



Community Clean Water Institute

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Community Clean Water Institute
Summary Water Quality Data 2004-2006
Laguna de Santa Rosa

Prepared May 2007

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.

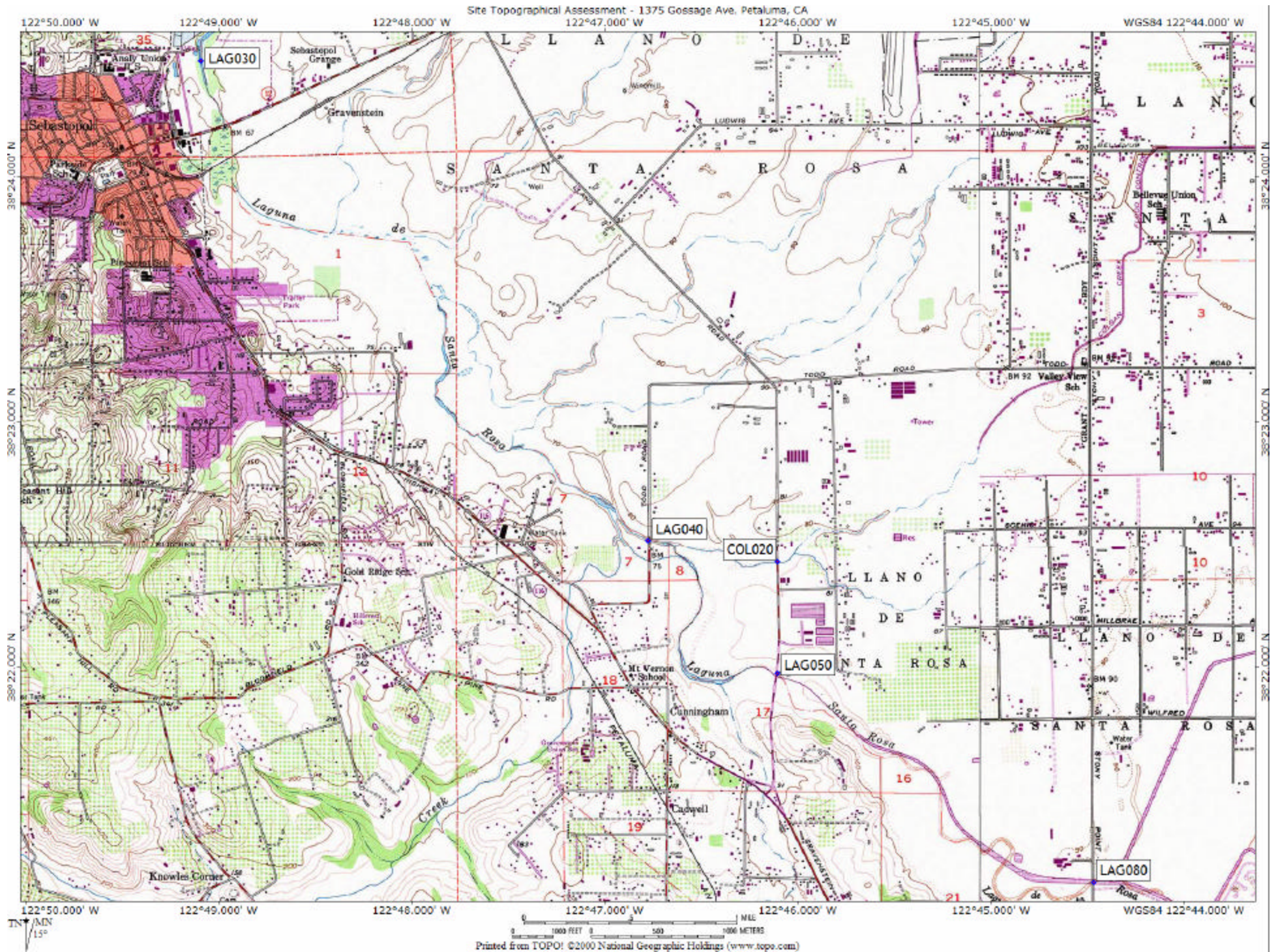
Field sampling includes dissolved oxygen, pH, conductivity, turbidity and water and air temperature, with some sites additionally measured for flow. A grab sample at the time of field testing is returned to CCWI for total phosphorous and nitrate-nitrogen analysis. Less frequently preformed analysis includes 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.

