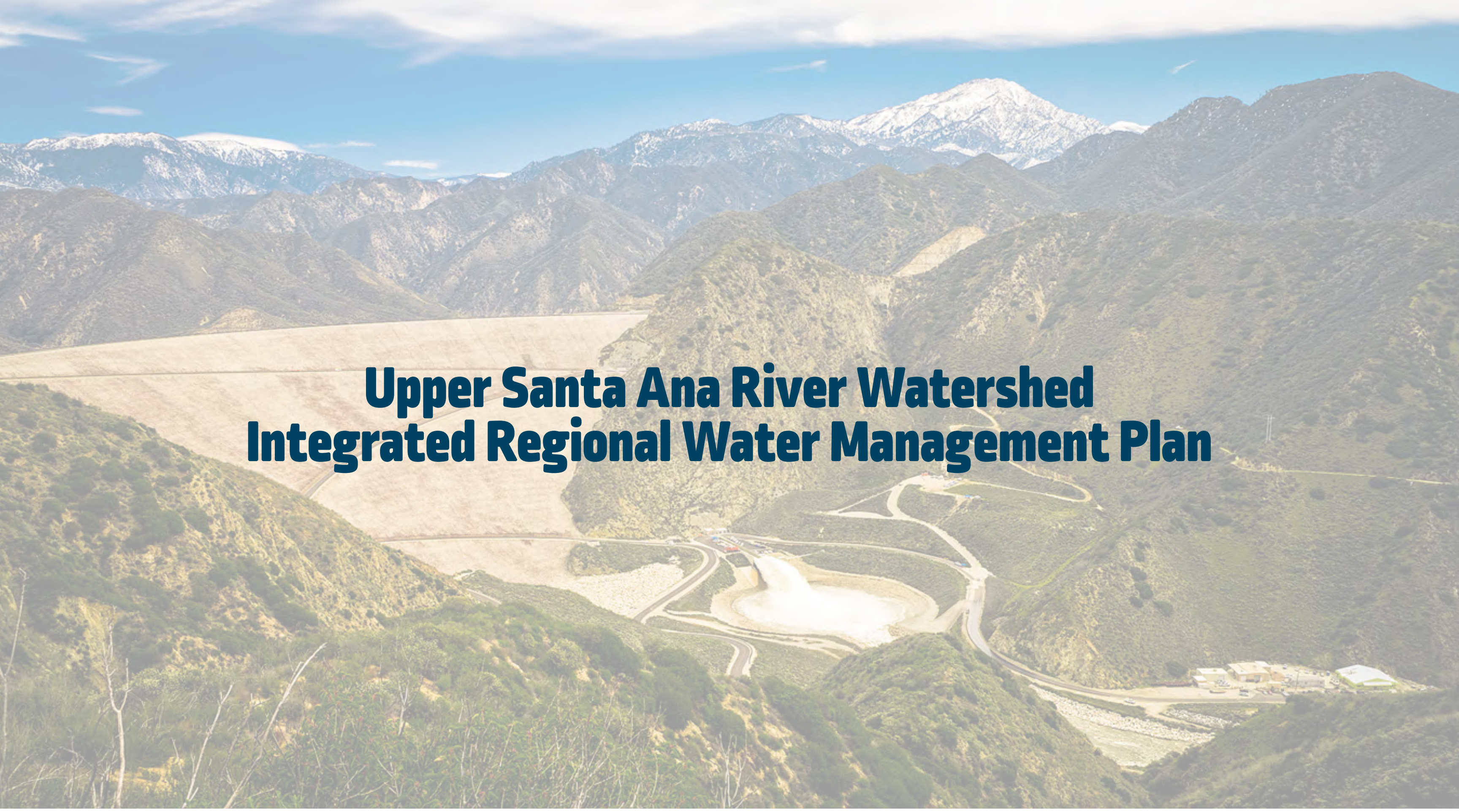

Upper Santa Ana River Watershed Integrated Regional Water Management Plan

January 2015

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Acronyms

Acronym	Definition
ACEC	Area of Critical Environmental Concern
AF	acre-foot
AFY	acre-feet per year
AHHG	area of historic high groundwater
Association	Upper Santa Ana Water Resources Association
Basin Plan	Water Quality Control Plan for the Santa Ana River Basin
BBARWA	Big Bear Area Regional Wastewater Agency
BDCP	Bay-Delta Conservation Plan
Big Bear Municipal	Big Bear Municipal Water District
BLM	U.S. Bureau of Land Management
BMO	Basin Management Objective
BMP	best management practice
BTAC	Basin Technical Advisory Committee
CAP	Customer Assistance Program
CASGEM	California Statewide Groundwater Elevation Monitoring
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIS	change in storage
Cl	Chloride
COD	Chemical Oxygen Demand
CRA	Colorado River Aqueduct
CWP	California Water Plan Update 2009
DACs	Disadvantaged Communities
DBCP	debromochloropropane
DEIR	Application Draft Environmental Impact Report
Delta	Sacramento-San Joaquin Delta
DMM	Demand Management Measure
DWR	California Department of Water Resources
EC	Electrical conductivity
Eastern	Eastern Municipal Water District
EPA	Environmental Protection Agency
ESA	US Endangered Species Act
ESRI	Environmental Systems Research Institute
Exchange Plan	Santa Ana River-Mill Creek Cooperative Water Project Agreement
Fontana Union	Fontana Union Water Company
GIS	Geographic Information System
HCP	Upper Santa Ana River Habitat Conservation Plan
HTROD	Hazardous Tree Removal Operations Division
IERCD	The Inland Empire Resource Conservation District
IEUA	Inland Empire Utilities Agency

Acronym	Definition
IRWM	Integrated Regional Water Management
IRWM Plan	Integrated Regional Water Management Plan
IWP	Integrated Watershed Plan
LAFCO	Local Agency Formation Commission
LID	Low impact development
MAC	Municipal Advisory Commission
MCL	maximum contaminant level
Metropolitan	Metropolitan Water District of Southern California
Mgd	million gallons per day
mg/L	milligrams per liter
MHI	median household income
MOU	Memorandum of understanding
MPD	Master Plans of Drainage
MSHCP	Multi-Species Habitat Conservation Plan
msl	mean sea level
Na	Sodium
NEPA	National Environmental Policy Act
NO_3	Nitrate
NPDES	National Pollutant Discharge Elimination System
NWIS	National Water Information System
OCWD	Orange County Water District
OPMODEL	Operations Model
OWOW	One Water One Watershed
PAEP	Project Assessment and Evaluation Plan
PCE	perchloroethylene
PIG	BTAC Project Implementation Group
ppb	parts per billion
Reclamation	United States Bureau of Reclamation
Region	Upper Santa Ana River Watershed IRWM Region
RIX	Rapid Infiltration and Extraction
RM	river mile
RPU	City of Riverside Public Utilities
RRWQCP	Riverside Regional Water Quality Control Plant
RUWMP	Regional Urban Water Management Plan
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SAR	Santa Ana River
SART	Santa Ana River Trail System
SARWQCB	Santa Ana Regional Water Quality Control Board
SAWPA	Santa Ana Watershed Project Authority
SBBA	San Bernardino Basin Area
SBCFCD	San Bernardino County Flood Control District
SBMWD	San Bernardino Municipal Water Department

Acronym	Definition
SBNF	San Bernardino National Forest
SBVWCD	San Bernardino Valley Water Conservation District
SBX7-7	Senate Bill X7-7 (Water Conservation Act of 2009)
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCWC	Southern California Water Committee
SDAC	Severely Disadvantaged Communities
SGPWA	San Gorgonio Pass Water Agency
SO4	Nitrogen
SOCs	Synthetic Organic Compounds
State	State of California
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAG	Technical Advisory Group
TDS	total dissolved solids
TIN	Total Inorganic Nitrogen
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USARW	Upper Santa Ana River Watershed
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
Valley District	San Bernardino Valley Municipal Water District
VOCs	Volatile Organic Compounds
Western	Western Municipal Water District
WQMA	Water Quality Management Agency
WRI-CSUSB	Water Resources Institute /California State University San Bernardino
WRP	water reclamation plant
WSPA	Wooly-Star Preserve Area
WUE	Water Use Efficiency
West Valley	West Valley Water District
WWTP	Waste Water Treatment Plant
YVWD	Yucaipa Valley Water District

Executive Summary

Integrated Regional Water Management in the Upper Santa Ana River Watershed Region

The Upper Santa Ana River Watershed (USARW) has a long-standing history of collaboration by water resource management agencies to manage the watershed's unique water supply, water quality, flood, and habitat challenges. In 2005, this collaboration allowed the agencies to successfully form the USARW Integrated Regional Water Management Region (IRWM Region or Region) and develop an integrated plan for managing water resources in the Region. The USARW Integrated Regional Water Management Plan (IRWM Plan) is the result of this effort. The 2014 IRWM Plan serves as an update to the IRWM Plan developed in 2007, and incorporates new information describing the Region, updates goals and objectives, re-evaluates strategies, and develops a process for future implementation of the IRWM Plan.

Stemming from this effort, the agencies in the Region created the Basin Technical Advisory Committee (BTAC) to facilitate implementation of the IRWM Plan. Development of the BTAC has strengthened dialogue and cooperation between agencies and has improved regional planning. The BTAC, which serves as the Regional Water Management Group, is open to all agencies and stakeholders who desire to participate in the IRWM Region's planning and management efforts.

Agencies Developing the IRWM Plan Update

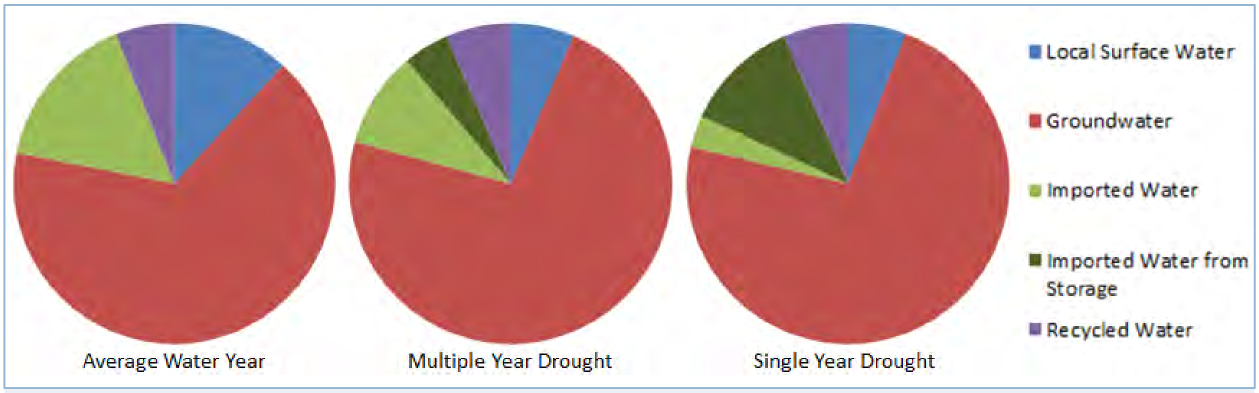
1. Big Bear Lake Department of Water and Power
2. Big Bear City Community Services District
3. City of Loma Linda
4. City of Redlands Municipal Utilities and Engineering Department
5. City of Rialto
6. City of Riverside Public Utilities Department
7. East Valley Water District
8. Fontana Union Water Company
9. San Bernardino County Flood Control District
10. San Bernardino Municipal Water Department
11. San Bernardino Valley Municipal Water District
12. San Bernardino Valley Water Conservation District
13. San Gorgonio Pass Water Agency
14. West Valley Water District

Water Resources Management Challenges

The USARW IRWM Region, which begins just upstream of Prado Dam and extends into the San Bernardino Mountains, covers over 850 square miles of urban area, agricultural land, and open space that provide a multitude of water resource-related benefits and challenges.

Water supply management in the Region dates back to the 1800s when predecessors of today's water agencies were constructing ditches to deliver water. Management now consists of dozens of water supply agencies that deliver water to this rapidly growing Region. These water suppliers also face institutional complexities (particularly those related to groundwater management) and must account for the hydrological variation that occurs in both local and imported water supplies. The IRWM Region's water suppliers plan to meet demand through a combination of imported water, groundwater, local surface water, recycled water, and water use efficiency programs. By 2035, demand in the Region is projected to increase by over 100,000 AFY, and will require the continued development of a diverse water supply portfolio to overcome various challenges and uncertainties.

As shown below, the IRWM Region is highly dependent on its local water supplies, particularly precipitation stored as groundwater, which provides approximately 67% of supplies during average years and over 70% of supplies during drought years. The Region plans to store as much water as possible in groundwater basins during wet years and then to pump this water from groundwater storage during drought years (i.e. conjunctive use).



To meet demand during drought years, the IRWM Region relies on local supplies and imported water from storage (based on 2015 supply projections).

Water suppliers must also manage for other uncertainties such as variability in supplies, particularly imported water, caused by drought and other reliability concerns such as catastrophic events (e.g. earthquakes), environmental protection goals and mandates in the Sacramento-San Joaquin Bay Delta (Delta), climate change, water quality, and imported water costs.

The IRWM Region's groundwater managers must balance conjunctive use with other constraints such as the risk of liquefaction. Careful monitoring and ongoing coordination among members of the BTAC is critical to achieve this balance.

Meeting the Region's water demand also requires management of local water quality. While groundwater quality is generally good in the Region, past industrial and military activities have required groundwater remediation of volatile organic compound (VOC) contamination plumes. Water quality treatment is also necessary in some areas to treat for other contaminants caused by agricultural activities and urban pollutants (e.g. nitrate, perchlorate, pesticides and inorganic materials). In addition, as water recycling increases in the future, the Region will need to monitor salt accumulation consistent with the Santa Ana Regional Water Quality Control Board's Basin Plan goals.

Another issue of concern in the Region is stormwater and flood management. Stormwater management has been an ongoing challenge in the USARW Region. In the past, flood events have caused loss of life and damage to property.

The San Bernardino County Flood Control District was created in response to historical flooding that caused loss of life and damage to property.

The San Bernardino National Forest is home to extraordinary natural resources.

Flood control facilities, such as detention basins, have provided much needed control of these flows. The IRWM Region's groundwater managers are working with flood control agencies to optimize the use of these flood control facilities to increase the recharge of stormwater into the groundwater basin. They hope to strike a balance between flood control and recharge that will ensure protection from flooding, while providing additional supplies to meet growing future demands and to supplement these supplies during drought years.

The USARW Region contains extraordinary natural resources, including the San Bernardino National Forest, which serves as the headwaters for the Santa Ana River. Downstream, the Santa Ana River and its tributaries provide habitat to riparian and aquatic species, and provide connectivity to upland habitats. The scrub, woodland, and riparian habitats in the Region support innumerable species, including species of concern such as the San Bernardino kangaroo rat, Santa Ana River wooly star, and Slender-Horned spine flower. The importance of the Region's habitats is underscored by the multiple environmental and ecological management plans currently in place, including the Western Riverside County Multi-Species Habitat Conservation Plan, Upper Santa Ana Wash Land Management and Habitat Conservation Plan, and Upper Santa Ana River Habitat Conservation Plan. In addition to serving as habitat, these areas provide valuable open space and recreational areas for the residents of and visitors to the Region. Though large areas of habitat and open space have been conserved, the IRWM Region recognizes the importance of further restoring or improving habitat that has been lost to urbanization, and preserving habitat that is in danger due to invasive species. Maintaining and improving the Region's habitats also serves to support surface water quality. In particular, ongoing forest thinning projects in the San Bernardino National Forest serve to maintain forest habitat, as well as reduce the danger of wildfires and their associated water quality impacts downstream from sedimentation.

The BTAC evaluated the vulnerability of the IRWM Region's resources to climate change impacts. Within the Region, climate change may exaggerate existing uncertainties by causing decreases in precipitation, less frequent but more intense storms, and higher temperatures. The BTAC identified several vulnerabilities associated with these impacts, including additional imported water supply uncertainty, additional potential challenges to capturing stormwater during more intense storms, water quality impacts due to more frequent and intense wildfires, degraded water quality and aquatic habitat impacts due to higher temperatures, flood system impacts due to more intense storms, and increased irrigation demand due to higher temperatures.

These issues and challenges to water supply, water quality, flood management, and habitat and open space must be carefully managed to maintain the IRWM Region's water resources for future generations.

Goals, Objectives and Strategies

The BTAC developed a series of goals to help the USARW IRWM Region overcome the variety of issues and challenges. In addition, BTAC established measureable objectives, or targets, they hope to achieve over the next 5-year planning cycle. These goals and objectives are listed below.

USARW IRWM Region Water Management Goals and Objectives

Goal	Objectives
Goal #1: Improve Water Supply Reliability	1a: Reduce demand 20% by 2020
	1b: Increase utilization of local supplies by 23,000 AFY • Stormwater: 20,000 AFY • Recycled Water: 3,000 AFY
	1c: Increase storage by 10,000 AF
	1d: Prepare for disasters by implementing 2 new interties between water agencies
	1e: Monitor and adaptively manage climate change impacts by implementing 3 projects that reduce energy demands
	1f: Ensure equivalent water supply services for DACs
Goal #2: Balance Flood Management and Increase Stormwater Recharge	2a: Utilize 500 acres of flood control retention/detention basins that are not currently used for recharge
	2b: Reduce FEMA reported flood area
	2c: Ensure equivalent implementation of flood projects in DAC areas and implement at least 1 flood control project in a DAC area
Goal #3: Improve Water Quality	3a: Ensure no violations of drinking water quality standards
	3b: Improve surface and groundwater quality by treating 3,000 AFY of water supply
	3c: Manage total dissolved solids and nitrogen in groundwater
	3d: Ensure equivalent water quality services for DACs
Goal #4: Improve Habitat and Open Space	4a: Improve habitat and open space by 1,200 acres
	4b: Identify "multi-use" opportunities to increase recreation and public access and identify at least 1 multi-use project

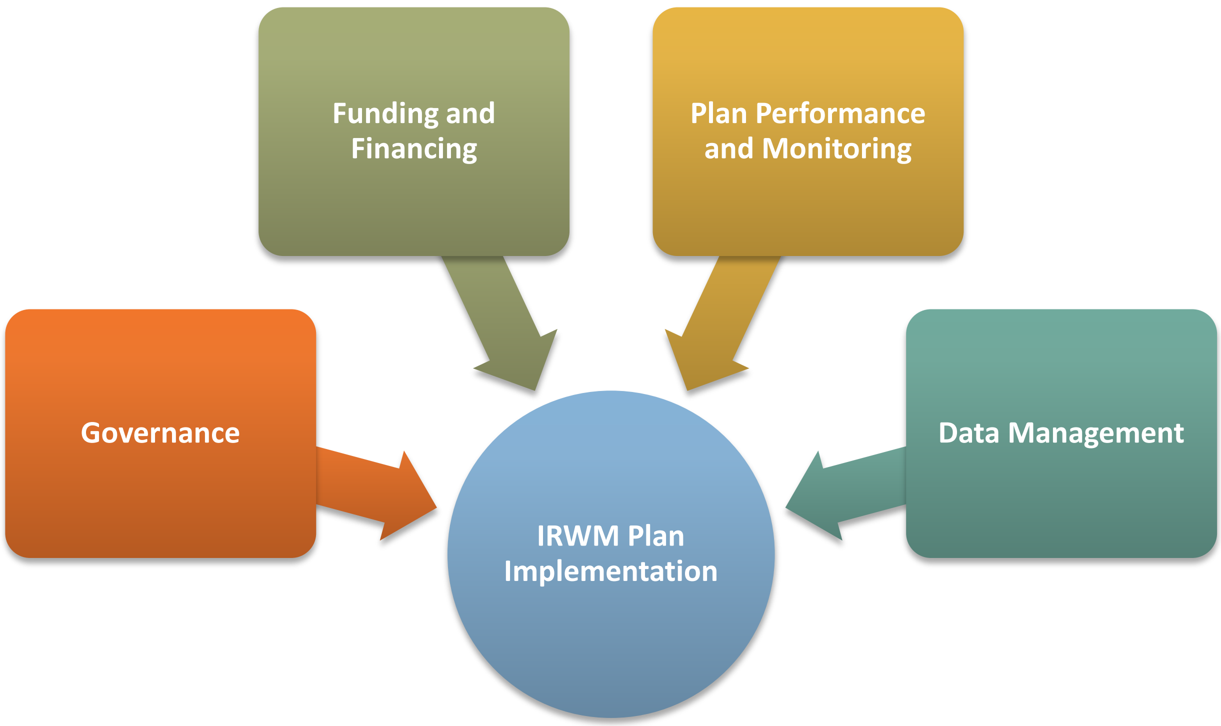
Keeping the Region's unique issues and challenges in mind, the BTAC developed a number of water management strategies to help them reach their goals and objectives. These strategies, listed below, intentionally align with the resource management strategies (RMS) listed in the *California Water Plan* and reflect the unique aspects of the Region's water resources.

Water Resource Management Strategies

1. Continue Basin Management in the San Bernardino Basin Area
2. Continue Forest Management
3. Continue Hazardous Fuels Reduction in the Forest
4. Coordinate Land Use Planning and Management with Water Resources Management
5. Develop Basin Management in Yucaipa Basin
6. Develop Desalination
7. Develop Watershed Management Projects and Programs
8. Improve Drinking Water Treatment and Distribution
9. Identify Corridors for Species
10. Identify Projects that Increase Recharge
11. Identify Projects that Increase Surface Water and Groundwater Storage Inside and Outside the Region
12. Identify Water Transfer Opportunities
13. Implement Agricultural Lands Stewardship
14. Implement Agricultural Water Use Efficiency
15. Implement Pollution Prevention Measures
16. Implement System Reoperation
17. Implement Urban Water Use Efficiency
18. Improve Supply Conveyance – Delta
19. Improve Supply Conveyance – Regional/ Local
20. Incorporate Environmental Opportunities and Constraints into the Design Process for Facilities
21. Incorporate Opportunities to Improve Habitat and Increase Recreation and Public Access During the Facilities Design Process
22. Increase Recycled Water Use
23. Increase Stormwater Capture
24. Maintain and Improve Water-Dependent Recreation
25. Manage High Groundwater Potential
26. Manage Urban Runoff
27. Match Water Quality to Use
28. Monitor Consumer Confidence Reports
29. Operate Existing Facilities to Increase Recharge
30. Optimize Wet Year Storage and Dry Year Pumping (Conjunctive Management & Groundwater)
31. Participate in the SAWPA Basin Management Task Force
32. Protect Recharge Areas
33. Provide Economic Incentives
34. Remediate Groundwater Contamination Plumes
35. Restore Ecosystems
36. Review DACs Every 5 Years
37. Support the Bay Delta Conservation Plan

Implementation of the IRWM Plan

To date, the agencies located within the USARW IRWM Region have successfully implemented numerous water management strategies and projects, and continuously monitor progress toward achieving their goals and objectives. The responsibility for implementation of the IRWM Plan will continue to be guided by the BTAC agencies, all of whom participated in the planning process and prepared the 2007 IRWM Plan and this 2014 IRWM Plan. The success of the IRWM Plan's implementation will be ensured through ongoing plan performance and monitoring, data management, and the Region's funding and financing plan. These ongoing activities in combination with the integrated goals, objectives, and strategies developed through this IRWM Plan will ensure that the Region's water resources are sustainably managed into the future.

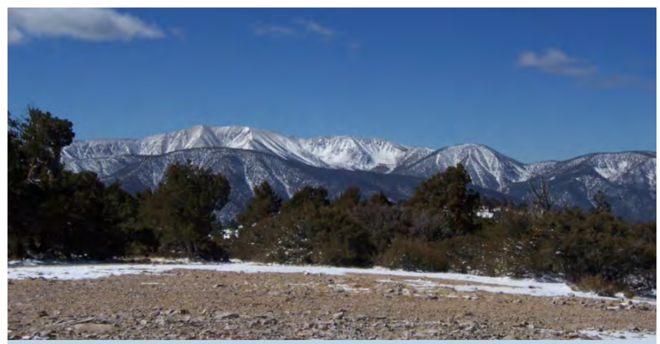


1 Regional Planning, Governance, Outreach and Coordination

1.1 Introduction

In 2005, the members of the Upper Santa Ana Water Resources Association (Association), composed of agencies in the Upper Santa Ana River (SAR) watershed that share a common concern for the area's water resources, met and agreed to develop an Integrated Regional Water Management Plan (IRWM Plan) to address water management issues for the communities of the Upper SAR watershed. The IRWM Plan was developed by several local agencies that formed a Technical Advisory Group (TAG), later becoming known as the Basin Technical Advisory Committee (BTAC).

The Upper Santa Ana River Watershed IRWM Region (IRWM Region or Region) covers 852 square miles of the SAR watershed (approximately 32% of the watershed), and is primarily located in San Bernardino and Riverside Counties, as shown in Figure 1-1. The Region is comprised of a number of cities and agencies, and has several unique factors that support the development of a plan to guide future water resources planning in the area, including: rapid population growth; hydrologic characteristics that separate it from the lower portion of the SAR watershed; and significant institutional issues, particularly those governing the IRWM Region's groundwater basins which are geologically separated from the lower watershed and are governed by their own judgments. This IRWM Plan was developed through ongoing efforts and partnerships with the cities and agencies in the Region to develop plans, projects, and programs at regional levels.



The Santa Ana River System originates high in the San Bernardino Mountains. (Photo by Ryan Gilmore).

The Region's first IRWM Plan, which was completed in 2007 (2007 IRWM Plan), identified, defined, and established strategies to capitalize on all water management opportunities that were present at that time or would potentially become available in the USARW Region in the future. With careful and thoughtful integrated planning, the participation of water managers and stakeholders, and the development of robust water management strategies and implementation tools, the Region's water entities have improved and continue to improve their water supply reliability and self-reliance for future water supplies. Continued implementation of the IRWM Plan will help the fast-growing IRWM Region continue to increase self-reliance, while providing reliable, high quality water for economic growth and enhancing the well-being of local residents.

1.2 Purpose and Need for the IRWM Plan

The primary purpose of the IRWM Plan is to encourage integrated planning among the agencies in the IRWM Region. In particular, the need to improve water supply reliability by implementing local supply projects is recognized as a priority given that imported water is increasingly viewed as a less reliable supply, and considering that the water purveyors within the Region rely on imported water to meet between 13% and 16% of their demands. As the IRWM Region continues to implement the strategies in the IRWM Plan, it will be better positioned during drought periods.

In addition, the IRWM Region is dedicated to protecting its groundwater basins from water quality degradation and threat of liquefaction, where applicable, as well as maintaining its natural and recreational water resources.

1.3 Regional Governance and Stakeholder Involvement

The agencies in the IRWM Region and the larger SAR watershed have a long history of working together to solve water resources related issues. These agencies recognize IRWM planning as another opportunity to work together to manage water resources on a regional level. The organizational structure of the Region's governance reflects this long history of openly working together. The open nature of the Region's governance structure allows for effective inter- and intra-regional collaboration, and a range of stakeholders that help to provide a balance in interest groups.

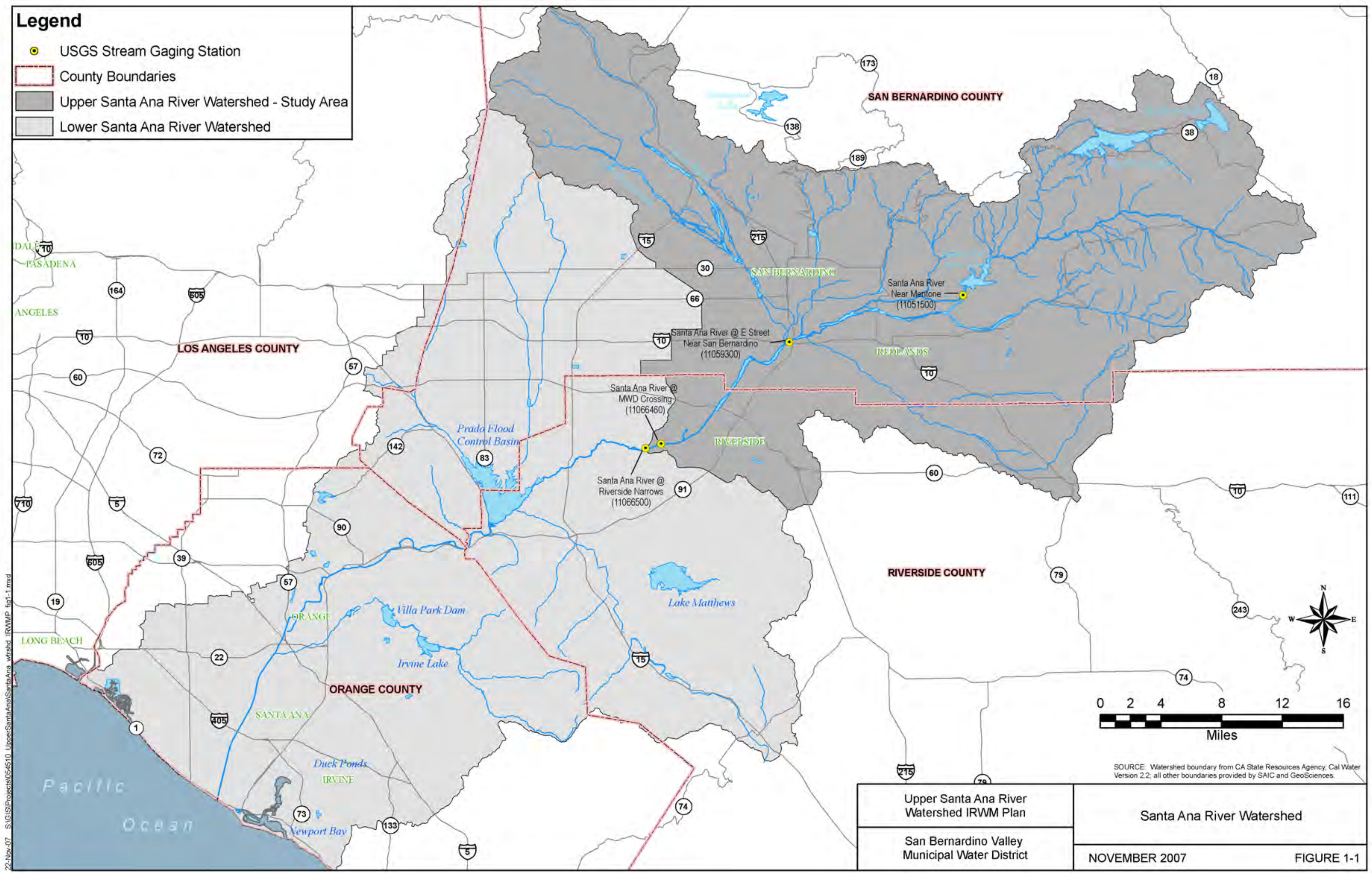
1.3.1 Regional Water Management Group

Agencies in the IRWM Region have a long history of working together to coordinate management of the Region's water resources, evidence of which can be seen in the various legal agreements provided in Appendix B related to surface water diversions, groundwater supply, water quality, and habitat preservation. The 2007 IRWM Plan was developed by several agencies that formed the TAG. The final copy of the 2007 IRWM Plan was adopted by sixteen different agencies in 2007-2008.

The TAG, which later became the BTAC, was created to facilitate implementation of the IRWM Plan, and serves as the Region's Regional Water Management Group (RWMG). Since adoption, the BTAC has been implementing the strategies in the IRWM Plan. Dialogue and cooperation have improved between agencies, improving regional planning. Participation in the BTAC is open to any agency that chooses to participate. Agencies that participate in the BTAC at the time of this 2015 IRWM Plan include:

1. Big Bear Lake Department of Water and Power
2. Big Bear City Community Services District
3. City of Loma Linda
4. City of Redlands Municipal Utilities and Engineering Department
5. City of Rialto
6. City of Riverside Public Utilities Department (Riverside Public Utilities)
7. East Valley Water District
8. Fontana Union Water Company
9. San Bernardino County Flood Control District
10. San Bernardino Municipal Water Department
11. San Bernardino Valley Water Conservation District
12. San Bernardino Valley Municipal Water District (Valley District)
13. San Gorgonio Pass Water Agency
14. West Valley Water District
15. Yucaipa Valley Water District

Figure 1-1: Santa Ana River Watershed



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1.3.2 Governance Structure

The Region has a distributed governance structure consisting of the BTAC, whose members provide recommendations to their respective governing bodies who then make decisions regarding water resources planning and projects in the Region, and stakeholders who are encouraged to take part in IRWM Plan development and implementation. The IRWM Plan document serves as a MOU for those agencies who adopt the Plan, as by adopting they have agreed to implement and use the Plan as a governing document.

The BTAC strives for consensus when making decisions, and in those cases where consensus cannot be reached, has provided a forum for discussion and early resolution of water issues in the region. If disputes cannot be resolved at this level, they are elevated to the policy level (governing bodies). The policy level is continuously informed by BTAC agencies' staff .

1.3.3 Stakeholder Identification and Involvement

In the initial stages of the planning process for the 2007 IRWM Plan, the Region identified a list of stakeholders. In general, the stakeholders for this planning process are described by four categories: (1) members of the BTAC as listed above, (2) other regional stakeholders and water agencies located in the Upper SAR watershed region, (3) watershed-based stakeholders located in the SAR watershed that are part of the larger integrated planning for the region discussed in the SAWPA Plan, and (4) federal and State of California agencies that were encouraged to participate throughout development of the IRWM Plan. The BTAC has encouraged local agencies to be active in the development of the IRWM Plan and to participate in the planning process. Specific steps taken by the BTAC to inform and encourage stakeholders' participation are discussed below.

Other Regional Water Agencies and Stakeholders

- San Bernardino County Board of Supervisors
- Riverside County Board of Supervisors
- Beaumont-Cherry Valley Water District
- Bear Valley Mutual Water Company
- Big Bear Municipal Water District
- City of Beaumont
- City of Calimesa
- City of Colton
- City of Fontana
- City of Loma Linda
- Marygold Mutual Water Company
- Muscoy Mutual Water Company
- Regents of the University of California
- Riverside Highland Water Company
- Riverside County Flood Control and Water Conservation District
- South Mesa Water Company
- Southern California Edison
- Orange County Flood Control District
- Terrace Water Company
- Western Heights Mutual Water Company

Santa Ana Watershed-based Stakeholders

- SAWPA and its member agencies (Eastern Municipal Water District, Inland Empire Utilities Agency (IEUA), Orange County Water District (OCWD), Western Municipal Water District (Western))

State and Federal Stakeholders

- California Department of Fish and Game
- California Department of Public Health
- California Department of Toxic Substances Control
- California Department of Water Resources
- Santa Ana Regional Water Quality Control Board (SARWQCB)State Water Resources Control Board (SWRCB)
- U.S. Army Corps of Engineers (USACE)
- U.S. Forest Service

Early in the planning process of the 2007 IRWM Plan, the BTAC assembled a list of stakeholders and sent a letter to each stakeholder, informing them of the planning process and encouraging them to participate. Stakeholders were invited to participate in the BTAC's bi-monthly, in-person meetings and by conference calls. The meetings focused on discussion of regional water management issues of the Region.

BTAC meetings continue to be open to stakeholders to attend and contribute to the IRWM process. Meeting announcements and agendas are emailed out to a comprehensive mailing list that includes both BTAC members and stakeholders. Agendas are also posted on Valley District's website in advance so all agencies, other stakeholders, and interested parties can participate throughout the planning process in discussion of the issues in which they were interested. The Region recognizes that stakeholders are necessary for the successful implementation of the IRWM Plan, particularly the implementation of projects that will help the Region to meet the objectives and strategies discussed in Chapters 4 and 5.

To obtain additional information on the Region's IRWM program, stakeholders are invited to contact any member of the BTAC to find out more information and get added to the email list.

1.3.4 Disadvantaged Community Outreach

In addition to the general stakeholder outreach discussed above, the 2015 IRWM Plan process included efforts in 2013 to identify and coordinate outreach with disadvantaged communities (DACs) to identify potential water resource needs. Representatives of the BTAC performed preliminary identification, organization, and assessment (described in Appendix C), and then coordinated with other members of the BTAC to outreach to the identified DAC areas. It was determined that, since DAC areas are contiguous portions of each of the water agencies' service areas, they receive equal services to non-DAC areas. However, these agencies have also noted that DAC issues will be included as an element of future planning efforts.

1.4 IRWM Plan Update Process

This IRWM Plan Update was prepared to satisfy the requirements described in the November 2012 *IRWM Proposition 84 and 1E Program Guidelines* by the California Department of Water Resources (DWR). The 2015 IRWM Plan documents the IRWM Region's current IRWM program and processes that have been implemented since 2005 when the Region was created. The 2015 IRWM Plan also reflects the current and projected challenges, opportunities, goals, and strategies of the Region. Notices of intent to adopt the IRWM Plan were published individually by each member of the BTAC. The IRWM Plan was presented to the governing body of each agency within the BTAC for adoption.

1.4.1 Progress in Meeting the Objectives of the 2007 IRWM Plan

Since the 2007 IRWM Plan was developed, the IRWM Region has made great strides in meeting its objectives through the implementation of projects and programs. Many of these projects and programs are ongoing, but all activities work towards supporting the objectives established the IRWM Region's 2007 IRWM Plan. Progress made in the last 7 years demonstrates that the 2007 IRWM Plan is working as intended and should be continued to be updated as goals and objectives change. Specific efforts made by the Region to in support of each 2007 IRWM Plan objective are described below.

Progress in Meeting Objective 1: Improve Water Supply Reliability
On an annual basis, the BTAC develops an Annual Water Management Plan. This plan looks at water levels and groundwater storage levels, and makes recommendations for groundwater recharge and/or dewatering. The plan also establishes a groundwater recharge threshold for the year. This threshold is based upon computer modeling and represents the maximum amount of water that could be recharged in the San Bernardino Basin Area (SBBA) without causing high groundwater.
On a monthly basis, Valley District provides a report that graphically tracks groundwater depths. The reports show any trends that are beginning to develop and allow the BTAC to implement the dewatering plan should levels surpass an established threshold. The dewatering plan was recently updated to include specific wells that could be used for dewatering, and establish general priorities to support the plan.
On a monthly basis, the BTAC tracks artificial recharge in the SBBA and compares it to the annual threshold in the Annual Water Management Plan. It also tracks artificial recharge in other basins.
On a monthly basis, Valley District tracks water supply in the Region. The monthly report takes into account available water from various sources and demands for the entire SBBA.
Through the BTAC conservation subcommittee, a new website iEfficient.com, was created that allows any retail customer in the SBBA to easily find their water provider's website where they can find more information on rebates as well as many other useful tips on saving water.
Gardening workshops have been held to help educate people on how to maintain landscaping with native and drought resistant plants. Collaborating with the local Sierra Club Chapter, Big Bear City Community Services District and the City of Big Bear Lake Department of Water and Power sponsor an annual xeriscape tour of valley landscaping. Local nurseries stock xeriscape plants for sale, and staff at the Big Bear City Community Services District and the City of Big Bear Lake Department of Water and Power are available to give advice regarding landscaping ideas.
Valley District has an arrangement with the Kern Delta Water District in Bakersfield to bank water for use in times of need, such as during extended drought periods. During times of drought imported water sources tend to be in higher demand, which can increase the price of imported water. By banking water, Valley District can import banked water and relieve some pressure off of imported water deliveries while also saving money by avoiding purchases of higher-cost imported water.
Valley District developed a Cooperative Recharge Program to encourage groundwater recharge in wet years when water is available. Since 2008, almost 107,000 acre-feet has been recharged under the program. Water recharge is the first step in the conjunctive use process.

Progress in Meeting Objective 1: Improve Water Supply Reliability
Valley District and its retail agencies have implemented regional conservation programs, including: *Water Saving Garden Friendly:* This program labels outdoor water saving products (plants, irrigation, etc.) in participating retail locations. The retail locations purchase the labels and apply them. The only cost to the water agencies is distributing bill stuffers to announce plant sales and any marketing of the program. *Weather-based Irrigation Controller Program:* Valley District pays 50% of the cost to install weather-based irrigation controllers and weather stations. This program is available to large water users (1,500 ccf per year, or higher). *Water conservation education program:* Valley District pays for over 100 water conservation education programs each year. The programs are generally distributed amongst the retail water agency boundaries by population. *Valley District Pays 25% of Rebates:* Valley District pays the retail water agencies within its service area 25% of the rebate amount provided to their customers. Valley District budgeted $65,000 for fiscal years 2012-13 and 2013-14.
In 2010, Valley District, in partnership with Western Municipal Water District (Western), received permits to divert up to 200,000 acre-feet per year (AFY) of SAR stormwater that used to flow to the Pacific Ocean but is now detained by the Seven Oaks Dam. Valley District is planning to construct the first phase of facilities downstream from Seven Oaks Dam that would be used to capture and use this water.
Valley District is partnering with agencies in the area to expand stormwater recharge. Valley District has partnered with Riverside Public Utilities and Western to identify stormwater capture opportunities on tributaries of the SAR, and has partnered with Riverside Public Utilities to divert and recharge water into the Riverside North groundwater basin. These projects are estimated to increase stormwater capture by up to 41,000 AFY. In the Yucaipa Basin, Valley District is working with the water agencies on a management plan that would include recharge of local stormwater.
Each year, Valley District calculates the change in groundwater storage for the SBBA. Since the IRWM Plan was adopted, Valley District has expanded its efforts to include calculating the change in storage for the Yucaipa Basin and is currently working on the calculation for the Rialto-Colton Basin. The change in storage calculation provides a “gage” for the basins which is used by the BTAC when they are forming their annual recommendations.

Progress in Meeting Objective 2: Protect and Enhance Water Quality
Any retail water agency serving water to the public must obtain a permit to operate from the California Department of Public Health (CDPH) Division of Drinking Water and Environmental Management. Permits to operate generally require water quality samples to be taken for various constituents throughout the water system to make sure that water that is being delivered to the public meets standards set by the Environmental Protection Agency (EPA) and CDPH. All samples taken need to be reported to CDPH on a frequency specified in the permit to operate, but generally require an annual report to be submitted. This is just one way water quality is monitored throughout the Region.

Progress in Meeting Objective 2: Protect and Enhance Water Quality
Since 2009, Valley District has been required to submit a water quality report every three years (Triennial Report) to the Santa Ana Regional Water Quality Control Board (SARWQCB). The report is limited to nitrogen and total dissolved solids (TDS) and is intended to analyze whether recharging groundwater with imported water has had any adverse impact on compliance with Salinity Objectives that were established in SARWQCB's Water Quality Control Plan for the Santa Ana River Basin (Basin Plan).
West Valley Water District has completed wellhead treatment to remove perchlorate and other remediation projects in the area continue to operate, cleaning up the groundwater basin.

Progress in Meeting Objective 3: Ecosystem Restoration and Environmental Enhancement
All of the Region's water suppliers are in compliance with the requirements of CDPH, which is one way water quality is monitored throughout the basin to ensure that there are no water quality impacts to ecosystems or other components of the environment.
Valley District's Triennial Report to the SARWQCB for nitrogen and TDS analyzes any adverse impacts on compliance with Salinity Objectives that were established in the Basin Plan. Since salinity objectives take into account beneficial uses, including ecosystems and habitats, the Triennial report helps to monitor potential effects that artificial recharge may have on ecosystems and the environment.
In 2007, Valley District and Western created a special habitat conservation fund that is used to fund a restoration project to restore sensitive habitat along the SAR for the benefit of the Santa Ana Sucker and other native fish. The restoration project includes removing non-native plants trash and debris and restoring stream banks and recontouring streambeds. Both agencies have pledged to continue making payments to maintain the restoration through 2016.
In 2013, Valley District and nine other agencies began the process of developing a Habitat Conservation Plan for the upper portion of the SAR.

1.4.2 Public Participation

Management of water resources in the IRWM Region takes place within a complex legal and institutional framework. Development of the 2015 IRWM Plan, a comprehensive and coordinated regional water management plan, involved the cooperation of many parties interested in water management. Update of the IRWM Plan began in 2013 with a general update of each chapter of the 2007 IRWM Plan. The BTAC solicited public involvement in the IRWM Plan process by presenting updates at regularly scheduled BTAC meetings and at regularly scheduled Board and Council meetings of some BTAC agencies (see Appendix A for meeting materials), as well as soliciting public comments on the draft IRWM Plan via email announcements. In addition, workshops were conducted in 2014 to develop additional information needed for the IRWM Plan to meet the requirements of *IRWM Proposition 84 and 1E Program Guidelines*. The BTAC encouraged public participation in preparation of the IRWM Plan to ensure the public's comments were considered in decisions about water management in the IRWM Region.

1.4.3 Planning, Reports and Technical Analyses

A considerable amount of available information was used to develop this update of the IRWM Plan, the primary sources of which are shown in Table 1-1. Table 1-1 shows the data or study used, how the data were analyzed, the results and information derived from the data or study, and how the information was used in the IRWM Plan.

Table 1-1: Planning, Reports and Technical Analyses Used in the IRWM Plan Update

Data or Study	Analysis Method	Results/Derived Information	Use in IRWM Plan
2010 Urban Water Management Plans	Review of current and projected drinking water supplies and demands, and facilities	Current and projected supplies and demands, quality concerns and facility descriptions	Used to update the water budget, and describe current and projected water supplies and demands, as well as describe current facilities and drinking water quality concerns
Court Judgments and Agreements	Review of current groundwater and surface water management activities	Current groundwater and surface water supply management activities	Used to describe groundwater and surface water management activities and develop strategies
Santa Ana River Watermaster Reports	Review of past and current Santa Ana River flows	Past and current Santa Ana River flows	Used to describe flows in the Santa Ana River, and demands on flows
Groundwater level data	Review of past and current groundwater levels	Groundwater level trends	Used to describe history of groundwater levels and develop strategies
U.S. Geological Survey (USGS) models and reports	Review of models and reports focused on groundwater basins	Descriptions of groundwater basins and groundwater supply	Used to describe groundwater basin areas and groundwater supply; Models used to test management strategies
Contaminant plume(s) data	Review of contaminant plumes in groundwater basins	Current quality impaired groundwater basins and specific areas of concern	Used to describe quality of groundwater basins and develop strategies for management
San Bernardino Valley Conservation District Engineering Investigations	Review of groundwater production and storage in Bunker Hill Basin	Current groundwater production and storage	Used to describe groundwater production and storage in Bunker Hill Basin
2006-2010 American Community Survey (U.S. Census Bureau)	Review of census block groups and designated places	Population, housing and income data for the 5-year period from 2006-2010	Used to estimate median household income for the Region, and locations of DACs
2010 Census (U.S. Census Bureau)	Review of census block groups and designated places	Population and housing data for the year 2010	Used to estimate current population for the Region

Data or Study	Analysis Method	Results/Derived Information	Use in IRWM Plan
2010 Integrated Report and 303(d) List (SWRCB)	Review of 303(d) listed water bodies	Listing of quality impaired waters throughout the State	Used to describe current water quality impairments
2011 Climate Change Handbook for Regional Planning	Review of climate change studies	Summary of climate change impacts, methods for assessing climate change in individual areas	Used to describe the threats to local and regional water resources from climate change in the Region; Methodologies used to assess climate change vulnerabilities in the Region
Valley District's Change in Groundwater Storage for the San Bernardino Basin Area and Yucaipa Basin Area Report	Review storage levels in the SBBA (Bunker Hill and Lytle combined	Groundwater storage levels	Used to assess storage levels in the SBBA and Yucaipa Basin Area

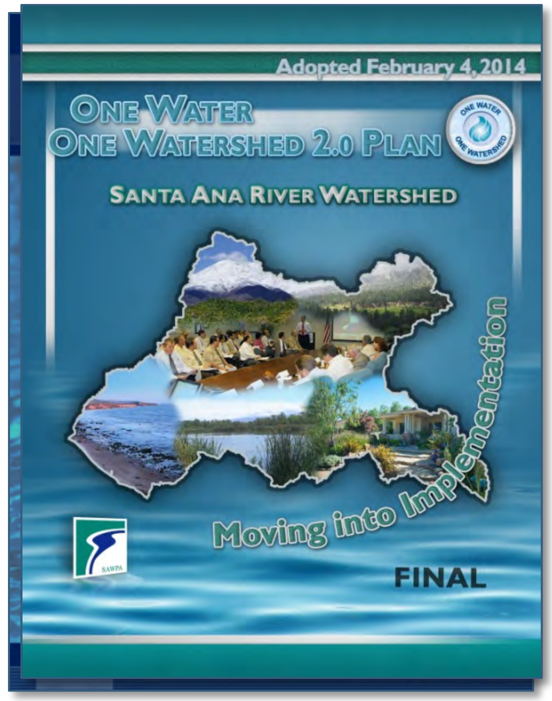
1.5 Regional Coordination

The IRWM Region regularly coordinates with neighboring and overlapping entities at the local, regional, and state level. The following is a discussion of how the Region has coordinated with neighboring IRWM regions, water resources planning, and land use planning in the development and on-going implementation of its IRWM Plan.

