California Regional Water Quality Control Board
North Coast Region

Laguna de Santa Rosa TMDL

2008 Source Analysis Monitoring Report

December 2008

1.0 INTRODUCTION

The Laguna de Santa Rosa (Laguna) watershed was added to the 2002 California Section 303(d) list of impaired waterbodies for excessive nutrients (nitrogen and phosphorus), low dissolved oxygen (DO), high temperature and mercury in fish tissue. Staff of the North Coast Regional Water Quality Control Board's (Regional Water Board) Total Maximum Daily Load (TMDL) Development Unit are scheduled to complete the technical analyses for the Laguna TMDLs (excluding mercury) by 2011.

This Report documents the water quality data collected during 2008 in support of the Laguna TMDL. Companion documents include the Monitoring Plan (NCRWQCB, 2008a) and Quality Assurance Project Plan (NCRWQCB, 2008b). The water quality data collected are presented below based on the identified Tasks in the Monitoring Plan.

2.0 SAMPLING LOCATIONS

Samples and field measurements will be collected near the mouth at the Laguna for 18 tributary locations, 8 Laguna mainstem locations and 3 Santa Rosa Creek mainstem locations. (See Tables below)

Table 1. Tributary Sampling Locations

Site_ID	Site Name	Site Location	Latitude	Longitude
ABR1	Abramson Creek	Guerneville Road	38.452	-122.794
BLU1	Blucher Creek	Lone Pine Road	38.365	-122.787
BRU1	Brush Creek	Mouth off Highway 12	38.453	-122.678
COL1	Colgan Creek	Llano Road	38.374	-122.769
COP1	Copeland Creek	Commerce Blvd	38.343	-122.712
COT1	Cotati Creek	Delano Park Bridge	38.324	-122.706
DSEB	Sebastopol Drain	Joe Rodata Trail	38.401	-122.819
GOS1	Gossage Creek	Highway 16	38.336	-122.741
HIN1	Hinebaugh Creek	Labath Avenue	38.350	-122.721
MAT1	Matanzas Creek	Brookwood Road	38.439	-122.702
MWC1	Mark West Creek	Slusser Road	38.485	-122.826
PET1	Peterson Creek	Guerneville Road	38.446	-122.781
PIN1	Piner Creek	Fulton Road	38.449	-122.770
TUR1	Turner Creek	Daywalt Road	38.352	-122.767
VIN1	Vine Hill Creek	Laguna Road	38.458	-122.847
WAS1	Washoe Creek	Derby Lane	38.336	-122.733
WIL1	Wilfred Creek (Bellevue Flood Control Channel)	Mouth at Stony Point Road	38.352	-122.740
WIN1	Windsor Creek	Mark West Station Road	38.511	-122.840

Table 2. Laguna and Santa Rosa Creek Mainstem Sampling Locations

Site ID	Site Name	Latitude	Longitude
LHW1	Laguna Headwater at Benson Road	38.324	-122.700
LSPR	Laguna at Stony Point Road	38.352	-122.741
LTOD	Laguna at Todd Road	38.375	-122.780
LJRT	Laguna at Joe Rodata Trail	38.401	-122.816
LSEB	Laguna at Sebastopol Community Center	38.408	-122.818
LOR1	Laguna at Occidental Pond	38.425	-122.830
LRR1	Laguna at River Road	38.485	-122.842
LTHR	Laguna at Trenton-Healdsburg Road	38.494	-122.853
SRHW	Santa Rosa Creek Headwater at Brush Creek	38.453	-122.677
SRFU	Santa Rosa Creek at Fulton Road	38.442	-122.770
SRWR	Santa Rosa Creek at Willowside Road	38.445	-122.807

3.0 MONITORING QUESTIONS AND ASSESSMENT METHODS

The Regional Water Board developed the Monitoring Plan to address the following set of management questions for the Laguna:

1. Are dissolved oxygen and temperature objectives being met in the Laguna de Santa Rosa watershed?

2. Do dissolved oxygen and temperature levels contribute to impairment of the beneficial uses of the Laguna watershed?

3. What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?

4. What are the driving processes / factors affecting temperature levels in the Laguna watershed?

The Monitoring Plan is organized by eight tasks to collect information for addressing these management questions. The data collected in 2008 will be presented and discussed in relation to these tasks.

The data collected were reviewed according to the Quality Assurance Project Plan. Data were examined for compliance with the stated Data Quality Objectives (DQOs). If DQOs were not met, data were not presented nor used in the TMDL *Source Analysis*. The data presented in this report comply with the DQOs and are of sufficient quality for use in the TMDL *Source Analysis*.

The data collected were assessed with a number of statistical methods to help answer the monitoring questions. Non-parametric statistical methods are used for all assessments. Nonparametric methods are often referred to as *distribution free* methods as they do not rely on assumptions that the data are drawn from a given probability distribution. Commonly used statistics like mean and standard deviation assume the data set follows a Gaussian (i.e., normal) distribution. Water quality data rarely meet that assumption. Non-parametric methods are more robust due to the reliance on fewer assumptions.

The *Mann-Whitney U test* is a non-parametric test for assessing whether two samples of observations come from the same distribution. The method is also known as the Wilcoxon Rank-Sum test. This statistical test is a nonparametric (i.e., distribution-free) inferential statistical method. Nonparametric methods are most appropriate approach for assessing water quality data which can have widely varying frequency distributions. The test null hypothesis is that the two samples are drawn from a single population. The test is similar to performing an ordinary parametric two-sample *t* test, but is based on ranking the data set.

The *Kruskal-Wallis Test* is a one-way analysis of variance conducted using ranked data. The non-parametric method is used for testing equality of population medians among groups. The test is an extension of the *Mann-Whitney Test* applied to 3 or more groups.

Regression on Order Statistics (ROS) is a method used to estimate distributional statistics when the data are highly censored (i.e., many non-detected analytical results). ROS is based on probability plotting and is also known as Helsel's robust method (Helsel, 1990).The approach fits a regression line to the log transformed sample result values above the detection limit and their corresponding z scores. The regression is then used to predict "fill-in" values for the non-detected sample results. The predicted results are then transformed back to arithmetic units. Distributional statistics are then estimated using the data set containing the predicted results from ROS. However, hypothesis tests were conducted using the reported detection limit and not the value predicted by ROS.

4.0 WATER QUALITY MONITORING DATA BY TASK

Task 1: Dissolved Oxygen (DO) Measurements

Objectives:

- To characterize the temporal and spatial variation of dissolved oxygen levels and ancillary constituents throughout the Laguna watershed.
- To help address management questions #1, 2 and 3.
    1) Are dissolved oxygen and temperature objectives being met in the Laguna de Santa Rosa watershed?
    2) Do dissolved oxygen and temperature levels contribute to impairment of the beneficial uses of the Laguna watershed?
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?

Procedures:

- Instream instantaneous measurements of DO were collected using a YSI 6600 Sonde with air calibration.
- Measurements were collected periodically at all sampling locations identified in Section 2.0 of this report.
- Measurements for each site will be collected both in the early morning hours (before 10:00) to access maximum DO level depression.
- Measurements were also collected in late afternoon hours (after 13:00) to help assess diel patterns (Task 4).

Results:

Results of instantaneous DO measurements have been assess separately for two seasons: Summer (June-Sept) and Fall (Oct-Dec). These dates correspond to when wastewater is allowed to be discharged by the Santa Rosa Subregional Water Reclamation System starting October 1. Sonde measurement data from Summer 2008 are presented in Appendix 1A. Sonde measurement data from Fall 2008 are presented in Appendix 1B. These data are summarized in Appendix 1C.

An issue with improper calibration of the DO Sonde probe was discovered in late summer. These DO measurements were culled from the data set and are not presented since their quality is suspect. Many of the suspect data were collected in the early morning. As a result, relatively few (11%) of the DO measurements of the Summer data set were made in the early morning. Even though the majority of Summer DO measurements were collected between mid-day and late afternoon, a large percentage (61%) were still below the Basin Plan Water Quality Objective of 7.0 mg/L. Assessment of Fall DO measurements show conditions did not improve much with 48% below the Water Quality Objective.

The data collected during the Summer (June-September) and Fall (October - December) was assessed for statistically significant differences at each sampling site (Appendix 1D). A difference was detected in only four (4) of the sampling locations. The low number of locations with differences in DO is likely due to the small Summer data set resulting from the Sonde calibration errors discussed above.

The data collected in the early morning (before 10:00) and late afternoon (after 13:00) were also assessed for statistically significant differences at each sampling location using the *Mann-Whitney U test*. No statistical difference was found between these times at any of the sampling locations. This result is likely due to the loss in statistical power due the low sample sizes at each location. More data is needed from each location to show the expected temporal difference.

Task 2: Temperature Measurements

Objectives:

- To characterize the temporal and spatial variation of instream water temperature levels in the Laguna watershed.
- To help address management questions #1, 2, 3 and 4.
    1) Are dissolved oxygen and temperature objectives being met in the Laguna de Santa Rosa watershed?
    2) Do dissolved oxygen and temperature levels contribute to impairment of the beneficial uses of the Laguna watershed?
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?
    4) What are the driving processes / factors affecting temperature levels in the Laguna watershed?

Procedures:

- Instream continuous measurements of temperature using Hobo Stowaway data-loggers were deployed following the *Forest Science Project* Stream Temperature Protocols. Continuous temperature measurements were successfully collected at 18 locations identified in Appendix 2A.
- Instream instantaneous measurements of temperature were also collected periodically using a YSI 6600 data Sonde.

Results:

Calibration results of the Hobo Stowaway data-loggers are presented in Appendix 2A. Both mean pre-calibration and post-calibration results were well below the QAPP accuracy guideline of 0.2ºC. Time series plots of the continuous temperature measurements are presented in Appendix 2B. Many of the data-loggers were deployed in locations that became dry during the period of measurement. Observations of zero stream flow were matched with the time series temperature plots. Periods where the data-loggers became exposed and began to measuring air temperature were easily distinguished by the change in magnitude of the diel variation. These air exposed temperature measurements were culled from the data and are not shown in Appendix 2B.

A summary of the results of the continuous temperature measurements is presented in Appendix 2C. These data were assessed using the salmonid life stage and lethal temperature thresholds (Carter, 2008). The life stage criteria are based on the maximum weekly maximum temperature (MWMT). Nine (50%) of the stream locations monitored exceed the criterion of adult migration. All of the locations exceed the criterion for spawning, egg incubation, and fry emergence.

Lethal criteria are based on daily maximum values. Seven (39%) of the stream locations monitored exceeded the lethal temperature for adult migration and holding. This includes all of the locations in the Laguna mainstem.

Results of instantaneous temperature measurements have been assessed separately for two seasons: Summer (June-Sept) and Fall (Oct-Dec). These dates correspond to when wastewater is allowed to be discharged by the Santa Rosa Subregional Water Reclamation System starting October 1. Sonde measurement data from Summer 2008 are presented in Appendix 1A. Sonde measurement data from Fall 2008 are presented in Appendix 1B. These data are summarized in Appendix 1C.

The instantaneous Sonde temperature data collected during the Summer (June-September) and Fall (October - December) was assessed for statistically significant differences at each sampling site (Appendix 1D). A difference was detected in only 15 of the sampling locations. This difference is expected due to the effect of cooling air temperature during the Fall months.

The difference between early morning (before 10:00) and late afternoon (after 13:00) was tested for a statistically significant difference for each sampling location. The test indicated that no difference was found between these times at all of the sampling locations. This result may simply be the loss in power due the low sample sizes. A larger sample size may have shown the expected temporal difference.

Task 3: Stratification Measurements

Objectives:

- To characterize the temporal and spatial variation of stratification in the Laguna watershed.
- To help address management questions #2, 3 and 4.
    2) Do dissolved oxygen and temperature levels contribute to impairment of the beneficial uses of the Laguna watershed?
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?
    4) What are the driving processes / factors affecting temperature levels in the Laguna watershed?

Procedures:

- Continuous instream measurements of temperature, DO and pH were collected at LOR1 and LSEB using a YSI 6600 Data Sonde with air calibration.
- Two Data Sondes were deployed near the surface and just off the bottom for a period of 5 days.
- Surface and near bottom Data Sonde measurements were also collected at five (5) locations along the thalweg of both lentic areas during productivity sampling (Task 7). Site IDs were numbered consectively southward along the thalwegs.

Results:

Results of the Data Sonde measurements collected at LOR1 and LSEB over 5 days are presented in Appendix 3A. Sampling dates were at the end of September during critical conditions for eutrophication impacts. Both sampling locations were only about 5 feet deep. At LSEB, the Data Sondes were deployed at 2.3 feet and 4.7 feet. At LOR1, the Data Sondes were deployed at 2.3 feet and 4.5 feet.

The measurements show that both lentic areas are polymictic. They stratify during the day due to surface heating, but completely destratify during the cooling of night. Mixed water column values for DO are around 4 mg/L for LSEB and 5 mg/L for LOR1 well below the Basin Plan Water Quality Objective. Both areas are also very productive with DO becoming supersaturated during daylight hours.

The lentic area at LOR1 is much more productive than LSEB. DO levels at LOR1 exceeded 20 mg/l and 250% saturation several days of the Data Sonde deployment. High productivity is also evident in the high pH values measured at LOR1. Both surface and near bottom measurements exceeded the Basin Plan Water Quality Objective for pH continuously over the 5 day deployment period.

The instantaneous Data Sonde measurements collected along the lentic thalwegs during productivity sampling are presented in Appendices 3B and 3C. The measurements verify observed stratification during daytime hours. A larger difference is observed between surface and bottom DO than with temperature. This observation implies that a large sediment oxygen demand is being exerted resulting in a pronounced DO gradient with depth. This DO gradient is not the result of a stable thermocline since the water column destratifies daily.

Task 4: Diel Measurements

Objectives:

- To characterize the temporal and spatial variation of diel patterns in dissolved oxygen and temperature levels in the Laguna watershed.
- To help address management questions #2, 3 and 4.
    2) Do dissolved oxygen and temperature levels contribute to impairment of the beneficial uses of the Laguna watershed?
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?
    4) What are the driving processes / factors affecting temperature levels in the Laguna watershed?

Procedures:

- Data collected for the other tasks will be used to assess information on diel patterns.
    1. Instantaneous DO measurements in early morning vs. late afternoon will be used to evaluate diel ranges at most locations.
    2. Continuous temperature measurements with data-loggers will be used to evaluate diel ranges at most locations.
    3. Continuous Sonde measurements collected at LOR and SEB for stratification will also be used to evaluate diel ranges in lentic areas.

Results:

Results of the range of instantaneous DO measurements at each sampling location are presented in Appendix 4A. Lentic Laguna locations (LOR1 and LSEB) show the largest diel DO ranges. Other locations with a large diel DO range include those where stream flow had ceased resulting in isolated ponds (e.g., MWC1 and PET1). Sonde measurements were made in these isolated ponds to assess extent of use impairment during critical conditions. Locations with continuous flow throughout the year showed the smallest diel DO ranges (e.g., BLU1, COP1, SRWR, VIN1). Conditions at these locations are likely the result of irrigation driven runoff providing a steady stream flow.

Results of the range of temperature measurements at each sampling location are presented in Appendix 4B. Presented are the diel ranges for both the instantaneous Sonde measurements and the continuous temperature measurements made with data-loggers. Median temperature values were compared for both the AM period (early morning before 10:00) and PM period (late afternoon after 13:00). These instantaneous temperature data show no explainable pattern. Results of the range of pH measurements at each sampling location are presented in Appendix 4C. These instantaneous pH data also show no explainable pattern

The inconsistent sampling caused by staff resourcing issues and a mix of intermittent and perennial streams resulted in data that does not inform the management questions.

Results of the continuous temperature measurements made with data-loggers are also summarized in Appendix 4B. These data show a similar pattern as the diel DO measurements. Locations with a large diel temperature range include those where stream flow had ceased resulting in isolated ponds (e.g., LTOD, BRU1 and WIL1) and lentic areas with little riparian coverage (e.g., LJRT, and LOR1). Due to sampling issues data from many locations were lost providing an incomplete assessment of diel variation watershed-wide.

Results of the range of continuous DO and temperature measurements at the lentic sampling locations (LOR1 and LSEB) are presented in Appendix 4C. Data Sondes were deployed near the surface and near the bottom for continuous measurements collected over five (5) days. These data show that constituents measured in the surface water quality exhibit a wider diel variation than bottom bottom waters. These data suggest that stratification and eutrophication processes are controlling water quality in lentic areas.

Task 5: Stream Flow Measurements

Objectives:

- To characterize the temporal and spatial variation of stream flow levels in the Laguna watershed.
- To help address management question # 3.
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?

Procedures:

- Instream instantaneous measurements of stream flow were made using using two USGS protocols (Rantz, 1982) depending on site conditions. The SonTek Acoustic Doppler Velocimeter (ADV) for was used for wadable streams and the float method for low sheet flows.
- Flow measurements were collected 14 locations identified in Section 2.0 of this report. Flows were not collected at the locations with USGS continuous flow gaging stations (LSPR, LOR1, and SRWR).

Results:

Results of the stream flow measurements at each sampling location are presented in Appendix 5A. These instantaneous stream flow data show no explainable pattern. Stream flow stopped at many of the sampling locations resulting in isolated ponds or completely dry stream beds. The inconsistent sampling caused by staff resourcing issues and a mix of intermittent and perennial streams resulted in data that does not inform the management question.

Task 6: Pollutant Sampling

Objectives:

- To characterize the temporal and spatial variation of pollutant levels in the Laguna watershed.
- To help address management question # 3.
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?

Procedures:

- Collect grab water samples and analyze for these pollutants: Total Suspended Solids (TSS), Biochemical Oxygen Demand, 5-day (BOD_5), Ammonia-Nitrogen (NH_3), Nitrate-Nitrogen (NO_3), Total Kjeldahl Nitrogen (TKN), Ortho-Phosphorus (OP), Total Phosphorus (TP), Total Mercury (THg) and methyl-Mercury (MMHg)
- Samples were collected from all 28 locations identified in Section 2.0 of this report. Tributary sites were be sampled three (3) times during June 2008 and again in September 2008. Mercury samples were collected once in June 2008 at 21 locations. Nine locations on the mainstem Laguna and Santa Rosa Creeks were only sampled only one (1) time during June 2008 due to an end of fiscal year budget constraint. During September, a large flowing stream was found draining from Sebastopol was sampled three (3) times.
- Triplicate samples were collected once for each pollutant at a randomly selected location. Field blanks were submitted to the lab for each pollutant poured at a randomly selected site.

Results:

Measured conventional pollutant concentrations are presented in Appendix 6A. Twelve (12) of the sampling locations were not sampled in September due to the lack of flowing water. During September the Laguna was found to be a series of ponds disconnected in surface water. Laguna samples were taken from these ponded areas. A large percentage of results were below analytical detection limits for three (3) of the constituents: BOD_5 (58%), NO_3 (14%), and TSS (9%).

Summary distributional statistics are shown in Appendix 6B. To better estimate the distributional statistics, ROS was conducted for the three (3) of the pollutants with a large percentage of results below analytical detection limits (i.e., BOD_5, NO_3, and TSS). Generally, a large difference is observed between the median and mean results verifying the data do not follow a normal distribution. Santa Rosa Creek results showed consistently lower pollutant concentrations than both the Laguna or tributary samples. Both TP and OP concentrations are much higher in

the Laguna than the tributaries suggesting internal loading. There are also much higher TSS and BOD_5 concentrations likely caused by organic material such as plankton and humic acids.

