Prior Lake - Spring Lake Watershed District

2009 Water Quality Monitoring Summary

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I. Introduction

The Prior Lake - Spring Lake Watershed District (PLSLWD) is located in the northeastern portion of Scott County and covers approximately 42 square miles (figure 1). Within that area lay approximately 14 lakes, 564 wetlands, and 30 miles of streams, ditches, or outlet channel. Altogether, these water resources cover about six percent of the watershed. The PLSLWD was originally created in 1970 to manage and preserve its valuable natural resources. In order to better accomplish these goals, the PLSLWD determined a complete and thorough understanding of the water quality conditions and trends was needed. Specifically, the PLSLWD wanted: high quality scientific data on which to base management decisions, reliable data upon which to build future Total Maximum Daily Load (TMDL) studies, a baseline status of previously unmonitored areas, a means for ensuring effectiveness of programs and projects, and to maintain NPDES compliance.

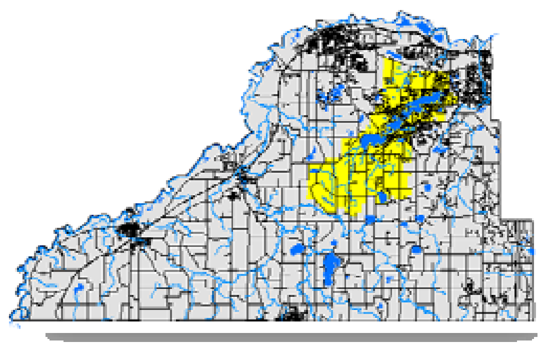


Figure 1 - Scott County, PLSLWD Highlighted

In an effort to begin addressing these needs, the PLSLWD contracted with the Scott Soil and Water Conservation District (SSWCD) in 2009 to conduct a comprehensive water quality monitoring program. This report presents all water quality data collected by SSWCD, in cooperation with PLSLWD staff. Sections III and IV of this report describe the methodology that was used to conduct monitoring activities, as well as the type and purpose of data that was collected. Attention is drawn to sample results that suggest areas of significant water quality concern. This is done to help determine where more intensive monitoring may be needed in the future. The appendices attached to this report present all the monitoring data collected in 2009, in tabular and graphical format.

II. Executive Summary

The PLSLWD contains a number of impaired water bodies, including Spring Lake, Upper Prior Lake, Lower Prior Lake, Fish Lake and Pike Lake. In addition, the Prior Lake Outlet Channel (PLOC) begins as an outlet of Lower Prior Lake and eventually leaves the PLSLWD to flow through Deans Lake and outlets into the Minnesota River, both of which are also impaired.

An impaired waterbody is defined as one that does not meet minimum state water quality standards, as established by the Minnesota Pollution Control Agency (MPCA) (http://www.pca.state.mn.us/water/tmdl). Since all impaired waterbodies within the PLSLWD are fed by the network of streams located in PLSLWD, this comprehensive monitoring program focused entirely on capturing water quality data from streams so that potential sources of pollution could be identified.

With only one year of data, it is difficult to make conclusive statements on the state of stream water quality in the PLSLWD. As more data are collected, conclusions that are more accurate will be drawn. Generally speaking, the data collected in 2009 appears to suggest that water quality is relatively good. This could be due to the very dry spring and summer, which resulted in minimal run-off and clear streams. It is too soon to determine whether the streams are normally clear during this time of year. Large late summer and fall rain events brought a different view of water quality. While some streams remained clear, others showed significant changes in water quality. As turbidity values passed 1000 FNU's and dissolved oxygen neared zero mg/L, potential problem areas were more clearly identified.

III. Method of Study

Since a program to establish Total Maximum Daily Loads (TMDLs[1]) had already begun, the PLSLWD needed to gather as much data about the watershed as possible in a relatively short amount of time. In order to have quality data upon which the TMDL program could rely, the PLSLWD prepared a comprehensive monitoring plan that provided detail regarding site selection, types of monitoring, sampling parameters, flow and precipitation data, sample frequency, and quality assurance/quality control. The following provides a brief description of each of these program components.

a. Site Selection:

Initially, nearly all accessible road/stream intersections were identified as the monitoring sites. Several sites were determined too dangerous for safe parking, however, and were thus removed from consideration, leaving a total of thirty-four locations that were ultimately monitored in 2009. The thirty four sites were grouped into three categories, including: Lake Input, Upper Watershed, and Prior Lake Outlet Channel (PLOC). The "Lake Input" group consisted of twelve sites (red points on figure 2). Flow from these sites discharge directly into Spring, Upper Prior, or Lower Prior Lakes.

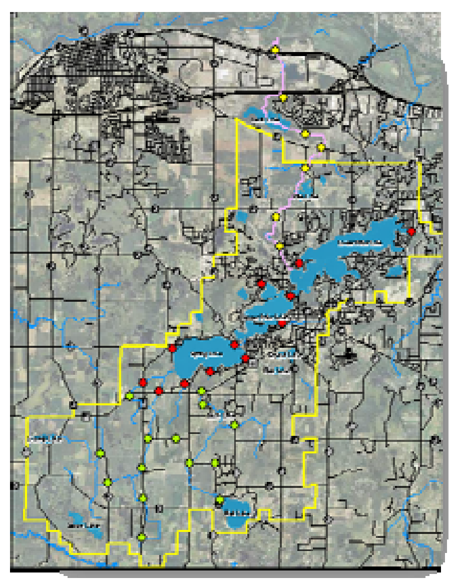


Figure 2 - Synoptic Monitoring Locations

[1] A Total Maximum Daily Load, or TMDL, is both a study and a calculation. The calculation is based on the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. The study determines what needs to be done in the watershed in order for the stream to reach that standard (http://www.epa.gov/OWOW/tmdl).

The "Upper Watershed" consisted of fourteen sites (green points on figure 2). The Upper Watershed is in the southern section of the PLSLWD, and though the stream segments here do not directly discharge, their flow does eventually reach the lakes. Eight sites were chosen along the PLOC (yellow points on figure 2). The Lake Input and PLOC sites are located in areas that are predominantly urbanized, compared to the Upper Watershed which is primarily rural and agricultural land uses. *See Appendix 1 for detailed site descriptions and locations.*

b. Monitoring Studies

Monitoring equipment was leased from the Scott Watershed Management Organization (WMO). Two types of monitoring studies were conducted based on the objectives of the PLSLWD and the capabilities and limitations of the available equipment. These types included deployment monitoring and synoptic monitoring.

Deployment monitoring consisted of monitoring a stream site for an extended period of time using a Hydrolab MS5 Multi-parameter Sonde (sonde). A sonde is a portable monitoring device used to record water quality instantaneously or continuously in a waterbody (figure 3). For the deployment monitoring study, sondes were anchored into the stream and recorded data continuously in 15-minute intervals for up to two weeks at a time. Parameters monitored in the PLSLWD included specific conductance, temperature, turbidity, and dissolved oxygen. Often two sondes were deployed simultaneously to compare two different sites along the same stream, but were also occasionally placed in different streams. For example, during one storm event, a sonde was placed upstream and another was placed downstream of Buck Lake to determine what, if any, water quality changes could be attributed to it flowing through the lake (figures 4 & 5). The deployment studies were also useful for examining natural daily fluctuations in dissolved oxygen. Because dissolved oxygen is lowest before sunrise, it would be very difficult to capture the lowest daily values without deploying the sondes. *Refer to Appendix 4 for all deployment monitoring results and figures.*

Figure 3 - Sonde

Figure 4. Sonde Locations for Deployment Study (white arrows indicate flow).

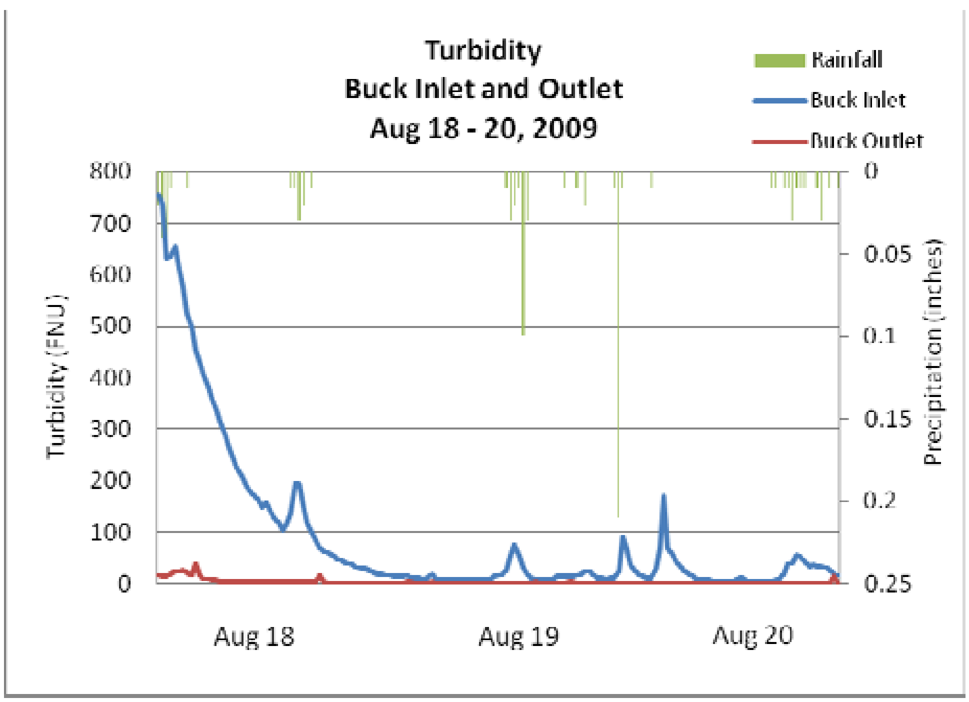


Figure 5. Results from deployment monitoring, before and after Buck Lake.

Synoptic monitoring is a method of monitoring numerous sites at approximately the same time to determine water quality simultaneously in a chosen area of concern. The PLSLWD and

SSWCD staff worked collaboratively in order to monitor all 34 monitoring sites in a few hours. By monitoring many sites at nearly the same time, potential "hot spots" (i.e. potentially significant source of pollution) can be identified in the watershed. See Table 1 for example and refer to Appendix 2 and 3 for more detailed synoptic monitoring results and figures.

Site #	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
6	7.40	7.70	9.00	885	7.71	1.50
7	18.30	8.06	9.11	755	9.88	2.00
11	37.10	7.42	9.12	704	6.51	0.05
14	3.70	7.60	8.92	586	6.30	1.00
16	0.00	7.46	9.26	606	6.80	
17	10.10	7.53	9.43	789	5.00	2.00
19	297.20	7.70	9.24	533	5.70	1.50
21	28.50	8.15	10.03	61	9.99	0.20
23	24.20	7.67	9.48	310	8.51	1.00
25	9.50	7.69	10.10	327	8.60	2.00
26	2.30	8.04	10.10	492	9.89	0.20
27	11.50	7.74	9.41	416	8.76	0.20
28	1194.00	7.92	9.45	208	10.20	2.50
29	3.30	7.97	9.81	592	8.18	0.20
30	4.00	7.68	10.19	371	7.14	3.50
31						0.00
32	2.80	7.68	12.07	711	5.74	0.75
33	14.60	7.73	10.36	123	10.26	
36	5.40	8.21	12.97	444	8.77	
38	7.50	7.40	9.55	511	7.45	1.00
40	101.10	7.71	9.64	626	8.69	1.00

Table 1. Synoptic monitoring results after large rain event on October 6, 2010. Highlighted cells indicate that sample exceeded the 25 NTU turbidity standard. All other parameters appear to be in good condition.

c. Sampling Parameters

Dissolved oxygen, pH (when possible[2]), specific conductance, turbidity, and temperature were monitored using the Hydrolab MS5 sonde. These are basic parameters that can be used to indicate whether pollution is likely in the stream. For instance, high turbidity may indicate high sediment loads from agriculture or urban run-off. Low dissolved oxygen may indicate an abundance of algae. High conductivity may be an indicator of road salt intrusion. By identifying

[2] Only one of the four sondes used had the capability to monitor pH.

which sites vary from acceptable levels, the PLSLWD is able to focus and refine future watershed monitoring and analyses efforts in areas that are more likely to be the contributing sources of pollution.

d. Flow and Precipitation

Flow and precipitation information is very important when analyzing data. It can help determine if a pollutant is caused by point or non-point source of pollution. For example, if water quality deteriorates after a rain event, it is possibly due to non-point sources, like run-off. If the water quality improves as the volume of water increase, it could mean that a point source of pollution is being diluted. Field staff visually estimated flow in cubic feet per second (cfs) while taking synoptic samples. Flow was not recorded during deployments, but precipitation was. Precipitation data was used from the Eagle Creek Metropolitan Council water monitoring station in Savage, Minnesota (directly northeast of the PLSLWD) which recorded a dataset every 15 minutes, the same interval as the deployment monitoring equipment.

e. Sample Frequency

Synoptic monitoring was scheduled every two weeks. However, towards the middle of summer, most stream flow ceased and synoptic monitoring only took place after rain events. Synoptic monitoring was conducted on 16 days in 2009.

Deployments were scheduled whenever possible, especially when a storm event was expected in order to capture the response of the stream site to rainfall. In 2009, 16 deployments were captured.

f. Quality Assurance / Quality Control

When not on extended deployment studies, sondes were calibrated daily for dissolved oxygen, weekly for pH and conductivity, and monthly for turbidity. Sondes were also directly compared to each other to verify that they measured closely in field conditions. All calibrations and comparisons were recorded in spreadsheets. Sondes were also cleaned, maintained, and upgraded when necessary.

During the beginning of the season, synoptic monitoring was performed at two-week intervals to avoid bias in samples. Towards the end of the monitoring year, the only times streams were flowing were after storm events. These samples will be more representative of rainfall events.

IV. Results

a. Introduction

Water quality was highly variable spatially and temporally throughout the PLSLWD. This section points out potential problem areas based on the 2009 results. *Please refer to Appendix 2, 3 and 4 for complete dataset results.* The table below represents maximum and/or minimum results for each site during the synoptic studies. A more in-depth explanation and analysis of each specific parameter is described below the table.

Synoptic Monitoring Results – 2009 Maximum and Minimum Values							
Site #	General Location of Monitoring Site	Minimum DO (mg/L)	Maximum Turbidity (FNU)	Maximum pH	Maximum Conductivity (µs/cm)	Average Flow (CFS)	# of Samples taken
22	Lake Input	9.62	3.4	7.97	511	0.00	10
36	Lake Input	6.71	5.4	8.21	466	n/a	13
16	Lake Input	3.08	6.4	8.71	635	4.00	10
17	Lake Input	1.22	10.1	8.00	1076	0.67	12
24	Lake Input	9.98	13.6	7.71	1117	0.34	4
7	Lake Input	0.90	18.3	8.91	778	2.14	29
23	Lake Input	8.51	24.2	7.77	784	0.14	3
38	Lake Input	4.12	28.0	7.72	922	0.48	12
21	Lake Input	7.14	30.0	8.93	505	2.64	12
33	Lake Input	6.41	40.0	8.06	2030	0.15	4
40	Lake Input	5.60	101.1	7.84	1853	0.21	11
19	Lake Input	1.55	297.2	7.70	1980	0.38	8
26	Outlet Channel	6.36	3.7	8.64	566	0.84	13
32	Outlet Channel	5.16	5.8	7.68	720	0.32	3
31	Outlet Channel	7.14	6.9	7.92	470	0.32	3
29	Outlet Channel	4.86	12.0	8.05	660	0.02	6
25	Outlet Channel	4.62	15.2	9.02	931	1.35	16
30	Outlet Channel	11.26	35.9	9.64	524	0.19	3
27	Outlet Channel	4.54	40.7	7.74	583	0.38	11
28	Outlet Channel	9.00	1194	7.92	548	0.33	7
5	Upper Watershed	6.97	0.7	8.05	1226	0.42	7
18	Upper Watershed	7.60	1.6	7.95	704	0.04	3
10	Upper Watershed	4.04	2.7	7.91	711	0.13	8
12	Upper Watershed	2.45	3.3	7.82	1076	0.43	12
14	Upper Watershed	0.94	5.8	8.02	674	1.92	14
8	Upper Watershed	3.51	7.5	9.10	461	0.39	9
2	Upper Watershed	8.71	10.8	7.98	1693	0.17	9
3	Upper Watershed	2.06	11.2	8.01	1164	1.24	11
5A	Upper Watershed	2.31	12.1	7.92	1016	1.84	10
15	Upper Watershed	0.48	12.7	7.91	715	1.03	11
4	Upper Watershed	7.83	16.1	7.61	1344	0.12	2
20	Upper Watershed	1.41	19.7	8.36	1262	0.21	8
6	Upper Watershed	2.89	32.2	7.93	1027	2.05	14
11	Upper Watershed	6.51	37.1	8.05	718	1.21	10

Table 2 – Yellow highlighting indicates samples did not meet water quality standards. Green highlighting indicates the value exceeded the typical range for minimally impacted streams in the North Central Hardwood Forest Ecoregion (McCollar and Heiskary, 1993).

b. Turbidity

Turbidity is a measurement of water clarity or cloudiness. The higher the turbidity value, the cloudier the water. Turbidity is affected by the concentration and type of suspended material in the water, such as soil particles and/or algae.

The state water quality standard for turbidity is 25 NTU's (Nephelometric Turbidity Units). However, the sondes used for monitoring turbidity in the PLSLWD measure in FNU's (Formazin Nephelometric Units). Very few turbidity-monitoring devices actually measure in NTU's. For example, turbidity can also be measured in NTRU's, JTU's, FTU's, and even more depending on the type of equipment used. The values produced from different equipment is often similar, but not interchangeable due to the various methods available for measuring turbidity (angle of diffraction, light source used, etc). Further studies would need to be conducted to find a true relationship between FNU's and NTU's, but each site can have a different relationship depending upon the suspended particle properties (i.e. color, shape, and reflectivity of particles) causing the turbidity. This issue continues to be an on-going discussion and will most likely not be resolved in the near future; however, the Minnesota Pollution Control Agency (MPCA) is working on resolving this issue. For this study, it was assumed that 25 NTU's are very close to 25 FNU's.

Figure 6 displays the maximum turbidity values recorded during the synoptic monitoring in 2009. Sites #19, #28, and #40 had the highest turbidity values. Site #11 (Buck Lake Inlet) also had extremely high turbidity values that were discovered in the deployment study (see figure 5). PLSLWD staff will look into possible solutions for reducing turbidity in all of these locations.

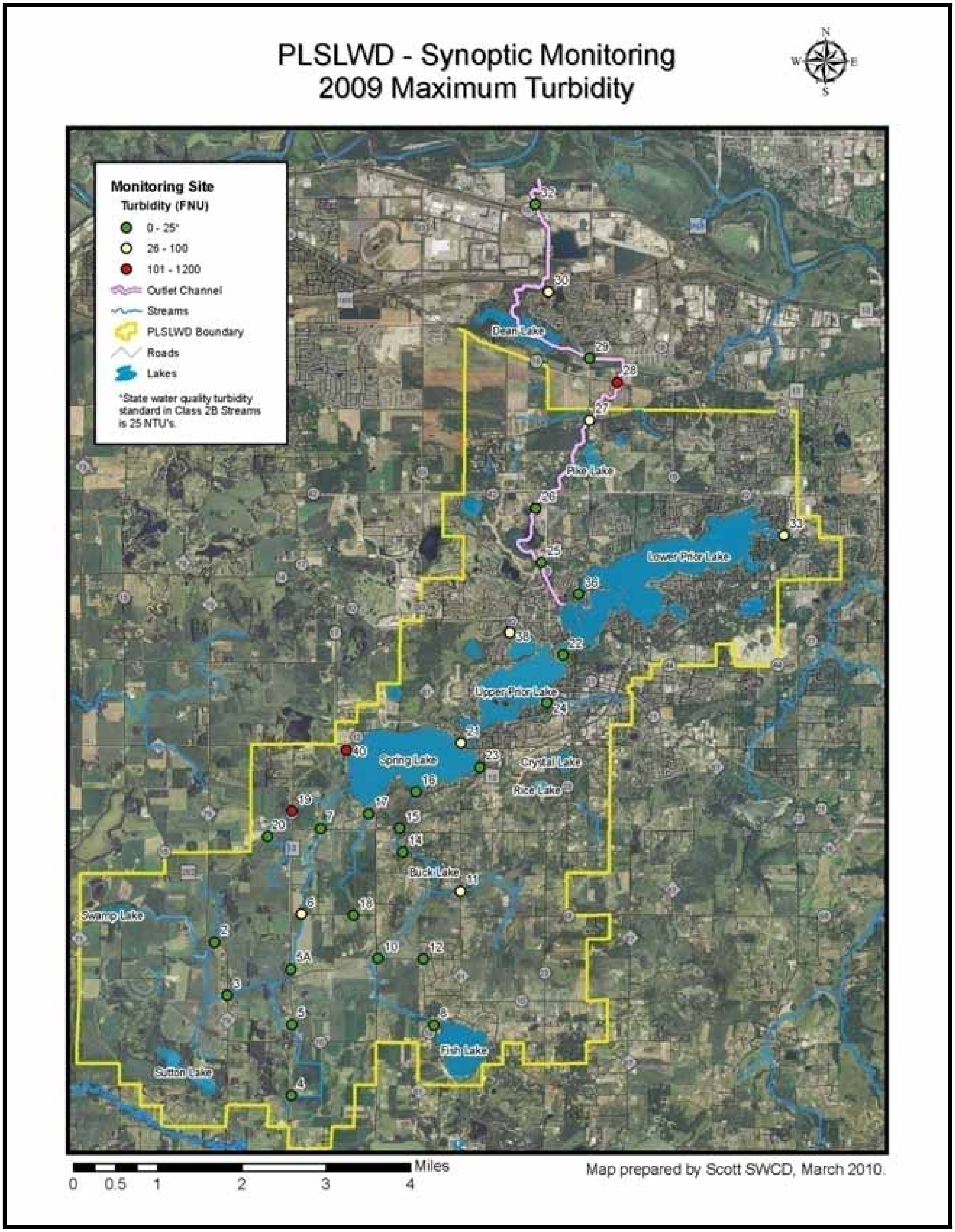


Figure 6 – 2009 Maximum Turbidity Values Collected from Synoptic Monitoring Study

c. Dissolved Oxygen

Dissolved Oxygen (DO) is defined as the concentration of oxygen molecules dissolved in water. Low dissolved oxygen levels are often a result of excessive nutrient loading and subsequent algal growth. As algae die off, DO is consumed by bacteria during the decomposition process [biological oxygen demand (BOD)] which can lead to insufficient oxygen levels for fish and other aquatic life (MPCA, 2009).

The state water quality standard for DO depends upon the class of water. In PLSLWD, there are two classes of water: 2B (cool and warm water fisheries) and 2D (wetlands). The water quality standard for Class 2B is 5.0 mg/L as a daily minimum. The Class 2D standard is "If background is less than 5.0 mg/L as a daily minimum, maintain background. Maintain background means the concentration of the water quality substances, characteristics, or pollutants shall not deviate from the range of natural background concentrations or conditions such that there is a potential significant adverse impact to the designated uses" (Minnesota Office of the Revisor of Statutes, 2010).

In general, DO was very good in the PLSLWD with the exception of a few (sites 7, 14, 15, 17, and 20). Most of these sites are located in or downstream of a wetland complex and low DO readings are more common in wetlands than streams. For example, the deployment study displays extreme variations on site #14 (Buck Lake Outlet), which is immediately downstream of a wetland. The data illustrates that the DO levels at Buck Lake Outlet never got above the 5 mg/L and as low as 0.12 mg/L in one week in June.

According to MPCA wetland monitoring specialist Mark Gernes, low DO readings are not surprising downstream of a wetland complex (Buck Lake). He stated, "Most of the DO production in wetlands comes from release of oxygen from submergent plants during photosynthesis. As the growing season progresses, floating plants shade the submergent plants, DO production decreases, and DO drops. In addition, water levels often drop, exposing substrates resulting in the water temperature increasing and DO concentration typically depressing." However, he also points out that "More field data would be needed to really understand what is going on at the Buck Lake Outlet." Further investigation, site visits, and water chemistry samples could help determine whether these low DO readings are of concern or just natural. *See Figure 7 for minimum dissolved oxygen readings in 2009.*

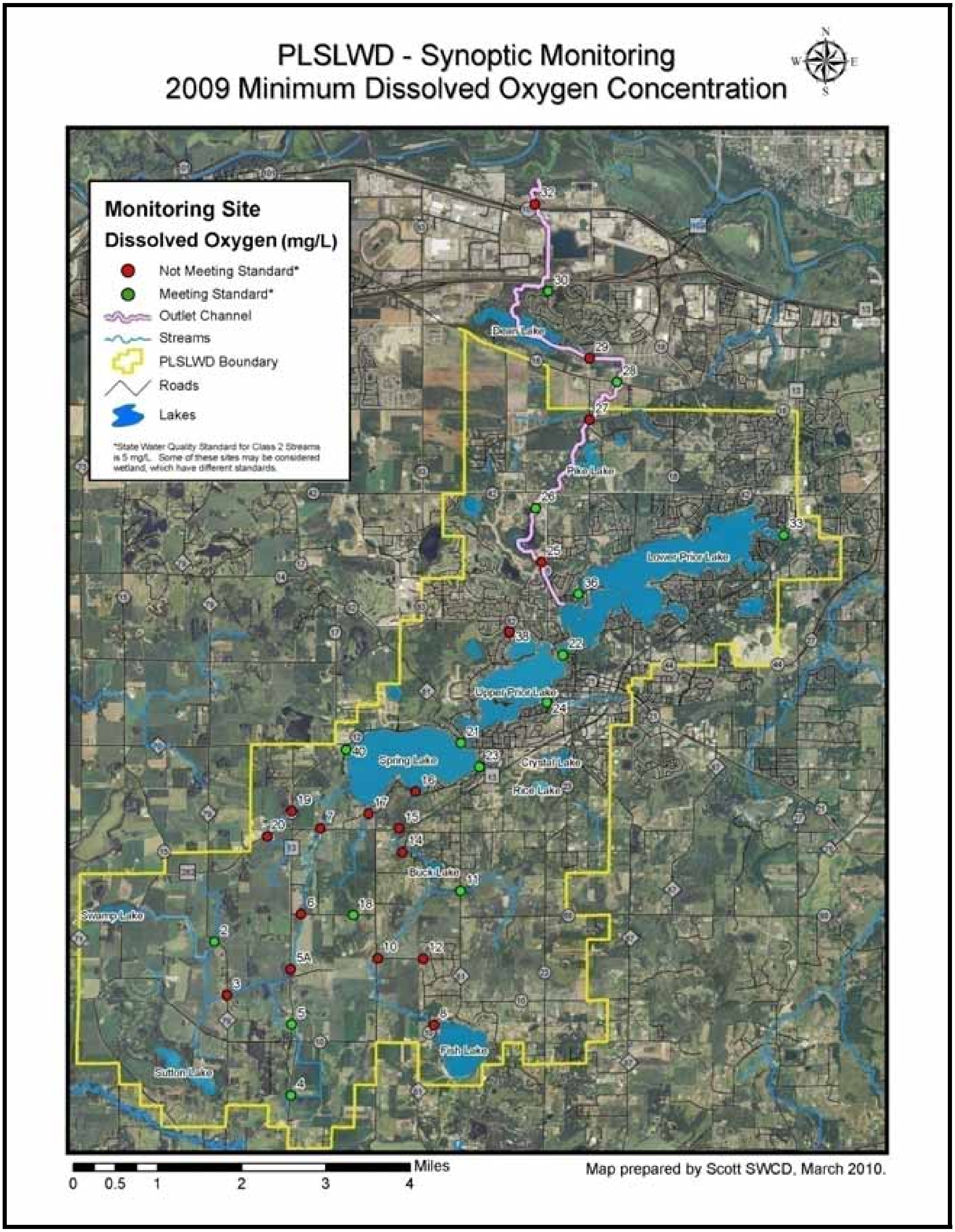


Figure 7 – Red points indicate that dissolved oxygen readings had gone below the 5 mg/L standard for streams during the 2009 synoptic monitoring study.

d. Specific Conductance (conductivity)

Conductivity is a means of measuring the ability of water to conduct electricity (Our Lake, 2010). Specifically, conductivity in water is affected by the presence of chloride, nitrate, sulfate, phosphate anions, sodium, magnesium, calcium, iron, and aluminum cations (EPA, Feb 25, 2010). Higher conductivity values indicate that pollution may be a concern or it can also be naturally high depending on the geology of the soil and bedrock. Pure water has a theoretical value of zero µs/cm. Some anthropogenic (human caused) sources of high conductivity may include wastewater treatment plant effluent, road run-off (road salt and automobile fluids), and agriculture run-off (Murphy, 2010).

