Santa Margarita River Home$_2$Ocean
A Citizen's Water Quality Monitoring Program

Data Report

Data Summary and Interpretation
For Annual Quarters:
July – September 2003
October – December 2003
January – March 2004
April – June 2004
July – September 2004

Data Interpretation for
Bioassessment Activities:
June 11, 2003
November 7, 2003
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To the citizen volunteers who donated their time, energy, enthusiasm, skills, and knowledge to the successful completion of this program, thank you. The many tasks you participated in included developing newsletter layouts, writing newsletter articles, attending water quality workshops, trainings and presentations, and enthusiastically disseminating the knowledge gained about water quality issues and the $Home_2Ocean$ Program. You also spent many hundreds of hours collecting and testing water quality samples. Without your involvement, the data interpreted in this report would not have existed. Thank you.

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1. INTRODUCTION

The Santa Margarita River watershed covers approximately 750 square miles within northern San Diego County and southwestern Riverside County. Murrieta and Temecula Creeks converge and form the Santa Margarita River west of the Interstate 15 and just north of the San Diego/Riverside County line. The river's mainstem descends, undammed, for 27 miles, through Riverside County, San Diego County, and Camp Pendleton before emptying into the Pacific Ocean at the Oceanside Harbor. In recent years, the Santa Margarita River has experienced increased urbanization and farming operations in the upper watershed. This urbanization is causing serious impacts on this river, its ecosystem and the overall health of the watershed.

Mission Resource Conservation District's Santa Margarita River Home$_2$Ocean A Citizen's Water Quality Monitoring Program (Home$_2$Ocean Program) monitored the water quality, in the Santa Margarita River watershed, of the Santa Margarita River (SMR) and two of its tributaries, Rainbow and Stone Creeks. The water quality of Adobe and Cole Creeks, which drain into Murrieta Creek, were also monitored.

The participants of the Home$_2$Ocean Program are Riverside County Flood Control, San Diego State University (SDSU), San Diego Stream Team, County of Riverside Flood Control, the County of San Diego, The Nature Conservancy (TNC), and citizen volunteers. The goals of the Home$_2$Ocean Program are to implement a citizen-based volunteer water quality monitoring program and to increase public awareness of Santa Margarita River watershed issues through the following activities: 1) develop a citizen-based water quality monitoring program; 2) solicit and train volunteers to carry out 14 months of water sampling and four bioassessment procedures to monitor the physical habitat and biological conditions of significant tributaries of the Santa Margarita River; 3) use the monitoring program and the information it generates to educate the general public about the current state of the watershed; and 4) assess watershed awareness of targeted groups through the implementation of a watershed questionnaire before and after outreach efforts.

The Santa Margarita River mainstem sampling site, as well as the entire reach of Stone Creek, was located on the Santa Margarita Ecological Reserve (SMER), which lies just north of Fallbrook and is in both northwest San Diego County and southwest Riverside County. SMER is a field study station owned, in part, by Bureau of Land Management, California Department of Fish and Game, and the San Diego State University and is managed by SDSU. The Rainbow Creek sampling site was located in the northern portion of Fallbrook on Fallbrook Public Utility District land.

The Santa Margarita River, Rainbow Creek, and Stone Creek were sampled every two weeks, starting at the same time every sampling date and each site was sampled in the same sequence for a total of 29 sampling dates. Stone Creek was sampled first, then the Santa Margarita River mainstem, and Rainbow Creek was sampled last. The sampling started around 9 am and finished by 12 o'clock noon. The sequence in which the sampling sites were sampled was determined by logistics. Stone Creek was the farthest site from Mission RCD's office and also tended to have a higher density of biting insects later in the morning than any other of the sampling sites. Thus, this site was selected to be the first site sampled in the morning. The Santa Margarita River mainstem sampling site was between the Stone Creek and Rainbow Creek sampling sites and was thus, selected to be sampled after Stone Creek.

The Santa Margarita River was sampled above the confluences of Stone and Rainbow Creeks and only one braid (or side channel) of the river was sampled.

Adobe and Cole Creeks are located on the Santa Rosa Plateau Ecological Reserve (SRPER) near Murrieta, CA, in southwestern Riverside County. SRPER is owned and managed by The Nature Conservancy, the County of Riverside, and the California Department of Fish and Game. Both creeks are located on the eastern portion of the Santa Margarita River watershed. Adobe and Cole Creeks were not sampled as often as the other three sites, as they were sampled, not by the volunteers who monitored SMR mainstem, Rainbow Creek, and Stone Creek, but by a TNC Project Ecologist who followed both the $Home_2Ocean$ Program's QAPP and Framework Monitoring Plan, and used the $Home_2Ocean$ Program's monitoring equipment. The sampling site on Cole Creek was ephemeral, as was Stone Creek at the first sampling site. Adobe and Cole Creeks were sampled as often as the Project Ecologist was able, on the same sampling dates as the Stone Creek, Rainbow Creek, and SMR mainstem sampling sites. Adobe Creek was always sampled first, with Cole Creek always being sampled second. Sampling usually commenced at 1 pm and ended at 2 pm.

Maps of the sampling sites are attached to this report as Appendix A. Photographs of the sampling sites are attached to this report as Appendix B.

The sampling methods for the water quality and physical habitat parameters are described, in detail, in the $Home_2Ocean$ Program's Framework Monitoring Plan, which is attached to this report as Appendix C. The water quality data collected and interpreted in this report is attached to this report as Appendix D. The sampling site conditions for each sampling date can be found attached to this report as Appendix E.

The land uses for each of the individual watersheds are distinct. Stone Creek's watershed consists primarily of open spaces with diverse vegetation. There are very little agricultural or urbanized developments in this watershed. This was true for the two sampling sites used on Stone Creek. Rainbow Creek's watershed consists of dense agricultural and urbanized developments (including residential and commercial land uses) at its headwaters. There is a high density of agriculture along the entire length of the creek until it reaches the Santa Margarita River. The Santa Margarita River watershed is highly diverse in its land uses, which range from agriculture, commercial, and residential to range lands and natural open vegetation spaces. The land uses in Adobe Creek's watershed, as with Stone Creek, is primarily open spaces with diverse vegetation, which ranges from grassland to chaparral. Cole Creek's watershed is more diverse in its land uses than Adobe Creek, as it includes ranchette style developments, equestrian and small scale agricultural land uses. Stone Creek was chosen to serve as a reference site for the Santa Margarita River and Rainbow Creek sampling sites. Rainbow Creek was chosen to represent a highly impacted water body. The Santa Margarita River site was chosen, as the data from this water body will be used to generate a baseline understanding of the water quality in the upper Santa Margarita River. Adobe and Cole Creeks were chosen to generate a baseline understanding of the water quality in the upper section of the Santa Margarita River watershed.

A land use map of the Santa Margarita River watershed is attached to this report as Appendix F.

Water is imported from the Colorado River into Lake Skinner where it is mixed with State Project Water (SPW) to dilute the high TDS levels found in the water from the Colorado River.

Rancho California Water District discharges this mixture directly into the confluence of Murrieta and Temecula Creeks, the start of the Santa Margarita River. During the 2003/2004 water year (beginning in October 2003 and ending in September 2004), approximately 34% of the 3,146 acre feet (1,025,127,246 gallons) of water discharged into the SMR was State Project water, while the other 66% was Colorado River water (Jenks 2005). The average TDS level of the State Project/Colorado River water during the 2003/2004 water year was 499.6 mg/L (ppm).

The State Water Resources Control Board Water Quality Control Plan (Basin Plan) for the San Diego Region designates the beneficial uses and water quality objectives for the inland surface waters in the Santa Margarita River watershed. Rainbow Creek is listed on the Clean Water Act 303(d) list as being impaired by excess nitrogen and phosphorus. The upper section of the Santa Margarita River, which includes the water quality sampling site, is also on the 303(d) list for phosphorus.

2. DATA POINT EXPLANATIONS

Appendix G: Missing Data Point Explanations displays the following narrative in a summary table of sampling dates, parameters, and reasons for when water quality data was not gathered.

Stone Creek: Water quality sampling did not take place on Stone Creek between August 12 and November 4, 2003, as the sampling site had dried-up. Sampling did not resume until November 18, 2003, when the rainy season resulted in the creek filling with water. The creek did not initially flow, at the start of the rainy season, but rather formed standing pools of water. Water quality sampling did not take place at this site on January 27, 2004, as there were no vehicles available to access the sampling site. Streamflow was never monitored at this site, as there was never enough flow to perform a velocity test, which is necessary to measure streamflow.

The data represented by Stone Creek are from two sampling sites. Before May 18, 2004, the original sampling site was used. As Stone Creek dried up and only standing pools remained, it was decided that another sampling site was needed. The second sampling site, where Stone Creek is fed by a perennial spring, was approximately 0.25 miles downstream of the original sampling site. The first sampling site on Stone Creek was ephemeral, while the second sampling site was not. During the late stages of the non-rainy season in 2004, all of the water in Stone Creek, downstream of the conjunction of Stone Creek and the unnamed spring, is from the unnamed spring. Thus, all of the water quality, physical habitat, and bioassessment data from May 18, 2004 on are from the second sampling site on Stone Creek. The two sites' data are distinguished by the first site's data being represented by open circles, while closed circles represent the second site's data.

For Stone Creek, the water quality parameters (not including streamflow, total coliform, and *E. coli*) were sampled approximately 73% of the total 30 possible sampling dates. The total coliform and *E. coli* quantities were sampled approximately 70% of the total 30 possible sampling dates. Streamflow was never measured at Stone Creek. Air temperature was recorded approximately 77% of the total 30 possible sampling dates.

Santa Margarita River (SMR) mainstem: Water quality sampling did not occur at this site, on August 26, 2003, as access to the site was blocked by road construction on the one road onto the south end of the Santa Margarita Ecological Reserve. Streamflow was not measured at this site for the September 23 and November 4, 2003 sampling dates, as the proper wading equipment for the volunteers was not available. Streamflow was also not measured at this site on October 21, 2003 and June 1, 2004, as there was no surface flow, only subsurface flow, and so a velocity test was unable to be performed due to the measuring method for flow velocity. This occurred due to either wind resistance in the opposite direction of the current on the surface of the water or by upstream obstacles blocking the surface water flow.

For Santa Margarita River, the water quality parameters (not including streamflow) were sampled approximately 93% of the total 30 possible sampling dates. Streamflow was measured approximately 80% of the total 30 possible sampling dates. Air temperature was recorded approximately 87% of the total 30 possible sampling dates.

Rainbow Creek: Streamflow was unable to be monitored at this site on December 16, 2003, as leaves had blocked the creek at the trail crossing and back-eddies had formed, which made performing a velocity test impossible due to the measuring method for flow velocity.

For Rainbow Creek, the water quality parameters (not including streamflow, total coliform, and *E. coli*) were sampled approximately 97% of the total 30 possible sampling dates. Streamflow, total coliform, and *E. coli* were sampled approximately 93% of the total 30 possible sampling dates. Air temperature was recorded approximately 90% of the total 30 possible sampling dates.

Adobe Creek: Streamflow was never monitored at this site, as there was never enough flow to perform a velocity test, which is necessary to measure streamflow. Total coliform and *E. coli* levels were never measured for this site, during the reporting period, as the $Home_2$Ocean Program did not initially plan to incorporate the data, from this site, into the interpretation report.

For Adobe Creek, the water quality parameters of water temperature, pH, and total dissolved solids were sampled approximately 100% of the total 14 sampling dates. Dissolved oxygen and turbidity were sampled approximately 93% of the total 14 sampling dates, while ortho-phosphates and nitrate-nitrogen were sampled approximately 43% of the total 14 sampling dates. Air temperature was measured approximately 86% of the total 14 sampling dates.

Cole Creek: Streamflow was never monitored at this site, as there was never enough flow to perform a velocity test, which is necessary to measure streamflow. Cole Creek was sampled only nine of the 14 dates, as the sampling site was dry on five occasions. Total coliform and *E. coli* levels were never measured for this site, during the reporting period, as the $Home_2$Ocean Program did not initially plan to incorporate the data, for this site, into the interpretation report.

For Cole Creek, the water quality parameters of water temperature, dissolved oxygen, pH, and total dissolved solids were sampled approximately 100% of the total 9 sampling dates. Turbidity was sampled approximately 89% of the total 9 sampling dates, while ortho-phosphates and nitrate-nitrogen were sampled approximately 67% of the total 9 sampling dates. Air temperature was also measured approximately 67% of the total 9 sampling dates.

All sites: Air temperature was not measured July 29 and August 12, 2003 as new bulb thermometers had to be reordered and no others were available for use. The December 30, 2003 sampling date was cancelled due to the holiday season.

3. PHYSICAL HABITAT DATA

3.1 PERCENT OVERSTORY DENSITY

Canopy (overstory) density can affect water quality by influencing, not only temperature through the presence or absence of shade, but it can also affect the chemical properties of water, in some instances, by the leeching of chemicals from the leaves that drop into the water into the water itself. The importance of water temperature is discussed in Section 7.3 Water Temperature & Air Temperature.

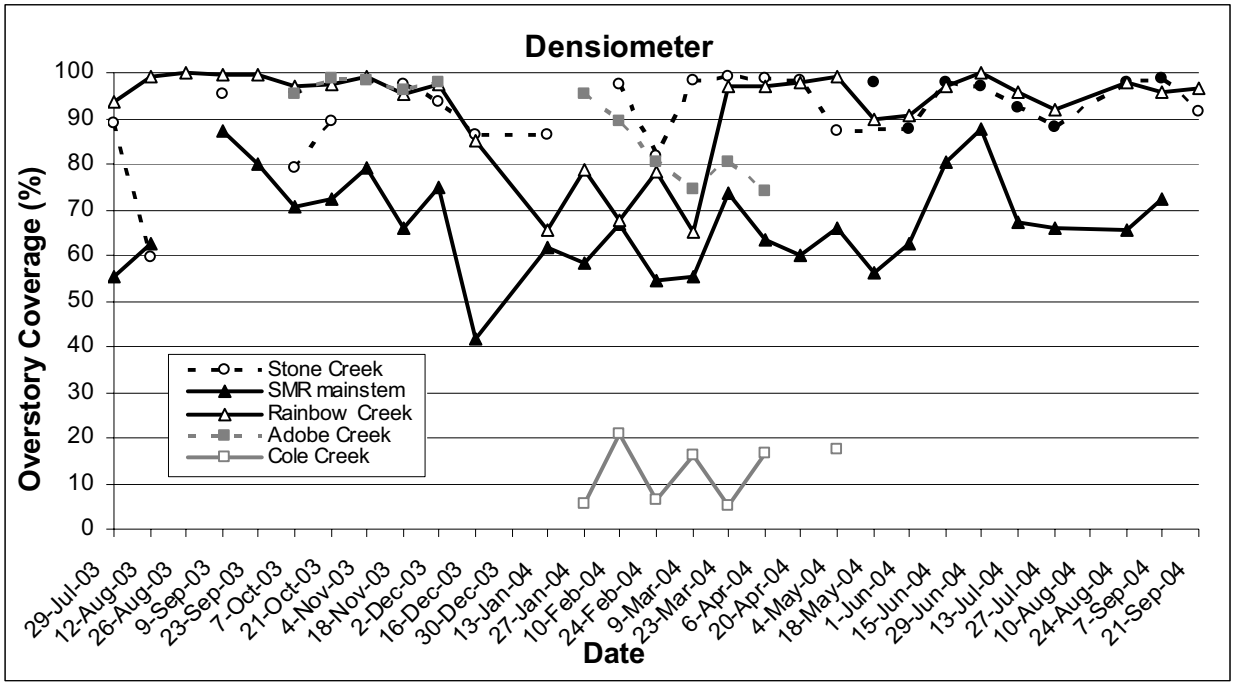


Figure 1. The physical habitat condition of percent overstory coverage, or canopy density, was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis scale represents each date the physical habitat conditions were recorded.

Stone Creek maintained a fairly high and stable canopy density. This was thought to be due to the fact that Stone Creek is lined with coast live oak trees (*Quercus agrifolia Nee*), which is predominantly due to perennial low flow water conditions. Very rare flooding regimes with low flow conditions allow for the growth of the thick oak canopy. The combination of the oaks' thick foliage and the fact that they are an evergreen tree resulted in consistently high percentages of overstory coverage throughout the year.

Rainbow Creek is lined with sycamore trees (*Platanus occidentalis*), which are deciduous (they loose their leaves during the fall and winter months and grow new leaves each spring). A low flooding regime with stable, unvarying water conditions leads to high canopies that change seasonally. During the spring and summer, the canopy maintained a high percentage of overstory density (usually at or near 100% coverage), as the sycamores were densely populated and had large, healthy leaves. However, when the sycamores lost their leaves in the fall and winter, the percent density dropped in response. During the March 2004 sampling

dates, the percent canopy coverage reestablished its former spring percentage as the leaves on the trees grew back.

Santa Margarita River is lined with sycamores and coast live oaks, as well as other tree species. However, it is not as densely distributed, which resulted in the percent overstory coverage to be lower than the densely populated Rainbow and Stone Creeks. High flooding regimes combined with high flow conditions result in long-term fluctuations in canopy density due to vegetative breakdown, regeneration, and seasonal changes. When the sycamores lost their leaves, a decrease in the percent overstory coverage was observed for this site, as well. The percent overstory coverage began to regain its previous summer density as the leaves on the sycamores grew back.

Adobe Creek is lined with coast live oaks (evergreen), Engelmann oaks (*Quercus engelmannii*) (semi-deciduous), and sycamores and willows (deciduous). Engelmann oaks and willows are the tree species present at the sampling site and it has overstory density patterns to similar those of Rainbow Creek. Upstream of the sampling site is a huge stand of coast live oaks under which the creek travels.

Cole Creek is lined with sycamores, coast live oaks, and Engelmann oaks. At the sampling site, however, the trees, which were all sycamores, were set so far back from the water's edge that the sampling site was not shaded. Thus, this sampling site had continuously low percentages of overstory coverage.

4. RAINFALL

4.1 MEASUREABLE RAINFALL (TABLE AND GRAPH)

Measurable precipitation (rainfall) can greatly influence water quality. It can, on a temporary basis, dilute some water quality parameters, while increasing others. Rainfall, when it can not be absorbed into the ground, will flow on land into the nearest creek, river, lake or ocean. Anything that is on the surface of the ground can be carried into the nearest water body by the excess rainfall (called stormwater runoff). Examples of water quality pollutants that can be distributed into a water body by stormwater runoff are fertilizers, manure, pesticides, and sediment. This input of nutrients or other pollutants to the water course can be detrimental to the health of a water body.

Table 1. Total cumulative measurable precipitation (in inches) during the 2003-2004 rain season, with the rain season beginning July 1, 2003 and ending June 30, 2004, was recorded by the southern weather station on the San Diego State University's Santa Margarita River Ecological Reserve in Riverside County. No measurable precipitation was measured between May 30, 2004 through September 29, 2004 (the end of the water quality sampling period).

Calendar Day	Precipitation (in.)	Calendar Day	Precipitation (in.)	Calendar Day	Precipitation (in.)
7/11/2003	0.02	12/15/2003	1.42	2/25/2004	5.82
7/30/2003	0.15	12/23/2003	1.45	2/26/2004	7.13
9/2/2003	0.16	12/24/2003	1.56	2/27/2004	7.15
9/12/2003	0.16	12/25/2003	2.75	3/1/2004	7.26
9/16/2003	0.17	1/2/2004	3.07	3/2/2004	7.60
9/17/2003	0.17	1/3/2004	3.09	3/14/2004	7.60
10/10/2003	0.18	1/20/2004	3.26	3/15/2004	7.61
10/16/2003	0.18	1/26/2004	3.26	3/16/2004	7.61
10/30/2003	0.22	1/28/2004	3.27	3/20/2004	7.61
11/1/2003	0.39	1/29/2004	3.27	3/22/2004	7.62
11/4/2003	0.40	2/2/2004	3.86	3/23/2004	7.64
11/12/2003	1.03	2/3/2004	3.99	3/24/2004	7.65
11/13/2003	1.07	2/14/2004	4.00	4/1/2004	7.92
11/15/2003	1.14	2/18/2004	4.35	4/2/2004	7.99
11/16/2003	1.27	2/19/2004	4.36	4/3/2004	8.01
12/7/2003	1.31	2/21/2004	4.57	4/9/2004	8.01
12/11/2003	1.37	2/22/2004	5.39	4/17/2004	8.30
12/12/2003	1.37	2/23/2004	5.70	5/29/2004	8.36
12/14/2003	1.41	2/24/2004	5.72		

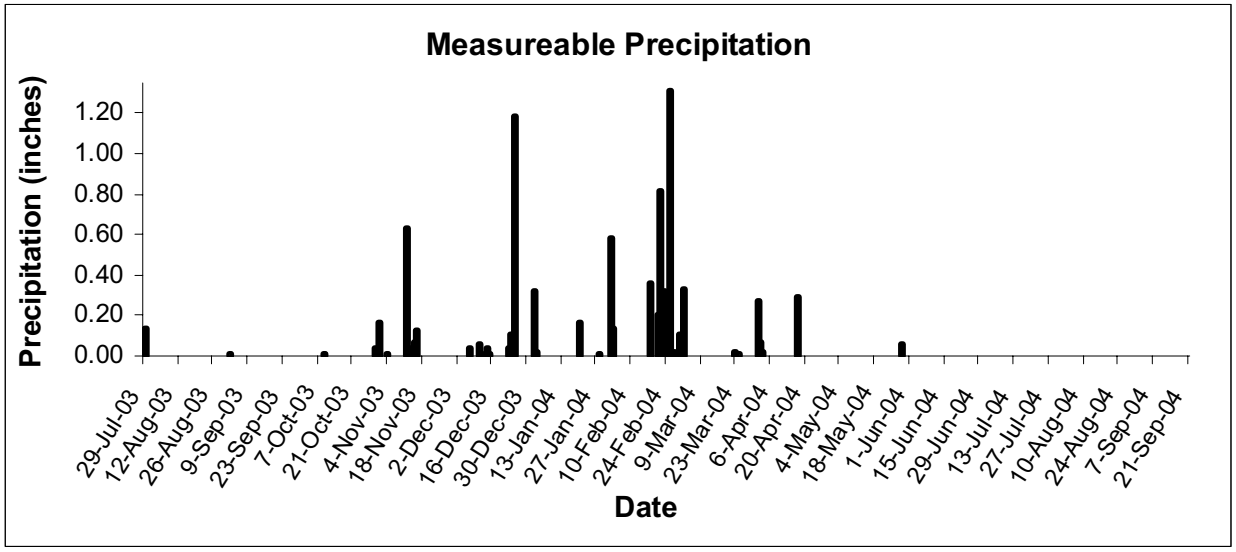


Figure 2. Measurable precipitation (in inches), between the dates of July 29, 2003 and September 30, 2004, was measured and recorded on a weather station at the south end of San Diego State University's Santa Margarita River Ecological Reserve in southwestern Riverside County. The last day of measurable precipitation, during this sampling period, was on May 29, 2004. The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

There were 18 days between July 29, 2003 and May 29, 2004 in which more than 0.10 inch of precipitation fell during a 24-hour period. The most pertinent days (which will be used to correlate with monitored water quality parameters) are November 1, November 12, and December 25, 2003, as well as January 2, February 2, the period between February 18 and February 23, and February 26, 2004.

