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10.1 San Diego River Watershed Management Area Description

The San Diego River Watershed Management Area (WMA) (HU 907.00), is the second largest watershed lying entirely within San Diego County. The San Diego River WMA land area is 277,543 acres (Figure 10-1). The watershed includes four hydrologic areas: Lower San Diego, San Vicente, El Capitan, and Boulder Creek. The watershed is drained by the San Diego River which discharges into the Pacific Ocean between Mission Beach and Ocean Beach. Annual precipitation ranges from 10.5 inches near the coast to nearly 35 inches in the eastern portion of the watershed (Figure 10-1).

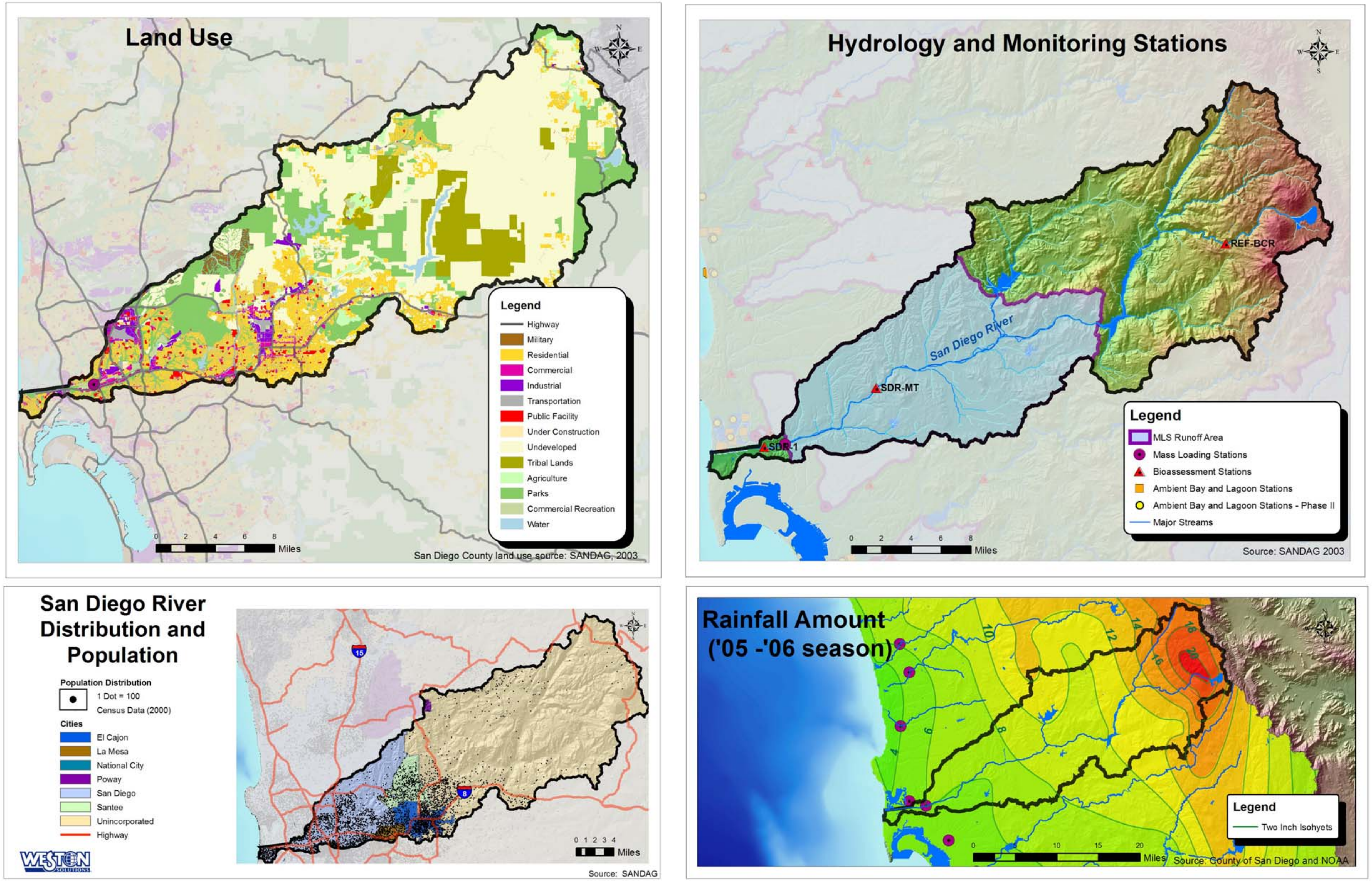


Figure 10-1. San Diego River Watershed Management Area.

10.1.1 Land Use

The San Diego River Watershed contains the second largest percentage of unincorporated land in San Diego County: 74.7% of the watershed is unincorporated. The remaining areas of the watershed include the Cities of El Cajon, La Mesa, Poway, San Diego, and Santee. Land use within the watershed is primarily undeveloped (44.3%), parks and recreation (18.1%), and residential (15.4%). Other uses are comprised of Tribal lands (7.4%), transportation (5.7%), agriculture (2.3%), commercial (1.2%) and industrial (1.3%), as illustrated in Figure 10-2 (SANDAG, 2003). Approximately half of the watershed is privately-owned land. The remaining portions are mostly federally-owned with a small percentage of land being state or locally-owned. The San Diego Watershed is the most populated in the county containing over 506,000 people, yet it has a rather low population density of 1.82 persons per acre.

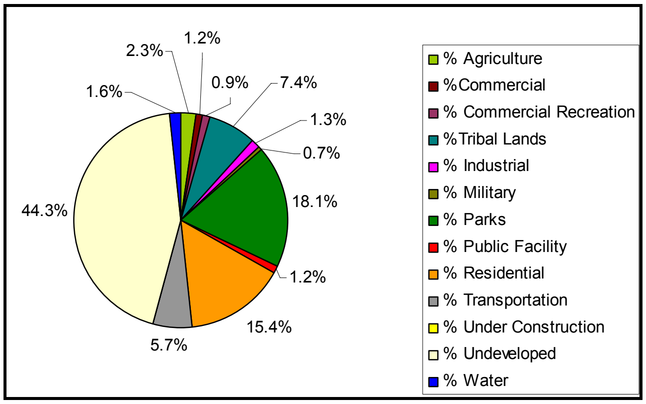


Figure 10-2. Percent Land Use for San Diego River WMA

10.1.2 Beneficial Uses

The San Diego River Watershed provides many beneficial uses with its many reservoirs, lakes, rivers, and creeks. A listing of the beneficial uses from the San Diego Basin Plan are presented in Table 10-1. The watershed contains the San Diego River, Boulder Creek, El Capitan Reservoir, San Vicente Reservoir, Lake Jennings, Lake Cuyamaca, and Lake Murray. Principal aquifers in the watershed include the Santee/El Monte Basin and the Mission Valley Basin. In addition to water resources the watershed contains many parks and open space areas. Famosa Slough is a 37-acre wetland that lies near the mouth of the San Diego River and provides wetlands habitat. Mission Trails Regional Park provides nearly 5,800 acres of natural habitat and recreation areas.

Table 10-1. Beneficial uses within the San Diego River Watershed.

Beneficial Uses	Inland Surface Waters	Coastal Waters	Reservoirs and Lakes	Ground Waters
Municipal and Domestic Supply	●		●	●
Agricultural Supply	●		●	●
Industrial Service Supply	●		●	●
Industrial Process Supply	●		●	●
Navigation				
Contact Water Recreation	●	●	●[1]	
Non-Contact Water Recreation	●	●	●	
Commercial and Sport Fishing		●		
Warm Freshwater Habitat	●		●	
Cold Freshwater Habitat	●		●	
Estuarine Habitat		●		
Wildlife Habitat	●	●	●	
Biological Habitats		●		
Rare, Threatened, or Endangered Species	●	●	●	
Marine Habitat		●		
Migration of Aquatic Organisms		●		
Aquaculture				
Shellfish Harvesting		●		
Spawning, Reproduction and/or Early Development				
Hydropower Generation			●	

[1] Shore and boat fishing only. Other REC1 uses prohibited.

Source: Basin Plan September 8, 1994 (Tables 2-2, 2-3, 2-4, 2-5)

10.1.3 Regulatory Water Quality Challenges

Table 10-2 presents the water bodies in the San Diego River Watershed that have been placed on the SWRCB 303(d) list. Major impacts to the watershed include surface water quality degradation, habitat degradation and loss, sediment, invasive species, eutrophication, and flooding (San Diego County, 2006). Constituents that have been placed on the SWRCB 2002 303(d) list for water bodies throughout the watershed are bacterial indicators, TDS, phosphorus, eutrophication, pH, and dissolved oxygen. Factors that may be impairing water quality in the watershed include urban runoff, agricultural runoff, mining operations, sewage spills, sand mining, and other natural sources (San Diego County, 2006).

The San Diego Regional Water Quality Control Board is considering a Basin Plan amendment to incorporate proposed bacteria indicator TMDLs developed in “Project I - Beaches and Creeks in the San Diego Region”. Project I involved calculating TMDLs for numerous surface waters throughout the San Diego Region. TMDLs are only proposed for coastal shorelines and creeks discharging to shorelines. Creeks discharging to lagoons, bays, or harbors were not included. TMDLs for lower Forrester Creek, lower San Diego River and the beach at the mouth of the San Diego River have been proposed. Several municipalities have been identified as responsible parties. Interim and final goals for reducing fecal coliform and enterococcus loading over 10 years have been identified. These reductions are to be achieved by the municipalities through conditions written in the MS4 Storm Water Permit.

Table 10-2. Water bodies on the SWRCB 303(d) list in the San Diego River Watershed.

Water Body Name	Hydrologic Sub Area (HSA)	HSA #	Pollutant/Stressor
Famosa Slough and Channel	Mission San Diego	907.11	Eutrophic
Pacific Ocean Shoreline	Mission San Diego	907.11	Bacterial Indicators
Lower San Diego River	Mission San Diego	907.11	Fecal Coliform, Low Dissolved Oxygen, Phosphorus, TDS
Forrester Creek	Santee	907.12	Fecal Coliform, pH, TDS

Source: SWRCB, 2003

The Famosa Slough has also been identified in the new San Diego Regional Water Quality Control Board (RWQCB) Investigation Order and Technical Report for Lagoons TMDL Project - Order No. R9-2006-0076, which establishes monitoring requirements for dischargers. Famosa Slough is impaired due to eutrophic conditions. Investigation Order No. R9-2006-0076 requires the dischargers to develop a monitoring program and submit monitoring program reports. Responsible dischargers to the Famosa Slough, as identified within the Lagoon Order, include the City of San Diego and Caltrans. This order requires monitoring to begin during the 2007-2008 wet weather monitoring season.

The 2006 303(d) list is in the process of being finalized by the State Water Resources Control Board (SWRCB). The list includes several additions to the San Diego River Watershed. This list has not been formally adopted by the SWRCB but can be found on the SWRCB website (http://www.waterboards.ca.gov/tmdl/303d_lists2006.htmL).

10.1.4 Mass Loading Station Site Description

The San Diego River (SDR) mass loading station (MLS) is located along a natural channel in San Diego, adjacent to the Fashion Valley Mall (Figure 10-1). The contributing runoff area consists of over 107,200 acres, which is approximately 39% of the San Diego Watershed land area. The major land uses within the contributing runoff area are residential (29%), parks (24%), and undeveloped (21%). The San Diego River drains into the Pacific Ocean.

The San Diego River mass loading station is co-located with a USGS stream gauging station which is approximately 50 meters downstream. The channel substrate of the location is composed primarily of silt and sand with a random amount of cobbles and boulders.

The high volume of discharge that occurred during the 2004-2005 wet weather season produced a scour point at the location of the MLS in stream monitoring equipment. The high flows substantially deepened the channel bed and altered the dynamics of this point in the channel. During preparation for the 2005-2006 wet weather monitoring season, the submerged pressure transducer area-velocity meter and sample strainer were relocated slightly downstream and laterally to the base of the scour point to obtain optimal conditions for flow monitoring. It was not possible to relocate the equipment outside of the scour point; however, the dynamics of the channel at this point were favorable for collecting flow data. The new location was selected as the best available point to monitor flow without substantially altering the location of the mass loading station. Flow data presented in this report is comparable to data from the USGS stream gauging station. The flow runoff equation used to estimate flow at this location during the 2004-2005 wet weather season was modified due to the changes in the channel dimensions. Flow measurements used for composite sample collection purposes during the 2005-2006 wet weather monitoring season were calculated utilizing a geometric equation. The equation produces an estimated flow rate using the stage of the stream, velocity of the stream, and the surveyed dimensions of the channel.

