SECTION 2

Study Area Description

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2.0 STUDY AREA DESCRIPTION

2.1 Regional Setting

A summary of the general geographical setting of San Diego County including the regional topography, climate, hydrology, land use, and population is presented in this section. Much of the land use data presented in this report is based on the 2006 San Diego Association of Governments (SANDAG) geographic information system (GIS) data.

2.1.1 Geomorphology

San Diego County can be divided between three distinct geomorphic regions: the Coastal Plain Region as exposed west of the Peninsular Ranges, the Peninsular Range Region, and the Salton Trough Region as exposed east of the Peninsular Ranges (Figure 2-1). This geomorphic division reflects a basic geologic difference between the three regions; with Mesozoic metavolcanic, metasedimentary, and plutonic rocks predominating in the Peninsular Ranges, and Cenozoic sedimentary rocks predominating to the west and east of the central mountain range. The irregular contact between these geologic regions reflects the ancient topography of this area before it was buried by the thick sequence of Cretaceous and Tertiary sedimentary rocks deposited over the last 75 million years by ancient rivers and in ancient seas.

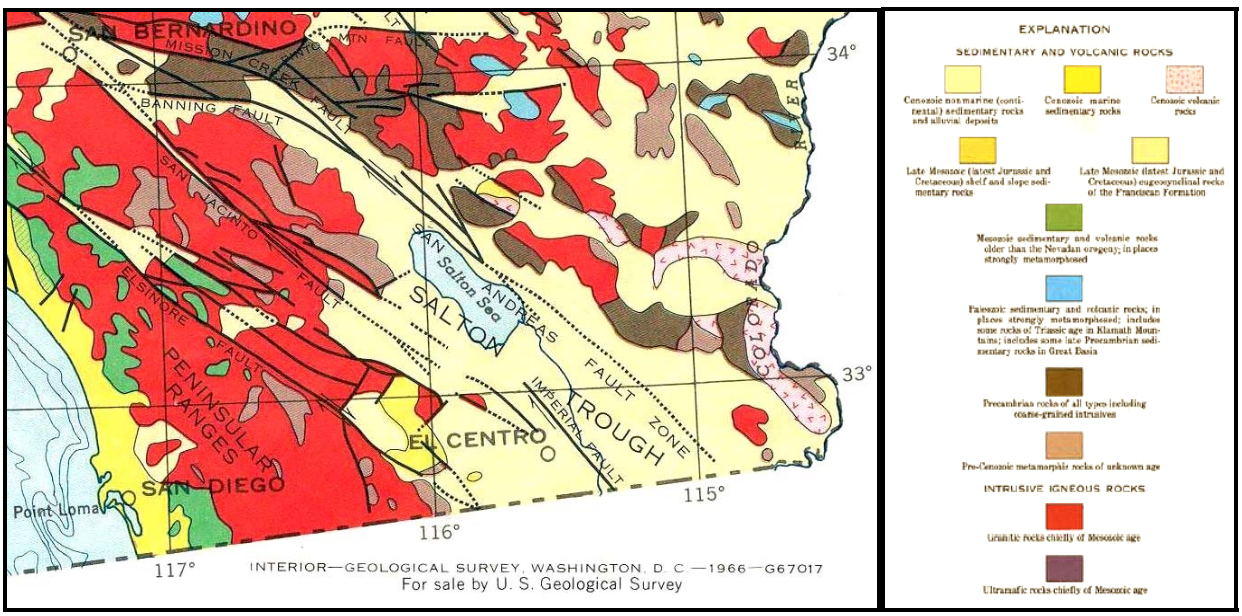

Figure 2-1. San Diego County Geology.

In the Coastal Plain region, resistant peaks composed of Mesozoic crystalline rocks extrude through the younger Cretaceous and Tertiary sedimentary cover and demonstrate the amount of topographic relief on the buried landscape of western San Diego County. The Coastal Plain Region is underlain by a sequence of marine and non-marine sedimentary rock units. Faulting has broken up this sedimentary sequence into a number of distinct fault blocks in the southwestern part of the county. North of La Jolla the effects of faulting are not as great and the rock units here are relatively undeformed.

The Peninsular Ranges Region is underlain primarily by plutonic rocks that formed from the cooling of molten magmas deep within the earth's crust. These magmas were generated during subduction of an oceanic crustal plate that was converging on the North American Plate between 140 and 90 million years ago. Over this long period of time, extensive masses of granitic rocks accumulated at depth to form the Southern California Batholith. Intense heat associated with these plutonic magmas metamorphosed the ancient sedimentary rocks into which the plutons intruded. These metasediments are now preserved in the Peninsular Range Region as marbles, slates, schist, quartzites and gneiss.

Approximately the eastern one-third of San Diego County falls within the Salton Trough Region. The Salton Trough is the northern landward extension of the Gulf of California and is undergoing active deformation related to faulting along the San Jacinto and Elsinore fault zones. These fault zones are in turn related to the major tectonic feature in the region, the San Andreas Fault.

Much of the land surrounding the Salton Sea in the Imperial and Coachella valleys is below present sea level. This is the result of crustal thinning and subsidence caused by the same extensional tectonics that continue to form the Gulf of California today. As a result of this rifting and subsidence, the Salton Trough has been filled with sediments to a depth of up to five miles since the early Miocene, approximately 24 million years ago. The source of these sediments has been the local mountain ranges, as well as the ancestral and modern Colorado River (Deméré, 2005).

San Diego County is located within the Peninsula Range Physiographic Province of California. One of the most prominent physical features in the region is the northwest-trending Peninsula Range which includes, from north to south, the Santa Ana, Agua Tibia, Palomar, Volcan, Cuyamaca, and Laguna Mountains. Generally, the region exhibits a gently sloping, dissected western surface and a steep eastern slope. The province is separated from the Salton Trough west of the Colorado River by abrupt fault scarps of marked relief (RWQCB, 1994).

The San Diego Region is divided into a coastal plain area, a central mountain-valley area, and an eastern mountain-valley area. The coastal plain area is a series of wave cut platforms overlain by thin terrace deposits. This terraced surface has been deeply incised by streams draining generally westward to the sea, and has been smoothed and rounded by local erosion. Local elevations range from sea level to approximately 1,500 feet. The coastal plain extends from the coast inland, along a band approximately 10 miles in width.

The central mountain-valley area is characterized by ridges and intermountain basins that extend from the coastal plain, northeastward to the Elsinore fault zone. The basins or valleys range in elevation from approximately 500 to 5,000 feet, are generally of fault block origin, and have been altered by erosion. The floors of the intermountain valleys are generally underlain by moderate thicknesses of alluvium. Notable examples of this occur near El Cajon, Escondido, and Ramona where elevations range from approximately 500 to 1,500 feet above sea level. At higher elevations ranging from 2,000 to 6,000 feet near the Laguna Mountains, Santa Ysabel, and Valley Center, plateau surfaces have been developed in the central mountain-valley area.

To the northeast of the Elsinore fault zone, the region has been designated as the eastern mountain-valley area. This area is comprised of broad, relatively flat valleys which are structurally of fault block origin. Locally, the down-dropped grabens contain thick sections of alluvial deposits. These valleys generally rise to the southeast from approximately 1,000 feet in elevation near Temecula to the rolling plateaus of Glenoak, Lewis, and Reed valleys which range from 3,000 to 3,500 feet in elevation.

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Surrounding mountains include Red Mountain, Cahuilla Mountain, and Bachelor Mountain and elevations range from 4,000 to 7,500 feet above sea level (RWQCB, 1994).

The hydrologic soil groups are shown in Figure 2-2 (USDA). The coastal regions are largely comprised of very low infiltration, Group D Soil Type. Other areas are dominated by soil with low to moderate infiltration capacity. High infiltration, Group A soil is confined to only a few riparian regions.