Box plots showing distribution of samples for each station and pollutants are shown in Appendix 6C. These plots also confirm the results do not follow a normal distribution. These plots allow a visual comparison of the concentrations between sampling locations. Note that the box plots for NO_3 do not show several sampling locations with very high concentrations (i.e., COL1, DSEB, LJRT).

The difference between June results and September results was tested for a statistically significant difference for each pollutant and those sampling locations with three samples in each month. Most of the pollutants and locations showed no significant difference between months. Those locations and pollutants with an observed difference are shown in Appendix 6D.

Measured total and methyl mercury concentrations are presented in Appendix 6E. Results at Wilfred Creek (WIL1), as known as Bellevue Flood Control Channel are much higher than concentrations measured at all other locations. This location drains urban areas suggesting an industrial pollutant source. However, None of the samples exceed the California Toxic Rule criterion of 0.050 ug/L for the protection of human health. Since the Laguna is listed for mercury in fish tissue, the bioaccumulation factor used to derive the criterion must be different in the Laugna. Methyl mercury concentrations were an order of magnitude greater from Mark West Creek (MWC1) that all other sampling locations.

Results of triplicate samples are presented in Appendix 6E. Triplicate samples are collected to assess the overall variability of the sampling process. Most of the constituents show an expected range of variability except TSS in June 2008. The high variability is associated with the third replicate sample collected. This is high result is likely due to stream bottom sediment being inadvertently mixed into the water column during the collection of the first two sample replicates and is not a representative sample.

Results of the blank samples are presented in Appendix G. Most of the sample blank results were measured below the minimum detection limit. Nitrate was detected just at the MDL in June and likely does not represent any contamination. Ammonia blanks during both June and September were much higher that the MDL of 0.02 mg/L. Many of the samples were recorded below the blanks indicating that the high blank results were not caused by systematic contamination. The most likely source of contamination would have been the distilled water used may have been exposed to some unknown source of ammonia.

Task 7: Productivity Measurements

Objectives:

- To characterize the temporal and spatial variation of phytoplankton levels in the Laguna watershed.
- To help address management question # 3.
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?

Procedures:

- Collected grab samples for analysis of chlorophyll-*a* and phaeophytin-*a* concentrations from three Laguna lotic locations (LTOD, SRWR, and LTHR) and two lentic areas (LSEB at 3 locations & LOR1 at 5 locations).
- Samples were collected 4 times between August and November 2008.
- Triplicate grab samples were collected at a randomly selected site.
- Instream measurements of fluorescence (Turner Design Fluorometer using EPA Method 445.0) were also collected along the thalweg of the LSEB (2 times) and LOR1 (3 times) to assess the spatial variability. Samples were also taken once at each of the lotic locations to provide a wider range for the fluorescence-chlorphyll-*a* calibration curve.
- Locations of grab samples and fluorometric measurements are presented in Appendix 7A.

Results:

Results of the chlorophyll-*a* and phaeophytin-*a* sample concentrations are presented in Appendix 7B. Mean chlorophyll-*a* concentrations for Occidental Road Pond and for Sebastopol Pond are 0.605 mg/L and 0.071 mg/L, respectively. Both of these levels far exceed the 0.010 mg/L criteria for impaired uses due to eutrophication (Creager et al. 2006). A large number of the phaeophytin-*a* samples were measured below the MDL indicating that the phytonplanton were actively growning and not in senesence.

Results of the triplicate samples are presented in Appendix 7C. Total sampling variabilty was in the range expected for chlorophyll-*a* sampling with a CV at 20%. Phaeophytin-*a* samples showed a slightly higher variation, but these numbers are biased due to substituting the MDL value. The samll number of samples replicated restricts the use of ROS for predicting values below the MDL.

The calibration curve relating chlorophyll-*a* concentrations to in-situ measured fluorescence is presented in Appendix 7D. The Pearson linear regression was significant at explaining 29% of the variance with homoscedasic residuals.

Using the calibration curve, chlorophyll-*a* concentrations were estimated from fluorescence measurments. These estimates were combined with chlorophyll-*a* concentrations measured from grab samples to present spatial variability in Appendix 7D. Results show that Occidental Road Pond has generally higher chlorophyll-*a* levels at the inflow (LOR1) in relation to the outflow (LOR5). This pattern is also observed in Sebastopol Pond with higher in chlorophyll-*a* levels at the inflow (SEB3) relative to the outflow (SEB1). Also, levels in Sebastopol Pond drop earlier than Occidental Road Pond.

Task 8: Phytoplankton Composition Sampling

Objectives:

- To characterize the temporal and spatial variation of phytoplankton composition in the mainstem Laguna.
- To help address management question # 3.
    3) What are the driving processes / factors affecting dissolved oxygen levels in the Laguna watershed?

Procedures:

- Sample the phytoplankton community composition of the mainstem Laguna.
- Olympus Compound Microscope using dichotomous key qualitatively identify the most abundant phytoplankton species to the lowest taxa possible using an Sedwick-Rafter counting cell aliquot (Lind, 1974)

Results:

This task was not fully conducted due to limiting staff resources.

An unusual, very bright lime green phytoplankton bloom was observed at LOR1 while staff were collecting samples on 11 September 2008. A sample was collected and placed under the microscope the next day. Several staff informally identified the dominant taxa to be *Mycrocystis sp*.. Due to the possible significant of the find, arrangements were made to make a professional identification with Trina Mackie, a researcher at UC Berkeley. The unusual bloom was not evident when a new sample was collected. This sample was shipped to UC Berkley and the dominant taxa were found to be chlorophytes, euglenophyta, and diatoms. It is uncertain at this time whether the unusual bright green bloom contained *Microcystis sp.*

5.0 CITATIONS

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NCRWQCB, 2008a. Laguna de Santa Rosa TMDL - Monitoring Plan. North Coast Regional Water Quality Control Board. Santa Rosa, CA. June 2008.

NCRWQCB, 2008b. Laguna de Santa Rosa TMDL – Quality Assurance Project Plan. North Coast Regional Water Quality Control Board. Santa Rosa, CA. June 2008.

Appendix

Appendix 1A. Instantaneous Data Sonde Measurement Results - Summer 2008.

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
ABR1	28-Jul-08	12:24	--	16.0	7.4
ABR1	15-Sep-08	16:19	4.4	15.7	7.9
BLU1	12-Aug-08	11:17	2.7	14.6	7.1
BLU1	29-Jul-08	11:29	--	14.3	7.0
BLU1	24-Jul-08	13:45	--	14.4	7.0
BLU1	29-Aug-08	15:20	1.5	17.2	7.2
BLU1	12-Sep-08	17:10	1.2	14.1	6.9
BRU1	8-Aug-08	9:55	--	17.4	7.6
BRU1	15-Sep-08	14:41	6.9	19.9	7.9
BRU1	25-Sep-08	15:10	6.2	18.4	7.8
BRU1	25-Jul-08	12:19	--	19.4	8.3
COL1	29-Jul-08	11:12	--	17.6	7.8
COL1	24-Jul-08	12:35	--	12.8	7.1
COP1	24-Jul-08	8:02	--	16.3	7.7
COP1	12-Aug-08	13:10	4.1	18.3	7.5
COP1	29-Aug-08	13:40	3.0	19.6	7.4
COP1	12-Sep-08	18:05	3.3	16.4	7.8
GOS1	12-Aug-08	11:54	4.4	16.3	7.4
GOS1	24-Jul-08	12:03	--	16.0	7.4
GOS1	28-Jul-08	13:35	--	17.6	7.7
GOS1	29-Aug-08	14:43	5.2	20.6	6.8
GOS1	25-Sep-08	17:18	4.2	14.5	7.6
HIN1	24-Jul-08	11:37	--	19.0	7.8
HIN1	29-Aug-08	14:27	5.6	25.1	7.6
HIN1	28-Jul-08	14:44	--	21.3	7.7
HIN1	12-Aug-08	14:49	5.0	21.4	7.6
HIN1	25-Sep-08	16:28	9.3	19.5	8.2
HIN1	12-Sep-08	17:35	8.9	20.0	8.0
LHW1	24-Jul-08	8:51	--	16.3	7.8
LHW1	29-Jul-08	12:20	--	15.0	7.9
LJRT	29-Jul-08	10:28	--	16.2	7.4
LJRT	8-Aug-08	13:15	--	16.7	7.7
LJRT	24-Jul-08	14:30	--	17.3	7.6
LJRT	29-Aug-08	15:46	4.3	20.1	7.4
LJRT	22-Sep-08	17:20	7.7	16.1	7.6
LOR1	25-Jul-08	11:39	--	22.5	8.4

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
LOR1	29-Aug-08	16:59	15.6	29.0	9.2
LOR1	5-Aug-08	17:15	--	26.1	8.6
LOR1	29-Sep-08	18:06	13.5	22.3	9.1
LOR1	22-Sep-08	18:28	6.8	20.6	8.7
LOR1	29-Aug-08	17:02	16.2	28.9	9.1
LRR1	19-Sep-08	9:38	3.9	12.6	7.4
LRR1	5-Aug-08	14:05	--	18.6	7.5
LRR1	25-Jul-08	9:37	--	16.8	7.6
LSEB	29-Jul-08	9:43	--	20.1	7.6
LSEB	29-Jul-08	9:47	--	20.5	7.6
LSEB	8-Aug-08	13:42	--	19.9	7.7
LSEB	8-Aug-08	13:45	--	23.7	8.0
LSEB	24-Jul-08	14:50	--	19.3	7.6
LSEB	24-Jul-08	14:55	--	21.7	8.3
LSEB	12-Sep-08	16:29	3.3	18.4	7.5
LSEB	12-Sep-08	16:29	11.4	21.7	8.4
LSEB	29-Aug-08	16:40	8.0	23.7	7.5
LSEB	29-Sep-08	17:42	3.5	16.5	7.5
LSEB	29-Sep-08	17:47	11.2	18.5	8.6
LSEB	22-Sep-08	18:07	4.2	16.5	7.5
LSEB	22-Sep-08	18:07	8.4	19.4	8.0
LSEB	29-Aug-08	16:37	1.0	20.5	7.5
LTH1	12-Aug-08	9:13	5.4	17.7	7.8
LTH1	5-Aug-08	15:50	--	18.7	7.8
LTH1	29-Sep-08	16:11	5.6	15.2	7.7
LTH1	25-Jul-08	9:17	--	17.2	7.8
LTH1	12-Sep-08	15:23	6.5	17.2	7.9
LTH1	19-Sep-08	9:24	6.0		7.9
LTOD	29-Jul-08	10:56	--	17.6	8.2
LTOD	12-Aug-08	10:56	7.9	20.9	8.4
LTOD	24-Jul-08	13:10	--	18.3	8.0
LTOD	29-Aug-08	15:07	9.3	28.1	8.6
LTOD	12-Sep-08	16:52	10.0	21.4	8.5
LTOD	25-Sep-08	17:41	9.9	18.2	8.6
MAT1	28-Jul-08	9:50	--	16.5	7.8
MAT1	8-Aug-08	11:19	--	15.5	7.7
MAT1	15-Sep-08	15:25	4.0	15.3	7.6
MAT1	25-Sep-08	16:00	6.4	15.9	7.6
MWC1	19-Sep-08	9:07	5.2		7.4

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
MWC1	5-Aug-08	13:35	--	17.2	7.4
MWC1	25-Jul-08	8:01	--	16.7	7.2
PET1	28-Jul-08	12:03	--	23.5	8.2
PET1	8-Aug-08	15:22	--	25.6	8.3
PIN1	28-Jul-08	11:28	--	20.6	7.7
PIN1	8-Aug-08	15:00	--	22.0	7.6
PIN1	15-Sep-08	15:57	7.2	20.2	7.9
SRFU	28-Jul-08	11:11	--	19.9	7.9
SRFU	8-Aug-08	14:24	--	21.3	7.7
SRFU	15-Sep-08	15:45	10.7	19.9	8.2
SRHW	8-Aug-08	10:02	--	15.6	7.8
SRHW	25-Jul-08	12:07	--	17.0	7.8
SRHW	25-Sep-08	15:18	4.4	15.3	7.6
SRHW	15-Sep-08	14:48	7.0	16.9	7.7
SRWR	28-Jul-08	8:12	--	18.8	7.7
SRWR	29-Jul-08	14:10	--	19.7	7.8
SRWR	12-Sep-08	15:52	7.6	17.2	7.8
SRWR	15-Sep-08	16:32	8.0	16.8	7.9
TUR1	29-Jul-08	11:56	--	14.3	7.4
TUR1	24-Jul-08	12:57	--	18.0	7.1
VIN1	25-Jul-08	10:18	--	12.6	7.7
VIN1	12-Sep-08	15:39	9.7	14.3	7.8
VIN1	5-Aug-08	16:05	--	17.7	7.9
VIN1	29-Sep-08	16:32	9.3	14.3	7.9
WAS1	24-Jul-08	9:51	--	14.5	7.9
WAS1	12-Aug-08	13:46	1.5	15.6	7.2
WAS1	29-Aug-08	14:01	0.6	17.1	6.9
WAS1	25-Sep-08	17:02	1.2	13.1	7.3
WIL1	24-Jul-08	11:05	--	19.2	8.1
WIL1	29-Aug-08	14:14	16.6	26.6	8.4
WIL1	25-Sep-08	16:46	13.4	17.8	8.7
WIL1	12-Sep-08	17:25	11.9	20.3	8.7
WIL1	12-Aug-08	7:55	6.6	23.9	8.0
WIN1	19-Sep-08	8:49	4.4		7.5
WIN1	25-Jul-08	8:51	--	15.4	7.5
WIN1	12-Sep-08	15:07	2.8	16.4	7.5
WIN1	29-Sep-08	15:56	2.7	15.3	7.3
WIN1	12-Aug-08	13:26	3.6	15.5	7.3

Appendix 1B. Instantaneous Data Sonde Measurement Results - Fall 2008.

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
ABR1	19-Nov-08	8:43	5.4	11.6	7.0
BLU1	02-Oct-08	16:26	4.3	14.4	7.0
BLU1	15-Oct-08	9:40	4.6	10.3	7.5
BLU1	20-Oct-08	16:52	4.8	11.5	7.6
BLU1	23-Oct-08	16:31	5.5	10.6	7.1
BLU1	25-Nov-08	11:23	6.1	9.5	7.1
BLU1	26-Nov-08	10:06	7.2	9.6	7.1
BRU1	31-Oct-08	8:53	6.7	12.9	7.4
BRU1	06-Oct-08	13:47	1.4	18.6	7.0
BRU1	16-Oct-08	14:41	0.6	12.8	7.4
BRU1	25-Nov-08	13:51	11.0	10.9	7.7
BRU1	26-Nov-08	11:45	10.1	10.5	7.6
COL1	14-Nov-08	9:48	6.8	11.2	7.3
COP1	16-Oct-08	16:13	1.9	11.5	7.7
COP1	23-Oct-08	14:54	3.0	11.8	7.7
COP1	25-Nov-08	9:50	3.1	11.1	7.4
DSEB	02-Oct-08	15:55	7.1	16.6	7.4
DSEB	03-Oct-08	9:11	9.0	14.9	7.6
DSEB	09-Oct-08	16:41	7.5	14.6	7.5
DSEB	21-Nov-08	9:58	8.0	11.1	7.4
DSEB	24-Nov-08	16:21	8.1	11.7	7.2
DSEB	25-Nov-08	12:47	7.6	11.9	7.1
GOS1	20-Oct-08	17:13	5.1	13.4	7.4
GOS1	23-Oct-08	16:08	5.9	12.9	7.6
GOS1	14-Nov-08	9:15	2.3	12.6	7.9
GOS1	25-Nov-08	11:04	6.8	10.8	7.5
HIN1	02-Oct-08	17:08	10.9	20.4	8.3
HIN1	16-Oct-08	17:10	13.6	18.0	8.4
HIN1	23-Oct-08	14:40	14.0	16.3	8.3
HIN1	14-Nov-08	8:30	7.0	12.3	7.7
HIN1	25-Nov-08	10.52	11.6	11.7	7.9
HIN1	26-Nov-08	15:24	11.2	12.9	8.0
LHW1	06-Oct-08	16:16	1.4	16.7	7.2
LHW1	25-Nov-08	10:09	7.7	11.4	7.3
LHW1	26-Nov-08	13:20	9.7	12.8	6.9
LJRT	02-Oct-08	15:39	5.9	15.6	7.3
LJRT	03-Oct-08	9:17	5.6	14.6	7.3

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
LJRT	09-Oct-08	16:51	8.4	14.6	7.5
LJRT	20-Oct-08	16:20	10.3	13.8	7.8
LJRT	21-Nov-08	9:46	9.6	8.6	7.3
LJRT	24-Nov-08	16:15	11.0	12.0	7.5
LJRT	25-Nov-08	12:47	6.9	10.9	7.1
LJRT	26-Nov-08	10:20	6.9	10.7	7.1
LOR1	09-Oct-08	17:24	7.2	18.8	8.7
LOR1	10-Oct-08	9:50	5.7	15.1	8.6
LOR1	19-Nov-08	9:43	4.0	14.5	7.3
LOR1	24-Nov-08	16:43		13.6	7.3
LOR1	25-Nov-08	13:26	3.3	12.7	7.3
LRR1	09-Oct-08	15:34	2.2	16.1	7.3
LRR1	07-Nov-08	9:38	3.2	13.6	7.2
LRR1	26-Nov-08	9:07	6.1	10.9	7.2
LSEB	09-Oct-08	17:11	3.9	16.0	7.5
LSEB	09-Oct-08	17:15	7.3	18.0	7.7
LSEB	25-Nov-08	13:10	10.5	11.4	7.5
LSPR	14-Nov-08	8:50	4.0	13.0	7.2
LTH1	09-Oct-08	15:10	5.9	15.6	7.5
LTH1	20-Oct-08	14:36	7.3	12.8	7.6
LTH1	07-Nov-08	9:17	4.5	13.2	7.2
LTH1	25-Nov-08	14:57	7.3	10.8	7.3
LTH1	26-Nov-08	16:17	6.3	11.0	7.3
LTOD	03-Oct-08	9:45	4.5	15.1	7.9
LTOD	20-Oct-08	16:45	9.7	13.6	8.7
LTOD	14-Nov-08	10:00	2.3	12.9	6.9
LTOD	25-Nov-08	11:21	5.0	11.0	7.1
LTOD	26-Nov-08	9:55	7.5	10.9	7.1
MAT1	06-Oct-08	15:12	3.4	15.7	7.4
MAT1	16-Oct-08	15:24	5.6	15.0	7.8
MAT1	31-Oct-08	9:23	8.9	13.7	7.7
MAT1	25-Nov-08	14:13	9.2	11.5	7.5
MAT1	26-Nov-08	12:20	6.8	11.3	7.5
MWC1	07-Nov-08	8:59	8.6	12.3	7.6
MWC1	26-Nov-08	8:57	9.1	10.6	7.6
PET1	21-Nov-08	9:22	6.6	8.9	7.4
PIN1	10-Oct-08	8:56	4.8	13.0	7.4
PIN1	23-Oct-08	14:03	7.5	12.4	7.6
PIN1	19-Nov-08	8:59	7.7	12.4	7.5
PIN1	24-Nov-08	14:45	10.9	11.2	7.7