Evidence of trash and debris are commonly observed in the channel during equipment installations and monitoring events. In addition, human waste from transient individuals is frequently observed on the stream banks within the vicinity of this site.

10.1.5 Stream Bioassessment Site Description

Stream bioassessment in the San Diego River WMA included two urban affected monitoring sites. One bioassessment site upstream of the MLS was located in Mission Trails Regional Park, and one bioassessment site downstream of the MLS was located upstream of the Morena Blvd. overcrossing in Mission Valley (Figure 10-1).

10.1.6 Ambient Bay and Lagoon Monitoring Site Description

The San Diego River is not included in the Ambient Bay and Lagoon Monitoring (ABLM) Program. Famosa Slough, which is 303(d) listed for eutrophic conditions, is located to the west of Interstate 5 adjacent to the San Diego Sports Arena. The slough is also included in the Final Lagoons TMDL Investigation Order (Regional Water Quality Control Board Order R9-2006-076, 2006). The slough lies perpendicular to the flow of the San Diego River and is influenced by tidal flushing from the river. It is unique in that the San Diego River does discharge directly to the estuary and is one reason that it has not been included in the ABLM Program.

10.2 Watershed Water Quality Monitoring

Watershed water quality monitoring data is one leg of the triad approach used in performing the watershed management assessments. This includes the analysis of chemistry, bacteria, and toxicity data collected from three storm water events at the MLS, dry weather data collected during the 2005 dry weather monitoring program, and available/relative third party data.

10.2.1 2005-2006 Storm Water Monitoring and Results

Annual storm water monitoring has occurred at the San Diego River MLS since the 2001-2002 wet weather monitoring season. Three storm events were monitored at the MLS during the 2005-2006 wet weather monitoring period occurring on October 18, 2005, February 19, 2006 and March 11, 2006.

10.2.1.1 Storm Water Monitoring Event Summary

The first storm of the 2005-2006 wet weather monitoring season occurred on October 18, 2005. The storm moved into northern San Diego County from the northeast on October 16, 2005. This was an unusual pattern for a storm to approach San Diego County, typically storms approach primarily from the northwest and occasionally from the southwest. This storm was characterized by rainfall that began in the east and spread generally southwest. Rainfall began in the mountains and worked toward the coastal areas in contrast to the usual pattern of rain beginning at the coast and working into the mountains. After approximately one day of slow movement the storm system began to produce sufficient rainfall in the San Diego River Watershed to provide runoff and monitoring was initiated. The storm produced a total of 0.68" of rainfall. Rainfall statistics for monitored storm events for the San Diego River MLS area are presented in Table 10-3. A total of 46 one-liter composite sample aliquots were collected at a pace of one sample for every 60,000 cubic feet of water that passed by the monitoring station. Grab samples were collected prior to the peak of the storm hydrograph. Monitoring was conducted over a 22-hour period which captured the rise and initial peak of the runoff produced by the storm.

Table 10-3. 2005-2006 Rainfall Statistics for Monitored Storm Events for the San Diego River Mass Loading Station.

Date Start	Total Rain (in)	Duration (hr)	Intensity (in/hr)	Antecedent Dry Days
10/17/2005	0.68	44	0.02	27
2/18/2006	0.48	35	0.01	46
3/10/2006	1.01	32	0.03	10

The second storm monitored at the San Diego MLS during the 2005-2006 wet weather monitoring season occurred on February 19, 2006. The storm began to move into San Diego County on February 17, 2006. After monitoring the storm over a day the storm began to produce sufficient rainfall to provide runoff in the San Diego River Watershed and monitoring was initiated. The storm produced a total of 0.48" of rainfall Table 10-3. A total of 41 one-liter composite sample aliquots were collected at a pace of one sample for every 100,000 cubic feet of water that passed by the monitoring station. Grab samples were collected prior to the peak of the storm hydrograph. Monitoring was conducted over a 20-hour period which captured the rise and initial peak of the runoff produced by the storm.

The third storm monitored at the San Diego MLS during the 2005-2006 wet weather monitoring season occurred on March 11, 2006. The storm moved into San Diego County on March 10, 2006 and quickly began to produce sufficient rainfall to provide runoff in the San Diego River Watershed and monitoring was initiated. The storm produced a total of 1.01" of rainfall Table 10-3. A total of 29 one-liter composite sample aliquots were collected at a pace of one sample for every 300,000 cubic feet of water that passed by the monitoring station. Grab samples were collected prior to the peak of the storm hydrograph. Monitoring was conducted over an 18-hour period which captured the rise and initial peak of the runoff produced by the storm.

Hydrographs from each storm event are presented in Appendix A.

10.2.1.2 Storm Water Monitoring Results

Analytical results from the 2005-2006 wet weather monitoring period at the San Diego River MLS are presented with the historical results in Table 10-4. Sample results are compared to the water quality objectives (WQO) that are also provided in the table. A detailed description of the WQO sources and the technical reasoning of how the results are compared to the WQO are provided in Section 3.4. Discussion of sample results occur in groups; conventional parameters, bacteriological, pesticides, metals, and toxicity. A comparison of these results to previous monitoring data is presented in Section 10.2.2.

Conventional constituent results were below their respective water quality objectives with the exception of total dissolved solids (TDS) and turbidity. TDS results were above the water quality objective of 1,000 mg/L on October 18, 2005 (1,490 mg/L) and on February 19, 2006 (1,370 mg/L). TDS was below the WQO during the March 11, 2006 monitoring event (655 mg/L). Turbidity was above the WQO of 20 NTUs during all three monitoring events. Turbidity results, though just above the WQO, ranged from 27.3 NTUs on October 18, 2005 to 34.8 NTUs on February 19, 2006.

Fecal coliform is the only bacterial indicator with a water quality objective for wet weather monitoring. Fecal coliform results were above the REC-1 WQO of 400 MPN/100 mL during all three monitoring events. Results for fecal coliform ranged from 800 MPN/100mL on March 11, 2006 to 70,000 MPN/100 mL on October 18, 2005. All three bacterial indicators were considerably higher during the first rainfall event on October 18, 2005. The highest total coliform and enterococcus results measured at this site also occurred on this date (1,100,000 MPN/100 mL and 50,000 MPN/100 mL, respectively).

The pesticides Chlorpyrifos, Diazinon, and Malathion were not detected in any sample during the 2005-2006 wet weather monitoring season.

Several total metals were detected in storm water samples collected during the 2005-2006 wet weather monitoring season. The total metals arsenic, copper, lead, nickel, and zinc were detected in all three storm water monitoring events but were below their respective hardness based WQO. Total cadmium was detected in only one monitoring event which occurred on March 11, 2006 (0.012 mg/L). This result for total cadmium was above the hardness based chronic WQO (0.007 mg/L) but below the hardness based acute WQO (0.02 mg/L). This was also the only detection of total cadmium in the historical record for the San Diego River MLS.

Table 10-4. Analytes measured at the San Diego River mass loading station.

ANALYTE	UNITS	WQO	SOURCE	2001-2002			2002-2003			2003-2004			2004-2005			2005-2006			Frequency Above WQO	Mean Ratio to WQO
				11/29/01	2/17/02	3/17/02	11/8/02	12/16/02	2/11/03	11/12/03	2/3/04	3/2/04	10/27/04	2/11/05	2/18/05	10/18/05	2/19/06	3/11/06		
General / Physical / Organic																				
Electrical Conductivity	umhos/cm			1680	2230	2270	1568	811	1550	2470	1546	995	560	126	747	2870	2490	1262		
Oil and Grease	mg/L	15	USEPA Multi-Sector General Permit	<1	4	<1	10.70	<1.00	2.39	4.83	<1	<1	<1	<1	<1	<1	<1	<1	0%	0.12
pH	pH Units	6.5-8.5	Basin Plan	7.3	7.6	7.5	7.68	7.64	7.61	7.48	7.70	7.26	7.16	7.63	7.20	7.79	8.07	7.74	0%	0.00
Bacteriological																				
Enterococci	MPN/100 mL			80	2,200	170	17,000	13,000	7,000	11,000	23,000	358	22,000	2,300	22,000	50,000	3,000	5,000		
Fecal Coliform	MPN/100 mL	400	Basin Plan	130	**30,000**	170	**110,000**	**17,000**	**5,000**	**13,000**	**2,300**	**500**	**5,000**	**800**	**1,300**	**70,000**	**3,000**	**800**	87%	43.17
Total Coliform	MPN/100 mL			2,300	80,000	3,000	220,000	50,000	23,000	50,000	28,000	11,000	300,000	30,000	50,000	1,100,000	50,000	30,000		
Wet Chemistry																				
Ammonia As N	mg/L			0.9	0.7	0.2	0.34	0.13	0.19	<0.1	<0.1	1.8	0.38	0.28	0.95	0.19	0.31	<0.1		
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan				5.11	1.5	2.04	0.48	0.62	7.90	0.2	0.5	8.2	4.1	9.2	1.3	0%	0.14
Biochemical Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	12	**58.8**	3.4	4.73	<2.0	20.7	8.44	**45.2**	2.94	4.22	3.68	3.39	8.24	2.21	5.17	13%	0.41
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	28	**154**	54	71	48	63	83	67	52	98	**283**	56	62	65	74	13%	0.70
Dissolved Organic Carbon	mg/L						6.80	8.68	10.70	16.6	4.26	5.57	33.2	2.94	5.62	9.41	12.8	5.59		
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.3	0.03	0.12	0.19	0.24	0.19	0.41	0.13	0.15	0.44	<0.05	0.32	0.24	0.37	0.11	0%	0.11
Nitrate As N	mg/L	10	Basin Plan	0.9	0.8	0.3	0.67	0.56	0.57	0.5	0.2	0.63	0.37	0.66	1.01	0.63	0.25	0.29	0%	0.06
Nitrite As N	mg/L	1	Basin Plan	0.12	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0%	0.03
Surfactants (MBAS)	mg/L	0.5	Basin Plan	<0.5	**0.6**	<0.5	<0.1	<0.1	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	7%	0.49
Total Dissolved Solids	mg/L	1000	Basin Plan	869	691	796	**1260**	676	896	**1540**	**1120**	491	594	756	490	**1490**	**1370**	655	33%	0.91
Total Kjeldahl Nitrogen	mg/L			2.7	2.9	1.7	1.6	1.2	1.5	1.4	2.8	2	2.3	<0.5	23.3	1.6	4.3	1.5		
Total Organic Carbon	mg/L						18.3	39.8	12.4	16.7	11.7	11.5	62	9.61	9.6	22.4	14.1	8.57		
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	1.21	0.4	0.28	0.57	1.01	0.33	0.34	0.23	0.35	0.85	0.28	0.44	0.5	0.45	0.52	0%	0.26
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	<20	24	20	43	**212**	66	34	<20	21	**477**	50	61	31	42	48	13%	0.77
Turbidity	NTU	20	Basin Plan	8.6	15.3	13.1	**40.7**	**104**	**34.5**	19.9	**31.2**	**22.4**	**234**	14.5	**30.9**	**27.3**	**34.8**	**32.3**	67%	2.21
Pesticides																				
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game	<0.03*	<0.03*	**0.03**	**0.043**	**0.051**	**0.048**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	31%	0.87
Diazinon	µg/L	0.08	CA Dept. of Fish & Game	**0.21**	**0.10**	0.08	0.051	0.051	0.038	<0.01	<0.01	<0.01	<0.01	0.038	<0.01	<0.01	<0.02	<0.02	13%	0.52
Malathion	µg/L	0.43	CA Dept. of Fish & Game				<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	0%	0.04
Hardness																				
Total Hardness	mg CaCO3/L			429	399	490	545	331	483	759	476	206	201	364	251	706	751	366		
Total Metals																				
Antimony	mg/L	0.006	Basin Plan	<0.002	0.003	<0.002	<0.002	0.006	**0.007**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	7%	0.46
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.003	0.002	0.005	0.005	0.008	0.004	0.005	0.006	0.003	0.006	0.006	<0.002	0.008	0.005	0.006	0%	0.10
Cadmium	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.012**	7%	0.19
Chromium	mg/L	(b)	CTR (Cr VI)	0.005	<0.005	0.007	<0.005	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.01
Copper	mg/L	(b)	40 CFR 131	0.007	0.028	0.011	0.009	0.021	0.017	0.008	0.013	0.006	**0.025**	0.006	0.006	0.01	0.008	0.008	7%	0.47
Lead	mg/L	(b)	40 CFR 131	0.003	0.004	0.009	0.007	**0.035**	0.011	0.004	0.006	0.005	**0.060**	0.005	0.004	0.004	0.006	0.007	13%	0.99
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.004	0.005	0.004	0.007	0.005	0.005	0.005	0.003	<0.002	0.006	0.003	0.002	0.007	0.005	0.003	0%	0.03
Selenium	mg/L	0.02	40 CFR 131	<0.002	0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.11
Zinc	mg/L	(b)	40 CFR 131	0.029	0.112	0.067	0.031	0.118	0.077	0.046	0.053	0.026	0.213	0.033	0.032	0.075	0.045	0.068	0%	0.22
Dissolved Metals																				
Antimony	mg/L	(e)	40 CFR 131	<0.002	<0.002	<0.002	0.002	0.007	0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Arsenic	mg/L	0.34 (c)	40 CFR 131	0.002	<0.001	0.002	0.004	0.003	0.003	0.004	0.003	0.002	<0.002	<0.002	<0.002	0.003	<0.001	<0.001	0%	0.01
Cadmium	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0%	0.09
Chromium	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.01
Copper	mg/L	(b)	40 CFR 131	0.006	0.015	<0.005	0.005	0.006	0.015	<0.005	0.005	<0.005	<0.005	<0.005	0.005	0.005	<0.005	<0.005	0%	0.20
Lead	mg/L	(b)	40 CFR 131	0.002	<0.002	0.002	0.006	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0%	0.15
Nickel	mg/L	(b)	40 CFR 131	0.003	0.005	0.002	0.006	<0.002	0.003	0.003	0.003	<0.002	0.003	0.002	0.002	0.003	0.004	0.002	0%	0.02
Selenium	mg/L	0.02 (d)	40 CFR 131	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.01
Zinc	mg/L	(b)	40 CFR 131	0.022	0.084	<0.020	0.026	0.037	0.070	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.053	0.026	0.035	0%	0.08
Toxicity																				
Ceriodaphnia 96-hr	LC50 (%)	100		>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	0%	0.00
Ceriodaphnia 7-day survival	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0%	0.00
Ceriodaphnia 7-day reproduction	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	**50**	100	100	7%	0.13
Hyalella 96-hr	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0%	0.00
Selenastrum 96-hr	NOEC (%)	100		100	**25**	100	100	100	100	100	100	100	100	100	100	100	100	100	7%	0.27

