

A wide-angle photograph of the San Diego skyline, featuring numerous skyscrapers and buildings along the waterfront, with the ocean visible in the foreground.

2013 San Diego Integrated Regional Water Management Plan

3 Region Description

The San Diego IRWM Region (Region) as defined by this 2013 IRWM Plan consists of eleven parallel and similar watersheds within the County of San Diego that discharge to coastal waters. Figure 3-1 provides an overview of the Region's watersheds and *Chapter 5, Watershed Characterizations* provides a detailed discussion of the water resources within each watershed. The Region boundaries were selected primarily on the basis of water management regulatory and political jurisdictional boundaries. Other factors that influenced IRWM Plan boundary selection included similarities in hydrology and watershed characteristics and a common imported water supply.

3.1 Region Overview

Population

The Region addressed by this 2013 IRWM Plan includes all but a small fraction of the County's population. Table 3-1 presents existing and projected population within the County and Water Authority service area. Table 3-1 also presents a population breakdown by ethnicity and age. Population within the region is projected to increase by approximately 28% by the year 2030.

Table 3-1 also illustrates that nearly all of the County's population is within the Water Authority service area. The portion of the County's population outside the Water Authority service area is dependent on local groundwater supply.

Social and Cultural Makeup

The Region is culturally diverse and features national and ethnic communities from throughout the world, including large and active national and ethnic communities from Mexico, Central and South America, the Caribbean, Africa, Europe, former Eastern bloc nations, the Middle East, India, China, Southeast Asia, and the Pacific Islands.

As shown in Table 3-1, the Region's diverse ethnic groups comprise a majority of the County's population. Population gains are projected within all ethnic communities.

By numbers, Hispanics represent the fastest growing segment of the population, and currently comprise roughly one-third of the Region's population. The Region also features a diverse Asian population that includes large communities that celebrate heritage from China, Southeast Asia, and India. Pacific Islander populations within the County are projected to show the greatest percentage increase in the next twenty years, with populations projected to increase from approximately 25,000 to more than 65,000 by year 2030 (SANDAG, 2010).

Figure 3-1: Overview of Region's Watersheds



Legend

- San Diego IRWM Region
- Funding Area Boundary
- Watershed
- City Boundaries
- Waterbody
- County
- River
- Freeway



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Miles

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Table 3-1: Existing and Projected Population

Category	Demographic Parameter	2010	2015	2020	2025	2030	2035
Population (millions)	San Diego County ¹	3,095,313 ²	3,364,191	3,535,000	3,703,824	3,870,000	4,026,131
	Water Authority Service Area ³	3,007,977 ⁴	3,271,773	3,438,837	3,599,952	3,758,933	3,906,718
	Percent of San Diego County	NA	97%	97%	97%	97%	97%
San Diego County Population Breakdown by Age ¹	Percent Age 0-19	25%	27%	27%	26%	26%	25%
	Percent Age 20-39	31%	29%	28%	28%	28%	27%
	Percent Age 40-64	32%	32%	31%	29%	28%	28%
	Percent Age 65+	11%	13%	15%	17%	19%	20%
San Diego County Population Breakdown by Ethnicity ¹	Percent White	48%	47%	45%	44%	42%	40%
	Percent Hispanic	32%	32%	34%	35%	37%	39%
	Percent Asian	11%	10%	11%	11%	11%	11%
	Percent Black	6%	5%	5%	5%	5%	5%
	Percent Native American	1.4%	1%	1%	1%	1%	1%
	Percent Pacific Islander	0.6%	1%	1%	1%	1%	1%
	Percent Other/Mixed	4	4%	4%	4%	4%	4%

1 From SANDAG 2050 Regional Growth Forecast (SANDAG, 2010), except 2010 data. Percent values rounded to nearest 1%.

2 From 2010 U.S. Census (U.S. Census Bureau, 2012).

3 From Water Authority 2010 Urban Water Management Plan (Water Authority, 2011a), except 2010 data.

4 Calculated based on average percentage of population estimated in Water Authority Service Area from 2015-2035.

The County includes 18 Tribal Nation Reservations, more than any other county in the United States. Native Americans within the Region comprise four tribal groups: the Luiseño, Cupeño, and Cahuilla groups from North San Diego County, and the Kumeyaay/Diegueño tribal group. Only a small percentage of the Region's Native American population of 17,000 lives within the Tribal Reservation lands (SANDAG, 2010). Tribal nations are detailed further in *Chapter 4, Tribal Nations of San Diego County*.

Table 3-2 summarizes language use within the County. As shown in the table, English and Spanish are the dominant languages within the Region. English is the sole language of approximately two-thirds of the population, and more than one-fifth of the population speaks Spanish.

Table 3-2: Culture/Language Use (2010)

Language	Principal Language Spoken at Home	Percent who Speak English Less than "Very Well"
English	63.3%	NA
Spanish	24.6%	11.1%
Other Indo-European	3.0%	0.8%
Asian/Pacific Islander	7.8%	3.6%
Other Languages	1.3%	0.6%
Totals	100%	16.1%

From 2010 U.S. Census for adults over the age of 25 (U.S. Census Bureau, 2012).

Table 3-3 summarizes the range of education within the adult population of the County. Approximately 30% of the adult population has a 4-year college degree, and more than 10% of the population has a graduate degree. Less than 15% of the adult population did not graduate from high school.

Table 3-3: Education (2010)

Highest Level of Education Attained	Percent	Cumulative Percent
Graduate Degree	12.8%	12.8%
Bachelor's Degree	21.4%	34.2%
Associates Degree	8.6%	42.8%
Attended College	23.2%	66.0%
High School Graduation	19.3%	85.3%
Attended High School	7.3%	92.6%

From 2010 Census for adults over the age of 25 (U.S. Census Bureau, 2012).

Housing

Table 3-4 summarizes projected housing units and types within the Region. Approximately 60% of the population resides in single-family units, though the percent of households living in multiple-unit structures is projected to increase in the next 20 years.

Table 3-4: Existing and Projected Housing¹

Housing within the County ²	2008	2030	2050	Change 2008 – 2050	
Occupied Units	1,140,654	1,369,807	1,529,090	388,436	34%
Households in Single Family Units (percent of total)	692,382 (61%)	750,022 (55%)	761,699 (50%)	69,317	10%
Households in Multiple Family Units (percent of total)	405,023 (36%)	581,143 (42%)	732,832 (48%)	327,809	81%
Households in Mobile Homes (percent of total)	43,249 (4%)	38,632 (3%)	34,559 (2%)	-8,690	-20%

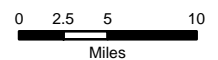
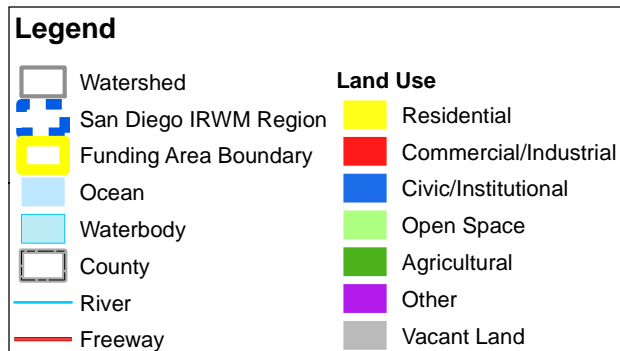
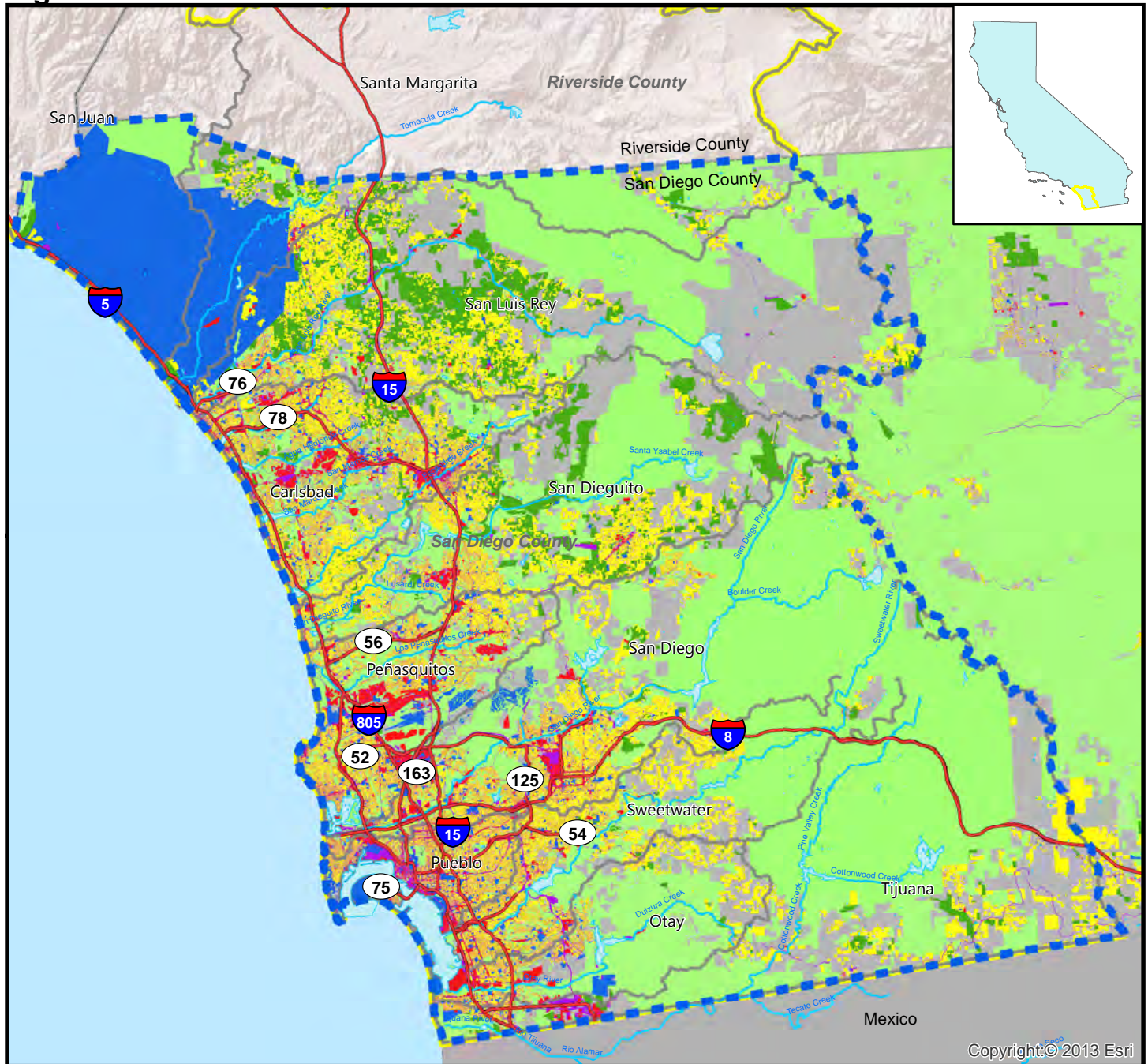
1 From San Diego Association of Governments (SANDAG), *2050 Regional Growth Forecast* (SANDAG, 2010).

2 The Region addressed in this IRWM Plan includes all of the Water Authority Service Area and almost all of the County's population. Only a small fraction of the County's population is within the Colorado River watershed and is outside the Region addressed in this IRWM Plan.

Land Use

Figure 3-2 presents land use within the Region. Table 3-5 summarizes existing and projected land use acreages within the County. Significant residential development within the Region is projected to occur within the next 25 years. Approximately 20% of the County is currently classified as vacant developable land. By year 2035, vacant developable land is projected to decrease to 8% of the total San Diego County land. Residential lands within the County are projected to more than double by year 2050.

Figure 3-2: Land Use



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Table 3-5: Existing and Projected Land Use within the County (Acres)

Land Use	Existing (2008)	2020	2035	2050	Change 2013 - 2050	
Residential	340,586	512,781	650,999	738,576	397,990	116%
Civic/Institutional	157,623	212,812	213,358	214,210	56,587	36%
Commercial/Industrial	39,449	41,446	44,496	48,198	8,749	22%
Other	123,793	131,350	131,267	131,215	7,422	6%
Parks and Open Space	1,443,074	1,390,141	1,390,981	1,392,257	(50,817)	(4%)
Agricultural	112,300	106,544	79,144	57,739	(54,561)	(49%)
Vacant Land	510,382	332,134	216,962	145,013	(365,369)	(71%)
Total	2,727,207	2,727,207	2,727,207	2,727,207	0	0%

Sources: SANDAG, 2012; Personal communication, G. Chung (SANDAG), 2013

Agricultural lands are projected to be reduced by almost half; the percentage of land in the County identified as agricultural in use will fall from 4% to 2%. The agricultural lands shown in Table 3-5 include both irrigated agriculture and non-irrigated (cattle grazing) lands across the entire County. Most irrigated agriculture that occurs within the Region is within the Water Authority's service area. As documented within the Water Authority's *2010 Urban Water Management Plan*, agricultural water demands are projected to decrease as a result of conversion of irrigated agricultural lands to residential uses (Water Authority, 2011a).

The United States military owns more than 6% of the Region's land. Major bases that include significant open space or undeveloped lands include U.S. Marine Corps (USMC) Camp Pendleton, Fallbrook Naval Weapons Annex, and Miramar Air Station. The military acts as a steward of the open space environment and coordinates with local jurisdictions for watershed planning and environmental protection.

Other large federal land holdings within the Region include recreational lands owned and managed by the United States Bureau of Land Management (BLM) and the United States Forest Service (USFS).

Regional Economy

Table 3-6 summarizes projected jobs within the Region. Employment is forecast to increase in line with housing (33% and 34%, respectively) through 2050.

Table 3-6: Existing and Projected Jobs within the County¹

Jobs within the County ²	2008	2030	2050	Change 2008 – 2050	
Jobs	1,501,080	1,752,630	2,003,038	501,958	33%

¹ From San Diego Association of Governments (SANDAG), *2050 Regional Growth Forecast* (SANDAG, 2010).

² The Region addressed in this IRWM Plan includes all of the Water Authority Service Area and almost all of the County's population. Only a small fraction of the County's population is within the Colorado River watershed and is outside the Region addressed in this IRWM Plan.

Table 3-7 summarizes the County's Gross Regional Product for the past four years. The County's Gross Regional Product exceeded \$155 billion during 2010 (San Diego Regional Chamber of Commerce, 2013). Historically dependent on military spending, the Region's economy has diversified during the past 20 years. The economic recession during 2007 – 2009 resulted in a decline of Gross Regional Product, but has seen gains since 2010. Manufacturing is the largest economic contributor to the local economy, accounting for \$25 billion of the Gross Regional

Product. Leading industries within the region include telecommunications, electronics, computers, industrial machinery, aerospace, shipbuilding, biotechnology, and instruments. Currently, 1,400 companies in the region employ nearly 160,000 high technology workers. The telecommunications industry alone contributes more than \$5 billion to the local economy each year (San Diego Regional Chamber of Commerce and San Diego County, 2013).

Table 3-7: Gross Regional Product within the County

Year	San Diego County Gross Regional Product ¹ (\$ billions)	Percent Increase from Prior Year
2007	156.8	-
2008	158.5	1.0%
2009	153.9	-2.9%
2010	155.3	0.9%

¹ Gross regional product data from San Diego Regional Chamber of Commerce Economic Research Bureau and County of San Diego (2013).

Tourism is the second largest industry in the Region. In 2012, visitor spending in the County exceeded \$7.5 billion. Defense represents the third largest industry, and more than a dozen USMC and Navy bases and support facilities exist within the County.

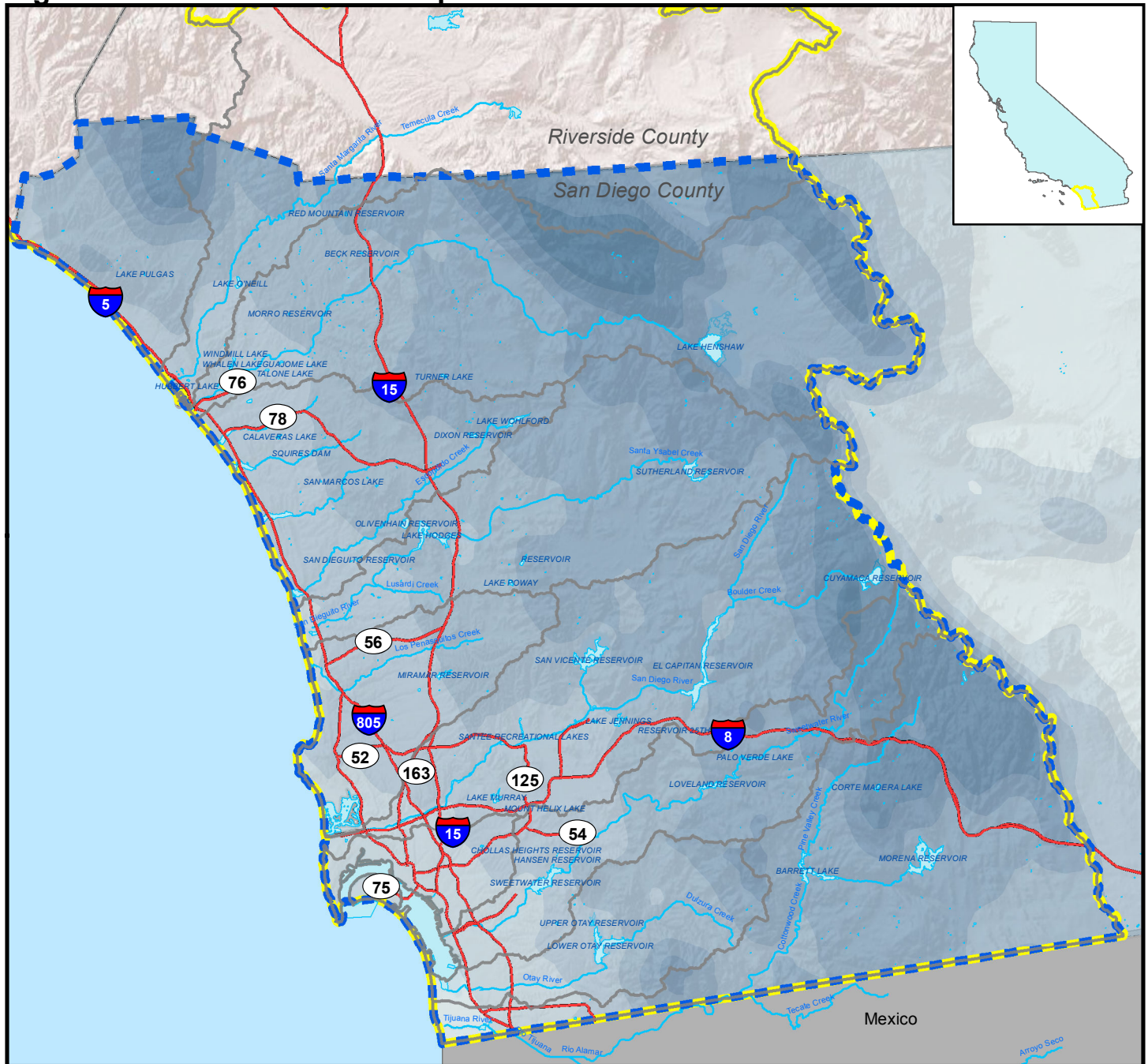
Agriculture ranks as the fourth largest industry in the Region. The 2011 annual crop value within the County (almost all of which is irrigated agriculture) exceeded \$1.68 billion. This represents a 2% increase from 2010's total of \$1.64 billion. Although the value increased, the acreage devoted to commercial agriculture decreased by approximately 1% (1,927 acres) (San Diego County Department of Agricultural Weights and Measures, 2012). The County has the 18th largest agricultural economy in the country (San Diego County Department of Agricultural Weights and Measures, 2012). With limited precipitation and local water sources, agriculture within the Region is dependent on imported water.

Climate and Precipitation

The Region experiences a Mediterranean climate characterized by mild temperatures year-round at the coast. Inland area weather patterns are more extreme, with summer temperatures often exceeding 90 degrees Fahrenheit and winter temperatures occasionally dipping below freezing. Average annual rainfall is approximately 10 inches per year on the coast, and in excess of 33 inches per year in the inland mountains. More than 80% of the region's rainfall occurs between December and March (Water Authority, 2011a). Figure 3-3 presents the geographic distribution of mean annual precipitation within San Diego County, demonstrating that annual precipitation in the region follows a pattern of increased precipitation with increased elevation.

Significant variation in precipitation also occurs from year to year. Table 3-8 summarizes annual precipitation for a 155-year period at the San Diego Lindbergh Field and City of Escondido precipitation stations. Annual precipitation totals range from more than double the annual mean to less than half the annual mean.

Figure 3-3: Mean Annual Precipitation



Legend

- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- Ocean
- Waterbody
- County
- River
- Freeway

Mean Annual Precipitation (in.)

- 3 to 9 inches
- 9 to 12 inches
- 12 to 15 inches
- 15 to 18 inches
- 18 to 21 inches
- 21 to 24 inches
- 24 to 30 inches
- 30 to 35 inches



0 2.5 5 10
Miles



Table 3-8: Annual Variation in Precipitation at San Diego Lindbergh Field, 1850-2012

Parameter		San Diego Lindbergh Field, 1850-2011 ¹		Escondido, 1875-2012 ²	
		Annual Precipitation (inches)	Percent of Annual Mean	Annual Precipitation (inches)	Percent of Annual Mean
Maximum Observed Value		27.6	279%	32.8	214%
Percentile Values:	5%	17.2	174%	28.0	182%
	10%	15.3	155%	25.3	165%
	25%	11.8	119%	18.7	122%
	50%	9.2	93%	13.8	90%
	75%	7.0	71%	11.3	74%
	90%	5.4	54%	8.1	53%
	95%	4.4	44%	6.7	44%
Minimum Observed Value		3.0	31%	4.4	29%
Mean Annual Value		9.9	---	15.3	---

1 Annual calendar year precipitation at San Diego Lindbergh Field for the period 1850 through 2011. From Western Regional Climate Center (2013).

2 Annual calendar year precipitation at Escondido Station for the period 1875-2012. From Western Regional Climate Center (2013).

While the mean annual precipitation at the Escondido precipitation station is 50% greater than at the San Diego Lindbergh Field station, Table 3-8 demonstrates that both stations exhibit a similar statistical distribution about the mean. This is due to the fact that most of the San Diego winter precipitation occurs as a result of eastward-moving frontal storm systems that affect the entire Region. The mean is skewed by a few years of exceptionally high precipitation; as such, precipitation totals above the annual mean occurred only 45% of the time at the two precipitation stations. San Diego Lindbergh Field precipitation was between 7.0 inches (71% of normal) and 11.8 inches (119% of normal) during approximately 50% of the years, while Escondido precipitation was between 11.3 inches (74% of normal) and 18.7 inches (122% of normal) during 50% of the years. For comparison, the South Coast Hydrologic Region, which includes the San Diego IRWM Region north through Los Angeles and Ventura Counties, averages 16.9 inches of precipitation, while the Sacramento River Hydrologic Region, which includes the City of Sacramento, averages over 37 inches per year (DWR, ND).

While all but a fraction of Region's precipitation occurs during November through April, a significant majority of the potential evaporation (which is approximately equal to the evapotranspiration rate of grass) occurs during summer and autumn months. More than 80% of the potential evaporation occurs during the months of March through October. Potential evaporation within the region ranges from approximately 3.7 feet per year in coastal valleys to more than 4.2 feet per year in inland valleys (DWR, 1986, DWR, 2010).

3.2 Defining Boundaries for the Region

The San Diego Region as defined by this IRWM Plan consists of eleven parallel and similar watersheds within the County of San Diego that discharge to coastal waters. The regional boundaries were selected primarily on the basis of regulatory, jurisdictional, and political boundaries. Other factors that influenced IRWM Plan boundary selection included similarities in hydrology and watershed characteristics, and a common imported water supply.

Appropriateness of Region

The San Diego IRWM Region is appropriate for regional water management. The selected regional boundaries take into account Regional Board jurisdiction, political jurisdictions, physical and hydrologic characteristics, the imported water supply service area, and wastewater service considerations.

Regional Board Jurisdiction

The Region is entirely within the jurisdiction of the San Diego Regional Board (designated as Region 9 among California's Regional Boards). Water quality and wastewater discharges within the Region are regulated by policies and regulations established in the Regional Board's *Water Quality Control Plan for the San Diego Basin* (Basin Plan). Ocean and marine water quality is regulated by policies and regulations established in the Basin Plan (Regional Board, 1994), Ocean Plan (State Board, 2005), and Enclosed Bays and Estuaries Plan (State Board, 1991).

Municipal stormwater runoff within the Region is regulated through a single National Pollutant Elimination Discharge System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit issued by the Regional Board to designated Copermittees. Two of the three RWMG agencies (the County and City of San Diego) comprise the largest land area among the regulated Copermittees.

The Regional Board's jurisdiction includes the southern portions of Orange and Riverside Counties. The IRWM Plan boundaries, however, are limited to the County on the basis of political jurisdictions, development and land use trends, land use regulatory authority, water supply, and stormwater regulation and control (see insert to right).

Political Jurisdictions

The Region is located entirely within the County of San Diego. The County is comprised of five Board of Supervisor Districts, each represented by one elected official. Districts 1, 3, and 4 are entirely within the Region, and approximately the western two-thirds of Districts 2 and 5 are within the Region. Through authorities delegated by the California Department of Public Health (CDPH), the County maintains

Watersheds, Hydrologic Units, Hydrologic Areas, and Watershed Management Areas

A watershed is an area of land that drains downslope to a common point. A hydrologic unit (HU) is a drainage area delineated by DWR that may include one or more individual sub-watersheds. Within this IRWM Plan, 'watershed' refers to HU. An HU is further subdivided into hydrologic areas (HA), each of which may represent one or more sub-watersheds.

The San Diego Region is comprised of eleven DWR-designated HUs, four of which (San Juan, Carlsbad, Peñasquitos, and Pueblo) are comprised of several smaller parallel sub-watersheds that drain to common coastal waters. Seven of the Region's HUs constitute watersheds for the Region's primary rivers: Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tijuana.

The Regional Board defines a watershed management area (WMA) as a drainage area that may include one or more HUs or watersheds. As designated by the Regional Board, three HUs (Pueblo, Sweetwater, and Otay) are combined to form the San Diego Bay WMA. The Peñasquitos HU is comprised of the Mission Bay WMA and the Los Peñasquitos WMA. The Region's remaining seven hydrologic units constitute their own individual WMAs.

local regulatory oversight within the Region on drinking water wells, monitoring wells, small water systems, recycled water use, and the beach recreational water quality program. The County also regulates on-site wastewater systems through an agreement with the Regional Board.

Eighteen incorporated municipalities exist within the Region, including the Cities of Carlsbad, Chula Vista, Coronado, Del Mar, El Cajon, Encinitas, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, Poway, San Diego, San Marcos, Santee, Solana Beach, and Vista.

Physical and Hydrologic Characteristics

Each of the Region's east-west-trending watersheds flows from elevated regions in the east toward coastal lagoons, estuaries, or bays in the west. Each of the watersheds features similar habitats at similar elevations, and all watersheds share habitat restoration and protection needs. A significant majority of the volume of surface flow in each of the watersheds is comprised of runoff from seasonal precipitation that predominantly occurs during the winter and spring months. Surface flows during summer and fall months are typically low, and consist of urban runoff, agricultural runoff, and surfacing groundwater. Each of the watersheds has similar water quality characteristics and faces similar water quality problems.

Imported Water Supply

Imported water supplied by the Water Authority is the predominant source of supply within the Region. The Region's imported water supply infrastructure crosses watershed and jurisdictional boundaries and requires coordination among local agencies and entities to address water supply, water quality, and habitat issues. This broader perspective promotes funding for regional projects and increases the economy of scale for the Region's local supply development projects.

Wastewater Service

Wastewater generated in the Region is either locally recycled or exported to one of the regional ocean outfall disposal systems. The Region's urban wastewater agencies have organized – both through the formation of JPAs and through interagency contracts – into five multi-jurisdictional wastewater systems based around the Region's five deep-water ocean outfalls. This shared infrastructure requires a high level of collaboration and coordination between local agencies within the Region. Further, the Region's agencies are collaborating with the International Boundary and Water Commission to address trash and wastewater pollution in the shared Tijuana River watershed.

3.3 Disadvantaged Communities

Disadvantaged communities (DACs) are defined by DWR as communities with a combined Median Household Income (MHI) of less than 80% of the statewide MHI (DWR and SWRCB, 2007). The 2012 IRWM Guidelines define DACs based on data from the 2006-2010 American Community Survey. This defines DACs as Census tracts with an MHI of \$48,706 (DWR, 2012). The San Diego IRWM Region has refined data, with projections of 2013 MHI by Census blocks, produced by Nielsen-Claritas. Per the Nielsen-Claritas projections, 2013 statewide MHI is \$58,724, making the 80% criteria to define DACs as \$46,979 (Nielsen-Claritas, 2013). The decrease in statewide MHI from 2010 to 2013 has caused some of the Region's communities to no longer be considered DACs per the State standards; however, due to the Region's concern with addressing the needs of DACs, both the 2010 and 2013 data has been included in this Plan. The DAC information presented in Figure 3-4A and Figure 3-4B and discussed in the following sections represents the best available data on the location and nature of economically disadvantaged communities in the Region and does not constitute final or complete representation of DACs due to the scale of the data available

Additional income survey and other reliable data sources that demonstrate the location and nature of DACs in the Region may be used to further refine the data set and can be used for purposes of justifying grant eligibility based on DAC service areas.

Several communities and rural areas within the Region have an average MHI that is less than 80% of Statewide. The 2013 IRWM Plan uses various geographical designations to analyze DACs, including cities, County of San Diego community planning areas, and City of San Diego community planning areas. However, the use of larger planning areas can at times cause smaller portions of the planning area that are economically disadvantaged to be overlooked. The RWMG recently analyzed MHI values on a Census block basis to identify smaller pockets of DACs for outreach purposes. Figure 3-4A illustrates the community planning areas (CPAs) within the Region that are considered economically disadvantaged according to either the 2010 MHI criteria at tract level and the 2013 projections at block level. Figure 3-4B shows those areas within the City of San Diego that are considered DACs by either the 2010 or the 2013 data. Figure 3-4A also demonstrates the location of DACs with respect to the Water Authority's service area, which is used to distinguish Urban and Rural DACs as described below. Based on the 2010 Census data, eight of the County's 18 incorporated cities are considered DACs or contain DACs; these cities are El Cajon, Imperial Beach, Oceanside, Carlsbad, Escondido, San Marcos, National City, and San Diego. Additionally, based on the same data, 24 of the 58 City of San Diego CPAs and 18 of the 23 County CPAs are considered DACs or contain areas that qualify as DACs (SANDAG, 2013). Analysis of the 2013 data reduces these down to 22 and 13, respectively (Nielsen-Claritas, 2013).



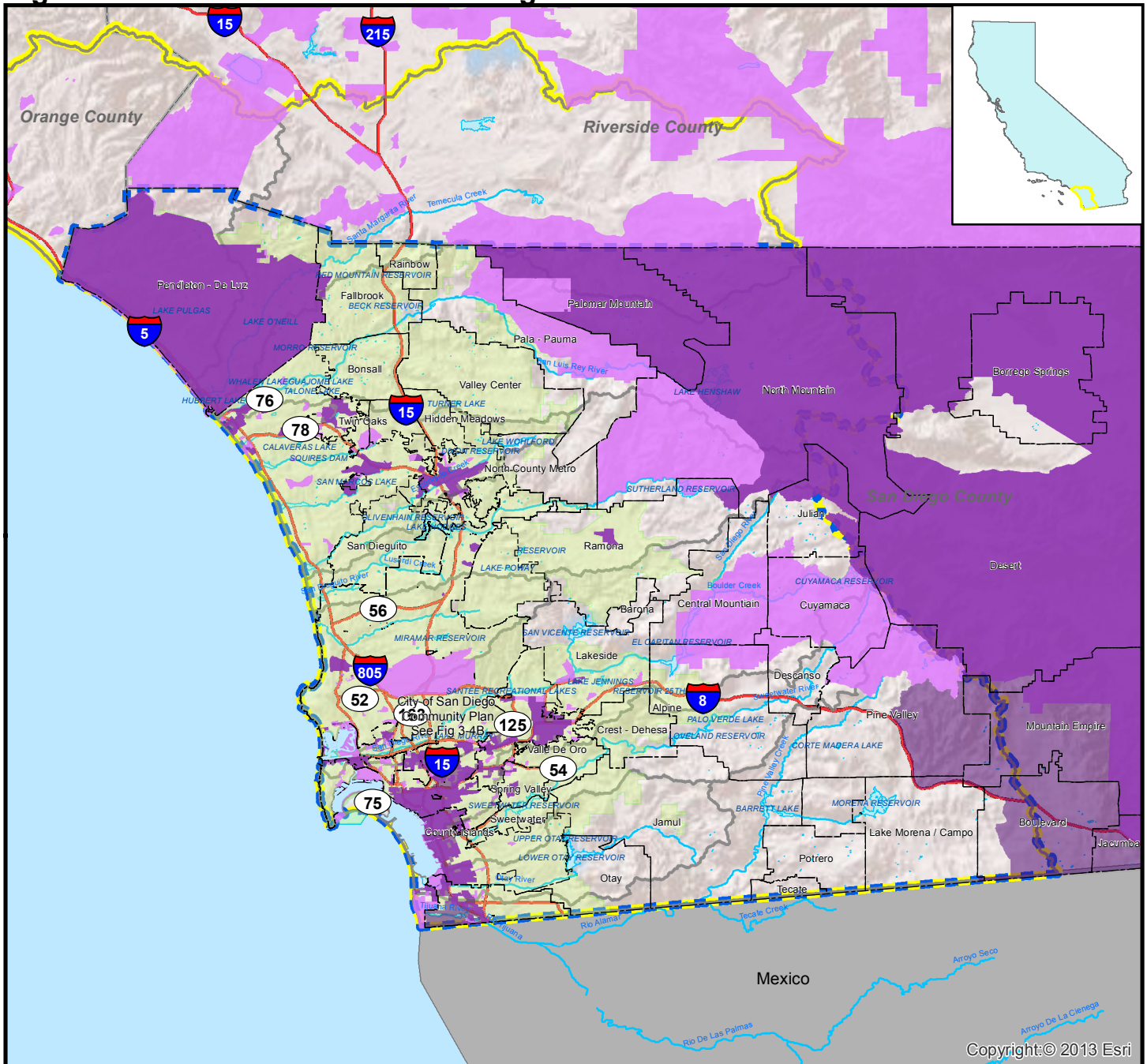
Chollas Creek is a widely acknowledged disadvantaged community with surface water quality issues.

Photo credit: Leslie Reynolds, Groundwork San Diego-Chollas Creek

Table 3-9 summarizes communities (by planning area) within the Region that meet DWR and State Board criteria for designation as DACs. The CPAs shown in the table are all CPAs in the Region that contain at least some DAC areas. Some CPAs are entirely or primarily DAC, while others (denoted by an asterisk) only contain small pockets of DACs. The table also shows how the DAC status for these areas has changed since 2000. The DACs are geographically distributed throughout the Region.

2010 Census data indicated that numerous Census tract neighborhoods in many of the Region's planning areas (both in incorporated and unincorporated areas) have MHIs that are less than 80% of the statewide MHI. Consistent with the recommendations of the *San Diego IRWM Public Outreach and Disadvantaged & Environmental Justice Community Involvement Plan*, actions are underway to outreach and collaborate with DACs throughout the Region.

Figure 3-4A: Location of Disadvantaged Communities



Legend

- 2013 Disadvantaged Communities
- 2010 Disadvantaged Communities
- San Diego County Water Authority
- Community Planning Area
- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- Ocean
- Waterbody
- County
- River
- Freeway

Community Planning Areas (CPA) Containing Disadvantaged Communities (DAC)

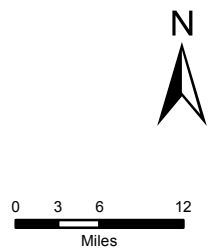
- | | |
|---------------------------------|---------------------------|
| Alpine CPA*** | Mountain Empire CPA** |
| Bostonia County/Lakeside CPA*** | North County Metro CPA* |
| Central Mountain CPA* | City of Escondido |
| City of Carlsbad*** | City of San Marcos |
| City of Oceanside*** | North Mountain County CPA |
| County Islands CPA | Pala-Pauma CPA* |
| Cuyamaca CPA* | Palomar Mountain CPA |
| Descanso CPA*** | Pendleton-DeLuz CPA |
| Desert CPA | Pine Valley CPA |
| Fallbrook CPA*** | Ramona CPA*** |
| Fallbrook CPA*** | Spring Valley CPA |
| Julian CPA | Twin Oaks CPA*** |

*Areas meeting 2010 DAC criteria but not 2013 criteria

**Areas meeting 2013 DAC criteria but not 2010 criteria

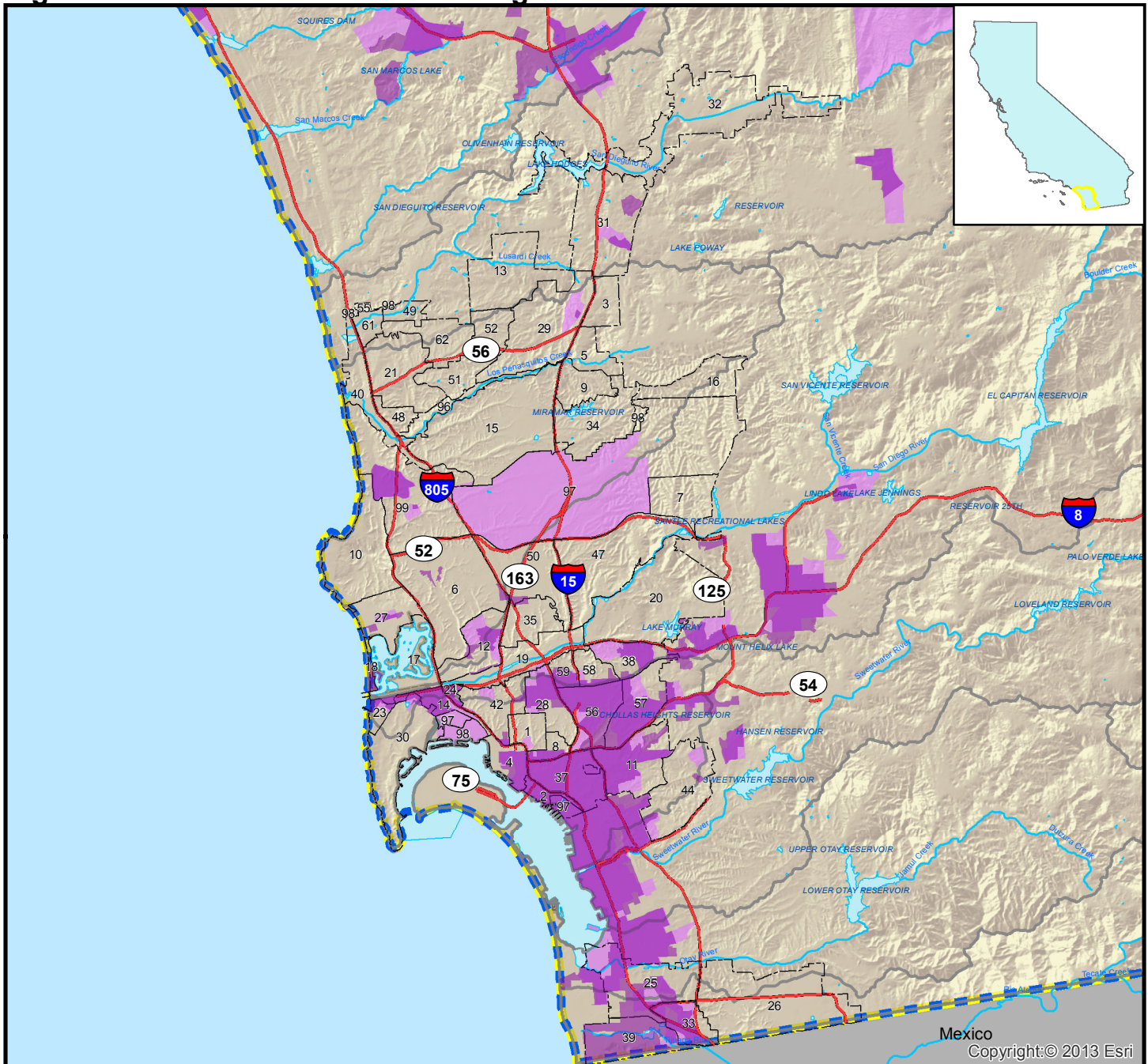
***Areas containing small pockets of DAC

Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse, 2010 Census Data.
 DAC defined as a block group with a median household income (MHI) of less than \$48,706 (80% of the Statewide MHI).
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Figure 3-4B: Location of Disadvantaged Communities in Central Area



Legend

- 2013 Disadvantaged Communities
- 2010 Disadvantaged Communities
- Community Plan
- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- Ocean
- City Boundaries
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- Freeway

Community Planning Areas (CPA) Containing Disadvantaged Communities (DAC)

- | | |
|--------------------------------|------------------------------------|
| 2 - Barrio Logan CPA | 37 - Southeastern San Diego CPA |
| 6 - Clairemont Mesa CPA*** | 38 - College Area CPA |
| 8 - Greater Golden Hill CPA | 42 - Uptown CPA*** |
| 9 - Miramar Air Station CPA* | 44 - Skyline-Paradise Hills CPA*** |
| 10 - La Jolla CPA*** | 56 - City Heights CPA |
| 11 - Encanto CPA | 57 - Eastern Area CPA |
| 14 - Midway CPA | 58 - Kensington-Talmadge CPA*** |
| 17 - Mission Bay Park CPA | 59 - Normal Heights CPA |
| 23 - Pacific Beach CPA*** | 98 - Harbor CPA |
| 24 - Old San Diego CPA | 99 - University CPA*** |
| 25 - Otay Mesa CPA** | |
| 29 - Rancho Penasquitos CPA*** | |
| 31 - Rancho Bernardo CPA*** | |
| 33 - San Ysidro CPA | |

Cities Defined as DACs:

- City of National City
- City of Imperial Beach*
- City of El Cajon

*Areas meeting 2010 DAC criteria but not 2013 criteria

**Areas meeting 2013 DAC criteria but not 2010 criteria

***Areas containing small pockets of DAC

Sources: Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse, 2010 Census Data.

