below on **Table 7-2** is a record of all the funded projects and their respective benefits. These follow the same key target improvement areas as shown above. Development and implementation of projects such as these contribute to the overall goal in creating a sustainable watershed.

Table 7-1 Implementation Projects Funded by Proposition 84 Chapter 2 Round 1

Project	Benefits
Santa Ana Watershed Vireo Monitoring and Breeding Bird Surveys	• Restored 300 acres of endangered bird species habitat
Arlington Desalter Connection Project No. 27 – 1208 & Western Municipal Water District Promenade Connection	• Water use efficiency increase of 11,200 AFY
Groundwater Replenishment System – Flow Equalizer	• Recycling reuse increase of 12,000 AFY •
Perris II Desalination Facility	• Groundwater desalination of 6,050 AFY • Non-point source reduction of 7 MGD • 21,000 tons of salt removed • Two acres of preservation restored
Cactus Basins No. 3 and No. 3A	• Stormwater capture storage increase of 15,000 AFY • 700 acres of preservation restored
Sludge Dewatering, Odor Control, and Preliminary Sludge Thickness at Plant No. 1, Project No. P1 – 101	• Recycling reuse increase of 78,400 AFY
Perchlorate Wellhead Treatment System Pipelines	• 101 tons of salt removed
Chino Creek Well-field, Wells 1,2, and 3	• Groundwater desalination of 2,900 AFY • One ton of salt removed
Cucamonga Creek Watershed Regional Water Quality Project (Mill Creek Wetlands)	• New storage of 160 AF • 14 acres of preservation restored
Repairs to the Unlined RCP Reach IVA and Reach IV-B Santa Ana Regional Interceptor (SARI)	• Supports continued brine disposal
Well 21 and 22 Project	• Groundwater desalination of 6,300 AFY
Alamitos Barrier Improvement Project	• 520 tons of salt removed
Arlington Basin Water Quality Improvement Project	• Stormwater capture storage increase of 1,300 AFY • 16 acres of preservation restored

Table 7-2 Implementation Projects funded by Proposition 84 Chapter 2 Round 2

Project	Benefits
Wineville Regional Recycled Water Pipeline and Groundwater Recharge Systems Upgrades	• Stormwater capture storage increase of 4,600 AFY • 46 acres of preservation restored

Forest First – Increase Stormwater Capture and Decrease Sediment Loading through Forest Ecological Restoration	• 1,750 acres of preservation restored
Perris Desalination Program – Brackish Water Wells 94, 95 and 96	• Groundwater desalination of 2,900 AFY • 4,060 tons of salt removed
San Sevaine Ground Water Recharge Basin	• Stormwater capture storage increase of 2,000 AFY • 26 acres of preservation restored
Vulcan Pit Flood Control and Aquifer Recharge Project	• Stormwater capture storage increase of 2,000 AFY • 60 acres of preservation restored
Wilson III Basins Project and Wilson Basins/Spreading Grounds	• Stormwater capture storage increase of 1,300 AFY •
Peters Canyon Channel Water Capture and Reuse Pipeline	• Reduction of TMDL and other pollutants
Corona/Home Gardens Well Rehabilitation and Multi-Jurisdictional Water Transmission Line Project	• Restoration of water service
Commercial/Industrial/Institutional Performance-Based Water Use Efficiency Program	• Water use efficiency increase of 400 AFY
Quail Valley Subarea 9 Phase 1 Sewer System Project	• Septic tank to sewer conversion
Francis Street Storm Drain and Ely Basin Flood Control and Aquifer Recharge Project	• Stormwater capture storage increase of 622 AFY
Customer Handbook to Using Water Efficiently in the Landscape	• Water use efficiency increase of 7,240 AFY
Plunge Creek Water Recharge and Habitat Improvement	• Stormwater capture storage increase of 1,250 AFY • 50 acres of preservation restored
Prado Basin Sediment Management Demonstration Project	• Stormwater capture storage increase of 450 AFY
Enhanced Stormwater Capture and Recharge along the Santa Ana River	• Stormwater capture storage increase of 14,600 AFY
14th Street Groundwater Recharge and Storm Water Quality Treatment Integration Facility	• Stormwater capture storage increase of 400 AFY
Soboba Band of Luiseño Indians Wastewater Project	• Feasibility Study
Canyon Lake Hybrid Treatment Process	• 525 acres of preservation restored • 50% reduction in total Phosphorus concentration
Recycled Water Project Phase I (Arlington-Central Avenue Pipeline)	• Recycling reuse increase of 6,000 AFY
Regional Residential Landscape Retrofit Program	• Water use efficiency increase of 1,000 AFY

Table 7-3 Impacts and Benefits of Water Resource Optimization

<table>
<tr><th rowspan="2">Pillar</th><th colspan="2">Within IRWM Region</th><th colspan="2">Inter-Regional</th></tr>
<tr><th>Potential Impacts</th><th>Potential Benefits</th><th>Potential Impacts</th><th>Potential Benefits</th></tr>
<tr><td>Water Resource Optimization</td>
<td>• Increased expenses
• Surface water loss
• Ocean habitat loss
• New discharge issues associated with brine line disposal</td>
<td>• 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 ground water 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 sport fishing
• Water utility easements provide trail opportunities
• Enhances property value</td>
<td>• New outflow locations
• New discharge locations
• Additional storage/ infrastructure construction will increase Green House Gas (GHG) emissions</td>
<td>• 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 inter-regional drought, natural disaster, or terriost attack</td></tr>
</table>

Table 7-4 Impacts and Benefits of Beneficial Use Assurance

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Beneficial Use Assurance	• Increase of Green House Gas (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 LID (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 • Extends the life of fixtures and appliances • Reduces the perceived need for water softeners.	• 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 terriost attacks via the conservation of water supplies • Promotes new and innovative water treatment methods

Table 7-5 Impacts and Benefits of Water Use Efficiency

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Water Use Efficiency	• 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 (i.e., gray water systems, cisterns for roof runoff) • Reduced stress on existing infrastructure • Provides opportunity for conservation of local surface and ground water 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 CA constitutional obligations and 20% by Year 2020 compliance • Provide inter-regional 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)

Table 7-6 Impacts and Benefits of Land Use and Water Planning

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Land Use and Water Planning	• Increased short term construction and site-specific impacts • Possible long term construction projects to meet Low Impact Development standards • Possible long term construction through urban areas, which may be detrimental to surrounding businesses	• Increased water supply • Improved water quality • Practice resource stewardship • Smart growth through higher density 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 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 gw recharge • Promotes the efficient use of water • Provide market for green products and water saving devices	• Increased short term construction and site-specific impacts • Projects prove to be very expensive and continued maintenance could create government budget cuts elsewhere	• Supports less reliance on imported water supplies. • Creates opportunity for multi-agency projects that are 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 inter-regional innovative, low-impact designs and practices • Creates future ideas that prove to be more innovative energy-efficient designs

Table 7-7 Impacts and Benefits of Stormwater: Resource and Risk Management

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Stormwater: Resource and Risk Management	• 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 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	• 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 • Increased emergency flows that create inter-regional disaster planning

Table 7-8 Impacts and Benefits of Natural Resource Stewardship

<table>
<tr><th rowspan="2">Pillar</th><th colspan="2">Within IRWM Region</th><th colspan="2">Inter-Regional</th></tr>
<tr><th>Potential Impacts</th><th>Potential Benefits</th><th>Potential Impacts</th><th>Potential Benefits</th></tr>
<tr><td>Natural Resources Stewardship</td><td>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</td><td>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
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</td><td>Loss of land use and associated inter-regional revenue</td><td>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 growth through tourism</td></tr>
</table>

Table 7-9 Impacts and Benefits of Operational Efficiency and Water Transfers

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Operational Efficiency and Water Transfer	• Increased short term constructio n and site-specific impacts	• Improved efficiency of water transfers • Improved infrastructure • Reduced green house gas • 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 Green House Gases (GHG) • Reduces overall energy costs associated with pumping/wheeling • Aids emergency flow strategies that support inter-regional disaster planning

Table 7-10 Impacts and Benefits of Disadvantaged and Tribal Communities

<table>
<tr><th rowspan="2">Pillar</th><th colspan="2">Within IRWM Region</th><th colspan="2">Inter-Regional</th></tr>
<tr><th>Potential Impacts</th><th>Potential Benefits</th><th>Potential Impacts</th><th>Potential Benefits</th></tr>
<tr><td>Disadvantaged and Tribal Communities</td><td>• Increases energy consumption associated with pumping/wheeling
• Increased short term construction and site-specific impacts</td><td>• Assurance of reliable drinking water
• Contains projects that address safe drinking water and wastewater treatment needs of DACs (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</td><td>• Increase of inter-regional water usage
• Increase of green house gases (GHG) emissions</td><td>• 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</td></tr>
</table>

Table 7-11 Impacts and Benefits of Government Partnership

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Government Partnership	• Possible long term operating cost • Delayed implement ation of projects between regional agencies	• Creates partnership with DWR (Department of Water Resources) • 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 IRWMP's 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 multi-purpose rebate programs • Increase of multi-purpose projects • Coordination of IRWM with State and Federal agencies

Table 7-12 Impacts and Benefits of Energy and Environmental Impact Response

Pillar	Within IRWM Region		Inter-Regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Energy and Environmental Impact Response	• 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 greenhouse gas 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 Green House Gases (GHG) emissions • Protects interconnecting natural forests • Maximized energy efficiency • May spur more projects/ideas of reducing carbon footprint

Conclusion

Implementation of these projects found in the OWOW 2.0 Plan proves to be critical in creating a sustainable watershed. We must understand that the development of ideas and methods not only have a direct impact within the region, but also inter-regionally. The information above is a list of potential impacts and benefits relatable to the Pillars found in the OWOW 2.0 Plan. These benefits and impacts are separated into two different categories that give a brief analysis of the strategic implementation. It is important that these potential impacts are realized so that if they do occur, the watershed is prepared. Also it is important to see the potential benefits these outcomes could have on the region and inter-regions. The development and implementation of multi-benefit projects will remain challenging and require sustained effort by agencies that manage water.

8.0 Finance

The Santa Ana Watershed Project Authority ("SAWPA") has engaged David Taussig and Associates, Inc. ("DTA") to investigate financing alternatives for public facilities and regional planning to be included as part of SAWPA's Integrated Regional Water Management Plan ("IRWMP"), also known as One Water One Watershed ("OWOW") 2.0.

Even with uncertainty in the economy, agencies are unable to wait around for funding. Financing and design efficiencies can and will be improved with regional/inter-agency coordination and transparency.

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 are:

- Public facilities and programs developed through the OWOW 2.0 process will be adequately financed and constructed in a timely manner, and the planning and coordination for these types of integrated projects also will be adequately funded.
- The OWOW 2.0 program, through SAWPA or through the actions of its Steering Committee, is able to maximize the availability of public debt financing (and the use of Federal and State grants and loans) for regional infrastructure or programmatic needs, while minimizing the financial burden on the individual agencies and/or property owners.

- Public financing for regional programs or infrastructure is equitable, financially feasible, efficiently utilized and consistent with each agency's goals and, when necessary, meets all relevant nexus and benefit criteria.
- Public financing mechanisms avoid creating a financial and administrative burden to the public agency, and develop cost savings through increased efficiency in the public arena.
- The certainty and sustainability of identified options for funding regional water projects and integrated planning will be discussed.

SAWPA, as the leading watershed wide water resource agency for the Santa Ana River Watershed (the "Watershed") and region, plays a major role in administering, participating, coordinating, and facilitating efforts to address regional water management issues. To date, these efforts have been funded primarily by the SAWPA member agencies. SAWPA's governance structure is a Joint Powers Authority ("JPA") involving five member agencies: Eastern Municipal Water District ("EMWD"), Inland Empire Utilities Agency ("IEUA"), Orange County Water District ("OCWD"), San Bernardino Valley Municipal Water District ("SBVMWD") and Western Municipal Water District ("WMWD"). It is particularly noteworthy that SAWPA's activities benefit multiple stakeholders throughout the Santa Ana River Watershed, many of whom are not SAWPA member agencies and do not share in supporting SAWPA's annual IRWM expenses budget, which are estimated at between $250,000 and $800,000 – depending on whether an IRWMP update is necessary during the year. These stakeholders include over 97 water related agencies, 3 counties, 59 cities and various State water, environmental and regulatory agencies, federal agencies, other special districts and groups.

California voters approved Propositions 84, 1E, and 1C in 2006. Under Proposition 84, $114 million has been allocated to the watershed subject to an adoption of an Integrated Regional Water Management Plan. Using a decentralized, comprehensive stakeholder involvement process, as well as involving experts from all fields and areas within the watershed, an extraordinarily collaborative and visionary plan was developed. The Santa Ana Watershed Integrated Regional Water Management Plan, called the OWOW Plan, was adopted in November 2010 with a goal of addressing the major water challenges over the next two decades. Highly respected industry-wide as the leading IRWM region in California, SAWPA is expected to receive funding in each round of the Proposition 84 IRWM program. Through the OWOW effort, SAWPA secured $12.0 million in funding for Round I implementation with a DWR-SAWPA contract executed in June 2012. Round II funding for 20 projects in the Santa Ana IRWM Region is projected to be $16 million with contracts among DWR/SAWPA and project proponents expected in the fall of 2013. According to a recent statement by the DWR, Round III IRWM implementation grant applications will not be available until early 2015.

Funding Options for Integrated Regional Planning Efforts

SAWPA and its regional planning efforts are critical for the future of the watershed. Yet SAWPA's bottom-up, broad-based approach requires that SAWPA expend valuable resources for coordination, support, and facilitation. To date, SAWPA's efforts have been largely funded by the SAWPA member agencies and grant funded administration funds. With California's uncertain future economic climate, grant funding through water bonds is no longer a secure funding source. In addition, SAWPA's member agencies tightened their financial belts during the Great Recession which threatens SAWPA's largest funding source. Finally, many parties benefit from SAWPA's leadership and value creation, but do not contribute to SAWPA's OWOW Plan development and Plan update expenses.

It is imperative that SAWPA 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 a document titled, "2012 OWOW Funding Options" ("Study"). DTA found the Study to be comprehensive, creative, and reasonable in its recommendations and conclusions.