More measurable rainfall data, from six other rain gauges in the region of the sampling sites, is attached to this report as Appendix H.

5. WATER QUALITY DATA

5.1 SUMMARY TABLE OF WATER QUALITY DATA

The descriptive statistics of the water quality data for all five sampling sites are summarized in the following two tables.

Table 2. The summary statistics of the data, for the Stone Creek, Rainbow Creek, and Santa Margarita River sampling sites near Fallbrook, CA, collected between the sampling period of July 29, 2003 and September 30, 2004. Discharge (streamflow) was not measured at either of the two Stone Creek sampling sites.

	Air Temp	Water Temp	DO	pH	TDS	Turbidity	Ortho-PO_4	NO_3-N	Flow	Total Coliform	*E. Coli*
	(°C)	(°C)	mg/L	unit	mg/L	NTU	mg/L	mg/L	CFS	MPN/100 ml	MPN/100 ml
Stone Creek site 1: July 29, 2003 through May 4, 2004											
Mean	18.8	15.5	4.7	7.2	580	1.1	0.13	0.05		3471	386
Median	17.5	14.7	5.2	7.1	577	0.0	0.12	0.05		1195	17
St. Dev.	4.3	2.8	1.3	0.4	23	2.0	0.05	0.04		6786	1175
Min	11.0	11.7	1.8	6.5	551	0.0	0.07	0.00		51	1
Max	25.0	22.1	6.3	8.3	631	8.0	0.26	0.13		24200*	4106
n	14	13	13	13	13	13	13	13		12	12
Stone Creek site 2: May 18, 2004 through September 30, 2004											
Mean	20.5	17.0	8.3	7.5	710	0.4	0.10	0.37		1427	5
Median	19.5	16.9	8.4	7.5	709	0.3	0.09	0.38		566	4
St. Dev.	2.4	1.4	0.5	0.2	7	0.3	0.02	0.07		1856	7
Min	17.5	14.7	7.0	7.1	697	0.0	0.06	0.24		170	1
Max	23.5	20.6	9.1	7.7	719	1.2	0.14	0.50		6294	21
n	9	9	9	9	9	9	9	9		9	9
Santa Margarita River mainstem: July 29, 2003 through September 30, 2004											
Mean	19.82	18.4	8.3	7.6	799	5.7	0.16	0.83	3.3	9256	75
Median	20	20.5	8.0	7.6	819	1.8	0.10	0.75	2.9	7250	25
St. Dev.	5.48	5.1	1.7	0.2	93	18.2	0.23	0.33	2.2	7993	220
Min	12	8.7	5.4	7.2	440	0.5	0.00	0.36	1.3	530	6
Max	29	27.3	11.6	8.2	915	100.0	1.40	1.88	12.0	24200*	1190
n	26	28	28	28	28	28	28	28	24	28	28
Rainbow Creek: July 29, 2003 through September 30, 2004											
Mean	21.31	17.2	8.7	7.5	1240	0.8	0.88	11.45	1.01	6080	342
Median	21.5	17.4	8.6	7.6	1267	0.3	0.60	11.40	0.91	4481	66
St. Dev.	4.74	3.5	1.0	0.2	144	2.1	0.94	1.79	0.54	6202	833
Min	13	11.1	6.4	7.0	551	0.0	0.10	7.20	0.37	112	7
Max	28.5	27.8	10.9	7.9	1329	12.2	5.40	14.60	3.13	24200*	4352
n	27	29	29	29	29	29	29	29	28	28	28

*This value is the upper limit of the water quality parameter's test. This value was used in the calculations of the descriptive statistics for the parameter.

Table 3. The summary statistics of the data, for the Adobe and Cole Creeks sampling sites near Murrieta, CA, collected between the sampling period of July 29, 2003 and September 30, 2004. Discharge (streamflow) and bacteria levels were not measured at either of the two sampling sites.

	Air Temp	Water Temp	DO	pH	TDS	Turbidity	Ortho-PO_4	NO_3-N	Flow	Total Coliform	*E. Coli*
	(°C)	(°C)	mg/L	unit	mg/L	NTU	mg/L	mg/L	CFS	MPN/100 ml	MPN/100 ml
Adobe Creek: July 29, 2003 through September 30, 2004											
Mean	20.38	16.1	9.0	7.1	427	1.7	0.13	0.03			
Median	21.75	15.3	8.6	7.1	393	1.4	0.08	0.03			
St.Dev.	6.079	4.3	2.0	0.3	78	1.6	0.13	0.03			
Min	10	1.5	6.2	6.6	326	0.5	0.04	0.00			
Max	30	25.0	14.2	7.8	600	6.9	0.41	0.07			
n	12	14	13	14	14	13	6	6			
Cole Creek: July 29, 2003 through September 30, 2004											
Mean	20.33	19.8	9.0	7.4	344	10.6	0.05	0.01			
Median	19	20.8	8.7	7.3	319	2.1	0.06	0.00			
St.Dev.	6.861	6.4	1.8	0.4	144	16.4	0.03	0.02			
Min	14	11.1	6.6	7.0	142	0.0	0.01	0.00			
Max	29	29.9	13.5	8.3	667	50.0	0.11	0.05			
n	6	9	9	9	9	8	6	6			

The completedness of each water quality parameter, for all of the sampling sites, is discussed in Section 4 DATA POINT EXPLANATIONS.

5.2 STREAMFLOW

Discharge (streamflow) can affect several water quality parameters. If there is not enough water discharged, then water might not be churned over rocks and debris in the water course, which would reduce the amount of dissolved oxygen in the water. Low discharge might also increase bacteria levels, as water will be remaining in one place for a longer period of time could allow for bacteria growth and population concentration.

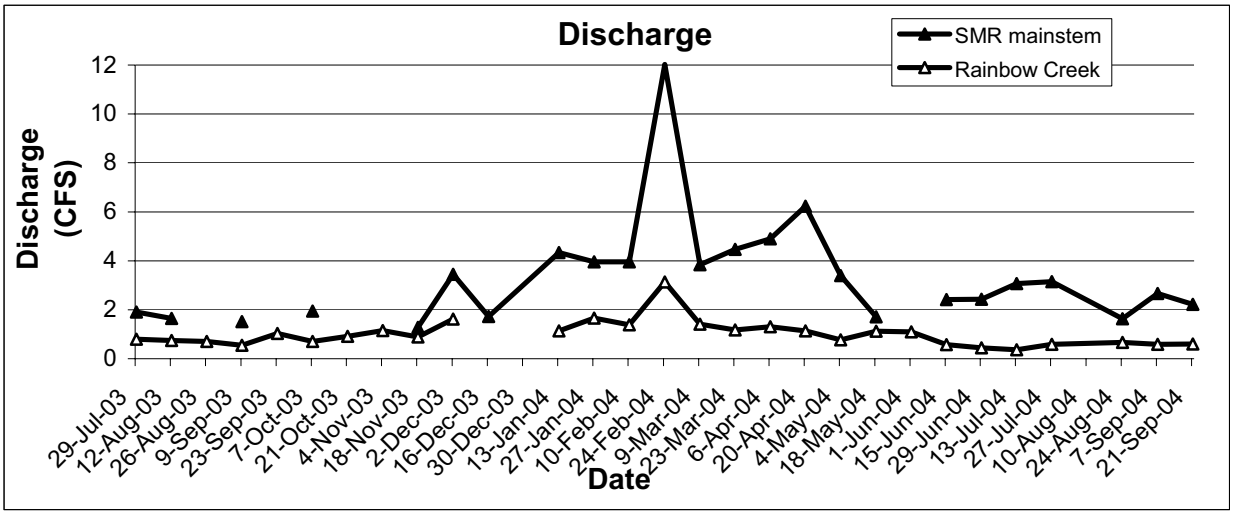


Figure 3. The physical habitat condition of discharge (streamflow) in Rainbow Creek and the Santa Margarita River (SMR) mainstem was monitored at Rainbow Creek and the Santa Margarita River mainstem sampling sites during the sampling period of July 29, 2003 through September 30, 2004. The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates. The y-axis is the streamflow in cubic feet per second (CFS).

The hydrograph of Figure 3 discloses several facts. The primary fact is that the Santa Margarita River (SMR) always had a much greater discharge rate (cubic feet per second) than Rainbow Creek. This is interesting to note as the Rainbow Creek sampling site was approximately 1 to 1.5 feet wider than the SMR sampling site, while it is approximately 1 to 2 feet shallower than the SMR sampling site. This means that more water was flowing through a narrower, deeper channel at the SMR sampling site than at the Rainbow Creek sampling site. Second, streamflow, at both sites, increased in response to increasing rainfall amounts. The drainage area of the Santa Margarita River watershed is much larger than the sub-watershed of Rainbow Creek, and so its streamflow increase was dramatically larger as it peaked at nearly 12 cubic feet per second. The streamflow at Stone Creek was never measured due to the fact that there was not enough velocity and water volume to perform a streamflow measurement. This fact is important to note as Stone Creek is approximately 1 to 2 feet wide and about 1 to 6 inches deep (approximately 1 sq ft) in comparison to the 13 foot wide and 2 foot deep (26 sq ft) SMR. Rainbow Creek is approximately 14 sq ft (14 foot wide and 1 foot deep). Stone Creek is much smaller and has less velocity and water volume than the other two sampling sites, which will affect water quality parameters, such as dissolved oxygen and bacterial counts.

The volume of water in Rainbow Creek and SMR (at the sampling sites), along with reach length, average cross-sectional area, and flow velocity, can be found attached to this report as Appendix I.

5.3 WATER TEMPERATURE & AIR TEMPERATURE

According to the California State Water Resources Control Board, water temperature can be considered as one of the most important water quality parameters. It influences both physical characteristics of water quality as well as many biological functions of the organisms living in the water. Water temperature influences the amount of dissolved oxygen in the

water as colder water can hold more dissolved oxygen than warmer water. Water temperature also affects the metabolic rates of the plants and animals in the water. The sensitivity of organisms to toxic waste, diseases, and parasites is also influenced by water temperature. The timing of aestivation (reduced metabolic activity), migration, and even reproduction is also affected by water temperature.

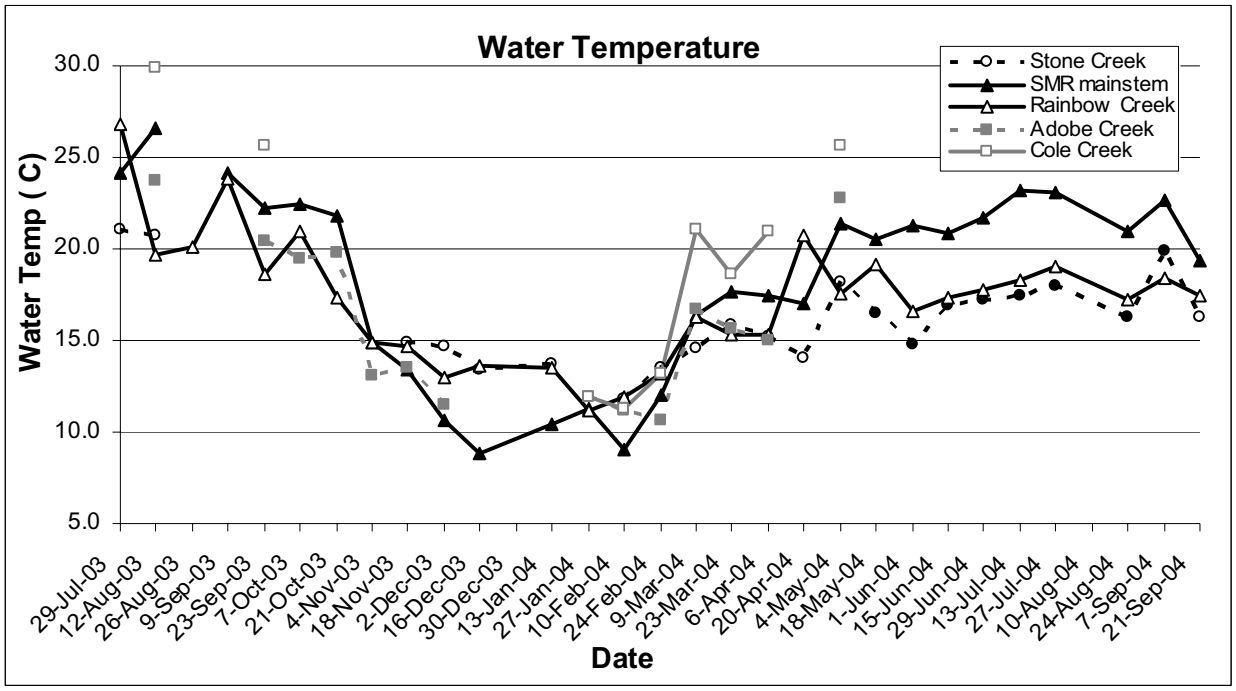


Figure 4. The water quality parameter of water temperature (in degrees Celsius) was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

As the year progressed from summer to fall to winter, the water temperature decreased. The temperature maintained a sort of equilibrium throughout the winter months (with more frequent rainy days) and began to increase during the early spring months. The water temperatures values, at all five sites, were within a close range of each other and followed the same trends. The air and water temperatures decreased and increased at approximately the same time.

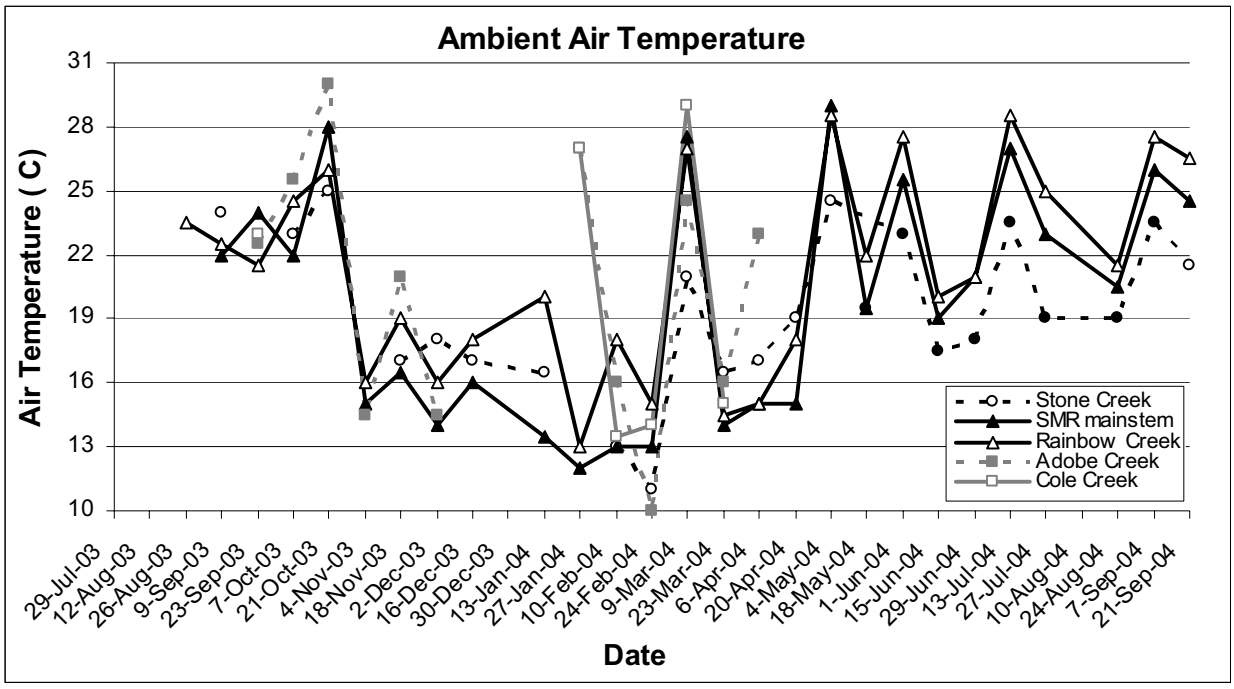


Figure 5. The physical habitat condition of air temperature was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

The ambient air temperature at all five sites decreased during the late fall and maintained the lower temperatures during the winter and early spring months. This was in concurrence with the frequent rainy days.

5.4 DISSOLVED OXYGEN

The California State Water Resources Control Board states that the amount of dissolved oxygen in water is vital to most aquatic organisms' survival and growth. High dissolved oxygen levels are needed by some species such as stoneflies and trout, while low dissolved oxygen levels are needed by other species such as dragonflies, worms, and catfish. When there is not enough oxygen in the water adult and juveniles may die, growth of the organisms is reduced, eggs and larvae won't survive, and the species that were originally present may be replaced with new, invasive species.

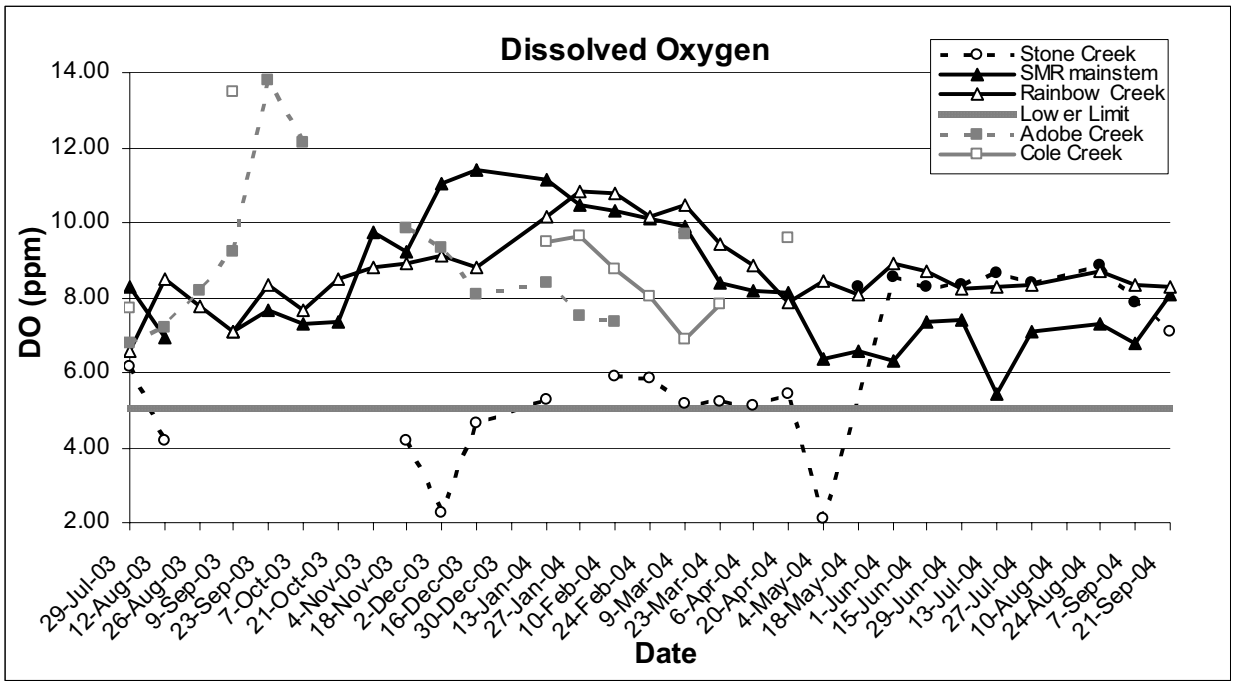


Figure 6. The water quality parameter of dissolved oxygen (in parts per million) was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

Over the course of the sampling period, the dissolved oxygen (DO) levels increased as the water temperatures decreased. This was an expected relationship between the two parameters as gases are more soluble in colder waters. Cole Creek had a high DO value for the sampling date of September 9, 2003, while Adobe Creek had high DO levels for the sampling dates of September 23 and October 7, 2003. The reasons for the high DO levels, at these two sampling sites, is that there were algae blooms in the water at the sampling sites. As the sites were sampled in the middle of the day, the plants were photosynthesizing and thus producing oxygen rather than using it. Stone Creek had noticeably lower DO levels than the other four sites. There are two possible reasons for this trend. First, there is very little algae or aquatic plant cover within Stone Creek, possibly a result of the consistent shade from the overstory canopy. Almost 100% of the plants growth is on the banks of the creek. This lack of vegetation in the stream would result in very little oxygen input into the water from biotic sources. Second, the water only trickles through the riffles at Stone Creek. There is not a lot of high velocity turnover of the water or turbulence, which would increase the DO levels in the water. These reasons were apparent during the May 4, 2004 sampling when samples were taken at one of the few standing pools of water that remained in Stone Creek. Also, for this sampling date, the decomposition of organic material (i.e. leaves, other plant material) would also have caused the DO in the water to plummet. During the next sampling date of May 18, 2004, the sampling location was moved to the second sampling site for Stone Creek.

The San Diego Region Basin Plan states that the lowest range limit for DO in waters that supports warm-water fishes is between 5 to 6 ppm (milligrams per milliliter). For cold-water fishes the Basin Plan objectives state the lowest range limit is 6 ppm. As the inland surface waters in the SMR watershed are listed as supporting both cold- and warm-water fishes, only

Stone Creek violates the Basin Plan objectives. The creek is ephemeral and so small that it is thought that it would not support fishes at this time.

5.5 pH

According to the California State Water Resources Control Board, the growth and survival of aquatic organisms require a narrow pH range. If the pH levels are too low or high (2 or 13) damage to gills, exoskeletons, and fins can occur. Chemical properties in the water can also be changed at differing pH levels, which can be toxic to the aquatic fauna living in the water. For example, an increase in pH causes nontoxic ammonium to convert into a toxic form of ammonia. A decrease in pH levels can increase the amount of dissolved mercury in the water.