See last page for footnotes and source references.

Table 10-4. Analytes measured at the San Diego River mass loading station.

Blank spaces have been verified and no data is available due to changes in the monitoring program.

(a) Un-ionized Ammonia is a calculated value, non-detectable values calculated at the detection limit. Basin Plan WQO is 0.025 mg/L; values shown here have been converted to µg/L.
(b) Water Quality Objective for dissolved metal fractions are based on total hardness and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(c) Water Quality Objectives for dissolved metal fractions are based on water effects ratios (WER) and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(d) Water Quality Objective is based on the total recoverable form as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(e) USEPA has not published an aquatic life criterion value.

Shaded text – bold values exceed the **CCC** water quality objective and bold/underlined results exceed the **CMC** water quality objective.

* Indicates detection limit exceeds water quality objective.

Sources
USEPA National Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit for Industrial Activities, 65 Federal Register (FR) 64746, Final Reissuance, October 30, 2000. Table 3 - Parameter benchmark values.
Siepmann and Finlayson 2000.
Basin Plan, September 8, 1994.
Assembly Bill 411 - Title 17 of the California Code of Regulations, Section 7958.
USEPA Federal Register Document 40 CFR Part 131, May 18, 2000.

The dissolved metals arsenic, copper, nickel, and zinc were detected but were below their respective hardness based WQO. Dissolved nickel and zinc were detected in all three wet weather monitoring events, while dissolved arsenic and copper were only detected in the first monitoring event on October 18, 2006. All dissolved metals were below their respective hardness based WQO for both the CCC and the CMC.

Toxicity was not observed for the acute or chronic survival endpoints for the species *Ceriodaphnia dubia* during any of the storm water monitoring events during the 2005-2006 wet weather monitoring season. Toxicity was observed for the 7-day reproduction endpoint for *Ceriodaphnia dubia* during the October 18, 2005 monitoring event (NOEC=50%). In comparison to the control result, which had a mean number of young produced per adult of 37.8, the 100% concentration sample had a mean number of young produced per adult of 25.3 which was slightly lower but statistically significant. In comparison to the no observed effect concentration which was the 50% diluted sample, the mean number of young produced per adult was 30.2 and was not statistically different from the control. This was the first time chronic reproductive toxicity was observed for *Ceriodaphnia dubia* at the San Diego River MLS. Toxicity to *Hyalella azteca* or the freshwater algae *Selenastrum capricornutum* was not observed in any samples during the 2005-2006 wet weather monitoring season.

10.2.2 Relationships/Analyses

An evaluation of storm water monitoring data collected at the San Diego River MLS over the past five years was performed. Several constituents have had analytical results measured above their respective WQO. Fecal coliform and turbidity are two constituents that have frequently had results above their respective WQO. Fecal coliform results have consistently been above the WQO for a total of 13 of 15 storm events (87%). Turbidity results were measured above the WQO during 10 of 15 storm events (67%). Results for nutrients have never been above their respective water quality objectives during any of the 15 storm events monitored.

Conventional constituents that have had concentrations measured above their respective WQO, but less frequently include the following:

- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- MBAS
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)

There is no pattern or trend evident with the results for these constituents with the exception of TDS. TDS results are typically above the WQO during the first or second storm of the season but never during the last storm of the season. This is consistent with data provided by Padre Dam which is discussed later in this section and is likely attributable to importation of water from the Colorado River.

Total coliform and enterococcus have also had consistently elevated levels. Visual observation of the bacteriological results indicate that higher results occur during the first storm event of each wet weather season in comparison to the second and third storm events monitored later in the season.

Chlorpyrifos, Diazinon, and Malathion were not detected during any storm events monitored during the 2005-2006 monitoring season. Chlorpyrifos results were above the WQO during the 2001-2002 and 2002-2003 monitoring seasons. However, Chlorpyrifos has not been detected over the past three monitoring seasons. Diazinon results were above the water quality objective during the 2001-2002 wet weather monitoring season. However, diazinon results have steadily decreased over the past five years of monitoring. Analysis of the results indicate that there is a significant decreasing trend in Diazinon (R^2=0.58) concentrations. Malathion has not been detected at the San Diego River MLS over the past four years of monitoring.

During the last five years of monitoring, four total metals (antimony, cadmium, copper, and lead) have had results infrequently above their respective WQO. One result for total antimony was above the basin plan WQO during the 2002-2003 monitoring season. The one and only detection of total cadmium over the past five years of monitoring occurred on March 11, 2006 and was above the hardness based chronic WQO but below the acute WQO. Total copper and total lead have been detected in every sample since the 2001-2002 monitoring season. Only one result for total copper (October 27, 2004) and two results for total lead (December 16, 2002 and October 27, 2004) were above the hardness based chronic WQO. However, the results for both total copper and total lead were below their respective hardness based acute WQO.

Results for dissolved metals have never been above their respective hardness based acute or chronic WQO over the past five years of monitoring at the San Diego River MLS. There are no significant upward or downward trends evident for dissolved metals at the San Diego River MLS.

Toxicity has only been observed in two monitoring events over the past five years of monitoring at the San Diego River MLS. The first occasion of observed toxicity was in the algal growth endpoint for *Selenastrum capricornutum* on February 17, 2002. The second occasion of observed toxicity was in the chronic reproductive endpoint for *Ceriodaphnia dubia* during the October 18, 2005 monitoring event.

In order to illustrate the magnitude of the water quality exceedances for 2005-2006, the ratio of water quality results to the WQOs were plotted for constituents that have had WQO exceedances. The results are shown in Figure 10-3. The largest single exceedance was for fecal coliform, which was approximately 175 times the WQO during the October 18, 2005 storm event. The average magnitude of water quality exceedances was also determined for each constituent by calculating the mean ratio of water quality results to the WQOs from all storm events from October 2001 through April 2005. Mean ratios are illustrated in Figure 10-3. The largest mean ratio exceedance for the period of record was for fecal coliform, which exceeded the WQO by nearly 50 times. The next largest average exceedance was for turbidity, which exceeded the WQO by approximately 2 times.

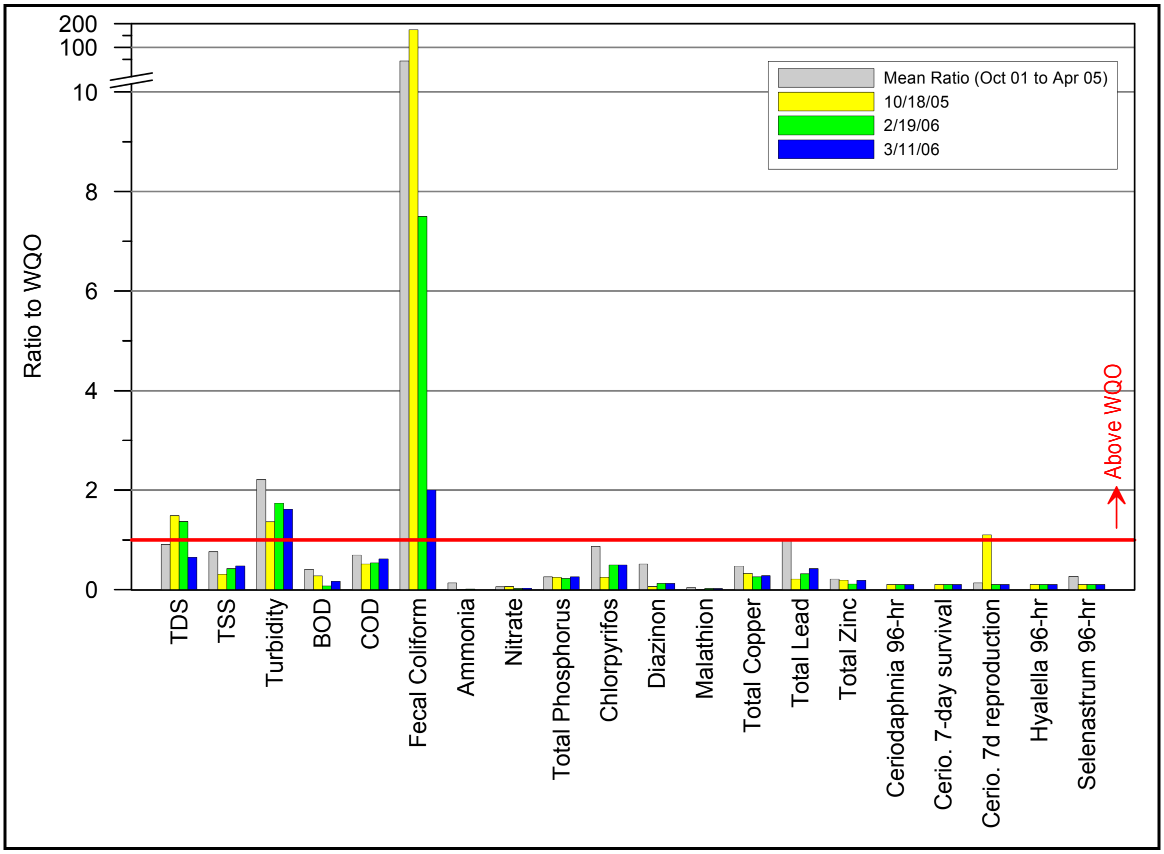


Figure 10-3. San Diego River water quality ratios.

10.2.3 Wet Weather Constituent Loadings Analysis

Loading values for each constituent sampled were derived using the EMC values obtained from composite samples collected at the San Diego River MLS site and the recorded volume of water discharged during the sampling period. For each of the three storm events, the mean and coefficient of variation were calculated and are reported in Table 10-5.

The constituent (EMC) loads at the San Diego River MLS site were compared to the mean water quality objective (WQO) loads, calculated by multiplying the mean flow (Table 10-5) by constituent WQOs. This comparison shows that fecal coliform, TDS, and total cadmium mean EMC loads were above the mean WQO loads. The fecal coliform EMC load was two orders of magnitude greater than the WQO load, with an EMC load of 15.3 trillion MPN/day, compared to the WQO load of 627 billion MPN/day.

The TDS EMC load of 150,309 kg/day was nearly twice the WQO load of 78,498 kg/day. The total cadmium mean EMC load of 1.16 kg/day was only marginally larger than its WQO load of 1.16 kg/day, this is most likely due to one wet weather sampling event having results above the WQO. Two of the three sampling events resulted in non-detect values for total cadmium.