1.5.1 Coordination with Neighboring IRWM Regions and IRWM Planning

Santa Ana Watershed Project Authority and One Water One Watershed Plan

SAWPA is a regional agency that has a major role in water resources planning in the SAR watershed. SAWPA was formed in 1968 as a planning agency and was transformed in 1972 through a change in its mission to plan and build facilities that would protect the water quality of the SAR watershed. SAWPA is a Joint Powers Authority, classified as a Special District (government agency) in which it carries out functions useful to its member agencies: Inland Empire Utilities Agency, Eastern Municipal Water District, Orange County Water District, Valley District, and Western. Two of SAWPA's member agencies, Western and Valley District, are part of this IRWM Plan. SAWPA's vision is to have a sustainable SAR watershed that supports economic and environmental vitality as well as an enhanced quality of life. SAWPA's regional leadership is a model of collaboration and cooperation utilizing integrated solutions. To that extent, SAWPA has developed an IRWM Plan for the entire SAR watershed titled the One Water One Watershed (OWOW) Plan.



Water users in the SAR watershed have worked together for decades to develop an integrated regional approach to water management for the entire watershed. In 2002, SAWPA developed a phased planning process called the Santa Ana Integrated Watershed Plan (IWP). In 2005, the IWP was updated as an IRWM Plan to cover the entire SAR watershed. In April 2007, SAWPA launched the OWOW Plan for the Watershed. This broad planning document is the framework for overall water management in the watershed and is largely based upon the planning efforts of its member agencies. The OWOW Plan is a "macro-level" plan that is consistent with DWR's *California Water Plan* (Bulletin 160) and State Water Resources Control Board's (SWRCB) Strategic Plan, Watershed Management Initiative, and the basin planning process.

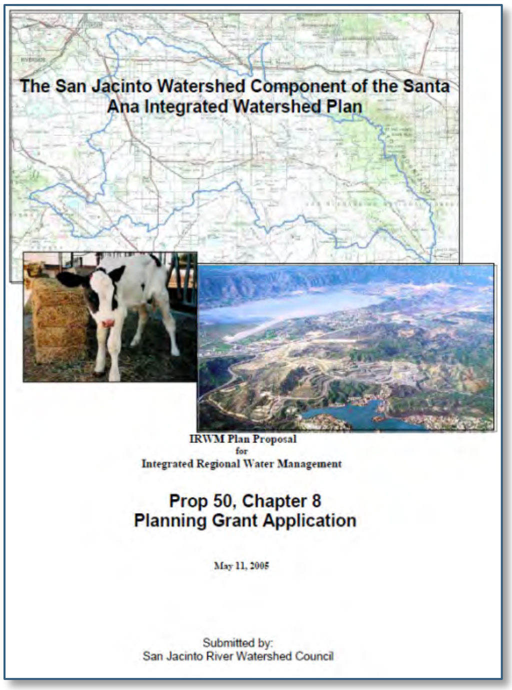
This 2015 IRWM Plan for the USARW Region is a complementary planning process to the SAWPA process and has been incorporated into the OWOW Plan. By focusing on a finer scale, the USARW IRWM Plan reveals that the Upper SAR watershed has several unique water management challenges and issues. The purpose of the USARW planning process is to focus on local issues specific to the upper watershed and to assess water management opportunities in greater detail. This collaborative process addresses some of the long-term water management strategies of the Upper SAR watershed and will greatly contribute to protecting and enhancing reasonable and beneficial uses of the watershed's water resources. This planning process is a part of the overall SAR water management planning process and is in agreement with past and current SAWPA regional planning initiatives. In addition, several agencies in the IRWM Region also take part in SAWPA planning efforts. For example, Valley District took the lead in writing one of the chapters of the OWOW Plan.

Western Municipal Water District IRWM Plan

Western's service area consists of a 510-square-mile area located primarily in western Riverside County with a population of over 850,000 people. Western relies on SWP and Colorado River water to augment its local water supplies. During drought years, these imported water sources will suffer from increased demands and increasingly poor water quality. Colorado River water may have salinity in excess of 800 milligrams per liter (mg/L) in dry years. Such water quality will not meet the water quality objectives of the SARWQCB and will thus make Colorado River water unsuitable for use without desalination treatment.

In 2008, Western prepared an IRWM Plan that addresses their service area only. Western's IRWM Plan is focused on putting water from all sources to maximum beneficial use. This strategy includes storage of imported water, when it is available, to augment dry year supplies.

It is the mission of Western to provide water supply, wastewater disposal, and water resource management to the public in a safe, reliable, environmentally sensitive, and financially responsible manner. Given the significant loss of groundwater wells in the Region due to water quality issues and the uncertainty of supplemental imported water supplies, implementing an IRWM Plan is imperative to Western. The objectives of the IRWM Plan are built on the identification of the water



management issues and solutions and refinement of the plan through a consensus of appropriate stakeholders. A number of water management strategies have been considered to meet the objectives defined for Western's IRWM Plan.

Western has already started identifying and implementing regional projects that will create cleaner, more reliable water supplies and optimize the use of imported water to reduce reliance on imported water during drought periods. Western and Valley District share a long history of working cooperatively to address the imbalance between available water supplies and the demands of a growing population in the Inland Empire area of Southern California (the urbanized portions of San Bernardino and Riverside Counties).

Valley District and Western sit on the Watermaster Committee for the Orange County Judgment (Orange County Water District v. City of Chino, et al., Case No. 117 628), and together make up the two-member Watermaster Committee for the Western Judgment (Western Municipal Water District of Riverside County v. East San Bernardino County Water District, Case No. 78426). Western is a stakeholder in the Upper SAR region because of its share in managing the water resources of the SBBA, and takes part in the Region's activities as a stakeholder. In addition, Western has served as a connection between the Region and other IRWM regions that Western overlaps, such as the Upper Santa Margarita Watershed IRWM Region. This connection has allowed for coordination on projects and grant applications.

San Jacinto Watershed Component of the Santa Ana Integrated Watershed Plan

The San Jacinto Component Plan, prepared in 2005 by the San Jacinto Watershed Council, focuses on specific water management strategies that address the unique and complex needs of the 732-square-mile San Jacinto Creek watershed. The plan is a component of the Santa Ana Integrated Watershed Plan (IWP) which was later updated to become the OWOW Plan. The San Jacinto Component Plan is a complementary planning effort that will build upon the work already completed by stakeholders participating in the SAWPA planning process by considering unique water quality and habitat needs in the San Jacinto watershed. These needs include National Pollutant Discharge Elimination System (NPDES) projects, additional reclaimed water management, and potential impacts of total maximum daily load (TMDL) requirements that specifically affect the residents (human, avian, animal, fish, plant, or insect) of the San Jacinto Creek watershed. This planning effort addresses issues that are specific to the San Jacinto Creek watershed and integrates the strategies with the Santa Ana IWP. The size of the SAR watershed and associated array of water resources naturally lend themselves to a large regional solution that integrates a number of watershed issues.

Riverside County has been identified as one of the fastest growing counties in the United States. This growth caused Riverside County to revise its General Plan in 2002. Further integration of water management strategies and coordination between competing interests benefits the watershed as a whole and would allow for more orderly development in Riverside County and overall protection of the San Jacinto Creek watershed consistent with the Component Plan.

Mojave IRWM Region and IRWM Plan

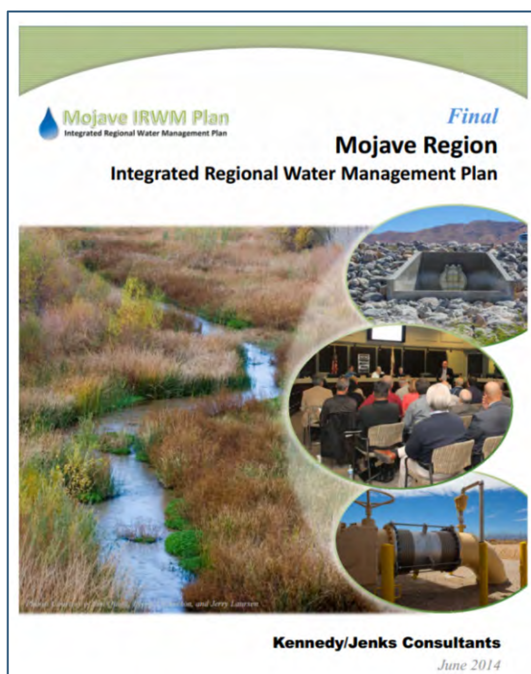
The Mojave IRWM Region encompasses the entire Mojave River watershed in the California High Desert area of San Bernardino County. A majority of the Mojave IRWM Region is overlapped by the Mojave Water Agency service area, which was originally established in 1959 for the purpose of improved management of declining groundwater levels in the area. Numerous groups participate in IRWM Plan development and ongoing implementation activities within the Mojave IRWM Region. The Mojave IRWM Region encompasses 58 municipal water purveyors with authority over water supply and management, and which share a common interest in enhancing water resource management to improve the reliability and sustainability of available resources. These water purveyors, along with other numerous public agencies and community groups, are part of the collaborative Mojave IRWM Planning process.

The Mojave IRWM Plan integrates components related to all aspects of water management in the Region, including, but not limited to, water supply, water quality, wastewater, recycled water, water conservation, storm water/flood management, watershed planning, climate change, habitat protection and restoration, and stakeholder and public outreach.

As part of San Bernardino County's Countywide Vision Process, the agencies that participate in the Mojave IRWM planning process and the IRWM Region collaborate with each other and with San Bernardino County to coordinate water resources management efforts with land use management planning.

1.5.2 IRWM Plan Relation to Local Water Planning and Land Use Planning

The Region's open governance structure allows for ongoing interaction between local planning efforts (both water and land use) and IRWM planning. Within the Region, local planning is conducted by counties, cities, local agencies, and special districts. San Bernardino County, cities, and water agencies within the Region coordinate as part of the San Bernardino Countywide Vision Process. Part of this process involves collaboration between water resource managers and land use planners on the water element to create mutually beneficial opportunities that ensure adequate water supplies and quality to support future population and economic growth within the County.



In addition, existing local, regional, and statewide plans were reviewed for relevant information to include as a part of the IRWM Plan update. The relevant plans, listed in Table 1-1, were used to further refine the Region's description, goals, and objectives. Table 1-1 lists each plan and how its information was used in the IRWM Plan.

The IRWM Region recognizes the importance of collaboration between land use planning and water resources management. The processes in place for updating the Region description, objectives, strategies, and projects incorporates input from land use planners that are a part of the stakeholder group, and those who take part in BTAC meetings. It will be necessary to continue coordination with these land use planners to ensure that the IRWM Plan is appropriately implemented.

1.6 Contents of the IRWM Plan

As discussed in Section 1.3, this 2015 IRWM Plan was prepared in accordance with DWR's *Integrated Regional Water Management Plan Standards*. Table 1-2 shows how the IRWM Plan is organized, and how it aligns with IRWM-related Guidelines established by DWR ("DWR Plan Standards"). A detailed DWR checklist of Prop 84 Guidelines is provided in Appendix D.

Table 1-2: IRWM Plan Update Organization and Alignment with DWR Plan Standards

IRWM Plan Update Chapter	DWR Plan Standard
Chapter 1: Regional Planning, Governance, Outreach and Coordination	Governance Integration Technical Analysis Relation to Local Water Planning Relation to Local Land Use Planning Stakeholder Involvement Coordination
Chapter 2: Region Description	Region Description Climate Change
Chapter 3: Water Budget	Region Description Technical Analysis
Chapter 4: Goals and Objectives	Objectives Integration Climate Change
Chapter 5: Water Management Strategies	Resource Management Strategies Integration Impacts and Benefits Climate Change
Chapter 6: Projects	Project Review Process Integration Climate Change
Chapter 7: IRWM Plan Implementation	Finance Relation to Local Water Planning Relation to Local Land Use Planning Climate Change
Chapter 8: Data Management and Plan Performance	Data Management Plan Performance and Monitoring

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2 Region Description

2.1 Location

The SAR watershed is the largest stream system in Southern California. The headwaters originate in the San Bernardino Mountains and are discharged to the Pacific Ocean approximately 100 miles to the southwest between Newport Beach and Huntington Beach. The SAR watershed covers over 2,650 square miles of widely varying forested, rural, and urban terrain and covers the more populated urban areas of San Bernardino, Riverside, and Orange Counties, as well as a lesser portion of Los Angeles County. Disputes over the use of water in the SAR led to the subdivision of the watershed into the Upper SAR watershed and Lower SAR watershed just upstream of Prado Dam.

The Upper Santa Ana River Watershed is an area with unique hydrological characteristics and water management issues.

The USARW IRWM Region covers 852 square miles, approximately 32% of the total SAR watershed, and is primarily located in San Bernardino and Riverside Counties. The Region includes Big Bear Lake as well as the cities and communities of San Bernardino, Yucaipa, Redlands, Highland, Rialto, Mentone, Colton, Grand Terrace, Loma Linda, Beaumont, and Riverside. This Region was selected for IRWM planning in large part because of the following factors:

- Rapid population growth in the area and the potential for continued rapid growth in the future. Population in the Region is expected to grow to nearly 1.3 million by 2035 from the current population of approximately 956,000.
- Significant institutional issues, hydrological characteristics, and court judgments that separate the Upper SAR watershed from the downstream portion of the watershed at the Riverside Narrows just upstream from Prado Dam. The Orange County Water District v. City of Chino, et al., Case No. 117628 (Orange County Judgment) and the Western Municipal Water District of Riverside County v. East San Bernardino County Water District, Case No. 78426 (Western Judgment), have significant influence on water management of the Upper SAR and dictate, to some degree, how water resources should be managed in the Upper SAR watershed.
- The Upper SAR watershed is an area with unique physical characteristics. The Upper SAR has widely variable hydrology and challenging water management issues, including the need to make use of local water supplies to make the Region self-sufficient. The agencies in the Region coordinate and collectively manage the groundwater spreading and pumping, and plan to establish a cooperative, integrated plan that will reduce or eliminate historical water right conflicts among the water agencies in the Upper SAR watershed.
- Groundwater basins in the Upper SAR watershed are generally separated from the groundwater basins in the lower watershed. The groundwater basin in which most Region-related activities take place is the San Bernardino Basin Area (SBBA), which is composed of the Bunker Hill and Lytle Creek subbasins. A discussion of groundwater basins within the Region is presented later in this chapter.

The Region is defined by the area that contributes surface runoff to the Riverside Narrows at U.S. Geological Survey (USGS) Gage 11066460. The USGS has operated this site as a continuous record gaging station since March 1970. There are numerous tributaries that contribute flow to the main stem of the SAR in the Region, including Mill Creek, City Creek, Plunge Creek (a tributary of City Creek), Mission Zanja Creek (located just upstream of the San Timoteo Creek), San Timoteo Creek, East Twin Creek, Warm Creek, and Lytle Creek.

2.2 Major Water Related Infrastructure

The water-related infrastructure of the Upper SAR watershed reflects the complex water history of the IRWM Region. The predecessors of many of the water agencies that are participating in the IRWM Plan were constructing ditches in the 1800s. The water rights and facilities established in the 1800s have helped determine the structure of today's water agencies and the arrangement of today's infrastructure. After State Water Project (SWP) facilities were extended into the Region in the early 1970s, State Water Contractors receiving deliveries from the East Branch of the SWP – Valley District, San Gorgonio Pass Water Agency, and Metropolitan Water District of Southern California (Metropolitan) – constructed pipelines to take advantage of the imported water. Figure 2-1 shows the major water-related infrastructure in the Region.

2.2.1 Regional Water Supply Infrastructure

Regional water supply infrastructure delivers local supplies across to the City of Riverside.

Groundwater and local surface water serve as important sources of regional water supply. The SBBA is a major source of water supply for agencies in San Bernardino and Riverside Counties. Three major regional transmission systems exist in the IRWM Region, and are used to deliver water to the City of Riverside. These are the Gage Canal, Waterman Pipeline, and Riverside Canal. The Gage Canal is owned by the Gage Canal Company. As of 2005, the City of Riverside owned approximately 59% of the Gage Canal Company. The canal extends from the SAR near Loma Linda to the Arlington Heights area. The Gage Canal is used to deliver both potable and irrigation water.

The Waterman Pipeline extends from the Bunker Hill Subbasin (discussed later in this chapter) to the Canyon Crest area, and is used to deliver groundwater to portions of the City of Riverside.

The Riverside Canal is a 12-mile canal extending from the City of Colton to Jefferson Street in the City of Riverside. Non-potable groundwater is conveyed in the Flume Pipeline to the Riverside Canal.

2.2.2 State Water Project Facilities

SWP water is imported into the Upper SAR watershed via the East Branch of the California Aqueduct. At the Devil Canyon Power Plant, located at the foot of the San Bernardino Mountains near Interstate 215, SWP water can be delivered in several directions in State facilities or in transmission systems belonging to State Water Contractors.

The SWP's Santa Ana Pipeline extends south from the East Branch, roughly paralleling Lytle Creek and into Lake Perris. Deliveries from the Santa Ana Pipeline can be made to Metropolitan member agencies including Western, Eastern Municipal Water District (Eastern), and the San Diego County Water Authority.

The California Aqueduct delivers imported water to the Upper Santa Ana River Watershed.

The East Branch Extension of the SWP is a combination of facilities built by Valley District and the State and funded by Valley District and San Gorgonio Pass Water Agency. Valley District operates these facilities for the State and San Gorgonio Pass Water Agency. The East Branch Extension makes deliveries from Devil Canyon east along the foothills of the San Bernardino Mountains and out to the San Gorgonio Pass Water Agency service area. Portions of the East Branch Extension, including the Foothill Pipeline, are used to implement the Santa Ana River-Mill Creek Cooperative Water Project Agreement (Exchange Plan). This agreement provides for a three-level exchange that allows Valley District to deliver water to the Yucaipa area by exchanging SAR and Mill Creek water among ten agencies. In the past, the Foothill Pipeline was also used to deliver local water to Devil Canyon Afterbay and on to Metropolitan, West Valley Water District (West Valley), and Fontana Water Company. Phase 2 of the East Branch Extension is expected to be completed by 2015. Phase 2 will bring the capacity of the Extension to 17,300 acre-feet (AF), which is the Agency's official allotment of SWP water, and is enough to supply approximately 35,000 families each year.

2.2.3 State Water Contractors Facilities

Four State Water Contractors have facilities in the IRWM Region: Valley District, San Gorgonio Pass Water Agency, Metropolitan, and San Gabriel Valley Municipal Water District.

Metropolitan's Inland Feeder extends from Devil Canyon to Diamond Valley Lake and the tunnels within the San Bernardino Mountains. Currently, the Foothill Pipeline is being used to make deliveries of SWP water to the completed portions of the Inland Feeder for delivery to Diamond Valley Lake.

Metropolitan's Rialto Pipeline is used to make deliveries from Devil Canyon to Metropolitan's F.E. Weymouth Treatment Plant in the San Gabriel Valley and to its Robert B. Diemer Treatment Plant, which supplies treated water to Western and Eastern. In addition, the Rialto Pipeline makes deliveries to surface water treatment plants owned by Metropolitan's member agencies and to groundwater recharge facilities.

The Devil Canyon-Azusa Pipeline is used primarily to make deliveries for replenishment of the Main San Gabriel Basin. Valley District owns capacity in this pipeline. Through this pipeline, Valley District can deliver SWP water to the western portion of its service area including West Valley and Fontana Water Company as well as the Cactus Spreading Basins.

Many of Valley District's facilities have been integrated into the SWP, as described in Section 2.2.1. In addition, Valley District has three pipelines that are not integrated into the SWP. These are the Baseline Feeder, Baseline Feeder Extension South, and Central Feeder. The Baseline Feeder is a 48-inch pipeline that serves potable water from the SBBA to the City of Rialto, West Valley, and Riverside Highland Water Company.

The Baseline Feeder Extension South is a 78-inch pipeline that was constructed north/south in alignment from the vicinity of 9th Street and Waterman Avenue in San Bernardino, south past the

Antil area where there is a major concentration of production wells, and on to the vicinity of the SAR. This pipeline will ultimately serve water from the SBBA throughout Valley District's service area and on to Riverside County.

Valley District completed the construction of a portion of the Central Feeder, in an east/west alignment in San Bernardino Avenue from Opal Avenue Westerly to Texas Street in Redlands. The Central Feeder may eventually be extended and connected to the Baseline Feeder Extension South and possibly to the SWP Santa Ana Pipeline.

The San Timoteo flood channel is a concrete-lined channel.

2.2.4 Regional Flood Control Infrastructure

The Upper SAR watershed consists of many tributaries flowing to the SAR. These tributaries exhibit a range of development from natural streams to concrete-lined channels. Many of the streams flow through heavily developed areas. The San Bernardino County Flood Control District (SBCFCD) operates and maintains many of the tributary systems that are deemed "regional" (750 cubic feet per second (cfs) or greater flow and/or 640 acres or greater of watershed as well as portions of the SAR). Smaller-scale control facilities are generally operated by local jurisdictions. Flood control agencies' boundaries follow the county boundaries for those areas which they manage.

The regional flood control facilities have been continually developed and operated by SBCFCD since its establishment in 1939 and are operated for the general safety of the residents of San Bernardino County. Flood control facilities and improvements protect vital roadways and utility corridors along with providing public recreational amenities such as trails and landscaping. Endangered species habitat is protected with various project and non-project related improvements.

Figure 2-1: Major Water Supply Infrastructure

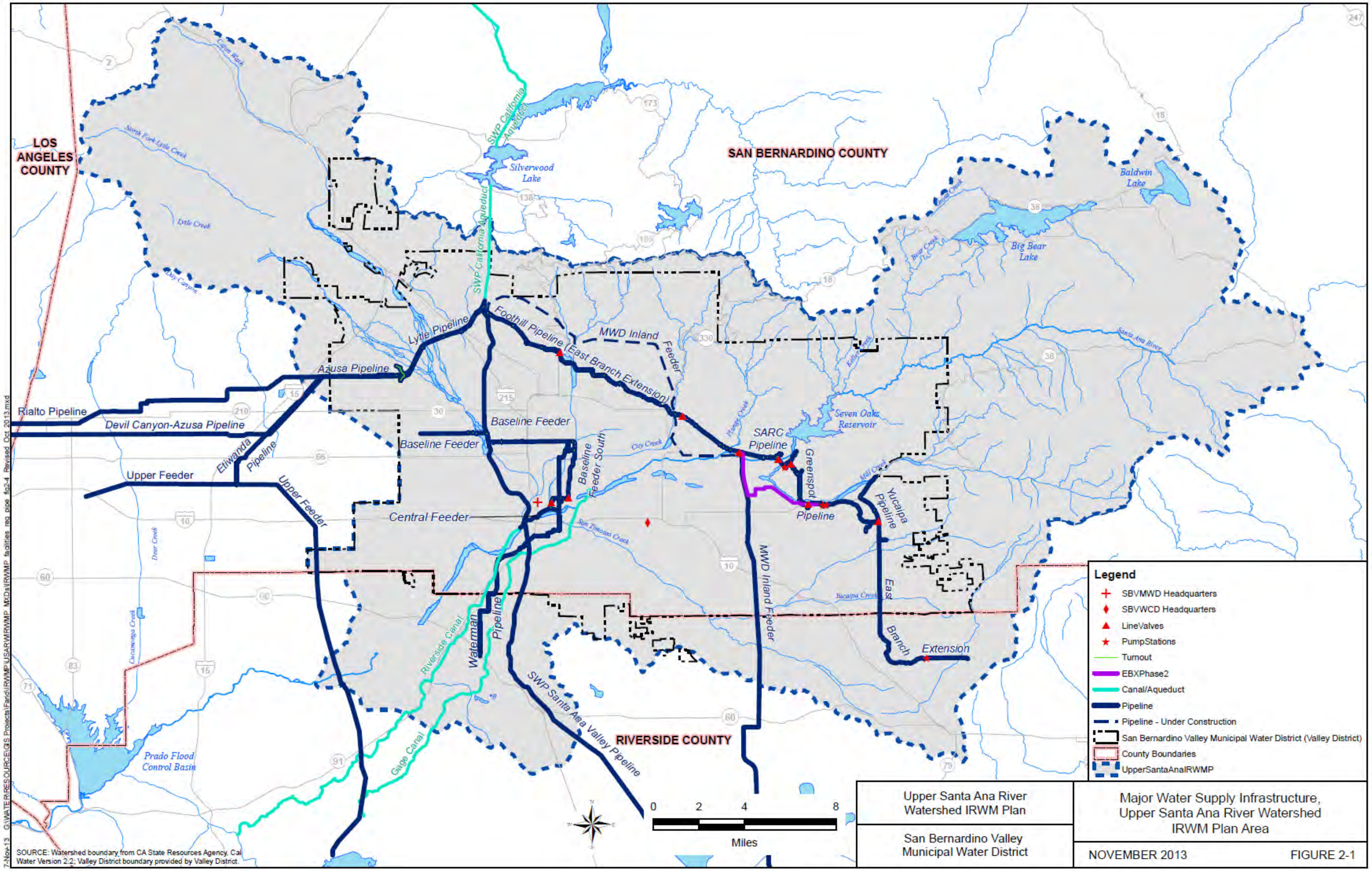
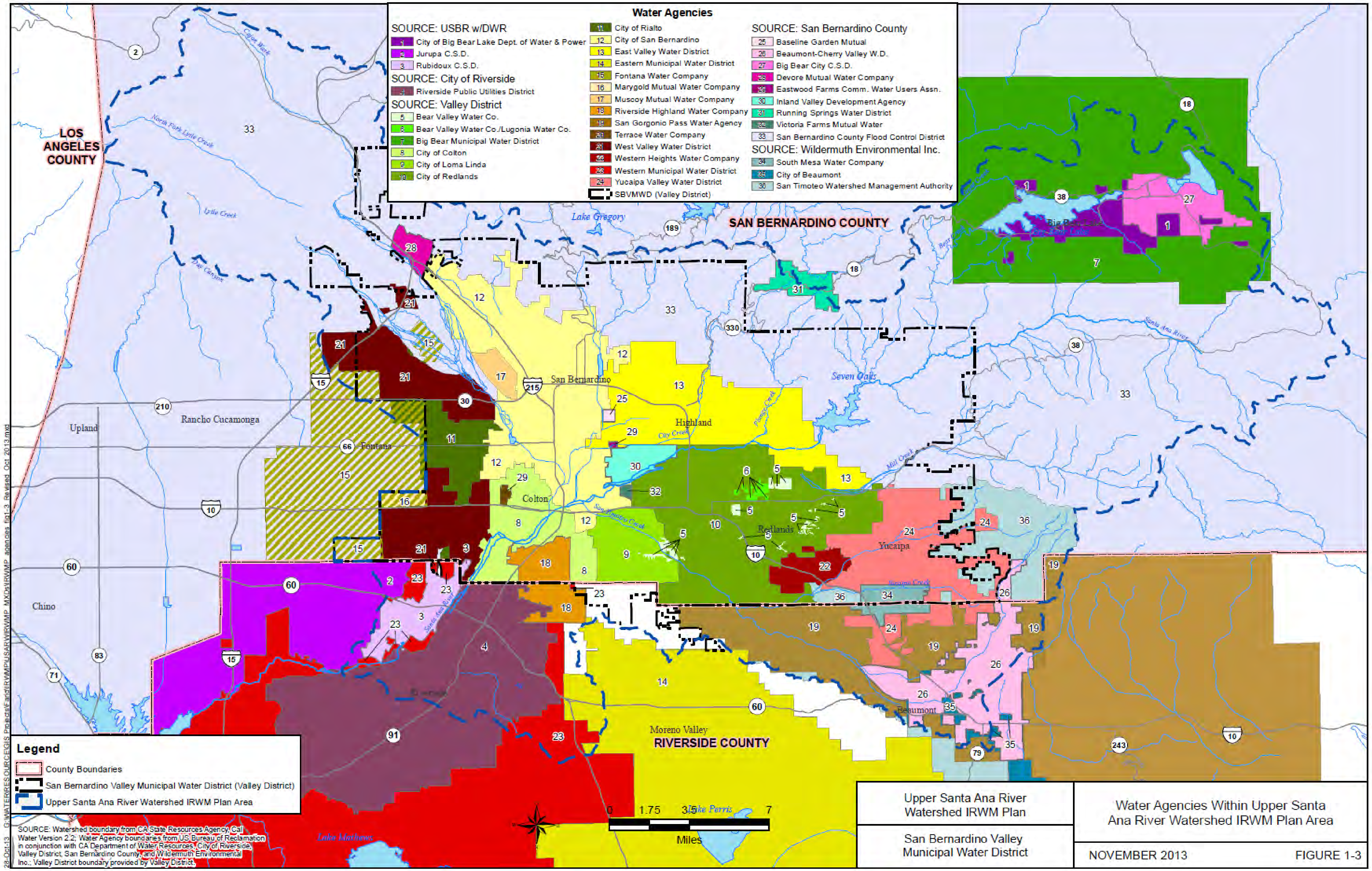


Figure 2-2: Water Agencies and Cities in the Upper Santa Ana River Watershed Region



2.3 Water Resource Management Agencies

Water resources in the IRWM Region are managed by a number of different entities, including water wholesalers and retailers, water conservation districts, flood control districts, and educational entities. These entities are described in this section and are shown in Figure 2-2.

2.3.1 Water Supply Managers, Retailers and Wholesalers

San Bernardino Valley Municipal Water District

Valley District was formed in 1954, under the Municipal Water District Act of 1911 (California Water Code Section 71000 et seq.) as a regional agency to plan a long-range water supply for the San Bernardino Valley. Valley District imports water into its service area through participation in the SWP and manages groundwater storage within its boundaries, and also provides stormwater disposal, recreation, and fire protection services. Valley District does not deliver water directly to retail water customers.

Valley District covers about 325 square miles, mainly in southwestern San Bernardino County, and has a population of about 600,000 people. It spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley, and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Fontana, Bloomington, Highland, East Highland, Grand Terrace, Mentone, and Yucaipa.

Valley District is responsible for long-range water supply management, including importing supplemental water, and is responsible for storage management of most of the groundwater basins within its boundaries and for groundwater extraction over the amount specified in the Orange County and Western Judgments explained below. Valley District has specific responsibilities for monitoring groundwater supplies in the SBBA and Rialto-Colton Subbasin, and for a portion of the minimum SAR flow required at the Riverside Narrows.

Valley District has developed a “cooperative recharge program” that is being successfully implemented to help replenish groundwater, using both SWP water and local runoff. Valley District takes delivery of SWP water at the Devil Canyon Power Plant Afterbay, which is located just within its northern boundary. The SWP water is conveyed 17 miles eastward to various spreading grounds and agricultural and wholesale domestic delivery points in the SBBA. Water is also conveyed westward for direct delivery in the Rialto-Colton Subbasin.

In the 1960s, dry conditions resulted in the over-commitment of water resources in the SAR watershed which led to lawsuits between water users in the upper and lower watersheds regarding both surface flows and groundwater. The lawsuits culminated in 1969 in the Orange County and Western Judgments. Under the terms of the judgments, Valley District became responsible for providing a portion of the specified SAR base flow to Orange County and for replenishing the SBBA under certain conditions. If the conditions of either judgment are not met by the natural water supply, including new conservation, Valley District is required to deliver supplemental water to offset the deficiency. The judgments resolved the major water rights issues that had prevented the development of long-term, region-wide water supply plans and established specific objectives for the management of the groundwater basins.

San Bernardino Valley Water Conservation District

The mission of the San Bernardino Valley Water Conservation District (SBVWCD) is to ensure that recharge of the Bunker Hill Subbasin is accomplished in an environmentally and economically responsible way using local native surface water to the maximum extent practicable.

The SBVWCD and its predecessors have conducted water conservation (groundwater recharge) activities for more than 100 years. SBVWCD operates two areas that overlie the Bunker Hill Subbasin in the San Bernardino Valley. These areas are at the upper end of the SAR wash area below Seven Oaks Dam and adjacent to Mill Creek just upstream of the confluence with the SAR (collectively, the wash area). The SBVWCD diverts surface water flows during both storm and normal runoff from the SAR and Mill Creek, and channels the flows into two separate systems of recharge basins where it is percolated into the groundwater basin for later pumping and use by local entities and private producers.

The SBVWCD's boundaries encompass more than 78 square miles and include portions of the communities of San Bernardino, Loma Linda, Redlands, Highland and Colton, as well as the unincorporated county area of Mentone and other unincorporated county "islands" within the incorporated cities.

City of Redlands

For nearly 100 years, the City of Redlands (Redlands) has been providing high-quality drinking water to Redlands and unincorporated areas of San Bernardino County. Currently, the city has 21,500 water service connections. More than 77,000 residents in Redlands, unincorporated areas of San Bernardino County, and a small part of the City of San Bernardino receive water service from Redlands. By supplying a blend of groundwater, surface water, and water imported from the SWP, Redlands meets its customers' demands, which average 25 million gallons per day (mgd) and a peak of over 50 mgd.

Redlands also owns and operates a sewer collection system and the Redlands Wastewater Treatment Facility that can treat 7.2 mgd of wastewater for industrial and irrigation purposes, including supplying water to the Southern California Edison Mountainview Power Plant.

West Valley Water District

West Valley is a public agency of the State of California and was formed in 1952 under the name of the Bloomington County Water District. Since that time, West Valley has gone through several name changes and has acquired numerous other water suppliers with water rights dating back over 100 years.

West Valley is located mainly within southwestern San Bernardino County and to a lesser amount within northern Riverside County. West Valley is adjacent to the western limits of the City of San Bernardino on the east, adjacent to and including the eastern part of the City of Fontana on the west, adjacent to the United States Forest Service boundary on the north, and the County of Riverside on the south. The majority of West Valley's service area lies within Valley District's boundaries. The validity and the extent of West Valley's water rights in Lytle Creek Subbasin, Rialto-Colton Subbasin, Rialto Basin, and the area known as "No Man's Land" are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

West Valley's service area is approximately 31 square miles, serving portions of the Cities of Rialto, Fontana, Colton and unincorporated areas of San Bernardino and Riverside Counties. West Valley utilizes water from five groundwater basins and treats surface water from Lytle Creek and SWP water at its 14.4 mgd Oliver P. Roemer Water Filtration Facility to serve over 19,000 water service connections.

East Valley Water District

East Valley Water District is a special district formed in 1954 through an election by local residents who wanted water service by a public water agency. Originally called the East San Bernardino County Water District, it was formed to provide domestic water service to the then unincorporated and agriculturally based communities of Highland and East Highland. Later, as the population increased, the need for a modern sewer system to replace the septic tanks became apparent. The residents voted to give East Valley Water District the responsibility for their sewer system, as they had done earlier with their water service.

Over the years, some of the service area was annexed to the City of San Bernardino, but water service remained with the East Valley Water District, primarily due to logistics and cost. In 1987, the City of Highland incorporated. Now, the East Valley Water District's previously agriculture-dominated area is urbanized, and few orange groves remain. The East Valley Water District's 33.5 square mile area services approximately 65,000 persons. All services are financed solely by rates; customers pay only for the benefits and services they receive. The East Valley Water District currently has 21,827 water service connections.

The forefathers of the East Valley Water District, anticipating a higher demand and a larger customer base, obtained water rights that date back over 100 years for the use of surface water from the SAR. Today, this surface water meets one-quarter of the district's water needs.

San Bernardino Municipal Water Department

San Bernardino Municipal Water Department (SBMWD) meets its customers' needs by providing high-quality service in water supply, water reclamation, and geothermal heating. SBMWD produces all of its own water, using 55 wells located in 45 square miles of water service area, and delivering it to more than 40,000 service connections through 650 miles of water mains. SBMWD reclaims over 30 million gallons of water each day from the City of San Bernardino, using innovative and cost-effective methods to make the reclaimed water safe for the environment and for reuse.

Yucaipa Valley Water District

Yucaipa Valley Water District (YVWD) is a special district that provides water supply, treatment, and distribution, recycled water supply and distribution services, and wastewater collection and treatment. Formed in 1971, YVWD acquired many of the private water companies serving the Yucaipa Valley. YVWD's most recent consolidations of water services occurred with the acquisition of the Harry V. Slack Water Company in 1987 and the Wildwood Canyon Mutual Water Company in 1992. YVWD currently satisfies the majority of its water demands from groundwater supplied through district-owned wells located throughout the service area. An extensive distribution system provides water storage and transmission throughout YVWD's service area. The only supply of surface water is provided through the Oak Glen Water Filtration Plant. Additional water sources that are expected to be available to YVWD in the near future include imported water through the SWP and recycled water from its Wochholz Regional WWTP.

City of Riverside

The City of Riverside Public Utilities Department (Riverside Public Utilities) provides potable water, non-potable water, recycled water, and electricity to the City of Riverside, and was established in 1895 (electricity) and 1913 (water). Riverside Public Utilities currently serves water to a population of 287,000 people through about 65,000 service connections within an area of 73.9 square miles. Riverside Public Utilities is committed to providing the highest quality water and electric services at the lowest possible rates to benefit the community. Riverside Public Utilities' annual total water demand is expected to increase from 85,215 AF in 2012 to an estimated 115,726

AF by 2035, and plans to develop additional water supply projects to meet future growth in demand.

San Gorgonio Pass Water Agency

San Gorgonio Pass Water Agency was established in 1961 by the California State Legislature. The service area includes the incorporated cities of Calimesa, Beaumont, and Banning, and the communities of Cherry Valley, Cabazon, Poppet Flat, San Timoteo Canyon, Live Oak Canyon, and the Banning Bench.

San Gorgonio Pass Water Agency, a State Water Contractor, purchases water from the State of California and sells it to local retail water agencies, which use the water either for direct deliveries or for groundwater recharge. Water is imported into the service area by the East Branch of the California Aqueduct. San Gorgonio Pass Water Agency operates the Little San Gorgonio Creek Recharge Facility on Orchard Street in Cherry Valley. The Little San Gorgonio Creek Recharge Facility includes six ponds in which SWP water is placed to percolate into the ground to recharge the Beaumont Subbasin.

City of Big Bear Lake Department of Water and Power

The City of Big Bear Lake Department of Water and Power is located in the San Bernardino Mountains at approximately 6,750 feet above sea level. With nearly 16,000 connections, the agency is dedicated to providing the City of Big Bear Lake, Moonridge, Fawnskin, Sugarloaf, Lake William, and portions of Erwin Lake and Rimforest with a safe, reliable source of water for public health and safety.

Key components of the City of Big Bear Lake Department of Water and Power's water system include adequate source capacity (wells) and storage capacity (reservoirs) to meet peak holiday and weekend demands, and replacement of old, leaky, undersized steel mainlines to provide adequate fire protection. The agency maintains 57 wells, 26 booster pumping units, 16 reservoirs, 2 manganese treatment plants, 1 surface water treatment plant, chlorination stations at all well pumping plants, 20 sample stations, approximately 180 miles of water main pipeline, and a complex pressure-reducing network.

The City of Big Bear Lake Department of Water and Power's water supplies come from snow and rain that percolates into the groundwater basin. The City of Big Bear Lake Department of Water and Power does not use lake water for public health and safety and no additional water is imported into the Big Bear Valley.

The City of Big Bear Lake Department of Water and Power has an aggressive water conservation program that has significantly reduced summertime consumption over the past several years. Community outreach programs keep customers informed on current water conditions, and the agency's Technical Review Team monitors, evaluates, and analyzes well and water consumption data on a continual basis. The agency's five-member Board of Commissioners is appointed by the City of Big Bear Lake's City Council and is made up of policy makers committed to safeguarding its water resources.

Big Bear City Community Services District

The Big Bear City Community Services District consists of overlapping Fire, Water, Sewer, Solid Waste (trash collection), and Street Lighting service areas and encompasses a total of 21.1 square miles. One or more services are provided to approximately 16,400 customers.

The water services are run by the Water Department. Major facilities of the Water Department include 73 miles of pipeline ranging from 1.5 to 20 inches in diameter, 10 vertical wells, 2 slant wells, 2 springs, 4 tank reservoirs with a total of 6.25 million gallons of water storage capacity, and

6 water booster stations. This infrastructure provides water to more than 6,018 customers as of 2012.

The sewer services are run by the Sewer Department, which maintains a system consisting of approximately 115 lineal miles of sewer pipeline, 2,842 manholes, and 7 sewer lift stations. The Sewer Department now services almost 12,000 homes and businesses. Sewage treatment and treated wastewater effluent export is handled by the Big Bear Area Regional Wastewater Agency (BBARWA), which is separate from, but partially funded by the Big Bear City Community Services District through fees.

Fontana Union Water Company

Fontana Union Water Company (Fontana Union) is a mutual water company and does not directly deliver water to domestic customers. Fontana Union asserts long-standing adjudicated, vested rights to Lytle Creek surface and subsurface flows and Lytle Creek Subbasin groundwater, as well as groundwater rights in Rialto-Colton Basin and "No Man's Land." The validity and extent of Fontana Union's water rights in Lytle Creek Subbasin, Rialto-Colton Basin and the area known as "No Man's Land" are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

Fontana Union delivers its available water to its shareholders in accordance with its Articles of Incorporation, Bylaws, and mutual water company law. Fontana Union is 97% owned by Cucamonga Valley Water District and San Gabriel Valley Water Company. Fontana Water Company, a division of San Gabriel Valley Water Company, diverts and produces water pursuant to its rights as Fontana Union's agent in accordance with a court-approved agreement. Under that court-approved agreement, Fontana Union allocates its Chino Basin pumping rights to Cucamonga Valley Water District, and Cucamonga also retains the option of taking delivery of its share of Fontana Union's other water sources.

Bear Valley Mutual Water Company

Bear Valley Mutual Water Company (Bear Valley Mutual) was formed in 1903 by the citrus growers of the Redlands/Highland area to ensure a dependable water supply under their control. Bear Valley Mutual has pre-1914 water rights to the first 88 cubic feet per second (cfs) of surface flow of the SAR. Bear Valley Mutual has appropriative rights on Bear Creek and a storage right in Big Bear Lake, as well as ownership of all the water inflow to the lake.

Beaumont-Cherry Valley Water District

Beaumont-Cherry Valley Water District was formed in 1919 under the Wright Act of 1897 (Water Code Section 20000, et seq.), and serves approximately eight square miles located in Riverside and San Bernardino Counties. Beaumont-Cherry Valley Water District owns approximately 2,800 acres along Little San Gorgonio and Noble Creeks and holds pre-1914 water rights to both streams, which amounts to 3,000 miner's inches of water (approximately 45,000 AF of water). The District has 20 wells in the Beaumont and Edgar Canyon Basins and currently serves about 30,000 consumers through 9,000 metered connections.

Big Bear Municipal Water District

Big Bear Municipal Water District (Big Bear Municipal) was formed in 1964 by the people of Big Bear Valley with the express purpose of stabilizing the level of Big Bear Lake. In January 1977, as a result of a stipulated judgment, Big Bear Municipal purchased title to the dam, reservoir lands lying beneath the lake, and the surface recreation rights to Big Bear Lake. As discussed above, Bear Valley Mutual has ownership rights to all water entering Big Bear Lake.

Big Bear Municipal is responsible for the following:

- Stabilization of the level of Big Bear Lake by managing the amount of water released to Bear Valley Mutual
- Watershed/water quality management
- Recreation management
- Wildlife habitat preservation and enhancement
- Bear Valley Dam and Reservoir maintenance

The stipulated judgment allows Big Bear Municipal to maintain a higher water level in the lake by delivering water to Bear Valley Mutual from an alternate source of water instead of from the lake. This alternate source of water is sometimes referred to as in-lieu water and mainly comes from the SWP. If Big Bear Municipal does not wish to purchase in-lieu water, it must deliver water from the lake to satisfy Bear Valley Mutual Water Company's demands. Studies performed for Bear Valley Mutual have estimated average lake releases to be 4,279 AFY.

City of Colton Public Utilities Department

The City of Colton's Public Utilities Department (Colton Public Utilities) provides water, wastewater and electrical services within the City of Colton. Water sources include groundwater from the Riverside North, Rialto-Colton, and Bunker Hill Subbasins. The validity and the extent of the City of Colton's water rights in Lytle Creek Subbasin, Rialto-Colton Subbasin, Rialto Basin, and the area known as "No Man's Land" are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085. Colton Public Utilities serves water to approximately 48,000 customers.

City of Loma Linda

The City of Loma Linda obtains groundwater from within the Bunker Hill Subbasin. Production facilities include eight production wells, four above-ground steel reservoirs, and two in ground pre-stressed concrete storage reservoirs, with a combined storage capacity of 14.9 million gallons. The reservoirs provide storage to the city's five different pressure zones. There are eight pressure-reducing stations in the distribution system that lower water pressure from one zone to another to provide constant regulated pressure. To transfer water between zones, there are five booster stations located in the different zones. Loma Linda also has two "emergency" connections to the City of San Bernardino and one to the City of Redlands to meet its supplemental needs. The city's population is approximately 23,600 people. Loma Linda also provides wastewater service.

City of Rialto

Residents of the City of Rialto (Rialto) obtain water from three purveyors: the Utilities Department of the City of Rialto, West Valley, and Fontana Water Company. Rialto provides water service for approximately 12,000 connections. Generally, these are the more developed portions of the city (West Valley provides the water in the remaining areas).

Rialto obtains water from the Rialto-Colton Subbasin, Lytle Creek Subbasin, SBBA, and the "Chino wells", the latter of which are not located within the adjudicated boundaries of Chino Basin. The validity and the extent of Rialto's water rights in Lytle Creek Subbasin, Rialto-Colton Subbasin, Rialto Basin, and the area known as "No Man's Land" are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

In recent years, most of these sources have been impacted by groundwater contamination, including perchlorate contamination of the Rialto-Colton Subbasin and the Chino wells. Rialto has adopted a "zero tolerance" policy for perchlorate, meaning that it will not serve water with any perchlorate even the water meets all of the public health standards. Rialto has installed treatment systems on some wells and is pursuing installation of additional treatment systems. In 2003, the City of Rialto declared a water shortage emergency in accordance with California Water Code Sections 350-359.