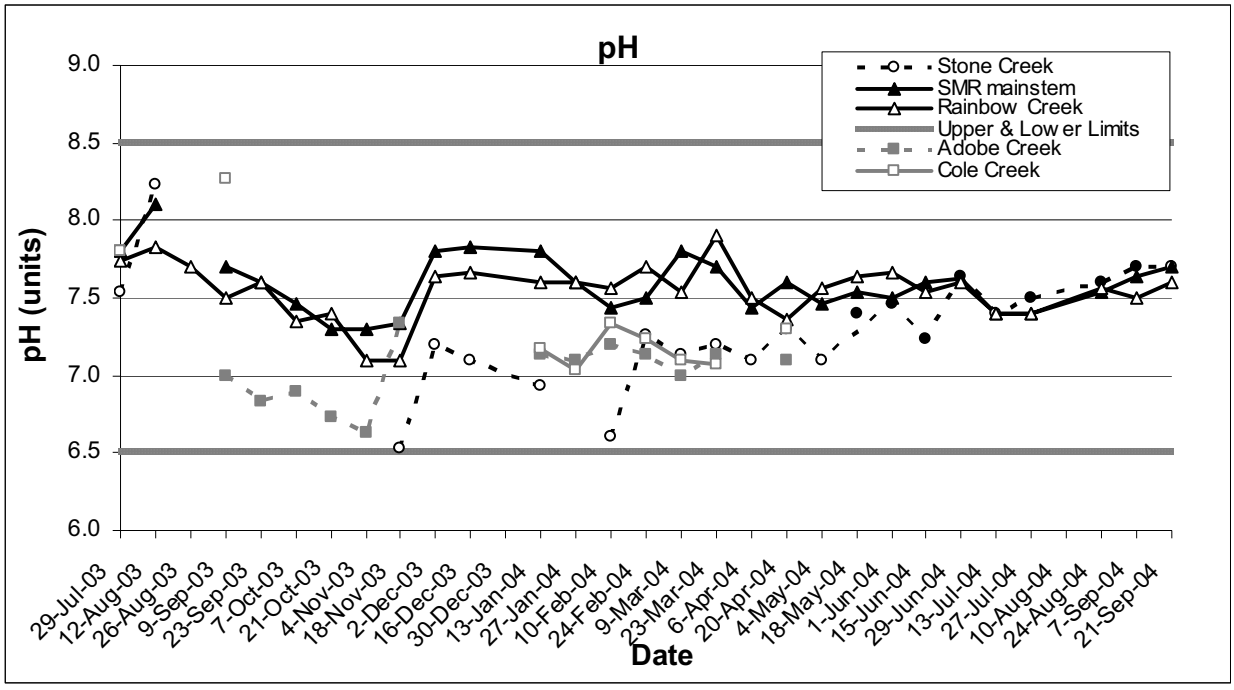


Figure 7. The water quality parameter of pH was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the Home$_2$Ocean Program's water quality sampling dates.

The optimal range of pH, for both aquatic animals and plants, is between 6.5 and 8.5, according to the Basin Plan Water Quality Objectives and shall not be below 6.5 or above 8.5. All of the pH values of all five sites were within this optimal range. Stone Creek neared the lower end of the pH range, but never dropped lower than the critical value of 6.5. A possible reason for the lower pH levels, in Stone, Adobe, and Cole Creeks, may be due to the type of canopy cover, or upstream vegetation, in the form of coast live oaks. Adobe and Cole Creeks would be exposed to fallen Engelmann oak leaves, as well. Decomposing oak leaves, in these slower flowing water bodies, would cause the water to become slightly acidic as oak leaves are acidic in nature due to tannic acid. Tannic acid is used as a pest repellent by the oak trees.

5.6 TOTAL DISSOLVED SOLIDS

Total dissolved solids (TDS) measure how much material is dissolved in water. TDS are solids in water that can pass through a filter, usually with a pore size of 0.45 micrometers. These materials can include carbonates, chlorides, nitrates, phosphates, and other ions. Some of the materials in TDS are necessary for the growth and survival of aquatic organisms. If TDS concentrations are too high or too low, as determined by the Basin Plan Objectives, organisms' growth may be limited and death can occur. High concentrations of TDS can also be linked to high levels of turbidity, which can reduce light levels in water, raise water temperature, and reduce photosynthesis.

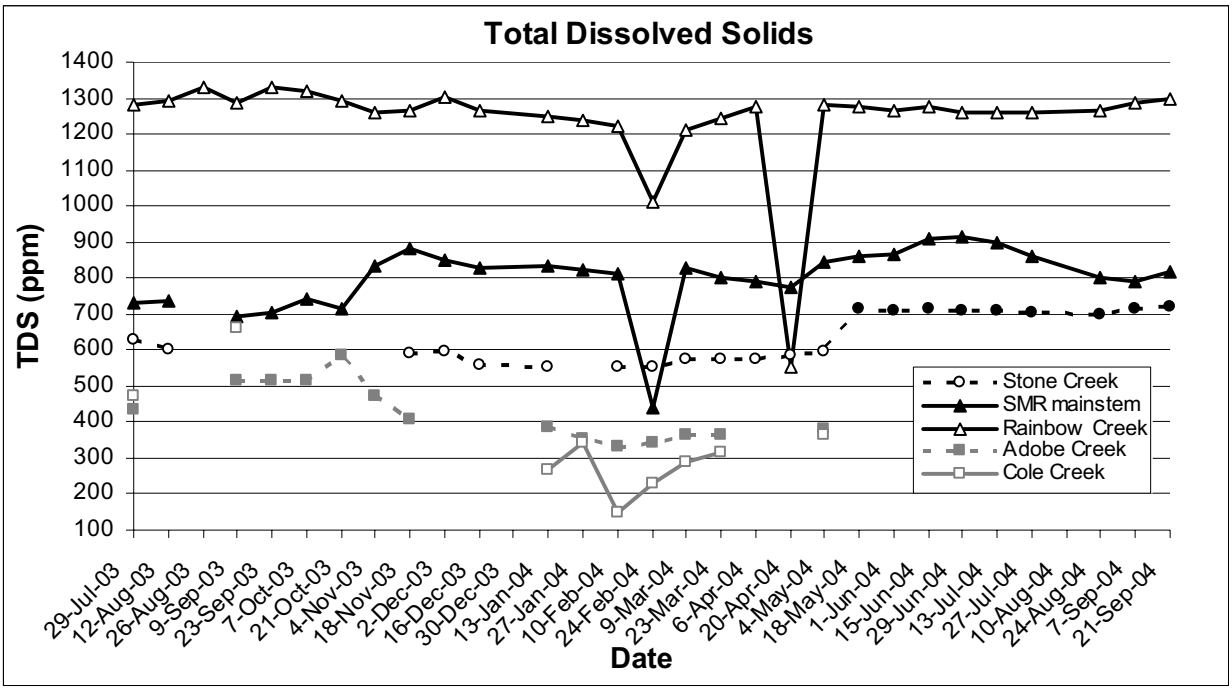


Figure 8. The water quality parameter of total dissolved solids (in parts per million) was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the Home$_2$Ocean Program's water quality sampling dates.

The Basin Plan Water Quality Objectives state that the TDS levels in inland surface waters in the San Diego Region should range between 300 and 2100 ppm. Four of the five sites fell within this TDS value range. Cole Creek was below 300 pm on four of the nine occasions it was sampled. A hydrologist, for the Santa Rosa Plateau Ecological Reserve equated the reserve to a sponge (decomposed granite with easy infiltration) which results in the water in the creeks (Adobe and Cole Creeks) coming from the ground, as opposed to surface runoff. The source of the water in the creeks is flowing and surfacing ground water, unless there is a very large storm event in which there will be surface runoff. This would be especially true around Cole Creek where the soil is mostly decomposed granite. Around Adobe Creek, there are more loamy soils, which might not filter dissolved solids as well as decomposed granite. Stone Creek and Adobe Creek had low TDS levels, which could be attributed to the fact that very little of the water in both creeks is from residential, agricultural, or commercial properties. Santa Margarita has a site specific Basin Plan Objective, which states that TDS levels must stay below 750 ppm. The Santa Margarita River TDS measured above 750 ppm

approximately 75% of the sampling dates. These high TDS levels may be attributed to agricultural runoff and the lack of dilution in the water body from rain water (as most of the high TDS levels were measured during the dry season). The higher TDS levels in Rainbow Creek can probably be attributed to the high levels of agricultural runoff in the water body. The drop in TDS at Rainbow Creek and SMR, on February 24, 2004, is thought to have been caused by the large rainfall events of that time period. The waters in the creek and river were diluted by rainwater that the TDS levels dropped significantly for a short time.

This was the first water quality parameter that made it apparent that this water quality monitoring program was not recording "first flush" values for any of the parameters. If the water quality parameters were recorded directly after a rainfall event, such as the rainfall event on November 12, 2003, the TDS readings may have been very different for that time, perhaps mimicking those observed on February 24, 2003. Instead, the water quality parameters were measured nearly a week after the November 12th rain, and so the water quality parameters may have already equilibrated to their "normal" values.

The TDS levels were much greater at the second sampling site of Stone Creek than the first sampling site. This is interesting to note as it is fed directly from a spring at the second site, which could have caused the increase in TDS.

5.7 TURBIDITY

According to the California State Water Resources Control Board, turbidity measures the amount of suspended particles in the water. The suspended particles can consist of algae, suspended sediment, organic matter, and pollutants. These suspended particles not only diffuse sunlight, but they also absorb heat. This combination can be detrimental to algal production as the temperature of the water is increased, while the availability of light is reduced. Suspended sediment is a common cause of high turbidity. This can be caused by erosion, either natural or man-made. High sediment levels can obstruct the gills of fish, and once it settles it can smother fish eggs and benthic insects while covering necessary gravel beds. Sediment can also carry pollutants, nutrients, and pathogens, which can be detrimental to the health of the water body.

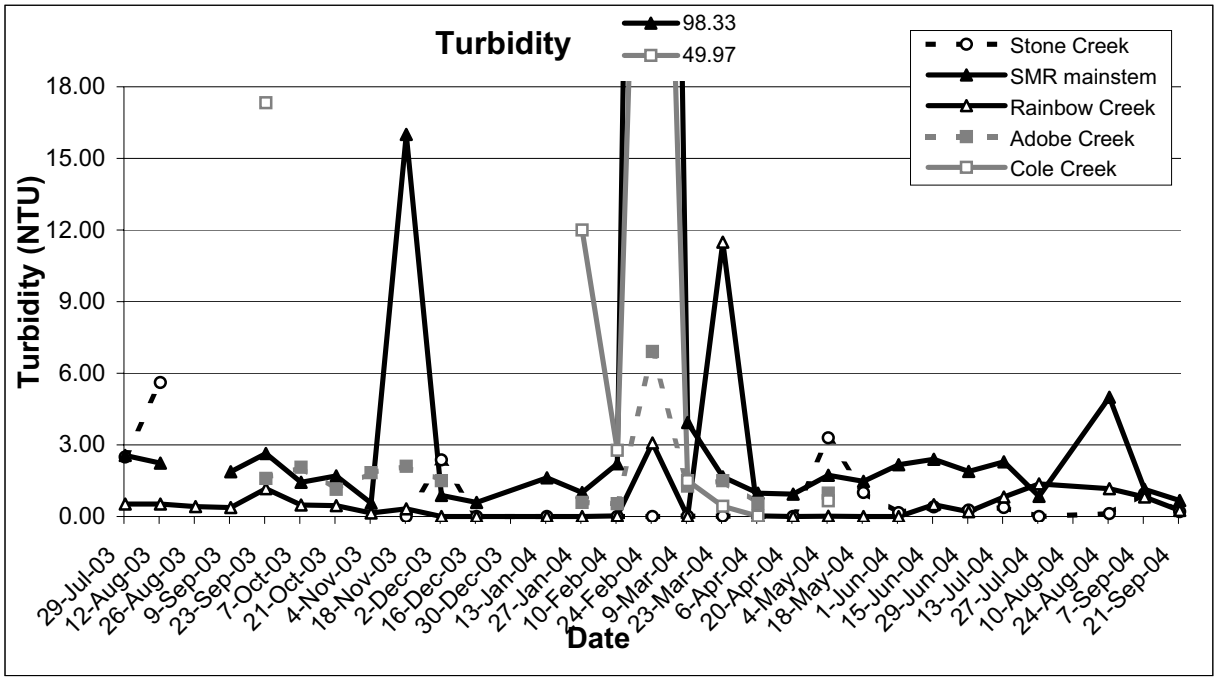


Figure 9. The water quality parameter of turbidity (in NTUs) was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

The Water Quality Objectives in the San Diego Basin Plan state that inland surface waters shall not exceed a maximum level of 20 NTUs for turbidity. This objective was violated once at the SMR sampling site and once at the Cole Creek sampling site. All of the spikes in turbidity (for all of the sites) occurring from November 4, 2003 to March 9, 2004 can be attributed to rainfall events. The SMR sampling site had the highest sediment levels, which turned the water murky and opaque suggesting impacts from sedimentation. The turbidity level on February 24, 2004 actually peaked at 98.33 NTUs. These spikes could have been caused by sediment from erosion that has been exacerbated by landscaping, construction, and agriculture. The spike on Stone Creek, on August 12, 2003, is thought to have been a result of natural causes, although it is unknown what those causes were. All of the water in Stone Creek, at that time, was in standing pools.

The spike seen March 23, 2004, on Rainbow Creek, was caused by sediment pollution, which was not related to a rainfall event. A small tributary on Rainbow Creek, a short distance upstream of where sampling took place, had tremendously high sediment content and was causing all of the water in Rainbow Creek, downstream of the tributary, to become murky and opaque. It was thought that either a construction job was occurring upstream in the tributary or that an agricultural operation was doing some landscaping. This was the first time that the water in Rainbow Creek was murky, as it had always been crystal clear and the bottom of the creek bed was always easily seen. The September 23, 2003 spike seen on the Cole Creek sampling site is from an unknown origin, as is the August 24, 2004 spike seen on the SMR sampling site. Algae was noted in this water body during that time period and it is unknown if the algae growth was a cause of the spike in turbidity or a consequence of the high turbidity.

5.8 ORTHOPHOSPHATES

Phosphates are necessary for the growth of aquatic plants and animals. Orthophosphates are produced by natural and man-made processes and are used by plants for growth and other metabolic functions. Phosphate is usually found in very low concentration in nature, which limits how fast aquatic plants can grow. When phosphates are added to the water system, plant growth, especially that of algae increases exponentially and can cause dissolved oxygen levels to plummet as the plant matter dies and decomposition begins. The process of algal growth and decrease in dissolved oxygen due to nutrient loading is called eutrophication. This decrease in dissolved oxygen, in combination with the reduction of light and water temperature caused by the plant growth, can be fatal for many aquatic organisms.

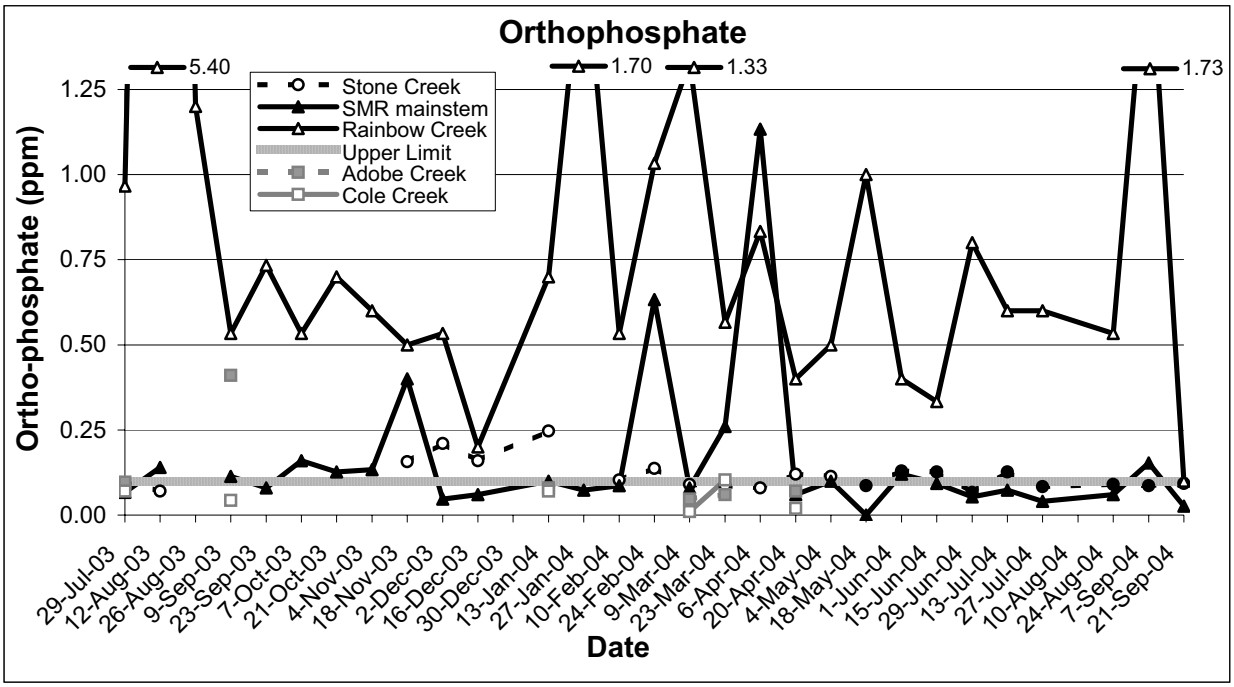


Figure 10. The water quality parameter of orthophosphate (in parts per million) was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the Home$_2$Ocean Program's water quality sampling dates.

The Water Quality Objectives in the San Diego Basin Plan state that inland surface waters shall not exceed a maximum level of 0.1 ppm for total phosphorous. Of the five sampling sites, Stone, Adobe, and Cole Creeks were the only sites that stayed near or below 0.1 ppm, although Adobe Creek had ortho-phosphate levels that were higher than 0.1 ppm on the sampling date of September 9, 2003. The reason for the high ortho-phosphate value on this sampling date is unclear. Orthophosphate was measured for all five of the sampling sites, which is only part the total phosphate. As orthophosphate is only a fraction of total phosphorous, the actual ratios of total phosphorous for the sampling sites, most importantly Rainbow Creek, may have been low. The spikes seen on Rainbow Creek and SMR, during the sampling period of March 9 through March 23, 2004, may be attributed to sediment in stormwater runoff.

Total phosphate is correlated with sediment and, thus, erosion, which can be either induced by humans or it can occur naturally in nature. High orthophosphate (dissolved phosphate)

levels reveal that the total phosphate levels are even higher. The orthophosphate levels in Rainbow Creek were consistently higher than those of the other four sampling sites. It was thought that this high baseline might be attributed to fertilizer runoff from agriculture entities combined with a low flow regime. It is possible that SMR has more agricultural fertilizer runoff than Rainbow Creek, but has lower orthophosphate levels due to the fact that is has a high flow regime and, thus, more aeration in the water. This aeration would increase plant growth and the orthophosphate levels would decrease as the demand for orthophosphate increased. The causes of the peaks, on Rainbow Creek, on August 12, 2003, January 27, 2004, and September 7, 2004 are unknown. They could be due to the upstream reconstruction of burms for tailwater agriculture systems.

5.9 NITRATE-NITROGEN

Nitrates are also a nutrient found naturally in water. However, just like phosphate, when too much nitrate is added to a water body eutrophication will result. Nitrate is a major ingredient in most fertilizers, so any fertilizer runoff entering a water body will cause the nitrate levels of that water body to rise. Other sources of nitrates are animal waste, sewage, and leaking septic systems.

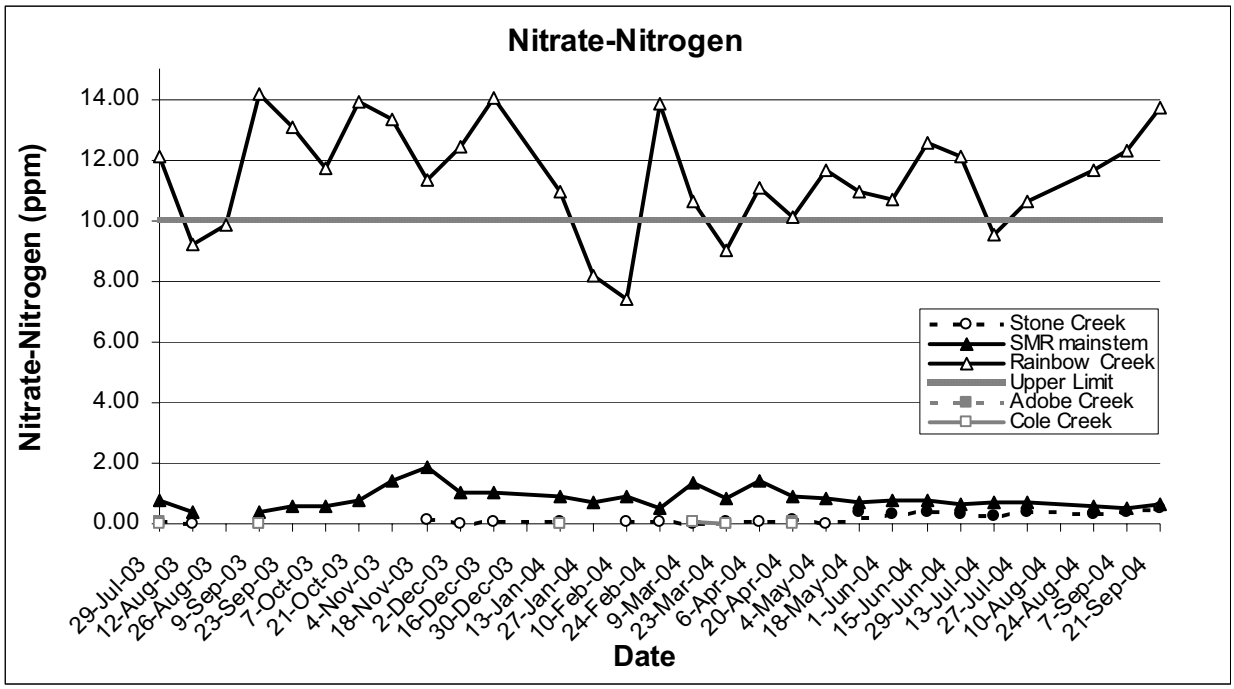


Figure 11. The water quality parameter of nitrate-nitrogen (in parts per million) was monitored at all five of the sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The dotted line at 10 ppm represents the TMDL upper limit. The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

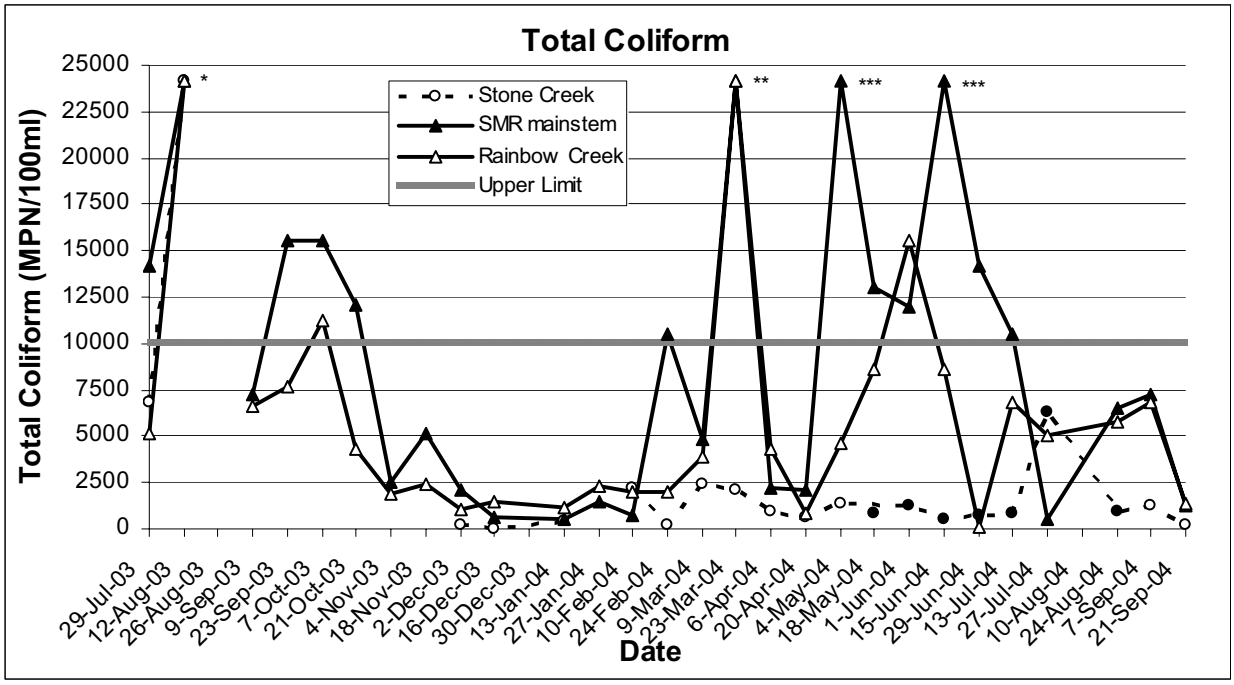
The Phase 1 goal nitrogen total maximum daily load (TMDL) for Rainbow Creek is 10 ppm. Only 23% of the sampling dates, at Rainbow Creek, had nitrate-nitrogen levels at or under 10 ppm. The high nitrate-nitrogen levels in Rainbow Creek are attributed to irrigation leaching, ground water contamination, and runoff from agricultural entities in the Rainbow Creek

watershed. The nitrate-nitrogen levels of Stone, Adobe, and Cole Creeks were consistently at or near 0.0 ppm for every sampling date they were measured. Although SMR also had much lower nitrate-nitrogen levels than Rainbow Creek, it violated the Water Quality Objectives in the San Diego Basin Plan on 21% of the sampling dates. The Water Quality Objectives state that inland surface waters shall not exceed a maximum level of 1.0 ppm for total nitrogen. None of the sites displayed any trends or responses to rainfall events.

