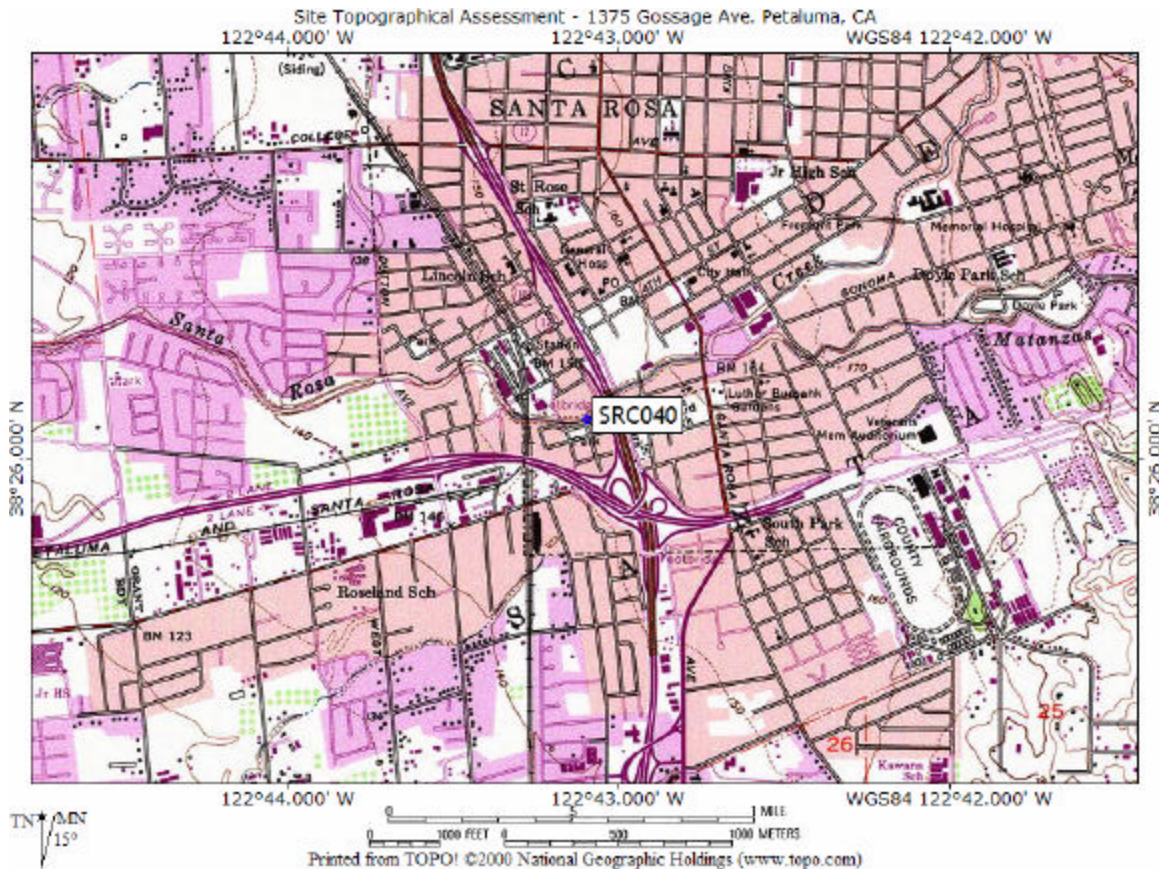


Santa Rosa Creek Water Quality, 2004-2006

Community Clean Water Institute's Citizen Water Quality Monitoring Program
CCWI Volunteer Field Operators: Paul Larkin, Bonnie Hogue, Heather Harper



Applicable Water Quality Objectives:

Nitrate-Nitrogen: < 1.0 mg/L

*EPA water quality goal for nitrate-nitrogen

Total Phosphorous: < 0.1 mg/L

*EPA water quality goal for total phosphate in streams and rivers

pH: > 6.5 and < 8.5

*North Coast Water Quality Control Board's Basin Plan Objectives

Conductivity: none applicable

*The North Coast Water Quality Control Board's Basin Plan Objectives are based on a weekly mean and apply only to the main stem of the Russian River. The data here consists of monthly grab samples, a weekly mean cannot be calculated.