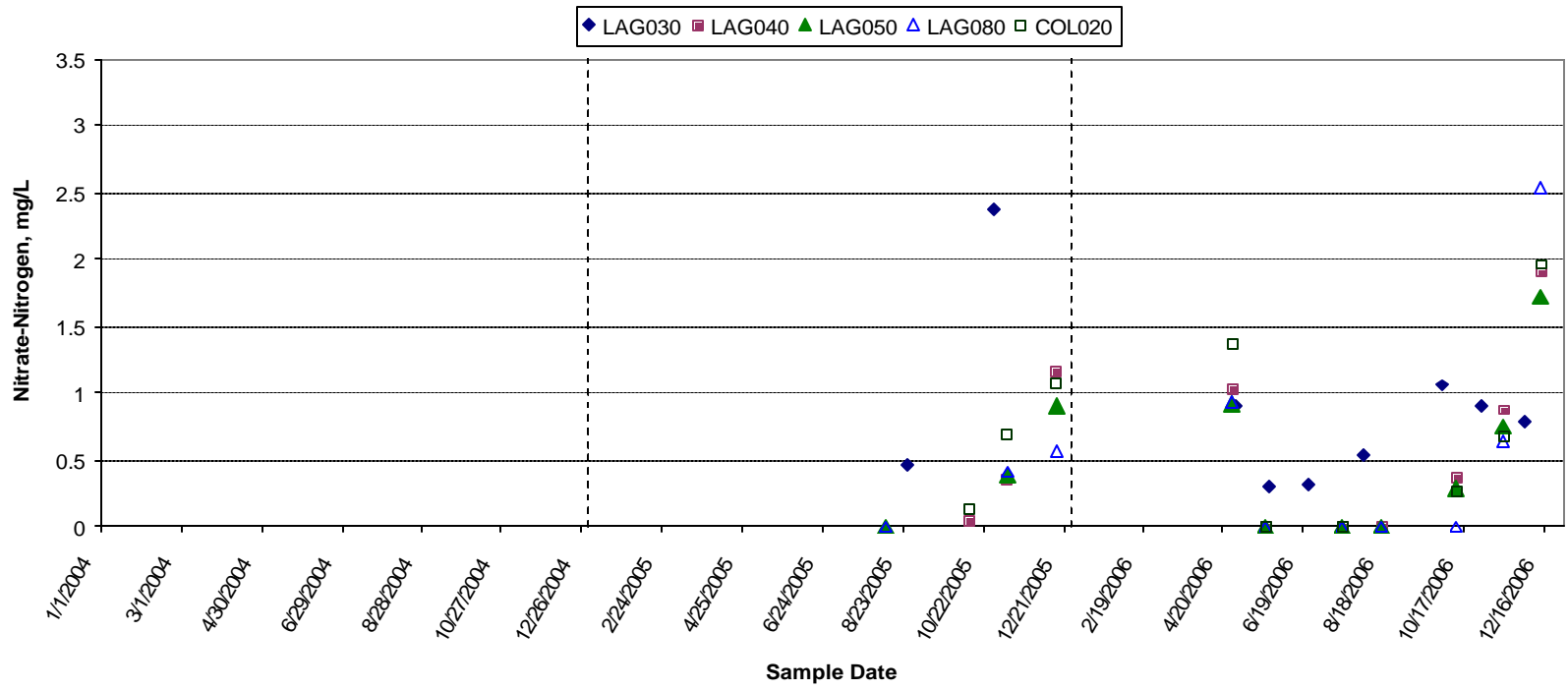
The Laguna de Santa Rosa is currently monitored at four sites, as well as one site on the tributary Colgan Creek, between Stony Point Road and the Sebastopol Community Center. Gail Ohlander and Steve Greek were our lead volunteer field operators. Data from 2004 to 2006 is displayed graphically and in summary charts. The metadata is available for download at our website by calendar year in Microsoft Excel format, www.ccwi.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	EPA120.1	Specific Conductance	--	10	micro 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

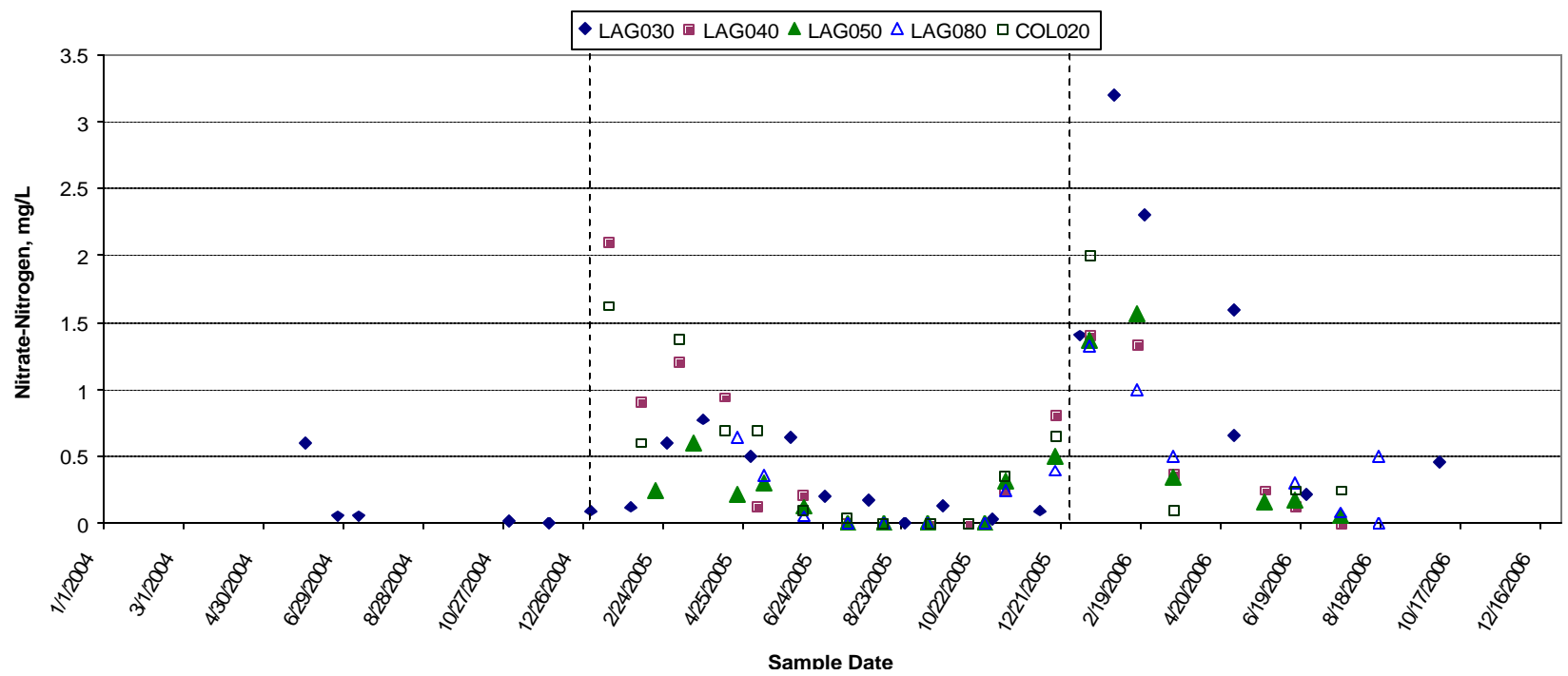
Site Map: LAG030, LAG040, LAG050, LAG080, COL020