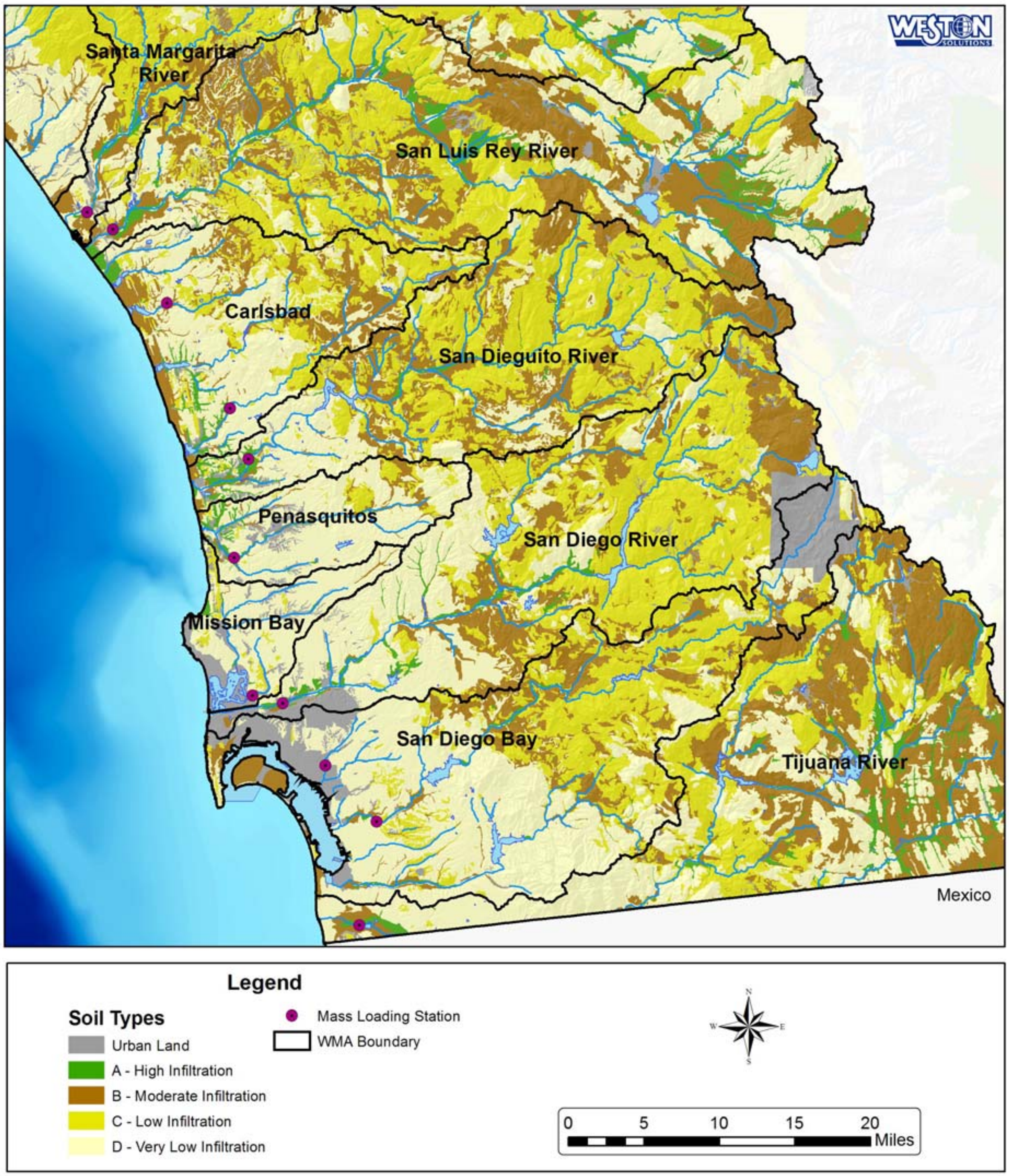


Figure 2-2. Hydrologic soil groups

2.1.2 Significant Regional Events

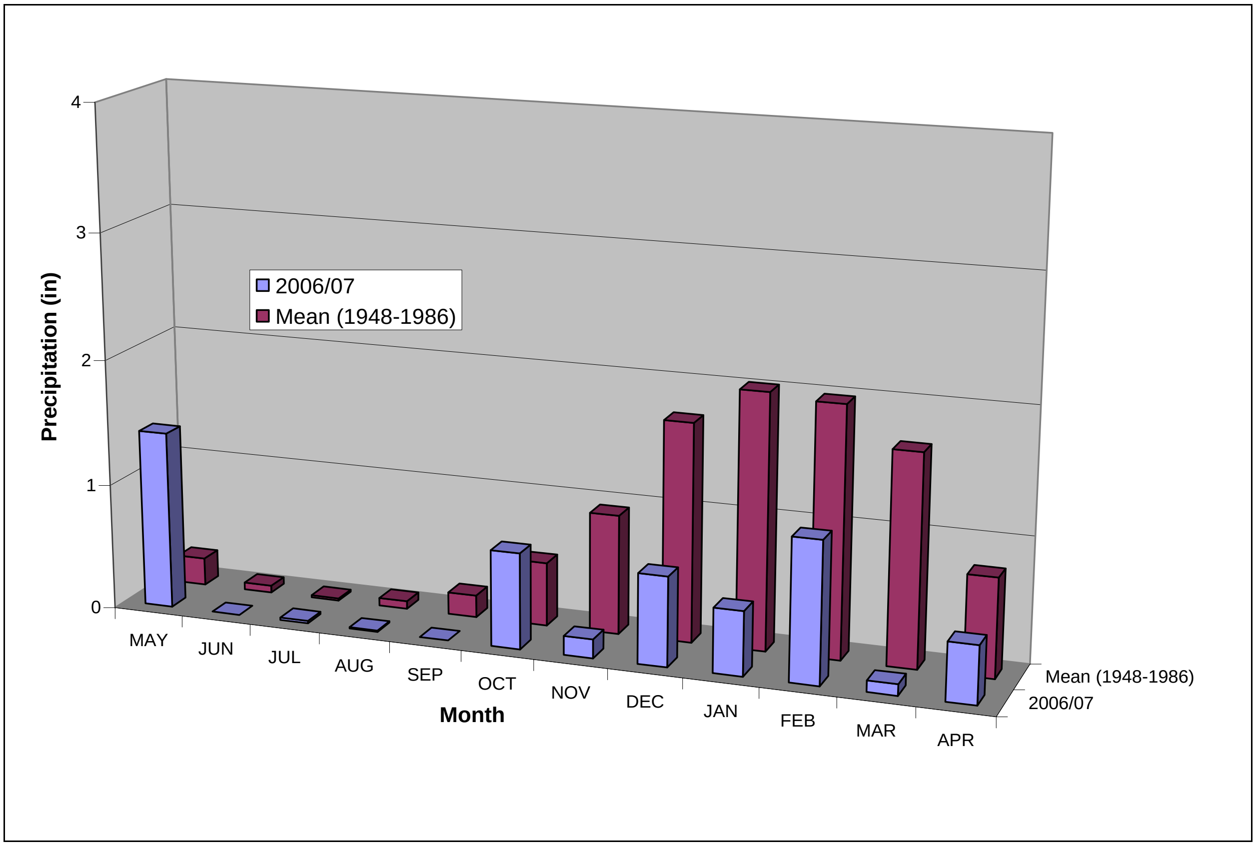
Southern California experienced several wildfires in 2003. Significant rainfall and flooding occurred during the 2004 – 2005 season, followed by moderate rainfall the following 2005 – 2006 season. In contrast, 2006 – 2007 was the third driest rainfall season for the region.

2.1.3 Rainfall and Climate

The San Diego Region coastal climate is generally mild with annual average temperatures near 65°F. As elevations increase inland, average temperatures decrease to approximately 57°F in the higher mountain areas. Warm, dry Santa Ana winds are frequent in the fall, resulting in the highest temperatures during the months of September and October. January is usually the coldest month of the year.

The coastal portions of San Diego County receive annual average rainfall amounts ranging from less than 9 inches in the extreme southwest to 11 inches in the north. The foothills to the east of the coastal plain receive precipitation amounts ranging from 17 inches in the north to 14 inches in the south. Mountain area precipitation ranges from 45 inches at Palomar Mountain in the north, to 39 inches at Lake Cuyamaca, and 21 inches at Laguna Mountain in the south.

On an annual basis, there are two distinct climatic periods: a dry (semi-arid) period from late April to mid-October, and a wet period from mid-October through late April. For the coastal and inland areas, the wet period typically provides 85 to 90 percent of the annual average rainfall, with the remaining rainfall attributed to residual storms and occasional "summer monsoons." Rainfall during 2006-2007 was generally below historical averages (Figure 2-3). The majority of the rain fell during the months of January, February, March, and April. April's rainfall amount was greater than historical averages.



Source: National Weather Service, 2007

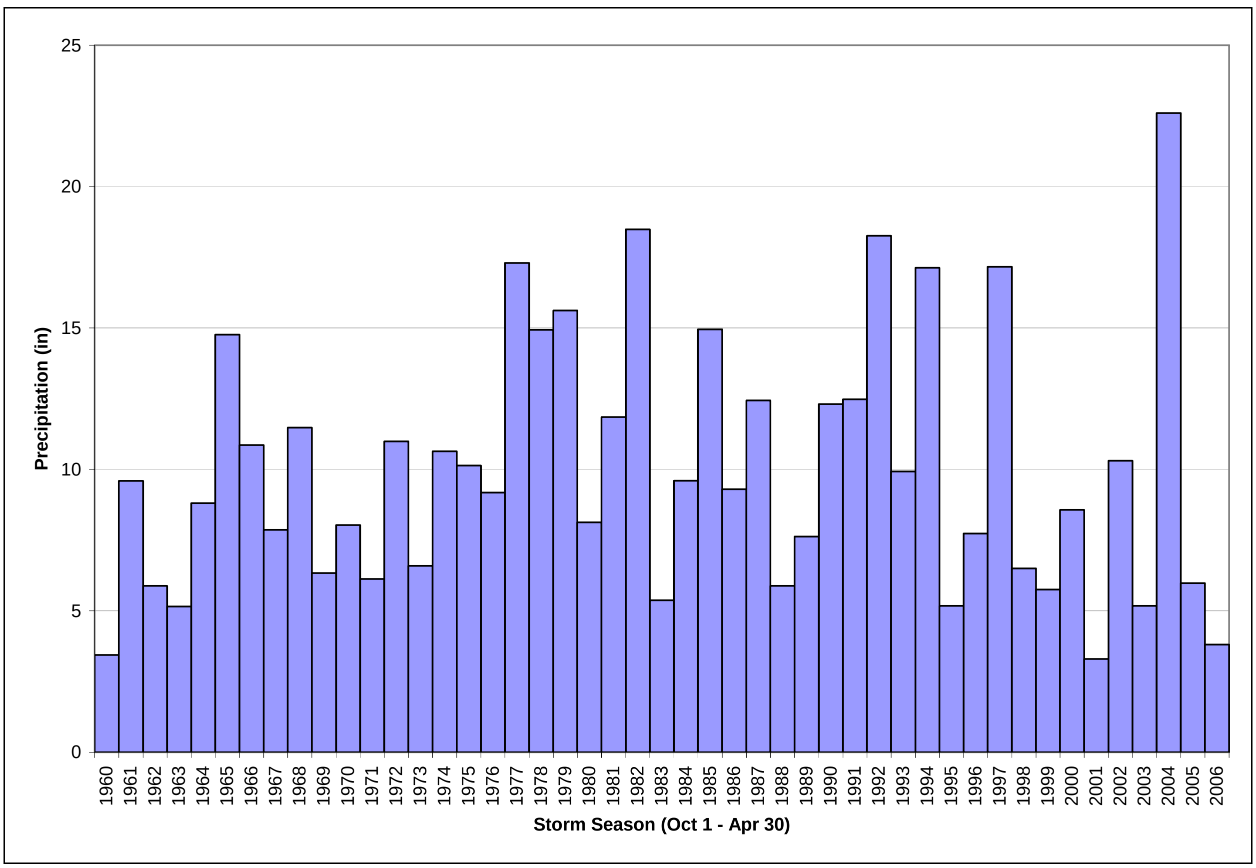
Figure 2-3. San Diego - Lindbergh Field Monthly Precipitation Summary 2006-2007 and Historical Mean (1948-1986).