Rialto operates wastewater service within the city and has recently initiated deliveries of recycled water to the California Department of Transportation. Surface water treatment of Lytle Creek water is provided by the Oliver P. Roemer Water Filtration Plant owned and operated by West Valley. Rialto owns a portion of the capacity of that plant.

Fontana Water Company

Fontana Water Company, a division of San Gabriel Valley Water Company, is a public utility regulated by the California Public Utilities Commission. Fontana Water Company's service area covers approximately 52 square miles with boundaries including the San Gabriel Mountains to the north and the Riverside County Line to the south. Fontana Water Company serves most of the City of Fontana and parts of Rancho Cucamonga, Ontario, and Rialto. Fontana Water Company serves a population of approximately 210,300 people with over 45,000 active service connections. Each year Fontana Water Company produces between 45,000 – 50,000 AF of water from water supply sources that include surface water from Lytle Creek and SWP water, which is treated at Fontana Water Company's Sandhill Water Treatment Plant and groundwater from the Lytle, Rialto, No-Man's Land, and Chino Basins. Fontana Water Company diverts and receives Lytle Creek surface water and produces groundwater in the Lytle, Rialto, and No-Man's Land Basins as an agent for Fontana Union, which asserts extensive water rights to these sources of supply pursuant to longstanding court judgments. The validity and the extent of Fontana Water Company's and Fontana Union's water rights in Lytle Creek Subbasin, Rialto-Colton Basin and the area known as "No Man's Land" are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

Marygold Mutual Water Company

Marygold Mutual Water Company (Marygold) serves customers generally located in the unincorporated community of Bloomington. Marygold obtains water from the Chino Basin through rights to the appropriative pool of Chino Basin and from the SBBA.

Muscoy Mutual Water Company

Muscoy Mutual Water Company (Muscoy) serves the majority of the unincorporated community of Muscoy. SBMWD serves the remainder of the Muscoy community. The community is located between the cities of San Bernardino and Rialto. All water produced by Muscoy is from the SBBA.

Riverside Highland Water Company

The Riverside Highland Water Company (Riverside Highland) serves both domestic and irrigation water in San Bernardino and Riverside Counties. Riverside Highland provides water to about 4,000 service connections in the City of Grand Terrace located in the Riverside Mesa south of the Santa Ana River and a portion of the Highgrove area of Riverside County. Riverside Highland obtains water from the Lytle Creek Subbasin, the SBBA, the Rialto-Colton Subbasin, Riverside North and Riverside South Basins.

Meeks & Daley Water Company

The City of Riverside owns stock in several mutual water companies, including the Meeks & Daley Water Company. Ownership interests in the Meeks & Daley Water Company entitle the City of Riverside to export rights of about 2,900 AF (or 38.6%) from the Bunker Hill Subbasin as of December 2010. Meeks & Daley Water Company was incorporated on September 1, 1885, and is the successor company to three Mutual Water Companies - Meeks & Daley Water Company, Agua Mansa Water Company, and the Alta Mesa Water Company. Meeks & Daley Water Company provides water to the stockholders for agricultural purposes. To fund operating expenses, the company assesses all shareholders twice per year based on the number of shares owed on the date of the assessment.

The company owns water rights in the Bunker Hill Subbasin and pumps water from a series of wells located within the basin, transporting this water through the Riverside and Gage Canals. At the end of the canal systems, Meeks & Daley Water Company operates a pipeline and pump station to deliver irrigation water to users in the southern portion of the City of Corona.

With the construction of additional delivery facilities in 1996, Meeks & Daley Water Company began delivering water to the Orange County Water District under the Orange County Water Transfer Project, with water delivered to the SAR for storage behind Prado Dam and subsequent release and groundwater recharge downstream. Riverside owns 59% of the Gage Canal Company stock. This company owns surface water rights to the SAR.

Other Water Purveyors in the Region

Other water purveyors in the IRWM Region include:

- South Mesa Water Company, which serves water to part of the City of Calimesa
- Terrace Water Company services, which is an area located between the service areas of Colton Public Utilities and West Valley
- Western Heights Mutual Water Company, which serves the southeast portion of the City of Redlands and a portion of the City of Yucaipa
- Eastwood Farms Community Water Users Association, which provides water to a small portion of the City of Highland
- Arroyo Verde Mutual Water District, which provides water to a small portion of the City of Highland
- Victoria Farms Mutual Water Company, which serves a population of approximately 1,000
- Inland Valley Development Agency, a joint powers authority comprised of San Bernardino County and the Cities of San Bernardino, Colton, and Loma Linda
- Devore Mutual Water Company, which serves an area near the intersection of Interstate 15 and Interstate 215
- Running Springs Water District, which serves the community of Running Springs
- Arrowhead Park County Water District, which serves an area adjacent to the Running Springs Water District

2.3.2 Flood Control Agencies

San Bernardino County Flood Control District

SBCFCD was formed as a special district in April 1939 after the 1938 floods in the County of San Bernardino. SBCFCD's functions include flood protection from major streams, flood control planning, storm drain management, debris removal programs, right-of-way acquisition, flood hazard investigations, and flood operations. SBCFCD has numerous Master Plans of Drainage for various areas within the county. A Master Plan of Drainage is a coordinated plan of flood control improvements for an area based on its future planned development that identifies existing flood control facilities that are inadequate to convey the 100-year peak storm flows, including needed improvements to existing facilities and new facilities that need to be constructed to provide an adequate level of flood protection. Since its inception, SBCFCD has worked with United States Army Corps of Engineers (USACE) to develop federally funded major flood control facilities in the county. SBCFCD manages its activities through six physical flood control zones. The budget projections are also determined for each zone through an annual budget study with most of the zones also having a 10-year plan. SBCFCD is also participating with Inland Empire Utilities Agency and Chino Basin Water Conservation District on the Chino Basin Recharge Improvement Project.

2.3.3 Other Water Related Entities

Water Resources Institute/California State University, San Bernardino

The Water Resources Institute/California State University San Bernardino (WRI-CSUSB) was established by the faculty senate in 1999. The senate and the university administration recognized that water is one of the most precious resources in its service area (San Bernardino and Riverside Counties) and set out to make water an area of distinction at this campus.

The WRI-CSUSB operates an extensive water resource archive that includes maps; aerial photographs; newspaper articles; water and environmental reference books; and federal, State, and local government documents, studies, and reports. This archive is gradually being digitized to make it more accessible to users. It also includes water and environmental data and metadata, thus expanding the concept of an archive beyond the original concept of hard copies of old documents.

The WRI-CSUSB is an interdisciplinary center for research, policy analysis, and education. The full-time staff is engaged in a variety of partnerships providing technical assistance to public and private water stakeholders. The WRI-CSUSB specializes in integrated watershed projects promoting land use practices that minimize the impact of development on watershed functions. The WRI-CSUSB manages the Alluvial Fan Task Force for DWR by working with stakeholders in the watershed on resource-efficient guidelines for developing on alluvial fan floodplains. The WRI-CSUSB assists the Local Government Commission with presenting the Ahwahnee Water Principles for Resource Efficient Land Use[1] to elected officials and developers on the connection between land use and water. The WRI-CSUSB partners with California Resources Connection, Inc. on the Inland Empire Sustainable Watershed Program developing Green Building Practices and Model Ordinances to overcome obstacles in resource-efficient land use.

Regents of the University of California

The Regents have rights to water from the SBBA, which is used by the University of California Riverside (UCR). The water is delivered to UCR by the Riverside Public Utilities Department.

[1] The Ahwahnee Water Principles for Resource-Efficiency Land Use are a set of stewardship actions that cities and counties can take that reduce costs and improve the reliability and quality of water resources.

2.4 Surface Hydrology

Surface hydrology of the IRWM Region is comprised of the SAR and its tributaries. A number of surface reservoirs in the Region are operated primarily for agricultural and urban water use, but are also regulated for instream flows and recharge of groundwater basins. The following sections describe the surface hydrology of the Region.

2.4.1 Natural Runoff

Runoff records provide information on the characteristics of flow in the SAR and its tributaries. Such records are available for a number of stream gaging stations located on the mainstem of the SAR and throughout the SAR watershed. The SAR runoff records demonstrate the highly variable nature of river flow, with large floods and long periods of extremely low flow. Three gaging stations provide streamflow data for the USARW. Mentone Gage (USGS record 11051500) is representative of SAR flow near Seven Oaks Dam. There are two other USGS gaging stations located downstream of Seven Oaks Dam, but within the USARW basin—the "E" Street Gage (USGS Gage 11059300) located in the City of San Bernardino at river mile (RM) 57.69 and the Metropolitan Water District Crossing Gage (Metropolitan Crossing) (USGS Gage 11066460) located at RM 45.7 near Riverside Narrows. Table 2-1 provides the annual median, maximum, and minimum streamflow recorded at the Mentone, "E" Street, and Metropolitan Crossing gages (see Figure 1-1 for gage locations).

Table 2-1 : Upper SAR Median, Maximum, and Minimum Annual Flow (in AF)

Gage	Median Annual Flow	Maximum Annual Flow	Minimum Annual Flow
Mentone[a]	10,913	204,812	9
"E" Street[b]	24,040	316,302	567
Metropolitan Crossing[c]	77,600	355,000	21,000

Source: USGS gage data.
[a] USGS Gage 11051500. Period of record is WY 1911-12 through WY 2011-12.
[b] USGS Gage 11059300. Period of record is WY 1938-39 through WY 1945-46, WY 1947-48 through 1953-54, WY 1966-67 through WY 2011-12.
[c] USGS Gage 11066460. Period of record is WY 1969-70 through WY 2011-12.

As exhibited in Table 2-1, flow in the SAR is highly variable from year to year. Flow in the SAR increases downstream due to inflows from tributaries, rising water[2], and treated water from wastewater treatment plants (WWTPs). SAR flows at the "E" Street Gage include flows from Mill Creek and San Timoteo Creek, but not from Lytle and Warm Creeks, which enter the SAR below the "E" Street Gage. SAR flows at the Metropolitan Crossing include inflows from Lytle and Warm Creeks, two large public WWTPs, and rising water.

Flows in excess of about 70,000 AFY have a frequency of occurrence of only 13% at the River Only Mentone Gage, whereas this same flow has a frequency of occurrence of 62% at the Metropolitan Crossing Gage. Additionally, in the upstream areas, minimum annual streamflows are generally much smaller than minimum annual flows in the downstream areas.

The largest monthly flows typically occurred in February and March, and the lowest monthly flows typically occurred between August and October. Although streamflow increases downstream, the timing of flows (i.e., when the monthly maximums and minimums occur) is similar to the timing of flows observed at the Mentone Gage.

[2] Rising water is used to describe noticeable increases in streamflow in reaches where a subsurface restriction forces groundwater to the surface.

There are numerous tributaries that contribute flow to the mainstem of the SAR in the Region, including Mill Creek, City Creek, Plunge Creek (a tributary of City Creek), Mission Zanja Creek (located upstream of San Timoteo Creek), San Timoteo Creek, East Twin Creek, Warm Creek, and Lytle Creek (Figure 2-3). The flow (under 100-year flood conditions[3]) contributed by each of these tributaries is provided in Table 2-2. As a reference, during a 100-year flood event, Seven Oaks Dam would release up to 5,000 cfs (USACE 1988).

Urbanization taking place in the valley areas of the SAR watershed has resulted in increased responsiveness of the basin to rainfall. The increase in impervious surfaces (such as roofs, roads, parking lots, etc.) and constructed drainages to remove surface water from urban areas has resulted in decreased groundwater infiltration and increased runoff from urban areas. These actions have reduced the lag time between peak rainfall and peak runoff (i.e., constructed drainage systems move water from the urban areas to the river faster than this water would move if the land was not developed).

Table 2-2 : Tributary Flow Contribution to the SAR (100-Year Flood Event Discharge in cfs)

Tributary	Inflow	River Mile
Mill Creek	23,000	68.67
City Creek & Plunge Creek (Combined)	16,460	62.87
Mission Zanja Creek	6,100	59.08
San Timoteo Creek	19,500	58.44
East Twin Creek	18,000	58.14
Lytle Creek & Warm Creek (Combined)	70,000	56.74

Source: USACE 2000 and SBCFCD 2013

Compared to a basin without the influence of urbanization, the same rainfall occurring over an urbanized segment of the basin will result in higher peak discharges, a shorter lag-time to the peak discharge, and an overall larger volume of water entering the local drainage channels. Because the SAR watershed is experiencing rapid growth, increased urbanization of the basin is expected to continue; therefore, this trend in increased discharge and decreased lag times between peak rainfall and peak streamflow is expected to continue in the future.

2.4.2 Imported Water

Imported water from the SWP is available to the Region through the IRWM Region's State Water Contractors: Valley District, San Gorgonio Pass Water Agency, and Metropolitan Water District of Southern California. Valley District is the fifth largest State Water Contractor, with an annual entitlement of 102,600 AF. Valley District lies on the East Branch of the California Aqueduct and takes delivery of SWP water at the Devil Canyon Power Plant. From this location, Valley District can deliver water to the west via the San Gabriel Valley Municipal Water District Pipeline (Valley District owns capacity in this pipeline) or to the east through the East Branch Extension of the SWP. San Gorgonio Pass Water Agency is downstream of Valley District on the East Branch of the California Aqueduct.

[3] A flood as defined under the Standard Flood Insurance Policy is a general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters or from the unusual and rapid accumulation of runoff of surface waters from any source. A 100-year flood refers to a flood level with a 1 in 100 percent chance of being equaled or exceeded in any given year.

Water availability through the SWP is intermittent and subject to frequent shortages. As a result, Valley District's "Rules for Service" require that all of its customers have a 100% backup for any amount of water they order from the SWP.

2.4.3 Wastewater

There are 14 publicly owned WWTPs located within the Region. Nine of these plants contribute to surface flow of the SAR. Between 1970 and 2012, the total volume of treated wastewater contributions to SAR flows increased from 44,000 AFY to 121,000 AFY, with a peak of 188,000 AF in 2004-2005 (SAR Watermaster 2013).

Redlands Wastewater Treatment Plant

Three wastewater treatment plants (Redlands, Beaumont, and Yucaipa) discharge to the SAR and its tributaries upstream of the City of San Bernardino, but these discharges generally do not flow continuously to the SAR at "E" Street (SAR Watermaster 2013). Two plants, the Rapid Infiltration and Extraction (RIX)[4] WWTP in the City of Colton and the Rialto WWTP in the City of Rialto, discharge directly to the SAR via a discharge channel at RM 53.46. Wastewater discharges from these plants have hydraulic continuity to the SAR above Riverside Narrows. Combined wastewater discharge from these two plants has risen from around 22,700 AFY in water year 1970-1971 to 44,745 AFY in water year 2011-2021 (SAR Watermaster 2013). The maximum wastewater discharge from these two plants occurred in water year 2000-2001 with 57,753 AF. The combined wastewater discharge is expected to increase to about 59,000 AFY, with both facilities operating at their respective design capacities (Table 2-3).

[4] The RIX WWTP went into operation in 1996 and provides tertiary treatment to all of the effluent from the Colton and San Bernardino Water Reclamation Plants. Prior to 1996, effluent from these plants entered the SAR just above and just below "E" Street, respectively.

Figure 2-3: Creeks and Rivers in the IRWM Region

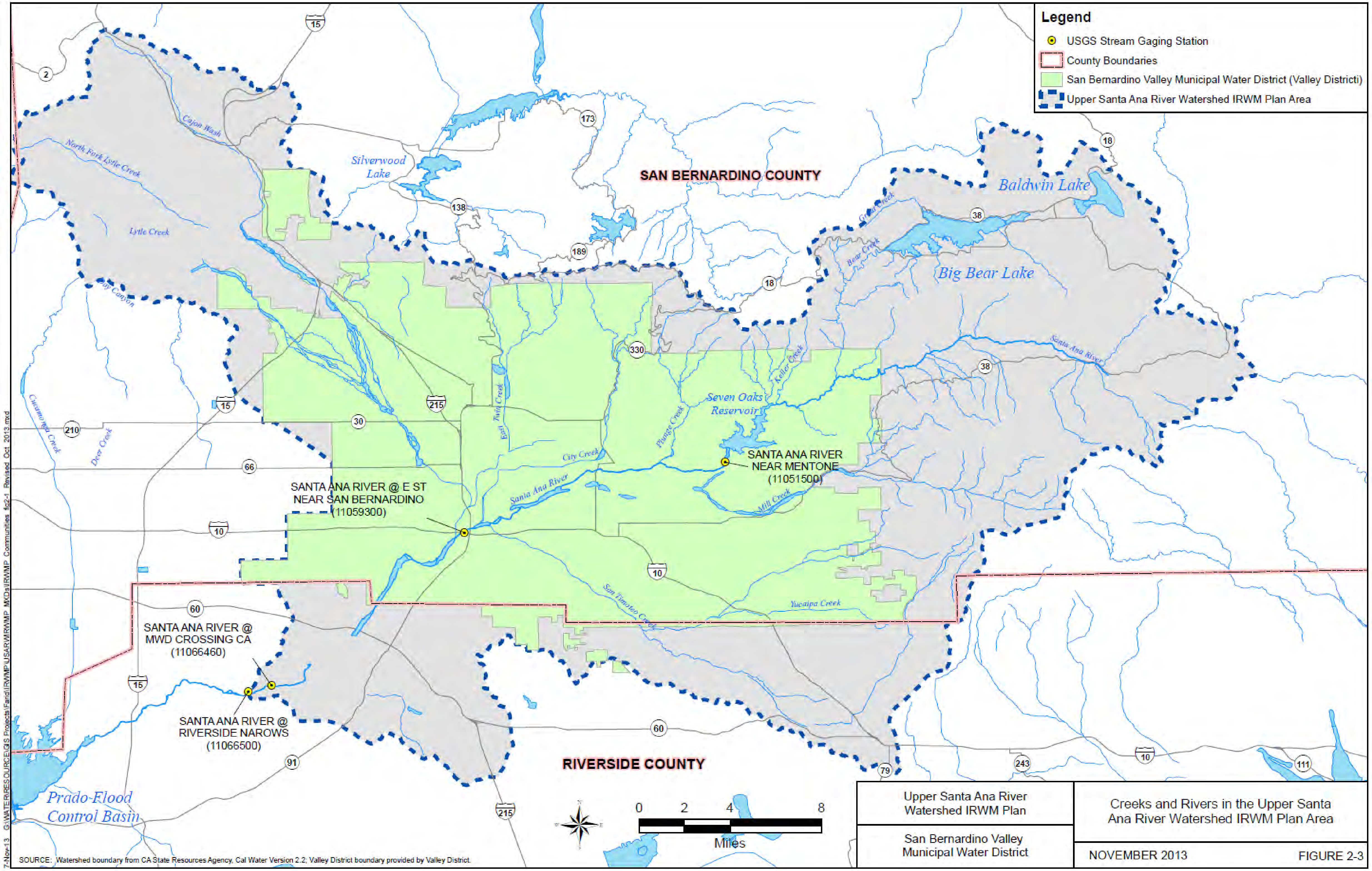


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Table 2-3: Treated Wastewater Discharged Directly to the SAR above Riverside Narrows

Facility	Current Discharge (AFY)	Potential Future Discharge (AFY)
RIX WWTP	37,966[a]	44,900
Rialto WWTP	6,703[a]	14,200
Total Discharges Directly to the SAR in the Region	**44,669**	**59,000**

[a] Based on 2011/2012 water year data reported in the Thirty-Second Annual Report of the SAR Watermaster (SAR Watermaster 2013).

Despite the likelihood that WWTP discharges will increase in the future, not all of the treated water may enter the SAR. Several cities and utilities are in the process of developing plans to recycle water for non-potable uses, which could decrease discharges to the river. For example, the City of San Bernardino is currently evaluating a program to sell approximately 10,000 AFY of tertiary effluent and use 15,000 AFY for recharge in the SBBA (of a total potential discharge of approximately 44,900 AFY) from the RIX facility. Valley District contracted with the City of San Bernardino to ensure that the RIX facility continues to release quantities of treated effluent to the SAR adequate to fulfill Valley District's obligations to provide 15,250 AF of baseflow each year at the Riverside Narrows as called for in the Orange County Judgment.

A number of other agencies have plans to improve recycled water production capacity and implement projects to use recycled water for non-potable uses in the future. Table 2-4 summarizes the proposed water recycling programs in the IRWM Region.

Several agencies have constructed recycled water distribution systems, or are in the process of planning and constructing recycled water distribution systems. These systems are discussed below.

Recycled Water Use in Beaumont-Cherry Valley Water District

The Beaumont-Cherry Valley Water District has constructed a recycled water distribution system throughout its service area which is nearly complete. This distribution system is plumbed to supply recycled water to parkways, medians, parks, schools, and the like. The City and the Beaumont-Cherry Valley Water District are negotiating an agreement in which the City would share its treated wastewater with the Beaumont-Cherry Valley Water District to use for non-potable purposes. In addition, the Beaumont-Cherry Valley Water District is negotiating with YVWD to purchase desalted recycled water for distribution for non-potable purposes.

It is anticipated that the Beaumont-Cherry Valley Water District will come to agreement with one of these entities in the near future and that recycled water will be available in the near future in its service area, freeing up more potable water to meet current and projected demands.

Table 2-4: Upper Santa Ana River Water Agencies Recycling Water Programs

Water Agency	Recycling Plant	Production Capacity	Description
Beaumont-Cherry Valley Water District	City of Beaumont WWTP	4 MGD	Expansion will upgrade production to 8 mgd.
Fontana Water Company	IEUA Regional treatment Plant 4	5.4 MGD	Fontana Water Company is currently constructing infrastructure to deliver recycled water in its service area.
City of Redlands Municipal Utilities and Engineering Department	City of Redlands WWTP	7.2 MGD	Recycled water used for basin recharge, irrigation and industrial purposes.
Rialto, City of & West Valley	City of Rialto Water Treatment Plant	12.0 MGD	Recycled water used for landscape irrigation on the I-10. City plans to expand use of recycled water.
Riverside Public Utilities	Riverside Regional Water Quality Control Plant	40 MGD	Applied for a change in permit to recycle up to 41,400 AFY.
SBMWD	San Bernardino Water Reclamation Plant	0.75 MGD	Construction of a tertiary plant at the existing San Bernardino Water Reclamation Plant to recycle water for landscape irrigation.
Yucaipa Valley Water District	Henry N. Wochholz WWTP	6.7 MGD	New plant at Oak Valley will increase total recycled water availability to 12,000 AFY.
SBMWD, City of Colton, City of Loma Linda, County of San Bernardino, and East Valley Water District	RIX	40 MGD	All the water from the RIX is currently released into the Santa Ana River. The City of San Bernardino is exploring selling part of its portion of the recycled water.

Recycled Water Use in City of Big Bear Lake Department of Water and Power and Big Bear City Community Services District

The BBARWA investigated the feasibility of using advanced treated recycled water from its treatment plant as a supplemental source of artificial surface recharge to the aquifers in the Baldwin and Big Bear Lakes area of western San Bernardino County. BBARWA undertook the investigation to ensure that an adequate supply of safe water would exist to supplement the current potable supplies for the residents and visitors of the Big Bear Valley. This is important because the primary water supply is groundwater, which can be depleted when extraction exceeds natural recharge. Multiple options are being considered that would supply between 500 AFY and 2,000 AFY of recycled water for groundwater recharge. Currently, approximately 2,200 AFY of secondarily treated (recycled) water from th e plant is being exported out of the Big Bear basins to Lucerne Valley via a pipeline. This recycled water has been identified as a potential supplemental supply to artificially recharge the ground water resources in the area. The water would be applied to spreading basins within the Baldwin and Big Bear Lakes area and, thus, would be a benefit by providing an assured supplemental recharge to the aquifers within the basins.

During February 2006, BBARWA certified the Final Environmental Impact Report Prepared for the Recycled Water Master Plan Project and received and filed the Recycled Water Master Plan (Resolution No. R.01-2006). However it should be noted the BBARWA did not file a Notice of Intent following the Certification. Additional work/efforts will be dependent upon the local water agencies identifying a need for the recharge effort.

Recycled Water Use for Fontana Water Company

Fontana Water Company is working cooperatively with the City of Fontana to design and construct the first phase of a recycled water program. Once recycled water becomes available and the necessary infrastructure is constructed, Fontana Water Company will be the purveyor of recycled water to those customers within its service area who can make use of such water. In the first phase of the recycled water program, Fontana Water Company will provide approximately 1,700 AF of recycled water to schools, parks, commercial customers, and Community Facilities Districts' landscape irrigation locations in the southern portion of the City of Fontana. Ultimate build-out in Fontana Water Company's service area will enable Fontana Water Company to provide approximately 6,000 AF of recycled water. Fontana Water Company supports the use of recycled water where its use is appropriate and where recycled water is available.

Recycled Water Use for City of Redlands Municipal Utilities and Engineering Department

Beginning in 2005, most effluent from the City of Redland's WWTP has met Title 22 standards for recycled water. In 2005, approximately 60% of the recycled water was used for industrial purposes, with the remainder used for groundwater recharge. The City of Redlands requires some new commercial development to provide dual plumbing for irrigation systems and to accommodate the use of recycled water as it becomes available. Through the use of financial incentives, the city expects industrial recycled water use to reach 3,000 AFY by 2020.

Recycled Water Use for City of Rialto and West Valley Water District

The City of Rialto is investigating the expansion of its existing tertiary treatment plant and reclaimed water system as a way to supplement the city's water supply. The existing tertiary treatment plant wastewater flows are approximately 7.5 mgd (9,000 AFY). The city currently discharges the majority of its flows to the SAR, but is under no obligation to continue this practice.

The City of Rialto has constructed facilities to provide the California Department of Transportation (Caltrans) with recycled water for 42,000 feet of landscape irrigation for Interstate-10. Caltrans has been using 1.0 mgd of recycled water during the summer months and 0.5 mgd during the winter for an annual total of 850 AF. Currently, there are no other users of the recycled water.

Rialto recently prepared a Wastewater Master Plan that investigated recycled water systems as a way to supplement the city's water supply and reduce the need to purchase water. The plan analyzed the feasibility of converting a currently unused water main that extends several miles up Riverside Avenue and identified potential landscape irrigation customers (San Bernardino Park, Convalescent Hospital, the Senior Center, a baseball field, and a recreation center). A Proposition 50 grant funded the construction of recycled water lines that tie into the unused water main. The city is also investigating the use of package plants in the north end of the city and has identified potential users of recycled water that could result in approximately 2,250 AFY.

All of the wastewater collection and treatment within the West Valley is handled by the City of Rialto. West Valley utilizes non-potable raw SWP water and decanted backwash water from the Oliver P. Roemer Water Filtration Facility to supply the El Rancho Verde Golf Course. Records show that the golf course consumed 1,357 AF in 2003. West Valley identified other additional potential users of recycled water that could result in approximately 3,700 AF of annual demand. Most of these new users are currently supplied with potable water.

Recycled Water Use for City of Riverside

The City of Riverside Public Works Department operates and maintains the Riverside Regional Water Quality Control Plant (RRWQCP). The daily average wastewater inflow to the RRWQCP is 34 mgd. Construction for an upgrade is currently underway to increase treatment plant capacity to 46 mgd, with the final plant capacity to reach 52 mgd by 2024. The service area of the RRWQCP extends beyond the Riverside Public Utilities service area to include the areas served by Jurupa, Rubidoux, and Edgemont Community Services District. Tertiary-treated effluent (recycled water) is discharged into the SAR.

The SWRCB approved Order WR 2008-0024 in May 2008, in which RRWQCP is required to discharge 25,000 AFY, compared to previous minimum discharge requirements of 15,250 AFY per the 1968 Prado Settlement. This order changed the place of use and purpose of use of a portion of the treated wastewater discharged into the SAR requested through Wastewater Change Petition WW-0045 as follows:

- Change of Place of Use: The Order expanded the place of use to include 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. The point of discharge to the SAR remained the same.
- Change of Purpose of Use: The Order modified the purpose of recycled water use to include municipal, industrial, and agricultural purposes.

Recycled Water Use for San Bernardino Municipal Water Department

The SBMWD operates the San Bernardino Water Reclamation Plant (WRP) serving the cities of San Bernardino, Highland, and Loma Linda, property that was formerly Norton Air Force Base, East Valley, Patton State Hospital, and portions of the unincorporated areas of San Bernardino County. All the wastewater at the San Bernardino WRP is treated to the secondary level. The secondary-treated effluent is sent to the RIX Facility and treated to tertiary levels, then released into the SAR. In mid-2006, the San Bernardino WRP re-activated its tertiary treatment facility and diverts approximately 0.75 mgd or 840 AFY of water from the influent stream to RIX for treatment to Title 22 standards for landscaping applications at the City of San Bernardino Municipal Golf Course and Caltrans located adjacent to Interstate 215. SBMWD estimates that in the future, the reclamation plant's service area will be able to potentially recycle an additional 2.25 mgd or 2,519 AFY of water for use within its service area (SBMWD 2005). Valley District and SBMWD are initiating a master plan study to evaluate the treatment of more secondary effluent at the existing WRP, reducing flows to the RIX.

Recycled Water Use for Yucaipa Valley Water District

YVWD treats recycled water meeting Title 22 requirements through its Henry N. Wochholz Wastewater Treatment Facility. Currently, treated effluent is conveyed through a land outfall and discharged to San Timoteo Creek. Three customers along the existing land outfall are receiving recycled water for irrigation purposes. Dual plumbing is being installed in new developments. Delivery amounts are expected to grow to about 6,700 AF by 2020 or about 24 percent of total agency water demands. Ultimately, YVWD expects to deliver about 8,000 AFY of recycled water (YVWD 2005).

In addition, a new WRP is planned to serve the Oak Valley development. This WRP will provide both wastewater treatment and a source of recycled water for the Oak Valley area. The Yucaipa

Wastewater Master Plan identifies the capacity of the new WRP at 4 mgd required to serve the needs of Oak Valley and other areas of the district from where wastewater could flow by gravity to the new WRP. Based on the projected capacities contained in the Yucaipa Wastewater Master Plan for both treatment plants, there are approximately 11 mgd of wastewater available for recycling (YVWD 2005).

2.4.4 Surface Water Quality

The IRWM Region is within the boundaries of the Santa Ana Regional Water Quality Control Board (SARWQCB). The SARWQCB has divided the mainstem of the SAR into six reaches. Reaches 1 through 6 have reach numbers beginning at the Pacific Ocean and increasing upstream. Reaches 3 through 6 are located in the Upper SAR watershed. These reaches are described in more detail below, from upstream to downstream.

Reach 6 (River Mile (RM) 70.93 and Above)

This reach includes the river upstream of Seven Oaks Dam where flows consist largely of snowmelt and storm runoff and water tends to be of excellent quality (SARWQCB 1995).

Reach 5 (RM 70.93 to RM 57.68)

This reach extends from Seven Oaks Dam to the Bunker Hill Dike (San Jacinto fault), which marks the downstream edge of the Bunker Hill Subbasin. This reach tends to be dry except during storm flows. The lower end of this reach sometimes has rising groundwater and includes the San Timoteo Creek, which flows on an intermittent basis (SARWQCB 1995).

Reach 4 (RM 57.68 to RM 49.00)

This reach includes the SAR from Bunker Hill Dike downstream to Mission Boulevard Bridge in Riverside. The bridge is the upstream limit of rising groundwater resulting from the constriction at Riverside Narrows. Until about 1985, most water in the reach percolated to the local groundwater leaving the lower part of the reach dry. However, flows in the lower end of this reach may now intermittently contain rising groundwater, RIX and Rialto discharge, and flows from San Timoteo Creek.

Reach 3 (RM 49.00 to RM 30.50)

This reach includes the SAR from Mission Boulevard Bridge in Riverside to Prado Dam. At the Riverside Narrows, rising groundwater feeds several small tributaries including Sunnyslope Channel, Tequesquite Arroyo, and Anza Park Drain (SARWQCB 1995).

Water Quality Issues

Water quality within the Upper SAR watershed is addressed through several plans, regulations and guidelines including the *Water Quality Control Plan for the Santa Ana River Basin* (Basin Plan), which includes beneficial use designations and water quality objectives. Those water bodies not meeting the Basin Plan water quality objectives and determined to have beneficial uses are listed on the State's 303(d) list of impaired water bodies, and require a TMDL to be developed. Table 2-5 shows the water bodies in the Upper SAR watershed that are listed on the State's 303(d) list for water quality impairments.

The SARWQCB states that the quality of the SAR is a function of the quantity and quality of the various components of the flows (SARWQCB 1995). Three components make up the flow of the water in the SAR: (1) storm flows, (2) baseflow, and (3) non-tributary flow. The relative proportion of these components varies throughout the year.

The first component, storm flows, results directly from rainfall, usually occurring between the months of December and April. Much of the rainfall and surface water runoff from the storms is captured and percolated into the groundwater basins. The quality of storm flow water is highly variable.

Table 2-5: 303(d) Listed Water Bodies in the Upper SAR

Water Body	Impairments
Big Bear Lake	Mercury, Noxious Aquatic Plants, Nutrients, PCBs
Grout Creek	Nutrients
Knickerbocker Creek	Pathogens
Lytle Creek	Pathogens
Mill Creek, Reach 1	Pathogens
Mill Creek, Reach 2	Pathogens
Mountain Home Creek	Pathogens
Mountain Home Creek, East Fork	Pathogens
Rathbone (Rathbun) Creek	Cadmium, Copper, Nutrients, Sediment/ Siltation
Santa Ana River, Reach 6	Cadmium, Copper, Lead
Santa Ana River, Reach 4	Pathogens
Santa Ana River, Reach 3	Copper (wet weather only), Lead, Pathogens
Summit Creek	Nutrients

Two TMDLs have been adopted to address the above impairments in the Upper SAR.

- TMDLs for Bacterial Indicators in the Middle Santa Ana River Watershed (February 3, 2005): Addresses pathogens in the Santa Ana River, Reach 3.
- Nutrient TMDL for Dry Hydrological Conditions for Big Bear Lake (April 21, 2006): Addresses nutrients in Big Bear Lake.

Baseflow makes up the second component of water flow in the SAR, a large portion coming from the discharge of treated wastewater into the river in addition to rising groundwater in the basin. This baseflow includes the non-point source discharges as well as the uncontrolled and unregulated agricultural and urban runoff. Water quality objectives are set in relation to the baseflow in the river, not to the total flow in the river (see Table 2-6). The intent of these objectives is to protect the river's groundwater recharge beneficial use. Compliance with these objectives is verified by annual measurement of the baseflow quality.

The quantity and quality of baseflow is most consistent during the month of August. At that time of year, the influence of storm flows and non-tributary flows is at a minimum and volumes of rising water and non-point source discharges tend to be low. The major component of baseflow in August is municipal wastewater. For these reasons, this period has been selected by the SARWQCB as the time when baseflow will be measured and its quality determined. To determine whether the water quality and quantity objectives for baseflow in Reach 3 of the SAR are being met, the SARWQCB collects a series of grab and composite samples during August of each year. The results are compared with the continuous monitoring data collected by USGS and data from other sources.

Table 2-6: SAR Basin Surface Water Quality Objectives (WQO)[a]

Inland Surface Streams Upper SAR Basin	Water Quality Objectives milligrams per liter (mg/L)						
	Total Dissolved Solids (TDS)	Hardness ($CaCO_3$)	Sodium (Na)	Chloride (Cl)	Total Inorganic Nitrogen (TIN)[b]	Sulfate (SO_4)	Chemical Oxygen Demand (COD)
Reach 2 - 17th Street in Santa Ana to Prado Dam	650[c]	---	---	---	---	---	---
Reach 3 - Prado Dam to Mission Blvd. - Baseflow	700	350	110	140	10[2]	150	30
Reach 4 - Mission Blvd. in Riverside to San Jacinto Fault	550	---	---	---	10	---	30
Reach 5 - San Jacinto Fault in San Bernardino to Seven Oaks Dam	300	190	30	20	5	60	25
Reach 6 - Seven Oaks Dam to Headwaters	200	100	30	10	1	20	5

Source: SARWQCB 1995

[a] A number of amendments to the WQOs of the Basin Plan have been proposed. However, these proposed amendments do not include changes to the WQOs applicable to Reaches 3 through 6 of the SAR (SARWQCB 2004).

[b] Total nitrogen, filtered sample.

[c] Five-year moving average.

The SARWQCB sets discharge requirements on wastewater discharges, the major source of baseflow in the SAR. Waste discharge requirements are developed on the basis of the limited assimilative capacity of the river. Non-point source discharges, generally from urban runoff and agricultural tailwater, are regulated by requiring compliance with Best Management Practices (BMPs), where appropriate.

The third component of flow in the SAR that influences water quality is characterized by the SARWQCB as non-tributary flow. Non-tributary flow is generally imported water released in the upper basin for recharge in the lower basin (SARWQCB 1995).

Streams on the Santa Ana Basin generally have increasing dissolved minerals as one goes downstream. This effect is due to the fact that water is used, recycled, and used again. The magnitude or amount of TDS concentration rises with each use of water. Groundwater also enters basin streams in some reaches, and their sampling indicated that some of the highest TDS (and in some cases nitrates) may occur at sites on the valley floor that are dominated by rising groundwater (USGS 2006). Nitrate concentrations are higher in Santa Ana Basin streams receiving treated wastewater than in streams without treated wastewater. The principal source of nitrate is fertilizer from historic agricultural operations.

Table 2-7 provides a summary of the available historical surface water quality data for TDS and nitrogen at points along the SAR (USGS 2007).

Table 2-7: Average Historic Surface Water Quality for Locations on the SAR (1990-2001)

Water Quality Constituent	Metropolitan Crossing Gage (Reach 3)[a]	RIX-Rialto Effluent Outfall (Reach 4)[a]	Mentone Gage (Reach 5)[a]
TDS	560[b]	520[c]	230[b]
TDS Basin Plan Objective by Reach	700	550	300
Total Inorganic Nitrogen (TIN)	7.3[b]	8.5[c]	0.3[b]
TIN Basin Plan Objective by Reach	10[d]	10	5

Source: USGS gage data. Data for River Only Mentone Gage begins in October 1998. Data for Riverside Narrows Gage begins in August 1997.
[a] Proposed amendments to the Basin Plan do not include changes to the water quality objectives in Reaches 3 through 6 of the SAR (SARWQCB 2004).
[b] USGS 2004.
[c] The TDS and TIN values assigned for RIX-Rialto are the maximum values that occurred during 2001-2002 as reported in Table 4.4-9 of the SBMWD RIX Facility Recycled Water Sales Program Preliminary Environmental Impact Report (PEIR), March 2003.
[d] Total nitrogen, filtered sample.

Imported Water Quality

Water is imported to the IRWM Region from the Colorado River via the Colorado River Aqueduct (CRA), owned and operated by Metropolitan, and from Northern California via SWP facilities. The TDS level in the CRA water averages approximately 700 mg/L and, during drought years, can increase to above 900 mg/L (Metropolitan and USBR 1999). Salinity projections for wet year conditions show TDS values between 650 and 800 mg/L (Metropolitan and USBR 1999). SWP water is suitable for most beneficial uses due to its low TDS levels of 200 to 300 mg/L (DWR 2003a). However, TDS levels of SWP water can vary due to drought conditions, flood events, reservoir management practices, and salt input from local streams.

In order to protect water quality impacts from imported water, the "Cooperative Agreement to Protect Water Quality and Encourage the Conjunctive Uses of Imported Water in the Santa Ana River Basin" was signed in 2007 by the SARWQCB, and the City of Corona, City of Riverside, Eastern Metropolitan Water District, Elsinore Valley Metropolitan Water District, Orange County Water District, Valley District, San Gorgonio Pass Water Agency, and Western (Recharge Parties).

This order states that long-term conjunctive use of groundwater in the Region requires that the quality of water in groundwater basins in the region be managed to meet the water quality objectives for nitrogen and TDS (collectively, the Salinity Objectives) adopted by the SARWQCB in the 1995 Water Quality Control Plan for the Santa Ana River Basin, as amended in 2004 by R8-2004-0001 (Basin Plan).

The parties that recharge imported water within the Santa Ana Region (Recharging Parties) agree to collect, compile, and analyze the total inorganic nitrogen (TIN) and 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 within the Region.

This agreement provides a framework for groundwater recharge of imported water and will facilitate conjunctive management in the region while protecting water quality. A copy of the agreement is presented in Appendix B.

2.5 Groundwater Systems and Management

The IRWM Region lies on the south slope of the Transverse Ranges Geologic Province. The Transverse Ranges are an east-west trending series of steep mountain ranges and valleys. The east-west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name Transverse. The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz Islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges. As a result, this is one of the most rapidly rising regions on Earth.

2.5.1 Groundwater Basin Descriptions

DWR Bulletin 118 maps four groundwater basins within the IRWM Region. These basins include the Upper Santa Ana Valley, Bear Valley, Big Meadows Valley, and Seven Oaks Valley groundwater basins. The last three basins are small, with a combined storage capacity of approximately 66,000 AF. The Upper Santa Ana Valley Groundwater Basin consists of eight subbasins:

1. Bunker Hill,
2. Rialto-Colton,
3. Riverside-Arlington,
4. San Timoteo,
5. San Jacinto, Cajon,
6. Yucaipa,
7. Chino, and
8. Cucamonga.

Cucamonga subbasin is entirely outside this Region and will not be discussed in the plan. Very small portions of the Chino and San Jacinto Subbasins are within the Region. Because of the small contribution of these two subbasins in overall groundwater management of the Region, they are not discussed in the IRWM Plan. Portions of the San Timoteo and Riverside-Arlington Subbasins are within the Region, while Bunker Hill, Rialto-Colton, Yucaipa, and Cajon Subbasins are entirely within the Region. Bunker Hill Subbasin along with the locally recognized Lytle Creek Subbasin (shown as overlapping Bunker Hill Subbasin and Rialto-Colton Subbasin in Figure 2-4), form the San Bernardino Basin Area (SBBA). The SBBA is the focus of this IRWM Plan and plays a central role in the water supply for communities within the Region. Brief descriptions of the groundwater basins and subbasins in the Upper SAR watershed are presented below. The storage capacities of the basins and subbasins are listed in Table 2-8 and the locations are shown in Figure 2-4.

Table 2-8: Groundwater Basins in USARW IRWM Region

Bulletin 118-Defined Groundwater Basin	DWR Groundwater Basin Number	Surface Area (acres)	Groundwater Storage Capacity (thousand AF)
Upper Santa Ana Valley:	8-02		
Bunker Hill Subbasin	8-02.06	89,600	5,976
Cajon Subbasin	8-02.05	23,200	—
Rialto-Colton Subbasin	8-02.04	30,100	2,517
Riverside-Arlington Subbasin	8-02.03	58,600	243
San Timoteo Subbasin	8-02.08	73,100	2,010
Yucaipa Subbasin	8-02.07	25,300	808
Bear Valley	8-09	19,600	42
Big Meadows Valley	8-07	14,200	10
Seven Oaks Valley	8-08	4,080	14

In some cases, the locally defined groundwater basins boundaries are different than those described in Bulletin 118, as shown in Figure 2-4. The remainder of the groundwater discussion will be focused on locally recognized basin boundaries.

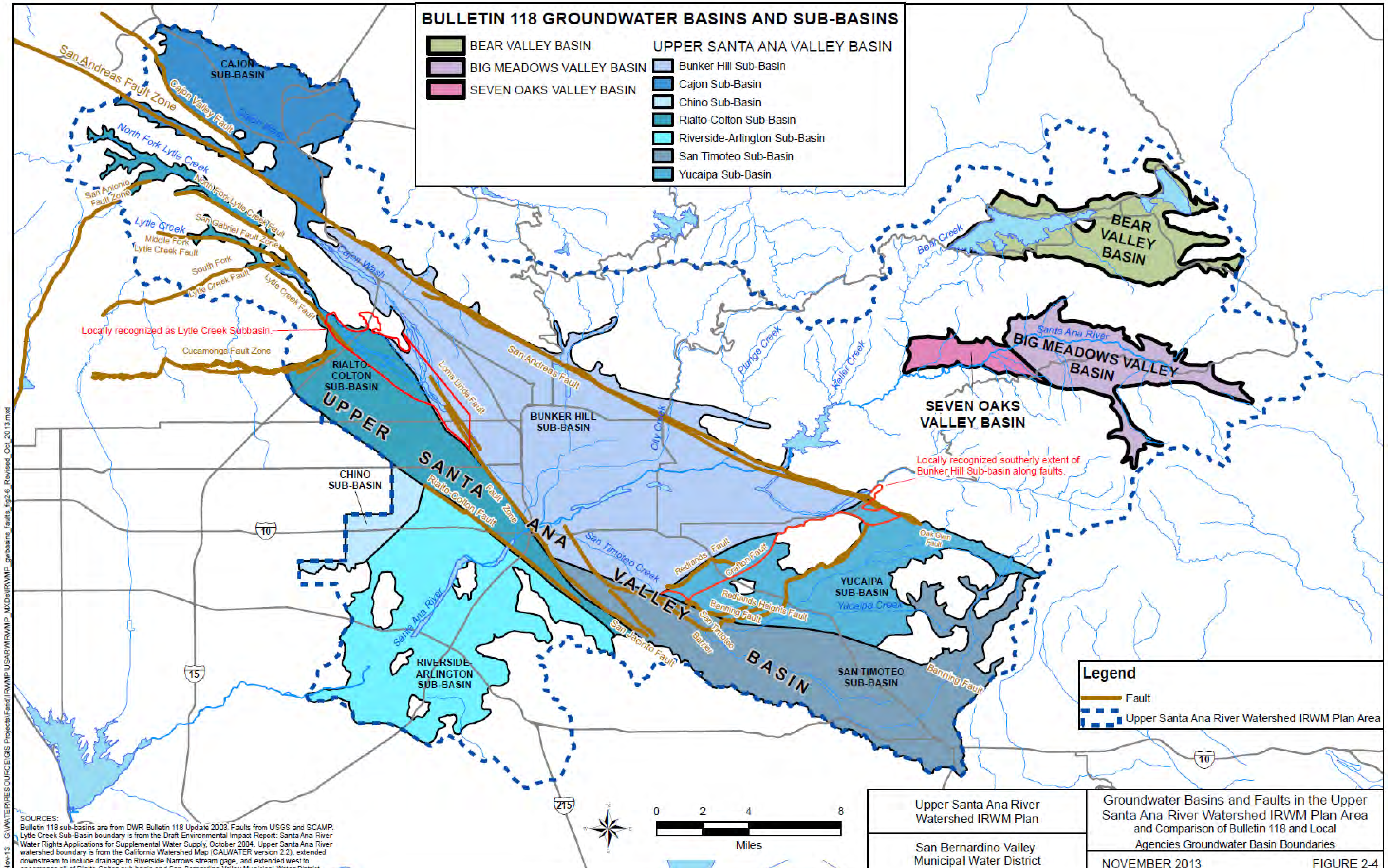
San Bernardino Basin Area

The 1969 Western-San Bernardino Judgment defines an area known as the SBBA. This area is defined as the "…area above Bunker Hill Dike [San Jacinto fault], but excluding certain mountainous regions and the Yucaipa, San Timoteo, Oak Glen and Beaumont Basins" (Figure 2-5). The SBBA traditionally refers to two groundwater subbasins – Bunker Hill and Lytle Creek.

Bunker Hill Subbasin is the largest subbasin in the Upper SAR watershed. The basin is bordered on the northwest by the San Gabriel Mountains and Cucamonga fault zone; on the northeast by the San Bernardino Mountains and San Andreas Fault zone; on the east by the Banning fault and Crafton Hills; and on the south by a low, east-facing escarpment of the San Jacinto fault and the San Timoteo Badlands.