Rain events can dilute the concentration of ions in a water body due to the naturally low conductivity values of rainwater. However, if the watershed has many pollutants, like road salt and dirty streets, the conductivity may increase during a rain event. The MPCA reports that the conductivity values of a minimally impacted streams in the North Central Hardwood Forest range from 40 – 840 µs/cm (McCollor and Heiskary 1993). No state water quality standard has been determined for conductivity; however, the Natural Resources Research Institute (NRRI) at the University of Minnesota Duluth created a relationship between chlorides and conductivity. The state water quality standard for chloride is 230 mg/L and they found that the chloride standard is equivalent to a conductivity value of approximately 960 µs/cm (Lakesuperiorstreams, 2010).

The lowest conductivity value observed was during synoptic monitoring with a value of 60.7 µs/cm at site # 21 (the connection between Spring Lake and Upper Prior Lake) during a rain event on October 6, 2009. The highest value was 2,030 µs/cm at site #33 during a rain event on April 1, 2009. Refer to Figure 8 to see the range of maximum conductivity values observed in 2009. Besides site #33, sites #2, #19, and #40 have the next highest values and are all located in the Upper Watershed.

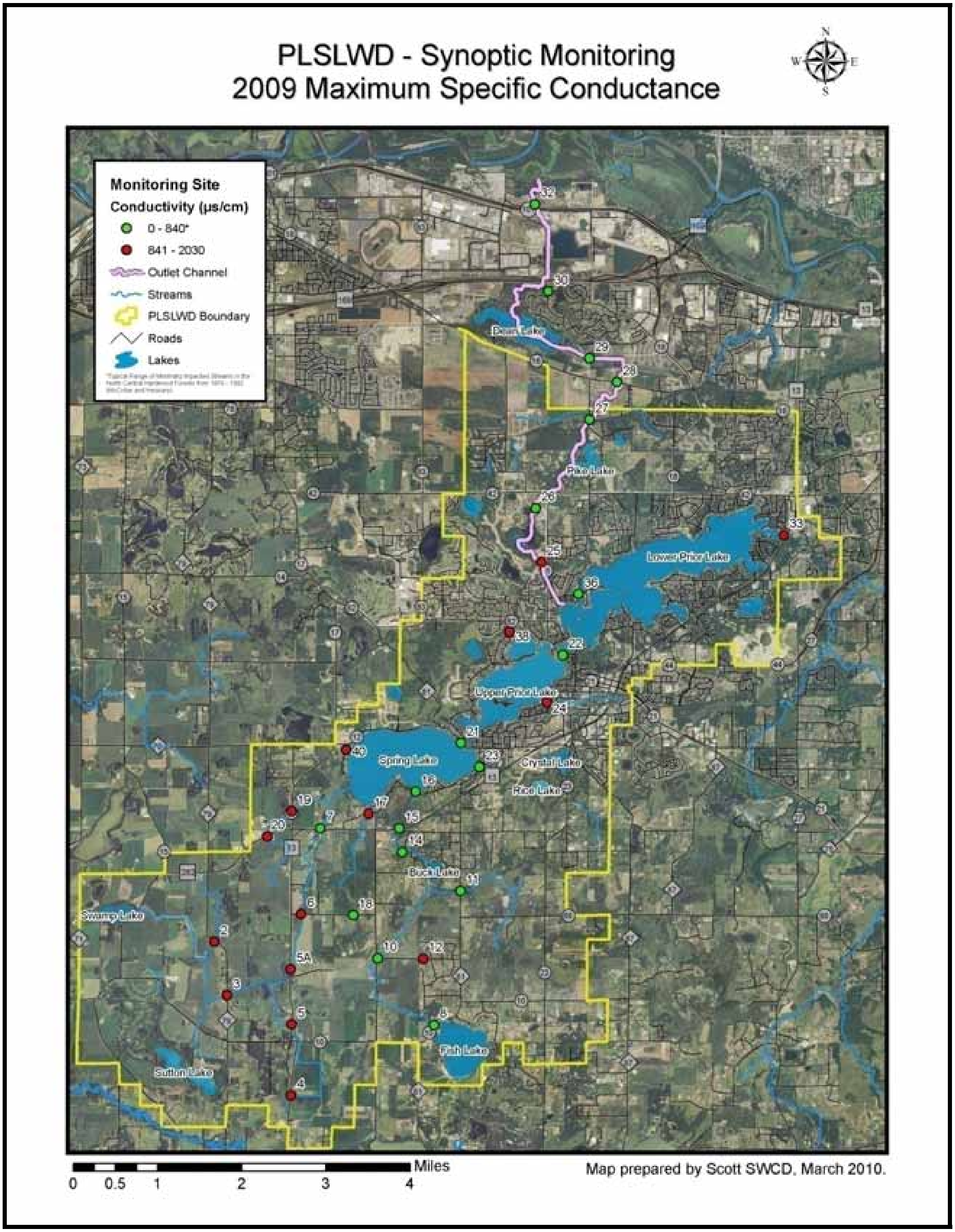


Figure 8 – Red points indicate that a synoptic sample exceeded the range of minimally impacted streams in the North Central Hardwood Forest in 2009 (McCollar and Heiskary).

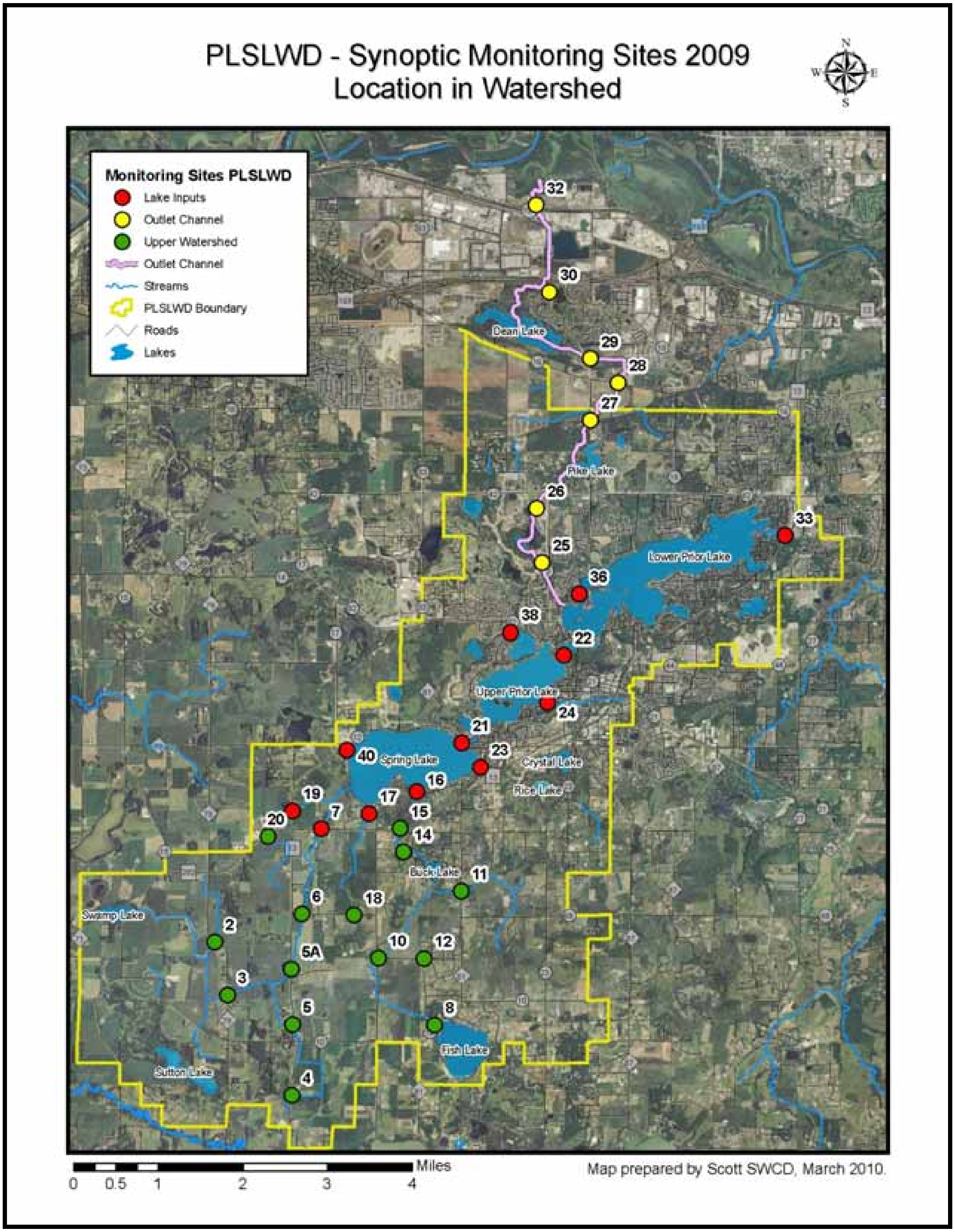
e. Conclusions

Synoptic and deployment water quality monitoring have generated an abundance of high quality data, from which an initial assessment of the watershed may be completed. Data from most sites in the Prior Lake Spring Lake Watershed appear to suggest that water quality is in relatively good condition. Monitoring results from some sites, however, point to areas of concern where possible sources of pollution are creating poor conditions.

The monitoring efforts conducted in 2009 will continue in 2010, in order to capture trends, seasonal and weather variations, and land use impacts. In addition, data gathered in 2009 will be used to locate areas of the watershed that may be monitored more intensely and/or areas potential for conservation practice implementation.

f. Recommendations

- Utilize the 2009 monitoring program results presented in this report to identify locations where more intensive monitoring may be needed.
- Continue biweekly (every other week) synoptic monitoring, which will be useful for analyzing trends and finding potential "hot spots."
- Continue deployment monitoring, preferably during rain events to examine stream reactions to rainfall and run-off.
- Monitor stage, flow, and chemistry data biweekly at two locations along the PLOC – preferably one in the beginning (site 25) and one near the end (site 29) to examine how water quality changes along the PLOC.
- Monitor stage, flow, and chemistry data biweekly at four locations in the upper watershed (sites 40, 19, 14, and 17) to examine all inputs to Spring Lake. This will be useful data for the Spring Lake TMDL study and helping determine reasons for high turbidity and conductivity values at sites 40 and 19, as well as low DO at site 14.
- Monitor stage, flow, and chemistry data at lake input, site 33, where high turbidity and conductivity appear often.
- Whenever possible, monitor PLSLWD Ferric Chloride sites on same days as above mentioned chemical sampling sites to more easily compare water quality results.
- Examine land use in watersheds upstream of sites with poor water quality results to see if any obvious problems appear – especially sites 40, 19, 28, and 11.
- Visit Buck Lake at least one time during the year (preferably during July) to analyze water, plant and algae conditions. Possibly conduct an aquatic vegetation survey to help determine cause of low dissolved oxygen levels at Buck Lake Outlet.
- Share results with local land use and resource management agencies to begin implementing Best Management Practices that begin to address identified water quality issues.


PLSLWD - Synoptic Monitoring Sites 2009
Location in Watershed
Monitoring Sites PLSLWD
Lake Inputs
Outlet Channel
Upper Watershed
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
Dean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

Site #	General Location	Waterbody name	Location	Notes
1	Upper Watershed	Private Ditch 13F	Outlet of Swamp Lake at Redwing Trail	Not enough water to monitor
2	Upper Watershed	County Ditch 13	CR 79 ~ 0.9 feet S of Hwy 282	Lots of agriculture upstream and surrounding
3	Upper Watershed	County Ditch 13	CR79 ~ 1.8 miles S of Hwy 282	Lots of agriculture upstream and surrounding
4	Upper Watershed	County Ditch 13	Hwy 13 ~ 0.65 miles S of CR 10 (Lydia)	
5	Upper Watershed	County Ditch 13	Langford Way ~ 0.2 miles N of CR 10 (Lydia)	
5A	Upper Watershed	County Ditch 13	Hwy 13 ~ 0.87 miles N of CR 10 (Lydia)	PLSLWD water monitoring site with staff gauge
6	Upper Watershed	County Ditch 13	0.1 miles east of Hwy 13 on 190th St E	
7	Lake Inputs	County Ditch 13	0.2 miles east of Hwy 13 and Hwy 282 intersection	Geis Farm – PLSLWD Iron Chloride monitoring site
8	Upper Watershed	Fish Lake Outlet	Fish Lake Outlet and Fairlawn Ave (CR 10) crossing	Downstream of fish lake outlet control structure ~ 30 feet.
10	Upper Watershed	Private Ditch 05	Intersection of Vergus Ave and 195th St E	
11	Upper Watershed	Unnamed Tributary	Crossing of Fairlawn Ave (CR 81) and inlet to buck lake ~ 0.3 miles N of Fox Ridge Road	Buck Lake Inlet (BLI) site
12	Upper Watershed	Unnamed tributary	0.55 miles east of Vergus Ave on 195th St E	Small tributary coming out of wetland
13	Upper Watershed	Wetland	0.5 miles east of CR 81 on Fox Ridge Rd	Wetland that does not have safe area for parking. Did not monitor here.
14	Upper Watershed	Private Ditch 03A	Crossing of Pandora Blvd	Buck Lake Outlet (BLO) site.
15	Upper Watershed	Private Ditch 03	Crossing of Hwy 13	Ditch through a wetland. 0.5 miles upstream of Spring Lake.

Site #	General Location	Waterbody name	Location	Notes
16	Lake Input	Spring Lake Inlet	West of culdesac on South Shore Circle	0.01 miles upstream of Spring Lake. Need to walk through private yard to take measurement from private dock. Coming out of big wetland complex.
17	Lake Input	Spring Lake Inlet / Private Ditch 01	Spring Lake Circle/Lakeview drive Intersection	0.14 miles upstream of Spring Lake. Has failing control structure on south side of road. Small, agricultural watershed.
18	Upper Watershed	Private Ditch 01	0.26 miles west of Vergus Ave on 190th St E	
19	Lake Input	Private Ditch 13A	0.2 miles N of Hwy 282 on CR 17 (Marschall Rd)	Highly ag watershed. Downstream of Krueger Farm and Hwy Dept.
20	Upper Watershed	Private Ditch 13A	Crossing of Hwy 282 by Hwy Dept (0.3 miles west of Marschall Rd	
21	Lake Inputs	Spring Lake Outlet	Crossing of Spring Lake Road SW	Flows to Upper Prior Lake
22	Lake Inputs	Connection of Upper and Lower Prior Lake	Under Hwy 21 bridge by boat marina	PLSLWD staff gauge located here
23	Lake Inputs	Spring Lake Inlet	Crossing of Sunset Trail SW ~ 0.22 miles S of Spring Lake Rd SW	
24	Lake Inputs	Upper Prior Lake Inlet	Green Heights Trail SW and Dutch Ave SE intersection	Near Captain Jacks
25	Outlet Channel	Outlet Channel Segment 1	Jeffers Pass NW crossing	Near Jeffers Pond Elementary School – beginning of outlet channel
26	Outlet Channel	Outlet Channel Segment 1	Fountain Hills Dr NW crossing	After Jeffers Pond

27	Outlet Channel	Outlet Channel Segment 3	Pike Lake Trail NE crossing	Very end of Segment 3
Site #	**General Location**	**Waterbody name**	**Location**	**Notes**
28	Outlet Channel	Outlet Channel Segment 5	Hwy 16 crossing	Very beginning of Segment 5. Directly downstream of Muhlenhart Farm.
29	Outlet Channel	Outlet Channel Segment 5	Pike Lake Road crossing	Middle of Segment 5. Inlet to Deans Lake
30	Outlet Channel	Outlet Channel Tributary to Segment 6	Crossing of walking path south of and parallel to Hwy 169	This water comes from development SE of this monitoring site. This does not include water from Deans Lake.
31	Outlet Channel	Outlet Channel Segment 6	Crossing of walking path South of and parallel to Hwy 169	End of Segment 6. No water flowing from Segment 6 (Deans Lake) in 2010.
32	Outlet Channel	Outlet Channel Segment 8	Crossing of Park Drive 0.06 miles N of Hwy 101	Very beginning of Segment 8. Mostly spring fed water in dry conditions. Will flow when culvert under Hwy 101 is dry.
33	Lake Inputs	Unnamed tributary	0.49 miles S of CR 42/Hwy 13 intersection on west side of Hwy 13.	Inlet to Lower Prior Lake. Taken from parking lot adjacent to Hwy 13.
35	Lake Inputs	Unnamed tributary/storm water pipe	Near intersection of Shady Beach Trail NE and Birchwood Ave NE	Only flows during storm events
36	Lake Inputs	Lower Prior Lake	Under Lords St NE bridge that connects to small island.	This captures water quality from Lower Prior Lake
38	Lake Inputs	Upper Prior Lake Input	Crossing under Freemont Ave NW ~ 0.13 miles S of CR82	0.04 miles upstream of Upper Prior Lake
39	Lake Inputs	Upper Prior Lake Input	~ 0.99 miles NE of Spring Lake Rd SW and Northwood Road NW intersection	Never flowed enough to monitor
40	Lake Inputs	Input to Spring Lake	~0.07 miles SW of 170th St E on Sunset Rd	

This table includes all data collected during the synoptic monitoring in 2009, sorted by site number. Green shaded cells indicate the sample was taken during a rain event, bolded red values indicate the sample did not meet water quality standards or is outside the range of minimally impacted streams in the North Central Hardwood Forest Ecoregion (McCollar and Heiskary).

Synoptic Data - Sorted by Site						
Site # & Sample Date	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
2						
3/25/09	2.30	7.38	2.57	**1659**	9.09	0.20
4/1/09	0.00	7.90	2.05	**1396**	12.39	0.50
4/9/09	0.00	7.12	5.66	**1572**	12.47	0.20
4/15/09	0.00	7.20	7.83	**1482**	11.29	0.10
4/22/09	0.00	7.72	7.60	**1437**	11.43	0.10
4/29/09	10.80	7.98	10.50	**1693**	14.91	
5/6/09	0.00	7.98	15.35	**1451**	10.99	0.20
5/13/09	0.60	7.87	15.18	**1481**	8.71	0.10
5/20/09	3.40	7.87	18.32	**1397**	11.43	0.10
5/27/09						0.00
8/20/09						
3						
3/25/09	11.20	7.47	2.48	833	7.81	3.20
4/1/09	0.00	7.31	1.21	581	8.97	2.00
4/9/09	0.00	7.40	2.61	604	11.79	1.50
4/15/09	0.00	7.47	8.23	**915**	10.93	0.20
4/22/09	0.00	8.01	6.76	**972**	7.65	0.30
4/29/09	0.00	7.95	8.40	718	11.54	2.00
5/6/09	1.40	7.88	12.63	826	8.41	1.50
5/13/09	0.60	7.80	13.05	433	7.13	1.50
5/20/09	0.70	7.97	16.82	566	10.05	
5/27/09	1.60		13.70	634	**3.41**	
7/1/09						0.00
8/20/09	4.10		16.02	**1164**	**2.06**	0.20
4						
3/25/09	16.10	7.44	3.33	**1300**	8.82	0.50
4/1/09	0.00	7.61	2.25	**1344**	7.83	0.20
4/9/09						0.00
4/15/09						0.00
4/29/09						0.00
8/20/09						0.00

Synoptic Data - Sorted by Site						
Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
5						
4/1/09	0.10	7.83	1.94	**871**	10.39	1.00
4/9/09	0.00	7.44	3.76	**998**		0.20
4/15/09	0.00	7.68	5.61	**1086**	11.33	0.05
4/22/09	0.00	7.74	6.48	**1173**	9.72	0.20
4/29/09	0.00	8.05	8.83	**1063**	12.99	1.00
5/6/09	0.00	7.85	12.71	**1075**	8.26	0.50
5/13/09	0.00	7.80	13.46	**1047**	7.47	0.20
5/20/09	0.70	7.73	15.89	**1226**	6.97	0.20
6						
3/25/09	9.00	7.33	2.63	686	8.45	5.00
4/1/09	0.00	7.72	1.72	657	9.78	3.00
4/9/09	0.00	7.71	4.90	688	12.53	4.00
4/15/09	0.00	7.78	8.07	761	10.90	2.00
4/22/09	0.00	7.77	8.14	**1027**	6.10	1.50
4/29/09	0.00	7.88	10.54	**995**	9.42	3.00
5/6/09	0.00	7.93	14.75	799	6.50	2.00
5/13/09	1.80	7.72	13.83	651	5.54	1.50
5/20/09	13.10	7.71	17.59	714	**3.76**	
5/27/09	**32.20**		14.13	814	**3.54**	0.10
6/8/09	8.40		11.45	794	6.76	1.50
7/1/09	8.30	7.54	17.00	**954**	**3.72**	0.10
8/20/09	3.50		17.49	**847**	**2.89**	1.50
10/6/09	7.40	7.70	9.00	**885**	7.71	1.50
7						
3/25/09	8.10	7.84	2.15	563	10.13	8.06
4/1/09	4.85	8.04	2.91	636	12.98	3.44
4/9/09	9.90	7.66	5.94	685	13.76	1.91
4/15/09	3.95	8.30	11.45	669	15.05	1.33
4/22/09	10.45	8.91	9.85	685	13.47	
4/29/09	5.05	8.67	12.52	707	13.07	1.20
5/6/09	6.98	8.72	17.40	725	11.74	0.95
5/13/09	6.05	8.21	14.70	660	6.70	0.66
5/20/09	12.00	7.86	18.75	682	6.03	
8/20/09	6.50		20.24	611	**0.90**	0.66
10/6/09	18.30	8.06	9.11	755	9.88	2.00

Synoptic Data - Sorted by Site						
Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
8						
4/1/09	0.70	7.99	2.53	366	11.47	0.20
4/9/09	1.50	7.11	4.86	461	11.14	0.20
4/15/09	3.10	**9.10**	8.10	443	11.30	0.10
4/22/09	0.90	8.06	8.82	425	11.18	1.00
4/29/09	2.20	8.46	10.98	429	10.01	1.50
5/6/09	7.50	7.85	15.33	453	5.93	0.10
5/20/09	3.20	7.63	19.26	442	6.51	0.50
5/27/09	0.20		15.77	432	5.87	0.15
6/8/09	1.90		12.07	453	**3.51**	0.10
8/20/09						0.00
10						
3/25/09	2.70	7.85	1.82	532	9.30	
4/1/09	0.00	7.91	1.51	618	11.78	
4/9/09	0.00	7.74	5.05	638	11.06	
4/15/09	0.00	7.85	7.40	675	9.57	
4/22/09	0.00	7.70	7.78	700	8.20	
4/29/09	0.00	7.50	9.29	671	8.76	0.50
5/6/09	0.00	7.69	13.77	699	5.07	
5/13/09	0.30	7.55	13.70	711	**4.04**	
5/27/09						0.00
6/8/09						0.00
8/20/09						0.00
11						
3/25/09	2.50	7.84	1.65	443	10.50	2.00
4/1/09	0.00	7.88	1.21	509	11.39	1.50
4/9/09	0.00	7.89	5.61	547	11.83	2.00
4/15/09	0.00	7.57	8.91	589	10.25	1.50
4/22/09	0.30	7.97	9.45	609	9.28	1.50
4/29/09	0.00	8.04	10.08	630	9.22	1.50
5/6/09	0.60	8.04	15.36	668	7.91	1.00
5/13/09	1.20	8.05	14.69	686	8.01	0.50
5/20/09	2.10	7.96	18.01	718	7.05	0.50
10/6/09	**37.10**	7.42	9.12	704	6.51	0.05
12						
3/25/09	3.30	7.78	1.29	639	8.75	1.52