Rainfall statistics for the San Diego region were developed at the request of the EPA by Steuber and Nold (1986), based upon the historical data records from the National Oceanic and Atmospheric Administration (NOAA) rain gauge at San Diego International Airport's Lindbergh Field (Table 2-1). A 39-year record from 1948 through 1986 was used to statistically analyze rainfall at this site. Results of this analysis indicated that an average of 18 storm events occur each year. The average yield of each event is 0.38 inches of rain over an approximate nine-hour period. Storm events were defined as a total accumulation of at least 0.1-inch of precipitation, together with intensities averaging at least 0.01 inches of precipitation per hour. Additionally, estimation of a representative storm event for the San Diego region was based on a statistical evaluation of this record. Based on the results of this statistical analysis, the typical storm event for the San Diego region yields 0.19 to 0.57 inches of rain and lasts 6 to 12 hours. Figure 2-4 presents a 46-year summary of annual rainfall at San Diego's Lindberg Field.

Table 2-1. Rainfall Statistics for San Diego International Airport (1948 through 1986).

Month	Average Total (inches)	Average Event Duration (hours)	Average Event (inches)	Average Number of Events
January	2.05	11.78	0.51	3.51
February	1.96	11.10	0.43	2.94
March	1.81	10.80	0.45	3.37
April	0.75	6.31	0.23	1.77
May	0.20	2.41	0.09	0.51
June	0.07	1.07	0.08	0.19
July	0.02	0.28	0.00	0.03
August	0.07	1.07	0.08	0.19
September	0.19	2.77	0.10	0.31
October	0.42	4.31	0.18	0.78
November	1.07	8.19	0.38	2.28
December	1.74	9.29	0.37	2.53
Annual Average	**10.44**	**9.24**	**0.38**	**18.33**

Source: Steuber and Nold, 1986



Source: National Weather Service, 2007

Figure 2-4. San Diego - Lindberg Field Storm Season Rainfall 1960 to 2006.

2.1.4 Hydrology

San Diego County has two major drainage basins; the Pacific and the Salton Sea Basin (Figure 2-5). The majority of San Diego County and all major population centers in the region are contained within the Pacific Basin. The Pacific Basin drains from the highlands in the east portion of the county to the Pacific Ocean in the west. The region is divided into nine WMAs and 11 major hydrologic units (HU) (Figure 2-5). The nine WMAs are further broken down into 48 hydrologic areas (HA) (Table 2-2). The San Diego Region covers most of San Diego County and parts of southwestern Riverside and Orange Counties.

Most of the surface water streams of San Diego County are interrupted in character, having both perennial and ephemeral components. This is a result of the regional rainfall pattern and the development of surface water impoundments. Most of the major surface water streams are captured by impoundments. Many of these surface water impoundments store both natural runoff and imported water.

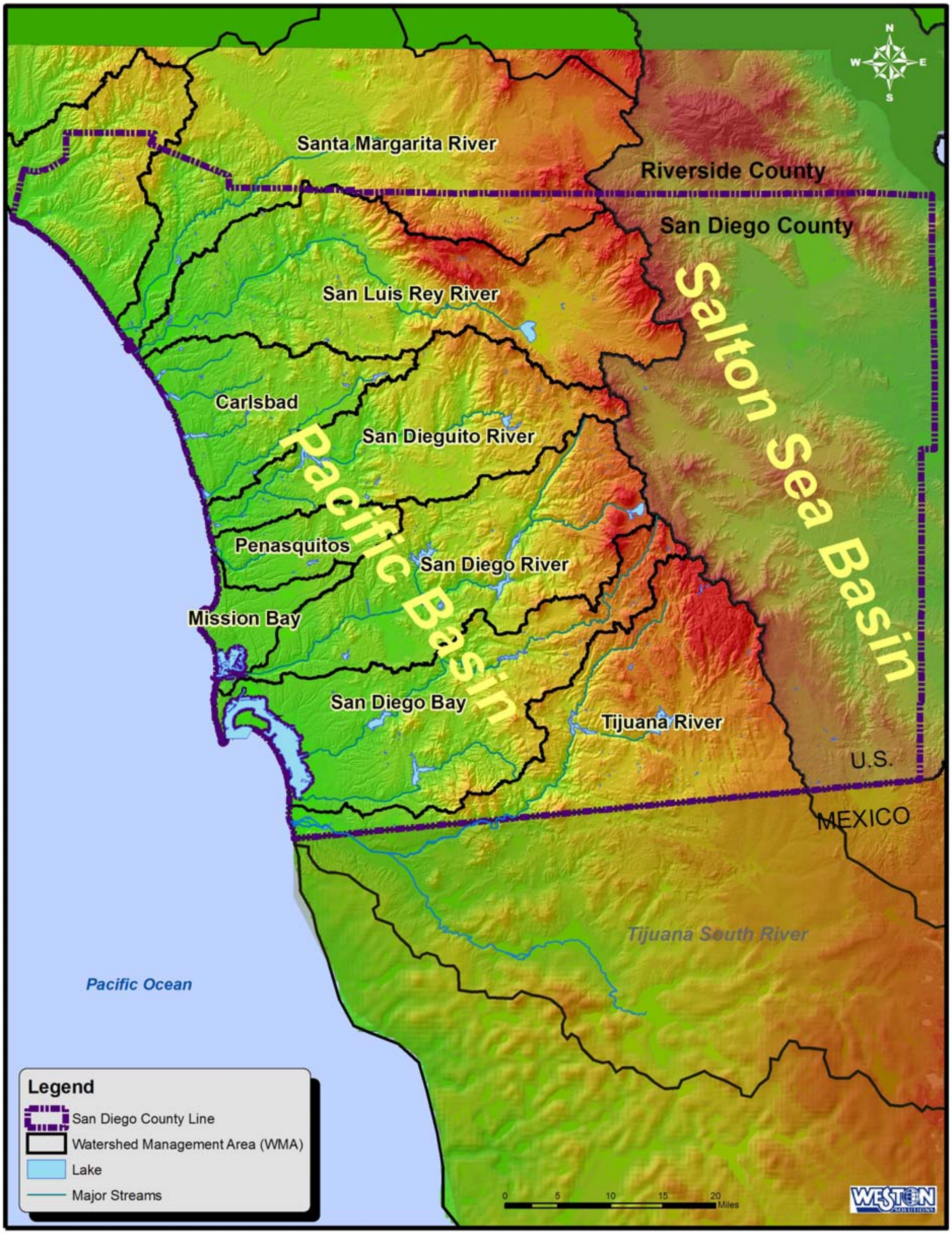


Figure 2-5. San Diego Watershed Management Areas.

Table 2-2. Hydrologic Areas in the San Diego Region.

Watershed Management Area	Hydrologic Unit	HU #	Hydrologic Area	HA #
Santa Margarita	Santa Margarita	902.00	Ysidora DeLuz Murrieta Auld Pechanga Wilson Cave Rocks Aguanga Oakgrove	902.10 902.20 902.30 902.40 902.50 902.60 902.70 902.80 902.90
San Luis Rey	San Luis Rey	903.00	Lower San Luis Monserate Warner Valley	903.10 903.20 903.30
Carlsbad	Carlsbad	904.00	Loma Alta Buena Vista Creek Agua Hedionda Encinas San Marcos Escondido Creek	904.10 904.20 904.30 904.40 904.50 904.60
San Dieguito	San Dieguito	905.00	Solana Beach Hodges San Pasqual Santa Maria Valley Santa Isabel	905.10 905.20 905.30 905.40 905.50
Los Peñasquitos	Peñasquitos	906.00	Miramar Reservoir Poway	906.10 906.20
Mission Bay	Peñasquitos	906.00	Scripps Miramar Tecolote	906.30 906.40 906.50
San Diego River	San Diego	907.00	Lower San Diego San Vincente El Capitan Boulder Creek	907.10 907.20 907.30 907.40
San Diego Bay	Pueblo San Diego Sweetwater Otay	908.00 909.00 910.00	Point Loma San Diego Mesa National City Lower Sweetwater Middle Sweetwater Upper Sweetwater Coronado Otay Valley Dulzura	908.10 908.20 908.30 909.10 909.20 909.30 910.10 910.20 910.30
Tijuana	Tijuana	911.00	Tijuana Valley Potrero Barrett Lake Monument Morena Cottonwood Cameron Campo	911.10 911.20 911.30 911.40 911.50 911.60 911.70 911.80

Source: RWQCB, 2001

Ground water throughout San Diego County occurs in basins that are relatively small in area and usually shallow. Nearly all of the ground water basins in the county have been intensively developed for municipal and agricultural supply purposes. Figure 2-6 illustrates the regional ground water basins and Figure 2-7 and Table 2-3 present the regional reservoirs.

Source: SDCWA, 2000

Figure 2-6. Major Ground Water Basins in San Diego County.