DAC defined as a block group with a median household income (MHI) of less than \$48,706 (80% of the Statewide MHI).

\\rmcsd\RMCS\Projects\GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-4B_Location of DACs in SD 060713.mxd

0 1.25 2.5 5
Miles

RMC

Table 3-9: Economically Disadvantaged Communities

HU ¹	Name ²	Disadvantaged City or Community Planning Area (CPA) ³	Jurisdiction	2000 DACs	2010 DACs	2013 DACs
901 902	San Juan Santa Margarita	Pendleton-DeLuz CPA	County	•	•	•
902 903	Santa Margarita San Luis Rey	Palomar Mountain CPA	County		•	•
		Fallbrook CPA*	County		•	•
903	San Luis Rey	North Mountain County CPA	County	•	•	•
		Pala-Pauma CPA	County		•	
903 904	San Luis Rey Carlsbad	City of Oceanside*	City of Oceanside		•	•
		City of Carlsbad*	City of Carlsbad		•	•
904	Carlsbad	North County Metro CPA	County		•	
		Twin Oaks CPA*	County		•	•
		City of San Marcos	City of San Marcos		•	•
		City of Escondido	City of Escondido		•	•
906	Peñasquitos	Miramar Air Station CPA	City of San Diego		•	
		Mission Bay Park CPA	City of San Diego		•	•
		Rancho Peñasquitos CPA*	City of San Diego		•	•
		University CPA*	City of San Diego		•	•
		La Jolla CPA*	City of San Diego		•	•
		Clairemont Mesa CPA*	City of San Diego		•	•
		Pacific Beach CPA*	City of San Diego		•	•
905 906	San Dieguito San Diego	Ramona CPA*	County		•	•
907	San Diego	Bostonia County/Lakeside CPA*	County	•	•	•
		Central Mountain CPA	County		•	
		Julian CPA	County		•	•
		City of El Cajon	City of El Cajon	•	•	•
		Rancho Bernardo CPA*	City of San Diego		•	•
907 908	San Diego Pueblo	Normal Heights CPA	City of San Diego	•	•	•
		College Area CPA	City of San Diego	•	•	•
		Ocean Beach CPA	City of San Diego	•		
		Midway CPA	City of San Diego	•	•	•
		County Islands CPA	County		•	•
		Old San Diego CPA	City of San Diego	•	•	•
		Kensington-Talmadge CPA*	City of San Diego		•	•
907 909	San Diego Sweetwater	Alpine CPA*	County		•	
		Cuyamaca CPA	County		•	
		Descanso CPA*	County		•	
908	Pueblo	Barrio Logan CPA	City of San Diego	•	•	•
		Centre City CPA	City of San Diego	•		
		Spring Valley CPA	County		•	•
		City Heights CPA	City of San Diego	•	•	•
		Eastern Area CPA	City of San Diego	•	•	•
		Greater Golden Hill CPA	City of San Diego	•	•	•
		Greater North Park CPA	City of San Diego	•		
		Encanto CPA	City of San Diego	•	•	•
		Lindbergh Field CPA	City of San Diego	•	•	
		Southeastern San Diego CPA	City of San Diego	•	•	•
		Uptown CPA*	City of San Diego		•	•
908 909	Pueblo Sweetwater	City of National City	City of National City	•	•	•
		Skyline-Paradise Hills CPA*	City of San Diego		•	•

HU ¹	Name ²	Disadvantaged City or Community Planning Area (CPA) ³	Jurisdiction	2000 DACs	2010 DACs	2013 DACs
910 911	Otay Tijuana	City of Imperial Beach	City of Imperial Beach	•	•	•
		Otay Mesa - Nestor CPA	City of San Diego		•	•
911	Tijuana	San Ysidro CPA	City of San Diego	•	•	•
		Mountain Empire CPA	County	•		•
		Desert CPA	County		•	•
911 909	Tijuana Sweetwater	Pine Valley CPA	County		•	•
<i>80% Statewide Median Household Income</i>				<i>\$37,520</i>	<i>\$48,706</i>	<i>\$46,979</i>

1 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

2 Some planning areas fall within multiple watersheds

3 * denotes a CPA that contains small pocket(s) of DAC

DAC advocates have indicated that additional efforts to validate DACs in the Region are necessary, because U.S. Census data is often unable to capture the true economic conditions of various communities in San Diego County, particularly those communities with a high number of undocumented residents, tribal communities, or other residents that may not participate in providing information to the U.S. Census. For the 2013 IRWM Plan, this effort included using 2013 MHI projections on a Census block level for a refined understanding of DAC areas. Areas that may no longer qualify as DACs per the 2013 data, but are considered DACs with the 2010 data, remain areas of concern and will continue to be included in outreach efforts associated with the IRWM Program.

DAC Assistance

The RWMG has worked directly with many organizations that are involved with addressing water-related issues of DACs and environmental justice (EJ) communities within the Region, including: San Diego Coastkeeper, Environmental Health Coalition, Rural Community Assistance Corporation (RCAC), Jacobs Center for Neighborhood Innovation, Groundwork San Diego-Chollas Creek, WildCoast, and others. Outreach has focused on identifying DAC issues, needs, and concerns, as well as ensuring DAC and EJ representation on the RAC.

Within the San Diego IRWM Region, DACs are typically classified as either an Urban DAC – those DACs that are located within the Water Authority’s service area (with municipal water and wastewater service), or a Rural DAC – those DACs that exist outside the bounds of a city or are not served by a Water Authority member agency. This distinction aids planners in addressing the true needs of DACs in the Region, as Rural DACs and Urban DACs face different issues and challenges. Some areas are rural in nature due to their distance from the Region’s urban core, although they are served by large public water systems and therefore have characteristics of both Rural and Urban DACs. One such community, which includes Ramona, is provided water services by Ramona MWD, a Water Authority member agency.

In 2010, 2012, and 2013, targeted outreach to DACs was undertaken by the RWMG. The purpose of this outreach effort was to develop an understanding of the water needs in DACs within the Region, and increase awareness of IRWM funding opportunities.

Urban DACs Issues and Needs

As described above, Urban DACs fall within the service area of a water or wastewater agency. Of the communities in the Region that have been identified as DACs using both 2010 and 2013 data, the majority are Urban DACs. These include:

- Miramar Air Station CPA*
- Mission Bay Park CPA
- City of El Cajon
- Normal Heights CPA
- Old San Diego CPA
- Barrio Logan CPA
- Eastern Area CPA
- College Area CPA
- Midway CPA
- Twin Oaks CPA†
- North County Metro CPA*
 - City of Escondido
 - City of San Marcos
- Bostonia County/Lakeside CPA†
- City of Oceanside†
- City of Carlsbad†
- Pacific Beach CPA†
- Rancho Bernardo CPA†
- Uptown CPA†
- City Heights CPA
- Encanto CPA
- Lindbergh Field CPA*
- Southeastern San Diego CPA
- City of National City
- City of Imperial Beach
- San Ysidro CPA
- Otay Mesa-Nestor CPA**
- Greater Golden Hill CPA
- Ramona CPA†
- Spring Valley CPA
- County Islands CPA
- Fallbrook CPA†
- Rancho Peñasquitos CPA†
- University CPA†
- La Jolla CPA†
- Clairemont Mesa CPA†
- Kensington-Talmadge CPA†
- Skyline-Paradise Hills CPA†

* Area meeting 2010 DAC criteria but not 2013 criteria

**Area meeting 2013 DAC criteria but not 2010 criteria

†CPA containing only a small pocket(s) of DAC

Because Urban DACs are located within water agency service areas, their water resources needs are generally centered around community development and surface water quality issues, rather than drinking water quality or drinking water supply issues, as they receive safe drinking water through their water agency. DWR's definition of a critical water supply or water quality need of a DAC often fails to encompass what the Urban DACs (and their relevant planning agencies) consider a critical water supply or water quality need. Therefore it can be challenging to obtain funding for Urban DAC water projects, as they often do not qualify for the funding match waivers frequently provided for DAC projects. While Urban DACs in the Region receive safe drinking water from local water agencies, increases in water rates (refer to Section 3.10 for more information) can have a disproportionate impact on DAC residents, because they tend to spend a larger percentage of their income on water compared to those in higher-income communities. .

During rain events, Urban DACs often suffer from flooding due to creek constrictions, which can result from inadequately-sized drains and culverts, vegetation overgrowth (particularly *Arundo donax*), creek realignment, pollution, or illegal dumping. Urban DAC areas are also prone to flooding due to high runoff from impervious surfaces associated with urbanization and the typical lack of parks or other non-paved recreation areas in Urban DACs. In order to improve surface permeability while not restricting economic growth potential in Urban DACs, more assistance is necessary for de-channelization, hydro-modification, and to implement Low Impact Development (LID) projects to reduce stormwater runoff and associated flooding. These projects could also be used as an



Illegal dumping in creeks and watersheds is a common problem faced by Urban DACs.

Photo credit: Leslie Reynolds, Groundwork San Diego-Chollas Creek



Water quality concerns in urban creeks can result from illegal dumping, invasive species, and stormwater runoff.

Photo credit: Leslie Reynolds, Groundwork San Diego-Chollas Creek

opportunity to provide increased access to recreational areas, which is sorely lacking in most Urban DACs.

The high volume of stormwater runoff also contributes to the poor surface water quality in Urban DACs, as it is often polluted and drains directly into creeks. Although many of the residents of Urban DACs are aware of the pollution problems, and TMDLs have been developed for some streams that traverse Urban DACs, challenges remain. For example, while TMDLs for metals and bacteria in Chollas Creek have been developed, illegal dumping (especially of large trash items such as mattresses) in creeks and watersheds is a common problem that causes water quality issues in Urban DACs. A large-trash collection program would help reduce these incidents and the public health and safety hazards they often represent. Watershed stakeholders have reported that homelessness presents water quality issues throughout the Region, especially in homeless encampments located alongside the Region's water bodies that are prone to becoming a place for trash and other illegally-dumped items to accumulate.

Pollution of San Diego Bay waters also substantially impacts Urban DACs, many of which are located adjacent to the Bay, near industrial areas. Bay pollution from industry, runoff, and other activities has negatively impacted subsistence fishermen, many of whom are residents of Urban DACs.

Additionally, insufficient water quality monitoring has been completed in the San Diego Bay wetlands, again located near or in Urban DACs, to understand and address water quality issues. Low-lying Urban DACs near the Bay will also suffer disproportionately from the effects of sea level rise as a result of climate change. These areas will be more susceptible to floods and inundation from storm surges, which are anticipated to be larger and more frequent.

One of the biggest issues facing Urban DACs is food security. Food security is one of the highest priorities in these areas and must be addressed before full DAC involvement in other issues, including water quality. However, some urban DACs use community gardens to help offset food needs, and irrigation costs may impact their ability to care for such gardens.

Urban DACs, like their rural counterparts, frequently lack the financial and technological resources to design, implement, operate, and maintain water projects. Because of this, they require financial assistance for project implementation, particularly to support ongoing operation and maintenance (O&M) costs. Non-governmental organizations (NGOs) that propose projects in Urban DACs should consider the long-term stewardship of the projects in question, and determine post-project ownership of any acquired land at the outset of the projects, to ensure the resources necessary to achieve the long-term benefits associated with the projects. For creek restoration projects, or those projects that improve recreational or access opportunities, public safety should always be considered. In Urban DACs, there may be a need for additional park rangers or security officers to ensure public safety in recreation areas.

Effective water conservation, watershed, and stormwater management outreach and education is lacking in Urban DACs. In order to be most effective, outreach and education efforts should come from the community or peers, rather than top-down through an agency. Outreach efforts should also aim to raise awareness of the existence of surface waters in Urban DACs, which will assist in improving stewardship of these resources. These efforts should be tailored to the community and be multilingual.

Priority projects in Urban DACs include those with education, creek restoration, passive recreation, hydro-modification, stormwater management/pollution prevention, public safety, and those that address sea level rise adaptation components.

Rural DACs

Rural DACs are located outside of the jurisdictional boundaries of the Region's water and wastewater agencies, and are not provided municipal water supply or wastewater infrastructure. Of the communities in the Region that have been identified as DACs using both the 2010 and 2013 data, the following are Rural DACs:

- North Mountain County CPA
- Pala-Pauma CPA*
- Palomar Mountain CPA
- Pendleton-DeLuz CPA
- Pine Valley CPA
- Mountain Empire CPA**
- Alpine CPA*†
- Central Mountain CPA*
- Cuyamaca CPA*
- Descanso CPA*†
- Julian CPA
- Desert CPA

** Area meeting 2010 DAC criteria but not 2013 criteria*

***Area meeting 2013 DAC criteria but not 2010 criteria*

†CPA containing only a small pocket(s) of DAC

It should be noted that more rural communities may be designated as DACs following additional efforts that may be taken to characterize DACs in the Region.

Unlike Urban DACs, Rural DACs are not consistently supplied with a safe source of drinking water. Due to infrastructure, source water quality, and other issues, the primary water-related concern of Rural DACs is meeting drinking water needs with a safe, reliable source of drinking water. Rural DACs often lack access to much-needed infrastructure and financing, as well as the resources to adequately maintain existing system facilities. As a result, drinking water systems in Rural DACs often face significant challenges in complying with longstanding and new drinking water rules (EPA 2007).

Three major problems that impede the sustainability of small community water systems include:

- 1) contamination of drinking water source water from wastewater intrusion, agricultural influences, naturally occurring contaminants, and/or contaminant spills from industrial activities;
- 2) seasonal weather changes resulting in floods or droughts may require design options to bypass treatment during rain and storm events and identification of alternative water supplies (including water reuse sources) to increase capacity during droughts; and
- 3) deteriorating collection and distribution systems compromise source water quality and increase the cost of water treatment.

Rural communities within the San Diego IRWM Region's unincorporated areas have water supply and water quality issues that may be exacerbated by climate change, poor economies, and lack of community expertise. Inadequate water supply to support existing communities is a public health risk, especially considering that the rural portions of the Region are also those that are particularly susceptible to wildfires. The majority of drinking water maximum containment level (MCL) violations in the Region occur with small public water systems, and inadequate wastewater treatment can result in unplanned discharge events.

The infrastructure needs of Rural DACs are so extensive that there is not enough currently available funding to meet the needs of Rural DACs throughout the Region. CDPH has 41 small (less than 10,000 population) systems located in San Diego County on its 2013 State Revolving Fund (SRF) Priority Project List, with many systems listed for multiple improvements (CDPH 2013). The State Board has a similarly lengthy list of communities requesting funding from the Clean Water SRF for wastewater improvements. Additional challenges to obtaining funding for Rural DAC projects includes a regulatory burden that is often too difficult for Rural DACs to meet and difficulties in providing matching funds, both of which cause DAC projects to look unfavorable when compared to non-DAC projects during consideration for funding.

Rural DACs in the San Diego IRWM Region are faced with critical water supply issues in that some areas have inadequate water supplies to support existing connections. Rural DACs also face water quality issues associated with costs as it is costly to provide supplemental treatment processes to improve the water quality of contaminated drinking water source waters, and it is also difficult for small DAC systems to afford improvements because they have fewer ratepayers to share the costs. Further, Rural DACs may lack the technical expertise and financial stability to access funding programs that could be implemented to address cost-related issues. Because of the lack of internal capacity for small water systems, a supporting agency should provide capacity (such as engineering) to support necessary improvements for Rural DAC systems. The lack of technical



Aging storage tanks can lead to contamination of rural water supplies.

Photo credit: Dave Harvey, Rural Community Assistance Corporation

capacity and support from agencies also contributes to the high cost of DAC projects through an inability to adequately perform O&M activities during the life of a system.

Some of the other issues facing Rural DACs include groundwater contamination, potentially from leaking septic tanks. Leaking or improperly sited septic tanks also pose a public health hazard, though the conversion from septic to sewer is expensive, and Rural DACs often struggle to find assistance in funding such projects. The San Dieguito and San Diego groundwater basins have experienced contamination, as has the Otay/San Diego Formation, which is being considered by U.S. Geological Survey (USGS) for groundwater use. As described above, small water systems often lack the ability to treat contaminated water with a supplemental treatment process. Drinking water supplies for some Rural DACs have also been contaminated with ash from recent wildfires. It is anticipated that the projected increase in wildfire frequency and intensity resulting from climate change will inordinately affect Rural DACs, which are more likely to be located near fire-prone areas and less likely to have the ability to defend against fires. Some Rural DACs lack sufficient water supplies for fire protection, further increasing the danger.

Illegal dumping, especially of chemicals or hazardous wastes in creeks and watersheds, is a common problem reported in Rural DACs. Awareness of existing programs such as the County's permanent Household Hazardous Waste Collection Facilities in Ramona and El Cajon and the County's collection events that travel throughout unincorporated areas of the County can help to reduce illegal dumping and associated water quality impacts.

To meet the needs of Rural DACs, the San Diego IRWM Region will need to identify solutions that recognize that the needs of Rural DACs differ from those of Urban DACs. In order to be most effective, the Region may develop and implement targeted, multilingual outreach to Rural DACs that is tailored to the community being addressed. Finally, appropriate support must be provided to enable Rural DACs to develop projects, secure funding for projects, and properly operate and maintain their systems.

Community Support for DACs and Environmental Justice Communities

The U.S. EPA defines Environmental Justice as:

...the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies...It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

In addition to the efforts of the San Diego IRWM Program, a variety of organizations in the IRWM Region work to address the needs of DACs and EJs:

San Diego Coastkeeper

The San Diego Coastkeeper's mission is to protect and restore fishable, swimmable, and drinkable waters in San Diego County. Coastkeeper enhances public awareness of water quality and other water-related issues through their extensive community outreach and participation program that involves hands-on stewardship activities such as beach cleanups and water quality sampling.

Rural Community Assistance Corporation

The Rural Community Assistance Corporation (RCAC) focuses its San Diego-based efforts in the rural portions of the Region that generally do not receive municipal water or wastewater services.

RCAC completes a variety of work to address the needs of DACs and EJs, including providing technical assistance, training, and funding support.

California Rural Water Association

California Rural Water Association (CRWA) works to provide on-site technical assistance and specialized training for rural water and wastewater systems. Similar to RCAC, CRWA focuses its work on the rural portions of the Region that do not receive municipal water or wastewater.

Environmental Health Coalition

The Environmental Health Coalition (EHC), founded in 1980, is a community-based organization founded in Barrio Logan, an Urban DAC. It works to achieve environmental and social justice through leader development, organizing, and advocacy. EHC focuses on green energy and jobs, healthy kids, border environmental justice, and toxic-free neighborhoods.

Groundwork San Diego

Groundwork San Diego–Chollas Creek works with the communities surrounding Chollas Creek to improve the creek and communities. It strives to create opportunities for people to learn new skills and take action, help businesses grow, and create safer and healthier neighborhoods. It achieves these goals through three overarching programs: 1) Environmental education, 2) Clean creeks and healthy habitats, and 3) Thriving communities.

Jacobs Center for Neighborhood Innovation

The Jacobs Center for Neighborhood Innovation seeks to create community change by teaming up with residents in under-invested communities. It seeks to empower residents to take ownership of the change they wish to see in their communities, and provide financial, technical, and other forms of support. The Jacobs Center works in Chollas View, Emerald Hills, Lincoln Park, Mountain View, Mount Hope, North Encanto, Oak Park, South Encanto, Valencia Park, and Webster.

Civic San Diego

Civic San Diego is a public non-profit founded by the City of San Diego following the dissolution of the Redevelopment Agency of the City of San Diego in 2012. Its main responsibility has been the redevelopment and subsequent revitalization of Downtown San Diego, though it also works in the surrounding neighborhoods, including four Urban DACs: Barrio Logan, City Heights, Southeastern, and San Ysidro.



Jacobs Center for Neighborhood Innovation serves an important role in improving creek conditions in Southeast San Diego.

Photo credit: Charles Davis, Jacobs Center for Neighborhood Innovation

3.4 Watersheds

As shown in Figure 3-1, the Region addressed in this IRWM Plan is comprised of eleven watersheds that are tributary to coastal waters. Table 3-10 summarizes the characteristics of the eleven watersheds, which are described in greater detail in *Chapter 5, Watershed Characterizations*.

3.5 Water Management Systems

This section includes an overview of the various water management systems in the San Diego IRWM Region, including water supply, wastewater, water reuse, stormwater, and flood control.

Table 3-11 presents a breakdown of member agency water supplies from 2010-2011. Approximately 21% of the overall regional supply was from local sources (groundwater, local surface water, and recycled water). A total of 10 member agencies use local surface water sources, of these nine develop potable supplies from the local surface waters, and 10 member agencies develop local groundwater supplies. Additionally, 16 of the 24 Water Authority member agencies provide recycled water supply for irrigation purposes and other non-potable uses within their respective service areas.

Local hydrologic conditions (precipitation, evaporation, and surface flows) influence both the quantity of water demand and the availability of local supplies within the Region. Total water use can also be influenced by local economic conditions, which contributed to the reduction in demands between 2007 and 2012. Table 3-12 summarizes the variation in Region's local water supplies from 1999-2011.

Water Supply outside Water Authority Service Area

All but a small fraction of the Region's 3.1 million residents live within the Water Authority's service area (refer to Table 3-1). Rural residences and small communities that exist outside the Water Authority service area are entirely dependent on groundwater resources, and rely exclusively on individual groundwater wells or community water wells operated by small community water systems or private water companies.

While the Region's groundwater-dependent population is relatively small (compared to the population served by the Water Authority), the population is spread over a significant geographic portion of the Region. The availability of groundwater in the portion of the Region that lies east of the Water Authority's service area is limited by (1) available precipitation recharge, (2) recharge infiltration limitations, (3) low aquifer yields, and (4) limited groundwater storage capacity. The majority of this area is underlain by fractured rock aquifers. Such aquifers typically have well yields no more than several gallons per minute. Shallow alluvial valleys exist along several of the river and stream valleys in portions of the eastern section of the Region. Groundwater production from these shallow aquifers, however, is constrained by the limited aquifer storage. Overall, the groundwater-limiting factors listed above severely limit the potential of additional growth and development in this area of the County.

Table 3-10: Summary of the Region's Watersheds¹

HU ²	Name	Watershed Area (sq. miles)	Primary Watercourses or Hydrologic Areas	Approximate Length ³ (miles)	Elevation Range ⁴ (feet MSL)	Primary Tributaries
901	San Juan	150 ⁵	San Mateo Creek San Onofre Canyon Las Pulgas Canyon	21	0 - 3575	Coastal estuaries/marshes Pacific Ocean
902	Santa Margarita River	200 ⁶	Santa Margarita River	55	0 – 6190	Santa Margarita Estuary Pacific Ocean
903	San Luis Rey River	558	San Luis Rey River	52	0 – 6530	San Luis Rey River Mouth Pacific Ocean
904	Carlsbad	210	Loma Alta Creek	8	0 – 460	Loma Alta Slough Pacific Ocean
			Buena Vista Creek	11	0 – 1670	Buena Vista Lagoon Pacific Ocean
			Encinas HA	4	0 - 350	Pacific Ocean
			Aqua Hedionda Creek	10	0 – 1300	Agua Hedionda Lagoon Pacific Ocean
			San Marcos Creek	14	0 – 1670	Batiquitos Lagoon Pacific Ocean
			Escondido Creek	24	0 – 2330	San Elijo Lagoon Pacific Ocean
905	San Dieguito River	346	San Dieguito River	42	0 – 5720	San Dieguito Lagoon Pacific Ocean
906	Peñasquitos	100	Los Peñasquitos Creek Rose Creek Tecolote Creek	18	0 – 2700	Los Peñasquitos Lagoon Mission Bay
907	San Diego River	440	San Diego River	44	0 – 6510	San Diego River Estuary Pacific Ocean
908	Pueblo	60	Chollas Creek	8	0 – 830	San Diego Bay Pacific Ocean
909	Sweetwater River	230	Sweetwater River	41	0 – 6510	Sweetwater River Estuary San Diego Bay
910	Otay River	160	Otay River	23	0 – 3720	San Diego Bay
911	Tijuana River	470 ¹¹	Tijuana River	47	0 – 6380	Tijuana River Estuary Pacific Ocean

¹ Adapted from basin descriptions presented in Comprehensive Water Quality Control Plan Report (Regional Board, 1976).

² Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

³ Approximate distance of eastern end of the watershed to the Pacific Ocean.

⁴ Approximate range of elevation in feet above mean sea level (MSL) within the watershed.

⁵ The San Juan Watershed comprises approximately 476 square miles. The lower 150 square miles of this watershed is within the County and the Region addressed within this IRWM Plan; this area includes four hydrologic areas: San Mateo, San Onofre, Las Pulgas, and Stuart Mesa. The upper portion of the watershed lies within Orange County and is addressed by that Region's IRWM Plan.

⁶ The Santa Margarita River Watershed area is approximately 750 square miles. The lower 200 square miles of this watershed is within the County and the Region addressed within this IRWM Plan. The remainder of the Santa Margarita River Watershed lies within Riverside County, and includes the communities of Temecula and Murrieta.

⁷ The Tijuana River Watershed is approximately 1,750 square miles; approximately 27% of the land area is within the Region.

While some community well systems outside the Water Authority's service area maintain records of overall water production, very few wells are required to be metered for production. As a result, it is difficult to estimate the overall quantity of water supplies used. The low-density residential population in this area uses a small fraction of water when compared to the overall Water Authority supply. However, non-residential water use within this area (e.g. agriculture, golf courses, campgrounds, resorts, retreat centers, public parks, casinos, hotels, and industrial uses) can represent a sizable demand on available groundwater resources.

Table 3-11: Member Agency Water Supply – Water Authority Service Area

Water Authority Member Agency	2011 Water Supply ¹ (Acre-feet per Year)			Percent of Supply from Local Sources	Source of Member Agency Local Supply		
	Total Agency Supply	Water Authority Imported Supply	Member Agency Local Supply ²		Recycled Water	Local Surface Water	Ground-water
Carlsbad MWD	19,231	15,830	3,401	17.69%	•		
City of Del Mar	1,151	1,088	63	5.46%	•		
City of Escondido	23,355	13,307	10,049	43.02%	•	•	
Fallbrook PUD	12,158	11,649	508	4.18%	•	•	
Helix Water District	31,811	20,666	11,145	35.04%		•	•
Lakeside Water District	3,910	3,251	659	16.85%			•
City of National City ³	6,685	1,685	5,000	74.79%		•	•
City of Oceanside	26,193	21,559	4,635	17.69%	•		•
Olivenhain MWD	20,958	18,440	2,518	12.02%	•		
Otay Water District	33,710	29,861	3,849	11.42%	•		
Padre Dam MWD	12,168	11,459	709	5.83%	•		
Camp Pendleton	9,244	838.6	8,406	90.93%	•		•
City of Poway	11,181	10,603	578	5.17%	•		
Rainbow MWD	18,608	18,608	0	0.00%			
Ramona MWD	6,522	5,808	714	10.94%	•	• ⁴	•
Rincon Del Diablo MWD	8,142	5,770	2,371	29.12%	•		
City of San Diego	189,393	161,552	27,842	14.70%	•	•	•
San Dieguito Water Dist.	6,863	1,901	4,962	72.30%	•	•	
Santa Fe Irrigation Dist.	9,475	4,102	5,373	56.71%	•	•	
South Bay Irrigation Dist. ³	14,136	5,344	8,792	62.20%		•	•
Vallecitos Water District	15,412	15,412	0	0.00%			
Valley Center MWD	26,100	25,674	426	1.63%	•		
Vista Irrigation District	17,916	10,818	7,097	39.61%		•	•
Yuima MWD	2,623	1,619	1,004	38.29%			•
Totals	526,945	416,844	110,101	20.89%			

1 From Water Authority Annual Report for Fiscal Year 2010-2011 (Water Authority, 2011b).

2 Includes local recycled water, surface water, and groundwater supplies. Does not reflect conserved water. Also does not include groundwater pumped by private well owners or surface water outside the Water Authority's service area.

3 Local water supply is from Sweetwater Authority (a joint powers agency comprised of the South Bay Irrigation District and City of National City).

4 Ramona MWD uses local surface water along with imported raw water for irrigation customers. Ramona MWD currently does not treat local surface water for potable use.

3.5.1 Imported Water

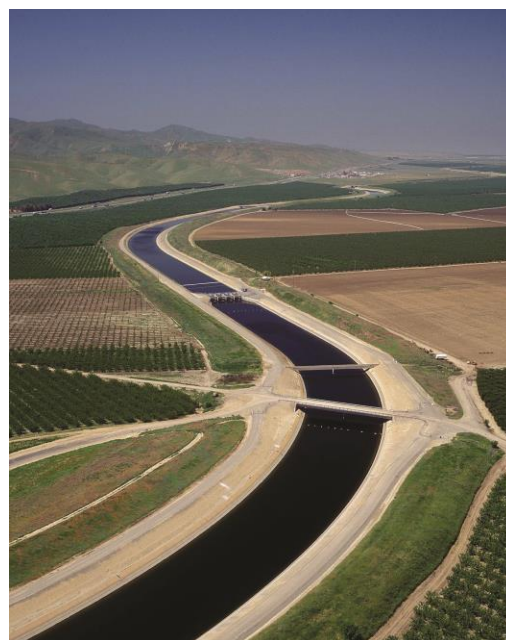
The Water Authority purchases imported water from three main sources: the Metropolitan Water District of Southern California (Metropolitan), conserved agricultural water from the Imperial Irrigation District (IID), and conserved water from projects that lined the All-American and Coachella Canals. The Water Authority has also acquired spot water transfers to offset reductions in supplies from Metropolitan during water shortage years.

Metropolitan is Southern California's wholesale water agency, and the Water Authority is the largest customer among Metropolitan's 26 member agencies. Metropolitan derives its water supply from two sources: the Colorado River and the State Water Project (SWP). Metropolitan owns and operates the Colorado River Aqueduct to deliver Colorado River water to Southern California. Metropolitan is the largest of the State Water Contractors that receive supplies from the SWP. SWP water (originating from the Bay Delta) is delivered to Metropolitan via the California Aqueduct.

In 1998, the Water Authority entered into a transfer agreement with IID to purchase conserved agricultural water. Through the agreement, the Water Authority received 70,000 acre-feet (AF) in 2010 and will receive an annually-increasing volume up to 200,000 AF by 2021. The volume then remains fixed for the remainder of the 75-year agreement. Metropolitan conveys the IID transfer water to the Water Authority via an exchange agreement. Through the 2003 Quantification Settlement Agreement (QSA) on the Colorado River, the Water Authority also receives 77,700 AF per year of conserved water from lining of the All-American and Coachella Canals for 110 years (Water Authority, 2013).

As shown in Table 3-12, imported water supplies provided through the Water Authority have comprised between 79 and 93% of the Region's water supply in recent years. Except during periods of extreme drought, Water Authority supplies typically comprise approximately 80% of the Region's water supply.

The Water Authority takes delivery of the Metropolitan/IID transfer and canal lining project supplies at a point located six miles south of the San Diego County-Riverside County border. The Water Authority conveys imported water to its member agencies through two aqueducts that consist of five large-diameter pipelines. Figure 3-5 shows the locations of the Water Authority aqueducts. The aqueducts follow general north-to-south alignments, and the water is delivered largely by gravity. The First Aqueduct includes Pipelines 1 and 2, which are located in a common right-of-way and are operated as a unit. These pipelines have a combined capacity of 180 cubic feet per second (CFS). Pipelines 3, 4, and 5 form the Second Aqueduct. These pipelines are operated independently and are located in separate rights-of-way from the First Aqueduct. Pipelines 3, 4, and 5 have respective capacities of 280 CFS, 470CFS, and 500CFS. Key appurtenant facilities to the aqueduct system include flow control facilities, pump stations, control valves, and air release mechanisms. The Water Authority delivers the imported supply to member agencies via 88 turnouts along the aqueduct system.



Imported water provides approximately 80% of the Region's water supply.

Photo credit: San Diego County Water Authority

Table 3-12: Imported Water Reliance within the Region, 1999-2011

Fiscal Year	Water Supply in Acre-feet per Year ¹			Percent of Regional Supply from Imported Water ²
	Total Regional Supply ²	Water Authority Imported Supply	Member Agency Local Supply ³	
1999-2000	694,995	580,118	114,877	83.5%
2000-2001	646,387	564,140	82,247	87.3%
2001-2002	686,529	615,572	70,957	89.7%
2002-2003	649,622	586,849	62,773	90.3%
2003-2004	715,763	666,008	49,755	93.0%
2004-2005	644,845	573,048	71,797	88.9%
2005-2006	687,253	576,620	110,633	83.9%
2006-2007	741,893	661,309	80,584	89.1%
2007-2008	691,931	608,903	83,029	88.0%
2008-2009	643,900	555,789	88,211	86.3%
2009-2010	566,443	494,960	71,484	87.4%
2010-2011	526,945	416,844	110,101	79.1%

1 From *Water Authority Annual Reports* for Fiscal Years 1999-2000 through 2010-2011 (Water Authority, 2011b).

2 Regional supply provided by water agencies within the Water Authority service area. As noted in Table 3-1 all but a small fraction of the Region's population is within the Water Authority service area. Local groundwater is the source of water supply in rural areas outside the water distribution networks of the Water Authority member agencies.

3 Includes local recycled water, surface water, and groundwater supplies. Does not reflect conserved water. Also does not include groundwater pumped by private well owners.

The five pipelines of the First and Second Aqueducts allow the Water Authority to take delivery of both treated (filtered and disinfected) and untreated water from Metropolitan. The Water Authority's treated water supplies come from its own Twin Oak Valley Water Treatment Plant, purchases from Metropolitan's Skinner Water Treatment Plant, and purchases from the Helix Water District's R.M. Levy Water Treatment Plant. These supplies are delivered directly to member agency potable water distribution systems. Untreated water supplies are delivered to member agency surface reservoirs or water treatment facilities.

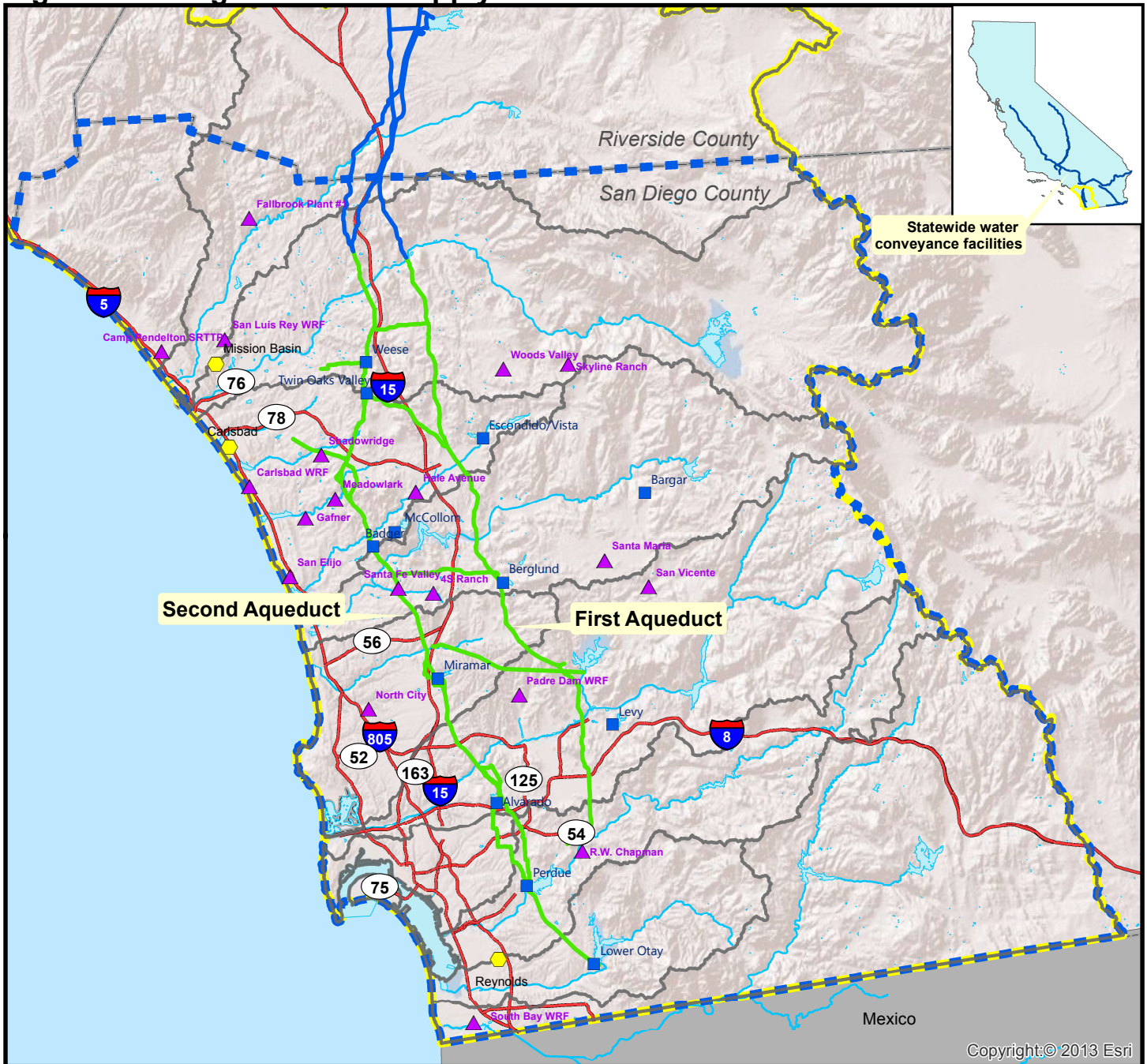
3.5.2 Regional Water Supply Infrastructure

Figure 3-5 presents the location of key local water supply infrastructure within the Region. The 25 surface water reservoirs located within the Region are summarized in Table 3-13. Local water supply reservoirs exist within eight of the Region's eleven watersheds, and local surface water supplied 27,300 AF of water in 2010 (Water Authority 2011). A total of 17 reservoirs are currently connected to the Water Authority's aqueduct system.