SAWPA is not the only agency struggling to find a way to fund the coordination and facilitation of regional planning efforts. As part of this Report, we have investigated funding sources used by other IRWM regions. While the California Department of Water Resources ("DWR") and others encourage an integrated approach to infrastructure planning, until a long term stable funding source is identified, it will be difficult to fully achieve the desired benefits.

SAWPA Study of Funding Alternatives

The Study identifies seven funding mechanisms that may be used to fund all or a portion of SAWPA's ongoing operating expenses. Each of these mechanisms is discussed briefly below. While individually, these mechanisms may not be an ideal source of stable, long term funding, taken in combination, one or more of these mechanisms could provide a revenue stream to offset or reduce the current contributions from SAWPA members.

- Grant Funding
- Voluntary Contributions
- Project Application Fee
- Fee on Projects Funded
- Public Private Funding Partnerships
- Form an IRWP Planning Committee
- Continue Status Quo

Grant Funding

SAWPA has been successful in receiving planning grants in the past and will continue to pursue all grant funds that are available in the future. However, planning grant funds may not always be available and should be thought of as supplemental funding, rather than a permanent source of funding.

Grant funding typically is tied to State bond funds, which are uncertain at best. While there is an expectation that a water bond will appear on the November 2014 ballot, past attempts to put the measure on the ballot did not succeed; and even if on the ballot, approval by the voters is not guaranteed.

Voluntary Contributions

Voluntary contributions of money and staff time are appreciated by SAWPA. However, SAWPA member agencies have contributed a disproportionately large share of SAWPA's funding requirements. In addition, by their nature, this type of funding is voluntary, and therefore is not a reliable source of long term funding. Voluntary contributions are a significant component of the funding for this conference.

A segregated fund administered within the SAWPA Planning Department, known as the One Water One Watershed Fund ("OWOW Fund"), was created to provide a means for other agencies or groups to participate financially in the development of the OWOW process and to help offset costs borne by SAWPA and its member agencies. The OWOW Fund collects and manages funds provided to SAWPA for development and implementation of the OWOW program.

The following is SAWPA's official policy for the administration of the OWOW Fund:

"Upon receipt of funds from agencies or other groups provided for the purpose of supporting the One Water One Watershed Program, SAWPA shall deposit such funds into a segregated account (Fund No. 392 - OWOW). This account will accrue interest. The segregated account will be included in the SAWPA budget during the annual budget cycle. SAWPA administrative and project costs will be deducted from the account.

All project-related expenditures from this account shall be reviewed by the SAWPA Commission to ensure consistency with the purpose of the One Water One Watershed Program and regional integrated watershed planning. Activities undertaken under this fund include:

- Collection, collation and analysis of data for One Water One Watershed plans
- Development of written materials, including maps and diagrams, to support the One Water One Watershed Program
- Development and implementation of stakeholder outreach and education activities in support of One Water One Watershed planning
- Provision of technical assistance and facilitation in the development of specific sub-regional plans in support of broader One Water One Watershed objectives

Participation and funding of activities undertaken as part of this fund does not imply an endorsement of specific projects developed under the One Water One Watershed Program."

Application Fee for Project Grant Submittals

A new funding option would be for SAWPA to charge an application fee for each project an agency submits for funding. For the first round of Proposition 84 funding, 297 project applications were submitted to SAWPA for inclusion in the OWOW plan and for consideration of possible funding. By charging a modest application fee of $500 or $1,000 per project, SAWPA could have generated $148,500 to $297,000. However, it is unknown if the number of projects submitted would have been reduced as a result of such a fee.

In addition, charging a fee for each project generates a one-time funding source that is linked to future grant funding, rather than an ongoing permanent source.

Fee for Project Successful In Obtaining Grant

A slightly different funding option would be to charge an administrative fee on each project selected to receive grant funding. By charging the successful project applicants, those who benefit most from the IRWMP process would help pay a portion of SAWPA's ongoing costs.

For Round I of Proposition 84, 13 projects in the watershed received $12.7 million in grant funding. If SAWPA charged a 10% fee for each project, this would have generated $1.3 million for planning and facilitation.

As mentioned above, charging a fee for successful projects generates a one-time funding source that is linked to future grant funding, rather than an ongoing permanent source. SAWPA's legal counsel is reviewing the legality of charging such a fee.

Public Private Partnerships

Many businesses and business coalitions benefit from the work done by SAWPA to develop and implement OWOW and OWOW 2.0. A new funding option would be for SAWPA to identify these businesses and try to form beneficial relationships such that the businesses would be willing to contribute funds in support of the OWOW effort. Like voluntary contributions, this type of funding is optional, and therefore is not a stable source of long term funding.

IRWMP Planning Committee Memberships

Development of an IRWMP Planning Committee could create a permanent source of funding for SAWPA's ongoing efforts. If such a task force included all stakeholders within the watershed and required a minimal annual contribution from each, this would result in a permanent funding source for the OWOW program at a minimal cost to each stakeholder (currently estimated at less than $5,000 per agency annually).

To get agencies to agree to be part of the task force and make contributions annually, there needs to be a compelling and beneficial reason for them to join. Task force membership would need to offer agencies more benefit than just receiving grant funding. Demonstrating the direct benefit of regional planning to each agency and organization sufficiently to assure regular and ongoing budgeted funding in the task force would be the most difficult hurdle to implementation. SAWPA has used the task force model to successfully fund projects in the past.

Status Quo

Another option to secure funding for SAWPA's ongoing planning and collaboration efforts is to continue the current model of relying upon contributions from the SAWPA member agencies.

In many ways, funding from the five SAWPA member agencies reflects a broad based multi-agency approach for funding regional integrated planning. With most of the SAWPA member agencies serving as a wholesale water agency or water supplier role for a large area in the watershed, their sub-agencies provide funding to the SAWPA member agencies through water connection fees and rates. Funding received by water fees and rates by each of the SAWPA member agencies from sub-agencies and the general public is funneled in part to support SAWPA in its ongoing regional planning efforts.

SAWPA Funding Versus Other Funding Approaches

Survey of Leading IRWM Regions

As a part of this Report, DTA has investigated the funding approached used by other IWRM regions. In the course of DTA's research, DTA interviewed DWR staff regarding the myriad of methodologies that IRWM regions are using to fund their respective ongoing operational expenses. DWR staff provided DTA with a list of several the most highly respected and innovative IRWM regions and suggested that DTA contact them and catalogue their approaches to funding. The following are DTA's observations after conducting interviews with staff at the following agencies.

The survey participants (in no particular order) were:

- Sacramento River Sub Region Funding Area – IRWM Region No. 1, American River Basin; Regional Water Authority staff
- North Coast Sub Region Funding Area – IRWM Region No. 21, North Coast; Humboldt County Planning Department
- San Diego Sub Region Funding Area – IRWM Region No. 26, San Diego; San Diego County Water Authority
- Tulare/Kern Sub Region Funding Area – IRWM Region No. 38, Upper Kings Basin Integrated Regional Water Management Authority; Kings River Conservation District

DTA's interviews with the IRWMs revealed that all of the funding methodologies in use by the survey participants were either already implemented by SAWPA or are under consideration in SAWPA's "2012 OWOW Funding Options" Study. The most notable area of possible improvement for SAWPA is that other IRWMs have been able to develop higher percentages and a broader array of stakeholders contributing funds to support their respective operations.

The Kings Basin IRWM Authority in the Tulare/Kern Funding is funded primarily through a broad coalition of regional agricultural, municipal and community interests with a membership of 50+/- members each paying $7,000 in annual fees plus a one-time $30,000 fee to fund the original IRWMP. Further, grant applicants must be "sponsored" by a member in good standing to qualify for grant consideration.

The San Diego IRWM is funded through fiscal year 2016 with a MOU documenting combined support from San Diego County, the City of San Diego and the San Diego Water Authority to fund IRWM operations up to a total of $1,470,000; San Diego's funding sources are more vertically diverse and are a closer reflection the type of organizations (i.e. governmental, public utility, private water purveyors) submitting projects for grant funding. The San Diego IRWM region is studying the use of an application fee for grant submittals to fund its operations.

Similar to SAWPA, the American Basin IRWM governance structure is a Joint Powers Agreement ("JPA"). The American Basin IRWM is funded by a consortium of similar type organizations, water purveyors plus wastewater organizations; there are a total of 25 water and wastewater agencies operating within the IRWM boundaries. 18 of the 25 share the IRWM's ongoing administration expenses. In this case the funding source is horizontal; however, the cost sharing has greater breadth.

Voluntary Subscriber Fees

In addition to reviewing the Study and surveying other IRWM regions, SAWPA recommended that DTA investigate voluntary subscriber fees, similar to those proposed by the Murrieta Fire Department.

Murrieta Fire Department Case Study

With funding decreasing over the past few years the Murrieta Fire Department ("MFD") searched for ways to maintain its current level of service without raising taxes. To help offset the costs of providing Emergency Medical Service ("EMS"), the MFD has proposed a program that would help compensate for the cost of emergency calls. The Murrieta EMS Subscription Program would be an annual, voluntary membership fee designed to shield Murrieta residents and businesses from out-of-pocket expenses related to EMS.

MFD's proposed cost recovery program will charge $350 per response, per person for each medical aid response that is performed. As an alternative to paying this charge, the MDF EMS Subscription Program ("Subscription Program") allows residents and business owners the option of paying a small annual fee rather than being charged the response fee. For single-family homes, the cost is $48 per year. For businesses the cost of this membership depends on the size of the business measured by the number of employees. The Subscription Program membership covers all response fees for services rendered.

Similar to MFD's model, SAWPA could use a combination of committee membership with grant application fees where committee members pay lower grant application fees than non-members.

Conclusions

In one form or another, all of the funding mechanisms described above are available to SAWPA. Further study and vetting by SAWPA leadership and legal counsel are required for implementation. With California's uncertain future economic climate, grant funding through water bonds is unreliable at best. At the same time, due to the Great Recession, SAWPA member agencies have had to tighten their financial belts fueling funding uncertainty. In addition, concerns about equity require that SAWPA investigate methods to spread its costs over a broader group of stakeholders.

Facility Funding Options

The One Water One Watershed Plan 2.0 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 which may provide funding beyond Proposition 84 Chapter 2 grant funding.

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 Report is on local funding sources.

While 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. DTA strongly recommends that public agencies continue to search and apply for available grants and loans; to the extent that projects are able to receive such funding, the need to undertake the local mechanisms cited below is diminished. However, local sources of revenue are recommended because they are under the control of each agency and are more predictable for long-term planning purposes.

State Funding

2014 Bond Measure

A California Water Bond is currently slated for the November 4, 2014 ballot, as a legislatively-referred bond act. The measure is known by its supporters as the Safe, Clean, and Reliable Drinking Water Supply Act and in its current configuration would authorize the State to borrow $11.1 billion to overhaul the state's water system.

A water bond measure was originally certified to be on the State's 2010 ballot. It was removed and placed on the 2012 ballot. The California State Legislature, on July 5, 2012 approved a bill to take the measure off the 2012 ballot and put it on the 2014 ballot, purportedly to increase the likelihood of the approval of the Jerry Brown Tax Hike Initiative in 2012. Although there will be plenty of hot-button issues on the 2014 ballot in California, some observers predict that "the biggest fight, the sharpest split, may come over water. Specific spending proposals currently under consideration include:

- $455 million for drought relief projects, disadvantaged communities, small community wastewater treatment improvements and safe drinking water revolving fund
- $1.4 billion for "integrated regional water management projects"
- $2.25 billion for projects that "support delta sustainability options"
- $3 billion for water storage projects
- $1.7 billion for ecosystem and watershed protection and restoration projects in 21 watersheds
- $1 billion for groundwater protection and cleanup
- $1.25 billion for "water recycling and advanced treatment technology projects"

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 bonds to support safe drinking, 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 $3,440,000,000 general obligation bonds to fund a variety of water projects, including:

- Specified CALFED Bay-Delta Program projects 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; and
- 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 general obligation 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 (“SRF”) which 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, watershed protection or restoration, estuary management projects, and more traditional municipal wastewater treatment projects. The Drinking Water SRF is a loan program that provides low-cost financing to eligible entities within the State and tribal lands for public and private water systems infrastructure projects needed to achieve or to maintain compliance with safe drinking water requirements and to protect public health. Small water systems and disadvantaged communities are given higher funding priority. Both SRFs are managed by the State and funded by the federal Environmental Protection Agency.

Other State Funding
Shown below is a list of other State funding programs:

• California Department of Fish and Game Pacific Coast Salmon Restoration Fund (Fisheries Restoration Grant Program)
• California Coastal Conservancy Proposition 84 Funds
• California Coastal Conservancy Southern California Wetlands Recovery Project Community Wetland Restoration Grants
• California Wildlife Conservation Board
• California State and Regional Water Quality Control Board Clean Water Grant Program
• California Integrated Watershed Management Grant Program Proposition 50 Funds
• California Department of Parks and Recreation Habitat Conservation Fund
• CalTrans Environmental Enhancement and Mitigation Program
• U.C. California/NOAA California Sea Grant College Program

Federal Funding

2013 Water Resources Development Act

On March 20, 2013 the Senate Environment and Public Works (EPW) 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 further leverage 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 loans it from the federal government directly to a project.

Title X of WRDA has $250 million authorized for the WIFIA program ($50 million per year for five years 2014-2018) with eligibility for both water resources projects (flood control, levees, dams, etc.) 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

Shown below is a list of other federal funding programs and options:

NOAA/NMFS Restoration Center Community-Based Restoration Program
• NOAA/NMFS Restoration Center Open Rivers Initiative
• NOAA/NMFS Proactive Species of Concern Grant Program
• NOAA National Sea Grant College Program
• NOAA Coastal and Estuarine Land Conservation Program
• NOAA/ACOE/USFWS/EPA/NRCS Estuary Habitat Restoration Program
• EPA Wetlands Protection Grants and Near Coastal Waters Programs

• US. Department of Transportation Highway Bridge Rehabilitation and Replacement Program
• U.S. Fish and Wildlife Service National Coastal Wetlands Conservation Grant Program
• U.S. Fish and Wildlife Service Coastal Program
• U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program
• U.S. Fish and Wildlife Service North American Wetland Conservation Act
• National Resource Conservation Service
• Federal Highway Administration – Road Aquatic Species Passage Funding

In 2012, 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 State Revolving Fund Programs
- Create a Federal infrastructure trust fund
- Create a Water Infrastructure Finance Innovation Act (WIFIA)
- Create a National Infrastructure Bank
- Modify Private Activity Bond Restrictions
- Reinstate Build America Bonds

Increase Funding for State Revolving Fund Programs

Typical State Revolving Fund ("SRF") programs are funded by an initial (and periodic) capital injection(s) by the Federal government and managed by individual states. Annual capital appropriations by the Federal government fund the SRFs. The SRF essentially functions as a bank, 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.