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
PIN1	26-Nov-08	11:19	9.5	11.2	7.6
SRFU	10-Oct-08	9:09	9.1	12.1	7.7
SRFU	23-Oct-08	14:14	11.1	13.1	8.1
SRFU	31-Oct-08	9:58	9.9	14.3	7.9
SRFU	24-Nov-08	14:30	14.7	11.5	8.2
SRFU	26-Nov-08	10:49	11.7	11.2	8.0
SRHW	06-Oct-08	14:07	8.1	16.5	7.6
SRHW	16-Oct-08	14:47	8.7	15.9	7.9
SRHW	31-Oct-08	9:04	9.1	12.8	7.8
SRHW	25-Nov-08	13:54	10.6	11.0	7.9
SRHW	26-Nov-08	11:48	10.3	10.9	7.8
SRWR	09-Oct-08	16:07	5.1	14.8	7.5
SRWR	10-Oct-08	9:37	6.1	13.6	7.5
SRWR	19-Nov-08	9:56	7.9	11.9	7.6
SRWR	21-Nov-08	8:44	8.7	10.2	7.6
SRWR	24-Nov-08	15:01	9.6	11.0	7.8
SRWR	26-Nov-08	9:30	10.6	10.6	7.7
VIN1	09-Oct-08	15:44	9.6	12.9	7.7
VIN1	07-Nov-08	9:53	9.8	11.8	7.8
VIN1	19-Nov-08	9:25	10.2	11.7	7.6
VIN1	25-Nov-08	14:48	10.4	11.4	7.7
VIN1	26-Nov-08	9:18	10.2	10.8	7.6
WAS1	02-Oct-08	17:26	0.7	15.5	7.2
WAS1	02-Oct-08	17:30	9.3	18.7	8.1
WAS1	06-Oct-08	16:39	0.6	15.6	7.2
WAS1	06-Oct-08	16:42	3.8	18.2	7.3
WAS1	15-Oct-08	9:05	6.8	11.8	7.1
WAS1	16-Oct-08	16:39	4.2	11.3	7.5
WAS1	16-Oct-08	16:43	8.9	16.2	7.6
WAS1	23-Oct-08	15:30	10.5	13.8	8.0
WAS1	23-Oct-08	15:32	10.9	13.6	7.8
WAS1	14-Nov-08	9:27	5.3	12.7	7.3
WAS1	25-Nov-08	10:26	4.3	10.6	7.4
WAS1	25-Nov-08	10:26	11.4	11.1	7.9
WAS1	26-Nov-08	13:35	10.0	11.5	7.7
WIL1	02-Oct-08	16:52	10.2	19.6	8.5
WIL1	06-Oct-08	16:55	5.8	18.8	8.0
WIL1	16-Oct-08	16:58	5.4	14.0	7.9
WIL1	23-Oct-08	15:57	5.8	13.9	7.9
WIL1	14-Nov-08	9:00	1.6	13.2	7.3

Site ID	Date	Time	DO (mg/L)	Temp. (◦C)	pH
WIL1	25-Nov-08	10:41	7.9	10.6	7.3
WIL1	26-Nov-08	15:15	6.0	11.1	7.2
WIN1	09-Oct-08	14:44	2.5	14.1	7.2
WIN1	20-Oct-08	14.26	3.0	12.6	7.1
WIN1	07-Nov-08	8:41	6.8	12.7	7.4
WIN1	25-Nov-08	15:09	8.3	10.9	7.3
WIN1	26-Nov-08	16:27	4.1	11.3	7.2

Appendix 1C. Summary of Instantaneous Data Sonde Measurement Results – 2008.

Site ID	DO (mg/L)		Temperature (◦C)		pH	
	Summer Median	Fall Median	Summer Median	Fall Median	Summer Median	Fall Median
ABR1	4.4	5.4	15.8	11.6	7.7	7.0
BLU1	1.5	5.2	14.4	10.5	7.0	7.1
BRU1	6.5	6.7	18.9	12.8	7.8	7.4
COP1	--	3.0	15.2	11.4	7.4	7.5
DSEB	3.3	7.8	17.3	13.3	7.6	7.4
GOS1	4.4	5.5	16.3	12.7	7.4	7.6
HIN1	7.3	11.4	20.7	14.6	7.7	8.2
LHW1	--	7.7	15.7	12.8	7.9	7.2
LJRT	6.0	7.6	16.7	12.9	7.6	7.3
LOR1	14.5	4.8	24.3	14.5	8.9	7.3
LRR1	3.9	3.2	16.8	13.6	7.5	7.2
LSEB	6.1	7.3	20.0	16.0	7.6	7.5
LSPR	--	4.0	--	13.0	--	7.2
LTH1	5.8	6.3	17.2	12.8	7.8	7.3
LTOD	9.6	5.0	19.6	12.9	8.5	7.1
MAT1	5.2	6.8	15.7	13.7	7.7	7.5
MWC1	5.2	8.8	17.0	11.5	7.4	7.6
PET1	--	6.6	24.6	8.9	8.3	7.4
PIN1	7.2	7.7	20.6	12.4	7.7	7.6
SRFU	10.7	11.1	19.9	12.1	7.9	8.0
SRHW	5.7	9.1	16.2	12.8	7.8	7.8
SRWR	7.8	8.3	18.0	11.5	7.8	7.6
TUR1	--	--	16.1	--	7.3	--
VIN1	9.5	10.2	14.3	11.7	7.8	7.7
WAS1	1.2	4.8	15.0	12.2	7.3	7.3
WIL1	12.7	5.8	20.3	13.9	8.4	7.9
WIN1	3.2	4.1	15.5	12.6	7.5	7.2

Note: Summer months are June, July, August and September. Fall months are October and November

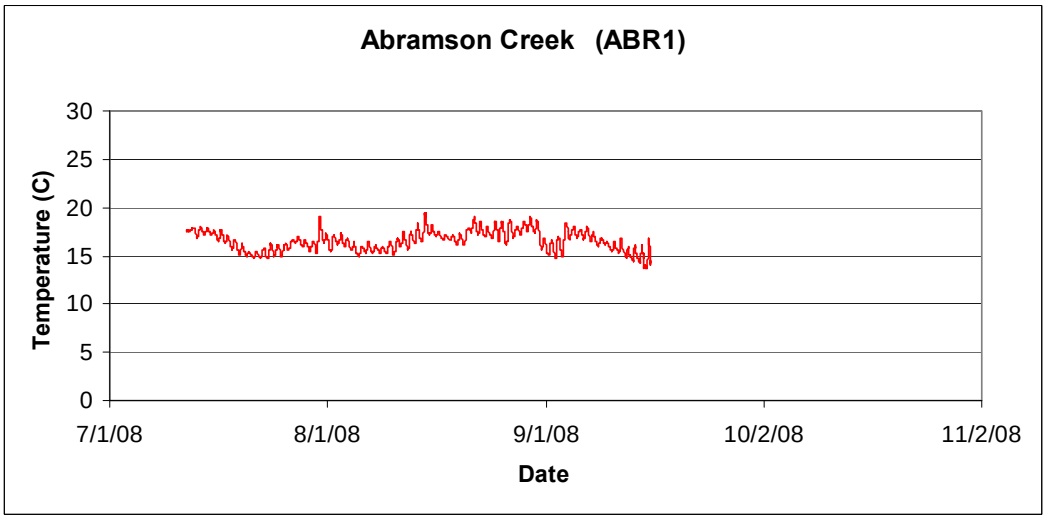
Appendix 1D. Statistically Significant Differences observed between Summer and Fall 2008 Instantaneous Data Sonde Measurement Results

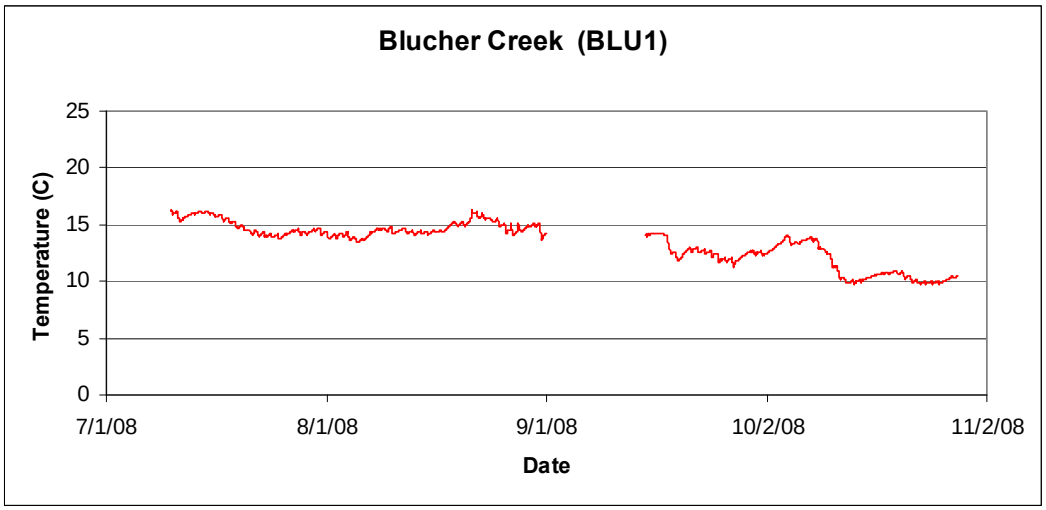
Site ID	Constituents with a Significant Seasonal Difference
BLU1	Temperature, DO
BRU1	Temperature, pH
GOS1	Temperature
HIN1	Temperature, DO
LJRT	Temperature
LOR1	Temperature, DO
LSEB	Temperature
LTH1	Temperature, pH
LTOD	Temperature
PIN1	Temperature
SRFU	Temperature
SRWR	Temperature
VIN1	Temperature
WIL1	Temperature, DO, pH
WIN1	Temperature, pH

Appendix 2A. Temperature Data-Logger Calibration Results.

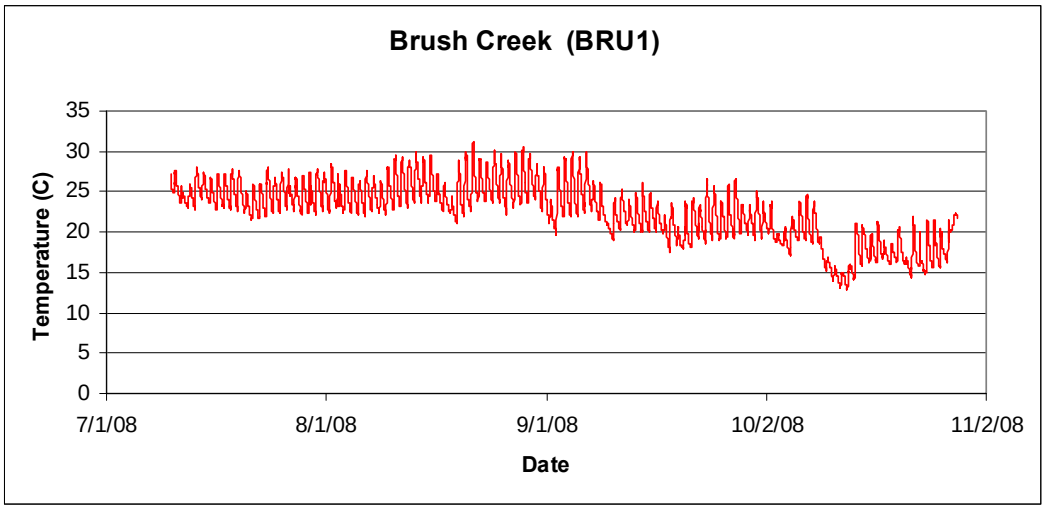
Site ID	Mean Difference between NIST Thermometer Reading and Data-Logger (°C)		
	Overall	Pre-Calibration	Post-Calibration
ABR1	-0.19	-0.39	0.11
BLU1	0.29	0.36	0.16
BRU1	0.22	0.33	0.05
COL1	0.50	0.64	0.29
COP1	-0.59	0.00	-1.48
HIN1	0.41	0.72	-0.06
LJRT	0.16	0.13	0.19
LOR1	0.24	0.25	0.11
LRR1	-0.38	-0.66	0.03
LTOD	0.23	0.30	0.14
MWC1	-0.46	-0.88	0.16
PIN1	-0.53	-1.02	0.19
SRHW	0.13	0.00	0.33
TUR1	0.42	0.67	0.03
VIN1	-0.28	-0.62	0.23
WAS1	0.54	0.81	0.14
WIL1	0.49	0.71	0.18
WIN1	-0.03	-0.13	0.11
Mean	**0.06**	**0.07**	**0.05**

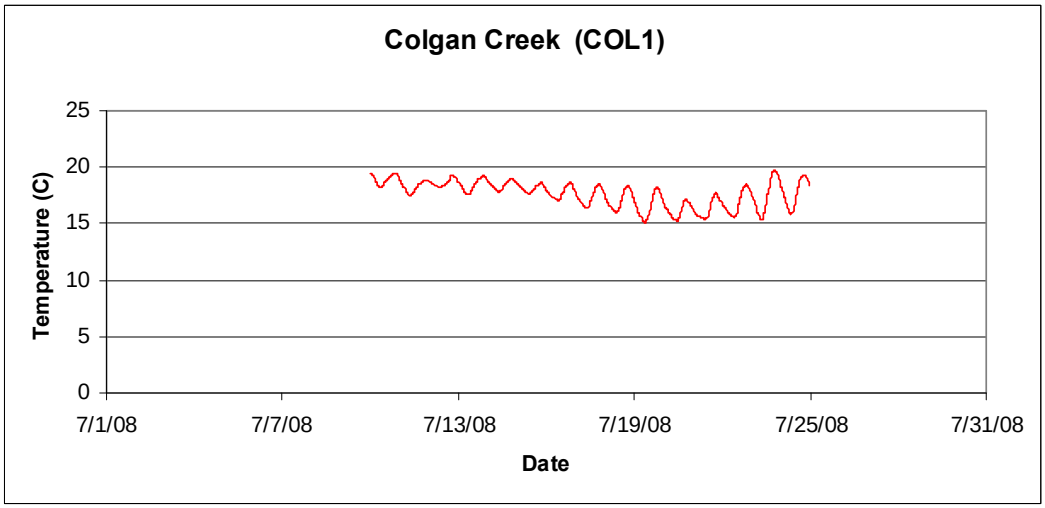
Appendix 2B. Continuous Water Temperature Measurement Results.



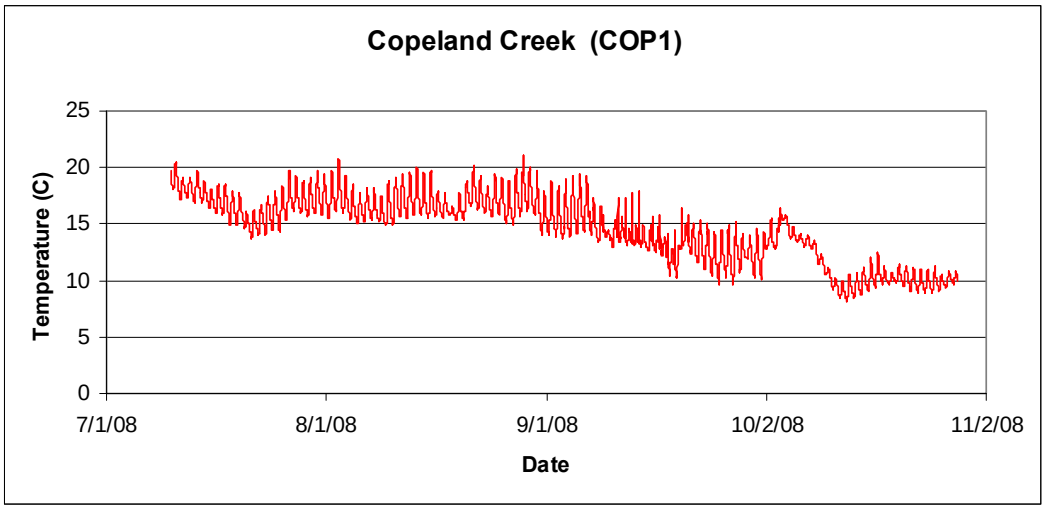


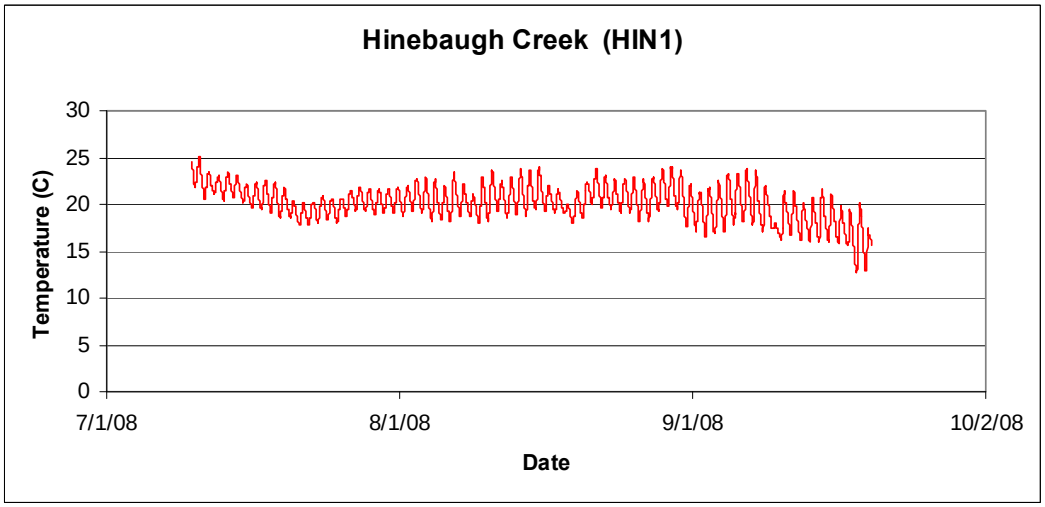
Appendix 2B. Continuous Water Temperature Measurement Results.



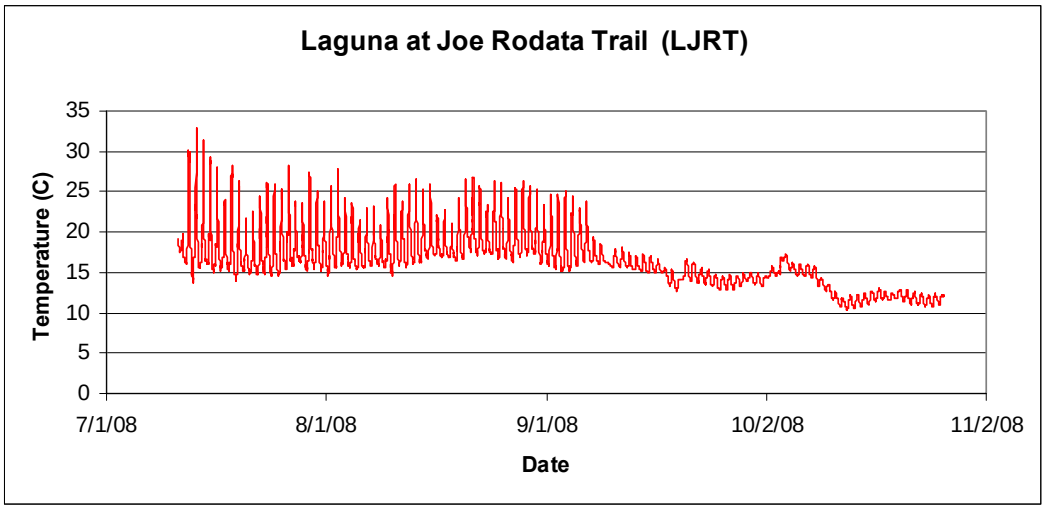


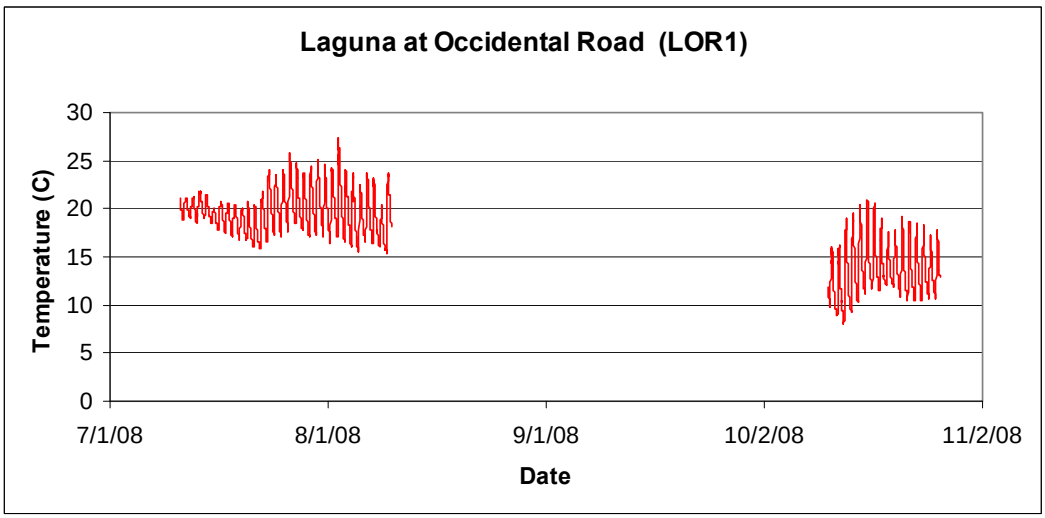
Appendix 2B. Continuous Water Temperature Measurement Results.