6. PATHOGEN INDICATORS

6.1 TOTAL COLIFORM

Total coliform is a group of bacteria that includes fecal (bacteria found in the intestines and feces of mammals) and non-fecal bacteria. Total coliform is present in unpolluted water bodies, and only signify a problem when their levels rise above those stated by the Department of Environmental Health.



* Total coliform levels, at all three of the sampling sites, met or exceeded the upper limit (24,200 MPN/100 ml) of the total coliform test performed by the state certified laboratory.

** Total coliform levels, at the Rainbow Creek and the Santa Margarita River mainstem sampling sites, met or exceeded the upper limit (24,200 MPN/100 ml) of the total coliform test performed by the state certified laboratory.

*** Total coliform levels, at the Santa Margarita River mainstem sampling site, met or exceeded the upper limit (24,200 MPN/100 ml) of the total coliform test performed by the state certified laboratory.

Figure 12. The water quality parameter of total coliform (in most probable number per 100 milliliters) was monitored at three of the five sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

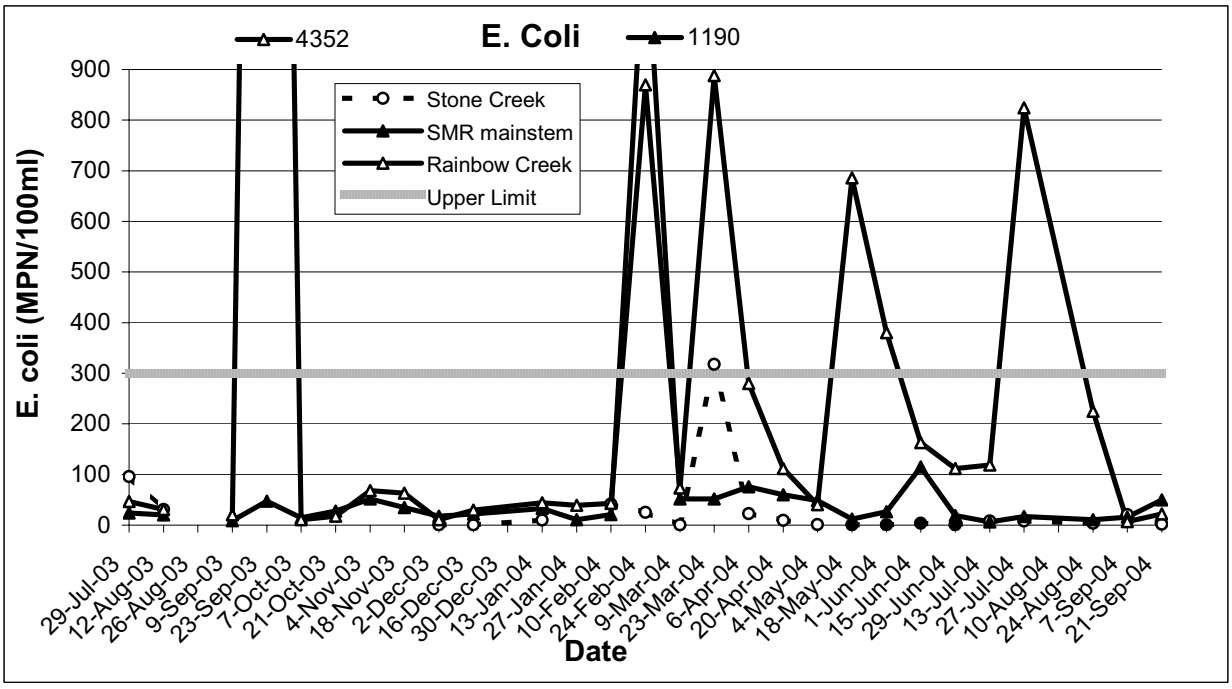
According to the County of San Diego Department of Environmental Health, the upper limit of the acceptable range for total coliform is 10,000 MPN/100 ml. This standard for recreational waters indicates that SMR mainstem and Rainbow Creek surpassed the standards and would be considered contaminated for several sampling dates. It is unknown what caused the spike on August 12, 2003. It could possibly be attributed to laboratory error and probably does not reflect the true value of total coliform in the water bodies. The spike observed on March 23, 2004 can be correlated with the high turbidity levels in Rainbow Creek and the Santa Margarita River. This was after a rainfall event and can reflect mammal waste that was washed into the water bodies. A trend that can be seen is that as the rainy season started in

early November, the total coliform densities decreased at all three sites, which might be due to a dilution factor from the rain.

6.2 *ESCHERICHIA COLI (E. coli)*

Escherichia coli (*E. coli*) is a fecal bacterium that causes the disease gastroenteritis. It is found in water bodies that have been contaminated by animal waste. *E. coli* does occur in low levels in nature, but high levels indicate contamination.

According to the County of San Diego Department of Environmental Health, the upper limit of the acceptable range for fecal coliform is 400 MPN/100 ml. The Regional Water Quality Control Board estimates that *E. coli* makes up approximately 80% of fecal coliform (Berg 1978). Thus, the estimate of the acceptable range for *E. coli* is 300 MPN/100 ml.



* *E. coli* levels at the Rainbow Creek sampling site.
** *E. coli* levels at the Santa Margarita River mainstem sampling site

Figure 13. The water quality parameter of *Escherichia coli* (*E. coli*) (in most probable number per 100 milliliters) was monitored at three of the five sampling sites during the sampling period of July 29, 2003 through September 30, 2004. Stone Creek was sampled at two sites: sampling site one (open circles) and sampling site two (closed circles). The x-axis dates correspond with the $Home_2Ocean$ Program's water quality sampling dates.

The spikes seen on February 24 could be attributed to first flush measurements, as a rather large rainfall event occurred only 2 days prior to sampling. However, Rainbow Creek spikes again, on March 23 and July 27, 2004, which are not near a rainfall event. The cause of these spikes is not understood, nor is the spike, March 23, 2004, for Stone Creek. It could be that the few residences in the Stone Creek watershed had overflowing of their septic tanks, in March, due to the rainy season. The February 24, 2004 spikes, for Rainbow Creek and the Santa Margarita River, could be attributed to storm water runoff carrying animal waste and septic system failures. The September 23, 2003 spike on Rainbow Creek could be attributed to human error or a septic system malfunction from farther upstream.

The standard for recreational waters indicates that Rainbow Creek regularly surpassed the standards and would be considered contaminated at those times. This contamination probably cannot be attributed to failed septic systems as the septic system failures or sewage spills usually result in a 1:1 ratio of *E. coli* and total coliform. The spikes could be attributed to domestic or wild waste. Another possibility is that human waste, not coming from a septic system, was responsible for the high levels. The Rainbow Creek and SMR spikes seen on February 24 could be attributed to first flush measurements, as a rather large rainfall event occurred only 2 days prior to sampling.

7. BIOASSESSMENT DATA INTERPRETATION

Samples of benthic macroinvertebrates were collected on June 11, 2003, November 7, 2003, and May 2004 from Stone Creek, Rainbow Creek, and the Santa Margarita River. The bioassessment samples were collected following the California Department of Fish and Game's California Stream Bioassessment Procedure (CSBP). Physical habitat characteristics were also observed, graded, and recorded for the three sampling dates.

Seven metrics were used to "grade" the water quality of the water bodies using the Southern California B Index of Biological Integrity (SoCal B-IBI) (Ode *et al*. 2005). The seven metrics used in the SoCal B-IBI are percent collector individuals, percent noninsect taxa, Coleoptera richness, predator richness, percent intolerant individuals, and EPT richness.

The SoCal B-IBI scores were categorized to give a water quality condition or "grade". A score of 0-19 earned a ranking of "very poor" water quality, while a score of 20-39 indicated a ranking of "poor" water quality. A score of 40-59 ranked the water quality as "fair", while a score of 60-79 ranked the water quality as "good". A score of 80-100 indicated that the water quality was "very good" (Ode *et al*. 2005).

Table 4. The water quality of Stone Creek was graded using the SoCal B-IBI.

Water Body	Sampling Date	Final SoCal B-IBI Score
Stone Creek	6/11/2003	44.33
Stone Creek	5/22/2004	52.91
Stone Creek	6/18/2005	35.75
	Average Score	**44.33**

Table 5. The water quality of the Santa Margarita River was graded using the SoCal B-IBI.

Water Body	Sampling Date	Final SoCal B-IBI Score
SMR mainstem	6/11/2003	25.74
SMR mainstem	11/7/2003	20.02
SMR mainstem	5/22/2004	25.74
SMR mainstem	6/18/2005	18.59
	Average Score	**22.52**

Table 6. The water quality of Rainbow Creek was graded using the SoCal B-IBI.

Water Body	Sampling Date	Final SoCal B-IBI Score
Rainbow Creek	6/11/2003	18.59
Rainbow Creek	11/7/2003	22.88
Rainbow Creek	5/22/2004	14.3
Rainbow Creek	6/18/2005	21.45
	Average Score	**19.31**

Using the SoCal B-IBI scores in Tables 5, 6, and 7 it is indicated that Rainbow Creek, with an average score of 19.31, has "very poor" water quality, while the Santa Margarita River, with an average score of 22.52, has "poor" water quality. Stone Creek, which served as our reference site and had an average score of 44.33, was graded with "fair" water quality. These scores, based on metrics calculated from bioassessment data, support the Water Quality and Pathogen Indicator data from Sections 7 and 8 of this report.

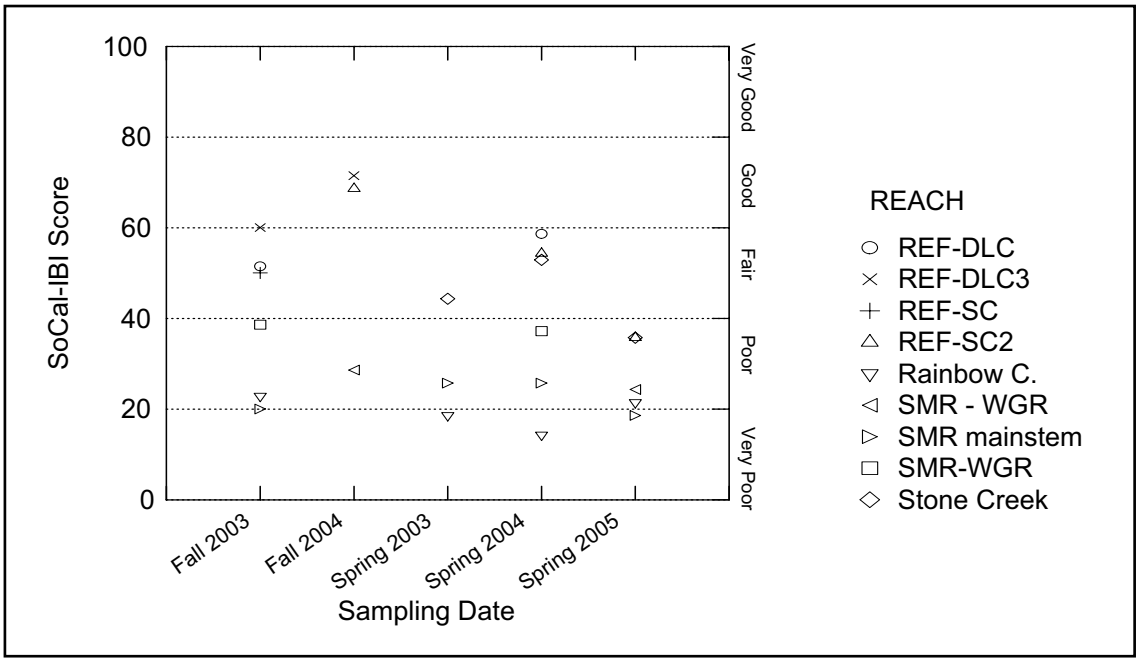


Figure 14. The SoCal-IBI Scores for the Home$_2$Ocean Program's sampling sites were plotted with regional SoCal-IBI Scores that were collected by the County of San Diego. The sampling sites (reaches) are as follows: REF-DLC is De Luz Creek, REF-DLC3 is also De Luz Creek, REF-SC is Sandia Creek, REF-SC2 is also Sandia Creek, Rainbow C. is Rainbow Creek, SMR-WGR and SMR – WGR are the Santa Margarita River.

The County of San Diego sampled local water courses from October 2003 through May 2004 and from October 2004 through May 2005. The data can be found in the San Diego County Municipal Copermittee 2003-2004 Urban Runoff Monitoring Report for the October 2003 trough May 2004 sampling period and in the Draft San Diego County Municipal Copermittee 2004-2005 Urban Runoff Monitoring Report for the October 2004 through May 2005 sampling period. The sampling sites were in water ways near where the Home$_2$Ocean Program sampled.

When the Home$_2$Ocean Program's sampling sites' SoCal-IBI Scores are compared with local SoCal-IBI Scores (Figure 14) it can be seen that Stone Creek ranked among the reference sites used by the County of San Diego and that Rainbow Creek is the most impacted site of all the sites sampled. As even the reference sites are all below the "Very Good" grade, the SoCal-IBI is being studied to see if a modification in the metrics is needed.

Physical/Habitat Quality: The California Department of Fish and Game established the protocols used to assess and rank the physical habitat according to visual physical habitat parameters. A physical/habitat quality (Phab) worksheet measures the physical integrity of the sampling sites and integrates 10 different parameters into a single value. These values

range from 0 to 200 “points”. Four categories are used for physical conditions: Optimal (200 – 150 points), Suboptimal (149 – 100 points), Marginal (99 – 50 points), and Poor (40 – 0 points) (Harrington and Born, 1999).

Table 7. The Physical/Habitat Quality Scores (Phab Scores) were calculated based on the visual habitat parameters at each site for each of the bioassessment sampling dates. NS indicates that the site was not sampled on the sampling date.

Sampling Date	Stone Creek - Physical/Habitat Quality Score	SMR mainstem - Physical/Habitat Quality Score	Rainbow Creek - Physical/Habitat Quality Score
6/11/2003	143	125	150
11/7/2003	NS	144	159
5/22/2004	161	137	155
Mean	152	135	155
St. Dev.	13	10	5

The Phab scores reveal that while Rainbow Creek have the most impacted water quality it still ranked as, visually, the most un-impacted of the three sites. This is interesting to note, as it should be stressed in educational presentations that water quality cannot always be judged by how the water and surrounding habitat looks.

8. REFERENCES

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Harrington, Jim and Born, Monique. 1999. Measuring the health of California streams and rivers: A methods manual for: water resource professional, citizen monitors, and natural resources students. 2nd Edition. Sustainable Land Stewardship International Institute.

Jenks, James S. 2005. Santa Margarita River Watershed Annual Watermaster Report Water Year 2003-04. United States of America vs. Fallbrook Public Utility District, et al Civic No. 1247-SD-T. Fallbrook, CA, Santa Margarita River watershed.

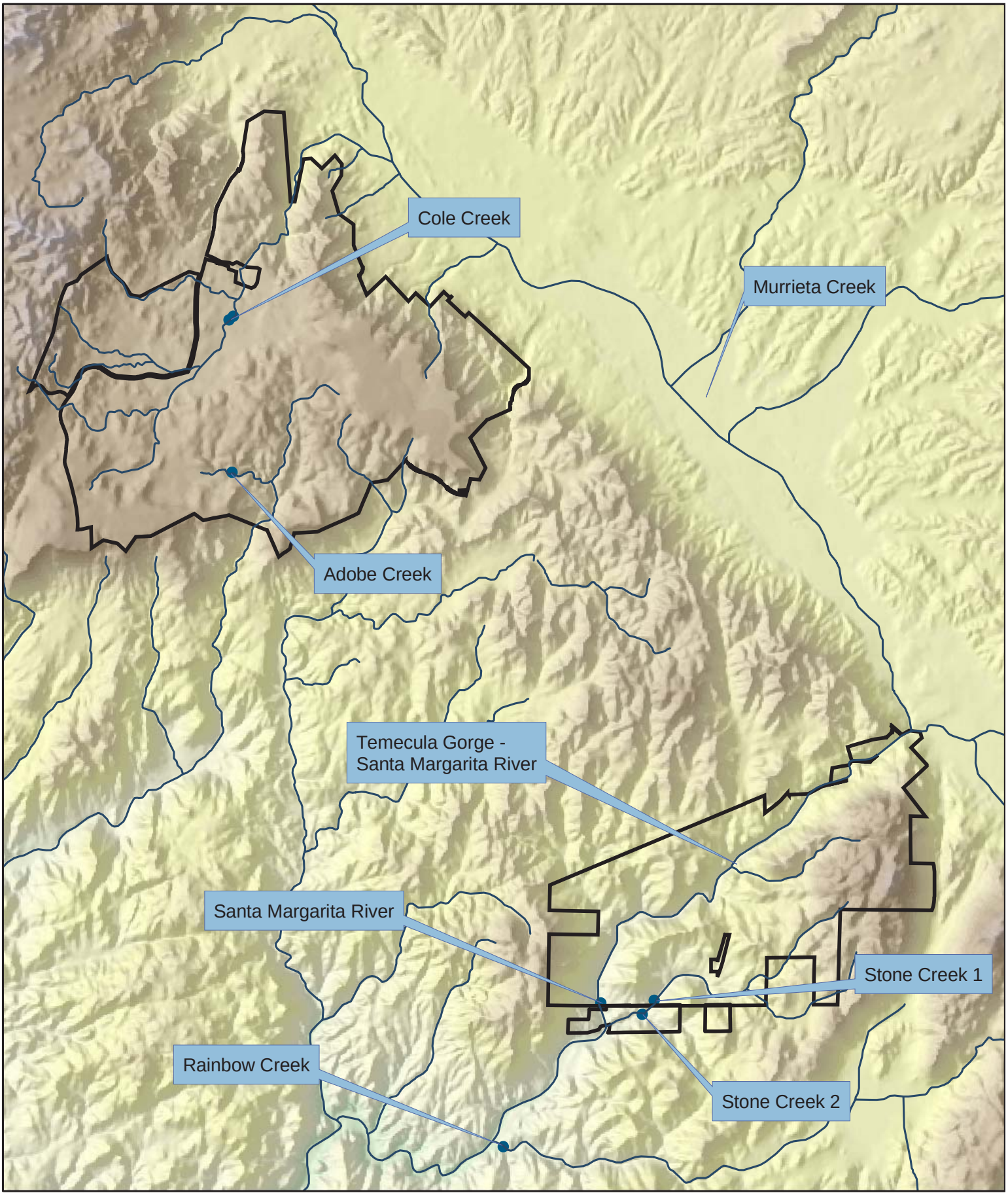
Ode, Peter R., Rehn, Andrew C., and Jason T. 2005. A quantitative tool for assessing the integrity of southern coastal California Streams. Environmental Management 35: 493-504.

APPENDIX A

Maps of the sampling sites.

