San Diego River WMA

10.1 Monitoring Site Descriptions

The San Diego River watershed management area includes the San Diego River watershed (HU 907.00), which is the second largest watershed lying entirely within San Diego County and consists of approximately 277,500 acres (Figure 10-1). It 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 at Ocean Beach.

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 (58%). Other major uses are residential (18%), and parks and recreation (15%) (SANDAG 2000). 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 has a rather low population density of 1.82 persons per acre.

The San Diego River watershed provides many beneficial uses with its many reservoirs, lakes, rivers, and creeks (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. Famosa Slough lies at the mouth of the San Diego River and provides wetlands habitat. In addition to water resources the watershed contains many parks and open space areas. Mission Trails Regional Park provides nearly 5,800 acres of natural habitat and recreation areas.

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, 2002). 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. The sources of the contaminants include urban runoff, sewage spills, and sand mining (San Diego County 2002). Annual precipitation ranges from 10.5 inches near the coast to nearly 35 inches in the eastern portion of the watershed (Figure 10-1).

The San Diego River (SDR) mass loading station is located along a natural channel in San Diego, adjacent to the Fashion Valley Mall. 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.

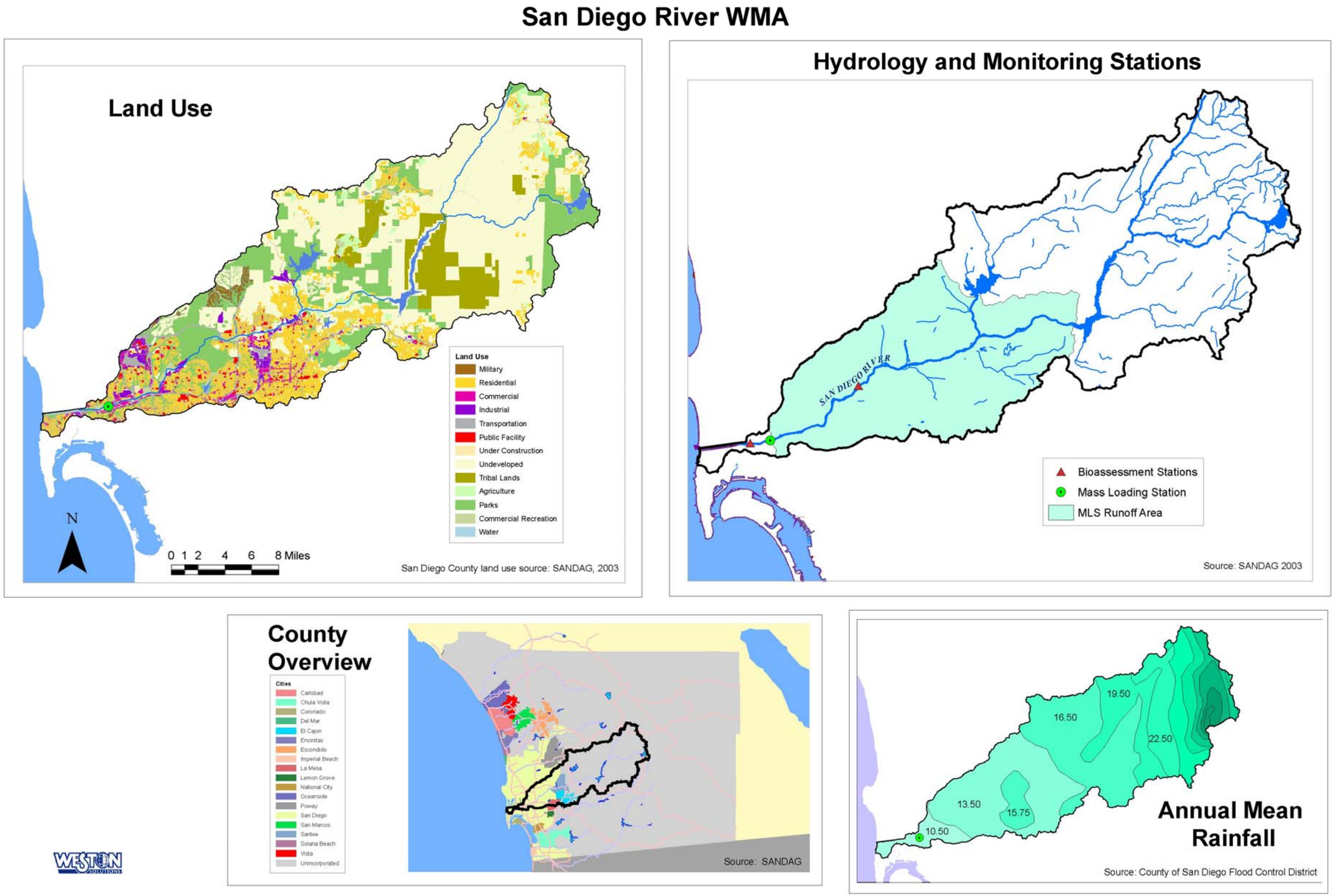

Figure 10-1. San Diego River Watershed Management Area.