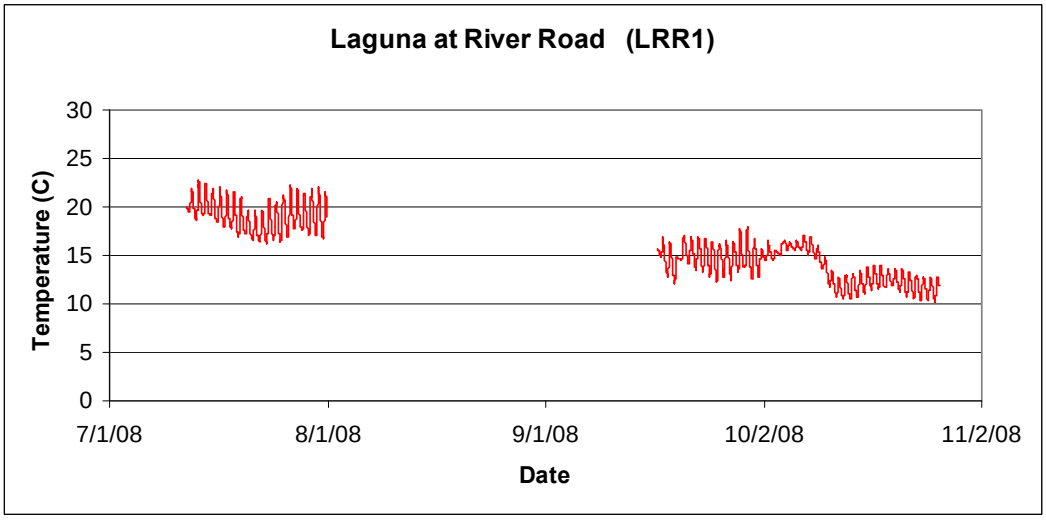


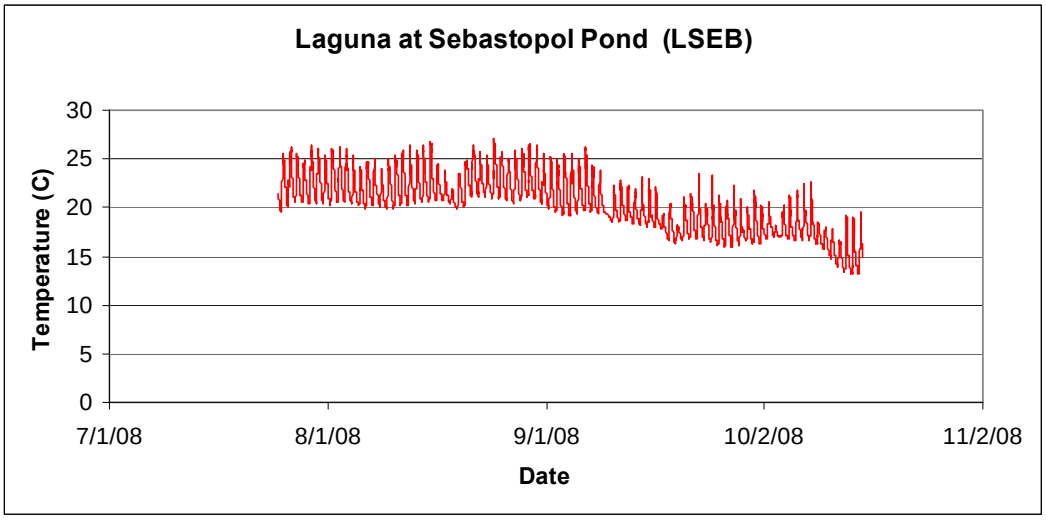
Appendix 2B. Continuous Water Temperature Measurement Results.

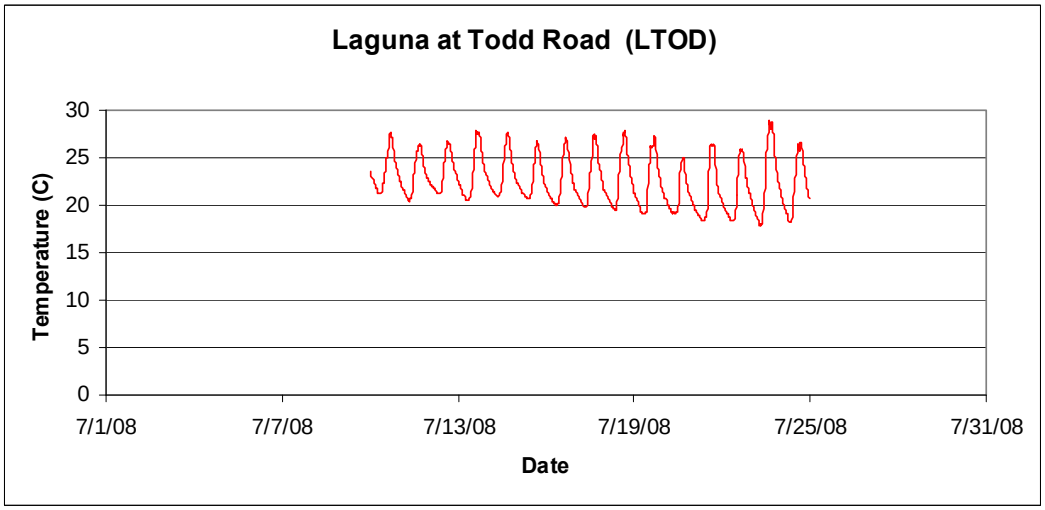




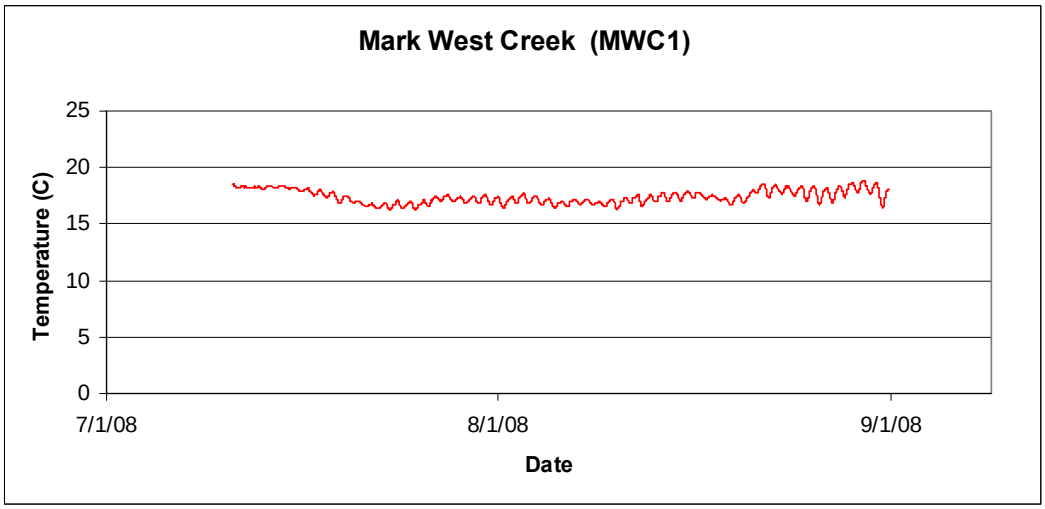
Appendix 2B. Continuous Water Temperature Measurement Results.

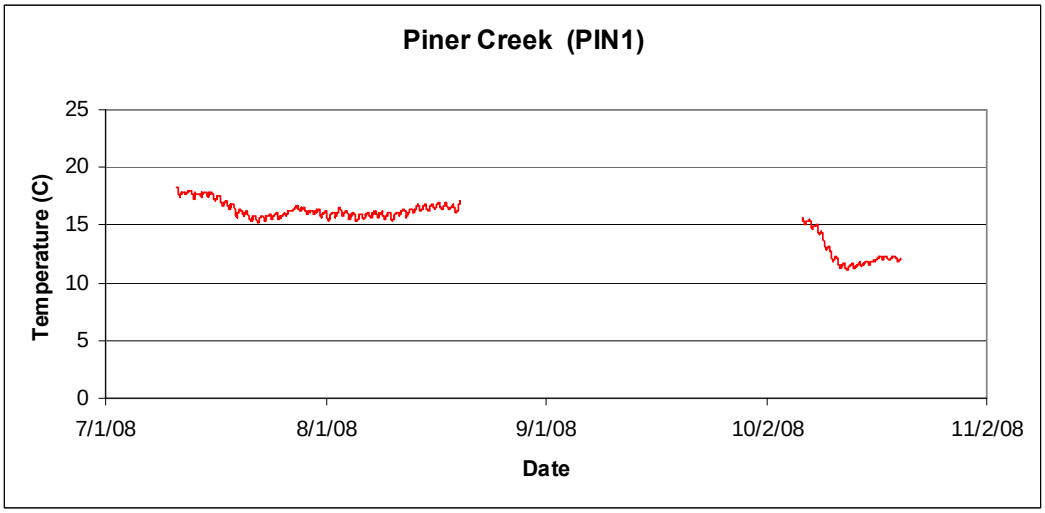




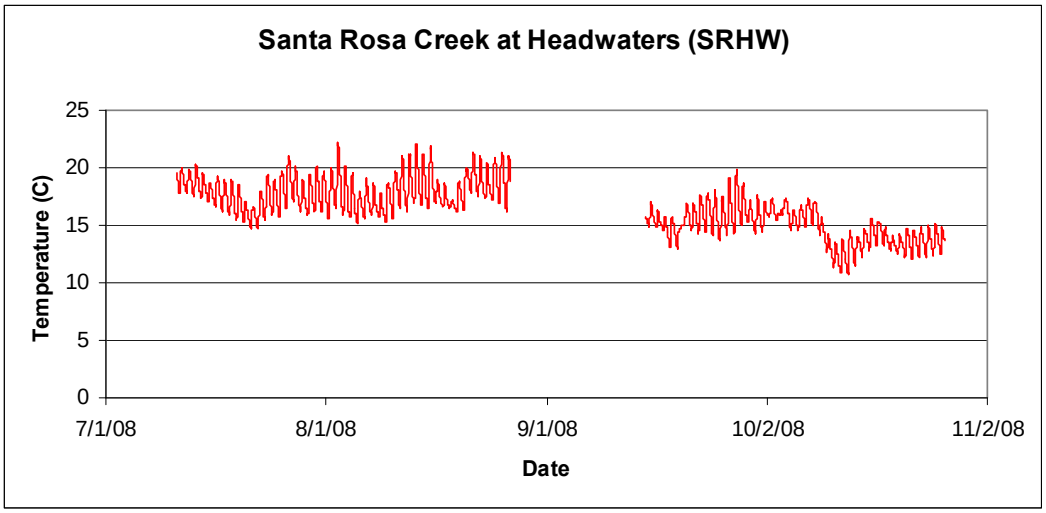


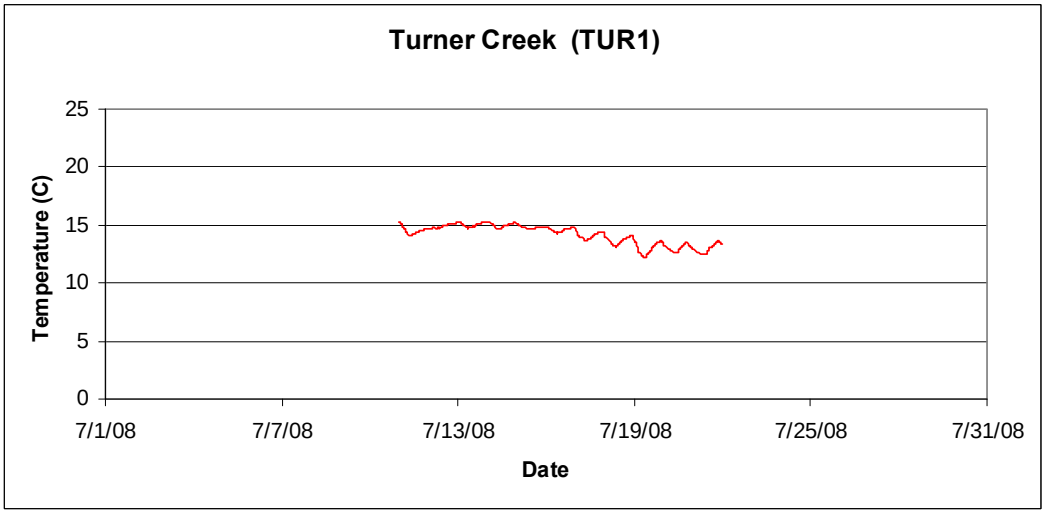
Appendix 2B. Continuous Water Temperature Measurement Results.



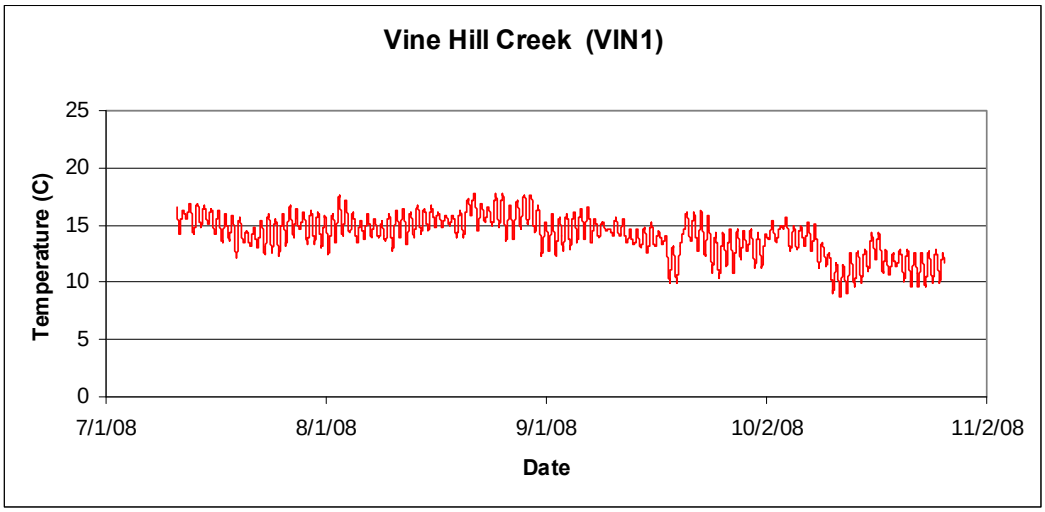


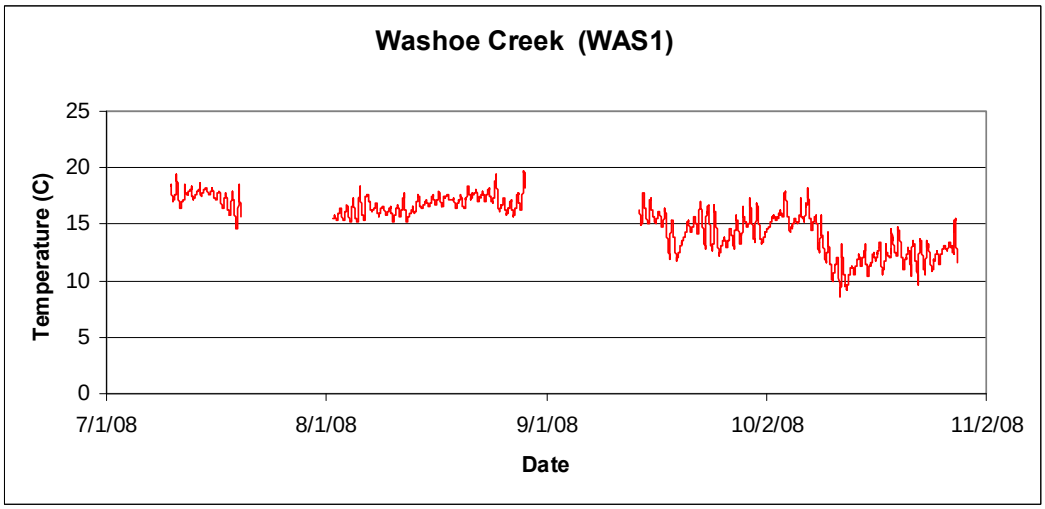
Appendix 2B. Continuous Water Temperature Measurement Results.