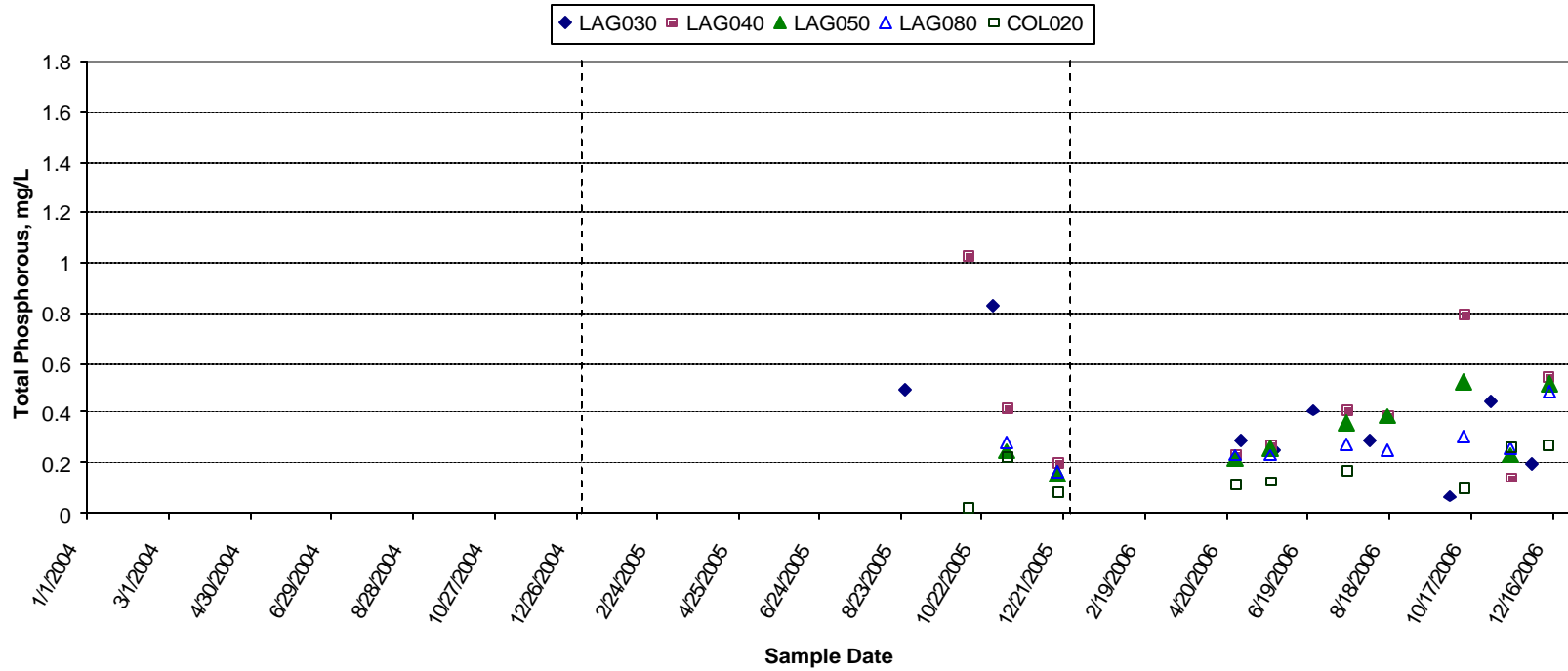
Laguna de Santa Rosa Nitrate-Nitrogen, ion chromatography