Lytle Creek Subbasin is not mapped in DWR Bulletin 118; however, the subbasin is an integral part of the Upper Santa Ana Valley Groundwater Basin and a major recharge area for both the Bunker Hill and Rialto-Colton subbasins. The Lytle Creek Subbasin is adjoined on the west by the Rialto-Colton subbasin along the Lytle Creek fault, and on the east and southeast by the Bunker Hill subbasin along the Loma Linda fault and Barrier G. The northwestern border of the subbasin is delineated by the San Gabriel Mountains, and runoff from the mountains flows south/southeast through Lytle and Cajon Creeks into the basin. Historically, local agencies have recognized Lytle Creek Subbasin as a distinct groundwater subbasin. Fontana Water Company and Fontana Union assert that the water rights in Lytle Creek are set forth in long-standing court judgments governing the rights of the parties in that basin. The validity and the extent of Fontana Water Company's and Fontana Union's water rights in Lytle Creek Subbasin are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

Figure 2-4: Groundwater Basins in the IRWM Region



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The Lytle Creek Subbasin contains Lytle Creek, with extensive headwaters in the adjacent mountain areas and a river channel comprised of deep, porous alluvial deposits. Sediments within the Lytle subbasin are, for the most part, highly permeable, and the aquifer has a high specific yield. Water levels in the Lytle Creek subbasin have fluctuated in excess of 200 feet over relatively short periods (less than 5 years) and in select wells (e.g., City of Rialto's City No. 1 well).

The entire SBBA has a surface area of approximately 141 square miles or 90,000 acres and lies between the San Andreas and San Jacinto faults. The numerous faults surrounding the SBBA impede the movement of groundwater and produce springs and a high water table in several areas. The SBBA is uniquely constrained by shallow groundwater levels when the basin is too full, and causes a liquefaction hazard. The Pressure Zone, which is within the SBBA, is described in more detail in this chapter because of high groundwater levels that historically have been of concern in the IRWM Region.

Estimates of the change in groundwater volume, or storage, in the SBBA are made annually by both Valley District and the SBVWCD. The SBBA has an estimated storage capacity of 5,976,000 AF. In general, the far eastern and northwestern portions of the Bunker Hill subbasin show the largest decreases in groundwater elevation, while the rest of the subbasin shows mostly stable or increasing elevations.

Groundwater in the Bunker Hill Subbasin generally flows in a southwesterly direction from the San Bernardino Mountains to the Colton Narrows. The San Jacinto fault generally runs perpendicular to the groundwater flow and acts as a partial barrier resulting in water level differences across the fault. This phenomenon also contributes to the high groundwater located within the City of San Bernardino, commonly referred to as the Pressure Zone (Figure 2-6). In the past, water levels in the Pressure Zone were raised high enough to cause artesian conditions.[5]

For the basin as a whole, there can be wide fluctuations in the average depth to groundwater from year to year, with annual changes as great as almost 40 feet. However, for the most part, annual changes register less than 20 feet (+ or -), with only six years exceeding this range. There are, however, noticeable variations in water movement across subbasins.

Recharge to the Bunker Hill Subbasin historically has resulted from infiltration of runoff from the San Gabriel and San Bernardino Mountains in areas where the upper confining member is absent or from the forebay area north of the pressure zone. The SAR, Mill Creek, and Lytle Creek contribute more than 60% of the total recharge to the groundwater system (USGS 1989). Lesser contributors include Cajon Creek, San Timoteo Creek, and most of the creeks flowing southward out of the San Bernardino Mountains. The subbasin is also replenished by deep percolation of water from precipitation and resulting runoff, percolation from delivered water, and water spread in streambeds and spreading grounds.

Percolation from streams is the major source of recharge in the SBBA. Recharge occurs both in the stream channels and in nearby artificial recharge basins. As a result of the highly permeable river channel deposits and the artificial recharge operations, nearly all of the flow in the smaller streams is recharged to the upper and middle aquifers close to the mountain front.

During floods, the major streams transmit large volumes of water over a short period, resulting in some surface water exiting the basin without contributing to groundwater recharge. Recharge to the SBBA also results from underflow (subsurface inflow), direct infiltration of precipitation, return flow, infiltration from underground sanitary sewer lines and storm drains, and artificial recharge of imported water. Total underflow for 1945 to 1998 averaged about 5,000 AFY (Danskin et. al. 2006). Annual inflow values have declined from a maximum of about 7,000 AF in 1945 to about 4,000 AF

5 Conditions where groundwater levels rise above the land surface in confined aquifers.

in 1998, predominately as a result of declining water levels in the Yucaipa subbasin. With the exception of unusually wet years, recharge from direct precipitation on the valley floor is minimal. An additional source of recharge is that derived from return flow of water pumped from and used locally within the SBBA, estimated at 30% (Hardt and Hutchinson 1980).

Groundwater discharge from the SBBA occurs from (1) rising water, (2) subsurface outflow, and (3) groundwater extractions. Rising water primarily occurs in the lower reaches of Warm Creek, when groundwater rises above the level of the ground surface or channel bottom and contributes to surface flows. The quantity of groundwater discharge into the creek for the period 1945 to 1992 was determined to be highly variable, with a maximum discharge exceeding 40,000 AFY and a minimum discharge of zero for 16 consecutive years, from 1963 to 1978 (Danskin et al).

Subsurface outflow occurs in the vicinity of the SAR at the Colton Narrows and where Lytle Creek emerges from the San Gabriel Mountains. In the vicinity of the SAR at the Colton Narrows, subsurface outflow was estimated to range from 14,300 to 23,700 AFY for the period 1936 to 1949. Subsurface outflow north of Barrier J was estimated to be between 2,700 and 4,200 AFY during water years 1935 to 1960 (DWR 1970b; Dutcher and Garrett 1963).

While streamflow and subsurface outflow contribute to basin discharge, groundwater extraction is the primary discharge of groundwater from storage. Extracted water is used for agricultural, municipal, and industrial purposes. Most pumping is located near major streams, including the SAR, Lytle Creek, Warm Creek, and East Twin Creek. As the area has become urbanized, the quantity of agricultural pumping has declined considerably, presently accounting for less than 20% of the gross pumping (Danskin et al. n.d.). However, overall pumping has increased in the basin due to increased pumping for municipal and industrial purposes. Prior to 1940, gross pumping in the basin was less than 110,000 AFY, while current pumping has reached as high as about 209,500 AFY (Western-San Bernardino Watermaster 2012).

As the SBBA is the largest groundwater basin in the IRWM Region, a considerable amount of effort has gone into the management of this important resource. The Western-San Bernardino Watermaster provides a careful accounting of the SBBA on an annual basis. If pumping in the area exceeds the safe yield of the basin, then water must be imported to offset the amount exceeding the safe yield. If pumping in the area is below the safe yield, then the basin accrues "credits" in a like amount. The representative entities for the Western Judgment are Valley District and Western. Valley District is solely responsible for providing replenishment of the SBBA if cumulative extractions exceed the cumulative safe yield. The IRWM Plan's objectives, strategies and projects serve as recommendations that are used by the two Boards of Directors to manage the SBBA.

Figure 2-5: SBBA Basin Area and Faults

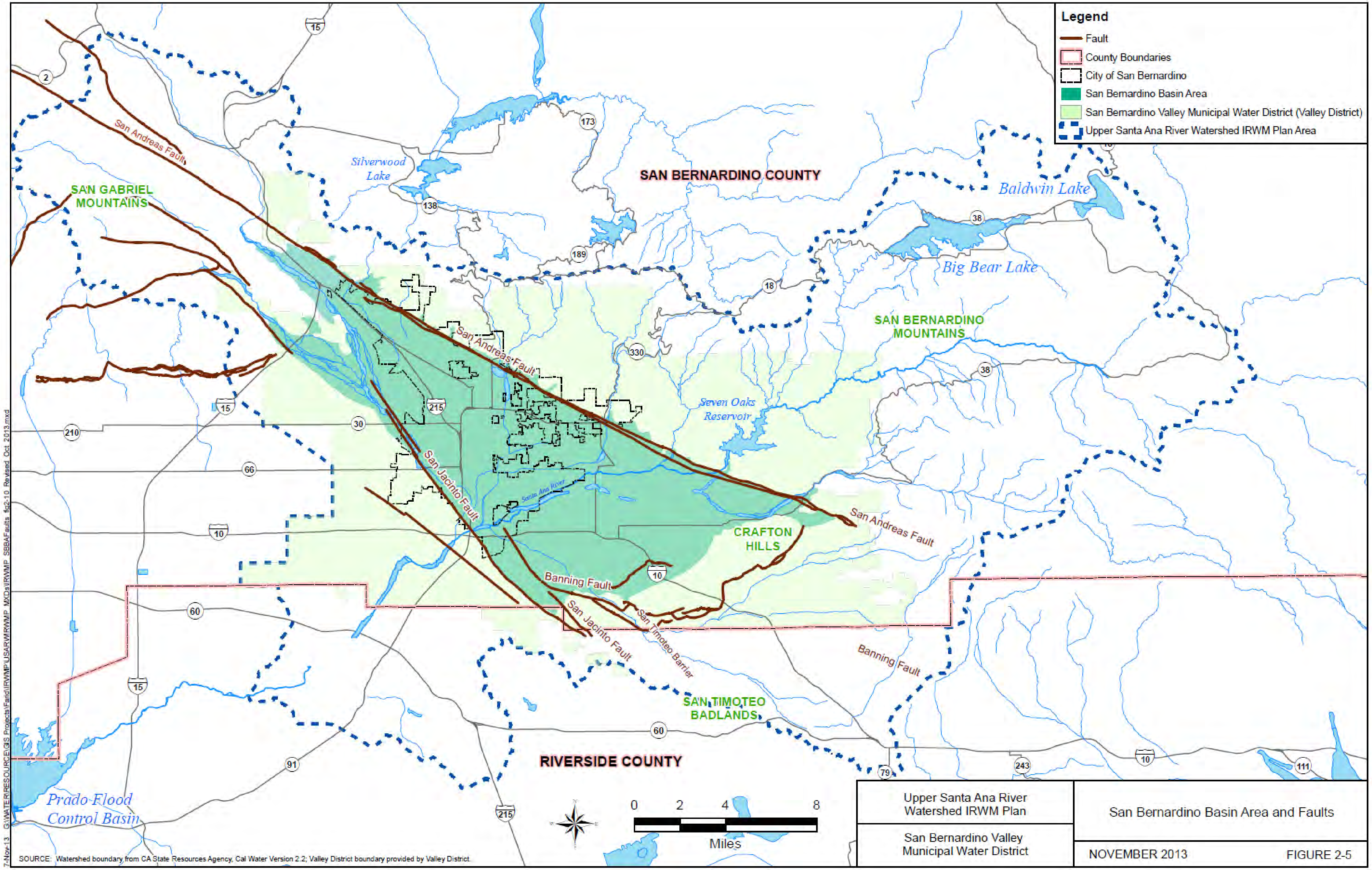
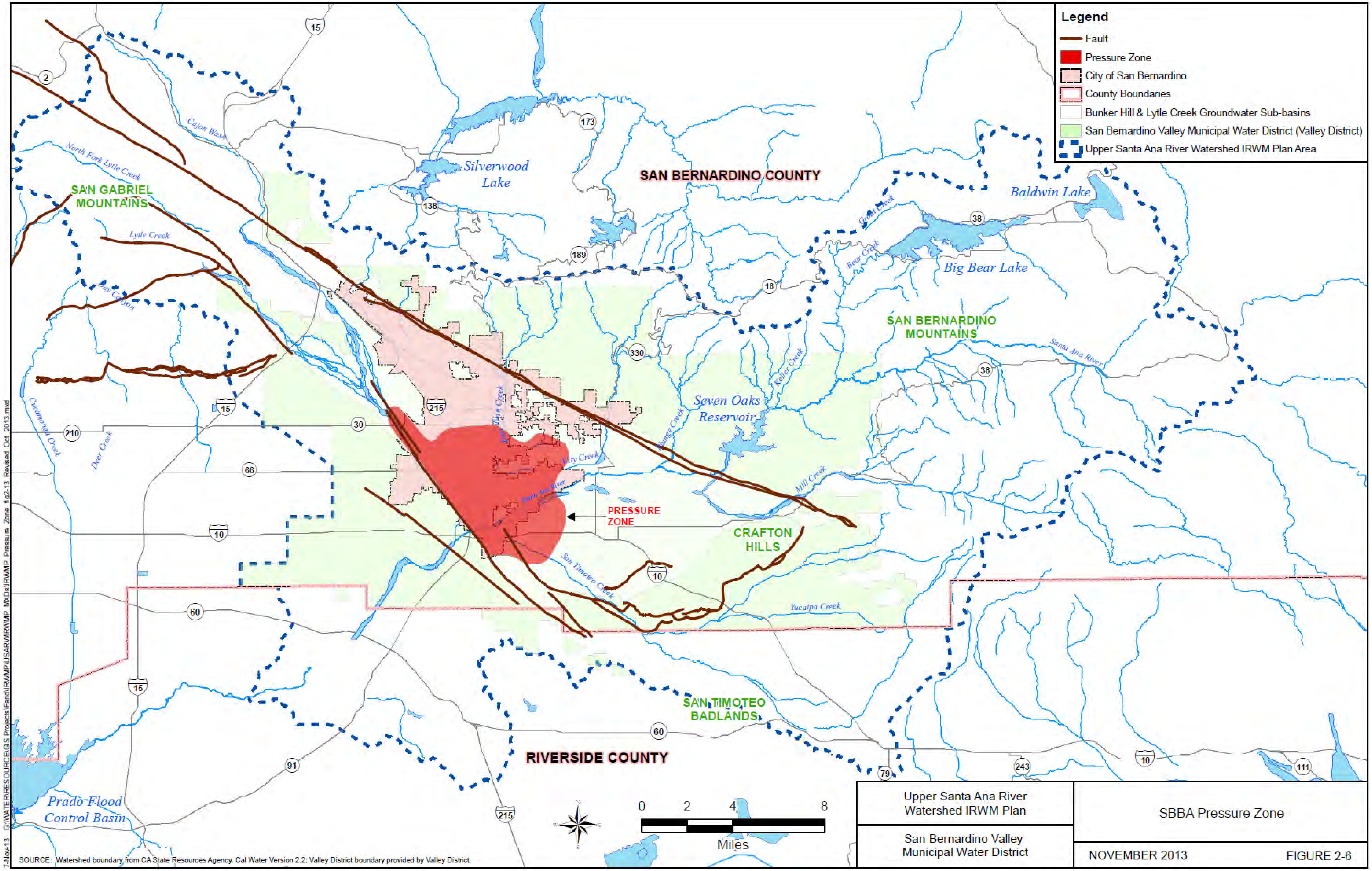


Figure 2-6: SBBA Pressure Zone



Storage of imported water during wet years also helps the Valley District Board of Directors achieve its objective of importing all of Valley District's available SWP entitlement water into southern California. In 2008, the Valley District Board directed its staff to work with the Basin Technical Advisory Committee (BTAC) on a storage program that would store water in wet years for later use during dry years.

A regional water management plan is prepared each year by the BTAC that includes recommendations for basin management and utilization of water resources. This plan is forwarded onto the two agencies that make up the Western-San Bernardino Watermaster for review and approval: Valley District and Western.

Rialto-Colton Subbasin

The Rialto-Colton Subbasin underlies a portion of the upper Santa Ana Valley in southwestern San Bernardino County and northwestern Riverside County. This subbasin is about 10 miles long and varies in width from about 3.5 miles in the northwestern part to about 1.5 miles in the southeastern part. The Rialto-Colton Subbasin is bounded to the north east by Lytle Creek Subbasin. The southwest boundaries of the Rialto-Colton Subbasin are disputed and are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085. The SAR cuts across the southeastern part of the basin in some maps. The subbasin generally drains to the southeast, toward the SAR, the Chino Basin, and the Riverside-Arlington Basin. Warm Creek and Lytle Creek join near the southeastern boundary of the subbasin and flow to meet the SAR near the center of the southeastern part of the subbasin.

The principal recharge areas are Lytle Creek, Reche Canyon in the southeastern part of the subbasin, and the SAR in the south-central part of the subbasin. Lesser amounts of recharge are provided by percolation of precipitation to the valley floor, underflow, and irrigation and septic returns (DWR 1970, Wildermuth 2000). Underflow occurs from fractured basement rock (DWR 1970, Wildermuth 2000) and through the San Jacinto fault in younger SAR deposits at the south end of the subbasin (Dutcher and Garrett 1958) and in the northern reaches of the San Jacinto fault system (Wildermuth 2000). Artificial recharge is also used to maintain basin levels, and will be discussed later in this section.

Cajon Subbasin

The Cajon Subbasin underlies Cajon Valley and Lone Pine Canyon, mostly in Cajon Pass, which is the boundary between the San Gabriel and San Bernardino Mountains. This subbasin is bounded by the Upper Mojave River Valley Groundwater Basin on the north along a surface drainage divide and the Bunker Hill Subbasin of the Upper Santa Ana Valley Groundwater Basin on the south. Cajon and Lone Pine Creeks drain the valley southward as tributaries to the SAR. The San Andreas Fault zone crosses the southern part of the subbasin and cuts up Lone Pine Canyon. Springs are found along the trace of the fault zone indicating it is a barrier to groundwater.

Riverside-Arlington Subbasin

The Riverside-Arlington Subbasin underlies part of the SAR Valley in northwest Riverside County and southwest San Bernardino County. The subbasin includes the Riverside North subbasin which is the portion of the Riverside subbasin in San Bernardino County. The northeast boundary of the Riverside-Arlington Subbasin is formed by the Rialto-Colton fault, and a portion of the northern boundary is a groundwater divide beneath the community of Bloomington. The SAR flows over the northern portion of the subbasin.

The Rialto-Colton fault to the northeast separates the Riverside-Arlington subbasin from the Rialto-Colton subbasin. The fault is a barrier to groundwater flow along its length, especially in its northern reaches (Wildermuth 2000). A groundwater divide in the alluvium separates the Riverside portion from the Arlington portion of the subbasin (DPW 1934). The Riverside-Arlington Subbasin is replenished by infiltration from SAR flow, underflow past the Rialto-Colton fault, intermittent underflow from the Chino subbasin, return irrigation flow, wastewater discharge, and deep percolation of precipitation (DPW 1934, Wildermuth 2000).

San Timoteo Subbasin

The San Timoteo Subbasin underlies Cherry Valley and the City of Beaumont in southwestern San Bernardino and northwestern Riverside Counties. The surface is drained by Little San Gorgonio Creek and San Timoteo Canyon to the SAR. Groundwater is replenished by subsurface inflow and percolation of precipitation, runoff, wastewater discharge, and imported water. Runoff and imported water are delivered to streambeds and spreading grounds for percolation (DWR 1967a, 1970). The San Timoteo Subbasin is not adjudicated, and reliable estimates of total groundwater extractions are not available. However, because water table elevations within the San Timoteo Subbasin have not declined, it's assumed that long-term pumping within the basin is less than long-term average recharge.

Yucaipa Subbasin

The Yucaipa Subbasin underlies the southeast part of San Bernardino Valley. The average annual precipitation ranges from 12 to 28 inches. This part of the San Bernardino Valley is drained by Oak Glen, Wilson, and Yucaipa Creeks south and west into San Timoteo Wash, a tributary to the SAR.

Dominant recharge to the subbasin is from percolation of precipitation and infiltration within the channels of overlying streams, particularly Yucaipa and Oak Glen Creeks; underflow from the fractures within the surrounding bedrock beneath the subbasin; and artificial recharge at spreading grounds. Four artificial recharge facilities with a total capacity of about 56,500 AFY were noted in 1967 (DWR 1967b). By increasing the spreading acreage along Oak Glen Creek by 25 to 50 acres, the capability exists to spread 7,000 to 14,000 AF of surface water annually to recharge the Yucaipa Subbasin (YVWD 2000a).

The Yucaipa Subbasin is not adjudicated; however, a groundwater management plan (AB 3030 Plan) is underway to proscribe collective management of the subbasin. With ample storage, ability to recharge the basin by spreading surface waters and apparent flexibility in managing groundwater levels without subsidence problems, the Yucaipa subbasin could be conjunctively managed both to meet normal annual demands and to meet water resource needs in the event of a drought and curtailment or loss of inconsistent surface water supplies, resulting in a highly reliable water supply. Current goals are to secure agreements to not pump beyond the safe yield of the basin, supplementing supplies with imported surface water.

Bear Valley Groundwater Basin

Bear Valley Groundwater Basin underlies Bear Valley and is bound by the San Bernardino Mountains in southern San Bernardino County. Big Bear Lake, which lies in the western portion of the valley, receives runoff from Grout Creek to the northwest, Van Dusen Canyon to the northeast, Sawmill Canyon and Sand Canyon to the southeast, Knickerbocker and Metcalf Creek to the south, and North Creek to the southwest. Baldwin Lake, which is typically dry, lies in the northeast portion of the valley and receives occasional runoff from Van Dusen Canyon to the northwest and Shay Creek to the south (Geoscience 2001).

A groundwater divide exists between Big Bear Lake and Baldwin Lake in the vicinity of the Big Bear Airport (Geoscience 1999). Faults are mapped, but it is not known if these are barriers to groundwater movement. Recharge of this basin is likely from percolation of precipitation and runoff and underflow from fractured crystalline rocks.

Bear Valley Groundwater Basin is not currently adjudicated, and is not currently in overdraft.

Big Meadows Valley Groundwater Basin

Big Meadows Valley Groundwater Basin underlies a mountain valley in the upper reach of the SAR. The basin is bounded on the west by Seven Oaks Valley Groundwater Basin along the Slide Peak fault (Rogers 1967) and elsewhere by the San Bernardino Mountains. The valley is drained by the SAR. The Slide Peak, Santa Ana, and San Gorgonio faults are mapped as cutting through basin materials (Rogers 1967); however, it is not known whether these faults impede groundwater movement. The Big Meadows Valley Basin Groundwater Basin is not currently adjudicated.

Seven Oaks Valley Groundwater Basin

Seven Oaks Valley Groundwater Basin underlies a mountain valley in the upper reaches of the SAR. The basin is bounded on the east by Big Meadows Valley Groundwater Basin along the Slide Peak fault (Rogers 1967) and elsewhere by the San Bernardino Mountains. The Slide Peak and Santa Ana faults are mapped as cutting through basin materials (Rogers 1967); however, it is not known whether these faults impede groundwater movement. It’s assumed that recharge is derived principally from percolation of precipitation and stream flow in the SAR. The Seven Oaks Valley Groundwater Basin is not currently adjudicated.

2.5.2 Recharge Area Programs

Conjunctive use of surface water and groundwater is a long-standing practice in the IRWM Region. Part of the potable water used in the Region is imported from sources in the Sierra and Northern California through the SWP. Several reservoirs are operated primarily for the purposes of storing surface water for domestic and irrigation use, but groundwater basins are also recharged from the outflow of some reservoirs. The concept is to maintain streamflow over a longer period of time than would occur without regulated flow and thus provide for increased recharge of groundwater basins. Most of the larger basins in this Region are managed with many conjunctive use projects being developed to optimize and manage water supply. Numerous groundwater spreading grounds have been developed to recharge the groundwater basins when adequate surface water supply is available. Management of the water level in the SBBA, in general, and the Pressure Zone (see Figure 2-6), in particular, is a focus of the groundwater management of the Region.

Storage Program

Storage of imported water during wet years helps Valley District achieve the objective of importing all of Valley District’s available SWP entitlement water into southern California. In 2008, the Valley District Board directed its staff to work with the BTAC on a storage program that would store water in wet years for later use during dry years.

The primary recommended storage location is local groundwater basins. Local groundwater basins are preferable due to the proximity to end users, the significant investment in wells that can be used to extract the water, and the reduction in evaporation associated with storing the water underground. To meet future demands in the Region, groundwater modeling results indicate that Valley District will need to import an average of about 62,000 AFY. During wet years, over 37,000 AF of this water would be stored. In dry years, 50,000 AF would be pumped from storage thereby reducing the Valley District service area’s dry year need from the State Water Project (SWP) to 12,000 AF (see Table 3-4 in Chapter 3).

The *2011 State Water Project Final Delivery Reliability Report* predicts that the SWP may deliver as low as 11% of its maximum delivery capability during a future drought. Most recently, the 2014 drought has resulted in deliveries of five percent of SWP allocations. Valley District's ultimate direct delivery need is about 30%, leaving a 19%, or 19,000 AF, deficit in dry years. A storage program is currently being developed that would store enough water be upstream of the Valley District service to make up for this deficit during dry years.

Spreading Grounds

Numerous groundwater spreading grounds have been developed to recharge the groundwater basins.

Artificial recharge in the IRWM Region's groundwater basins has been occurring as early as 1912. Because of the extremely permeable sand and gravel deposits in the Region's groundwater basins, maximum instantaneous recharge rates are high. Based on a recharge efficiency rate of 95%, the total quantity of artificial recharge in the basin averaged about 7,400 AFY from 1972 to 1992. Because of the size of several of the recharge basins and exceptionally permeable material, a larger quantity of water could be imported and recharged along the base of the San Bernardino Mountains, if necessary (i.e., recharge basin capacity and infiltration rates are not currently limiting the amount of imported water that is recharged). Any additional recharge and extraction should be carefully planned and implemented to avoid liquefaction and unacceptable decreases in groundwater levels in the basins.

Numerous existing groundwater recharge facilities (spreading grounds or spreading basins) are located in the SBBA, Rialto-Colton, and Yucaipa Subbasins. The locations of these facilities are shown in Figure 2-7, and selected characteristics are summarized in Table 2-9. Existing turnouts serve each recharge facility, with the exception of the Cactus Spreading and Flood Control Basins, which would be served by the Cactus Basins Pipeline proposed by Valley District.

Table 2-9: Recharge Facilities

Facility Name	Owner or Operator	Conveyance Used to Serve Facility Turnout Name & Capacity (cfs)	Recharge Facility Characteristics[1]			
			Active Recharge Facility Area[2] (acres)	Percolation Rate[3] (feet/day)	Monthly Capacity (AF)	Groundwater Basin (and Subbasin) Recharged[4]
SAR Spreading Grounds	SBVWCD	Foothill Pipeline Santa Ana Low Flow (288) Santa Ana Intake (200 Max)	64[4]	3	12,000	SBBA (Bunker Hill)
Devil Canyon and Sweetwater Basins	SBCFCD[5]	Foothill Pipeline Sweetwater (37)	30	1.5	1,350	SBBA (Bunker Hill)
Lytle Basins	Lytle Creek Water Conservation Association	Fontana Power Plant Constructed drainage channel	Variable	1.5	Variable	SBBA (Lytle Creek)
City Creek Spreading Grounds	SBCFCD	Foothill Pipeline City Creek (60)	75	1.5	3,375	SBBA (Bunker Hill)
Patton Basins	SBCFCD	Foothill Pipeline Patton (12)	3	0.3	27	SBBA (Bunker Hill)
Waterman Basins	SBCFCD	Foothill Pipeline Waterman (135)	120	0.5	1800	SBBA (Bunker Hill)
East Twin Creek Spreading Grounds	SBCFCD	Foothill Pipeline Waterman (135)	32	1.5	1440	SBBA (Bunker Hill)
Badger Basins	SBCFCD	Foothill Pipeline Sweetwater (22)	15	0.5	225	SBBA (Bunker Hill)
Mill Creek	SBVWCD	Greenspot Pipeline Mill Creek Spreading (50) Mill Creek Intake (110)	66	3	6,000	SBBA (Bunker Hill)

Facility Name	Owner or Operator	Conveyance Used to Serve Facility	Recharge Facility Characteristics[1]			
		Turnout Name & Capacity (cfs)	Active Recharge Facility Area[2] (acres)	Percolation Rate[3] (feet/day)	Monthly Capacity (AF)	Groundwater Basin (and Subbasin) Recharged[4]
Cactus Spreading and Flood Control Basins	SBCFCD	San Gabriel Valley MWD Lytle Pipeline	46	1.5	2,070	Rialto-Colton
		Lower Lytle Creek (55)				
Wilson Basins	SBCFCD	East Branch Extension	12	1	360	Yucaipa subbasin
		Wilson Basins (30)				
Garden Air Creek	Valley District	East Branch Extension	n/a	n/a	n/a	San Timoteo subbasin
		Garden Air Creek (16)0				

[1] Values are from tabulation on map contained in Water Right Application by Valley District and Western to appropriate water from the SAR or by engineering evaluation of spreading grounds.

[2] Recharge facility area is the geographical extent of each basin that can be inundated for recharge.

[3] Estimated percolation rate. This is the estimated rate at which water can percolate into the ground through the basin, expressed in feet per day. The values used have generally been computed from the annual recharge capacity. These rates are typically about one-half of the percolation rates presented by the USGS (1972). The use of the small percolation rates is reasonable in that it would involve longer-term percolation rates that are typically smaller than short-term rates.

[4] Note that there may be flow out of the subbasin or basin identified. For example, a report by Geoscience Support Services, Inc. (1992) estimated that only 36 percent of the water recharged in the upper Lytle Creek area remains in the Lytle Creek subbasin, while most of it flows to the Rialto-Colton subbasin.

[5]Recharge facility area based upon 4/11/03, SBVWCD Report: “SBVWCD Basin Storage Capacity for SAR and MC.” Or by estimating using GIS.

2.5.3 Groundwater Quality

Groundwater quality varies among the Region’s groundwater basins, particularly in the subbasins of the Upper SAR due to geology and faulting patterns and recharge points, and from anthropogenic sources of contamination.

San Bernardino Basin Area

Groundwater in the SBBA is generally a calcium-bicarbonate type, containing equal amounts (on an equivalent basis) of sodium and calcium in water near the land surface and an increasing predominance of sodium in water from deeper parts of the valley-fill aquifer. A TDS range of 150 to 550 mg/L, with an average of 324 mg/L, is found in public supply wells (DWR 2003). Electrical conductivity (EC) is a measure of total dissolved ionic constituents. EC has been measured within a range of 95 to 2,920 microMhos (μMhos) with an average of 523 μMhos.

Figure 2-7: Spreading Grounds in the IRWM Region

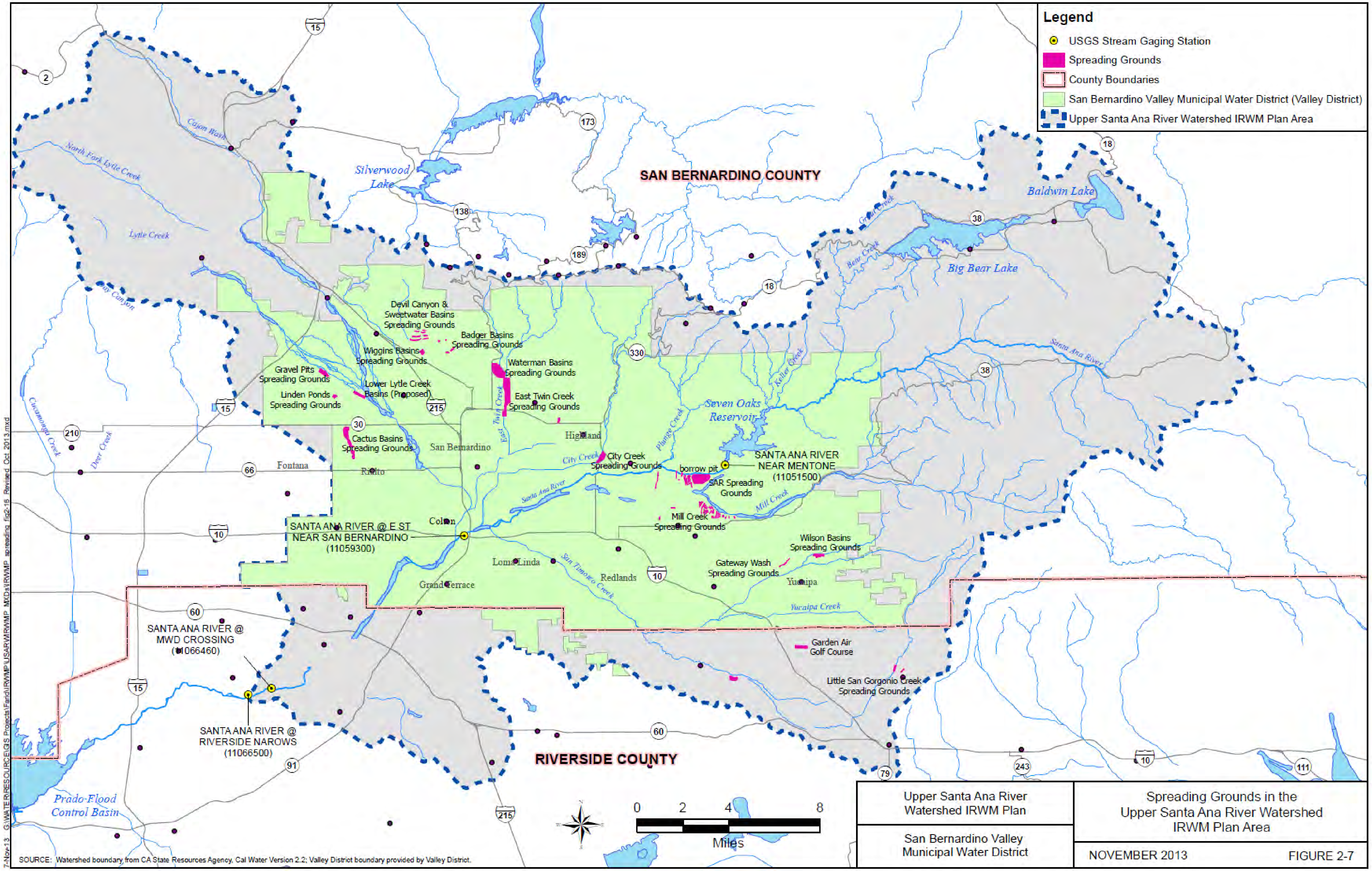
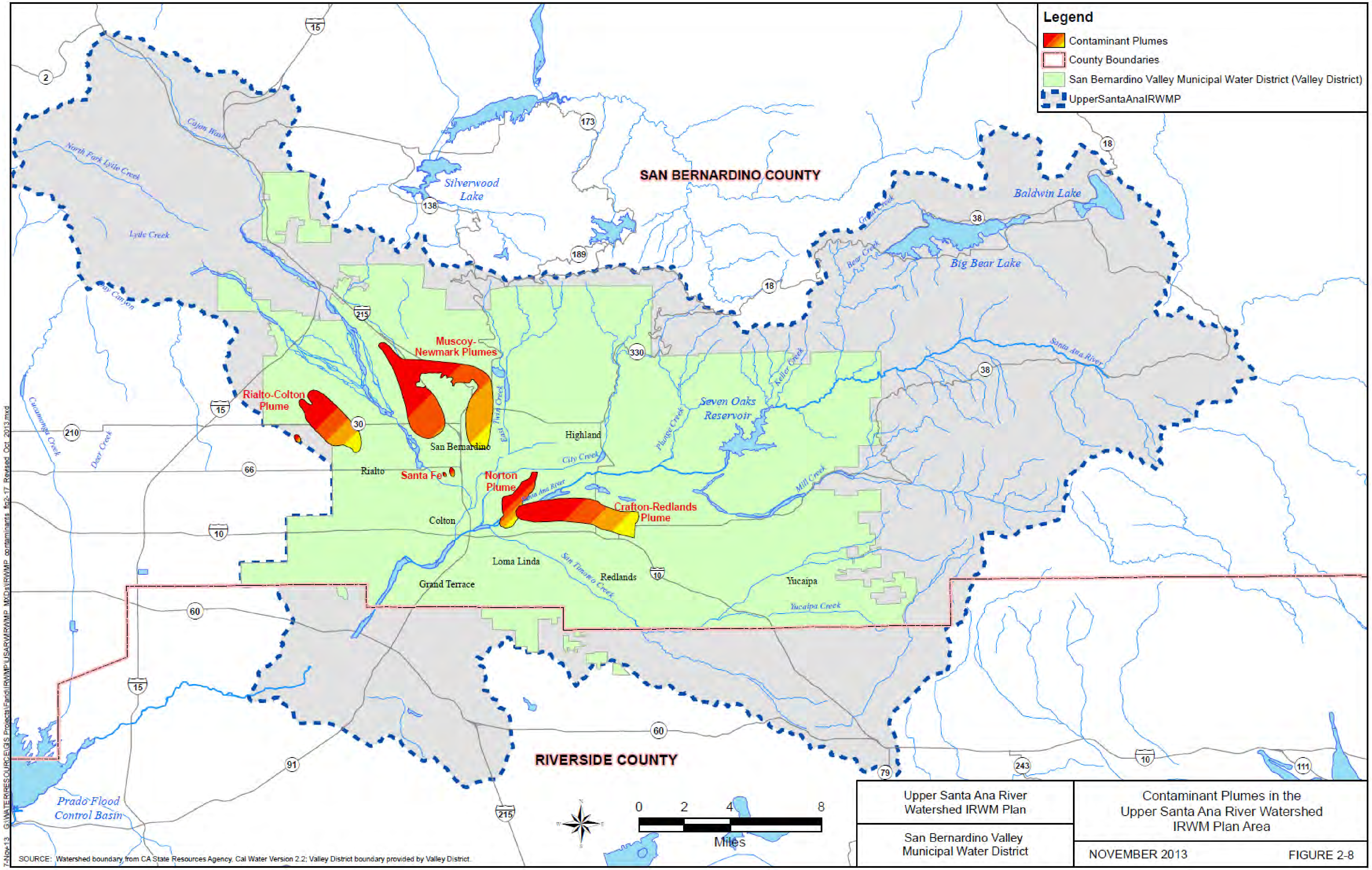


Figure 2-8: Contaminant Plumes in the IRWM Region



The inorganic composition of the groundwater may be affected by geothermal water emanating from faults and fractures in the bedrock surface underlying the aquifer. For example, concentrations of fluoride that exceed the public drinking water standard have limited the use of groundwater extracted near some faults and from deeper parts of the aquifer.

In some public supply well locations in the SBBA, some inorganic compounds (primary and secondary), radiological constituents, nitrates, pesticides, Volatile Organic Compounds (VOCs), Synthetic Organic Compounds (SOCs), and perchlorate were found above the maximum contaminant level (MCL) (see Table 2-10).

Table 2-10: Contaminants in SBBA Wells

Constituent	No. Wells Sampled	No. of Wells with a Concentration Above MCL
Inorganics (primary)	212	13
Radiological	207	34
Nitrates	214	34
Pesticides	211	20
VOCs and SOCs	211	32
Inorganics (secondary)	212	25
Perchlorate	369	156[1]

Source: DWR 2003. and Geoscience

[1] The MCL for Perchlorate is 6ug/l, while the "action level" is 4ug/l.

The SBBA is affected by five major groundwater contaminant plumes (Figure 2-8). Plumes in the basin include (1) the Crafton-Redlands plume, with trichloroethylene (TCE) and lower levels of perchloroethylene (PCE), debromochloropropane (DBCP) and perchlorate; (2) the Norton Air Force Base TCE and PCE plume, stretching 2.5 miles from its source and contaminating 100,000 AF of groundwater; (3 and 4) the Muscoy and Newmark plumes near the Shandon Hills, which are Superfund sites with TCE and PCE; and (5) the Santa Fe plume with PCE, TCE, and 1,2 dichloroethylene (1,2-DCE) contamination.

Within the City of San Bernardino, the Newmark plume and the Muscoy plume consist primarily of PCE. The plumes have impacted San Bernardino water supply wells. Under the federal Superfund Program, the U.S. Environmental Protection Agency (EPA) has implemented cleanup of these plumes, including use of groundwater extraction and treatment using granulated activated carbon. The treated water is then used to supplement the City of San Bernardino's potable water supply. It appears that cleanup efforts will be adequate to protect 32 down-gradient water supply wells (SAWPA 2002). However, groundwater model simulations suggest that containment of the plume will need additional extraction wells that will result in pumping of at least 14,000 AFY (Danskin, et al 2006).

The Norton Air Force Base plume, located just to the southwest of the former installation in the City of San Bernardino, is a major contaminant plume, consisting primarily of TCE and PCE. The plume has impaired 10 wells owned by the City of Riverside and the City of San Bernardino. Cleanup efforts by the Air Force, consisting of soil removal, soil gas extraction, and groundwater treatment, have significantly reduced this plume. The treatment plants now operate in a standby mode (SAWPA 2002).

Two commingled plumes, comprising the Crafton-Redlands plume, have impacted water supply wells for the cities of Riverside, Redlands, and Loma Linda, including Loma Linda University wells.

One plume contains TCE and the other perchlorate; both are in the upper 300 to 400 feet of groundwater. TCE has been measured in water supply wells at over 100 parts per billion (ppb), over 20 times the MCL of 6 ppb. Currently, however, water supply well concentrations are around 7 ppb. Perchlorate is present in water supply wells at concentrations up to 77 ppb.

As required by the SARWQCB, the Lockheed Martin Corporation (Lockheed) has prepared contingency plans to address impacts of the plume on water supply wells. These include blending, treatment, and/or providing alternative water supply sources. The plumes are currently being captured by the City of Riverside's Gage Well Field. Lockheed has installed granular activated carbon treatment units at some of the gage wells to remove TCE and has installed ion exchange units on some of these wells for the removal of perchlorate (SAWPA 2002).

The Santa Fe groundwater plume consists primarily of 1,2-DCE, TCE, and PCE. This plume is currently being monitored (ERM 2001).

Separately from the foregoing remediation efforts, Fontana Water Company currently operates and maintains a groundwater remediation project at its Plant F10 pursuant to a long-term agreement with San Bernardino County, the owner and operator of the Mid Valley Sanitary Landfill and corresponding Clean-Up and Abatement Order issued to San Bernardino County by the RWQCB. The 5,000 gpm treatment plant utilizes liquid phase granular activated carbon to treat for volatile organic compounds including, but not limited to, PCE, TCE, 1,1-DCE, and cis-1,2-DCE. The plant treats and removes those contaminants from groundwater extracted from both the Rialto-Colton and No Man's Land subbasins.

Rialto-Colton Subbasin

In public supply well samples in the Rialto-Colton Subbasin, the average TDS is 264 mg/L, with a range of 163 to 634 mg/L (DWR 2003). Other source samples show an average TDS of 230 mg/L and a range of 201 to 291 mg/L. This is a lower TDS range than the groundwater in the Bunker Hill Subbasin, where TDS levels from 1995 through 1997 ranged as high as 1,000 mg/L along the SAR. The San Jacinto fault markedly affects the groundwater chemistry in the basin. The TDS in groundwater downstream from the San Jacinto fault is greater than that in the surface water found in the Bunker Hill outflow area.

Of 38 public supply wells sampled, two were over the MCL for nitrates, and in three wells, secondary inorganics, VOCs, and SOCs exceeded the MCL (Table 2-11). Most reported nitrate concentrations are less than 22.5 mg/L, with a few samples ranging from 45 to 90 mg/L. Most of the wells sampled did not contain constituents over the MCL concentration.

More than 143 water source wells in Riverside and San Bernardino Counties alone now exceed 4 ppb of perchlorate contamination (California Department of Health Services 2003a). In the Valley District service area, the City of Rialto, the City of Colton, West Valley, and Fontana Water Company have shut down or restricted the use of 20 wells due to perchlorate contamination in the Rialto-Colton Subbasin, where concentrations reach above 4 ppb (SARWQCB 2003b).

Table 2-11: Contaminants in Rialto-Colton Subbasin Wells

Constituent	No. Wells Sampled	No. Wells with a Concentration Above an MCL
Inorganics (primary)	38	0
Radiological	40	0
Nitrates	38	2
Pesticides	40	0
VOCs and SOCs	40	3
Inorganics (secondary)	38	3
Perchlorate	38	7[1]

Source: DWR 2003 and Geoscience.
[1] No MCL has been established for Perchlorate. But "action level" is 4 ug/L

Cajon Subbasin

Groundwater within the Cajon Subbasin has an average TDS content of about 130 mg/L, with a range of 99 to 155 mg/L. The TDS range is lower than in the Riverside, Bunker Hill, and Yucaipa Subbasins, and comparable to the Rialto–Colton Subbasin. Only two public supply wells have been sampled. No exceedance of MCL in drinking water has been reported.

Riverside-Arlington Subbasin

The Riverside-Arlington Subbasin contains groundwater that is calcium or sodium bicarbonate dominated. Of the water sampled from 46 wells, TDS ranged from 210 to 889 mg/L, with an average of 463 mg/L (see Table 2-12) (DWR 2003). From other sources, TDS has been found to range from 320 to 756 mg/L. This is a higher TDS range than in the Rialto–Colton and Bunker Hill Subbasins.

In some of the sampled public supply wells, MCLs were exceeded for inorganics (primary and secondary), radiological constituents, nitrates, pesticides, VOCs, and SOCs. Nitrate (as NO_3) concentrations of greater than 20 mg/L were detected as early as the 1940s, probably due to historical land uses, including citrus production. NO_3 was the constituent found most frequently in the sampled wells, followed by pesticides. Only a few wells were found to have concentrations of primary and secondary inorganic compounds.

Table 2-12: Contaminants in Riverside-Arlington Subbasin Wells

Constituent	No. Wells Sampled	No. Wells with a Concentration Above an MCL
Inorganics (primary)	48	2
Radiological	48	11
Nitrates	51	21
Pesticides	50	19
VOCs and SOCs	50	8
Inorganics (secondary)	38	3

Source: DWR 2003

San Timoteo Subbasin

Groundwater beneath San Timoteo Canyon is dominated by sodium bicarbonate and calcium bicarbonate. Water samples from 24 public supply wells have an average TDS content of approximately 253 mg/L, with a range of 170 to 340 mg/L. The TDS range is lower than in the Riverside, Bunker Hill, and Yucaipa Subbasins and comparable to the Rialto–Colton Subbasin. Out of 27 sampled wells, one well contained secondary inorganics above the MCL (Table 2-13). Otherwise, no contaminants were found (DWR 2003).

Table 2-13: Contaminants in San Timoteo Subbasin Wells

Constituent	No. Wells Sampled	No. Wells with a Concentration Above an MCL
Inorganics (primary)	27	0
Radiological	26	0
Nitrates	28	0
Pesticides	27	0
VOCs and SOCs	27	0
Inorganics (secondary)	27	1

Source: DWR 2003

Yucaipa Subbasin

Most of the recent groundwater samples from the Yucaipa Subbasin indicate a calcium bicarbonate-type groundwater, generally meeting drinking water standards, with little variation across the basin. Groundwater has higher mineral concentrations, but otherwise is similar to the surface water in the area. The average TDS from public supply wells is 322 mg/L, with a range of 200 to 630 mg/L. This is similar to average TDS values of 343 mg/L and 334 mg/L estimated from other sources (DWR 2003).

Table 2-14 contains data from wells sampled for various pollutants (DWR 2003). Some samples contained concentrations above the MCL. This was true for one sample with primary inorganics, VOCs, and SOCs; four samples with pesticides and secondary inorganics; and 12 samples with nitrates. In the Yucaipa Subbasin, nitrates above the MCL were found more frequently than any other constituent in the sample well set.

Table 2-14: Contaminants in Yucaipa Subbasin Wells

Constituent	No. Wells Sampled	No. Wells with a Concentration Above an MCL
Inorganics (primary)	43	1
Radiological	44	1
Nitrates	46	12
Pesticides	43	4
VOCs and SOCs	44	1
Inorganics (secondary)	43	4

Source: DWR 2003

Bear Valley Groundwater Basin

Groundwater in Bear Valley Groundwater Basin is generally good. The eastern part of the basin is characterized by elevated fluoride. Other constituents of concern include manganese, uranium, and arsenic. Table 2-15 contains data from wells sampled for various pollutants (DWR 2003). These constituents are all naturally occurring, and while have at times resulted in the need for blending projects, have not led to groundwater supply disruption.