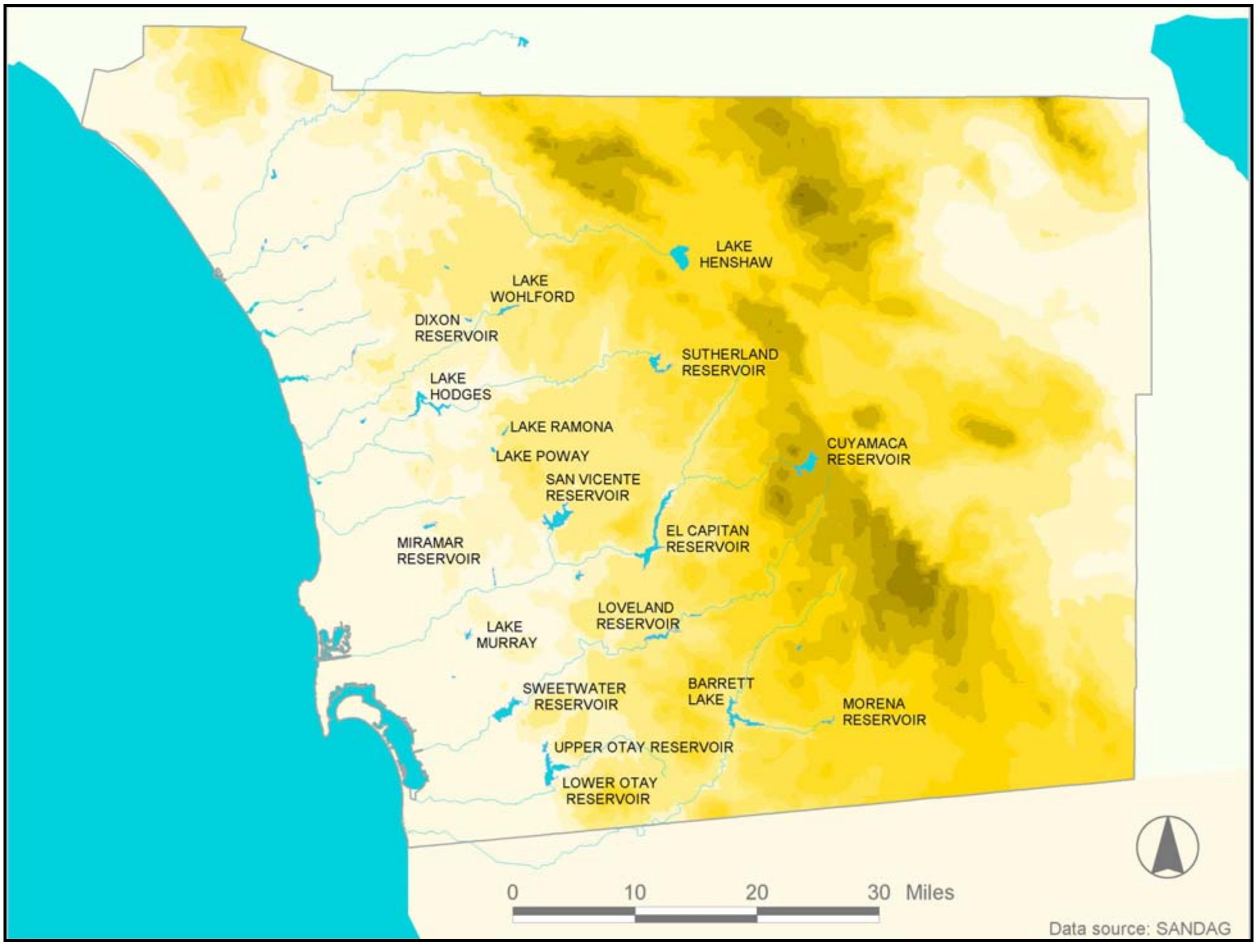


Figure 2-7. San Diego Reservoirs.

Table 2-3. Reservoirs in the San Diego Region.

Reservoir	Watershed	Owner	Year Built	Water Source	Capacity (AF)	Elevation (Ft)
Lake Henshaw	San Luis Rey	Vista Irrigation District	1923	Natural Runoff	51,774	2,656.92
Lake Wohlford	Carlsbad	City of Escondido	1924	Natural Runoff/ Upstream Releases	6,506	1,460.30
Dixon	Carlsbad	City of Escondido	1970	First Aqueduct	2,606	1,042.80
Sutherland	San Dieguito	City of San Diego	1953	Natural Runoff	29,685	72.90
Lake Hodges	San Dieguito	City of San Diego	1918	First Aqueduct/ Natural Runoff	33,550	84.58
Olivenhain	San Dieguito	San Diego County Water Authority	2003	Natural Runoff	24,364	989.5
San Dieguito	San Dieguito	San Dieguito Water District/ Santa Fe Irrigation district	1918	Second Aqueduct/ Upstream Releases	883	243.60
Lake Ramona	San Dieguito	Ramona Municipal Water District	1980	First Aqueduct	12,000	1,248.60
Lake Poway	San Dieguito	City of Poway	1971	First Aqueduct	3,330	930.80
Lake Miramar	Peñasquitos	City of San Diego	1960	Second Aqueduct	7,185	105.87
Lake Cuyamaca	San Diego	Helix Water District	1887	Natural Runoff	8,195	4,622.20
San Vincente	San Diego	City of San Diego	1943	First Aqueduct/ Natural Runoff/ Upstream Releases	90,230	175.38
El Capitan	San Diego	City of San Diego	1934	First Aqueduct/ Natural Runoff	112,807	116.58
Lake Jennings	San Diego	Helix Water District	1962	First Aqueduct	9,790	677.25
Lake Murray	San Diego	City of San Diego	1918	Second Aqueduct/ Upstream Releases	4,818	90.86
Loveland	Sweetwater	Sweetwater Authority	1945	Natural Runoff	25,400	1,298.36
Sweetwater	Sweetwater	Sweetwater Authority	1888	Natural Runoff	30,079	203.82
Lower Otay	Otay	City of San Diego	1919	Second Aqueduct/ Natural Runoff/ Upstream Releases	49,510	128.14
Barrett Lake	Tijuana	City of San Diego	1922	Natural Runoff/ Upstream Releases	37,947	104.34
Lake Morena	Tijuana	City of San Diego	1912	Natural Runoff	50,207	103.36

Source: SDCWA, 2000

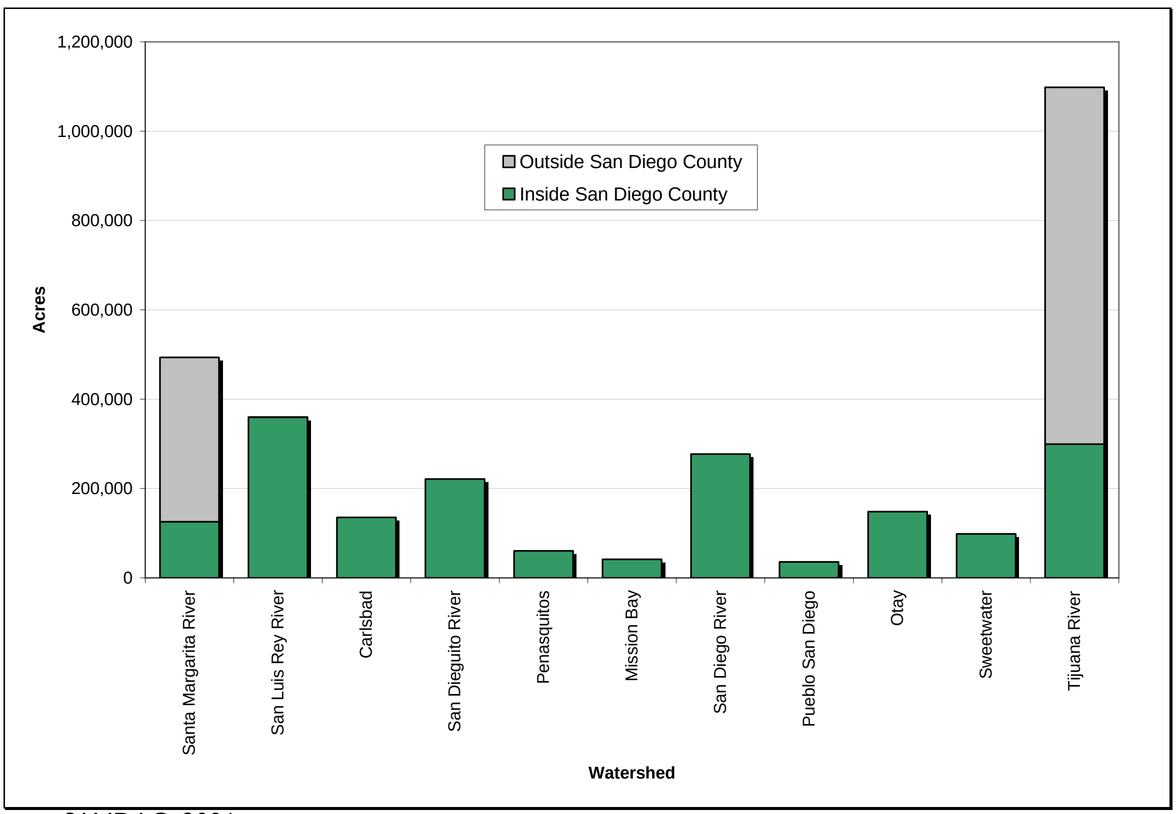
2.1.5 Land Areas

The WMA boundaries are jurisdictional group boundaries set by the RWQCB rather than natural hydrologic drainage area boundaries. In most cases, the WMA and the watershed cover the same geographic area. There are two exceptions: the Los Peñasquitos and Mission Bay WMAs split the Los Peñasquitos watershed. Figure 2-5 indicates the WMA boundaries. The San Diego Bay WMA combines the Pueblo San Diego, Sweetwater, and Otay watersheds.

While Tijuana WMA is the largest of the San Diego WMAs, only 27% actually lies within the San Diego region (Figure 2-8). Similarly, only 27% of the Santa Margarita WMA lies within San Diego County.

Watershed areas are geographical boundaries that define a watercourse and its associated drainage basin. A single watershed can cross multiple jurisdictional boundaries. Table 2-4 presents the multi-jurisdictional composition of each watershed. Unincorporated areas include County, Federal, and Indian Lands. Areas in the Tijuana River and Santa Margarita River Watersheds there are outside of San Diego County are county are counted as unincorporated areas in the following table.

Land ownership for the San Diego watersheds is primarily private. Approximately 58% of the San Diego watersheds are privately owned (Figure 2-9). The figure refers only to lands that fall within San Diego County. The 'Local' category includes city and county jurisdictions.