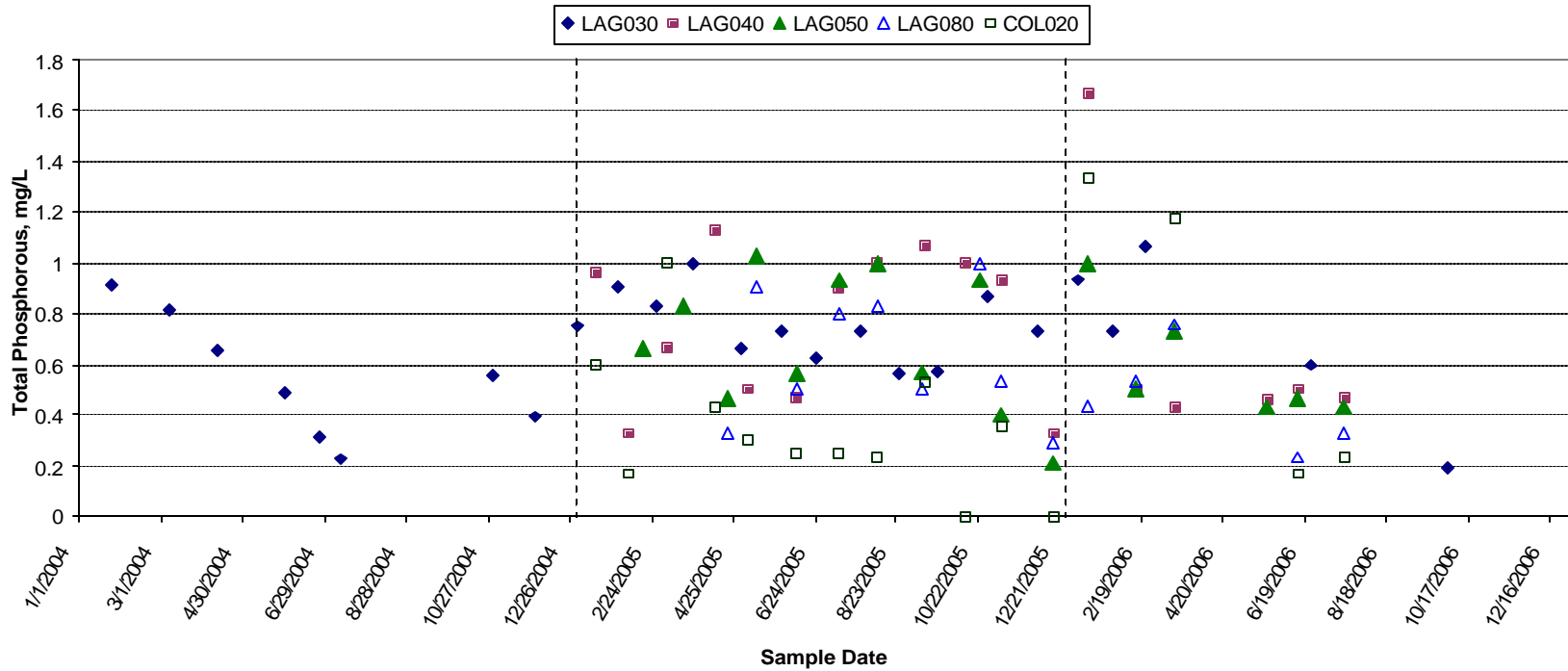
Laguna de Santa Rosa Nitrate-Nitrogen colorimetric