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)

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

Stream bioassessment monitoring in the San Diego River WMA has occurred at two urban affected sites and one reference site. The upper urban affected monitoring reach is located in lower Mission Trails Park. This site has very good in-stream riffle habitat with complex and stable boulder and cobble, and the riparian zone is undisturbed. Flow is year-round, but can be very low during the dry season in drought years. The lower monitoring reach is located near the Morena Boulevard overpass. Finding suitable riffle habitat in this reach is problematic, as the majority of the river is deep and slow flowing throughout Mission Valley. There is only one high quality riffle with good flow velocity and a rocky substrate. A reference site has been sampled one time on Cedar Creek, south of the town of Julian on Cedar Creek Road. The habitat quality is very good but the stream does not always flow through the dry season, as was the case in October of 2003. Cedar Creek also suffered from very heavy sediment loading after the Cedar Fire of 2003, and is not currently suitable for sampling.

10.2 Storm Water Monitoring Summary

Three storm events were monitored at the MLS on San Diego River during 2004-2005. For the 2004-2005 wet season events, monitoring took place on October 27, 2004 and February 11 and 18, 2005. The results from these storms are discussed in the following section (10.2.1) and presented in Table 10-3. A comparison of these results to previous years is provided in section 10.2.2.

10.2.1 2004-2005 Results

Four conventional constituents exceeded water quality objectives during at least one of the three storms monitored in 2004-2005, including fecal coliform, chemical oxygen demand (COD), TSS, and turbidity. Fecal coliform exceeded the WQO during all three storm events monitored during the 2004-2005 wet weather season. Fecal coliform is the only bacterial indicator with a water quality objective for wet weather monitoring. Turbidity exceeded the WQO during the October 27, 2004 and February 18, 2005 storm events. Total suspended solids exceeded the WQO during the October 27, 2004 storm and COD exceeded the WQO during the February 11, 2005 storm event.

None of the objectives for pesticides, hardness, total metals, and dissolved metals were exceeded in the 2004-2005 season at the San Diego River mass loading station.

No toxicity was observed for any samples collected from San Diego River during 2004-2005 (See Section 3.1.6.2 for details on toxicity testing). All the bioassay test results had NOEC values of 100%.

Table 10-3. Analytes measured at the San Diego River mass loading station.

ANALYTE	UNITS	WQO	SOURCE	2001-02			2002-03			2003-04			2004-05			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	02/11/05	02/18/05		
General / Physical / Organic																	
Electrical Conductivity	umhos/cm			1680	2230	2270	1568	811	1550	2470	1546	995	560	126	747		
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	0%	0.14
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	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		
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**	83%	38.58
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		
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		
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	0%	0.12
Biological 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	17%	0.47
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	28	**154**	54	71	48	63	83	67	52	98	**283**	56	17%	0.73
Dissolved Organic Carbon	mg/L						6.80	8.68	10.70	16.6	4.26	5.57	33.2	2.94	5.62		
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%	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%	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%	0.04
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	8%	0.48
Total Dissolved Solids	mg/L	1000	Basin Plan by watershed	869	691	796	**1260**	676	896	**1540**	**1120**	491	594	756	490	25%	0.85
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		
Total Organic Carbon	mg/L						18.3	39.8	12.4	16.7	11.7	11.5	62	9.61	9.6		
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%	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	17%	0.86
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**	58%	2.37
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	33%	0.97
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	17%	0.62
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%	0.05
Hardness																	
Total Hardness	mg CaCO3/L			429	399	490	545	331	483	759	476	206	201	364	251		
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	8%	0.47
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%	0.09
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%	0.03
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%	0.00
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%	0.29
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		
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%	0.00
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%	0.10
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%	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		
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%	0.00
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%	0.03
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%	0.00
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%	0.12
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		
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%	0.00
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%	0.10
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%	0.07

Table 10-3. Analytes measured at the San Diego River mass loading station.

ANALYTE	UNITS	WQO	SOURCE	2001-02			2002-03			2003-04			2004-05			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	02/11/05	02/18/05		
Toxicity																	
Ceriodaphnia 96-hr	LC50 (%)	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	0%	0.00
Ceriodaphnia 7-day reproduction	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	0%	0.00
Hyalella 96-hr	NOEC (%)	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	8%	0.33

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 $\mu g/L$.
(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 – exceeds water quality objective.

* Indicates detection limit exceeds water quality objective.

<u>Sources</u>
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.

10.2.2 Relationships/Analyses

During the last four years of monitoring, there have been occasional WQO exceedances from BOD, COD, MBAS, TDS, TSS, and total antimony. For the constituents that exceeded water quality objectives during multiple storm events, there is no pattern or trend to be discerned. Turbidity exceeded the WQO during seven of the 12 storm events (58%). Fecal coliform consistently has exceeded the WQO in 10 out of 12 storms (83%). Total coliform and enterococcus also consistently had elevated levels.

Nutrients have never exceeded water quality objectives during any of the 12 storm events monitored. Chlorpyrifos and Diazinon were not detected during any storm events monitored during the 2003-2004 and 2004-2005 monitoring years. However, this contrasts with the previous two years in which Chlorpyrifos and Diazinon were consistently detected and frequently exceeded the water quality objective. Analysis of the results suggests that there is a significant downward trend in Diazinon (R^2=0.58) concentrations. Malathion has never been detected at the MLS during wet weather events (since monitoring began in Fall 2002).