Table 10-5. Storm Event Loading Statistics for the San Diego River mass loading station.

Constituent	Units	Mean SDR Load	Coefficient of Variation (%)	Mean SDR WQO Load
General/ Physical/Organic				
Flow	cfs	64	73	-
Oil and Grease (O&G)	kg/day	78	73	2,355
Bacteriological				
Total Coliform	MPN/day	2.58E+14	123	na
Fecal Coliform	MPN/day	**1.53E+13**	138	6.27E+11
Enterococci	MPN/day	1.54E+13	79	na
Wet Chemistry				
Total Dissolved Solids (TDS)	kg/day	**150,309**	38	78,498
Total Suspended Solids (TSS)	kg/day	6,949	86	15,700
Phosphorus, Total	kg/day	78	78	314
Phosphorus, Dissolved	kg/day	31	57	314
Nitrate	kg/day	50	54	1,570
Nitrite	kg/day	4	73	157
Total Kjeldahl Nitrogen (TKN)	kg/day	362	68	na
Ammonia	kg/day	22	76	na
Biochemical Oxygen Demand, 5-day (BOD_5)	kg/day	707	94	4,710
Chemical Oxygen Demand (COD)	kg/day	10,992	81	18,840
Total Organic Carbon (TOC)	kg/day	1,852	31	na
Dissolved Organic Carbon (DOC)	kg/day	1,270	51	na
Methylene Blue Active Substances (MBAS)	kg/day	39	73	78
Pesticides				
Diazinon	kg/day	0.002	73	0.013
Chlorpyrifos	kg/day	0.002	73	0.003
Malathion	kg/day	0.002	73	0.068
Total Metals				
Antimony (Sb), Total	kg/day	0.39	73	0.94
Arsenic (As), Total	kg/day	0.94	71	7.85
Cadmium (Cd), Total	kg/day	**1.16**	166	1.15
Chromium (Cr), Total	kg/day	0.39	73	101.14
Copper (Cu), Total	kg/day	1.29	67	4.79
Lead (Pb), Total	kg/day	1.00	89	2.92
Nickel (Ni), Total	kg/day	0.64	35	26.46
Selenium (Se), Total	kg/day	0.39	73	3.14
Zinc (Zn), Total	kg/day	9.79	83	60.89
Dissolved Metals				
Antimony (Sb), Dissolved	kg/day	0.39	73	na
Arsenic (As), Dissolved	kg/day	0.19	40	53.38
Cadmium (Cd), Dissolved	kg/day	0.08	73	0.98
Chromium (Cr), Dissolved	kg/day	0.39	73	31.96
Copper (Cu), Dissolved	kg/day	0.44	52	4.60
Lead (Pb), Dissolved	kg/day	0.16	73	1.72
Nickel (Ni), Dissolved	kg/day	0.42	52	26.41
Selenium (Se), Dissolved	kg/day	0.39	73	3.14
Zinc (Zn), Dissolved	kg/day	5.44	70	59.55

These loading estimates do not include additional loading delivered to the receiving water after the composite sample collection was completed since continual base flows have not been monitored under this program. Continual flow monitoring will be performed during the 2006-2007 wet weather monitoring season in order to capture the annual base flow conditions. Constituent concentrations during base flow conditions will not be monitored until the 2007-2008 season after the adoption of the revised storm water permit (Order R9-2006-0011). Annual loading estimates will be performed in future reports when this data is available.

10.2.4 Watershed Storm Water Modeling

The estimated average pollutant storm load and the expected loads are compared in this section and are based on the modeling methods provided in Section 3. This comparison can provide watershed managers with additional information on what pollutants are causing unexpectedly high loads.

Figure 10-4 shows the mean modeled loads calculated in GIS for the San Diego River Watershed based on the rainfall from the three monitored events, land use impervious values, and assumed constituent concentrations. Both load estimates base the runoff volume on the storm rainfall interpolated across the watershed from the County's ALERT rain gage network and the watershed's imperviousness. The loads represent the average amount during the monitored events. The measured loads are calculated by using the mean measured concentrations found during the 2005-2006 storm season. The modeled loads are calculated by assuming the concentrations running off of the different land uses in the watershed correspond to the median land use event mean concentrations found in the National Stormwater Quality Database. A more detailed description of the modeling methods is provided in Section 3.

The loading estimate for total dissolved solids based on measured concentrations are ten times higher than the predicted load estimated from the land use characteristics. This comparison is similar to other watersheds in San Diego County. Higher than expected TDS may be attributable to naturally occurring dissolved minerals, or from groundwater discharges as a result of increased irrigation, importation of water, dry weather flows, and agricultural water use.

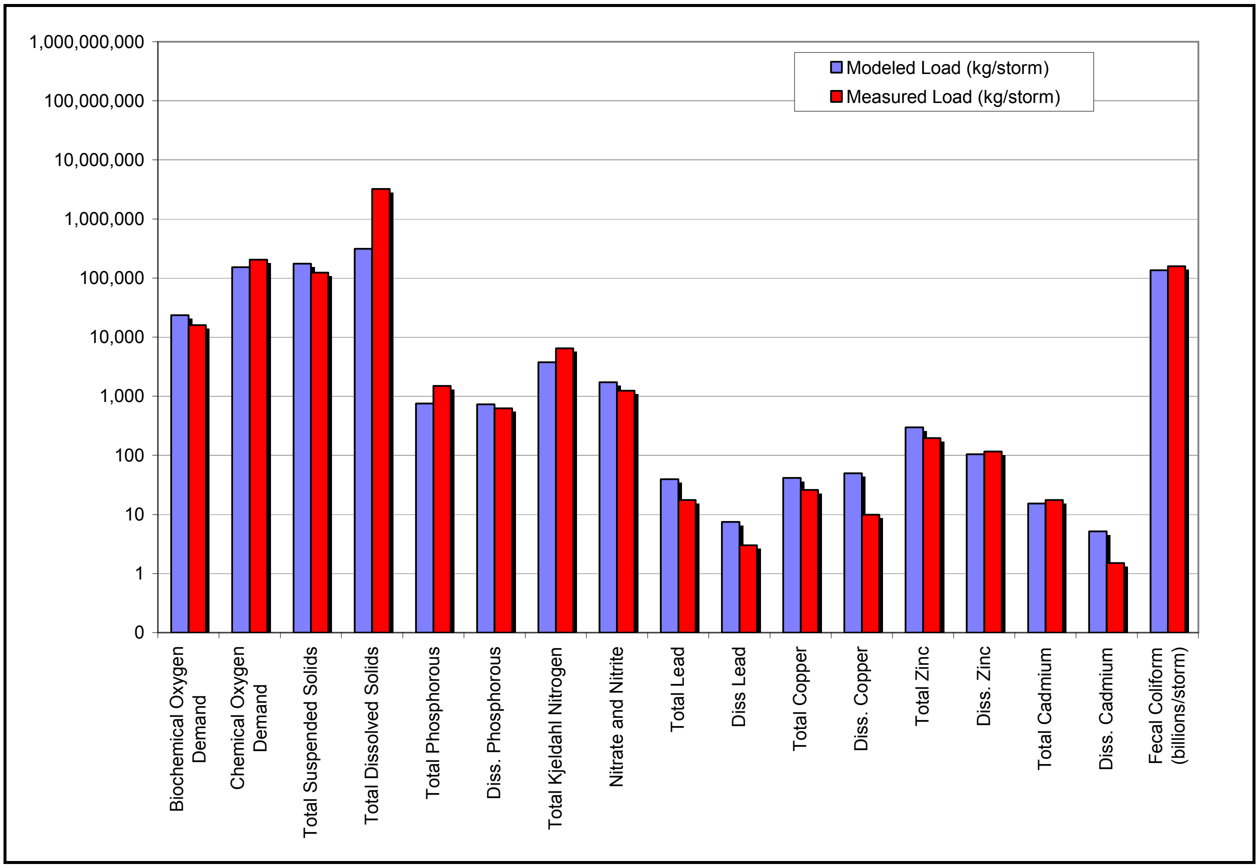


Figure 10-4. Mean modeled and measured loads for the San Diego River Watershed.

10.2.5 2005 Dry Weather Monitoring Data Evaluation

In addition to the wet weather monitoring discussed above, a separate dry weather monitoring program is carried out by each jurisdiction. Dry weather monitoring reports are provided separately by each jurisdiction in its Jurisdictional Urban Runoff Management Program (JURMP) Annual Report. Dry weather data is also provided in a regional data sharing format which is used for the watershed management area assessments and regional comparisons in this report as described in Section 3. Dry weather monitoring sites with field parameter and chemistry results are presented in this section and are shown on Figure 10-5.

Water quality monitoring was performed at 178 locations in the San Diego River WMA during the 2005 dry weather monitoring program. Of these, 154 sites are located upstream of the mass loading station in the San Diego River. A summary of the 2005 dry weather monitoring results for the San Diego River WMA are presented below in Table 10-6.

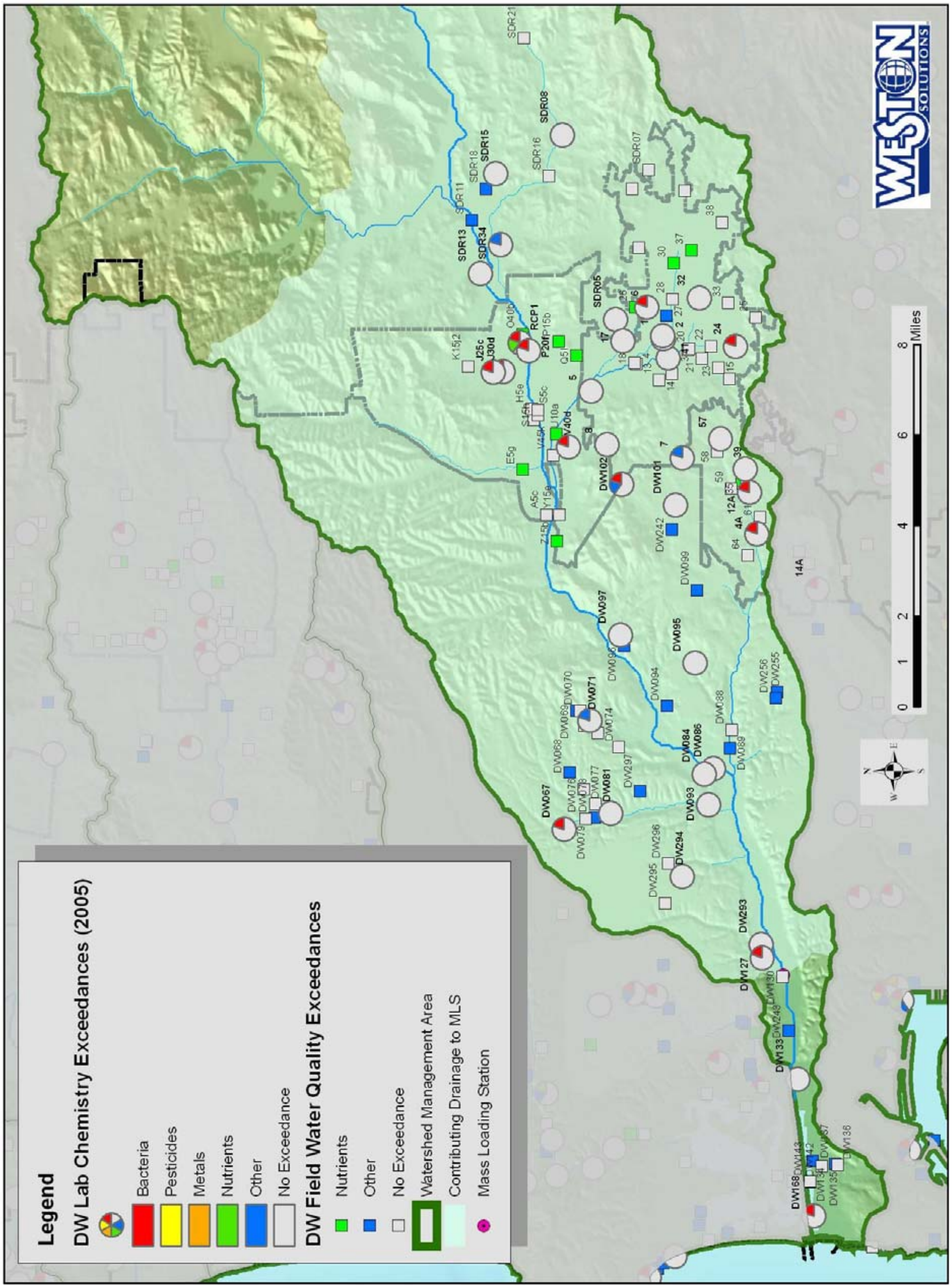


Figure 10-5. 2005-San Diego River WMA dry weather exceedance map.