Appendix A: Home2Ocean Program Sampling Sites

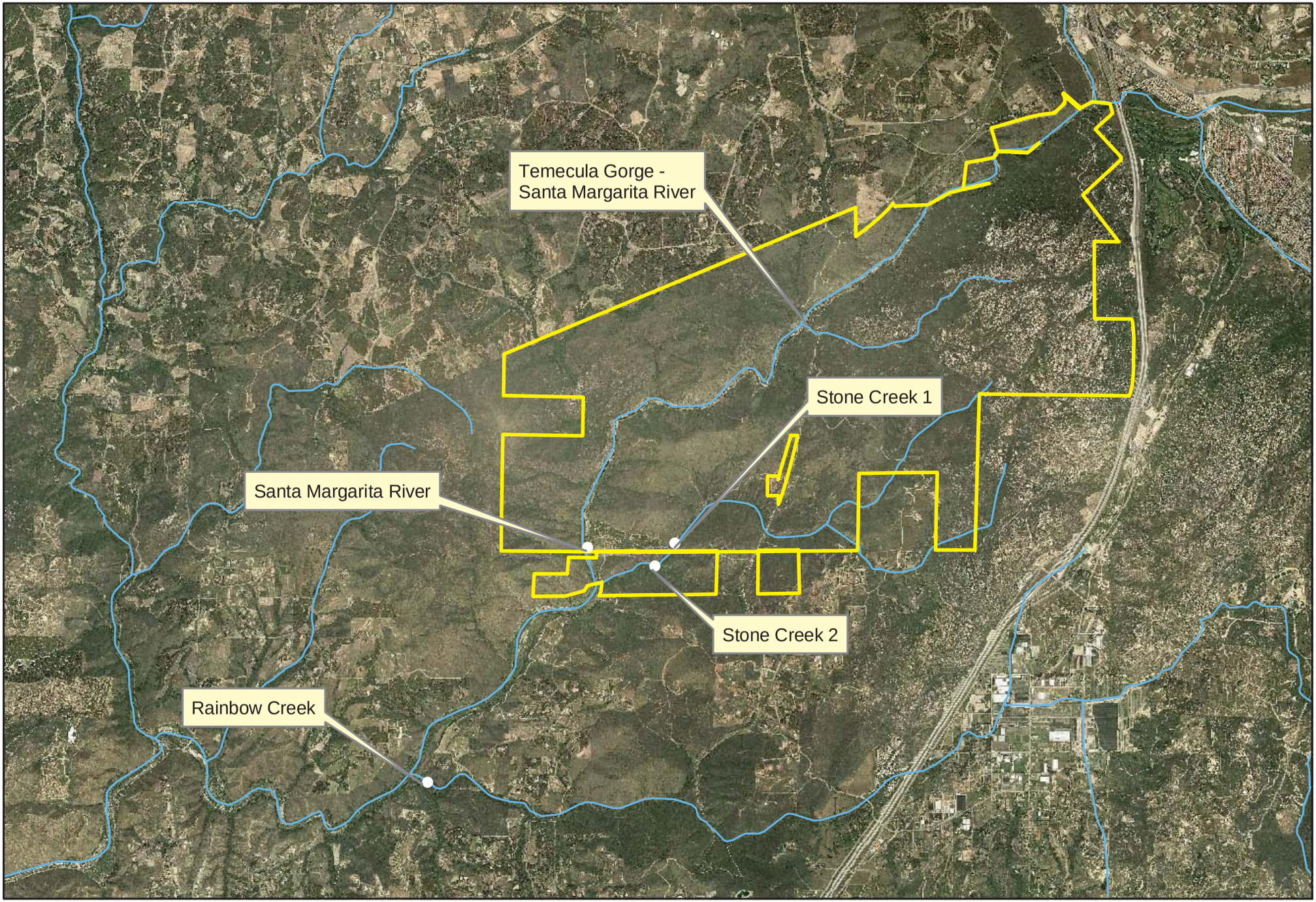
Mission Resource Conservation District



Appendix A: Home2Ocean Program

Fallbrook & Santa Margarita Ecological Reserve Sampling Sites

Mission Resource Conservation District



Appendix A: Home2Ocean Program

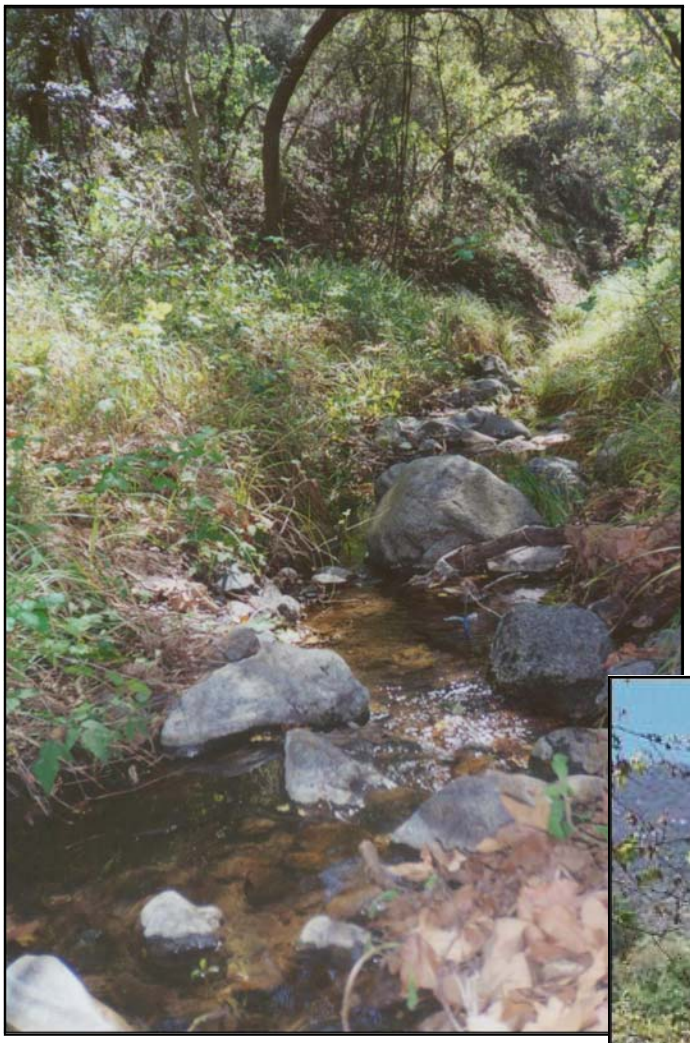
Santa Rosa Plateau Ecological Reserve Sampling Sites

Mission Resource Conservation District

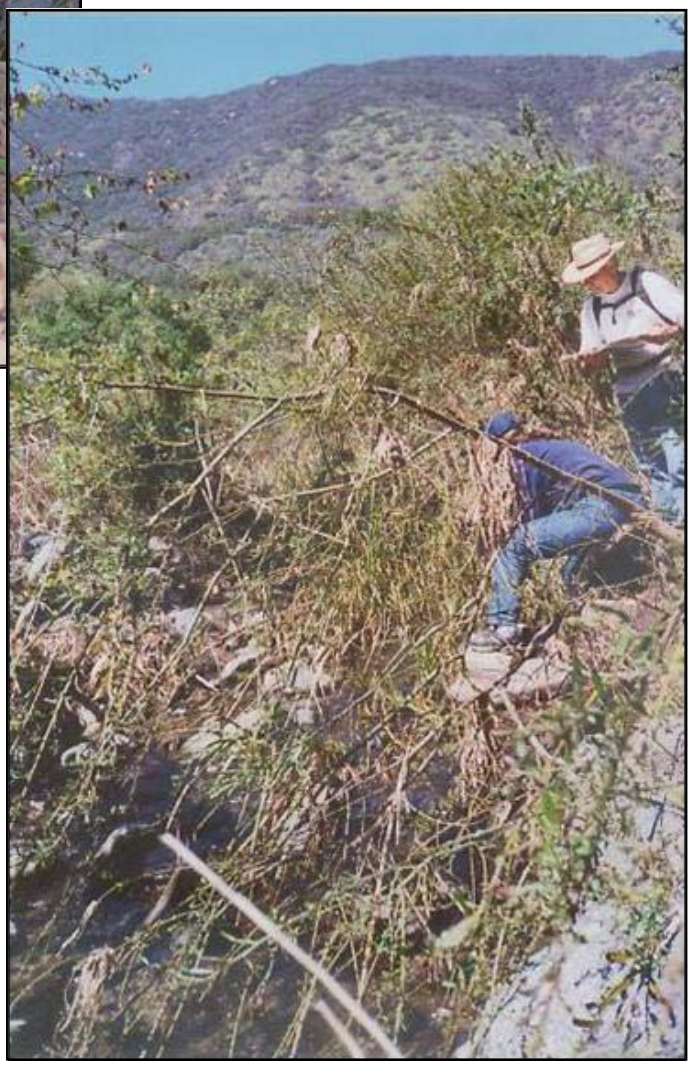
APPENDIX B

Photographs of the water quality sampling sites.

PHOTOGRAPHS OF THE HOME$_2$OCEAN PROGRAM'S SAMPLING SITES



Left: Stone Creek sampling site 1 in March 2003.



Right: Santa Margarita River mainstem sampling site in March 2003.

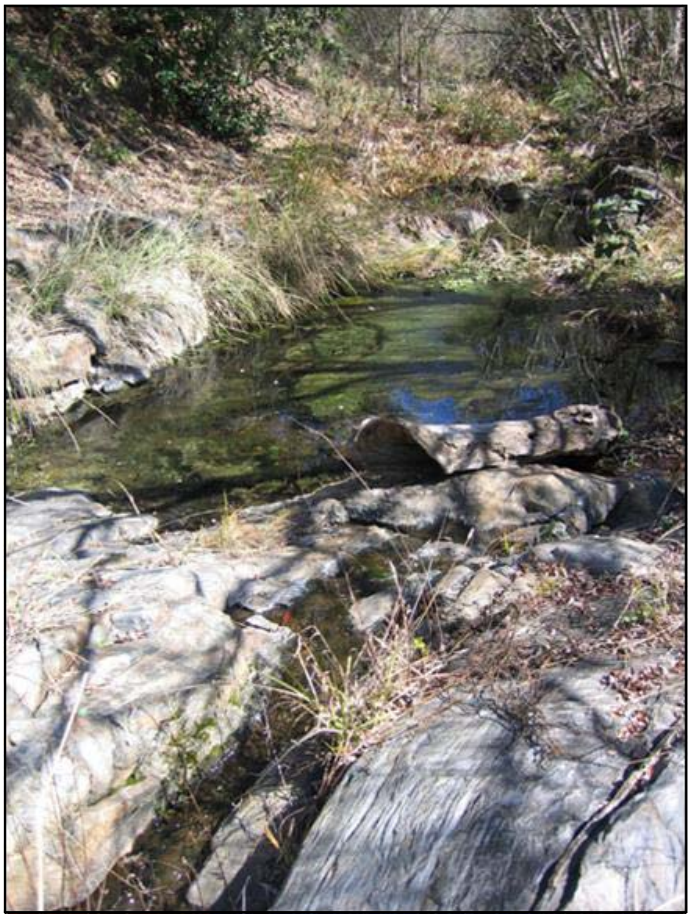
Above: Rainbow Creek sampling site in March 2003.

Below: Stone Creek sampling site 1 in February 2004.

Above: Santa Margarita River sampling site in February 2004.

Below: Rainbow Creek sampling site in February 2004.

Above: Cole Creek sampling site in February 2004.



Right: Adobe Creek sampling site in February 2004.

Above: Stone Creek sampling site 2 in September 2004.

Below: Santa Margarita River sampling site in September 2004.

Above: Rainbow Creek on September 21, 2004.

Below: Cole Creek in June 2004.

Above: Adobe Creek in June 2004.

APPENDIX C

The Framework Monitoring Plan for the $Home_2$Ocean Program

Santa Margarita River Home$_2$Ocean

Citizen's Water Quality Monitoring Program

Framework Monitoring Plan

Completed Plan Prepared By:
Judith Mitchell
Bethany Brock

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Section 1 Introduction

1.1 The Santa Margarita River Watershed

The Santa Margarita River watershed covers approximately 750 square miles within northern San Diego County and southwestern Riverside County. Two major tributaries, Murrieta and Temecula Creeks, form the Santa Margarita River. The river's main stem descends for 27 miles, through Riverside County, San Diego County, and Camp Pendleton before emptying into the Pacific Ocean. In recent years, the Santa Margarita River has been experiencing increased urbanization and farming operations in the upper watershed. This urbanization is causing serious impacts on this river, its ecosystem and the overall health of the watershed. Currently, there is not an organized effort to collect and analyze water quality related data by a community organization in the entire watershed.

1.2 Mission Resource Conservation District

The mission of the Mission Resource Conservation District (Mission RCD) is to prevent and control soil erosion and sediment damage caused by agricultural and other land use activities. Its mission is also to provide for the conservation of soil and water resources. The goals of the Mission RCD are to furnish technical aid and information to private landowners and other government and community agencies for the creation and implementation of conservation practices[1]. Mission RCD has developed several programs to address water quality issues that pertain to the Santa Margarita River and its tributaries.

1.3 Participants and Goals of the Home$_2$Ocean Program

The participants of Mission RCD's Santa Margarita River Home$_2$Ocean Citizen Water Quality Monitoring Program (Home$_2$Ocean Program) are Riverside County Flood Control, San Diego State University (SDSU), San Diego Stream Team, Riverside County Resource Conservation District, and citizen volunteers.

The goals of the Home$_2$Ocean Program are to implement a citizen-based volunteer water quality monitoring and to increase public awareness of Santa Margarita River watershed issues through the following activities:

- Develop a citizen-based water quality monitoring program;
- Solicit and train volunteers to carry out 14 months of water sampling and four bioassessment procedures to monitor the physical habitat and biological condition of significant tributaries of the Santa Margarita River;
- Use the monitoring program and the information it generates to educate the general public about the current state of the watershed; and
- Assess watershed awareness of targeted groups through the implementation of a watershed questionnaire before and after outreach efforts.

[1] Rivers, Trails and Conservation Assistance Program of the National Park Service. 1995. Santa Margarita River Watershed: Today's Management Framework: Participants in Profile. San Francisco, CA.

Section 2 Monitoring Sites, Sampling Schedule, and Sampling Parameters

2.1 Monitoring Sites and Sampling Schedule

Three monitoring sites were selected for this program. One site is the Santa Margarita River's main stem located on the Santa Margarita Ecological Reserve (SMER), which is owned and managed by SDSU. A second site is Rainbow Creek, a tributary of the Santa Margarita River, which is located on Fallbrook Public Utility District property in Fallbrook. This site receives differing agricultural and urban land-use runoff. The final site is Stone Creek, which is also located on the SMER and is also a tributary of the Santa Margarita River. It differs from the other sites as it drains only endemic flora and one organic farm.

Water quality samples will be collected and analyzed every two weeks. This will entail a total of approximately 30 collection days over a fourteen-month period. All of the sites will be sampled on the same day, in sequence, during a time period of three hours. The sequential order of sampling sites will be to start sampling at Rainbow Creek, followed by the Santa Margarita River's main stem, and will end at Stone Creek.

2.2 Sampling Parameters

Several water quality parameters will be monitored by the citizen volunteers: pH, phosphates (PO_4^{-3}), temperature, turbidity, nitrates (NO_3^-), total dissolved solids, width and depth of flow, velocity, dissolved oxygen, and coliform bacteria. The site conditions that will be observed, in the habitat assessment portion of the monitoring activity, are algae presence and density, water clarity and color, and flow, foam, litter, odor, and oil presence.

Four bioassessment procedures to monitor physical habitat and biological conditions (i.e. benthic macroinvertebrates) will also be completed in the fourteen-month period. The habitat observations that will be gathered at the time of the bioassessment procedures are: epifaunal substrate/available cover, cobble embeddedness, velocity/depth regimes, sedimentation deposition, channel flow status, channel alteration, frequency of riffles, bank stability, vegetative protection, and riparian vegetative zone width.

Section 3 Monitoring Protocols

Chemical, physical, and bacterial parameters will be monitored using protocols outlined in the Santa Margarita River Home$_2$Ocean Field Monitoring Manual. All water samples will be taken from the main river current or where homogeneous mixing of water occurs. All samples and measurements will be taken upstream of the sampler.

3.1 Water Quality Protocols

Each water quality parameter measurement will have three replicates.

- Water pH will be measured using a waterproof pH meter. The pH meter electrode will be submerged one-half to one inch into the water. Once the reading has stabilized, the data will be recorded on the Field Sampling Sheet.
- The dissolved oxygen in the water will be measured with a waterproof dissolved oxygen meter (DO meter). The probe will be fully or partially immersed in flowing water and will not be

allowed to touch any surface. When the reading has stabilized, the value will be recorded on the Field Sampling Sheet.

- Water temperature will be measured with a bulb thermometer as well as with the DO meter. To measure the temperature with a bulb thermometer, the thermometer will be immersed in the creek or river water. The thermometer will remain immersed for one to two minutes to allow for equilibration, and then will be read while it is still immersed. If immersion is not possible or the value can't be read, due to low water levels, then a water sample can be collected in a container. The temperature from this solution is viable if the temperature is measured directly after the collection of the water sample, but after allowing for thermometer equilibration. The temperature value and unit will be recorded on the Field Sampling Sheet.

Water temperature will also be measured with the DO meter, at the same time as it measures the dissolved oxygen content. After the reading has stabilized, the dissolved oxygen content and temperature of the water will be displayed. This temperature value will be recorded, along with the dissolve oxygen data, on the Field Sampling Sheet.

- Total dissolved solids (TDS) will be measured with an electronic TDS meter. The electrode will be submerged into the water until the sensor is fully covered. Once the reading has stabilized, the value will be recorded on the Field Sampling Sheets.
- Turbidity will be measured with a turbidity meter (turbidimeter). First, a water sample will be collected and covered. This sample will be set aside until it equilibrates with the ambient air temperature and to let gases escape. Then, an empty turbidity tube will be rinsed with a portion of the sample and any excess water will be shaken out. The turbidity tube will then be filled with the sample by pouring the sample down the side of the tube to avoid creating bubbles. The tube will then be capped and wiped dry with a clean lint-free tissue. The turbidity tube will be placed in the turbidimeter and the turbidity value will be read. This value will be recorded on the Field Sampling Sheet.
- The quantity of nitrates and phosphates in the water will be determined with a nitrate test kit and a low range phosphate test kit, respectively, in conjunction with a colorimeter. Water samples will be collected at the same time as the other water quality parameters. These samples will be stored in an ice cooler with blue ice packs until they are analyzed in the office laboratory at Mission RCD. The samples will be prepared and the colorimeter will be used according to the colorimeter's operator's manual. The measured and calculated results will be recorded on the Field Sampling Sheet.
- Streamflow will be determined by using the orange peel and river profile method described in the *State Water Resources Control Board Clean Water Team Citizen Water Quality Monitoring* manual[2]. All results will be recorded on the Field Sampling Sheet.

3.2 Physical Habitat Protocols

3.2.1 Air temperature, Overstory Density, and Location Protocols

- Air temperature will be measured with a bulb thermometer that will be placed in the shade, if possible, and recorded after the readings have stabilized. The value will be recorded on the Field Sampling Sheets.
- Overstory density will be determined using a densiometer. The densiometer will be read at a designated location that will be used on every sampling date. The densiometer will be read three times for each site each sampling date. First, the densiometer will be read while

[2] Clean Water Team. 2001. Citizen Monitoring Program of the State Water Resources Control Board: Draft Compendium Water Quality Monitoring and Assessment. 2nd Draft.

the observer is facing upstream. Second, the densiometer will be read as the observer faces the river or stream. Third, the densiometer will be read while the observer is facing downstream. The number of dots observed and percent overstory density will be calculated for each reading and recorded on the Field Sampling Sheet.

- The latitude and longitude of each site will be determined using a GPS hand-held unit. The latitude and longitude will be read at a designated location that will be used every sampling date. The values will be recorded on the Field Sampling Sheet.

3.2.2 Visual Assessments

The following site conditions will be assessed using the codes provided on the bottom of the second page of the Field Sampling Sheets. If, at any time, "other" is chosen, a description must be included. Observations will be made from a designated location along the water body that will be used for each sampling date. The protocols for the visual assessment portion of the Field Sampling Sheets are described in the *State Water Resources Control Board Clean Water Team Citizen Water Quality Monitoring* manual.

- Weather conditions – all applicable current weather conditions at the sites will be recorded.
- Algae – algae growth will be specified as either free floating or as attached to the rocks or cobbles in the stream. The percentage of algae present within the stream or river will be recorded.
- Clarity– the clarity of the water will be determined by how clearly, if at all, the observer can see the streambed or greater than four inches below the surface of the water.
- Color – the color of the flowing water will be determined by visually observing the stream.
- Flow – water flow will be a visual estimation of how much water is flowing past a specific point.
- Foam – foam presence and appearance on the water will be visually observed.
- Litter – the amount of litter will be observed and recorded.
- Odor – the presence or absence of any odor at the site will be recorded.
- Oil – the presence of petroleum or other oily substances will be described and recorded.

3.3 Bacterial Protocols

A certified laboratory will determine the presence and quantity or absence of total and fecal coliform bacteria. The test kit that the laboratory will use will be Colilert® 24 hour Test Kit. The selected laboratory will determine the protocols for the bacterial testing.

3.4 Bioassessment Protocols.

Bioassessment sampling will be performed using protocols specified in the *Measuring the Health of California Stream and Rivers* manual[3] and under the guidance of the San Diego Stream Team's Quality Assurance Project Plan. The stream habitat quality will be assessed, at the same time as the bioassessment procedures are conducted, using the California Dept. of Fish and Game Physical Habitat Assessment Form and protocols.

[3] Harrington and Born. 2000. Measuring the Health of California Streams and River: a methods manual for resource professionals, citizen monitors, and natural resource students. 2nd edition.

Section 4 Field Sampling Sheets

4.1 Entering Data in the Field Sampling Sheets

Instructions for completing the Santa Margarita River Home$_2$Ocean Citizen Water Quality Monitoring Program Field Sampling Sheets are as follows.

4.1.1 Introductory Section

- Date: Record the date of when the sampling activity occurred.
- Recorder/Name: Write the name of the person filling out the field sampling sheet.
- Field Samplers: List all of the volunteers present for the sampling activity.
- Location: Write the name of the sampling site.
- Latitude and Longitude: Write the latitude and longitude of the sampling site.
- Time (military): Write the starting time of the sampling activity in military time.
- Rain in last 24 hours?: Specify if there was rain at the sampling site within the last 24 hours.
- Weather Conditions: Specify all of the current weather conditions using the codes on the bottom of the second page of the Field Sampling Sheet.

4.1.2 Field Measurements

For each of the field measurements, specify the instrument ID number in the appropriate spaces. There will be three replications for each measurement. The replications results will be recorded in the 1st, 2nd, and 3rd result boxes, respectively. The protocols for measuring all of the field measurement items are described in Section 3 Monitoring Protocols. Each replicate will be recorded as follows.

- Air Temperature: Record, in this box, the air temperature that was measured with a bulb thermometer in Celsius (° C).
- Water Temp w/Bulb Therm: Record, in this box, the water temperature that was measured with a bulb thermometer in Celsius (° C).
- Water Temp w/DO meter: Record, in this box, the water temperature that was measured with a dissolved oxygen meter in Celsius (° C).
- Dissolve Oxygen: Record the percent oxygen saturation (% Sat) and oxygen parts per million (ppm) that were measured with the DO meter in these two boxes.
- pH: Record, in this box, the water pH that was measured with the pH meter.
- Total Dissolved Solids: Record, in this box, the total dissolved solids (TDS), in parts per million (ppm), that were measured with the TDS meter.
- Turbidity: Record, in this box, the turbidity, in Nephelometric Turbidity Units (NTU), that was measured with the turbidity meter.
- The phosphate and nitrate values in this section are calculated by multiplying the measured office lab data results with the dilution ratio of the samples.
    - Phosphate (calculated lab results): Record the calculated phosphate results in parts per million (ppm).
    - Nitrate (calculated lab results): Record the calculated nitrate results in parts per million (ppm).