During the last three years of monitoring, only one metal (Antimony) has exceeded the water quality objective. Total and dissolved metals have persistently been below the water quality objectives.

In order to illustrate the magnitude of the water quality exceedances for 2004-2005, the ratio of water quality results to the WQOs were plotted for several of the most common constituents of concern. The results are shown in Figure 10-2. The largest single exceedance was for fecal coliform, which exceeded the WQO by 12.5 times during the October 27, 2004 storm. There was also a noticeable single exceedance for TSS, which exceeded the WQO by 4.7 times during the October 27, 2004 storm. 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 2004. Mean ratios are illustrated in Figure 10-2. The largest average 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 approximately 1.6 times.

In addition to the wet weather monitoring discussed above, there are 54 sites in the San Diego River WMA where water quality is monitored during dry weather. Of these, 49 sites are located upstream of the mass loading station on San Diego River. Only those sites that are located upstream of the MLS and downstream of any reservoir are included in the evaluation, therefore approximately eight dry weather sites within the San Diego River WMA are not included in the dry weather results (See Section 3.4 for details on dry weather sampling).

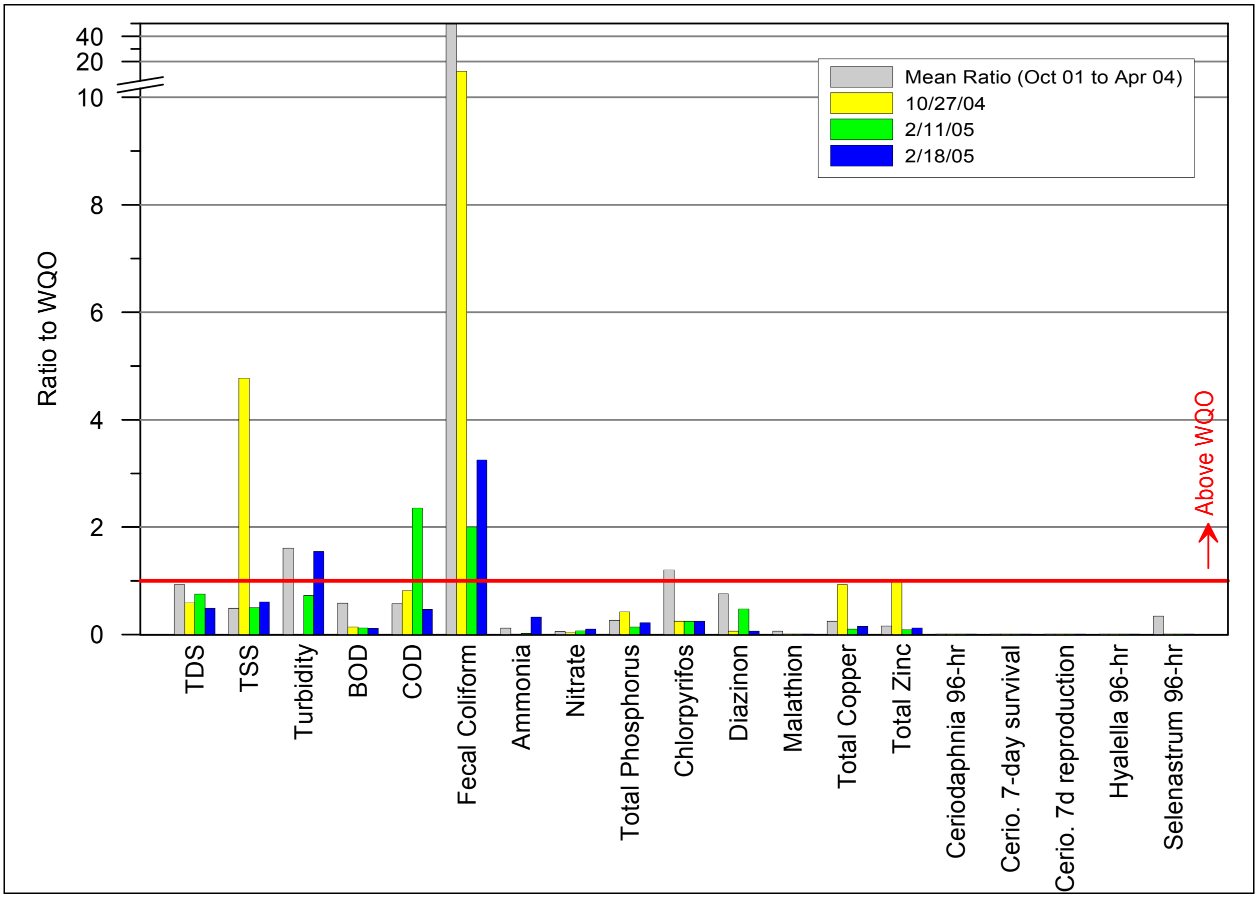

Figure 10-2. San Diego River water quality ratios.

Table 10-4. San Diego River WMA 2004 Dry Weather Exceedance Matrix.