Water Temperature: instantaneous max 24 C

*The North Coast Water Quality Control Board's Basin Plan Objectives do not state numerical cut-off values, and applicable standards used in the 2006 303-d list are based on 7-day means. The data here consists of monthly grab samples, a weekly mean cannot be calculated. Proposed instantaneous max is 24C.

Turbidity: <25 NTU

*John W Sigler's 1984 paper "The Effects of Chronic Turbidity on Density and Growth of Steelheads and Coho Salmon". used in 2006 303-d list.

Dissolved Oxygen: > 7.0 mg/L

*North Coast Water Quality Control Board's Basin Plan Objectives

Project Description

Community Clean Water Institute's Volunteer Citizen Water Quality Monitoring Program supports community members in investigating Sonoma County's surface waters. The program objective is to involve local citizens in gathering baseline indicators, investigate potential source of pollution, and identify streams of concern in need of further study. The program produces useful data along with providing education and stewardship opportunities to the public. CCWI acts as custodian of water quality equipment, data management, trainer and coordinator of the monitoring program. Our volunteers are field operators who use standardized procedures to perform water quality tests at 50 sites throughout Sonoma County.

Field sampling includes dissolved oxygen, pH, conductivity, turbidity and water and air temperature, with some sites additionally measured for flow. A grab sample at the time of field testing is returned to CCWI for total phosphorous and nitrate-nitrogen analysis. Less frequently performed analysis includes total coliforms, e. coli, and ammonia. See method description below. For a detailed account of methods for sample collection and handling, data management, record keeping and field and laboratory analysis, please contact our office.

Our goal was monthly monitoring of each site. Due to the challenge of coordinating between volunteer monitors' schedules and absences some fluctuation in time of day, month, and number of sampling events per year occurred. Monthly testing is useful in identifying streams or areas that fall outside the norm or the expected for the season, and for indicating where ecosystem, fish or human health may be at risk. However monthly monitoring misses the daily fluctuations in temperature, dissolved oxygen, bacteria, nutrients and turbidity that occur. Nutrients and turbidity in particular may spike to troubling levels during rain events, then fall back to baseline within days or even hours. The resolution of monthly monitoring can miss most or all of these events during a given rainy season.