According to the Congressional Research Service, Congress is considering expanding the funding for SRF programs.

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 are dedicated or "earmarked" for expenditure on specific purposes.

Public focus on the Federal deficit decreases the likelihood that a water trust fund could be established. However, some members of Congress propose to increase infrastructure spending with a water trust fund.

Water Infrastructure Finance Innovation Act ("WIFIA")

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 Department of Transportation.

A WIFIA program would be similar to the TIFIA and potentially administered by the Environmental Protection Agency. 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, a significant benefit to water management projects. 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 Sen. Barbara Boxer's water resources bill on Wednesday, 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 includes language that would expedite the environmental review process that many critics say leads to unnecessary delays and added costs in such projects. The bill next moves to the House of Representatives for their consideration.

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.

Modify Private Activity Bond Restrictions

Private Activity Bonds are tax-exempt bonds that are available for privately owned water facilities that are either 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.

Reinstate 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. Congress is considering reinstating Build America Bonds to target water infrastructure projects.

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 National Fish and Wildlife Foundation.

Proposition 218

One of the key funding considerations of this Report is Proposition 218 which was approved by the voters in California in 1996. This constitutional amendment, which is also called the “Right to Vote on Taxes Act,” is arguably the most significant impediment to arise against adequate local infrastructure funding since the adoption of Proposition 13 in 1978. Proposition 218 was a successful effort by the State’s voters to ensure that local governments could not levy 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 need to be approved by at least one-half of the electorate, all special taxes need to be approved by at least two-thirds of the electorate, and all special assessments and property-related fees must be approved by at least one-half of the impacted property owners submitting mailed ballots prior to the public hearing at which such special assessments or fees are to be approved by a local legislative body (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 (e.g., the payment of debt service on outstanding bond issuances). The only exceptions to these voter requirements are fees for sewer, water, and refuse collection. However, based on 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, capacity fees), but also to the recovery of costs to regulate fee payer activities (plan check fees, building permit fees).

A tax is a charge imposed by government to pay for general governmental purposes (“general tax”) or specific governmental purposes (“special tax”). Assessments 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, in order 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 being considered a property-related fee, 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 (a) the fee was not property-related, and (b) the fee was exempt from the voter requirement as a result of the sewer and water fee exemptions under Proposition 218.

The Howard Jarvis Taxpayers Association appealed to the Sixth Appellate District of the State Court of Appeals, which overturned the trial court's finding by a 3-0 vote. The basis for the Appeal Court's decision was an emphasis on Proposition 218's fundamental premise that "the provisions of this act shall be liberally construed to effectuate its purposes of limiting local government revenue and enhancing taxpayer consent." As a result, the Appeals Court determined that a fee based on land use was not a charge directly based on use (such as the metered use of water for a water fee), and that it was in fact a fee based on ownership of property because a property owner could not escape the fee by declining to accept the service. The Appeals Court went on to declare that stormwater management activities are separate from sewer and water services, and therefore would not be eligible for the voter exemption permitted under Proposition 218 for sewer and water fees. The State Supreme Court denied the City's petition to review the Appeals Court's decision.

Santa Clara County Decision

On July 14, 2008, the State Supreme Court, in the case of *Silicon Valley Taxpayers Association v. Santa Clara County Open Space Authority*, decided two key points relating to Proposition 218. First, the State Supreme Court held that legal challenges to special assessments are subject to independent judicial review, reversing a number of pre-Proposition 218 cases which gave more deference to the public agency that established the assessment district. Second the State 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 assessment district 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 to be acquired 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 State 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 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, and (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 continue to scrutinize assessments as they pertain to the requirements of Proposition 218.

Summary of Proposition 218 Nexus Requirements

Under Proposition 218 a fee or a charge shall not be imposed unless it meets all of the following requirements:

- Revenues derived from the fee or charge shall not exceed the funds required to provide the property related service;
- 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;
- The amount of 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;
- 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; and
- 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.

Local Revenue Sources

This section contains brief summaries of a number of mechanisms that may provide funding for local agencies. The findings in these sections are based on a review of relevant literature and DTA 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 assured 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; to the extent that projects are able to receive such funding, the need to undertake the local mechanisms cited below is diminished. This section summarizes financing mechanisms that may be utilized by local agencies in place of general fund revenues. **Table 8-1** and **Table 8-2** located at the end of this Chaptersummarize financing alternatives that should be considered, as well as brief descriptions their advantages and disadvantages.

Longevity and Certainty of Funding

In an effort to clarify the California Department of Water Resources 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 Ms. Tracie Billington, the Branch Chief for DWR's IRWM Grants and Funding. Ms. Billington 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.

As explained by Ms. Billington, 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 process have been ranked, and in general the higher ranking projects having a greater "Certainty" or probability of being financed than the lower ranked submittals.

In addition, those financing mechanisms which have been approved and are included in current Federal, State, or local budgets have a greater level of certainty than those which 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 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 (as of January 1, 2013, the rate shall not exceed 9.5% based on a base rate of 7.5%).

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, 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 2/3 majority vote.

Statewide, only 35 out of 68 special purpose tax measures (those requiring a 2/3 vote) were approved by the relevant electorate in the November 2012 election. School parcel taxes had the highest passing rate of 64%, County special taxes had a passing rate of 58%, and Special Districts had a passing rate of 44%. City special taxes had a passing rate of only 33%. To be successful, a local would need to undertake an effective public outreach effort to demonstrate to voters the benefits to that will be achieved through this additional tax.

As a result of California Proposition 30, the State's base sales tax rate was increased by 0.25% (from 7.25% to 7.5%) on January 1, 2013. The 0.25% tax rate increase will expire on December 31, 2016. Local agencies will find it extremely difficult to pass an additional sales tax increase to fund regional water projects until after the State 0.25% tax increase expires.

Stormwater Utility Fee

A municipal stormwater utility fee ("Stormwater Utility Fee") can be adopted under 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, operations, and maintenance for their storm drainage, water and sewerage 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 sewerage systems.

Revenues derived from the fees levied under Section 5471 can be used for the acquisition, construction, reconstruction, maintenance, and operation of storm drainage, water and sewerage systems, as well as the repayment of principal and interest on bonds issued for the construction or reconstruction of these storm drainage, water and sewerage systems.

As a parcel-related fee, a Stormwater Utility Fee must be calculated according to Proposition 218 guidelines for fees set forth in Section III.C.3.

Los Angeles County Case Study

The County of Los Angeles has been considering how best to implement a dedicated funding mechanism for surface water quality since at least 2005. Waterways throughout the county have been found to be polluted above acceptable levels under the federal Clean Water Act and other state and federal laws. The Los Angeles County Flood Control District has recently proposed to adopt a Clean Water, Clean Beaches Measure, which would establish an annual fee to pay for clean water programs. The proposed clean water fee would be imposed on property within the Los Angeles County Flood Control District, which includes most of Los Angeles County (with the exception of portions of the Antelope Valley), for the purpose of improving water quality and reducing pollution from stormwater and urban runoff.

The proposed clean water fee would provide dedicated funding for local and regional projects and programs to help keep pollution out of stormwater and runoff, clean up pollution that flows into waterways, and use stormwater and runoff to recharge groundwater supplies. The proposed fee for each parcel is based on impervious area, which is determined based on land use, zoning, and lot size.

On January 15, 2013, the Board of Supervisors opened a public hearing to listen to public testimony regarding the proposed measure. Due to significant community and agency concerns at the hearing, the Board of Supervisors kept the protest period open for an additional 60 days. On March 12, 2013 the Board again listened to public testimony. At the conclusion of public testimony the Board of Supervisors voted to not proceed with the Clean Water, Clean Beaches Measure at this time and then directed Public Works to continue working towards consensus with stakeholders on key elements of the proposed measure and to report back on progress in 90 days. If consensus is reached among the stakeholders, the Board of Supervisors may consider placing the proposed fee on the general ballot in June or November of 2014.

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 nexus between costs and benefits, as well as a clear separation between existing development and future development. Therefore, to implement fees of this nature, a nexus 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. Since 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 (discussed in Section C above). 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 on a large-scale financing program (e.g., an entire city or water district); the protest provision has little impact 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 which secures debt service payments of the bonds. As such, these bonds usually finance facilities related to 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 general obligation bonds, but a lower rate than the land-secured bonds (CFD or AD). In addition, there is usually a requirement that revenues generated from an enterprise exceed debt service on bonds by twenty-five percent (25%). This "coverage" protects the bond holders from minor delinquencies and defaults that may occur.

Development Impact Fee

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 at the time 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.

AB 1600, which promulgated Section 66000 and other sections of the Government Code, was enacted by the State of California in 1987 to regulate the imposition of DIFs within the State. AB 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 Government Code section 66013.

While DIFs and connection fees cannot typically be leveraged (i.e., provide security for bonds or other debt instruments), 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 of future development, DIFs could be utilized 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 general obligation ("G.O.") bonds by a public agency issuer represents a pledge on the issuer's part to levy a uniform ad valorem property tax 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 operations or maintenance.

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 resurgence in G.O. bond authorization was seen. This latter proposition 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 which 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 Report. 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 District

There are a number of types of Assessment Districts ("ADs") that can be utilized 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, flood control facilities, utility lines and landscaping. Other types of public improvements which have a "regional" significance (e.g., major roads, bridges, flood control facilities, etc.) 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 Assessment District 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, as 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 discussed above, 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 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 the following:

"Special benefit means 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 C 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 Community Facilities District ("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 twelve 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 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 ("Act") was enacted by the California State Legislature in 1982 (Section 53311 et. seq. of the Government Code) to provide an alternate means of financing public infrastructure and services subsequent to the passage of Proposition 13 in 1978. The Act 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. The Act defines the area subject to a special tax as a CFD. If fewer than twelve 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 assured. The Act 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 five 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 five years or more, would qualify for this financing.

Furthermore, 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 ad valorem 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 or 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. As 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 a COPs or LRB financing include a public agency, a non-profit corporation and a trustee. The non-profit corporation may be formed specifically to construct and own the necessary improvements, the funds for which are generated from the proceeds of the COPs or LRB sale. The non-profit 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 non-profit 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 certificates or bonds 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 certificate or bond holders.

There are two major problems associated with COPs or 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 or LRBs, so these mechanisms could not be utilized 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 certificates. 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 non-recourse to its general fund.

Sewer and water improvements, parking facilities and other revenue-generating public uses can be financed with revenue bonds. Debt service on these bonds may be paid through monthly utility bills, parking fees, and other revenues, etc. Bonds are not sold until sufficient revenues are available to provide a level of bond debt service coverage which is acceptable to the municipal bond market. As water rates are already used to fund the ongoing cost of providing water, financing new water facilities through the use of public enterprise revenue bonds will often require an increase in water rates.

Table 8-1 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 • Currently preempted by State 0.25% sales tax increase
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 WMA basis	• Will require property owner or registered voter election
Water User Fee	• No election requirement under Proposition 218; but ballot protest process is recommended • No legal constraints on raising funds other than nexus • Can pay O&M or capital costs	
Sewer User Fee	• No election requirement under Proposition 218; but ballot protest process is recommended • No legal constraints on raising funds other than nexus • Can pay O&M or capital costs	

(Continuation of Table 8-1 Traditional Finance Measures Table)

Financing Mechanism	Advantages	Disadvantages
Refuse Collection Fee	• No election requirement under Proposition 218; but ballot protest process is recommended • No legal constraints on raising funds other than nexus • 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 which 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
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 Community Facilities District	• 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, as 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 aren't predictable • Statutory and constitutional limitations on the size of municipal debt may apply

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 Nexus

Since the California Energy Commission ("CEC") 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 ("GHGs"). About the same time, the CEC commenced development of its first water-energy research program. The California Public Utilities Commission ("CPUC") conducted workshops to explore whether and how the water-energy nexus 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 Environmental Protection Agency has a Sustainable Infrastructure program which is intended to help water and wastewater utilities to 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. Since 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 in 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 (notably the private finance initiative), capital investment is made by the private sector on the basis of a contract with government to provide agreed 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 in the infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, so as to make it more attractive to the private investors. In some other cases, the government may support the project by providing revenue subsidies, including tax breaks or by removing guaranteed annual revenues for a fixed time period.

Typically, a public sector consortium forms a special company called a "special purpose vehicle" ("SPV") 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 SPV. It is the SPV 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. Two examples of PPPs are discussed on the next page.

West Coast Infrastructure Exchange

Funded by two Rockefeller Foundation grants totaling $750,000, the West Coast Infrastructure Exchange ("Exchange") is a start-up non-profit entity that was established to tap into the expertise of development and finance leaders to save money, find innovative financing methods and achieve cost savings via collaboration in order to make projects more feasible. Participating jurisdictions include the states of California, Oregon and Washington, as well as, British Columbia. The goal of the exchange is to explore ideas together, to share best practices and technical expertise, to help identify infrastructure projects that might help benefit from some private involvement, and to work together to find out what projects might be bundled to make them more appealing to the private sector. Target infrastructure investment opportunities include, but are not limited to energy transmission and efficiency, water storage capacity, municipal water systems and wastewater management.

During the start-up phase, through 2013, the Exchange will operate with an interim management team representing each partner office, coordinated by the Oregon State Treasury. Committees will begin to establish a framework for evaluating projects. The Exchange will seek a director with experience in public infrastructure management. After those steps have been completed, the Exchange will begin serving as an information source and develop a process for connecting projects to financing, potentially including private capital.

By establishing a center of expertise to provide technical assistance, setting standards and providing investment information, and simultaneously advancing new mechanisms for project finance the Exchange has the potential to attract large private institutional investors.

The following table (**Table 8-2**) compares traditional project operations to the Exchange's performance-based methodology.