Constituent	Number of Exceedances	Number of Samples Collected	Average Ratio of Exceedance*	St. Dev. Ratio of Exceedance
pH	3	49	0.13	0.23
Turbidity	8	45	5.61	33.3
Nitrate	2	46	0.32	0.42
Ammonia	7	46	1.00	3.76
Phosphorus	6	46	0.42	0.67
MBAS	1	48	0.25	0.15
Diazinon	2	41	0.34	1.29
Total Coliform	20	49	2.72	5.31
Fecal Coliform	5	49	0.47	1.27
Enterococcus	12	49	0.63	0.78

* Average ratio of exceedance is equal to the average concentration for all samples collected divided by the Water Quality Objective.

Table 10-4 shows exceedances and ratios of exceedances for constituents that were measured during the 2004 dry weather monitoring program. During dry weather sampling there were exceedances of action levels at the monitoring sites located above the mass loading station for pH, turbidity, nitrate, ammonia, phosphorus, MBAS, Diazinon, total and fecal coliform, and enterococcus. Of these, turbidity and total coliform had average ratios of exceedance much greater than one. A map for the WMA showing DWS exceedances is found in Figure 10-3. Pie symbols appear at dry weather stations that have had water quality exceedances. The colored slices of the pie show the different constituent groups that contributed to the exceedances. The constituents that exceeded objectives during the 2004-2005 wet weather season and the 2004 dry weather monitoring program were fecal coliform and turbidity.

10.2.3 Third Party 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 2004 through December 2004 at six locations upstream from the MLS were evaluated and compared to wet weather and dry weather sample results. Parameter groups that were included in the Padre Dam data include nutrients, conventionals, 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 exceeded the Basin Plan WQO for TDS in 52 of 72 samples; turbidity exceeded the WQO in 8 of 72 samples; dissolved oxygen exceeded the WQO in 33 of 72 samples, fecal coliform exceeded the WQO in 17 of 72 samples, and *E. coli* exceeded the WQO in 20 out of 72 samples. Although the lower San Diego River is listed on the 303(d) list for phosphorus, there were no water quality objective exceedances of phosphorus for 2004 in the Padre Dam samples. Parameters that exceeded water quality objectives in Padre Dam data, dry weather data, and wet weather MLS data include TDS, 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 and frequently exceed the Basin Plan surface water quality objective within the San Diego River WMA. TDS concentrations frequently exceed water quality objectives and have historically exceeded water quality objectives in this WMA based on natural variability. This condition may have been exacerbated by the increased importation of Colorado River water (San Diego Regional 303(d) Workgroup 2002).

10.2.4 TIEs

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 the Triad Decision Matrix. Toxicity was not observed in any of the three storm events during the 2004-2005 storm season.

10.2.5 Summary and Conclusions

Turbidity and elevated levels of bacterial indicators, specifically fecal coliform, appear to be the most consistent, primary water quality concerns within the watershed. Based on the period of record, there appears to be a significant downward trend in Diazinon concentrations at the MLS.