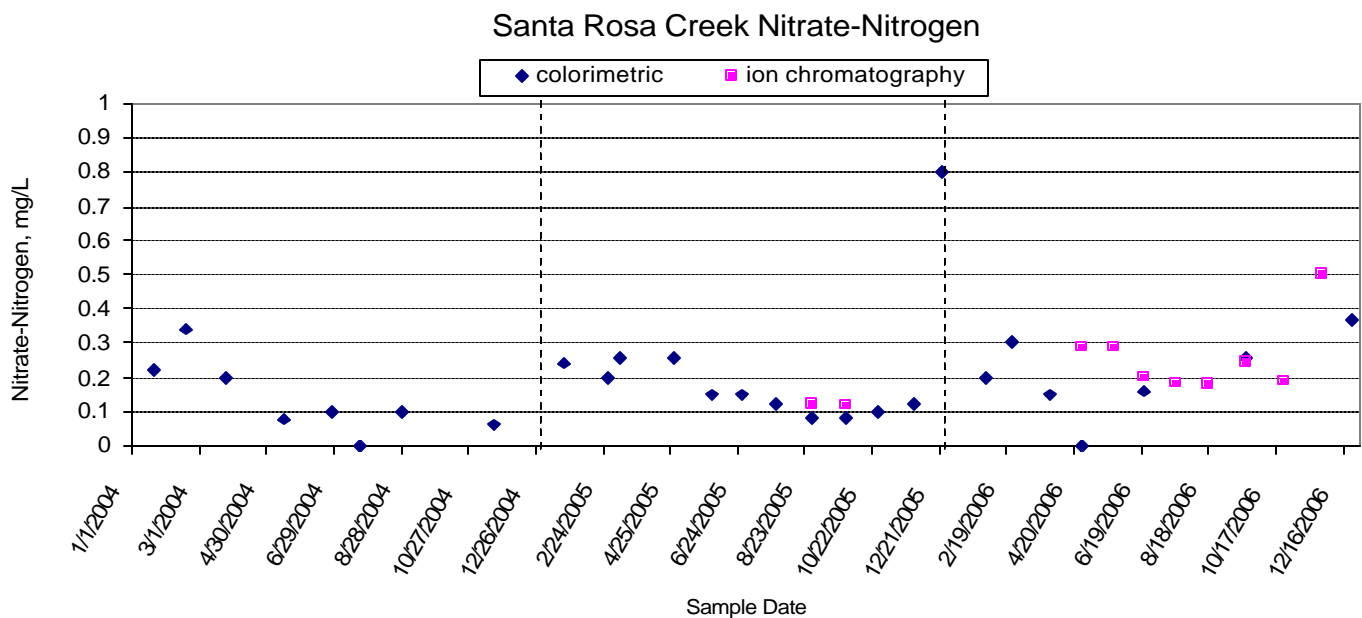
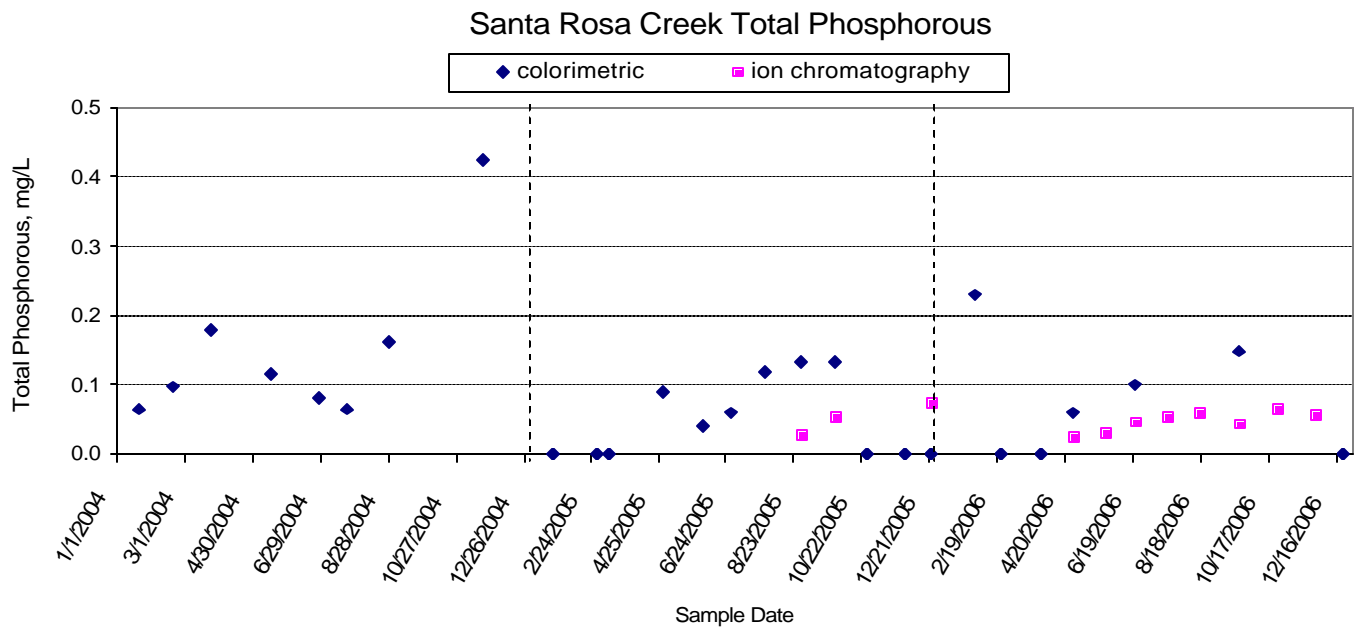
The data for Santa Rosa Creek does not show any major problems. Problems include conductivity and temperature being too high in summer, phosphate is somewhat high, and conditions are not great for spawning in winter. The creek is known to have an e. coli bacteria problem and due to its urban nature likely harbors some heavy metals and other manmade toxins this program did not test for.