4.1.3 Measured Office Lab Data

- The dilution ratio will be recorded for the phosphate and nitrate tests in the dilution ratio box.
- The actual phosphate and nitrate results will be entered in their respective boxes in this section. The units will be in parts per million (ppm).

4.1.4 Densiometer Reading

Each densiometer reading (the number of dots counted) will be recorded. Then the percent overstory density will be calculated and recorded in the "% overstory density" boxes for each reading.

4.1.5 River Profile #1 and #2

The width of the river or stream will be entered, in the units of feet, in the "Width of Selection" section. The intervals of the river profile and each respective depth will be recorded in the "Distance" and "Total Depth" sections. The units for the "Distance" and "Total Depth" sections are in feet. The river profile #1 is the downstream river profile and is separate from the upstream river profile #2.

4.1.6 Streamflow Data

The distance or length of the velocity run will be recorded in the "Distance" column, while the time it took for the orange peel to travel the designated distance will be recorded in the "Time" column. The units for the "Distance" column are in feet, while the units for the "Time" column are in seconds.

4.1.7 Site Conditions

The codes at the bottom of the second page of the field sampling sheet will be used to complete this section.

4.1.8 Notes

Any extra notations, questions or comments made by the field samplers will be entered in this section.

Section 5 Analysis Location, Custody Procedures, and Equipment

5.1 Analysis Location, Equipment Calibration and Maintenance, and Custody Procedures

Water temperature, dissolved oxygen, pH, total dissolved solids, turbidity, and streamflow will all be measured in the field. The visual assessment of the stream and habitat, and benthic macroinvertebrate sampling will also be performed in the field. The nitrate and phosphate analysis

will be performed in the office laboratory at Mission RCD. A professional laboratory will perform the coliform bacteria testing.

The following equipment will be calibrated, according to their manufacturer's instructions, at the start of each sampling day: DO meter, pH meter, and TDS meter. Bulb thermometers do not need to be calibrated before each use. The equipment will be maintained according to their manufacturer's instructions.

The custody procedures for the samples are detailed in the Quality Assurance Program Plan for the $Home_2$Ocean Citizen Water Quality Monitoring Program.

5.2 Supplies and Equipment list

The following lists encompass all of the supplies and equipment that will be needed to execute the $Home_2$Ocean program.

5.2.1 Field Supplies and Field Testing Equipment

The following supplies and equipment will be used for the field sampling portion of the $Home_2$Ocean program. Not all of the items listed below are to be used in the field, as some are to be used for calibrating the field equipment.

- Calculator
- Clipboard
- Densiometer – Convex Model A
- DO meter, DO 300, WP – Oakton
- D-shaped kick net
- Envirosafe thermometer (two)
- Equipment carrying buckets
- First Aid Kit
- Flags
- Grab pole
- Hand sanitizer
- Ice cooler
- Isopropyl alcohol
- Keson open reel measuring tape (two)
- Labels
- Latex gloves
- Marking tape/string
- Meridian GPS unit – Magellan
- Paper towels
- Pens, pencils, sharpie marker
- pH buffer pack – Oakton
- Sampling bottles
- Stadia level rod
- Stopwatch/clock
- TDS calibration kit
- Trash bags
- Turbidity meter – LaMotte
- Turbidity standard (1413 µs)
- Waders/rubber boots
- Waste containers
- Water bottles
- WP pH Testr2 – Oakton
- WP TDS Testr Low– Oakton

5.2.2 Laboratory Supplies and Laboratory Testing Equipment

The following supplies and equipment will be used in the office laboratory at Mission RCD. These items will be used to analyze the water quality parameters of nitrate and phosphate as well as to maintain all of the lab and field equipment.

- Antiseptic hand cleaner
- Anti-static cloth
- Batteries
- BOAS safety eyewear
- Bottle brush
- Isopropyl alcohol

- Lab table matting
- Latex gloves
- Lens cleaner towelettes
- Liquinox cleaning solution
- Reagent Test Kit – Nitrate
- Reagent Test Kit – Phosphate, low range
- Smart2 Colorimeter – LaMotte
- Square mouth bottles
- Test tubes (15 ml)
- Wash bottles
- Waste containers

Appendix 1. Field Sampling Sheets

FRONT OF FIELD SAMPLING SHEET:

Date	Recorder/Name
Field Samplers	
Location	
Latitude and Longitude	
Time (military)	Rain in Last 24 hours? Yes No
Weather Condititons (use codes on reverse side)	

Field Measurements	Instrument ID	Measured Field & Calculated Lab Data			Notes
		1st result	2nd result	3rd result	
Air Temperature (C)					
Water Temp w/bulb Therm. (C)					
Water Temp w/DO meter (C)					
Dissolved Oxygen (% Sat)					
Dissolved Oxygen (ppm)					
pH					
Total Dissolved Solids TDS (ppm)					
Turbidity (ntu)					
Phosphates (ppm) (calculated lab results)					
Nitrates (ppm) (calculated lab results)					

Measured Office Lab Data (ppm)			
	Phosphate	Nitrate	Dilution ratio
1st result			
2nd result			
3rd result			

Densiometer Reading		
	# of dots	(% overstory density)
result 1		
result 2		
result 3		

River Profile #1 (downstream)			
Width of Selection (ft)			
Distance (ft)	Total Depth (ft)	Distance (ft)	Total Depth (ft)

River Profile #2 (upstream)			
Width of Selection (ft)			
Distance (ft)	Total Depth (ft)	Distance (ft)	Total Depth (ft)

BACK OF FIELD SAMPLING SHEET:

Streamflow Data			
		Distance (ft)	Time (s)
Interval 1	Run 1		
	Run 2		
	Run 3		
Interval 2	Run 1		
	Run 2		
	Run 3		
Interval 3	Run 1		
	Run 2		
	Run 3		
Interval 4	Run 1		
	Run 2		
	Run 3		
Interval 5	Run 1		
	Run 2		
	Run 3		

Site Conditions (use codes at bottom of page)	
Algae	
Clarity	
Color	
Flow	
Foam	
Litter	
Odor	
Oil	

Notes

Field Sampling Codes*

Weather conditions (choose all that apply)

0	clear/sunny
1	calm
2	light breeze
3	windy
4	very windy
5	overcast/cloudy
6	partly cloudy
7	foggy
8	drizzle
9	rain
10	snow
11	hail
12	other (describe)

Algae (specify as floating or attached to the rocks)

0	none
1	light (<5%)**
2	moderate (5-25%)
3	high (26-50%)
4	dense (>50%)

** % of algae in area of streambed

Clarity

0	clear
1	cloudy (can see bottom in >4" water)
2	murky (can't see bottom in 4" or less)

Color

0	none
1	amber
2	blue
3	brown
4	green
5	olive brown
6	red
7	yellow
8	other (describe)

Flow

0	stagnant (NOT flowing)
1	trickle (<1 quart/sec)
2	moderate (<5 gallons/sec)
3	high (>5 gallons/sec)

Foam

0	none
1	separate bubbles
2	moderate (<1/2 in high)
3	high (>1/2 inch high)

Litter

0	none
1	light (< 5 pieces)
2	moderate (6-10)
3	high (11-25 pieces)
4	mildly dense (26-50)
5	dense (>50 pieces)

Odor

0	none
1	ammonia
2	chlorine
3	decaying organisms
4	feces (sewage)
5	fishy
6	musty
7	petroleum
8	sulfide (rotten egg)
9	other (describe)

Oil

0	none
1	light sheen (rainbow)
2	slick
3	tar on banks/bed

*State Water Resource Control Board. 2001. Draft Compendium Water Quality Monitoring and Assessment: 2nd Draft.

APPENDIX D

Collected and interpreted water quality data

WATER QUALITY DATA FOR THE HOME$_2$OCEAN PROGRAM'S SAMPLING SITES

Sampling Date	Sampling Location	Time (military)	Rain in 24 hrs?	Weather Conditions	Air Temp (˚C)	Water Temp (˚C)	DO (mg/L)	pH	TDS (mg/L)	Turbidity (NTU)	PO4 (mg/L)	NO3 (mg/L)
7/29/2003	Stone Creek 1	945	Yes	PrtlyCldy,Calm	NS	21.1	6.14	7.5	467	2.49	0.09	0.06
7/29/2003	SMR mainstem	1027	Yes	PrtlyCldy,LtBrz	NS	24.2	8.29	7.8	540	2.34	0.07	0.76
7/29/2003	Rainbow Creek	1200	Yes	Clear/Sunny	NS	26.8	6.59	7.7	950	0.53	0.97	12.13
8/12/2003	Stone Creek 1	944	No	PrtlyCldy	NS	20.8	4.16	8.2	443	5.68	0.07	0.00
8/12/2003	SMR mainstem	1020	No	PrtlyCldy	NS	26.6	6.92	8.1	543	2.2	0.14	0.37
8/12/2003	Rainbow Creek	1129	No	Clear/Sunny	NS	19.7	8.50	7.8	957	0.57	5.40	9.20
8/26/2003	Stone Creek 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/26/2003	SMR mainstem	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/26/2003	Rainbow Creek	929	No	Clear/Sunny	23.5	20.1	7.77	7.7	997	0.41	1.20	9.87
9/9/2003	Stone Creek 1	930	No	OvrCast/Cldy	24	NS	NS	NS	NS	NS	NS	NS
9/9/2003	SMR mainstem	951	No	OvrCast/Cldy	22	24.1	7.09	7.7	520	1.87	0.11	0.38
9/9/2003	Rainbow Creek	1143	No	Clear/Sunny	22.5	23.9	7.11	7.5	967	0.39	0.53	14.17
9/23/2003	Stone Creek 1	934	No	Clear/Sunny	NS	NS	NS	NS	NS	NS	NS	NS
9/23/2003	SMR mainstem	1000	No	Clear/Sunny	24	22.2	7.67	7.6	530	2.65	0.08	0.57
9/23/2003	Rainbow Creek	1033	No	PrtlyCldy	21.5	18.6	8.35	7.6	997	1.15	0.73	13.10
10/7/2003	Stone Creek 1	936	No	Clear/Sunny	23	NS	NS	NS	NS	NS	NS	NS
10/7/2003	SMR mainstem	957	No	Clear/Sunny	22	22.4	7.29	7.5	557	1.45	0.16	0.59
10/7/2003	Rainbow Creek	1123	No	Clear/Sunny	24.5	21.0	7.67	7.4	990	0.5	0.53	11.70
10/21/2003	Stone Creek 1	930	No	Clear/Sunny	25	NS	NS	NS	NS	NS	NS	NS
10/21/2003	SMR mainstem	950	No	Clear/Sunny	28	21.8	7.33	7.3	537	1.75	0.13	0.75
10/21/2003	Rainbow Creek	1045	No	Clear/Sunny	26	17.3	8.49	7.4	970	0.45	0.70	13.90
11/4/2003	Stone Creek 1	925	Yes	PrtlyCldy	NS	NS	NS	NS	NS	NS	NS	NS
11/4/2003	SMR mainstem	934	Yes	PrtlyCldy	15	14.9	9.72	7.3	627	0.6	0.13	1.40
11/4/2003	Rainbow Creek	1015	Yes	PrtlyCldy	16	14.9	8.80	7.1	943	0.175	0.60	13.30
11/18/2003	Stone Creek 1	922	No	Clear/Sunny	17	14.9	4.19	6.5	443	0	0.16	0.10
11/18/2003	SMR mainstem	1000	No	Clear/Sunny	16.5	13.4	9.23	7.3	660	16	0.40	1.87
11/18/2003	Rainbow Creek	1056	No	Clear/Sunny	19	14.7	8.90	7.1	950	0.275	0.50	11.33
12/2/2003	Stone Creek 1	930	No	Clear/Sunny	18	14.7	2.25	7.2	447	2.45	0.21	0.03
12/2/2003	SMR mainstem	1017	No	Clear/Sunny	14	10.7	11.03	7.8	637	0.85	0.05	1.01
12/2/2003	Rainbow Creek	1140	No	Clear/Sunny	16	13.0	9.13	7.6	977	0	0.53	12.43
12/16/2003	Stone Creek 1	930	No	Clear/VryWndy	17	13.4	4.67	7.1	420	0	0.16	0.05
12/16/2003	SMR mainstem	10	No	Clear/Wndy	16	8.8	11.42	7.8	620	0.605	0.06	1.06
12/16/2003	Rainbow Creek	1121	No	Clear/VryWndy	18	13.6	8.82	7.7	950	0	0.20	14.03

Sampling Date	Sampling Location	Time (military)	Rain in 24 hrs?	Weather Conditions	Air Temp (˚C)	Water Temp (˚C)	DO (mg/L)	pH	TDS (mg/L)	Turbidity (NTU)	PO4 (mg/L)	NO3 (mg/L)
1/13/2004	Stone Creek 1	930	No	Clear/LtBrz	16.5	13.7	5.25	6.9	417	0.005	0.25	0.08
1/13/2004	SMR mainstem	1009	No	PrtlyCldy	13.5	10.5	11.12	7.8	627	1.64	0.10	0.92
1/13/2004	Rainbow Creek	1134	No	Clear/Calm	20	13.5	10.18	7.6	937	0	0.70	10.93
1/27/2004	Stone Creek 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/27/2004	SMR mainstem	857	No	Clear/Sunny	12	11.3	10.45	7.6	617	1	0.07	0.74
1/27/2004	Rainbow Creek	1002	No	Clear/Sunny	13	11.2	10.81	7.6	927	0	1.70	8.17
2/10/2004	Stone Creek 1	906	No	Clear/Sun/Windy	13	11.8	5.90	6.6	777	0	0.10	0.05
2/10/2004	SMR mainstem	930	No	Clear/Sun/Windy	13	9.0	10.32	7.4	1143	2.21	0.09	0.88
2/10/2004	Rainbow Creek	1021	No	Clear/Sun/Windy	18	11.9	10.76	7.6	1723	0	0.53	7.43
2/24/2004	Stone Creek 1	900	Yes	OvrCast/Drizzle	11	13.5	5.82	7.3	777	0	0.14	0.05
2/24/2004	SMR mainstem	935	Yes	OvrCast/Cldy	13	12.1	10.08	7.5	620	97.5	0.63	0.49
2/24/2004	Rainbow Creek	1032	Yes	Calm/PrtlyCldy	15	13.2	10.15	7.7	1430	3.11	1.03	13.87
3/9/2004	Stone Creek 1	900	No	Clear/Sunny	21	14.5	5.16	7.1	813	0.02	0.09	0.01
3/9/2004	SMR mainstem	930	No	Clear/LtBrz	27.5	16.4	9.88	7.8	1167	3.9	0.08	1.32
3/9/2004	Rainbow Creek	1040	No	Clear/LtBrz	27	16.2	10.49	7.5	1710	1.3	1.33	10.60
3/23/2004	Stone Creek 1	915	No	Foggy/Drizzle	16.5	15.8	5.20	7.2	810	0.025	0.09	0.05
3/23/2004	SMR mainstem	940	No	Foggy/Drizzle	14	17.7	8.38	7.7	1130	1.6	0.26	0.85
3/23/2004	Rainbow Creek	1030	No	Foggy/Drizzle	14.5	15.3	9.45	7.9	1750	11.485	0.57	9.03
4/6/2004	Stone Creek 1	900	No	OvrCast/Cldy	17	15.2	5.12	7.1	810	0	0.08	0.05
4/6/2004	SMR mainstem	925	No	OvrCast/Cldy	15	17.4	8.20	7.4	1113	0.935	1.13	1.44
4/6/2004	Rainbow Creek	1030	No	OvrCast/Cldy	15	15.3	8.85	7.5	1800	0.05	0.83	11.10
4/20/2004	Stone Creek 1	925	No	Clear/Sunny	19	14.0	5.44	7.3	823	0	0.12	0.11
4/20/2004	SMR mainstem	1000	No	Clear/Sunny	15	17.1	8.13	7.6	1090	0.925	0.06	0.90
4/20/2004	Rainbow Creek	1105	No	Clear/LtBrz	18	20.8	7.88	7.4	777	0	0.40	10.13
5/4/2004	Stone Creek 1	908	No	Clear/Sunny	24.5	18.2	2.08	7.1	840	0.95	0.11	0.01
5/4/2004	SMR mainstem	948	No	Clear/Sunny	29	21.4	6.34	7.5	1190	1.9	0.10	0.85
5/4/2004	Rainbow Creek	1100	No	Clear/Sunny	28.5	17.5	8.46	7.6	1803	0.025	0.50	11.63
5/18/2004	Stone Creek 2	910	No	Clear/Sunny	19.5	16.5	8.27	7.4	1010	1.075	0.09	0.40
5/18/2004	SMR mainstem	1000	No	Clear/Sunny	19.5	20.5	6.56	7.5	1210	1.5	0.00	0.71
5/18/2004	Rainbow Creek	1100	No	Clear/Sunny	22	19.2	8.08	7.6	1800	0	1.00	10.93
6/1/2004	Stone Creek 2	910	No	Clear/Sunny	23	14.8	8.55	7.5	1000	0.125	0.13	0.33
6/1/2004	SMR mainstem	950	No	Clear/Sunny	25.5	21.3	6.34	7.5	1220	2.05	0.12	0.75
6/1/2004	Rainbow Creek	1045	No	Clear/Sunny	27.5	16.6	8.89	7.7	1783	0	0.40	10.67
6/15/2004	Stone Creek 2	909	No	OvrCast/Cldy	17.5	16.9	8.31	7.2	1007	0.425	0.13	0.38

Sampling Date	Sampling Location	Time (military)	Rain in 24 hrs?	Weather Conditions	Air Temp (˚C)	Water Temp (˚C)	DO (mg/L)	pH	TDS (mg/L)	Turbidity (NTU)	PO4 (mg/L)	NO3 (mg/L)
6/15/2004	SMR mainstem	943	No	Calm/PrtlyCldy	19	20.9	7.33	7.6	1280	2.3	0.09	0.79
6/15/2004	Rainbow Creek	1015	No	Clear/Sunny	20	17.3	8.69	7.5	1800	0.4	0.33	12.57
6/29/2004	Stone Creek 2	900	No	OvrCast/Cldy	18	17.2	8.36	7.6	997	0.225	0.07	0.32
6/29/2004	SMR mainstem	945	No	PrtlyCldy	21	21.7	7.42	7.6	1290	1.975	0.05	0.67
6/29/2004	Rainbow Creek	1030	No	Clear/Sunny	21	17.7	8.24	7.6	1780	0.225	0.80	12.13
7/13/2004	Stone Creek 2	905	No	PrtlyCldy/Calm	23.5	17.4	8.65	7.4	1000	0.36	0.13	0.25
7/13/2004	SMR mainstem	930	No	PrtlyCldy/Calm	27	23.2	5.45	7.4	1267	2.325	0.07	0.73
7/13/2004	Rainbow Creek	1040	No	Clear/Sunny	28.5	18.3	8.29	7.4	1780	0.8	0.60	9.50
7/27/2004	Stone Creek 2	910	No	Clear/LtBrz	19	17.9	8.40	7.5	993	0	0.08	0.38
7/27/2004	SMR mainstem	950	No	Clear/LtBrz	23	23.1	7.07	7.4	1210	0.925	0.04	0.70
7/27/2004	Rainbow Creek	1047	No	Clear/LtBrz	25	19.0	8.32	7.4	1780	1.35	0.60	10.60
8/24/2004	Stone Creek 2	900	No	PrtlyCldy/Calm	19	16.2	8.85	7.6	983	0.1	0.09	0.33
8/24/2004	SMR mainstem	940	No	Clear/LtBrz	20.5	21.0	7.32	7.5	1130	4.85	0.06	0.59
8/24/2004	Rainbow Creek	1100	No	Clear/Sunny	21.5	17.2	8.69	7.6	1787	1.2	0.53	11.67
9/7/2004	Stone Creek 2	900	No	Clear/LtBrz	23.5	19.9	7.89	7.7	1010	0.95	0.09	0.41
9/7/2004	SMR mainstem	938	No	Clear/Sunny	26	22.6	6.76	7.6	1113	1.2	0.15	0.51
9/7/2004	Rainbow Creek	1045	No	Clear/LtBrz	27.5	18.4	8.34	7.5	1813	0.775	1.73	12.27
9/21/2004	Stone Creek 2	917	No	Clear/LtBrz	21.5	16.2	7.07	7.7	1013	0.2	0.09	0.49
9/21/2004	SMR mainstem	952	No	Clear/Wndy	24.5	19.4	8.07	7.7	1150	0.675	0.03	0.61
9/21/2004	Rainbow Creek	1111	No	Clear/LtBrz	26.5	17.5	8.31	7.6	1827	0.275	0.10	13.73

Sampling Date	Sampling Location	Densiometer (% canopy density)	Total Coliform (MPN/100 ml)	*E. coli* (MPN/100 ml)
7/29/2003	Stone Creek 1	88.91	6867	95.9
7/29/2003	SMR mainstem	55.28	14136	24.3
7/29/2003	Rainbow Creek	93.41	5172	46.5
8/12/2003	Stone Creek 1	59.44	>24192	31
8/12/2003	SMR mainstem	62.56	>24192	20
8/12/2003	Rainbow Creek	99.31	>24192	31
8/26/2003	Stone Creek 1	NS	NS	NS
8/26/2003	SMR mainstem	NS	NS	NS
8/26/2003	Rainbow Creek	100.00	NS	NS
9/9/2003	Stone Creek 1	95.15	NS	NS
9/9/2003	SMR mainstem	87.17	7230	<10
9/9/2003	Rainbow Creek	99.65	6630	20
9/23/2003	Stone Creek 1	NS	NS	NS
9/23/2003	SMR mainstem	79.89	15531	47.4
9/23/2003	Rainbow Creek	99.65	7701	4352
10/7/2003	Stone Creek 1	79.20	NS	NS
10/7/2003	SMR mainstem	70.53	15531	14.8
10/7/2003	Rainbow Creek	97.23	11199	10.8
10/21/2003	Stone Creek 1	89.25	NS	NS
10/21/2003	SMR mainstem	72.27	12033	28
10/21/2003	Rainbow Creek	97.57	4352	18
11/4/2003	Stone Creek 1	NS	NS	NS
11/4/2003	SMR mainstem	79.20	2480	52
11/4/2003	Rainbow Creek	98.96	1920	68
11/18/2003	Stone Creek 1	97.57	NS	NS
11/18/2003	SMR mainstem	66.03	5170	35
11/18/2003	Rainbow Creek	95.49	2370	63
12/2/2003	Stone Creek 1	93.41	208	<1
12/2/2003	SMR mainstem	75.04	2050	17.5
12/2/2003	Rainbow Creek	97.57	1050	10.9
12/16/2003	Stone Creek 1	86.48	51	<1
12/16/2003	SMR mainstem	41.76	622	22
12/16/2003	Rainbow Creek	85.09	1510	30