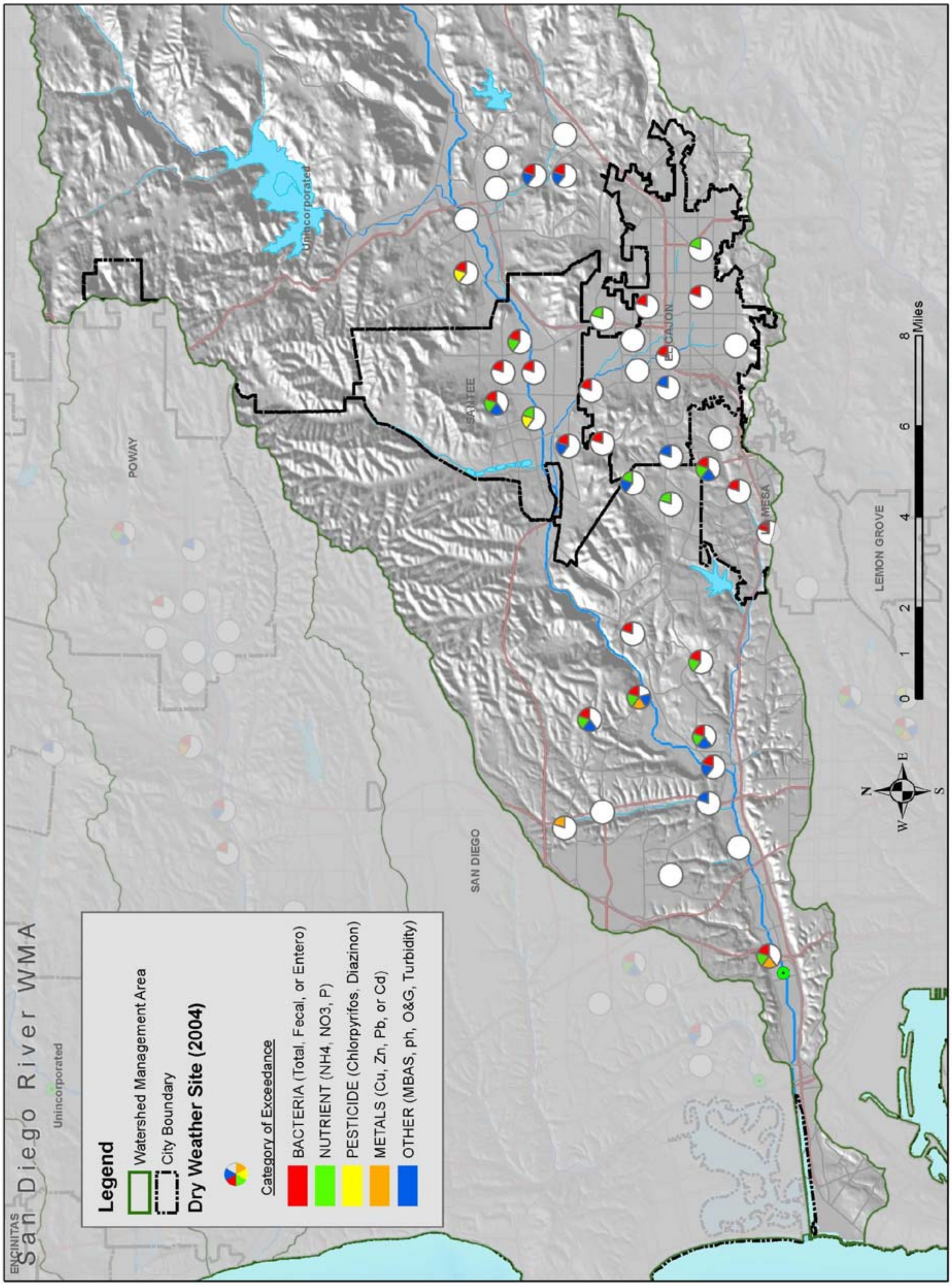

Figure 10-3. San Diego River WMA dry weather exceedance map.

10.3 Stream Bioassessment

Stream bioassessment in the San Diego River WMA included two urban affected monitoring sites. The upstream site was located in Mission Trails Regional Park, and the downstream site was located upstream of the Morena Blvd. overcrossing in Mission Valley.

10.3.1 Results and Discussion

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 2004 survey and Very Poor for the May 2005 survey (Table 10-5) (See Section 3.2 for details on the sampling approach). Taxa richness was moderate to low, with 23 and 14 different taxa collected in the October 2004 and May 2005 surveys, respectively. Two and three different EPT taxa were collected in the October and May surveys. There were no organisms collected that are highly intolerant to impairment, and the percent tolerant comprised 33% and 2% of the community in October 2004 and May 2005, respectively.

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. Water quality was variable, with very high specific conductance in October and relatively low values in May. Specific conductance values were 6.018 mS/cm in October and 1.691 mS/cm in May. Values for pH were 7.5 and 8.2 for the October and May surveys, respectively.

The benthic community was seasonally variable. In October, dominance by a single taxon was low and Chironomid midges; the biting midge, *Dasyhelea*; the caddisfly, *Hydroptila*; the clam, *Corbicula fluminea*; and the damselfly, *Argia,* were the most abundant (Table 10-6). In May, the community was dominated by the black fly, *Simulium,* and the mayflies, *Baetis* and *Fallceon quilleri*. Percent collector filterers plus collector gatherers increased from 53% of the community in October to 97% in May.

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.

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 2004 and May 2005 surveys (Table 10-5). The IBI scores were eight and four, which was an increase from the 2003-2004 surveys when the site was the lowest rated site in the county. Taxa richness was about double the previous years' surveys, with 17 and 12 different taxa collected in October and May, respectively. One EPT taxon was collected in both surveys. There were no organisms collected that are highly intolerant to impairment, and the percent tolerant taxa comprised 42% and 15% of the community in October and May, respectively.

The physical habitat of the monitoring reach was sub-optimal to near marginal. The San Diego River has a very low gradient through all of Mission Valley, although the riffles sampled were some of the only places where current velocity is greater than 1 ft/sec. and cobble was present. Two of the sample transects were dominated by cobble and small boulder, and one was primarily root mat. Specific conductance was relatively high to moderate, but lower than at the Mission Trails site. Values were

3.825 ms/cm in October 2004 and 1.547 ms/cm in May 2005. Values for pH were 7.7 and 7.4 for the October and May surveys, respectively.

Table 10-5. Selected Biological Metrics and Physical Measures of the San Diego River WMA.

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)	
Survey	**Oct-04**	**May-05**	**Oct-04**	**May-05**
Index of Biotic Integrity/ Qualitative Rating	**20 Poor**	**6 Very Poor**	**8 Very Poor**	**4 Very Poor**
Metrics				
Taxa Richness	23	14	17	12
EPT Taxa (mayflies, stoneflies, and caddisflies)	2	3	1	1
% Intolerant Taxa	0%	0%	0%	0%
% Tolerant Taxa	33%	2%	42%	15%
Average Tolerance Value	6.8	5.6	6.7	6.1
% Collector Filterers +Collector Gatherers	53%	97%	67%	83%
Physical Measures				
Elevation	180		10	
Physical Habitat Score	158	181	120	144
Riffle Velocity (ft/sec)	0.8	1.6	2.3	1.8
Substrate Composition				
Silt	13%			
Sand		3%	10%	37%
Gravel	2%	7%	10%	6%
Cobble	30%	72%	40%	35%
Boulder	27%	18%	7%	22%
Roots	26%		33%	
Bedrock/Solid	2%			
Water Quality				
Temperature °C	19.4	18.8	21.4	20.8
pH	7.5	8.2	7.7	7.4
Specific Conductance (ms/cm)	6.018	1.691	3.825	1.547
Relative Chlorophyll (μg/L)	2.9	4.9	5.3	8.2

Table 10-6. San Diego River WMA Community Summary.