Table 10-6. Summary of the 2005 Dry Weather Monitoring Results in the San Diego River WMA.

Analyte	Units	DW Action Level	No. Samples	Minimum	Mean	Maximum
Conductivity*	mS/cm		178	0.3	10.2	930
Oil & Grease	mg/L	15	49	1.6	2.5	9.1
pH	pH units	6.5-8.5	178	6.8	8.0	9.8
Enterococcus	MPN/100mL	10,000	49	80	9,210	160,000
Fecal Coliform	MPN/100mL	20,000	62	1	9,399	240,000
Total Coliform	MPN/100mL	50,000	62	170	121,790	1,600,000
Ammonia (NH3-N)	mg/L	1	156	<0.1	0.4	10.0
Nitrate (NO3-N)	mg/L	10	167	<0.1	4.5	25.0
MBAS	mg/L	1	49	<0.05	0.2	0.3
Ortho-phosphate (PO4-P)	mg/L	2	156	<0.05	0.3	2.3
Turbidity	NTU	20	165	0.0	29.2	738
Chlorpyrifos	µg/L	0.5	47	<0.05	<0.05	<0.05
Diazinon	µg/L	0.5	47	<0.05	0.027	0.110
Total Hardness	mg CaCO3/L		49	323	824	3,470
Cadmium, Diss	µg/L	(a)	49	<5	na	<5
Copper, Diss	µg/L	(a)	49	<1	5.07	59.00
Lead, Diss	µg/L	(a)	49	0.50	2.29	14.00
Zinc, Diss	µg/L	(a)	49	<5	21.79	481

* All data are as reported by co-permittees. No unit conversions were made
Mean values are calculated including non-detect results at half the reporting limit. If the mean value was less than the reporting limit, then the mean was not included in the table
(a) Dry weather action level for dissolved metal fraction based on total hardness and calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000 If Total Hardness was greater than 400 mg/L, then 400 mg/L was used to calculate dissolved metals water quality objectives

Table 10-7 summarizes all of the 2005 Dry Weather Program constituent exceedances. Constituent results that were above the dry weather action level at the dry weather monitoring sites include ammonia, total and fecal coliform, enterococcus, nitrate, ortho-phosphate, pH, and turbidity.

Table 10-7. San Diego River WMA 2005 Dry Weather Exceedance Matrix.

Constituent	Number of Exceedances	Number of Samples Collected	Average Ratio of Exceedance*	St. Dev. Ratio of Exceedance
Ammonia	5	156	0.39	0.84
Total Coliform	16	62	2.40	6.18
Fecal Coliform	7	62	0.48	1.62
Enterococcus	5	49	0.94	2.98
Nitrate	17	167	0.45	0.53
Ortho-phosphate	2	156	0.15	0.18
pH	2	178	0.07	0.11
Turbidity	31	165	1.51	4.93

* Average ratio of exceedance is equal to the average concentration for all samples collected divided by the dry weather action level.

Constituents with average ratios of exceedance and standard deviations greater than one indicate more frequent and wider ranges of exceedances. Constituents with average ratios of exceedance and standard deviations less than one indicate exceedances that occur on a more random and infrequent basis. In the San Diego River WMA, total coliform and turbidity had average ratios of exceedance greater than one.

Figure 10-5 depicts the 2005 dry weather program monitoring sample locations. Locations shown with circles have both field parameters and laboratory sample results. Locations shown as squares have field parameter results only. Pie symbols appear at dry weather stations that have had dry weather action level exceedances. The colored slices of the pie show the different constituent groups that contributed to the exceedances.

10.2.6 Third Party Data

Third party data was collected from the San Diego River Watershed under the Surface Water Ambient Monitoring Program (SWAMP) and by Padre Dam Municipal Water District. The SWAMP data meets the acceptability for assessment under this program since it is performed under the SWAMP QA program. Padre Dam data meets the criteria since it is analyzed by a laboratory certified by the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP). Additional third party data may be considered for future assessments upon determination of meeting the QA acceptance criteria as provided in the Methods Section 3.0.

10.2.6.1 Padre Dam Data

Third party data was provided by Padre Dam Municipal Water District (Padre Dam) and is presented in Table 13-23 of the Regional Assessments (Section 13). Monthly monitoring results collected from January 2005 through December 2005 at six locations upstream from the MLS. The results were evaluated and compared to wet weather WQO and dry weather action levels. Parameter groups that were included in the Padre Dam data include nutrients, conventional constituents, and microbiology. The sample results from Padre Dam represent a snapshot of the water quality conditions upstream of the MLS throughout the year. For parameters on the 303(d) list for the lower San Diego River, results from Padre Dam were above the Basin Plan WQO for TDS in 53 of 72 samples; dissolved oxygen results were above the WQO in 24 of 72 samples, and fecal coliform results were above the WQO in 11 of 72 samples. Although phosphorus is on the 303(d) list for the lower San Diego River, no phosphorus results were above the WQO during 2005 in samples from Padre Dam.

Turbidity results were above the WQO in 12 of 72 samples; Nitrate results were above the WQO in 2 of 72 samples; and *E. coli* results were above the WQO in 15 out of 72 samples. Parameters that exceeded water quality objectives in Padre Dam data, dry weather data, and wet weather MLS data include turbidity, fecal coliform, and total coliform.

The Padre Dam data for TDS confirms previous work that shows that storm water runoff concentrations of TDS during wet weather events are considerably lower than during dry weather periods. TDS concentrations can be influenced by groundwater inputs. TDS concentrations frequently exceed water quality objectives and have historically exceeded water quality objectives in this WMA as a result of natural variability. This condition may be exacerbated by the increased importation of Colorado River water (San Diego Regional 303(d) Workgroup 2002).

10.2.6.2 Third Party SWAMP Data

Third party data was collected from the San Diego River Watershed under the Surface Water Ambient Monitoring Program (SWAMP) in May 2004 (Appendix H). This data meets the acceptability for assessment under this program since it is performed under the SWAMP QA program. Additional third party data may be considered for future assessments upon determination of meeting the QA acceptance criteria as provided in the Methods Section 3.0. A full suite of constituents were analyzed including organochlorine pesticides, triazine herbicides, PAHs, and PCBs in addition to metals, inorganics, and physical measurements.

A total of four sample locations were monitored in the San Diego River WMA. One sample each was collected from Boulder Creek, Los Coches Creek, Forrester Creek, and the San Diego River. Constituents with sample results above the WQO include turbidity, sulfate, and manganese. Turbidity was above the WQO only in the Boulder Creek sample (31.1 NTU). Sulfate (277 mg/L) and manganese (estimated value of 121 mg/L) were above the WQO only in the San Diego River Sample.

Only one organochlorine pesticide (oxadiazon) was detected, only in the Forrester Creek and San Diego River samples (0.01e μg/L and 0.024 μg/L, respectively). The triazine herbicides propazine, simazine, and terbuthylazine were detected in the Forrester Creek sample (0.133e μg/L, 0.1e μg/L, and 0.113e μg/L respectively), while secbumeton and terbuthylazine were detected in the San Diego River (0.243e and 0.314e μg/L, respectively). No other pesticides, PAHs, or PCBs were detected in the four samples collected during the 2004 SWAMP program in the San Diego River WMA.

10.2.7 TIEs

Toxicity identification evaluation (TIE) testing was not performed on San Diego River samples. This mass loading station has not been identified as a TIE candidate site based upon past Triad Decision Matrix evaluations. Toxicity was observed for the reproductive endpoint (NOEC=50%) for *C. dubia* during the October 18, 2005 storm event but could not be attributed to any of the chemical constituents measured in the storm water sample. Toxicity was not observed for any other species or during the remaining monitoring events on February 19, 2006 or March 11, 2006.

10.2.8 Watershed Water Quality Monitoring Summary

Turbidity and elevated levels of bacterial indicators, specifically fecal coliform, appear to be the primary water quality concerns within the watershed. The Padre Dam data for TDS confirms previous work that shows that storm water runoff concentrations of TDS during wet weather events are considerably lower than during dry weather periods. Based on the period of record, there appears to be a significant downward trend in Diazinon concentrations at the MLS.

10.3 Stream Bioassessment

Stream bioassessment in the San Diego River WMA included two urban affected monitoring sites and one reference site. The upstream urban site was located in Mission Trails Regional Park (SDR-MT), and the downstream site was located upstream of the Morena Blvd. overcrossing in Mission Valley (SDR-1). A new reference site was established in October 2005 on Boulder Creek upstream of Boulder Creek Road (REF-BCR) and was sampled again in May 2006.

In addition to the Index of Biotic Integrity, a new analysis tool has recently become available for summarizing benthic macroinvertebrate communities in California. Known as the O/E ratio, it is the ratio of organisms observed at a site (O) to the organisms expected to occur at a site (E). The "expected" value is based on percent probability of capture of specific taxa under reference conditions and also accounts for factors such as temperature, precipitation, and geology. An O/E ratio of 0.80 or higher represents an unimpacted benthic community. This represents a 20 percent loss of the biodiversity expected in the benthic community.

10.3.1 Results and Discussion

Relative WMA Ranking and Trends Over Time

In order to graphically represent how each WMA test sites are ranked by benthic community quality within the County, rescaled IBIs based on the percent deviation from the median County score is presented in Figure 10-6 (see Section 3.2.7 for a detailed explanation of the re-scaling procedure). Relative ranking of the San Diego River WMA sites (highlighted in blue) show a large disparity between the two sites. San Diego River in Mission Trails Park (SDR-MT) was about 16 percent higher than the median of all County sites, and San Diego River in Mission Valley (SDR-1) was about 28 percent below the County median, and was the lowest rated site in the program.

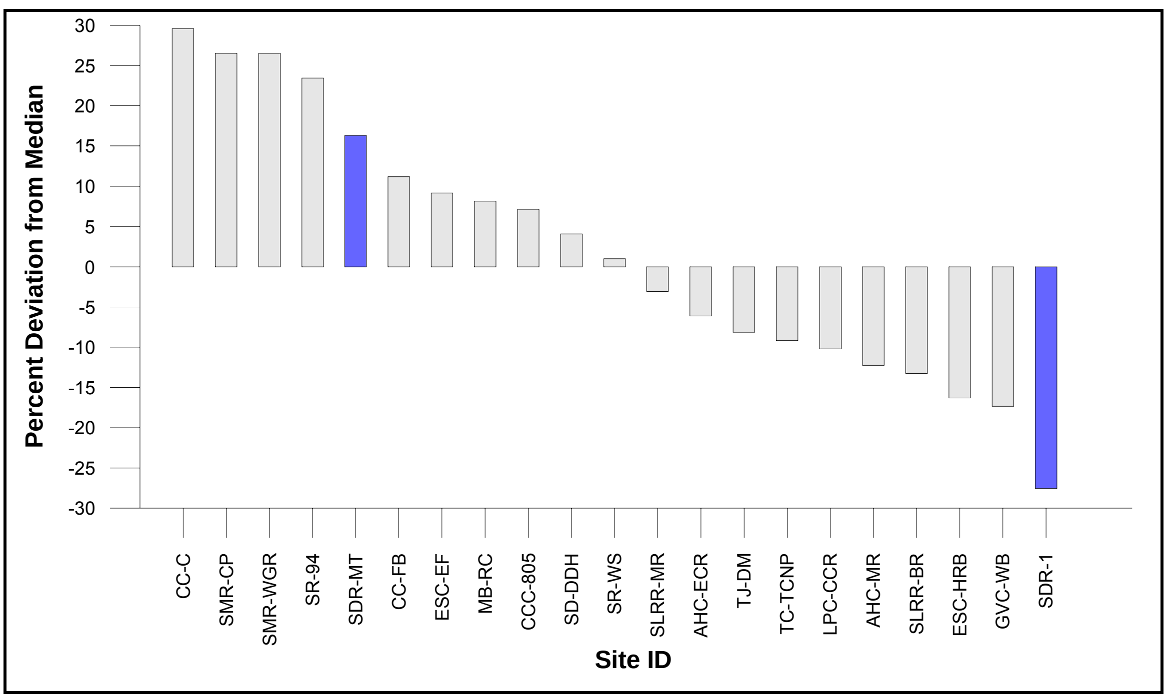


Figure 10-6. Relative Ranking of Rescaled IBI Scores for San Diego River WMA

Figure 10-7 shows the average IBI scores for the San Diego River WMA sites in comparison with the San Diego County-wide average IBI score, excluding reference sites. The San Diego River sites average IBI scores ranged from 5.0 in May 2005 and 2006 to 14.0 in October 2003, and were generally rated lower than the County average score.