Several reservoirs within the Region are currently operated as hydroelectric power generation facilities: the Bear Valley Facility which is connected to Lake Wohlford and operated by the City of Escondido, two facilities (Roger Miller and David C. McCollom) that are operated by the Olivenhain Municipal Water District and connected to the Olivenhain Reservoir, and a forty megawatt (40 MW) power generation facility that was constructed as part of a pumped storage project that links Olivenhain Reservoir and Hodges Reservoir.

Table 3-14 summarizes regional water treatment facilities operated by the Water Authority and its member agencies and identifies associated sources of filtration plant raw water supply.

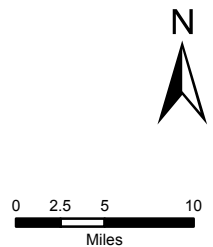
Figure 3-5: Regional Water Supply Infrastructure



Legend

- Water Treatment Plant
- ▲ Water Reclamation Facility
- ⬡ Desalination Facility
- Metropolitan Water District Aqueducts
- San Diego County Water Authority Aqueducts
- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- Waterbody
- County
- River
- Freeway

Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse, Metropolitan Water District
 \\vmcsd\RMCS\Projects\GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-5_Regional Water Supply Infra 060713.mxd



RMC

Table 3-13: Principal Surface Water Reservoirs¹

HU ²	Watershed	Reservoir	Operating Agency	Capacity (Acre-Feet)	Aqueduct Connection ³
903	San Luis Rey	Turner ⁵	Valley Center Municipal Water Dist.	1,612 ⁴	
		Henshaw	Vista Irrigation District	51,774	
904	Carlsbad	Dixon	City of Escondido	2,606	•
		Wohlford	City of Escondido	6,506	
		Olivenhain ⁶	Water Authority and Olivenhain Municipal Water District	24,364	•
		San Dieguito	San Dieguito Water District and Santa Fe Irrigation District	883	•
905	San Dieguito	Hodges	City of San Diego	30,251	•
		Sutherland	City of San Diego	29,685	
		Ramona	Ramona Municipal Water District	12,000	•
		Poway	City of Poway	3,330	•
906	Peñasquitos	Miramar	City of San Diego	7,185	•
907	San Diego	Murray	City of San Diego	4,818	•
		San Vicente	City of San Diego	90,230	•
		El Capitan	City of San Diego	112,807	• ⁷
		Cuyamaca	Helix Water District	8,195	
		Lake Jennings	Helix Water District	9,790	•
909	Sweetwater	Loveland	Sweetwater Authority	25,387	
		Sweetwater	Sweetwater Authority	28,079	•
910	Otay	Lower Otay	City of San Diego	49,510	•
911	Tijuana	Barrett	City of San Diego	37,947	
		Morena	City of San Diego	50,207	

1 From 2010 Urban Water Management Plan (Water Authority, 2011).

2 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

3 Bullets indicate which reservoirs are connected to the Water Authority's San Diego Aqueduct to receive untreated aqueduct water.

4 Reservoir is not currently used as a source of raw potable water supply.

5 Reservoir is out of service for maintenance and scheduled to return online in 2012.

6 Reservoir jointly owned and operated by the Water Authority and Olivenhain Municipal Water District. Reservoir is part of the Water Authority's Emergency Storage Program.

7 El Capitan Reservoir is indirectly connected, via San Vicente Reservoir, to the Water Authority's aqueduct.

Table 3-14: Potable Water Treatment Facilities¹

HU ²	Watershed	Treatment Facility	Operating Agency	Capacity (million gallons per day)	Aqueduct Connection ³
903	San Luis Rey River	Weese	City of Oceanside	25	•
904	Carlsbad	Escondido/Vista ⁴	City of Escondido Vista Irrigation District	65	•
		Badger ⁵	San Dieguito Water District Santa Fe Irrigation District	40	•
		McCullom ⁵	Olivenhain Municipal Water District	34	•
		Escondido/Vista ⁴	City of Escondido Vista Irrigation District	65	•
		Twin Oaks Valley	San Diego County Water Authority	100	•
905	San Dieguito River	Berglund	City of Poway	24	•
		Bargar	Ramona Municipal Water District	4 ⁶	
906	Peñasquitos	Miramar	City of San Diego	140 ⁷	•
907	San Diego River	Alvarado ^{7,8}	City of San Diego	200	•
		Levy	Helix Water District	106	•
909	Sweetwater	Perdue	Sweetwater Authority	30	•
910	Otay	Lower Otay	City of San Diego	40	•

1 From 2010 *Urban Water Management Plans* (Water Authority, 2011a and City of San Diego, 2011).

2 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

3 Bullets indicate which treatment plants are connected to receive untreated water from the Water Authority's San Diego Aqueduct.

4 Treatment plant is physically located within the Carlsbad Watershed, but receives untreated water from Lake Henshaw (Vista Irrigation District) within the San Luis Rey River (903) watershed.

5 Treatment plant is located within the Carlsbad Watershed, but receives surface water supplies from imported water sources and from Hodges Reservoir within the San Dieguito Watershed (905).

6 The Bargar Water Treatment Plant has not been in operation since 2007 when it could not meet new requirements. In 2011 the Ramona Water District Board of Directors agreed not to pursue a plan to bring the out-of-service plant into operation during times of emergency.

7 The Miramar Water Treatment Plant has the ability to increase to 215 million gallons per day (MGD) in the future with approval from CDPH based upon results of a future treatment process study (high Filtration Rate Study) that is yet to be performed (City of San Diego 2011).

8 Water from Sutherland Reservoir (within the San Dieguito River Watershed) can be directed to San Vicente Reservoir (within the San Diego River Watershed) (San Diego River Watershed Work Group 2005). San Vicente Reservoir is one of the sources of untreated water supply for the Alvarado Water Treatment Plant.

Public water agencies currently utilize groundwater resources to develop municipal water supply within the following watersheds: San Juan (901), Santa Margarita River (902), San Luis Rey River (903), San Dieguito River (905), San Diego (907), and Sweetwater (909). Demineralization treatment of groundwater is utilized in three of these groundwater basins. Table 3-15 summarizes groundwater demineralization treatment facilities within the Region.

Table 3-15: Groundwater Demineralization Facilities

HU ¹	Watershed	Groundwater Demineralization Facility	Operating Agency	Treatment Capacity ² (MGD)	Source of Groundwater
902	Santa Margarita	Haybarn Canyon	USMC Camp Pendleton	6.9	Santa Margarita Basin
903	San Luis Rey River	Mission Basin	City of Oceanside	6.37	Mission Basin
909	Sweetwater River	Reynolds	Sweetwater Authority	4.0	Lower Sweetwater Basin

1 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

2 Potable water production capacity. Influent treatment plant capacity is larger as part of the flow is lost as waste brine. MGD = million gallons per day

Emergency Storage Program

Recognizing the Region's dependence on timely delivery of imported water supplies, the Water Authority has initiated an Emergency Storage Project (ESP) designed to provide water to the Region during imported water interruptions of up to two months of complete loss of imported supplies or six months of partial outage.

When completed in 2014, the ESP will consist of storage and conveyance facilities that will allow the Water Authority to maintain a 75% service level to member agencies during interruption of imported water deliveries. ESP facilities will be located in the north and east portions of the Water Authority service area, and are being constructed in phases. Table 3-16 summarizes existing and planned ESP facilities.

Table 3-16: Emergency Storage Program Facilities and Schedule

Key Facilities	Facility Components and Details	Scheduled Completion
Olivenhain Dam/Reservoir, Pipeline and Pump Station	A. 318-foot tall Olivenhain Dam B. Olivenhain pipeline to connect the Olivenhain Reservoir to the Water Authority's Second Aqueduct C. Water transfer pump station	A. Completed in 2003 B. Completed in 2002 C. Completed in 2005
Hodges Reservoir Pipeline and Pump Station	A. Pipeline connecting Olivenhain Reservoir to Hodges Reservoir B. Electrical facilities to deliver power locally C. Pump station to generate power and move water between Hodges Reservoir and Olivenhain Reservoir	A. Completed in 2007 B. Completed in 2008 C. Operational in 2012
San Vicente Pipeline and Pump Station	A. 11-mile pipeline to connect the San Vicente Reservoir to the Water Authority's Second Aqueduct B. Pump station and other facilities to move water from San Vicente Reservoir to the Second Aqueduct	A. Completed in 2010 B. Completed in 2010
San Vicente Dam Raise	A. Additional 117 feet added to the existing San Vicente Dam to provide additional storage capacity for emergency use and during times of water scarcity	A. Under Construction through 2013
North County Pump Station	A. Pump station to move emergency water supplies to the northern-most areas of the County	A. Anticipated for completion by 2018

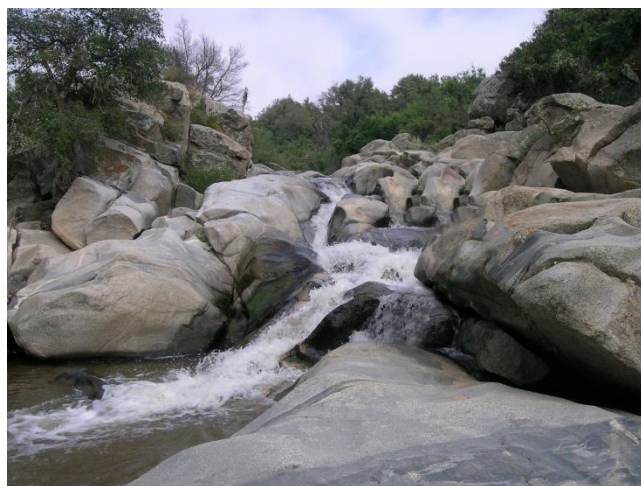
3.5.3 Surface Water Resources

There are over 200 streams and creeks in San Diego County, converging into five major rivers: the Santa Margarita, San Luis Rey, San Dieguito, San Diego, and Sweetwater Rivers.

Streamflow

A major element of the water cycle, streamflow refers to the flow of water in streams, rivers, and other channels. By volume, most of the surface flow in streams and rivers within the San Diego Region is from precipitation runoff (storm events). The amount of storm precipitation that becomes streamflow depends on (1) topography, land uses, and soil permeability; (2) the frequency and timing of storm events; and (3) stormwater management practices. Streamflows during non-storm periods (“dry weather flows”) are the result of urban runoff, agricultural runoff, and surfacing groundwater. Dry weather flows, though small by volume, are significant in that they may carry pollutant loads and can alter the seasonal nature of aquatic and riparian habitats.

Stream gaging stations monitored as part of the USGS network currently exist in all but two of the Region’s watersheds. Table 3-17 summarizes permanent streamflow monitoring stations within the region. More than 50 years of streamflow data are available from twelve of the Region’s streamflow gages. Table 3-17 also presents mean and median annual streamflow at each of the existing USGS stream gaging stations.



Santa Ysabel Creek just above the gorge.

Photo credit: Jeff Pasek, City of San Diego

Significant differences exist between mean and median streamflows. As previously noted the Region is categorized as a semi-arid climate and experiences few hydrologic events that contribute to surface flows. Mean streamflow is predominantly affected by sporadic extreme hydrologic events, whereas median streamflow is more representative of daily surface runoff for the Region.

Figures 3-6 through 3-8 present mean and median monthly streamflow for three of the largest watercourses within the Region. These three watercourses generate the same trend of peak streamflow in the February to March period. The figures also show the variance of mean and median streamflow,

which is caused by the occasional extreme hydrologic event. As indicated by the monthly mean values in the figures, nearly 90% of the streamflow volume in the Santa Margarita, San Luis Rey, and San Diego Rivers occurs during the months of December through May. The majority of streamflow occurs as a result of direct stormwater runoff from a few major storm events within each rainy season. Because significant precipitation within the region typically occurs over only 30 to 60 days of the year, streamflow on most days remains low. This is demonstrated by the median streamflow values shown in Figures 3-6 through 3-8.

Table 3-17: U.S. Geological Survey Surface Flow Gaging Stations

HU ¹	Watershed	No. Gaging Stations in Watershed ²	Currently Operating Stream Gages ²	Annual Streamflow ² (cubic feet per sec.)		Period of Record ²
				Median Daily Flow	Mean Annual Flow	
901	San Juan	11 ³	Las Flores Creek at Las Pulgas Canyon	0.2	1.5	1999 - 2012
			Las Flores Creek near Oceanside	0.0	1.8	1952 - 2012 ⁴
			San Onofre Creek at San Onofre	0.0	1.8	1947 - 2010 ⁵
			Cristianitos Creek above San Mateo Ck.	0.5	3.7	1994 - 2012
			San Mateo Creek near San Clemente	0.2	12.4	1953 - 2012 ⁶
902	Santa Margarita River	10 ⁷	Santa Margarita River at Ysidora	8.1 ⁸	41.3 ⁸	1923 - 2012 ⁹
			Santa Margarita River near Fallbrook	7.0 ¹⁰	42.2 ¹⁰	1924 - 2012 ¹⁰
			O'Neill Spillway near Fallbrook	0.0	0.2	1998 - 2012
			Lake O'Neill outlet near Fallbrook	0.4	1.6	1998 - 2012
			Lake O'Neill trib. near Fallbrook	0.0	0.1	2001 - 2005 ¹¹
			Fallbrook Creek near Fallbrook	0.4	1.5	1993 - 2012
			DeLuz Creek near DeLuz	0.9	11.7	1992 - 2012
			DeLuz Creek near Fallbrook	0.0	4.3	1951 - 2005 ¹²
			Rainbow Creek near Fallbrook	0.5	3.7	1989 - 2012
			Sandia Creek near Fallbrook	3.6	9.5	1989 - 2012
903	San Luis Rey River	11	San Luis Rey River at Oceanside	2.3	36.3	1940 - 2012 ¹³
904	Carlsbad	1	[None currently operating]	NA	NA	NA
905	San Dieguito River	9	Santa Maria Creek near Ramona	0.0	6.3	1912 - 2012 ¹⁴
			Guejito Creek near San Pasqual	0.1	2.8	1946 - 2012 ¹⁵
			Santa Ysabel Creek near Ramona	0.1	10.5	1955 - 2012
906	Peñasquitos	10	Los Peñasquitos Creek at Poway	1.9	11.3	1964 - 2012
907	San Diego River	5	San Diego River at Fashion Valley	6.7	38.6	1982 - 2012
			San Diego River at Mast Blvd.	1.9	24.9	1912 - 2012
			Los Coches Creek near Lakeside	0.5	1.9	1984 - 2012
			Padre Barona Creek near Lakeside	0.0	1.4	2005 - 2008
908	Pueblo	0	[None currently operating]	NA	NA	NA
909	Sweetwater	3	Sweetwater River near Descanso Sweetwater River near Dehesa	0.3	8.9	1957 - 2012
910	Otay	2	Jamul Creek near Jamul	0.2 ¹⁶	13.2 ¹⁶	1940 - 2012
911	Tijuana River	7	Tijuana River near Dulzura	0.2	1.8	1936 - 1990
			Campo Creek near Campo	0.1	3.2	1937 - 2012

1 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

2 From USGS (2012). Many of the historical gaging stations were temporary and were operated for short periods of time as part of special streamflow investigations. Streamflow records summarized above are for gaging stations that remain in operation and for gaging stations that were discontinued in recent years.

3 All USGS stream gages within the San Juan HU (901) are within the Region.

4 Stream gage not in operation during 1978-1993.

5 Stream gage not in operation during 1968-1998. Stream gage discontinued in 2010.

6 Stream gage not in operation during 1968-1993.

7 A total of ten historic gaging stations (all currently still operational) are in the San Diego County portion of the Santa Margarita River Watershed. An additional ten historical gaging stations have existed in Riverside County within the Santa Margarita River Watershed. Seven of these stations are currently in operation, including: Santa Margarita River at Temecula (1923-present), Temecula Creek near Aguanga (1957-present), Pechanga Creek near Temecula (1987-present), Murrieta Creek near Murrieta (1997-present), Warm Springs near Murrieta (1987-present), Santa Gertrudis Creek at Temecula (1987-present), and Murrieta Creek near Temecula (1930-present).

8 Listed mean and median are for 1981-2012. Mean and median flow during 1923-1948 was 43.3 CFS and 1.6 CFS, respectively, but these flows are not equivalent to the post-1980 flows due to construction of downstream conservation ponds (see USGS, 2012).

9 Stream gage not in operation during 1975-1979 and 2000-2001.

10 A flood destroyed the original stream gage in 1980. The stream gage was relocated in 1989 to its current site near the Fallbrook Public Utility District sump. Listed mean and median streamflows are for the current gage station location (1989-2012).

11 Gaging station discontinued in 2005.

12 Stream gage not in operation during 1968-1990 and 1991-2003. Gaging station discontinued in 2006.

13 Stream gage not in operation during 1942-1946 and 1991-1993. The gaging station was also operated from 1912-1914 but flows from these years are not included in the above-listed mean and median statistics.

14 Stream gage not in operation during 1921-1946.

15 The stream gage was relocated in 1957.

16 Includes flow diverted to Jamul Creek by the City of San Diego from Barrett Reservoir (in the Tijuana River Watershed) via the Dulzura conduit. Stream gaging station not in operation from October 1978 through September 1984.

Figure 3-6: Mean and Median Monthly Streamflows – Santa Margarita River at Fallbrook

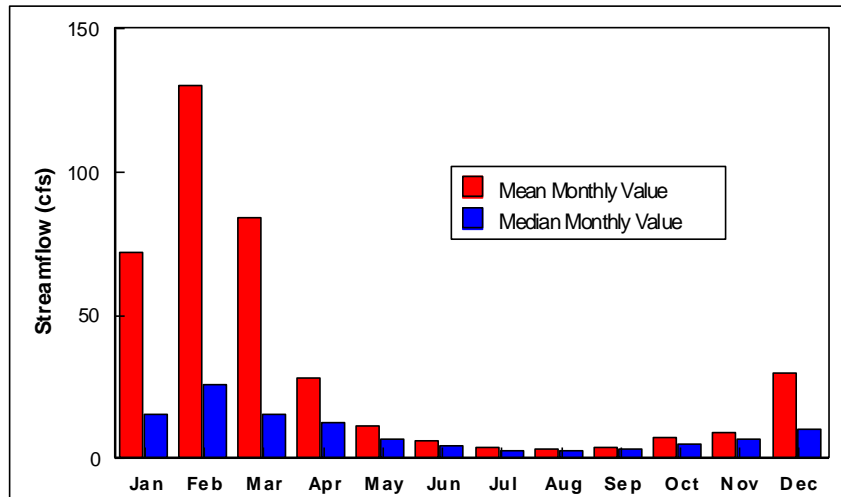


Figure 3-7: Mean and Median Monthly Streamflows – San Luis Rey River at Oceanside

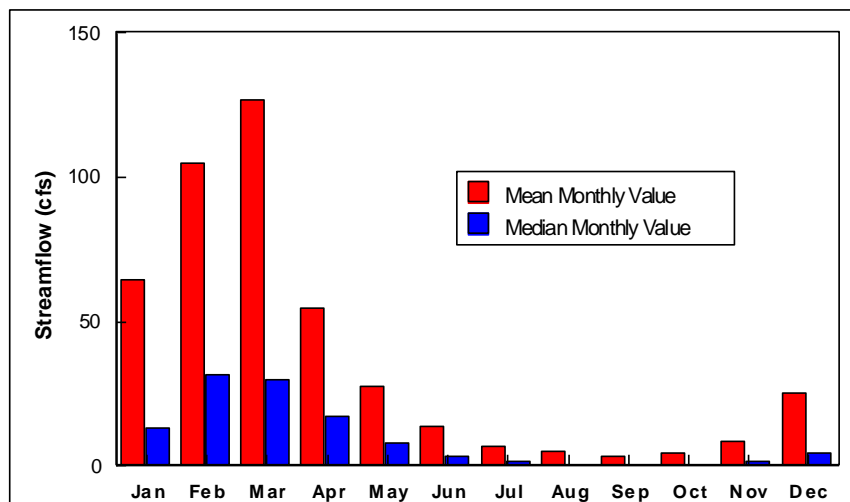


Figure 3-8: Mean and Median Monthly Streamflows – San Diego River at Mast Blvd.

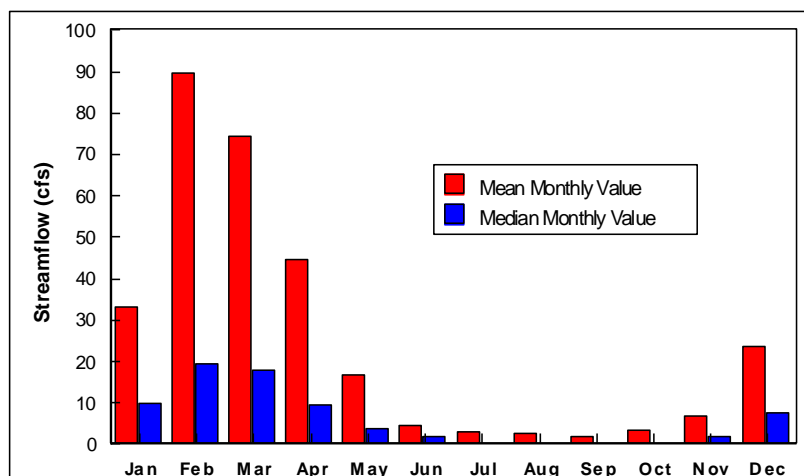


Table 3-189 compares pre-1975 and post-1975 summertime streamflow at the Santa Margarita, San Luis Rey, and San Diego River gaging stations. A major cause of the increase in median monthly streamflow values from pre-1975 to post-1975 can be attributed to urbanization in the watershed, which has reduced soil percolation and absorption by increasing paved surfaces, thereby increasing runoff.

While runoff directly associated with precipitation contributes most of the annual volume of streamflow, urban runoff, agricultural runoff, and surfacing groundwater are the prime sources of surface flow during non-storm (dry weather) periods. The Region has experienced a trend of increasing non-storm flows during the past 30 years as the region has developed. Increased development has resulted in increased imported water use and increased urban runoff. Additionally, the availability of good-quality imported water within the Water Authority service area has resulted in reduced groundwater use in the Region's coastal areas during recent decades, increasing the amount of surfacing groundwater that contributes to streamflow in the downstream areas of the region.

Table 3-18: Comparison of Pre-1975 and Post-1975 Median Monthly Summer Streamflow

Gaging Station	Median Monthly Summer Streamflow ¹ in Cubic Feet per Second (CFS)	
	Prior to 1975	After 1975
Santa Margarita River at Fallbrook	1.5 ²	5.7 ³
San Luis Rey River at Oceanside	0.0 ⁴	3.7 ³
San Diego River at Mast Boulevard	0.0 ⁵	2.6 ³

1 Median of monthly streamflow values (CFS) for the summer months June through October, as reported by U.S. Geological Survey (2012).

2 Data period covering 1924 through 1974.

3 Data period from 1975 through 2012.

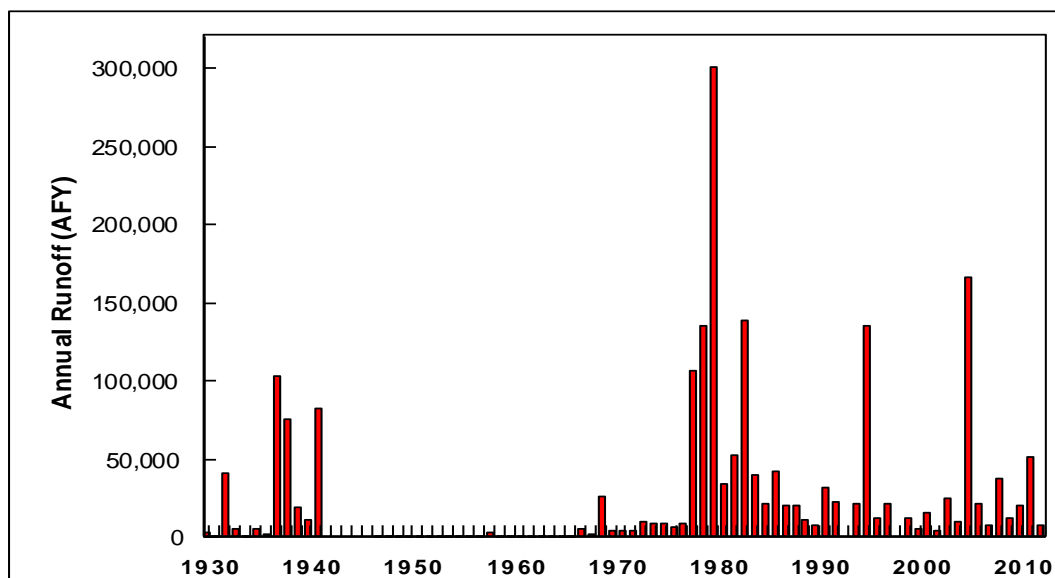
4 Data period from 1929 through 1974.

5 Data period from 1912 through 1974.

As shown in Table 3-18, prior to 1975, San Diego River and San Luis Rey River median streamflows during July through October were zero. Since 1975, summertime streamflows of several cubic feet per second have occurred on a sustained basis.

Figure 3-9 presents annual runoff data for the San Luis Rey River at Oceanside that depicts the significant variation in annual runoff within the Region. While median annual runoff at the San Luis Rey River at Oceanside during 1929-2012 was 8,000 acre-feet per year (AFY), annual runoff has exceeded 100,000 AFY during seven years of the period of record. A total of 54% of the San Luis Rey River runoff during 1929-2012 occurred during these seven years.

Figure 3-9: Annual Runoff - San Luis Rey River at Oceanside



Coastal Waters

Each of the Region's eleven watersheds features coastal water resources that support wildlife habitat, endangered species, and recreational uses (see Appendix 3-A for a list of the designated beneficial uses of Region coastal waters).

The Region's coastal lagoons represent a unique resource, and the Region features more coastal lagoons than any comparably-sized area in California. Eight of the Region's watersheds discharge to the following estuaries or brackish coastal lagoons:

- San Mateo Lagoon, San Onofre Lagoon, and Las Flores Lagoon (San Juan Watershed),
- Santa Margarita River Estuary (Santa Margarita River Watershed),
- San Luis Rey River Estuary (San Luis Rey River Watershed),
- Loma Alta Slough, Batiquitos Lagoon, Buena Vista Lagoon, Agua Hedionda Lagoon, and San Elijo Lagoon (Carlsbad Watershed),
- San Dieguito Lagoon (San Dieguito River Watershed),
- Los Peñasquitos Lagoon (Peñasquitos Watershed),
- San Diego River Estuary (San Diego River Watershed), and
- Tijuana River Estuary (Tijuana River Watershed).

A portion of the Peñasquitos Watershed (Rose and Tecolote Creeks) discharges to Mission Bay, a widely used regional recreational asset. Three watersheds (Sweetwater, Otay, and a portion of the Pueblo) discharge to San Diego Bay, an important regional commercial and recreational asset.

State Board Resolution No. 74-28 requires Regional Board's to designate coastal waters as Areas of Special Biological Significance (ASBS) if the waters contain "biological communities of such extraordinary, even though unquantifiable, value that no acceptable risk of change in their environment as a result of man's activities can be entertained."

The Basin Plan designates two ASBS within the Region, both of which are coastal waters of the Peñasquitos Watershed:

- La Jolla Ecological Reserve Area, and
- San Diego Marine Life Refuge Area.

Numerous recreational beaches, recreational areas and ecologic reserves (see Sections 3-8 and 3-9) exist within the Region's eleven watersheds.

3.5.4 Wastewater

The Region produces approximately 300 MGD of wastewater, which is treated at one of 32 wastewater treatment or water reclamation facilities. Wastewater is typically treated to secondary standards prior to ocean discharge, or to tertiary levels if intended for distribution for non-potable use. The processes through which wastewater is treated to higher levels and reused are discussed further in Section 3.5.5.

Wastewater in the Region may undergo four levels of treatment. Primary treatment removes heavy solids through settling by gravity. Advanced primary treatment further removes solids using chemicals that cause clumping of smaller solids to allow solids to settle out of water for removal. Secondary treatment uses primary-treated water, and subjects it to biological treatment, wherein microbes are used to break down biological substances. Tertiary treatment filters secondary effluent through a medium such as coal to reduce total dissolved solids (TDS) and other water quality impairments.

The Region treats approximately 100 MGD of wastewater to primary standards, 100 MGD to secondary standards, and 40 MGD to tertiary standards. Planned projects would increase this capacity to 120 MGD, 120 MGD, and 78 MGD, respectively, by 2040 (Water Authority, 2011). Water that is not treated to tertiary levels and reused as recycled water is discharged through one of the Region's five deep-water ocean outfalls, summarized in Table 3-19 and shown in Figure 3-10. As shown, there are four primary sewersheds within the Region – a sewershed is the area of land from which wastewater is collected and conveyed to a treatment facility. These sewersheds are:

- 1) the area that conveys wastewater to the Oceanside Ocean Outfall,
- 2) the area that conveys wastewater to the Encina Ocean Outfall,
- 3) the area that conveys wastewater to the San Elijo Ocean Outfall, and
- 4) the area that conveys wastewater from the Metropolitan (Metro) Wastewater System, including the Point Loma Ocean Outfall and the South Bay Ocean Outfall.

Please note that the Metro Wastewater sewershed (indicated in blue on Figure 3-10) conveys wastewater to both the Point Loma Ocean Outfall and the South Bay Ocean Outfall; however, the source of wastewater that is conveyed to each facility varies on a day-to-day basis depending on wastewater flow availability and various operational parameters.

In addition to providing means for wastewater and recycled water disposal, the outfalls can also be used as a salinity management asset. Four of the regional municipal wastewater outfalls are currently being used for disposal of saline or brackish water, including:

- Oceanside Ocean Outfall is used for disposal of demineralization brine from the City of Oceanside's groundwater desalter and demineralization brine from a local industry,

- Encina Ocean Outfall is used for the disposal of demineralization brine from the City of Carlsbad Water Reclamation Facility when demineralization facilities are operational,
- San Elijo Ocean Outfall is used for disposal of brackish cooling tower water from the Palomar Energy Plant in Escondido via the City of Escondido Industrial Brine Collection System, and demineralization brine from the San Elijo Joint Powers Authority Water Reclamation Facility, and
- Point Loma Ocean Outfall is used for disposal of demineralization brine from the City's North City Water Reclamation Plant.

Table 3-19: Municipal Wastewater Ocean Outfalls¹

HU ²	Name	Outfall	Operating Agency	Discharge Distance Offshore (ft)	Permitted Discharge Flow (MGD)	Agencies Served
903	San Luis Rey River	Oceanside	City of Oceanside	8,050	22.9 ³	City of Oceanside
					3.6 ⁴	USMC Base Camp Pendleton
					2.4 ⁵	Fallbrook Public Utility District
904	Carlsbad	Encina	Encina Wastewater Authority	7,800	43.3 ⁶	Encina Wastewater Authority ⁷
		San Elijo	San Elijo Joint Powers Authority ⁸	8,000	18.0 ⁹	City of Escondido
					5.25 ¹⁰	San Elijo JPA ¹¹
908	Pueblo	Point Loma	City of San Diego	23,470	240 ¹²	San Diego Metropolitan Sewerage System ¹³
911	Tijuana River	South Bay	City of San Diego ¹⁶	23,600	15 ¹⁴	San Diego Metropolitan Sewerage System ^{13,15}
					25 ¹⁷	U.S. Boundary and Water Commission ¹⁷

¹ Compiled from adopted recycled water discharge permits adopted by the Regional Board. See footnotes below.

² Numerical watershed (hydrologic unit) and hydrologic area designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

³ City of Oceanside per Regional Board Order No. R9-2009-0016, NPDES CA0107433. The permitted discharge is the combined discharge from the San Luis Rey Water Reclamation Facility, La Salina Wastewater Treatment Plant and waster brine from the Mission Bay Desalting Facility.

⁴ U.S. Marine Corps Base Camp Pendleton per Regional Board Order No. R9-2012-0041 and Addendum No. 1, NPDES CA0109347.

⁵ Fallbrook Public Utility District per Regional Board Order No. R9-2012-0004, NPDES CA0108031.

⁶ Encina Wastewater Authority per Regional Board Order No. R9-2011-0019, NPDES CA0107395. The permitted discharge is the combined discharge from the Encina Water Pollution Control Facility, Meadowlark Water Reclamation Plan, Shadowridge Water Reclamation Plant and Carlsbad Water Reclamation Facility

⁷ Encina Wastewater Authority member agencies include Buena Sanitation District, City of Carlsbad, City of Encinitas, Leucadia County Water District, Vallecitos Water District, and City of Vista.

⁸ The San Elijo Ocean Outfall is jointly owned by the City of Escondido and San Elijo Joint Powers Authority.

⁹ City of Escondido per Regional Board Order No. R9-2010-0086, NPDES CA0107981.

¹⁰ San Elijo Joint Powers Authority per Regional Board Order No. R9-2010-0087, NPDES CA0107999.

¹¹ San Elijo Joint Powers Authority member agencies include the City of Solana Beach and City of Encinitas.

¹² Point Loma Ocean Outfall per Regional Board Order No. R9-2009-0001, NPDES CA0107409.

¹³ The City of San Diego serves as operating agency for the San Diego Metropolitan Wastewater System (Metro System). The Metro System serves the following agencies: City of Coronado, City of Chula Vista, City of Del Mar, City of El Cajon, City of Imperial Beach, City of La Mesa, City of National City, City of Poway, City of San Diego, Lemon Grove Sanitation District, Padre Dam Municipal Water District, Otay Water District, Lakeside/Alpine Sanitation District, Spring Valley Sanitation District, East Otay Sewer Maintenance District and Winter Gardens Sewer Maintenance District.

¹⁴ South Bay Ocean Outfall per Regional Board Order No. R9-2013-0006, NPDES CA0109045.

¹⁵ Metro System member agencies tributary to the South Bay Ocean Outfall include the City of San Diego, City of Imperial Beach, and City of Chula Vista.

¹⁶ South Bay Ocean Outfall is jointly owned by the City of San Diego and the U.S. Government (International Boundary and Water Commission).

¹⁷ U.S. Boundary and Water Commission (IBWC) South Bay International Treatment Plant that treats up to 25 MGD of wastewater from Tijuana, Mexico. The IBWC discharge to the South Bay Ocean Outfall is regulated by Regional Board Order No. 95-50 (NPDES CA0108928) and Cease & Desist Order No. 96-52.

3.5.5 Water Reuse

Beneficial reuse of wastewater is an important component of the Region's local water resources, both now and in the future. Water reuse includes non-potable reuse and potable reuse – in both cases secondary treated wastewater receives additional treatment to match its quality to the intended use. Non-potable reuse involves production of tertiary-treated recycled water in accordance with Title 22 of the California Code of Regulations. Non-potable recycled water, discussed in detail below, is used today throughout the Region for irrigation, toilet flushing, and industry. Although potable reuse is not currently part of the Region's water supply, it is being actively studied and pursued in the Region. Potable reuse involves advanced treatment of tertiary-quality recycled water to create purified water, which is similar in quality to distilled water, and as its name suggests, can be added to drinking water supplies.

Water reuse can increase water supply reliability by increasing the availability of local supplies and reducing the need to import water from outside the Region. The benefits of water reuse can include cost savings, energy savings, reduced wastewater discharges, avoidance of the need for peak surface water treatment capacity, improved water quality, and reduced fertilizer application needs when used for irrigation.

Since its inception, the IRWM Program has provided over \$16 million to a variety of water reuse projects. In total, approximately 40% of San Diego's IRWM grant funding has been awarded to water reuse projects.

Non-Potable Reuse

During 2010, Water Authority member agencies reported the reuse of approximately 28,000 AF of non-potable recycled water. The use of non-potable recycled water within the Region is projected to increase to approximately 50,000 AFY by 2035 (Water Authority, 2011a).

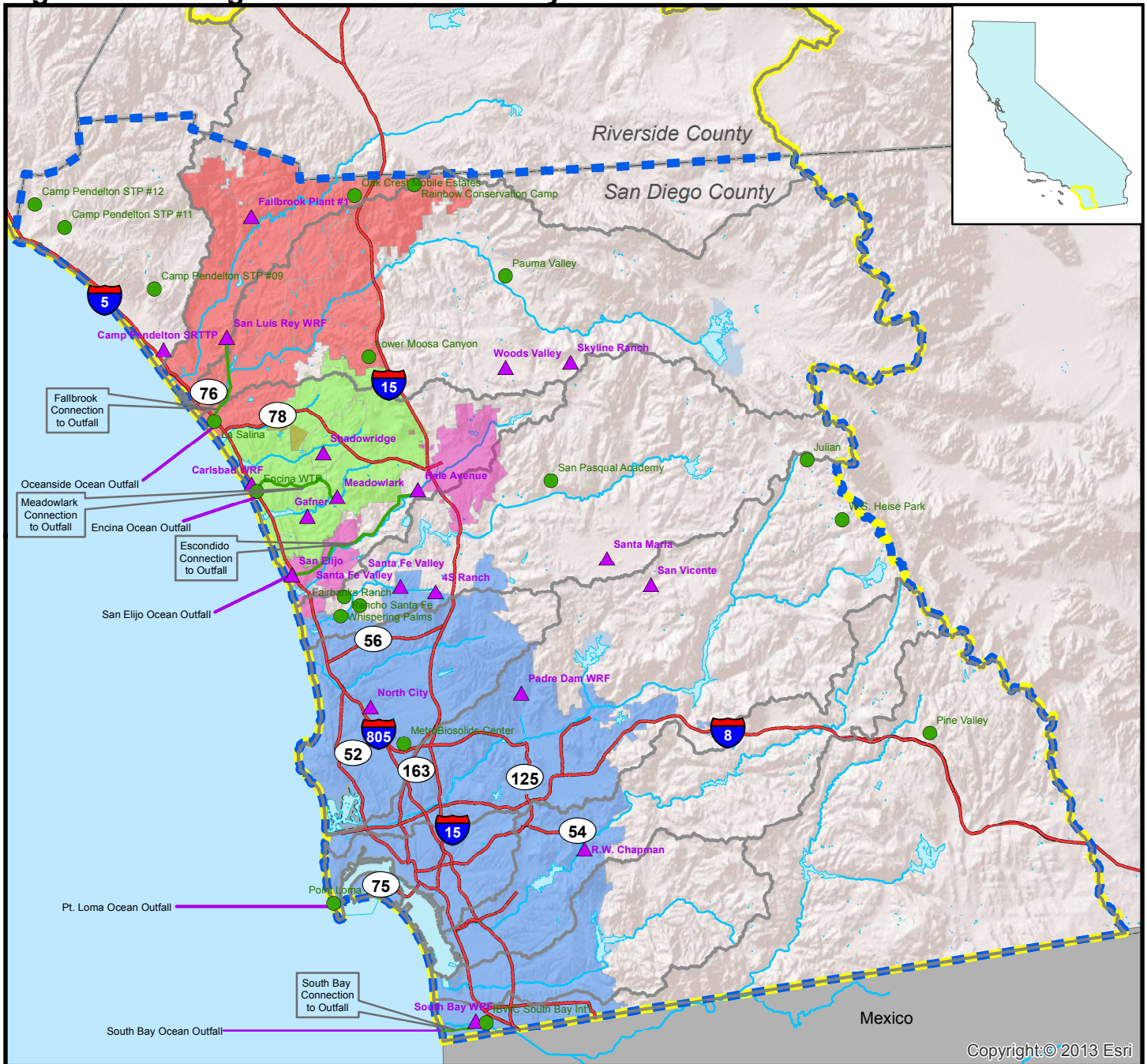
Since currently most recycled water is used for irrigation, recycled water demands vary substantially throughout the year, increasing in the dry summer months and decreasing in the wet winter months. A key and necessary component of water recycling is providing means of disposal or storage of excess recycled water supplies during periods of reduced demand. Local agencies may utilize either storage ponds or regional ocean outfall facilities to handle excess recycled water or wastewater flows during periods of wet weather or limited demand. An exception to this is Padre Dam MWD, which has a permit to discharge recycled water to the Santee Lakes, which overflows to the San Diego River.