Site	Survey	Taxon	Common Name	Percent Composition	Tolerance Value	Functional Feeding Group
San Diego River in Mission Trails Regional Park (SDR-MT)	Oct-04	**Chironomidae**	**non-biting midges**	**17%**	**6**	**Collector Gatherer/Filterer**
		Dasyhelea	biting midge	12%	6	Collector Gatherer
		Hydroptila	microcaddisfly	10%	6	Piercer Herbivore
		Corbicula fluminea	clam	10%	10	Collector Filterer
		Argia	dancer damselfly	8%	7	Predator
	May-05	***Simulium***	**black fly**	**57%**	**6**	**Collector Filterer**
		Baetis	minnow mayfly	21%	5	Collector Gatherer
		Fallceon quilleri	minnow mayfly	11%	4	Collector Gatherer
		Chironomidae	non-biting midges	6%	6	Collector Gatherer/Filterer
		Oligochaeta	earth worm	2%	5	Collector Gatherer
San Diego River Upstream of Morena Blvd. (SDR-1)	Oct-04	***Simulium***	**black fly**	**31%**	**6**	**Collector Filterer**
		Turbellaria	flatworm	14%	4	Predator
		Hyalella	amphipod	13%	8	Collector Gatherer
		Corbicula fluminea	clam	11%	10	Collector Filterer
		Prostoma	tongue worm	10%	8	Predator
	May-05	***Simulium***	**black fly**	**52%**	**6**	**Collector Filterer**
		Hydra	hydra	15%	5	Predator
		Chironomidae	non-biting midges	10%	6	Collector Gatherer/Filterer
		Hyalella	amphipod	10%	8	Collector Gatherer
		Oligochaeta	earth worm	4%	5	Collector Gatherer

The benthic community was dominated by the the black fly, *Simulium,* in both surveys, but the community was otherwise variable (Table 10-6). In the October survey, flatworms, the amphipod, *Hyalella*, and the clam, *Corbicula fluminea,* were abundant. In the May survey, *Hydra*, Chironomid midges and *Hyalella* were abundant. The most significant organism collected was the sensitive caddisfly, *Oxyethira,* in October, which comprised two percent of the community. The amphipod, *Americorophium*, typically an estuarine species that likely colonizes the site from farther downstream, was much less abundant than in previous surveys (MEC-Weston 2005). This may have been due to the higher freshwater flows from the heavy winter rains.

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. Constituents of concern identified during storm water sampling that would have a negative impact on the biological community included total suspended solids and turbidity (Table 10-3). Toxicity to *Ceriodaphnia* and *Hyalella* from storm water was not detected in 2004-2005. Total dissolved solids and metal concentrations were below exceedance levels, but were present in high enough concentrations to have a probable cumulative impact on sensitive organisms.

10.3.2 Summary and Conclusions

The San Diego River WMA was sampled at two monitoring sites on San Diego River, one in Mission Trails Regional Park, and one 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 IBI score of the Mission Valley site increased substantially from the previous years surveys, and relatively high numbers of a sensitive caddisfly were collected in October 2004.

10.4 Ambient Bay and Lagoon Monitoring

No sampling was performed at the mouth of the San Diego River as part of the Ambient Bay and Lagoon Monitoring program.

10.5 WMA Assessment

The San Diego River Watershed Management Area was assessed utilizing chemistry and toxicity data collected during storm events from a single MLS, chemistry data collected from 49 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, 2004 and were located upstream of the MLS. The data from Padre Dam was incorporated in to 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 10-7.

For the San Diego watershed, four constituents were found to have a high frequency of occurrence and are listed below. All constituents received three diamonds based on Criterion No. 3, with the exception of fecal coliform which received three diamonds based on Criterion No. 1. These constituents include:

- Fecal Coliform
- Total Coliform
- Enterococcus
- Turbidity

One constituent was found to have a medium frequency of occurrence and received two diamonds based on Criterion No. 7. This constituent was:

- Total dissolved solids

Two constituents, ammonia and orthophosphate, were found to have a low frequency of occurrence (one diamond) based on dry weather data alone. However, after combining third party data from Padre Dam in the evaluation, these constituents were no longer identified as COCs.

Table 10-7. Constituent exceedances in the San Diego River WMA.