Table 8-2 Comparison between Traditional Projects

Assessing the WCX

The West Coast Infrastructure Exchange is employing a performance-based infrastrucure, which approaches project management differently than traditional models, the ways in which are detailed in the chart below (click to enlarge).

Types of Projects

Traditional	Performance-Based Infrastructure
Limited analysis of alternatives, focus on capacity additions	Thorough analysis of alternatives, consider demand and supply side solutions equally, benefit-cost analysis drives decision-making
Project planning doesn't consider impact of climate change	Project planning accounts for predicted changes in sea level, precipitation and extreme weather events
Each jurisdiction finances and delivers projects on their own	Jurisdictions plan together and pool resources to lower project costs and deliver better regional outcomes
Projects funded through general taxes, gas taxes, and federal grants	Projects funded with user fees such as variable tolls for highways and bridges
Design-Bid-Build: One group designs the project and an entirely separate group with the low bid builds the project	Design-Build-Operate-Maintain: Public owner contracts with one entity for best value on delivered infrastructure services over life of project Design-Build-Finance-Maintain: Public owner contracts with one entity which delivers financing and project with best value for public owner
Tax-exempt debt offers lowest cost of capital for public projects	Taxable debt in context of public-private partnership delivers more value to public

Chart courtesy of westcoastx.com

Pace Program

Property Assessed Clean Energy ("PACE") programs enable property owners to finance private "green" improvements including water conservation improvements, as well as, solar panels, heating and air conditioning systems, pool filtration equipment, windows and doors, water conservation improvements, fuel cells and other types of energy saving improvements. The funding for the improvements is repaid through an annual assessment on the property tax bill. DTA currently serves as the Assessment Engineer for Western Riverside Council of Government's ("WRCOG") HERO Program for Western Riverside County as well as WRCOG's statewide California HERO Program. The HERO Program is WRCOG's version of a PACE Program, which offers qualified property the opportunity to finance energy efficiency and water conservation improvements for their properties.

Since the HERO Program was launched in early 2012, 7,897 applications have been received, with 5,157 approved for energy improvements totaling $146.15 million. Approximately $36.1 million in bonds have been closed to date to fund eligible improvements.

To the extent that local property owners reduce their water and/or energy usage through a PACE program, the demand for new water and other infrastructure may be reduced.

Government Legislation

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 facility.

Crowd Sourcing

Crowd funding, 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 loses 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 crowd funding 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, and thus 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 either via identification or emotion in order to get individuals to contribute but also to get them to spread the word of the project on to likeminded crowdfunders. In a crowdfunding ecosystem it is crucial to make the purpose of the call for capital as clear as possible as raising funds for vague purposes can make it difficult for the individual crowdfunders to truly identify themselves with the campaign. Donation-based crowdfunding is therefore the model that will require the most carefully thoughtful communications strategy, and the most persistent communications effort.

While donations are granted due to either identification or an emotional attachment to the project's cause and/or urgency, rewards have to be interesting themselves, meaning 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 crowdsourcing. Similar to the signs along freeways acknowledging contributions for maintenance, SAWPA may use a similar signage 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 school and universities establishing building fund campaigns for a new sports facility. Religious organizations often have campaigns to raise funding to build new churches. However, public appetite for funding water infrastructure through crowdsourcing may be limited.

Energy Service Company ("ESCO") And Energy Saving Performance Contract ("ESPC")

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 seven to twenty year time 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:

- develop, design, and arrange financing for energy efficiency projects
- install and maintain the energy efficient equipment involved
- measure, monitor, and verify the project's energy savings
- assume 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 so that 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 Savings Performance Contracts ("ESPCs"), also known as Energy Performance Contracts ("EPCs"), are an alternative financing mechanism authorized by the United States Congress designed to accelerate investment in cost effective energy conservation measures in existing Federal buildings.

ESPCs allow Federal agencies to accomplish energy savings projects without up-front capital costs and without special Congressional appropriations. The Energy Policy Act of 1992 (EPACT 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 ("FEMP") of the United States Department of Energy ("DOE") as required by the Energy Policy Act of 1992. The final DOE ruling came into effect on May 10, 1995. The use of ESPCs by Federal agencies was reauthorized in the Energy Policy Act of 2005 ("EPACT 2005") through the end of Fiscal Year (FY) 2016 and permanently reauthorized in The Energy Independence and Security Act of 2007 ("EISA").

Regional General Obligation Bond

With a traditional General Obligation bond, as discussed in Section III.D.1.(f), bonds are issued by a public agency, based on a pledge of the ad valorem property taxes for all (or a portion) of the properties within the issuer's jurisdiction. Recently, Joseph Zoba, General Manger at Yucaipa Valley Water District, has proposed the use of regional general obligation bonds to raise funds regionally to be used for regional projects. This would avoid the time consuming and expensive Federal and State processes to compete for funds. A regional general obligation 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 general obligation 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 2/3 vote necessary to establish such a program.

Conclusions

As stated in the Introduction, SAWPA engaged David Taussig and Associates, Inc. ("DTA") to investigate financing alternatives for public facilities and regional planning. In addition to its many years of successes regarding all facets of financing public infrastructure, DTA has furthered its expertise by recently working with other significant public agencies, including the California Department of Water Resources, 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 (specific recommendations are described in detail in the body of the report):

- Throughout the prosecution of this assignment, DTA conducted many interviews with recognized leading public finance experts and reviewed the body of current, available industry documents and communications. Consistent throughout DTA's research, SAWPA is universally regarded as one of, if not 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, 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, served or are the responsibility of a single governmental entity. Literally dependent entirely on the lay of the land, the topography of a broad region determines a watershed's boundaries. In most, if not all 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, 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.

Limitations of Report

The conclusions and recommendations in this report rely on the information provided to DTA at the time of the writing of the Report by the following parties was true, correct, and complete:

1. The Santa Ana Watershed Project Authority
2. The California State Department of Water Resources

9.0 Data Management and Plan Performance/Monitoring

Managing water resources data at a watershed-wide level in a centralized and consistent manner, and providing access to this information to key stakeholders and the public at large is critical to the successful implementation of the Santa Ana Watershed Project Authority (SAWPA) One Water One Watershed (OWOW) 2.0 Plan. This chapter reports on the various methods and tools developed by SAWPA and others to monitor performance, manage data and provide new tools to support the implementation of the OWOW Plan. This includes a watershed assessment of how effectively progress is being made in achieving the OWOW 2.0 goals, objectives, and planning targets.

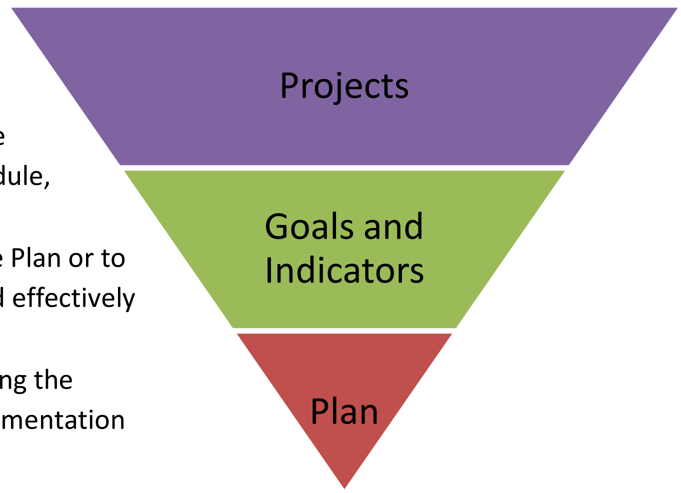
The results of the watershed assessment tool and reporting provides users with the status and trends in water resources, as well as the economic, ecologic and social systems that make up the watershed. This scientific, data-driven watershed assessment benefits local, regional, state and federal agencies and organizations by conveying a systematic, scientific evaluation of conditions developed for and presented to a wide-ranging audience. Integrated assessment and reporting of environmental and community conditions promote cooperative management and decision-making by increasing the public's awareness of regional conditions.

In addition, this report describes the mechanism for future plan evaluation and implementation and is designed to meet the Integrated Regional Water Management (IRWM) requirements for Plan Performance and Monitoring while also providing OWOW 2.0 with a mechanism for celebrating successes, drawing resources to challenges, and improving the health of the Santa Ana River Watershed (SARW). 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.

OWOW Plan Performance and Monitoring

Through OWOW 2.0, SAWPA has developed a process to evaluate and implement the OWOW 2.0 Plan. The intent of which is to:

- Ensure progress is being made toward meeting the objectives of the Plan
- Ensure specific projects identified in the Plan are being implemented as planned in terms of schedule, budget, and technical specifications
- Identify potential necessary modifications to the Plan or to specific projects, in order to more efficiently and effectively accomplish the goals and objectives of the Plan
- Provide transparency and accountability regarding the disbursement and use of funds for project implementation



This process includes performance measures (indicators) and monitoring to document progress toward meeting the OWOW 2.0 Plan goals. Monitoring will take place at two levels, the plan and individual implementation project. Linking the two are a set goals, each made up of a number of specific indicators.

It is anticipated that plan performance will be evaluated every three to five years. This is based upon a number of limiting factors including:

- The scale and complexity of the Santa Ana River Watershed
- Availability of data updates
- Window of time required to complete projects

Results of this, as well as future evaluations will be published by SAWPA in the OWOW Webpage, and will include the use of visual tools (i.e. dashboards) to show progress to date in achieving the plan goals.

Project Monitoring

The evaluation (rating and ranking) of projects, detailed in **Chapter 6 Project/Program Review, Evaluation and Prioritization**, is conducted through a multi-step process under the direction of the OWOW governance structure. Through this process projects of high value in achieving OWOW goals are identified to move forward for implementation and monitoring. The frequency of which this process for updating project ratings and rankings is conducted is based upon the availability of funding for projects. Projects implemented through OWOW are monitored through a Data Management System (DMS) maintained by SAWPA. This DMS is designed to ensure "lessons learned" from project-specific monitoring efforts will be used to improve SAWPA's ability to implement future projects in the OWOW Plan. SAWPA has established a "datamart" with the State to link directly to the California Environmental Data Exchange Network (CEDEN) database to down load data available for the SARW 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 DMS are described in detail in the Data Management section of this chapter.

SAWPA provides oversight on projects that are implemented through the Department of Water Resources (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 information on 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 monitoring schedule and processes can be maintained

Data Management Approach

The Santa Ana River Watershed (SARW) includes over a hundred municipalities and public agencies, and each municipality and agency is responsible for monitoring a wide range of parameters for many varied programs. SAWPA has directed each of these agencies to submit data to state agencies where appropriate and project performance data to SAWPA. The SARW Region has, therefore, determined that the focus should be on collecting the data already being provided by project proponents funded through the IRWM Program (and therefore already meeting DWR data requirements) and use of that data for the purposes of determining Plan Performance as described previously. Projects funded through the IRWM implementation funding programs are required to provide data from approved project performance monitoring programs in formats already consistent with the list of state agency databases called out in DWR guidance. Therefore, the Region can ensure that the data provided can be effectively shared and used by the State and the Region's stakeholders.

SAWPA recognizes that a great deal of valuable data is collected from studies and projects not funded through the IRWM Program but which could benefit the Region and the State if made accessible. Therefore, SAWPA is working to expand the capabilities of a number of in-house tools to assist Regional stakeholders and agencies who wish to provide datasets to the Region through the IRWM Program, these datasets will be uploaded to the SAWPA database, but SAWPA would not be responsible for determining if these datasets meet DWR requirements nor for including the data into the Plan Performance assessment process. The region may, in the future, pursue additional funding to further enhance and grow the Region's DMS to fully include datasets from projects and programs not funded through the IRWM program.

Stakeholders contribute data through the projects funded by the IRWMP and are directed to input data into the appropriate state database. Additionally, stakeholders also contribute data through task force efforts such as the Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Load (TMDL) Task Force and the Middle Santa Ana River Pathogen TMDL Task Force.

Data that were not required to be submitted to state database but are deemed important are placed in SAWPA database and are made accessible through web tools, maps and tables. This database is reviewed by SAWPA staff and routinely backed up. Data quality is corrected through the use of spatial queries and then displayed through 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 are submitted to the State through databases such as CEDEN as well as the SAWPA database, are available through web tools and data requests. These web tools combine tabular data with spatial data 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 per contract is available through a number of tools that use a weekly connection to CEDEN database which provides a very up-to-date view of the data. Data compatibility with State databases is exceptionally high due the feedback loop caused by using web based tools displayed near real time submitted data.

OWOW Plan Monitoring

There are a number of ongoing monitoring programs that are collecting data in the Region to support the OWOW Program. Current pertinent monitoring activities in the Region are described briefly below.

Lake Elsinore and Canyon lake Nutrient TMDL

The Lake Elsinore and Canyon Lake Nutrient TMDL Task Force is comprised of local stakeholders seeking to address the nutrient TMDLs defined by the 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 LESJWA 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, 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.

Middle Santa Ana River Pathogen TMDL

The Middle SAR Pathogen TMDL Task Force is a collaborative effort of public and private sector agencies and interests focused on the development of pathogen TMDLs for SAR 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 Water Quality Control Board (RWQCB) in their 2005 Amendment to the Basin Plan. These include the implementation of a watershed-wide monitoring program to assess compliance with 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.

Urban Water Management Plans

The Urban Water Management Planning Act (UWMP Act) requires that planning projections be evaluated over at least a 20 year period. 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 both local and imported water supplies. Local resources include precipitation in the form of snow pack, surface flow and groundwater. Imported resources for the Watershed are primarily from the Colorado River Aqueduct (CRA) and the State Water Project (SWP). UWMP's evaluate scenarios that help prepare for water supply reliability the Watershed assuming a multi-year drought.

Technical Analysis

In addition, there a vast amount of data utilized in the creation of the OWOW 2.0 Plan, which are not directly reported to the State. This data and technical information is used to develop the water management needs in the OWOW 2.0 Plan. The data collected is considered adequate for the needs of developing the OWOW plan in representing current conditions, the scope of historical highs and lows and future forecasts and projections. **Table 9.1** identifies the studies, models and other data sets used to create tables, charts and graphics throughout the OWOW Plan.