Sampling Date	Sampling Location	Densiometer (% canopy density)	Total Coliform (MPN/100 ml)	*E. coli* (MPN/100 ml)
1/13/2004	Stone Creek 1	86.48	397	10
1/13/2004	SMR mainstem	61.52	530	33
1/13/2004	Rainbow Creek	65.68	1160	44
1/27/2004	Stone Creek 1	NS	NS	NS
1/27/2004	SMR mainstem	58.40	1460	11
1/27/2004	Rainbow Creek	78.68	2300	39
2/10/2004	Stone Creek 1	97.57	2170	42
2/10/2004	SMR mainstem	66.72	702	21
2/10/2004	Rainbow Creek	67.76	2000	43
2/24/2004	Stone Creek 1	81.63	170	25
2/24/2004	SMR mainstem	54.59	10500	1190
2/24/2004	Rainbow Creek	78.16	1970	870
3/9/2004	Stone Creek 1	98.27	2420	<1
3/9/2004	SMR mainstem	55.28	4880	52
3/9/2004	Rainbow Creek	64.99	3870	73
3/23/2004	Stone Creek 1	99.31	2140	318
3/23/2004	SMR mainstem	73.65	>24200	52
3/23/2004	Rainbow Creek	96.88	>24200	888
4/6/2004	Stone Creek 1	98.61	989	23
4/6/2004	SMR mainstem	63.60	2250	76
4/6/2004	Rainbow Creek	96.88	4350	280
4/20/2004	Stone Creek 1	98.27	645	9.7
4/20/2004	SMR mainstem	60.13	2090	60.1
4/20/2004	Rainbow Creek	97.92	810	112
5/4/2004	Stone Creek 1	87.17	1400	1
5/4/2004	SMR mainstem	66.03	>24192	48.7
5/4/2004	Rainbow Creek	98.96	4610	40.3
5/18/2004	Stone Creek 2	97.92	846.2	<1
5/18/2004	SMR mainstem	56.32	12997	12.1
5/18/2004	Rainbow Creek	89.60	8664	686
6/1/2004	Stone Creek 2	87.52	1220	<1
6/1/2004	SMR mainstem	62.56	12000	26.6
6/1/2004	Rainbow Creek	90.64	15500	380
6/15/2004	Stone Creek 2	97.92	501.2	4.1

Sampling Date	Sampling Location	Densiometer (% canopy density)	Total Coliform (MPN/100 ml)	*E. coli* (MPN/100 ml)
6/15/2004	SMR mainstem	80.24	>24192	115
6/15/2004	Rainbow Creek	96.88	8664	163
6/29/2004	Stone Creek 2	96.88	712	<1
6/29/2004	SMR mainstem	87.52	14136	19
6/29/2004	Rainbow Creek	100.00	112	112
7/13/2004	Stone Creek 2	92.37	866.4	8.2
7/13/2004	SMR mainstem	67.07	10462	6.3
7/13/2004	Rainbow Creek	95.84	6867	119
7/27/2004	Stone Creek 2	88.21	6294	8.15
7/27/2004	SMR mainstem	66.03	545.2	16.8
7/27/2004	Rainbow Creek	92.03	5012	824.2
8/24/2004	Stone Creek 2	97.92	960	4.1
8/24/2004	SMR mainstem	65.68	6488	10.5
8/24/2004	Rainbow Creek	97.92	5794	224.9
9/7/2004	Stone Creek 2	98.61	1276.8	21
9/7/2004	SMR mainstem	72.27	7270	16.1
9/7/2004	Rainbow Creek	95.84	6867	7.2
9/21/2004	Stone Creek 2	91.68	170	2
9/21/2004	SMR mainstem	69.15	1300	50
9/21/2004	Rainbow Creek	96.53	1400	22

APPENDIX E

Site conditions recorded for the sampling sites between July 29, 2003 and September 30, 2004

KEY FOR SITE CONDITION CODES*

NS = Not Sampled

Algae (specify as floating or attached to the rocks)

0	none
1	light (<5%)**
2	moderate (5-25%)
3	high (26-50%)
4	dense (>50%)

** % of algae in area of streambed

Water Clarity

0	clear
1	cloudy (can see bottom in >4" water)
2	murky (can't see bottom in 4" or less)

Water Color

0	none
1	amber
2	blue
3	brown
4	green
5	olive brown
6	red
7	yellow
8	other (describe)

Water Flow

0	stagnant (NOT flowing)
1	trickle (<1 quart/sec)
2	moderate (<5 gallons/sec)
3	high (>5 gallons/sec)

*State Water Resource Control Board. 2001. Draft Compendium Water Quality Monitoring and Assessment: 2nd Draft.

Foam

0	none
1	separate bubbles
2	moderate (<1/2 in high)
3	high (>1/2 inch high)

Litter

0	none
1	light (< 5 pieces)
2	moderate (6-10)
3	high (11-25 pieces)
4	mildly dense (26-50)
5	dense (>50 pieces)

Odor

0	none
1	ammonia
2	chlorine
3	decaying organisms
4	feces (sewage)
5	fishy
6	musty
7	petroleum
8	sulfide (rotten egg)
9	other (describe)

Oil

0	none
1	light sheen (rainbow)
2	slick
3	tar on banks/bed

SITE CONDITIONS OF THE HOME$_2$OCEAN PROGRAM'S SAMPLING SITES

STONE CREEK (Sites 1 and 2)

DATE	Location	Algae	Clarity	Color	Flow	Foam	Litter	Odor	Oil
7/29/2003	Stone Creek	high	clear	none	trickle	none	none	none	none
8/12/2003	Stone Creek	light	murky	olive brwn	stagnant	none	none	none	none
8/26/2003	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
9/9/2003	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
9/23/2003	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
10/7/2003	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
10/21/2003	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
11/4/2003	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
11/18/2003	Stone Creek	none	clear	none	trickle	none	none	none	none
12/2/2003	Stone Creek	light	clear	none	trickle	none	none	none	none
12/16/2003	Stone Creek	none	clear	none	trickle	none	none	none	none
1/13/2004	Stone Creek	none	clear	none	trickle	none	none	none	none
1/27/2004	Stone Creek	NS	NS	NS	NS	NS	NS	NS	NS
2/10/2004	Stone Creek	none	clear	none	trickle	none	none	none	none
2/24/2004	Stone Creek	none	clear	none	trickle	none	none	none	none
3/9/2004	Stone Creek	moderate	clear	none	trickle	none	none	none	none
3/23/2004	Stone Creek	none	clear	none	trickle	none	none	none	none
4/6/2004	Stone Creek	none	clear	none	trickle	none	none	none	none
4/20/2004	Stone Creek	light	clear	none	trickle	none	none	none	none
5/4/2004	Stone Creek	light	clear	none	none	none	none	decay org	none
5/18/2004	Stone Creek 2	none	clear	none	trickle	none	none	none	none
6/1/2004	Stone Creek 2	light	clear	none	trickle	none	none	none	none
6/15/2004	Stone Creek 2	none	clear	none	trickle	none	none	none	none
6/29/2004	Stone Creek 2	none	clear	none	trickle	none	none	none	none
7/13/2004	Stone Creek 2	light	clear	none	trickle	none	none	none	none
7/27/2004	Stone Creek 2	light	clear	none	trickle	none	none	none	none
8/24/2004	Stone Creek 2	none	clear	none	trickle	none	none	none	none
9/7/2004	Stone Creek 2	none	clear	none	trickle	none	none	none	none
9/21/2004	Stone Creek 2	light	clear	none	trickle	none	light	none	none

SANTA MARGARITA RIVER MAINSTEM

DATE	Location	Algae	Clarity	Color	Flow	Foam	Litter	Odor	Oil
7/29/2003	SMR main	NA	cloudy	olive brwn	moderate	none	none	none	none
8/12/2003	SMR main	light	clear	brwn grn	moderate	none	none	none	none
8/26/2003	SMR main	NS	NS	NS	NS	NS	NS	NS	NS
9/9/2003	SMR main	light	murky	olive grn	moderate	none	light	decay org	none
9/23/2003	SMR main	light	clear	none	moderate	none	none	none	none
10/7/2003	SMR main	light	clear	olive brwn	trickle	none	none	none	none
10/21/2003	SMR main	light	clear	olive brwn	moderate	separate	none	none	none
11/4/2003	SMR main	light	clear	none	moderate	separate	none	none	none
11/18/2003	SMR main	NS	murky	olive brwn	moderate	moderate	none	none	none
12/2/2003	SMR main	none	clear	none	moderate	none	none	none	none
12/16/2003	SMR main	high	clear	none	moderate	none	none	none	none
1/13/2004	SMR main	light	clear	none	moderate	none	none	slight decay	none
1/27/2004	SMR main	light	clear	amber	moderate	separate	none	none	none
2/10/2004	SMR main	none	cloudy	none	moderate	none	none	none	none
2/24/2004	SMR main	none	murky	muddy	moderate	separate	none	none	none
3/9/2004	SMR main	light	cloudy	olive brwn	moderate	separate	none	none	none
3/23/2004	SMR main	light	clear	none	moderate	separate	none	none	none
4/6/2004	SMR main	light	clear	none	moderate	separate	none	none	none
4/20/2004	SMR main	moderate	clear	none	moderate	separate	none	none	none
5/4/2004	SMR main	light	clear	none	moderate	moderate	none	none	none
5/18/2004	SMR main	none	clear	none	moderate	moderate	none	none	none
6/1/2004	SMR main	light	cloudy	none	moderate	moderate	none	none	none
6/15/2004	SMR main	moderate	clear	none	moderate	moderate	none	none	none
6/29/2004	SMR main	moderate	cloudy	none	moderate	moderate	none	none	none
7/13/2004	SMR main	light	clear	none	moderate	separate	none	none	none
7/27/2004	SMR main	moderate	clear	none	moderate	separate	none	none	none
8/24/2004	SMR main	light	cloudy	none	moderate	moderate	none	vegetation	none
9/7/2004	SMR main	light	clear	none	moderate	none	none	none	none
9/21/2004	SMR main	light	clear	none	moderate	separate	none	decay org	none

RAINBOW CREEK

DATE	Location	Algae	Clarity	Color	Flow	Foam	Litter	Odor	Oil
7/29/2003	Rainbow C.	light	clear	amber	moderate	none	none	none	none
8/12/2003	Rainbow C.	NS	NS	NS	NS	NS	NS	NS	NS
8/26/2003	Rainbow C.	moderate	clear	olive brwn	moderate	none	none	none	none
9/9/2003	Rainbow C.	light	clear	none	moderate	none	none	none	none
9/23/2003	Rainbow C.	light	clear	none	moderate	none	none	none	none
10/7/2003	Rainbow C.	light	clear	amber	trickle	none	none	none	none
10/21/2003	Rainbow C.	light	clear	amber	moderate	none	none	none	none
11/4/2003	Rainbow C.	light	clear	none	moderate	none	none	none	none
11/18/2003	Rainbow C.	light	clear	none	moderate	none	none	wet leaves	none
12/2/2003	Rainbow C.	none	clear	none	moderate	none	none	none	none
12/16/2003	Rainbow C.	none	clear	none	moderate	none	none	none	none
1/13/2004	Rainbow C.	moderate	clear	none	moderate	separate	none	horsey	none
1/27/2004	Rainbow C.	moderate	clear	none	moderate	none	none	none	none
2/10/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
2/24/2004	Rainbow C.	none	clear	none	moderate	separate	none	none	none
3/9/2004	Rainbow C.	light	clear	none	moderate	separate	none	none	none
3/23/2004	Rainbow C.	light	murky	brown	moderate	separate	none	none	none
4/6/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
4/20/2004	Rainbow C.	moderate	clear	none	moderate	none	none	none	none
5/4/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
5/18/2004	Rainbow C.	none	clear	none	moderate	none	none	none	none
6/1/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
6/15/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
6/29/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
7/13/2004	Rainbow C.	moderate	clear	none	moderate	none	none	none	none
7/27/2004	Rainbow C.	moderate	clear	none	moderate	none	none	none	none
8/24/2004	Rainbow C.	none	clear	none	moderate	none	none	none	none
9/7/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none
9/21/2004	Rainbow C.	light	clear	none	moderate	none	none	none	none

ADOBE CREEK

DATE	Location	Algae	Clarity	Color	Flow	Foam	Litter	Odor	Oil
8/12/2003	Adobe C.	high	clear	none	none	none	none	none	none
9/23/2003	Adobe C.	high	clear	none	none	none	none	organic	none
10/8/2003	Adobe C.	high	clear	green	none	none	none	none	none
10/21/2003	Adobe C.	dense	clear	none	stagnant	none	none	none	none
11/4/2003	Adobe C.	moderate	clear	olive brwn	stagnant	none	none	none	none
11/18/2003	Adobe C.	moderate	clear	green	stagnant	none	none	none	none
12/2/2003	Adobe C.	dense	clear	none	stagnant	none	none	none	none
1/27/2004	Adobe C.	high	clear	none	trickle	none	none	musty	none
2/10/2004	Adobe C.	dense	clear	none	trickle	none	none	decay	none
2/24/2004	Adobe C.	light	clear	none	moderate	separate	none	none	none
3/9/2004	Adobe C.	light	clear	none	moderate	none	none	none	none
3/23/2004	Adobe C.	moderate	clear	none	trickle	none	none	none	none
4/6/2004	Adobe C.	moderate	clear	none	trickle	none	none	none	none
5/8/2004	Adobe C.	moderate	clear	none	trickle	none	none	none	none

COLE CREEK

DATE	Location	Algae	Clarity	Color	Flow	Foam	Litter	Odor	Oil
8/12/2003	Cole Creek	moderate	cloudy	olive brwn	none	none	none	organic	none
9/23/2003	Cole Creek	moderate	clear	olive brwn	none	none	none	none	none
1/27/2004	Cole Creek	none	cloudy	none	stagnant	none	none	none	none
2/10/2004	Cole Creek	none	cloudy	none	stagnant	none	none	none	none
2/24/2004	Cole Creek	none	cloudy	brown	moderate	none	none	none	none
3/9/2004	Cole Creek	light	clear	none	trickle	none	none	none	none
3/23/2004	Cole Creek	light	clear	amber	stagnant	none	none	none	none
4/6/2004	Cole Creek	light	clear	none	stagnant	none	none	none	none
5/8/2004	Cole Creek	moderate	clear	none	stagnant	none	none	none	none

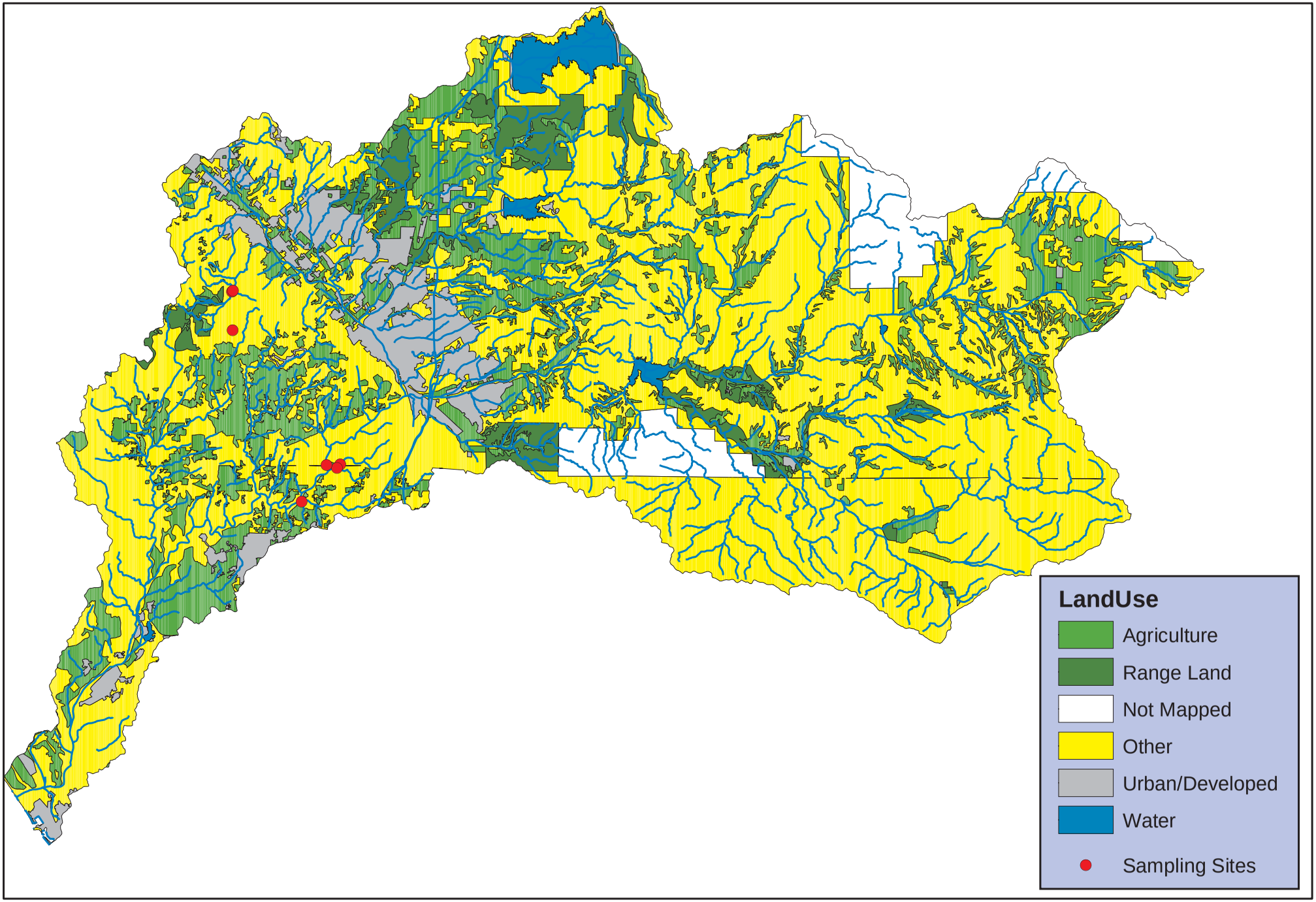
APPENDIX F

Land use map of the Santa Margarita River watershed.

Appendix F: Home2Ocean Program

Santa Margarita River Watershed Land Uses

Mission Resource Conservation District



APPENDIX G

Missing data point explanations

NS = Not Sampled

Sampling Date	Site	Air Temp	Water Temp	DO	pH	TDS	Turbidity	Ortho-PO_4	NO_3-N	Flow*	Total Coliform**	*E. Coli****	Comments
		(°C)	(°C)	mg/L	unit	mg/L	NTU	mg/L	mg/L	CFS	MPN/100 ml	MPN/100 ml	
7/29/2003	Rainbow Creek	NS											No bulb thermometer
7/29/2003	SMR mainstem	NS											No bulb thermometer
7/29/2003	Stone Creek 1	NS								NS			No bulb thermometer
8/12/2003	Adobe Creek	NS		NS				NS		NS	NS	NS	No bulb thermometer
8/12/2003	Cole Creek	NS					NS			NS	NS	NS	No bulb thermometer
8/12/2003	Rainbow Creek	NS											No bulb thermometer
8/12/2003	SMR mainstem	NS											No bulb thermometer
8/12/2003	Stone Creek 1	NS								NS			No bulb thermometer
8/26/2003	Rainbow Creek										NS	NS	Mix up with Lab, no pick up
8/26/2003	SMR mainstem	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	Couldn't access site
8/26/2003	Stone Creek 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	Couldn't access site
9/9/2003	Rainbow Creek												
9/9/2003	SMR mainstem												
9/9/2003	Stone Creek 1		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No water at sampling site
9/23/2003	Adobe Creek									NS	NS	NS	
9/23/2003	Cole Creek									NS	NS	NS	
9/23/2003	Rainbow Creek												
9/23/2003	SMR mainstem									NS			No waders to measure flow
9/23/2003	Stone Creek 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No water at sampling site
10/7/2003	Rainbow Creek												
10/7/2003	SMR mainstem												
10/7/2003	Stone Creek 1		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No water at sampling site
10/8/2003	Adobe Creek							NS	NS	NS	NS	NS	
10/21/2003	Adobe Creek							NS	NS	NS	NS	NS	
10/21/2003	Rainbow Creek												
10/21/2003	SMR mainstem									NS			No surface flow to measure
10/21/2003	Stone Creek 1		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No water at sampling site
11/4/2003	Adobe Creek							NS	NS	NS	NS	NS	
11/4/2003	Rainbow Creek												
11/4/2003	SMR mainstem									NS			No waders to measure flow
11/4/2003	Stone Creek 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	Very small puddles at site
11/18/2003	Adobe Creek							NS	NS	NS	NS	NS	

Sampling Date	Site	Air Temp	Water Temp	DO	pH	TDS	Turbidity	Ortho-PO_4	NO_3-N	Flow*	Total Coliform**	*E. Coli***	Comments
		(°C)	(°C)	mg/L	unit	mg/L	NTU	mg/L	mg/L	CFS	MPN/100 ml	MPN/100 ml	
11/18/2003	Rainbow Creek												
11/18/2003	SMR mainstem												
11/18/2003	Stone Creek 1									NS	NS	NS	Creek bed had some water
12/2/2003	Adobe Creek							NS	NS	NS	NS	NS	
12/2/2003	Rainbow Creek												
12/2/2003	SMR mainstem												
12/2/2003	Stone Creek 1									NS	NS	NS	No water at sampling site
12/16/2003	Rainbow Creek									NS			Could not measure flow
12/16/2003	SMR mainstem												
12/16/2003	Stone Creek 1									NS	NS	NS	
1/13/2004	Rainbow Creek												
1/13/2004	SMR mainstem												
1/13/2004	Stone Creek 1									NS			
1/27/2004	Adobe Creek									NS	NS	NS	
1/27/2004	Cole Creek									NS	NS	NS	
1/27/2004	Rainbow Creek												
1/27/2004	SMR mainstem												
1/27/2004	Stone Creek 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No car to access site
2/10/2004	Adobe Creek							NS	NS	NS	NS	NS	
2/10/2004	Cole Creek							NS	NS	NS	NS	NS	
2/10/2004	Rainbow Creek												
2/10/2004	SMR mainstem												
2/10/2004	Stone Creek 1									NS			
2/24/2004	Adobe Creek							NS	NS	NS	NS	NS	
2/24/2004	Cole Creek							NS	NS	NS	NS	NS	
2/24/2004	Rainbow Creek												
2/24/2004	SMR mainstem												
2/24/2004	Stone Creek 1									NS			
3/9/2004	Adobe Creek							NS	NS	NS	NS	NS	
3/9/2004	Cole Creek							NS	NS	NS	NS	NS	
3/9/2004	Rainbow Creek												
3/9/2004	SMR mainstem												
3/9/2004	Stone Creek 1									NS			
3/23/2004	Adobe Creek									NS	NS	NS	