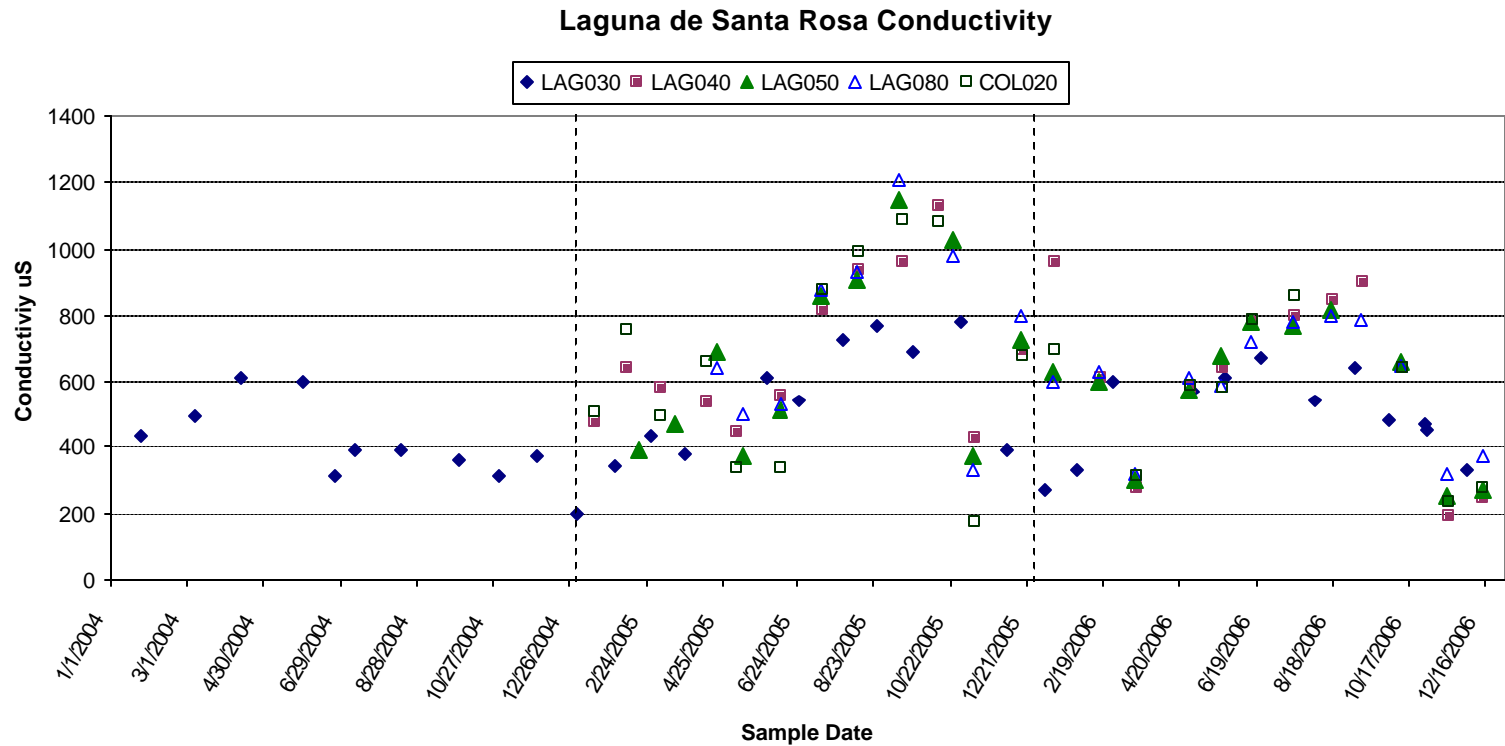
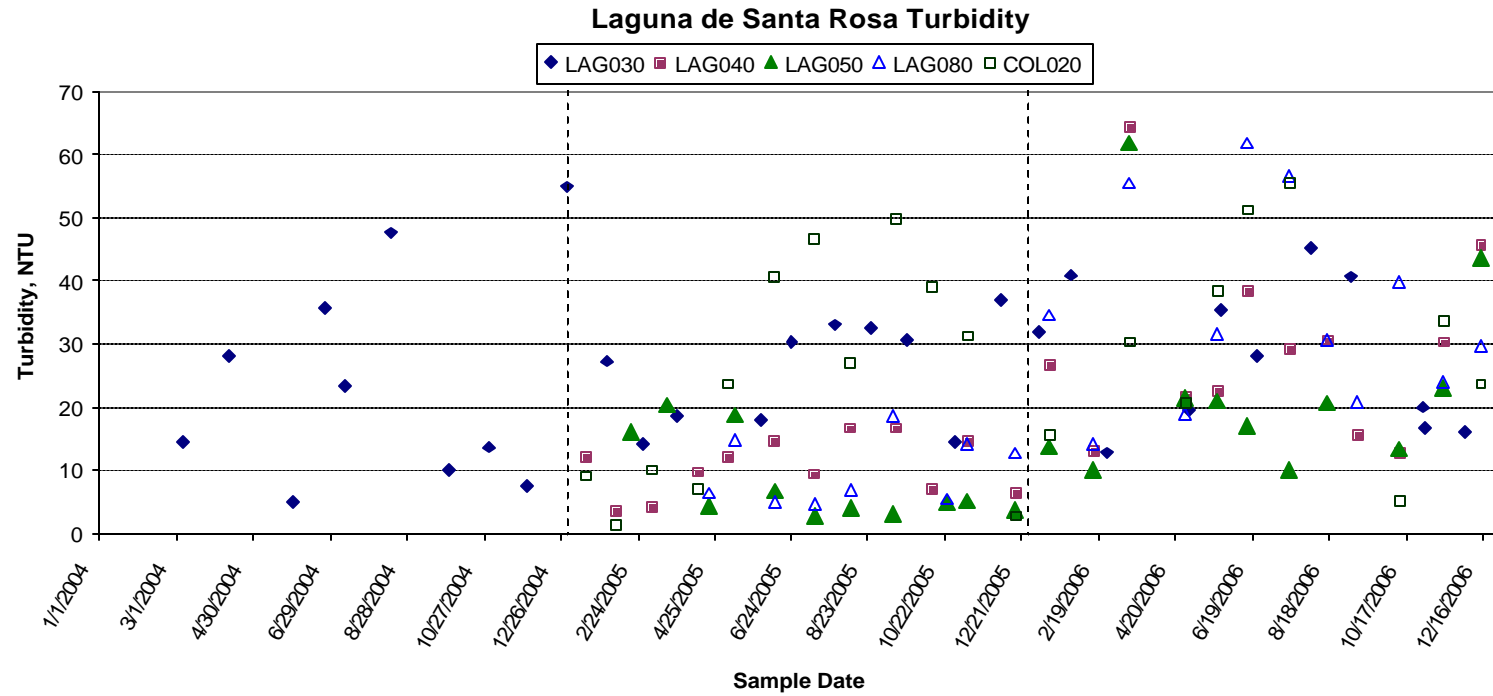