Santa Rosa Creek is currently monitored at one site at Olive Park in the center of downtown Santa Rosa, close to where Hwy. 101 and Hwy. 12 cross. This stretch of creek has been enhanced as part of the Prince Memorial Greenway. The channel is braided at lower flows with stream side vegetation maturing, and substrate is mostly gravel and sand. Data from 2004 to 2006 is displayed here graphically and in a summary chart. The metadata is available for download at our website by calendar year in Microsoft Excel format, www.cwi.org/issues/data.htm.

	METHODNAME	METHODDESCR	Res	Reporting Limit	Units
Field	EPA170.1B	Temperature by Bulb	0.3	NA	Deg C
Field	EPA170.1T	Temperature by Thermocouple	0.1	NA	Deg C
Field/LAB	EPA150.1	pH	0.1	NA	pH Units
Field/LAB			--	10	micro
Field/LAB	EPA120.1	Specific Conductance			Siemens
Field/LAB	EPA180.1	Hach 2100P Turbidimeter	--	0.01	NTU
Field	ICM-DO	Dissolved Oxygen (polarographic)	0.1	NA	mg/L
Field	Hach10360	Dissolved Oxygen (luminescent)	0.1	NA	mg/L
LAB	IDEXX9223	Bacteria	--	1	MPN
LAB	IDEXX9223	<i>E. coli</i> Bacteria	--	1	MPN
LAB	HachNI-14	NO2+NO3-N (color wheel)	--	0.02	mg/L
LAB	LaMotte3649-SC	NO2+NO3-N (colorimeter)	--	0.02	mg/L
LAB	EPA300.0M	NO3-N (Ion Chromatography)	--	0.02	mg/L
LAB	HachPO-24	PO4-P (color wheel)	--	0.03	mg/L
LAB	LaMotte3653-SC	PO4-P (colorimeter)	--	0.03	mg/L
LAB	EPA300.0M	PO4-P (Ion Chromatography)	--	0.03	mg/L

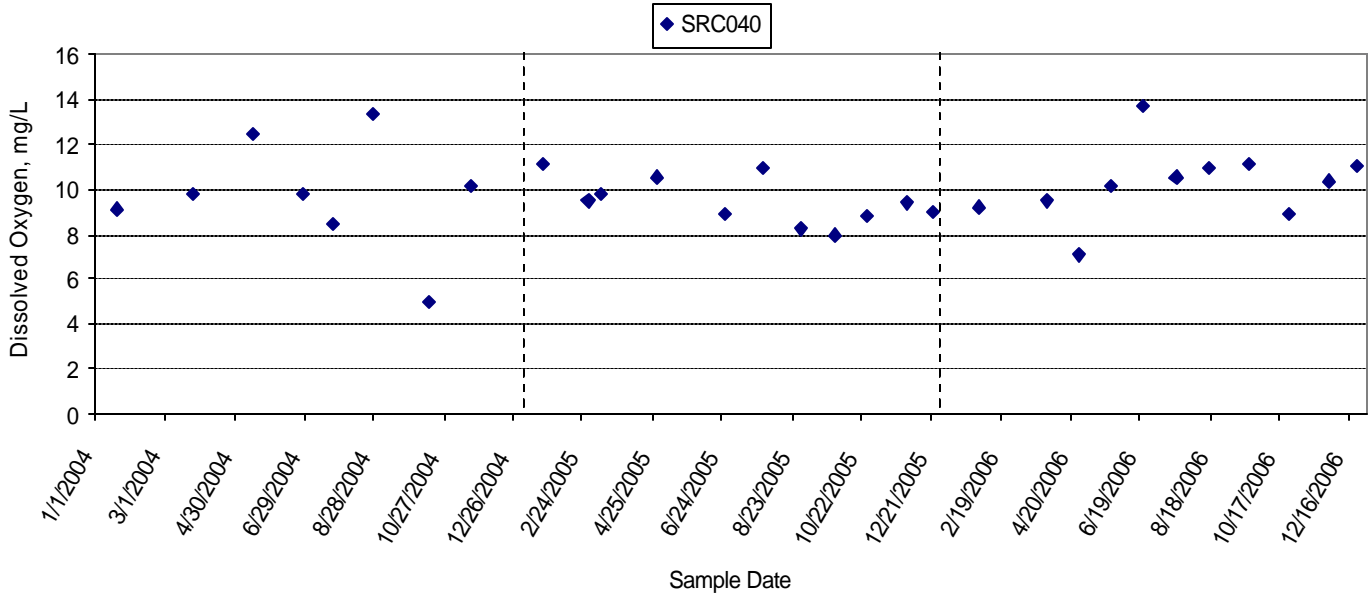
Santa Rosa Creek (SRC040) Water Quality Data 2004-2006