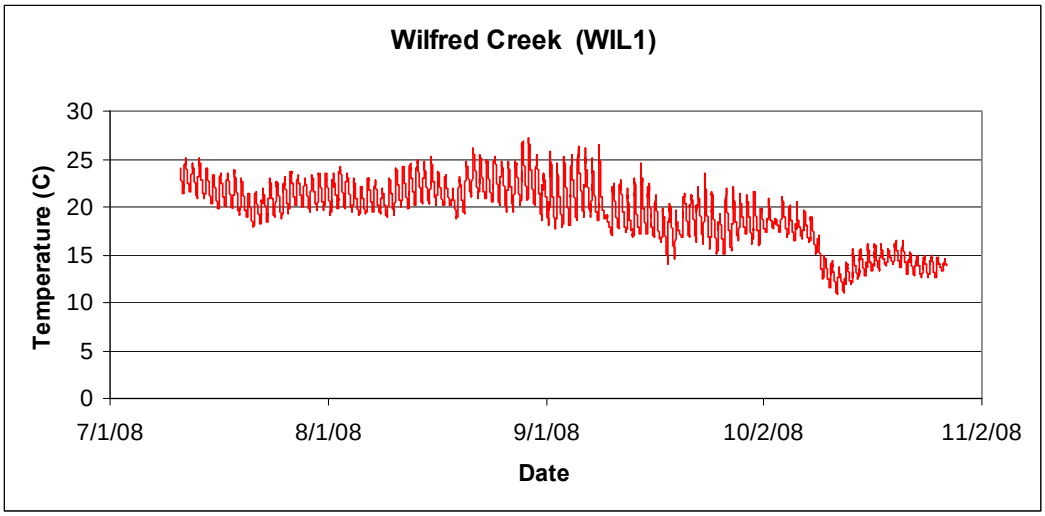


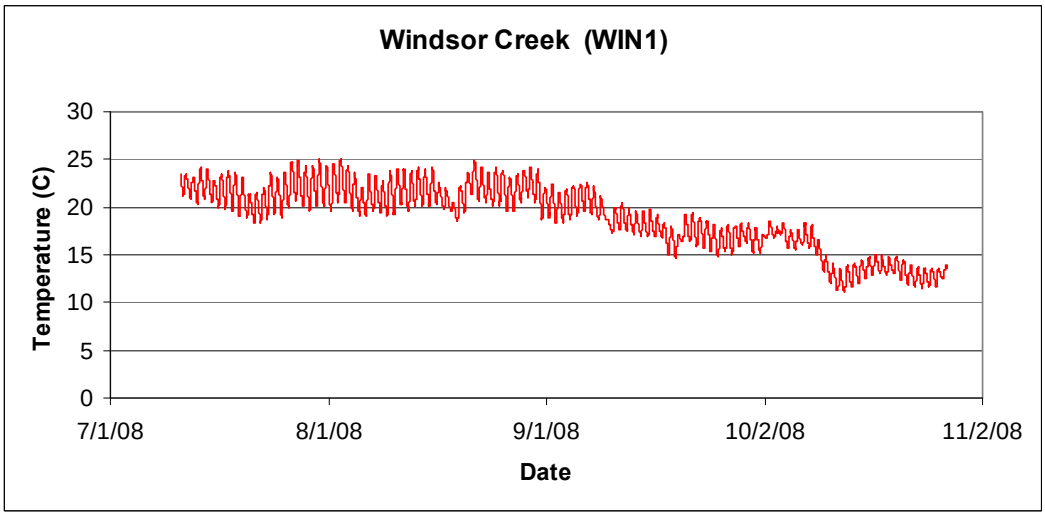
Appendix 2B. Continuous Water Temperature Measurement Results.





Appendix 2B. Continuous Water Temperature Measurement Results.

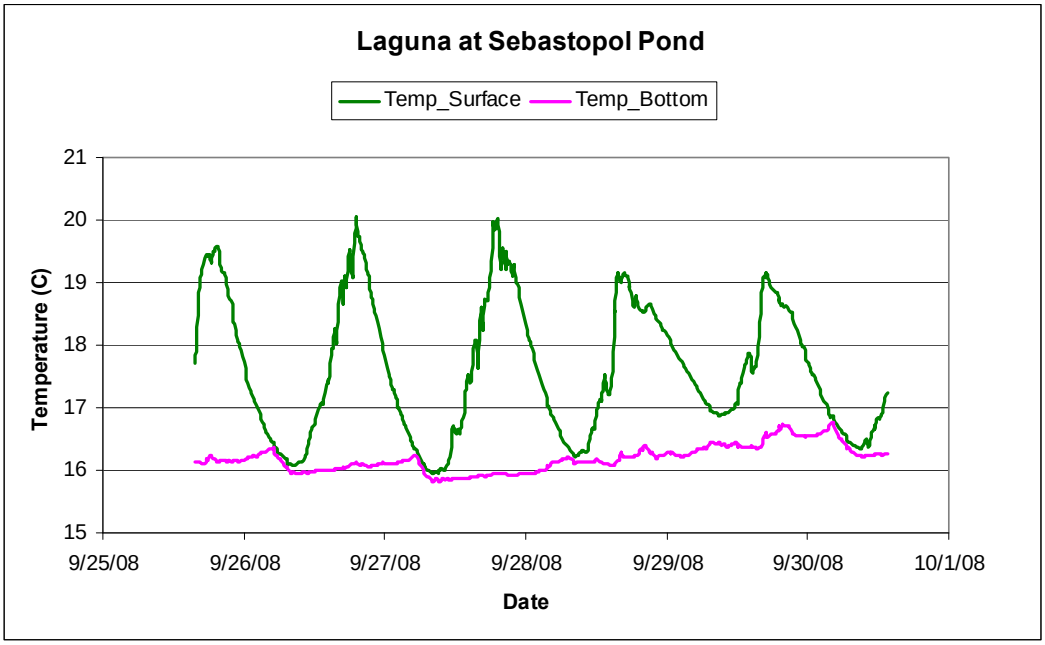


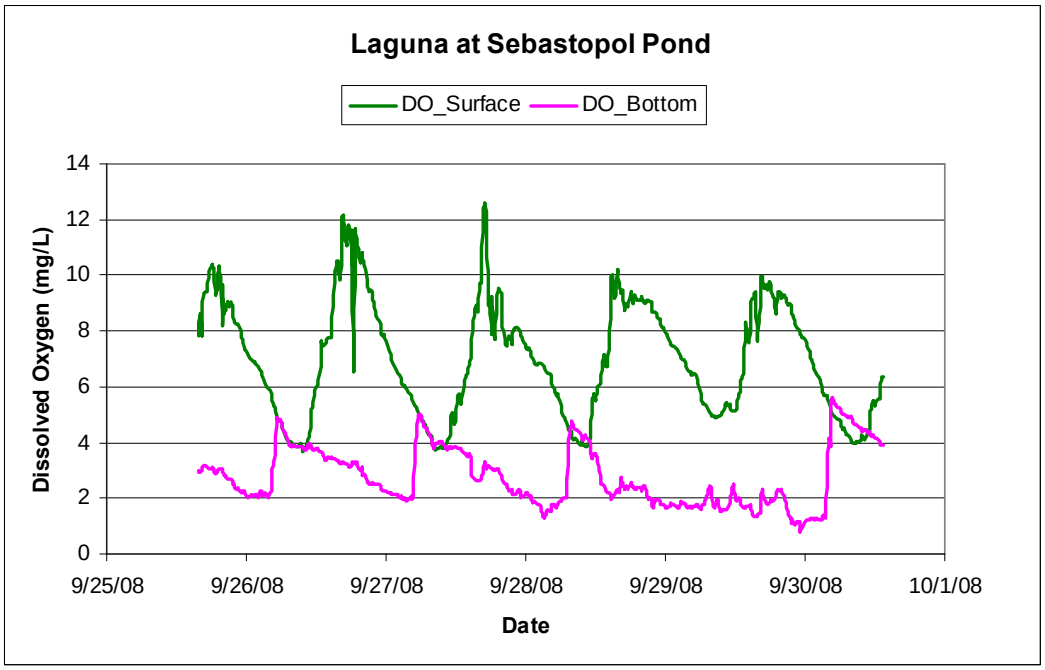


Appendix 2C. Continuous Water Temperature Measurement Summary.

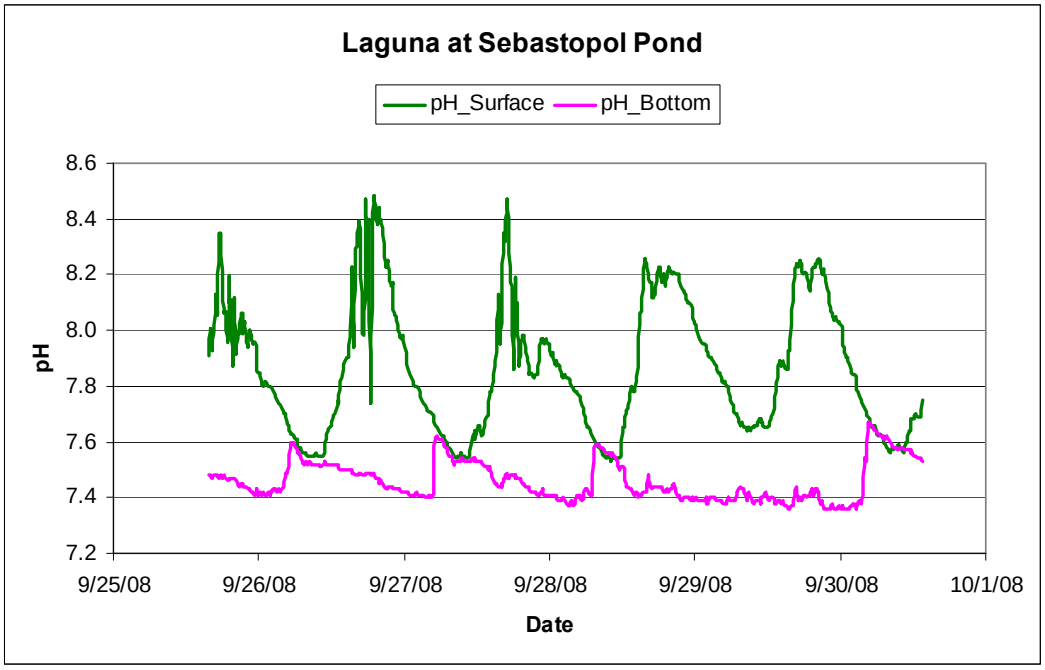
Site ID	MWMT (C)	Daily Max (C)
ABR1	18.69	19.51
BLU1	16.12	16.25
BRU1	29.67	24.73
COL1	19.02	19.67
COP1	19.72	21.1
HIN1	23.36	25.04
LJRT	29.11	32.95
LOR1	24.91	27.38
LRR1	22.02	22.73
LSEB	26.11	27.06
LTOD	27.42	28.84
MWC1	18.53	18.89
PIN1	17.9	18.32
SRHW	20.86	22.23
TUR1	15.09	15.29
VIN1	17.41	17.77
WAS1	18.51	19.46
WIL1	25.63	27.21
WIN1	24.64	25.02

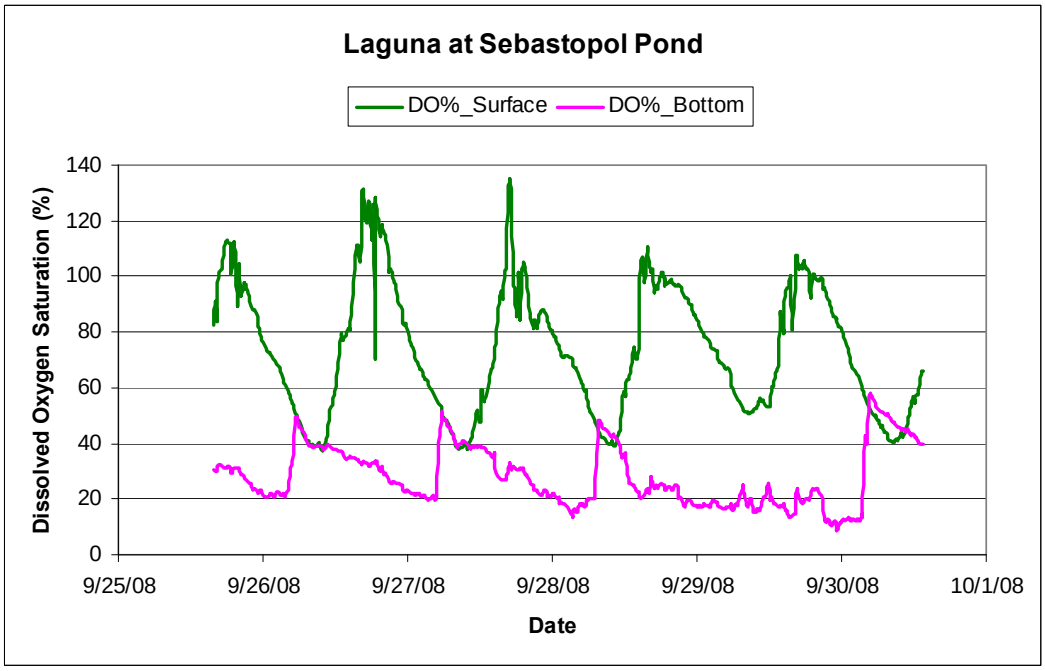
Appendix 3A. Lentic Diel Stratification Measurement Results.



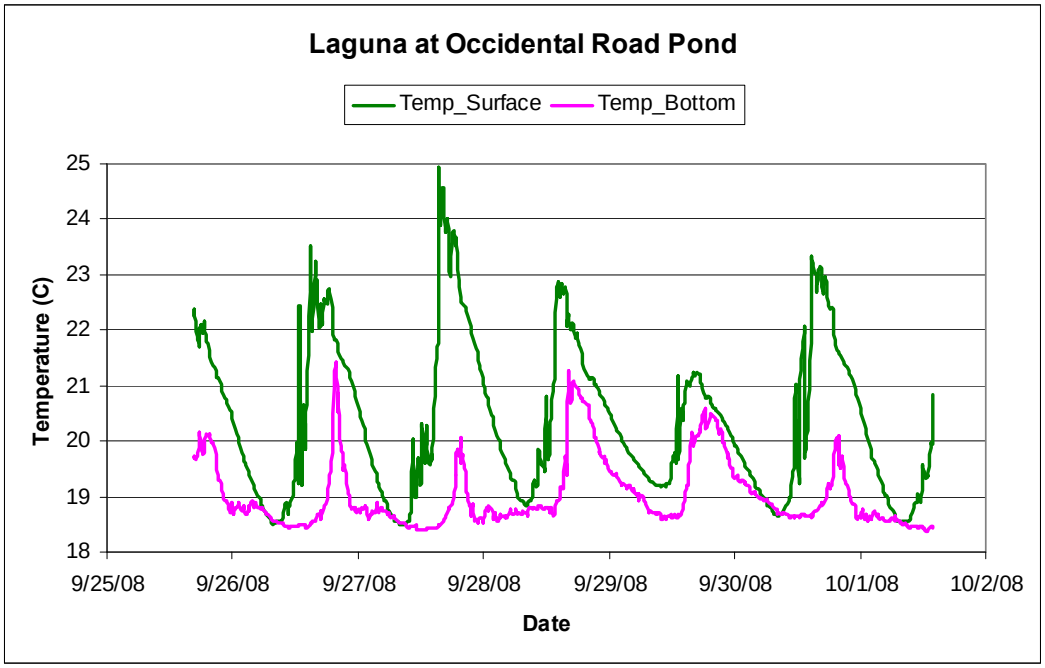


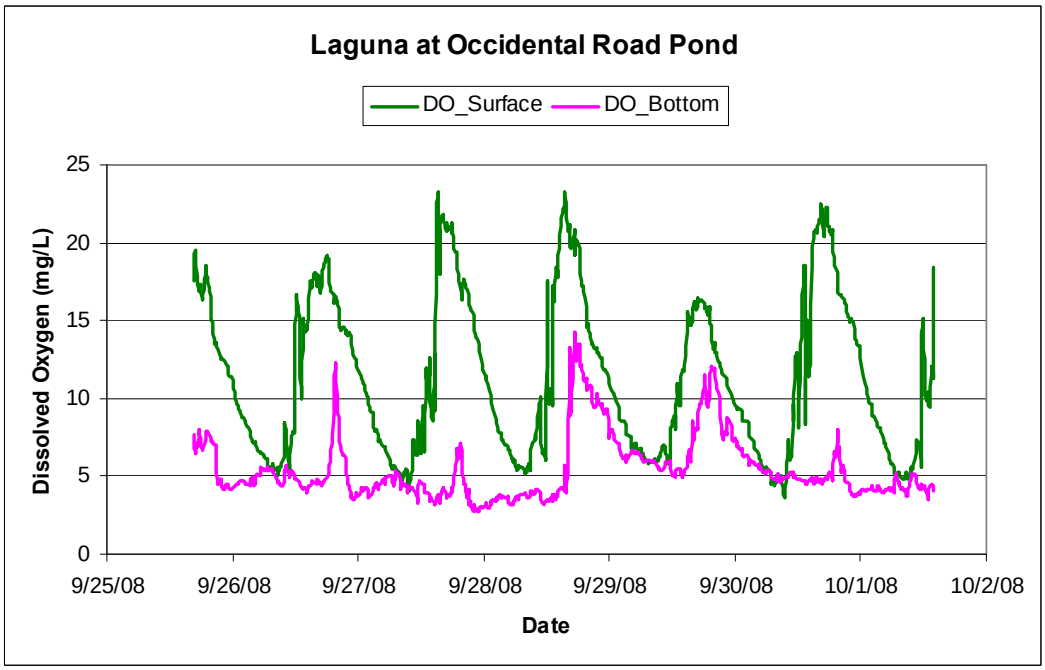
Appendix 3A. Lentic Diel Stratification Measurement Results.



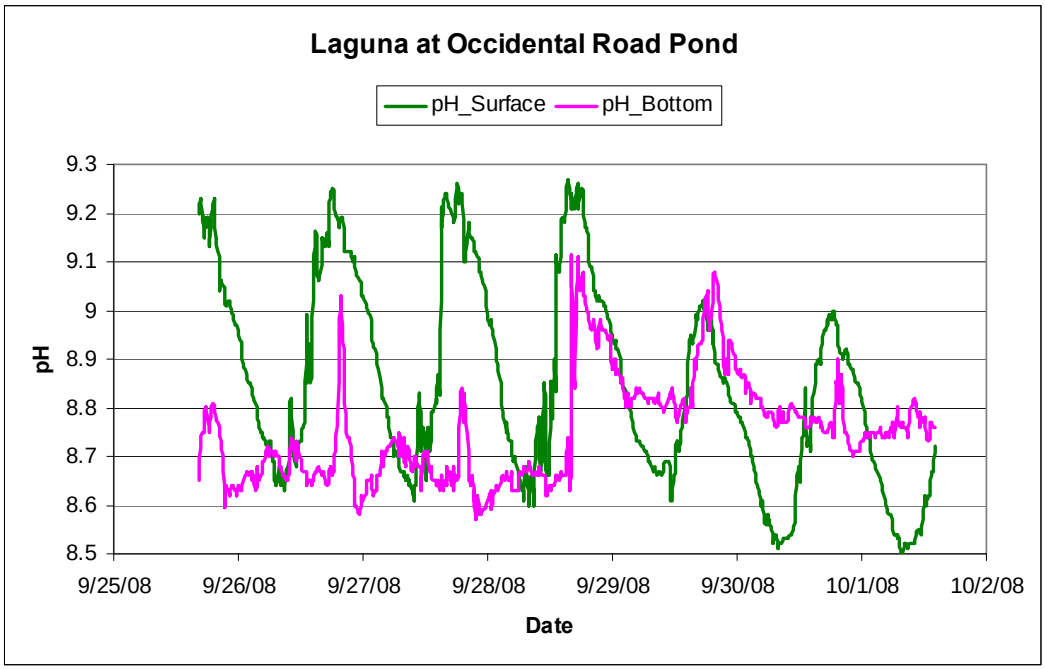


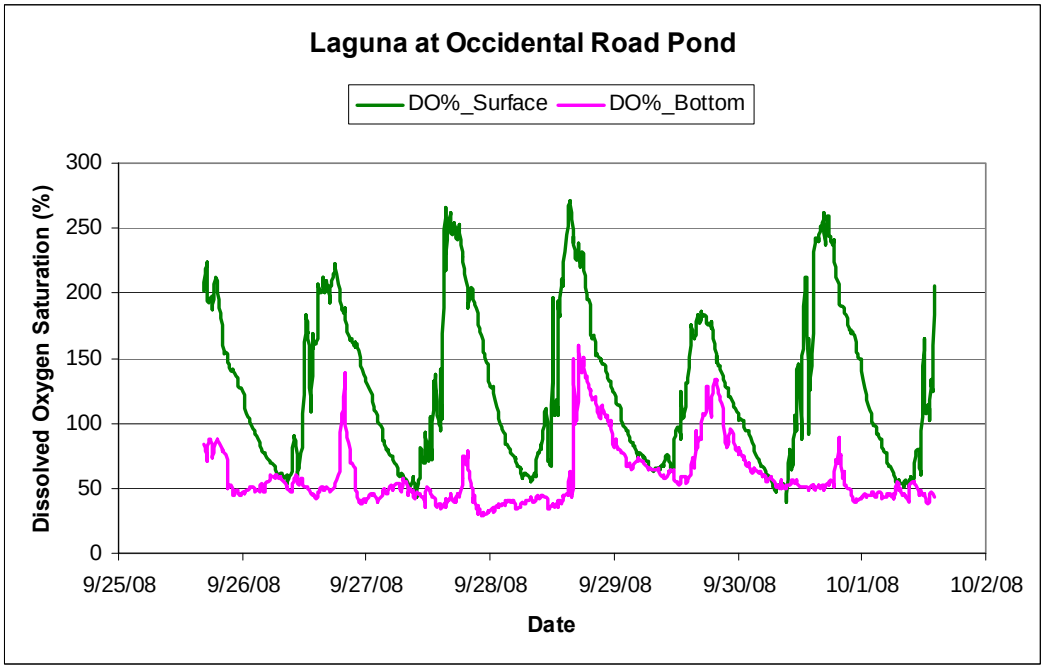
Appendix 3A. Lentic Diel Stratification Measurement Results.