Synoptic Data - Sorted by Site						
Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
4/1/09	0.60	7.77	1.60	730	8.29	0.40
4/9/09	0.00	7.55	3.92	797	7.90	1.00
4/15/09	0.00	7.75	5.95	**845**	5.53	0.20
4/22/09	0.00	7.51	5.58	**850**	**4.90**	0.20
4/29/09	0.00	7.82	9.36	809	6.55	0.20
5/6/09	0.00	7.70	12.22	**882**	**4.07**	0.20
5/13/09	0.00	7.60	13.21	**896**	**4.03**	0.10
5/20/09	1.50	7.48	15.86	**1000**	**2.45**	
5/27/09	0.80		12.37	**1076**	**2.69**	0.10
6/8/09	0.00		11.17	**850**	**4.42**	0.30
8/20/09	0.00		18.11	746	**2.53**	0.50
14						
3/25/09	0.00	7.49	2.51	346	9.35	4.00
4/1/09	0.00	7.79	3.33	526	11.05	4.00
4/9/09	0.00	8.02	7.33	549	13.33	5.00
4/15/09	0.00	7.89	10.71	553	11.51	2.00
4/22/09	0.00	7.76	10.49	584	7.58	
4/29/09	0.00	8.00	11.03	594	7.71	3.00
5/6/09	0.00	7.88	16.23	604	6.96	1.50
5/13/09	0.00	7.79	15.06	619	7.45	2.00
5/20/09	0.30	7.73	18.98	629	7.48	1.20
5/27/09	0.00		14.70	637	**3.30**	0.30
6/8/09	0.00		12.42	586	6.41	0.25
7/1/09	5.80	7.34	17.84	674	**0.94**	0.20
8/20/09	0.00		17.28	590	**1.06**	0.50
10/6/09	3.70	7.60	8.92	586	6.30	1.00
15						
3/25/09	0.00	7.50	1.31	363	8.38	1.00
4/1/09	0.00	7.51	2.17	535	8.41	
4/9/09	0.00	7.51	4.70	579	9.39	3.00
4/15/09	0.00	7.70	7.76	589	7.56	
4/22/09	0.00	7.64	7.93	600	5.73	
4/29/09	0.00	7.91	9.92	614	7.84	
5/6/09	0.00	7.79	14.21	628	**4.90**	
5/13/09	0.00	7.69	14.60	626	**4.71**	
5/20/09	1.70	7.54	18.15	660	**4.80**	

Synoptic Data - Sorted by Site						
Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
6/8/09						0.00
7/1/09	8.80	7.24	17.56	715	**0.48**	
8/20/09	12.70		16.90	576	**1.10**	0.10
16						
3/25/09	0.15	7.70	0.46	411	9.37	5.00
4/1/09	0.00		0.11	455	9.12	15.00
4/9/09	0.00	8.71	1.91	559	7.32	3.00
4/15/09	0.70		6.13	555	7.45	
4/22/09	0.20	7.43	5.09	593	**3.08**	
4/29/09	6.40		7.46	626	8.13	0.00
5/6/09	0.00	7.71	11.03	626	5.01	
5/13/09	0.00		14.13	635	7.61	
5/20/09						0.00
5/27/09						0.00
10/6/09	0.00	7.46	9.26	606	6.80	
17						
3/25/09	3.90	7.71	2.97	482	10.72	2.00
4/1/09	0.00		2.37	675	12.10	1.00
4/9/09	0.00	8.00	6.45	723	13.60	1.00
4/15/09	0.00	7.55	9.09	776	14.97	0.50
4/22/09	0.00	7.77	8.77	805	11.97	0.50
4/29/09	0.00	7.99	10.42	737	14.07	1.00
5/6/09	0.00	7.73	14.42	782	7.60	0.75
5/13/09	0.00	7.56	14.09	830	**4.92**	0.10
5/20/09						0.00
5/27/09	1.80		13.78	**1076**	**1.22**	0.10
6/8/09	0.00		11.55	814	**3.42**	0.20
7/1/09						0.00
8/20/09	2.60		16.34	661	**2.03**	0.20
10/6/09	10.10	7.53	9.43	789	5.00	2.00
18						
3/25/09	1.60	7.72	2.71	479	7.60	0.10
4/1/09	0.00	7.95	2.43	704	12.15	0.20
4/9/09						0.00
4/15/09						0.00
4/29/09	0.00	7.89	10.53	686	8.25	

Synoptic Data - Sorted by Site						
Site # & Sample Date	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
5/6/09						0.00
5/27/09						0.00
6/8/09						0.00
8/20/09						0.00
19						
3/25/09	24.90	7.64	2.59	830	**3.88**	1.00
4/1/09	0.10		1.29	**1330**	10.32	0.20
4/9/09	3.50		4.93	**1657**	12.87	0.20
4/15/09	13.20		6.69	**1980**	9.17	0.10
4/22/09						
4/29/09	11.50		10.96	**1636**	9.56	0.10
5/6/09	0.10		14.55	**1813**	5.63	0.10
5/13/09						0.00
5/20/09						0.00
5/27/09						0.00
8/20/09	23.60		17.59	798	**1.55**	1.00
10/6/09	**297.20**	7.70	9.24	533	5.70	1.50
20						
3/25/09	13.50	7.76	2.36	657	8.70	1.00
4/1/09	0.00	7.81	1.76	828	8.56	0.20
4/9/09	0.00	8.36	5.12	**929**	10.25	0.10
4/15/09	0.00	7.91	7.02	**996**	6.55	0.05
4/22/09						0.00
4/29/09	0.00	8.03	10.42	**1009**	11.83	0.30
5/6/09	0.00	7.51	13.47	**1141**	**3.59**	0.01
5/13/09	0.80	7.53	13.97	**1262**	7.15	
5/27/09						0.00
8/20/09	19.70		17.20	678	**1.41**	
21						
3/25/09	0.40	8.93	3.37	345	11.96	
4/1/09	**30.00**		2.30	470	12.10	5.00
4/9/09	5.20		7.31	493	13.69	2.50
4/15/09	7.60		8.56	486	16.70	3.50
4/22/09	6.70		9.27	488	11.99	5.00
4/29/09	7.90		11.03	488	12.02	4.50
5/6/09	8.30		14.89	491	11.58	3.00

Synoptic Data - Sorted by Site						
Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
5/13/09	7.60		14.74	495	9.61	2.50
5/20/09	9.60		17.71	500	9.36	2.50
5/27/09	3.60		17.10	505	9.53	2.00
6/8/09	0.20		16.26	476	7.14	1.00
7/1/09						0.00
10/6/09	**28.50**	8.15	10.03	61	9.99	0.20
22						
3/25/09	1.50	7.97	4.45	468	10.22	
4/1/09	0.00		3.68	504	10.14	
4/9/09	0.10		6.65	495	15.40	
4/15/09	0.00		8.63	494	15.50	
4/22/09	0.40		11.06	494	13.14	
4/29/09	0.20		12.19	490	12.29	
5/6/09	0.00		15.52	511	10.12	
5/13/09	1.70		15.64	502	10.25	
5/20/09	3.40		17.42	509	9.62	
5/27/09	2.70		18.23	500	9.82	
6/8/09						0.00
23						
3/25/09	1.30	7.77	2.32	625	8.93	0.20
4/1/09	0.00		1.88	784	9.70	0.30
4/9/09						0.00
4/15/09						0.00
4/22/09						0.00
4/29/09						0.00
5/13/09						0.00
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
10/6/09	24.20	7.67	9.48	310	8.51	1.00
24						
3/25/09	12.20	7.71	3.78	763	10.08	2.00
4/1/09	0.00		4.26	875	10.68	0.50
4/15/09	2.40		12.85	**1117**	12.15	0.20
4/22/09						
4/29/09						0.00

Synoptic Data - Sorted by Site						
Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
5/13/09						0.00
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
25						
3/25/09	12.85	7.93	2.50	**925**	9.86	
4/1/09	1.20		2.13	744		1.50
4/9/09	3.20		7.47	649	11.28	1.00
4/15/09	2.30		11.03	659	9.98	1.00
4/22/09	4.10		10.35	619	9.81	2.00
4/29/09	3.40		11.94	650	9.65	2.00
4/30/09	6.30		16.64	652	11.91	1.50
5/6/09	4.30		17.92	632	8.29	1.00
5/13/09	3.60		16.55	560	8.95	1.30
5/20/09	7.10		19.82	513	11.29	1.50
5/27/09	2.30		17.27	529	10.85	0.30
6/8/09						0.00
7/1/09	2.20	**9.02**	21.14	540	11.37	0.30
8/10/09	3.40	8.27	26.64	474	6.60	2.00
8/20/09	0.70	7.74	19.74	452	5.55	2.10
10/6/09	9.50	7.69	10.10	327	8.60	2.00
26						
3/25/09	0.00		3.88	449	10.84	2.00
4/1/09	0.00		3.99	450		2.50
4/9/09	0.00		9.06	458	12.14	1.50
4/15/09	0.00		12.96	465	10.03	0.30
4/22/09	0.40		11.43	467	9.86	0.50
4/29/09	0.00		12.85	465	11.06	0.50
4/30/09	3.70		15.17	469	10.90	1.00
5/6/09	3.60		18.59	457	10.29	0.20
5/13/09	2.00		16.13	453	8.60	1.00
5/20/09	2.90		19.95	421	10.26	0.50
5/27/09	0.20		17.87	453	7.72	0.10
6/8/09						0.00
7/1/09	2.40	8.64	20.38	566	10.85	0.10
8/10/09						0.00

Synoptic Data - Sorted by Site						
Site # & Sample Date	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
8/20/09	2.80	8.11	20.94	487	6.36	3.00
10/6/09	2.30	8.04	10.10	492	9.89	0.20
27						
3/25/09						0.00
4/1/09	14.60		3.53	482	12.57	1.00
4/9/09	**35.30**		8.64	505	12.26	1.00
4/15/09	**40.70**		11.73	530	9.60	0.50
4/22/09	10.10		11.13	583	8.54	0.20
4/29/09	8.70		13.14	534	9.52	0.30
4/30/09	10.80		15.50	528	9.21	1.00
5/6/09	4.20		18.16	516	8.09	0.50
5/13/09	3.40		16.29	501	8.94	0.40
5/20/09	4.10		19.62	535	8.49	0.10
5/27/09						
6/8/09						0.00
7/1/09						0.00
8/10/09						0.00
8/20/09	9.30	7.61	19.48	441	**4.54**	0.50
10/6/09	11.50	7.74	9.41	416	8.76	0.20
28						
3/25/09						0.00
4/1/09	**30.00**		2.42	475	12.72	1.00
4/9/09	**186.50**		10.90	514	10.56	0.50
4/15/09						0.00
4/22/09						0.00
4/29/09	**40.40**		12.12	548	10.16	0.10
4/30/09	**61.50**		16.55	536	9.00	0.30
5/6/09	**30.20**		17.66	543	9.56	0.10
5/13/09	**40.70**		17.40	515	10.79	0.10
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
8/10/09						0.00
8/20/09						
10/6/09	**1194.00**	7.92	9.45	208	10.20	2.50
29						

Synoptic Data - Sorted by Site						
Site # & Sample Date	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
3/25/09	8.25	8.05	3.90	657	9.88	
4/1/09	12.00		3.61	589	10.79	
4/9/09						0.00
4/15/09	9.80		10.21	598	13.45	0.00
4/22/09						0.00
4/29/09						0.00
4/30/09						0.00
5/6/09						0.00
5/13/09						0.00
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
8/10/09						0.00
8/20/09	6.40	7.70	17.07	590	**4.86**	0.00
10/6/09	3.30	7.97	9.81	592	8.18	0.20
30						
3/25/09	5.40	7.92	3.40	469	12.72	0.00
4/1/09	5.80		3.68	524	11.26	2.00
4/9/09						0.00
4/15/09						0.00
4/22/09						0.00
4/29/09						0.00
4/30/09						0.00
5/6/09	16.90		17.89	512	12.32	
5/13/09						0.00
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
8/10/09	**35.90**	**9.64**	28.08	415	17.03	0.50
10/6/09	4.00	7.68	10.19	371	7.14	3.50
32						
3/25/09	0.00		4.77	720	5.16	0.10
4/1/09						0.00
4/9/09						0.00
4/15/09						0.00
4/22/09						0.00

Synoptic Data - Sorted by Site						
Site # & Sample Date	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
4/30/09						0.00
5/6/09						0.00
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
8/10/09	5.80	7.38	24.26	144	7.39	3.00
10/6/09	2.80	7.68	12.07	711	5.74	0.75
33						
3/25/09	**40.00**	8.06	5.50	**1818**	11.39	0.50
4/1/09	**28.20**		2.97	**2030**	12.42	1.00
4/9/09						0.00
4/15/09						0.00
4/22/09						0.00
4/29/09	**31.30**		10.99	**1891**	6.41	0.10
5/6/09						0.00
5/13/09						0.00
5/20/09						0.00
5/27/09						0.00
6/8/09						0.00
10/6/09	14.60	7.73	10.36	123	10.26	
36						
3/25/09	0.00	8.17	5.03	416	9.72	n/a
4/1/09						n/a
4/9/09	0.00		6.47	462	11.85	n/a
4/15/09	0.00		9.98	456	14.07	n/a
4/22/09	0.10		10.52	463	12.10	n/a
4/29/09	0.60		12.52	463	10.90	n/a
5/6/09	3.80		16.13	466	9.91	n/a
5/13/09	2.00		15.31	459	10.23	n/a
5/20/09	3.30		18.50	456	10.84	n/a
5/27/09	2.90		18.21	465	8.59	n/a
6/8/09	0.60		15.62	465	7.61	n/a
8/20/09	0.00		21.42	439	6.71	n/a
10/6/09	5.40	8.21	12.97	444	8.77	n/a
38						
3/25/09	7.75	7.72	1.12	368	9.86	1.00

Site # & Sample Date	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
4/1/09	10.80		2.84	594	12.19	1.00
4/9/09	9.80		5.47	671	11.28	0.50
4/15/09	20.90		8.70	798	11.39	0.20
4/22/09	8.00		7.90	922	7.82	0.20
4/29/09	**26.20**		10.78	637	10.03	0.10
5/6/09	**28.00**		15.84	653	6.21	0.10
5/13/09	21.30		15.00	701	**4.47**	0.10
5/20/09	20.90		18.73	796	**4.86**	0.10
6/8/09						0.00
8/20/09	4.60		17.56	493	**4.12**	1.50
10/6/09	7.50	7.40	9.55	511	7.45	1.00
40						
3/25/09	2.60	7.84	1.70	**1290**	9.40	0.30
4/1/09	0.00		1.58	**1696**	10.01	0.20
4/9/09	0.00		2.58	**1703**	9.27	0.20
4/15/09	2.00		4.38	**1658**	8.52	0.10
4/22/09	0.00		5.60	**1722**	8.70	0.20
4/29/09	1.70		8.93	**1748**	8.21	0.10
5/6/09	0.00		11.70	**1853**	7.59	0.10
5/13/09	1.70		12.02	**1811**	6.58	0.10
5/20/09	6.60		15.82	**1664**	8.20	0.10
5/27/09						0.00
8/20/09	12.70		17.14	**1153**	5.60	0.15
10/6/09	**101.10**	7.71	9.64	626	8.69	1.00
5A						
3/25/09	11.10	7.66	2.57	853	7.99	5.00
4/1/09	0.50	7.66	1.47	660	9.01	3.00
4/9/09	3.70	7.73	3.24	694	10.31	2.50
4/22/09	0.00	7.81	7.51	**1016**	7.63	1.00
4/29/09	0.00	7.92	10.12	**998**	7.91	3.00
5/6/09	0.00	7.87	14.18	821	6.03	1.80
5/13/09	0.80	7.77	13.13	537	**4.78**	1.50
5/20/09	4.40	7.65	17.61	692	**2.47**	0.30
5/27/09	3.70		13.98	798	**3.81**	0.10
8/20/09	12.10		17.14	783	**2.31**	0.20

This table includes all data collected during the synoptic monitoring in 2009, sorted by date. Green shaded cells indicate the sample was taken during a rain event, bolded red values indicate the sample did not meet water quality standards or is outside the range of minimally impacted streams in the North Central Hardwood Forest Ecoregion (McCollar and Heiskary).

Synoptic Data - Sorted by Date

Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
3/25/09						
2	2.30	7.38	2.57	**1659**	9.09	0.20
3	11.20	7.47	2.48	833	7.81	3.20
4	16.10	7.44	3.33	**1300**	8.82	0.50
6	9.00	7.33	2.63	686	8.45	5.00
7	8.10	7.84	2.15	563	10.13	8.06
10	2.70	7.85	1.82	532	9.30	
11	2.50	7.84	1.65	443	10.50	2.00
12	3.30	7.78	1.29	639	8.75	1.52
14	0.00	7.49	2.51	346	9.35	4.00
15	0.00	7.50	1.31	363	8.38	1.00
16	0.15	7.70	0.46	411	9.37	5.00
17	3.90	7.71	2.97	482	10.72	2.00
18	1.60	7.72	2.71	479	7.60	0.10
19	24.90	7.64	2.59	830	**3.88**	1.00
20	13.50	7.76	2.36	657	8.70	1.00
21	0.40	8.93	3.37	345	11.96	
22	1.50	7.97	4.45	468	10.22	
23	1.30	7.77	2.32	625	8.93	0.20
24	12.20	7.71	3.78	763	10.08	2.00
25	12.85	7.93	2.50	**925**	9.86	
26	0.00		3.88	449	10.84	2.00
27						0.00
28						0.00
29	8.25	8.05	3.90	657	9.88	
30	5.40	7.92	3.40	469	12.72	
31						0.00
32	0.00		4.77	720	5.16	0.10
33	**40.00**	8.06	5.50	**1818**	11.39	0.50
36	0.00	8.17	5.03	416	9.72	
38	7.75	7.72	1.12	368	9.86	1.00
40	2.60	7.84	1.70	**1290**	9.40	0.30

Synoptic Data - Sorted by Date						
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
5A	11.10	7.66	2.57	**853**	7.99	5.00
4/1/09						
2	0.00	7.90	2.05	**1396**	12.39	0.50
3	0.00	7.31	1.21	581	8.97	2.00
4	0.00	7.61	2.25	**1344**	7.83	0.20
5	0.10	7.83	1.94	**871**	10.39	1.00
6	0.00	7.72	1.72	657	9.78	3.00
7	4.85	8.04	2.91	636	12.98	3.44
8	0.70	7.99	2.53	366	11.47	0.20
10	0.00	7.91	1.51	618	11.78	
11	0.00	7.88	1.21	509	11.39	1.50
12	0.60	7.77	1.60	730	8.29	0.40
14	0.00	7.79	3.33	526	11.05	4.00
15	0.00	7.51	2.17	535	8.41	
16	0.00		0.11	455	9.12	15.00
17	0.00		2.37	675	12.10	1.00
18	0.00	7.95	2.43	704	12.15	0.20
19	0.10		1.29	**1330**	10.32	0.20
20	0.00	7.81	1.76	828	8.56	0.20
21	**30.00**		2.30	470	12.10	5.00
22	0.00		3.68	504	10.14	
23	0.00		1.88	784	9.70	0.30
24	0.00		4.26	**875**	10.68	0.50
25	1.20		2.13	744		1.50
26	0.00		3.99	450		2.50
27	14.60		3.53	482	12.57	1.00
28	**30.00**		2.42	475	12.72	1.00
29	12.00		3.61	589	10.79	
30	5.80		3.68	524	11.26	2.00
31						
32						0.00
33	**28.20**		2.97	**2030**	12.42	1.00
36						0.00
38	10.80		2.84	594	12.19	1.00
40	0.00		1.58	**1696**	10.01	0.20
5A	0.50	7.66	1.47	660	9.01	3.00

Synoptic Data - Sorted by Date						
Site # & Date Sampled	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
4/9/09						
2	0.00	7.12	5.66	**1572**	12.47	0.20
3	0.00	7.40	2.61	604	11.79	1.50
4						0.00
5	0.00	7.44	3.76	**998**		0.20
6	0.00	7.71	4.90	688	12.53	4.00
7	9.90	7.66	5.94	685	13.76	1.91
8	1.50	7.11	4.86	461	11.14	0.20
10	0.00	7.74	5.05	638	11.06	
11	0.00	7.89	5.61	547	11.83	2.00
12	0.00	7.55	3.92	797	7.90	1.00
14	0.00	8.02	7.33	549	13.33	5.00
15	0.00	7.51	4.70	579	9.39	3.00
16	0.00	8.71	1.91	559	7.32	3.00
17	0.00	8.00	6.45	723	13.60	1.00
18						0.00
19	3.50		4.93	**1657**	12.87	0.20
20	0.00	8.36	5.12	**929**	10.25	0.10
21	5.20		7.31	493	13.69	2.50
22	0.10		6.65	495	15.40	
23						0.00
25	3.20		7.47	649	11.28	1.00
26	0.00		9.06	458	12.14	1.50
27	**35.30**		8.64	505	12.26	1.00
28	**186.50**		10.90	514	10.56	0.50
29						0.00
30						0.00
31						0.00
32						0.00
33						0.00
36	0.00		6.47	462	11.85	
38	9.80		5.47	671	11.28	0.50
40	0.00		2.58	**1703**	9.27	0.20
5A	3.70	7.73	3.24	694	10.31	2.50
4/15/09						
2	0.00	7.20	7.83	**1482**	11.29	0.10

Synoptic Data - Sorted by Date						
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
3	0.00	7.47	8.23	**915**	10.93	0.20
4						0.00
5	0.00	7.68	5.61	**1086**	11.33	0.05
6	0.00	7.78	8.07	761	10.90	2.00
7	3.95	8.30	11.45	669	15.05	1.33
8	3.10	**9.10**	8.10	443	11.30	0.10
10	0.00	7.85	7.40	675	9.57	
11	0.00	7.57	8.91	589	10.25	1.50
12	0.00	7.75	5.95	845	5.53	0.20
14	0.00	7.89	10.71	553	11.51	2.00
15	0.00	7.70	7.76	589	7.56	
16	0.70		6.13	555	7.45	
17	0.00	7.55	9.09	776	14.97	0.50
18						0.00
19	13.20		6.69	**1980**	9.17	0.10
20	0.00	7.91	7.02	**996**	6.55	0.05
21	7.60		8.56	486	16.70	3.50
22	0.00		8.63	494	15.50	
23						0.00
24	2.40		12.85	**1117**	12.15	0.20
25	2.30		11.03	659	9.98	1.00
26	0.00		12.96	465	10.03	0.30
27	**40.70**		11.73	530	9.60	0.50
28						0.00
29	9.80		10.21	598	13.45	0.00
30						0.00
31						0.00
32						0.00
33						0.00
36	0.00		9.98	456	14.07	
38	20.90		8.70	798	11.39	0.20
40	2.00		4.38	**1658**	8.52	0.10
4/22/09						
2	0.00	7.72	7.60	**1437**	11.43	0.10
3	0.00	8.01	6.76	**972**	7.65	0.30
5	0.00	7.74	6.48	**1173**	9.72	0.20

Synoptic Data - Sorted by Date						
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
6	0.00	7.77	8.14	**1027**	6.10	1.50
7	10.45	8.91	9.85	685	13.47	
8	0.90	8.06	8.82	425	11.18	1.00
10	0.00	7.70	7.78	700	8.20	
11	0.30	7.97	9.45	609	9.28	1.50
12	0.00	7.51	5.58	**850**	**4.90**	0.20
14	0.00	7.76	10.49	584	7.58	
15	0.00	7.64	7.93	600	5.73	
16	0.20	7.43	5.09	593	3.08	
17	0.00	7.77	8.77	805	11.97	0.50
19						
20						0.00
21	6.70		9.27	488	11.99	5.00
22	0.40		11.06	494	13.14	
23						0.00
24						
25	4.10		10.35	619	9.81	2.00
26	0.40		11.43	467	9.86	0.50
27	10.10		11.13	583	8.54	0.20
28						0.00
29						0.00
30						0.00
31						0.00
32						0.00
33						0.00
36	0.10		10.52	463	12.10	
38	8.00		7.90	**922**	7.82	0.20
40	0.00		5.60	**1722**	8.70	0.20
5A	0.00	7.81	7.51	**1016**	7.63	1.00
4/29/09						
2	10.80	7.98	10.50	**1693**	14.91	
3	0.00	7.95	8.40	718	11.54	2.00
4						0.00
5	0.00	8.05	8.83	**1063**	12.99	1.00
6	0.00	7.88	10.54	**995**	9.42	3.00
7	5.05	8.67	12.52	707	13.07	1.20

Synoptic Data - Sorted by Date						
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
8	2.20	8.46	10.98	429	10.01	1.50
10	0.00	7.50	9.29	671	8.76	0.50
11	0.00	8.04	10.08	630	9.22	1.50
12	0.00	7.82	9.36	809	6.55	0.20
14	0.00	8.00	11.03	594	7.71	3.00
15	0.00	7.91	9.92	614	7.84	
16	6.40		7.46	626	8.13	0.00
17	0.00	7.99	10.42	737	14.07	1.00
18	0.00	7.89	10.53	686	8.25	
19	11.50		10.96	**1636**	9.56	0.10
20	0.00	8.03	10.42	**1009**	11.83	0.30
21	7.90		11.03	488	12.02	4.50
22	0.20		12.19	490	12.29	
23						0.00
24						0.00
25	3.40		11.94	650	9.65	2.00
26	0.00		12.85	465	11.06	0.50
27	8.70		13.14	534	9.52	0.30
28	**40.40**		12.12	548	10.16	0.10
29						0.00
30						0.00
31						0.00
33	**31.30**		10.99	**1891**	6.41	0.10
36	0.60		12.52	463	10.90	
38	**26.20**		10.78	637	10.03	0.10
40	1.70		8.93	**1748**	8.21	0.10
5A	0.00	7.92	10.12	**998**	7.91	3.00
4/30/09						
25	6.30		16.64	652	11.91	1.50
26	3.70		15.17	469	10.90	1.00
27	10.80		15.50	528	9.21	1.00
28	**61.50**		16.55	536	9.00	0.30
29						0.00
30						0.00
31						0.00
32						0.00

Synoptic Data - Sorted by Date

Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
5/6/09						
2	0.00	7.98	15.35	**1451**	10.99	0.20
3	1.40	7.88	12.63	826	8.41	1.50
5	0.00	7.85	12.71	**1075**	8.26	0.50
6	0.00	7.93	14.75	799	6.50	2.00
7	6.98	8.72	17.40	725	11.74	0.95
8	7.50	7.85	15.33	453	5.93	0.10
10	0.00	7.69	13.77	699	5.07	
11	0.60	8.04	15.36	668	7.91	1.00
12	0.00	7.70	12.22	882	**4.07**	0.20
14	0.00	7.88	16.23	604	6.96	1.50
15	0.00	7.79	14.21	628	**4.90**	
16	0.00	7.71	11.03	626	5.01	
17	0.00	7.73	14.42	782	7.60	0.75
18						0.00
19	0.10		14.55	**1813**	5.63	0.10
20	0.00	7.51	13.47	**1141**	3.59	0.01
21	8.30		14.89	491	11.58	3.00
22	0.00		15.52	511	10.12	
25	4.30		17.92	632	8.29	1.00
26	3.60		18.59	457	10.29	0.20
27	4.20		18.16	516	8.09	0.50
28	**30.20**		17.66	543	9.56	0.10
29						0.00
30	16.90		17.89	512	12.32	
31						0.00
32						0.00
33						0.00
36	3.80		16.13	466	9.91	
38	**28.00**		15.84	653	6.21	0.10
40	0.00		11.70	**1853**	7.59	0.10
5A	0.00	7.87	14.18	821	6.03	1.80
5/13/09						
2	0.60	7.87	15.18	**1481**	8.71	0.10
3	0.60	7.80	13.05	433	7.13	1.50
5	0.00	7.80	13.46	**1047**	7.47	0.20