Date Sampled	conductivity	Dissolved oxygen	pH	Turbidity	Water temperature	NO3-N colorimetric	NO3-N chromatography	PO4-P colorimetric	PO4-P chromatography
1/21/2004	250	9.1	7.4		11.5	0.22		0.07	
2/19/2004	120		8.4	30.00	12.0	0.34		0.10	
3/25/2004	180	9.8	8.5		14.0	0.20		0.18	
5/16/2004	490	12.5	8.6	1.09	18.0	0.08		0.12	
6/28/2004	330	9.8	8.4	2.33	21.0	0.10		0.08	
7/23/2004	550	8.4	8.0	1.65	21.0	0.00		0.07	
8/28/2004	530	13.3	8.3	1.11	19.5	0.10		0.16	
10/15/2004	570	5.0	7.9	0.33	16.5				
11/19/2004	500	10.2	8.1	0.52	11.0	0.06		0.42	
1/21/2005	330	11.1	8.1	4.15	10.0	0.24		0.00	
2/28/2005	200	9.5	7.9	37.50	12.0	0.20		0.00	
3/11/2005	340	9.8	8.1	3.28	14.0	0.26		0.00	
4/28/2005	420	10.5	8.2	1.03	14.5	0.26		0.09	
6/2/2005	390		8.4	1.54	18.0	0.15		0.04	
6/28/2005	490	8.9	8.2	1.23	16.5	0.15		0.06	
7/29/2005	520	10.9	8.1	1.29	17.0	0.12		0.12	
8/30/2005	570	8.2	7.9	2.92	16.5	0.08	0.127	0.13	0.027
9/29/2005	540	8.0	8.1	3.00	15.0	0.08	0.123	0.13	0.055
10/27/2005	500	8.8	7.8	1.85	14.5	0.10		0.00	
11/29/2005	250	9.4	7.6	5.30	10.5	0.12		0.00	
12/23/2005	190	9.0	7.1	55.50	13.0	0.80	1.248	0.00	0.073
1/31/2006	220	9.2	7.6	37.70	9.5	0.20		0.23	
2/23/2006	400		7.7	1.75	8.0	0.30		0.00	
3/30/2006	230	9.5	7.6	25.90	11.0	0.15		0.00	
4/27/2006	210	7.1	7.0	7.51	15.0	0.00	0.29	0.06	0.023
5/25/2006	440	10.2	8.3	2.89	15.5		0.291		0.029
6/22/2006	440	13.7	8.7	1.29	22.0	0.16	0.206	0.10	0.047
7/20/2006	470	10.5	8.1	1.82	19.0		0.189		0.055
8/17/2006	490	10.9	8.4	2.52	17.0		0.183		0.06
9/21/2006	470	11.1	8.0	2.08	15.8	0.26	0.25	0.15	0.043
10/25/2006	490	8.9	8.1	1.15	12.0		0.191		0.065
11/28/2006	320	10.3	8.1	2.71	8.5		0.504		0.057
12/23/2006	320	11.0	7.8	10.80	8.5	0.37		0.00	
mean	387	9.8	8.0	8.19	14.5	0.19	0.327	0.09	0.049
median	420	9.8	8.1	2.33	14.5	0.15	0.206	0.07	0.055
std. dev.	134	1.7	0.4	13.79	3.8	0.15	0.323	0.09	0.016
min	120	5.0	7.0	0.33	8.0	0.00	0.123	0.00	0.023
max	570	13.7	8.7	55.50	22.0	0.80	1.248	0.42	0.073
n	33	30	33	31	33	27	11	27	11
violations	na	1	2	5	0	0	1	10	0