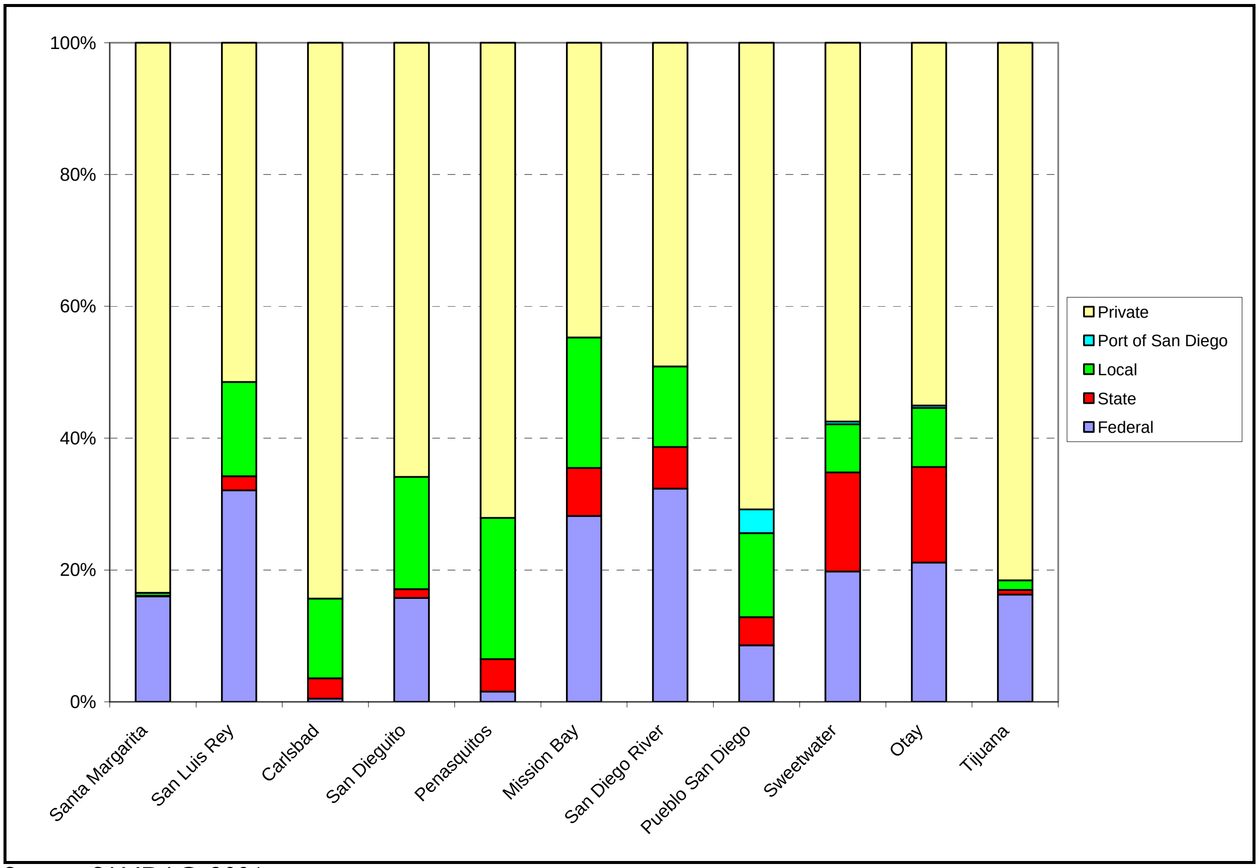
Source: SANDAG, 2006

Figure 2-8. Watershed Areas of the San Diego Hydrologic Region.

Table 2-4. Watershed Acreages by Jurisdiction.

City	Santa Margarita River	San Luis Rey River	Carlsbad	San Dieguito River	Los Peñasquitos	Mission Bay	San Diego River	Pueblo San Diego	Sweetwater River	Otay	Tijuana River	Other	Total Acres	Percent
Carlsbad			24,999										24,999	0.8%
Chula Vista									14,411	17,539			31,949	1.0%
Coronado										5,122			5,122	0.2%
Del Mar				994	151								1,145	0.0%
El Cajon							9,280						9,280	0.3%
Encinitas			12,524										12,524	0.4%
Escondido		52	17,656	5,962									23,670	0.8%
Imperial Beach										721	2,116		2,838	0.1%
La Mesa							3,032	1,613	1,138				5,784	0.2%
Lemon Grove								1,646	857				2,503	0.1%
National City								2,544	2,167	124			4,835	0.2%
Oceanside	148	15,877	10,945										26,971	0.9%
Poway				9,011	15,441		587						25,039	0.8%
San Diego				27,346	42,970	43,237	46,797	30,046	2,047	6,601	13,981		213,025	6.8%
San Marcos			15,581										15,581	0.5%
Santee							10,574						10,574	0.3%
Solana Beach			588	1,600									2,187	0.1%
Vista		745	11,179										11,924	0.4%
Unincorporated	493,133	343,211	41,872	176,406	1,862	31	207,284	129	127,486	68,392	1,082,131	163,432	2,705,368	86.3%
Total Acres	493,282	359,885	135,345	221,320	60,423	43,268	277,554	35,978	148,106	98,499	1,098,228	163,432	3,135,319	100.0%
Percent	15.7%	11.5%	4.3%	7.1%	1.9%	1.4%	8.9%	1.1%	4.7%	3.1%	35.0%	5.2%	100.0%	

(SANDAG, 2007)



Source: SANDAG, 2006

Figure 2-9. Land Ownership in San Diego Watersheds.

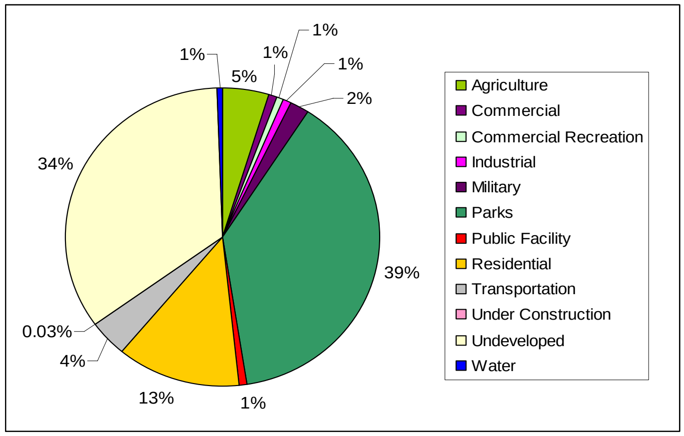
2.1.6 Land Use

The Watershed Management Areas make up the Pacific Basin of the San Diego Region which drains west to the Pacific Ocean. Land use within the Pacific Basin of San Diego County varies considerably from undeveloped vacant land to industrial (Table 2-5). Overall land use in the county is dominated by undeveloped vacant land (due mostly to geomorphological characteristics, i.e. steep terrain, limited water source, etc.) and park/recreational areas. These two land uses encompass approximately 72.9% of the total land area in the region. Residential and agricultural land uses comprise approximately 12.3% and 4.9%, respectively. Military and transportation land uses comprise approximately 6% combined. All other land use categories, including industrial, public facilities and commercial, make up the remaining 3.7% (SANDAG, 2006).

Table 2-5. Overall Land Use Distribution in Watershed Management Areas.

Percent Land Use for the Pacific Basin of San Diego County

Agriculture	4.9%
Commercial	0.6%
Commercial Recreation	0.8%
Industrial	0.8%
Military	2.1%
Parks	38.5%
Public Facility	0.8%
Residential	12.3%
Transportation	3.9%
Under Construction	0.03%
Undeveloped	34.4%
Water	0.7%



Source: SANDAG, 2006

Land use type can affect both the amount of runoff and the constituents of concern detected in runoff. Highly urban areas usually contain more impervious surfaces that generally produce more runoff per unit of rain than undeveloped areas. As development increases, impervious surface area within the watershed increases, thereby producing more runoff and a larger peak storm flow, which occurs sooner during a storm event than in undeveloped areas (TNS, 2002). Table 2-6 illustrates the estimated impervious surface area per WMA. Total estimated impervious surface area within the Watershed Management Areas of San Diego County equals approximately 22.4 % (The Center for Watershed Protection, 2006). Land use data for Riverside County (USGS) and Mexico (SDSU) was used for areas outside San Diego County.

Table 2-6. Estimate of % of Impervious Surface for each WMA

Santa Margarita River	San Luis Rey River	Carlsbad	San Dieguito River	Los Peñasquitos	Mission Bay	San Diego River	San Diego Bay	Tijuana River	Tijuana South River
11.1%	21.1%	38.3%	20.0%	43.4%	49.9%	27.3%	30.8%	16.8%	8.3%

2.1.7 Population

San Diego County currently has an estimated population of 2,813,833 (Table 2-7). The City of San Diego comprises a large proportion of this population with approximately 44% of the total county population living within the city limits. Unincorporated areas of the County represent another 16% of the overall population. Cumulatively, the remaining 17 cities comprise 40% of the population although individually, each of these cities represents less than 7% of the total population in the County.

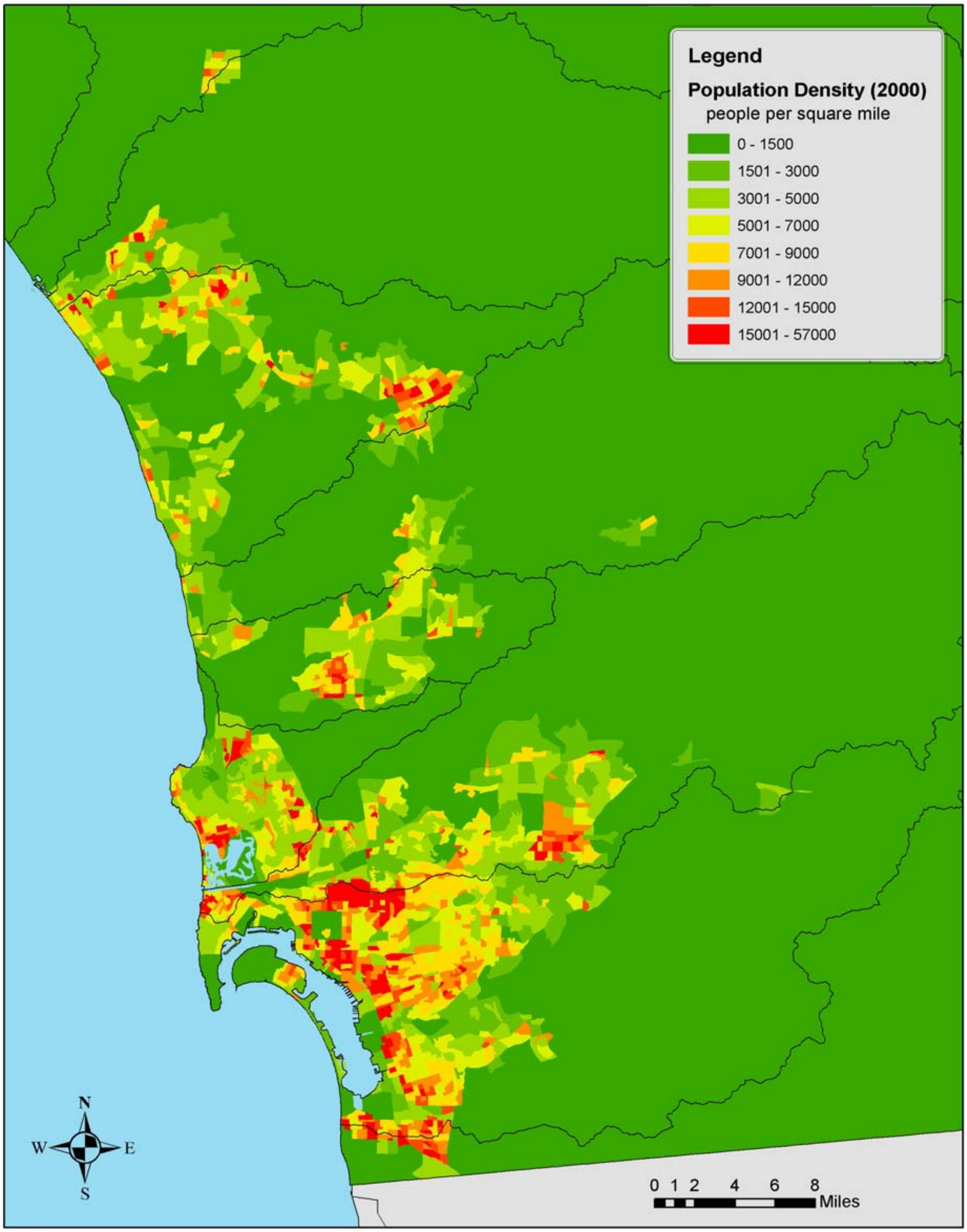
Table 2-7. Population Distribution in San Diego County (Census, 2000).