Synoptic Data - Sorted by Date						
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
6	1.80	7.72	13.83	651	5.54	1.50
7	6.05	8.21	14.70	660	6.70	0.66
10	0.30	7.55	13.70	711	**4.04**	
11	1.20	8.05	14.69	686	8.01	0.50
12	0.00	7.60	13.21	**896**	**4.03**	0.10
14	0.00	7.79	15.06	619	7.45	2.00
15	0.00	7.69	14.60	626	4.71	
16	0.00		14.13	635	7.61	
17	0.00	7.56	14.09	830	**4.92**	0.10
19						0.00
20	0.80	7.53	13.97	**1262**	7.15	
21	7.60		14.74	495	9.61	2.50
22	1.70		15.64	502	10.25	
23						0.00
24						0.00
25	3.60		16.55	560	8.95	1.30
26	2.00		16.13	453	8.60	1.00
27	3.40		16.29	501	8.94	0.40
28	**40.70**		17.40	515	10.79	0.10
29						0.00
30						0.00
33						0.00
36	2.00		15.31	459	10.23	
38	21.30		15.00	701	**4.47**	0.10
40	1.70		12.02	**1811**	6.58	0.10
5A	0.80	7.77	13.13	537	**4.78**	1.50
5/20/09						
2	3.40	7.87	18.32	**1397**	11.43	0.10
3	0.70	7.97	16.82	566	10.05	
5	0.70	7.73	15.89	**1226**	6.97	0.20
6	13.10	7.71	17.59	714	**3.76**	
7	12.00	7.86	18.75	682	6.03	
8	3.20	7.63	19.26	442	6.51	0.50
11	2.10	7.96	18.01	718	7.05	0.50
12	1.50	7.48	15.86	**1000**	**2.45**	
14	0.30	7.73	18.98	629	7.48	1.20

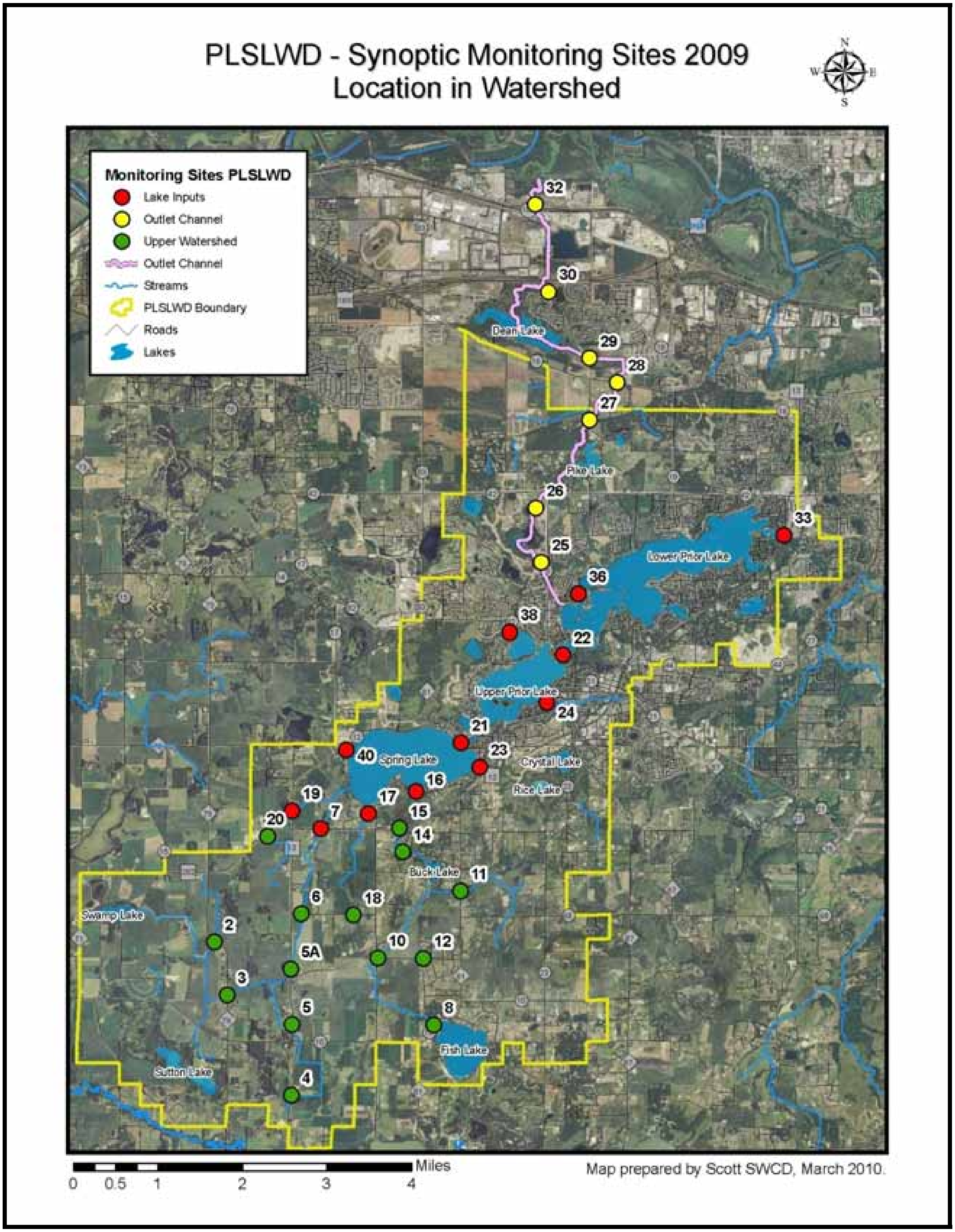
Synoptic Data - Sorted by Date

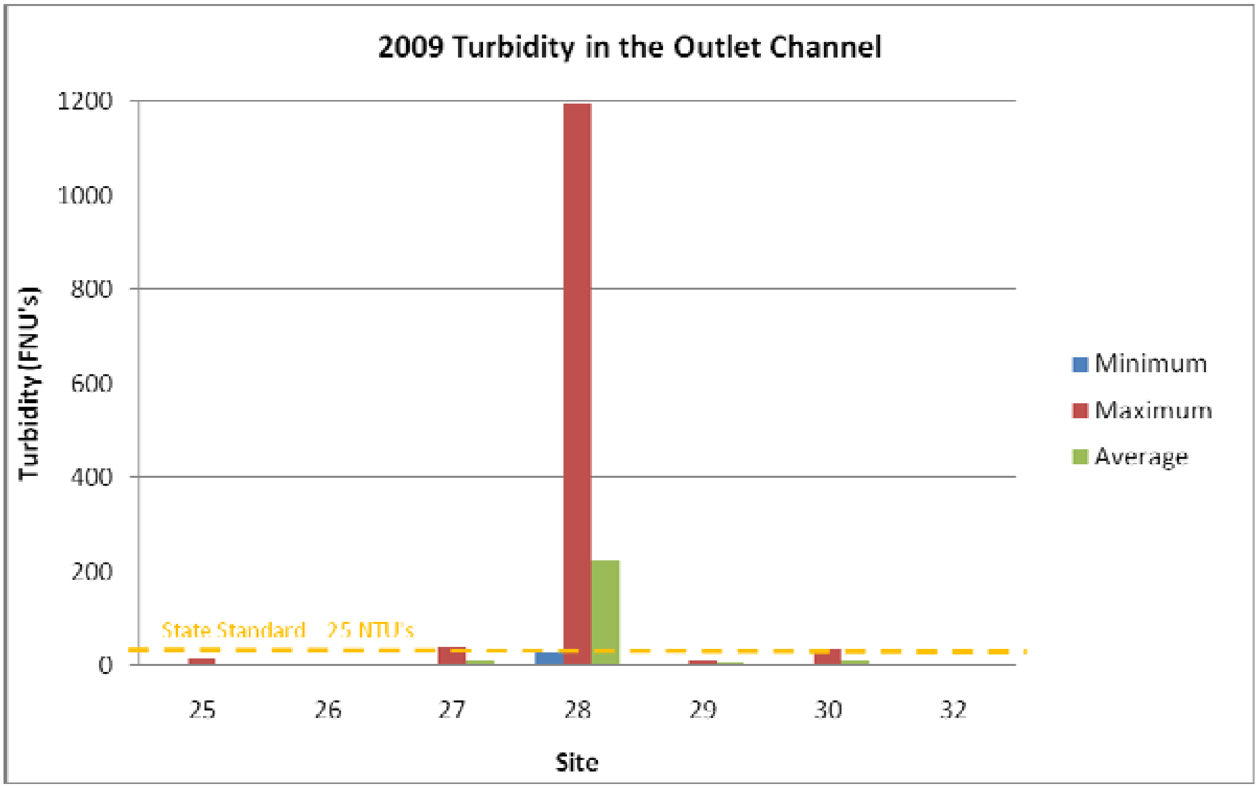
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
15	1.70	7.54	18.15	660	**4.80**	
16						0.00
17						0.00
19						0.00
21	9.60		17.71	500	9.36	2.50
22	3.40		17.42	509	9.62	
23						0.00
24						0.00
25	7.10		19.82	513	11.29	1.50
26	2.90		19.95	421	10.26	0.50
27	4.10		19.62	535	8.49	0.10
28						0.00
29						0.00
30						0.00
31						0.00
32						0.00
33						0.00
36	3.30		18.50	456	10.84	
38	20.90		18.73	796	**4.86**	0.10
40	6.60		15.82	**1664**	8.20	0.10
5A	4.40	7.65	17.61	692	**2.47**	0.30
5/27/09						
2						0.00
3	1.60		13.70	634	**3.41**	
6	**32.20**		14.13	814	**3.54**	0.10
8	0.20		15.77	432	5.87	0.15
10						0.00
12	0.80		12.37	**1076**	**2.69**	0.10
14	0.00		14.70	637	**3.30**	0.30
16						0.00
17	1.80		13.78	**1076**	**1.22**	0.10
18						0.00
19						0.00
20						0.00
21	3.60		17.10	505	9.53	2.00
22	2.70		18.23	500	9.82	

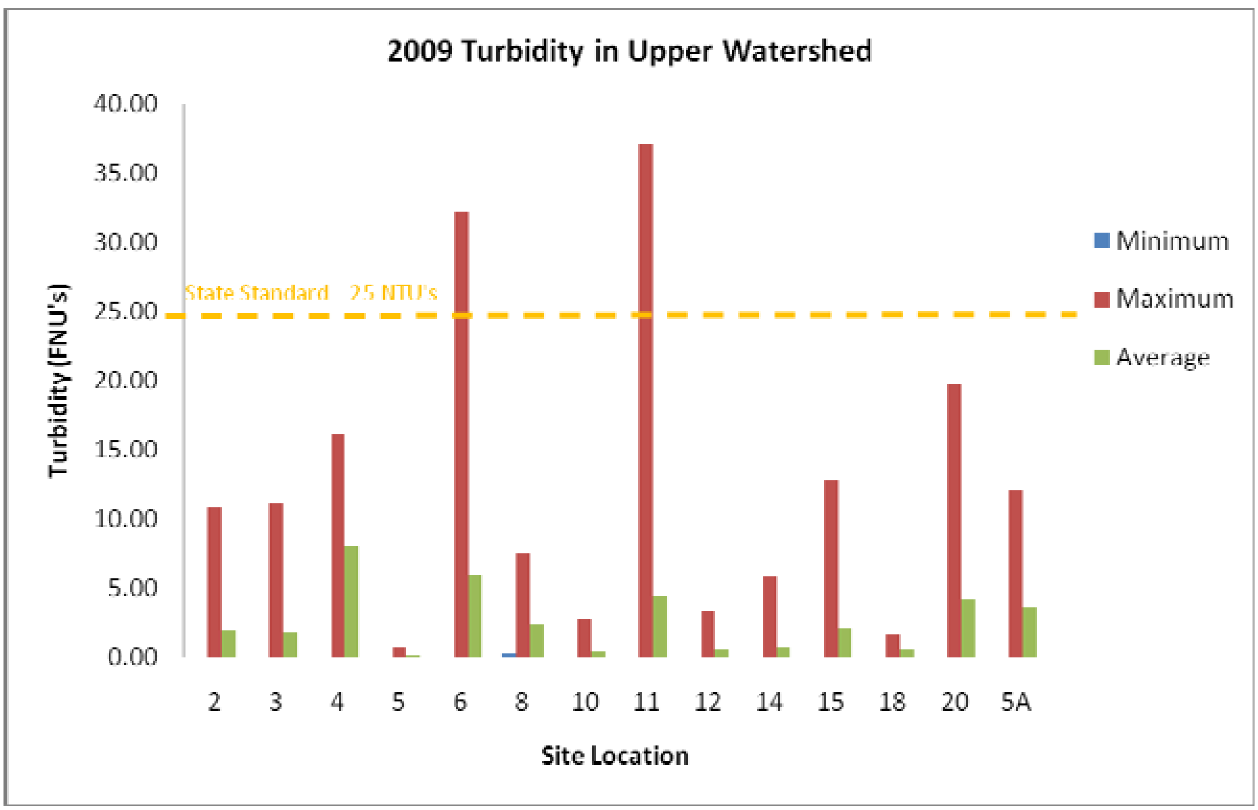
Synoptic Data - Sorted by Date						
Site # & Date Sampled	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
23						0.00
24						0.00
25	2.30		17.27	529	10.85	0.30
26	0.20		17.87	453	7.72	0.10
27						
28						0.00
29						0.00
30						0.00
31						0.00
32						0.00
33						0.00
36	2.90		18.21	465	8.59	
40						0.00
5A	3.70		13.98	798	**3.81**	0.10
6/8/09						
6	8.40		11.45	794	6.76	1.50
8	1.90		12.07	453	3.51	0.10
10						0.00
12	0.00		11.17	**850**	4.42	0.30
14	0.00		12.42	586	6.41	0.25
15						0.00
17	0.00		11.55	814	**3.42**	0.20
18						0.00
21	0.20		16.26	476	7.14	1.00
22						0.00
23						0.00
24						0.00
25						0.00
26						0.00
27						0.00
28						0.00
29						0.00
30						0.00
31						0.00
32						0.00
33						0.00

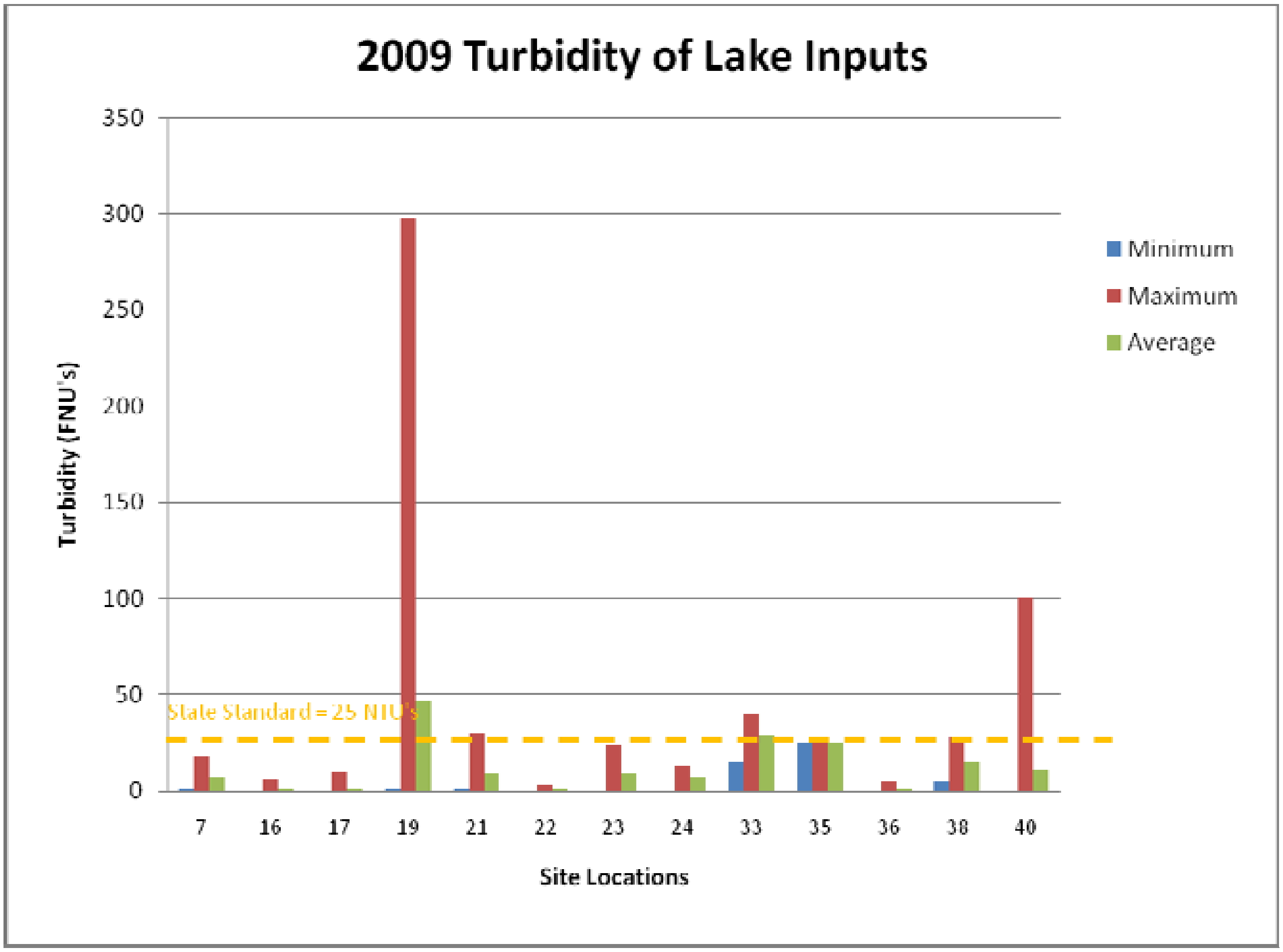
Synoptic Data - Sorted by Date						
Site # & Date Sampled	**Turbidity (FNU)**	**pH (units)**	**Temperature (°C)**	**Specific Conductivity (µs)**	**Dissolved Oxygen (mg/L)**	**Estimated Flow (CFS)**
36	0.60		15.62	465	7.61	
38						0.00
7/1/09						
3						0.00
6	8.30	7.54	17.00	**954**	**3.72**	0.10
14	5.80	7.34	17.84	674	**0.94**	0.20
15	8.80	7.24	17.56	715	**0.48**	
17						0.00
21						0.00
25	2.20	9.02	21.14	540	11.37	0.30
26	2.40	8.64	20.38	566	10.85	0.10
27						0.00
8/10/09						
25	3.40	8.27	26.64	474	6.60	2.00
26						0.00
27						0.00
28						0.00
29						0.00
30	**35.90**	**9.64**	28.08	415	17.03	0.50
31						0.00
32	5.80	7.38	24.26	144	7.39	3.00
8/20/09						
2						
3	4.10		16.02	**1164**	**2.06**	0.20
4						0.00
6	3.50		17.49	**847**	**2.89**	1.50
7	6.50		20.24	611	**0.90**	0.66
8						0.00
10						0.00
12	0.00		18.11	746	**2.53**	0.50
14	0.00		17.28	590	**1.06**	0.50
15	12.70		16.90	576	**1.10**	0.10
17	2.60		16.34	661	**2.03**	0.20
18						0.00
19	23.60		17.59	798	**1.55**	1.00
20	19.70		17.20	678	**1.41**	

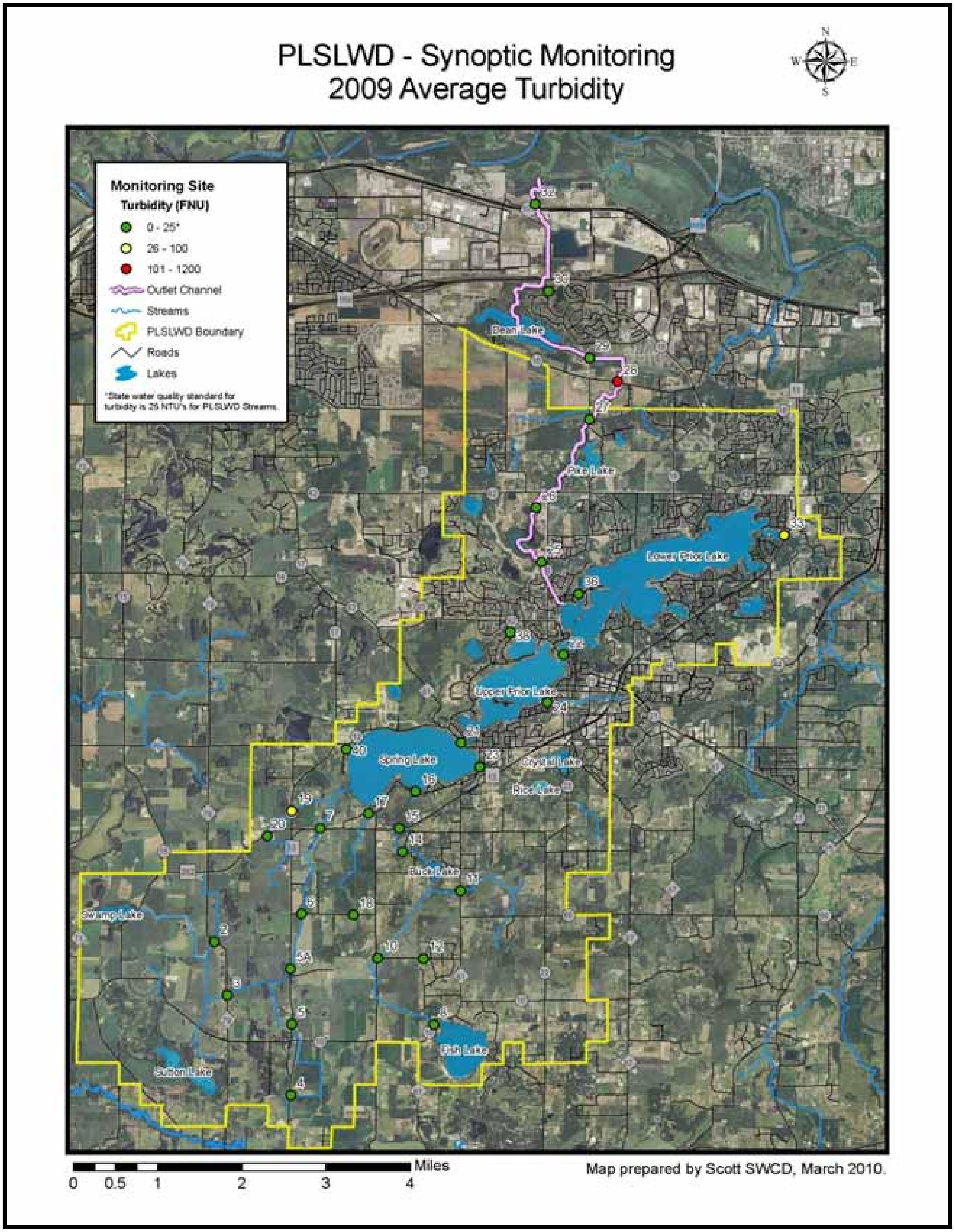
Synoptic Data - Sorted by Date						
Site # & Date Sampled	Turbidity (FNU)	pH (units)	Temperature (°C)	Specific Conductivity (µs)	Dissolved Oxygen (mg/L)	Estimated Flow (CFS)
25	0.70	7.74	19.74	452	5.55	2.10
26	2.80	8.11	20.94	487	6.36	3.00
27	9.30	7.61	19.48	441	**4.54**	0.50
28						
29	6.40	7.70	17.07	590	**4.86**	0.00
36	0.00		21.42	439	6.71	
38	4.60		17.56	493	**4.12**	1.50
40	12.70		17.14	**1153**	5.60	0.15
5A	12.10		17.14	783	**2.31**	0.20
10/6/09						
6	7.40	7.70	9.00	**885**	7.71	1.50
7	18.30	8.06	9.11	755	9.88	2.00
11	**37.10**	7.42	9.12	704	6.51	0.05
14	3.70	7.60	8.92	586	6.30	1.00
16	0.00	7.46	9.26	606	6.80	
17	10.10	7.53	9.43	789	5.00	2.00
19	**297.20**	7.70	9.24	533	5.70	1.50
21	**28.50**	8.15	10.03	61	9.99	0.20
23	24.20	7.67	9.48	310	8.51	1.00
25	9.50	7.69	10.10	327	8.60	2.00
26	2.30	8.04	10.10	492	9.89	0.20
27	11.50	7.74	9.41	416	8.76	0.20
28	**1194.00**	7.92	9.45	208	10.20	2.50
29	3.30	7.97	9.81	592	8.18	0.20
30	4.00	7.68	10.19	371	7.14	3.50
31						0.00
32	2.80	7.68	12.07	711	5.74	0.75
33	14.60	7.73	10.36	123	10.26	
36	5.40	8.21	12.97	444	8.77	
38	7.50	7.40	9.55	511	7.45	1.00
40	**101.10**	7.71	9.64	626	8.69	1.00