Table 2-15: Contaminants in Bear Valley Basin Wells

Constituent	No. Wells Sampled	No. Wells with a Concentration Above an MCL
Inorganics (primary)	33	7
Radiological	37	0
Nitrates	32	0
Pesticides	20	0
VOCs and SOCs	31	0
Inorganics (secondary)	33	5

Source: DWR 2003

Big Meadows Valley Basin

Groundwater in Big Meadows Valley Groundwater Basin is considered to be of good quality. Table 2-16 contains data from wells sampled for various pollutants (DWR 2003), and shows that no wells have exceeded MCLs.

Table 2-16: Contaminants in Big Meadows Valley Wells

Constituent	No. Wells Sampled	No. Wells with a Concentration Above an MCL
Inorganics (primary)	4	0
Radiological	3	0
Nitrates	4	0
Pesticides	3	0
VOCs and SOCs	3	0
Inorganics (secondary)	4	0

Source: DWR 2003

Seven Oaks Valley Basin

Information is not available for the quality of Seven Oaks Valley Basin.

2.6 Ecological and Environmental Resources and Management

The IRWM Region contains unique and valuable ecological and environmental resources. The following section will discuss these resources, and the various management plans used to maintain them.

2.6.1 SAR Corridor

The SAR corridor is defined as the area located within the incised channel of the river. Persistent aquatic and riparian habitats are present immediately downstream of the Seven Oaks Dam plunge pool; in oxbows; in fault zones; in areas with manmade or natural water sources, such as a tributary confluence or a storm drain outfall; in areas with perched water tables; and downstream of river mile (RM) 54.5, where groundwater emerges and flows on the surface of the riverbed (USACE 2000). Much of the habitat within the SAR corridor provides optimal foraging opportunities and several areas provide adequate breeding areas for raptors. Trees found in the riparian woodlands provide perches for foraging over the scrub and grassland.

Except during the winter months of December through March, surface flows in the SAR between Seven Oaks Dam and the San Bernardino International Airport are generally absent, and the riverbed is a braided, dry channel. Riparian habitat from Cuttle Weir to the airport is uncommon and limited to a few patches.

Downstream from the airport, surface flows are more prevalent and large areas of contiguous, well-developed riparian habitat as well as giant reed (*Arundo donax*) infestations along the banks of the SAR are common. Just downstream of the region are Prado Flood Control Basin and Prado Dam. Approximately 2,150 acres of land upstream of Prado Dam are owned by Orange County Water District, the local sponsor for Prado Dam. Within this area are approximately 465 acres of constructed wetlands as well as large areas of mature riparian habitat, naturally occurring wetlands, and deep water habitats.

The vegetation communities discussed above provide wildlife habitat throughout most of the SAR corridor. In general, wildlife within the area is extremely diverse and abundant due to the amount of natural open space and diversity of habitat types from the active river channels to the uppermost flood terraces. While a few wildlife species depend entirely on a single habitat type, the mosaic of all the vegetative communities within the Region and adjoining areas constitutes a functional ecosystem for a variety of wildlife species.

The SAR contains a variety of riverine conditions and habitat types that support a number of fish species throughout nearly the entire river when winter and spring flows are present. Portions of the SAR, such as the segment that traverses the alluvial fan, are dry during most of the year and, consequently, offer only temporary habitat for fish.

The scrub, woodland, and riparian habitats in the SAR corridor provide foraging and cover habitat for song birds including year-round residents, seasonal residents, and migrating individuals. The overall condition of these communities in the corridor is good and mostly undisturbed. In addition, portions of the SAR and its tributaries provide a perennial water source for birds.

The SAR wash is a state-designated Significant Natural Area. Approximately 27 sensitive plant and animal species are known to occur in the wash. About 760 acres of land belonging to the U.S. Bureau of Land Management (BLM) land within the Upper SAR wash area downstream from the Greenspot Bridge have been designated by BLM as an Area of Critical Environmental Concern (ACEC) because of the presence of the federally listed species, SAR wooly-star, and the San Bernardino kangaroo rat (U.S. Fish and Wildlife Service (USFWS) 1988).

Wildlife corridors link areas of suitable habitat that are separated by unsuitable habitat such as rugged terrain, development, or changes in vegetation. Riverbeds often provide a favorable passageway for wildlife movement to otherwise disconnected areas. Historically, the SAR bed was likely to have supported substantial regional wildlife movement. In addition, the SAR floodplain may have acted as a hub for wildlife movement with many major tributaries converging in a relatively short section of the river. In recent years, however, loss of habitat due to development on the floodplain and surrounding lowlands, as well as construction of Seven Oaks Dam, are likely to have greatly reduced the amount of regional movement through the corridor.

2.6.2 San Bernardino National Forest

The U.S. Forest Service (USFS) has jurisdiction over land uses in the San Bernardino National Forest, which is about 1/3 of the land within the Region. The *San Bernardino National Forest Land and Resource Management Plan of 1988* (USDA Forest Service 1988) directs the management of the forest. Its goal is to provide a management program that reflects a mix of activities that allows both the use and protection of forest resources; fulfills legislative requirements; and addresses local, regional, and national issues.

The San Bernardino National Forest is divided into 15 management areas based on (1) combinations of watersheds that have similar characteristics, (2) wilderness areas, and (3) potential wilderness areas. The Seven Oaks Dam and adjacent areas are located in the Central Section of the San Gorgonio District of the Santa Ana Management Area. Much of the area in this district is classified as the Santa Ana Recreation Area, a designation designed to provide continued protection of the recreation values for which it was established.

The management for this area emphasizes (1) fire management, (2) recreation (dispersed recreation opportunities in the lower SAR area), and (3) other integrated activities (including wildlife management and non-motorized recreation).

San Bernardino National Forest Watershed Management Planning

The upper reaches of the SAR watershed are located in the San Bernardino National Forest. The San Bernardino National Forest is one of 18 national forests in California, collectively referred to as Region 5 of the USFS. In 1981, Region 5 entered into a Management Area Agreement with the

SWRCB pursuant to Clean Water Act Section 208. This agreement designates Region 5 as the Water Quality Management Agency (WQMA) for the San Bernardino National Forest.

As the WQMA, Region 5 is responsible for the proper installation, operation, and maintenance of State- and EPA-approved BMPs in the San Bernardino National Forest. Region 5 is tasked with the responsibility of (1) correcting water quality problems in National Forests; (2) perpetually implementing BMPs; and (3) carrying out identified processes for improving or developing BMPs. In the Upper SAR watershed, the San Bernardino National Forest works conjunctively with the RWQCB on water quality issues such as TMDLs.

Currently, Region 5 is working with the State and RWQCBs to re-certify the Management Area Agreements pursuant to recent changes in State law, such as the new Nonpoint Source Implementation and Enforcement Policy. The process of revising the WQMP and Management Area Agreements will be a joint SWRCB and Region 5 effort. This will be a collaborative effort to develop a plan that identifies, prioritizes, and annually updates site-specific issues. In addition to re-certification of the Management Area Agreements, the San Bernardino National Forest will be implementing its 2006 Forest Plan. The Forest Plan describes the strategic direction at the broad program-level for managing the San Bernardino National Forest, including watershed management initiatives over the next 10 to 15 years. More recently, the United States Forest Service, San Bernardino National Forest completed an invasive species removal National Environmental Policy Act (NEPA) decision for the Mill Creek drainage (2014). Implementation of the decision is moving forward with various partners including Santa Ana Watershed Association (SAWA) and Southern California Edison (SCE). Additional partnerships and funding opportunities are being pursued to reduce the seed source that ultimately works against forest management.

Hazardous Tree Removal Program

It’s estimated that approximately 90% of the precipitation in the Region falls on the San Bernardino National Forest. Presently, the forest has approximately 10 times more trees than can be supported by local precipitation. These “extra” trees are the result of development within the forest and the accompanying suppression of wildfire, which naturally thins the forest. These extra trees consume extra water and make the forest more susceptible to fire. When fire does occur, the resulting debris flows down the mountains and fills the SBCFCD debris basins, making them ineffective. Proactively thinning the forest costs a fraction of cleaning up the debris following a wildfire. As a result, Flood Control has begun participating in tree removal in the forest.

The SBCFCD Hazardous Tree Removal Operations Division (HTROD) is given responsibility for the development and contract administration of tree removal and fuels reduction projects on private lands in the vicinity of the San Bernardino National Forest. Tree removal/fuel reduction projects include the felling, removal and disposal of dead, dying, and diseased trees, and any vegetation which creates a hazardous fuel for fires. In addition, the placement and/or installation of products and materials are required as needed, to prevent erosion and/or displacement of sediment.

2.6.3 U.S. Bureau of Land Management Area of Critical Environmental Concern

The BLM designated an ACEC in the SAR in 1994. The purpose of the ACEC designation is to protect and enhance the habitat of federally listed species occurring in the area while providing for the administration of valid existing rights (BLM 1996). The species of concern in the SAR area include the SAR wooly-star, the Slender-Horned spineflower, and the San Bernardino kangaroo rat. The BLM manages over 1,100 acres that are part of the ACEC. Although the establishment of the ACEC is important in regard to conservation of sensitive habitats and species in this area, the administration of valid existing rights supersedes BLMs conservation abilities in this area. Existing rights include a withdrawal of federal lands in this area for water conservation through an act of

Congress, February 20, 1909 (Pub. L. 248). The entire ACEC is included in this withdrawn land and may be available for water conservation measures such as the construction of percolation basins, subject to compliance with the act.

2.6.4 U.S. Army Corps of Engineers Wooly-Star Preserve Area

To protect significant populations of the SAR wooly-star (a federally protected plant species), lands within the corridor of the SAR and portions of the alluvial fan terraces were set aside as a conservation area. The Wooly-Star Preserve Area (WSPA) is a 764-acre area located west of the Greenspot Bridge that crosses the SAR. The WSPA was established by mitigation in the 1990s by the USACE and local sponsors to address impacts related to the construction of Seven Oaks Dam.

The San Bernardino Kangaroo rat is a species of concern in the SAR area. (Photo, courtesy of NPS).

2.6.5 Western Riverside County Multi-Species Habitat Conservation Plan

The Multi-Species Habitat Conservation Plan (MSHCP) is a comprehensive, multi-jurisdictional plan that focuses on the conservation of species and their habitats in western Riverside County. The plan area includes all unincorporated land in Riverside County west of the crest of the San Jacinto Mountains to the Orange County line, as well as the jurisdictional areas of a number of cities. The MSHCP established a conservation area of more than 500,000 acres and focuses on the conservation of 146 species.

2.6.6 Upper Santa Ana River Habitat Conservation Plan

Water agencies, SBCFCD and other stakeholders have begun the process of developing an Upper Santa Ana River Habitat Conservation Plan (HCP) for purposes of acquiring an incidental take permit under Section 10 of the US Endangered Species Act (ESA). It is anticipated that the HCP will also provide the necessary elements for allowing other and similar permits under applicable California Endangered Species Act provisions and will address coordination efforts with California Fish and Wildlife. The area covered by the HCP is anticipated to be the USARW down to Riverside Narrows and will consist of three phases: Phase 1 is scoping, Phase 2 is HCP document development, and Phase 3 is permit processing and plan adoption. When complete, the wildlife agencies will issue permits that will allow the projects in the HCP to proceed.

2.6.7 Wash Plan Habitat Conservation Plan

In 1993, representatives of numerous agencies - including water, mining, flood control, wildlife, and municipal interests - formed a Wash Committee to address mining issues local to the upper SAR wash area. The role of the Committee was subsequently expanded, and it began meeting in 1997 to determine how this area might accommodate all of the important functions represented by the participating agencies.

The Wash Committee seeks to disregard land ownership lines in favor of a "best use" strategy for land use planning. It is anticipated, for example, that significantly disturbed areas are more favorable for mining while undisturbed lands are more favorable for wildlife. This project is expected to produce a Land Management and Habitat Conservation Plan for the wash planning area, covering 4,500 acres ranging from the mouth of the SAR canyon to Alabama Street in the Santa Ana River wash. When complete, the wildlife agencies will issue permits that will allow mining, stormwater capture and other projects to proceed.

2.6.8 Unarmored Threespine Stickleback Shay Pond Fish Refugium

The Unarmored Threespine Stickleback fish is a federally endangered species occurring in the eastern end of Big Bear Valley. The refugium was developed to mitigate probable impacts of groundwater development on public and private lands, and to preserve USFS Special Use Permits issued to water and sewer agencies in Big Bear Valley. Collaboration between the Big Bear City CSD, City of Big Bear Lake Department of Water and Power and the Big Bear Area Regional Wastewater Agency purchased 2.25 acres of private land surrounding a surviving population of the fish, and continually supplies up to 65 acre-feet of water annually to keep the pond filled. The agencies also supply equipment and operators to clean out the pond in order to maintain habitable area for the fish as directed by the U.S. Fish and Wildlife Service.

2.7 Land Use and Agricultural Lands Stewardship

Figure 2-9 presents the 2012 land use within the IRWM Region. The total area of the Region is 552,785 acres, of which 303,790 acres, or about 55%, are covered by the national forest located in the easterly and northerly areas of the Region. Thirty-six percent of agriculture acreage is being replaced by urban areas from 27,780 acres in 2007 to 17,890 acres in 2012. Currently, agriculture only represents a little over 3% of the land use of the Region. Urban areas are about 22% of the Region. The large areas of agricultural land use are south of the SAR.

A number of local land use agencies have approved general plans and specific plans in the Region. These plans are relevant to this IRWM Plan. These local land use planning agencies play a major role in zoning and land use decisions in the Region. The California Government Code contains statutes addressing the subject of the applicability of local land use controls on planning and construction of public water facilities. However, it is generally the practice of Valley District and other local agencies to voluntarily comply with the standards specified in applicable local land use and building code regulations.

2.8 Population

2.8.1 Historic Population and Housing Growth in the Plan Area

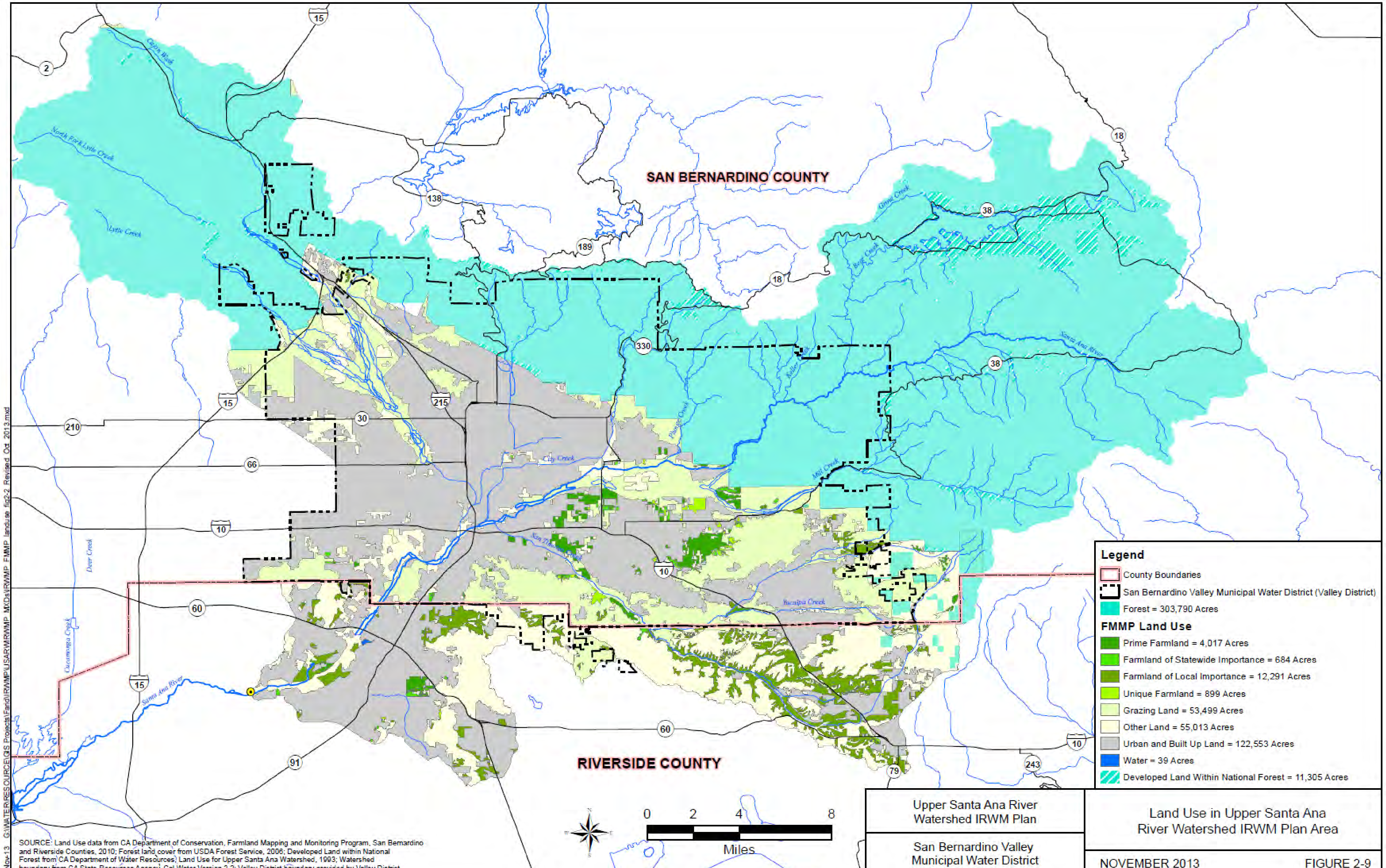
The IRWM Region covers part of the two-county area of San Bernardino and Riverside. Population figures for 2000 and 2010 for Riverside and San Bernardino Counties are presented in Table 2-17. Over the decade of the 2000s, both counties experienced substantial increases in population – 41.9% for Riverside County (with an average rate of 3.6% annually) and over 18.8% for San Bernardino County (1.7% annually). The population of the two-county Region increased by over 973,732 persons or about 29.8% (2.6% annually) during this time period.

Table 2-17: Riverside and San Bernardino County Population, 2000 and 2010

Area	Population		Change: 2000-2010
	2000	2010	Average Annual Percent Increase
Riverside County	1,551,943	2,202,361	3.6%
San Bernardino County	1,718,312	2,041,626	1.7%

Source: U.S. Census 2000 and 2010

Figure 2-9: Land Use in the IRWM Region



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The number of housing units contained in the two counties grew from about 1,186,000 in 2000 to 1,509,205 in 2010. This increase of 27.3% took place at an average annual rate of 2.4%. Population of the Valley District's service area, which covers a majority of the Region, between 2005 and 2010 grew by 16,500 or 2.6 percent, which is about a 0.51% growth annually. Population of the Region increased by 21,200 from 2005 to 2010.

2.8.2 Future Population Growth in the IRWM Region

The Southern California Association of Governments (SCAG) adopted the *2012 Growth Forecast for the Regional Transportation Plan* in April 2012 that includes population projections for 2020 and 2035 for various geographic areas (SCAG data). Table 2-18 presents these data for Riverside and San Bernardino Counties. The counties are projected to experience average annual growth rates of 1.7% and 1.3%, respectively, between 2020 and 2035.

Table 2-18: SCAG County Population Projections, 2020-2035

Area	Population			Change: 2020-2035		
	2008	2020	2035	Number	Total Increase	Average Annual Increase
Riverside	2,128,000	2,592,000	3,324,000	732,000	+28%	+1.7%
San Bernardino	2,016,000	2,268,000	2,750,000	482,000	+21%	+1.3%

Estimates of future populations were developed for this plan using U.S. Census 2010 block-level data. The service area boundaries were overlaid digitally on census maps using a Geographic Information System (GIS). Where census blocks were split by service area boundaries, the proportion of the census block contained in the service area was calculated and used to prorate the population of the particular census block to the respective service area.

Based on 2010 Census data, the current population in the Region is estimated to be 955,866. A population growth rate for the Region was defined based on SCAG's projected populations for 2008, 2020, and 2035 contained in the 2012 Integrated Growth Forecast.

Over the period 2000 to 2025, and using SCAG county-level population projections, the number of residents in the Region is projected to increase by approximately 409,800 (Table 2-19).

Table 2-19: Current and Projected Population for the Region (2010 to 2035)

Service Area	2010[1]	2015	2020	2025	2035
Region [2]	955,866	983,048	1,077,400	1,178,400	1,271,700

[1] Based on 2010 U.S. Census information for the service area populations as of April 2000.

[2] Region includes the San Gorgonio Pass Water Agency.

2.9 Economic Condition and Social and Cultural Composition of the Region

Like most communities in Southern California, the USARW IRWM Region has seen a continued increase in population and change in the economic base as agricultural and vacant land is replaced with residential housing, leading to urban and service sector jobs.

Food preparation and service, healthcare, and distribution and transportation are the fastest growing employment opportunities in the Region.

Much of the population growth of the Region since the 1970s is linked with the economies of Los Angeles and Orange Counties because they are within commuter range, and the housing prices in the Region are more affordable. Also, population growth over the past three decades is attributed to a marked increase in immigration from Mexico, Latin America, and the Pacific Rim.

In spite of the economic recession, which led to a net loss of 118,200 jobs from 2006 to 2012 in the Inland Empire, the last two years have shown signs of economic recovery. Data from 2012 and 2013 shows that 23,025 and 28,300 jobs have been created, respectively. The three major recovering economic sectors in the area include food preparation and service (7,267 jobs), distribution and transportation (5,833 jobs), and health care (4,100 jobs). Other sectors such as management, professional, technical and scientific firms, and amusement services also contributed modestly to job creation. Employment growth in the Inland Empire reached 2.4% in 2012 compared to the State growth of 2.1%, which represent 8.3% of the jobs created in the state.

2.9.1 Disadvantaged Communities

An economically disadvantaged community (DAC) is defined by the State as a community with a median annual household income (MHI) of 80% or less than the State median annual household income. In 2010, the State's annual MHI was $61,632.

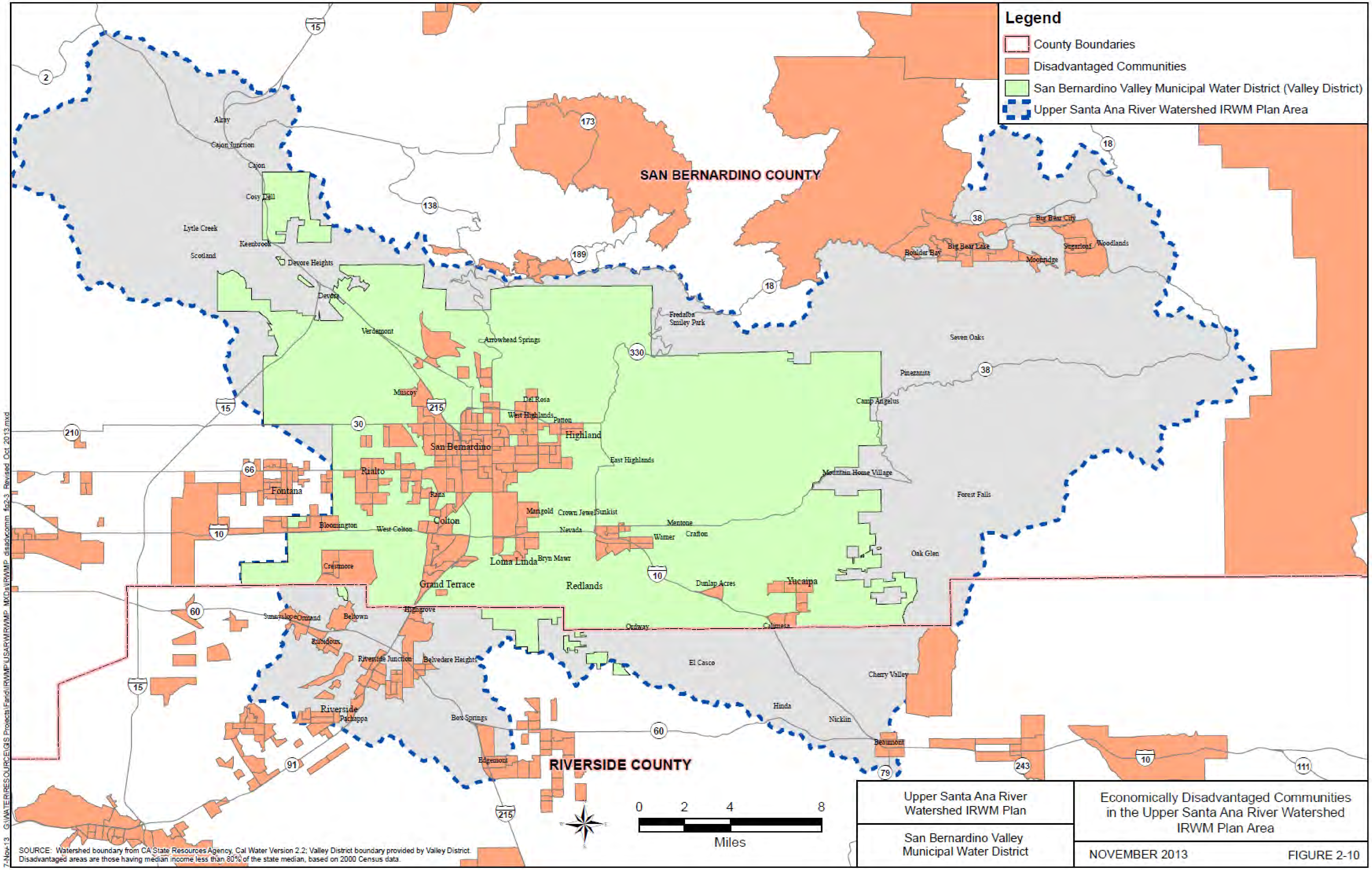
DAC and severely disadvantaged community (SDAC) areas were identified and characterized for the IRWM Region. The analysis used to identify DACs is discussed in more detail in Appendix C. In accordance with DWR guidance, the 2012 IRWM Guidelines[6] state that if household income was below 80% of the MHI for California, equivalent to $48,706, the community is considered a DAC. Additionally, if household income is below $33,325, the tract is mapped and shown as a SDAC based on CDPH guidance website[7]. Population and other demographic data were used from the same source. Figure 2-3 shows the DACs in the Region.

A large number of census tracts in the Region are classified as DAC or SDAC. Nine cluster areas were identified in the Region (see Figure 2-10), while a central area for DACs and SDACs occurs between the east side of the City of San Bernardino and west side of the City of Highland. From this central area, DACs and SDACs are somewhat scattered outward towards Colton, Fontana and Riverside.

The vast majority of DACs and SDACs receive water supplies that meet all state and federal standards for water quality from the utility which serves the area they live in. Areas with the largest concentrations of DAC and SDAC residents have developed programs to assist the DAC members in paying their water related bills while still ensuring their water and wastewater service are meeting all applicable state and federal regulations.

[6] California Department of Water Resources. 2012 Proposition 84 and 1E IRWM Guidelines. 2012 IRWM Guidelines. http://www.water.ca.gov/irwm/grants/guidelines.cfm
[7] California Department of Public Health. http://www.cdph.ca.gov/Pages/Default.aspx

Figure 2-10: DACs in the IRWM Region



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In these areas affordability can be a challenge which providers have special programs to assist residents and special grants may be available to households near the poverty level.

2.9.2 Native American Tribes

Various tribes of Native Americans inhabited the Region in the past. Today, the San Manuel Band of Mission Indians and Morongo Band of Mission Indians are present in the region.

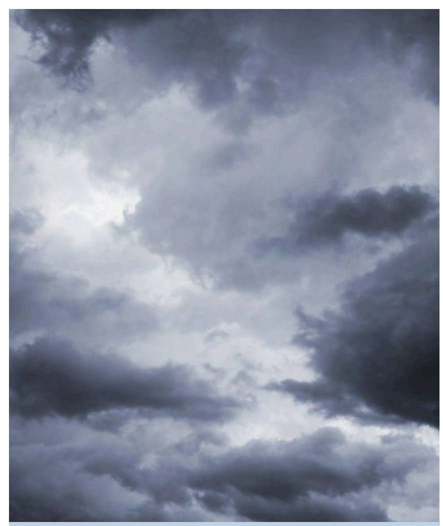
2.10 Climate

2.10.1 Existing Climate

Climate in the IRWM Region is characterized by relatively hot, dry summers and cool winters with intermittent precipitation. The largest portion (73%) of average annual precipitation occurs during December through March and rainless periods of several months are common in the summer. Precipitation is nearly always in the form of rain in the lower elevations and mostly in the form of snow above about 6,000 feet mean sea level (msl) in the San Bernardino Mountains. Mean annual precipitation ranges from about 12 inches in the vicinity of Riverside, to about 20 inches at the base of the San Bernardino Mountains, to more than 35 inches along the crest of the mountains.

The historical record indicates that a period of above-average or below-average precipitation can last more than 30 years, such as the recent dry period that extended from 1947 to 1977. The Region has been experiencing an ongoing drought since 2005.

Three types of storms produce precipitation in the SAR watershed: general winter storms, local storms, and general summer storms. General winter storms usually occur from December through March. They originate over the Pacific Ocean as a result of the interaction between polar Pacific and tropical Pacific air masses and move eastward over the basin. These storms, which often last for several days, reflect orographic (i.e., land elevation) influences and are accompanied by widespread precipitation in the form of rain and, at higher elevations, snow. Local storms cover small areas, but can result in high intensity precipitation for durations of approximately six hours. These storms can occur any time of the year, either as isolated events or as part of a general storm, and those occurring during the winter are generally associated with frontal systems (a "front" is the interface between air masses of different temperatures or densities). General summer storms can occur in the late summer and early fall months in the San Bernardino area, although they are infrequent.



The Region has an annual precipitation that ranges from 12 inches in low areas to 40 inches along the crest of the mountains.

2.10.2 Impacts and Effects of Climate Change

Recent climate change modeling for the SAR watershed (see Appendix E) suggests that a changing climate will have multiple effects on the Region. Adaptation and mitigation measures will be necessary to account for these effects.

Predicted Impacts and Effects of Climate Change

The IRWM Region's currently consistent climate with hot summers and cool winters with mild precipitation, and rain in low elevations with snow in higher elevations would change as temperatures increase, resulting in less precipitation as snow which would affect the snow pack. Increased precipitation as rain would make it more difficult to capture storm flows and store them for drier periods.

The Intergovernmental Panel on Climate Change has vetted and approved 112 climate models based on projections in greenhouse gas emissions and associated changes in precipitation and temperature. These models make use of various greenhouse gas emissions scenarios based on population growth and economic activity. Global climate models used in the study were scaled down to 12 kilometer grids to make them relevant for regional analysis. The down-scaled global climate model projections are produced by internationally recognized climate modeling centers around the world and make use of greenhouse gas emissions scenarios, which include assumptions of projected population growth and economic activity. Projected climate variables, including daily precipitation, minimum temperature, maximum temperature and wind speed were included, as well as historical model simulations over the period from 1950 to 1999. Final products included data sets at key locations for precipitation, temperature, evapotranspiration, April 1st Snow Water Equivalent, and stream flow.

The models show that in the future the number of days over 95°F will increase in multiple locations. The Region chose two cities with different temperature ranges to compare the increase across the entire watershed. The cities of Riverside, and Big Bear were used to see the projections of the number of days that would be above 95°F and the results are shown in Table 2-20.

Table 2-20: Days per Year Exceeding 95°F

City	Historical (°F)	2020 (°F)	2050 (°F)	2070 (°F)
Riverside	43	58	72	82
Big Bear	0	0	2	4

The numbers of high temperature days in Riverside are believed to double between the present and 2070. Similar increases in temperature can be anticipated throughout the inland valleys. These increased temperature levels will increase water demands across the watershed mainly for agricultural and irrigation purposes. The higher temperature days in Big Bear have the potential to affect the forest ecosystem and the snow related recreational activities in the area.

The forest ecosystems in the San Bernardino National Forest are currently on the decline. Alpine and subalpine forests are anticipated to decrease in area by fifty to seventy percent by 2100. It is believed that the increased greenhouse gas emissions calculated above are a primary factor contributing to the decline of these fragile ecosystems.

While high elevation ecosystems decrease, the severity of future floods is likely to increase. The likelihood of a 200 year storm event or longer is anticipated to be significantly higher in 2070. This increases the potential for negative impacts on nearby infrastructure. Furthermore, storms are expected to be more severe but less frequent. Despite these assumptions, the aftermath of a severe storm is highly variable. It is known that there are significant variability's in the results of storm severity.

In addition to changes in ecosystems and storm severity, warmer temperatures may also decrease the annual amount of snow fall and increase the instance of rain in higher elevations. This alteration of precipitation type is likely to cause negative impacts for snow related recreational activities characteristic of the area's ski resorts. From a local standpoint, Big Bear and Snow Valley both lie below 3000 m and are anticipated to experience a decline in snowpack by 2070. Furthermore, it is projected that there will be a decrease in overall winter precipitation of the area by 2070. On a larger scale, the increased temperatures could affect the Sierras in a similar way, threatening the reliability of the SWP.

Addressing Climate Change

Climate change can be addressed in two ways, mitigation and adaptation. Mitigation focuses on reducing the carbon emissions for water treatment and transportation. Decreasing carbon emissions for water treatment and transportation may also result in reduced energy costs for water purveyors. These measures will also help in compliance of the California Global Warming Solutions Act (Assembly Bill 32 or AB 32).

Adaptation addresses operational changes that need to be made in order to accommodate the increasing temperatures, the increased possibility for severe flooding and the decreasing precipitation as snow predicted by the climate models.

Plans for greenhouse gas mitigation focus on the relationship between water and energy. This relationship can be quantified and projections for future trends can be developed. The California Global Warming Solutions Act requires greenhouse gas levels to be reduced to the 1990 level by the year 2020. A Greenhouse Gas Emissions Calculator was used to calculate the current emissions levels and this spreadsheet tool will be used to create predictions for future emissions levels.

The Greenhouse Gas Emissions Calculator was developed as part of a Basin Study of the Santa Ana River in a partnership between SAWPA and Reclamation. The calculator showed that for the Upper SAR watershed, the most appropriate ways to effectively reduce the volume of carbon emissions related to water treatment and meet AB 32 goals would be to reduce imported water usage, and increase local supply usage and water use efficiency.

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3 Water Budget

The water budget for the IRWM Plan compares the supply and demand for the IRWM Region. The water supply and water demand data that comprise the water budget are used in the development of integrated water management strategies that will be used to manage both supplies and demands into the future. The data presented are based upon water demand figures provided by each water agency in the Region. Actual demand figures for each agency may be different based upon the water agency's water right(s) recognized by the State of California.

3.1 Data Sources

The IRWM Plan water budget relies primarily on the 2010 UWMPs for each water supplier within the IRWM Region. Table 3-1 provides a list of the water agencies within the Region and the UWMPs that were used in this analysis. Not all water agencies have completed the 2010 update of their UWMPs, and not all agencies are required to publish a UWMP (agencies that provide water to less than 3,000 connections and less than 3,000 AFY are not required to publish a UWMP). For these agencies, the necessary data for the water budget were obtained from the Western-San Bernardino Watermaster Report. For the purpose of preparing the water demands and supplies, the Region's water agencies were divided into four groups:

1) Non-Plaintiffs (water agencies in San Bernardino County of the Western Judgment (Western Municipal Water District of Riverside County v. East San Bernardino County Water District, Case No. 78426)
2) Plaintiffs of the Western Judgment (water agencies in Riverside County)
3) Water agencies outside the Western Judgment and located in the San Gorgonio Pass Water Agency service area
4) Water agencies outside the Western Judgment and located in the San Bernardino Mountains area

Table 3-1: Data Utilized in the Water Budget

Water Agency	2010 UWMP	Other Documents
Non-Plaintiffs of the Western Judgment		
Colton, City of	✓	
East Valley Water District	✓	
Fontana Water Company	✓	
Loma Linda, City of	✓	
Marygold		Watermaster, 2007 IRWM Plan
Muscoy		Watermaster, 2007 IRWM Plan
Redlands, City of – Municipal Utilities and Engineering Department	✓	
Rialto, City of	✓	
SBMWD	✓	
Terrace Water Company		Watermaster, 2007 IRWM Plan
West Valley	✓	
YVWD[1]	✓	
Other/Private[2]		Watermaster
Plaintiffs of the Western Judgment		
Meeks & Daley Water Company		Watermaster
Riverside Highland Water Company	✓	Watermaster
Riverside Public Utilities	✓	Watermaster
San Gorgonio Pass Water Agency		
Beaumont-Cherry Valley Water District	✓	
Banning, City of[3]	✓	
Cabazon Water District[3]	✓	
South Mesa Water Company	✓	
YVWD[1]	✓	
San Bernardino Mountains Area		
Big Bear City Community Services District		2010 Water Master Plan
City of Big Bear Lake Department of Water and Power	✓	
Big Bear Municipal		2007 IRWM Plan

[1] YVWD overlies the San Gorgonio Pass Water Agency and the Valley District. YVWD includes Western Heights Water Company and Oak Valley.
[2] Includes Devore Water Company, Crafton Water Company, Inland Valley Development Company, Mount Vernon Water Company, Pioneer Mutual Water Company, Pharaoh-Powell Mutual Water Company, Redlands Water Company, Tennessee Water Company, California Portland Cement Company, Corridor Land Company, El Rivino Country Club, and Elsinore Valley Metropolitan Water District.
[3] Agencies outside of the SAR Watershed but inside the San Gorgonio Pass Water Agency service area.

3.2 Applied Water Demands

The applied water demands developed for the water budget are based on the demand projections provided by each individual agency. If demand projections were unavailable, water demand was calculated based on historical demand trends using historical data compiled by the Watermaster. Currently, there are no environmental demands or downstream flow requirements in the IRWM Region. The applied water demands from 2015 to 2035 are summarized in Table 3-2.

Figure 3-1 displays the total projected water demands in the Region, which are expected to increase by about 27% from 392,881 AF in 2015 to 497,606 AF in 2035 (Table 3-2).

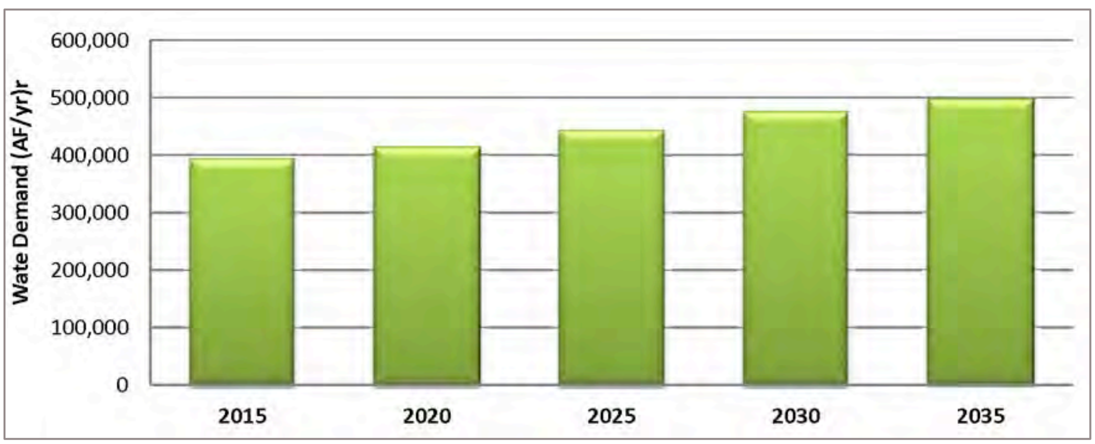
Table 3-2: Future Applied Water Demands in the Region (AFY)

Water Agency	2015	2020	2025	2030	2035
Non-Plaintiffs of the Western Judgment					
Colton, City of	13,010	12,608	13,000	13,770	14,853
East Valley Water District	22,925	24,721	29,235	33,814	38,461
Fontana Water Company[1]	37,519	39,613	42,572	45,532	48,741
Loma Linda, City of	5,811	5,478	5,819	6,181	6,565
Marygold[2]	1,500	1,500	1,500	1,500	1,500
Muscoy[2]	2,100	2,100	2,100	2,100	2,100
Redlands, City of – Municipal Utilities and Engineering Department	30,208	33,030	36,925	39,005	39,005
Rialto, City of	11,676	10,964	10,964	10,964	10,964
SBMWD	51,928	48,839	50,591	52,409	54,296
Terrace Water Company[2]	900	900	900	900	900
West Valley	23,964	27,526	32,143	34,646	38,109
YVWD[3]	18,749	16,699	16,553	19,078	19,152
Other/Private[4]	19,900	19,600	19,300	19,000	19,000
Subtotal	**240,190**	**243,577**	**261,602**	**278,899**	**293,646**
Plaintiffs of the Western Judgment[5]					
Meeks & Daley Water Company	7,800	7,800	7,800	7,800	7,800
Riverside Highland Water Company	5,100	5,945	7,210	7,950	7,950
Riverside Public Utilities	98,050	107,400	111,800	116,600	119,800
Regents of California	500	500	500	500	500
Subtotal	**111,450**	**121,645**	**127,310**	**132,850**	**136,050**
San Gorgonio Pass Area					
Beaumont-Cherry Valley Water District	12,453	13,492	14,947	16,526	18,417
Banning, City of	10,376	10,183	11,243	12,413	13,705
Cabazon Water District[6]	4,000	8,000	12,000	16,000	16,000
South Mesa Water Company	2,740	3,200	3,560	3,900	4,300
YVWD[3]	1,582	1,952	2,552	3,382	4,743
Subtotal	**31,151**	**36,827**	**44,302**	**52,221**	**57,165**

Water Agency	2015	2020	2025	2030	2035
San Bernardino Mountains Area					
Big Bear City Community Services District	1,307	1,464	1,620	1,620	1,620
City of Big Bear Lake Department of Water and Power	2,283	2,364	2,448	2,535	2,625
Big Bear Municipal	6,500	6,500	6,500	6,500	6,500
Subtotal	**10,090**	**10,328**	**10,568**	**10,655**	**10,745**
TOTAL	**392,881**	**412,377**	**443,782**	**474,625**	**497,606**

[1] The demands shown for Fontana Water Company are their projected total demand minus 5,000 AFY of imported water supplies from Inland Empire Utilities Agency. Portions of the supplies will be delivered outside the Region.
[2] Utilized future demand projections from 2007 IRWM Plan.
[3] Includes Western Heights Water Company and Oak Valley and overlies both the San Gorgonio Pass Water Agency and Valley District.
[4] Includes Bear Valley Mutual Water Company, Devore Water Company, Crafton Water Company, Inland Valley Development Company, Mount Vernon Water Company, Pioneer Mutual Water Company, Pharaoh-Powell Mutual Water Company, Redlands Municipal Utilities and Engineering Department, Tennessee Water Company, California Portland Cement Company, Corridor Land Company, El Rivino Country Club, Elsinore Valley Metropolitan Water District, San Gabriel Valley Water Company, and Reche Canyon Mutual Water Company.
5 The demands for the Plaintiffs are their adjusted rights to the SBBA, except for Riverside Public Utilities and Riverside Highland Water Company. Future demand projections for Riverside Public Utilities obtained from 2010 UWMP and include wholesale deliveries.
[6] The demands shown for the Cabazon Water District were obtained from a 2006 letter report to LAFCO. Actual demands are projected to be reduced from those shown based on current demands.

Figure 3-1: Total Water Demands within the Region



3.2.1 Increase in Water Demand in Dry Years

During drought periods, water demands increase due to the increased irrigation demands for agriculture and landscaping. The demands outlined in Table 3-2 and Figure 3-1 represent the average water demands projected by the water agencies. For the purposes of the modeling of the SBBA analysis, water demands were assumed to increase in "critically dry" years by 4% (DWR Bulletin 160-93). Critically dry years were defined to be the driest 20% of years using the SAR annual flows near Mentone from 1962 to 2000. Table 3-3 shows the results of the projected water demands for the SBBA for an average year, multi-year drought, and single-year drought.

Table 3-3: Region-wide Demands for Average and Drought Conditions

	2015	2020	2025	2030	2035
Average Year	392,881	412,377	443,782	474,625	497,606
Multi-Year Drought	408,596	428,873	461,533	493,610	517,510
Single-Year Drought	408,596	428,873	461,533	493,610	517,510

3.2.2 Reduced Demand Due to Conservation

Conservation reduces water demand in ways that are not easily measured. Demand is reduced through changed consumer behaviors and more water-efficient fixtures like ultra-low-flow toilets and showerheads. These savings happen gradually over time as non-conserving fixtures are replaced with newer water-efficient models. The agencies within the IRWM Region implement a prescribed set of urban water conservation BMPs according to the Urban Water Management Planning Act. The current water demands reflect the effect of water conservation projects that are implemented by the purveyors. Demand projections in the UWMPs include estimates of conservation due to the implementation of future water conservation programs.

3.3 Water Supplies

The following sections provide a description of each water supply within the IRWM Region, the projected demands for each supply, and an estimate of the available water supply based on data presented in UWMPs and the Western-San Bernardino Watermaster report. The majority of groundwater basins in the Region are adjudicated, and therefore have pumping restrictions that limit demands. The projected demands on each water supply were based on the UWMPs. The projected water supplies of water purveyors were scaled to meet the projected demand, which was necessary to make a realistic projection of demand on shared water supplies within the Region.

3.3.1 Groundwater and Local Surface Water

San Bernardino Basin Area

The SBBA was adjudicated by the Western Judgment in 1969. The judgment established the natural safe yield of the SBBA to be a total of 232,100 AFY for surface water diversions and groundwater extractions. Surface water is diverted from Mill Creek, Lytle Creek, and the SAR. The average surface water diversions in the SBBA for direct use from 1968 to 2000 were 39,000 AFY. It was determined in the Western Judgment that the Plaintiffs have a 64,862 AFY share of the safe yield, which equates to 27.95% of the safe yield. The Plaintiffs include the City of Riverside (the successor to the Riverside Water Company and the Gage Canal Company), Riverside Highland Water Company, Meeks & Daley Water Company, and Regents of the University of California.

The Non-Plaintiffs' (agencies within San Bernardino County) rights are 167,238 AF, which equates to 72.05% of the safe yield. If the Non-Plaintiff extractions exceed the safe yield of the SBBA, Valley District is obligated to import and recharge a like amount of water into the SBBA. The Western-San Bernardino Watermaster produces an annual report calculating the total extractions and comparing it to the safe yield. If the total extractions are less than the safe yield, there is a groundwater "credit" in the basin. If the total extractions are more than the safe yield, there is a replenishment obligation. Table 3-4 and Figure 3-2 outline the projected increase in demands for the local surface water and groundwater in the SBBA and provide an estimate of how much replenishment will be needed in the future. According to the 2012 Annual Western-San Bernardino

Watermaster Report, Valley District has 114,369 AF of credit accumulated in the SBBA through 2011.

To meet future demands in the IRWM Region, groundwater modeling results indicate that Valley District will need to import an average of about 62,000 AF of water each year. During wet years, over 37,000 acre-feet of this water would be stored. In dry years, 50,000 AF would be pumped from storage thereby reducing the Valley District service area's dry year need from the SWP to 12,000 AF (see Table 3-9 and Table 3-10).