Location	Population	Percentage
Carlsbad	78,247	2.8%
Chula Vista	173,556	6.2%
Coronado	24,100	0.9%
Del Mar	4,389	0.2%
El Cajon	94,869	3.4%
Encinitas	58,014	2.1%
Escondido	133,559	4.7%
Imperial Beach	26,992	1.0%
La Mesa	54,749	1.9%
Lemon Grove	24,918	0.9%
National City	54,260	1.9%
Oceanside	161,029	5.7%
Poway	48,044	1.7%
San Diego	1,223,400	43.5%
San Marcos	54,977	2.0%
Santee	52,975	1.9%
Solana Beach	12,979	0.5%
Vista	89,857	3.2%
Unincorporated	442,919	15.7%
Total	2,813,833	100%

Sources: Census, 2000, U.S. Census Bureau; SANDAG

Residential areas tend to be concentrated along the coast, extending up to 30 miles inland in areas of favorable terrain. Inland urban expansion has resulted in the development of major transportation corridors to accommodate newer residential tracts. Strip commercial zones are common along the larger transportation corridors. Industrial centers are generally situated in areas adjoining military facilities, along transportation corridors, and on Port of San Diego property.

Population density within the watersheds mirrors urban development, with the San Luis Rey Watershed being the least densely populated and the Pueblo San Diego watershed being the most densely populated (Figure 2-10).



US Census, 2000

Figure 2-10. Population Per Acre for Watersheds Entirely within the San Diego Region (Tijuana population not included).

Increase in population leads to increase in development, and generally more impervious areas. The increase in impervious surfaces typically leads to higher peak flows and increased runoff volume. Table 2-8 presents the estimates and projections of population for proportions of Watershed Management Areas within San Diego County. The San Diego Bay Watershed Management Area has the highest estimated population while Mission Bay has the highest population density. Water quality concerns will most likely become more of an issue in the watersheds that are projected to have significant population growth. The four least densely populated Watershed Management Areas (Santa Margarita, San Luis Rey, San Dieguito, and Tijuana River) are projected to grow at the fastest rate with projected population increases. The Tijuana River estimates only show U.S. population numbers. Figure 2-11 graphically shows the population projections by Watershed Management Area.

Table 2-8. Population Estimates and Projections by WMA.

Watershed Management Area	2005 People per Square Mile	2005 Estimated Population	2020 Projected Population	Percent Increase by 2020
Santa Margarita River	132	25,916	31,679	22%
San Luis Rey River	293	164,402	204,891	25%
Carlsbad	2604	550,726	632,962	15%
San Dieguito River	492	170,014	209,667	23%
Los Peñasquitos	2689	253,910	284,116	12%
Mission Bay	3602	231,730	249,915	8%
San Diego River	1190	524,838	589,070	12%
San Diego Bay	2349	1,017,900	1,168,534	15%
Tijuana River	176	82,123	118,838	45%

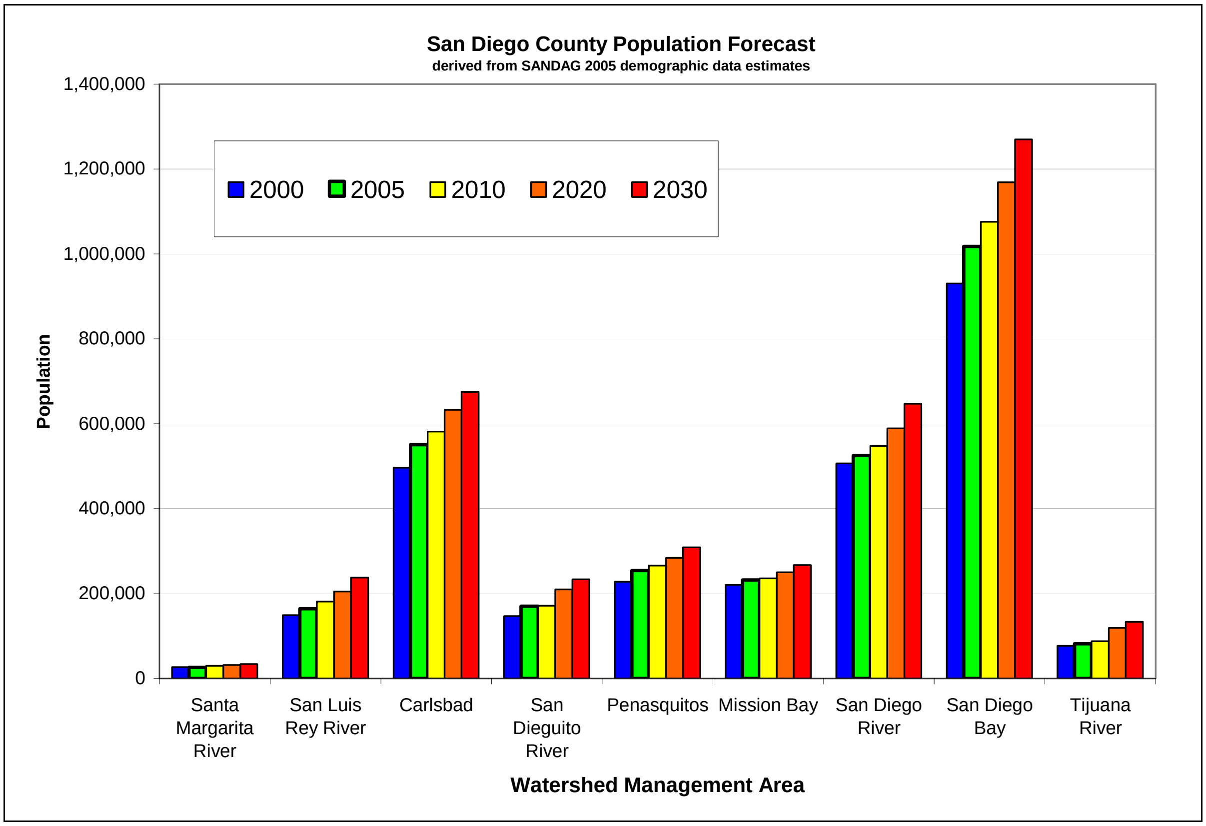


Figure 2-11. Population for Watershed Management Areas Entirely Within the San Diego Region.

2.2 Monitoring Site Descriptions

Monitoring site locations for the 2006-2007 MLS are shown in Figure 2-12, along with outlines of their respective runoff areas. Land use differs substantially within each catchment area and is discussed in the following sections and presented in Figure 2-13 and Figure 2-14 (US and Mexico data included). While most of the MLS sites are located within the more urbanized areas of the WMA, most of the open land identified in the runoff area is typically covered by chaparral. The following sections of this report summarize the major characteristics of each MLS. MLS are described in detail in each respective WMA section.

Figure 2-12. Mass Loading Station Locations (runoff/capture area shown in blue).