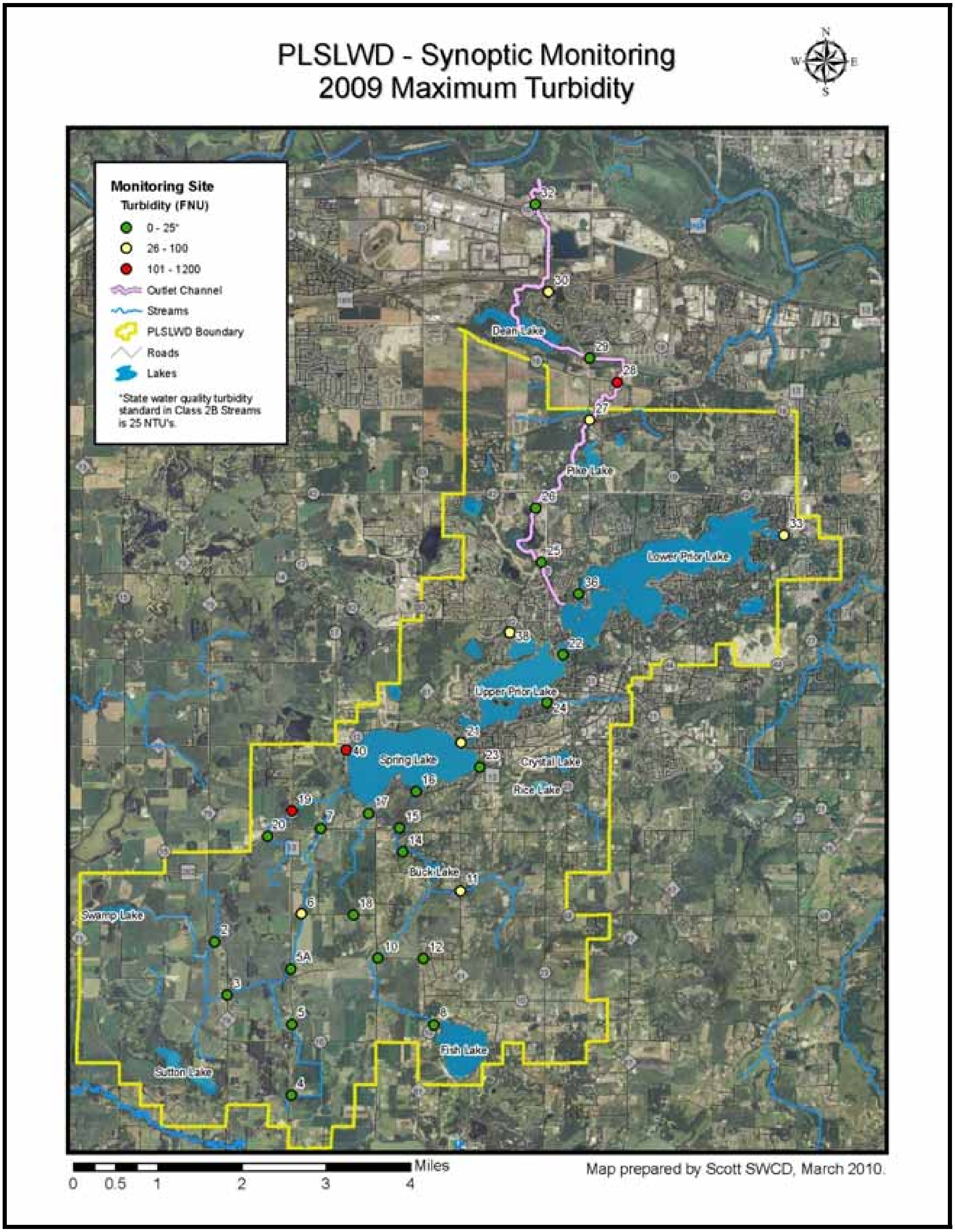

PLSLWD - Synoptic Monitoring Sites 2009
Location in Watershed
Monitoring Sites PLSLWD
Lake Inputs
Outlet Channel
Upper Watershed
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
Dean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

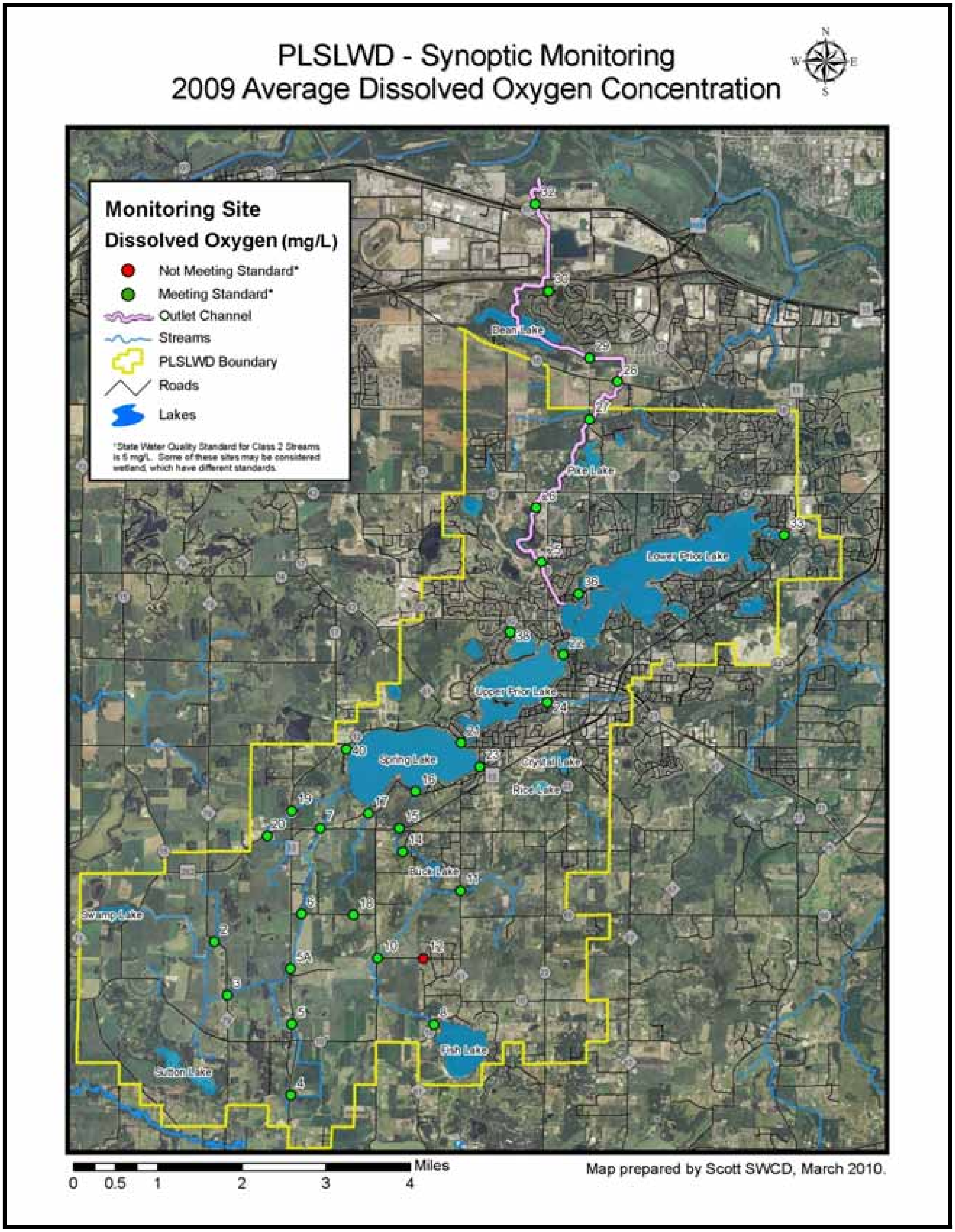

2009 Turbidity in the Outlet Channel
1200
1000
800
600
400
200
0
Turbidity (FNU's)
State Standard 25 NTU's
25
26
27
28
29
30
32
Site
Minimum
Maximum
Average

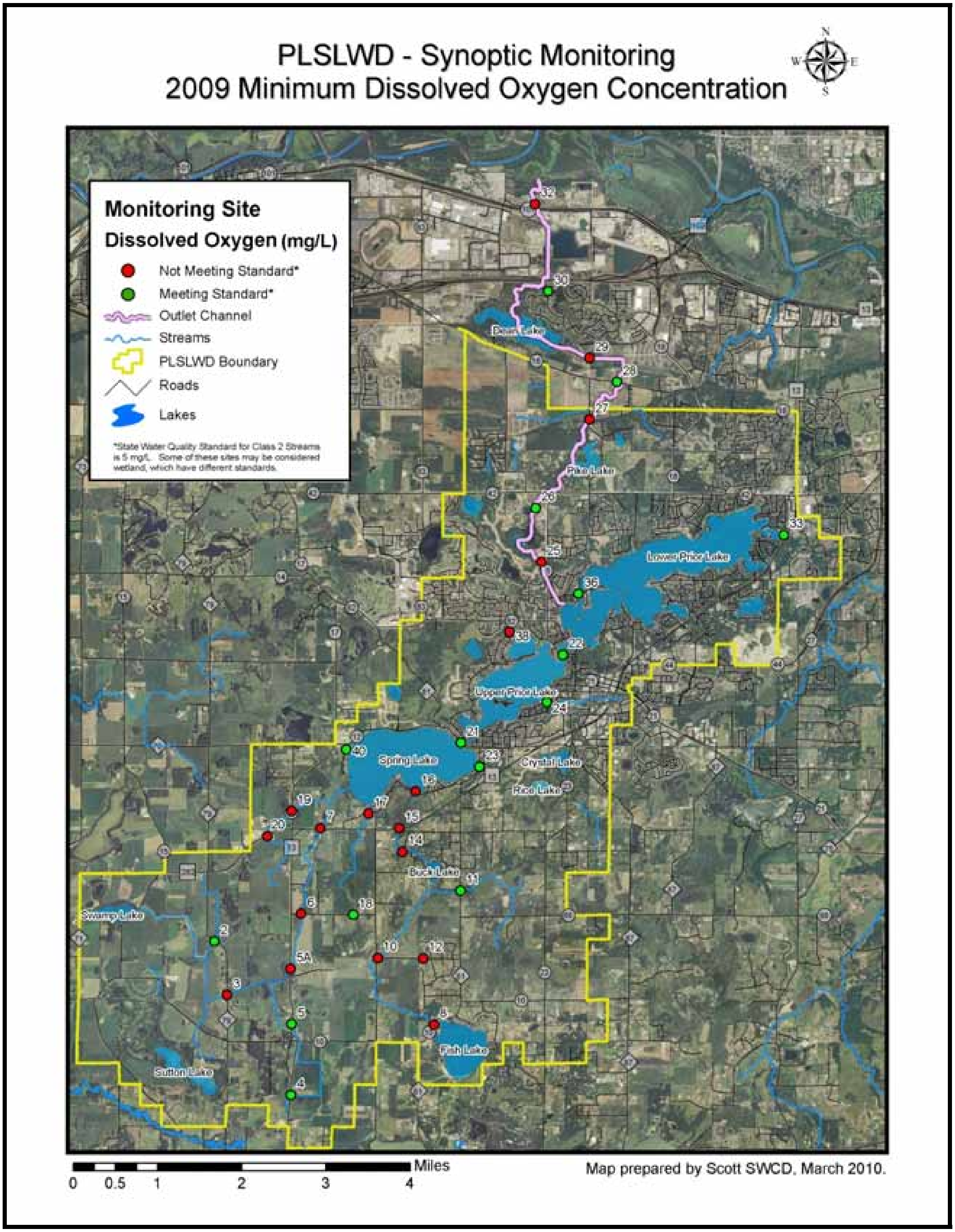

2009 Turbidity in Upper Watershed
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Turbidity (FNU's)
State Standard 25 NTU's
2
3
4
5
6
8
10
11
12
14
15
18
20
5A
Site Location
Minimum
Maximum
Average


2009 Turbidity of Lake Inputs
350
300
250
200
150
100
50
0
Turbidity (FNU's)
State Standard = 25 NTU's
7
16
17
19
21
22
23
24
33
35
36
38
40
Site Locations
Minimum
Maximum
Average

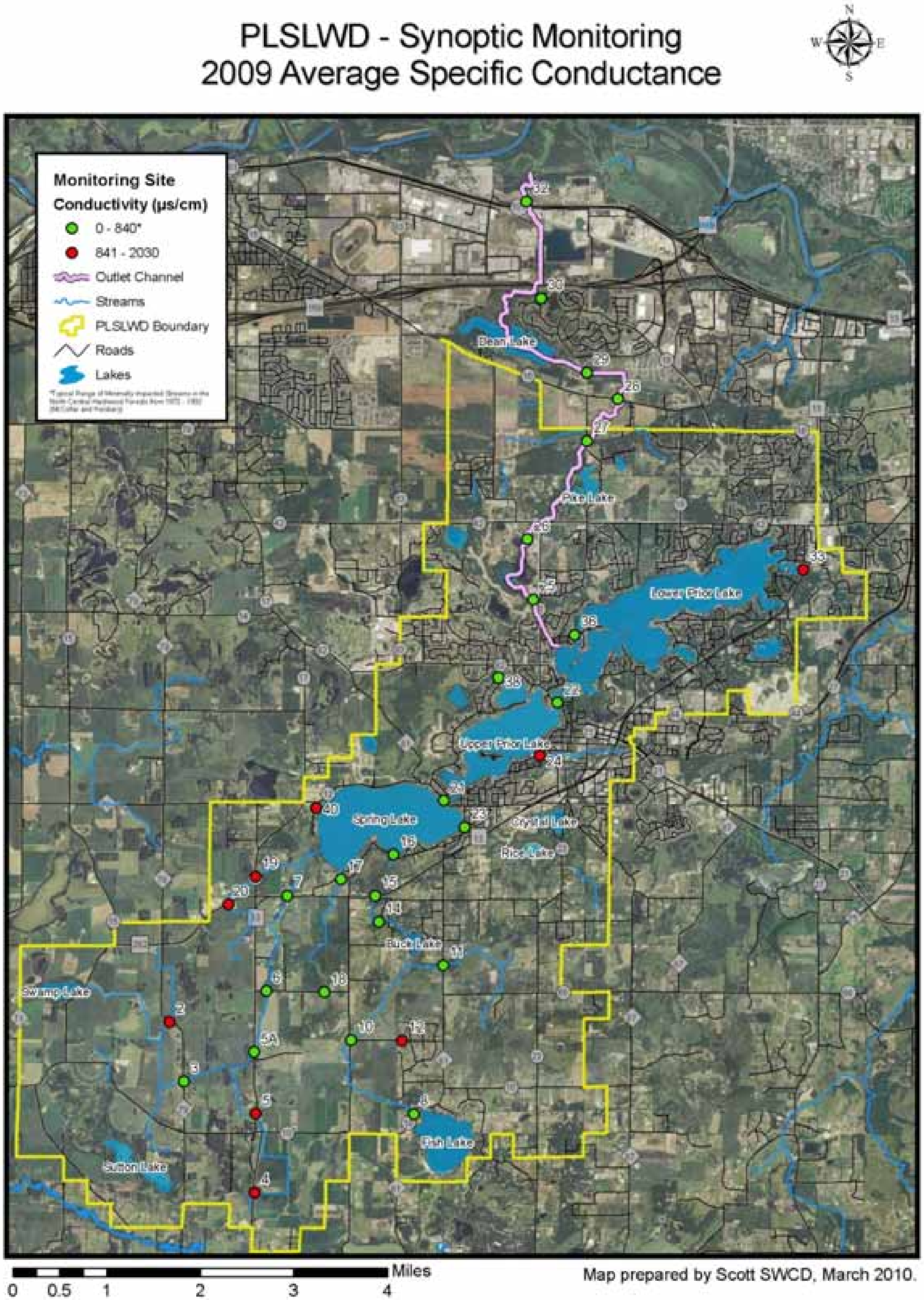

PLSLWD - Synoptic Monitoring
2009 Average Turbidity
Monitoring Site
Turbidity (FNU)
0 - 25*
26 - 100
101 - 1200
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
*State water quality standard for turbidity is 25 NTU's for PLSLWD Streams.
Bean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

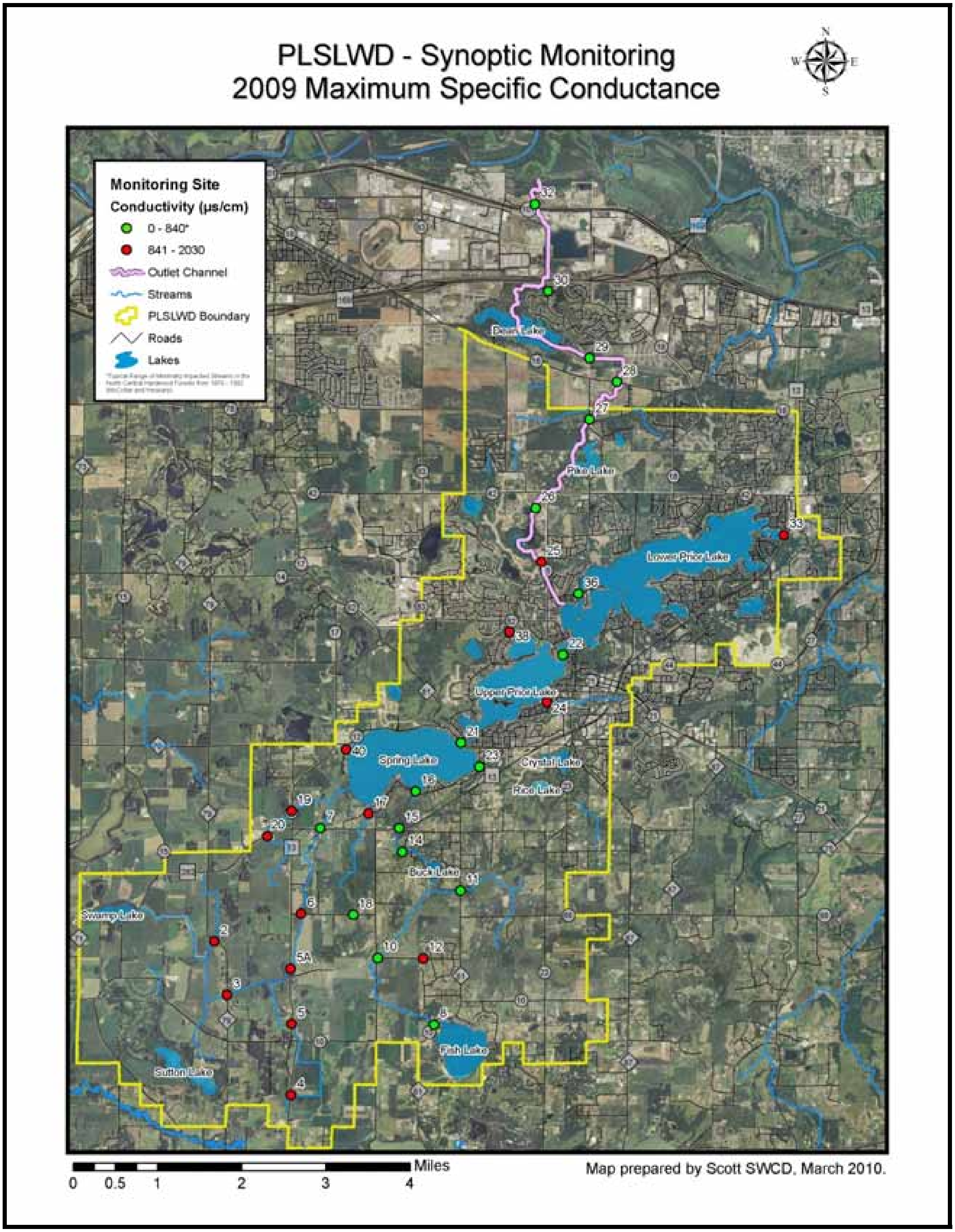

PLSLWD - Synoptic Monitoring
2009 Maximum Turbidity
Monitoring Site
Turbidity (FNU)
0 - 25*
26 - 100
101 - 1200
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
*State water quality turbidity standard in Class 2B Streams is 25 NTU's.
Dean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

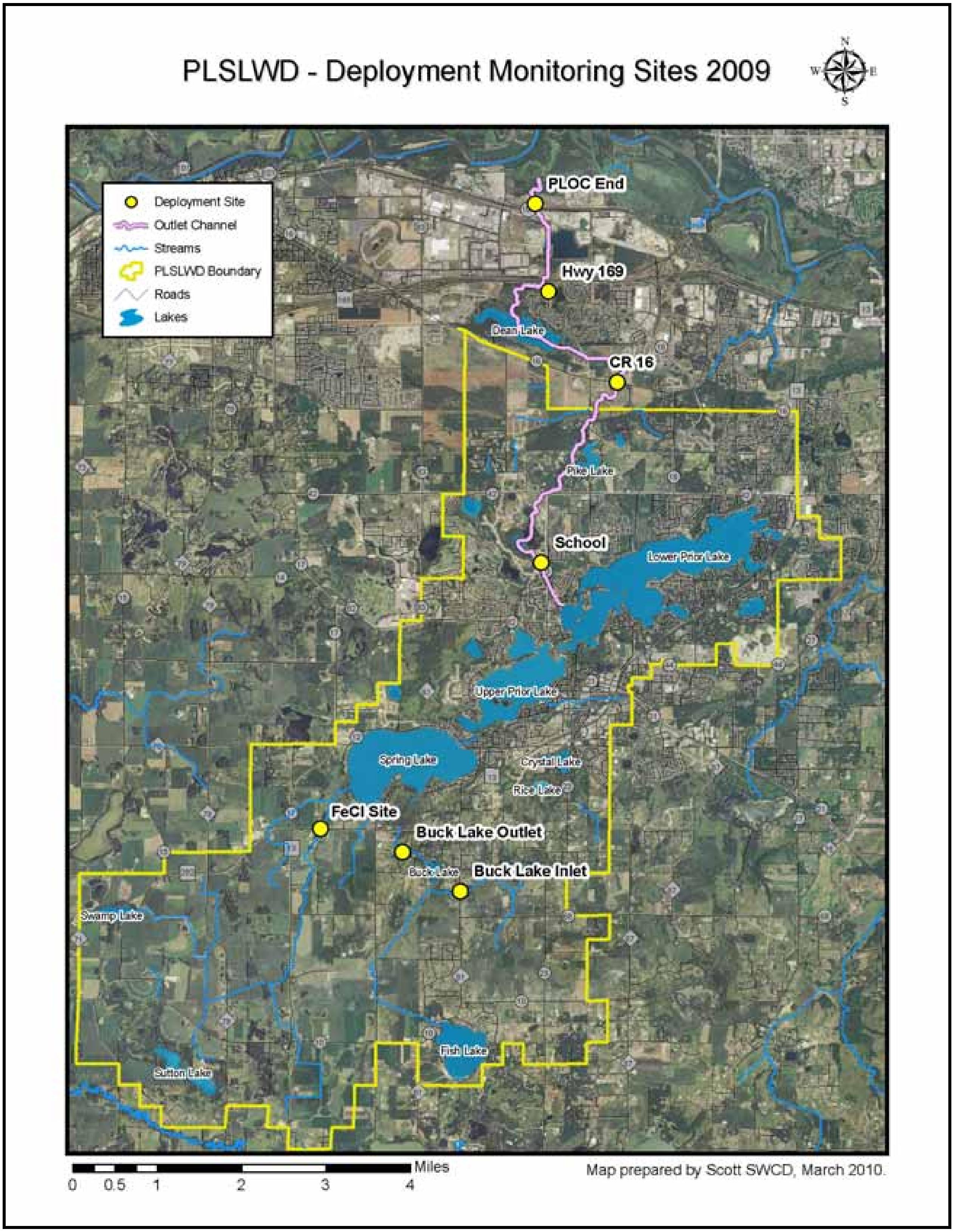

PLSLWD - Synoptic Monitoring
2009 Average Dissolved Oxygen Concentration
Monitoring Site
Dissolved Oxygen (mg/L)
Not Meeting Standard*
Meeting Standard*
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
*State Water Quality Standard for Class 2 Streams is 5 mg/L. Some of these sites may be considered wetland, which have different standards.
Bean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

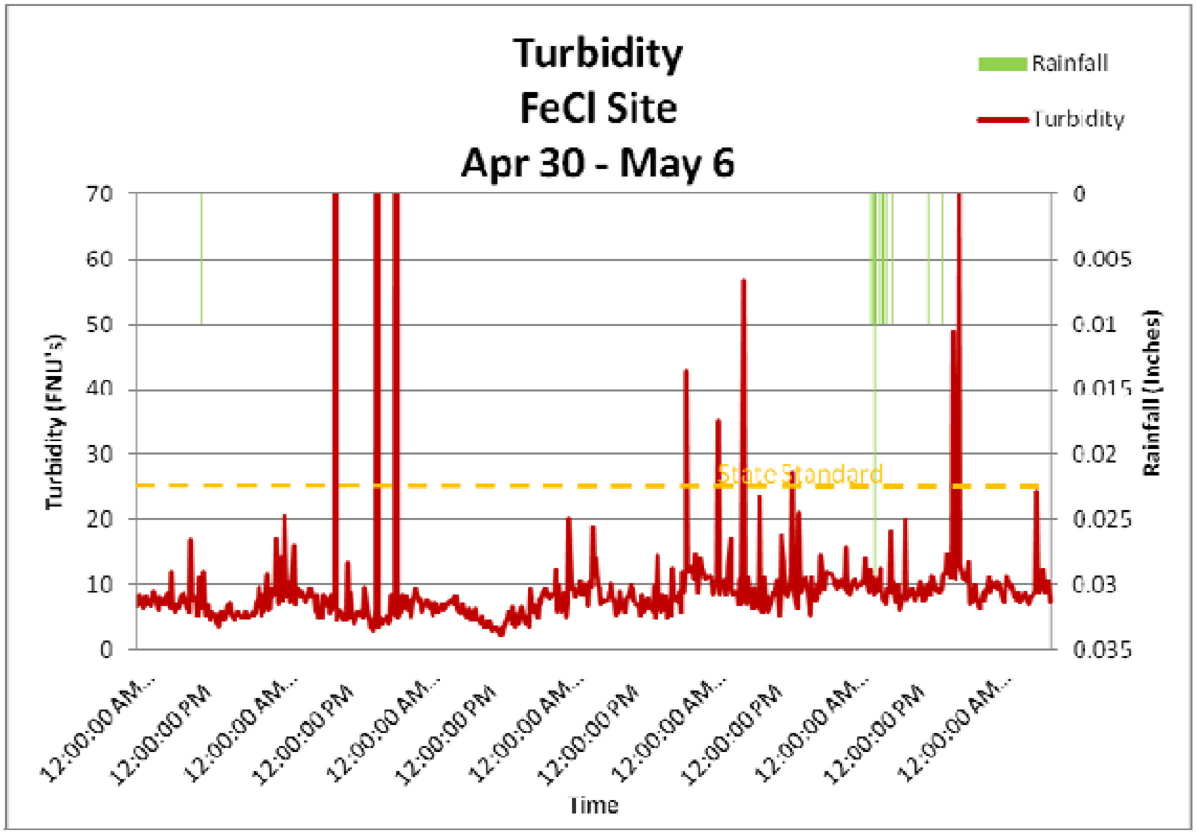

PLSLWD - Synoptic Monitoring
2009 Minimum Dissolved Oxygen Concentration
N
S
W
E
Monitoring Site
Dissolved Oxygen (mg/L)
Not Meeting Standard*
Meeting Standard*
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
*State Water Quality Standard for Class 2 Streams is 5 mg/L. Some of these sites may be considered wetland, which have different standards.
Dean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