Figure 3-10 presents the location of all wastewater and recycled water infrastructure within the Region. Table 3-20 summarizes the Region's existing wastewater and water recycling facilities, and indicates which of the Region's water reclamation plants are capable of treating water to tertiary standards for non-potable reuse.

Recycled water is primarily used to irrigate commercial landscaping, parks, campgrounds, golf courses, freeway medians, greenbelts, athletic fields, crops, orchards, and nursery stock. Recycled water is also used to augment supplies in recreational or ornamental lakes or ponds, control dust at construction sites, recharge groundwater basins, and for industrial cooling water. Because tertiary treated recycled water is higher in nutrients than potable water, this water source can also reduce the amount (and therefore the costs) of fertilizer application.

Since non-potable reuse doesn't require the pumping associated with water from the SWP or the Colorado River, it typically has lower energy needs and greenhouse gas emissions compared to imported potable water.

Figure 3-10: Regional Wastewater/Recycled Water Infrastructure



Legend

- | | |
|------------------------------|---------------------------|
| ● Wastewater Treatment Plant | Ocean Outfall Sewersheds |
| ▲ Water Reclamation Facility | ■ Oceanside Outfall |
| — Ocean Outfalls | ■ Encina Outfall |
| — Connection to Outfalls | ■ San Elijo Outfall |
| □ Watershed | ■ Metro Wastewater System |
| ■ San Diego IRWM Region | - Pt. Loma Outfall |
| ■ Funding Area Boundary | - South Bay Outfall |
| ■ Ocean | |
| ■ Waterbody | |
| ■ County | |
| — River | |
| — Freeway | |



0 2.5 5 10
Miles

RMC

Table 3-20: Wastewater and Recycled Water Treatment Facilities

HU ¹	Watershed	Agency	Name of Treatment Facility	Permitted Secondary Treatment Capacity (mgd)	Permitted Tertiary Treatment Capacity (mgd)	Recycled Water Use in 2010 ² (acre-feet)
902	Santa Margarita	Camp Pendleton	Southern Regional		3.75 ³	5273
		Camp Pendleton	STP 9	0.7 ⁴		
		Camp Pendleton	STP 11	3.15 ⁵		
		Camp Pendleton	STP 12	0.35 ⁶		
		Rainbow Municipal Water District	Oak Crest Mobile Estates	0.012 ⁷		
		California Department of Forestry and Fire Protection (CalFire)	Rainbow Conservation Camp	0.0125 ⁸		
903	San Luis Rey	City of Oceanside	San Luis Rey	13.5 ⁹	0.7 ⁹	119 ⁹
		Fallbrook Public Utility District	Plant No. 1		2.7 ¹⁰	543 ¹⁰
		Valley Center Municipal Water District	Woods Valley Ranch		0.147 ¹¹	44 ¹¹
		Valley Center Municipal Water District	Lower Moosa Canyon	1 ¹²		
		Skyline Ranch Country Club, LLC	Skyline Ranch	0.055 ¹³		
		Pauma Valley Community Service District	Pauma Valley	0.15 ¹⁴		
904	Carlsbad	Buena Sanitation District/City of Vista	Shadowridge ⁸		1.16 ¹⁵	0 ¹⁵
		Carlsbad Municipal Water District	Carlsbad		4.0 ¹⁶	1,324 ¹⁶
		Leucadia Wastewater District	Gafner		1.0 ¹⁷	269 ¹⁷
		Vallecitos Water District	Meadowlark		5.0 ¹⁸	2,768 ¹⁸
		City of Escondido	Hale Avenue		9.0 ¹⁹	3,692 ¹⁹
		San Elijo Joint Powers Authority	San Elijo	5.25 ²⁰	2.48 ²⁰	1,160 ²⁰
		City of Oceanside	La Salina	5.5 ²¹		
		Encina Wastewater Authority	Encina	40.5 ²²		
905	San Dieguito River	Olivenhain Municipal Water District	4-S Ranch		2.0 ²³	895 ²³
		Ramona Municipal Water District	Santa Maria	1.0 ²⁴	0.35 ²⁴	209 ²⁴
		Rancho Santa Fe Community Services District	Santa Fe Valley		0.485 ²⁵	105 ²⁵
		Rancho Santa Fe Community Services District	Rancho Santa Fe	0.45 ²⁶		
		Whispering Palms Community Services District	Whispering Palms	0.2 ²⁷		
		Fairbanks Community Services District	Fairbanks Ranch	0.275 ²⁸		
		County of San Diego	San Pasqual Academy	0.05 ²⁹		
906	Peñasquitos	City of San Diego	North City		30.0 ³⁰	7,505 ³⁰
		City of San Diego	Metropolitan Biosolids Center	N/A ³¹		
907	San Diego River	Padre Dam Municipal Water District	Padre Dam		2.0 ³²	2,016 ³²
		Ramona Municipal Water District	San Vicente		0.75 ³³	520 ³³
		County of San Diego	W.S. Heise Park	0.018 ³⁴		
		County of San Diego	Julian	0.04 ³⁵		
908	Pueblo	City of San Diego	Point Loma	240 ³⁶		

HU ¹	Watershed	Agency	Name of Treatment Facility	Permitted Secondary Treatment Capacity (mgd)	Permitted Tertiary Treatment Capacity (mgd)	Recycled Water Use in 2010 ² (acre-feet)
910	Otay River ¹⁹	Otay Water District	R.W. Chapman		1.3 ³⁷	1,033 ³⁷
911	Tijuana River	City of San Diego	South Bay	15 ³⁹	15.0 ³⁹	4,705 ³⁹
		International Boundary and Water Commission	South Bay International	25 ⁴⁰		
		County of San Diego	Pine Valley	0.04 ⁴¹		

- 1 Numerical watershed (hydrologic unit) and hydrologic area designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
- 2 Recycled water use for year 2010 as reported by member agencies in *2010 Urban Water Management Plan* (Water Authority, 2011a). Reporting criteria for recycled water use may vary on an agency-by-agency basis.
- 3 Permitted tertiary treatment capacity per Regional Board Order No. R9-2009-0021. The listed recycled water use for 2010 does not include 657 acre-feet of effluent from Camp Pendleton secondary treatment percolation ponds.
- 4 Regional Board Order No. 98-04
- 5 Regional Board Order No. 97-13
- 6 Regional Board Order No. 98-05
- 7 Regional Board Order No. 93-69
- 8 Regional Board Order No. R9-2009-0009
- 9 The San Luis Rey facility is permitted to discharge 13.5 MGD secondary effluent, or up to 15.4 MGD with written approval from the Regional Board in accordance with its discharge permit. Regional Board Order No. R9-2011-0016 as amended by R9-2012-0042.
- 10 Regional Board Order No. 91-39 and Addenda Nos. 1, 2 and 3.
- 11 Regional Board Order No. 98-09 and Addendum No. 1. The listed recycled water use for 2010 does not include 347 acre-feet of secondary effluent from the Lower Moosa Canyon Water Reclamation Facility that is discharged to percolation ponds or secondary effluent from Skyline Ranch Country Club Reclamation. The Skyline plant was formerly managed by Valley Center Municipal Water District but is now privately owned.
- 12 Regional Board Order No. 95-32, as amended
- 13 Regional Board Order No. R9-2005-0258
- 14 Regional Board Order No. R9-2006-0049
- 15 Regional Board Order No. 93-82 and Addenda Nos. 1 and 2. Facility is currently not in operation. Due to high production costs, the City of Vista suspended operations of the facility in 2003. A feasibility study was completed in 2009 to evaluate the feasibility upgrading the facility.
- 16 Regional Board Order No. 2001-352.
- 17 Regional Board Order No. R9-2004-0223.
- 18 Regional Board Order No. R9-2007-0018. Recycled water from the Meadowlark Water Reclamation Facility is purveyed by Carlsbad Municipal Water District and Olivenhain Municipal Water District.
- 19 Regional Board Order No. 93-70 and Addendum No. 1. Recycled water from the Hale Avenue facility is purveyed by the City of Escondido and Rincon Del Diablo Municipal Water.
- 20 Regional Board Order No. R9-2010-0087. Recycled water from the San Elijo facility is purveyed by the Santa Fe Irrigation District, San Dieguito Water District, and City of Del Mar.
- 21 Regional Board Order No. R9-2011-0016 as amended by R9-2012-0042
- 22 The Encina Wastewater Pollution Control Facility is permitted to produce secondary water (up to 40.5 MGD), but sells up to 5 MGD of this to Carlsbad WRF (4 MGD) and Gaftner WRF (1 MGD) for tertiary treatment. Regional Board Order No. R9-2011-0019
- 23 Regional Board Order No. R9-2003-0007.
- 24 Regional Board Order No. 2000-177.
- 25 Regional Board Order No. R9-2002-0013.
- 26 Rancho Santa Fe Community Services District (<http://www.rsfcscd.com/aboutus.html>), Accessed August 29, 2013.
- 27 Regional Board Order No. 94-80
- 28 Regional Board Order No. 93-05, as amended
- 29 Regional Board Order R9-2009-0072
- 30 Regional Board Order No. 97-03 and Addendum No. 1. Recycled water use per City of San Diego 2010 UWMP. Recycled water from the North City Water Reclamation Plant is purveyed by Olivenhain Municipal Water District, the City of Poway and City of San Diego.
- 31 The Metro Biosolids Center is a solids handling facility, dewatering sludge produced by North San Diego and Point Loma wastewater treatment facilities. As such, it does not have a permitted capacity.
- 32 Regional Board Order No. 97-49 (recycled water irrigation) and Order No. R9-2003-0179, NPDES CA0107492 (lake replenishment). Recycled water is for replenishing Santee Lakes.
- 33 Regional Board Order No. R9-2009-0005.
- 34 Regional Board Order No. 93-09
- 35 Regional Board Order No. 83-09, as appended
- 36 Point Loma is permitted to treat to Advanced Primary rather than Secondary. Regional Board Order No. R9-2009-0001
- 37 Plant is located in Sweetwater Watershed, but recycled water use is in Otay Watershed. Regional Board Order No. 92-25 and Addendum No. 1.
- 38 Regional Board Order No. 93-112. However, this permit was rescinded in 2010.
- 39 Plant can discharge a total of up to 15 MGD, either secondary, tertiary, or some combination of the two. Regional Board Order No. R9-2013-0006; Regional Board Order No. 2000-203 and Addenda Nos. 1 and 2. Recycled water use per City of San Diego 2010 UWMP.
- 40 Regional Board Order No. 96-50
- 41 Regional Board Order No. 94-161

Despite the cost and energy savings associated with non-potable reuse, it also requires additional work by the local water agency, thus additional cost, for regulatory compliance. Because tertiary treated recycled water is a non-potable resource, it must be segregated from potable water and delivered through a separate distribution system. This recycled water distribution system is commonly referred to as the “purple pipe” system. The purple pipe system includes not only pipelines, but also all other water conveyance infrastructure such as pumps, valves, and storage tanks. While such facilities may exist for potable water, separate infrastructure must be constructed and operated for recycled water, and there must be infrastructure and agency programs to ensure that the non-potable recycled water does not mix with potable water. Additionally, higher levels of TDS in recycled water compared to potable water can lead to accelerated corrosion, requiring more frequent infrastructure replacement than in potable systems or use of demineralization facilities to reduce salinity, which adds cost to system operations.



Recycled water is used primarily for landscape and agricultural irrigation.

Photo credit: City of San Diego

The IRWM Program has been supportive of expanding non-potable reuse in the Region by funding treatment plant improvements, distribution system expansions, inter-connections and use site retrofits.

Potable Reuse

Although non-potable reuse is widespread in the Region, non-potable reuse alone does not achieve the full potential for beneficial reuse of wastewater. Potable reuse is another alternative under study as a means to increase water reuse. Potable reuse would involve advanced treatment of tertiary-quality recycled water to produce purified water, which would be similar in quality to distilled water (City of San Diego 2013). The purified water would then become part of the raw water supply, treated again at a drinking water treatment plant, and distributed through the existing potable water system. The health and safety of the drinking water is ensured by having multiple treatment barriers between recycled water and drinking water.

Several agencies – including the City of San Diego, City of Escondido, City of Oceanside, Padre Dam Municipal Water District, and San Elijo Joint Powers Authority – are exploring different technologies that would allow for future potable reuse. In the City of San Diego’s 2006 *Water Reuse Study*, a group of stakeholders determined that the preferred option for water reuse would be to augment the City’s San Vicente Reservoir with advance-treated purified water (City of San Diego 2013). This type of system is called indirect potable reuse through reservoir augmentation (IPR/RA), wherein the reservoir provides an environmental buffer in the string of multiple treatment barriers. The schematic below shows the processes for indirect potable reuse through reservoir augmentation.

***Multiple Treatment Barriers for the City of San Diego's Proposed
Indirect Potable Reuse/Reservoir Augmentation Project***



Source: City of San Diego 2013

Another form of potable reuse being studied by the City of San Diego is direct potable reuse, or DPR, which would not include the reservoir as an environmental buffer. In this system, advance treated purified water would be delivered directly to the drinking water treatment plant. At this time it is not clear what additional treatment barriers would be needed for a direct potable reuse project in the San Diego region.

Two agencies in California are responsible for regulating potable reuse projects: the California Department of Public Health (CDPH), which regulates drinking water supplies, and the State Water Resources Control Board through its nine Regional Water Quality Control Boards, which regulate surface water and groundwater discharges. In California, IPR projects using groundwater recharge have been safely operated since the 1960s. After completing numerous technical studies and research, the city of San Diego has received conceptual approval from both CDPH and the Regional Board to implement an IPR project using reservoir augmentation at San Vicente Reservoir.

Potable reuse can provide multiple water management benefits to the Region. As expressed by IRWM stakeholders, potable reuse would further diversify the Region's water supplies and achieve environmental objectives by reducing wastewater discharges to the ocean. Investing in potable reuse would be a more efficient investment than solely focusing on upgrades to wastewater systems because it helps toward two goals – water supply and wastewater management (refer to the comment letter from the Metro JPA Technical Advisory Committee in Appendix 6-D). Savings from offloading wastewater systems could reduce water supply costs to consumers by \$1000 per AF (City of San Diego 2013). Potable reuse would also reduce the cost of higher salinity to utilities and consumers through water quality improvements associated with advanced water treatment. Because purified water has TDS levels much lower than the existing imported water (about 15 mg/L compared to 500 mg/L), blending of the two supplies will reduce overall salinity. Operations and maintenance costs associated with corrosion would be substantially reduced in the potable water system for consumers. The savings from reduced TDS has been estimated at \$100 per AF (City of San Diego 2012).

The IRWM Program has funded several projects to conduct important research that will advance the opportunities to reuse our water. This will lead to the opportunity to further integrate the Region's water supply and wastewater management efforts and achieve multiple benefits.

***The City of San Diego is Testing the Feasibility of IPR and DPR at its
Advanced Water Purification Demonstration Facility***



The City of San Diego has been studying indirect potable reuse (IPR) using reservoir augmentation since the 1990s, recently with the Water Purification Demonstration Project. The Water Purification Demonstration Project, which began in 2007 and was completed in 2012, consisted of installation and operation of a 1 mgd demonstration-scale Advanced Water Purification Facility, studies of San Vicente Reservoir, education and outreach, and assessments of regulations, energy use, and costs; all with oversight by an Independent Advisory Committee. Although there are currently no regulations for IPR using reservoir augmentation, the results of the Water Purification Demonstration Project allowed CDPH to issue a letter of conceptual regulatory approval for the City's proposed 15 mgd IPR project using San Vicente Reservoir. Similarly, in a 2012 resolution the Regional Board expressed support of the City's proposed IPR projects, and in 2013 the Regional Board issued a letter validating the proposed regulatory pathway for a project at San Vicente Reservoir (City of San Diego, 2013).

The City of San Diego's proposals to augment drinking water supplies through potable reuse has support of residents: in a 2012 poll of City residents, 73% of respondents strongly favored or somewhat favored using advanced treated recycled water as an addition to the Region's drinking water supply (City of San Diego, 2013).

The City of San Diego is also investigating options for Direct Potable Reuse (DPR). The City has teamed with the WaterReuse Foundation to conduct additional research at the Advanced Water Purification Facility to test treatment and monitoring technologies. The City's Advanced Water Purification Facility is ideal for this research because it uses full-scale components, and the water produced can be returned to the purple pipe system. DPR is an emerging concept – there is currently no regulatory framework for DPR projects in California. The results of these on-going projects will support establishing regulatory guidelines for DPR. Continuing tours and education at the facility will further public understanding of the health and safety aspects of potable reuse.

The City's IPR and DPR initiatives are supported by grant funding from the San Diego IRWM Program.

3.5.6 Groundwater Resources

The San Diego IRWM Region contains 24 separate groundwater basins, as defined by the California Department of Water Resources (DWR) Bulletin 118 (DWR, 2003). These groundwater basins are:

- San Mateo Valley
- San Onofre Valley
- Santa Margarita Valley
- San Luis Rey Valley
- Warner Valley
- Escondido Valley
- San Pasqual Valley
- Santa Maria Valley
- San Dieguito Creek
- Poway Valley
- Mission Valley
- San Diego River Valley
- El Cajon Valley
- Sweetwater Valley
- Otay Valley
- Tijuana Basin
- Batiquitos Lagoon Valley
- San Elijo Valley
- Pamo Valley
- Ranchita Town Area
- Cottonwood Valley
- Campo Valley
- Potrero Valley
- San Marcos Area

Though this Plan uses the groundwater basins defined by Bulletin 118, other local or regional plans may define basins slightly differently. For example, the *Salinity and Nutrient Management Planning Guidelines*, produced by the Water Authority and the Southern California Salinity Coalition, defines the San Luis Rey Valley groundwater basin as five basins: Oceanside/Mission, Bonsall, Moosa, Pala, and Pauma. Some basins that are recognized by a management agency may not be recognized in Bulletin 118, such as the Middle Sweetwater aquifer. The Regional Board has begun to use the basins as named and defined in the *Salinity and Nutrient Management Planning Guidelines* when referring to Salt and Nutrient Management Plans in the Region.

For the most part, groundwater within the Region occurs in alluvial aquifers, residuum (crystalline bedrock that has weathered in place), aquifers comprised of semi-consolidated or consolidated sediments, and fractured crystalline rock. Other water-bearing formations in the Region include the Poway Group, San Diego Formation, San Mateo Formation, La Jolla Group, Santiago Peak Volcanics and Otay Formation. Figure 3-11 presents the locations of groundwater basins (as defined in Bulletin 118) in the Region. Groundwater yields from fractured rock and residuum can be sufficient to provide water supply for individual homes, but these aquifer types are typically not sufficiently productive to warrant supply development by water supply agencies (Water Authority, 1997). Table 3-21 summarizes characteristics of key groundwater aquifers within the Region.

Aside from the Warner, San Luis Rey Valley, and Sweetwater Valley Basins, none of the Region's alluvial aquifers exceed a storage capacity of 100,000 AF. A total of ten alluvial aquifers, however, are estimated to exceed a 50,000 AF capacity. Aquifers comprised of alluvial deposits (alluvium) provide much of the current groundwater production capacity within the region. Yields from the Region's larger aquifers are typically on the order of several thousand acre-feet per year (Water Authority, 1997; DWR, 2003).

Sources of groundwater recharge in the Region include creeks, precipitation, discharges from treatment plants, underflow from dams, and return flow. The imported water that is applied to the land as irrigation water (for agriculture and domestic irrigation) contributes to the groundwater supply in the form of return flows and may also be a resource for agencies that have usable aquifers.

Figure 3-11: Bulletin 118 Groundwater Basins

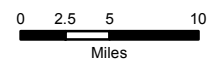
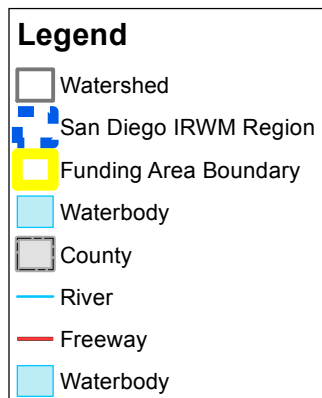
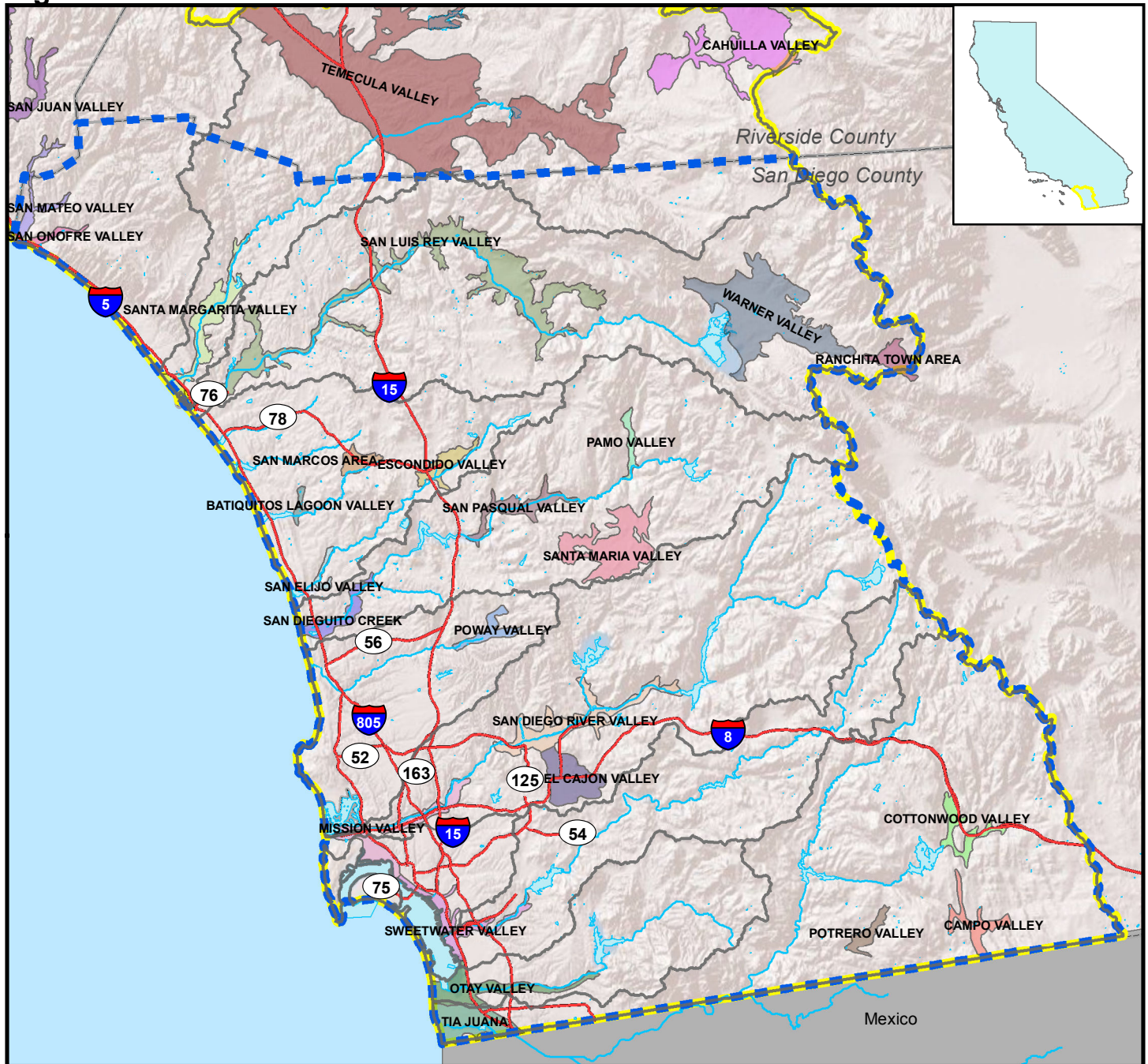


Table 3-21: Summary of the Region's Principal Groundwater Aquifers¹

Groundwater Basin	Basin Number	Water-Bearing Formations	Surface Area (sq. miles)	Estimated Storage Capacity (AF)	Estimated Potential Yield ²⁴ (AFY)	Aquifer Depth (Feet)	
						Maximum	Average
San Mateo Valley	9-2	Alluvium, San Mateo	4.7 ⁴	14,000 ⁴	3,180 ³	100 ⁴	60 ⁴
San Onofre Valley	9-3	Alluvium, San Mateo	2.0 ⁴	6,500 ⁴	1,420 ³	55 ⁴	25 ⁴
Santa Margarita Valley	9-4	Alluvium, Residuum, Fractured Rock	12.4 ⁴	61,600 ⁴	5,400 to 16,700 ⁶	200 ⁴	175 ⁴
San Luis Rey Valley ⁵	9-7	Alluvium, La Jolla	46.0 ^{4,5}	240,000 ^{4,5}	22,400 to 23,400 ^{5,6,7}	1,650 ^{4,8}	200 ^{4,9}
Warner Valley	9-8	Alluvium, Residuum	37.5 ⁴	550,000 ⁴	12,000 ⁶	900 ^{4,10}	900 ^{4,10}
Escondido Valley	9-9	Alluvium, Residuum, Fractured Rock	4.5 ⁴	24,000 ⁴	NA ¹¹	NA ¹¹	NA ¹¹
San Pasqual Valley	9-10	Alluvium, Residuum	7.1 ⁴	63,000 ⁴	5,800 ⁶	200 ⁴	120 ⁴
Santa Maria Valley	9-11	Alluvium, Residuum	19.2 ⁴	77,000 ⁴	>2,500 ⁶	225 ⁴	40 ⁴
San Dieguito Creek	9-12	Alluvium, La Jolla, Santiago Peak Volcanics	5.6 ⁴	52,000 ⁴	<2,500 ⁶	180 ⁴	125 ⁴
Poway Valley	9-13	Alluvium, Residuum, Poway	3.8 ⁴	2,330 ⁴	NA	75 ⁴	40 ⁴
Mission Valley	9-14	Alluvium, San Diego	11.5 ⁴	42,000 ⁴	2,000 to 4,000 ⁶	200 ⁴	80 ⁴
San Diego River Valley ¹²	9-15	Alluvium	15.4 ^{4,12}	97,000 ^{4,12}	5,000 to 8,000 ^{6,12,13}	200 ⁴	70 ⁴
El Cajon Valley	9-16	Alluvium, Fractured Rock	11.2 ⁴	32,500 ⁴	NA ¹¹	350 ⁶⁴	NA ¹¹
Sweetwater Valley	9-17	Alluvium, San Diego	9.3 ⁴	973,000 ¹⁴	8,400 - 10,400 ^{6,15}	2,000 ^{4,16}	700 ^{4,16}
Otay Valley	9-18	Alluvium, San Diego, Otay	11 ⁴	28,900 ⁴	NA ¹¹	1,400 ⁴	100 ⁴
Tijuana Basin	9-19	Alluvium, San Diego	11.6 ⁴	80,000 ^{4,7}	5,000 to 6,800 ^{6,17}	1,700 ^{4,18}	80 ^{4,18}
Batiquitos Lagoon Valley	9-22	Alluvium, La Jolla	1.2 ⁴	NA ¹¹	NA ¹¹	100 ⁴	NA ¹¹
San Elijo Valley	9-23	Alluvium, La Jolla, Santiago Peak Volcanics	1.4 ⁴	8,500 ⁴	NA ¹¹	1,650 ⁴	50 ⁴
Pamo Valley	9-24	Alluvium, Residuum	2.3 ⁴	NA ¹¹	NA ¹¹	NA ¹¹	NA ¹¹
Ranchita Town Area	9-25	Alluvium, Residuum	4.9 ⁴	NA ¹¹	NA ¹¹	130 ⁴	NA ¹¹
Cottonwood Valley	9-27	Alluvium, Residuum	6.0 ⁴	NA ¹¹	NA ¹¹	100 ⁴	NA ¹¹
Campo Valley	9-28	Alluvium, Residuum	5.5 ⁴	63,450 ⁴	NA ¹¹	100 ⁴	55 ⁴
Potrero Valley	9-29	Alluvium, Residuum	3.2 ⁴	NA ¹¹	NA ¹¹	NA ¹¹	NA ¹¹
San Marcos Area	9-32	Alluvium, Residuum	3.3 ⁴	NA ¹¹	NA ¹¹	175 ⁴	NA ¹¹

Table 3-21: Summary of the Region's Principal Groundwater Aquifers¹

Groundwater Basin	Basin Number	Water-Bearing Formations	Surface Area (sq. miles)	Estimated Storage Capacity (AF)	Estimated Potential Yield ²⁴ (AFY)	Aquifer Depth (Feet)	
						Maximum	Average
1 Groundwater Basin names and numerical designations per California Department of Water Resources <i>California's Groundwater</i> (Bulletin 118).							
2 Total existing long-term yield that could be realized on an annual basis without causing long-term overdraft. Does not consider yield restrictions that may be necessary to prevent impacts to groundwater-dependent vegetation or yield restrictions necessary to protect or improve existing groundwater quality. In many coastal basins, the available groundwater yield may not be of a quality that meets potable or irrigation use standards.							
3 Value reported by U.S. Marine Corps Base Camp Pendleton within Metropolitan Water District of Southern California <i>Groundwater Assessment Study</i> , Chapter IV, Groundwater Basin Reports (Metropolitan Water District of Southern California, 2007).							
4 Value or estimated presented within California Department of Water Resources <i>California's Groundwater</i> (Bulletin 118)(DWR, 2003).							
5 Includes Oceanside Mission Basin, Bonsall Basin, Moosa Basin, and Pala/Pauma Basin.							
6 Value reported within Metropolitan Water District of Southern California <i>Groundwater Assessment Study</i> , Chapter IV, Groundwater Basin Reports (Metropolitan Water District of Southern California, 2007).							
7 Estimated yield for Mission Basin (7,000-10,000 AFY), Bonsall Basin (5,400 AFY), and Pala/Pauma Basin (8,000 AFY).							
8 Maximum depth of La Jolla Formation within the San Luis Rey Valley groundwater basin.							
9 Average depth of alluvium within the San Luis Rey Valley groundwater basin.							
10 Depth for Temecula Arkose formation which underlies the Warner Basin.							
11 Value currently unknown, as reported within DWR Bulletin 118 (DWR, 2003).							
12 Includes the Mission Valley Basin and Santee-El Monte Basin.							
13 Estimated yield includes 2,000-3,000 AFY from the Mission Valley Basin and 3,000-4,000 AFY from the Santee-El Monte Basin.							
14 Capacity includes capacity of underlying San Diego Formation. DWR (2003) estimates the storage capacity of alluvium within the Sweetwater Valley Groundwater basin at 17,000 to 20,000 acre-feet.							
15 Estimated yield includes 2,400 AF from the lower Sweetwater River Valley alluvium, 3,000 AF from the middle Sweetwater River Valley alluvium, and 3,000-5,000 AFY from the San Diego Formation.							
16 Listed thickness for the San Diego Formation within the Sweetwater River Valley.							
17 Yield is for the San Diego Formation within the Lower Tijuana Basin.							
18 Depth of San Diego Formation extends to 1700 feet. Maximum depth of alluvium is 150 feet.							

The Water Authority (2011a) reports that existing groundwater production for municipal supply purposes exceeds 18,000 AFY within the region, and includes:

- more than 8,500 AFY of production within the Santa Margarita, San Mateo, and San Onofre Basins within USMC Base Camp Pendleton,
- 2200 AFY of production by the City of Oceanside from the Mission Basin (lower San Luis Rey River Valley Basin),
- approximately 980 AFY of production by mutual water company wells within the Yuima Water District boundaries in the Pauma Basin (upper San Luis Rey River Valley Basin),
- more than 900 AFY of production within the Santee Basin by the Lakeside Water District,
- 150 AFY of production within the El Monte Basin by the Helix Water District,
- approximately 150 AFY of production within the El Monte Basin by the City of San Diego, and
- more than 5,400 AFY of production within the San Diego Formation and Lower Sweetwater River Valley by Sweetwater Authority.

In 1954, the Vista Irrigation District began pumping groundwater from the Warner Valley groundwater basin to supplement raw water supplies in Lake Henshaw (VID 2011). Although VID groundwater pumping from the Warner Valley groundwater basin varies, VID estimates that since 1960 the median annual groundwater production has been 7,702 AFY (VID 2011). This pumping is not included within the Water Authority's estimates of groundwater use.

Significant groundwater resources have been found to exist in deeper aquifers comprised of semi-consolidated or consolidated sediments. Recent field investigations indicate that one such deep aquifer, the San Diego Formation, has significant unused water storage and groundwater production potential.

While significant understanding occurs for larger alluvial aquifers that have supported ongoing groundwater development projects, additional study and evaluation is required to better understand aquifer characteristics and water supply development potential within the Region's deeper and less utilized aquifers. To address this need, the USGS, in partnership with local water agencies, has initiated a comprehensive geologic and hydrologic study of the Region's aquifers. Key objectives of the San Diego Hydrology Project include:

1. Develop an integrated, comprehensive understanding of the geology and hydrology of the San Diego area, focusing on the San Diego Formation and the overlying alluvial deposits.
2. Use this understanding to evaluate expanded use of the alluvial deposits and the San Diego Formation for recharge and extraction.

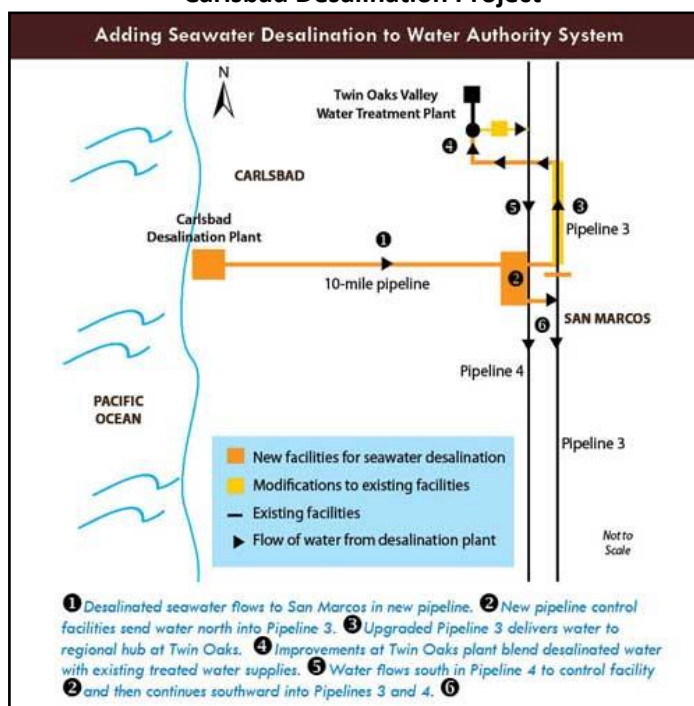
To develop data in support of these objectives, the USGS study has completed 12 multiple-depth test wells in and around the San Diego Formation, along with an additional well in the Santa Ysabel area. Four additional deep test wells are planned as part of this effort.

3.5.7 Desalinated Seawater

Poseidon Resources, a private investor-owned company, is constructing a 50 MGD seawater desalination plant adjacent to the Encina Power Station in Carlsbad. When completed in 2016, the plant will be the largest seawater desalination facility in the Western Hemisphere. As part of the project, Poseidon Resources is also constructing a 10-mile conveyance pipeline to link the desalination plant to the Water Authority's second aqueduct.

The Water Authority in November 2012 approved a 30-year Water Purchase Agreement with Poseidon Resources for the purchase of up to 56,000 AFY of desalinated seawater. Poseidon Resources will own and operate the desalination facility and will assume risks associated with constructing, maintaining, and operating the facility, and ensuring that water quality meets standards specified within the agreement. The Water Authority, in turn, has agreed to purchase the water that meets specified standards at a set price during the 30-year agreement period. Additionally, the agreement specifies that the Water Authority can purchase the desalination plant for one dollar at the end of the 30-year agreement. Once constructed, the Water Authority will own and operate the 10-mile conveyance pipeline. Two of the Water Authority's

Figure 3-12: Conveyance Facilities for Carlsbad Desalination Project



member agencies, the City of Carlsbad and the Vallecitos Water District have agreed to purchase a total of 6,000 AFY of the desalinated water.

The Water Authority is in the process of implementing improvements to its regional water delivery and treatment system to integrate desalinated water. These system improvements (see Figure 3-12) will allow the Water Authority to blend the desalinated supply into treated water in Pipelines 3 and 4 of the second aqueduct. The Water Authority also is involved in two feasibility studies of additional seawater desalination plants, one at Camp Pendleton Marine Corps Base and the other in Rosarito, Baja California, in conjunction with several parties that receive water from the lower basin of the Colorado River. In addition, the Otay Water District is in discussion with a private company to develop a binational desalination plant in Rosarito.

3.5.8 Conservation

Water conservation is a fundamental component of the Region's water supply diversification effort. The Water Authority and its member agencies have been aggressively implementing water conservation since 1990. There are two types of water conservation in the Region, both of which contribute to Regional water supplies: 1) water conserved through reduced loss from the system, and 2) water conserved through reduced user demand. Water conservation through loss reduction has been achieved through projects that line the canals that bring imported water to the Region and other infrastructure improvements. Potable water demand reduction can take place in a traditional water conservation setting whereby water users use less water on a per capita basis. In addition to traditional water conservation, implementation of onsite systems that use alternative water sources such as graywater systems, rainwater harvesting systems or on-site industrial reuse can reduce potable water demands.

Water Use Reduction Programs

Significant Water Authority and member agency funding has been directed toward implementing comprehensive water conservation best management practices (BMPs) (see inset below) to reduce water use for residential, commercial, and agricultural irrigation, and to reduce water use in homes, businesses, industries, and institutions.