Appendix 3A. Lentic Diel Stratification Measurement Results.
Note: Surface measurements were collected at 1 meter depth. Bottom measurements were collected at 1 meter from bottom.





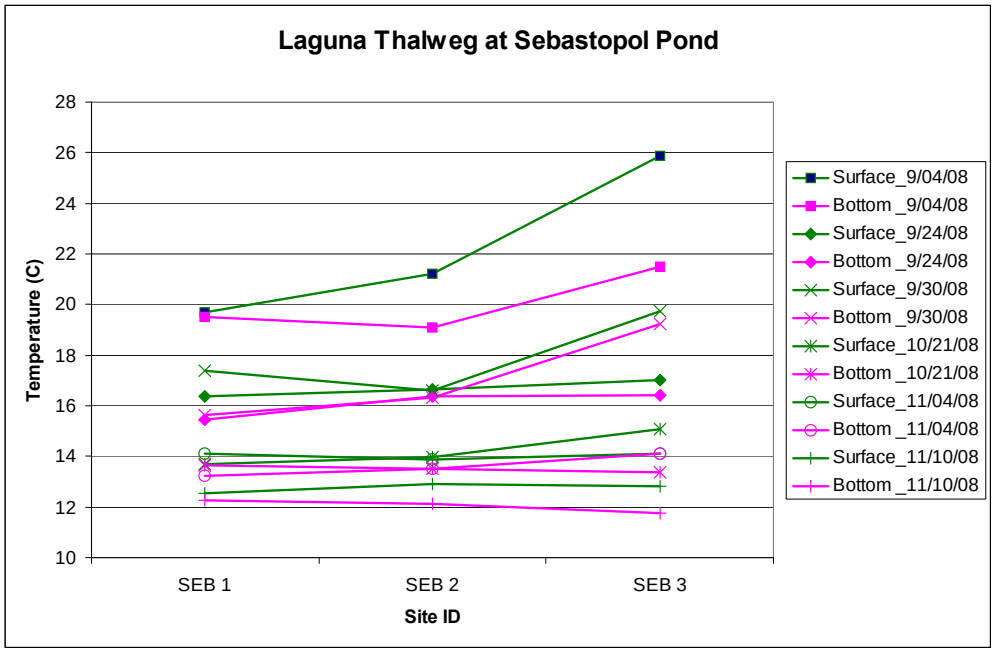
Appendix 3B. Lentic Instantaneous Stratification Measurement Results

Date	Site ID	Time	Depth (ft)	Temperature (ºC)	DO (mg/L)	DO Saturation (%)	pH
8/27/2008	LOR 1	1050	1.50	24.58	21.29	257	9.11
8/27/2008	LOR 1	1050	3.62	21.82	7.24	82	8.65
8/27/2008	LOR 2	1120	2.16	28.27	28.92	368	9.14
8/27/2008	LOR 2	1120	5.31	21.58	3.88	44	8.39
8/27/2008	LOR 3	1150	2.40	23.45	11.3	134	8.68
8/27/2008	LOR 3	1150	4.87	22.41	7.23	83	8.51
8/27/2008	LOR 4	1220	2.23	27.18	24.96	316	9.01
8/27/2008	LOR 4	1220	4.57	22.9	6.23	74	8.21
8/27/2008	LOR 5	1305	1.59	27.83	21.6	274	8.87
8/27/2008	LOR 5	1305	--	--	--	--	--
9/2/2008	LOR 1	1210	2.20	23.2	11.82	138	8.81
9/2/2008	LOR 1	1210	6.05	21.73	5.57	64	8.36
9/2/2008	LOR 2	1235	2.53	22.5	9.65	113	8.71
9/2/2008	LOR 2	1235	7.39	21.77	4.35	50	8.25
9/2/2008	LOR 3	1249	2.62	22.18	10.43	122	8.87
9/2/2008	LOR 3	1249	7.33	20.85	3.25	36	8.38
9/2/2008	LOR 4	1310	2.54	25.35	22.1	265	9.21
9/2/2008	LOR 4	1310	5.37	19.73	3.19	36	8.22
9/2/2008	LOR 5	1323	2.49	24.99	14.48	176	8.85
9/2/2008	LOR 5	1323	3.11	21.62	4.81	56	7.9
9/4/2008	SEB 1	1355	1.93	19.71	8.95	98	--
9/4/2008	SEB 1	1355	3.09	19.52	8.5	92	--
9/4/2008	SEB 2	1425	1.77	21.23	8.71	98	--
9/4/2008	SEB 2	1425	4.37	19.1	3.08	33	--
9/4/2008	SEB 3	1440	1.34	25.89	7.3	89	--
9/4/2008	SEB 3	1440	2.61	21.51	4.08	45	--
9/23/2008	LOR 1	1140	2.37	19.96	14.21	155	9.02
9/23/2008	LOR 1	1140	5.22	18.46	8.66	93	8.73
9/23/2008	LOR 2	1205	2.48	20.7	19.39	215	9.29
9/23/2008	LOR 2	1205	7.12	18.28	6.47	69	8.67
9/23/2008	LOR 3	1230	2.25	19.62	12.09	134	8.9
9/23/2008	LOR 3	1230	8.02	18.88	1.31	15	8.57
9/23/2008	LOR 4	1250	2.27	20.1	10.87	123	8.84
9/23/2008	LOR 4	1250	4.74	18.67	6	64	8.63
9/23/2008	LOR 5	1315	2.20	22.1	9.07	104	8.52
9/23/2008	LOR 5	1315	2.95	18.3	6.08	65	7.52
9/24/2008	SEB 1	1045	2.28	16.36	6.94	71	7.75
9/24/2008	SEB 1	1045	4.02	15.44	6.79	68	7.62
9/24/2008	SEB 2	1115	1.97	16.64	4.72	49	7.52
9/24/2008	SEB 2	1115	5.28	16.36	4.54	46	7.47
9/24/2008	SEB 3	1136	1.61	17.03	4.16	44	7.51
9/24/2008	SEB 3	1136	3.08	16.43	3.45	35	7.45

Date	Site ID	Time	Depth (ft)	Temperature (ºC)	DO (mg/L)	DO Saturation (%)	pH
9/30/2008	SEB 1	1320	1.97	17.38	10.23	107	8.3
9/30/2008	SEB 1	1320	4.20	15.62	7.78	79	7.79
9/30/2008	SEB 2	1350	2.19	16.6	5.38	55	7.54
9/30/2008	SEB 2	1350	5.47	16.31	4.52	46	7.46
9/30/2008	SEB 3	1410	1.72	19.75	8.75	97	8
9/30/2008	SEB 3	1410	2.96	19.23	8.33	90	7.9
10/1/2008	LOR 1	1351	2.05	20.88	16.23	183	9.34
10/1/2008	LOR 1	1351	4.21	18.35	10.45	109	8.83
10/1/2008	LOR 2	1401	2.01	20.25	14.39	165	9.24
10/1/2008	LOR 2	1401	4.25	17.84	7.68	81	8.88
10/1/2008	LOR 3	1414	2.05	20.82	15.23	171	9.24
10/1/2008	LOR 3	1414	8.92	18.16	4.04	43	8.67
10/1/2008	LOR 4	1430	2.05	21.3	13.8	156	9.2
10/1/2008	LOR 4	1430	4.33	18.51	5.52	59	8.77
10/1/2008	LOR 5	1438	1.77	23.32	17.45	205	9.35
10/1/2008	LOR 5	1438	--	--	--	--	--
10/21/2008	SEB 1	1220	2.40	13.71	4.4	42	7.38
10/21/2008	SEB 1	1220	3.10	13.65	4.36	43	7.37
10/21/2008	SEB 2	1240	2.03	13.98	6.53	63	7.55
10/21/2008	SEB 2	1240	4.84	13.52	6.56	64	7.59
10/21/2008	SEB 3	1255	2.32	15.1	10.93	108	8.16
10/21/2008	SEB 3	1255	4.36	13.37	9	86	7.63
10/22/2008	LOR 1	1140	2.07	15.89	11.98	119	9.01
10/22/2008	LOR 1	1140	6.80	14.9	5.75	57	8.55
10/22/2008	LOR 2	1155	2.04	15.74	13.22	135	9.07
10/22/2008	LOR 2	1155	6.72	15.24	8.91	89	8.84
10/22/2008	LOR 3	1215	2.06	16.2	14.41	148	9.1
10/22/2008	LOR 3	1215	9.79	15.43	1.77	18	8.57
10/22/2008	LOR 4	1235	1.98	16.96	16.1	165	9.1
10/22/2008	LOR 4	1235	5.78	14.39	4.48	44	8.49
10/22/2008	LOR 5	1250	2.05	17.88	21.37	226	9.22
10/22/2008	LOR 5	1250	3.21	13.75	6.28	61	7.84
11/4/2008	SEB 1	1428	2.00	14.12	2.48	25	6.98
11/4/2008	SEB 1	1428	7.39	13.22	1.91	18	6.97
11/4/2008	SEB 3	1459	2.00	14.1	2.39	23	6.93
11/4/2008	SEB 3	1459	4.81	14.09	2.38	23	6.93
11/4/2008	SEB 4	1456	2.03	14.11	2.43	24	6.93
11/4/2008	SEB 4	1456	6.27	14.11	2.42	24	6.93
11/4/2008	SEB 5	1501	2.03	14.12	2.44	24	6.92
11/4/2008	SEB 5	1501	4.50	14.13	2.43	24	6.93
11/4/2008	SEB2	1438	2.00	13.87	2.43	24	6.95
11/4/2008	SEB2	1438	7.78	13.51	2.47	24	6.99
11/5/2008	LOR 1	1310	1.99	13.87	2.63	26	6.97
11/5/2008	LOR 1	1310	8.45	12.66	2.41	23	6.94
11/5/2008	LOR 2	1321	2.03	14.83	2.15	21	6.99

Date	Site ID	Time	Depth (ft)	Temperature (ºC)	DO (mg/L)	DO Saturation (%)	pH
11/5/2008	LOR 2	1321	10.06	12.48	2.55	24	6.9
11/5/2008	LOR 3	1340	2.05	14.73	1.86	18	6.99
11/5/2008	LOR 3	1340	11.86	13.24	1.71	16	7.01
11/5/2008	LOR 4	1359	2.07	15.2	1.76	18	7.03
11/5/2008	LOR 4	1359	7.43	13.48	1.25	12	6.96
11/5/2008	LOR 5	1412	2.07	14.5	1.49	15	6.99
11/5/2008	LOR 5	1412	4.92	13.5	1.08	10	6.94
11/10/2008	LOR 1	1437	1.97	14.46	2.96	29	7.08
11/10/2008	LOR 1	1437	8.41	12.49	1.77	17	7.02
11/10/2008	LOR 2	1448	1.96	15.23	3.69	37	7.1
11/10/2008	LOR 2	1448	8.89	12.12	2.01	19	6.96
11/10/2008	LOR 3	1512	1.98	15.71	3.08	31	7.12
11/10/2008	LOR 3	1512	10.46	12.61	1.01	10	6.98
11/10/2008	LOR 4	1527	1.97	16.04	2.87	29	7.11
11/10/2008	LOR 4	1527	6.68	12.51	0.87	8	6.98
11/10/2008	LOR 5	1539	2.01	16.6	2.96	30	7.1
11/10/2008	LOR 5	1539	4.55	12.75	0.84	8	6.99
11/10/2008	SEB 1	1220	2.03	12.54	3.11	29	7.02
11/10/2008	SEB 1	1220	3.71	12.25	2.7	25	7.01
11/10/2008	SEB 2	1227	2.01	12.93	3.25	31	7.02
11/10/2008	SEB 2	1227	6.74	12.12	3.28	31	7.02
11/10/2008	SEB 3	1230	2.09	12.8	3.82	36	7.03
11/10/2008	SEB 3	1230	5.09	11.74	3.83	35	7.03

Appendix 3C. Lentic Instantaneous Stratification Measurement Result Plots



Appendix 4A. Diel Range of Instantaneous DO Measurements.
Note: AM is 00:00 to 12:00 hours. PM is 12:01 to 23:59 hours

SITE ID	Median AM DO (mg/L)	Median PM DO (mg/L)	Range between Median DO values (mg/L)	Range of all DO values (mg/L)
ABR1	5.4	4.4	1.0	1.0
BLU1	4.6	4.3	0.3	4.3
BRU1	6.7	6.2	0.5	10.5
COL1	6.8	--	--	0.0
COP1	3.1	3.0	0.1	2.3
DSEB	8.5	7.5	1.1	1.9
GOS1	2.3	5.1	2.9	3.6
HIN1	7.0	10.1	3.1	9.0
LHW1	--	5.6	5.6	8.3
LJRT	7.6	8.0	0.4	6.8
LOR1	4.8	10.4	5.5	12.9
LRR1	3.9	2.2	1.8	3.9
LSEB	1.0	7.6	6.6	10.4
LSPR	4.0	--	--	0.0
LTH1	5.4	6.4	1.0	2.8
LTOD	6.0	9.8	3.8	5.4
MAT1	8.9	5.6	3.3	6.2
MWC1	8.6	--	8.6	3.9
PET1	6.6	--	6.6	0.0
PIN1	6.3	7.5	1.2	6.1
SRFU	9.5	12.9	3.4	5.6
SRHW	9.1	8.4	0.7	6.2
SRWR	8.3	7.8	0.5	5.5
VIN1	10.2	9.6	0.6	1.1
WAS1	6.1	1.3	4.7	9.9
WIL1	4.1	8.1	4.0	15.1
WIN1	5.6	3.0	2.6	5.8

Appendix 4B. Diel Range of Temperature Measurements.

SITE ID	Instantaneous Median AM Temperature (ºC)	Instantaneous Median PM Temperature (ºC)	Instantaneous Median Temperature Range (ºC)	Continuous Median Diel Temperature Range (ºC)
ABR1	11.6	15.7	4.0	1.3
BLU1	10.3	14.2	3.9	0.4
BRU1	15.1	18.4	3.3	4.9
COL1	11.2	--	--	1.9
COP1	13.7	16.4	2.7	2.9
DSEB	13.0	14.6	1.6	--
GOS1	12.6	14.5	1.9	--
HIN1	12.3	20.0	7.8	3.6
LHW1	16.3	14.8	1.5	--
LJRT	11.6	15.9	4.3	5.6
LOR1	14.8	21.4	6.7	6.4
LRR1	13.1	17.4	4.3	2.8
LSEB	20.5	18.9	1.6	4.9
LSPR	13.0	--	--	--
LTH1	17.2	15.2	2.0	--
LTOD	13.0	18.3	5.3	7.3
MAT1	15.1	15.3	0.2	--
MWC1	12.3	17.2	4.9	0.8
PET1	8.9	25.6	16.7	--
PIN1	12.7	16.3	3.6	0.6
SRFU	13.2	13.1	0.1	--
SRHW	12.8	15.6	2.8	3.4
SRWR	11.9	16.8	4.8	--
VIN1	11.7	14.3	2.5	2.7
WAS1	12.7	14.6	1.9	1.2
WIL1	18.5	18.3	0.3	4.0
WIN1	14.1	14.1	0.0	2.9

Appendix 4C. Diel Range of Instantaneous pH Measurements

SITE ID	Median AM pH	Median PM pH	Range between Median pH values	Range of all pH values
ABR1	7.0	7.9	0.9	0.9
BLU1	7.5	7.1	0.5	0.7
BRU1	7.5	7.7	0.1	0.9
COL1	7.3	--	--	0.0
COP1	7.6	7.7	0.1	0.4
DSEB	7.5	7.4	0.1	0.4
GOS1	7.9	7.6	0.3	1.1
HIN1	7.7	8.0	0.3	0.8
LHW1	7.8	7.1	0.7	0.8
LJRT	7.3	7.5	0.2	0.6
LOR1	7.9	8.7	0.8	2.0
LRR1	7.3	7.4	0.1	0.4
LSEB	7.6	7.6	0.0	1.1
LSPR	7.2	--	--	0.0
LTH1	7.8	7.6	0.1	0.8
LTOD	7.5	8.6	1.1	1.7
MAT1	7.8	7.6	0.2	0.4
MWC1	7.5	7.4	0.1	0.4
PET1	7.4	8.3	0.9	0.9
PIN1	7.4	7.7	0.2	0.5
SRFU	7.8	8.1	0.3	0.5
SRHW	7.8	7.7	0.1	0.4
SRWR	7.6	7.8	0.2	0.4
VIN1	7.6	7.8	0.1	0.3
WAS1	7.3	7.3	0.0	1.1
WIL1	7.7	8.2	0.5	1.6
WIN1	7.5	7.3	0.2	0.4

Appendix 4D. Median Daily Range of Continuous Lentic Sonde Measurements collected 25-30 September 2008.

Constituent	LOR1		LSEB	
	Surface	Bottom	Surface	Bottom
DO (mg/L)	16.2	5.7	5.7	3.0
Temperature (ºC)	4.3	1.9	2.6	0.4
pH	0.6	0.3	0.7	0.2

Appendix 5A. Instantaneous Stream Flow Measurement Results

Site ID	Date	Flow (cfs)
BLU1	24-Jul-08	0.08
BLU1	29-Jul-08	0.24
BLU1	2-Oct-08	0.06
BLU1	23-Oct-08	0.16
BLU1	25-Nov-08	0.64
BRU1	6-Oct-08	0.09
GOS1	24-Jul-08	0.91
GOS1	28-Jul-08	0.48
GOS1	25-Sep-08	0.02
LHW1	24-Jul-08	0.02
LRR1	16-Jul-08	1.09
LRR1	16-Jul-08	1.75
LRR1	5-Aug-08	0.20
LTH1	5-Aug-08	1.02
LTH1	9-Oct-08	4.18
MAT1	28-Jul-08	0.17
MAT1	6-Oct-08	0.21
PIN1	28-Jul-08	2.76
SRFU	28-Jul-08	0.71
SRFU	26-Nov-08	1.92
SRHW	28-Jul-08	0.45
SRHW	25-Sep-08	0.08
SRHW	6-Oct-08	0.55
SRHW	16-Oct-08	0.10
SRHW	26-Nov-08	2.05
VIN1	25-Jul-08	0.44
VIN1	5-Aug-08	0.33
VIN1	29-Sep-08	0.50
WAS1	23-Oct-08	0.49
WIL1	24-Jul-08	0.09
WIN1	25-Jul-08	0.08
WIN1	9-Oct-08	0.36

Appendix 6A. Conventional Constituent Sample Results.
Below minimum detection limit (MDL) results are shown as < MDL value.