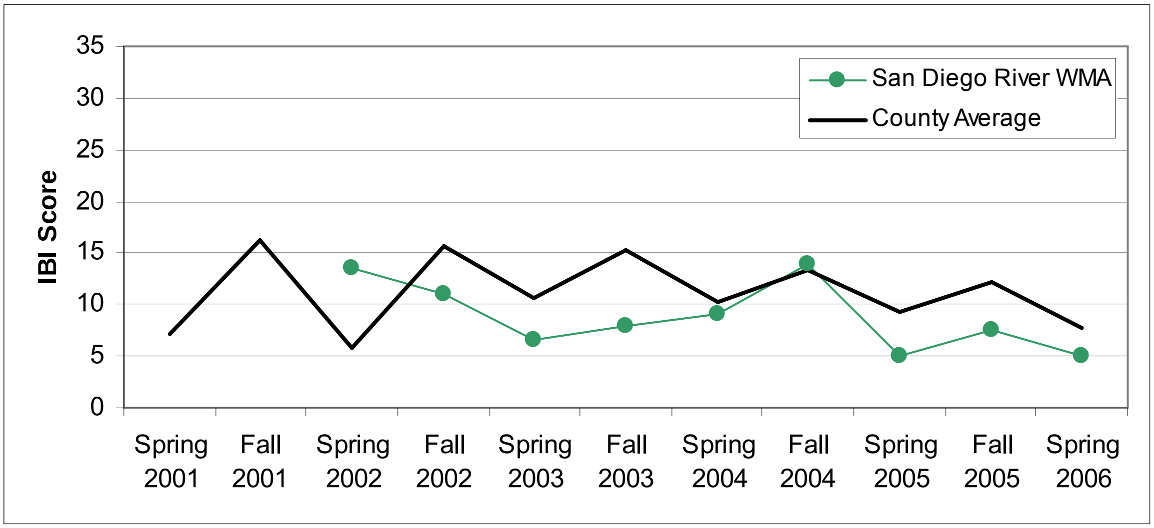


Figure 10-7. Index of Biotic Integrity Scores, WMA Average Over Time

San Diego River in Mission Trails Regional Park: SDR-MT

The Mission Trails monitoring site had a benthic community with an Index of Biotic Integrity rating of Poor for the October 2005 survey and Very Poor for the May 2006 survey, with IBI scores of 14 and 6, respectively (Table 10-8). There were 18 and 14 different taxa collected in the October 2005 and May 2006 surveys, respectively. Five and three different EPT taxa were collected in the surveys. There were no organisms collected that are highly intolerant to impairment, and the percent tolerant taxa was low and comprised six and one percent of the community in October and May, respectively.

Preliminary results of the O/E analysis show that the Mission Trails monitoring site had a ratio of 0.41 (Appendix B.9). This implies that the benthic community has lost an estimated 59 percent of the biodiversity expected to occur at the site.

The physical habitat of the monitoring reach was optimal. The substrate had very complex cobble, boulder, and tree root niche space suitable for colonization. The willow riparian zone was mostly undisturbed and the relatively steep gradient of the river made for good current velocity. Specific conductance values of 2.054 and 2.023 mS/cm were recorded in October and May, respectively. Values for pH were 8.3 and 8.1.

Table 10-8. Selected Biological Metrics and Physical Measures of the San Diego River Watershed Management Area.

San Diego River Watershed Management Area	San Diego River in Mission Trails Regional Park (SDR-MT)		San Diego River Upstream of Morena Blvd. (SDR-1)		Boulder Creek Reference Site (REF-BCR)	
Survey	**Oct-05**	**May-06**	**Oct-05**	**May-06**	**Oct-05**	**May-06**
Index of Biotic Integrity/ Qualitative Rating	**14 Poor**	**6 Very Poor**	**1 Very Poor**	**4 Very Poor**	**25 Poor**	**31 Fair**
O/E Ratio		**0.41**		**0.33**		**0.65**
Metrics						
Taxa Richness	18	14	12	13	29	20
EPT Taxa (mayflies, stoneflies, and caddisflies)	5	3	0	2	12	8
% Intolerant Taxa	0%	0%	0%	0%	1%	0%
% Tolerant Taxa	6%	1%	47%	44%	8%	2%
Average Tolerance Value	5.5	4.9	6.6	5.9	5.2	5.4
% Collector Filterers +Collector Gatherers	91%	97%	94%	92%	91%	81%
Physical Measures						
Elevation	180		10			
Physical Habitat Score	181	156	134	142	180	172
Riffle Velocity (ft/sec)	1.7	1.1	1.4	1.1	1.0	1.2
Substrate Composition						
Silt	2%	2%	33%	8%	2%	
Sand	5%	57%	7%	44%	23%	23%
Gravel	7%	3%	22%	13%	23%	17%
Cobble	70%	13%	28%	15%	28%	37%
Boulder	17%	18%	10%	12%	24%	23%
Roots		7%		8%		
Bedrock/Solid						
Water Quality						
Temperature (°C)	16.5	20.1	21.3	20.1	14.4	20.5
pH	8.3	8.1	7.5	7.6	8.0	7.7
Specific Conductance (mS/cm)	2.054	2.023	2.949	2.268	0.349	0.331
Dissolved Oxygen (mg/L)	4.67	8.74	5.59	4.85	10.30	6.73

*Very Poor: 0-13, Poor: 14-26, Fair: 27-40, Good: 41-55, Very Good: 56-70

The benthic community was similar in each survey. Baetid mayflies (*Baetis* and *Fallceon quilleri*) dominated the community, followed by Chironomid midges and the black fly *Simulium* (Table 10-9). Hydropsychid caddisflies were collected in the October survey only. Percent collector filterers and collector gatherers comprised from 91 to 97 percent of the community.

The San Diego River mass loading station was too spatially disconnected from the Mission Trails site to correlate any of the storm water information with the benthic community.

Table 10-9. Macroinvertebrate Community Summary: Five Most Abundant Taxa for San Diego River Watershed Management Area

		Taxon	Common Name	Percent Composition	Tolerance Value	Functional Feeding Group
San Diego River in Mission Trails Regional Park (SDR-MT)	Oct-05	***Baetis***	**minnow mayfly**	**25%**	**5**	**Collector Gatherer**
		Chironomidae	non-biting midges	24%	6	Collector Gatherer/Filterer
		Simulium	black fly	17%	6	Collector Filterer
		Fallceon quilleri	minnow mayfly	17%	4	Collector Gatherer
		Hyalella	amphipod	4%	8	Collector Gatherer
	May-06	***Baetis***	**minnow mayfly**	**43%**	**5**	**Collector Gatherer**
		Fallceon quilleri	minnow mayfly	33%	4	Collector Gatherer
		Chironomidae	non-biting midges	9%	6	Collector Gatherer/Filterer
		Simulium	black fly	9%	6	Collector Filterer
		Argia	dancer damselfly	1%	7	Predator
San Diego River Upstream of Morena Blvd. (SDR-I)	Oct-05	***Hyalella***	**amphipod**	**40%**	**8**	**Collector Gatherer**
		Simulium	black fly	29%	6	Collector Filterer
		Americorophium	amphipod	18%	4	Collector Gatherer
		Turbellaria	flatworm	5%	4	Predator
		Enallagma/ Ischnura	dancer damselfly	2%	9	Predator
	May-06	***Americorophium***	**amphipod**	**47%**	**4**	**Collector Gatherer**
		Hyalella	amphipod	40%	8	Collector Gatherer
		Chironomidae	non-biting midges	4%	6	Collector Gatherer/Filterer
		Turbellaria	flatworm	4%	4	Predator
		Corbicula	clam	1%	10	Collector Filterer
Boulder Creek Reference Site (REF-BCR)	Oct-05	***Baetis***	**minnow mayfly**	**26%**	**5**	**Collector Gatherer**
		Hydropsyche	net-spinning caddisfly	21%	6	Collector Filterer
		Chironomidae	non-biting midges	19%	6	Collector Gatherer/Filterer
		Fallceon quilleri	minnow mayfly	11%	4	Collector Gatherer
		Simulium	black fly	6%	6	Collector Filterer
	May-06	**Chironomidae**	**non-biting midges**	**39%**	**6**	**Collector Gatherer/Filterer**
		Baetis	minnow mayfly	29%	5	Collector Gatherer
		Hydroptila	micro caddisfly	10%	6	Piercer Herbivore
		Fallceon quilleri	minnow mayfly	8%	4	Collector Gatherer
		Ochrotrichia	micro caddisfly	4%	4	Piercer Herbivore

San Diego River at Morena Blvd.: SDR-1

The Mission Valley monitoring site had a benthic community with an Index of Biotic Integrity rating of Very Poor for both the October 2005 and May 2006 surveys, with IBI scores of 1 and 4, respectively (Table 10-8). There were 12 and 13 different taxa collected. There were no EPT taxa collected in October and 2 were collected in May. There were no organisms collected that are highly intolerant to impairment, and the percent tolerant taxa comprised 47 and 44 percent of the community in October and May, respectively.

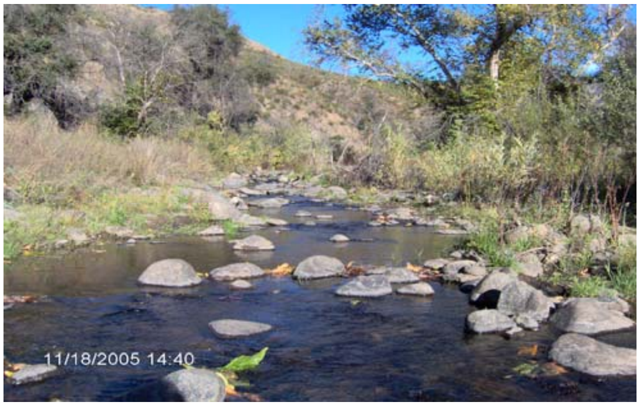
Preliminary results of the O/E analysis show that the Mission Valley monitoring site had a ratio of 0.33 (Appendix B.9). This implies that the benthic community has lost an estimated 67 percent of the biodiversity expected to occur at the site.

The physical habitat of the monitoring reach was sub-optimal. The San Diego River has a very low gradient through all of Mission Valley, although the riffles sampled are some of the only places where current velocity is greater than 1 ft/sec. and cobble is present. Two of the sample transects were dominated by cobble and small boulder, and the other was sampled in pool habitat. Specific conductance was relatively high, with values of 2.949 and 2.268 ms/cm. Values for pH were 7.5 and 7.6.

The benthic community was dominated by Amphipods in both surveys, and the black fly *Simulium* was also abundant in the October survey (Table 10-9). The amphipod *Americorophium*, an estuarine species tolerant of freshwater is typically collected in high numbers at this site, likely recruiting from the San Diego River estuarine habitat.

The San Diego River mass loading station was located approximately one mile upstream of the bioassessment station and water quality measures may be correlated with the site. Turbidity was the only constituent of concern identified during storm water sampling that would have a negative impact on the biological community (Table 10-4). Toxicity was observed for the 7-day reproductive endpoint for *Ceriodaphnia dubia* during one wet weather monitoring event, but was not observed for *Hyalella azteca*. Total dissolved solids was above the water quality objective during the first two monitoring events, and were present in high enough concentrations to have a possible cumulative impact on sensitive organisms. Considering the very low IBI scores of the bioassessment site, it is possible that there may be unmeasured constituents contributing to the degradation of the biological community.

Boulder Creek Reference Site: REF-BCR



The Boulder Creek reference monitoring site had a benthic community with IBI scores of 25 and 31 and quality ratings of Poor in the October 2005 survey, and Fair in the May 2006 survey (Table 10-8). There were 29 and 20 different taxa collected, with 12 and 8 different EPT taxa in October and May, respectively. Organisms that are highly intolerant to impairment accounted for one percent of the community in the October survey.

Preliminary results of the O/E analysis show that the Boulder Creek Reference monitoring site had a ratio of 0.65 (Appendix B.9). This implies that the benthic community has lost an estimated 35 percent of the biodiversity expected to occur at the site.

The stream habitat was optimal, with an oak and sycamore riparian zone and a substrate of layered cobble and boulder. The site lacked good canopy cover, which allowed for a fair amount of springtime algae growth. Specific conductance values were 0.349 and 0.331 ms/cm and pH values were 8.0 and 7.7.