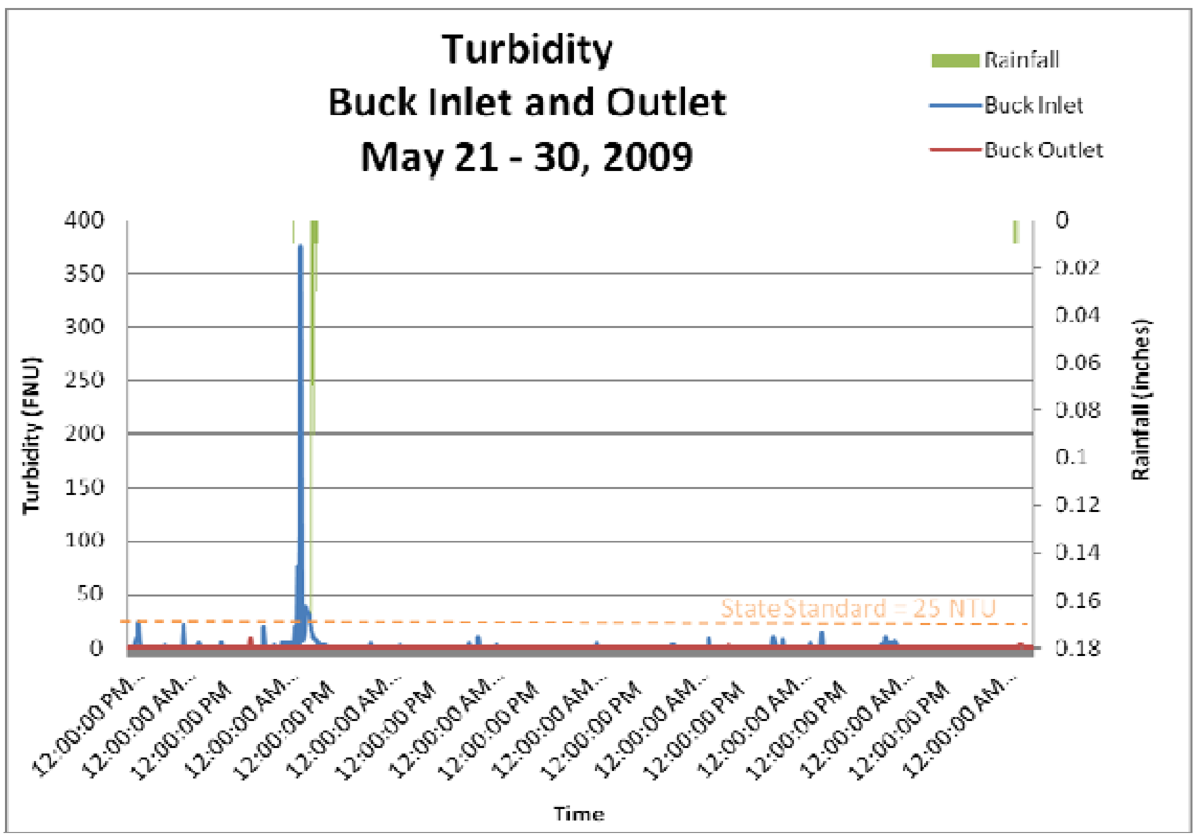
PLSLWD - Synoptic Monitoring
2009 Average Specific Conductance

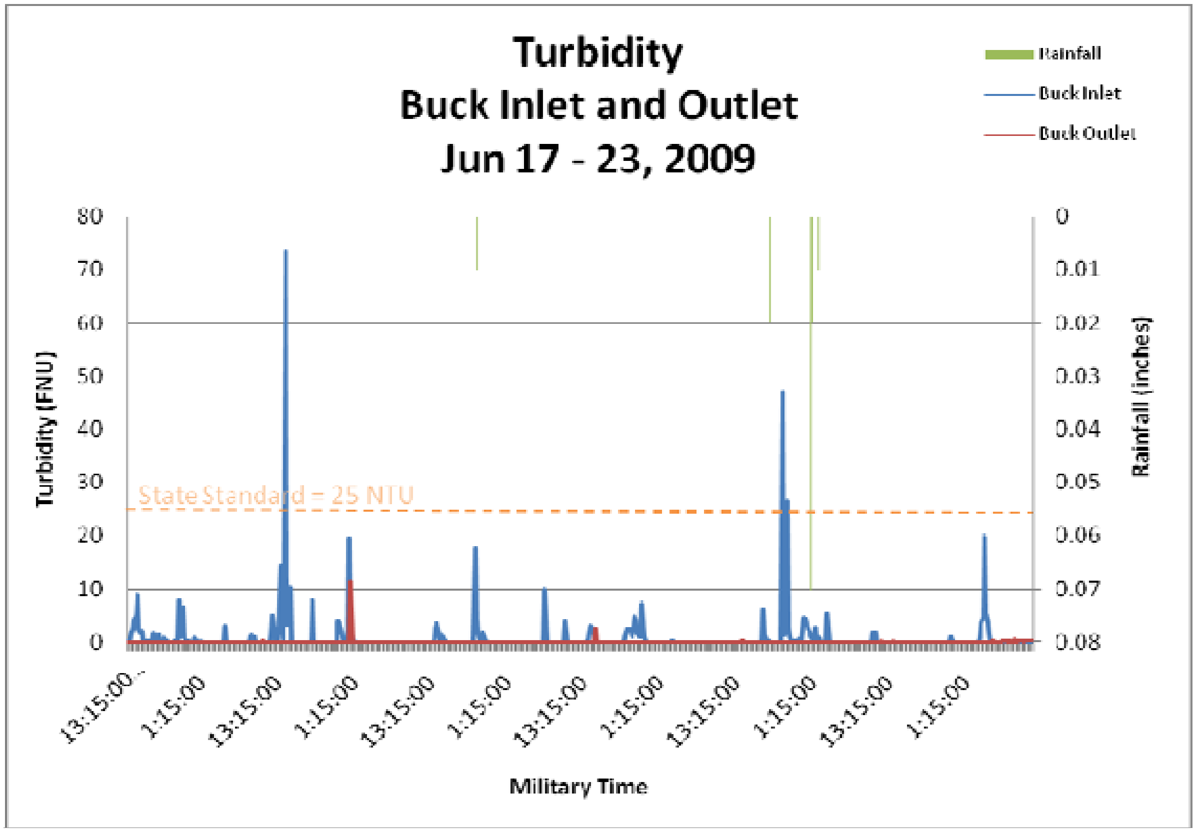


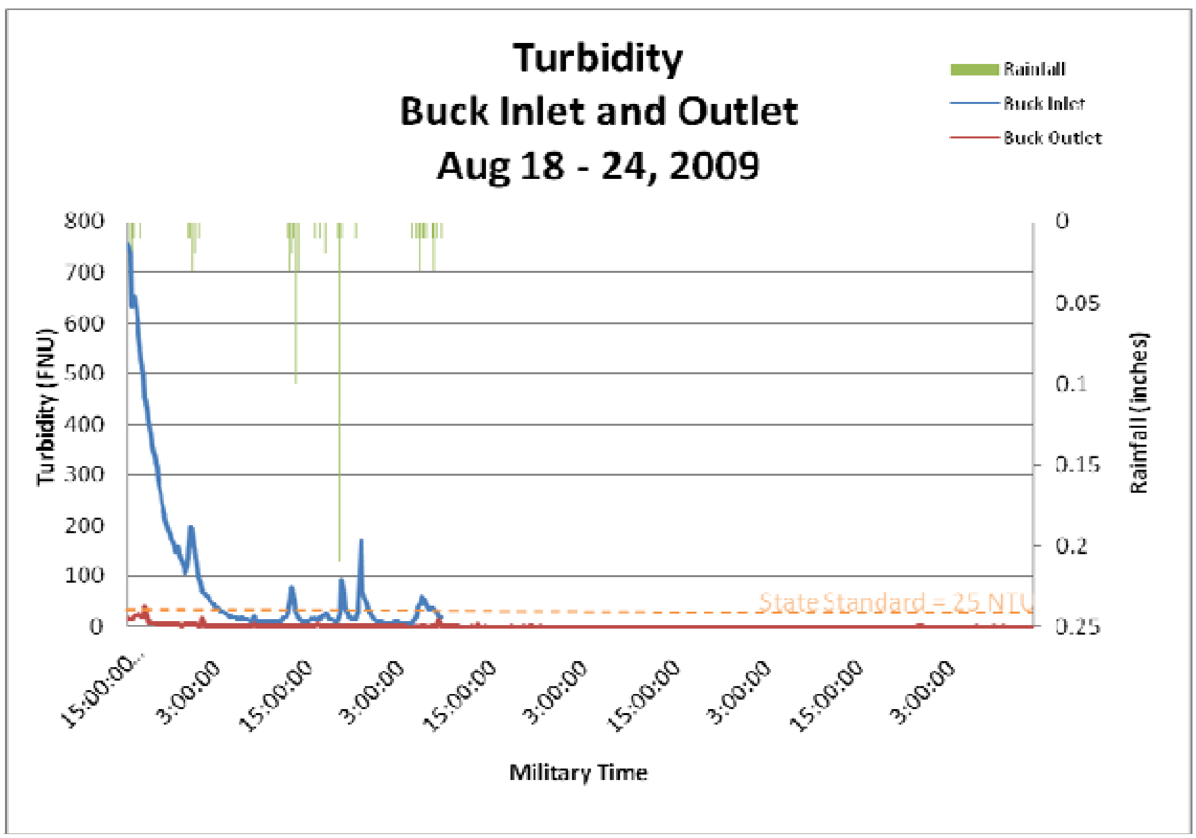

PLSLWD - Synoptic Monitoring
2009 Maximum Specific Conductance
Monitoring Site
Conductivity (µs/cm)
0 - 840*
841 - 2030
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
Dean Lake
Pike Lake
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
Buck Lake
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

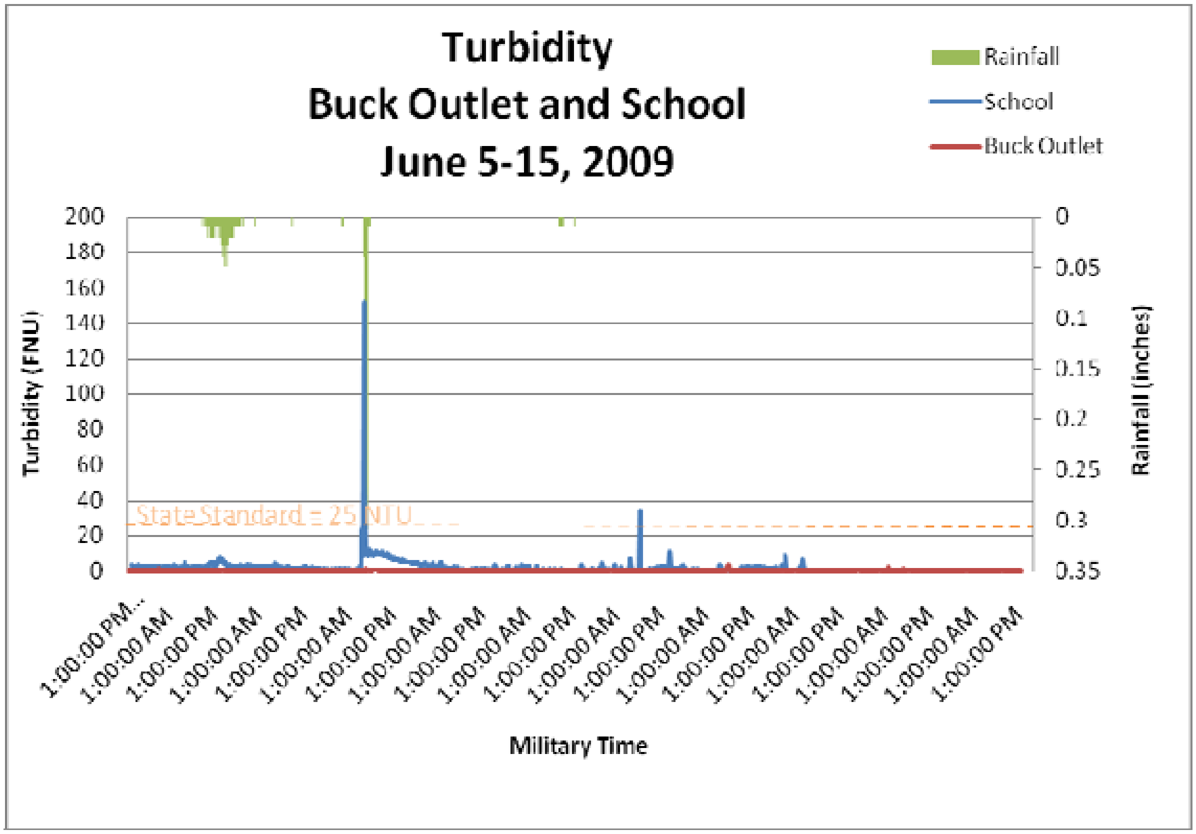

PLSLWD - Deployment Monitoring Sites 2009
N
W
E
S
Deployment Site
Outlet Channel
Streams
PLSLWD Boundary
Roads
Lakes
PLOC End
Hwy 169
Dean Lake
CR 16
Pike Lake
School
Lower Prior Lake
Upper Prior Lake
Spring Lake
Crystal Lake
Rice Lake
FeCl Site
Buck Lake Outlet
Buck Lake
Buck Lake Inlet
Swamp Lake
Fish Lake
Sutton Lake
Miles
0 0.5 1 2 3 4
Map prepared by Scott SWCD, March 2010.

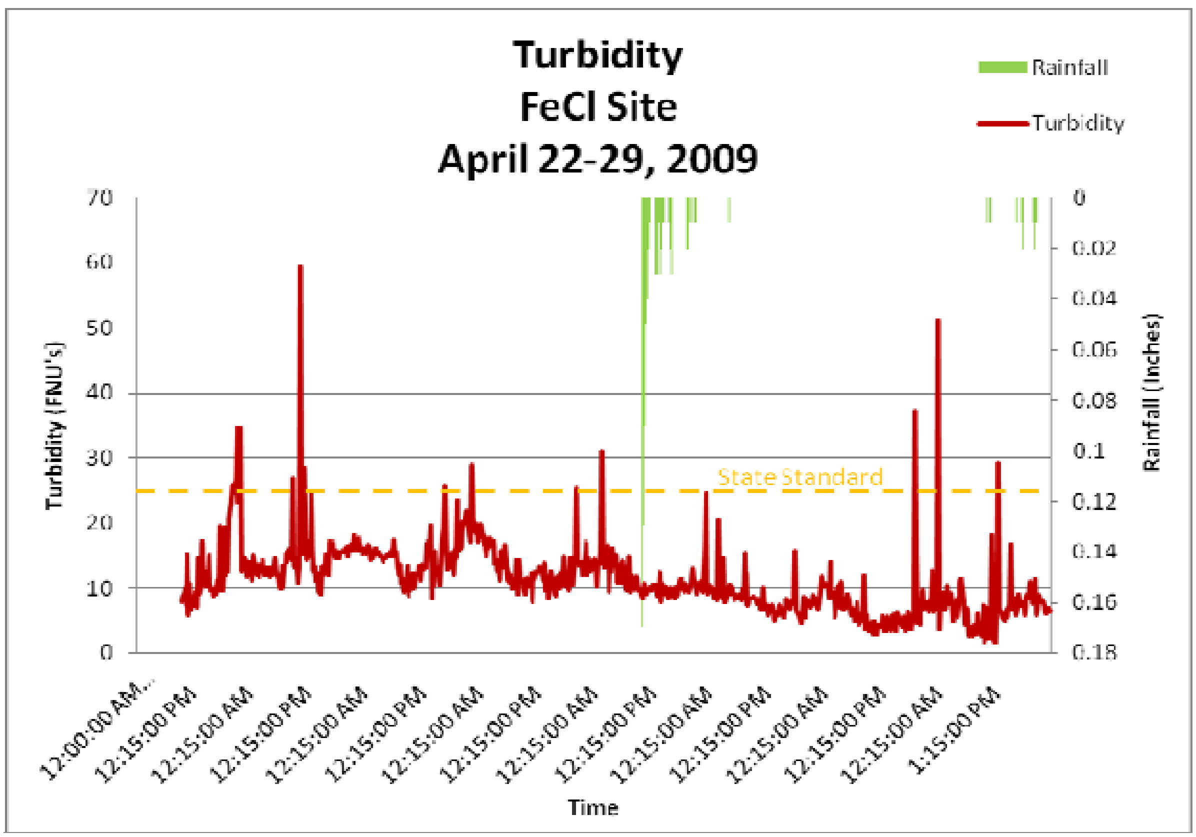

Turbidity
FeCl Site
Apr 30 - May 6
Rainfall
Turbidity
State Standard
Turbidity (FNU's)
Rainfall (Inches)
70
60
50
40
30
20
10
0
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
12:00:00 AM...
12:00:00 PM
Time

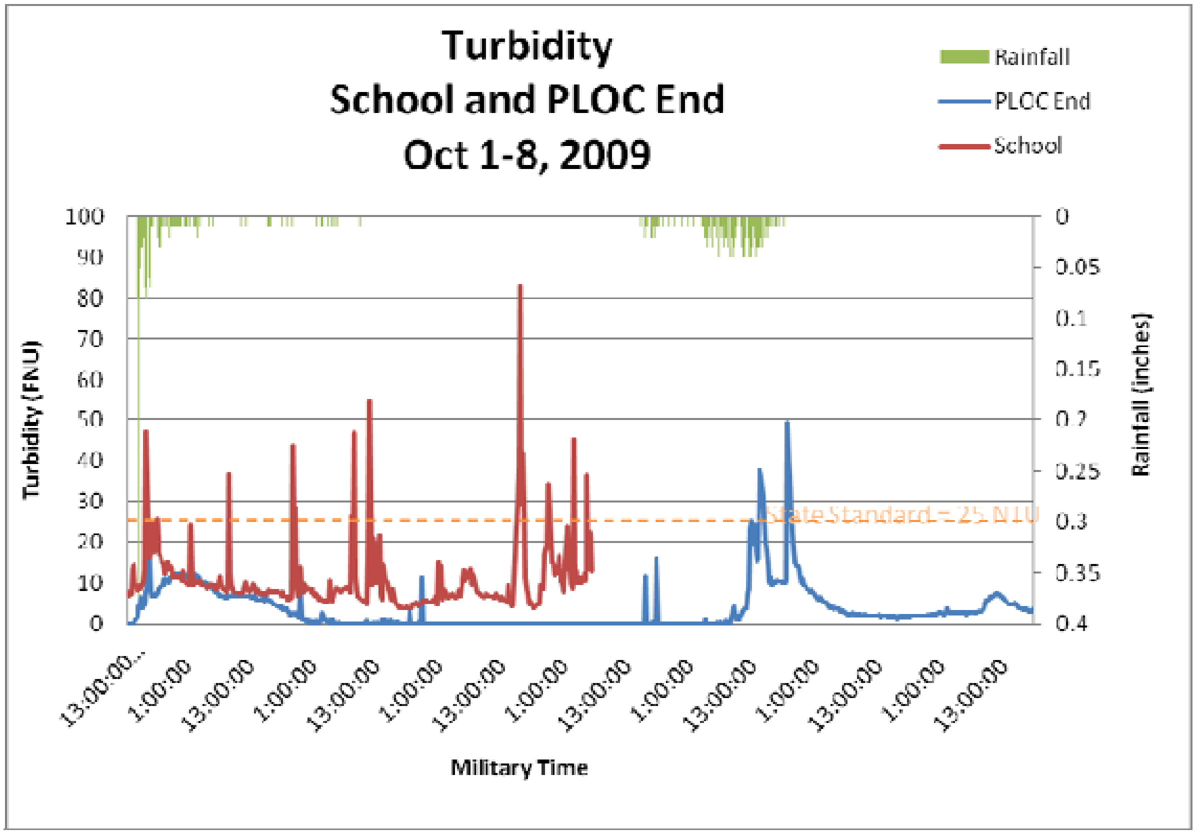

Turbidity
Buck Inlet and Outlet
May 21 - 30, 2009
Rainfall
Buck Inlet
Buck Outlet
State Standard = 25 NTU
Turbidity (FNU)
Rainfall (inches)
400
350
300
250
200
150
100
50
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
12:00:00 PM...
12:00:00 AM...
12:00:00 PM
Time

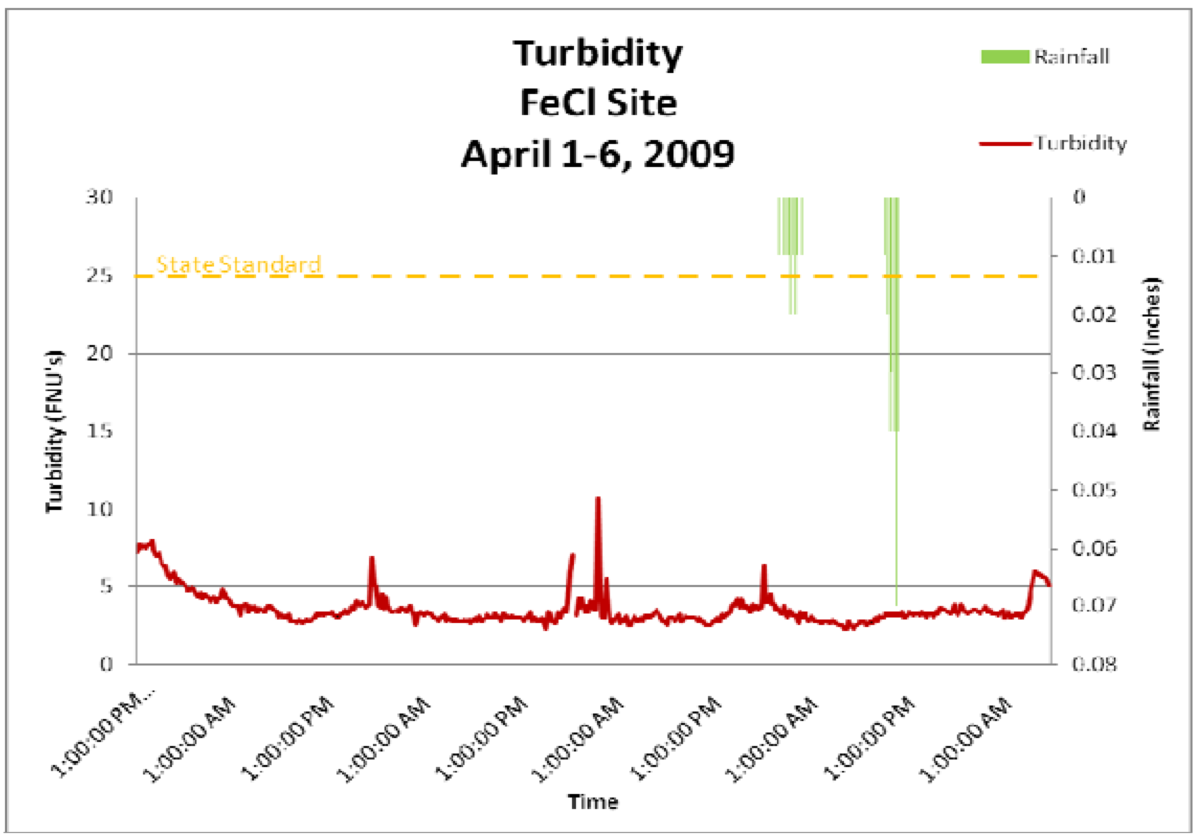

Turbidity
Buck Inlet and Outlet
Jun 17 - 23, 2009
Rainfall
Buck Inlet
Buck Outlet
Turbidity (FNU)
Rainfall (inches)
State Standard = 25 NTU
80
70
60
50
40
30
20
10
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
Military Time

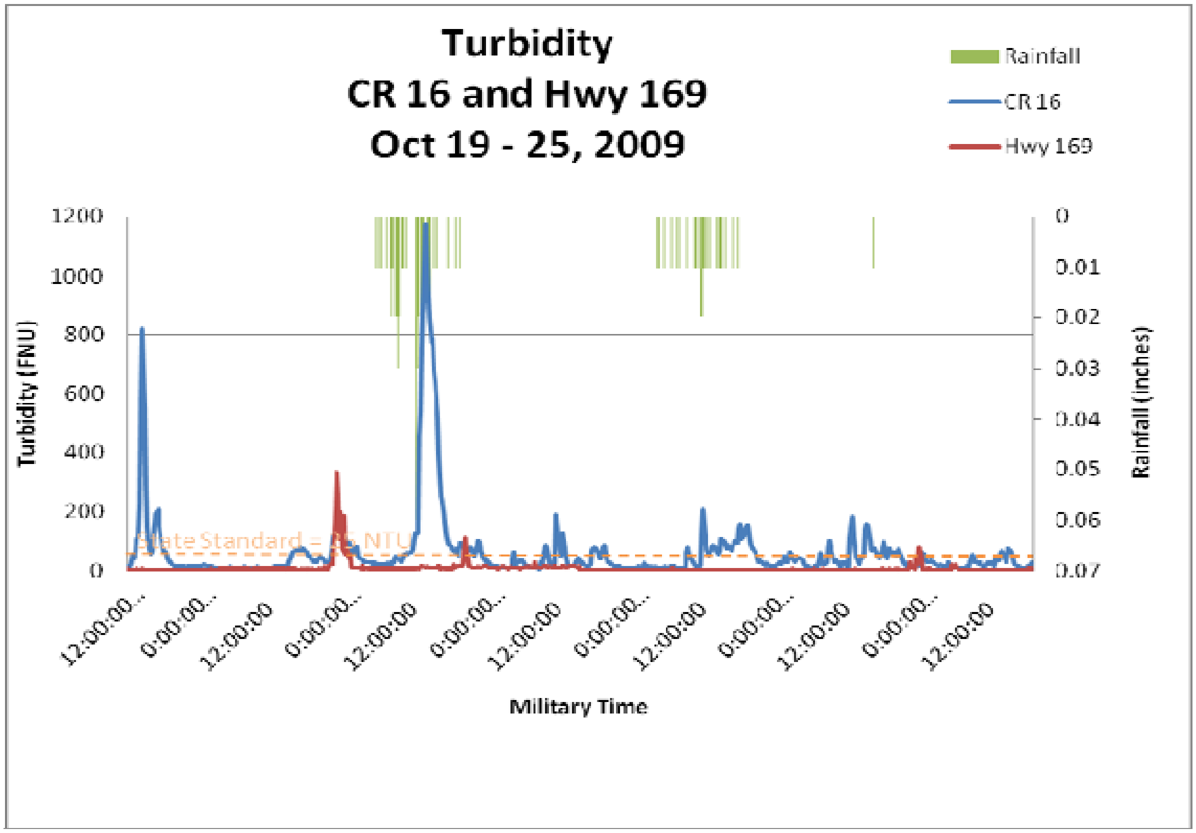

Turbidity
Buck Inlet and Outlet
Aug 18 - 24, 2009
Rainfall
Buck Inlet
Buck Outlet
Turbidity (FNU)
Rainfall (inches)
State Standard = 25 NTU
800
700
600
500
400
300
200
100
0
0
0.05
0.1
0.15
0.2
0.25
15:00:00
3:00:00
15:00:00
3:00:00
15:00:00
3:00:00
15:00:00
3:00:00
15:00:00
3:00:00
Military Time