The *2011 State Water Project Final Delivery Reliability Report* predicts that the SWP may deliver as low as 11% of its maximum delivery capability during a future drought, and most recently was reduced to 5% during the 2014 drought. Valley District's ultimate direct delivery need is about 30%, leaving a 19% or 19,000 AF deficit in dry years. A storage program is currently being developed that would store enough water upstream of the Valley District service area to make up for this deficit during dry years.

The SBBA is forecasted to supply over 50% of the future water demand within the Region. Computer models were used to help determine whether the available surface water (local surface water and imported water) and groundwater supplies would meet ultimate demands (2035). Based on the modeling results, if the SWP is as reliable as DWR estimated in 2011 (60%), the SBBA storage can be maintained to meet the 2035 demands (See Section 3.3.2. below for additional information on SWP reliability).

Table 3-4: Projected SBBA Local Surface Water Diversions and Groundwater Extractions (AFY)

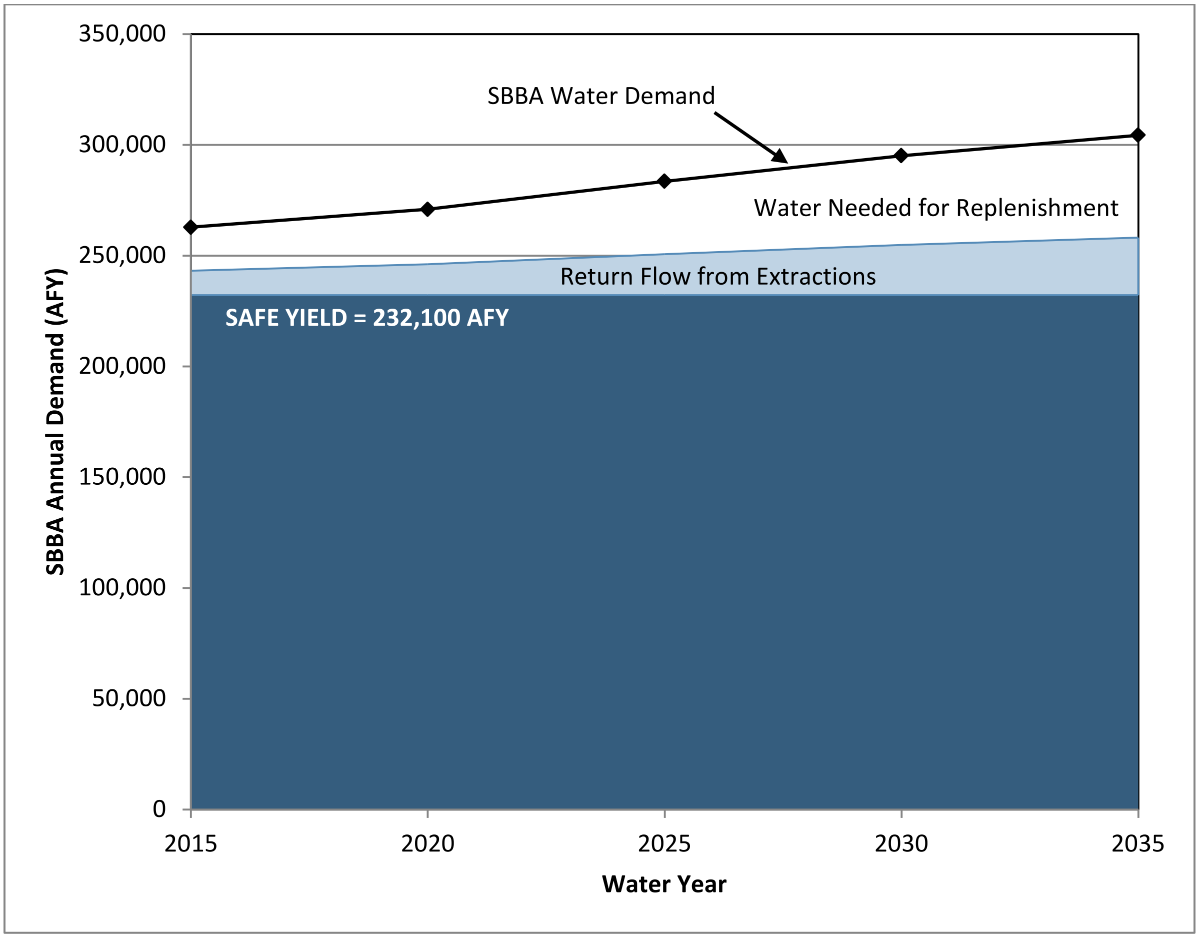
Water Agency	2015	2020	2025	2030	2035
Non-Plaintiffs					
Colton, City of	7,000	6,783	6,994	7,408	7,991
East Valley Water District	26,786	28,312	32,150	36,042	39,992
Fontana Water Company	15,100	15,100	15,100	15,100	15,100
Loma Linda, City of	6,814	6,418	6,814	7,236	7,683
Marygold	1,500	1,500	1,500	1,500	1,500
Muscoy	2,100	2,100	2,100	2,100	2,100
Redlands, City of – Municipal Utilities and Engineering Department	33,209	32,109	33,266	34,549	34,549
Rialto, City of	8,700	8,000	8,000	8,000	8,000
SBMWD	50,233	52,671	54,730	56,866	59,082
Terrace Water Company	900	900	900	900	900
West Valley	17,500	20,500	25,500	28,500	30,500
Other/Private	19,900	19,600	19,300	19,000	19,000
Subtotal	**189,742**	**194,993**	**206,354**	**217,201**	**226,397**
Plaintiffs					
Meeks & Daley Water Company	7,800	7,800	7,800	7,800	7,800
Riverside Highland Water Company	5,100	5,945	7,210	7,950	7,950
Riverside Public Utilities[1]	59,626	61,626	61,626	61,626	61,626
Regents of California	500	500	500	500	500
Subtotal	**73,026**	**75,871**	**77,136**	**77,876**	**77,876**
Total Groundwater and Surface Water Demand	**262,768**	**270,864**	**283,490**	**295,077**	**304,273**
Safe Yield	**232,100**	**232,100**	**232,100**	**232,100**	**232,100**
Extractions above Safe Yield	**30,668**	**38,764**	**51,390**	**62,977**	**72,173**
Return Flow from Extractions above the Safe Yield[2]	**11,040**	**13,955**	**18,500**	**22,672**	**25,982**
Replenishment Obligation[3]	**19,628**	**24,809**	**32,890**	**40,305**	**46,191**

[1] In 2015, the Riverside Public Utilities plans to recharge 2,000 AF of water in the Bunker Hill Basin and by 2020 they plan to recharge 4,000 AF through the Seven Oaks Dam Conservation Project. Production from the Bunker Hill Basin includes 4,200 AF of water owned by Western.

[2]The Western Watermaster assumes a 36 percent return flow from extractions above the safe yield.

[3]The Replenishment Obligation is the Extractions above the Safe Yield minus the Return Flow from the extractions above the Safe Yield.

Figure 3-2: SBBA Water Budget



Rialto-Colton Subbasin

The groundwater extractions in the Rialto-Colton Subbasin are governed by the Rialto Basin Decree and the Western Judgment. The Western Judgment refers to this subbasin as the "Colton Basin Area". Fontana Water Company, City of Rialto, City of Colton, and West Valley Water District are subject to the Rialto Basin Decree, entered on December 22, 1961, by the Superior Court for the County of San Bernardino. Entitlement extractions for any given water year (October 1 to September 30) are affected by groundwater elevations between March and May for three specific "index" wells (Duncan Well, Willow Street Well, and Boyd Well). Under specified conditions, groundwater extractions may be limited. The scope of the limitation is disputed and is the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitle San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

The Western Judgment requires Valley District to maintain the average lowest static water levels in three index wells in the Colton Basin Area and Riverside North Subbasins at 822.04 feet above mean sea level (msl). If the water levels fall below 822.04 feet above msl, Valley District is obligated to recharge the basin with imported water or reduce extractions. Extractions for use in Riverside County are limited to 3,381 AFY.

The safe yield for the Rialto-Colton Subbasin was not defined by the Western Judgment or the Rialto Basin decree. Extractions during the five-year base period of the Western Judgment, 1959 to 1963, were, on average, 11,731 AFY. Extractions have averaged 18,771 AFY from 1996 to 2011. Since 1971, when the Watermaster reports began, the water levels in the three index wells have never fallen below 822.04 feet. In 2012, the average lowest static level was 835.89 feet above msl for the three index wells. Projected extractions in the Rialto-Colton Subbasin are found in Table 3-5Table 3-4.

Since the safe yield has not been determined for the Rialto-Colton Subbasin, the average extraction from 1996-2005 of 17,300 AFY was used as the available supply from the Rialto-Colton Subbasin in the water budget summary.

Table 3-5: Projected Extractions in the Rialto-Colton Subbasin (AFY)[1]

Water Agencies	2015	2020	2025	2030	2035
Colton, City of	4,515	4,375	4,511	4,778	5,154
Fontana Water Company	7,600	7,600	7,600	7,600	7,600
Rialto, City of	2,000	2,000	2,000	2,000	2,000
Riverside Public Utilities	2,700	2,700	2,700	2,700	2,700
West Valley	4,000	6,000	6,000	6,000	6,000
Reche Canyon Mutual Water Company[2]	72	72	72	72	72
Total	**20,887**	**22,747**	**22,883**	**23,150**	**23,526**
Historical Average (1996-2005)	17,300	17,300	17,300	17,300	17,300

[1] Extractions from the area referred to as "No Man's Land" are not included in the table. However, whether the area referred to as "No Man's Land" is part of the Rialto-Colton Subbasin is disputed and is the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

[2] Projected extraction by Reche Canyon Mutual Water Company is assumed to equal the average extraction from 1996-2005.

Riverside North Subbasin

The Riverside North Subbasin is the portion of the Riverside Basin in San Bernardino County (part of the larger Riverside-Arlington Subbasin of the Upper Santa Ana Valley). Groundwater extractions in the Riverside North Subbasin are governed by the Western Judgment. Extractions for use in San Bernardino County are unlimited, provided that water levels at three index wells in the Rialto-Colton and Riverside North Subbasins stay above 822.04 feet above msl. Extractions from the Riverside North Subbasin for use in Riverside County are limited to 21,085 AFY.

Total extractions during the five-year base period of the Western Judgment, 1959 to 1963, were, on average, 33,729 AFY. Historically, average static low measurements have never been below 822.04 feet and in 2012 were 835.89 feet above msl. Because the safe yield of the Riverside North Subbasin has not been determined, the average historical extraction from 1996 to 2005 of 30,100 AFY was used as the available supply of the Riverside North Subbasin. Table 3-6 lists the projected demands on the Riverside North Subbasin. If increased production causes the water levels to drop, water agencies would have to either restrict use or Valley District would need to recharge the basin with imported water.

Table 3-6: Projected Extractions in the Riverside North Subbasin (AFY)

Water Agencies	2015	2020	2025	2030	2035
Colton, City of	1,496	1,450	1,495	1,584	1,708
Rialto, City of	1,000	1,000	1,000	1,000	1,000
Riverside Public Utilities	17,000	17,000	17,000	17,000	17,000
West Valley	2,000	2,000	2,500	3,000	4,000
Agencies in Riverside County[1]	4,100	4,100	4,100	4,100	4,100
SBMWD – RIX Overextraction[2]	7,900	7,900	7,900	7,900	7,900
Other/Private[3]	6,000	6,000	6,000	6,000	6,000
TOTAL	**39,496**	**39,450**	**39,995**	**40,584**	**41,708**
Historical Average (1996-2005)	30,100	30,100	30,100	30,100	30,100
Riverside North Aquifer Storage and Recovery Project	3,500	3,500	3,500	3,500	3,500
TOTAL	**33,600**	**33,600**	**33,600**	**33,600**	**33,600**

[1]Agencies in Riverside County have the adjusted right of 21,085 AF in the Riverside North Basin.
[2]The RIX facility overlies the Riverside North Basin. In order to ensure that the secondary effluent applied to ground does not percolate to the groundwater and it is fully recovered, it is necessary that extractions exceed the amount of water applied. At present, this water is discharged from the RIX outfall into the SAR. In the long-term, the over-extractions rates will be approximately 10 percent more than that recharged (Watermaster 2003 pg. 14). Number used is based on the five year average from 2007-2011.
[3]Includes California Portland Cement Company, Corridor Land Company, El Rivino Country Club, and Elsinore Valley Metropolitan Water District.

Yucaipa Subbasin

YVWD estimates the safe yield of the Yucaipa Subbasin to be 10,000 AFY (YVWD 2005 UWMP, pgs. 2-6). YVWD accounts for the majority of the demand on the Yucaipa Subbasin. The City of Redlands Municipal Utilities and Engineering Department and South Mesa Water Company also extract water from the Yucaipa Subbasin to a lesser extent. YVWD demands are projected to increase from 20,331 AF in 2015 to 23,895 AF by 2035. In order to meet demands above the groundwater safe yield, YVWD plans to recycle water and import surface water from Mill Creek, SAR, and the SWP through transfer and exchange agreements with the City of Redlands and Valley District. YVWD's new water treatment plant became operational in 2007. There is potential to increase spreading of water in the Wilson Creek spreading grounds and also to utilize the Oak Glen Creek stream channel for additional recharge. By maximizing the existing spreading grounds and expanding spreading acreage along Oak Glen Creek (25 to 50 acres), the capability exists to spread from 7,000 to 14,000 AF of surface water annually into the Yucaipa Basin. Table 3-7 lists the projected demands on the Yucaipa Subbasin.

Table 3-7: Projected Extractions in the Yucaipa Subbasin (AFY)

Water Agencies	2015	2020	2025	2030	2035
Redlands, City of – Municipal Utilities and Engineering Department	256	248	265	281	281
South Mesa Water Company	1,720	1,720	1,927	1,672	1,816
YVWD	5,829	5,829	5,829	5,829	5,829
TOTAL	**7,805**	**7,797**	**8,021**	**7,782**	**7,926**
Safe Yield	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**

San Gorgonio Pass Area Groundwater Basins

The supplies available in the San Gorgonio Pass Area Groundwater Basins are based on the San Gorgonio Pass Water Agency 2010 UWMP, the City of Banning 2010 UWMP, and the Beaumont-Cherry Valley Water District 2013 UWMP Update. The San Gorgonio Pass Water Agency report concluded that the agency will have to identify, procure, and import additional supplemental water supplies between 2020 and 2025. However, local groundwater supplies will be sufficient until that time, so long as the San Gorgonio Pass Water Agency continues importing water from the SWP as projected in their UWMP. The available groundwater supplies in the San Gorgonio Pass region are found in Table 3-8.

Bear Valley Groundwater Basin

Big Bear Community Services District supplies all its water from groundwater in Big Bear Valley. The City of Big Bear Lake Department of Water and Power also produces groundwater from the Bear Valley groundwater basin. The projected extractions from Bear Valley groundwater basin are found in Table 3-8.

Big Bear Lake

Big Bear Municipal has a contract with Bear Mountain/Snow Summit to sell water from Big Bear Lake for snowmaking. The contract allows the sale of up to 1,300 AFY and no more than 11,000 AF for any 10-year period. Currently, the sales of water for snowmaking have not exceeded 1,000 AFY. The projected extractions from Big Bear Lake are found in Table 3-8.

Water from Big Bear Lake is used for snowmaking at local ski resorts. Most of the melted snow from the resorts flows back into the lake.

No Man's Land

Fontana Water Company and City of Rialto currently and intend to continue to extract water from an area known as "No Man's Land" in the quantities shown in Table 3-8. Water rights in the area, the hydrogeologic nature of this area, as well as the quantities of water produced in this area, are the subject of a lawsuit currently pending in the Superior Court for the County of San Bernardino entitled San Bernardino Valley Municipal Water District et al. v. San Gabriel Valley Water Co. et al., Case No. CVDS1311085.

Riverside South Basin

Riverside Public Utilities extracts water from the Riverside South Basin, which is adjudicated under the Western-San Bernardino Judgment and is located in Riverside County. Riverside Public Utilities plans to extract 15,074 AFY from the basin in 2015, and increase to 32,674 AFY in 2035.

Chino Basin

Fontana Water Company and West Valley extract water from Chino Basin, an adjudicated basin managed by the Chino Basin Watermaster. Fontana Water Company relies on Chino Basin as its primary groundwater source, and plans to extract 5,319 AFY from the basin in 2015, increasing to 12,041 AFY in 2035. West Valley doesn't plan to extract groundwater from the basin until 2020 when it will extract 900 AFY.

Table 3-8: Projected Extractions of Other Groundwater and Surface Water Supplies (AFY)

Water Agencies	2015	2020	2025	2030	2035
San Gorgonio Pass Area Groundwater Basins					
Edgar Canyon Basin	1,867	2,260	2,260	2,260	2,260
Beaumont Basin	5,566	6,561	6,626	6,446	6,367
Banning Storage Unit	1,130	1,130	1,130	1,130	1,130
Banning Canyon	4,070	4,070	4,070	4,070	4,070
Cabazon Storage Unit	4,585	5,805	5,248	4,716	5,012
San Timoteo Groundwater Basin	230	230	230	230	230
Singleton Basin	600	600	600	600	600
Surface Runoff from Edgar Canyon	2,000	3,000	3,000	3,000	3,000
Return Flows	**429**	**438**	**448**	**458**	**468**
Sub-Total	**22,437**	**26,054**	**25,572**	**24,870**	**25,097**
Bear Valley Groundwater Basin					
City of Big Bear Lake Department of Water and Power	2,228	2,307	2,389	2,474	2,562
Big Bear City Community Services District	1,307	1,464	1,620	1,620	1,620
Sub-Total	**3,535**	**3,771**	**4,009**	**4,094**	**4,182**
Big Bear Lake					
Big Bear Municipal[1]	1,000	1,000	1,000	1,000	1,000
No Man's Land					
Fontana Water Company	6,000	6,000	6,000	6,000	6,000
Rialto, City of	1,000	1,000	1,000	1,000	1,000
Sub-Total	**7,000**	**7,000**	**7,000**	**7,000**	**7,000**
Riverside South					
Riverside Public Utilities[2]	15,074	20,274	24,674	29,474	32,674
Chino Basin					
Fontana Water Company	5,319	6,413	8,372	10,332	12,041
West Valley	0	900	900	900	900
Sub-Total	**5,319**	**7,313**	**9,272**	**11,232**	**12,941**
TOTAL PROJECTED SUPPLIES	**54,365**	**65,412**	**71,527**	**77,670**	**82,894**

[1] Surface water from Big Bear Lake used for snow making.

[2] Riverside Public Utilities plans to augment groundwater supplies from Riverside South by constructing a recharge facility at Pellissier Ranch. The Pellissier Ranch Aquifer Storage and Recovery project includes 6,000 AFY of groundwater and stormwater recharge, and 4,000 AFY of recycled water recharge.

3.3.2 Imported Water

SWP water is delivered from Northern California to Valley District; the amount of water that is entitled to each State Water Contractor is listed in Table A of the SWP's water supply contracts, which is commonly referred to as "Table A" allotments. Valley District has the fifth largest SWP contract out of all State Water Contractors, with a maximum Table A amount of 102,600 AFY through 2035. To help assess the reliability of SWP supplies, DWR publishes a biannual State Water Project Delivery Reliability Report. In this report, various hydrologic studies are conducted on the expected deliveries (expressed as percentage of entitlement) that would be available during different hydrologic years from 1922 to 2003. The *2011 State Water Project Delivery Reliability Report* contains many of the same operational challenges as the 2009 report, including pumping restrictions as outlined in the 2008 and 2009 federal biological opinions and the effects of climate change on supplies. The estimates in the 2011 report for water deliveries for Table A water supply deliveries are not significantly different from projections in the 2009 report, but have decreased since the 2005 report. The 2011 report estimated that, on average, 61% of the Table A SWP amounts would be delivered based on 2011 existing conditions and 60% based on 2031 future conditions. Therefore, Valley District's Table A amount of 102,600 AF is estimated to be 60% reliable, or, on average, Valley District could receive 61,440 AFY of the Table A amount in the future.

The water agencies in the Valley District service area forecast approximately 30,622 AFY for SWP deliveries in 2035, outlined in Table 3-9, based upon UWMP projections. This includes direct deliveries to Valley District's retail agencies, and an average of 6,500 AFY (65,000 AF in any ten year period) that is sold to Big Bear Municipal for distribution to Bear Valley Mutual "in-lieu" of releases from Big Bear Lake.

Valley District is estimated to need approximately 46,191 AFY to meet the replenishment obligations in the SBBA with the projected demands in 2035 (Table 3-4). Replenishment may also be required for the Colton Basin Area and the Riverside North Basins depending on the future water levels. Valley District would have 30,818 AFY of available SWP water to use for replenishment from its Table A amount after the SWP deliveries in 2035.

The other primary state water contractor in the IRWM Region is the San Gorgonio Pass Water Agency. The San Gorgonio Pass Water Agency has a contracted Table A amount of 17,300 AFY, but is currently limited to importing approximately 11,000 AFY until the next phase of the East Branch Extension is completed. The need for SWP water in the San Gorgonio Pass to meet the projected demands is higher than the current San Gorgonio Pass Water Agency Table A amount. Table 3-9 summarizes the forecasted demand for SWP water in the San Gorgonio Pass area and Table 3-10 is the available SWP supplies to the Region based on State Water Contractors' Table A amounts. Crestline-Lake Arrowhead Water Agency is outside of the Region but provides approximately 60 AFY water to the City of Big Bear Lake Department of Water and Power.

Table 3-9: Projected Deliveries of State Water Project (AFY) to the Region

Water Agencies	2015	2020	2025	2030	2035
SBVMWD					
Direct Deliveries[1]	21,683	20,079	20,749	24,055	24,122
Big Bear Municipal[2]	6,500	6,500	6,500	6,500	6,500
Subtotal	**28,183**	**26,579**	**27,249**	**30,555**	**30,622**
Water for Recharge/Groundwater Pumping[3]	34,281	35,885	35,215	30,885	30,818
SWP Deliveries	**62,464**	**62,464**	**62,464**	**61,440**	**61,440**
San Gorgonio Pass Water Agency					
SWP Deliveries	**10,553**	**10,553**	**10,553**	**10,380**	**10,380**
Crestline-Lake Arrowhead Water Agency					
SWP Deliveries	**55**	**57**	**59**	**61**	**63**
Total Deliveries	**73,017**	**73,017**	**73,017**	**71,940**	**71,940**

[1] Demands for imported water for East Valley Water District, City of Redlands Municipal Utilities and Engineering Department, City of San Bernardino, West Valley, and YVWD provided as part of the 2010 Regional UWMP. Demands for Fontana Water Company estimated from 2010 Fontana Water Company UWMP. Demands for Crestline-Lake Arrowhead Water Company from 2007 IRWM Plan.
[2]Distributed to Bear Valley Mutual "in-lieu" of releases from Big Bear Lake.
[3] Imported water not used for direct deliveries or deliveries to Big Bear Municipal will be recharged to support groundwater pumping. The anticipated imported water demands include direct delivery, local water banking and sustainability program.

Table 3-10: Available State Water Supplies Based on Table A Amounts (AFY)

Water Agencies	Table A Amount	Average Reliability (60%)	Multi-Year Drought Reliability (33%)	Single-Year Drought Reliability (11%)
Valley District	102,400	61,440	33,792	11,264
San Gorgonio Pass Water Agency [1]	17,300	10,380	5,709	1,903
Crestline-Lake Arrowhead Water Agency[2]	100	60	33	11
Total	**119,800**	**71,880**	**39,534**	**13,178**

[1] San Gorgonio Pass Water Agency plans to acquire additional SPW for the City of Banning and the Beaumont-Cherry Valley Water District.
[2] Crestline-Lake Arrowhead Water Agency supplies approximately 60 AFY to the City of Big Bear Lake Department of Water and Power for use in Rimforest.

3.3.3 Recycled Water

The Colton/San Bernardino Rapid Infiltration and Extraction (RIX) Tertiary Treatment Facility, owned and operated by the City of San Bernardino, treats secondary-treated wastewater from the City of Colton's and San Bernardino MWD's water reclamation plants to tertiary levels for release into the SAR. The RIX facility was designed as a 40-mgd plant, but currently operates at 27 mgd. The Orange County Judgment (Orange County Water District v. City of Chino, et al., Case No. 117628) stipulated that Valley District shall be responsible for the delivery of an average annual supply of 15,250 AF of "base flow" at the Riverside Narrows. Per the terms of an agreement between SBMWD and Valley District, SBMWD releases at least 16,000 AFY of treated wastewater to the SAR to meet Valley District's downstream obligations under the Orange County Judgment.

In 2003, SBMWD released a Programmatic Environmental Impact Report evaluating the sale of excess effluent to potential buyers downstream. SBMWD has previously determined that the use of recycled water from the RIX facility to offset water demands within its service area is not feasible at this time. The RIX facility is located at an elevation and distance from SBMWD's service area that makes it economically impractical to utilize recycled water (SBMWD 2005). This could change if the water is not sent to the RIX facility.

The projected use of recycled water is summarized by water agency in Table 3-11. Recycled water use is forecasted to increase from 26,598 AFY in 2015 to 62,429 AFY in 2035.

Table 3-11: Projected Use of Recycled Water (AFY)

Water Agencies	2015	2020	2025	2030	2035
Banning, City of	1,680	1,680	1,680	1,680	1,680
Beaumont-Cherry Valley Water District	5,372	6,216	7,342	8,440	8,843
Fontana Water Company	1,500	2,500	3,500	4,500	6,000
Redlands, City of – Municipal Utilities and Engineering Department [1]	2,214	3,040	3,290	3,290	3,290
Rialto, City of[2]	336	336	336	336	336
Riverside Public Utilities	3,650	5,800	5,800	5,800	5,800
SBMWD	5,600	7,000	13,000	19,600	25,500
South Mesa Water Company	110	145	190	244	244
YVWD	6,136	7,121	8,309	9,572	10,736
Total	**26,598**	**33,838**	**43,447**	**53,462**	**62,429**

[1] The recycled water by the City of Redlands would otherwise percolate into the SBBA. In the water budget summary this was not counted as a new supply. The recycled water that would otherwise discharge into surface streams and flow out of the Region was counted as new supply.
[2] The City of Rialto delivers approximately 0.3 mgd of recycled water for park irrigation. The projected use of recycled wastewater within the City's service area for the next 25 years is uncertain as funding for infrastructural improvements is needed.

3.4 Water Budget Summary

The current balance between supply and applied demand for the USARW IRWM Region is presented as the summary of the water budget in Table 3-12 to Table 3-16 and Figure 3-3. Based on this analysis, the water supplies within the Valley District and San Bernardino Mountains area are adequate to meet the demands through 2035. This is assuming the SWP reliability as published in the *2011 State Water Project Delivery Reliability Report*, and that the infrastructure needed for future projects is in place. This analysis also relies on the 20% by 2020 reduction in demand set forth in Senate Bill X7-7 and the conservation efforts of the agencies as projected in their UWMPs.

In a normal year, SWP water not used for direct deliveries is banked in groundwater storage. Therefore, it is assumed that in any year, Valley District will have its long-term SWP supply available through a combination of SWP deliveries and SWP from storage (2010 RUWMP). Local surface water supplies are based on precipitation patterns in the future similar to those seen in the past.

Table 3-12: Water Budget Summary for Valley District and San Bernardino Mountains (AFY) for an Average Year

Supply or Demand Type	2015	2020	2025	2030	2035
SBBA Surface Water	39,000	39,000	39,000	39,000	39,000
Big Bear Surface Water	1,000	1,000	1,000	1,000	1,000
Seven Oaks Supply[1]	10,800	10,800	10,800	10,800	10,800
Oak Glen	350	350	350	350	350
Sub-Total Local Surface Water	**51,150**	**51,150**	**51,150**	**51,150**	**51,150**
SBBA Groundwater	128,238	128,238	128,238	128,238	128,238
SBBA Return Flows from Extractions above safe yield[2]	11,040	13,955	18,500	22,672	25,982
SBBA return flow from SWP deliveries[3]	7,806	7,228	7,470	8,660	8,684
Rialto-Colton Groundwater	17,300	17,300	17,300	17,300	17,300
Riverside North Groundwater	33,600	33,600	33,600	33,600	33,600
Yucaipa Groundwater	10,000	10,000	10,000	10,000	10,000
Other Groundwater	15,854	18,084	20,281	22,326	24,123
Active Recharge Program	0	28,000	28,000	28,000	28,000
Sub-Total Groundwater	**222,326**	**256,405**	**263,389**	**270,796**	**275,927**
Direct Deliveries SWP Water[4]	**21,683**	**20,079**	**20,749**	**24,055**	**24,122**
Big Bear Municipal SWP Water[4]	**6,500**	**6,500**	**6,500**	**6,500**	**6,500**
SWP Storage	**34,281**	**35,885**	**35,215**	**30,885**	**30,818**
Sub-Total SWP Water	**62,464**	**62,464**	**62,464**	**61,440**	**61,440**
Sub-Total Recycled Water	**9,919**	**13,367**	**20,977**	**29,075**	**37,292**
Total Supplies	**347,371**	**383,386**	**397,980**	**412,461**	**425,809**
Total Demands	**250,280**	**253,905**	**272,170**	**289,554**	**304,391**
Surplus	**97,091**	**129,481**	**125,810**	**122,907**	**121,418**

[1] The Plaintiffs portion is 27.95% and the Non-Plaintiffs portion is 72.05% or 10,800 AFY.
[2] The Watermaster estimates 36% return flows from extractions above the safe yield of the SBBA. This is estimated in Table 3-4.
[3] The Watermaster estimates a 36% return from the direct deliveries of SWP in the SBBA.
[4] The amount of water used in the given year is the minimum between (a) the difference between the applied demand and the surface water, groundwater, recycled water, and future Seven Oaks Supply and (b) the available Table A water found in Table 3-10.

Table 3-13: Water Budget Summary for San Gorgonio Pass Water Agency Area

Supply or Demand Type	2015	2020	2025	2030	2035
Surface Runoff (Edgar Canyon)	2,000	3,000	3,000	3,000	3,000
Groundwater	20,437	23,054	22,572	21,870	22,097
Imported Water	10,380	10,380	10,380	10,380	10,380
Recycled Water	7,431	8,532	10,063	11,713	12,933
Total Supplies	**40,248**	**44,966**	**46,015**	**46,963**	**48,410**
Total Demands	**31,151**	**36,827**	**44,302**	**52,221**	**57,165**
Surplus/Deficit	**9,097**	**8,139**	**1,713**	**-5,258**	**-8,755**

Table 3-14: Region-Wide Water Budget Summary for Average Year (AFY)

	2015	2020	2025	2030	2035
Local Surface Water	53,150	54,150	54,150	54,150	54,150
Groundwater	297,640	343,871	356,488	369,336	379,918
Imported Water	71,880	71,880	71,880	71,880	71,880
Recycled Water	26,598	33,838	43,447	53,462	62,429
Total Supplies	**449,268**	**503,739**	**525,965**	**548,828**	**568,377**
Total Demands	**392,881**	**412,377**	**443,782**	**474,625**	**497,606**
Surplus/Deficit	**56,387**	**91,362**	**82,183**	**74,203**	**70,771**

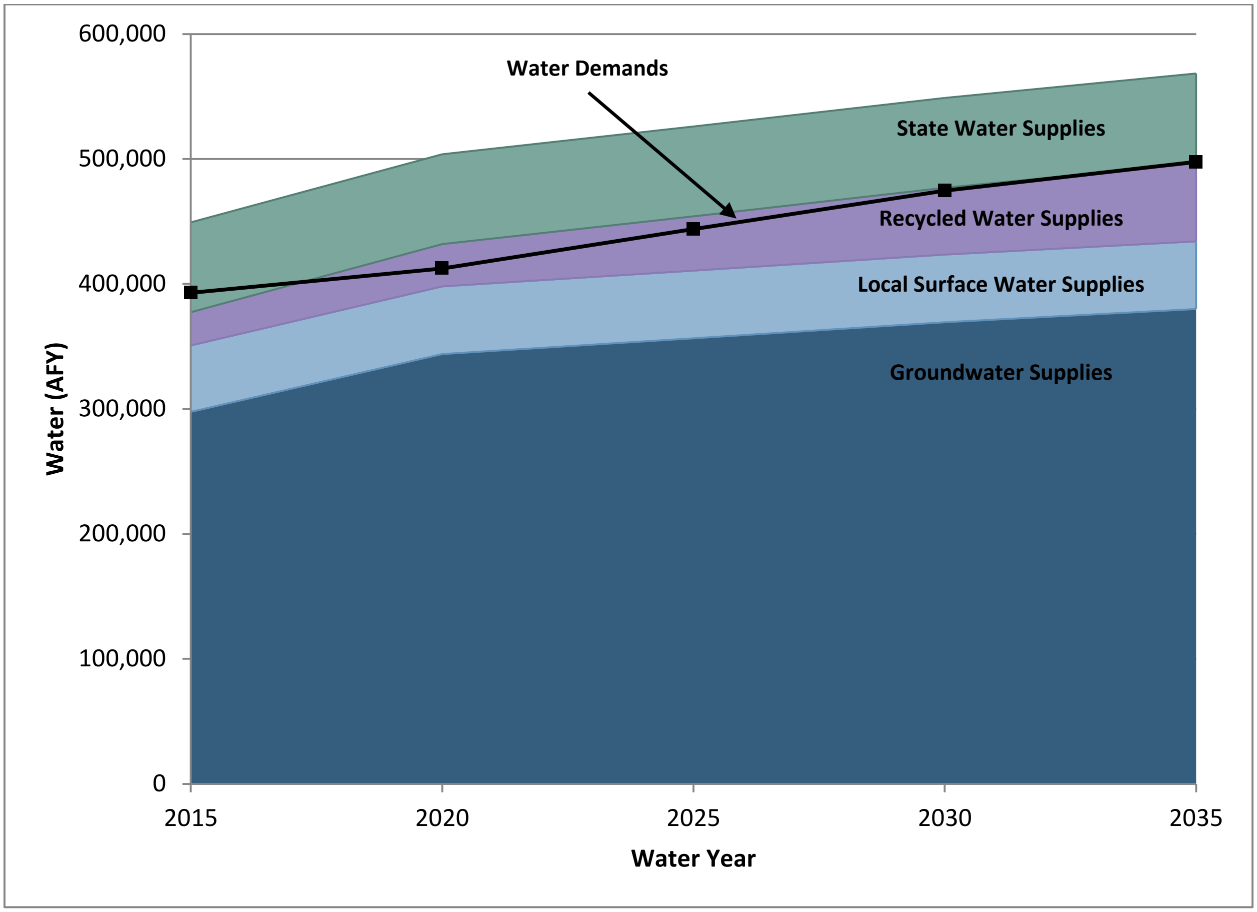
Table 3-15: Region-Wide Water Budget Summary for Multi-Year Drought (AFY)

	2015	2020	2025	2030	2035
Local Surface Water	26,010	26,610	26,610	26,610	26,610
Groundwater	297,640	343,871	356,488	369,336	379,918
Imported Water	39,600	39,600	39,600	39,600	39,600
Imported Water from Storage	18,814	0	0	4,668	9,019
Recycled Water	26,598	33,838	43,447	53,462	62,429
Total Supplies	**408,596**	**443,853**	**466,079**	**493,610**	**517,510**
Total Demands	**408,596**	**428,873**	**461,533**	**493,610**	**517,510**
Surplus/Deficit	**0**	**14,981**	**4,546**	**0**	**0**

Table 3-16: Region-Wide Water Budget Summary for a Single-Dry Year (AFY)

	2015	2020	2025	2030	2035
Local Surface Water	23,843	24,393	24,393	24,393	24,393
Groundwater	297,640	343,871	356,488	369,336	379,918
Imported Water	13,178	13,178	13,178	13,178	13,178
Imported Water from Storage	47,338	13,593	24,028	33,242	37,592
Recycled Water	26,598	33,838	43,447	53,462	62,429
Total Supplies	**408,596**	**428,873**	**461,533**	**493,610**	**517,510**
Total Demands	**408,596**	**428,873**	**461,533**	**493,610**	**517,510**
Surplus/Deficit	**0**	**0**	**0**	**0**	**0**

Figure 3-3 : Region-Wide Water Budget Summary for Average Year



The shortage in supply in

Table 3-13 within the San Gorgonio Pass Water Agency service area will require the acquisition of additional imported water supplies. The San Gorgonio Pass Water Agency 2010 UWMP outlines potential methods for augmenting its future supplemental imported water supply, including short term spot market purchases and long term permanent transfers of water rights.

During multi-year and single-year droughts, the IRWM Region is more reliant upon groundwater. Based on groundwater modeling of the SBBA, during a dry period, agencies typically increase their groundwater extractions to overcome any deficiency in local surface water and imported water supplies. Computer modeling suggests that groundwater extractions in the SBBA will increase to meet the demands in drought years if imported water is captured and stored when it is available in "wet years." The storing of local and SWP water in the SBBA in wet years for later use during dry periods is one of the foundational management strategies in the IRWM Plan. Storage locations up stream of Valley District's service area, along the SWP, is also undertaken to enable the direct delivery to treatment plants during dry years.

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4 Goals and Objectives

4.1 Introduction

The primary purpose of the IRWM Plan is to provide a roadmap for the management of water resources in the area to ensure long-term, reliable water supply availability for the IRWM Region. The first step in developing this roadmap is the formulation of broad water management goals and more specific water management objectives that can help achieve those goals. The goals and objectives described in the sections that follow shape the desired outcome from implementation of the IRWM Plan.

4.2 Water Management Objectives Development Process

A key element of the IRWM planning process is the development of water management objectives that will help address the needs of the IRWM Region, while also speaking to the water management strategies outlined in the *California Water Plan* and *IRWM Proposition 84 and 1E Program Guidelines*. To determine these objectives, the needs of the Region must be identified, as well as goals to address those needs.

4.2.1 Regional Needs Identification

Using the 2007 IRWM Plan, the BTAC discussed the current issues and needs of the Region. Below is a discussion of the issues and needs that were identified.

Reliance on Imported Water

The Region estimates that it will depend on imported water from the SWP for up to one quarter of its water supply. Dependence on imported water creates reliability issues due to vulnerabilities such as:

- Susceptibility to interruption during catastrophic conditions
- Periods of statewide drought
- Environmental protection goals and mandates in the Sacramento-San Joaquin Bay Delta
- Climate change
- Imported water quality
- Imported water cost increases

As the health of the Delta environment has deteriorated and fish populations have declined, state and federal regulations have limited the SWP's ability to pump and convey water to southern California. In addition to environmental challenges, aging Delta levees are also crumbling and not able to withstand the impacts of catastrophic earthquakes, floods and rising sea levels. This growing crisis poses the threat of statewide economic and ecological disaster.

Groundwater is a major source of water supply for the Upper Santa Ana Region.

Diversifying water supplies will improve reliability and reduce pressures from population and demand increases.

Groundwater Management

Precipitation stored as groundwater is a major source of water supply in the IRWM Region. At times, parts of the Region can experience high groundwater levels that must be managed in order to reduce the risk of liquefaction. Additionally, preserving and improving water quality in the groundwater basins is important to maintaining safe drinking water quality.

Due to the significance of groundwater management in the IRWM Region, the following three groundwater management needs were established for the Region:

1. *Maximize Conjunctive Use*: The BTAC has developed Conjunctive Use Guidelines for the SBBA that are intended to optimize the storage potential in this basin. Conjunctive use potential should also be evaluated for the other basins in the Region.
2. *Reduce the Risk of Liquefaction*: A significant portion of the SBBA—generally, the downtown and southern portions of the City of San Bernardino—is an area of historically high groundwater. Groundwater levels in this area have been artesian in the past. When high groundwater is combined with the thick layer of sand in the aquifer it can cause liquefaction in an earthquake.
3. *Protect Groundwater Quality*: Groundwater management is currently influenced by the presence of contamination plumes. Most of these plumes resulted from historic military and industrial operations in the Region.

Because groundwater is such an important supply for the Region, these needs were incorporated into the overall IRWM Objectives.

Water Quality

Groundwater quality in the Upper SAR watershed is generally good, though there are a number of contamination plumes in the upper watershed that are in the process of being remediated. Water quality impacts in the Region are largely due to the presence of the defense industry and agriculture. In the past, the defense industry routinely dumped solvents onto the ground which soaked into the groundwater. Agriculture resulted in an accumulation of salts that are now in the unsaturated soils overlying groundwater basins (now defined in the Basin Plan as groundwater management zones). These salts will degrade groundwater quality over time.

Currently, the primary groundwater quality concerns in the IRWM Region include TDS, nitrogen, PCE, TCE, and perchlorate. Additionally, some surface waters in the Region are on the State's 303(d) list for pathogens, nutrients, metals, sediment, and/or PCBs. Implementing projects that protect and improve water quality in the Region is important to protecting drinking water quality as well as protecting water quality in downstream areas.

Flood Management

The management of storm waters that flow through the San Bernardino Valley has been an ongoing challenge since the SBCFCD was created in 1939. Multiple flooding events, some with the loss of life, have occurred in the intervening years. One of the primary purposes of the SBCFCD is to manage flood waters and natural stream flow for the protection of residents, public and private properties and the utilities that are vital for the communities.

The SAR Wash was historically a natural floodplain and alluvial fan that provided a place to convey frequent devastating flood waters and to deposit sediment. The alluvial deposit provided excellent conditions for establishing settling basins for percolating surface water to the groundwater basin, providing a significant source of water supply for the Upper SAR watershed. Substantial development has occurred in these areas, with additional development planned for the future. Protecting open space areas that can be used for flood protection is critical. Retaining stormwater for recharge is also desirable to help meet future water supply needs.

Habitat and Open Space Preservation

The IRWM Region contains extraordinary natural resources, including the San Bernardino National Forest in its headwaters, and unique habitat types, endangered or threatened species in the San Bernardino Valley. The Region desires to be proactive in working with Federal and State agencies to improve habitat and open space, and increase recreational areas.

Disaster Preparedness

The IRWM Region is located in a seismically active area of Southern California. Four major fault zones are found in the Region, including the San Jacinto Fault, the Chino-Corona segment of the Elsinore Fault, the Cucamonga Fault, and the San Andreas Fault. Numerous other minor faults associated with these larger fault structures may also present substantial hazards.

While not the only cause for a catastrophic water supply interruption, the postulated magnitude 8.0 earthquake on the San Andreas Fault is one of the most likely disasters that could occur in the Region. The effects of a large magnitude earthquake on water supply were estimated based on post-earthquake surveys, earthquake planning reports included in purveyor's UWMPs, and available reports prepared by State and federal agencies. Other catastrophic interruptions caused by regional power failure, terrorist attack, or other man-made or natural catastrophic event could cause similar conditions and issues to water supply systems in the Region.

A conceptual level analysis has been performed to assess possible impacts due to seismic activity. As additional data and information becomes available, a more detailed analysis should be conducted. Appendix F includes the following:

- An earthquake literature search of major earthquake events and what has been learned from such events.
- Evaluation of catastrophic interruption of regional facilities.
- Vulnerabilities of the Region's water supply system to SWP supply interruption.
- Vulnerability of local purveyors' systems to an earthquake.
- Summary of Findings and Recommendations including a Water Shortage Contingency Plan.
- Water Shortage contingency planning.

In addition, the UWMPs within the Region also include water contingency planning information and are updated every 5 years.

Sustainability

The IRWM Region recognizes the need to make water management decisions that ensure resources are maintained for future generations. This includes incorporating economic, social, land use, environmental sustainability into water resource management decisions. DACs are often more vulnerable to water supply, flood, and water quality issues. The Region has made ensuring equivalent services to DACs a priority and intends to maintain these services through the planning horizon of the IRWM Plan.

Climate Change

In order to identify the potential impacts to the IRWM Region's water resources as a result of climate change, the BTAC conducted a vulnerability assessment using the Vulnerability Assessment Checklist available in DWR's *2011 Climate Change Handbook for Regional Planning*. The questions and answers for this checklist are provided in Appendix G. Below is a list of the areas of the Vulnerability Assessment Checklist that should be viewed as a priority within the Region, and should be addressed to protect the Region from potential climate change impacts.

- Processes that require cooling water
- Climate sensitive agriculture
- Reliance on imported water
- Wildfires that effect water quality
- Threatened beneficial uses of water bodies

Based on the checklist above, the following vulnerabilities were identified for the Upper SAR Basin. The vulnerabilities were listed in rank order by the BTAC subcommittee updating the IRWM Plan. In all cases, actions identified in the IRWM address vulnerabilities.

1) *Uncertainty around the Sacramento-San Joaquin Bay Delta, especially given dependence on snow pack for water supplies will make imported supplies less reliable.*

The Region's ability to capture additional stormwater and store it in the large underlying groundwater basins will provide some ability to offset this vulnerability. In addition, the Region plans to maximize the import of water during wet years and store it in the large underlying groundwater basins which will also help offset this vulnerability.

2) *Current groundwater capture facilities are not operationally equipped to capture less frequent, but more intense storm events.*

As much of the Region's water supply ultimately falls on precipitation, either as rain or snow, in the local mountains, the ability to capture more intense storm flows is crucial. As these flows are often intense and of short duration, further development of additional facilities to capture and recharge the tail end of an intense storm becomes crucial in the Region. Plans for these facilities are discussed elsewhere in the IRWM Plan. Additionally, through a partnership between SBVWCD and Valley District, capacity to recharge water from released from the Seven Oaks Dam will be increased. As the dam serves to attenuate flood flows, this project is well suited to increase the Region's capacity to recharge water.

3) *More frequent drought periods will result in more frequent and intense wildfires. Water quality and the ability to capture storm flows will be reduced.*

Wildfires are already a concern in the Region, and have historically caused water quality and flood control issues. Should climate change increase drought periods and result in more frequent and intense wildfires, water quality and flood control will be further impacted.

4) *Increased surface water temperatures will degrade water quality and negatively impact aquatic life, especially in mountain areas.*

High gradient stream systems located in the mountainous areas support a number of species that exist in a narrow geographic range limited by altitude. Some of the more sensitive species, such as the mountain yellow-legged frog, are listed by the U.S. Fish and Wildlife Service and active restoration and recovery programs are underway. Increases in surface water temperature will negatively impact aquatic life as already narrow geographic ranges will be further reduced.

5) *Uncertainty related to managing intense winter storms to protect downstream life and property will make holding water in the flood system for recharge more difficult.*

As seasonal storms become less frequent and more intense, flood management may become more complex. However, collection of water for recharge during intense storm events is difficult and most efforts are focused on "scalping" the tail of a storm flow. The high volume flows move downstream and the tailing, less intense flows can be collected by rubber dams or other structures. These structures are intended to be deflated or moved during high flow events. Planning is underway for a number of these facilities within the watershed.

6) *Increased temperatures will result in increased water demand for landscape irrigation.*

As days with highs over 95 degrees increase in frequency, absent any intervention, landscape irrigation demands would increase. Recent programs by local water retailers, including a popular public-private partnership called Water Saving Garden Friendly, have provided education and resources for homeowners and businesses to reduce irrigation demand through the use of drought tolerant plants in landscaping. A recent partnership with California State University resulted in a drought tolerant demonstration garden where the public can see and better understand the benefits of drought tolerant landscaping. Additionally, like in most parts of California, numerous incentive programs are underway to increase water use efficiency by the homeowner, especially outdoor use. These programs will need to be continued or even expanded to counteract increasing temperatures in the future.