Laguna de Santa Rosa Total Phosphorous, ion chromatography

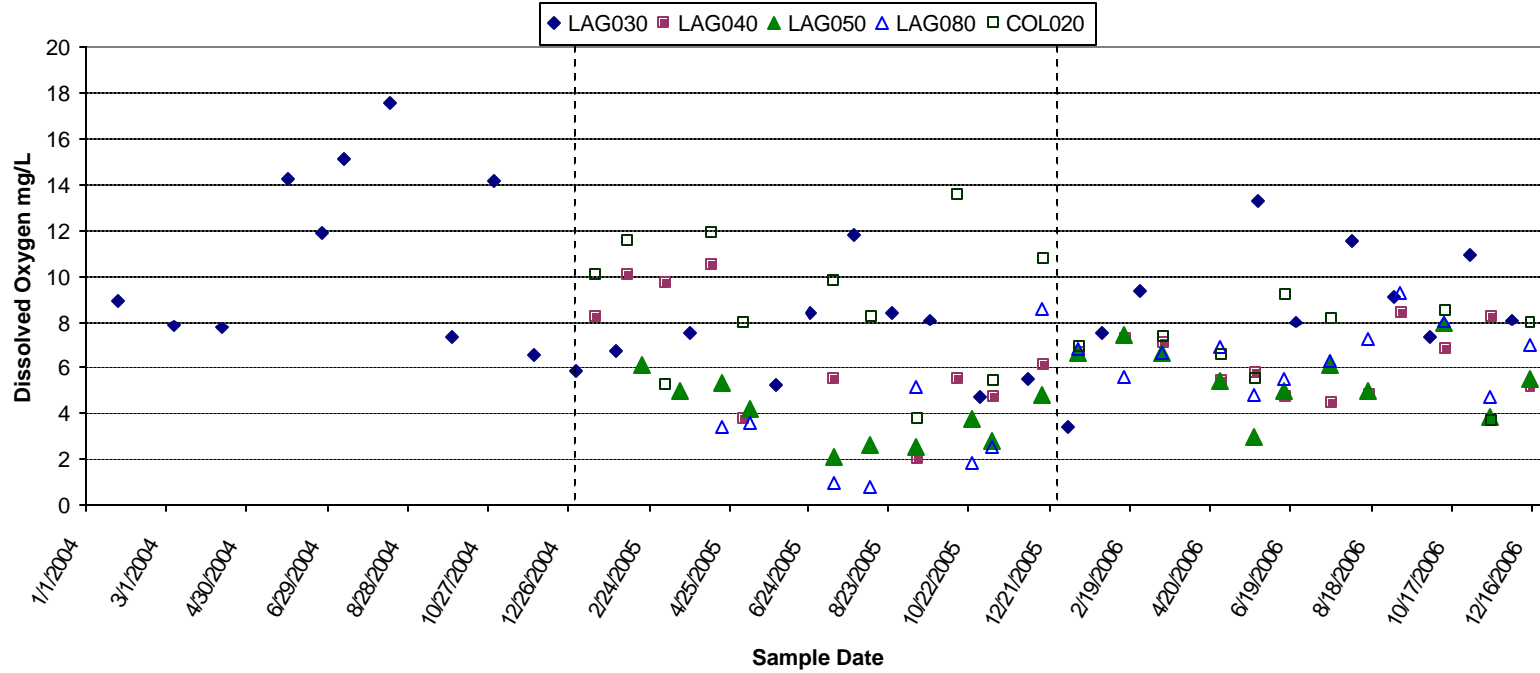


Laguna de Santa Rosa Total Phosphorous, colorimetric

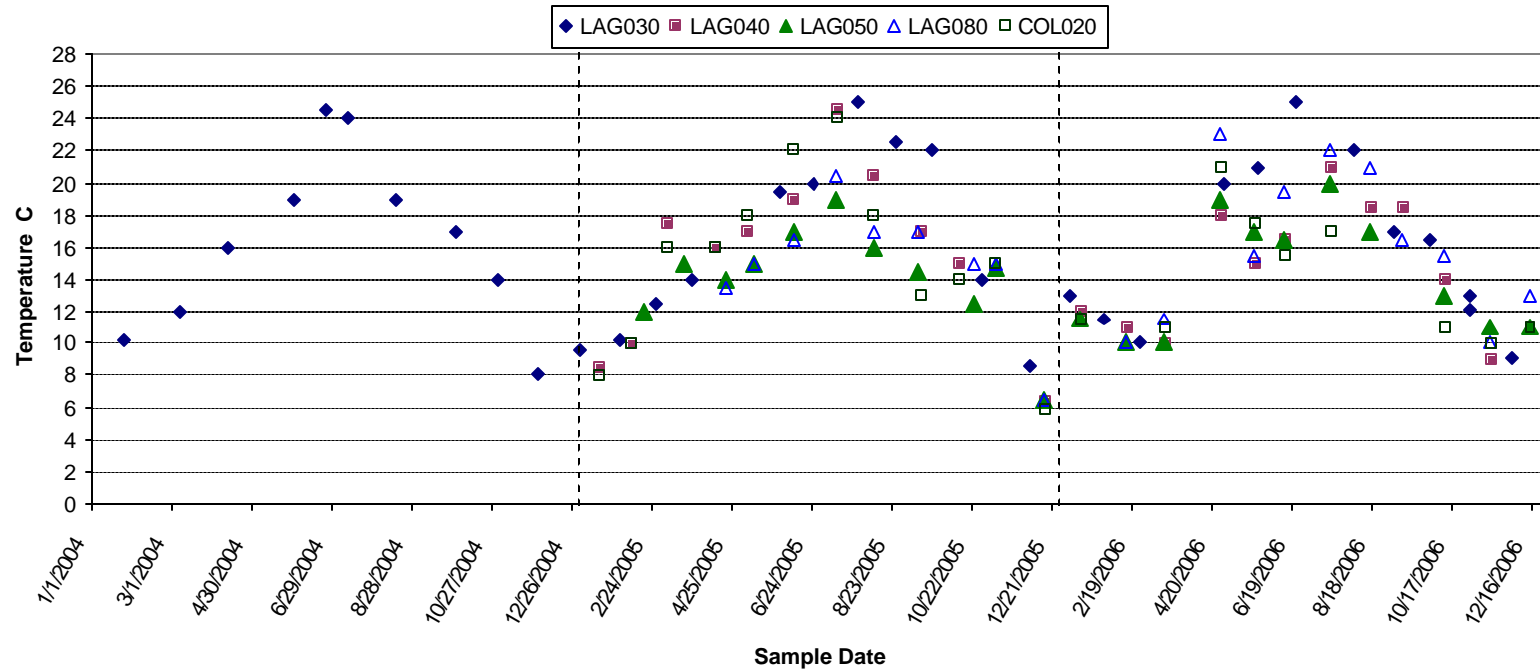




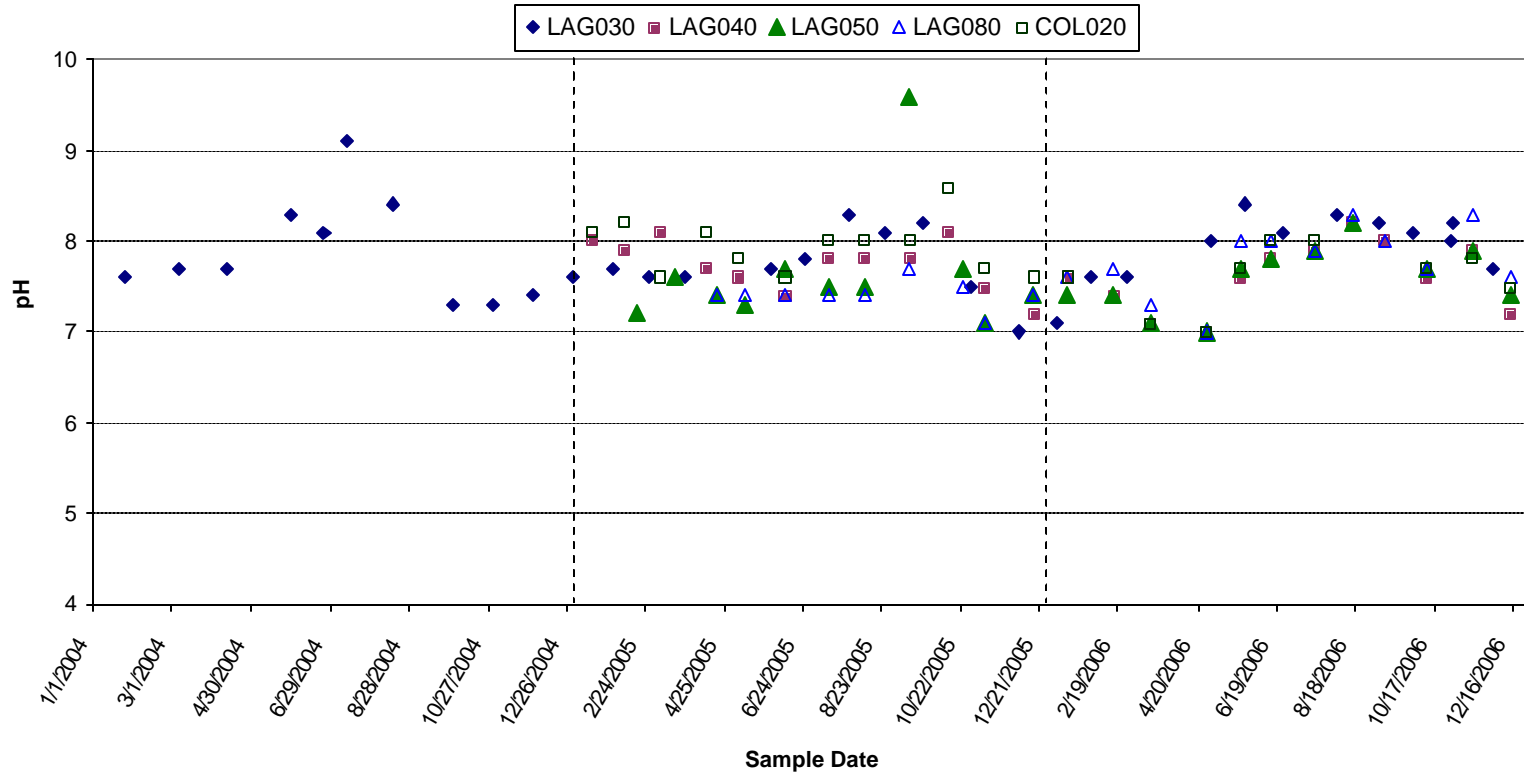
Laguna de Santa Rosa Dissolved Oxygen



Laguna de Santa Rosa Temperature



Laguna de Santa Rosa pH



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

Dissolved Oxygen: > 7.0 mg/L for salmonid streams

*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: none applicable

*The North Coast Water Quality Control Board's Basin Plan Objectives do not state numerical cutoff 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.