Site ID	Date Sampled	BOD_5 (mg/L)	TSS (mg/L)	$NO_{3+}NO_2$ (mg/L)	TKN (mg/L)	NH_3 (mg/L)	TP (mg/L)	OP (mg/L)
ABR1	11-Jun-08	< 3	10	0.29	0.5	0.16	0.30	0.30
ABR1	18-Jun-08	10	19	0.26	1.6	0.35	0.41	0.25
ABR1	24-Jun-08	6	13	0.17	0.7	0.11	0.40	0.32
BLU1	11-Jun-08	< 3	7	0.18	0.5	0.14	0.42	0.38
BLU1	18-Jun-08	5	6	0.13	0.6	0.12	0.51	0.47
BLU1	24-Jun-08	3	3	0.07	0.6	0.13	0.63	0.61
BRU1	11-Jun-08	< 3	3	0.02	0.4	0.07	0.06	0.03
BRU1	18-Jun-08	5	21	0.02	0.3	0.09	0.05	0.02
BRU1	24-Jun-08	5	7	0.02	0.5	0.10	0.06	0.01
COL1	11-Jun-08	3	14	11.30	1.4	0.13	0.82	0.78
COL1	18-Jun-08	4	24	9.05	1.7	0.11	0.27	0.10
COL1	24-Jun-08	10	71	9.93	1.9	0.13	0.24	0.07
COP1	11-Jun-08	< 3	7	0.10	0.2	0.13	0.14	0.11
COP1	18-Jun-08	6	7	0.10	0.4	0.10	0.14	0.11
COP1	24-Jun-08	3	3	0.06	0.4	0.11	0.18	0.15
COT1	11-Jun-08	< 3	13	0.07	0.8	0.36	0.32	0.23
COT1	18-Jun-08	4	17	0.08	2.1	1.10	0.52	0.41
COT1	24-Jun-08	5	92	0.06	2.8	1.40	0.84	0.46
DSEB	11-Sep-08	< 3	6	1.70	0.6	0.18	0.18	0.16
DSEB	17-Sep-08	< 3	6	1.90	0.4	0.24	0.44	0.46
DSEB	29-Sep-08	< 3	< 2	1.73	0.3	0.12	0.15	0.11
GOS1	11-Jun-08	< 3	6	0.28	0.7	0.17	0.82	0.78
GOS1	18-Jun-08	4	9	0.23	0.1	0.13	0.99	0.92
GOS1	24-Jun-08	6	36	0.20	1.3	0.18	3.04	1.00
GOS1	11-Sep-08	< 3	6	0.06	1.3	0.15	1.31	1.01
GOS1	17-Sep-08	< 3	8	0.06	0.5	0.15	0.77	0.80
GOS1	29-Sep-08	5	12	0.08	0.6	0.07	0.73	0.59
HIN1	11-Jun-08	< 3	29	0.05	0.5	0.10		0.15
HIN1	18-Jun-08	< 3	33	0.05	0.5	0.09	0.23	0.18
HIN1	24-Jun-08	3	27	0.08	0.4	0.14	0.25	0.16
HIN1	11-Sep-08	< 3	18	0.05	0.5	0.09	0.23	0.21
HIN1	17-Sep-08	4	37	0.03	0.5	0.13	0.22	0.13
HIN1	29-Sep-08	< 3	9	0.03	0.2	0.13	0.20	0.16
LHW1	11-Jun-08	< 3	2	0.11	0.4	0.17	0.26	0.22
LHW1	18-Jun-08	< 3	3	0.07	0.5	0.14	0.27	0.22
LHW1	24-Jun-08	3	3	0.06	0.6	0.14	0.26	0.22
LJRT	11-Jun-08	< 3	15	< 0.01	0.5	0.11	0.30	0.52
LJRT	18-Jun-08	4	44	1.76	0.3	0.07	0.22	0.22
LJRT	24-Jun-08	3	5	1.51	1.1	0.10	0.41	0.29
LJRT	11-Sep-08	< 3	31	0.99	0.6	0.16	0.10	0.21
LJRT	17-Sep-08	< 3	74	1.18	0.6	0.25	0.21	0.13
LJRT	29-Sep-08	< 3	20	1.34	0.5	0.11	0.19	0.14

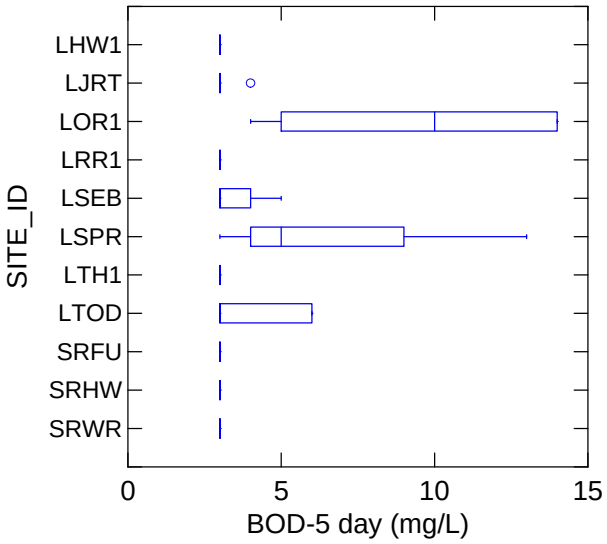
Site ID	Date Sampled	BOD_5 (mg/L)	TSS (mg/L)	$NO_{3+}NO_2$ (mg/L)	TKN (mg/L)	NH_3 (mg/L)	TP (mg/L)	OP (mg/L)
LOR1	18-Jun-08	4	55	< 0.01	0.9	0.08	0.51	0.42
LOR1	11-Sep-08	14	115	< 0.01	6.0	0.58	0.67	0.30
LOR1	17-Sep-08	6	102	0.04	1.7	0.68	0.45	0.25
LOR1	29-Sep-08	14	19	0.07	3.6	0.33	0.51	0.36
LRR1	11-Jun-08	< 3	16	0.07	0.5	0.08	0.39	0.45
LRR1	11-Sep-08	30	242	< 0.01	2.5	0.09	2.03	1.66
LRR1	17-Sep-08	3	6	< 0.01	0.4	0.18	0.82	0.82
LRR1	29-Sep-08	< 3	8	0.01	0.3	0.06	0.48	0.42
LSEB	11-Sep-08	< 3	40	0.06	1.1	0.18	0.23	0.30
LSEB	17-Sep-08	3	35	< 0.01	0.1	0.15	0.33	0.18
LSEB	29-Sep-08	5	26	< 0.01	1.0	0.08	0.25	0.17
LSPR	11-Jun-08	13	129	0.01	4.6	0.51	0.65	0.25
LSPR	11-Sep-08	5	36	0.02	1.3	0.21	0.62	0.52
LSPR	17-Sep-08	< 3	6	< 0.01	0.7	0.19	0.35	0.31
LSPR	29-Sep-08	5	10	0.01	1.1	0.12	0.35	0.28
LTH1	11-Jun-08	< 3	11	0.07	0.4	0.14	0.38	0.45
LTH1	18-Jun-08	< 3	11	0.05	0.1	0.13	0.42	0.37
LTH1	24-Jun-08	3	9	0.04	0.6	0.08	0.53	0.48
LTH1	11-Sep-08	< 3	13	0.02	0.5	0.12	0.96	0.92
LTH1	17-Sep-08	3	37	0.02	0.4	0.28	0.94	0.97
LTH1	29-Sep-08	< 3	7	0.01	0.4	0.11	0.70	0.62
LTOD	11-Jun-08	3	16	0.01	1.1	0.19	1.13	1.10
LTOD	18-Jun-08	3	23	< 0.01	1.1	0.23	1.43	1.37
LTOD	24-Jun-08	6	18	< 0.01	1.1	0.11	1.55	1.45
LTOD	11-Sep-08	3	14	0.02	1.0	0.18	1.96	1.84
LTOD	17-Sep-08	6	37	0.02	0.9	0.21	1.57	1.64
LTOD	29-Sep-08	3	63	< 0.01	2.3	0.12	2.09	1.50
MAT1	11-Jun-08	< 3	3	0.18	0.2	0.07	0.04	0.01
MAT1	18-Jun-08	3	4	0.13	0.1	0.13	0.16	0.13
MAT1	24-Jun-08	< 3	2	0.07	0.2	0.07	0.17	0.15
MAT1	11-Sep-08	< 3	3	0.12	0.3	0.12	0.19	0.20
MAT1	17-Sep-08	< 3	15	0.13	0.3	0.08	0.17	0.18
MAT1	29-Sep-08	< 3	7	0.16	0.7	0.13	0.25	0.22
MWC1	11-Jun-08	< 3	< 2	0.02	0.1	0.08	0.08	0.08
MWC1	18-Jun-08	< 3	< 2	0.02	< 0.1	0.07	0.08	0.07
MWC1	24-Jun-08	< 3	6	0.06	0.2	0.07	0.09	0.07
PET1	11-Jun-08	< 3	16	0.02	0.7	0.12	0.25	0.24
PET1	18-Jun-08	6	42	< 0.01	0.8	0.10	0.35	0.21
PET1	24-Jun-08	7	41	0.01	1.3	0.16	0.40	0.25
PIN1	11-Jun-08	< 3	7	0.02	0.4	0.10	0.17	0.14
PIN1	18-Jun-08	< 3	8	< 0.01	0.4	0.08	0.14	0.10
PIN1	24-Jun-08	< 3	8	0.01	0.4	0.11	0.18	0.13
PIN1	11-Sep-08	< 3	43	0.02	0.1	0.08	0.19	0.09
PIN1	17-Sep-08	< 3	5	< 0.01	0.2	0.12	0.10	0.06
PIN1	29-Sep-08	< 3	5	0.01	0.4	0.13	0.08	0.05
SRFU	11-Jun-08	< 3	< 2	0.02	0.2	0.06	0.17	0.14
SRFU	11-Sep-08	< 3	2	0.02	0.2	0.11	0.04	0.02

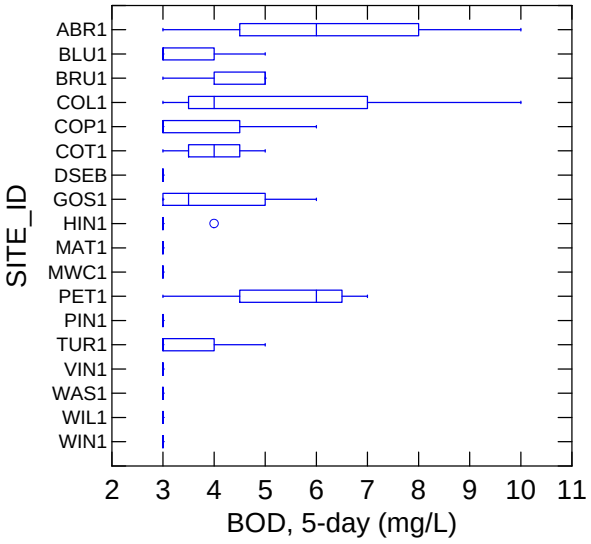
Site ID	Date Sampled	BOD_5 (mg/L)	TSS (mg/L)	$NO_{3+}NO_2$ (mg/L)	TKN (mg/L)	NH_3 (mg/L)	TP (mg/L)	OP (mg/L)
SRFU	17-Sep-08	< 3	2	0.01	0.2	0.07	< 0.02	< 0.01
SRFU	29-Sep-08	< 3	4	< 0.01	0.2	0.07	0.03	0.01
SRHW	11-Jun-08	< 3	< 2	0.08	0.2	0.07	0.08	0.06
SRHW	18-Jun-08	< 3	< 2	0.07	0.3	0.07	0.07	0.05
SRHW	24-Jun-08	< 3	2	0.07	0.4	0.10	0.07	0.05
SRWR	11-Jun-08	< 3	< 2	0.03	0.2	0.07	0.10	0.10
SRWR	11-Sep-08	< 3	< 2	0.06	0.2	0.07	0.13	0.12
SRWR	17-Sep-08	< 3	< 2	0.02	0.2	0.15	0.10	0.10
SRWR	29-Sep-08	< 3	< 2	0.03	0.3	0.09	0.12	0.09
TUR1	11-Jun-08	< 3	8	0.04	1.3	0.52	0.24	0.10
TUR1	18-Jun-08	< 3	4	0.02	2.3	1.09	1.69	1.52
TUR1	24-Jun-08	5	10	0.02	2.8	0.19	1.87	1.65
VIN1	11-Jun-08	< 3	3	0.47	0.2	0.08	0.16	0.17
VIN1	18-Jun-08	< 3	3	0.43	0.4	0.08	0.25	0.15
VIN1	24-Jun-08	3	4	0.23	0.2	0.10	0.16	0.13
VIN1	11-Sep-08	< 3	3	0.34	0.2	0.07	0.15	0.14
VIN1	17-Sep-08	< 3	3	0.42	0.1	0.08	0.12	0.14
VIN1	29-Sep-08	< 3	2	0.39	0.1	0.06	0.15	0.13
WAS1	11-Jun-08	< 3	2	0.07	0.3	0.10	0.46	0.43
WAS1	18-Jun-08	< 3	10	0.02	0.6	0.14	0.62	0.56
WAS1	24-Jun-08	3	37	0.07	0.6	0.16	0.41	0.38
WIL1	11-Jun-08	< 3	9	0.01	0.8	0.17	0.89	0.79
WIL1	18-Jun-08	3	111	< 0.01	0.9	0.14	1.05	1.05
WIL1	24-Jun-08	3	26	0.03	1.0	0.11	1.24	1.32
WIN1	11-Jun-08	< 3	< 2	0.04	0.3	0.11	0.21	0.23
WIN1	18-Jun-08	< 3	10	0.02	0.2	0.09	0.23	0.19
WIN1	24-Jun-08	< 3	3	0.02	0.4	0.10	0.24	0.21

Appendix 6B. Summary Statistics of Conventional Constituent Results.
Non-detect results for BOD_5, TSS, and NO_3 were estimated using ROS.

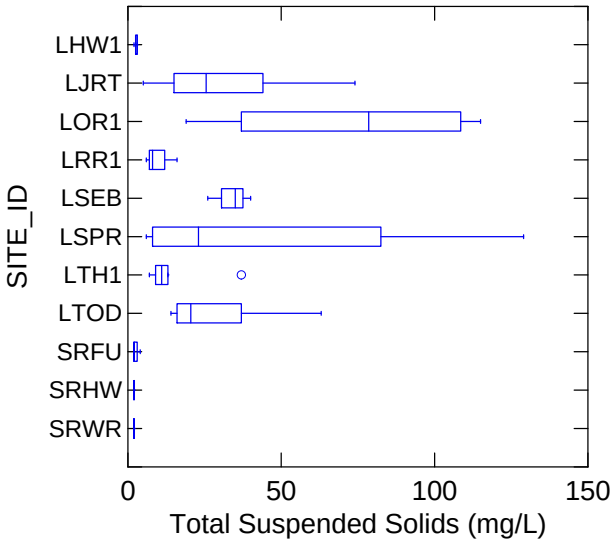
Constituent	BOD_5 (mg/L)	TSS (mg/L)	NO_3 (mg/L)	TKN (mg/L)	NH_3 (mg/L)	TP (mg/L)	OP (mg/L)
Laguna							
Median	3.0	18.5	0.02	0.7	0.14	0.47	0.40
Mean	4.4	36.1	0.21	1.1	0.19	0.68	0.60
Lower Quartile	1.1	9.8	0.01	0.5	0.11	0.29	0.24
Upper Quartile	5.0	37.8	0.07	1.1	0.20	0.85	0.85
Santa Rosa Creek							
Median	0.5	1.5	0.03	0.2	0.07	0.08	0.06
Mean	0.5	1.8	0.04	0.2	0.08	0.08	0.07
Lower Quartile	0.4	1.4	0.02	0.2	0.07	0.06	0.04
Upper Quartile	0.5	2.0	0.07	0.3	0.10	0.11	0.10
Tributaries							
Median	1.4	7.0	0.06	0.5	0.12	0.24	0.18
Mean	2.1	13.3	0.53	0.7	0.18	0.43	0.34
Lower Quartile	0.5	3.0	0.02	0.3	0.09	0.16	0.13
Upper Quartile	3.0	14.3	0.16	0.7	0.14	0.47	0.43

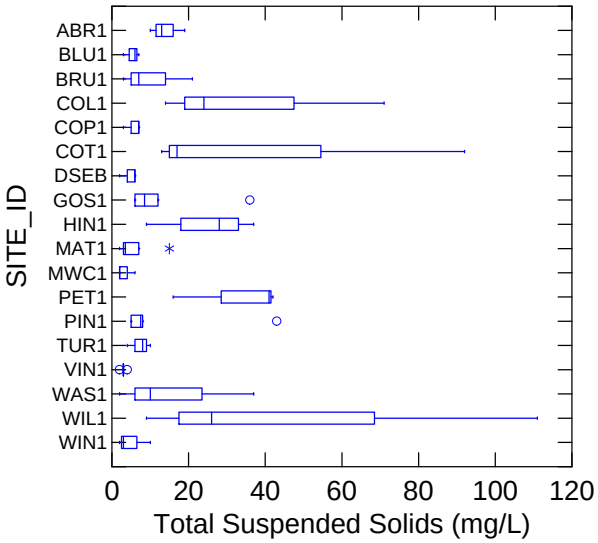
Appendix 6C. Box Plots of Conventional Constituent Results - BOD_5



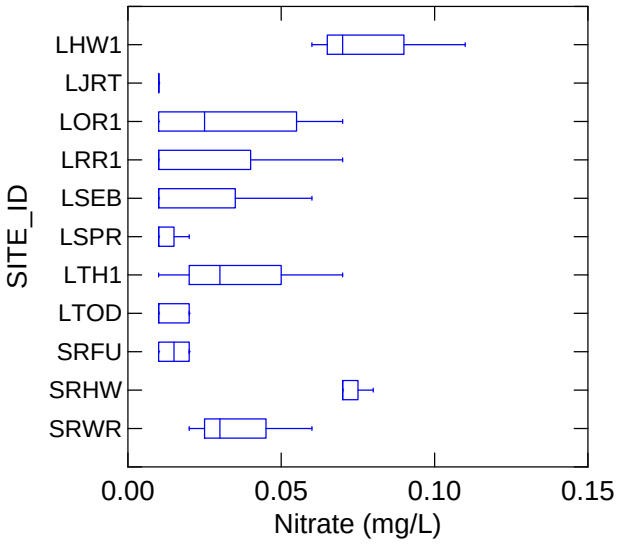


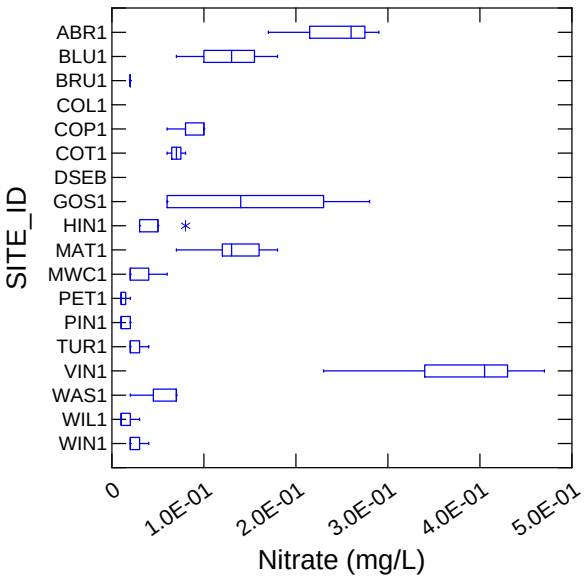
Appendix 6C. Box Plots of Conventional Constituent Results - TSS