7) *Decreased runoff and subsurface flows from the mountain front areas as the result of more frequent and severe droughts.*

As drought conditions become more frequent, it becomes more important to capture storm flows when they are available. Further development of recharge facilities within the IRWM Region and imports of water during wet years for underground storage allows the Region to store water in the wet years for use during periods of drought. The Bunker Hill Subbasin is a tremendous resource and the cooperative management of the basin has created the structure where more water could be stored in wet years.

As summarized above, most of the IRWM Region's vulnerabilities are addressed by work already occurring in the upper watershed. More active stormwater capture and more active recharge of imported water in wet years will help prepare the Region for changed climatic conditions.

4.2.2 Goals and Objectives Development

Water management goals are the broad statements that drive water management planning in the IRWM Region. Water management objectives are the more specific and measureable ways of achieving these goals. The objectives in this Plan are tailored to the Region's needs and priorities as well as the priorities of the State. Water management strategies are the methods the Region plans to use to achieve its objectives (Figure 4-1). These strategies are described in detail in Chapter 5.

Figure 4-1: Hierarchy of Goals, Objectives and Strategies

Objectives Development Process

The BTAC is responsible for preparing and updating the IRWM Plan, including reviewing and refining the objectives to ensure they remain relevant to current needs of the IRWM Region. The IRWM Plan objectives were originally developed for the 2007 IRWM Plan. Since that time, the water agencies and other stakeholders in the Region have reviewed and commented on the Plan sections. These comments have been incorporated to ensure the issues and priorities of the Region are reflected. The BTAC reviewed the updated water management goals, objectives and strategies at a workshop on September 16, 2014 to incorporate any remaining concerns and adjust the objectives as needed.

Considerations

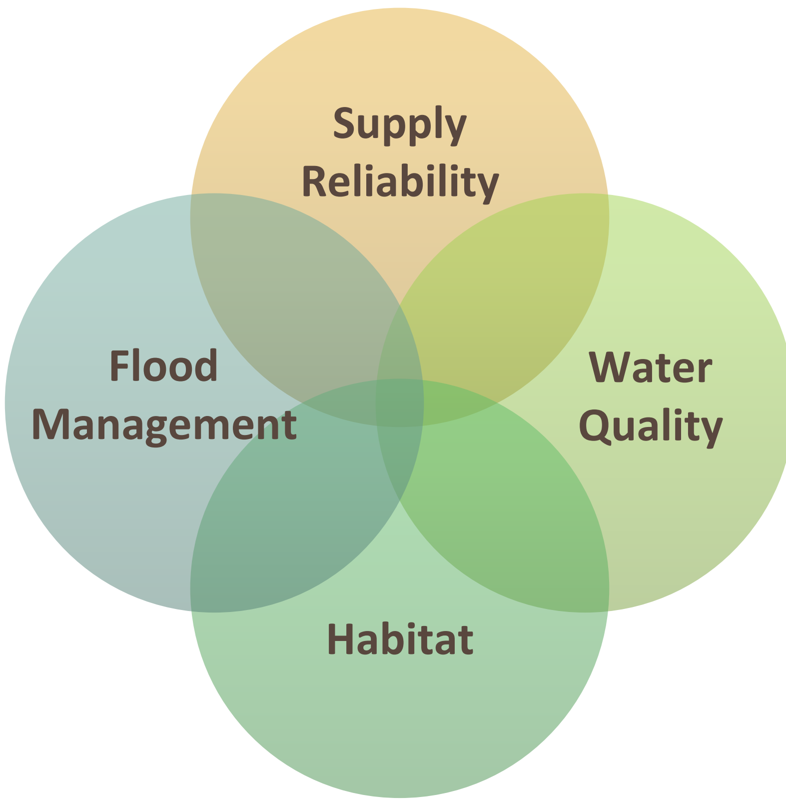
Several policies were considered when developing the water management objectives. Water management in the Region is governed by a complex set of technical constraints, court decisions, judgments, and agreements. Water management objectives for the Region must be consistent with these legal documents. Other considerations included consulting the Basin Plan objectives. Water quality standards found in the Basin Plan were used to identify measurable targets for water quality in the groundwater and surface water bodies. The State's 20x2020 water use efficiency goals set forth in the Water Conservation Act of 2009 were also used to develop measurable objectives for the Region's water supply goal.

4.3 Water Management Goals and Objectives

Using the needs of the IRWM Region described in the previous section, the Region established the following goals, also shown in Figure 4-2:

1. Improve Water Supply Reliability
2. Balance Flood Management and Increase Stormwater Recharge
3. Improve Water Quality
4. Improve Habitat and Open Space

Figure 4-2: Upper SAR Watershed IRWM Regional Goals



The Region agreed that achieving the IRWM goals would require the identification of more specific and measurable objectives that relate to each of the 4 goals. The resulting 15 objectives consider the State's planning guidance in the *2012 IRWM Proposition 84 and 1E Program Guidelines*, as well as the priorities and opportunities unique to the IRWM Region. These objectives are shown in Table 4-1 and described in the sections that follow.

Table 4-1: Upper SAR Watershed IRWM Region Objectives

Goal	Objective
Goal #1: Improve Water Supply Reliability	1a: Reduce demand 20% by 2020
	1b: Increase utilization of local supplies by 23,000 AFY • Stormwater: 20,000 AFY • Recycled Water: 3,000 AFY
	1c: Increase storage by 10,000 AF
	1d: Prepare for disasters by implementing 2 new interties between water agencies
	1e: Monitor and adaptively manage climate change impacts by implementing 3 projects that reduce energy demands
	1f: Ensure equivalent water supply services for DACs
Goal #2: Balance Flood Management and Increase Stormwater Recharge	2a: Utilize 500 acres of flood control retention/detention basins that are not currently used for recharge
	2b: Reduce FEMA reported flood area
	2c: Ensure equivalent implementation of flood projects in DAC areas and implement at least 1 flood control project in a DAC area
Goal #3: Improve Water Quality	3a: Ensure no violations of drinking water quality standards
	3b: Improve surface and groundwater quality by treating 3,000 AFY of water supply
	3c: Manage total dissolved solids and nitrogen in groundwater
	3d: Ensure equivalent water quality services for DACs
Goal #4: Improve Habitat and Open Space	4a: Improve habitat and open space by 1,200 acres
	4b: Identify “multi-use” opportunities to increase recreation and public access and identify at least 1 multi-use project

4.3.1 Goal #1: Improve Water Supply Reliability

Water supply reliability can generally be improved by reducing demand and/or by increasing supply. Demand reduction is required by the Water Conservation Act of 2009 (SBX7-7), which requires retail water agencies to reduce demands 20% by 2020. Water supply for the Region can be developed by increasing use of supplies such as recycled water, groundwater, and stormwater.

True reliability occurs when there is additional supply over projected demand. This redundancy, or "reliability margin", in supplies allows the Region to adapt to changing conditions. For example, developing additional stormwater capture may overcome a deficit in the amount of precipitation assumed into the future. The IRWM Region has decided to use a reliability margin of 10% in its analysis. This 10% exceedance of supplies over demands will help the Region adapt to unknowns such as future precipitation amounts, future imported water availability, climate change impacts and other unknowns.

Several objectives were identified to improve water supply reliability in the Region. These include managing demands, increasing local supplies, increasing overall water storage, preparing for potential disasters, managing climate change impacts, and ensuring DACs receive equivalent services.

Objective 1a: Reduce demand 20% by 2020.

SBX7-7 requires retail water agencies to reduce demands 10% by 2015 and 20% by 2020. The BTAC is tracking each retail water agencies progress toward these goals on an annual basis and providing the status in its Regional UWMP.

Wholesale water agencies like Valley District and San Gorgonio Pass Water Agency are not held responsible for the demand reductions, but are required to help the retail water agencies within their service areas achieve these goals (Water Code §10608.36). Water conservation programs in the Region have grown over the past several years.

In 1983, the California legislature enacted the Urban Water Management Planning Act (Water Code Sections 10610-10658). The Act states that every retail water supplier providing 3,000 AF of water annually or supplying water to 3,000 customers or more must file a UWMP with DWR. The requirement is designed to ensure thoughtful planning for future water reliability. Water purveyors must submit an updated plan and have that plan deemed complete by DWR every five years. The statute requires quite a detailed assessment, including an analysis of Demand Management Measures (DMMs). DMMs are programs and activities that encourage, regulate or incentivize water conservation. The Urban Water Management Planning Act identities fourteen (14) DMMs, also referred to as BMPs, which are to be evaluated in each UWMP.

By reducing regional water demand 20% by 2020, this objective will help retail water agencies meet their SBX7-7 water use efficiency goals and help alleviate demands on water supplies. Widespread implementation of water use efficiency programs and other BMPs will increase water supply reliability in the Region.

Objective 1b: Increase utilization of local water supplies by 23,000 AFY (stormwater: 20,000 AFY and recycled water: 3,000 AFY)

Increasing the use of local water supplies helps the Region develop a more diverse water supply portfolio that adds resiliency against interruptions in imported water deliveries and increasing imported water costs. Local water supply opportunities include increasing stormwater capture, recycled water, and groundwater use through projects that develop the infrastructure to capture, store, or transport the water supplies locally. In addition, increasing local supply use will help to reduce dependence on the Delta.

Objective 1c: Increase storage by 10,000 AF.

Storing water, primarily in groundwater basins, in wet years for later use during dry periods (conjunctive use) is a foundational strategy to help improve water supply reliability. Through the Valley District Cooperative Recharge Program, retail agencies in the Valley District service area store imported water during wet years so that it is available in dry years. Since 2008, nearly 107,000 AF has been stored under this program. However, the area will need to increase this amount, over time, to help offset increasing demands and other uncertainties. The preferred storage location is in local groundwater basins to reduce evaporative losses and transportation costs, though storage can also occur in upstream locations or the Central Valley. Storing water locally has the advantage of improving reliability by reducing the vulnerabilities associated with transporting the water from other agencies' jurisdictions, but this objective also includes increasing storage outside the Region.

The Cuttle Weir is a concrete and rock diversion structure owned by the San Bernardino Valley Water Conservation District and is used to divert water from the Santa Ana River to the Conservation District's Santa Ana River Spreading Grounds for artificial recharge of the SBBA. The Seven Oaks Dam can be seen in the background.

Objective 1d: Prepare for disasters by implementing two new interties between water agencies.

Implementing storage and intertie projects will improve the Region's resiliency against disasters such as earthquakes and other catastrophic events that could cause damage to water supply systems. Earthquakes can displace pipelines, interrupt power supply to pump stations and treatment facilities, and cause water service outages of local and SWP water. Increasing storage can provide reserves if there is an interruption of SWP water and interties can be used during an emergency to supply water from water systems that are not damaged.

Objective 1e: Monitor and adaptively manage climate change impacts by implementing three projects that reduce energy demands.

Generally, there is great uncertainty in the magnitude, timing, and location of precipitation and runoff changes associated with climate change. However, it is generally agreed that climate change could change runoff patterns. There is also a great level of uncertainty in the reduction, if any, in water supply due to climate change for Southern California and for USARW, in particular. The strategies identified to improve water supply reliability would also be useful in mitigating potential impacts from climate change. Therefore, the Region has decided to continue to implement the various water supply reliability strategies while monitoring actual conditions. When actual conditions warrant, the IRWM Program will adapt, as necessary, by changing its strategies or developing new strategies. Another way the IRWM Region is preparing for climate change is by ensuring supplies exceed demands by at least 10% (reliability margin).

Objective 1f: Ensure equivalent water supply services for DACs

Supporting water supply projects that benefit DACs is an important aspect in maintaining water supply reliability. The Region strives to maintain equitable water supply services for DACs, and will continue to do so in the future.

4.3.2 Goal #2: Balance flood management and increase stormwater recharge

While conveying flood water safely through the IRWM Region is of critical importance, detaining runoff for recharge is also desirable. This goal represents the Region's need to balance the use of flood control basins and channels to reduce flood risk while using of these same flood control facilities to enhance stormwater capture and recharge.

Objective 2a: Utilize 500 acres of flood control retention/detention basins that are not currently used for recharge.

Combined with the dwindling water supplies around the state, the water agencies desire to continue to wisely utilize the natural streams and local groundwater for the benefit of all the residents. Using flood control basins to capture stormwater for recharge will increase groundwater supplies while reducing flood risk. This objective has the additional benefit of improving water quality issues associated with stormwater runoff.

Objective 2b: Reduce FEMA reported flood area.

Preserving flood plains will reduce the risk of flood waters damaging municipal and private property. The Region recognizes the importance of preserving flood plains to decrease flood risk.

Objective 2c: Ensure equivalent implementation of flood projects in DAC areas by implementing at least one flood control project in a DAC area.

The Region recognizes the importance of supporting flood management projects in DACs, and will continue to ensure equivalent implementation of flood projects in DAC areas.

4.3.3 Goal #3: Improve Water Quality

Improving water quality in the IRWM Region is critical for ensuring safe and sustainable surface and groundwater, human health and preserving aquatic species.

Objective 3a: Ensure no violations of drinking water quality standards.

The retail water agencies in the Region must comply with water quality regulations. These regulations require routine sampling of water supplies to ensure compliance. Overall water quality is reported to customers in annual consumer confidence reports. The Region is not recommending any additional water quality monitoring requirements beyond what is already required by state and federal regulations, but does set the objective of ensuring the water quality requirements are met.

Objective 3b: Improve surface and groundwater quality by treating 3,000 AFY of water supply.

Local surface water and groundwater are important water supply sources for the Region, and maintaining and improving the water quality of these supplies ensures safe water for human health and aquatic life. Several contaminant plumes are present throughout the Region, and include the Newmark-Muscoy, Redlands-Crafton, Santa Fe, former Norton Air Force Base, Rialto-Colton Subbasin, and No-Man's Land plumes. Cleanup of the Newmark-Muscoy and former Norton Air Force Base Plumes is progressing under the EPA Superfund Program. In each case, treatment is required to remove the contaminant before the water can be served to customers.

Objective 3c: Manage total dissolved solids and nitrogen in groundwater.

Long-term historic land use practices caused the accumulation of salts and nitrates in the soils overlying the groundwater basins in the Region, and have resulted in TDS and nitrate contamination in the basins. The construction and operation of groundwater desalters to extract and treat poor-quality groundwater has been and continues to be an essential component of salt and nutrient management in the Santa Ana watershed. Such projects will be increasingly important in the USARW to protect local water supplies and provide supplemental, reliable sources of potable supplies.

Objective 3d: Ensure equivalent water quality services for DACs.

The majority of DACs receive water supplies that meet all state and federal standards for water quality from the utility which services their area. The Region will continue to identify projects that improve upon the water quality services provided to DACs.

4.3.4 Goal #4: Improve Habitat and Open Space

Improving habitat and open space areas has multiple benefits for the IRWM Region including improving water supply, water quality, flood management, ecological resources and recreational opportunities. The Region recognizes the potential to improve water resources management by protecting and improving open space areas.

Objective 4a: Improve habitat and open space by 1,200 acres.

Habitat and open space provide multiple benefits including ecological protection and stewardship; creation of recreational opportunities; protection of water source and quality through promotion of natural recharge, attenuation of runoff and reduction of erosion; and improvement of quality of life. Restoration projects can also protect threatened and endangered species. Restoring and improving habitat through integrated water resources projects and programs will help the Region to maintain and improve habitat benefits.

The San Bernardino National Forest is home to extraordinary natural resources.

Objective 4b: Identify "multi-use" opportunities to increase recreation and public access and identify at least one multi-use project.

The Region recognizes the need to balance between growth of urban areas and the environment to maintain a viable habitat for native plant and wildlife species, and to maintain a high quality of life for watershed residents and visitors. An effective way to establish this balance is the development of open space corridors that allow for multiple species habitat, wetlands, storm flow capture and aquifer recharge, water quality improvements, and passive and active recreational facilities and open spaces.

4.3.5 Prioritization of Objectives

Given that this IRWM Plan is intended to be a truly integrated plan, the IRWM Region elected not to prioritize the IRWM objectives with the understanding that each objective is equally important relative to the others. The Region may prioritize objectives as funding opportunities become available in order to align projects with the goals of each funding program.

4.4 Consistency with Statewide Objectives

As mentioned throughout the IRWM Plan, the IRWM planning process has been developed and implemented taking into consideration DWR's IRWM Guidelines. The IRWM Region's objectives are consistent with the Statewide Priorities laid out in the Guidelines, as shown in Table 4-2.

Table 4-2: Comparison between IRWM Plan Objectives and Statewide Priorities

Upper SAR Watershed IRWM Plan Objectives	Statewide Priorities							
	Drought Preparedness	Use and Reuse Water More Efficiently	Climate Change Response Actions	Expand Environmental Stewardship	Practice Integrated Flood Management	Protect Surface Water and Groundwater Quality	Improve Tribal Water and Natural Resources	Ensure Equitable Distribution of Benefits
1a: Reduce demand 20% by 2020.	●	●	●	○		○	○	○
1b: Increase utilization of local supplies by 23,000 AFY (stormwater: 20,000 AFY and recycled water: 3,000 AFY).	●	●	●	○	○	○	○	○
1c: Increase storage by 10,000 AF.	●	○	●	○		○	○	○
1d: Prepare for disasters by implementing two new interties between water agencies.	●	○	●		○		○	○
1e: Monitor and adaptively manage climate change impacts by implementing three projects that reduce energy demands.	○	○	●	○	○	○	○	○
1f: Ensure equivalent water supply services for DACs	●	○	○	○	○		○	●
2a: Utilize 500 acres of flood control retention/detention basins that are not actively used for recharge.	●	●	○	○	●	○	○	○
2b: Reduce FEMA reported flood area.			○	○	●	○	○	○
2c: Ensure equivalent implementation of flood projects in DAC areas and implement at least one flood project in a DAC area.			○	○		○	○	●
3a: Ensure no violations of drinking water quality standards.			○	○		●	○	○
3b: Improve surface and groundwater quality by treating 3,000 AFY.			○	○		●	○	○
3c: Manage total dissolved solids and nitrogen in groundwater.			○			●	○	○
3d: Ensure equivalent water quality services for DACs.			○	○		●	○	●
4a: Improve habitat and open space by 1,200 acres.			○	●	○	○	○	○
4b: Identify "multi-use" opportunities to increase recreation and public access and identify at least one multi-use project.			○	●	○		○	○

● IRWM Plan objective directly supports the listed Statewide Priority
○ IRWM Plan objective can indirectly support the listed Statewide Priority

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5 Water Management Strategies

This chapter considers the water management strategies the USARW IRWM Region can use to meet the goals and objectives discussed in Chapter 4.

5.1 Consideration of Strategies

The BTAC reviewed the strategies used in the 2007 IRWM Plan and determined that they were still applicable to the Region. In order to be consistent with the California Water Plan (CWP), the IRWM Region adopted the terminology used in the *2013 CWP Update*. The Region considered the RMS in relation to the needs, goals, and objectives (which include climate change related objectives) determined by stakeholders and presented in Chapter 4. The strategies to include in the IRWM Plan were discussed and vetted during a BTAC workshop on September 16, 2014. The RMS included as strategies in the IRWM Plan are those that have synergies with the Region's goals and objectives. Additional water management strategies specific to the Region were developed by stakeholders for the 2007 IRWM Plan and reviewed during the BTAC Workshop on Objectives and Strategies.

The following RMS were not considered feasible or applicable for implementation in the IRWM Region:

- *Precipitation Enhancement*: This strategy was briefly explored in the Upper SAR watershed and determined to be unsuccessful. The stakeholder group decided this strategy is impractical for the Region and will not be considered as a water resource management strategy at this time.
- *Surface Storage – CALFED/State*: Although this strategy could improve water supply reliability for the Region, it is not as cost effective as groundwater storage. Given the abundant groundwater storage opportunities in the IRWM Region, the BTAC decided that surface storage should not be considered as an Upper SAR watershed regional strategy at this time.
- *Other Strategies (crop idling for water transfer, dewvaporization/atmospheric pressure desalination, fog collection, irrigated land retirement, rainfed agriculture, snow fences, and waterbag transport/storage technology)*: Many of these RMS are either infeasible or use relatively new and unproven technologies; therefore, they would not be favored unless all other strategies presented in this chapter have been exhausted. Specific characteristics of the Region that make several of these strategies impractical include low amounts of rain, fog, and agriculture.

In many instances, regional strategies can address multiple IRWM planning objectives and goals. For example, protection of recharge areas could help meet the objectives increase storage, reduce flood risk, improve water quality, and restore and improve habitat and open space. The remainder of this chapter describes the strategies selected for inclusion in the IRWM Plan, shown in Table 5-1, as well as the integration of these strategies.

Table 5-1: Water Resource Management Strategies

Strategies	Goals			
	Improve Water Supply Reliability	Balance Flood Management and Increase Stormwater Recharge	Improve Water Quality	Improve Habitat and Open Space
Continue Basin Management in the San Bernardino Basin Area	✓			
Continue Forest Management and Hazardous Fuels Reduction		✓	✓	✓
Coordinate Land Use Planning and Management with Water Resources Management		✓	✓	✓
Develop Basin Management in Yucaipa Basin	✓			
Develop Desalination	✓			
Develop Watershed Management Projects and Programs			✓	✓
Improve Drinking Water Treatment and Distribution			✓	
Identify Corridors for Species				✓
Identify Projects that Increase Recharge	✓	✓		
Identify Projects that Increase Surface Water and Groundwater Storage Inside and Outside the Region	✓			
Identify Water Transfer Opportunities	✓			
Implement Agricultural Lands Stewardship		✓		
Implement Agricultural Water Use Efficiency	✓			
Implement Pollution Prevention Measures			✓	
Implement System Reoperation	✓			
Implement Urban Water Use Efficiency	✓			
Improve Supply Conveyance – Delta	✓			
Improve Supply Conveyance – Regional/ Local	✓			
Incorporate Environmental Opportunities and Constraints into the Design Process for Facilities				✓
Incorporate Opportunities to Improve Habitat and Increase Recreation and Public Access During the Facilities Design Process				✓
Increase Recycled Water Use	✓			
Increase Stormwater Capture	✓	✓	✓	
Maintain and Improve Water-Dependent Recreation				✓
Manage High Groundwater Potential in the SBBA	✓			
Manage Urban Runoff			✓	
Match Water Quality to Use			✓	
Monitor Consumer Confidence Reports			✓	

Strategies	Goals: Improve Water Supply Reliability	Balance Flood Management and Increase Stormwater Recharge	Improve Water Quality	Improve Habitat and Open Space
Operate Existing Facilities to Increase Recharge		✓		
Optimize Wet Year Storage and Dry Year Pumping (Conjunctive Management & Groundwater)	✓			
Participate in the SAWPA Basin Management Task Force			✓	
Protect Recharge Areas	✓	✓	✓	✓
Provide Economic Incentives	✓	✓	✓	✓
Remediate Groundwater Contamination Plumes			✓	
Restore Ecosystems		✓		✓
Review DACs Every 5 Years	✓	✓	✓	✓
Support the Bay Delta Conservation Plan			✓	

5.2 Strategies for Implementing the IRWM Plan

The water management strategies selected for inclusion in the IRWM Plan are discussed in the following sections. These strategies are organized according to the goals discussed in Chapter 4:

1. Improve Water Supply Reliability
2. Balance Flood Management and Increase Stormwater Recharge
3. Improve Water Quality
4. Improve Habitat and Open Space

5.2.1 Strategies to Improve Water Supply Reliability

Implement Urban Water Use Efficiency

Urban Water Use Efficiency (WUE) involves reducing potable water used for municipal, commercial, industrial, irrigation and aesthetic purposes, and is an important element in almost every water purveyor's water resource planning efforts. Such efficiency methods include incentives, public education, and other efficiency-enhancing programs. Significant progress has been made to reduce urban water use in the IRWM Region. The Region plans to continue these programs and work on other strategies such as implementing water rate structures that reduce water waste.

This strategy aligns with the Region's objectives to reduce demand 20% by 2020 and monitor and adaptively manage climate change impacts.

Implement Agricultural Water Use Efficiency

Agricultural WUE includes improvements in technology and management of water, both on-farm and at the water supplier level through the use of incentives, public education, and other programs to achieve reductions in the amount of water used for agricultural irrigation. Future agricultural WUE measures will focus on development of new technologies, and further economic incentives.

Though implementation of this strategy will help the IRWM Region to achieve its goal of improving water supply reliability and adaptively managing climate change impacts, since agriculture is not a large industry in the IRWM Region, implementing agricultural WUE will provide limited benefit to the IRWM Region.

Increase Stormwater Capture

Water supply reliability in the Region can be increased by capturing local stormwater that historically flowed to the ocean. The Region is working on a variety of projects that would capture more of this local resource. This strategy will help increase storage and utilization of local supplies.

Continue Basin Management in the San Bernardino Basin Area

The SBBA is a major source of groundwater for the IRWM Region. The IRWM Region is currently working to maximize the conjunctive use of this important resource through its Cooperative Recharge Program (storing water in wet years) and Conjunctive Use Project (building extraction facilities for dry years). The BTAC also evaluates liquefaction potential on a monthly basis and has a dewatering plan should additional pumping be required to lower water levels and reduce liquefaction potential.

The SBBA is managed to balance recharge with high groundwater levels.

Manage High Groundwater Potential in the SBBA

The SBBA is uniquely constrained by shallow groundwater levels when the basin is too full. The shallow groundwater conditions have been artesian in the past and occur in an area of South San Bernardino called the Pressure Zone, or Area of Historic High Groundwater. High groundwater levels increase the risk of liquefaction, flood basements and can impact underground utilities. These conditions can also limit opportunities for recharge and/or groundwater banking in the basin.

The management strategy developed for the SBBA has been called the “tilted basin” concept. Management of groundwater levels under the tilted basin concept consists of recharging the basin along the foothills of the San Bernardino Mountains, farther upstream of the area of historic high groundwater (AHHG) Recharging along the foothills increases the “travel time” to the Pressure Zone thereby delaying any possible high groundwater conditions. Part of this strategy also includes installing new wells in the basin through Valley District’s Conjunctive Use Project to help prevent the recurrence of high groundwater and the BTAC dewatering plan which can be implemented if water levels are nearing the limit of 50 feet below ground surface.

Develop Basin Management in Yucaipa Subbasin

While the SBBA and Rialto-Colton subbasins are already managed, there is a desire to similarly manage the Yucaipa Subbasin to maintain supply reliability. This strategy will improve management of the Yucaipa Subbasin to both continue the ability of retailers to use groundwater to meet demand, and take advantage of storage capacity in the basin to improve regional water supply reliability.

Identify Projects that Increase Surface Water and Groundwater Storage Inside and Outside the Region

This strategy will improve water supply reliability by increasing storage, increasing utilization of local supplies, and preparing for disasters that could cause an interruption in imported water or failure of regional water conveyance.

Optimize Wet Year Storage and Dry Year Pumping (Conjunctive Management & Groundwater)

Conjunctive use, storing water in wet years for later use during dry years, can help improve the Region's long-term and seasonal water supply reliability. This strategy also helps to maximize the utilization of California's "feast or famine" hydrology which is characterized by wet years and dry years with relatively few years in between. Implementation of this strategy supports the Region's objectives of increasing utilization of local supplies and increasing storage. This strategy also increases water supply reliability by helping meet the objective to prepare for disasters by implementing storage projects and adaptively managing climate change impacts.

Increase Recycled Water Use

Water supply reliability in the Region can be improved by increasing the use of recycled water. Use of recycled water eliminates the need for an equivalent amount of potable water. Recycled water is also extremely reliable since wastewater flows continue independent of whether it is a wet period or a dry period.

Develop Desalination

Desalination is the removal of salts from saline waters, including ocean water and brackish groundwater. Because the IRWM Region is located inland, ocean water desalination is not considered a likely or cost-effective source for this area. However, desalination of recycled water may be necessary and desalination of some groundwater supplies may also be required to allow the Region to access additional supplies. This is particularly true for recovery of high salinity groundwater in the Yucaipa and Beaumont groundwater basins.

Implement System Reoperation

System reoperation allows for better management and movement of existing water supplies, and includes managing surface storage facilities to optimize the availability and quality of stored water supplies. System reoperation could involve balancing supply and delivery forecasts, coordinating and interconnecting reservoir storage, and optimizing depth and timing of withdrawals. This strategy will help the Region improve water supply reliability by helping to meet objectives such as increasing utilization of local supplies and increasing storage.

Improve Supply Conveyance – Delta

The IRWM Region relies on the SWP for imported water supplies. Improvements to the SWP system increase the reliability of this supply source. The Region recognizes the importance of the SWP and, therefore, desires to support the Bay-Delta Conservation Plan which would restore reliability to the SWP while also improving habitat.

Improve Supply Conveyance – Regional/Local

Local and regional water supply conveyance in the IRWM Region can include both natural watercourses and man-made facilities such as pipelines and flood control channels. Infrastructure associated with these conveyance facilities includes pumping plants and diversion structures. The local/regional conveyance strategy seeks to improve existing conveyance systems by upgrading aging distribution systems, as well as to increase system flexibility and reliability through the addition of interconnections among water resource systems. Establishing performance metrics for quantitative and qualitative indicators, and assuring adequate resources to maintain the condition and capacity of existing constructed and natural conveyance facilities are also aspects of this strategy. Opportunities exist in the Region to improve conveyance, such as those areas identified by Valley District in its Peak Day Demands analysis provided in Appendix I.

Conveyance infrastructure improvements and upgrades can improve the operational flexibility of delivery systems to better accommodate peak demands and emergency water needs, which will help the Region to meet its objective of preparing for disasters. Additional local and regional conveyance can also increase utilization of local supplies and ensure equivalent water supply services for DACs.

Identify Water Transfer Opportunities

Water transfers are temporary or long-term changes in the point of diversion, place of use, or purpose of use by contracting or moving water from one beneficial use to another. Through pipeline interties and other facilities, the IRWM Region has the ability to make a variety of water transfers. These transfers would typically be used in times of shortage caused by drought or emergency, such as an earthquake. The IRWM Region will be identifying additional interties that would increase the opportunity for future water transfers.

Provide Economic Incentives

Economic incentives, in the form of loans, grants, or water pricing support, are important for successful implementation of projects as a lack of adequate funds can prevent a project from moving forward. Incentives can result in lower operation costs or lower local costs of implementing a project.

The economic incentives strategy can be used to help the Region meet all objectives for the improve water supply reliability goal by incentivizing water conservation, and projects that increase storage, improve disaster preparedness, and monitoring climate change impacts.

Protect Recharge Areas

Recharge areas protection focuses on safeguarding of lands that are important locations for groundwater recharge. Natural recharge areas include stream beds and open spaces that allow water to permeate into the ground, while artificial recharge areas can include ponds or basins that collect water and allow it to permeate. These recharge areas can be protected through land use planning, land conservation and habitat protection programs. If recharge areas cease functioning properly, there may not be sufficient groundwater for storage or use.

Protecting natural areas such as stream beds will improve stormwater recharge.

In the IRWM Region, the United States Geological Survey (USGS) determined that most of the natural recharge occurs in the unlined streams and creeks within the San Bernardino Valley. Recharge also occurs in the flood control detention basins along the foothills. Protection of recharge areas include two primary goals: 1) ensuring that the streams, creeks, and flood control detention basins are not lined with concrete; and 2) preventing pollutants from entering groundwater to avoid expensive treatment that may be needed prior to potable, agricultural, or industrial beneficial uses.

Due to the IRWM Region's high utilization of local groundwater basins, recharge areas protection is a key strategy to ensure the sustainability and reliability of the groundwater supply. Protecting recharge areas will help the Region increase utilization of the local water source.

Review DACs Every 5 Years

Equivalent services are provided for DACs in the IRWM Region. To ensure this continues, the Region plans on reviewing the projects and services in DACs every five years when the IRWM Plan is updated.

5.2.2 Strategies to Balance Flood Management and Increase Stormwater Recharge

Continue Forest Management and Hazardous Fuels Reduction in Forest

SBCFCD has a program to proactively thin trees in the forest that would have historically been thinned by wildfire. This practice reduces flood risk by reducing, or eliminating, debris that runs down streams and fills debris/detention basins following wildfire. Because proactively thinning the forest is a fraction of the cost of cleaning debris, the Region should continue to proactively thin the forest to decrease the potential risk of debris basins be inundated after wildfire. Implementation of this strategy will reduce flood risk and improve the functionality of flood control basins so that more stormwater can recharge the groundwater basins.

Operate Existing Facilities to Increase Recharge

Modifications and/or adjustments to SBCFCD facilities may be needed to effectively integrate water recharge concepts. While the primary function of SBCFCD is 'flood control', water conservation is part of the SBCFCD mission. Cooperation between the SBCFCD and water agencies will allow for further adaptation of flood control facilities with the facilities of other local agencies for the preservation of local waters. All basins and SBCFCD storm water conveyance systems in zones 2 and 3 have potential for utilization in groundwater recharge scenarios given the proper study, design concept, and configuration. In addition, avenues for future SBCFCD/local agency agreements can be sought after and planned so as to truly integrate mutual efforts for water conservation.

Identify Projects that Increase Recharge

Flood control projects, such as new detention basins, can be used to increase recharge of local stormwater runoff in addition to reducing flood risk in the IRWM Region. These projects will have the additional benefit of increasing groundwater storage to improve water supply reliability. Secondarily, these projects will improve water quality in surface waters by reducing stormwater runoff volumes.

Implement Agricultural Lands Stewardship

Agricultural lands stewardship protects and promotes agricultural production through integrating positive water resource management strategies into agricultural activities. This includes preserving agricultural land, maintaining and creating wildlife habitat within agricultural land, reducing land erosion and runoff pollution, removing invasive species, and creating riparian buffers.

Since agriculture is not a large industry in the IRWM Region, practicing agricultural lands stewardship will provide limited benefit to the IRWM Region.

Provide Economic Incentives

As mentioned above, economic incentives can be used to help achieve all the Region's objectives. The Region can continue to seek grants to fund stormwater recharge projects that will improve flood management.

Restore Ecosystem

Ecosystem restoration affects the return of selected ecosystems to a condition similar to its state before any disturbance occurred. Some ecosystems within the IRWM Region remain undisturbed; however, much of the low-lying areas are urbanized and therefore highly disturbed. Additionally, fire suppression in the San Bernardino forest has resulted in tree overgrowth that contributes to basins being clogged with debris as mentioned above. Ecosystem restoration, where possible, will indirectly improve stormwater recharge and the preservation of flood plains.

Coordinate Land Use Planning and Management with Water Resources Management

Land use planning and management uses land controls to manage, minimize, or control activities that may negatively affect the quality and availability of groundwater and surface waters, natural resources, or endangered or threatened species. More efficient and effective land use patterns promote integrated regional water management. Integrating land use and water management consists of planning for housing and economic development needs of a growing population while providing for the efficient use of water, water quality, energy, and other resources.

Through the land use planning and management strategy, the IRWM Region intends to work more closely with land use planning agencies to ensure that they considering and implementing low impact development policies and other BMPs that improve stormwater infiltration and reduce runoff flows.

Protect Recharge Areas

The recharge areas protection strategy, described above, will help the Region improve reduce flood risk and improve stormwater recharge, as well as improve supply, by protecting natural areas such as stream beds to improve stormwater recharge.

Review DACs Every 5 Years

The IRWM Region offers equivalent services for DACs. To ensure equivalent services continue to be provided, the Region plans on reviewing the projects and services conducted in DACs every five years when the Plan is updated.

5.2.3 Strategies to Improve Water Quality

Monitor Consumer Confidence Reports

Retail water agencies in the Region must comply with water quality regulations, including routine sampling of water supplies to ensure compliance. Overall water quality is reported to customers in annual consumer confidence reports. The IRWM Region plans to use these reports as a strategy to ensure drinking water quality standards are met.

Remediate Groundwater Contamination Plumes

Groundwater management is currently influenced by the presence of contamination plumes. Avoiding any impacts to and from the plumes, and removing the contaminants when possible is a Basin Management Objective for the Region and is also consistent with the Groundwater Management Act, Sections 10750-10756 of the California Water Code (AB3030).

Support Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is intended to improve habitat in the Delta while improving supply reliability for the SWP. The BDCP will also result in improved water quality for the SWP, primarily in dry years. In dry years, there is less fresh water to keep salt water from flowing into the Delta. The freshwater increases in salts as it passes through the Delta. The BDCP will move the SWP intakes to the north and bypass the Delta, limiting the increase in salinity during dry years and thereby improving the quality of water delivered through the SWP to the IRWM Region and the rest of Southern California.

Participate in SAWPA Basin Management Task Force

The SAWPA Basin Management Task Force compiles and collects monitoring data to evaluate water quality in the SAR and the groundwater basins. Participation in the Task Force contributes to understanding and reacting to surface and groundwater quality issues in the Region. This strategy will help the Region meet the objective to improve surface and groundwater quality, and manage TDS and nitrate in the Region.

Continue Forest Management and Hazardous Fuels Reduction

This strategy has multiple benefits including the improvement of water quality. As mentioned above, SBCFCD has a tree removal program that proactively cuts trees that would have historically been thinned by wildfire. This program improves water quality by reducing the flow of debris into detention basins following wildfire. The IRWM Region will continue this proactive strategy.

Increase Stormwater Capture

Local stormwater is of very high quality. Therefore, capturing and recharging more local stormwater not only improves water supply reliability but also improves water quality. Capturing stormwater for groundwater recharge can apply to the Region's objective to manage TDS and nitrogen by diluting these constituents with water that is of higher quality than imported water.

Improve Drinking Water Treatment and Distribution

Perchlorate treatment facilities, similar to the West Valley Water District plant above, treat groundwater for use in the Region.

Public water systems must develop and maintain adequate water treatment and distribution facilities to meet the goal of providing a reliable supply of safe drinking water. The drinking water treatment and distribution strategy includes improving the quality of potable water supplied to customers and improving conveyance systems to improve the quality of supplies delivered from treatment facilities. Implementing this strategy will support the IRWM Region's objectives to ensure no violations of drinking water standards by improving water quality and the ability to access and increase groundwater supply that may not have been previously available due to quality concerns. Improving supply quality and distribution will also help achieve the Region's objective to continue to provide high quality drinking water to DACs and throughout the retail water agency service areas.

Implement Pollution Prevention Measures

Pollution prevention controls or reduces pollutants from point and nonpoint sources that can affect multiple environmental resources, including water supply, water quality, and riparian and aquatic habitat. Strategies that prevent pollution can include public education, efforts to identify and control pollutant contributing activities, and regulation of pollution-causing activities. Pollution prevention includes implementation of water quality BMPs that reduce contaminant concentrations to reduce loading to 303(d) listed receiving waters and/or supply sources. BMPs can include either structural BMPs, where the BMP involves designing and building structural treatment and control facilities, or non-structural BMPs, where the BMP does not require construction of a physical component to filter stormwater.

Projects that remove contaminants using the soil as a filter have the secondary benefit of mitigating flood risk and increasing stormwater recharge, thereby increasing water supply reliability. Pollution prevention can improve water quality for all beneficial uses by protecting water at its source and therefore reducing the need and cost for other water management and treatment options. By preventing pollution throughout the watershed, water supplies can be used and reused for a broader number and types of downstream water uses. Protecting source water is consistent with a watershed management approach to water resources problems.

Manage Urban Runoff

The IRWM Region plans to work with land use authorities to improve urban runoff management which includes strategies for managing or controlling urban runoff, such as intercepting, diverting, controlling, or capturing stormwater runoff or dry weather runoff. Urban runoff management strategies, coupled with centralized groundwater recharge or decentralized low impact development (LID) projects, can also help to improve the ability for those flows to once again reach the groundwater aquifers. Several BMPs can be used to manage urban runoff and prevent surface water quality contamination such as public education, bioswales, permeable pavers, vegetated buffers, rainwater harvesting, construction erosion control, and others. Reducing dry weather flows that are often caused by over-irrigation may also be improved through water conservation programs that aim to improve water use efficiency and efficient irrigation practices.

The urban runoff management strategy supports the Region's objective of to improve surface and groundwater quality and has the secondary benefits of reducing flood risk.

Match Water Quality to Use

Matching water quality to use recognizes that not all water uses require the same quality of water. Agricultural, municipal, landscape and residential water uses have different water quality needs. Achieving water quality standards can also be impacted by natural background conditions, natural flow conditions, irreversible human impacts, hydrologic modifications, natural features of the water body and economic hardships.

Matching water quality to water use by recognizing the different needs, natural background conditions, hydrologic limitations, and economics ensures that limited public resources can be focused on the most significant problems. Benefits of this strategy can include providing cost saving opportunities by reducing treated water costs if users can be supplied with raw water or recycled water, while reserving high quality water for drinking water purposes. This strategy can help the IRWM Region to achieve its goal to improve water quality.

Provide Economic Incentives

As explained previously, economic incentives can be applied to most of the Region's objectives to promote project development and behavior change. Economic incentives such as grants and rebates can help fund projects that treat groundwater and surface water or prevent pollution, such as BMPs.

Coordinate Land Use Planning and Management with Water Resources Management

The IRWM Region plans to work with land use authorities to encourage implementation of the land use planning and management strategy, as mentioned previously, which addresses water resource issues through effective land planning measures. Implementing LID and BMPs reduces urban runoff and dry weather flows which can improve surface water and stormwater quality.

Protect Recharge Areas

The recharge areas protection strategy can help the IRWM Region meet its goal to improve water quality. Through protecting recharge areas, the Region can infiltrate more stormwater which, due to its high water quality, can improve groundwater quality through diluting TDS and nitrate levels.

Develop Watershed Management Projects and Programs

Watershed management utilizes planning, programs, and projects to restore and enhance watershed functions. Watershed planning encompasses a broader perspective on water resources management, including improving and protecting water quality, ecosystems, and open space. Using the watershed as a basic management unit promotes multi-benefit, integrated projects and collaboration among policies and actions, often requiring the involvement of stakeholders. Given this, projects that use watershed management can help the IRWM Region to meet several of its objectives including improving surface and groundwater quality and managing TDS and nitrogen.

5.2.4 Strategies to Improve Habitat and Open Space

Incorporate Environmental Opportunities and Constraints into the Design Process for Facilities

There may be opportunities to improve environmental resources when designing stormwater capture and recharge facilities. When possible, facilities may be designed to reduce environmental impacts and promote natural habitat.

Identify Corridors for Species

In anticipation of further growth in the IRWM Region, there is a need for a balance between growth of urban areas and the environment to maintain viable habitat for native plant and wildlife species, and to maintain a high quality of life for watershed residents and visitors. An effective means of establishing this balance is the development of open space corridors that allow for multiple species habitat, wetlands, storm flow capture and aquifer recharge, water quality improvements, and passive and active recreational facilities and open spaces. This strategy will be implemented through two habitat conservation plans by identifying corridors used by sensitive wildlife species to move from place to place.

When completed, the Santa Ana River Trail System will extend from Huntington Beach to the crest of the San Bernardino Mountains.

Incorporate Opportunities to Improve Habitat and Increase Recreation and Public Access During the Facilities Design Process

The Region's expanding population means that new facilities will continue to be needed to manage water supplies. The Region has an opportunity to incorporate habitat improvement, and recreation and public access during the design process of these new facilities. This strategy will maintain and create new opportunities for the public to enjoy the area's waterways and other recreational amenities; enhance the watershed's natural features; and ensure access to the Region's wetlands, lakes, and streams.

Provide Economic Incentives

As mentioned in previous sections, economic incentives are useful tools to promote projects. Restoration projects that improve habitat and public access often require additional funding sources to make them economically feasible.

Restoration Ecosystems

The ecosystem restoration strategy discussed previously applies directly to helping the IRWM Region meet its goal to restore and improve habitat and open space. The IRWM Region is currently developing the Upper SAR Habitat Conservation Plan, which will result in habitat for aquatic species.

Ecosystem restoration will help to improve habitat for aquatic species, such as the Santa Ana sucker.

Continue Forest Management and Hazardous Fuels Reduction

Similar to agriculture management strategies, forest management directs the implementation of forest management projects and programs to help support water resources. Such a strategy may include long-term monitoring, multi-party coordination, communication between downstream and upstream communities and water users, and revisions to water quality plans that address concerns with impaired water bodies.

This strategy can help the IRWM Region achieve its objectives to improve habitat and increase multi-benefit recreational and public access opportunities.

Coordinate Land Use Planning and Management with Water Resources Management

As described previously, the IRWM Region will work with land use authorities to implement the land use planning and management strategy that plans for more efficient and effective land use patterns that also promote integrated regional water management. This strategy will help the Region meet its objective to identify more multi-use opportunities that increase recreation and public access. Examples include building recharge basins that can also be used as habitat or adding trial systems around recharge areas.

Protect Recharge Areas

The recharge areas protection strategy can be used to meet the IRWM Region's objectives of restoring and improving habitat and open space when recharge areas, such as streams and channels, are restored to natural habitat to improve recharge. Recharge areas can also be used as recreational areas such as public parks and trail systems to meet the Region's objective to increase multi-use opportunities for recreation and public access.

Maintain and Improve Water-Dependent Recreation

The strategy to maintain and improve water-dependent recreation seeks to enhance and protect water-dependent recreational opportunities and public access to recreational lands through water resources management. Water-dependent recreation within the Region includes opportunities to access or be alongside lakes and river corridors. This strategy is especially applicable to Big Bear Lake where people fish, swim, boat, and participate in other activities such as water skiing in a reservoir.

Develop Watershed Management Projects and Programs

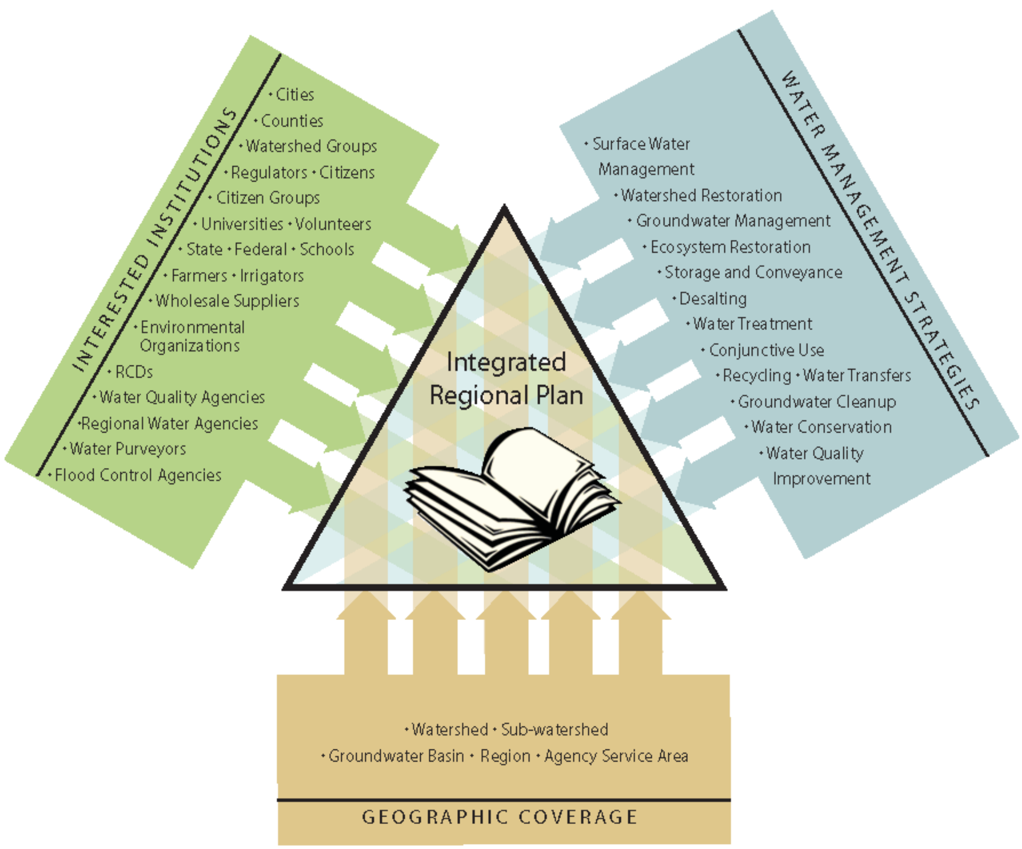
As explained above, the watershed management strategy promotes multi-benefit, integrated projects and can be applied to most of the IRWM Region's objectives. Watershed management involves restoring and improving watershed functions which applies to the Region's objectives to restore habitat.