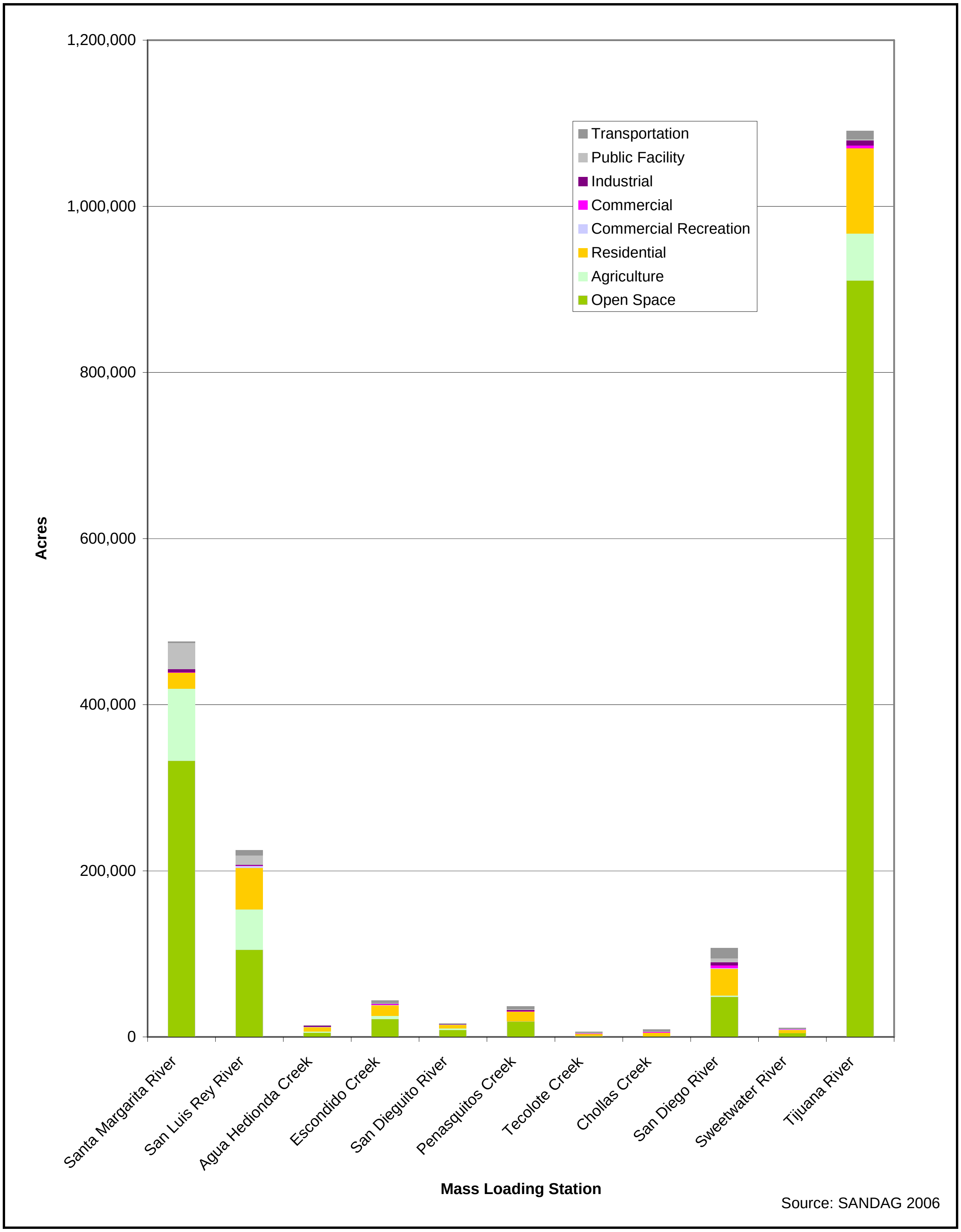


Figure 2-13. Contributing Runoff Land Use Acreages by Mass Loading Station.

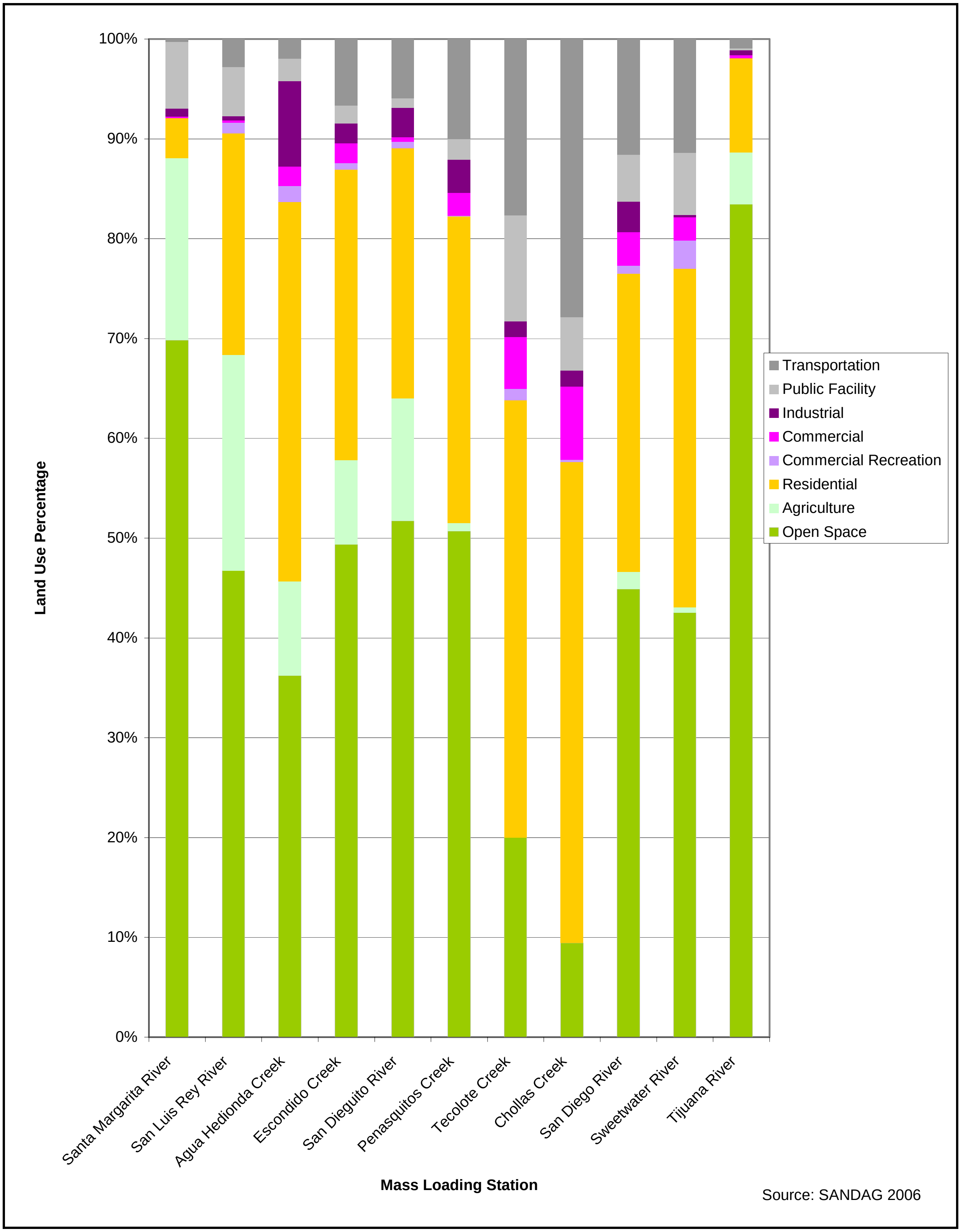


Figure 2-14. Contributing Runoff Land Use Percentages by Mass Loading Station.

Table 2-9 illustrates the estimated impervious surface area per contributing area to each mass loading station. The Chollas Creek mass loading station drainage area has the highest calculated imperviousness. The Santa Margarita River drainage area has the lowest imperviousness. Land use data for Riverside County (USGS) and Mexico (SDSU) was used for areas outside San Diego County.

Table 2-9. Estimate of % of Impervious Surface for each MLS Drainage Area

Santa Margarita River	San Luis Rey River	Agua Hedionda Creek	Escondido Creek	San Dieguito River	Los Peñasquitos Creek	Tecolote Creek	San Diego River	Chollas Creek	Sweetwater River	Tijuana River
11%	23%	30%	25%	23%	27%	46%	32%	53%	30%	14%

2.3 Storm Event Summary

2.3.1 Representative Storm Event

Estimation of a representative storm event in the San Diego region was based on the statistical evaluation of the long-term data records from the National Weather Service rain gauge located at Lindbergh Field. Based on the results of this statistical analysis, the "typical" storm event at Lindbergh Field yields 0.19 to 0.57 inches of rain and lasts 6 to 12 hours. Since the depth and duration of a typical storm event varies in different parts of the county where monitoring stations are located, storm events that were preceded by 72 hours of dry weather and were forecast to be greater than 0.10 inches were considered viable events for mobilization.

A look at the 2006-2007 rain data together with the total rainfall for the year shows that representative storm events that were suitable to monitor occurred in October, December, February, and April. Figure 2-15 and Figure 2-16 summarize daily rainfall totals and distributions within San Diego County. The monitored storms were preceded by at least 72 hours of dry weather.

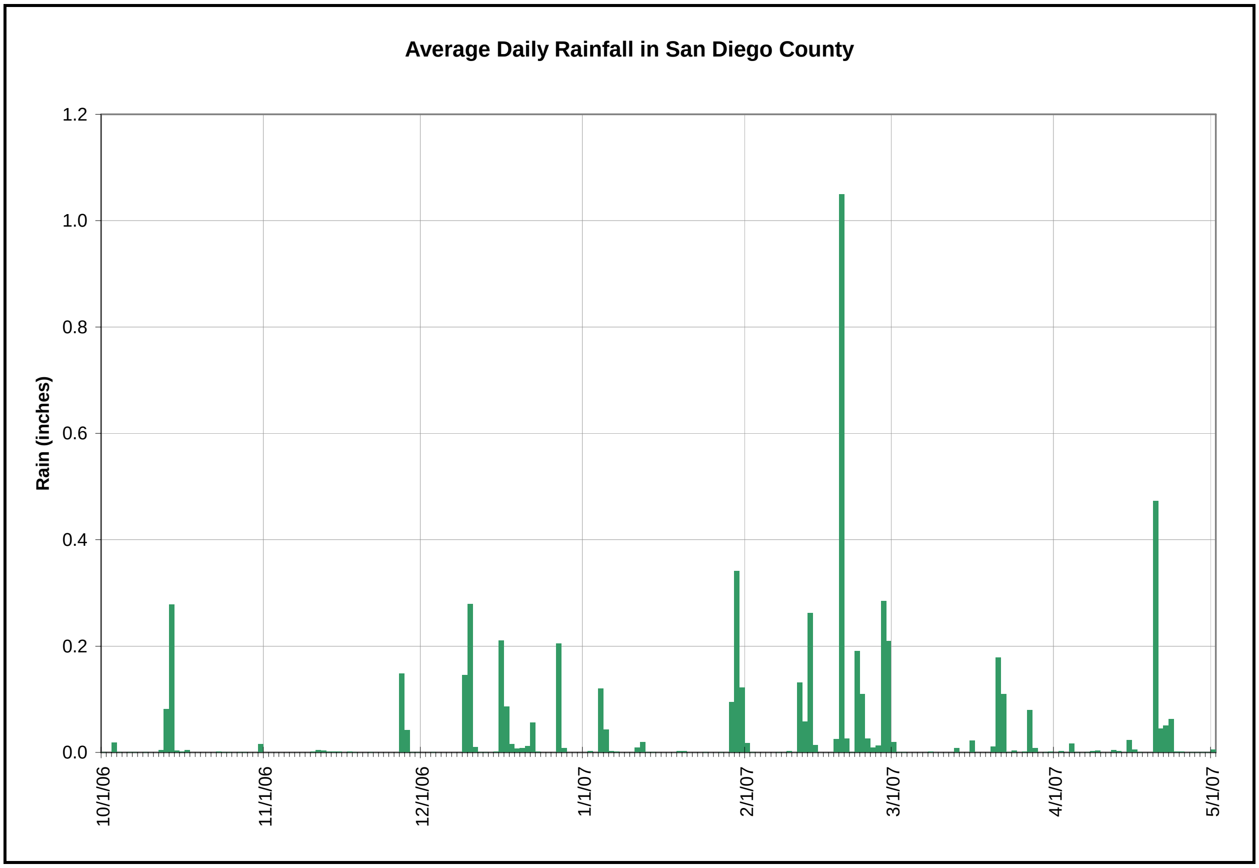


Figure 2-15. San Diego County Daily Rainfall Totals During the 2006-2007 Wet Season.