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		CUMULATIVE		2004			
	#/3	%	#/3	%	#/3	%	#/3	%	#/12	%	#	%		
Conventional Parameters														
pH	0	0	0	0	0	0	0	0	0	0	3	4	-	-
BOD	1	33	0	0	1	33	0	0	2	17	NA	NA	-	-
COD	1	33	0	0	0	0	1	33	2	17	NA	NA	-	-
Surfactants (MBAS)	1	33	0	0	0	0	0	0	1	8	1	2	-	-
Total Dissolved Solids	0	0	1	33	2	67	0	0	3	25	52	72	♦♦	7
Total Suspended Solids	0	0	1	33	0	0	1	33	2	17	NA	NA	-	-
Turbidity	0	0	3	100	2	67	2	67	7	58	16	13	♦♦♦	3
Nutrients														
Ammonia	0	0	0	0	0	0	0	0	0	0	7	6	-	-
Orthophosphate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6	5	-	-
Nitrate as N	0	0	0	0	0	0	0	0	0	0	2	2	-	-
Bacteriological														
Total Coliform	1	33	2	67	1	33	2	67	6	50	23	19	♦♦♦	3
Fecal Coliform	1	33	3	100	3	100	3	100	10	83	20	17	♦♦♦	1
Enterococcus	0	0	2	67	2	67	2	67	6	50	12	24	♦♦♦	3
Pesticides														
Chlorpyrifos	1	33	3	100	0	0	0	0	4	33	0	0	-	-
Diazinon	2	67	0	0	0	0	0	0	2	17	2	5	-	-
Total Metals														
Antimony	0	0	1	33	0	0	0	0	1	8	NA	NA	-	-
Dissolved Metals														
Copper	0	0	0	0	0	0	0	0	0	0	3	6	-	-
Toxicity													**EVIDENCE OF PERSISTENT TOXICITY?**	
Selenastrum 96-hour	1	33	0	0	0	0	0	0	1	8	NA	NA	No	
Bioassessment	IBI Rating												**EVIDENCE OF BENTHIC ALTERATION?**	
San Diego River, at Mission Trails Park	Poor		Poor		Poor		Very Poor		Poor		NA		Yes	
San Diego River, at Mission Valley (DS)	Very Poor		Very Poor		Very Poor		Very Poor		Very Poor		NA			

* = Total number of observations varied among constituents.
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

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 water quality objective in 46% 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.

Toxicity tests conducted on *Selenastrum* showed evidence of toxicity in one of the 12 tests conducted since 2001. No other test organism 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 10-4 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 MLS results in Table 10-7 for each constituent category. The overall number of water quality objectives exceedances at the San Diego River MLS has remained low during the last four monitoring seasons with bacteriological and conventional parameters being the only COC during the past two monitoring seasons.