The benthic community was somewhat variable between the two surveys, primarily due to differences in the lower abundance taxa and the decrease in Hydropsychids from October to May. The dominant taxa were similar for each survey, as Baetid mayflies (*Baetis* and *Fallceon quilleri*) and Chironomid midges were collected in high numbers in October and May (Table 10-9). A number of rare and/or sensitive taxa were collected at the site including the mayfly *Serratella*, the stoneflies (*Malenka* and immature Capniids), and the caddisflies *Helicopsyche* and *Gumaga*.

10.3.2 Stream Bioassessment Summary

The San Diego River WMA was sampled at three monitoring sites, including two urban sites and one reference site. The urban sites were in Mission Trails Regional Park and near Morena Blvd. in Mission Valley. The Mission Trails site had an Index of Biotic Integrity rating of Poor and Very Poor, and the Mission Valley site had an IBI rating of Very Poor. The reference site on Boulder Creek had IBI ratings of Poor and Fair. The Poor rating was two points from the threshold of the Fair rating, and the site supported numerous sensitive taxa indicating that the water quality was likely very good.

10.4 Ambient Bay and Lagoon Monitoring Program

The San Diego River is not included as part of the Ambient Bay and Lagoon Monitoring program.

10.5 San Diego River WMA Assessment

The San Diego River Watershed Management Area was assessed utilizing chemistry and toxicity data collected during storm events from a single MLS, field and chemistry data collected from up to 154 dry weather monitoring sites upstream of the MLS, six locations from third party data provided by Padre Dam Municipal Water District, and IBI scores generated at two bioassessment sites. Third party data sample results provided by Padre Dam Municipal Water District were collected from six locations on a monthly basis from January through December, 2005 and were located upstream of the MLS. The data from Padre Dam was incorporated into the dry weather data for the triad assessment. The watershed management area assessment methods presented in Section 3.4 were applied to these data to determine which constituents were of concern and to develop a high, medium, or low frequency of occurrence for these constituents. The results of this assessment are presented in Table 10-10.

10.5.1 San Diego River WMA Criterion Assessment

Three constituents were found to have a high frequency of occurrence in the San Diego River Watershed. Fecal coliform received three diamonds based on Criterion No. 1 while total coliform and turbidity received three diamonds based on Criterion No. 3.

One constituent was found to have a medium frequency of occurrence. Total dissolved solids was assigned two diamonds based on Criterion No. 7 and is primarily a result of the inclusion of data from Padre Dam.

One constituent was found to have a low frequency of occurrence. Enterococcus was assigned one diamond based on Criterion No. 9.

Although the watershed assessment process did not indicate they were a COC, dissolved oxygen and phosphorus are considered potential contaminants of concern due to their listing on the 303(d) list for the lower San Diego River. Dissolved oxygen exceeded the Basin Plan water quality objective in 33% of the samples from data provided by Padre Dam. Other water bodies within the San Diego River Watershed are 303(d) listed for constituents and conditions such as eutrophication at the Famosa Slough and Channel. Eutrophic conditions are indicative of elevated nutrient levels, which were not supported by the WMA assessment methodology in the San Diego River MLS, but may occur in localized site specific areas.

Table 10-10. Constituent exceedances in the San Diego River WMA.

San Diego River																
CONSTITUENTS WITH ANY WET WEATHER (MLS) WQO OR DRY WEATHER ACTION LEVEL EXCEEDANCE	MLS (Wet Weather) Results												Dry Weather Results *		Frequency of Occurrence	Criterion No.
	2001/2002		2002/2003		2003/2004		2004/2005		2005/2006		CUMULATIVE		2005			
	#/3	%	#/3	%	#/3	%	#/3	%	#/3	%	#/15	%	#	%		
Conventional Parameters																
pH	0	0	0	0	0	0	0	0	0	0	0	0	2	1	-	-
BOD	1	33	0	0	1	33	0	0	0	0	2	13	NA	NA	-	-
COD	1	33	0	0	0	0	1	33	0	0	2	13	NA	NA	-	-
Surfactants (MBAS)	1	33	0	0	0	0	0	0	0	0	1	7	0	0	-	-
Total Dissolved Solids	0	0	1	33	2	67	0	0	2	67	5	33	53	74	♦♦	7
Total Suspended Solids	0	0	1	33	0	0	1	33	0	0	2	13	NA	NA	-	-
Turbidity	0	0	3	100	2	67	2	67	3	100	10	67	27	13	♦♦♦	3
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	5	2	-	-
Nutrients																
Ortho-phosphate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	2	1	-	-
Nitrate as N	0	0	0	0	0	0	0	0	0	0	0	0	17	8	-	-
Bacteriological																
Total Coliform	1	33	2	67	1	33	2	67	2	67	8	53	10	9	♦♦♦	3
Fecal Coliform	1	33	3	100	3	100	3	100	3	100	13	87	15	13	♦♦♦	1
Enterococcus	0	0	2	67	2	67	2	67	1	33	7	47	4	10	♦	9
Pesticides																
Chlorpyrifos	1	33	3	100	0	0	0	0	0	0	4	27	0	0	-	-
Diazinon	2	67	0	0	0	0	0	0	0	0	2	13	0	0	-	-
Total Metals																
Antimony	0	0	1	33	0	0	0	0	0	0	1	7	NA	NA	-	-
Cadmium	0	0	0	0	0	0	0	0	1	33	1	7	NA	NA	-	-
Copper	0	0	0	0	0	0	1	33	0	0	1	7	NA	NA	-	-
Lead	0	0	1	33	0	0	1	33	0	0	2	13	NA	NA	-	-
Toxicity															EVIDENCE OF PERSISTENT TOXICITY?	
Ceriodaphnia 7-day reproduction	0	0	0	0	0	0	0	0	1	33	1	7	NA	NA	No	
Selenastrum 96-hour	1	33	0	0	0	0	0	0	0	0	1	7	NA	NA	No	
Bioassessment	IBI Rating														EVIDENCE OF BENTHIC ALTERATION?	
San Diego River, at Mission Trails Park	Poor		Poor		Poor		Very Poor		Very Poor		Poor		NA		Yes	
San Diego River, at Mission Valley (DS)	Very Poor		Very Poor		Very Poor		Very Poor		Very Poor		Very Poor		NA			

* = Total number of observations varied among constituents (dry weather data upstream of MLS and Padre Dam data combined).
NA = Not assessed
\- = Constituent results are below the defined requirements for a Low Frequency of Occurrence rating.
♦ = Low Frequency of Occurrence rating.
♦♦ = Medium Frequency of Occurrence rating.
♦♦♦ = High Frequency of Occurrence rating.
DS = Downstream of MLS

Toxicity tests have shown evidence of toxicity only once for two separate species and during two separate events of the 12 tests conducted since 2001. One event during the 2005-2006 monitoring season exhibited toxicity for the 7-day reproduction endpoint for *Ceriodaphnia*. One event during the 2001-2002 monitoring season exhibited toxicity for *Selenastrum*. No other test organisms have showed evidence of toxicity. Therefore, there is no evidence of persistent toxicity in the San Diego River Watershed.

IBI scores resulting from bioassessment monitoring on the San Diego River consistently indicated a rating of Very Poor at the Mission Valley bioassessment site. The Mission Trails Park site received a rating of poor the first three years of monitoring and very poor the last year of monitoring. Therefore, there are indications of benthic alteration within the San Diego River Watershed.

Figure 10-8 summarizes the number of water quality exceedances for six categories of constituents. Categories include conventionals, nutrients, bacteria, pesticides, metals and toxicity. The stacked bars were developed using number of exceedances from values of wet weather MLS results in Table 10-10 for each constituent category. The overall number of water quality objective exceedances at the San Diego River MLS has remained relatively low during the last three monitoring seasons. The figure also indicates that bacteriological and conventional parameters are the only constituent groups exceeded the WQO on a frequent basis.

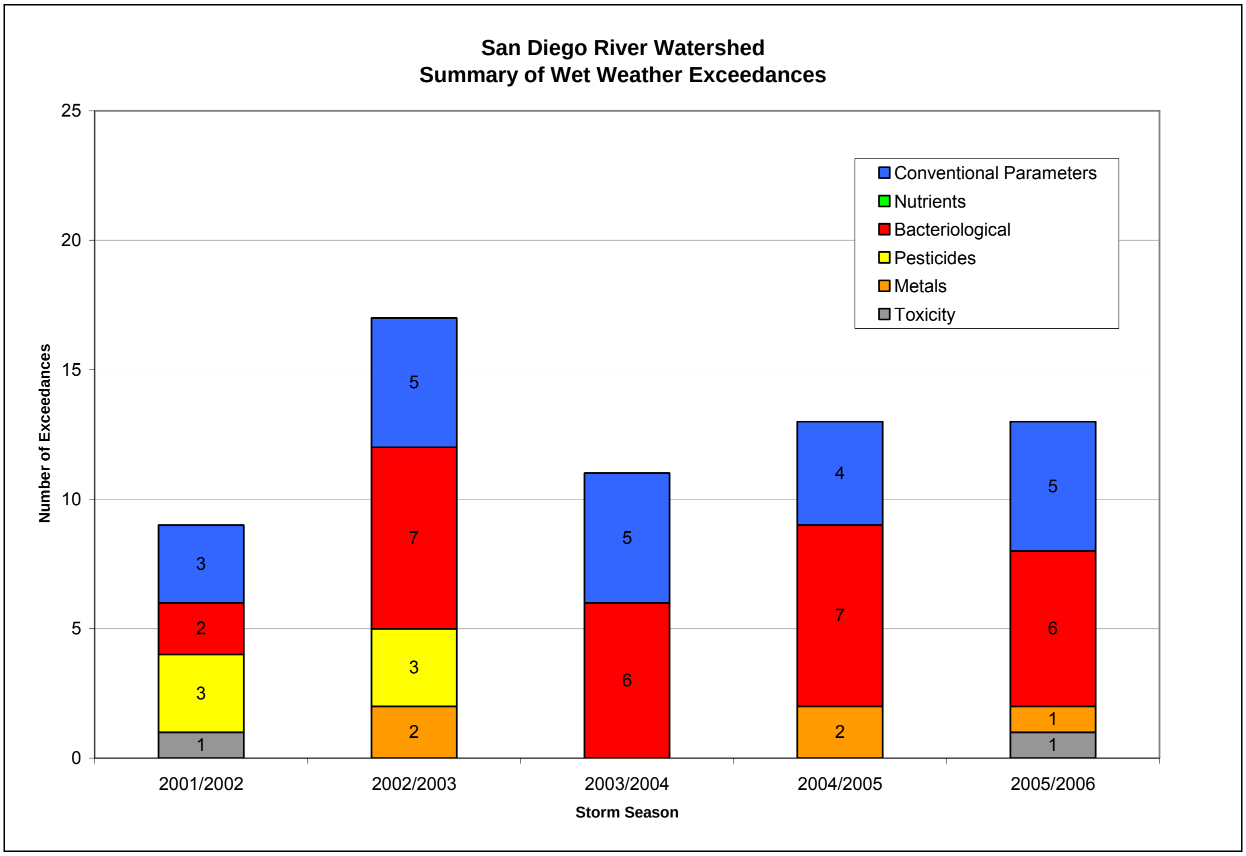


Figure 10-8. Stacked bar chart of the number of wet weather exceedances of constituent groups in San Diego River.

Evaluation of scatterplots presented in Appendix C indicate that concentrations of TDS, which is a medium frequency COC, sporadically exceeded the water quality objective and does not appear to be decreasing. A statistically significant decreasing trend for Diazinon (R^2=0.58) was also evident with no exceedances of the WQO since the 2001-2002 monitoring season.

10.5.2 Triad Decision Matrix

The triad decision matrix combines the occurrence of COC with the toxicity and bioassessment results to determine possible conclusions about the watershed and provide possible actions for future monitoring or assessment. Table 10-11 summarizes these results and lists possible conclusions and actions.

Table 10-11. Triad Decision Matrix Results for the San Diego River WMA.

Chemistry	Toxicity	Benthic Alteration	Possible Conclusion(s)	Possible Actions or Decisions
Persistent exceedances of water quality objectives (high frequency COC identified)	No evidence of persistent toxicity	Indications of alteration	Test organisms not sensitive to problem pollutants Benthic impact due to habitat disturbance, not toxicity	1) Continue monitoring to gather long-term trend information. 2) Evaluate upstream source identification as a high priority. 3) Consider whether different or additional test organisms should be evaluated. 4) Consider potential role of physical habitat disturbance. 5) TIE would not provide useful information with no evidence of toxicity.