5.3 Integration of Water Management Strategies

Integrated planning encourages broad investigation of the interrelated strategies and implementation of projects that provide multiple benefits and serve a wide range of strategies. Integrated regional water management planning brings various water interests, stakeholders, and institutions together to plan for future management and use of resources in a large geographic area (Figure 5-1). The BTAC recognized from the beginning of the IRWM planning process that management of groundwater resources, surface supplies, stormwater, and imported water are inseparable and intrinsically interrelated. It is also recognized that water quality plays a critical role in management of groundwater basins and groundwater conjunctive use implementation.

As described throughout this Chapter, a number of strategies can provide multiple benefits to the Region. In addition, interrelated water management strategies can be incorporated into planning and project implementation so that they work together in an integrated fashion. Some examples of such integrated planning are discussed below.

Figure 5-1: Integrated Planning

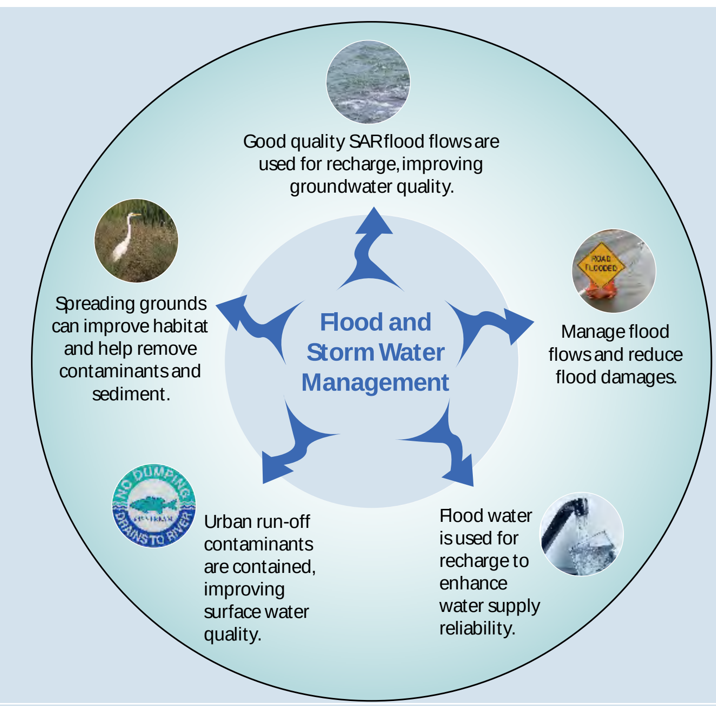


5.3.1 Integration of Local Surface Water and Groundwater Resources Strategies

As discussed previously, groundwater provides a majority of the water supply to the IRWM Region and groundwater basins are used for water storage to regulate the highly variable local surface water supplies. In order to continue to regulate the highly variable surface water in the Region, surface water and groundwater resources must be integrated and optimized. When surface water is available it should be used for recharge as well as direct use. In addition, the Region should work to limit the amount of high flows that go to the ocean in any given year. These goals can be achieved through integration of surface water and groundwater strategies.

5.3.2 Integration of Stormwater Management, Flood Management, Water Supply Reliability, and Surface and Groundwater Quality

Although stormwater can cause flooding, with proper management it could provide a source of water supply to the Region. Improvement in the management of stormwater can help the region achieve multiple objectives while integrating multiple strategies. Generally speaking, stormwater is captured and conveyed to detention basins to reduce peak flood flows and reduce flood damage. However, these detention basins can also be designed to settle the suspended sediment and pollutants out of the water, increase groundwater recharge, and possibly provide wildlife habitat. Use of stormwater for groundwater recharge and use of flood control detention basins for groundwater recharge during the non-flood seasons are strategies that have been used within the region and should be further enhanced to improve water supply reliability and groundwater quality in the Region.



Integration of Water Management and Flood Management Strategies in the Upper Santa Ana River Watershed

5.3.3 Integration of Water Supply and Reliability and Water Quality Strategies

Contamination plumes present a challenge and constraint for management and use of groundwater resources in the IRWM Region. An integrated approach has been taken to clean the plumes, which will eventually remove them as a constraint and improve water supply reliability for water users. Wherever possible, cleanup projects should seek to speed the cleanup of a contamination plume by pumping and treating water from key locations in the plume. This type of strategy can expedite the clean-up process.

5.3.4 Integration of Imported Water and Local Water Supplies and Strategies

The IRWM Region has a significant public investment in and is dependent upon imported water to meet its water needs into the future. However, the SWP can be unreliable. To improve the reliability of SWP water supply, the Region should take delivery of its entire Table A amount each year and store any “leftover” amount that is not used directly by the local water agencies. The water could be stored within local groundwater basins or in a “water bank.” By storing as much SWP water as possible during “wet” years, the Region will have that water available during drought periods.

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6 Projects

This chapter describes the projects that have been identified to help to meet the Region's objectives, and presents the process that will be used by the USARW IRWM Region to evaluate new projects once the plan has been adopted.

Many projects have been proposed by project sponsors in the IRWM Region to implement the water management strategies identified in this IRWM Plan. A "snapshot" of the project list at the time of this plan update is presented in Appendix J. Valley District will be developing a webpage on the Valley District website that will store an up-to-date project list for public viewing. The development of this webpage is discussed further in Chapter 7.

The focus of the Region's IRWM projects is driven by the IRWM Plan Goals and Objectives formulated during the planning process. These goals, discussed in detail in Chapter 4, include: 1) improving water supply reliability, 2) balancing flood management with increased stormwater recharge, 3) improving water quality, and 4) improving habitat and open space.

6.1 Project Submittal

The project submittal process is an ongoing process that allows for updating projects and including new projects. New projects will be reviewed and prioritized based upon the criteria developed by the IRWM Region (see page 6-3).

Some of the projects were taken from previous planning efforts, such as projects that will allow the Region to capture and use SAR floodwater. Projects included in previous SAWPA planning studies and UWMPs were also evaluated to identify specific projects that could achieve the objectives of the Region.

In a series of meetings starting in March 2006 and continuing through the present, members of the BTAC members reviewed the list of projects and provided additional input. The BTAC Project Implementation Group (PIG) is currently responsible for project evaluation and prioritization. Water agencies within the area that are not part of the BTAC are also encouraged to participate in development of the project list. Most of these projects are integrated and serve multiple strategies. Together, these projects help develop a regional system that would integrate the use of groundwater, SWP water, flood and stormwater, and local surface water to meet the Region's goals and objectives.

6.2 Project Prioritization and Screening Process

The primary purpose of project prioritization and ranking is to provide a process for water leaders in the IRWM Region to review the proposed projects and collectively decide the Region's priorities for the construction of facilities. To facilitate this task, a two-step prioritization and ranking process was developed. The first step reviews the projects to ensure that the project has a sponsor and meets the planning objectives and strategies as shown in Figure 6-1. The projects that do not pass the first step will not be eligible for inclusion in the IRWM Plan. The second step is to prioritize the projects that pass the first step. This is accomplished by first scoring the projects using the criteria outlined in Table 6-1 and then prioritizing them as either Tier 1 or Tier 2 through the project ranking process shown in Figure 6-2. It is important to note that project ranking and prioritization is a "snapshot in time" and that projects will move from tier to tier as they are further developed and meet the criteria requirements.

Figure 6-1: Upper SAR IRWM Plan Project Review Process

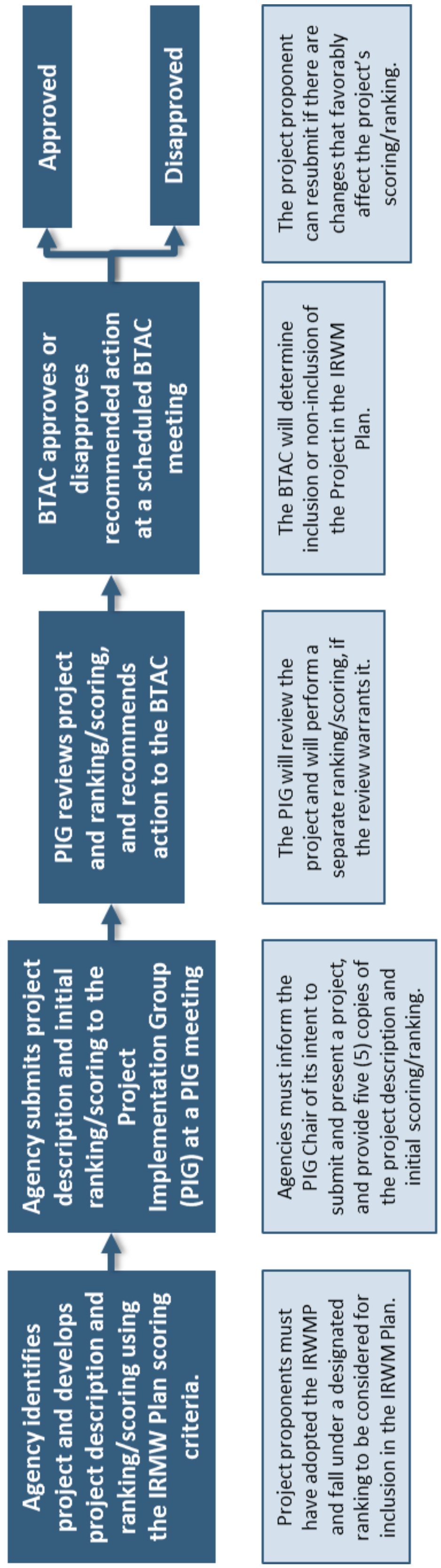
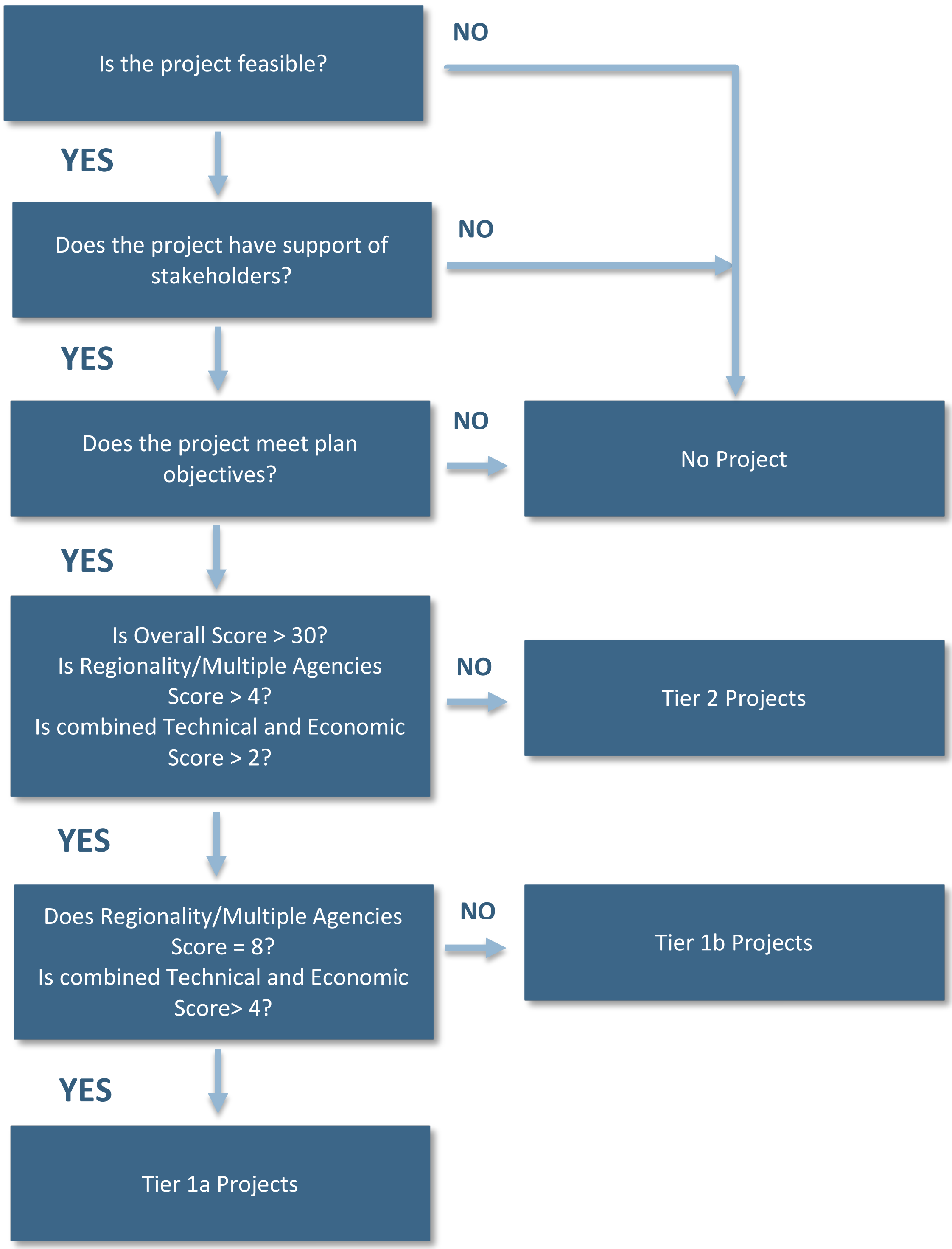


Table 6-1: Project Scoring Criteria

	Criteria	Scoring
Project Effectiveness	1 – Meet IRWM Plan Objectives	+1 for one objective +2 for each additional objective
	2 – Supports Integration and Multiple Water Resource Management Strategies	+1 for single strategy +5 if integrated +8 if integrated and supports multiple strategies
	3 – Technical Feasibility of the Project	+1 if knowledge of location and of the water system is demonstrated, or +2 if knowledge of location, of the water system, and with the material, methods, or processes proposed to be employed in the project is demonstrated.
	4 – Regionality/Multiple Agencies	+0 project that only serves single agency +5 project that combines the projects of up to three agencies +8 project that combines projects from more than three agencies
Project Commitment	5 – Project Status	+1 limited information +3 completed feasibility or pre-design documents +5 environmental and feasibility and detailed scope of work and budget completed
	6 – Project Costs and Financing	+0 no funds +2 10% funding +3 50% funding +5 90% or more funding
Other Critical Project Considerations	7 – Economic Feasibility	+1 limited information +3 completed feasibility and cost benefit analysis +5 strong tie to water quality and water supply benefits and other benefits and costs
	8 – Has Project Proponent Adopted Latest Updated IRWM Plan	+0 No +3 Yes
	9 – Consideration of Environmental Justice Concerns (Tribes/DACs)	+2 demonstrates specific benefits to critical DAC water issues, or +2 demonstrates specific benefits to critical Native American tribal communities, or +2 demonstrates consideration of Environmental Justice concerns. A total of +6 if project is able to address all three.
	10 – Adapting to the Effects of Climate Change	+0 increases energy usage +3 no increase in energy usage +5 reduces energy usage
	11 – Reducing Greenhouse Gas (GHG) Emissions	+0 no reduction in GHG emissions +3 consideration of options for carbon sequestration +5 demonstration of significant reduction in GHG emissions through a GHG emissions analysis
	12 – Reduce dependence on Delta	+0 no reduction in Delta water +3 demonstration of some reduction in Delta dependence +5 demonstration of significant reduction in Delta dependence

Figure 6-2: Planning Process for Project Screening and Ranking



Projects are evaluated on several criteria, as shown in Table 6-1. These include:

- Whether the project is regional;
- If the proponent has adopted the USARW IRWM Plan;
- The technical and economic feasibility of the project;
- If the project addresses the needs of DACs or tribes within the Region;
- If the project considers environmental justice concerns; and
- How the project helps adapt to climate change impacts and reduce GHG emissions.

After being scored, projects were ranked as Tier 1a, Tier 1b, or Tier 2. These categories are explained below.

Tier 1 Projects

Tier 1a and 1b projects score greater than 30 points according to the scoring criteria shown in Table 6-1, and meet the following criteria:

- Projects have completed or will complete environmental documentation, feasibility studies and cost estimates by July 1, 2015, and will be ready for implementation by July 1, 2016 (design will be completed).
- Projects have the support of stakeholders
- Projects meet IRWM Plan objectives
- Projects include up to three agencies as stakeholders
- Projects demonstrate knowledge of location of the water system, and with the material, methods or processes proposed to be employed in the project
- Projects demonstrate economic feasibility
- Projects serve the Region and reduce regional water supply system vulnerability
- Projects meet specific benefits to critical water issues related to DAC, Native American tribal communities or environment justice concerns
- Projects that reduce energy usage, reduce GHG emissions and adapt to the effects of climate change

Projects are further divided into Tier 1a and Tier 1b, where Tier 1a projects are regional (serve more than three communities), demonstrate greater technical feasibility, and greater economic feasibility.

Tier 2 Projects

Tier 2 projects include those projects that may not be regional, not have provided information regarding economic feasibility, and/or do not demonstrate technical knowledge. Once a Tier 2 project meets all of the necessary criteria, it can become a Tier 1a or Tier 1b project.

To prioritize and rank the projects, a set of scoring criteria were developed and reviewed by the BTAC. The criteria were then applied to all projects to prioritize implementation. A detailed list of projects available at the time this IRWM Plan was finalized and prioritization results, is shown in Appendix J.

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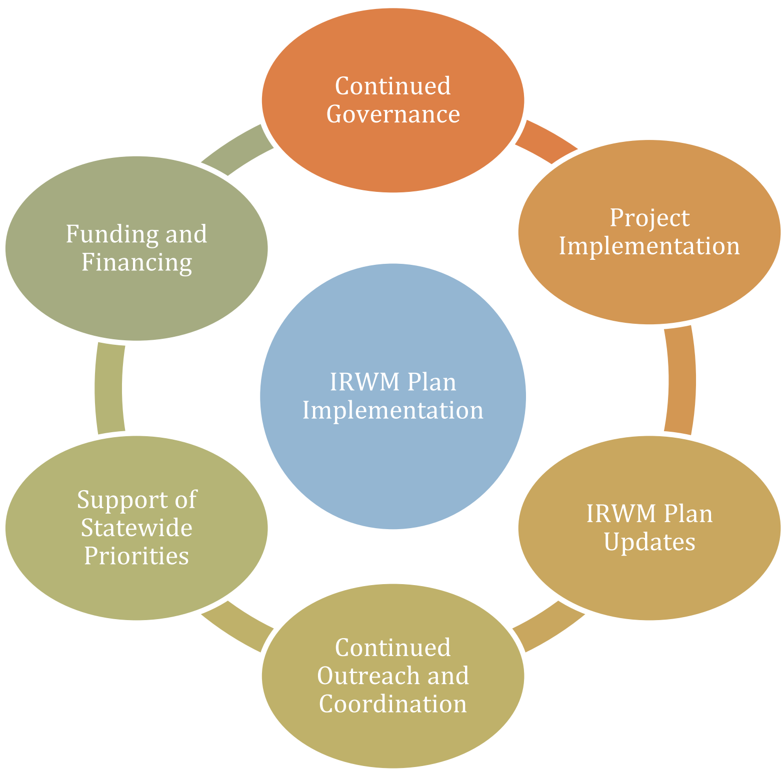
7 Implementation

This chapter provides the roadmap for accomplishing the Region's objectives and implementing projects included in the IRWM Plan. As described in Chapter 1, the BTAC has already made significant progress implementing the IRWM Plan. To date, the agencies located within the IRWM Region have been successfully implementing their strategies along with projects and are continuously monitoring progress toward their goals and objectives. The Region plans to continue within its current governance structure and in some cases improve upon IRWM Plan implementation as described in the sections below.

Figure 7-1: IRWM Plan Implementation Components



7.1 Continued Governance

The responsibility for implementation of the IRWM Plan will continue to be guided by the BTAC agencies, all of whom participated in the planning process and prepared this update of the IRWM Plan. The implementation responsibility will continue to be shared among the BTAC agencies based upon the jurisdiction of each responsible entity. The Region will continue its current governance structure, which has proven itself to be effective in both implementation of the 2007 IRWM Plan, as well as with other regional water resources planning efforts such as management of the SBBA and the SAR watershed.

7.2 Project Implementation

Project implementation is the responsibility of each project sponsor. For projects funded through IRWM-related grant programs, the BTAC will work with regional agencies to coordinate, apply, receive, and distribute the grant funding for project implementation. Projects formulated for the

IRWM Plan must periodically be updated and reprioritized, and new projects may be introduced for screening and prioritization. Activities necessary to update and prioritize projects will continue to be the responsibility of the BTAC PIG. Project implementation responsibilities include coordination with the appropriate local, State, and federal agencies to prepare and complete necessary environmental documents and to pursue opportunities to fund the projects that are under their jurisdiction, consistent with the IRWM Plan.

7.3 Periodic Review and Update of the IRWM Plan

In order to keep the IRWM Plan current, it should be refined as necessary, but no less than every five years. These refinements will be the result of knowledge gained through implementation of the IRWM Plan. The BTAC will assume responsibility for making updates to the IRWM Plan. Reviews and updates will focus on analyzing new information developed since the adoption of the previous IRWM Plan and the need for specific water management actions. The reviews would identify areas where the IRWM Plan has been successfully implemented, as well as areas where deficiencies are apparent.

The BTAC will continue to coordinate the regional planning activities of the IRWM Plan as needed, and coordinate with other IRWM planning efforts surrounding the Region, and with State and federal agencies.

Implementation of monitoring programs and data management and coordination is the responsibility of the entities managing the basins. This includes the BTAC for the SBBA, Rialto-Colton Subbasin, Yucaipa Subbasin, San Timoteo Subbasin, and North Riverside Basin, and Big Bear MWD for the Big Bear Lake Basin. Monitoring and data management for the USARW IRWM Plan is discussed in more detail in Chapter 8.

7.4 Continued Outreach and Coordination

Continued outreach and coordination with regional stakeholders and other planning efforts will be key to implementing this IRWM Plan. In keeping with the Region's efforts to involve stakeholders in its IRWM planning efforts, the Region will develop an IRWM Plan webpage to make available the IRWM Plan, an up-to-date project list, and information on BTAC meetings such as meeting announcements, agendas, and materials. Additional information may be posted as appropriate, such as IRWM Plan performance data and information on how to become involved with the BTAC. Valley District will be responsible for creating and maintaining the website, though the BTAC will contribute to providing information.

As the IRWM Plan contains vetted information on the Region's environment, potential climate change impacts, water supply and demand, and water management goals and performance measures, the IRWM Plan can be used to inform other water resources planning documents such as groundwater management, flood protection, watershed management, and water quality plans. In particular, the Region's IRWM Plan continues to be used as a reference for the San Bernardino Valley Regional UWMP. The regular collection of plan performance and monitoring data allows for the information in the IRWM Plan to be easily updated at least every five years.

The IRWM Plan can also coordinate with land use planning efforts and incorporate land use planning issues and strategies into water management decisions. Though agencies in the BTAC already take part in the San Bernardino Countywide Vision Project water element, there may be additional opportunities for involvement of land use planners with water resources planning, such as those opportunities shown in Figure 7-1. To further assess these opportunities, the Region will identify land use authorities, and meet with them to coordinate and discuss coordination opportunities. Once opportunities have been identified, the BTAC may further work with the land use authorities to incorporate issues and strategies from land use planning into water management plans, conduct regular meetings between water managers and land use planners, ensure land use planners are invited to BTAC meetings, or even include land use planners in the BTAC.

Figure 7-2: Opportunities for Coordination Between Land Use Planning and Water Management

Opportunities for Land Use Planners to Provide Input to Water Managers	Opportunities for Water Managers to Provide Input to Land Use Planners
• Floodplain management • Flood control planning • Groundwater recharge and conjunctive water use • Treatment and conveyance facilities • Water conservation • Watershed management and restoration	• Municipal landscaping programs • Public access and recreational area management • Changes in land use • General Plan updates • Planning and development review • Water supply for public safety and emergency planning purposes • Habitat management

7.5 Support Statewide Priorities

Improving water supply reliability and reducing reliance on the SWP during droughts is considered an issue of statewide significance. Environmental and fishery issues of the Delta, including endangered species, vulnerability of Delta levees, and Delta water quality issues, significantly reduce reliability of the SWP supplies. Recently, State water leaders and the Governor's Office have renewed discussions of building a Peripheral Canal around the Delta as an alternative to the current operations in the Delta. The Peripheral Canal has the potential to improve fishery issues, reduce the impact of water diversions on listed species, and improve drinking water quality (less TDS, trihalomethane, and bromide) for millions of Californians. These improvements to the Delta would result in increased reliability for the SWP supplies. The resolution of Delta conveyance issues, therefore, will benefit the Region and its water supply, and will significantly contribute to water supply reliability and water quality improvement in the USARW IRWM Region.

It should also be noted that a major consideration and a regional priority for formulation of this IRWM Plan is to improve water supply reliability and optimize the use of imported water to reduce reliance on imported water during droughts. Implementation of water management strategies of this IRWM Plan, therefore, will reduce stresses on SWP supplies, especially during drought periods, and will provide statewide water supply benefits.

7.6 IRWM Plan Funding and Financing

The Region plans for and secures funding and financing to implement the IRWM Plan, including ongoing IRWM Program management activities and project development and implementation. These components have specific activities, which are shown in Figure 7-2.

Figure 7-3: IRWM Funding and Financing Activities

IRWM Program Management

- BTAC Meetings
- Plan Performance Monitoring
- Intra-regional/DWR Outreach
- Data Management
- Plan Updates

Project Development and Funding

- Project Review and Prioritization
- Grant Applications
- Grant Management
- Project Implementation
- PIG Meetings

7.6.1 Funding and Financing Options

While regular BTAC meetings and other IRWM program operations generally rely on in-kind staff time and occasional assessments, project implementation may require a wider variety of funding options. Depending on the characteristics and scope of a particular project, some activities and projects currently identified in the IRWM Plan and future activities will likely be contingent on securing funding from federal, State, and/or local sources. Therefore, it is important for the BTAC, in coordination with project sponsors, to develop a financing plan that identifies funding sources and further refines priorities for project implementation. In addition, the agencies should actively engage in obtaining grant funding to assist in project implementation.

Potential funding sources include: water rates; assessments, fees, and taxes; loans and grants; and bonds. Methods for collecting this funding include in-kind time provided by BTAC agencies and project sponsors, as-needed assessments, and applying for loans and grants.

The following summarizes project funding approaches to date, as well as anticipated funding strategies.

Federal Funding

The federal grant funding sources are currently limited. The U.S. Bureau of Reclamation's (Reclamation) Challenge Grant Program provides funding for water management programs and projects in the western United States. This grant program might help fund the implementation of water conservation projects. Reclamation also provides funding for water recycling programs in Southern California. The U.S. Environmental Protection Agency (EPA) provides funding for environmental improvement projects. In addition, funding can be directed for implementation of projects under the IRWM Plan, through the Federal Energy and Water Development Appropriations legislation.

State Grant Funding

State funding may be a significant source of funding for implementation of the IRWM Plan. Current key State funding sources include the following:

- DWR's Proposition 84 IRWM Program, which provides funding for implementing multi-benefit projects that are included in IRWM Plans of DWR-accepted IRWM Regions (including the SAWPA Region, which the USARW Region is a part of)
- DWR's Local Groundwater Assistance Program, which provides funding to conduct groundwater studies or carry out groundwater monitoring and management activities
- DWR's Desalination Grant Program, which provides funding to conduct research, feasibility studies, pilot projects or construction of desalination projects (both ocean and groundwater)
- DWR's Water-Energy Grant Program, which provides funds to implement water use efficiency programs or projects that reduce GHG emissions, and reduce water and energy use
- SWRCB Recycled Water Facilities Grant, which provides funding for the planning, design, and construction of water recycling projects

Local Agency Funding

For years, local entities have been implementing cost-effective projects and programs at the local level. In the past, local funding has been used in part or in total to fund local water projects. Today, however, a major constraint in implementing many of the projects in this IRWM Plan is the lack of financial capacity and funding availability at the local level. Some of the communities in the IRWM Region are economically disadvantaged and they may not be able to finance costly projects. Bond laws generally require local agencies to share the cost of implementing their project unless the project benefits an economically disadvantaged community, in which case, the community could be qualified for exemption from local cost-sharing requirements.

7.6.2 Financing Plan

As mentioned previously, the agencies in the Region have successfully collaborated in management of their water resources for a number of years, allowing them to come together in 2005 to form the USARW IRWM Region and develop the first IRWM Plan. These efforts have been supported primarily through in-kind time from BTAC agencies and without being dependent upon outside funding to support the IRWM program. The Region intends to continue operating its IRWM program through local support from in-kind staff time. Table 7-1 shows the Region's funding and financing plan to achieve the IRWM Program management, project review and prioritization, project grants, project implementation, and planning needs.

Table 7-1: Financing Plan

Activity	Approximate Cost or Time Commitment	Funding Source and Percent of Cost	Funding Source Certainty/Longevity
IRWM Program Management			
Regional Program Management • BTAC Meetings • Plan Performance • Intra-regional collaboration • Data Management • Plan Updates • BTAC Water Conservation Subcommittee • Engineering Subcommittee	• 700 hrs/yr[1]	In-Kind: 100% BTAC Agencies Funds: BTAC Agencies	• On-going agency staff allocations • BTAC agency operating budget
Project Development and Implementation			
Project Review and Prioritization • PIG Meetings	Approximately annually	In-Kind: 100% PIG Agencies	On-going agency staff allocations
Project Grants • Grant Application • Grant Management	Dependent upon specific grant program	In-Kind: 100% Project Sponsors Funds: Member Agencies	• Contingent on funding available and # of projects • Contingent on grant program success
Project Implementation	Dependent upon type and size of project	In-Kind: Project sponsor Funds: Project sponsor agencies, grants, and loans	• On-going for the life of the project • Agency funding and staff allocations • Contingent on funding available • Contingent on grant program success

7.7 Obstacles to Implementation

The most significant obstacle to implementation of the IRWM Plan is funding of capital improvement projects. Considering the limited financial capacity of the agencies in the IRWM Region, it would be very difficult to fund projects with an estimated cost of $2 billion. Steps that can be taken to remedy funding obstacles include development of a capital improvement plan, implementation phasing, obtaining grant funding, and forging partnerships to fund major projects.

[1] These hours are approximated using the following assumptions: monthly meetings of the BTAC's 14 agencies (3 hours per meeting), development of annual plan performance reports (12 hours per year), annual project review and prioritization by the PIG (12 hours per year), monthly intra-regional collaboration (2 hours per month for one representative to attend SAWPA meetings), monthly data management for Valley District (2 hours per month), Plan Updates every 5 years (800 hours, annualized to 160 hours per year)

No other insurmountable obstacles to implementation of the IRWM Plan have been identified. As described earlier, the agencies within the Region have successfully worked together in the past on the development and implementation of projects and programs to improve the water resources management within the Region. Working together, these agencies have developed successful relationships, enabling them to accomplish tasks that satisfy the varied interests within the IRWM Region. Developing these initial relationships, trust, and accountability among the participating groups is one of the biggest challenges to any regional cooperation. The stakeholders and interested parties within the IRWM Region can continue to successfully work together to implement future projects to improve the water resources management for the citizens of the Region.

7.8 Impacts and Benefits of the USARW IRWM Plan

The Region has evaluated the impacts and benefits of implementation of the IRWM Plan, and considered all objectives, strategies and projects included as a part of the IRWM Plan. Given the integrated nature of the IRWM Plan, it's difficult to determine any specific benefits or disproportionate impacts to DACs or create environmental justice concerns. It's assumed that all projects will complete the State and/or federal environmental documentation necessary to fully analyze any project-specific impacts that may occur, including those to DACs or any environmental justice concerns.

7.8.1 IRWM Plan Benefits

One of the most significant benefits of the IRWM Plan is the planning process itself. The process has created a cooperative environment among all agencies in the Region, which meet on a regular basis to discuss the water management issues and plan for meeting future water needs of the Region. The agencies worked together to develop solution-oriented programs, they forged agreements, and they work together to provide the most basic and essential service to the communities—serving water. The IRWM planning process provided a framework for developing regional and integrated solutions.

Full implementation of the IRWM Plan will result in multiple benefits associated with meeting the objectives identified in Chapter 4. Key public and overall benefits from implementation of the plan elements include the following:

- Significant improvement in water supply reliability during drought periods while reducing reliance on imported water.
- Improved and coordinated management of the Region's surface water and groundwater resources, including conjunctive management of groundwater and surface water resources and recharge of groundwater basins.
- Improved water quality through effective management of groundwater resources, expediting cleanup process of contaminant plumes in the Region, and improving stormwater management.
- Improved flood protection.
- Plan to address climate change vulnerabilities including reduced GHG emissions and energy usage.
- Improved distribution and water quality to disadvantaged communities.
- Expanded environmental stewardship.
- Enhancement of water-dependent environmental assets.

- Improved water-related education, recreation, and public access opportunities in the Region.
- Improved understanding of the Region's water resources, including focused regional monitoring to ensure groundwater is used in a sustainable manner.
- Improved coordination of water management activities of the Region through sharing of ideas and mutually beneficial management of project opportunities.
- Coordinated development of water management strategies and associated projects.
- Improved preparation for a disaster.

The aforementioned benefits will be realized both within and outside of the Region as neighboring areas can benefit through inter-regional collaboration with SAWPA, as well as collaboration with agencies that overlap larger area, such as Western.

7.8.2 IRWM Plan Impacts

The potential negative impacts from implementing most of the projects in the Region's IRWM Plan are anticipated to be primarily short-term facility construction impacts. It is proposed that conjunctive water management projects include a monitoring and assessment element to evaluate the impacts of project implementation. Monitoring and assessment elements will provide tools to evaluate and modify project operation to mitigate potential impacts.

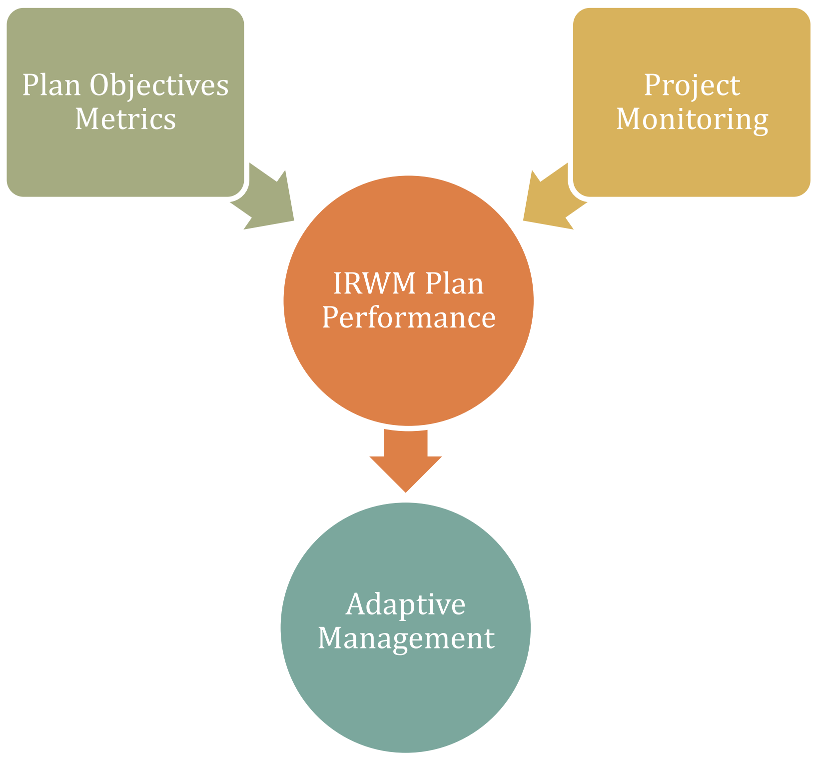
7.8.3 Environmental Documentation and County Ordinance Compliance

Permitting and environmental documentation will be required for new project facilities in accordance with federal, State, and local laws and ordinances. The project-specific environmental compliance will be performed by project sponsors on a case-by-case basis prior to project construction. Impacts and benefits of the proposed actions will be further assessed. All actions and investigations will be coordinated with local, State, and federal agencies to share information and ensure compliance with applicable laws and ordinances.

8 Data Management, Plan Performance and Adaptive Management

This chapter summarizes how data management and plan performance of the IRWM Plan will be conducted. The chapter is organized in three parts: 1) IRWM Plan Performance, which will describe how the Region will track progress in meeting its IRWM Plan objectives, 2) Data Collection, Monitoring and Management, which will describe how the Region collects and manages the data used to measure IRWM plan performance, and 3) Adaptive Management, which will describe how the Region will use the above information to adapt the IRWM Plan as changes occur in the Region.

Figure 8-1: Data Monitoring, Plan Performance and Adaptive Management Process



8.1 IRWM Plan Performance

In order to ensure that the IRWM Region is making progress towards implementing its IRWM Plan, it reviews and tracks Plan performance in two areas:

1. *Plan Objectives:* The Region tracks progress in meeting the IRWM Plan's objectives by tracking its various performance measures over time
2. *Project Monitoring:* The Region uses each project's monitoring plan to track performance of implemented projects

Plan Objectives Monitoring

The BTAC is responsible for monitoring progress in meeting IRWM Plan objectives on a periodic basis, and including the data as a part of the data management system described in the Section 8.2. The results of monitoring are presented at BTAC meetings, and are incorporated into regular IRWM

Plan updates to help the Region re-evaluate needs, objectives, and strategies. In addition, progress in meeting IRWM Plan goals will be reported every six months to the San Bernardino Valley Municipal Water District Advisory Commission on Water Policy.

The Region developed a number of performance measures that can be used to measure progress in meeting the objectives described in Chapter 4 of the IRWM Plan, and are shown in Table 8-1.

Table 8-1: Objectives and Performance Measures

Objective	Performance Measure
1a: Reduce demand 20% by 2020.	• Change in gallons per capita per day consumption • Change in AFY of agricultural water use
1b: Increase utilization of local supplies by 23,000 AFY. • Stormwater: 20,000 AFY • Recycled water: 3,000 AFY	• Change in AFY of stormwater captured • Change in AFY of recycled water use
1c: Increase storage by 10,000 AF.	• Change in AF of groundwater storage • Change in AF of reservoir storage • Documentation of maintenance of groundwater levels to reduce liquefaction risk • Number of projects implemented to manage high groundwater
1d: Prepare for disasters by implementing two new interties between water agencies.	• AFY of local supply projects implemented • AF change in storage as reported in groundwater management reports • AF of additional storage in reservoirs as reported in Urban Water Management Plans • Number of retail agency intertie projects implemented
1e: Monitor and adaptively manage climate change impacts by implementing three projects that reduce energy demands.	• Number of projects implemented in Region that promote adaptation strategies and reduce water related greenhouse gas emissions • Documentation of monitoring of climate change impacts
1f: Ensure equivalent water supply services for DACs	• Number of water supply projects benefiting DACs
2a: Utilize 500 acres of flood control retention/detention basins that are not actively used for recharge.	• Number of projects implemented that allow flood control basins to also be used for groundwater recharge • Development of engineering tools and methods to further the confidence in local weather forecasts and evaluate the risks of impounding water • Development of plans for additional maintenance, weed control, scarifying, and monitoring of water in spreading basins
2b: Reduce FEMA reported flood area.	• Number of projects implemented that reduce flood risk • Number of acres of flood plains preserved
2c: Ensure equivalent implementation of flood projects in DAC areas and implement at least one flood project in a DAC area.	• Number of flood risk reduction projects implemented that benefit DACs

Objective	Performance Measure
3a: Ensure no violations of drinking water quality standards.	• Documentation of meeting state and federal drinking water quality standards
3b: Improve surface and groundwater quality by treating 3,000 AFY.	• Number of projects developed to clean up contamination plumes • Change in AFY of stormwater captured
3c: Manage total dissolved solids and nitrogen in groundwater.	• Number of projects developed to manage TDS and nitrogen in groundwater
3d: Ensure equivalent water quality services for DACs.	• Number of water quality improvement projects benefiting DACs
4a: Improve habitat and open space by 1,200 acres.	• Number of projects implemented that restore and enhance habitat and open space • Number of acres of habitat and open space restored or enhanced
4b: Identify "multi-use" opportunities to increase recreation and public access and identify at least one multi-use project.	• Number of projects developed that implement "multi-use" opportunities to increase recreation and public access

Project Monitoring

Implementation of the projects selected for inclusion in the IRWM Plan will help the IRWM Region to meet its objectives. To track this information, project sponsors will be responsible for preparing a monitoring plan for their project. Information similar to that which is included in a Project Assessment and Evaluation Plan (PAEP) would be developed for projects prior to implementing the project. The goals of a PAEP are as follows:

- To provide a framework for assessment and evaluation of project performance,
- To maximize the value of public expenditures to achieve results,
- To identify measures that can be used to monitor progress towards achieving project goals, and
- To provide information to help improve current and future projects.

The monitoring plan will be based on project-specific information, and will:

- Describe project characteristics and the project sponsor
- Demonstrate consistency with local planning documents such as the IRWM Plan
- Identify project goals and link goals with desired outcome
- Select performance indicators
- Identify expected benefits and impacts
- Determine outcome indicators (site-specific, regional, and system-wide)
- Identify/implement monitoring needed to evaluate a project's performance, including frequency, locations and protocols/methodology
- Identify procedures to keep track of what is monitored and ensure the monitoring schedule is maintained and adequate resources (including funding) are available

- Analyze and assess data
- Evaluate overall success of the project
- Communicate the results to the BTAC

Project proponents will be responsible for providing data collected through project monitoring to the BTAC for use in tracking progress in meeting objectives.

8.2 Data Collection, Monitoring and Management

The IRWM Region has a long history of collecting and monitoring data to allow effective management of its water resources. These efforts have been incorporated into the IRWM Plan to support regional data collection, integrate with other regional and statewide programs, and identify data gaps.

8.2.1 Data Collection and Monitoring Efforts

An extensive network of data collection and monitoring is already in place in the IRWM Region. Currently, the following data are being collected in the Region:

- *Groundwater data*: Groundwater monitoring is in place for measuring groundwater production, water quality, and water levels representative of the various subbasins. Groundwater level data were used to evaluate the groundwater level trends as well as to evaluate the groundwater flows and included the following:
  - Target wells used in the groundwater model. A list of these wells, as well as a map showing the location of the targeted modeling wells, is presented in Appendix B.
  - Groundwater monitoring wells identified in various agreements (e.g., Seven Oaks Accord, Riverside Agreement). Monitoring of these wells is required to ensure full compliance with the terms of the agreements. A list of these wells is presented in Appendix B.
  - EPA/City of San Bernardino Newmark-Muscoy plume(s) monitoring wells.
  - Local purveyors' water production data required by judgments and provided to the Watermaster. All purveyors of wells that pump groundwater are required to report the annual production of the wells to the Watermaster. Production data are then presented in an annual report prepared by the Watermaster.
  - SBVWCD Engineering Investigations review groundwater production and storage in the Bunker Hill Subbasin.
- *Stream gage data*: Stream gages in the Region are operated by either the USGS or the SBCFCD and allow for stream flow data to be collected throughout the watershed.
- *Drinking water quality data*: Water quality data collected by water purveyors for all sources of water. These data are periodically monitored according to Title 22 and are required by the CDPH Division of Drinking Water and Environmental Management.
- *Water supply and demand data*: Water supply and demand data are reported by water purveyors in UWMPs every five years, and are required by DWR.
- *General Plan land use*: Information on land use is available through city and county general plans.

- *Santa Ana River flow data*: Santa Ana River Watermaster Reports contain information on flows and status in meeting flow requirements.
- *Project monitoring reports*: As discussed previously, project sponsors are asked to collect monitoring data on their implemented projects and communicate the results to the BTAC.
- *Surface and ground water quality data*: SWRCB regularly updates its Integrated Reports and 303(d) lists of quality impaired waters.

In order to track all of the performance measures listed in Table 8-1, it may be necessary to collect and monitor additional data not currently collected on a regular basis. These data needs include: GHG emissions from treatment and conveyance of water resources, information regarding changes in flood plain area, additional stream gages to improve flows in key areas to improve stormwater capture (such as above Seven Oaks Dam), and ongoing groundwater quality mapping to track changes in quality as treatment projects are put into place.

A monitoring plan has been developed for the Region as a component of the IRWM Plan to formalize and standardize data collection procedures that focus on groundwater and surface water. The objectives of the monitoring plan are to:

- Provide a standard methodology for the collection, storage, and reporting of hydrologic data.
- Document the collection of data needed for management of the groundwater basin to meet the requirements of various judgments. In the SBBA and other adjudicated basins, the Watermaster is responsible for collection, review, and compilation of the data needed for management of the basin and for providing a level of coordination among many water users.
- Provide the data needed for developing the “Annual Operation Plan” for management of the SBBA.
- Provide standardized procedures to collect source water data that agencies use to meet requirements of the CDPH drinking water standards.

Remaining data not collected as a part of this monitoring plan is expected to come from existing databases and monitoring efforts with established procedures. The Region assumes that the agencies performing these data collection and monitoring efforts have procedures in place to ensure accuracy of the data.

8.2.2 Data Management

Data that is collected is stored, organized, and secured in electronic databases and spreadsheets by the agency responsible for the data.

Data collected in the Region will be available to the stakeholders, DWR, and other local and state agencies. Data collected in support of state-funded water quality-related projects will be made available to the SWRCB’s Surface Water Ambient Monitoring Program and Groundwater Ambient Monitoring and Assessment Program. Valley District collects and reports water level data to the California Statewide Groundwater Elevation Monitoring (CASGEM) program for the Bunker Hill, Rialto-Colton, and Yucaipa Subbasins.

Data collected each year is used in a variety of different reports, including the BTAC management plan which is completed on an annual basis. Overall progress in meeting each IRWM Plan objective will be reported every five years as a part of regular IRWM Plan updates.

8.3 Adaptive Management

The USARW IRWM Plan represents the current state of water resources planning in the Region, based upon available information, and recognizes that water management strategies will continue to evolve in response to changing conditions. In recognition of the fluid nature of water management in the Region, the IRWM Plan incorporates an adaptive management approach that is intended to allow the IRWM Plan to stay current in light of changing conditions, such as local and regional water needs and changing regulatory requirements.

Given changing conditions, the planning process is continually evolving and developing additional data that improve the Region's understanding, which may redefine objectives and priorities to respond to these changing conditions.

The adaptive management framework is based on an iterative process of:

- Collecting information and data regarding the conditions within the Region
- Evaluating the new data to determine plan/project performance
- Formulating a plan in response to these changing conditions

Using data collected and monitored as part of IRWM Plan performance tracking discussed above, the Region will periodically review the issues and needs of the Region, and re-evaluate its objectives and strategies as needed based upon changing conditions. This process will allow the Region to proactively manage its available resources, including making investments in the planning and implementation of new projects and programs. This includes preparation of periodic updates of the IRWM Plan to respond to changing conditions (including climate change and the re-evaluation of any impacts and benefits) through a continued working relationship with the BTAC, and to inform project participants and stakeholders about changes to the IRWM Plan.

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