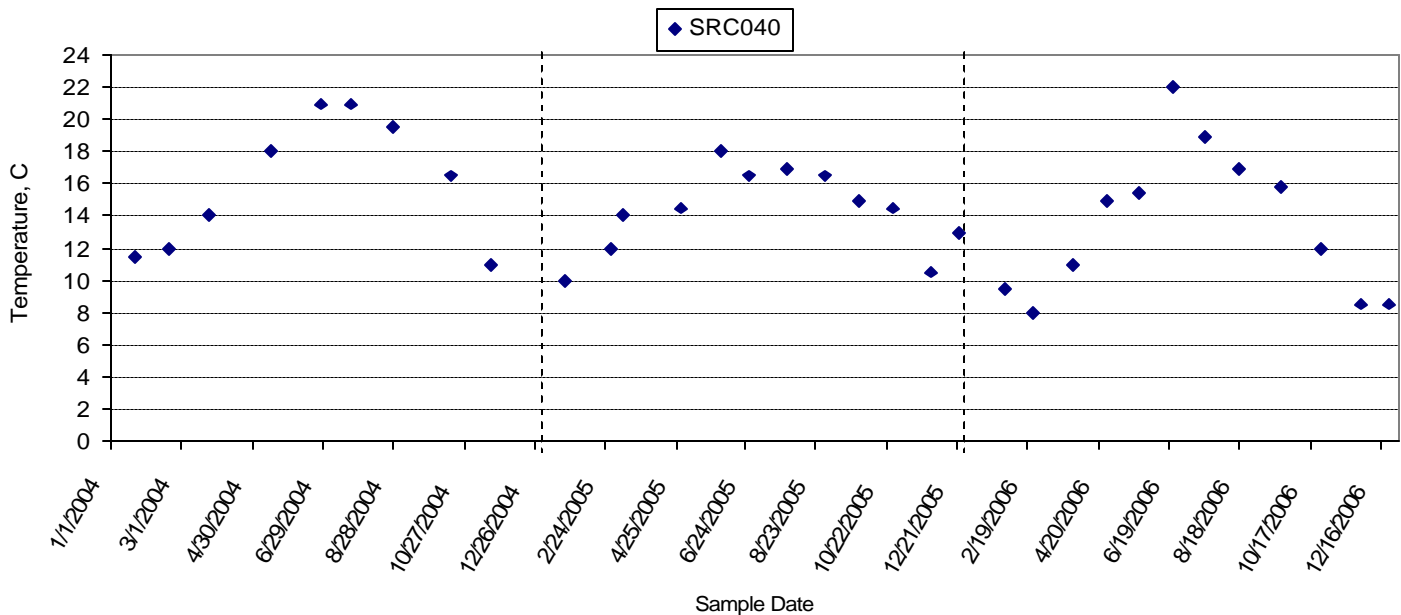


Santa Rosa Creek tested slightly high for phosphorous, and with the colorimetric method did occasionally exceed the 0.1 mg/L recommendation. Colorimetric and ion chromatography are different methods which gave different results on the same sample, the two method results may not be comparable. Higher nutrient levels in an urban stream are not unusual, though are also not natural. Nitrate levels did not exceed the recommended limit of 1.0 mg/L in any of the samples. However, nitrate is highly water soluble and peaks during rainy periods. Sampling resolution of once a month may have missed most or all of any storm-associated nitrate peaks. Nutrients in Santa Rosa Creek could be from industrial processes, pesticide and fertilizer runoff from lawns or farms, or human and animal effluent. Homeless encampments along the creek, pet feces and leaky sewer pipes are some of the possible effluent contributions. Excess nutrients can lead to eutrophic conditions with algae growth and low dissolved oxygen, and high nitrate levels can increase mortality of salmonid eggs and aelvin. These problems were not documented at the site, however summer algae mats did grow copiously.