The comprehensive water conservation program implemented by the Water Authority and its member agencies resulted in approximately 65,000 AF of water savings during 2010 (Water Authority, 2011a). Additional water conservation savings are projected as the Water Authority and its member agencies expand regional water conservation efforts. Additionally, the Water Authority and its members agencies are undertaking measures to comply with Senate Bill 7-7 (SBx7-7), which require retail urban water agencies to achieve a 20% reduction in per capita water use by 2020.

A Homeowners Guide to a WaterSmart Landscape

<http://www.sdcwa.org/landscape-guide-flipbook/>

A Homeowner's Guide to a WaterSmart Landscape



Starting in 2006, the Water Authority and member agencies began a transition in the approach to water conservation. Three Water Conservation Summits were held between 2006 and 2009. These summits, which placed an increased emphasis on landscape and commercial/industrial conservation, brought in business and industry, land use planning agencies, environmental groups and other stakeholders to participate in a regional approach to landscape conservation. Following the second summit, the region developed a Blueprint for Water Conservation to help the Water Authority and its member agencies strategically plan and implement conservation efforts and programs. The Blueprint includes strategies for saving water in landscaping, indoor uses and agriculture. The Water Authority is also implementing conservation partnerships with its member agencies, the Water Conservation Garden, Metropolitan Water District, and San Diego Gas and Electric.

***California Urban Water Conservation Council
Water Conservation Best Management Practices (BMPs)***

The Water Authority and its member agencies comply with all 13 water conservation BMPs developed by the California Urban Water Conservation Council, including:

Utilities Operations Programs

- Conservation coordinator
- Water waste prevention
- Wholesale agency assistance programs

Education Programs

- Public information programs
- School education programs

Residential

- Residential assistance program
- Landscape water survey
- High-efficiency clothes washers
- WaterSense Specification toilets
- WaterSense Specifications for residential development

Commercial, Industrial, and Institutional

- Commercial, industrial, and institutional savings

Landscape

- Savings for dedicated landscape irrigation accounts
- Savings from CII accounts within meters or mixed use meters

Source: CUWCC Resource Center: <http://www.cuwcc.org/bmps.aspx>

While many regional efforts have been implemented to increase conservation, especially with regards to outdoor water use for landscape irrigation, regional stakeholders have indicated that there are impediments to conservation actions. The public's attitude about what are acceptable landscaping options given the Region's warm and dry Mediterranean climate, need to change to match the current climate. There are a wide range of options available for landscapes which use a minimal amount of water and still look beautiful. Contrary to State law, homeowners associations are still trying to enforce outdated rules that restrict the use of certain plants, and therefore provide an impediment to landscaping with low water use plants. Public education and a conservation ethic is critical to achieving outdoor conservation.

Graywater

Graywater is defined as wastewater that is generated from domestic activities such as laundry and bathing. To protect human and environmental health, graywater systems reuse untreated wastewater that has not been contaminated by food or human waste for non-potable purposes, primarily irrigation.

Although the potential for graywater reuse to reduce potable water demand has long been recognized, permitting and regulations have presented significant barriers to widespread implementation of graywater systems in the Region. In 2009, however, DWR released an emergency order that eased the permitting process for graywater systems in California. Per State Plumbing Code Chapter 16A, graywater systems supplied by washing machines generally do not require a permit, though more complex systems or ones that utilize other graywater supply sources typically do. General requirements for graywater systems include the ability to direct graywater to both irrigation and sewer systems, a physical barrier or air gap to prevent backflow and cross-contamination, subsurface irrigation systems, and design that prevents ponding or runoff. Additionally, graywater cannot make direct contact with edible portions of food crops. Cities, counties, and other jurisdictions are able to place additional regulations on graywater systems and uses (HCD, 2010). Within the Region, local cities and the County of San Diego (Department of Environmental Health) regulate graywater through adoption of the plumbing code. Both the City of San Diego and the County regulate graywater per the State code with no additional restrictions.

Challenges to widespread implementation of graywater systems include the expense of installation and restrictions on use, both of which place limits on graywater system installation (City of San Diego, 2002). The City of San Diego has estimated that graywater could potentially provide 2,575 AFY of irrigation water by 2035 (City of San Diego 2013). If this amount of graywater were to be used in the City, it would represent just over 1% of the City's 2035 water demands (City of San Diego 2011).

Rainwater Capture

Rainwater capture is another tool for water conservation in the Region. As its name implies, rainwater capture involves diverting, capturing, and storing rainwater runoff before it enters the storm sewer system. Captured rainwater can be used for non-potable purposes, such as irrigation, or may be allowed to recharge into groundwater basins. Capturing and reusing rainwater reduces water demands for irrigation or groundwater recharge, benefits water quality through reduced stormwater runoff, reduces the load on regional stormwater infrastructure, and helps mitigate high runoff flows from impervious surfaces that cause hydromodification of streams and rivers. Rainwater capture through groundwater recharge is limited in the San Diego region due to the small size of the local groundwater basin and the presence of expansive clay soils.

Common methods of rainwater capture include installation of rain barrels to collect water from rooftops, and rain gardens designed to collect rainwater and allow the water to irrigate onsite plants. Though the Region encourages the use of rain barrels and rain gardens, it is important to properly design rainwater capture systems for the appropriate volume of water expected to be captured and to accommodate individual site characteristics, such as soil type or slope. The City of San Diego has produced a *Rainwater Harvesting Guide* (City of San Diego, 2012) that details how to design a rainwater harvesting system. This guide encourages customers to select plants for a proposed rain garden that have a corresponding water need to the expected volume of rainwater that can be captured by the system. For example, if the site only receives a few inches of rain per year, a rain garden of tropical plants would require additional irrigation, as its water needs would not be met by the captured rainfall. Instead, landowners in areas with low rainfall should select

less-water intensive plants, such as native plants or succulents. The City of San Diego initiated its Rain Barrel Rebate Pilot Program in 2012 which offers single-family residential customers the opportunity to receive a rebate when connecting a newly installed rain barrel to a rain gutter downspout in that collects precipitation from the rooftop. The amount of rain water that can be collected depends on several variables, including dimensions of the rooftop, storage capacity of the rain barrel(s), as well as the amount and timing of rainfall. A general rule of thumb follows that 1,000 square feet of rooftop surface captures 625 gallons of water when an inch of rainwater falls. Since the start of the City's program, over 300 rain barrel rebates have been issued with water savings projected at 1,113,250 gallons (3.4 AF) per year.

In addition to rainwater capture that involves capturing water and storing the water for irrigation purposes, landscapes can be modified to increase local infiltration potential, which will help to ensure that water that falls on the ground is infiltrated rather than running off the surface as stormwater. Increasing infiltration is a long-term rainwater capture strategy that helps to restore soil moisture and improve ecosystem health by restoring sub-surface water flows.

Low Impact Development (LID) is another method that can be implemented to capture rainwater and reduce stormwater runoff. The 2013 MS4 permit mandates that no additional runoff may occur from new developments in the MS4 permit area. This requirement will encourage implementation of rainwater capture-friendly LID measures, such as permeable surfaces, dispersed infiltration, rain barrels or cisterns, rain gardens, or bioswales (County of San Diego, 2007).

Reducing stormwater runoff could improve water quality by increasing natural filtration of pollutants from runoff flowing slowly through vegetation and percolation through permeable surfaces, reducing the amount of pollutants washing into local waterways over time, and reducing habitat changes that may have a negative impact on water quality. Though reduced runoff contributes to improved water quality, pollutants that are found on surfaces that runoff would have carried into waterways, is still present, and will enter waters during the "first flush" event – the first major storm event following the dry season. However, this first flush event tends to move pollutants to the ocean more quickly and at greater dilution than is carried by smaller rainfall events that would produce runoff without rainfall capture efforts in place.

3.5.9 Stormwater Management

Stormwater is managed through the Region's MS4 Permit, as described here and in Section 3.6.4. Stormwater in the Region is diverted to each agency's municipal separate storm sewer system (MS4). An MS4 system is legally defined as a system through which stormwater and non-stormwater are discharged to waters of the United States (Regional Board, 2013a). In the San Diego Region, MS4 systems fall into one or more of the following categories:

1. A medium or large MS4 that services a population of greater than 100,000 or 250,000 respectively
2. A small MS4 that is "interrelated" to a medium or large MS4
3. An MS4 which contributes to a violation of a water quality standard
4. An MS4 which is a significant contributor of pollutants to waters of the United States

The MS4 system comprises the ditches, storm pipes, retention ponds and other facilities constructed to store runoff or carry it to a receiving stream, lake, or ocean. Other constructed features in such a system include swales that collect runoff and direct it to storm drains and ditches. Most systems are designed to handle the amount of water expected during a 10-year storm. Larger

storms overload them and the resulting backed-up storm drains and ditches produce shallow flooding (FEMA, 2007).

An MS4 is designed to prevent or reduce flooding in developed areas. Because MS4s do not provide treatment prior to discharging collected stormwater, they can present a water quality challenge, as stormwater can have high levels of pollutants collected during runoff. The MS4s in the Region also collect urban runoff which can carry pesticides, fertilizers, and anything that is dumped into storm drains, such as oil or trash, to the receiving waters. As the Region continues to grow, addressing the problem of pollution from stormwater and the MS4 will be imperative. In general, stormwater programs governed by the MS4 process include:

- Urban runoff and receiving water monitoring during wet and dry weather,
- Assessment of water quality trends, potential sources, and impacts,
- Standards to manage runoff discharge rates and durations from all Priority Development Projects, and
- Programs to prevent, control, and treat sources of pollutants such as BMPs, water conservation, public education and outreach, maintenance of streets and storm water infrastructure, inspections of pollutant generating activities.

Stormwater is managed by the jurisdictions that own and operate the MS4 system, and regulated by an MS4 Permit granted by the Regional Board.

In 2001, the MS4 Permit for the San Diego Copermittees changed dramatically from past permits. New requirements included stormwater mitigation plans for new and re-development projects, expanded oversight of existing commercial and industrial areas, and the creation of both Jurisdictional Urban Runoff Management Programs (JURMP) and Watershed Urban Runoff Management Programs (WURMP). Each Copermittee developed a JURMP describing its plan to control urban runoff within its jurisdiction. In addition, WURMPs were developed collaboratively by all Copermittees whose jurisdictions fell partially or entirely within a watershed. The WURMPs were written to specifically address the management of priority water quality issues identified in each watershed.

In May 2013, a new MS4 Permit was issued for the Region. Over the next few years, this new permit will eventually include the portions of south Orange County and south Riverside County that are within the San Diego Regional Board area. New to this permit is the development of Water Quality Improvement Plans (WQIPs) for each watershed. WQIPs will define priority water quality conditions, establish water quality improvement goals and strategies, establish schedules for meeting the WQIP goals and incorporate integrated monitoring and assessment plans to help guide runoff management programs in improving water quality in MS4 discharges and receiving waters (Regional Board, 2013a). The new permit also includes more rigorous development and redevelopment requirements that include an offsite mitigation option for development projects where onsite retention and treatment are not technically feasible, or where applicants can demonstrate a greater overall benefit to water quality by mitigating offsite. The 2013 permit also includes adopted TMDL waste load allocations as numeric water quality based effluent limits that must be achieved by specified timelines. Finally, the permit now requires Copermittees to implement expanded programs to pro-actively address urban runoff discharges from residential areas, including a stronger emphasis on eliminating or reducing over-irrigation flows. Improved stormwater quality is a central component to multiple IRWM Plan objectives. Specifically, activities that contribute to Objective G and Objective H frequently manifest themselves as stormwater or stormwater quality control. The IRWM Program includes numerous projects that reduce

impervious surfaces, increase infiltration, and reduce runoff. Changes in landscaping practices, such as using water-wise plants instead of turf or improving irrigation practices, also help to reduce the pollutants in stormwater and runoff. Restoration projects also frequently increase the ability of an area to act as natural filters for runoff. By helping to meet the Plan objectives, these types of projects are more likely to be prioritized or selected for inclusion in IRWM funding packages, and help to improve stormwater management region-wide. Projects designed to improve the scientific basis of water quality regulations are consistent with the IRWM regulatory strategies outlined in *Chapter 7, Regional Coordination*.

Challenges to managing stormwater in the Region frequently stem from the expense of BMP installation, variability and uncertainty of BMP success, jurisdictional boundaries that are not aligned with watersheds or drainage areas, differences in land use and priorities, debate over appropriate water quality standards that are protective of beneficial uses, and uncertainty over the ability to comply with the terms of the Region's 2013 MS4 Permit. The WURMP and JURMP process, while important, is difficult, expensive, and time consuming. The 2013 MS4 permit requires Water Quality Improvement Plans (WQIP) instead of WURMPs. Under the expected terms of the new permit, WQIPs will cover the entire watershed and will require coordination between all copermittees whose jurisdictions fall within the watershed. There has also been some debate over the water quality standards established by the Regional Board, and the future may see a shift from some of the current concentration-based standards to biological criteria, such as those considered in the nutrient numeric endpoint (NNE) based standards. This shift may affect which management strategies are necessary or appropriate, and may make management easier or more challenging, depending on if or how changes to standards are implemented.

Another challenge to stormwater maintenance involves balancing multiple and sometimes conflicting interests. For example, the City of San Diego's Master Storm Water System Maintenance

Determining Appropriate Water Quality Objectives: Santa Margarita River

Nitrogen and phosphorous loading from the Santa Margarita River Watershed can result in low dissolved oxygen (DO) and increased algal blooms in the estuary and stream segments, several of which have been 303(d)-listed for nitrogen, phosphorus, or eutrophication. Total Maximum Daily Loads (TMDLs) are not currently in place in most of the Santa Margarita River Watershed segments which are listed for nutrient impairment. At this time, there is little scientific knowledge about the appropriate level of nutrients that the Santa Margarita River can sustainably assimilate.

The Santa Margarita River Nutrient Study – funded through Proposition 84, Round 1 – aims to establish the science and seek stakeholder consensus to develop seasonal nutrient water quality objectives (WQOs) that are protective of beneficial uses. Stakeholders believe that since the estuary through which the Santa Margarita River flows is open to the ocean during the winter (the wet season), nutrients in the river only have a short residence time before they enter the ocean. Development and adoption of seasonal WQOs would significantly decrease stormwater treatment costs during a timeframe in which there are no real impacts to riverine species or habitats.



Nutrient water quality data collection will help the Region better understand how to manage the Santa Margarita River.

Photo credit: JoAnn Weber, County of San Diego

Program identifies channels within the City's jurisdiction that have deposits of sediment and overgrowth of vegetation that require maintenance to restore stormwater and flood control capacity. This program was challenged by local organizations for its potential habitat fragmentation and biological impacts, and a Settlement Agreement was reached that incorporated additional water quality measures and biological mitigation requirements into the program. This program, and others across the Region, must balance flood control safety and stormwater maintenance requirements with natural resources protection.

3.5.10 Flood Management

Although precipitation in the Region is highly variable, flooding remains a high risk in many communities. Flooding in the Region occurs during periods of heavy rainfall, particularly after long dry spells (San Diego County, 2010).

The Floodplain Management Plan for the County of San Diego (FEMA, 2007) reports that from 1770 until 1952, 29 floods were recorded in the County of San Diego. Between 1950 and 2006, flooding prompted 12 Proclaimed States of Emergency in the County of San Diego. Several very large floods have caused significant damage in the County. The Hatfield Flood of 1916 destroyed the Sweetwater and Lower Otay Dams, and caused 22 deaths and \$4.5 million in damages. The most recent serious floods affecting the County occurred during tropical storms Kathleen (1977) and Doreen (1978) and during winter storms in 1980, 1987, 1993, 1998, and 2005. In the 1980 flood, approximately 16-20 inches of rain accumulated over a six week period. This slow moving storm, which was the most severe since the Hatfield Flood of 1916, lead to wide-spread small stream flooding and evacuations of residents in Mission Valley. The San Diego River at Mission Valley peaked at 27,000 CFS and caused \$120 million in damage (FEMA, 2007). Flooding during the 2004-2005 wet season caused \$7.7 million in damages, and flash flooding since 1993 has caused upwards of \$16 billion in damages, countywide (San Diego County, 2011a).

Within the Region there are two categories of flooding: precipitation-induced and non-precipitation-induced. Precipitation-induced flooding includes flash floods, debris flows, and alluvial fan floods. The central and eastern portions of San Diego County are most susceptible to flash floods where mountain canyons, dry creek beds, and high deserts are the prevailing terrain (FEMA, 2007). Additional risks from precipitation induced flooding stems from the association of wildfires with flooding. As fires remove vegetation, runoff is not taken up by vegetation and soils are destabilized. This leads to an increase in runoff entering streams, increasing flooding risks, and to an increase in debris flow risks. Because the Region is prone to wildfires, and this risk is expected to increase as an impact of climate change, the risk of flooding that is exacerbated by wildfires needs to be managed (San Diego County, 2011a). An additional flood risk that can be exacerbated by wildfires is non-native invasive vegetation species. Land that has been cleared by wildfire is more susceptible to regrowth of non-native invasive vegetation species. Invasive species, such as giant reed (*Arundo donax*), can outcompete native species and dominate riparian areas. Once established, *Arundo* in particular can change diverse native riparian areas into monotypic non-native riparian areas. *Arundo* provides very little habitat value to native wildlife and dead and dry stands can become a fire hazard themselves. The root system of *Arundo* along with its typical dense growth structure can cause increased sedimentation and narrowing of channels. This can increase flood risk on adjacent lands.

Non-precipitation-induced flooding is caused by urbanization, landform modification, faulty drainage facilities, dam failures, tsunamis, and seiches (standing waves in an enclosed or partially enclosed body of water). Of these, the Region is most at risk from flooding caused by urbanization and faulty drainage facilities. Urbanization increases impervious surfaces, and therefore increases

runoff. This runoff enters streams more quickly, in higher volumes, and at greater speeds. Each of these contributes to an increase in flood risk if the channels or streams are not able to accommodate the increased runoff. These problems can be made worse by faulty drainage facilities, which may fail or overflow if not adequately sized or maintained (San Diego County, 2011a).

Federal Emergency Management Agency (FEMA) flood zones represent the areas susceptible to the 1% annual chance flood (often referred to as the “100-year flood”), and the 0.2% annual chance flood (“500-year flood”). The 1% annual chance flood, also known as the “base flood,” has at least a 1% chance of occurring in any given year. FEMA designates this area as the Special Flood Hazard Area (SFHA) and requires flood insurance for properties in this area as a condition of a mortgage backed by federal funds. Designated high-risk areas are those within the 100-year floodplain, while areas within the 500-year floodplain are considered low-risk. Areas within the Region at highest risk for flooding are typically downstream areas along rivers, and concentrated around the coast at bays, coastal inlets, and estuaries. Properties that are included in the SFHA may be contested, and those interested in changing a property’s floodplain designation may submit a request for a Letter of Map Change (LOMC) to FEMA. If FEMA approves a LOMC, the FEMA Flood Insurance Rate Map will be officially revised or amended by FEMA; such an amendment will likely reduce insurance requirements and can reduce development restrictions.

Within the Region, over 101,000 people are exposed to high-risk from flooding. The potential losses due to damages to buildings in high-risk areas are over \$17 billion, with \$2.2 billion of critical facilities (e.g. hospitals, infrastructure) at high-risk from flooding (San Diego County, 2010). Locally identified “hot spot” flood areas are listed in Table 3-22 below.

In order to address these risks, a *Multi-Hazard Mitigation Plan* was developed for San Diego County (San Diego County, 2010). This Mitigation Plan included participation from the Water Authority, California Emergency Management Agency, FEMA, local and regional officials, the Rancho Santa Fe Fire Protection District, and stakeholder input. The Mitigation Plan includes specific goals, objectives, and actions for each jurisdiction to help address or mitigate the identified risks. Common actions related to mitigation of flood risks include maintaining current flood maps, discouraging growth in flood-risk areas, improving or maintaining stormwater systems, incorporation of natural flood control measures into design and development, continue to monitor and assess drainage, and develop comprehensive flood management and response plans (San Diego County, 2010).

Table 3-22: Local “Hot Spot” Flood Areas¹

HU	Watershed	Flooding Source	Location and/or Description
902	Santa Margarita River	Santa Margarita River	Sandia Creek Drive and Rock Mountain Drive affecting Fallbrook and DeLuz
903	San Luis Rey	Upper San Luis Rey River	Between Lake Henshaw and La Jolla Indian Reservation; Cole Grade Road; and Shearer Crossing (San Luis Rey River at I-15); Pauma Valley Drive: Wiskon Way; Valley Center Road (Rincon Casino)
904	Carlsbad	Escondido Creek	El Camino Del Norte near Rancho Santa Fe and Olivenhain
		Escondido Creek	At Country Club Road; Elfin Forest
		Twin Oaks Creek	At Sycamore Road/Walnut Grove
		San Marcos Creek	From Discovery Street to East of SR-78
905	San Dieguito River	San Dieguito River	Downstream from Hodges Reservoir to Del Mar
		Hatfield Creek	Magnolia Avenue in Ramona
		Santa Maria Creek	In Ramona; Rangeland Road
907	San Diego River	San Diego River	Mission Valley and Fashion Valley Mall; Fashion Valley Road; Avenida del Rio; Camino del Este
		San Vicente Creek	Below San Vicente Reservoir, Moreno Valley
		Lemon Crest (Lakeside)	Local flooding problem
		Dulene Drive (Lakeside)	Local flooding problem
		Adlai Drive (East Lakeview)	Local flooding problem
909	Sweetwater River	Spring Valley Creek	Quarry Road at Spring Valley Creek
		Sweetwater River	Singing Hills Country Club
		Wildoats Lane off Central Avenue	Yearly flooding problem identified by Flood Control staff
911	Tijuana River	Tijuana River Valley	Tijuana River Regional Park; Hollister Street; Dairy Mart Road
		Cottonwood Creek	Trailer Park at Barret Junction
		Campo Creek	Campo Valley flash flooding

¹ From *Floodplain Management Plan* (FEMA, 2007).

Flood Warning Program

The San Diego County Flood Control District (FCD) has the responsibility to provide flood warning services for the County of San Diego. This program encompasses three components: the ALERT Flood Warning System, the Webcam Program, and the Flood Forecast System.

The ALERT Flood Warning System

The ALERT Flood Warning System was developed in 1982 to address the need to obtain real-time rain and stream level data in order to detect flood-producing events early enough to respond in a timely manner. The system started out with 14 stations and has since expanded to over 120 stations. Data collected by the individual field stations are relayed in real-time to nearby data repeaters, which in turn, relay the data to the flood warning base station in Kearny Mesa. Incoming data is received by the flood warning computer, examined for quality control, examined for meeting any alarm criteria, then is placed into the database. Displays are updated, and if the data meet alarm criteria, a warning is issued on the computer, and a text message is assembled and sent to designated emergency personnel via email or smart phone. Emergency staff responds to the alarm

and contact the pertinent emergency agencies with information and recommendations. The ALERT flood warning system forms the core of the County Flood Warning Program and is used to provide input to flood forecast programs and provide real-time warning to emergency managers.

The FCD Webcam Program

The County of San Diego has several low water crossings over creeks and rivers. These crossings are either built directly on the river bottom or have small culverts to carry low flows under the road. Several times per year, heavy rainfall in the region is sufficient to cause enough runoff to flood several low water crossings in the County. The County has recently begun a program of placing internet webcams at key low water crossings with a history of flooding and flooding-related accidents. By accessing an in-house County website, these webcams can be controlled by emergency managers to check the magnitude of flooding at a crossing, check the quality of the road conditions during and immediately after flooding, identify vehicles that may have gotten trapped in the flood waters, and enable the public to examine the condition of the road during storms to determine whether they should use the crossing. Current webcams are located at Country Club Drive at Escondido Creek, Quarry Road at Spring Valley Creek, and Sandia Creek Road at Santa Margarita River. There is one candidate for a future webcam at Cole Grade Road on the San Luis Rey River. The public can view, but not control, the webcams at <http://sdcfcd.org/>.

The San Diego County Flood Forecast Program

Occasionally, the magnitude of the periodic flooding in San Diego County river systems is high enough to cause significant damage and injury. Recently, the FCD contracted with DHI Water and Environment to develop a comprehensive flood forecast model to cover the entire San Luis Rey Watershed and its primary tributaries. At regular timed intervals, the model retrieves rainfall and streamflow data from the ALERT Flood Warning system, and forecast rainfall from the National Weather Service website (<http://www.weather.gov/>). This information is run through the model to create a forecast of the expected flow conditions at several points along the San Luis Rey River and its primary tributaries. Analysis results are uploaded to a public website and a private emergency managers' website. The websites display the ALERT flood warning data from the stations within and near the watershed, point forecasts at nearly 100 bridges and low water crossings in the watershed, floodplain forecasts at five sensitive floodplains within the watershed, and a "state of the watershed" map showing the current water conditions at the forecast points. Emergency managers have access to detailed point forecasts, and animated floodplain maps that enable the user to drill right down to the street level to determined expected areas of flooding.

As funds allow, the model will be extended over time to cover the major watersheds of the San Diego River, Sweetwater River, San Dieguito River, and possibly the Tijuana River.

3.6 Internal Boundaries

3.6.1 Land Use Jurisdictions

Figure 3-13 identifies agencies responsible for land use and land planning within the region. The County, the 18 incorporated cities, and their associated planning districts support community planning, maintain comprehensive plans as required by statute, and administer and enforce land use codes and ordinances.

The USMC Base Camp Pendleton covers over 125,000 acres in the north portion of the Region. More than a dozen other military facilities exist within the Region. Additional federal land managers within the Region, in part, include the USFS, BLM, and the United States Fish and Wildlife Service (USFWS). USFS manages the Cleveland National Forest, which comprises the eastern portions of several of the Region's larger watersheds. BLM manages lands designated as Wilderness Areas, BLM National Monuments, BLM Public Lands, and BLM Wilderness Study Areas. USFWS manages the National Wildlife Refuge in the southwestern part of the County.

State land managers include the California Department of Fish and Wildlife (DFW), which manages land to implement DFW's Natural Community Conservation Plan (California Fish and Game Code Sections 2088-2805), and the California State Parks, which manages parklands such as Cuyamaca State Park. DFW's Natural Community Conservation Plan seeks to conserve natural communities at the ecosystem scale while accommodating compatible land use.

Tribal lands are significant in the Region: there are more Tribal Reservations within the County than in any other county in the United States (University of San Diego, 2006). These Reservation lands, which are governed by Tribal Nations, total 127,000 acres (approximately 200 square miles).

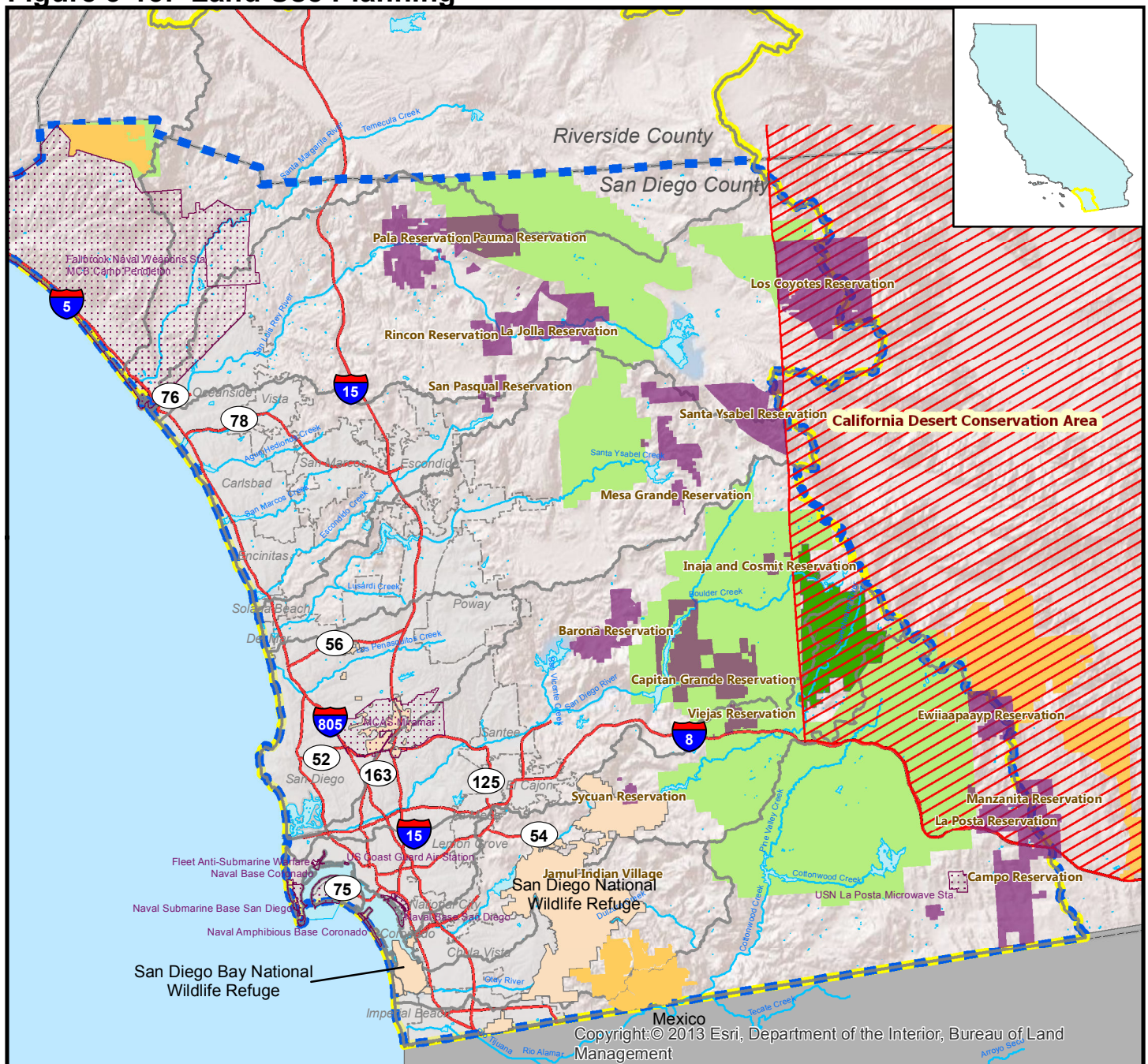
3.6.2 Water Supply Agencies

Water supply within the Region is predominantly imported water provided by the Water Authority, which is the sole regional imported water wholesale agency within the region. All major retail water agencies within the Region are members of the Water Authority. Figure 3-14 presents boundaries of Water Authority member agencies.

In addition to serving as the Region's provider of imported water, the Water Authority serves as a regional water planning agency to coordinate regional water issues. In this role, the Water Authority assists its member agencies (through financial, coordination, or planning support) in implementing local water planning and project development, and provides a forum for member agencies to discuss and address regional water issues. Most Water Authority member agencies maintain interagency agreements with adjoining member agencies to maximize conveyance flexibility and emergency response.

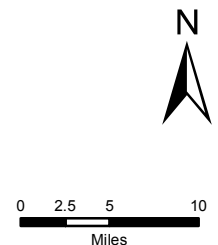
The rural eastern portion of the Region is outside the Water Authority's service area. Water service within this eastern area is provided by either onsite private wells or by small community water systems or private water companies.

Figure 3-13: Land Use Planning



Legend

- | | |
|--|---------------------------------|
| US Fish and Wildlife Service Wildlife Refuge | Ocean |
| Cuyamaca State Park | Waterbody |
| Tribal Lands | City Boundaries |
| Watershed | County |
| San Diego IRWM Region | Freeway |
| Funding Area Boundary | BLM National Conservation Areas |
| Freeway | BLM Wilderness Areas |
| BLM National Conservation Areas | Cleveland National Forest |
| BLM Wilderness Areas | Military Facilities |
| Cleveland National Forest | Watershed |
| Military Facilities | |
| Watershed | |



[illegible]

Legend

- Small Water Systems
- San Diego IRWM Region
- Prop 84 Funding Area Boundary
- Mexico
- Waterbody
- Freeway
- River

<u>Map ID</u>	<u>Small Water System</u>	<u>Map ID</u>	<u>Small Water System</u>
1	ALPINE OAKS ESTATES	26	NORTH PEAK MUTUAL WATER CO.
2	BARRETT HONOR CARK	27	OAKVALE PARK
3	BARRETT LAKE MOBILEHOME PARK	28	PALOMAR MOUNTAIN MW CO.
4	BUTTERFIELD OAKS MH PARK	29	PALOMAR OBSERVATORY
5	CAMP CUYAMACA	30	PAUMA VALLEY MUTUAL WATER CO.
6	CAMPO ELEMENTARY SCHOOL	31	PHOENIX HOUSE
7	CUYAMACA WATER DISTRICT	32	PINE VALLEY BIBLE CONF. CENTER
8	DEL DIOS MUTUAL WATER CO.	33	PINE VALLEY TRAILER PARK
9	DESCANSO DETENTION FACILITY	34	POTRERO ELEMENTARY SCHOOL
10	DIAMOND JACK'S RV RANCH	35	RANCHO CORRIDO RV RESORT
11	DUDLEY'S BAKERY	36	RANCHO DEL CAMPO WATER SYSTEM
12	GUATAY MUTUAL BENEFIT CORP.	37	RANCHO ESTATES MUTUAL WATER CO.
13	H & J WATER CO.	38	RANCHO SANTA TERESA MW CO.
14	HARBISON CANYON ESTATES	39	RICHARDSON BEARDSLEY PARK INC.
15	HEAVENLY OAKS	40	SAN PASQUAL ACADEMY
16	JULIAN YOUTH ACADEMY	41	SPENCER VALLEY SCHOOL
17	LAKE HENSHAW WATER CO.	42	STUART WATER CO.
18	LAKE MORENA TRAILER RESORT	43	SUNRISE ESTATES MW CO.
19	LAKE MORENA VIEWS MW CO.	44	TECATE VISTA MUTUAL WATER CO.
20	LAKE WOHLFORD RESORT	45	TWIN LAKES RESORT
21	LAZY H MUTUAL WATER CO.	46	WARNER SPRINGS RANCH
22	LIVE OAK SPRINGS WATER COMPANY	47	WARNER UNIFIED SCHOOL DIST.
23	LOS TULES MUTUAL WATER CO.	48	WILLOWSIDE TERRACE WATER ASSOC.
24	MOUNT LAGUNA IMPROVEMENT ASSN.	49	WYNOLA WATER DISTRICT
25	MOUNTAIN EMPIRE HIGH SCHOOL	50	YMCA CAMP MARSTON/RAINTREE

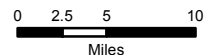


Table 3-23 presents a list of water systems within the Region that are supported by special districts or the County. In addition to the community water systems operated or supported by the County or special districts, nearly 200 mutual water companies provide water service (derived from local groundwater supply) to small communities within the Region. Table 3-24 presents mutual water companies within the Region that serve more than 200 service connections.

Tribal Nations within the Region are generally located on lands east of the Water Authority's service area and are dependent on local sources of water (primarily groundwater). The Rincon Band of Indians receives deliveries from Lake Henshaw, which stores both natural runoff and groundwater pumped from the Warner Basin. Their share of deliveries from Lake Henshaw is dependent on hydrologic conditions, as the groundwater is reserved for Vista Irrigation District and the City of Escondido.

Table 3-23: District-Operated Water Systems outside the Water Authority Service Area

HU ¹	Watershed	District	Community	Number of Connections ²	Water Source
903	San Luis Rey River	Mootamai Municipal Water District	Pala-Pauma	0 ³	Local groundwater
		Pauma Municipal Water District	Pala-Pauma	0 ⁴	Local groundwater
		San Luis Rey Municipal Water District	Fallbrook Valley Center Pala-Pauma	0 ⁵	Local groundwater
905	San Dieguito River	Questhaven Municipal Water District	San Dieguito	18	Local groundwater
907	San Diego River	Cuyamaca Water District	Cuyamaca	125	Local groundwater
		Julian Community Service District	Julian	188	Local groundwater
		Majestic Pines Community Service District ⁶	Julian	695 ⁶	Local groundwater
		Wynola Water District	Julian/Wynola	63	Local groundwater
909	Sweetwater	Descanso Community Service District	Descanso	315	Local groundwater
911	Tijuana River	County of San Diego (Campo Water and Sewer Maintenance District)	Campo	45	Local groundwater

1 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

2 Estimated number of connections as of 2011, per San Diego Local Agency Formation Commission (2011).

3 The Mootami Municipal Water District does not directly provide water. The district's operations are limited to protection of groundwater and riparian water sources. Water users within the district are served by privately-owned Pauma Valley Water Company or private wells.

4 The Pauma Municipal Water District does not directly provide water. The district manages water rights protection efforts and coordinates engineering activities related to water supply. All water within the district is obtained from private wells.

5 The San Luis Rey Municipal Water District is not authorized to provide water. The district funds activities to protect water and water storage rights of private owners.

6 A portion of the Majestic Pines Community Service District is within the Colorado River Basin, and is located outside the IRWM Plan region. Data are not available on the number of these customers that are inside the Region's boundaries.

Table 3-24: Mutual Water Company Systems outside the Water Authority Service Area¹

HU ²	Watershed	Water Company	Community	Number of Connections	Water Source
903	San Luis Rey River	Rancho Pauma Mutual Water Company	Pala-Pauma	396 ³	Local groundwater
907	San Diego River	Pine Hills Mutual Water Company	Julian/Pine Hills	465 ⁴	Local groundwater
		Pine Valley Mutual Water Company	Pine Valley	691 ⁵	Local groundwater
911	Tijuana	Lake Morena Oak Shores Mutual Water Company	Lake Morena	205 ⁶	Local groundwater

¹ Mutual water companies with more than 200 service connections servicing areas outside the Water Authority service area. Water systems with more than 200 service connections are regulated by the California Department of Public Health.

² Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

³ Pauma Valley Community Services District. Available: <http://www.paumavalleycsd.com/waterdist.php>. Accessed 14 May 2013.

⁴ Number of people served. Total number of connections not available. New York Times. 16 May 2012. Available: <http://projects.nytimes.com/toxic-waters/contaminants/ca/san-diego/ca3700905-pine-hills-mutual-water-company>. Accessed 14 May 2013.

⁵ Pine Valley Mutual Water Company. Available: <http://www.pinevalleywater.org/company-history.html>. Accessed 14 May 2013.