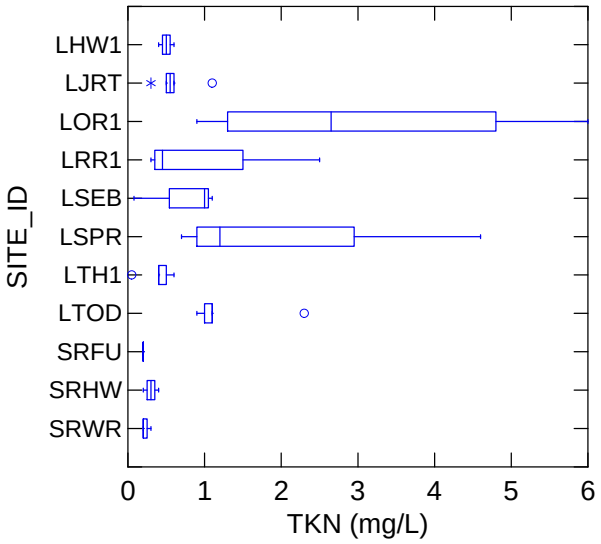


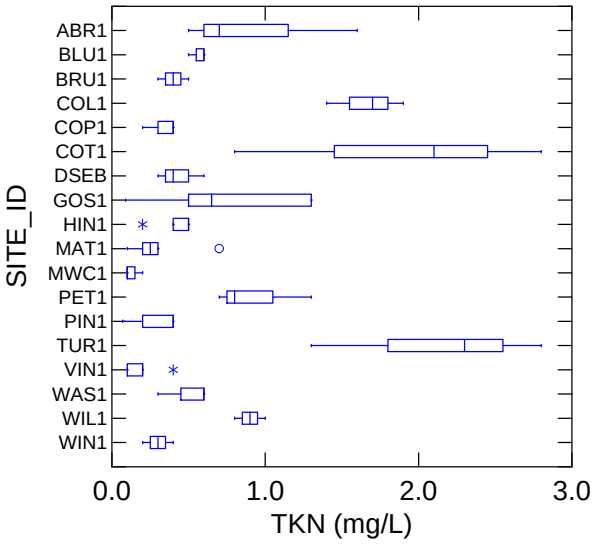
Appendix 6C. Box Plots of Conventional Constituent Results - NO_3



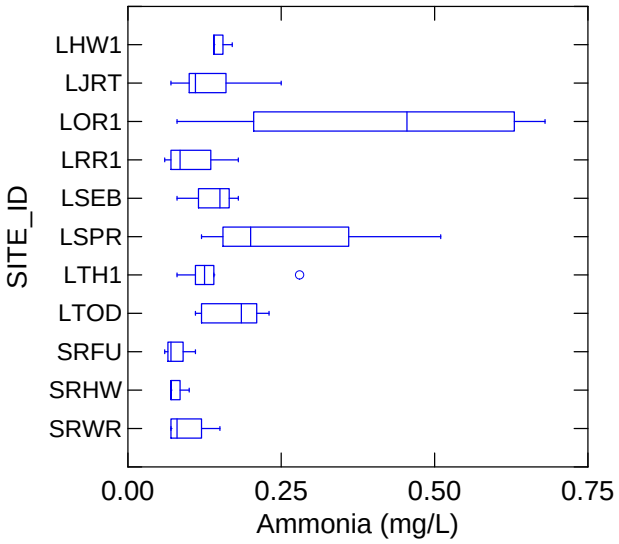


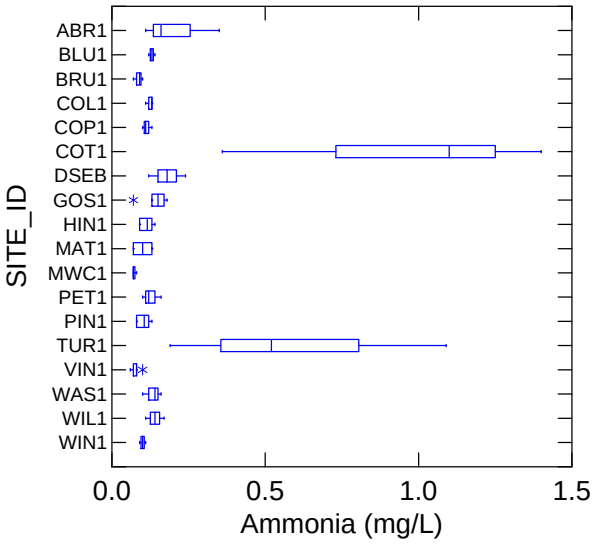
Appendix 6C. Box Plots of Conventional Constituent Results - TKN



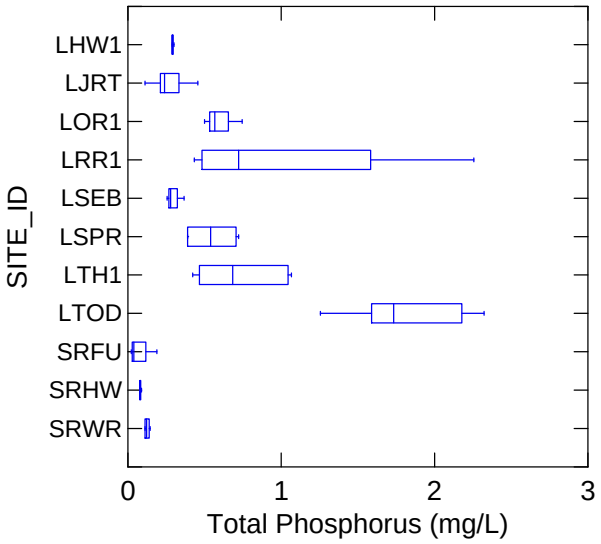


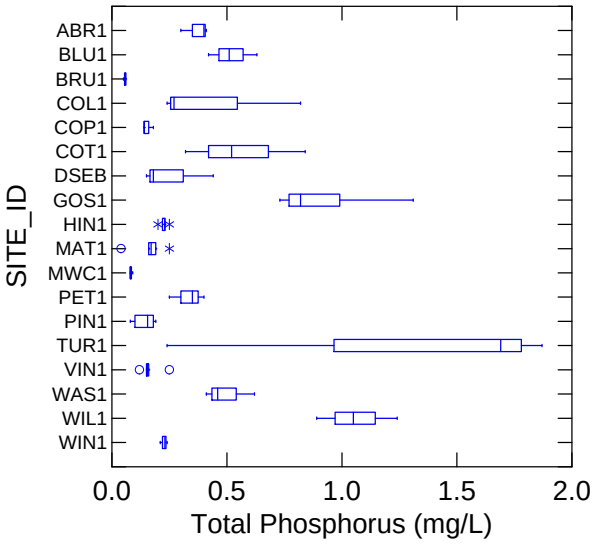
Appendix 6C. Box Plots of Conventional Constituent Results - NH_3



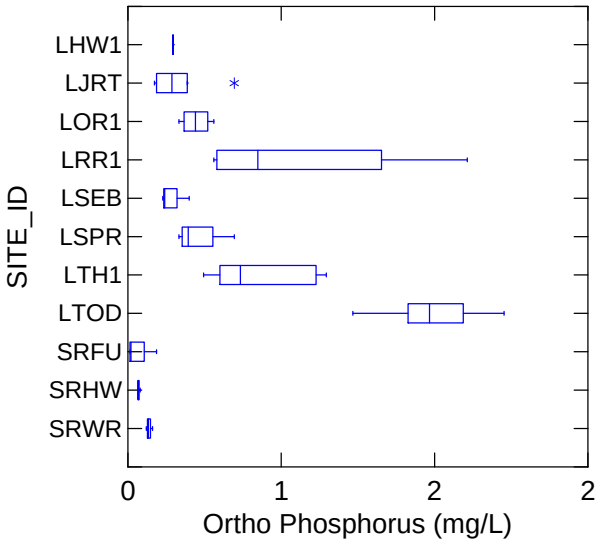


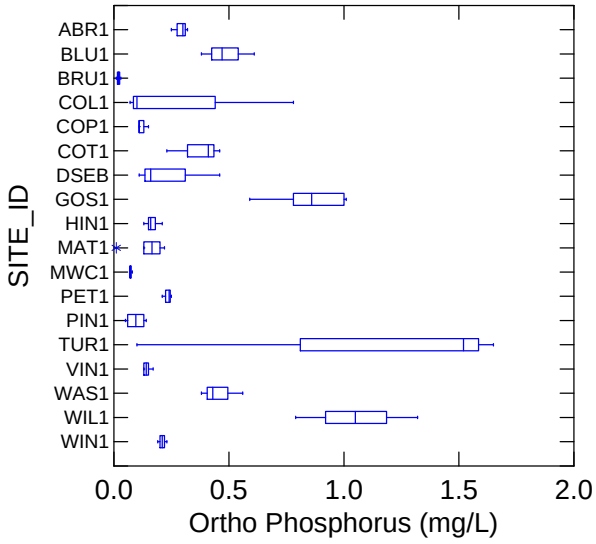
Appendix 6C. Box Plots of Conventional Constituent Results - TP





Appendix 6C. Box Plots of Conventional Constituent Results - OP





Appendix 6D. Significantly Different Results between Months.
Probability shown for Mann-Whitney U hypothesis Test

Pollutant	Site-ID	Probability	June Median	Sept. Median
NO_3	GOS1	0.046	0.23	0.06
NO_3	LTH1	0.046	0.05	0.02
TKN	MAT1	0.043	0.02	0.03
OP	LJRT	0.050	0.29	0.14
OP	LTH1	0.050	0.45	0.92
OP	LTOD	0.050	1.45	1.64
OP	MAT1	0.050	0.13	0.20
OP	PIN1	0.050	0.13	0.06
TP	LJRT	0.050	0.30	0.19
TP	LTH1	0.050	0.42	0.94
TP	LTOD	0.050	1.43	1.96
TP	VIN1	0.043	0.16	0.15

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Appendix 6E. Mercury Sample Results.
Minimum detection limit (MDL) = 0.020 ng/L.

Site ID	Date Sampled	THg (ng/L)	MMHg (ng/L
ABR1	26-Jun-08	7.580	0.299
BLU1	26-Jun-08	2.822	0.489
BRU1	26-Jun-08	4.082	0.202
GOS1	26-Jun-08	2.846	0.640
HIN1	26-Jun-08	6.045	0.280
LHW1	26-Jun-08	1.491	0.269
LJRT	26-Jun-08	7.614	0.234
LOR1	26-Jun-08	5.449	0.276
LRR1	26-Jun-08	2.573	0.215
LTH1	26-Jun-08	2.190	0.180
LTOD	26-Jun-08	5.461	0.484
MAT1	26-Jun-08	1.109	--
MWC1	26-Jun-08	1.214	4.100
PIN1	26-Jun-08	2.990	0.360
SRFU	26-Jun-08	2.699	0.401
SRHW	26-Jun-08	1.342	0.216
SRWR	26-Jun-08	1.092	0.294
VINI	26-Jun-08	2.105	0.192
WAS1	26-Jun-08	0.965	0.098
WIL1	26-Jun-08	12.86	0.957
WINI	26-Jun-08	1.479	0.266

Appendix 6F. Replicate Sample Results.
Below minimum detection limit (MDL) results are shown as < MDL value.

Constituent	June Replicates			June CV	September Replicates			Sept. CV
	1	2	3		1	2	3	
BOD_5 (mg/L)	< 3	< 3	< 3	NA	< 3	< 3	< 3	NA
TSS (mg/L)	125	129	914	117%	36	36	37	2%
NO_3 (mg/L)	0.02	0.01	0.01	43%	0.02	0.01	0.01	43%
TKN (mg/L)	0.6	0.4	0.4	25%	0.6	0.3	0.6	35%
NH_3 (mg/L)	0.05	0.07	0.08	23%	0.14	0.22	0.18	22%
TP (mg/L)	0.91	0.89	0.88	2%	0.23	0.15	0.23	23%
OP (mg/L)	1.1	1.09	1.1	1%	1.01	1.06	0.84	12%
THg (ng/L)	5.45	4.99	5.74	7%	--	--	--	--
MMHg (ng/L)	0.32	0.28	0.26	10%	--	--	--	--

Appendix 6G. Blank Sample Results.
Below minimum detection limit (MDL) results are shown as < MDL value.

Constituent	June 2008	Sept. 2008
BOD_5 (mg/L)	< 3	< 3
TSS (mg/L)	< 2	< 2
NO_3 (mg/L)	**0.01**	< 0.01
TKN (mg/L)	< 0.1	< 0.1
NH_3 (mg/L)	**0.21**	**0.10**
TP (mg/L)	< 0.02	< 0.02
OP (mg/L)	< 0.01	< 0.01
THg (ng/L)	< 0.20	--
MMHg (ng/L)	< 0.20	--

Appendix 7A. Lentic Sampling Locations.

Site ID	Latitude (N)	Longitude (W)	Sampling Location
LOR1	38.41572	122.82257	Southern most end of Occidental Road Pond. Site is farthest from Occidental Road bridge.
LOR2	38.41661	122.82515	Midway between LOR1 and LOR3
LOR3	38.42014	122.82340	Middle reach of Occidental Road Pond
LOR4	38.42316	122.82787	Midway between LOR3 and LOR5
LOR5	38.42509	122.82941	Northern most end of the pond near the Occidental Road bridge.
SEB1	38.41039	122.81642	Northern most end of Sebastopol Pond
SEB2	38.40881	122.81815	Middle reach of Sebastopol Pond.
SEB3	38.40657	122.81789	Southern reach of the pond, just south of the Pedsetrian Bridge. Access to lentic areas further south were blocked by woody debris during low water depths.
SEB4	38.40723	122.81817	10 yards south of SEB 3. Flows in November were high enough (due to rain) to allow access south of the snag blocking access south of SEB 3.
SEB5	38.40667	122.81796	10 yards south of SEB 4. Flows in November were high enough (due to rain) to allow access south of the snag blocking access south of SEB 3.

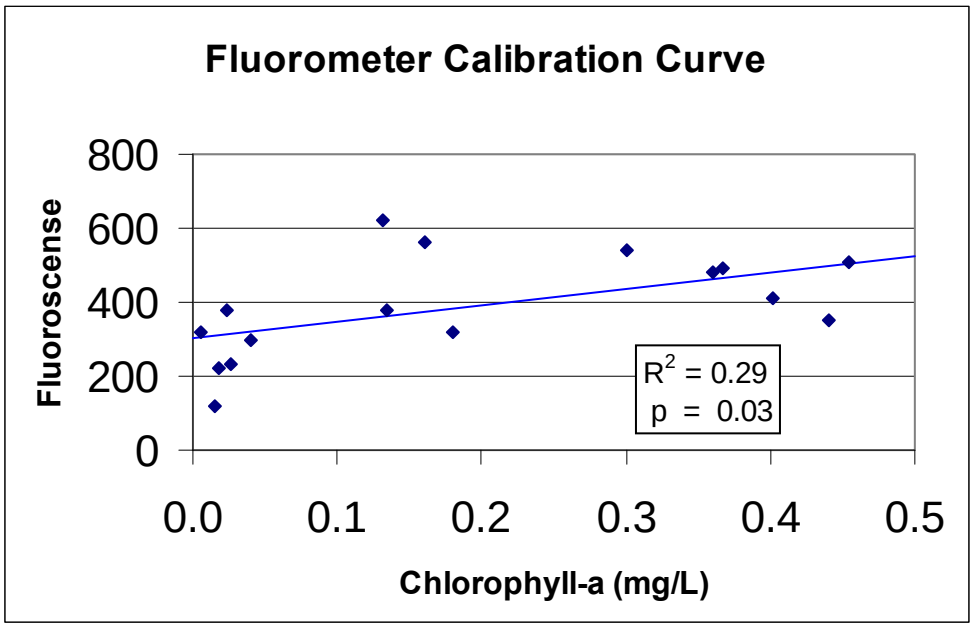
Appendix 7B. Chlorophyll and Phaeophytin Results.
Below minimum detection limit (MDL) results are shown as < MDL value.
The Median values are reported for samples collected in triplicate.
Samples identified with * indicate near surface collection at 2cm depth.

Date	Site ID	Chlorophyll-a (mg/L)	Phaeophytin-a (mg/L)
27-Aug-08	LOR1	0.367	< 0.018
27-Aug-08	LOR2	0.360	< 0.018
27-Aug-08	LOR3	0.454	< 0.036
27-Aug-08	LOR4	0.441	< 0.036
27-Aug-08	LOR5	0.401	< 0.036
27-Aug-08	SEB1	0.018	< 0.012
27-Aug-08	SEB2	0.027	< 0.012
27-Aug-08	SEB3	0.132	0.016
2-Sep-08	LTOD	< 0.024	< 0.024
4-Sep-08	LTH1 Median	0.015	< 0.014
4-Sep-08	SRWR	< 0.006	< 0.006
23-Sep-08	LOR1	0.180	< 0.017
23-Sep-08	LOR2	0.300	< 0.033
23-Sep-08	LOR3	0.160	< 0.033
23-Sep-08	LOR4	0.134	0.035
23-Sep-08	LOR5	0.040	0.063
24-Sep-08	LTHR	< 0.012	< 0.012
24-Sep-08	LTOD	0.023	0.049
24-Sep-08	SEB1	0.050	< 0.025
24-Sep-08	SEB2	0.080	< 0.025
24-Sep-08	SEB3 Median	0.107	0.033
24-Sep-08	SRWR	< 0.006	< 0.006
21-Oct-08	LTH1	< 0.008	< 0.008
21-Oct-08	LTOD	< 0.025	< 0.025
21-Oct-08	SEB2	< 0.025	< 0.025
21-Oct-08	SEB3	0.017	< 0.025
21-Oct-08	SEB1 Median	0.080	0.046
21-Oct-08	SRWR	< 0.008	< 0.008
22-Oct-08	LOR1	0.401	< 0.066
22-Oct-08	LOR2 *	2.480	< 0.2
22-Oct-08	LOR3 *	0.481	< 0.2
22-Oct-08	LOR4 *	0.881	< 0.2
22-Oct-08	LOR5 *	2.000	< 0.2

Appendix 7C. Replicate Sample Results.
CV calculations used MDL values used for results reported as '< MDL' value.

Date	Site ID	Sample / CV	Chlorophyll-a (mg/L)	Phaeophytin-a (mg/L)
4-Sep-08	LTHR	Replicate 1	0.015	0.014
		Replicate 2	0.014	0.014
		Replicate 3	0.020	0.014
		CV	20%	0%
24-Sep-08	SEB3	Replicate 1	0.107	0.033
		Replicate 2	0.160	0.033
		Replicate 3	0.053	0.049
		CV	50%	24%
21-Oct-08	SEB1	Replicate 1	0.080	0.046
		Replicate 2	0.100	0.033
		Replicate 3	0.070	0.025
		CV	18%	31%
Median CV			20%	24%

Appendix 7D. Fluoroscense – Chlororphyll-*a* Calibration Curve



Appendix 7E. Spatial Variability of Surface Cholophyll-a in Lentic Areas.