Based on the triad decision matrix, persistent exceedances of turbidity, no evidence of persistent toxicity, and evidence of benthic alteration, it is recommended to investigate possible upstream sources that may cause increased turbidity. It is possible that land use activities may contribute to higher turbidity concentrations. It is also recommended to continue monitoring to gather long-term trend information and to consider the potential role of physical habitat disturbance as factor influencing benthic alteration.

10.5.3 Water Quality Priority Ratings for the San Diego River WMA

The purpose of the water quality priority ratings is to identify water quality priorities within a watershed based on weighted averages of the sub-watershed ratings. Because it is a weighted average, larger sub-watersheds will have a greater influence in the overall watershed rating.

The water quality priority ratings presented in Table 10-12 are based on the methodology presented in the BLTEA report (WESTON, MOE, & LWA, 2005) and are presented in the Methods Section 3.4. Constituent groups and stressor groups are given a ranking from A to D with A being the highest priority rating and D the lowest priority rating. Items ranked with a D indicate that the constituent group or stressor is a low priority or does not have sufficient data to support a higher ranking. The ratings were based on current results presented in this 2005-2006 annual report and data from the following programs:

- Storm water Mass Loading Monitoring (MLS) – Wet Weather Data (1994-2006)
- Co-permittee Dry Weather Data Monitoring (2003-2005)
- Available Third Party Data (SWAMP, 2004 and Padre Dam, 2004-2005)
- Urban Stream Bioassessment Monitoring (2000-2006)
- Triad Assessment – Toxicity Testing of Storm water (2000-2006)
- 303(d) Listing (2003)

Table 10-12. Updated Water Quality Priority Ratings for the San Diego River WMA

Watersheds/Sub-watersheds	Percentage of Total Area	Priority Ratings*										
		Constituent Groups									Stressor Groups	
		Heavy Metals	Dissolved Minerals	Organics	Oil and Grease	Sediments	Pesticides	Nutrients	Gross Pollutants	Bacteria/ Pathogens	Benthic Alterations	Toxicity
San Diego River WMA	**100%**	***D***	***B***	***D***	***D***	***B***	***C***	***C***	***C***	***A***	***A***	***D***
Lower San Diego HA (907.10)	40%	*D*	*A*	*D*	*D*	*B*	*C*	*A*	*A*	*A*	*A*	*D*
San Vicente HA (907.20)	17%	*D*	*B*	*D*	*D*	*C*	*C*	*D*	*D*	*C*	*B*	*D*
El Capitan HA (907.30)	20%	*D*	*B*	*D*	*D*	*C*	*B*	*D*	*D*	*B*	*B*	*D*
Boulder Creek HA (907.40)	23%	*D*	*C*	*D*	*D*	*A*	*B*	*D*	*D*	*B*	*B*	*D*
Frequency of Occurrence Rating High[1]						♦♦♦				♦♦♦		
Constituents of Concern						Turbidity				Total Coliform Fecal Coliform		

1. High frequency of occurrence ratings are derived from the constituent exceedances tables and are provided for comparison purposes.

Notes:

** = Rating Calculated Based on Area Weighted Averages of Score Value from the sub-watershed areas.*

*** = Priority Level (Highest-A to Lowest-D)*

High Priority Level Based on Data

303d listing

Only bacteria and benthic alterations were identified as a high priority (A rated) constituent for the San Diego River WMA followed by dissolved minerals and sediments which were assigned a B rating. All other constituents were given either a C or D rating. A regional evaluation and summary of the BLTEA process is presented in the Regional Assessment Section 13. The complete tables used to calculate the ratings are presented in Appendix G.

The dissolved minerals category did not exist in the BLTEA report and was developed to address constituents that did not apply to the other constituent categories and to better assess the sediment category.

High frequency of occurrence ratings from the WMA criterion assessments were also included in the water quality priority rating summary table above. High frequency of occurrence ratings were determined for turbidity and total and fecal coliform for the San Diego River WMA. In comparison, the water quality priority ratings found a high priority (A) rating for bacteria but found a B priority rating for the sediments category. This is primarily driven by the wet weather exceedances of bacteria and the weighted averaging. Larger sub-watersheds will have a greater influence in the overall watershed rating. All other constituents were given either a C or D priority rating.

A list of potential likely or unknown sources for the bacteria category in the San Diego River WMA that are based on the threat to water quality inventory ratings tables from the BLTEA report (WESTON, MOE, & LWA, 2005) were ranked and are provided below in Table 10-13. The tables are not an all inclusive summary of sources in each WMA (e.g., does not consider naturally occurring sources). The tables were developed from the following list of potential sources that were agreed upon by the Copermittee Long-Term Effectiveness workgroup:

- Copermittees developed inventories
- County Department of Environmental Health Hazardous Material Database
- County Agriculture, Weights & Measures Database
- County Department of Environmental Health Food and House Database
- Thomas Brothers Maps
- Online Yellow Pages
- State Water Board list of dischargers subject to construction and industrial storm water general permit.
- Pretreatment Records

The basis of the source list was to identify sources that can be regulated and have the potential to discharge the pollutant types that are of focus of the urban runoff management programs.

Table 10-13. List of potential likely and unknown bacteria sources for the San Diego River WMA.

Potential Bacteria Sources	Number of Sources	Source Loading Potential
Eating or drinking establishments	1908	Likely
Animal Facilities	60	Likely
Botanical or zoological gardens and nurseries/greenhouses	45	Likely
Landscaping - parks, golf courses, cemeteries, etc.	11	Likely
POTWs (water and wastewater)	4	Likely
Home automobile associated activities, home and garden care activities, waste disposal	-	Likely
Roads, streets, highways, and parking facilities	-	Likely
Sites for disposing and treating sewage sludge	-	Likely
Development subject to SUSMPs	79	Unknown
Motor Freight	37	Unknown
Automobile wholesale	5	Unknown
Marinas	2	Unknown
Active or closed municipal landfills	1	Unknown
Auto parking lots and storage facilities	-	Unknown
Pest Control Services	38	Unknown
Flood management projects and flood control devices	-	Unknown
MS4s	-	Unknown
Park and Recreational facilities	-	Unknown

Source: Baseline Long-Term Effectiveness Assessment Report (Weston, MOE, & LWA, 2005).
"-" signifies that no inventory information is available
Based on limited inventory data provided by Copermittees in 2005

Several high priority (A) ratings were identified in the Lower San Diego HA. These include dissolved minerals, nutrients, gross pollutants, and bacteria, all of which had 303(d) listings or data to support to the rating. Benthic alteration was also a high priority (A) rated constituent in this sub-watershed which was based primarily on the stream bioassessment findings.

The high priority rating in the Lower San Diego HA for dissolved minerals was based primarily on the 303(d) listings for total dissolved solids (TDS), third party data from Padre Dam, and limited third party data (SWAMP) where manganese and sulfate results were above the WQO. Dissolved minerals are typically associated with naturally occurring processes. However, land use activities may result in increased concentrations of these parameters.

There are currently no inventories of potential sources that may contribute dissolved minerals based on the threat to water quality ratings provided in the BLTEA report (WESTON, MOE, & LWA, 2005). However, naturally occurring groundwater discharges as a result of increased irrigation, importation of water, dry weather flows, and agricultural water use may contribute to increases in dissolved minerals throughout the watershed. TDS was identified as a medium frequency COC based on storm water monitoring data even though parameters such as sulfate, manganese, and chloride are currently not measured under this program or under the dry weather program as was done in the SWAMP monitoring program. Additionally, this program is primarily focused on addressing urban runoff pollution which should be considered when addressing naturally occurring groundwater associated discharges.

10.6 Conclusions and Recommendations

The San Diego River Watershed is the second largest watershed in San Diego County. The contributing runoff area to the MLS is approximately 39% of the San Diego Watershed land area. The major land uses within the contributing runoff area are residential (29%), parks (24%), and undeveloped (21%).

For the San Diego River WMA, turbidity, total coliform, and fecal coliform were identified as high frequency of occurrence COC followed by TDS, which was identified as a medium frequency of occurrence COC. TDS during wet weather monitoring and monthly monitoring within the watershed by Padre Dam showed a medium frequency of occurrence but appears to be related to groundwater influences and local conditions. Enterococcus was identified as a low frequency of occurrence COC. A review of the scatterplots and trends shows only a statistically significant decreasing trend for Diazinon.

The constituent EMC loads at the San Diego River MLS site were compared to the mean water quality objective (WQO) loads, calculated by multiplying the mean flow by constituent WQOs. This comparison shows that fecal coliform, TDS, and total cadmium mean EMC loads were above the mean WQO loads. The fecal coliform EMC load was two orders of magnitude greater than the WQO load, while the TDS EMC load was twice the WQO load. The total cadmium mean EMC load was only marginally larger than its WQO load, this is most likely due to one wet weather sampling event having results above the WQO. Two of the three sampling events resulted in non-detect values for total cadmium.

The mean modeled loads calculated in GIS for the San Diego River Watershed indicate that the total dissolved solids load based on measured values is more than an order of magnitude higher than what might be expected from the land uses in the watershed. Dissolved minerals were also identified as a priority constituent in the water quality priority table. Higher than expected TDS may be attributable to naturally occurring dissolved minerals, or from groundwater discharges as a result of increased irrigation, importation of water, dry weather flows, and agricultural water use.

As noted in Section 10.2.6, the TDS water quality objective may not accurately reflect the natural conditions of the San Diego River WMA and is likely due to the increase in imported water and the influence of groundwater. Dissolved oxygen in samples collected by Padre Dam exceeded the Basin Plan water quality objective 33% of the time.

Third party data results from the San Diego River Watershed under the Surface Water Ambient Monitoring Program (SWAMP) in May 2004 found turbidity, sulfate, and manganese above the WQO. Results from the analyses of pesticides, herbicides, PAHs and PCBs were all below their respective WQO with only a few detections of herbicides and one pesticide compound.

Bioassessment monitoring in the San Diego River WMA occurred at three monitoring sites, including two urban sites and one reference site. The urban sites were in Mission Trails Regional Park and near Morena Blvd. in Mission Valley. The Mission Trails site had an Index of Biotic Integrity rating of Poor and Very Poor, and the Mission Valley site had an IBI rating of Very Poor. The reference site on Boulder Creek had IBI ratings of Poor and Fair. The Poor rating was near the threshold of the Fair rating, and the site supported numerous sensitive taxa indicating that the water quality was likely very good.

In addition to the WMA assessment findings, the water quality priority ratings found a high priority (A) rating for bacteria and found a B priority rating for the sediments category. All other constituents were given either a C or D priority rating which means the constituents were low priorities or lacked sufficient data to support a higher priority rating.

The information provided from the triad matrix results used in conjunction with the water quality priority ratings can assist the jurisdictions in making informed decisions in developing their WURMP programs. The two assessments also allow for an evaluation of where data gaps exist and where efforts should be targeted.

Utilizing the BLTEA rating methods for future data evaluations would also allow for long-term BMP effectiveness assessment. Incorporation of additional useable data from other third party sources such as POTWs and non-profit organizations would also help to increase the confidence of the water quality priority ratings and overall WMA assessments.

Several considerations should be made with respect to the findings provided in this watershed management area assessment. The recommendations for the San Diego River Watershed are to continue monitoring to gather long-term trend information, identify where data gaps exist and do not allow for informed decision making, and consider where watershed resources may be more effectively targeted to reduce turbidity, bacterial indicators, and impacts to the physical stream habitats. Assessment of water quality priority ratings should be continued on an annual basis. Storm water managers should be aware that several changes to the water quality priority ratings may be expected based on the additional parameters added in the proposed 2006 303(d) list. The draft monitoring order (R9-2006-0011) calls for three temporary watershed assessment stations (TWAS) for this watershed. These three stations should be placed with respect to addressing the spatial distribution of chloride, TDS, sulfate, manganese, nutrients and bacteria. Future monitoring stations associated with the outfall monitoring and source identification studies should also be located with respect to assessing the spatial distribution of constituents of concern and with respect to watershed priority activities. As watershed activities are developed based on the high water quality priority ratings, watershed monitoring stations may need to be located strategically to be able to effectively measure the pollutant load changes (either additions or reductions) with respect to location and sensitivity. In this manner, BMP strategies and decisions can be made to adjust and fine tune future BMP implementation in order to reach the desired load reductions necessary to meet the water quality objectives throughout the watershed and protect the beneficial uses.