Table 9-1 Source Material Used for OWOW 2.0 Technical Analyses

Data or Study	Analysis Method	Results	Use in IRWM Plan	Source
Tribal Communities	Spatial Analysis	Percent of Tribal Communities in the Watershed	Map of Tribal Communities	Southern California Association of Governments (SCAG)
Disadvantaged Communities	Spatial Analysis	Percent of Disadvantaged Communities in the Watershed	Map of Disadvantaged Communities	SCAG
Groundwater Management Zones	Groundwater Supply/Quality/Storage	GW Management Zone, Water Quality and available storage mapping	Map of GW management zones	RWQCB, Santa Ana Basin Plan
Watershed Land Use	Spatial Analysis/Land Use Trends	Spatial representation of available regions for groundwater recharge	Map of land use in the SARW	SCAG
Critical Habitat	Habitat/Spatial Analysis	Spatial representation of critical habitat	Map of critical habitat in the SARW	Various Agencies
Population	Population Projections	Projected Populations for the watershed until 2035	Map of population density in the SARW	SCAG
Flood Control Facilities	Spatial/Stormwater Capture Analysis	Stormwater Capture mapping	Map of flood control infrastructure in the SARW	Various Agencies
Groundwater Recharge Facilities	Recharge Opportunities/Spatial Analysis	GW recharge mapping	Map of GW recharge facilities and opportunities in the SARW	Various Agencies
Constructed Wetlands	Habitat/Stormwater Recharge Analysis	Habitat Area/Stormwater	Map of Constructed	Various Agencies

Data or Study	Analysis Method	Results	Use in IRWM Plan	Source
		Recharge Opportunities	Wetlands in the SARW	
Recycled Water Facilities	Spatial/Water Quality/Water Supply Analysis	Locations and dischargers along the SAR	Map of recycled water facilities in the SARW	Various Agencies
Agency Service Area	Spatial Analysis/Population Projections	Mapping of Agency Service Areas and Boundaries	Map of Agency Service Areas in the SARW and surrounding areas	UWMP/Retail Agencies
Watershed Delineations	Spatial Analysis	Sub-Watershed delineations within the SAR	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 SARW	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 SARW	Member Agencies
Surface Water	Water Quality/Spatial Analysis	Mapping of Surface Water	Mapping of surface water sources in the SARW	RWQCB, Santa Ana Basin Plan
Imported Water Infrastructure	Spatial Analysis/Economic Impacts	Mapping of Metropolitan Water District (MWDSC) Imported Water Infrastructure	Mapping of MWDSC Imported Water Infrastructure in the SARW	MWDSC Regional Plans
Fault Lines	Spatial Analysis/Infrastructure Risk Analysis	Mapping of fault lines with water infrastructure	Mapping of fault lines and water infrastructure	US Geological Survey (USGS)
Delta Smelt Impacts	Water Supply Projections	Projections of water supply affected by the	Water import projections for Chapter 5.4	MWDSC

Data or Study	Analysis Method	Results	Use in IRWM Plan	Source
		Delta Smelt impacts		
Impaired Water Bodies (303-D List)	Water Quality Analysis	Mapping of impaired water bodies in the SARW	Mapping the impaired water bodies in the SARW	303-D List
TMDL Projects	Water Quality Analysis	Mapping of TMDL projects in the SARW	Map of TMDL Projects in the SARW	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 (SAWA)
Water Quality Objectives	Water Quality Analysis	Mapping of water quality objectives in the SARW	Map and analysis of water quality objectives.	RWQCB, Santa Ana Basin Plan
Seawater Intrusion Zones	Water Quality/Spatial/Water Supply /Projections	Mapping of basins in danger of Saltwater Intrusion and the effects on supply	Map and analysis of potential seawater intrusion zones	Orange County Water District (OCWD)
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 SAR	Map of the Santa Ana River Trail	Various Agencies
Temperature	Climate Analysis	Mapping of temperature zones throughout the SARW	Map and analysis of temperature data throughout the SARW	U.S. Bureau of Reclamation (Reclamation)
Groundwater Plume Maps	Spatial Analysis/Water Quality Analysis	Mapping of contaminated GW due contamination plumes	Map and analysis of contaminated groundwater basins/plumes	Various Agencies

Plan Performance and Project Support Tools

SAWPA has developed a number of tools to facilitate the evaluation, dissemination and integration of data to track plan performance as well as new tools to support project proponents in collaboration and evaluating multiple resources necessary to develop new regional projects. The emphasis of tool development is to support the achievement of the OWOW plan objectives at both the plan and project implementation levels. Most of these tools were developed in-house by SAWPA staff. However, several tools also reflect the collaborative work of SAWPA and others. The watershed assessment tool was developed by SAWPA working closely with the Council for Watershed Health and Dr. Fraser Shilling, UC Davis. New project support tools to support climate change adaptation and mitigation were developed by the Reclamation, based on a funding partnership with SAWPA for the OWOW 2.0 Plan. The Reclamation tools were designed such that project proponents as well as the general public could evaluate the projected climate change impacts in the Santa Ana River Watershed as well as adaptation and mitigation measures to deal these changing conditions. It is anticipated that these tools can be effectively adapted to other IRWM regions and users across the State.

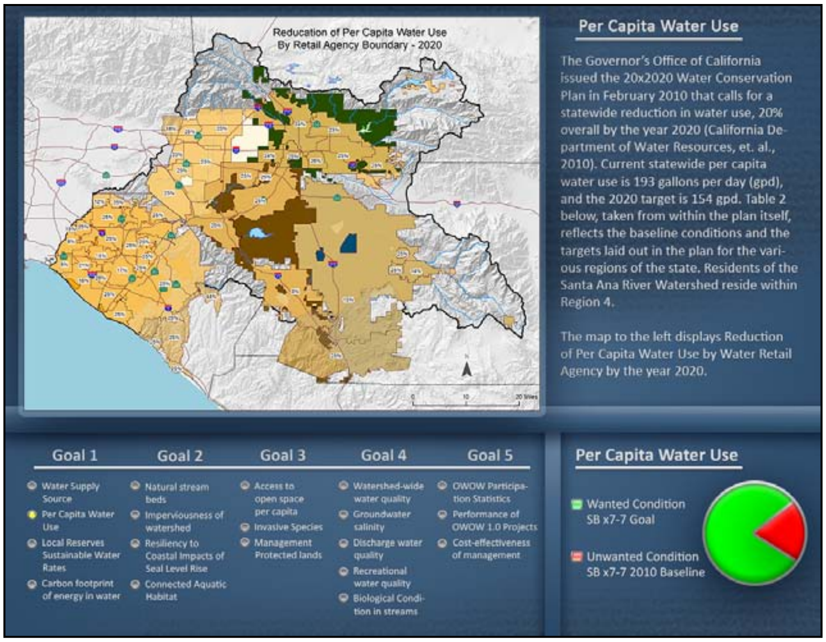
Many of the tools were designed to provide the user access to forms or data through graphical user interface (GUI) supported by Graphical information System (GIS) map layers and rely on the use of electronic reporting linked to a sequel database. It is intended that these tools will be further enhanced and expanded in the context of the OWOW Plan, as more and better data becomes available. With this information, SAWPA will be able to track the watershed's progress in meeting OWOW 2.0 goals, as well as, be responsive to opportunities to expand regional planning.

Watershed Assessment Framework and Tool

With the implementation of integrated projects and programs seeking to achieve a sustainable watershed, SAWPA early in the OWOW 2.0 planning scoping recognized the need for a common method of measuring progress on meeting the goals and objectives as well as the health of the Santa Ana River Watershed. SAWPA engaged the services of the Council for Watershed Health, a nonprofit organization, and Dr. Fraser Shilling of UC Davis to develop a watershed assessment framework for the Santa Ana River Watershed. Based on their experience with developing methodology for a Watershed Assessment Framework (WAF) using the Arroyo Seco watershed in the Los Angeles County and their work on developing a similar project for the State on the California Water Plan 2013 Update, the Council and Dr. Shilling were able to work with the Pillar workgroups to update the watershed management goals, establish planning targets or wanted conditions for the watershed and utilize data indicators or metrics from existing datasets or data collection efforts to track progress. With the input of SAWPA staff, a new tracking computer tool was created incorporating this work that will allow managers to evaluate and assess progress and assure actionable results for implementation.

SAWPA, working with their stakeholders, developed an interface to display the goals, indicators and results for SAWPA's OWOW 2.0 watershed assessment tool.

Figure 9-1 Watershed Assessment Tool



This interface provides the user a menu of watershed management goals and related indicators established for SAWPA's OWOW 2.0 watershed assessment. The user can select from this menu indicators that were used in the watershed assessment. When an indicator is selected, the screen updates to provide an in depth evaluation of the indicator, data employed and watershed score.

The tool includes the following features:

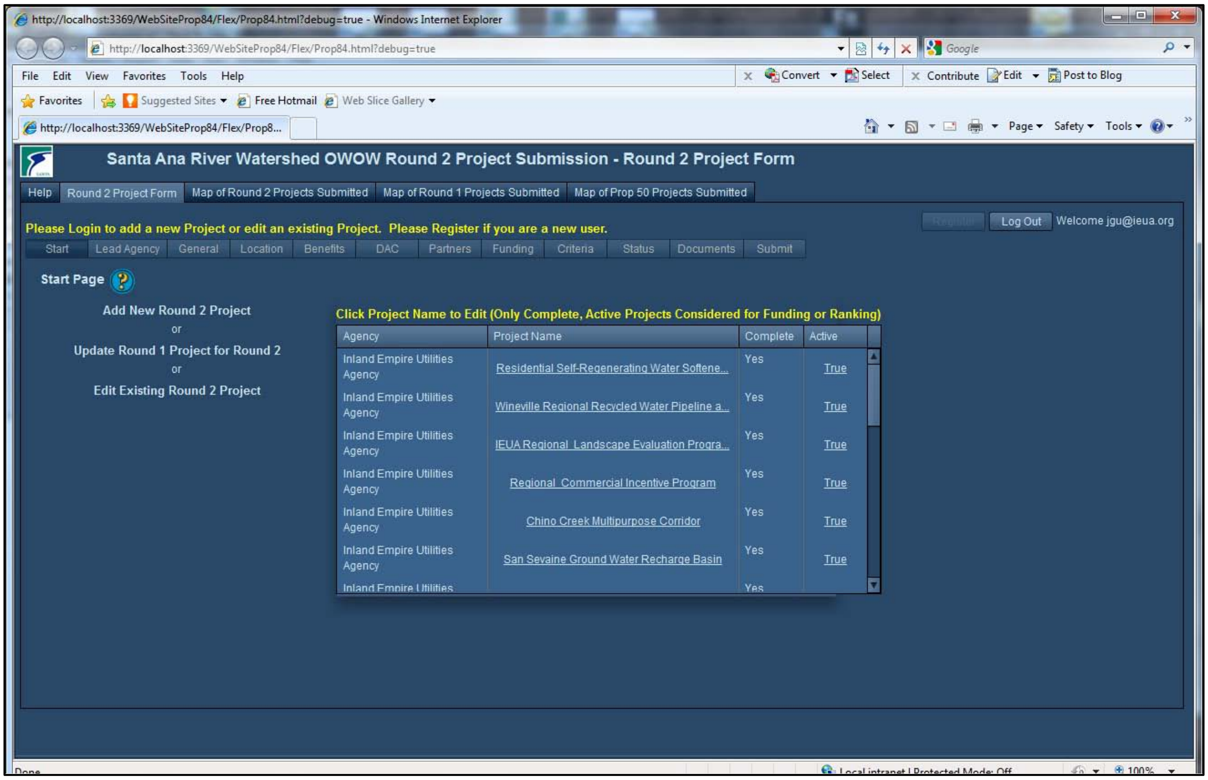
- Indicator narrative describing: What is it, Why it is important, Target or desired condition, Stress condition, Basis of calculation and use, What did we find out/How are we doing, How sure are we about our findings, Technical Information and Analysts
- Thematic map displaying the available spatial data
- Watershed assessment score

Using this assessment tool, SAWPA now has an effective, efficient and responsive ongoing monitoring program for the watershed. A report synopsis of the indicators selected for each goal, and what the analysis told us about the watershed is included in the **Appendix A**.

OWOW 2.0 Project Application Form

OWOW 2.0 Project Application Form was developed by SAWPA staff to provide stakeholders an on-line form for the submittal of project proposals for Proposition 84 Round 2 funding.