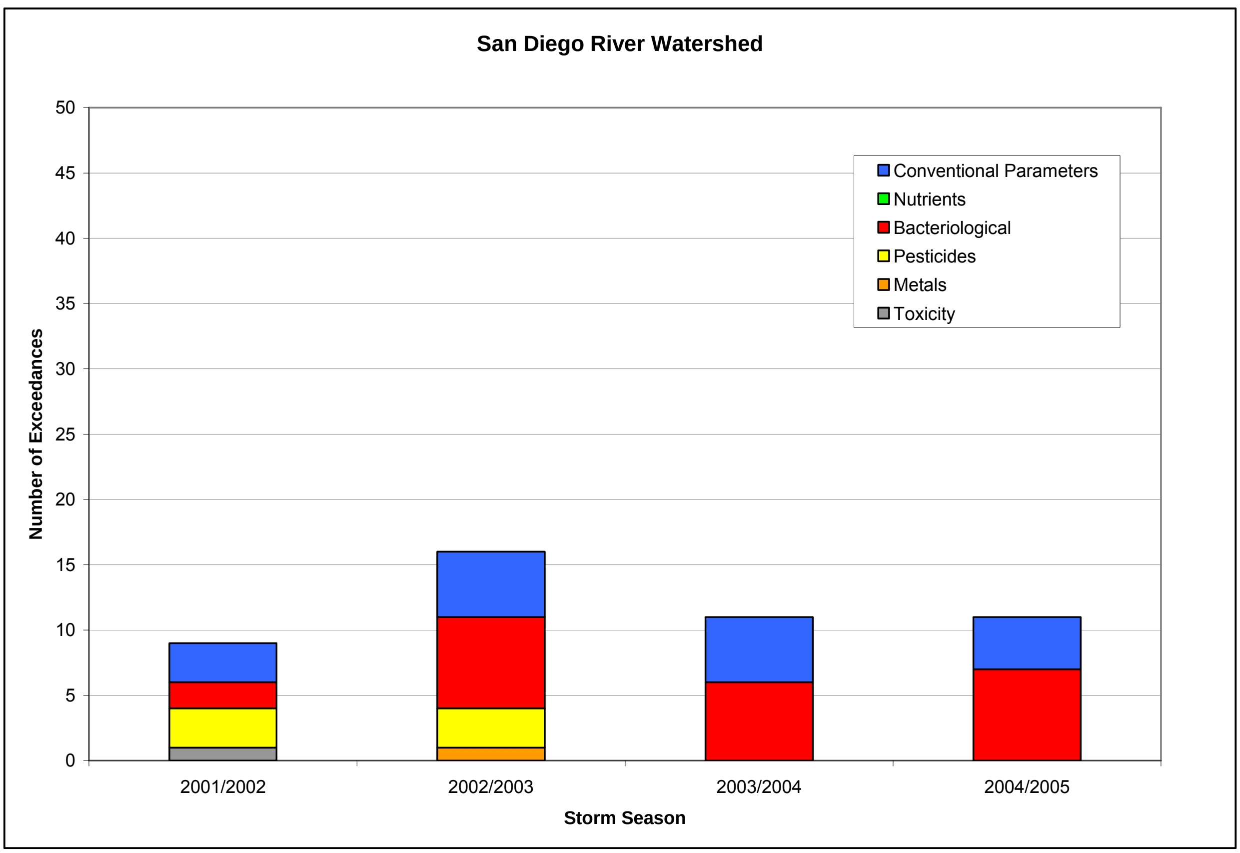

Figure 10-4. Stacked bar chart of the number of wet weather exceedances of constituent groups in San Diego River.

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. While conductivity can be used to estimate TDS values, it is notable that there is a statistically significant decreasing trend in conductivity (R^2=0.67) over the past four monitoring seasons. 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. There were no statistically significant increasing trends evident for any of the parameters monitored at the San Diego River MLS.

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 10-8 summarizes these results and lists possible conclusions and actions.

Table 10-8. Decision matrix results for 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 turbidity exceedances were elevated due to the excessive rainfall experienced during the 2004-2005 monitoring season. The increase in turbidity exceedances of the dry weather action levels from 2003 to 2004 also supports the need for increased attention to this parameter. It is also recommended to continue monitoring to gather long-term trend information and to consider the potential role of physical habitat disturbance.

Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Diego River WMA

The water quality priority ratings presented in Table 10-9 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 2004-2005 annual report and data from the following programs:

- Storm water Mass Loading Monitoring (MLS) – Wet Weather Data
- Co-permittee Dry Weather Data Monitoring
- Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring (ABLM)
- Urban Stream Bioassessment Monitoring
- Triad Assessment – Toxicity Testing of Storm water
- 303d Listing

Table 10-9. Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Diego River WMA

Watersheds/Sub-watersheds	Percentage of Total Area	Priority Ratings*									
		Constituent Groups								Stressor Groups	
		Heavy Metals	Organics	Oil and Grease	Sediments	Pesticides	Nutrients	Gross Pollutants	Bacteria/ Pathogens	Benthic Alterations	Toxicity
San Diego River WMA	**100%**	**D**	**D**	**D**	**A**	**B**	**C**	**C**	**A**	**A**	**D**
Lower San Diego HA (907.10)	40%	D	D	D	A	B	A	A	A	A	D
San Vicente HA (907.20)	17%	D	D	D	B	B	D	D	B	B	D
El Capitan HA (907.30)	20%	D	D	D	B	A	D	D	B	B	D
Boulder Creek HA (907.40)	23%	D	D	D	B	B	D	D	B	B	D

Notes:

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

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

The purpose of the BLTEA 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.

Sediments, bacteria, and benthic alteration were the highest priority (A rated) constituents for the San Diego River WMA followed by pesticides which was given a B rating. All other constituents were given either a C or D rating.

The Lower San Diego sub-watershed, which accounts for 40% of the San Diego River WMA, had high priority (A) ratings for sediments, nutrients, gross pollutants, bacteria, and benthic alteration. The El Capitan sub-watershed, which accounts for 20% of the San Diego River WMA, had a high priority (A) rating only for pesticides. The San Vicente sub-watershed, which accounts for 17% of the San Diego River WMA, and the Boulder Creek sub-watershed, which accounts for 23% of the San Diego River WMA, each had only B priority ratings for sediments, pesticides, bacteria, and benthic alteration.

A regional evaluation and description of the BLTEA is presented in the Regional Assessment Section 13. The complete tables used to calculate the ratings are presented in Appendix G.

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 and all three bacterial indicators 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. As noted in Section 10.2.3, the TDS water quality objective may not accurately reflect the natural conditions of the San Diego River WMA. Dissolved oxygen in samples collected by Padre Dam exceeded the Basin Plan water quality objective 46% of the time. Although ammonia and orthophosphate in dry weather data may indicate localized issues within the WMA, the evaluation and combination of Padre Dam data in the assessment process suggests that on a regional scale these constituents do not frequently exceed water quality objectives. The occurrence of these constituents may be a result of numerous activities or sources. The stream habitat quality was rated Poor in Mission Trails, a large open recreation space, and Very Poor in Mission Valley, a highly urbanized residential and commercial corridor. The Very Poor rating in Mission Valley may be a result of physical disturbances to habitat, insecticides or other COC that are not analyzed for in this program, or algal growth observed and measured as chlorophyll within the stream.

In addition to the WMA assessment findings, the BLTEA ratings found sediments, bacteria, and benthic alteration were the highest priority (A rated) constituents for the San Diego River WMA followed by pesticides which was given a B rating.

The information provided from the triad matrix results used in conjunction with the BLTEA ratings can assist the jurisdictions in making informed decisions in developing their WURMP programs. The two reports 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 BLTEA ratings and overall WMA assessments.

The recommendations for the San Diego River watershed are to continue monitoring to gather long-term trend information.