Sampling Date	Site	Air Temp	Water Temp	DO	pH	TDS	Turbidity	Ortho-PO_4	NO_3-N	Flow*	Total Coliform**	*E. Coli****	Comments
		(°C)	(°C)	mg/L	unit	mg/L	NTU	mg/L	mg/L	CFS	MPN/100 ml	MPN/100 ml	
3/23/2004	Cole Creek									NS	NS	NS	
3/23/2004	Rainbow Creek												
3/23/2004	SMR mainstem												
3/23/2004	Stone Creek 1									NS			
4/6/2004	Adobe Creek									NS	NS	NS	
4/6/2004	Cole Creek	NS								NS	NS	NS	
4/6/2004	Rainbow Creek												
4/6/2004	SMR mainstem												
4/6/2004	Stone Creek 1									NS			
4/20/2004	Rainbow Creek												
4/20/2004	SMR mainstem												
4/20/2004	Stone Creek 1									NS			
5/4/2004	Rainbow Creek												
5/4/2004	SMR mainstem												
5/4/2004	Stone Creek 1									NS			Dry at site, sampled upstream
5/8/2004	Adobe Creek	NS								NS	NS	NS	
5/8/2004	Cole Creek	NS								NS	NS	NS	
5/18/2004	Rainbow Creek												
5/18/2004	SMR mainstem												
5/18/2004	Stone Creek 2									NS			New Sampling Site
6/1/2004	Rainbow Creek												
6/1/2004	SMR mainstem									NS			No surface flow to measure
6/1/2004	Stone Creek 2									NS			
6/15/2004	Rainbow Creek												
6/15/2004	SMR mainstem												
6/15/2004	Stone Creek 2									NS			
6/29/2004	Rainbow Creek												
6/29/2004	SMR mainstem												
6/29/2004	Stone Creek 2									NS			
7/13/2004	Rainbow Creek												
7/13/2004	SMR mainstem												
7/13/2004	Stone Creek 2									NS			
7/27/2004	Rainbow Creek												
7/27/2004	SMR mainstem												

Sampling Date	Site	Air Temp	Water Temp	DO	pH	TDS	Turbidity	Ortho-PO_4	NO_3-N	Flow*	Total Coliform**	*E. Coli***	Comments
		(°C)	(°C)	mg/L	unit	mg/L	NTU	mg/L	mg/L	CFS	MPN/100 ml	MPN/100 ml	
7/27/2004	Stone Creek 2									NS			
8/24/2004	Rainbow Creek												
8/24/2004	SMR mainstem												
8/24/2004	Stone Creek 2									NS			
9/7/2004	Rainbow Creek												
9/7/2004	SMR mainstem												
9/7/2004	Stone Creek 2									NS			
9/21/2004	Rainbow Creek												
9/21/2004	SMR mainstem												
9/21/2004	Stone Creek 2									NS			

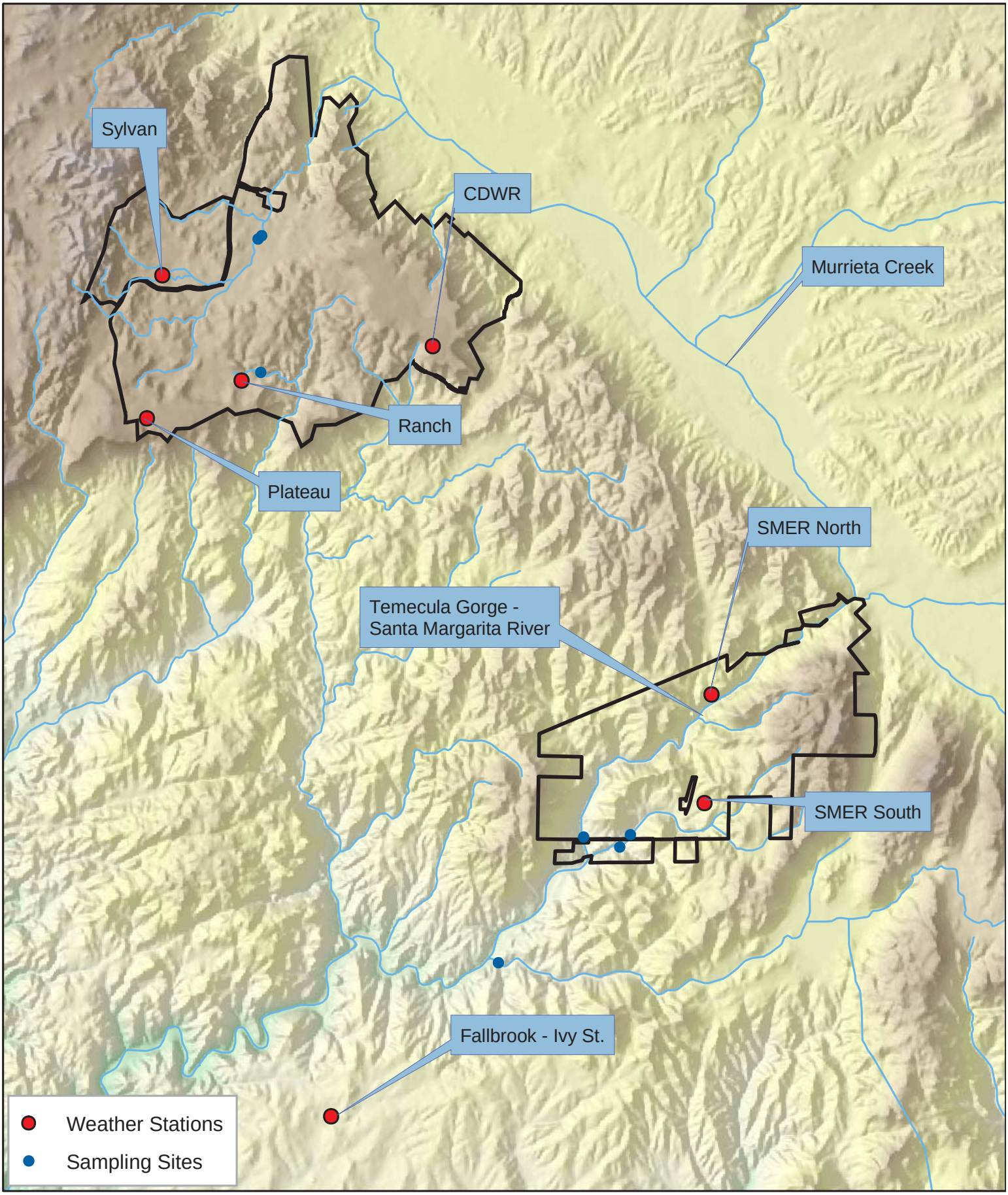
*Streamflow (discharge) was never measured at Stone Creek, Adobe Creek or Cole Creek.
**Total coliform was never measured at Adobe Creek or Cole Creek.
****E. coli* was never measured at Adobe Creek or Cole Creek.

APPENDIX H

Measurable precipitation data and maps of the rain gauges' locations in the Santa Margarita River watershed

Appendix H: Home2Ocean Program
Rain Gauge Map

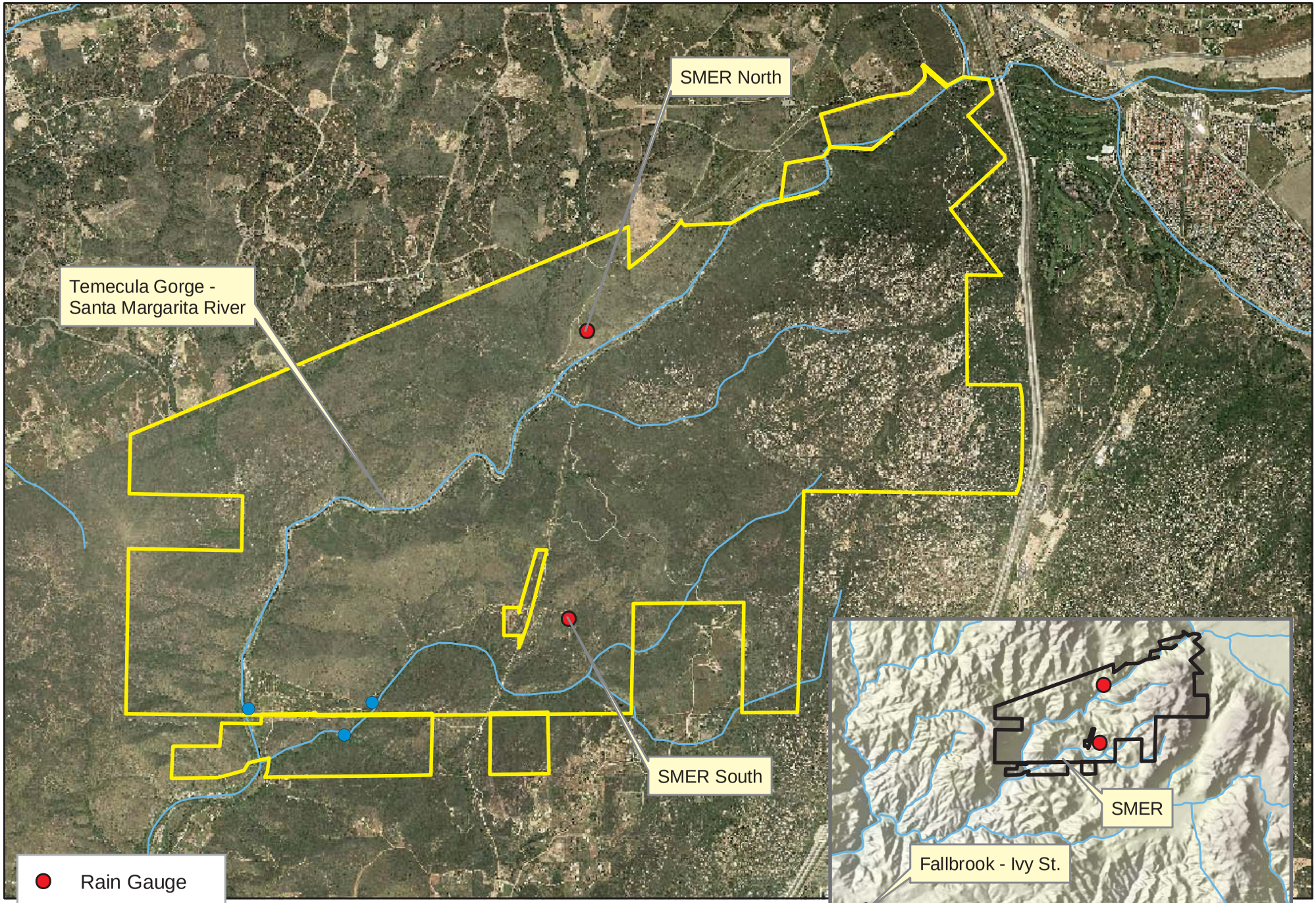
Mission Resource Conservation District



Appendix H: Home2Ocean Program

Fallbrook & Santa Margarita Ecological Reserve Rain Gauges

Mission Resource Conservation District



Appendix H: Home2Ocean Program

Santa Rosa Plateau Ecological Reserve Rain Gauges

Mission Resource Conservation District

Measurable precipitation from weather stations located in Fallbrook, the Santa Margarita Ecological Reserve (SMER), and the Santa Rosa Plateau Ecological Reserve (SRPER) during the rain season of 03-04 and the beginning of the rain season of 04-05. Rain seasons begin on July 1st and end on the following June 30th. NR denotes a date that a weather station did not record data.

	Fallbrook - Ivy St.	SMER - South	SMER - North	SRPER - CDWR	SRPER - Plateau	SRPER - Ranch	SRPER - Sylvan
Calendar Day	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**
7/11/2003	0	0.02	0	0	0	0	0
7/29/2003	0	0	0	0	0.01	0.01	0
7/30/2003	0.05	0.13	0.24	0	0.31	0.3	0.32
7/31/2003	0	0	0	0	0.01	0	0
9/2/2003	0	0.01	0	0	0	0	0
10/2/2003	0	0	0	0.01	0.01	0	0.01
10/3/2003	0	0	0	0	0.01	0.01	0
10/6/2003	0	0	0	0	0.01	0	0.01
10/10/2003	0	0	0	0.01	0.01	0.01	0
10/11/2003	0	0	0	0	0.01	0	0
10/30/2003	0	0.04	0	0.06	0.02	0.02	0.02
10/31/2003	0	0	0	0.02	0.1	0.07	0.05
11/1/2003	0.07	0.17	0	0.19	0.41	0.38	0.4
11/2/2003	0.01	0	0	0	0.01	0.01	0
11/3/2003	0	0	0	0	0	0	0.01
11/4/2003	0	0	0	0.01	0.04	0.01	0.04
11/5/2003	0	0	0	0	0	0.01	0
11/6/2003	0	0	0	0	0	0	0.01
11/8/2003	0	0	0.02	0	0	0	0
11/9/2003	0	0	0.2	0	0	0	0
11/12/2003	0.36	0.63	0	0.81	0.46	0.51	0.49
11/13/2003	0.23	0.04	0	0.04	0.39	0.54	0.3
11/14/2003	0	0	0	0	0	0	0.01
11/15/2003	0	0.07	0	0.04	0	0.01	0
11/16/2003	0.16	0.13	0	0.04	0.3	0.21	0.22
11/17/2003	0.01	0.00	0	0	0.01	0	0
11/18/2003	0	0	0	0	0.01	0	0.01
11/19/2003	0	0	0	0	0	0.01	0
11/22/2003	0	0	1.55	0	0	0	0
11/28/2003	0	0	0.26	0	0	0	0
12/7/2003	0.02	0.04	0.03	0.02	0.06	0.06	0.04
12/8/2003	0.01	0	0	0.01	0.06	0.03	0.03
12/9/2003	0	0	0	0	0	0	0.01
12/11/2003	0	0.06	0	0.07	0.02	0	0.01
12/12/2003	0	0	0	0	0.07	0.13	0.15
12/14/2003	0	0.04	0.02	0.02	0	0	0
12/15/2003	0.07	0	0	0	0.09	0.07	0.07

	Fallbrook - Ivy St.	SMER - South	SMER - North	SRPER - CDWR	SRPER - Plateau	SRPER - Ranch	SRPER - Sylvan
Calendar Day	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**
12/23/2003	0	0.04	0	0.02	0	0	0.01
12/24/2003	0	0.11	0.1	0.1	0.04	0.06	0.06
12/25/2003	0.16	1.19	0.91	1.51	0.54	0.58	0.24
12/26/2003	0.05	0	0	0	2.66	2.02	2.63
12/27/2003	0.02	0	0	0	0	0	0
1/2/2004	0.01	0.32	0.35	0.35	0	0	0
1/3/2004	0.01	0.02	0.02	0	0.65	0.54	0.4
1/6/2004	0	0	0	0	0	0.01	0
1/19/2004	0	0	0	0	0.02	0.01	0.01
1/20/2004	0	0.05	0.16	0.37	0	0	0
1/21/2004	0.03	0	0	0	0.71	0.66	0.74
1/24/2004	0	0	0	0	0.01	0	0
1/28/2004	0.03	0.01	0	0	0.06	0.06	0.03
1/29/2004	0	0	0	0	0.01	0	0.01
1/30/2004	0	0	0	0	0	0.01	0
2/1/2004	0	0	0	0	0.01	0	0
2/2/2004	0	0.59	0.61	0.7	0	0	0
2/3/2004	0.18	0.13	0.1	0.12	1.22	1.08	1.08
2/4/2004	0.02	0	0	0	0.01	0.01	0
2/5/2004	0.01	0	0	0	0	0	0
2/6/2004	0.01	0	0	0	0	0	0
2/18/2004	0	0.36	0.29	0.24	0	0	0
2/19/2004	0.11	0	0	0	0.43	0.38	0.39
2/21/2004	0.01	0.21	0.2	0.14	0.07	0.06	0.03
2/22/2004	1	0.82	0.96	1.1	1.24	1.16	1.23
2/23/2004	0.69	0.32	0.19	0.29	1.09	0.98	1
2/24/2004	0.03	0.02	0.03	0	0.06	0.02	0.05
2/25/2004	0.01	0.09	0.1	0.08	0.01	0.01	0
2/26/2004	1.45	1.31	1.23	1.47	2.21	2.16	2.02
2/27/2004	0.06	0.02	0	0	0.02	0.03	0.02
2/28/2004	0	0	0	0	0	0	0.04
2/29/2004	0	0	0	0	0.01	0	0
3/1/2004	0	0.11	0.09	0.23	0	0	0
3/2/2004	0.6	0.33	0.3	0.37	0.82	0.87	0.88
3/3/2004	0	0	0	0	0	0.01	0.02
3/4/2004	0	0	0	0	0	0	0.01
3/13/2004	0.01	0	0	0	0.01	0	0
3/23/2004	0	0.02	0	0	0	0	0
3/24/2004	0	0	0	0	0.02	0.02	0.01
3/26/2004	0	0	0	0	0.01	0.01	0
3/27/2004	0	0	0	0	0.01	0	0

	Fallbrook - Ivy St.	SMER - South	SMER - North	SRPER - CDWR	SRPER - Plateau	SRPER - Ranch	SRPER - Sylvan
Calendar Day	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**	**Inches**
4/1/2004	0	0.27	0.27	0.29	0	0	0
4/2/2004	0.61	0.07	0.07	0.08	0.4	0.42	0.33
4/3/2004	0.04	0	0.02	0.02	0.18	0.17	0.2
4/4/2004	0	0.02	0	0	0	0	0
4/5/2004	0	0	0	0	0.04	0.04	0.02
4/6/2004	0	0	0	0	0	0.01	0.01
4/7/2004	0	0.21	0	0	0	0	0
4/9/2004	0	0	0	0	0.02	0.01	0.02
4/10/2004	0	0	0	0	0.01	0.01	0
4/11/2004	0	0	0	0	0	0	0.01
4/12/2004	0	0	0	0	0	0.01	0
4/17/2004	0.25	0	0.24	0.24	0	0	0
4/18/2004	0.05	0	0	0.01	0.3	0.34	0.33
4/19/2004	0.01	0	0	0	0.01	0	0.01
4/22/2004	0.03	0	0	0	0.04	0.04	0.02
4/23/2004	0	0	0	0	0.01	0.01	0.01
5/28/2004	0.01	0	0	0	0	0	0
5/29/2004	NR	0.06	0.04	0.01	0.05	0.04	0.01
5/30/2004	0	0	0	0	0	0.01	0
6/19/2004	0	0	0	0	0.01	0	0
6/20/2004	0	0	0	0	0.01	0	0
6/22/2004	0	0	0	0	0.01	0	0
6/30/2004	0	0	0	0	0	0.01	0.01
7/2/2004	0	0	0	0	0.01	0	0
7/8/2004	0	0	0	0	0.01	0	0
8/28/2004	0	0	0	0	0.01	0	0
9/17/2004	0	0	0	0	0.01	0	0
9/18/2004	0	0	0	0	0.01	0	0

TOTAL	6.49	8.06	8.60	9.09	15.52	14.27	14.10

APPENDIX I

Waterbody volume (including average cross-sectional area, reach length, and flow velocity)

WATERBODY VOLUME DATA

The approximate volume of water (ft^3) at the Santa Margarita River and Rainbow Creek sampling sites were calculated by multiplying the reach length by the average cross-sectional area during the sampling period of July 29, 2003 through September 30, 2004. NS signifies dates that the cross-sectional area, reach length, and flow velocity were not measured and volume was not calculated.

	Santa Margarita River				Rainbow Creek			
Sampling Date	Volume (ft^3)	Flow Velocity (ft/sec)	Cross-sectional Area (ft^2)	Reach Length (inches)	Volume (ft^3)	Flow Velocity (ft/sec)	Cross-sectional Area (ft^2)	Reach Length (inches)
7/29/2003	128	0.08	23.63	65	7.8	0.08	9.92	82
8/12/2003	167	0.07	24.46	82	71.2	0.08	9.82	87
8/26/2003	NS	NS	NS	NS	58.8	0.08	9.04	78
9/9/2003	128.7	0.07	23.05	67	5.1	0.06	9.44	70
9/23/2003	NS	NS	NS	NS	54.9	0.11	9.42	70
10/7/2003	136.6	0.09	22.76	72	54.2	0.07	10.16	64
10/21/2003	NS	NS	NS	NS	57.2	0.09	10.24	67
11/4/2003	NS	NS	NS	NS	66.5	0.10	11.41	70
11/18/2003	124.7	0.06	22.33	67	63.6	0.08	11.40	67
12/2/2003	120	0.16	21.50	67	80.1	0.12	13.53	71
12/16/2003	132.3	0.07	23.70	67	NS	NS	NS	NS
1/13/2004*	71.5	0.31	13.83	62	58.9	0.11	10.09	70
1/27/2004	137.6	0.16	24.65	67	50	0.19	8.95	67
2/10/2004	109.6	0.21	19.10	69	44	0.17	7.88	67
2/24/2004	159.6	0.42	28.59	67	67.2	0.30	10.33	78
3/9/2004	130.6	0.16	23.40	67	46.2	0.16	9.08	61
3/23/2004	132.1	0.19	23.66	67	50.9	0.13	9.13	67
4/6/2004	144	0.19	25.79	67	46	0.15	8.90	62
4/20/2004	141.3	0.25	25.30	67	54.4	0.13	8.71	75
5/4/2004	134.1	0.14	24.10	67	46.1	0.09	8.65	64
5/18/2004	133.6	0.07	23.93	67	49.1	0.13	8.66	68
6/1/2004	NS	NS	NS	NS	52.2	0.13	8.57	73
6/15/2004	141.3	0.10	25.30	67	43.9	0.08	7.22	73
6/29/2004	136.4	0.10	24.44	67	47.8	0.06	7.86	73
7/13/2004	131.1	0.13	23.50	67	33.6	0.06	6.72	60
7/27/2004	140.6	0.13	25.20	67	33.6	0.07	7.98	50.5
8/24/2004	127.0	0.07	22.76	67	42.7	0.08	8.13	63
9/7/2004	120.5	0.12	21.60	67	44.3	0.08	7.70	69
9/21/2004	118.4	0.10	21.22	67	40.3	0.08	7.73	66

*At the Santa Margarita River sampling site, on this date, the cross-sectional area was measured upstream of the original sampling site as velocity tests, for streamflow data, could not be performed at the original sampling site.