Figure 9-2 Project Application Form



The OWOW 2.0 Project Application Form includes key information required to address the goals of SAWPA's OWOW 2.0 IRWM Program, as well as DWR's Proposition 84 Round 2 grant program. Access to the form requires the user to register and the account is password protected.
Key information included in the form includes:

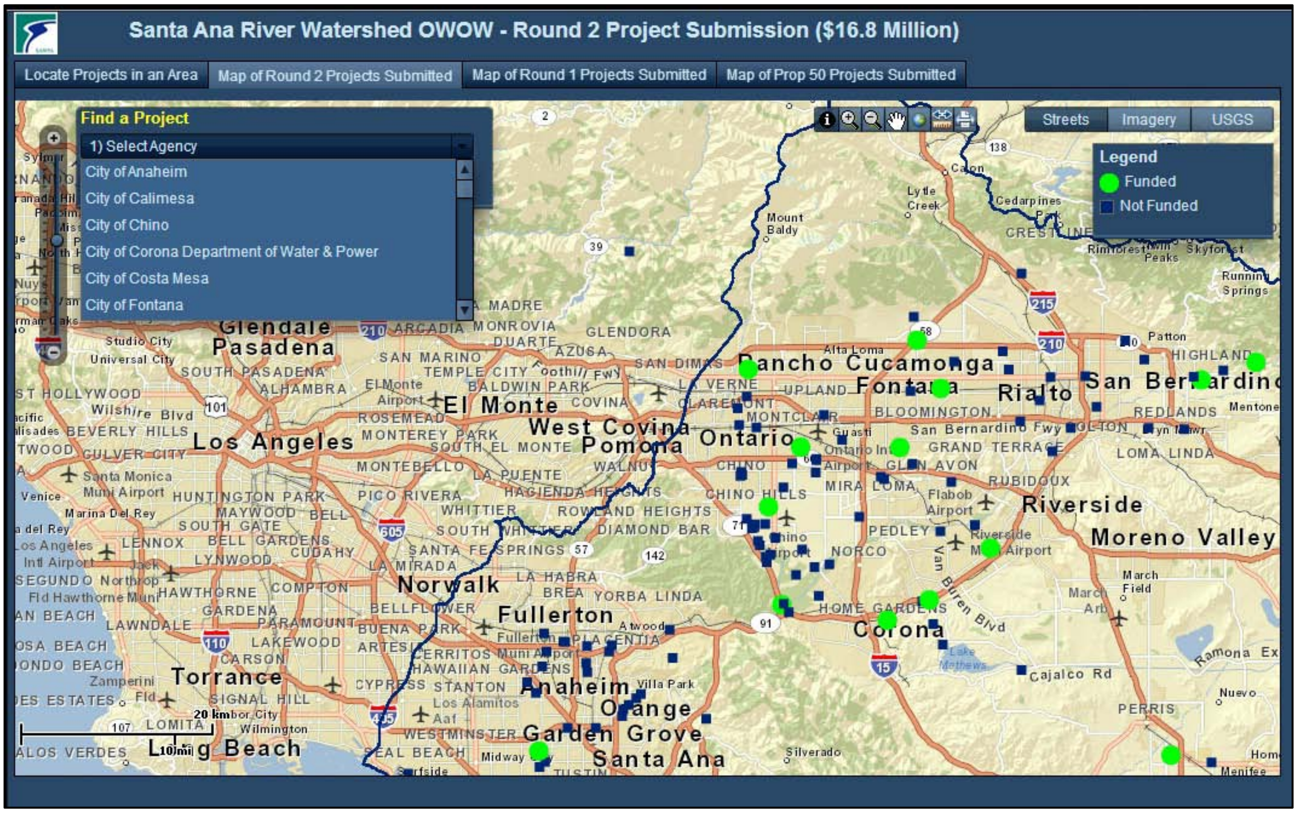
- Lead Agency Contact Information
- Project Location
- Project Benefits
- Disadvantaged Community and Tribal Support
- Project Funding
- Project Partners
- Project Status
- Attachments

Additionally, this on-line form provides the user the ability to import information from earlier proposal submissions.

OWOW 2.0 Submitted Project Map

OWOW 2.0 Submitted Project Map was developed by SAWPA staff to provide stakeholders a tool to identify and review other project proposals submitted for Proposition 84 Round 2 funding. In addition, the tool serves as a tool to assist project proponents with a tool identify potential project partners.

Figure 9-3 Submitted Project Map

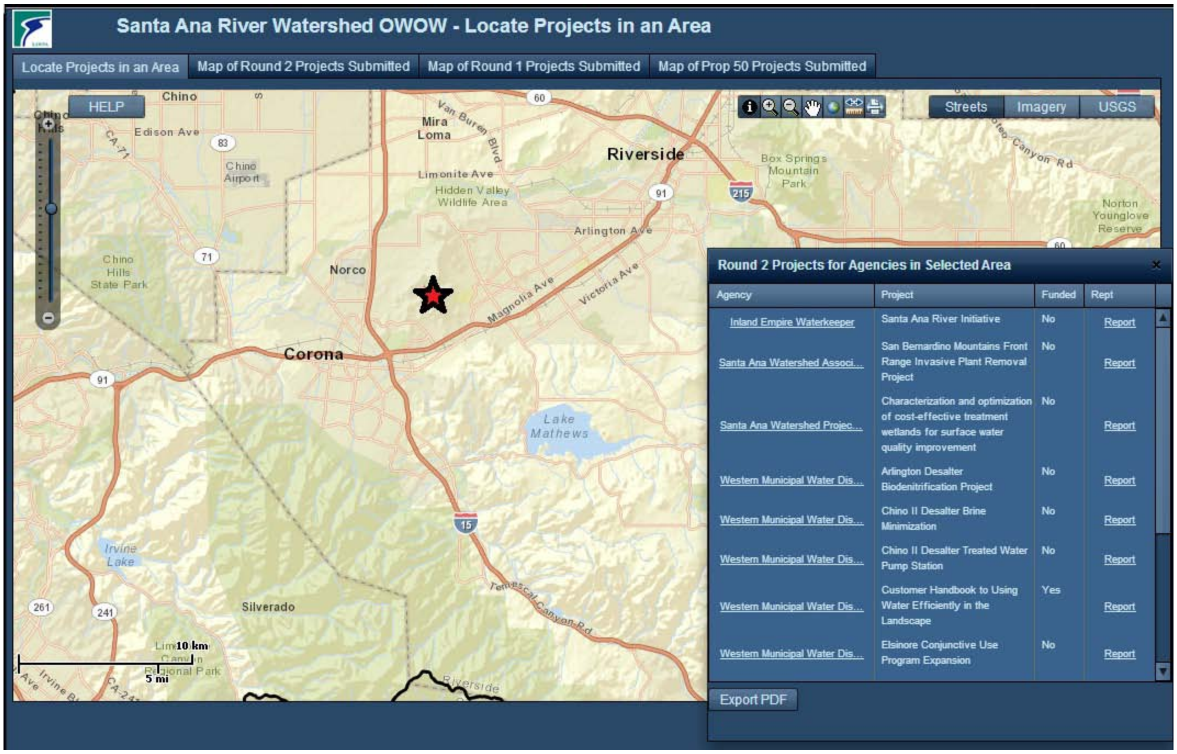


The Project Map identifies the location of each project submitted for Proposition 84 Round 2 funding. The user simply clicks on a project marker and a pop-up window is activated displaying a PDF copy of the completed OWOW 2.0 Project Application Form. Additionally, by hovering over a project marker, the user will be able to view the name of the project applicant.

OWOW 2.0 Project Partner Locator

OWOW 2.0 Project Partner Locator was developed by SAWPA staff to provide stakeholders a tool to identify potential project partners for the development of regional integrated watershed projects.

Figure 9-4 Project Partner Locator



The user simply clicks on the map and a pop-up window is activated displaying agencies whose service area overlaps the proposed project area.

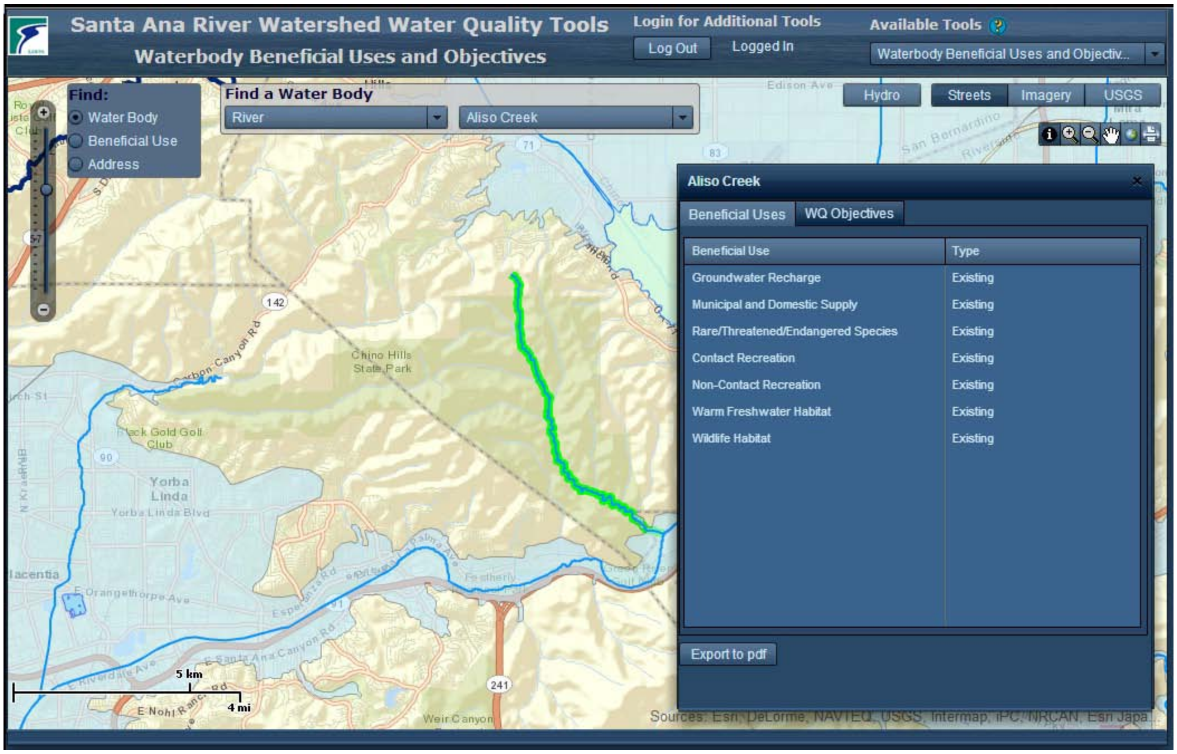
Santa Ana River Watershed Water Quality Tools

SAWPA partnering with the Santa Ana RWQCB 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 waterbodies within the Santa Ana Watershed.

Waterbody Beneficial Uses and Water Quality Objectives

SAWPA partnering with the Santa Ana RWQCB has developed an interactive web application to explore hydrologic features and regulatory criteria established for waterbodies within the Santa Ana Watershed Basin Plan.

Figure 9-5 Waterbody Beneficial Uses and Objectives



This tool provides the user the ability to search a map of the Santa Ana River Watershed to identify a particular hydrologic feature, waterbody beneficial use or street address through a series of searchable menus or by simply clicking on a particular map feature.

Searching by waterbody type activates a set of pull-down menus. The first pull-down menu lists waterbody types including: bays, lakes, rivers, wetlands and groundwater management zones. The second includes a list of each named waterbody of that type identified in the Santa Ana River Watershed Basin Plan. When the user selects a waterbody, a pop-up window is activated displaying applicable beneficial uses and water quality objectives.

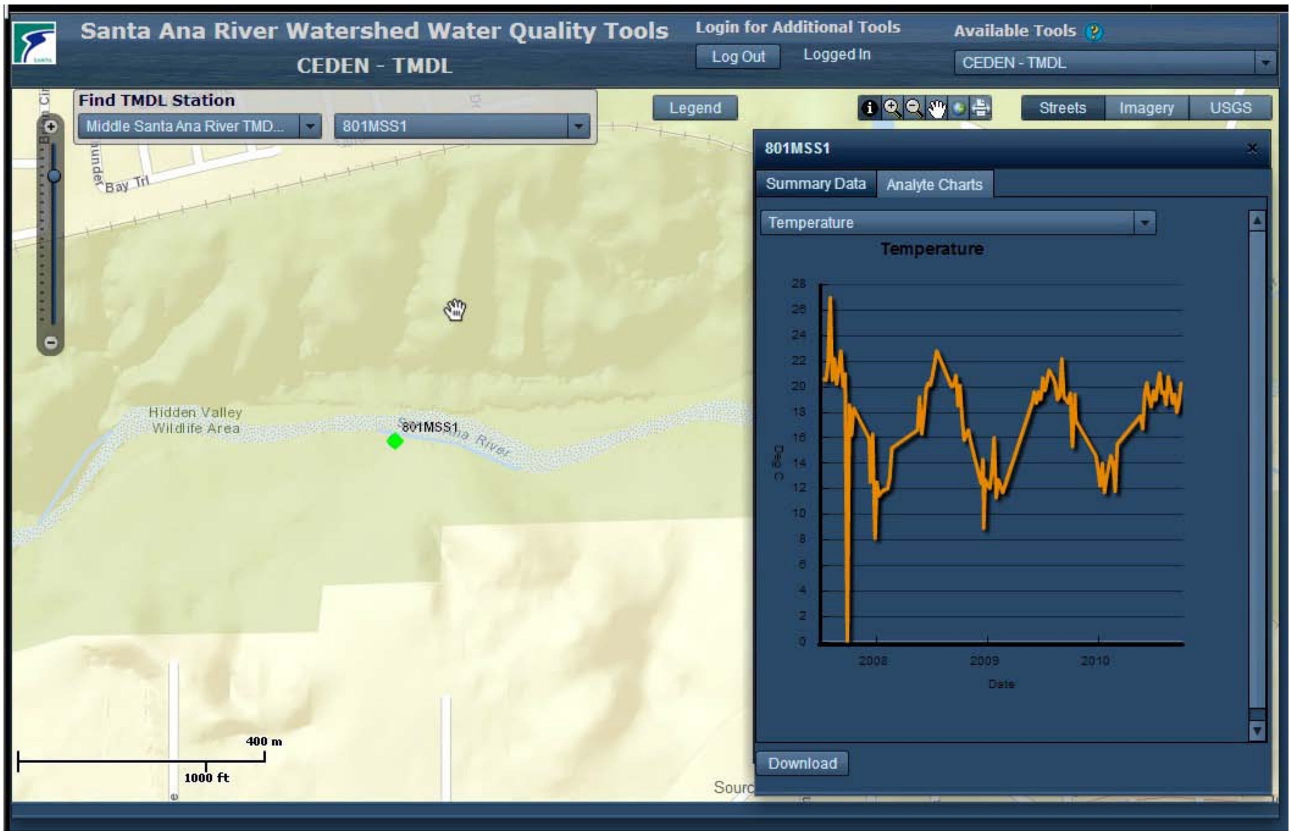
Searching by beneficial use activates a of pull-down menu of beneficial uses types identified in the Santa Ana River Watershed Basin Plan. When the user selects a beneficial use, each waterbody with that particular beneficial use is activated throughout the watershed. Selecting a waterbody activates a pop-up window displaying applicable beneficial uses and water quality objectives.

Additional features of this application include the ability to turn on/off waterbody features, export waterbody data to a PDF file, capture information from the screen and print to a PDF file, and multiple map backgrounds including: street map, satellite imagery and USGS quad.

Water Quality Monitoring Data Tool

SAWPA partnering with the Santa Ana Regional Water Quality Control Board has developed an interactive web application to examine surface water quality data for TMDL monitoring locations within the Santa Ana Watershed Basin Plan.

Figure 9-6 Watershed Water Quality Tools



This tool provides the user the ability to search monitoring locations by regulatory program through a series of searchable menus or by simply clicking on a particular monitoring location within the Santa Ana River Watershed. Current data available includes watershed-wide monitoring data collected through the Lake Elsinore and Canyon Lake nutrient and the Middle Santa Ana River pathogen TMDL programs. Data available in this application is updated on a weekly basis and served through a datamart connection established with CEDEN, managed by the California State Water Resources Control Board (SWRCB).