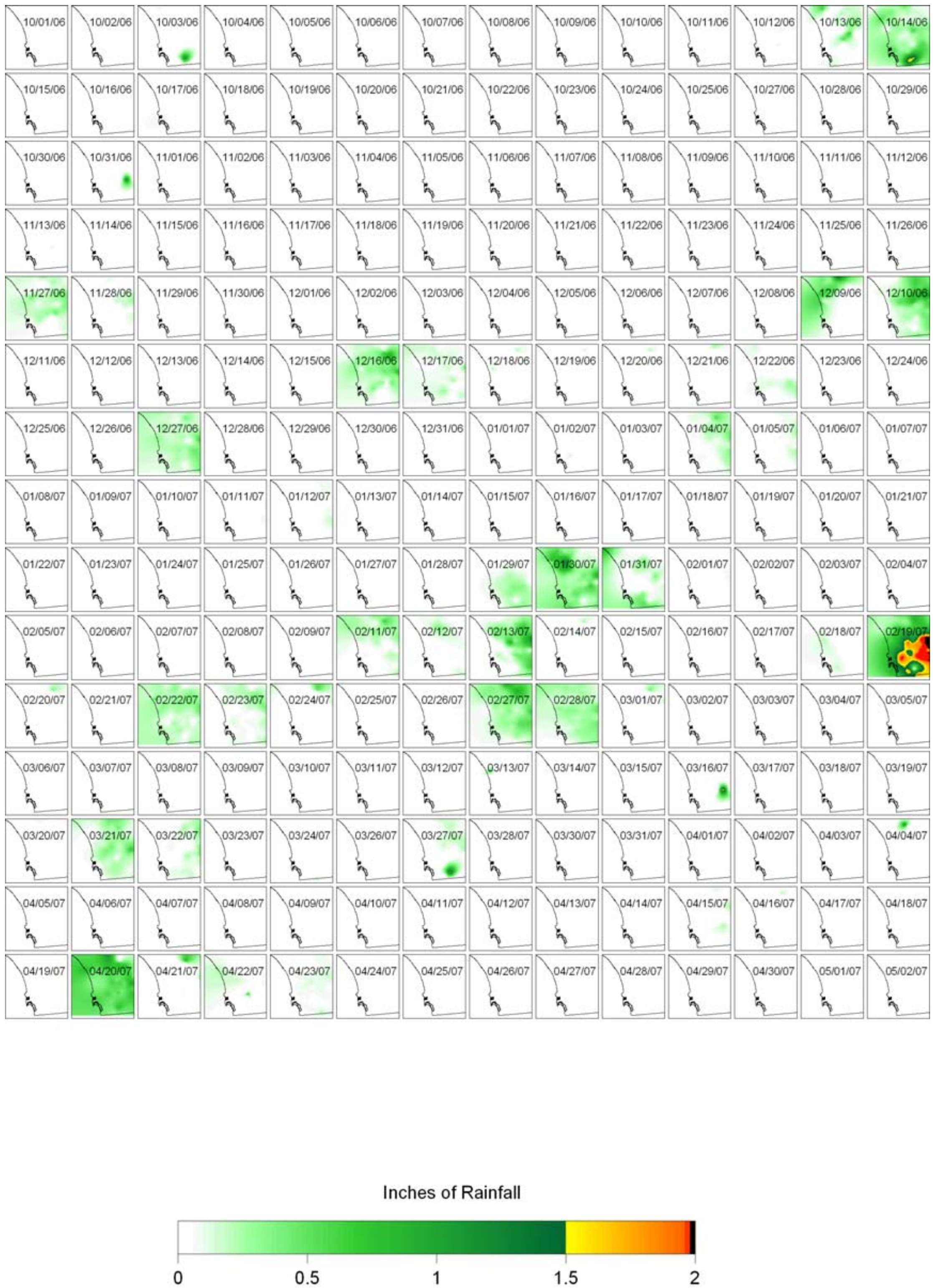


Figure 2-16. San Diego County Daily Rainfall Distribution During the 2006-2007 Wet Season.

2.3.2 Precipitation During Monitored Events

Rainfall during the 2006-2007 wet season was below the average of 10.44 inches (NWS, 2007). Rainfall totals for each MLS are presented in Table 2-10 for each of the monitored storm events. Rainfall distributions and totals were calculated by interpolating between rainfall amounts from available National Weather Service and San Diego County rain gauges for the San Diego County area and data available from rain gauges installed at the MLS. Distribution and amount of the rainfall over each watershed was calculated and interpolated in ArcView GIS, as illustrated in Figure 2-17.

Table 2-10. Rainfall Summary by Mass Loading Station for Monitored Storm Events.

MLS	10/14/2006	12/10/2006	1/30/2007	2/18/2007	4/20/2007
Santa Margarita River					
San Luis Rey River	0.37		0.46	0.43	
Agua Hedionda Creek	0.23		0.59	0.49	
Escondido Creek	0.26		0.92	0.70	
San Dieguito Creek		0.56	0.26	0.96	
Los Peñasquitos Creek		0.31	0.40	1.32	
Tecolote Creek		0.22	0.27	1.18	
San Diego River	0.33		0.47	1.37	
Chollas Creek	0.30	0.20		1.18	
Sweetwater River	0.46		0.37	1.22	
Tijuana River	0.12		0.08		0.32

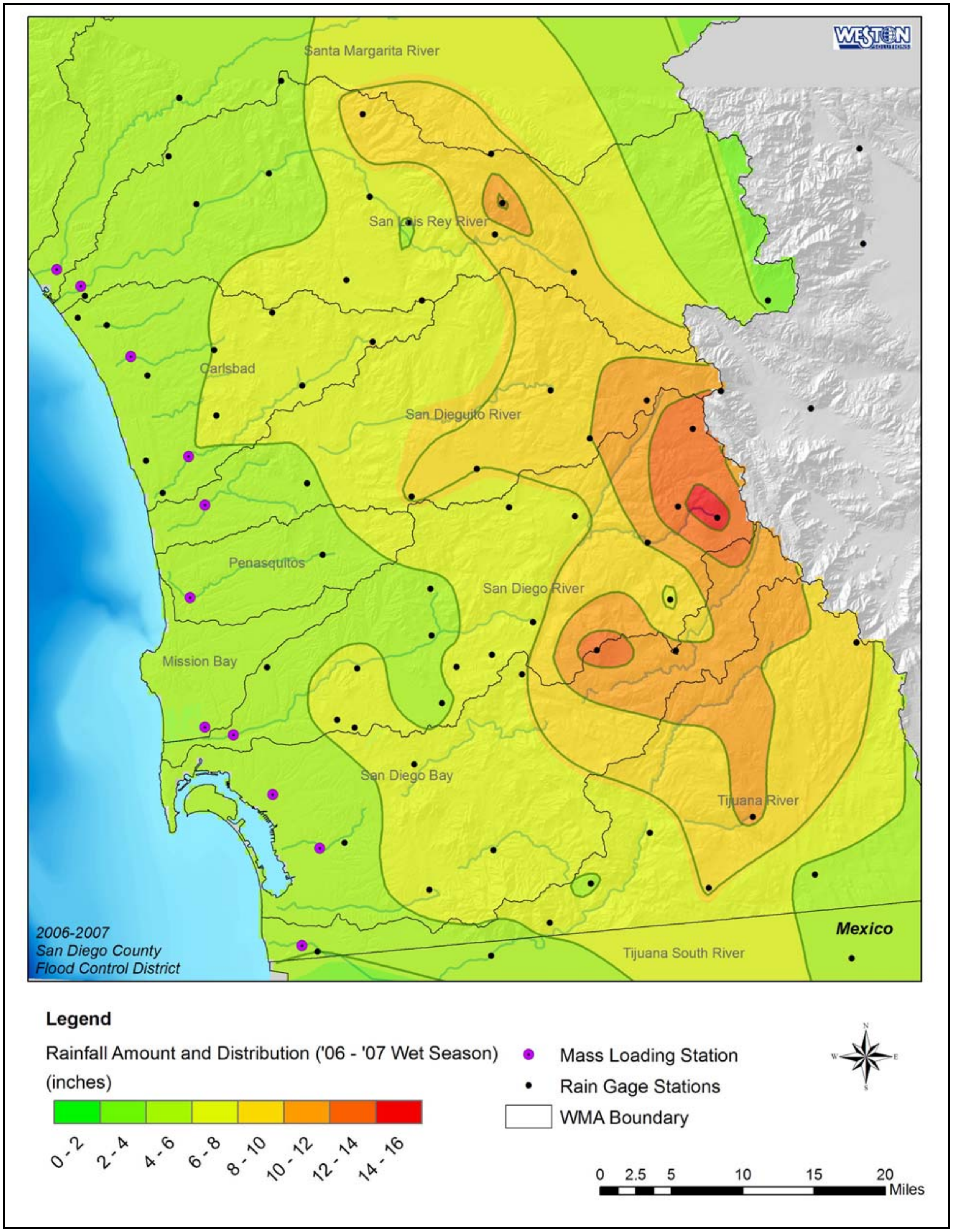


Figure 2-17. San Diego County 2006-2007 Rainfall Amount and Distribution.

2.3.3 Storm Water Runoff During Monitored Events

The design of the storm water monitoring program is based upon the isolation of individual storm events. Storm water runoff sampling protocol requires that a flow-weighted composite sample be obtained over the duration of runoff in order to sample total flow resulting from the precipitation event. Water quality sampling was terminated based upon the end of the precipitation and cessation of storm water flow. In larger watersheds with extended periods of runoff response, it was often necessary to terminate the automated samplers in order to avoid sampling ground water with runoff. Hydrographs and rainfall distribution for each monitored event at the eleven mass loading stations that recorded flow are presented in Appendix A.