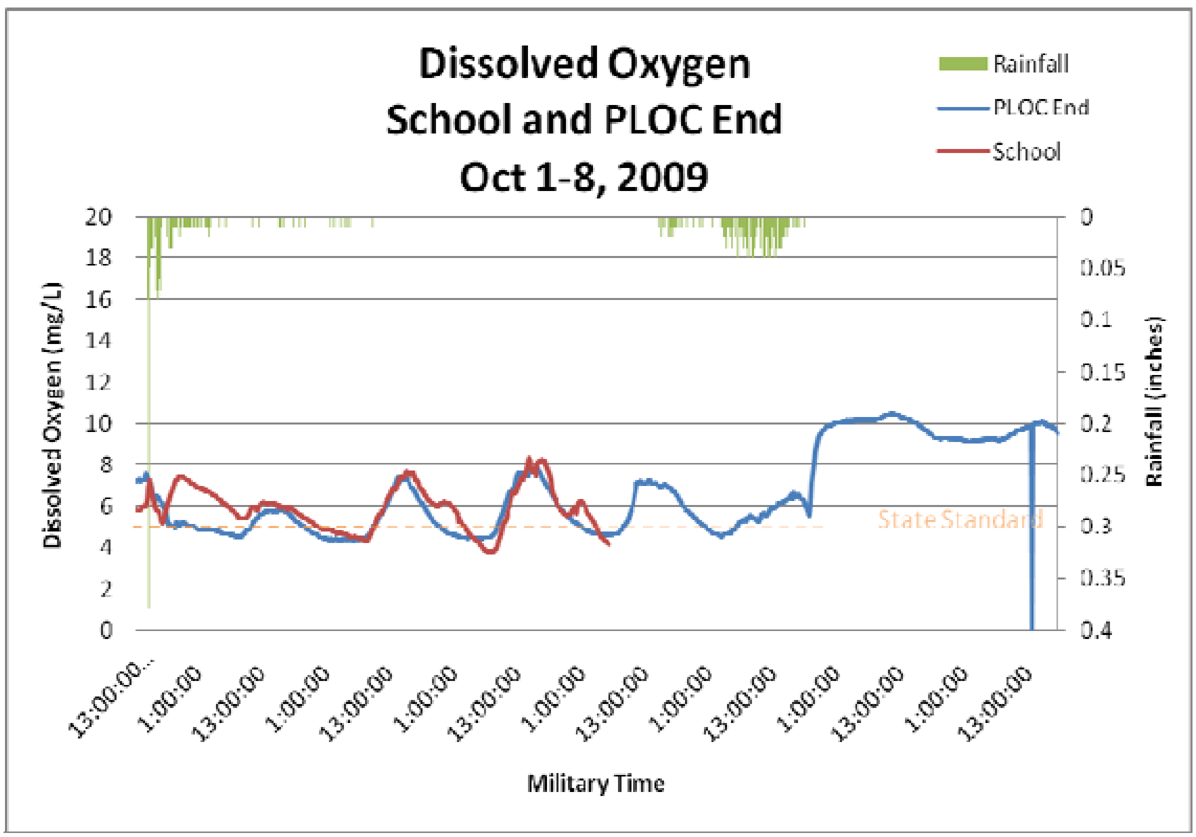

Turbidity
Buck Outlet and School
June 5-15, 2009
Rainfall
School
Buck Outlet
State Standard = 25 NTU
Turbidity (FNU)
Rainfall (inches)
Military Time
200
180
160
140
120
100
80
60
40
20
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
1:00:00 PM...
1:00:00 AM
1:00:00 PM

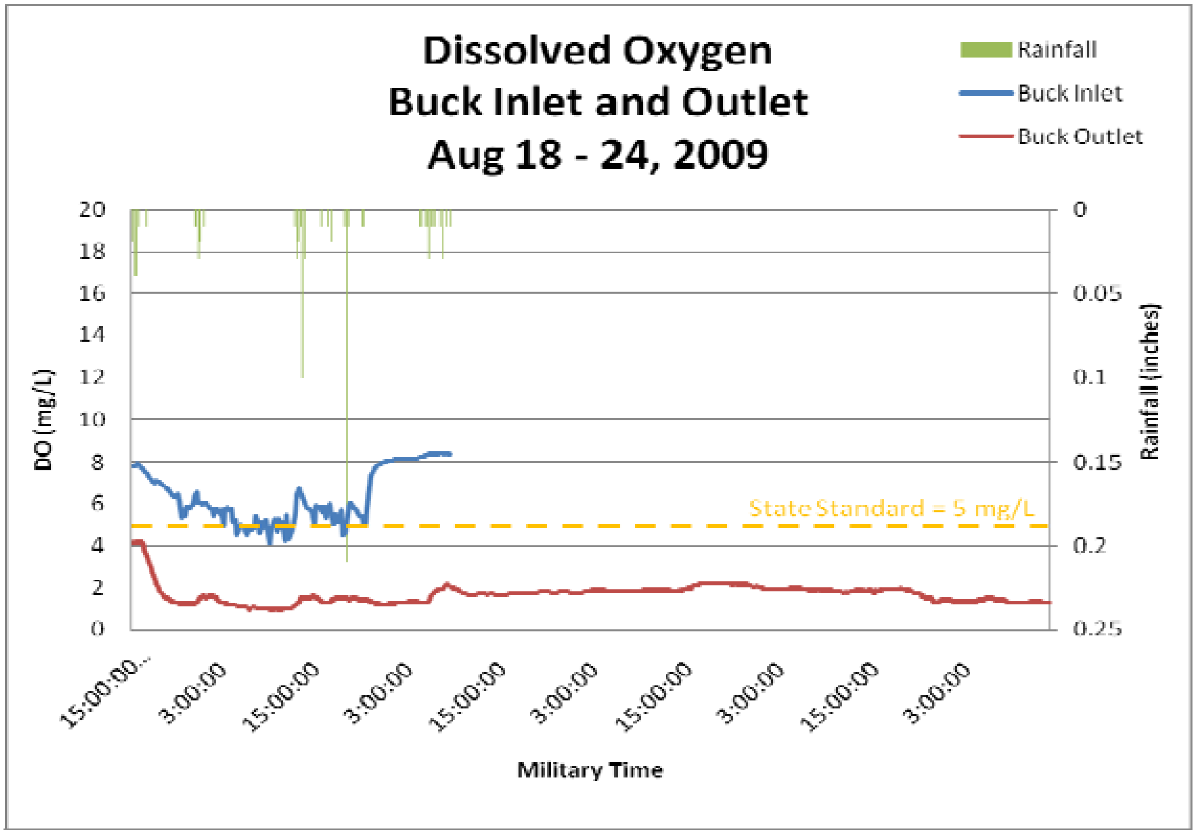

Turbidity
FeCl Site
April 22-29, 2009
Rainfall
Turbidity
State Standard
Turbidity (FNU's)
Rainfall (Inches)
Time
70
60
50
40
30
20
10
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
12:00:00 AM...
12:15:00 PM
12:15:00 AM
1:15:00 PM

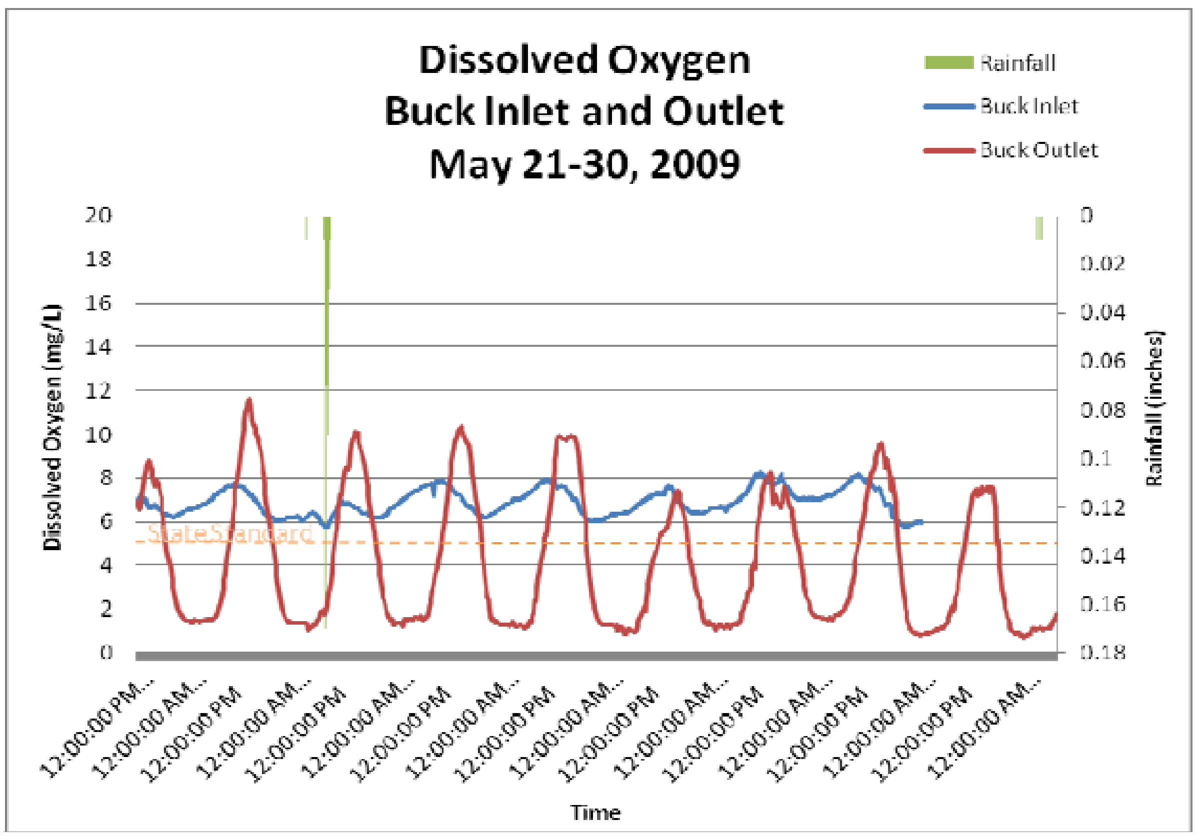

Turbidity
School and PLOC End
Oct 1-8, 2009
Rainfall
PLOC End
School
Turbidity (FNU)
Rainfall (inches)
State Standard = 25 NTU
Military Time
100
90
80
70
60
50
40
30
20
10
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
13:00:00...
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00

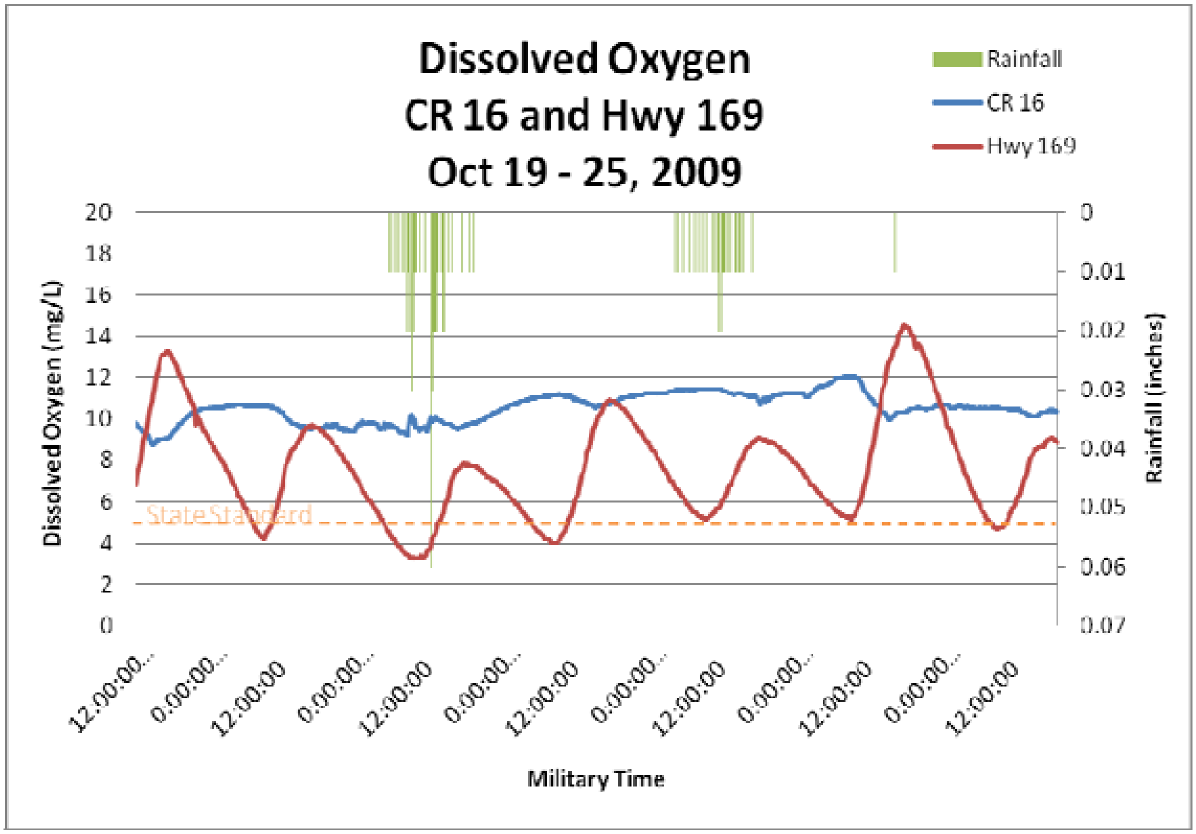

Turbidity
FeCl Site
April 1-6, 2009
Rainfall
Turbidity
State Standard
Turbidity (FNU's)
Rainfall (inches)
Time
30
25
20
15
10
5
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
1:00:00 PM...
1:00:00 AM
1:00:00 PM
1:00:00 AM
1:00:00 PM
1:00:00 AM
1:00:00 PM
1:00:00 AM
1:00:00 PM
1:00:00 AM

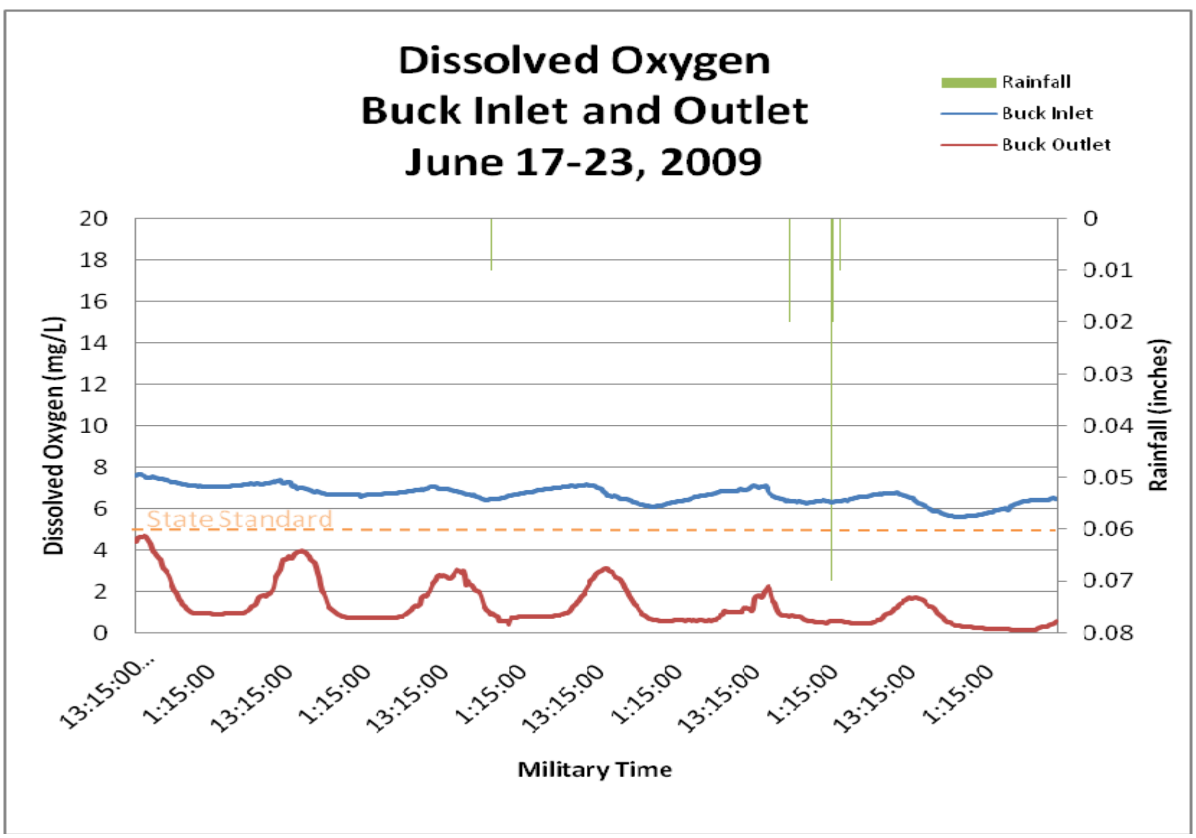

Turbidity
CR 16 and Hwy 169
Oct 19 - 25, 2009
Rainfall
CR 16
Hwy 169
Turbidity (FNU)
Rainfall (inches)
State Standard = 25 NTU
Military Time

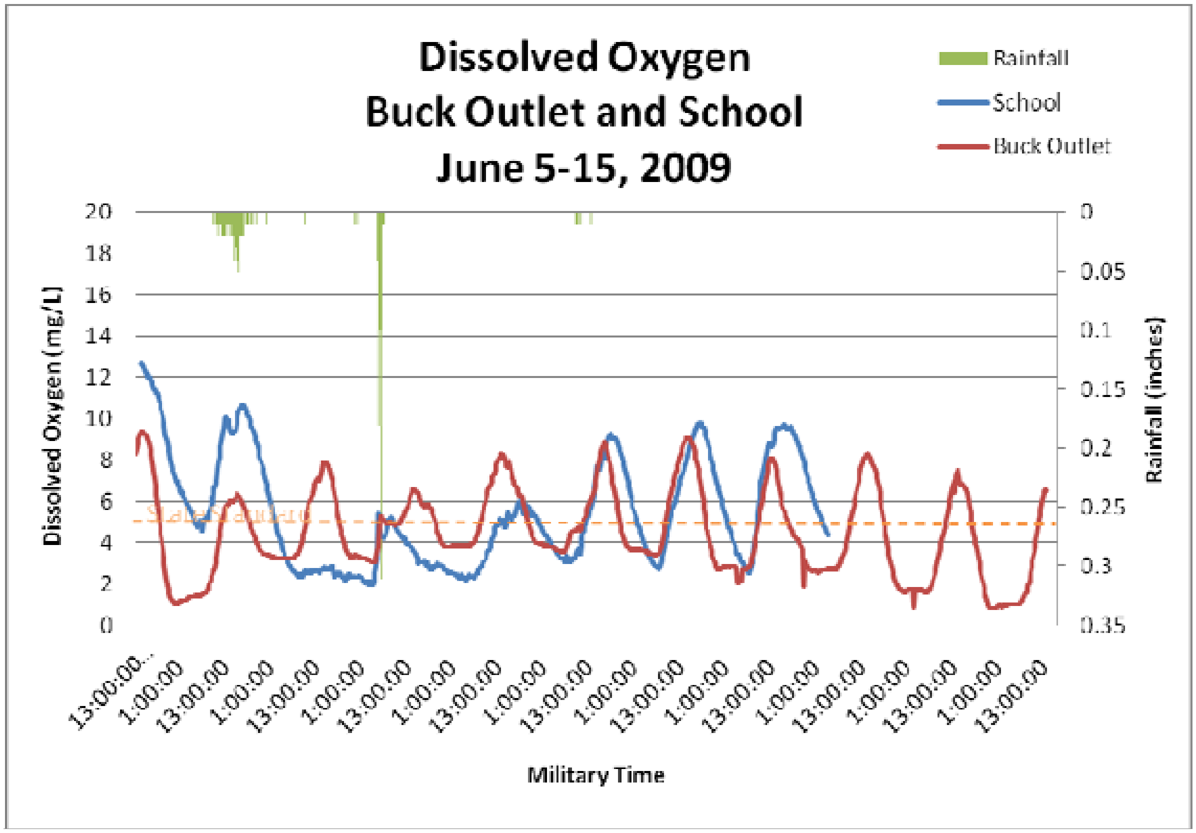

Dissolved Oxygen
School and PLOC End
Oct 1-8, 2009
Rainfall
PLOC End
School
Dissolved Oxygen (mg/L)
Rainfall (inches)
State Standard
Military Time

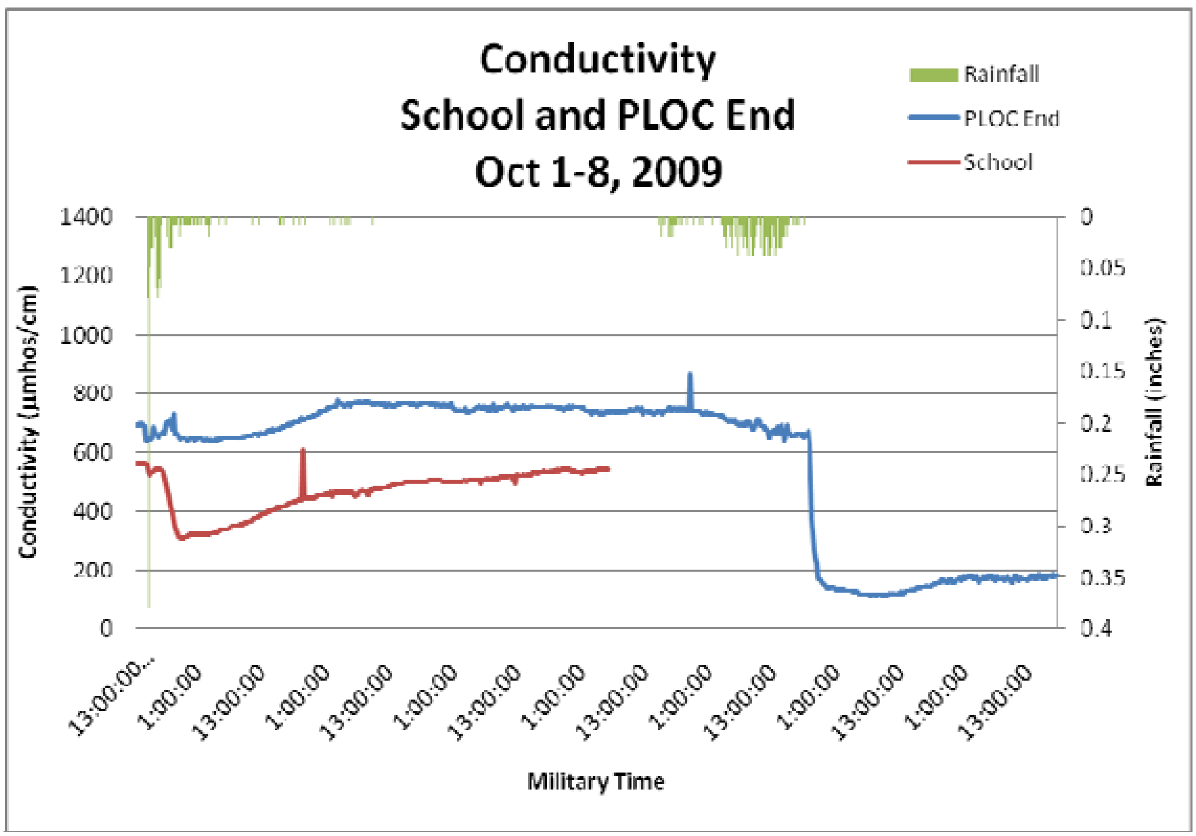

Dissolved Oxygen
Buck Inlet and Outlet
Aug 18 - 24, 2009
Rainfall
Buck Inlet
Buck Outlet
DO (mg/L)
Rainfall (inches)
State Standard = 5 mg/L
Military Time
15:00:00...
3:00:00
15:00:00