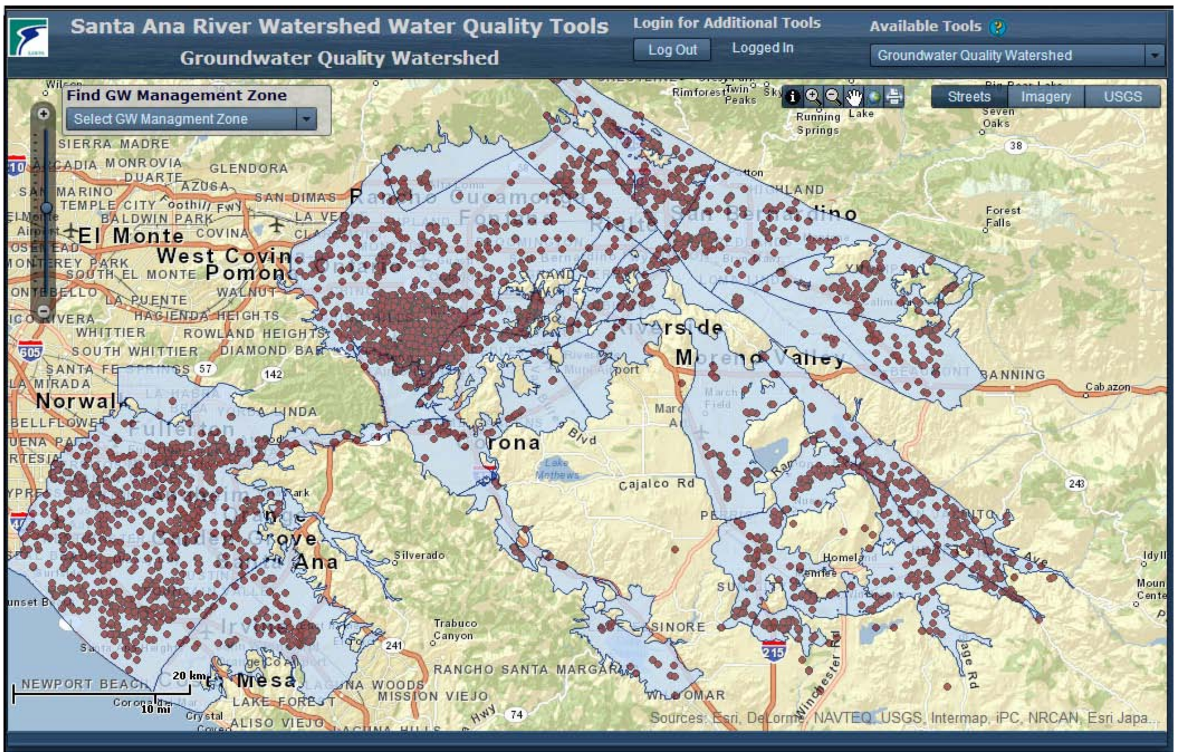
Searching by project activates a of pull-down menu listing regularly monitored stations. Selecting a particular monitoring station zooms the map to the selected location and activates a pop-up window with a series of tabs. The first tab includes a summary of available data collected at that monitoring location including: list of analytes, average result, unit of measure, number of samples and date range. A second tab includes a chart tool, which provides the user the ability to select an analyte from a pull-down menu to view available time series data graphically.

Additional features of this application include the ability to turn export waterbody data to a PDF file, capture information from the screen and print to a PDF file, and multiple map backgrounds including: street map, satellite imagery and USGS quad.

Ambient Groundwater Quality Tool

SAWPA partnering with the Santa Ana RWQCB has developed an interactive web application to examine summary groundwater quality data by groundwater management zones within the Santa Ana Watershed Basin Plan.

Figure 9-7 Groundwater Quality



This tool provides the user the ability to view groundwater quality data summarized by groundwater management zone as reported in the Recomputation of Ambient Water Quality in the Santa Ana River Watershed for TDS and NO3-N for the past 20 year well data collection period. The user can examine summary groundwater management zone data through a searchable menu or by simply clicking on a particular Santa Ana River Watershed groundwater management zone. Selecting a particular groundwater management zone “zooms” the map to the selected location and activates a pop-up window with a series of tabs.

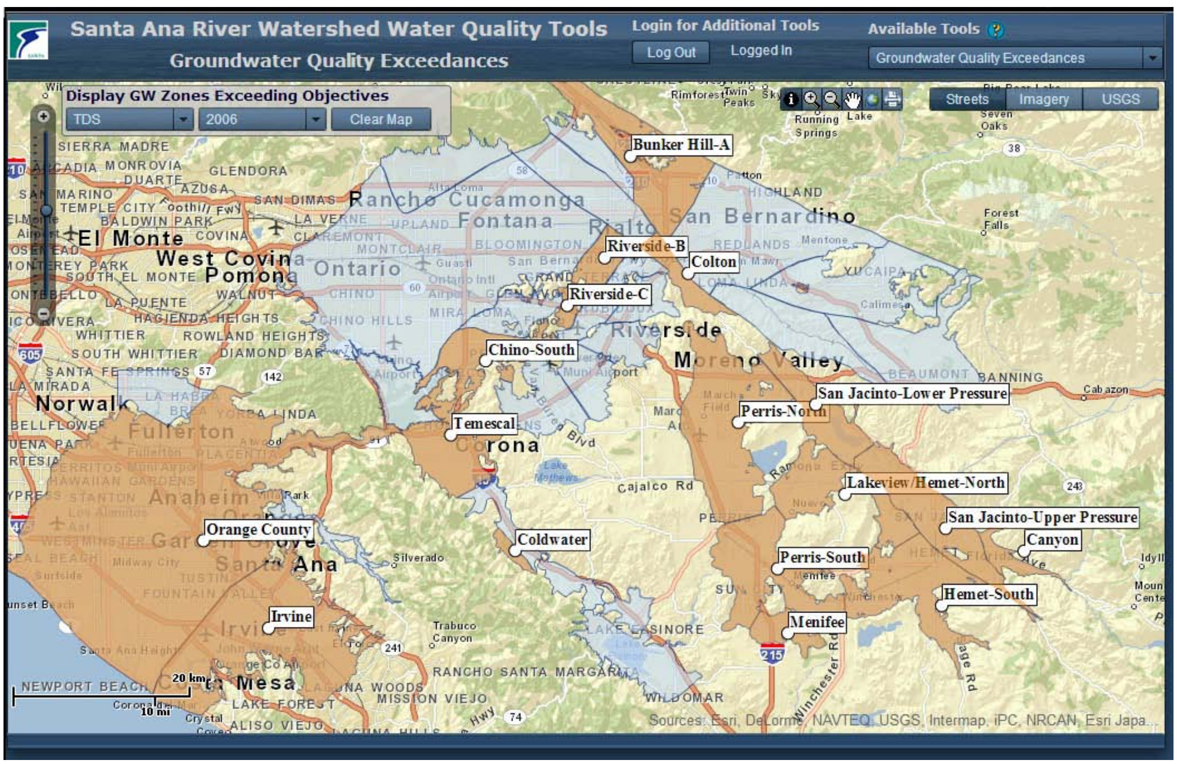
The first tab includes a summary of available data collected at that monitoring location including: list of analytes, average result, unit of measure, number of samples and date range. A second tab includes a graph of available TDS time series data plotted against its water quality objective. A third tab includes a graph of available NO3-N time series data plotted against its water quality objective. A fourth tab includes a chart tool, which provides the user the ability to select an analyte from a pull-down menu to view available time series data graphically.

Additional features of this application include the ability to turn export waterbody data to a PDF file, capture information from the screen and print to a PDF file, and multiple map backgrounds including: street map, satellite imagery and USGS quad.

Groundwater Basins Water Quality Modeling Tool

SAWPA partnering with the SWRCB has developed an interactive web application to examine exceedences to groundwater quality objectives for TDS and NO3-N by groundwater management zone within the Santa Ana Watershed Basin Plan.

Figure 9-8 Groundwater Quality Exceedances



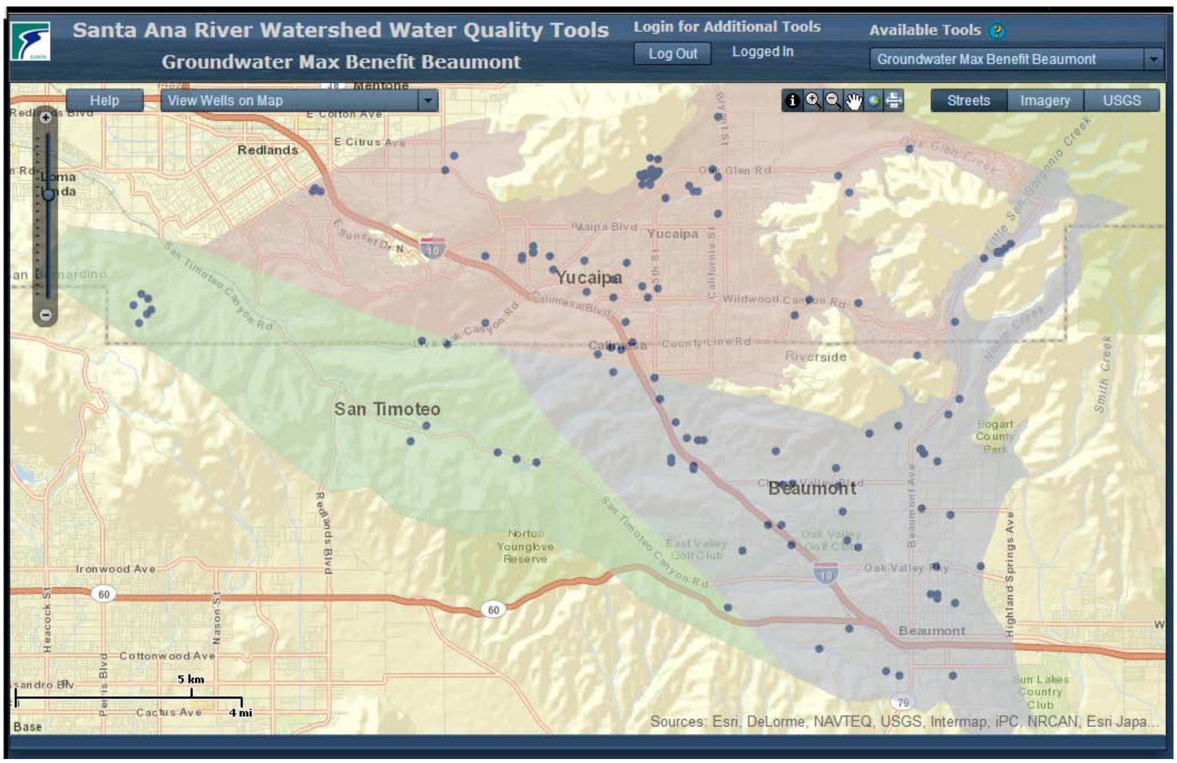
This tool provides the user the ability to view exceedences to groundwater quality objectives for TDS and NO3-N as reported by the Triennial Recomputation of Ambient Water Quality in the Santa Ana Watershed Reports. The user can identify groundwater management zones exceeding groundwater quality objectives for TDS and NO3-N through a series of pull-down menus by selecting between TDS and NO3-N and then selecting a year. After the selections are made, the map refreshes highlighting and naming the groundwater management zones with exceeding the selected groundwater quality objective for the selected year.

Additional features of this application include the ability to turn export waterbody data to a PDF file, capture information from the screen and print to a PDF file, and multiple map backgrounds including: street map, satellite imagery and USGS quad.

Groundwater Basins Maximum Benefit Water Quality Modeling Tool (DRAFT)

SAWPA partnering with the Santa Ana RWQCB is working to develop an interactive web application to examine exceedences to the max benefit groundwater quality objectives for TDS and NO3-N in the Beaumont groundwater management zone within the Santa Ana River Watershed.

Figure 9-9 Groundwater Maximum Benefit



This tool provides the user the ability to examine water quality relating to max benefit groundwater quality objectives for TDS and NO3-N for the Beaumont groundwater management zone as reported in the 2011, Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1990 to 2009. A pull-down menu provides the user the following options to evaluate well data in the Beaumont groundwater management zone.

NO3-N Exceeding BU Objective – highlights wells exceeding the max benefit groundwater quality objective NO3-N in the Beaumont groundwater management zone

NO3-N Concentration Range – view provides a color ramp of NO3-N water quality for all wells

TDS Exceeding BU Objective – highlights wells exceeding the max benefit groundwater quality objective TDS in the Beaumont groundwater management zone

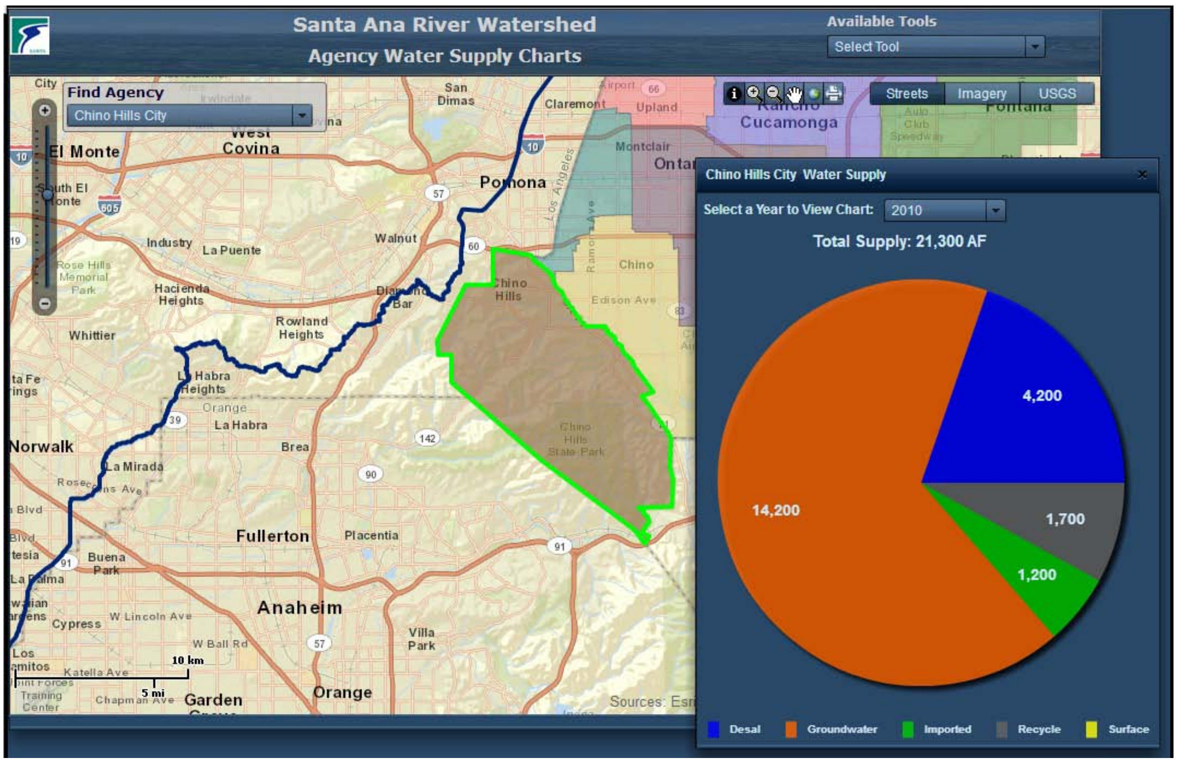
From any of these views, the user can select a highlighted well. This zooms the map to the selected location and activates a pop-up window displaying a summary of TDS and NO3-N water quality data.