Santa Rosa Creek Dissolved Oxygen

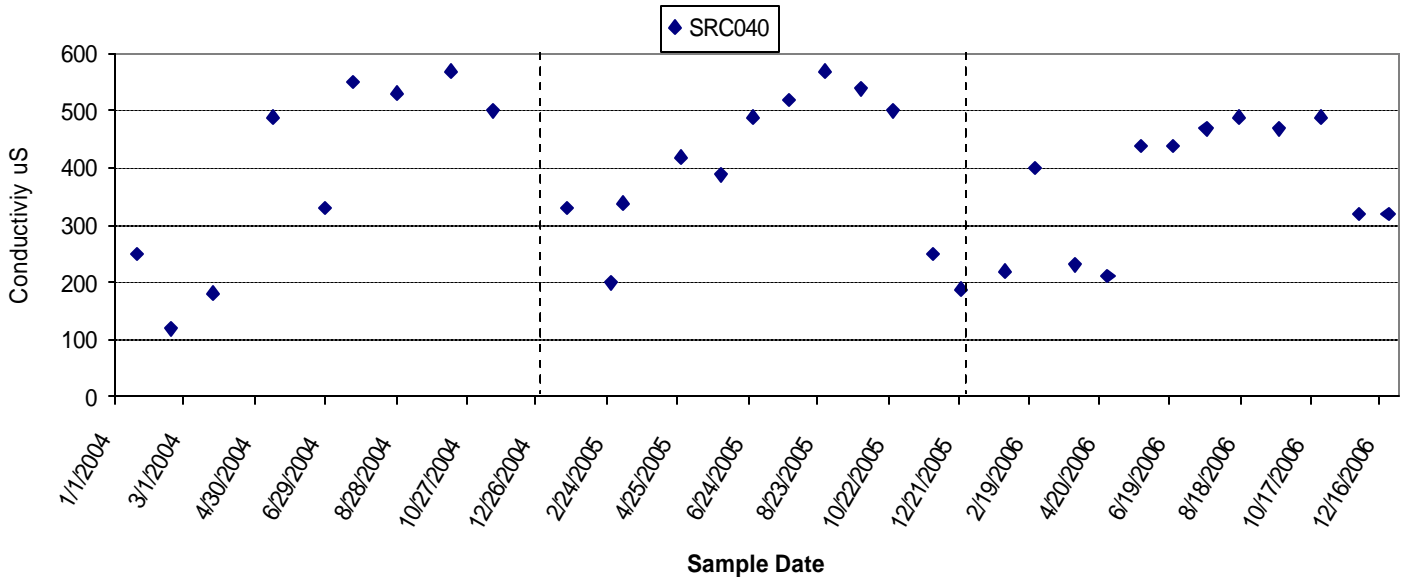


Santa Rosa Creek Temperature

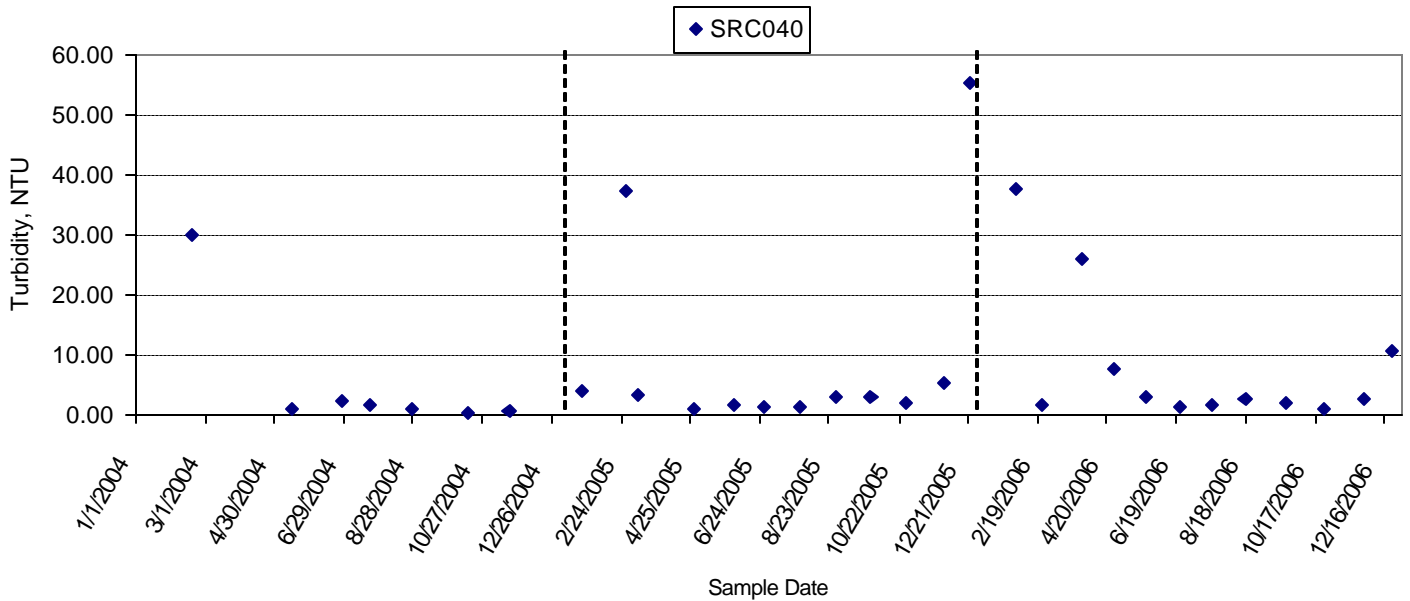


Dissolved oxygen and temperature may fluctuate during the day and year in ways that monthly data cannot capture. All sampling events occurred during the day, so the lowest dissolved oxygen and temperatures were probably missed. The seasonal affects for temperature are pretty clear in the graphs, with temperature dropping in winter. The optimum temperatures depend on the lifecycle of salmonids, but generally range from 4 to 16 C. Summer temperatures at the Santa Rosa Creek site may not be lethal (25C), but are definitely stressful (above 17C). Winter temperatures are also somewhat high, making this marginal habitat for spawning and egg incubation, though juveniles and adults would be fine. The sampling site is usually a riffle or a run below a riffle, so dissolved oxygen is generally acceptable. Above 11 mg/L during critical lifestages and above 8mg/L at other times is optimal for salmonids. The oxygen levels on Santa Rosa Creek were nearly always good for adults, but less so for spawning. If plant respiration is influential in this system dissolved oxygen may have dropped lower during the night, particularly in the summer when algae growth increases.

Santa Rosa Creek Conductivity



Santa Rosa Creek Turbidity



Conductivity increases throughout the summer as pollutants concentrate with evaporation. Winter rains and flows dilute ions, bringing conductivity down. This annual fluctuation is more pronounced in Santa Rosa Creek when compared to less urbanized, polluted creeks in the area. Turbidity levels look good, low during the summer and winter with relatively small spikes likely associated with rain events. Peak storm flows were not captured however, so the highest turbidity levels were missed. Only storm monitoring is able to accurately characterize peak sediment concentrations and runoff. Because Santa Rosa Creek through the downtown reaches is a cement conduit, flow and turbidity are likely flashy, rising and falling rapidly.