⁶ 2007 San Diego IRWM Plan. Available: <http://sdirwmp.org/2007-irwm-plan>

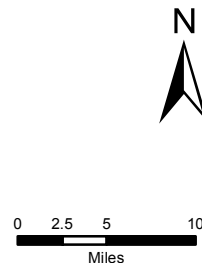
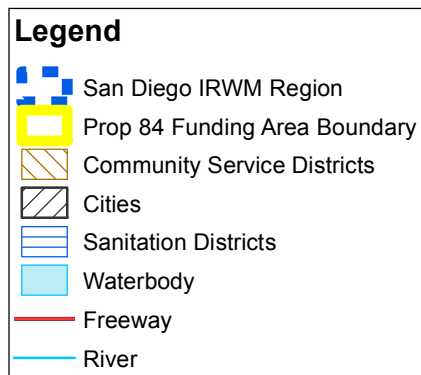
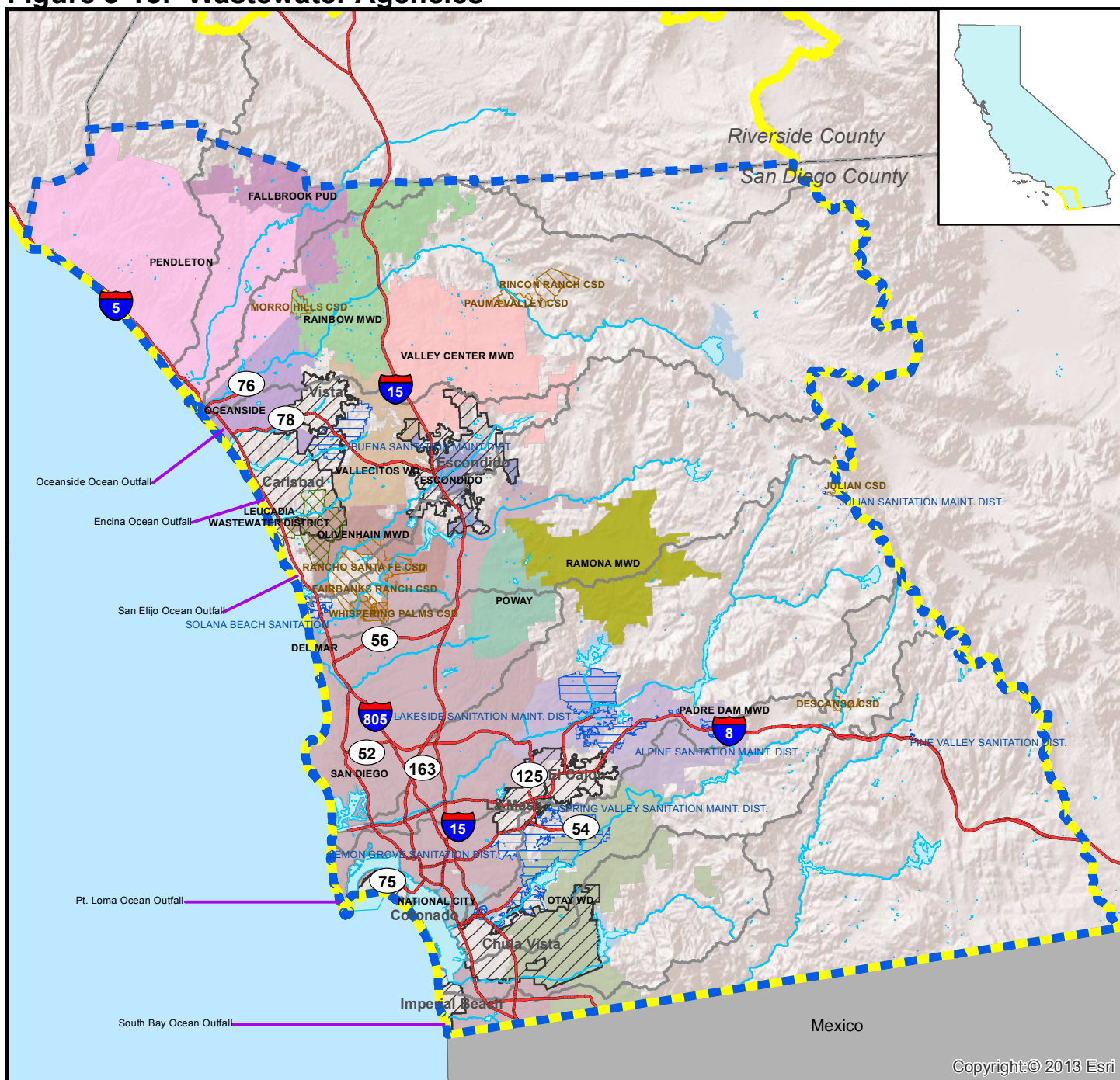
3.6.3 Wastewater Agencies

Municipalities and special districts provide wastewater service within the urbanized portion of the Region. Figure 3-15 presents wastewater agencies within the Region.

Section 3.5.4 presents a general description of the Region's wastewater infrastructure. The Region's urban wastewater agencies have organized (both through the formation of joint powers authorities and through interagency contracts) into five multi-jurisdictional wastewater systems based around the Region's five deep-water ocean outfalls. These include:

1. *Oceanside Ocean Outfall*. Fallbrook Public Utility District and USMC Base Camp Pendleton (southern portion of the base) have connected to the City of Oceanside system (via contract) to form an interconnected regional wastewater system in North San Diego County.
2. *Encina Ocean Outfall*. North County agencies that comprise the Encina Wastewater Authority (a joint powers authority) include the Buena Sanitation District, City of Carlsbad, City of Encinitas, Leucadia County Water District, Vallecitos Water District, and City of Vista.
3. *San Elijo Ocean Outfall*. The City of Escondido and San Elijo Joint Powers Authority jointly own the San Elijo Ocean Outfall. The San Elijo Joint Powers Authority is comprised of the City of Solana Beach, Cardiff Sanitation District, Olivenhain Municipal Water District, and Rancho Santa Fe Community Services District.
4. *Point Loma Ocean Outfall*. The Metropolitan Wastewater Sewer is operated by the City of San Diego on behalf of the Cities of Chula Vista, Coronado, Del Mar, El Cajon, Imperial Beach, La Mesa, National City, Poway, and San Diego, San Diego County, the Otay and Padre Dam Water Districts, and the East Otay, Lemon Grove, Alpine, Lakeside, Spring Valley, and Winter Gardens Sanitation Districts. *Note*: the City of Chula Vista is not a member of the Joint Powers Authority but receives wastewater service through the Metropolitan Wastewater System.
5. *South Bay Ocean Outfall*. The City of San Diego and the U.S. Government jointly own the South Bay Ocean Outfall.

Figure 3-15: Wastewater Agencies



In addition to the integrated wastewater systems listed above, a number of the Region's wastewater and recycled water agencies have entered into agreements to construct and operate joint facilities, share use of facilities owned by one or more entities, purvey recycled water to one another, address wastewater and recycled water service areas and responsibilities, share or assign industrial waste pretreatment responsibilities, conduct required monitoring, and mutually share resources during emergencies.

Special service districts provide wastewater service in less urbanized areas of the Region, including the communities of Whispering Palms, Valley Center, Fairbanks Ranch, Ramona, Rancho Santa Fe, and Pauma Valley. Sanitation districts operated by the County provide wastewater service to such inland communities as Julian, Pine Valley, and Campo. Local Tribes provide wastewater service within their respective reservation boundaries. Wastewater service outside of these districts is provided by onsite wastewater (septic) systems.

3.6.4 Stormwater Agencies

As noted in *Chapter 1, Introduction*, the Regional Board MS4 Permit regulates stormwater and urban runoff within the Region. The recent adoption of a new MS4 Permit in May 2013 shifts the emphasis of stormwater management more to watersheds. Under the 2007 permit, the County acted as Principal Permittee for the 21 Copermittees named in the permit. Each Copermittee is responsible for operating its own stormwater/urban runoff management program within its respective jurisdiction. Copermittees implement stormwater programs on a watershed basis following the boundaries of the Watershed Management Areas (WMAs).

The 21 Copermittees from the San Diego IRWM Region named in the 2013 MS4 Permit include:

- City of Carlsbad
- City of Chula Vista
- City of Coronado
- City of Del Mar
- City of El Cajon
- City of Encinitas
- City of Escondido
- City of Imperial Beach
- City of La Mesa
- City of Lemon Grove
- City of National City
- City of Oceanside
- City of Poway
- City of San Diego
- City of San Marcos
- City of Santee
- City of Solana Beach
- City of Vista
- County of San Diego
- San Diego Unified Port District
- San Diego County Regional Airport Authority

As Principal Permittee, the County coordinated with the County's 18 municipalities, the Unified Port District, and the County Regional Airport Authority in the development and implementation of regional stormwater monitoring programs, stormwater management plans, and best management practices. In this role, the County organized and managed the Stormwater Copermittee Regional Management Committee to facilitate interaction and coordination among the Copermittees.

Additionally, the County formed Project Clean Water (www.projectcleanwater.org) to address region-wide watershed issues through participation of a broad range of governmental agencies, non-governmental agencies, and regulators. As part of Project Clean Water, the Watershed Technical Advisory Committee was formed in 2004 to discuss and coordinate a range of watershed planning and implementation issues.

A new MS4 permit was adopted and went into effect in 2013 (Order No. R9-2013-0001 [NPDES No. CAS0109266]). Significantly, the 2013 permit does not have a Principal Permittee, and will eventually include all 39 agencies in Regional Water Quality Control Board Region 9 (this includes Copermittees from San Diego County, south Riverside County, and south Orange County). Copermittees will now be required to organize on a watershed scale for coordination and planning

of stormwater programs. However, given the nature of water management and jurisdictions in the Region and the fact that regional coordination on stormwater management will continue to be critical, it is likely that the County will continue to play a central role in facilitating coordination of stormwater management.

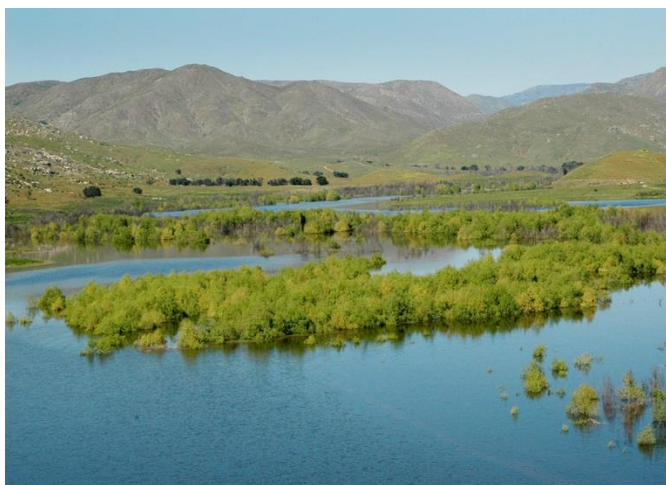
3.6.5 Flood Control Agencies

The San Diego County Flood Control District (Flood Control District) is the key flood control agency in the County. The Flood Control District (which is governed by the elected Supervisors of the County) establishes flood policies, maintains flood control facilities, operates a regional flood warning system, and is charged with protection of watercourses, watershed management, and protection of water quality.

The different agencies responsible for floodplain management within the region include:

- | | | | |
|-----------------------|--------------------------|-------------------------|------------------------|
| • County of San Diego | • City of El Cajon | • City of Lemon Grove | • City of San Marcos |
| • City of Carlsbad | • City of Encinitas | • City of National City | • City of Santee |
| • City of Chula Vista | • City of Escondido | • City of Oceanside | • City of Solana Beach |
| • City of Coronado | • City of Imperial Beach | • City of Poway | • City of Vista |
| • City of Del Mar | • City of La Mesa | • City of San Diego | |

The Flood Control District's role is to provide for the control of the flood and storm waters of the District, and of the flood and storm waters that flow into the District. The District's role also includes preserving such waters for beneficial use such as water supply, groundwater percolation, recreation, and environment, and to protect the land, properties, facilities, and people within the District from damage caused by storm and flood waters. The Flood Control District has an adopted Floodplain Management Plan for the County unincorporated area which assesses the flood hazards, summarizes the current flood management program, describes mitigation strategies, and provides a future action plan.



North end of El Capitan Reservoir, showing flooded trees.

Photo credit: Jeff Pasek, City of San Diego

As listed above, the eighteen other cities within the Region also have floodplain management responsibilities, which are similar to those of the District, but are only applied within that city's jurisdictional boundaries. Although the District spans the entire unincorporated portion of the County, no single entity within the Region currently coordinates floodplain management between the different floodplain managers.

3.6.6 Environmental Organizations

In addition to the above-noted federal land managers, many private foundations and conservancies have been established within the Region to preserve lands and to provide environmental management of conserved lands. Foundations or conservancies that provide environmental management of lagoons include: Batiquitos Lagoon Foundation, Buena Vista Lagoon Foundation, Agua Hedionda Lagoon Foundation, San Elijo Lagoon Conservancy, Los Peñasquitos Lagoon Foundation, and San Dieguito River Valley Land Conservancy.

Additional conservancy groups involved in conservation and environmental management, in part, include: CoastKeeper, the Southern California Coastal Water Research Project (SCCWRP) San Diego Task Force, The Nature Conservancy, the Trust for Public Land, the Escondido Creek Conservancy, Cottonwood Creek Conservancy, Fallbrook Land Conservancy, Bonsall Conservancy, Preserve Calaveras, Iron Mountain Conservancy, Back Country Land Trust, San Diego River Park Foundation, San Diego River Conservancy, Lakeside River Park Conservancy, and Groundwork San Diego-Chollas Creek. The San Diego Conservation Resources Network is a network that assists in coordinating efforts among the Region's conservancy groups.

3.7 Water Quality

The following sections focus on discussing water quality for the Region's various water resources. Water quality management and regulations pertaining to stormwater are described above in Section 3.5.9.

3.7.1 Imported Water Quality

Imported water provided to the Water Authority by Metropolitan is a blend of water from the SWP and Colorado River. The quality of imported supply provided at any time is a function of hydrologic conditions in Northern California and the Colorado River basin, and the blend of water between the two sources.

Total Dissolved Solids (TDS) concentrations in the Colorado River supply have varied significantly during the past 30 years depending on hydrologic conditions. Peak TDS concentrations in the Colorado River supply have exceeded 800 milligrams per liter (mg/L) during sustained years of below-normal runoff within the basin, while TDS concentrations approaching 500 mg/L have occurred after sustained years of above-normal runoff. Colorado River TDS concentrations have averaged approximately 650 mg/L over the past decade.

SWP supplies typically comprise a smaller percentage of the imported supply provided to the Water Authority, but TDS concentrations in the SWP supply are typically lower than those of Colorado River supplies, historically ranging from more than 425 mg/L to less than 300 mg/L.

While SWP supplies have lower TDS concentrations than Colorado River supplies, concentrations of nutrients (nitrogen and phosphorus) are higher in SWP supplies than in Colorado River supplies. Total nitrogen concentrations in the imported water provided by the Water Authority have ranged from 0.05 mg/L to 1.1 mg/L (as N), with the low values occurring during times when Colorado River supplies comprise a significant portion of the Region's imported supply (Flow Science, 2012). Total phosphorus concentrations in the imported supply have ranged from less than 0.005 mg/L to 0.08 mg/L (Flow Science, 2012).

3.7.2 Surface Water Quality

Designated Beneficial Uses

The Basin Plan designates beneficial uses for streamflow and surface waters, coastal waters, and reservoir and lake resources within the Region's 11 watersheds. Appendix 3-A presents these beneficial use designations as documented in the Basin Plan for each watershed. The Basin Plan also designates wildlife habitat, water contact recreation, and non-contact recreation of surface waters as beneficial uses within each of the watersheds. Additionally, portions of each of the 11 watersheds have been designated as warm-water or cold-water aquatic habitats. Municipal, agricultural, and industrial supplies are designated as beneficial uses of surface waters within 10 of the 11 watersheds.

Surface Water Quality Standards

The Basin Plan (Regional Board, 1994) establishes numeric and narrative water quality objectives to protect designated beneficial uses of inland surface waters and coastal waters. Appendix 3-B presents Basin Plan numerical water quality objectives for the Region. The Basin Plan establishes numeric water quality objectives for TDS, mineral constituents, and turbidity on a watershed-by-watershed basis within the Region. The Water Quality Objective for TDS for surface waters is set at 500 mg/L (the state and federal secondary drinking water standard) in most watersheds, but TDS objectives range from as low as 300 mg/L in the upper reaches of the San Diego River Watershed to as high as 2,100 mg/L in the downstream reach of the Tijuana River Watershed.

As shown in Appendix 3-B, water quality objectives that apply to the entire region are established for total and fecal coliform bacteria, nutrients (total nitrogen and total phosphorus), pH, dissolved oxygen, and unionized ammonia. The Basin Plan establishes a region-wide phosphorus standard of 0.025 mg/L for standing bodies of water, and a phosphorus standard of 0.05 mg/L for flowing waters. A narrative objective for biostimulatory substances defines total nitrogen standards at a 10:1 ratio to the total phosphorus limits; however, as indicated above, the Regional Board currently interprets these narrative objectives as numerical concentration standards.

Water quality objectives for toxic organic and toxic inorganic constituents are established at the corresponding state and federal drinking water standards for waters designated as municipal supply. The Regional Board also implements the Water Quality Criteria for Priority Toxic Pollutants for California Inland Surface Waters, Enclosed Bays and Estuaries, also known as the California Toxics Rule (CTR) established by the U.S. Environmental Protection Agency in Title 40 §141.38 of the Code of Federal Regulations. The CTR establishes numeric criteria for cyanide, metals, and toxic organic constituents (EPA, 2002).

The State Board established water quality objectives for ocean waters in the *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan). The Ocean Plan establishes receiving water standards for total coliform, fecal coliform, toxic inorganic constituents, and toxic organic constituents.

Basin Plan Surface Water Nutrient Standards

The San Diego Regional Board is the only one of the nine California Regional Boards to interpret narrative Basin Plan Objectives as numerical concentration standards for nitrogen and phosphorus in surface waters. The San Diego Basin Plan standard for phosphorus is 0.025 mg/L for standing bodies of water and 0.05 mg/L for flowing waters. The original 1976 San Diego Region Basin Plan cited historic nutrient-related biostimulation impacts to San Diego County's coastal lagoons as part of the justification for establishing the numerical phosphorus and nitrogen standards. The 1976 nutrient standards have been maintained in the current (1994) version of the Basin Plan. However, the San Diego Regional Board has indicated that they may consider narrative interpretation of nutrient objectives in the future.

In addition to complying with statewide regulations, the Region has recognized the need to improve surface water quality, especially within the Region's reservoirs given the important role that those reservoirs play in regional water supply reliability. Due to its concern for the water quality of its reservoirs, the City of San Diego prepared the *Source Water Protection Guidelines for New Developments* (Guidelines) in 2004. The Guidelines were prepared to assist municipal agencies, designers, land planners, developers, and laypersons in conducting site design planning and select best management practices (BMPs) that protect or improve the quality of runoff draining into the reservoirs. The Guidelines provide a stepwise, simplified BMP selection process to ensure that preferred source water protection BMPs are considered when designing new developments. Although the use of the Guidelines is voluntary, the guidance is consistent with state and local storm water permit requirements, as well as local planning protocols.

Section 303(d) Listed Waters

Per Section 303(d) of the Clean Water Act, the Regional Board and State Board are required to identify waters that do not meet applicable water quality objectives. Waters not attaining applicable water quality objectives are deemed to be "impaired" water bodies. Appendix 3-C presents 303(d) impaired water body listings for the Region's streams and rivers (Table C-1), lakes and reservoirs (Table C-2), and coastal/marine waters (Table C-3 and Table C-4).

Table 3-25 summarizes 303(d) listings for inland surface waters of the Region. As shown in this table, 72 inland surface water bodies are currently designated as not attaining applicable water quality objectives (Regional Board, 2009a; State Board, 2010). 303(d)-listed impaired inland surface waters are found in each of the Region's 11 watersheds. Refer to Appendix 3-C for a complete listing of impaired waters.

303(d) Impairment and Imported Water Reservoirs

A number of the Region's reservoirs are predominantly used for imported water storage, including Miramar, San Vicente, Murray, Jennings, and Sweetwater, and Otay Reservoirs. The Regional Board has listed several of the imported water storage reservoirs (see Appendix 3-C) as being on the State's 303(d) list of impaired water bodies for exceedance of water quality objectives that are based on drinking water secondary standards (MCLs); specifically for color, manganese, pH, iron, sulfate, and chloride. These listings require that TMDLs be developed to assure attainment of drinking water secondary standards in the reservoirs themselves. These goals cannot be achieved as many of these exceedances are the result of natural conditions.

While local water suppliers agree that water at the tap should be regulated and treated so that it complies with the secondary standards at the point of use, enforcing drinking water secondary standards in the environment does not enhance beneficial uses within these water bodies nor does it improve the quality of municipal water supply at the tap. Maintaining water quality in these reservoirs at levels which occur naturally would balance costs (both economic and environmental) with benefits to beneficial uses.



Lower Otay Reservoir

Photo Credit: Jeff Pasek, City of San Diego

Table 3-25: Summary of 303(d) Listings for Inland Surface Waters¹

HU	Watershed	Number of Listed Streams & Rivers ^{1,2}	Number of Listed Reservoirs & Lakes ^{1,3}	Impaired Water Parameters within Listed Streams, Rivers, Lakes or Reservoirs ^{1,4}		
901	San Juan	10	0	<ul style="list-style-type: none"> • Benzo(b)fluoranthene • Cadmium • Chloride • DDE • Diazinon • Dieldrin 	<ul style="list-style-type: none"> • Indicator bacteria • Nickel • Nitrogen • Phosphorus • Sediment toxicity 	<ul style="list-style-type: none"> • Selenium • Sulfates • Total dissolved solids • Toxicity • Turbidity
902	Santa Margarita River	11	0	<ul style="list-style-type: none"> • Chlorpyrifos • Copper • Diazinon • E. Coli • Enterococcus 	<ul style="list-style-type: none"> • Fecal coliform • Iron • Manganese • Nitrogen 	<ul style="list-style-type: none"> • Phosphorus • Sulfates • Total dissolved solids • Toxicity
903	San Luis Rey River	3	1	<ul style="list-style-type: none"> • Chloride • Enterococcus • Eutrophic 	<ul style="list-style-type: none"> • Fecal coliform • Nitrogen • Phosphorus 	<ul style="list-style-type: none"> • Selenium • Total dissolved solids • Toxicity
904	Carlsbad	8	1	<ul style="list-style-type: none"> • Ammonia • DDE • DDT • Enterococcus • Fecal coliform • Manganese 	<ul style="list-style-type: none"> • Nitrate and nitrite • Nitrogen • Nutrients • Phosphate • Phosphorus 	<ul style="list-style-type: none"> • Sediment toxicity • Selenium • Sulfates • Total dissolved solids • Toxicity
905	San Dieguito River	6	2	<ul style="list-style-type: none"> • Aluminum • Chloride • Color • Enterococcus • Fecal coliform • Iron 	<ul style="list-style-type: none"> • Manganese • Mercury • Total Nitrogen as N • Pentachlorophenol • pH 	<ul style="list-style-type: none"> • Phosphorus • Sulfate • Total dissolved solids • Toxicity • Turbidity
906	Peñasquitos	5	1	<ul style="list-style-type: none"> • Cadmium • Copper • Enterococcus • Fecal coliform • Indicator bacteria 	<ul style="list-style-type: none"> • Lead • Nitrogen • Phosphorus • Sediment toxicity • Selenium 	<ul style="list-style-type: none"> • Total dissolved solids • Toxicity • Turbidity • Zinc
907	San Diego River	5	3	<ul style="list-style-type: none"> • Benthic community effects • Chloride • Color • Dissolved oxygen 	<ul style="list-style-type: none"> • Enterococcus • Fecal coliform • Manganese • Total Nitrogen as N • pH 	<ul style="list-style-type: none"> • Phosphorus • Selenium • Sulfates • Total dissolved solids • Toxicity
908	Pueblo	3	0	<ul style="list-style-type: none"> • Copper • Diazinon • Indicator bacteria 	<ul style="list-style-type: none"> • Lead • Phosphorus • Total nitrogen 	<ul style="list-style-type: none"> • Trash • Zinc
909	Sweetwater River	2	2	<ul style="list-style-type: none"> • Aluminum • Dissolved oxygen • Enterococcus • Fecal coliform 	<ul style="list-style-type: none"> • Manganese • Nitrogen • pH • Phosphorus 	<ul style="list-style-type: none"> • Selenium • Total dissolved solids • Toxicity
910	Otay	2	1	<ul style="list-style-type: none"> • Ammonia • Color • Iron 	<ul style="list-style-type: none"> • Manganese • Nitrogen 	<ul style="list-style-type: none"> • pH • Toxicity
911	Tijuana River	4	2	<ul style="list-style-type: none"> • Ammonia nitrogen • Color • Dissolved oxygen • Eutrophic • Indicator bacteria • Manganese • Nitrogen 	<ul style="list-style-type: none"> • Perchlorate • Pesticides • pH • Phosphorus • Sediments • Selenium • Solids 	<ul style="list-style-type: none"> • Surfactants • Synthetic organics • Toxicity • Trace elements • Trash • Turbidity

¹ From State Water Resources Control Board *Final 2010 Integrated Report, Clean Water Act Section 303(d) List/305(b) Report* (2010), as approved by the U.S. Environmental Protection Agency on October 11, 2011.

² See Appendix C-3 (Table C-1) for rivers and streams listed as 303(d) impaired within the Region.

³ See Appendix C-3 (Table C-2) for reservoirs and lakes listed as 303(d) impaired within the Region.

⁴ Impaired water parameters listed for at least one receiving water within the watershed. See Appendix C-3.

Appendix 3-C presents impaired water body listings for coastal and marine waters. Each of the Region's 11 watersheds contains at least one coastal water or beach segment that is currently listed as impaired within the Region. A complete listing of impaired coastal water and beach segments is available in Appendix 3-C.

As part of the 303(d) impaired water designations, the Regional Board establishes priorities for conducting TMDL evaluations to identify and implement required actions to bring the water bodies into compliance with applicable standards. Table 3-26 summarizes TMDLs that have been adopted by the Regional Board to date. Table 3-27 summarizes TMDLs that are in progress.

Table 3-26: Adopted TMDLS

HU	Watershed	Receiving Water	Constituent	Regional Board Resolution (Date of Adoption)	Effective Date ¹
901	San Juan	Baby Beach Dana Point	Indicator bacteria	R9-2008-0027 (June 11, 2008)	September 15, 2009
902	Santa Margarita River	Rainbow Creek	Nitrogen & phosphorus	R9-2005-0036 (February 9, 2005)	February 1, 2006
906	Peñasquitos	Los Peñasquitos Lagoon	Sediment	R9-2012-0022 (June 13, 2012)	Approval pending ³
908	Pueblo	Shelter Island	Dissolved copper	R9-2005-0019 (February 9, 2005)	December 2, 2005
		Shelter Island Shoreline Park	Indicator bacteria	R9-2008-0027 (June 11, 2008)	September 15, 2009
		Chollas Creek	Diazanon	R9-2002-0123 (August 14, 2002)	September 11, 2003
		Chollas Creek	Copper, lead, zinc	R9-2007-0043 (June 13, 2007)	October 22, 2008
Various		Project I beaches & creeks ²	Indicator bacteria	R9-2010-0001 (February 10, 2010)	April 4, 2011

- 1 After Regional Board approval, the TMDL is approved by the State Water Resources Control Board, State of California Office of Administrative Law, and U.S. EPA. After EPA approval, the effective date of the TMDL becomes the date the TMDL was approved by the California Office of Administrative Law.
- 2 Includes Pacific Ocean shorelines in the San Joaquin Hills Hydrologic Subarea (901.11), Laguna Beach Hydrologic Subarea (902.12), Aliso Hydrologic Subarea (901.13), and Dana Point Hydrologic Subarea (901.14); Aliso Creek and mouth of Aliso Creek Estuary (901.13); San Juan Creek and mouth of San Juan Creek Estuary (901.27); Pacific Ocean shorelines at the Lower San Juan Hydrologic Subarea (901.27), San Clemente Hydrologic Area (901.3), San Luis Rey Watershed (903.0), San Marcos Hydrologic Area (904.5), San Dieguito Watershed (905.0), and Miramar Reservoir Hydrologic Area (906.1), and Scripps Hydrologic Area (906.3); Tecolote Creek (906.5), Forrester Creek (907.12), Lower San Diego River (907.11/907.12), Pacific Ocean shoreline in the San Diego Watershed (907.0), and Chollas Creek (908.22).
- 3 TMDL review by the State Water Resources Control Board, State of California Office of Administrative Law, and U.S. EPA is pending.

Table 3-27: Summary of TMDLS in Progress¹

HU	Watershed	Receiving Water	Pollutants to be Addressed in TMDLS
902	Santa Margarita River	Santa Margarita River Lagoon	• Nutrients
904	Carlsbad	Loma Alta Slough	• Bacteria • Nutrients
		Pacific Ocean shoreline at Loma Alta Creek	• Bacteria
		Buena Vista Lagoon	• Bacteria • Sediments • Nutrients
		Pacific Ocean shoreline at Buena Vista Creek	• Bacteria
		Agua Hedionda Lagoon	• Bacteria • Sediments
		Lower Agua Hedionda Creek	• Bacteria
		San Elijo Lagoon	• Bacteria • Sediments • Nutrients
		Pacific Ocean at San Elijo Lagoon Outlet	• Bacteria
		San Marcos Creek/Lake San Marcos (Voluntary Agreement)	• Nutrients
906	Peñasquitos	Los Peñasquitos Lagoon	• Sedimentation/ Siltation
907	San Diego River	Famosa Slough and channel	• Nutrients/ Eutrophication
908	Pueblo	Downtown anchorage	• Chlordane • PCB • PAH
		B Street Pier	• PAH • Zinc • PCB
		Mouth of Chollas Creek	• Chlordane • PCB • PAH
		Mouth of Paleta Creek	• Chlordane • PCB • PAH
		Mouth of Switzer Creek	• Chlordane • PCB • PAH
911	Tijuana River	Tijuana River and Estuary	• Sedimentation • Trash

¹ TMDLS in progress, as documented on the Regional Board TMDL website located at: www.srwcb.gov/rwqcb9.

Additional Constituents of Concern

The San Diego County separate storm sewer system (MS4) Copermittees coordinate in the development and implementation of a regional watershed-based receiving water monitoring program. Results of this comprehensive Receiving Waters and Urban Runoff Monitoring effort are evaluated and assessed on an annual basis. Table 3-28 summarizes high priority constituents of concern identified within this regional monitoring effort.

Table 3-28: High Priority Dry and Wet Weather Constituents¹

HU	Watershed	Mass Loading Station	Dry Weather Priority Constituents	Wet Weather Priority Constituents
906	Peñasquitos	Rose Creek	<ul style="list-style-type: none"> • Total dissolved solids • <i>C. dubia</i> reproduction² • <i>S. capricornutum</i> growth³ 	<ul style="list-style-type: none"> • Turbidity • Total dissolved solids • Bifenthrin
		Tecolote Creek	<ul style="list-style-type: none"> • Enterococcus • <i>C. dubia</i> chronic survival² • <i>C. dubia</i> reproduction² • <i>S. capricornutum</i> growth³ 	<ul style="list-style-type: none"> • Fecal coliform • Total suspended solids • Turbidity • Bifenthrin • Permethrin
907	San Diego River	San Diego River	<ul style="list-style-type: none"> • Enterococcus • Fecal coliform • Total nitrogen • Dissolved phosphorus • Total phosphorus • Total dissolved solids • <i>S. capricornutum</i> growth³ 	<ul style="list-style-type: none"> • Fecal coliform • Turbidity • Bifenthrin • <i>S. capricornutum</i> growth³
908	Pueblo	Chollas Creek	<ul style="list-style-type: none"> • Enterococcus • <i>C. dubia</i> reproduction² 	<ul style="list-style-type: none"> • Fecal coliform • Chemical oxygen demand • Total suspended solids • Turbidity • Bifenthrin • Permethrin
909	Sweetwater River	Sweetwater River	<ul style="list-style-type: none"> • Total phosphorus • Total dissolved solids • <i>C. dubia</i> reproduction² • <i>S. capricornutum</i> growth³ 	<ul style="list-style-type: none"> • Total dissolved solids • <i>S. capricornutum</i> growth³
910	Otay	Otay River	<ul style="list-style-type: none"> • Dissolved phosphorus • Total phosphorus • Total dissolved solids 	<ul style="list-style-type: none"> • NA
911	Tijuana River	Tijuana River	<ul style="list-style-type: none"> • Enterococcus • Ammonia as nitrogen • Turbidity • Total nitrogen • Dissolved phosphorus • Total phosphorus • Total dissolved solids • <i>C. dubia</i> reproduction² 	<ul style="list-style-type: none"> • Fecal coliform • Biochemical oxygen demand • Chemical oxygen demand • Total suspended solids • Turbidity • Dissolved phosphorus • Total phosphorus • Total dissolved solids • Diazinon • Bifenthrin • Permethrin • <i>C. dubia</i> acute survival² • <i>C. dubia</i> chronic survival² • <i>C. dubia</i> reproduction² • <i>H. azteca</i> acute survival⁴

¹ High priority constituents identified through the Watershed Management Assessment process within 2011-2012 Receiving Waters and Urban Waters Runoff Report (Weston Solutions, 2012) on the basis of recent and historic monitoring within the watersheds.

² *Ceriodaphnia dubia* (water flea) used as a test species in freshwater toxicity tests.

³ *Selenastrum capricornutum* (freshwater algae) used as a test species in freshwater toxicity tests.

⁴ *Hyalella azteca* (freshwater amphipod) used as a test species in freshwater toxicity tests.

On the basis of the 303(d) listings and monitoring conducted as part of region-wide monitoring programs, Table 3-29 summarizes region-wide water quality issues and constituents of concern for inland surface waters and coastal waters of the Region's 11 watersheds. Key water quality issues of interest in the Region include:

- *Indicator Bacteria.* Elevated concentrations of total or fecal coliform bacteria indicate the potential for elevated concentrations of pathogens. High concentrations of coliform bacteria resulted in beach advisories along each of the Region's watersheds. Table 3-30 summarizes beach advisories and closures during 2007-2011. Observed elevated coliform bacteria concentrations have occurred as a result of stormwater runoff, urban runoff, and sewer spills.
- *Sediment and Turbidity.* Discharges of sediment can adversely impact water clarity, wildlife habitat, and aquatic habitat. Additionally, sediment can adversely affect the hydraulics of lagoons and estuaries, decrease tidal flushing, and contribute to the transport of bacteria. Turbidity can adversely affect aquatic habitats by limiting light penetration and overall aesthetics.
- *Nutrients.* Elevated concentrations of nitrogen and phosphorus can result in algal blooms and impacts associated with emergent and submergent vegetation. Nutrients are of particular concern in watersheds that discharge to coastal lagoons and estuaries, as summer temperatures and lagoon hydraulics that limit tidal flushing may lead to algal blooms and fish kills due to decreased dissolved oxygen levels. Nutrients are also a concern in inland creek and lake systems for the same algal bloom concerns, which may occur due to water stagnancy. Nutrients can also be of concern in potable water reservoirs, as biostimulation effects can adversely affect reservoir dissolved oxygen, the treatability of supplies, and taste and odor.
- *Salinity.* Concentrations of TDS and dissolved mineral constituents can adversely impact aquatic and wildlife habitat and the usability of waters for municipal and irrigation supply. TDS concentrations in Region surface waters vary significantly, with TDS concentrations being lower during periods of extreme flow and higher during periods of lower flow.
- *Toxic Inorganic Compounds.* Toxic inorganic compounds (e.g., metals, nitrates, cyanide, and unionized ammonia) can adversely impact aquatic habitat, wildlife habitat, and water supply uses. As no inland point-source discharges of toxic inorganic pollutants exist within the Region, toxic inorganic compounds in the Region's surface waters can be presumed to originate from non-point sources.

Do TMDLs Address Critical Needs?

In 2010, the San Diego Regional Board adopted a TMDL for indicator bacteria at 20 beaches and creeks in the San Diego County Region (Resolution No. R9-2010-0001). The TMDL was adopted to address routine exceedances of water quality objectives for *Enterococcus*, fecal, and total coliform bacteria, which are indicators intended to protect primary contact recreation (REC-1) activities like swimming. Although *Enterococcus* and coliform bacteria are a commonly-used indicator of human pathogens, and can cause illness in recreational users, the presence of indicator bacteria in some of the TMDL's designated water bodies does not present the most critical water quality problem facing beneficial uses. In these cases, the adopted bacteria TMDL has established a de-facto priority for resource allocation within local stormwater programs. Many affected stakeholders have indicated that the implementation actions needed to comply with the TMDL during wet weather events drive costs and resources, diverting attention from other important issues. Use of alternative compliance methods rather than TMDLs would help to resolve resource allocation issues so that implementation actions truly address the most critical water quality and public health issues.

- **Toxic Organic Compounds.** Toxic organic compounds (e.g., pesticides and other EPA-designated priority pollutants) can adversely impact aquatic habitat, wildlife habitat, and water supply uses. Since no inland point-source discharges of toxic organic pollutants exist within the Region, toxic organic compounds in the Region's waters can be presumed to originate from non-point sources. As shown in Table 3-28, toxic organic compounds that have resulted in 303(d) impairment listings within the Region include benzo(b)fluoranthene, diazanon, dieldrin, DDT, pentachlorophenol, and perchlorate.

Table 3-29: Summary of Water Quality Issues for Surface Waters

HU ¹	Watershed	Water Quality Issues/Constituents of Concern ¹								
		Trash & Debris	Fecal Indicator Bacteria	Nutrients	Dissolved Oxygen	Turbidity	Sediment	Toxic Organics	Metals	TDS
901	San Juan		✓	✓		✓		✓	✓	✓
902	Santa Margarita River		✓	✓				✓	✓	✓
903	San Luis Rey River		✓	✓					✓	✓
904	Carlsbad		✓	✓				✓	✓	✓
905	San Dieguito River		✓	✓				✓	✓	✓
906	Peñasquitos		✓	✓		✓	✓		✓	✓
907	San Diego River		✓	✓	✓				✓	✓
908	Pueblo ²	✓	✓	✓			✓	✓	✓	✓
909	Sweetwater ²		✓	✓	✓				✓	✓
910	Otay ²			✓	✓			✓		✓
911	Tijuana River	✓	✓	✓	✓	✓	✓	✓	✓	✓

1 Constituent category is either listed as 303(d) impaired within the watershed (see Table 3-25 and Appendix C), or is identified as a high priority wet-weather or dry-weather constituent (see Table 3-28) as part of the 2011 *Receiving Waters and Urban Runoff Report* (Weston Solutions, 2012).

2 Pueblo, Sweetwater, and Otay are monitored and assessed separately, but are all a part of the San Diego Bay Watershed Management Area.

Table 3-30: Summary of Beach Advisory and Closures, 2007-2011¹

Parameter	Year				
	2011	2010	2009	2008	2007
Total number of samples	3,523	3,493	3,905	4,741	5,566
Number of beach monitoring stations	90	87	95	126	115
Closures					
Tijuana River beach closure days ²	218	266	112	153	128
SSO closure days ³	67	61	23	55	29
Total closure days	285	327	135	208	157
Advisory Days					
Rain advisory days ⁴	70	70	30	38	37
Bacterial exceedance advisories ⁵	117	163	254	174	350
Precautionary advisory days ⁶	30	40	24	57	85
Total advisory days	217	273	308	269	472

1 From San Diego County Department of Environmental Health Annual Beach Monitoring Summaries, 2007-2011.

2 Closure due to Tijuana River flow that may impact or threaten to impact beach water quality.

3 Closure due to reported sewage spill that may impact or threaten to impact beach water quality.

4 Advisory to refrain from water contact within 72 hours of precipitation runoff.

5 Advisory due to exceedance of body contact recreation (REC-1) bacteriological standards.

6 Advisory due to lagoon outlet excavations or localized runoff/discharges that may impact or threaten to impact beach water quality.

3.7.3 Wastewater Quality

Wastewater from municipal agencies along the coastal corridor in excess of recycled water needs is treated via secondary treatment and discharged through regional ocean outfalls. Secondary treatment standards require treatment to achieve a monthly average TSS and BOD concentrations of 30 mg/L, but most of the Region's wastewater plants produce secondary effluent that contains concentrations significantly below these limits.

The City of San Diego currently has a Clean Water Act Section 301(h) waiver from secondary treatment requirements for its Point Loma Wastewater Treatment Plant. Advanced primary treatment at Point Loma achieves an average TSS concentration of approximately 35 mg/L, slightly above the mandated federal limit. The Metropolitan Sewer System, however, is required to implement additional pretreatment to ensure that concentrations of toxic organic and inorganic pollutants in the Point Loma discharge are equivalent to secondary treatment.