Turbidity							Total phosphorous colorimetric						
	LAG030	COL030	LAG040	LAG050	LAG080	ALL		LAG030	COL030	LAG040	LAG050	LAG080	ALL
mean	25.55	26.77	19.89	15.67	24.13	22.60	mean	0.67	0.44	0.74	0.66	0.56	0.62
median	23.40	27.00	15.05	13.50	18.80	18.80	median	0.73	0.27	0.58	0.57	0.50	0.56
std. dev.	12.29	16.97	14.35	14.15	17.50	15.17	std. dev.	0.23	0.40	0.36	0.26	0.24	0.31
min	4.90	1.24	3.77	2.82	4.47	1.24	min	0.19	0.00	0.33	0.21	0.23	0.00
max	54.90	55.50	64.20	61.90	61.70	64.20	max	1.07	1.33	1.67	1.03	1.00	1.67
n	33	21	24	22	21	121	n	25	16	18	17	15	91
violations	15	10	7	2	8	42	violations	25	14	18	17	15	89
Water Temperature							Total phosphorous ion chromatography						
	LAG030	COL030	LAG040	LAG050	LAG080	ALL		LAG030	COL030	LAG040	LAG050	LAG080	ALL
mean	16.1	14.5	15.0	14.2	15.7	15.2	mean	0.401	0.149	0.442	0.322	0.276	0.319
median	16.0	15.0	15.5	14.7	15.5	15.0	median	0.351	0.130	0.403	0.261	0.261	0.263
std. dev.	5.2	4.7	4.5	3.4	4.3	4.5	std. dev.	0.201	0.089	0.278	0.131	0.087	0.198
min	8.0	6.0	6.5	6.5	6.5	6.0	min	0.191	0.000	0.139	0.158	0.165	0.000
max	25.0	24.0	24.5	20.0	23.0	25.0	max	0.830	0.267	1.023	0.520	0.483	1.023
n	35	21	24	22	20	122	n	8	9	10	9	9	45
violations	na	na	na	na	na	na	violations	8	6	10	9	9	42
Conductivity							Nitrate-nitrogen colorimetric						
	LAG030	COL030	LAG040	LAG050	LAG080	ALL		LAG030	COL030	LAG040	LAG050	LAG080	ALL
mean	489	620	655	628	666	599	mean	0.57	0.55	0.55	0.35	0.33	0.48
median	470	640	640	645	640	600	median	0.21	0.30	0.24	0.22	0.24	0.24
std. dev.	150	272	241	247	232	232	std. dev.	0.78	0.62	0.63	0.45	0.40	0.61
min	200	180	200	250	320	180	min	0.00	0.00	0.00	0.00	0.00	0.00
max	780	1090	1130	1150	1210	1210	max	3.20	2.00	2.10	1.56	1.32	3.20
n	35	21	24	22	21	123	n	26	16	18	17	15	92
violations	na	na	na	na	na	na	violations	4	3	4	2	2	15
Dissolved Oxygen							Nitrate-nitrogen ion chromatography						
	LAG030	COL030	LAG040	LAG050	LAG080	ALL		LAG030	COL030	LAG040	LAG050	LAG080	ALL
mean	9.1	8.1	6.5	4.8	5.3	7.0	mean	0.850	0.884	0.715	0.709	0.725	0.779
median	8.3	8.1	6.0	5.0	5.6	6.7	median	0.797	0.697	0.618	0.747	0.559	0.690
std. dev.	3.3	2.7	2.1	1.7	2.5	3.1	std. dev.	0.634	0.641	0.649	0.562	0.871	0.643
min	3.4	3.7	2.1	2.1	0.8	0.8	min	0.290	0.134	0.000	0.000	0.000	0.000
max	17.6	13.6	10.5	7.9	9.3	17.6	max	2.370	1.968	1.902	1.719	2.547	2.547
n	32	20	22	21	20	115	n	9	7	8	7	7	38
violations	7	6	14	19	15	61	violations	2	3	3	1	1	10

*violations indicate data not meeting the applicable water quality objective

Discussion

The three years of sample indicate some serious water quality problems in the Laguna de Santa Rosa. Phosphate levels violate standards almost every sample collected. Nitrate levels also are in violation frequently. While it is not all that uncommon to see nitrate spike around rain events, phosphate levels are typically low on Russian River streams, the Laguna is very much outside the norm for this pollutant. These high nutrient levels may be contributing to the growth of invasive weed *ludwigia* and the low dissolved oxygen levels. The cycle of nutrients including, sediment deposition and plant uptake and respiration, is complex in the Laguna. At times the levels found in the water column may be masked or enhanced by the levels of plant growth. Dissolved oxygen levels can also be heavily influenced by plant respiration during the day and depletion of oxygen at night. The Laguna oxygen levels are too low all year long. Factors are likely the slow, lake-like nature of the Laguna during some times of the year and eutrophication from over-growth of plants and algae in the water column. The time of the day for lowest dissolved oxygen, the early morning hours before the sun rises, are not even captured in this dataset, so we can only imagine that levels drop even further at night. Levels of at least 8mg/L are recommended for juvenile and adult stages and 11 mg/L for larval stages. Acute, or nearing 100%, mortality occurs at 3 and 6 mg/L respectively. The Laguna is certainly deadly to migrating fish at times.

Temperatures are too high in summer for fish, sometimes reaching into the mid and upper 20's C. Winter temperatures during migration are not optimal but are acceptable for passage of adults and juveniles, though not for spawning activities. pH ranges generally between 7 and 8.5, which is typical of Russian River streams.

Summer pH levels increase, on occasion above the regulatory limit of 8.5. Conductivity is the highest in the Russian River watershed that we have measured. It indicates possible pollution, and increases during the summer as ions concentrate in low inflows and evaporation. Winter rains dilute these salts, though even winter conductivity is somewhat higher than usually found in the area. Turbidity is too high all throughout the year. No storms were captured by our monthly monitoring program, so peak turbidity was not captured. Turbidity does not go back down to a low baseline as elsewhere in the Russian River basin, even during summer months.

The Laguna de Santa Rosa is listed as impaired through the Federal Clean Water Act's 303-d list for temperature, dissolved oxygen, phosphorous, nitrate and turbidity. The data gathered by CCWI supports this impairment status. We would recommend addition of conductivity as impaired, however the state has not set a standard for the Laguna on conductivity. Summer conditions are not hospitable to fish, and the Laguna is not spawning habitat. As for fall, winter and spring migration, dissolved oxygen levels are not ideal, though probably not consistently lethal either. The Laguna itself may not be important to fish production, it does empty into Mark West Creek and the Russian River, and fish trying to reach Santa Rosa Creek must traverse the Laguna's lower portion. The nutrients, turbidity, low dissolved oxygen and higher temperature water can impact other streams that have high fisheries value. The Russian River is somewhat buffered from the Laguna discharge in the summer due to the Eel River and Lake diversions which dilute pollutants in the Russian. Should low flow become a reality in the Russian, the Laguna could have a larger impact on summer water quality.