Additional features of this application include the ability to turn export waterbody data to a PDF file, capture information from the screen and print to a PDF file, and multiple map backgrounds including: street map, satellite imagery and USGS quad.

Pilot - Water Resource Management Tool

SAWPA partnering with DWR and Esri is working to develop an interactive web application to review and analyze water resources data for water purveyors operating in the Santa Ana River Watershed.

Figure 9-10 Agency Water Supply Charts

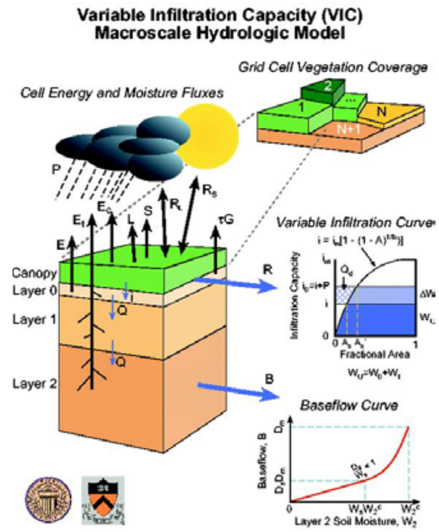


This tool will provide water planners a tool to assess data related to various sources of water supply, and water use, as well as, a number of other related water resource information for the Santa Ana River Watershed. This includes the ability to display, explore and analyze water resources data at a number of levels (agency, basin, watershed) and management scenarios projected over a 20-year planning horizon. The tool is anticipated to be on-line in 2014.

The completed tool will consider the following components:

- Water Retailers and Wholesalers

- Imported Water
- Groundwater withdrawals and recharge
- Water recycling
- Wastewater flows
- Conservation
- Surface withdrawals
- Water Use
- Planned Water Resource projects

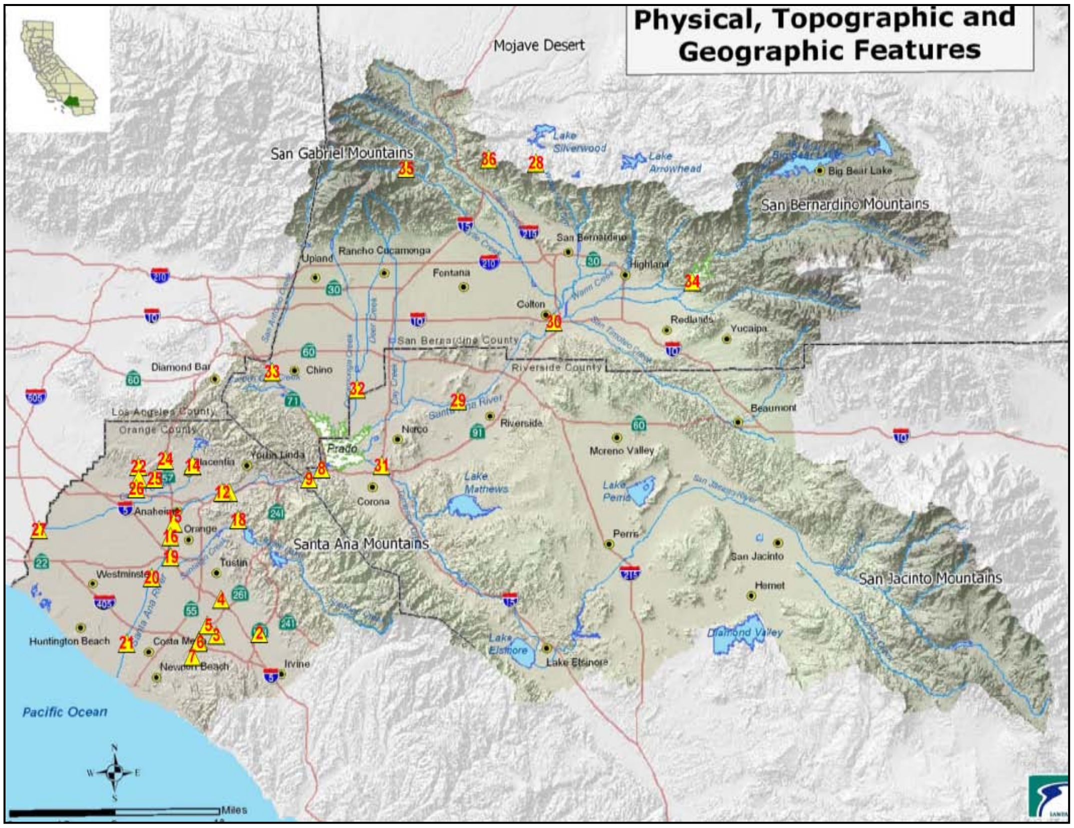


Climate Change Model

A partnership between SAWPA and Reclamation has produced an interactive climate change modeling tool to provide water planners with information on potential impacts of climate change within the Santa Ana River Watershed. The main objective of this particular tool is to develop a simplified modeling framework for evaluating climate change impacts on surface flows, temperature, snow melt, 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 enables the user to explore, identify and download custom climate change data for various scenarios modeled for the Santa Ana River Watershed. Recognizing the importance of potential impacts of climate change in the future, the tool will allow planners to foresee possible issues avoiding misallocation of resources and funds.

While this tool proves to be very useful to agencies within the Santa Ana River Watershed there are still some steps that Reclamation and SAWPA are taking in order to make it even more effective. This includes data refinement, model refinement, cross validation, and sea level rise information. All of these steps target any future issue or potential impact that climate change might have within the Santa Ana River Watershed.

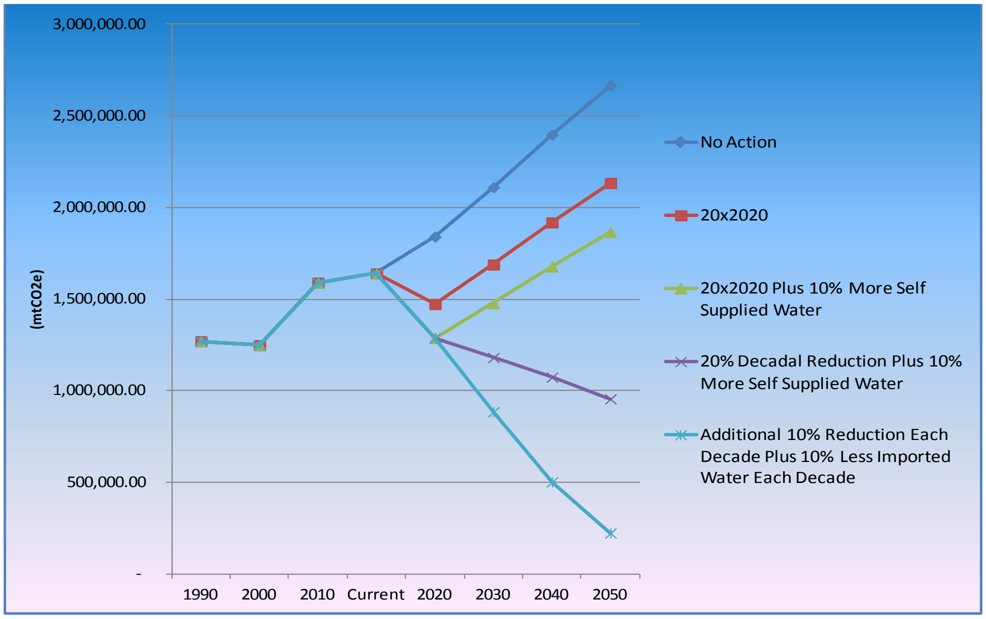
Figure 9-11 Physical, Topographic and Geographic Features within the SARW



Green House Gas Modeling Tool

Reclamation, working with SAWPA, developed an interactive green house gas emissions modeling tool to provide water planners and the public information about the impacts of green house gases on water resources within the Santa Ana Watershed. This tool enables the user to explore, identify and download custom green house gas data for a suite of water technologies modeled for the Santa Ana River Watershed. It will also exhibit energy consumption in the delivery and treatment process with relation to water. In accordance with AB – 32 (Assembly Bill) which requires regions within California to reduce their overall GHG emission, the tool also evaluates both the supply and demand of water in the Santa Ana River Watershed. This tool will prove to be very useful within the watershed because it allows agencies and SAWPA alike 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 is anticipated for use in future GHG emissions calculations by project proponents

Figure 9-12 GHG Emissions Scenario Comparison



Groundwater Basins Water Quality Modeling Tool

In partnership with SAWPA and Reclamation, an interactive groundwater modeling tool was developed to allow planner and other entities to identify potential impacts of climate change on groundwater resources within the Santa Ana River Watershed. The tool will enable the user to explore, identify and download groundwater data for various climate change scenarios modeled for the Santa Ana River Watershed. This data includes but is not limited to groundwater elevation, basin-average precipitation and potential ET, stream flows, M&I demand, agricultural demand, and augmented supplies. Utilization of this tool provides many different types benefits, the user is able to apply information the project might need in order to account for any future climate change scenarios. This is an important part of the project process, since an agency/public is able to identify problematic situations now they will be able to avoid or deal with them in the future. This tool at this time reflects four general groundwater management regions as defined by DWR for the watershed and is currently still under development.

OWOW Watershed Outreach Tools

SAWPA's technical approach for public outreach required a broad application of current technologies due to the difference in skill sets of the watershed audience. The demographics of this audience ranged from users who relied on the telephone (land line) for information to mobile users comfortable with Twitter. The middle ground in regards to user's technology comfort zone was the web itself. SAWPA's approach relied on three distinct technologies, the Web, Email, and Telephony, to best meet the user's abilities to receive information.

The Web provided SAWPA with several avenues of outreach. The first avenue being SAWPA's own website and SAWPA's ability to quickly modify and create pages dedicated to the OWOW process. Even the home page provided immediate announcements and directions for further information. The second avenue was a Water Blog linked to the SAWPA home page that provided additional information on a wide range of water topics, often supporting current issues or related projects. The third avenue was allowing users access through the web to project forms, project reports, and interactive GIS Tools. This provided users with additional information on all projects and water issues thru these reports and the use of the GIS Tools. The fourth avenue was providing profile sites for users to locate SAWPA and the OWOW planning process on Facebook and LinkedIn.

Telephony provided watershed users with the ability to dial in and provide input to many of the OWOW meetings that occurred at SAWPA. The use of a free audio bridge along with web enabled presentation tool allowed users to call in anywhere in the watershed and participate in the planning process. On the mobile side, the use of Twitter provided users with quick announcements and links to recently published documents, invitations to events, and current projects in the watershed.

These methods of outreach provided the multifaceted audience with up-to-date information while using technology they were comfortable with. Technology use and its methods are constantly being reviewed during the OWOW process and will be updated to further increase the watershed audience.

SAWPA's social media tool kit could include:

- Home base (Water Blog)
- Social conversation site (Twitter)
- Social profile site (Facebook) (B2C)
- Business profile (LinkedIn) (B2B)
- Search Tools (i.e., Google Blogs search or Technorati)

As efforts in a particular area grow, additional tools may need to be added (i.e., listening, social bookmarking, and photo sharing tools).

Other Social Outreach Tools

Watershed-Wide Master Calendar

The Watershed-wide master calendar was launched on January 15, 2012. Information about the watershed-wide calendar was sent out to the entire OWOW Constant Contacts data base announcing the new watershed-wide calendar and inviting outside agencies to post their agency's events onto this interactive master regional calendar. Participants may obtain passwords to input their events by contacting the IT Department.

As further refinements are made, the calendar will contain links to the respective agencies' websites (i.e., download registration information etc.) thus creating a helpful resource tool to all stakeholders. It is intended that the calendar will be a "go-to" place to check out watershed-wide events. Event postings will be promoted through in Linked In, Twitter, and Facebook posts every time an announcement or significant event is added.

In the early stages of development and implementation, most likely SAWPA staff will need to add and monitor the events on this calendar until outside interest and momentum are deemed acceptable and the calendar becomes self-sufficient. If this step is overlooked, the calendar's possible fate could be jeopardized immediately after launching. It is important to designate a staff member to monitor and remove outdated events that outside event planners do not remove. This staff member should monitor on a weekly basis posted events and remove any outdated events.

This tool will be in addition to the normal SAWPA in-house events/meetings calendar already posted on the SAWPA website.

Mass Emails

Mass emails are authorized by the General Manager prior to release. Every time a mass email is sent, Constant Contact provides an opportunity to send out that same message as a social media message concurrently to Linked In, Twitter and Facebook by utilizing Constant Contact's "Simple Task" option. This additional option should be incorporated as "normal" procedure when sending out future mass emails. By sending social media messages when sending out mass emails, SAWPA's social media presence could be further enhanced.