All of the Region's ocean outfall discharges comply with California Ocean Plan receiving water standards for toxic constituents. The City of San Diego's Ocean Monitoring Program monitors 120 square miles of ocean for the effects of ocean outfall discharges on marine health and identifies potential threats to public health.

3.7.4 Water Reuse Quality

Non-Potable Reuse

Non-potable reuse water (tertiary-treated recycled water) produced within the Region conforms to California Department of Public Health Title 22 requirements for disinfected tertiary recycled water, which requires disinfection and filtration to achieve:

- a 99.999% removal of indicator poliovirus (or provide equivalent disinfectant dose/contact time to achieve the same),
- median total coliform concentrations of less than 2.2 organisms per 100 milliliters,
- no more than 23 total coliform organisms per 100 ml in more than one sample during any 30 day period, and
- no sample exceeding a total coliform concentration of 240 organisms per 100 ml.

Concentrations of dissolved minerals in the Region's recycled water supplies vary depending on the quality of the source supply. Recycled water TDS concentrations are typically about 250 to 350 mg/L higher than the source water supply.



The City of San Diego Advanced Water Purification Facility is conducting pilot testing for indirect potable reuse.

Photo credit: City of San Diego

Table 3-31 summarizes water quality requirements for dissolved minerals that are established by the Regional Board for the Region's recycled water facilities. As shown in the table, recycled water TDS effluent limits typically range from 1000-1200 mg/L. To prevent salinity-related impacts to landscape and agricultural vegetation, most recycled water producers target recycled water TDS concentrations of 1000 mg/L or less. Several of the Region's coastal recycled water facilities include demineralization treatment that can be used during times of high TDS supply water to ensure conformance with recycled water TDS limits, including the Carlsbad Water Recycling Facility, San Elijo Water Reclamation Facility, and City of San Diego North City Water Reclamation Plant.

Potable Reuse

The water resulting from indirect potable reuse (discussed in detail in Section 3.5.5), which is referred to as purified water, is of similar quality to distilled water, containing 15 mg/L of TDS. During the demonstration and pilot study stages of IPR being conducted by the City of San Diego, this purified water is discharged to the recycled water system, helping to improve recycled water quality (City of San Diego, 2013). If IPR is fully implemented, the purified water would be blended with the lower-quality imported and local supplies in the San Vicente Reservoir, improving overall water quality in the reservoir.

Table 3-31: Recycled Water Quality

HU	Recycled Water Agency	Recycled Water Facility (Permit Number)	Permitted Recycled Water Concentration ¹ (mg/l) (Average annual value unless noted)				
			TDS	Chloride	Boron	Iron	Manganese
902	Camp Pendleton	Southern Regional (Order R9-2009-0021)	1200 ²	325 ³	0.6 ³	0.3 ³	0.05 ³
903	City of Oceanside	San Luis Rey (Order No. 93-07)	1200 ²	350 ²	0.5 ²	0.3 ²	0.15 ²
	Fallbrook Public Utility District	Plant No. 1 (Order No. 91-39)	See note ⁵	See note ⁶	0.5 ³	0.85 ³	0.15 ³
	Valley Center Municipal Water District	Woods Valley Ranch (Order No. 98-09)	1100 ²	300 ²	0.75 ²	0.3 ²	0.05 ²
904	Buena Sanitation District/City of Vista	Shadowridge ⁷	1200 ⁴	300 ²	0.5 ²	0.3 ²	0.07 ²
	Carlsbad Municipal Water District	Carlsbad (Order R9-2012-0027)	1100 ²	350 ³	0.75 ²	0.3 ²	0.1 ²
	Leucadia Wastewater District	Gafner (Order No. 93-41)	1500 ⁴	500 ⁴	0.5 ²	0.3 ²	0.05 ²
	Vallecitos Water District	Meadowlark (Order No. 93-23)	1500 ⁴	500 ⁴	0.5 ³	0.3 ³	0.05 ³
	City of Escondido	Hale Avenue (Order R9-2010-0032)	1000 ²	300 ²	0.75 ²	0.5 ²	0.2 ²
	San Elijo Joint Powers Authority	San Elijo (Order No. 2000-10)	1200 ²	400 ²	0.75 ²	0.3 ²	0.15 ²
905	Olivenhain Municipal Water District	4-S Ranch (Order R9-2003-0007)	1200 ⁴	350 daily	0.75 ³	0.85 ³	0.15 ³
	Ramona Municipal Water District	Santa Maria (Order No. 2000-177)	800 ²	200 ²	0.5 ²	0.3 ²	0.05 ²
	Rancho Santa Fe Community Services District	Santa Fe Valley (Order No. 92-04)	1500 ⁴	500 ⁴	0.5 ³	0.85 ³	0.15 ³
906	City of San Diego	North City (Order No. 97-03)	1200 ²	300 ²	0.7 ²	0.3 ²	0.05 ²
907	Padre Dam Municipal Water District	Padre Dam (Order NO. 97-49)	1100 ²	250 ²	0.6 ²	0.3 ²	0.05 ²
	Ramona Municipal Water District	San Vicente (Order R9-2009-0005)	550 ²	145 ²	0.7 ²	0.3 ²	0.06 ²
910	Otay Water District	R.W. Chapman (Order R9-2007-0038)	1376 ³	440 ³	0.7 ³	0.2 ³	0.03 ³
911	City of San Diego	South Bay (Order 2000-203)	1200 ³	260 ³	0.75 ³	0.3 ³	0.05 ³

1 Recycled water effluent quality limit established within the listed Regional Board recycled water permit or waste discharge requirements.

2 Effluent Limit expressed as an annual (12-month) average.

3 Effluent limit expressed as a monthly (30-day) average.

4 Effluent limit expressed as a daily maximum.

5 Recycled water TDS concentration not to exceed potable supply concentration by 450 mg/l.

6 Recycled water chloride concentration not to exceed potable supply concentration by more than 150 mg/l.

7 Shadowridge plant currently not in operation but Regional Board permit remains active.

3.7.5 Groundwater Quality

Designated Beneficial Uses

The Basin Plan designates beneficial uses for groundwater within each hydrologic area of the Region's eleven watersheds. Appendix 3-A presents beneficial uses for groundwater designated in the Basin Plan.

The Basin Plan designates municipal supply, agricultural supply, and industrial service supply as beneficial uses within a significant majority of the Region's hydrologic areas. Industrial process supply and fresh water replenishment (maintaining surface flows) are listed as beneficial uses within several of the Region's hydrologic areas. The Basin Plan does not designate wildlife habitat as a beneficial use of groundwater, but significant areas of riparian habitat and groundwater-dependent vegetation exist within each of the eleven watersheds.

Groundwater Quality Objectives

The Basin Plan establishes numerical groundwater quality objectives on a watershed-by-watershed basis for color, turbidity, detergent (methylene blue active substances, or MBAS), TDS, and mineral constituents. Additionally, the Basin Plan imposes state and federal drinking water standards for toxic inorganic and toxic organic constituents on groundwaters designated for domestic use.

Appendix 3-B presents Basin Plan numerical groundwater quality objectives within the Region. Groundwater quality objectives for TDS and mineral constituents are established as lower concentrations in the upstream portions of the watersheds and at higher concentrations in downstream portions of the watersheds.

Regional Constituents of Concern

While alluvial groundwater aquifers can be quickly recharged by stormwater or urban runoff, the porous nature of the aquifers render them susceptible to contamination by activities on the ground surface, contaminated stormwater infiltration, abandoned well heads, and from underground storage tanks.

Table 3-32 summarizes key groundwater quality issues within the Region. Constituents of concern within Region's groundwater aquifers include TDS, nitrate, iron and manganese, and toxic organic pollutants.

- *Total Dissolved Solids (TDS).* TDS can affect both the usability of groundwater as a domestic water source and as an irrigation water source. Groundwater TDS concentrations within coastal groundwater basins vary significantly, but have generally exhibited a trend of deteriorating water quality in recent decades as a result of seawater intrusion and salt load imbalances associated with imported water use (Water Authority, 1997). Coastal alluvial groundwater aquifers in the region that have experienced significant degradation from elevated TDS concentrations include the Lower Santa Margarita River Basin, Mission Basin (lower San Luis Rey Basin), Lower San Dieguito River Valley, Mission Valley (lower San Diego River Basin), Lower Sweetwater River Valley, and Lower Tijuana River Valley. Groundwater TDS concentrations in these coastal alluvial aquifers currently range from approximately 750 mg/l to more than 2000 mg/l. Among the principal alluvial groundwater aquifers within the Region, only the Pala/Pauma Basin, Warner Basin, and the upstream portions of the San Pasqual, El Monte, and Middle Sweetwater Basins contain groundwater TDS concentrations below the 500 mg/L state and federal secondary (non-enforceable) drinking water limits for TDS. Water quality in the San Diego Formation (a deep consolidated sediments aquifer that underlies a central portion of the City of San Diego) is

highly variable. Groundwater TDS concentrations in this aquifer may range from below 500 mg/L to more than 12,000 mg/L. Groundwater TDS concentrations within inland fractured rock aquifers are variable, but most wells produce groundwater that contains TDS concentrations that are suitable for potable water uses (Water Authority, 1997).

- *Nitrate.* State and federal primary (enforceable) drinking water MCLs for nitrate are established at 10 mg/L (as nitrogen). The Basin Plan establishes more stringent nitrate objectives (as low as 2.2 mg/L as nitrogen) for many of the Region's groundwater basins. Alluvial aquifers are susceptible to nitrate contamination from fertilizer application, animal confinement, wastewater percolation, and septic tank discharges. Exceedance of the Basin Plan nitrate objectives has been documented in portions of the San Luis Rey River and San Dieguito River Watersheds (Water Authority, 1997).
- *Iron and Manganese.* Iron and manganese occur naturally in Region's alluvial groundwaters. Groundwater from the Region's coastal aquifers periodically exceeds recommended state and federal secondary (non-enforceable) drinking water standards (0.3 mg/L for iron and 0.05 mg/L for manganese). Aquifers that have exhibited iron and manganese compliance problems include portions of the Santa Margarita River, San Luis Rey River, San Dieguito River, and San Diego River Watersheds (Water Authority, 1997).
- *Toxic Organic Compounds.* Several toxic organic compounds have been detected in groundwater within several of the Region's aquifers. Underground fuel tanks are a common source of groundwater contamination that may result in noncompliance with state and federal drinking water limits for benzene, methyl-tertiary-butyl ether (MTBE), and other volatile organic compounds. MTBE, in particular, is a key contaminant due to its low State of California primary MCL of 5 micrograms per liter ($\mu\text{g/L}$) and its ability to be rapidly dispersed by diffusion and advection throughout an aquifer. The State Board's Geotracker database system lists more than 100 sites of documented leaking underground fuel tanks within the Region's eleven watersheds. Although contamination effects from most of these sites are localized, a mile-long plume of petroleum derivatives from the Mission Valley Terminal (a fuel storage facility) contaminates portions of the Mission Valley aquifer in the San Diego River Watershed. The Mission Valley Terminal is under a Regional Board Order to reduce concentrations of dissolved phase petroleum hydrocarbon constituents to attain background water quality conditions by December 31, 2013 (Regional Board, 2005b).



High TDS and other constituents in groundwater can impact large scale irrigation operations (Torrey Pines Golf Course shown above).

Photo credit: Jeff Pasek, City of San Diego

In February 2009, the State Board adopted Resolution No. 2009-011, which established a statewide Recycled Water Policy. The Recycled Water Policy requires the State Board and the Regional Boards to exercise their authority to the fullest extent possible to encourage the use of recycled water, consistent with state and federal water quality regulations. The Recycled Water Policy identifies

stakeholder-driven salinity/nutrient management plans (SNMPs) as the appropriate means for identifying and managing salinity and nutrient loads associated with recycled water use. *Chapter 7, Regional Coordination* includes a detailed discussion of the Policy and SNMPs under development within the Region.

Table 3-32: Summary of Water Quality Issues for Principal Groundwater Aquifers¹

HU ²	Watershed	HA ²	Name of Aquifer	TDS Concentration Range (mg/l)	Water Quality Constituents of Concern ³			
					TDS	Nitrate	Iron & Manganese	Toxic Organics
901	San Juan	901.4	San Mateo	400 – 800	•	•		•
		901.5	San Onofre	600 - 1500	•	•		•
902	Santa Margarita River	902.00	Lower Santa Margarita ⁴	600 – 750	•		•	•
903	San Luis Rey River	903.1	Mission	500 - 2000	•		•	•
			Bonsall	600 - 3400	•	•		
			Moosa Canyon	200 – 900	•	•		
		903.2	Pala/Pauma	350 - 1400	•	•		
		903.3	Warner	250 – 350				
905	San Dieguito River	905.1	Lower San Dieguito	1000 - 27,000	•		•	
		905.3	San Pasqual	320 - 2500	•	•		
		905.4	Santa Maria	500 - 1500	•	•		
907	San Diego River	907.1	Mission Valley	1000 - 3000	•		•	•
			Santee/El Monte	500 - 3000	•		•	
909	Sweetwater	909.1	Lower Sweetwater	1700 - 3100	•			
		909.2	Middle Sweetwater	300 - 1400	•			
911	Tijuana River	911.1	Lower Tijuana	500 - 3000	•			
Vary	Pueblo Sweetwater Otay Tijuana River	908.00 909.00 910.00 911.00	San Diego Formation	340 – 12,000	•			

¹ From Water Authority *Groundwater Report* (1997).

² Numerical watershed (hydrologic unit and hydrologic area) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

³ Constituents that have exceeded state or federal drinking water primary or secondary standards in untreated groundwater (prior to treatment).

3.7.6 Desalinated Water Quality

As described within Section 3.5.7, desalination supply from the Carlsbad Desalination Plant is to be blended into the Water Authority's aqueduct system. Concentrations of dissolved minerals are low in desalinated product water. To prevent corrosive effects associated with these low concentrations of alkalinity and dissolved minerals, product water from the Carlsbad Desalination Plant will be stabilized prior to blending into the Water Authority aqueducts. After product water stabilization, TDS concentrations in the desalination supply are projected to average approximately 350 mg/L. Table 3-33 summarizes projected quality of the desalination supply from the Carlsbad Desalination Plant.

Table 3-33: Quality of Seawater Desalination Supply

Parameter	Projected Desalination Water Quality Carlsbad Desalination Facility	
	Central Tendency ¹ (not to be exceeded more than 50% of the time)	Extreme Value ¹ (not to be exceeded more than 10% of the time)
Total dissolved solids	350 mg/l	400 mg/l
Boron	0.75 mg/l	1.0 mg/l
Bromide	0.5 mg/l	0.8 mg/l
Chloride	180 mg/l	210 mg/l
Turbidity	0.3 NTU ²	0.5 NTU ²

1 Water quality terms incorporated into water purchase agreement between Poseidon Resources and the Water Authority.

2 Nephelometric Turbidity Units

3.8 Environmental Resources

Habitat Resources

The Region's 11 watersheds support many habitat communities and contain more rare, threatened, and endangered plant and animal species than any comparable land area in the continental United States (Pulliam and Babbitt, 1997). The County Multiple Species Conservation Program (MSCP) and Multiple Habitat Conservation Program (MHCP) are being implemented by the County and local jurisdictions to protect these resources. Figure 3-16 presents the boundaries of the MSCP and MHCP areas.

In addition to the 900-square-mile area covered by the MSCP and 175-square-mile area covered by the MHCP, the County is in the process of developing a North County MSCP encompassing approximately 487 square miles in the northwestern portion of the county, and an East County MSCP that addresses habitat needs within a 2,420-square-mile area. Approximately 41% of the MSCP Plan area is developed or urbanized, and about 5% is used for agriculture.

There is some disagreement about the effect of MSCP and MHCP programs that locate mitigation projects outside of the general area where an impact occurs. Because these programs establish formal mitigation areas, if the MSCP and MHCP areas are physically distant from the impact area, the mitigation site may be located at a distance from the physical biological impact. Outside-area mitigation or mitigation exportation has been noted as a concern by some IRWM stakeholders concerned that certain watersheds that do not contain MSCP and MHCP lands may be continually degraded as a result of this practice.

Other IRWM stakeholders hold that, while individual watersheds may be affected, federal and state policies governing no-net-loss of wetlands ensure that regional wetland functions and services will not decrease. Most on-site compensatory mitigation projects yield widely scattered, small, and isolated or "patch" wetlands, which are not buffered by adjacent uses because they are created at an actual project site to compensate only for a particular project's wetland losses. Ultimately, "patch" wetlands probably will fail not only because of their location and size, but because their ecological potential is limited by their separation from broader wetlands ecosystems. Larger mitigation efforts, such as MSCP and MHCP, consolidate resources and create an economy of scale, yielding more efficient wetlands protection. These off-site wetlands systems are more ecologically valuable than the isolated, on-site "patch" wetlands created from individual mitigation efforts. The ecological

benefits include: providing a habitat for a larger variety of wildlife; accommodating larger populations of the present species, which prevents inbreeding and promotes species stabilization; and allowing the wetlands to adapt to changes in the ecosystem.

Vegetation Communities

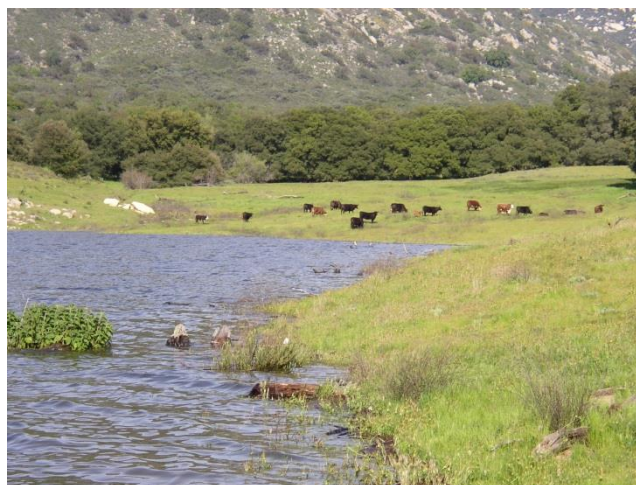
Table 3-34 describes the principal vegetation communities and characteristic species in the Region. In addition to the vegetation communities summarized in Table 3-3 vernal pools are also known to occur in San Diego County within the Santa Margarita River, Carlsbad, San Dieguito River, Peñasquitos, Otay River, and Tijuana River Watersheds. Vernal pool sites are characterized by fine textured soils underlain by cemented hardpan. Vernal pool vegetation typically consists of a low, herbaceous community dominated by annual herbs and grasses.

Wildlife and Endangered Species

The Region's vegetation communities support a wide array of wildlife species. San Diego County is home to approximately:

- 1534 total native plant species
- 75 species of reptiles and amphibians
- 140 species of mammals, including 23 species of bats
- 20,000 species of insects
- 492 species of birds, of which about 70 breed within the County

Over 200 plant and animals species in the County are listed as endangered, threatened, rare, or are candidates for listing (USFWS and DFW, 1998). Over half of these species occur in the southwest portion of Region within the MSCP area. Appendix 3-D presents listed species covered under the MSCP and describes their associated habitats. Appendix 3-D also presents non-listed species that occur within the MSCP area that are considered sensitive. Appendix 3-D acknowledges that the federal listing for Southern California steelhead refers to a population ranging from Santa Maria River to San Mateo Creek; despite the federal listing of this population's range, the historical southern boundary of the species' range is the United States-Mexico border.



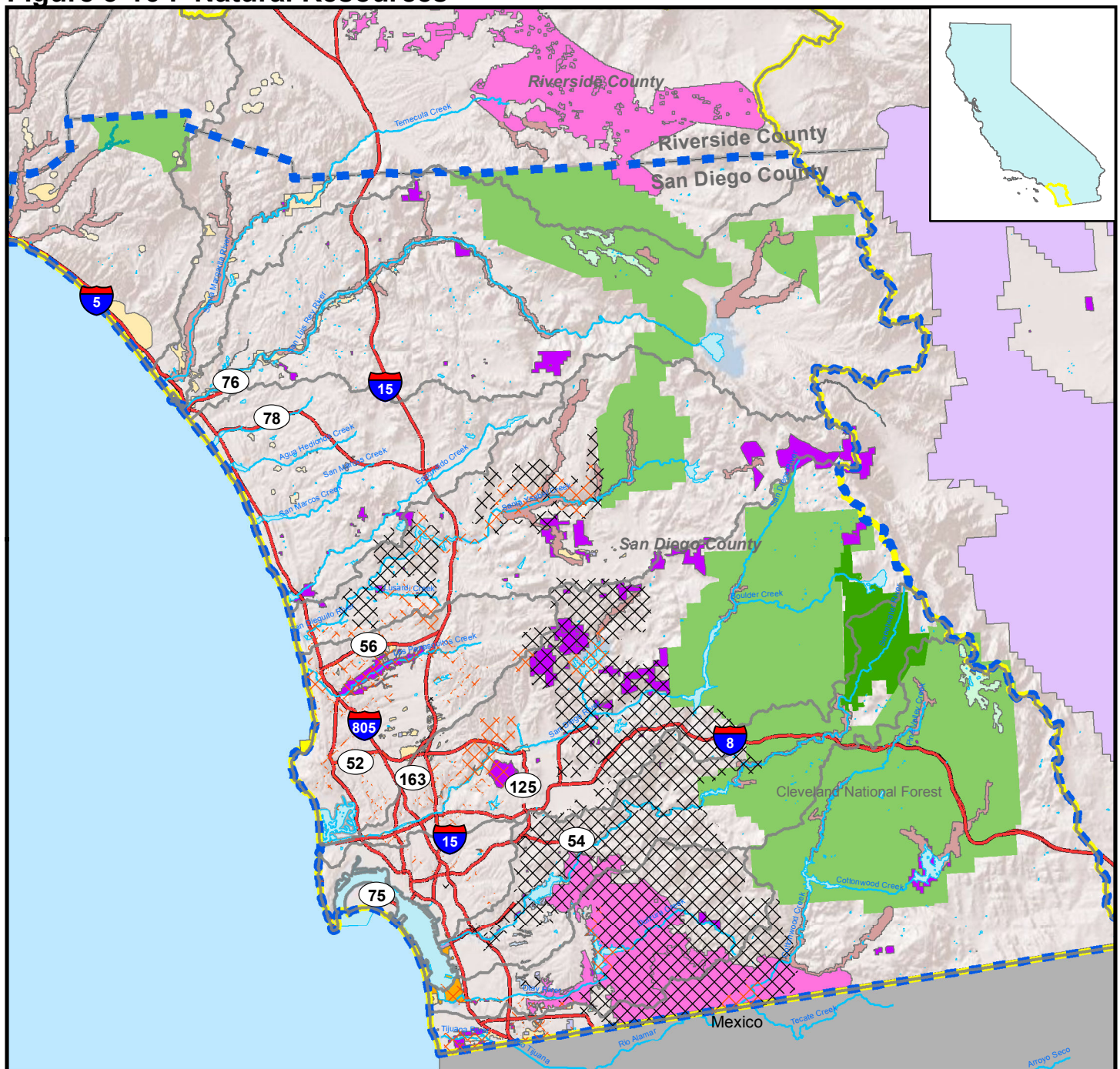
Water supply reservoirs, such as Lake Sutherland, provide important habitat corridors for native wildlife and livestock.

Photo credit: Jeff Pasek, City of San Diego

Wildlife corridors and linkages are a key component of the Region's species protection plans. The conservation programs identify primary wildlife corridors/linkages that (1) connect core biological resource areas within the protection plan boundaries, and (2) provide connections to habitat outside the boundaries. As an example, identified linkages in the MSCP include:

- Otay Ranch to Sycuan
- Sweetwater Reservoir to McGinty Mountain
- Interstate-8 at Lakeside
- Dehesa to El Capitan Reservoir
- Boden Canyon

Figure 3-16 : Natural Resources



Legend

Critical Habitat Areas

- Laguna Mountains Skipper Habitat
- Bufo Californicus Habitat
- Thread-Leaved Brodiaea Habitat
- Deinandra Conjugens Habitat
- Least Bell's Vireo Habitat
- Spreading Navarretia Habitat
- Peninsular Big Horn Sheep
- Quino Checkerspot Butterfly Habitat
- Riverside Fairy Shrimp Habitat
- San Diego Fairy Shrimp Habitat
- Southwestern Willow Flycatcher Habitat
- Western Snowy Plover Habitat
- Cuyama State Park
- San Diego Bay National Wildlife Refuge
- SC Steelhead Habitat

- Area of Special Biological Significance
- Cleveland National Forest
- Parks
- City of San Diego Multi-Habitat Planning Area (MHPA)
- San Diego County Multiple Species Conservation Program (MSCP)
- San Diego IRWM Region
- Funding Area Boundary
- County
- Watershed
- Waterbody
- River
- Freeway

0 2.5 5 10
Miles



Table 3-34: Summary of Vegetation Communities¹

Community	Range	Characteristic Vegetation Species
Coastal Sage Scrub	Extends from the coast to approximately a 1,500-foot elevation. Over 70% of the County's coastal sage scrub has been removed by urban development, but the habitat is found in portions of most of the Region's eleven watersheds.	<ul style="list-style-type: none"> California sagebrush (<i>Artemisia californica</i>) flat-top buckwheat (<i>Eriogonum fasciculatum</i>) laurel sumac (<i>Malosmalaurina</i>) white and black sage (<i>Salvia apiana</i> and <i>S. mellifera</i>)
Chaparral	Exists within an elevation range of 1,000 to 5,000 feet. Vegetation survives the prolonged summer drought season through deep root structure, leaves that minimize evaporation losses, and an ability to recover from wildfire.	<ul style="list-style-type: none"> manzanita (<i>Arctostaphylos</i> spp.) red shank (<i>Adenostoma sparsifolium</i>) oaks (<i>Quercus</i> spp.) chamise (<i>Adenostoma fasciculatum</i>) California lilac (<i>Ceanothus</i> spp.)
Coastal Sage-Chaparral Scrub	Transition community containing species typical of both chaparral and coastal sage scrub	<ul style="list-style-type: none"> (See Coastal Sage Scrub and Chaparral)
Grassland	Native and non-native grasslands occur throughout the Region's eleven watersheds. The largest mountain grassland in the County is at Lake Henshaw and Warner Ranch (San Luis Rey River watershed).	<ul style="list-style-type: none"> purple needlegrass (<i>Nasella pulchra</i>) wild barley (<i>Hordeum murinum</i>) rip-gut (<i>Bromus diandrus</i>) slender wild oat (<i>Avena barbata</i>) foxtail (<i>Bromus madritensis</i>).
Riparian/Wetlands	Occurs along watercourses within each of the Region's eleven watersheds. Consists of tall, open, broadleaved riparian forests, woodlands, and dense, broadleaved riparian thickets. Herbaceous plants dominate the understory.	<ul style="list-style-type: none"> willows (<i>Salix</i> spp.) western cottonwood (<i>Populus fremontii</i>) western sycamore (<i>Platanus racemosa</i>) mule fat (<i>Baccharis salicifolia</i>) Douglas mugwort (<i>Artemisia douglasiana</i>) cattails (<i>Typha</i> spp.), bulrush (<i>Scirpus</i> spp.) sedges (<i>Carex</i> spp.), primrose (<i>Oenothera</i> spp.)
Oak Woodlands	Consists of open or closed canopy woodlands dominated by oaks, including coast live oaks.	<ul style="list-style-type: none"> coast live oaks (<i>Quercus agrifolia</i>) Engelmann oaks (<i>Quercus engelmannii</i>)
Coniferous Forest	Found at elevations above 3,500 feet in the northeastern portion of the Region, including Palomar State Park, and the Laguna recreation area in Cleveland National Forest.	<ul style="list-style-type: none"> Jeffrey pine (<i>Pinus jeffreyi</i>) Coulter pine (<i>Pinus coulteri</i>) California Black Oak (<i>Quercus kelloggii</i>) incense cedar (<i>Libocedrus decurrens</i>) white fir (<i>Abies concolor</i>)
Beach/Foredunes	Found along the coast and bay shores, and characterized by stretches of loose, windswept, sandy dunes that vary in width from a few to several hundred feet.	<ul style="list-style-type: none"> Beach sun cup (<i>Camissonia cheiranthifolia</i>) Beach bur (<i>Ambrosia bipinnatifida</i>) Sea rockets (<i>Cakile maritima</i>)
Eucalyptus Woodland	Consists of open to dense stands of eucalyptus trees, which are an invasive, non-native species. The understory can include grasslands and chaparral habitats.	<ul style="list-style-type: none"> Eucalyptus (<i>Eucalyptus</i> spp.)
Disturbed Habitat	Disturbed habitat consists of previously disturbed areas that are either devoid of vegetation (dirt roads/trails) or support scattered non-native species	<ul style="list-style-type: none"> wild radish (<i>Raphanus sativus</i>) tumbleweed (<i>Salsola tragus</i>) totalote (<i>Centaurea meletensis</i>)
Shallow Bay	Includes Mission Bay and portions of San Diego Bay. Shallow bay areas may support some scattered emergent wetland vegetation.	<ul style="list-style-type: none"> None - primarily open water

³ Adapted from USFWS and DFW(1998).

Core biological resource areas and corridors within the City of San Diego portion of the MSCP area that are targeted for conservation include the Otay Lakes Cornerstone Lands, Marron Valley Cornerstone Lands, and San Vicente Cornerstone Lands. Similar linkages and core biological resource conservation lands are addressed within the North and East County habitat protection programs.

The Region's inland surface waters support both warm freshwater aquatic habitat and cold freshwater aquatic habitat. Common channel flow regimes within the Region include alluvial reaches, with pools, bars, and shallow riffles. Upstream sections of the Region's major watercourses may contain cobble and bedrock reaches. In 1998, the Regional Board implemented a four-year bioassessment program to expand ongoing efforts to assess the integrity of the Region's waters, develop indices of biological integrity, identify reference conditions, and develop baseline data. Assessment work completed to date indicates significant geographic and temporal variation in habitat integrity indices within the Region. The studies recommended designating the lower 25th percentile of reference site data as representing "poor" or "very poor" quality habitat. Monitoring sites with habitat indices in this lower 25th percentile were identified in portions of most of the Region's watersheds (DFW, 1999, 2001, 2002).

Aquatic, Estuarine, and Marine Habitats

Estuarine habitats within the Region include coastal lagoons, seagrass beds, southern coastal salt marsh, and brackish marsh. A wide range of intertidal marine habitats exist along the Region's coast, including: intertidal sandy beach, cobble beach, intertidal platform, intertidal boulder field, tidal pool, and rocky headland. Submerged marine habitats along the Region's coastline include: soft/sand bottom, rocky reef, seagrass beds, surfgrass, and kelp beds.

Many of the Region's estuarine habitats are located within coastal lagoons, which receive water from upstream creeks and rivers and also receive saline water from the Pacific Ocean. Due to their coastal nature, the inlets (openings) to the lagoons may become blocked by sand that is transported by tides, surf, and storm surges (San Elijo Lagoon Conservancy 2013). In order to maintain connectivity with the ocean, several of the Region's coastal lagoons are dredged on a regular basis. Dredging activities often require excavation equipment to remove sediment and sand accumulations that block lagoon inlets, and can temporarily prevent recreational access to the Region's lagoons. Although impacts from dredging may occur, these activities are considered necessary to maintaining lagoon health and ensuring that the Region's lagoons do not become stagnant for long periods of time (San Elijo Lagoon Conservancy 2013). **Invasive Species**

Non-native invasive vegetation species have become established in portions of all of the Region's watersheds. The non-native invasive vegetation can alter fire frequencies, soil conditions, local hydrology, and reduce the reproductive ability of native vegetation. Once established, the non-native vegetation can displace the native vegetation community and dependent wildlife. Invasive species impacting the Region's riparian community include, but are not limited to, giant reed (*Arundo donax*) and salt cedar (*Tamarix* spp.). Through increased water uptake, these species can lower natural water tables, limit groundwater recharge, and reduce streamflow. In addition to hydrological changes, salt cedar leaf litter can sufficiently increase soil salinity such that areas can become unsuitable for native vegetation and dependent wildlife. *Arundo* and *Tamarix* support few insects, the main food supply for insectivorous birds, while limiting or eliminating native vegetation and their associated habitats.

Invasive species also negatively affect aesthetics and recreational access, and can increase the potential for flooding. Other key invasive species within the Region include: iceplant (*Carpobrotus edulis*), Pampas grass (*Cortaderia selloana*), and German ivy (*Senecio mikanioides*). Iceplant

occupies significant areas of the Region, including coastal dunes, and can deprive native vegetation of moisture and nutrients. German ivy can cover native vegetation and reduce access to light and air. Pampas grass out-competes native vegetation through its aggressive root system. Invasive species eradication efforts are currently underway in many of the Region's watersheds.



Water quality monitoring and invasive removal, such as *Arundo Donax*, will improve the habitat quality of Chollas Creek.

Photo credit: Travis Prichard, San Diego CoastKeeper

The marine algae *Caulerpa taxifolia* is an invasive species of concern for the Region's coastal and marine waters. *Caulerpa taxifolia* grows as a dense blanket that covers and kills native aquatic vegetation. Once established, *Caulerpa taxifolia* results in the displacement of fish, invertebrates, marine mammals, and sea birds that are dependent on the displaced native marine vegetation (Regional Board, 2006b). In 2000, *Caulerpa taxifolia* was found in Agua Hedionda Lagoon (Carlsbad Watershed). Eradication efforts including chemical treatment, tarping, surveillance, and public outreach efforts were conducted by the Southern California *Caulerpa* Action Team. As a result of these efforts, full eradication of *Caulerpa taxifolia* has been achieved.

The Quagga mussel is a recent invasive species of critical concern within the Region. The Quagga mussel is a small mollusk that can adversely impact the Region's water supply operations and facilities by clogging pumps, clogging water lines, creating taste and odor problems in treated water supplies, and adversely altering ecosystems within the Region's surface water reservoirs. In February 2007, Metropolitan launched a comprehensive program to detect and control an invasion of Quagga mussels within Metropolitan's imported water supply network. Quagga mussels were confirmed in several of the Region's imported water supply reservoirs in August 2007. In 2010, a Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) was formulated by the Water Authority, along with DFW and others, to conserve and manage covered species under a comprehensive approach that contributes to the ongoing conservation and management efforts in San Diego County. The plan included a quagga and zebra mussel response and control action plan to control the spread of quagga and zebra mussels in San Diego County.

Invasive species within San Diego Bay represents an additional concern within the Region. Biological surveys conducted by DFW have confirmed the presence of over 50 non-native species within San Diego Bay (DFW, 2006).

3.9 Recreational Resources

The Region supports a wide array of recreational resources, with 70 miles of recreational beaches, which include:

- Nine California State Beaches: Cardiff, Carlsbad, Leucadia, Moonlight (operated by the City of Encinitas), San Elijo, San Onofre, Silver Strand, South Carlsbad, and Torrey Pines
- municipal beaches in Oceanside, Encinitas, Solana Beach, Del Mar, San Diego, Coronado, La Jolla, Mission Bay, Mission Beach, Ocean Beach, Pacific Beach, Point Loma, and Imperial Beach

Important coastal preserves and recreational areas include State, county and local parks, beaches and ecological reserves. Table 3-35 presents the larger State and regional recreational areas and ecological reserves within the Region.

As noted, there are two ASBS sites in the region: the La Jolla ASBS and the San Diego-Scripps ASBS. Together, these areas are part of the San Diego-La Jolla Underwater Park. The 6,000-acre underwater park (established by the City of San Diego) stretches from La Jolla Cove in the south to the north end of Torrey Pines Reserve.

The County Department of Parks and Recreation maintains 90 parks and recreational facilities covering over 40,000 acres, including local and regional parks, fishing lakes, community centers, special-use facilities, ecological preserves, and open spaces. The County also operates the County Trails Program that includes (1) a Regional Trails Plan that addresses over 650 miles of existing and planned trails, and (2) a Community Trails Master Plan that addresses over 1,400 miles of new and existing trails.

The City of San Diego maintains a parks system that includes three regional parks, six open space parks, three golf courses and numerous community parks. The City also maintains a lakes recreation program that offers fishing and water contact sports to visitors at nine surface water reservoirs. Additionally, the Region's other 17 municipalities maintain numerous community parks, regional parks, and open space preserves.

Cleveland National Forest covers significant portions of the Region, including upstream areas of the San Luis Rey River, San Dieguito River, San Diego River, Sweetwater, and Tijuana River Watersheds. Mountain area state parks within the Region include Palomar Mountain State Park (San Luis Rey River Watershed) and Cuyamaca Rancho State Park (San Diego and Sweetwater River Watersheds).

Table 3-35: Summary of Regional Parks and Reserves

HU	Watershed	Regional Park or Reserve ^{1,2,3}
903	San Luis Rey	<ul style="list-style-type: none"> Pilgrim Creek State Ecological Reserve San Luis Rey River Park (land acquisition in progress)
904	Carlsbad	<ul style="list-style-type: none"> Agua Hedionda Lagoon State Ecological Reserve Batiquitos Lagoon State Marine Park Buena Vista Creek State Ecological Reserve Buena Vista Lagoon State Ecological Reserve Carlsbad Highlands State Ecological Reserve San Elijo Lagoon State Ecological Reserve San Elijo State Marine Conservation Area Swami's State Marine Conservation Area
905	San Dieguito	<ul style="list-style-type: none"> Boden Canyon State Ecological Reserve (San Dieguito Watershed) San Dieguito Lagoon State Marine Park and Ecological Reserve (San Dieguito Watershed)
906	Peñasquitos	<ul style="list-style-type: none"> Blue Sky State Ecological Reserve La Jolla State Marine Conservation Area Matlahuayl State Marine Conservation Area Meadowbrook State Ecological Reserve San Diego Scripps State Marine Conservation Area South La Jolla State Marine Reserve Torrey Pines State Reserve
907	San Diego	<ul style="list-style-type: none"> Famosa Slough State Marine Conservation Area Mission Trails Regional Park San Diego National Wildlife Refuge
908	Pueblo	<ul style="list-style-type: none"> Cabrillo State Marine Reserve
909	Sweetwater	<ul style="list-style-type: none"> Chula Vista Wildlife Reserve Crestridge State Ecological Reserve McGinty Mountain State Ecological Reserve Rancho Jamul State Ecological Reserve San Diego National Wildlife Refuge Sweetwater Marsh National Wildlife Refuge Sweetwater Regional Park Sycuan Peak State Ecological Reserve
910	Otay	<ul style="list-style-type: none"> Otay Mountain State Ecological Reserve Otay Valley Regional Park San Diego National Wildlife Refuge South Bay County Biological Study Area
911	Tijuana	<ul style="list-style-type: none"> Border Field State Park Tijuana National Estuarine Sanctuary Tijuana River Mouth State Marine Conservation Area Tijuana River Valley Regional Park Tijuana Slough National Wildlife Refuge Walker Canyon State Ecological Reserve

¹ List of County of San Diego parks from County of San Diego (2012).

² List of City of San Diego parks from City of San Diego (2012).

³ List of marine protected areas and preserves adapted from DFW (2012).

3.10 Water Demand and Supply Diversification

Demand Forecasts

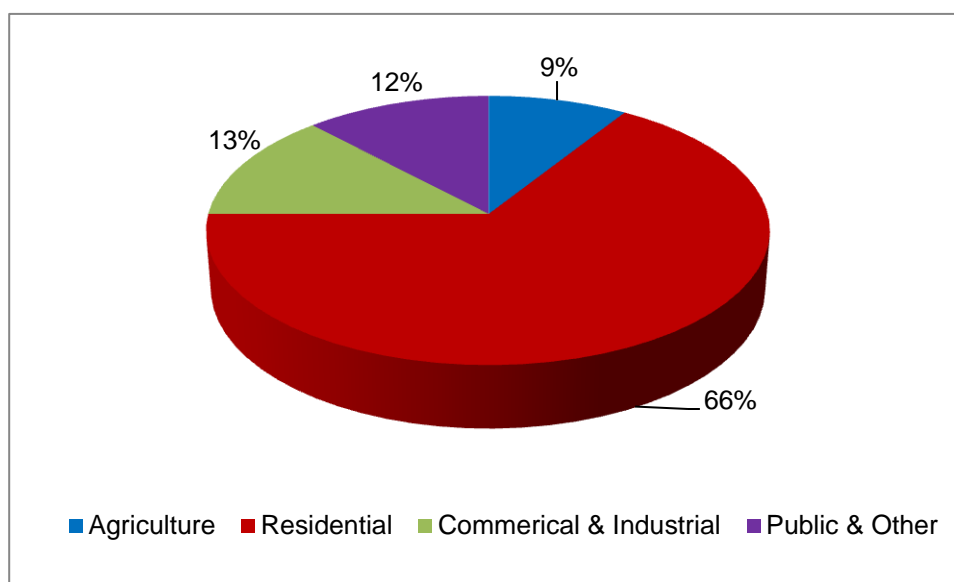
Demand for water in the Water Authority's service area includes municipal and industrial (M&I) demand and agricultural demand. M&I demand comprises 91% of regional water consumption and can be subdivided into residential demand and commercial/industrial demand (Water Authority, 2011a).

Approximately two-thirds of the M&I demand is currently for residential use. Residential water consumption includes both indoor and outdoor uses. Indoor water use includes sanitation, bathing, laundry, cooking, and drinking, while most outdoor use is for landscape irrigation. Outdoor residential M&I demands for single family homes may comprise up to 60% of total residential use (Water Authority, 2011a). Industrial water consumption consists of a wide range of uses, including product processing, aggregate washing, concrete batching, dust control, cooling, air conditioning, sanitation, and landscape irrigation. Commercial water demand is typically for sanitation, landscape irrigation, and drinking.

In recent years, agriculture demands have dropped significantly due to several factors, including water supply cutbacks, water rate increases, and economic downturn. Agricultural demand declined 55% between 2007 and 2010, from 98,000 AFY to 43,000 AFY. Agricultural water demand now accounts for less than 10% of the Water Authority's total water demand. All but a small fraction of the agricultural demand is for irrigation. Primary crops within the Region include avocados, citrus, flowers, and nursery products. Agricultural water use within the Water Authority's service area is concentrated mainly in the northern portion of the Region within the Fallbrook Public Utility District, the City of Escondido, Rainbow, Valley Center, Ramona, and Yuima Municipal Water Districts (Water Authority, 2011a).

Figure 3-17 shows FY 2012 water demand by customer sector.

Figure 3-17: FY 2012 Water Demand by Customer Sector Use



Source: Water Authority FY 2012 Annual Report

Because a significant portion of the overall regional water demand is for irrigation, weather and hydrologic conditions (precipitation, temperature, evaporation) have a significant effect on water demands within the Water Authority service area. Population, housing, and employment are also key factors in influencing the regional water demand. Over the last several decades a prosperous economy had stimulated local development and population growth, which in turn produced a relatively steady increase in water demand. However, by the late-2000s, the combination of economic recession, drought messaging, implementation of member agency mandatory water use restrictions, water rate increases, and mild local weather culminated in a dramatic multi-year decrease in total water demand. In fiscal year 2007, water demand in the Water Authority's service area reached a record level of 741,893 AF, only to drop roughly 24% to 566,443 AF by fiscal year 2010 (Water Authority, 2011a).

To forecast future M&I water use, the Water Authority selected the IWR-MAIN (Institute for Water Resources – Municipal and Industrial Needs) computer model. Versions of this econometric model have evolved over a 20-year period and are being used by many U.S. cities and water agencies. The IWR-MAIN system is designed to utilize projections of local population, housing, and employment and other demographic data to forecast M&I water demand. The Water Authority's version of the IWR-MAIN model was modified to reflect the Region's unique parameters and is known as CWA-MAIN.

Per a 1992 Memorandum of Agreement (MOA) between SANDAG and the Water Authority, the Water Authority agreed to use SANDAG's most recent regional growth forecasts for planning purposes. Water demands presented in the Water Authority's *2010 Urban Water Management Plan* were developed using the CWA-MAIN model and the SANDAG *2050 Regional Growth Forecast*. The CWA-MAIN model was adjusted to incorporate:

- estimated demands for Camp Pendleton that are based on historic trends, and
- a separate agricultural demand model that estimates demand on the basis of projected agricultural acreage, and updated crop distribution and irrigation management data.

Using this modeling approach, Table 3-36 presents projected water demands through 2035 under "normal year" hydrologic conditions.

Table 3-36: Normal Year Water Demand Forecast – Water Authority Service Area¹

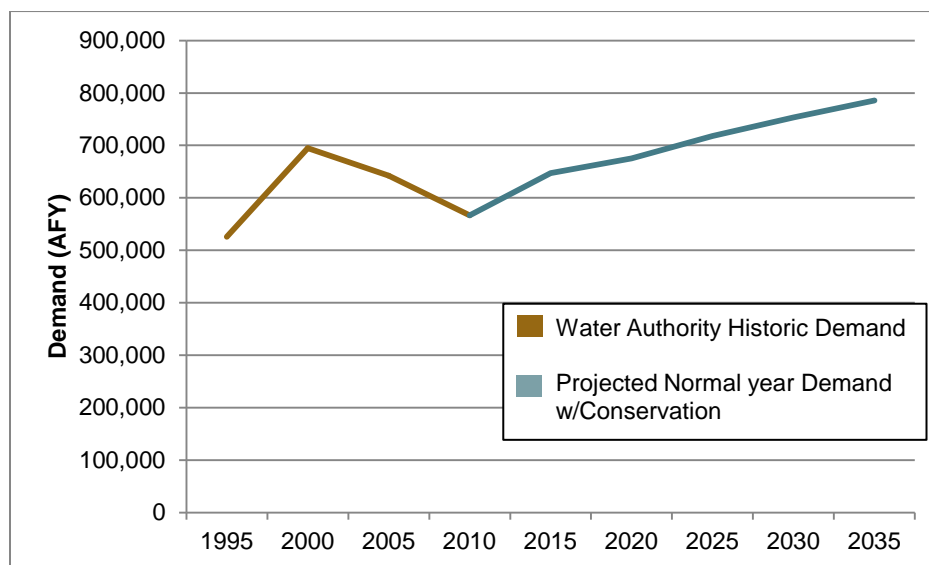
Demand Parameter	Projected Water Demand (acre-feet per year)				
	2015	2020	2025	2030	2035
M&I Baseline Forecast ²	590,731	661,415	728,574	788,174	839,417
Estimated Conservation Savings	6,737	46,951	72,234	97,280	117,528
M&I Forecast Reduced by Conservation	583,994	614,464	656,340	690,894	721,889
Agricultural Forecast	55,358	49,534	48,380	47,279	46,178
Total Projected Demand	639,352	663,998	704,720	738,173	768,067
Total Projected Demand with Pending Annexations and Additional Anticipated Growth	647,285	675,089	717,995	753,619	785,685

¹ From *2010 Urban Water Management Plan* (Water Authority, 2011a). Water demand estimates for the portion of the Region outside the Water Authority service area are not available.

² Includes M&I demands for Camp Pendleton area customers.

Figure 3-18 shows these projected demands alongside historic water demands. As described earlier, the decrease in water demand in 2010 is attributed to regulatory and conservation efforts, as well as the economy, water costs, and home foreclosures. Information presented in Table 3-36 and Figure 3-18 reflects current demand projections presented within the *2010 Urban Water Management Plan* (Water Authority, 2011a).

Figure 3-18: Historic Water Use and Projected Water Demands



Water Supply Diversification

The *California Water Plan Update 2009* (DWR, 2009) identifies short-term and long-term issues that may impact water supply availability and include (in part): population growth, drought, flood, earthquake, aging infrastructure, global climate change, and environmental restrictions. The *California Water Plan Update 2009* promotes diversification of regional water portfolios.

Recognizing that imported SWP and Colorado River supplies are subject to legal, environmental, drought, and other uncertainties, a key result area of the Water Authority's *Strategic Plan* is diversification of the Region's water portfolio. This diversification plan is based on:

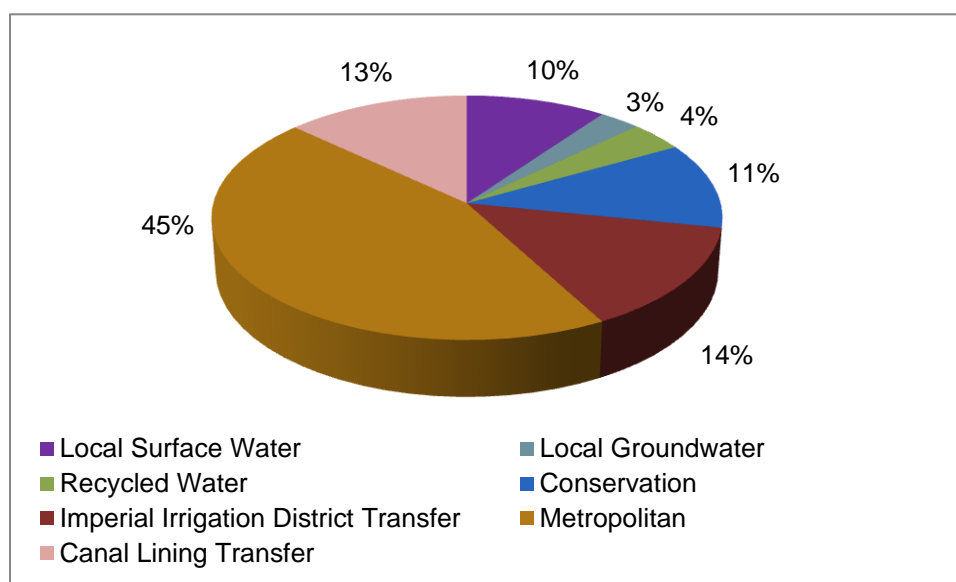
- Retail member agency compliance with Senate Bill (SB) X7-7 water conservation targets, requiring 20% reduction in potable water use by 2020.
- Completion of the Carlsbad Seawater Desalination Project by 2016.
- Increasing the amount of recycled water use and brackish groundwater demineralization facility yield implemented by member agencies.
- Full implementation of the IID water transfers.

Water conservation is a fundamental component of the Region's water diversification plan. The Water Authority and its member agencies have aggressively supported water conservation since 1990. Significant Water Authority and member agency funding has been directed toward implementing comprehensive conservation programs to reduce water use for residential, commercial, and agricultural irrigation, and to reduce water use in homes, businesses, industries, and institutions.

Water transfers that incorporate water conservation represent another key element of the Water Authority's water supply diversification effort. In 1998, the Water Authority executed an agreement with the IID for the conservation and transfer of agricultural water. Under the agreement, water conserved by Imperial County farmers who participate in a voluntary program would be transferred to the Water Authority. Water transferred to the Water Authority totaled 70,000 AF during 2010 and will increase annually to a maximum annual total of 200,000 AF in 2021.

Additionally, in 2003, the Water Authority contracted rights to 77,700 AFY of water conserved through projects that lined 24 miles of the All-American Canal and 37 miles of the Coachella Canal in Imperial County. An additional amount up to 4,850 AFY is available to the Water Authority depending on environmental requirements associated with the Coachella Canal. Work on the Coachella Canal lining project was initiated in 2004 and was completed in 2006. Work on the All-American Canal began in 2005 and was completed in 2010. Deliveries of conserved water to the Region began in 2007. Figure 3-19 shows FY 2012 water supply sources for the Region.

Figure 3-19: FY 2012 Water Supply Sources



Source: Water Authority FY 2012 Annual Report

Conserved IID agricultural water and water conserved through the canal lining projects is credited to the Water Authority through a 2003 agreement between the Water Authority and Metropolitan. Under the agreement, Metropolitan takes delivery of conserved IID agricultural water and water conserved by the canal lining projects. Metropolitan, in turn, provides the Water Authority with a like quality and quantity of water. Other components of the supply diversification effort undertaken by the Water Authority and its member agencies include the following:

- Groundwater** – Groundwater supplies are developed through management and recovery of good-quality alluvial groundwater or demineralization of poor-quality groundwater. Private wells are used to meet domestic and agricultural water needs within and outside the Water Authority's service area. A lack of groundwater use and demand data is a significant water management challenge in rural areas.

- **Seawater Desalination** – A seawater desalination facility is being built at the Encina Power Station in Carlsbad, and is expected to project 50 MGD of potable water when it reaches full capacity. The Water Authority has already entered into an agreement to purchase up to 56,000 AFY once production begins.
- **Indirect Potable Reuse** – IPR is being studied by the City of San Diego and partner organizations as an option for supplementing potable water supplies with highly-treated recycled water. A demonstration facility operational at the North City Water Reclamation Plant site has a 1 MGD capacity.

Taking into account projected water conservation savings, Table 3-37 presents a breakdown of projected water supplies and compares projected supplies with the demand forecast for a normal hydrologic year. As shown in Table 3-37, imported supplies from Metropolitan are projected to comprise approximately 41% of the total regional water demand by year 2035.

Table 3-37: Water Authority Water Supply Portfolio – Normal Water Year¹

Demand Parameter	Projected Water Supply (acre-feet per year)				
	2015	2020	2025	2030	2035
Water Authority Supplies					
• IID Water transfer ^{1,2}	100,000	190,000	200,000	200,000	200,000
• Canal Lining projects ^{1,3}	80,200	80,200	80,200	80,200	80,200
Coachella Lining	24,000	24,000	24,000	24,000	24,000
All American Lining	56,200	56,200	56,200	56,200	56,200
• Seawater desalination ^{1,4}	0	56,000	56,000	56,000	56,000
Water Authority Member Agency Supplies					
• Local surface water ^{1,5}	48,210	47,940	47,880	47,540	47,290
• Water recycling ⁶	38,660	43,730	46,600	48,280	50,000
• Groundwater ^{1,7}	22,030	26,620	27,620	28,360	28,360
Groundwater	11,710	11,100	12,100	12,840	12,840
Groundwater Recovery	10,320	15,520	15,520	15,520	15,520
Metropolitan Supplies ¹	358,190	230,600	259,690	293,240	323,840
Total Supplies ^{1,8}	647,290	675,090	717,990	753,620	785,690
Total Projected Demand with Conservation ^{1,8}	647,290	675,090	718,000	753,620	785,690

- 1 Verifiable expected water supplies for the Water Authority service area, as presented in 2010 Urban Water Management Plan (Water Authority, 2011a). Water budget data for the rural portion of the Region outside the Water Authority service area not available. Values rounded to nearest 10 acre-feet per year.
- 2 Expected Water Authority supply, per 1997 Water Conservation and Transfer Agreement between the Water Authority and the Imperial Irrigation District for the transfer of conserved agricultural water.
- 3 Expected Water Authority supply, per Quantification Settlement Agreement on the Colorado River. The supply includes 2,500 acre-feet of environmental water deliveries.
- 4 Proposed Carlsbad Desalination Project at Encina Power Station. Other desalination projects are currently being considered but are not considered verifiable supplies.
- 5 Expected average yield of member agency surface reservoirs during normal year hydrologic conditions.
- 6 Projected recycled water development based on member agency project implementation schedules.
- 7 Projected groundwater extraction yields by Water Authority member agencies during normal year hydrologic conditions. Includes groundwater recovery through demineralization treatment of brackish groundwaters.
- 8 Values may not add to exact total due to rounding.

In addition to assessing a normal hydrologic year, the Water Authority's *2010 Urban Water Management Plan* also developed supply estimates under single dry and multiple dry water years. Table 3-38 presents the Water Authority's water supply and demand assessment for a single dry water year. The *2010 Urban Water Management Plan* concludes that no shortages are anticipated within the Water Authority's service area under single dry-year through 2035 provided that (1) projected Metropolitan, Water Authority and member agency supplies are developed as planned, and (2) retail conservation targets are achieved.

The *2010 Urban Water Management Plan* indicates that, in multiple dry water years, the Region is at risk for shortages. The plan also notes that the most reliable method for alleviating shortages during a dry period is to enhance regional storage and local water supply development (Water Authority, 2011a). The Water Authority has also developed a *Water Shortage and Drought Response Plan* (Water Authority, 2006) that identifies shortage management actions to minimize the impacts of drought-related imported water shortages and to equitably allocate supplies to member agencies.

Table 3-38: Water Authority Water Supply Portfolio – Single Dry Water Year¹

Demand Parameter	Projected Water Supply (acre-feet per year)				
	2015	2020	2025	2030	2035
Water Authority Supplies					
• IID Water transfer ^{1,2}	100,000	190,000	200,000	200,000	200,000
• Canal Lining projects ^{1,3}	80,200	80,200	80,200	80,200	80,200
<i>Coachella Lining</i>	24,000	24,000	24,000	24,000	24,000
<i>All American Lining</i>	56,200	56,200	56,200	56,200	56,200
• Seawater desalination ^{1,4}	0	56,000	56,000	56,000	56,000
Water Authority Member Agency Supplies					
• Local surface water ^{1,5}	17,930	17,930	17,930	17,930	17,930
• Water recycling ⁶	38,660	43,730	46,600	48,280	50,000
• Groundwater ^{1,7}	20,300	25,500	25,500	25,500	25,500
Groundwater	9,980	9,980	9,980	9,980	9,980
Groundwater Recovery	10,320	15,520	15,520	15,520	15,520
Metropolitan Supplies ¹	430,430	305,100	338,500	376,020	409,390
Total Supplies ^{1,8}	687,520	718,460	764,730	803,930	839,020
Total Projected Demand with Conservation ^{1,8}	687,520	718,460	764,730	803,930	839,020

- 1 Verifiable expected water supplies for the Water Authority service area, as presented in *2010 Urban Water Management Plan* (Water Authority, 2011a). Water budget data for the rural portion of the Region outside the Water Authority service area not available. Values rounded to nearest 10 acre-feet per year.
- 2 Expected Water Authority supply, per 1997 Water Conservation and Transfer Agreement between the Water Authority and the Imperial Irrigation District for the transfer of conserved agricultural water. Expected Water Authority supply, per Quantification Settlement Agreement on the Colorado River. The supply includes 2,500 acre-feet of environmental water deliveries.
- 3 Proposed Carlsbad Desalination Project at Encina Power Station. Other desalination projects are currently being considered but are not considered verifiable supplies.
- 4 Expected average yield of member agency surface reservoirs during single dry year hydrologic conditions.
- 5 Projected recycled water development based on member agency project implementation schedules.
- 6 Projected groundwater extraction yields by Water Authority member agencies during single dry year hydrologic conditions. Projected groundwater recovery is through demineralization treatment of brackish groundwaters.
- 7 Values may not add to exact total due to rounding.

Water demand projections and water supply diversification strategies developed by the Water Authority are acknowledged by the DWR in the *California Water Plan Update 2009* (Bulletin No.

160). The *California Water Plan Update 2009* notes the importance of regional water supply planning, and describes water supply diversification strategies of the Water Authority and other Southern California agencies.

Cost of Water Supply Diversification

To meet the Region's water supply diversification goals, additional sources of local supply will need to be developed. However, development of new supplies to diversify the Region's portfolio will likely be more expensive than existing supplies. There are a number of factors that can influence supply development costs, such as, location, size, and configuration of a project. For example, brackish and seawater desalination project unit costs can vary based on the extent of the product water conveyance required, pumping requirements, access to existing infrastructure, and method of brine disposal.

Proposed groundwater desalination projects have an estimated unit cost of \$800-\$2,000 per acre-foot (Water Authority, 2010). The purchase and delivery of water from the Carlsbad Seawater Desalination Facility (currently under construction) has an estimated total unit cost that ranges between \$2,014 and \$2,257 per acre-foot, depending upon how much water is purchased annually.

The City of San Diego recently completed the Water Purification Demonstration Project, which demonstrated the feasibility of a full-scale reservoir augmentation project that could produce 15 MGD of potable water via reuse (refer to Section 3.5.5 for more information). The most recent cost estimate for a 15 MGD potable reuse facility was \$2,000 per acre-foot with an avoided wastewater cost of \$1,000 per acre-foot. In July 2012, the City of San Diego completed a *Recycled Water Study* that identified potable reuse opportunities in the Metropolitan Wastewater System service area (see Figure 3-10: Regional Wastewater/Recycled Water Infrastructure for map) and determined that 83 MGD of potable water production via reuse was foreseeable from various treatment sites. The estimated cost to produce 83 MGD of potable water via reuse is \$1,700-\$1,900 per acre-foot with an avoid wastewater cost of \$1,100 per acre-foot in 2011 dollars (City of San Diego, 2006).

The primary drivers influencing wholesale water rates are the costs related to the purchase and treatment of water. Supply costs are tied to the purchase of imported water from Metropolitan and of transfer supplies through the Water Authority's transfer agreement with IID. As the cost of imported water increases, local supply options become more cost-competitive and cost-effective in comparison. Despite higher water rates that may be associated with water supply diversification, these efforts have largely received support from local residents and water rate payers, and such support has been documented in a number of public opinion polls. A 2011 public opinion poll conducted by the Water Authority indicated that the vast majority of respondents (80%) support the Water Authority's diversification plan, with seawater desalination being identified as the most important component (Water Authority, 2011c). A 2012 Water Authority poll showed that 62% of residents felt that rate increases are necessary to maintain water supply reliability. Specifically, the 2012 poll found 58% of those surveyed would pay an additional \$5 per month to support adding seawater desalination to the Region's water supply.

3.11 Major Water Related Issues and Conflicts

As documented in this section, significant interrelationships exist among the Region's key water resources needs and IRWM Plan goals of enhancing water supply, enhancing recreation, and providing environmental stewardship. Table 3-39 summarizes key water management issues within the Region and potential conflicts that may occur in resolving the issues.

Table 3-39: Summary of Water Management Issues and Potential Conflicts

Water Management Issue	Potential Conflicts
Flood Control	<ul style="list-style-type: none"> • Difficulty in permitting invasive species removal and limitations on geographical or seasonal access to channel • Potential conflicts with environmental enhancement goals • Inconsistent or unreliable funding sources for flood control projects? • Zoning or land use restrictions for protection flood prone areas?
Stormwater	<ul style="list-style-type: none"> • Diverting noncompliant stormwater to groundwater recharge may conflict with groundwater protection goals • Proposed stormwater BMPs may conflict with local land use regulation
Water Supply	<ul style="list-style-type: none"> • Imported water may not comply with Basin Plan water quality objectives • Basin Plan objectives may conflict with indirect potable reuse operations • Groundwater production or recharge may conflict with environmental protection needs of groundwater-dependent vegetation • Managing supply cost increases
Water Quality Standards	<ul style="list-style-type: none"> • The need to meet water quality concentration limits may result in reduced discharges or flows required to support downstream beneficial uses • 303(d) listing/TMDL process may prevent implementation of projects that improve water quality but do not result in attainment of water quality goals • Existing standards may not be representative of actual beneficial use protection needs • Current "one-size-fits-all" Basin Plan objectives do not take into account seasonal or flow influences
Institutional Issues	<ul style="list-style-type: none"> • Potential conflicts may occur between land use regulations and water quality protection needs • Available Regional board staffing levels may be inconsistent with staffing needs required to address priority Basin Plan modifications • Interborder jurisdictional issues may hamper actions to achieve water quality objectives • Water rights may limit development of certain groundwater basins and may conflict with use of return flows from imported water irrigation
Salinity/Brine Management	<ul style="list-style-type: none"> • Water conservation measures may lead to increased wastewater salinity • Brine discharges to sewer may conflict with recycled water use needs • Brine discharges to ocean may conflict with environmental protection needs
Recreation	<ul style="list-style-type: none"> • Body contact and non-contact recreation may impact the water quality standards implemented to support such recreational uses • Sediment controls in watercourses may impact sand availability at downstream beaches
Climate Change	<ul style="list-style-type: none"> • Climate change may affect water supply availability because of droughts, seawater intrusion, changes in precipitation volumes and timing, altered fire and weather regimes, and potential changes in the availability of imported water supplies • Beneficial uses may be impacted by climate change or water quality standards more difficult to meet or no longer appropriate • Uncertainty related to climate change impacts make responses and mitigation efforts difficult to plan
Wastewater	<ul style="list-style-type: none"> • Regulatory pressure to upgrade the Point Loma Wastewater Treatment Plant • Cost drivers associated with wastewater systems, including treatment plant upgrades, ongoing treatment and operations, and infrastructure maintenance • Regulatory pressure associated with wastewater operations, including upgrading regional facilities such as the Point Loma Wastewater Treatment Plant

3.12 Neighboring and/or Overlapping IRWM Efforts

The San Diego IRWM is one of three IRWM efforts within the San Diego Regional Board (Region 9) jurisdiction, which is designated by DWR as the San Diego Funding Area for the IRWM Program. The other two IRWM regions in the San Diego Funding Area are the South Orange County IRWM and the Upper Santa Margarita River IRWM. The South Orange County IRWM effort is led by an RWMG that is comprised of the County of Orange, Municipal Water District of Orange County, and South Orange County Wastewater Authority. The Upper Santa Margarita IRWM effort is led by an RWMG comprised of the Rancho California Water District, County of Riverside, and Riverside County Flood Control and Conservation District.

RWMG agencies from the three San Diego Funding Area IRWM groups have formed the Tri-County Funding Area Coordinating Committee (Tri-County FACC) through a Memorandum of Understanding (MOU), and have been meeting regularly since 2008. The Tri-County FACC facilitates integration of projects and policies across the San Diego Funding Area where appropriate, and helps provide balance to the individual interests of the three IRWM Regions.

The Tri-County FACC governance structure also enables integrated management of watersheds and resources that cross jurisdictions, and specifically aims to coordinate work in the San Juan Watershed and the Santa Margarita River Watershed, both of which lie within at least two of the three IRWM regions (see Figure 3-20). As part of the MOU, the Tri-County FACC RWMGs have committed to coordinated planning and identification of opportunities to support common projects and goals. One example of this effort is a joint project between the Upper Santa Margarita River IRWM Region and the San Diego IRWM Region that seeks to provide better understanding of nutrient impacts in the Santa Margarita River Watershed, and to help determine appropriate levels of nutrients to protect beneficial uses. This project received Proposition 84, Round 1 funding from both planning regions.

The Tri-County FACC has entered into an agreement to share the IRWM funds allocated by DWR to the San Diego Funding Area. This agreement has facilitated coordination between RWMGs by reducing competition and conflicts over funding. The Tri-County FACC agreement is described below, and manages three different aspects: information sharing, shared infrastructure, and competing interests.

Information Sharing

The RWMGs have agreed to share data and information to inform efforts within the Funding Area and inter-regionally. This information sharing helps to facilitate collaboration and address interregional needs. Some of the organizations that help in this data sharing effort include the San Diego Regional Water Quality Control Board and the Stormwater Monitoring Coalition.

Each of the IRWM Plans in the San Diego Funding Area includes sections on data management and project selection. The Tri-County FACC acts as an advisory council to assist in the development of these sections, particularly in projects or programs that may cross IRWM Region boundaries, which may be funded, administered, or implemented by multiple Regions. Additionally, projects of importance to the watersheds that exist in multiple IRWM Regions are identified for coordination and prioritization in each of the relevant regions' project selection process.

The Stormwater Monitoring Coalition (SMC) is comprised of all Phase I municipal stormwater NPDES Principal Permittees and NPDES regulatory agencies in Southern California. This coalition includes Tri-County FACC RWMG members from the County of Orange, Riverside County Flood Control and Water Conservation District, and County of San Diego. SMC members have pooled

resources to address data gaps, develop technical information and tools, and improve monitoring effectiveness.

Tri-County FACC members also participate in the Regional Board's stakeholder groups for the development of TMDLs during the TMDL Basin Plan amendment process. Within the San Diego IRWM Region, members of the Upper Santa Margarita RWMG and the South Orange County RWMG are invited to attend RAC meetings, in order to stay better informed of the priorities and needs of the San Diego IRWM Region, and provide feedback through the public participation process.

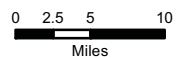
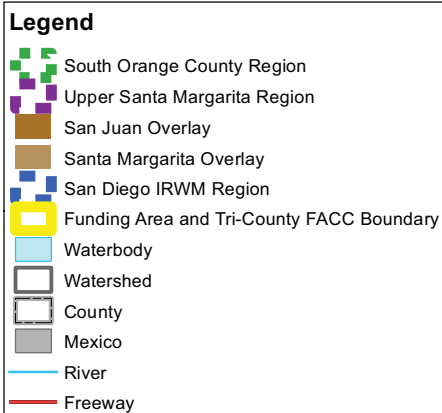
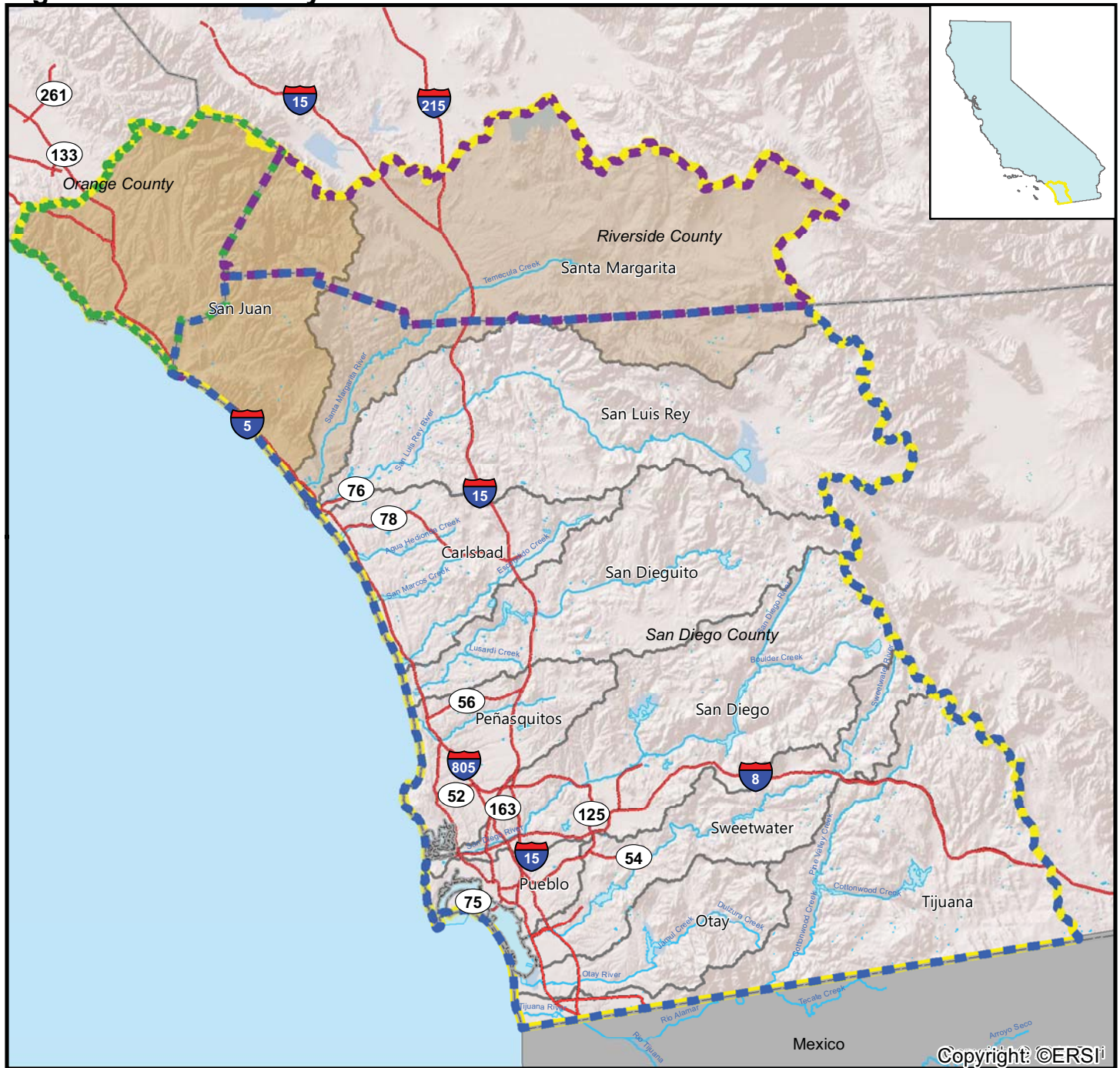
Shared Infrastructure

Each of the IRWM Regions in the Tri-County FACC is dependent on imported water, supplied through Metropolitan. As such, they share much of the same water infrastructure. Shared imported water infrastructure includes the Colorado River Aqueduct, Diamond Valley Lake, Lake Skinner, and other major pipelines, all of which are owned and operated by Metropolitan. The Lake Skinner Water Treatment Plant, also owned by Metropolitan, serves over 4 million people in the Tri-County FACC area. In addition to Metropolitan-owned imported water infrastructure, members of the Tri-County FACC also share pipelines used to supply parts of Camp Pendleton. This use of shared infrastructure helps provide common interests between the members of the Tri-County FACC, promoting collaboration between the RWMGs.

Competing Interests

Entities in the three Tri-County FACC regions have occasionally found themselves in conflict over water supply issues in the watersheds in overlay areas. However, various agreements and legal settlements have led to a cooperative management of water allocations between these entities. Currently, there is significant agreement on water allocations, and the Tri-County FACC is supporting collaborative efforts to improve the storage and management of water resources. Recently, some long-standing conflicts have been resolved, and cooperative projects funded. The Tri-County FACC MOU has also established how IRWM Proposition 84 grant funds will be allocated to each of the IRWM Regions in the Funding Area, making grant applications non-competitive within the San Diego Funding Area, and improving relations between RWMGs by reducing funding-related conflict. Though not all water-related conflicts have been resolved, the Tri-County FACC MOU shows the willingness of these agencies to work collaboratively to solve important water resource conflicts, furthering the integration of water resource management.

Figure 3-20: Tri-County FACC Boundaries



3.13 United States–Mexico Border Coordination

In addition to neighboring IRWM regions located to the north, the San Diego IRWM Region is bounded to the south by the country of Mexico. Due to this proximity, the Region shares several water resource planning and coordination efforts with Mexico.

With specific regards to water supply resources, the South Bay International Wastewater Treatment Plant, located in San Ysidro, was built to address issues associated with wastewater treatment needs in Mexico that had resulted in contamination of portions of the Tijuana River located in the United States (International Boundary and Water Commission, ND). In addition, the Otay Water District located in the Region has an emergency connection with Mexico to provide water supplies to the city of Tijuana in an emergency situation.

With respect to water quality, efforts have been underway to address pollution issues in the Tijuana River Valley Floodplain through the Tijuana River Valley Recovery Team (Recovery Team). The Recovery Team is organized through the San Diego Regional Water Quality Control Board, and has the goal of partnering with Mexico to implement watershed-based solutions to address issues that affect United States and Mexico portions of the Tijuana Watershed (Regional Board, 2013b).

Coordination with Mexico on water-related issues continues to grow in the Region, and in 2012 the U.S. Environmental Protection Agency and the Secretary for the Environment and Natural Resources of Mexico signed the Border 2020 agreement, which aims to address environmental issues such as water quality pollution (EPA 2013). Further, the Otay Water District recognizes that Mexico may be a potential future customer for recycled water supplies, and also has plans to develop a bi-national seawater desalination plant in Rosarito, Mexico (Otay Water District, 2011).

As stated in the *Tijuana River Valley Recovery Strategy (TRVRS)*, efforts to protect and restore Tijuana River Valley resources are not new; sediment management, land preservation and habitat restoration have been conducted in the Tijuana Watershed for many years. Local, state, and federal management agencies, along with non-governmental organizations and other stakeholders have invested substantial effort and funding in project planning and implementation both in the United States and in Mexico to improve conditions. Investments to improve wastewater treatment began in the 1980s and 1990s. Recent activities have included pollution prevention and source control for sediment and trash, water quality improvements, flood control, improved recreational opportunities, and public education and outreach. These projects demonstrate the dedication and wealth of experience that the various operating agencies and stakeholders have invested in the Valley and watershed (TRVRS 2012).

The future brings many challenges for the Tijuana River Valley Recovery Team. The bi-national nature of the watershed is one major hurdle. It is well known that source control and pollution prevention activities can be the most cost-effective solutions to reduce sediment and trash loading. With the majority of the watershed situated in Mexico, planning and implementing source control and other projects across the international border present an added challenge to an already complex issue.

Despite existing and future planned efforts to coordinate with Mexico on water management and watershed-based solutions, the limited decision making authority of bi-national agencies results in long processes and implementation challenges. . The IRWM Program will continue to work with existing organizations in the Region to address cross-border issues and implement integrated water management solutions, as appropriate.

3.14 Climate Change

Hydrologic conditions in the Region, within California, and in the Colorado River Basin will likely be altered as a result of global climate change (based on conditions observed over the past century). DWR coordinated a literature search on global warming issues and summarized probable global warming impacts within Chapter 4 of the *California Water Plan Update 2005* (DWR, 2005) and within *Progress on Incorporating Climate Change into Management of California's Water Resources* (DWR, 2006). Key changes in hydrologic conditions forecasted by these DWR reports include:

- *Snowpack Changes.* While snowpack represents a negligible component of the water balance within the Region's local water supplies, snowpack in the Sierra Nevada Mountains represents California's largest water storage component. Decreased snowpack in the Sierras will result in increased runoff during October through March, adversely affecting California's water storage and potentially affecting the amount of imported water available to the Region.
- *Hydrologic Patterns.* Global warming may result in a shift in storm tracks. Existing data (DWR, 2006) show a trend of increasing precipitation in Northern California and decreasing precipitation in Southern California during the past century, but El Niño effects (increased Pacific Ocean temperatures) have been shown to result in a shift of the Pacific Coast winter storm tracks toward the south. Other patterns may emerge over time.
- *Storm Intensity.* Flood management, erosion, and water quality impacts could occur if climate change results in increased precipitation intensity and reduced health plant cover.
- *Sea Level Rise.* Sea level rises associated with global warming could increase coastal erosion, impacting ecosystems and tidal wetlands. Sea level rises would also increase salinity intrusion into the Sacramento Bay Delta, adversely impacting the quality of SWP supplies delivered to the Region.
- *Water Temperatures.* Increased air temperatures and modified storm patterns may result in increased reservoir water temperatures, adversely affecting cold water and other species and increasing the intensity of algae blooms.
- *Increased Regional Temperatures.* Increased air temperatures will lead to greater evaporation of reservoirs and lakes, higher demand in energy for cooling, and greater demand for agriculture.
- *Water Demand.* Potential global warming effects on vegetation evapotranspiration are currently unknown; however, irrigation demands could potentially increase. While increased temperature results in increased evapotranspiration, this may be partially offset by the fact that increased atmospheric carbon dioxide can result in reduced vegetation water consumption.
- *Energy Demand.* Global warming effects may result in increased energy demands that will require increased conservation and efficiency measures.

DWR has also identified needs for further research in each of these areas to assess how global climate change may affect California water planning. Regardless of the projected altered conditions, improving local stewardship of the Region's water resources will likely improve the Region's ability to more robustly deal with changed climatic conditions.

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