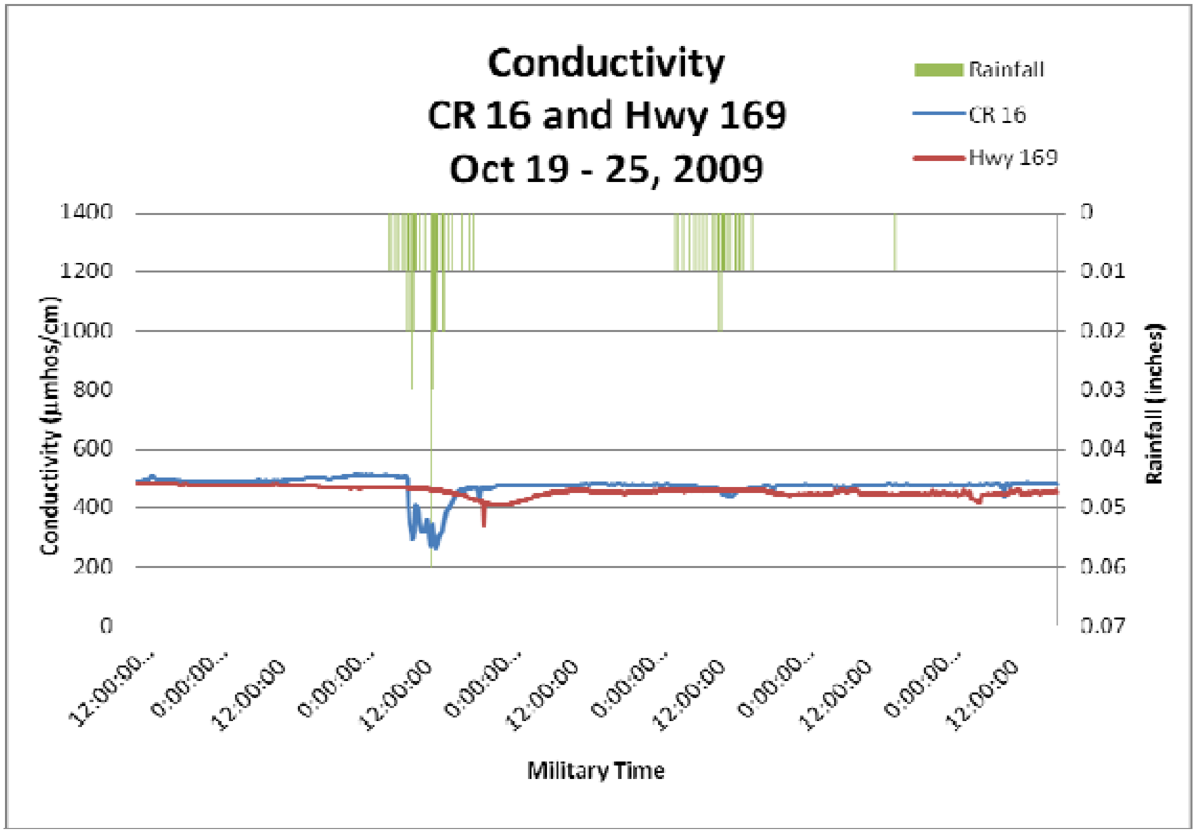

Dissolved Oxygen
Buck Inlet and Outlet
May 21-30, 2009
Rainfall
Buck Inlet
Buck Outlet
Dissolved Oxygen (mg/L)
Rainfall (inches)
State Standard
Time
12:00:00 PM...
12:00:00 AM...
12:00:00 PM

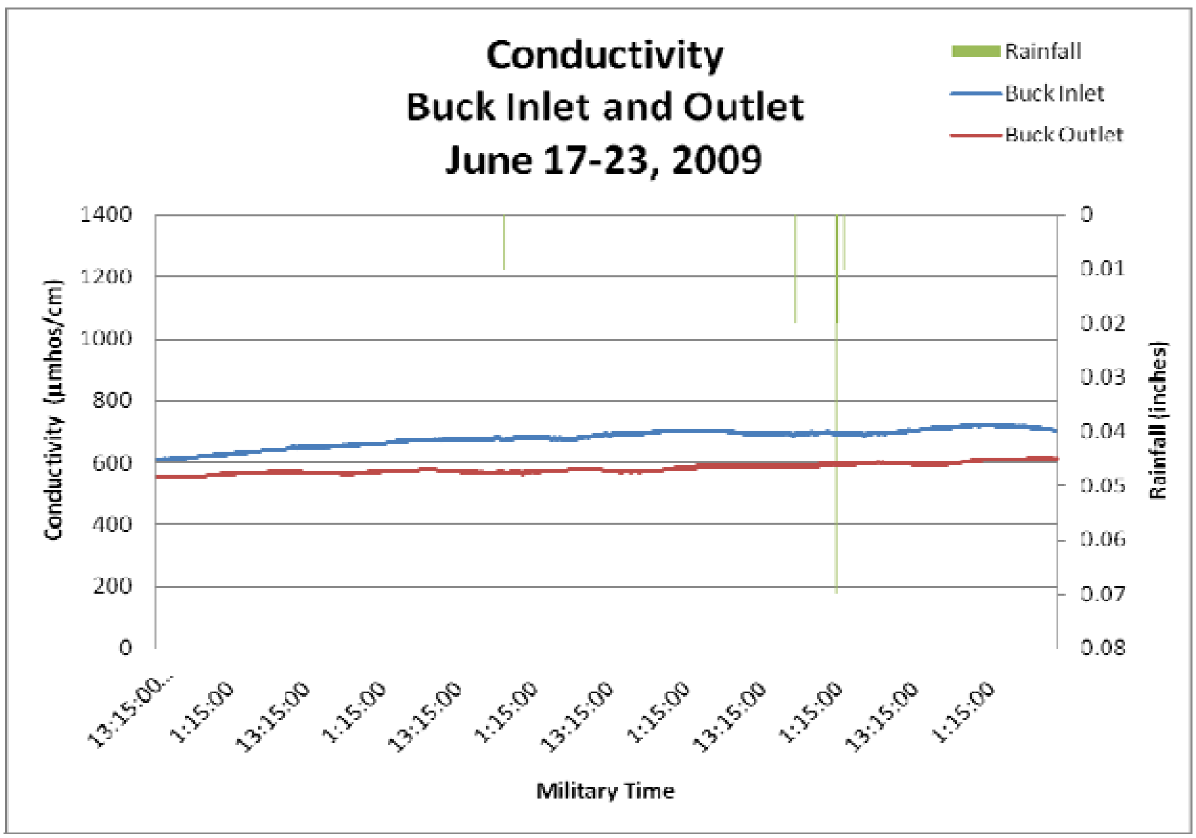

Dissolved Oxygen
CR 16 and Hwy 169
Oct 19 - 25, 2009
Rainfall
CR 16
Hwy 169
Dissolved Oxygen (mg/L)
Rainfall (inches)
State Standard
Military Time

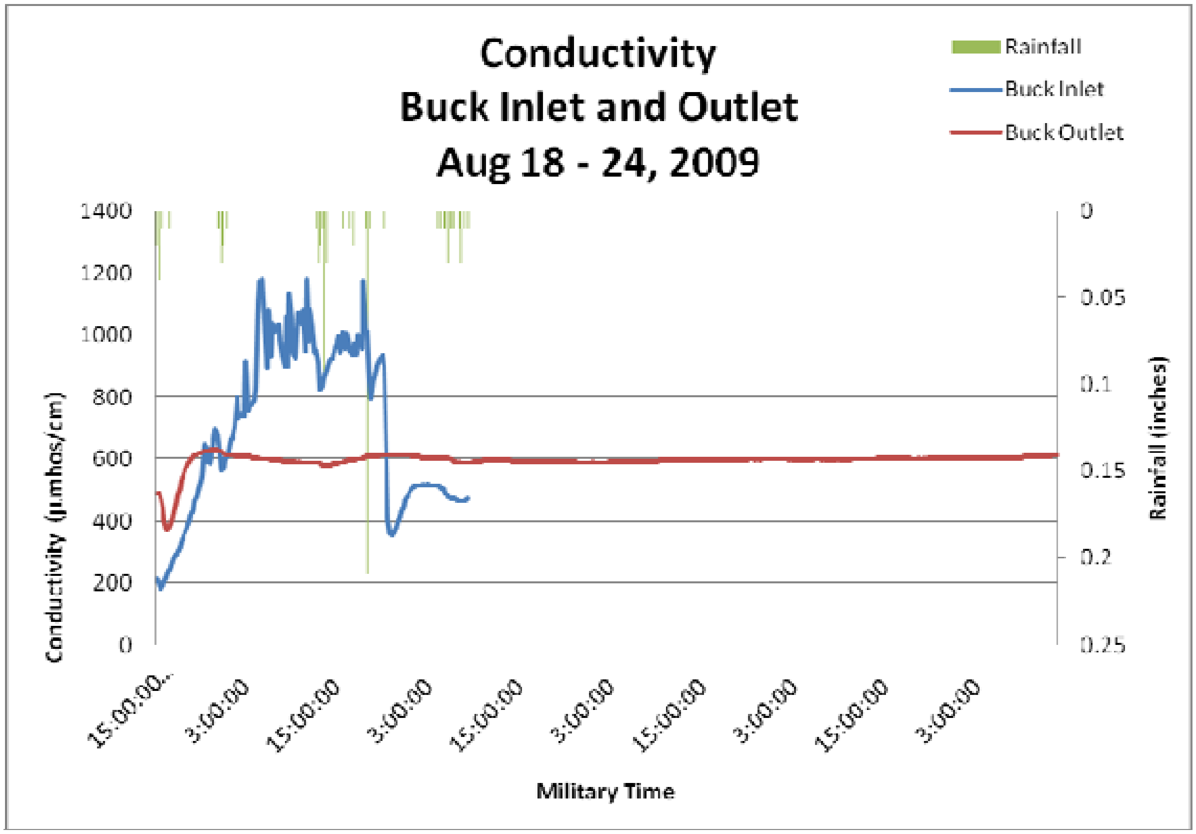

Dissolved Oxygen
Buck Inlet and Outlet
June 17-23, 2009
Rainfall
Buck Inlet
Buck Outlet
Dissolved Oxygen (mg/L)
Rainfall (inches)
State Standard
Military Time

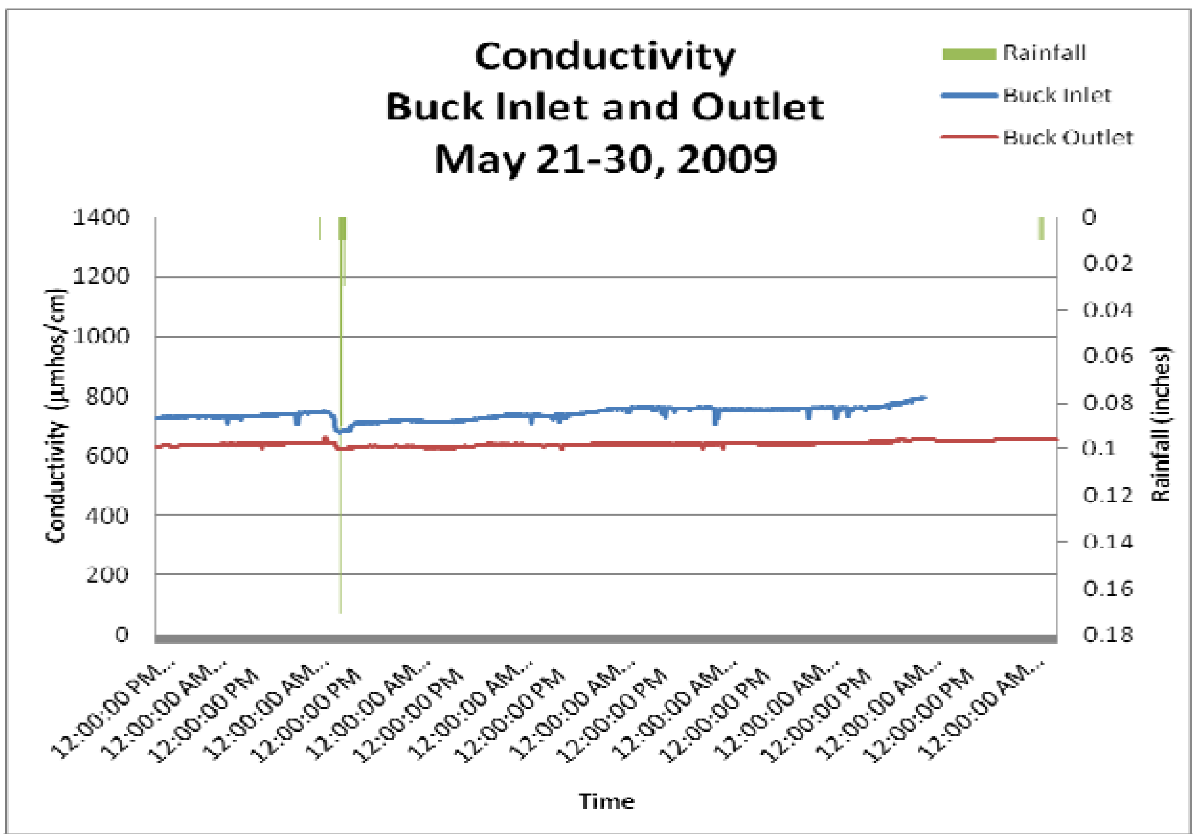

Dissolved Oxygen
Buck Outlet and School
June 5-15, 2009
Rainfall
School
Buck Outlet
Dissolved Oxygen (mg/L)
20
18
16
14
12
10
8
6
4
2
0
Rainfall (inches)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
13:00:00...
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
Military Time

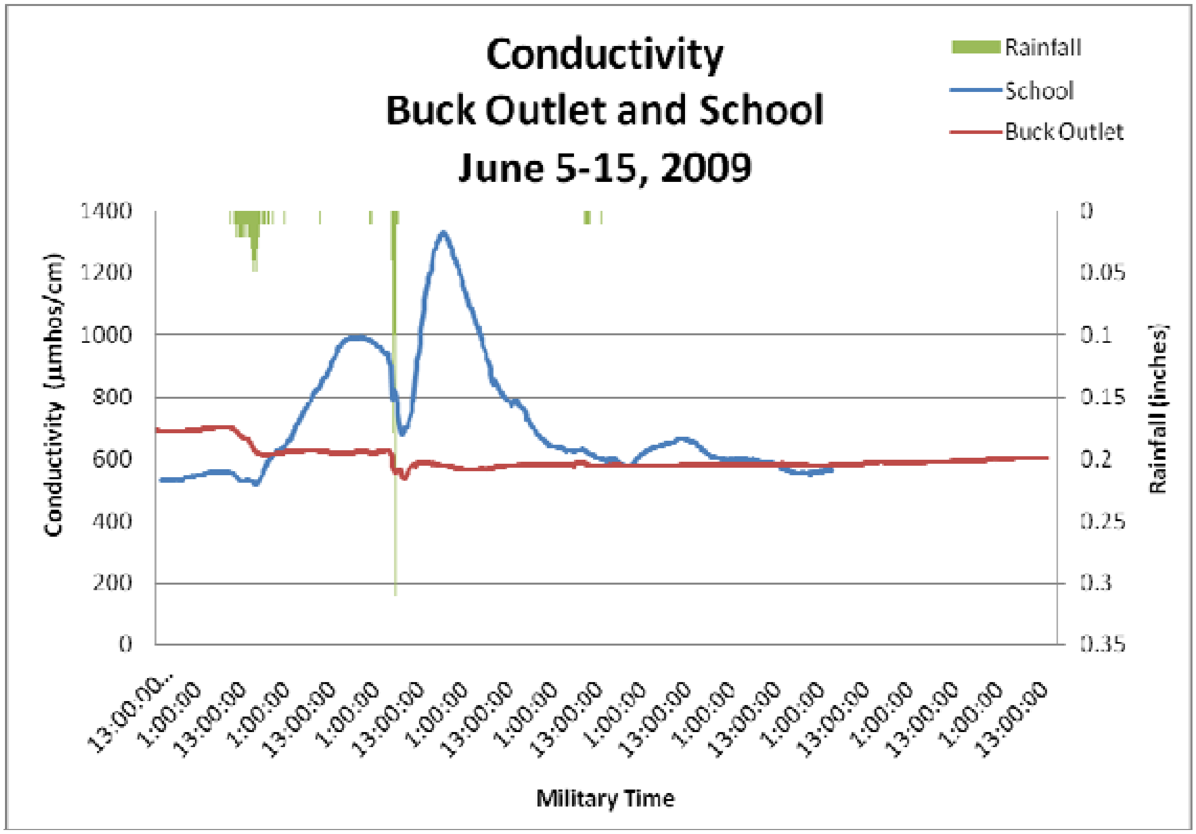

Conductivity
School and PLOC End
Oct 1-8, 2009
Rainfall
PLOC End
School
Conductivity (µmhos/cm)
1400
1200
1000
800
600
400
200
0
Rainfall (inches)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
13:00:00...
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
Military Time


Conductivity
CR 16 and Hwy 169
Oct 19 - 25, 2009
Rainfall
CR 16
Hwy 169
Conductivity (µmhos/cm)
1400
1200
1000
800
600
400
200
0
Rainfall (inches)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
12:00:00...
0:00:00...
12:00:00
0:00:00...
12:00:00
0:00:00...
12:00:00
0:00:00...
12:00:00
0:00:00...
12:00:00
0:00:00...
12:00:00
Military Time

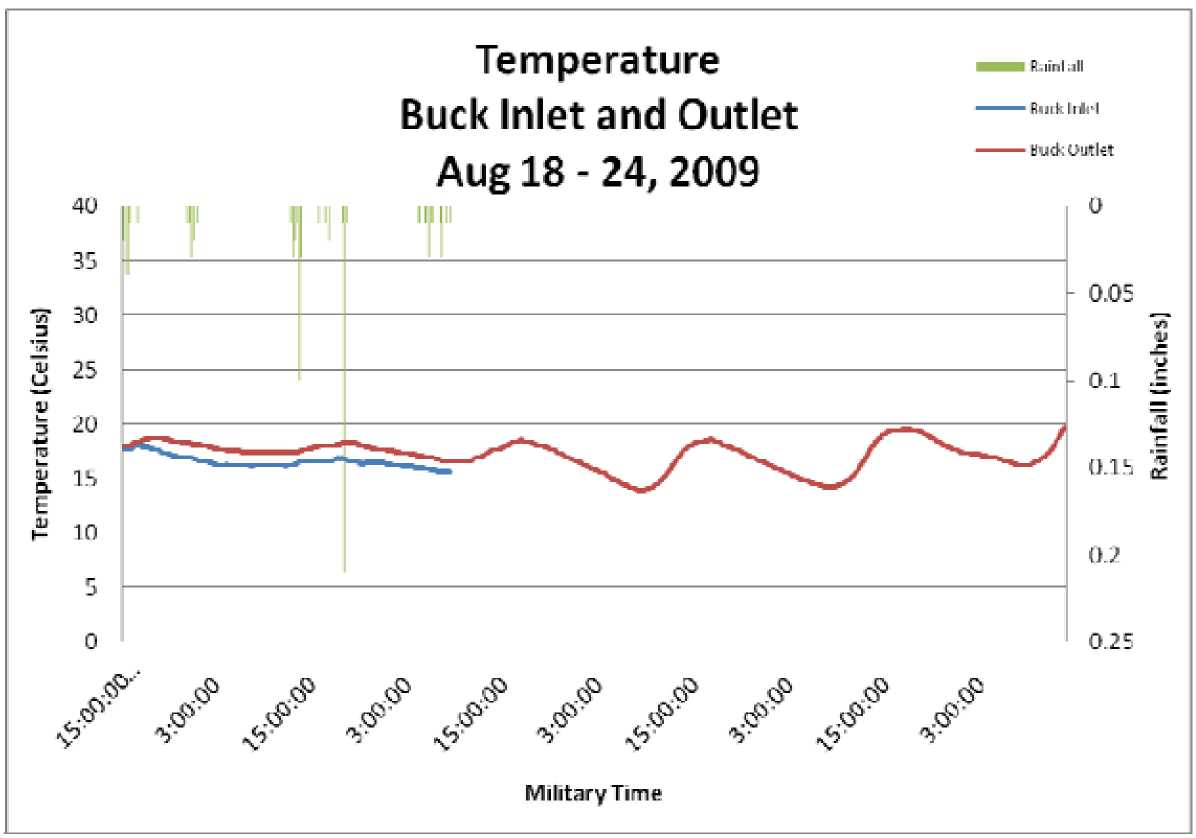

Conductivity
Buck Inlet and Outlet
June 17-23, 2009
Rainfall
Buck Inlet
Buck Outlet
Conductivity (µmhos/cm)
1400
1200
1000
800
600
400
200
0
Rainfall (inches)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
13:15:00...
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
Military Time


Conductivity
Buck Inlet and Outlet
Aug 18 - 24, 2009
Rainfall
Buck Inlet
Buck Outlet
1400
1200
1000
800
600
400
200
0
0
0.05
0.1
0.15
0.2
0.25
Conductivity (µmhos/cm)
Rainfall (inches)
15:00:00..
3:00:00
15:00:00
3:00:00
15:00:00
3:00:00
15:00:00
3:00:00
15:00:00
3:00:00
Military Time

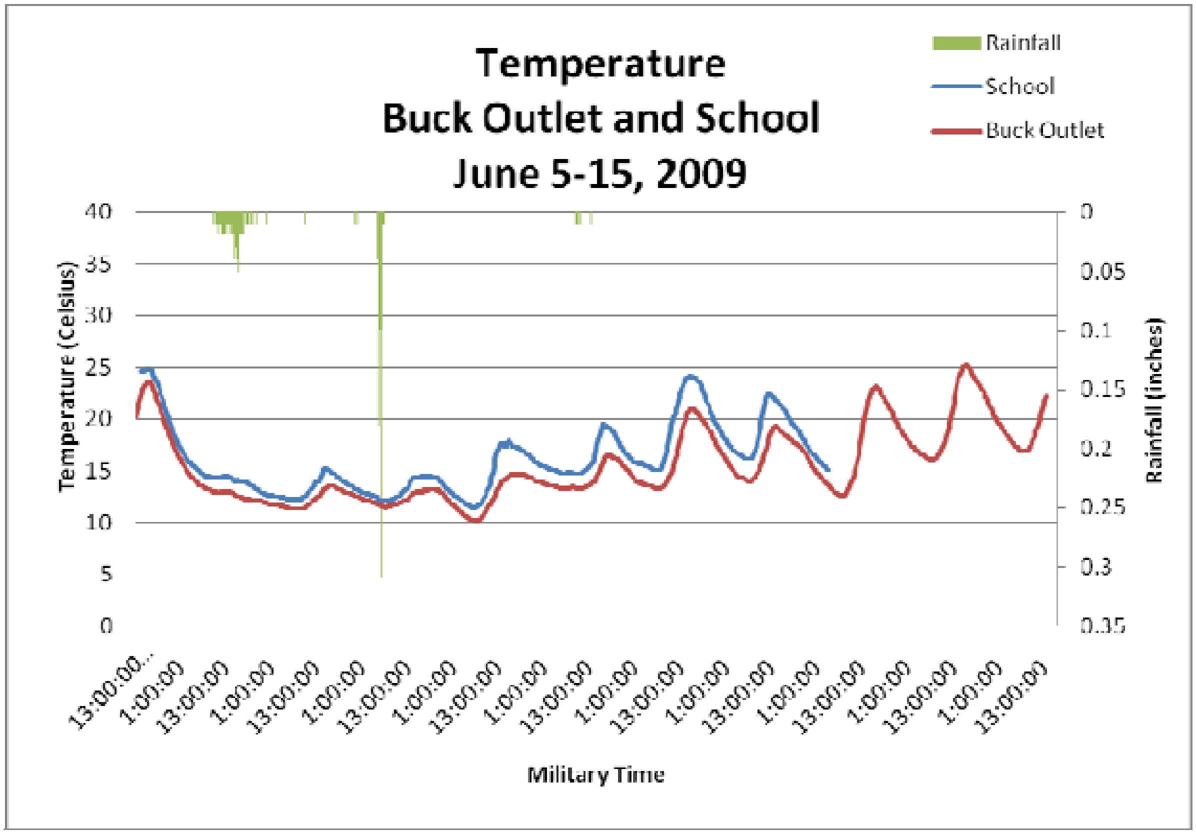

Conductivity
Buck Inlet and Outlet
May 21-30, 2009
Rainfall
Buck Inlet
Buck Outlet
1400
1200
1000
800
600
400
200
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
Conductivity (µmhos/cm)
Rainfall (inches)
12:00:00 PM...
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
12:00:00 PM
12:00:00 AM...
Time

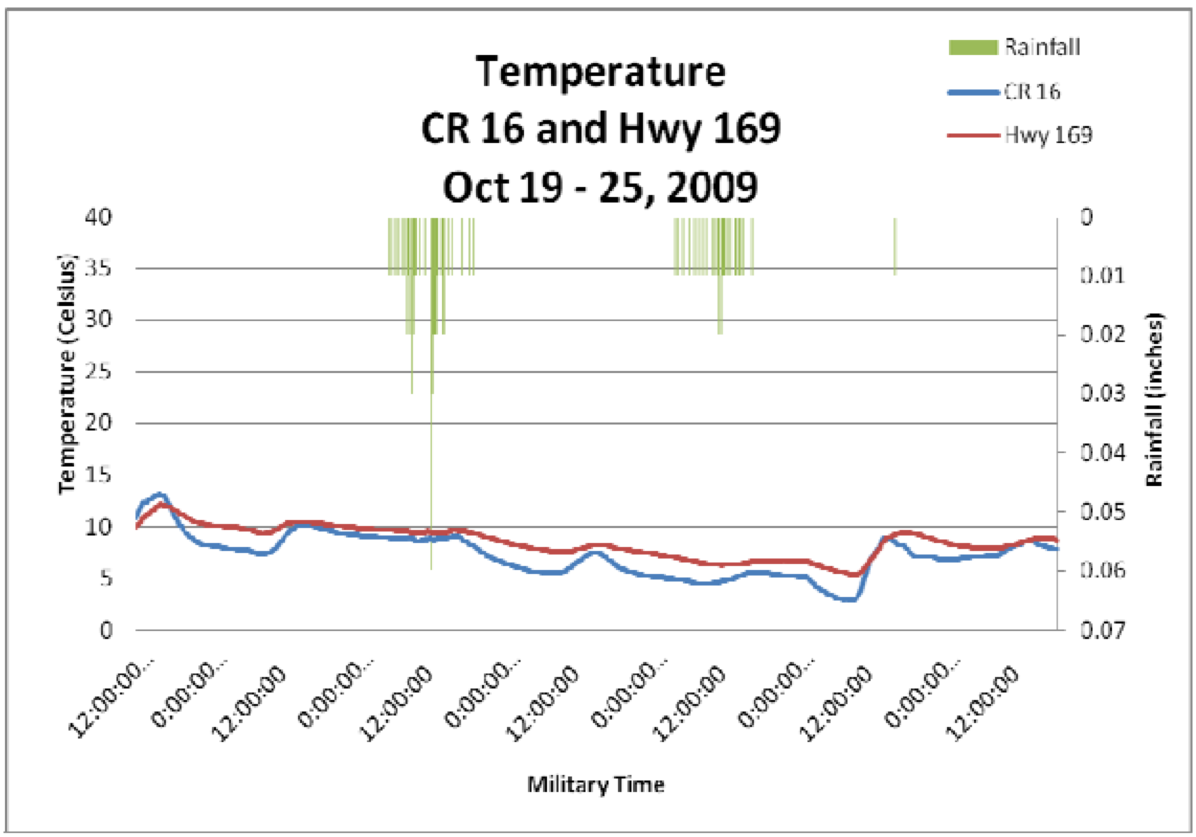


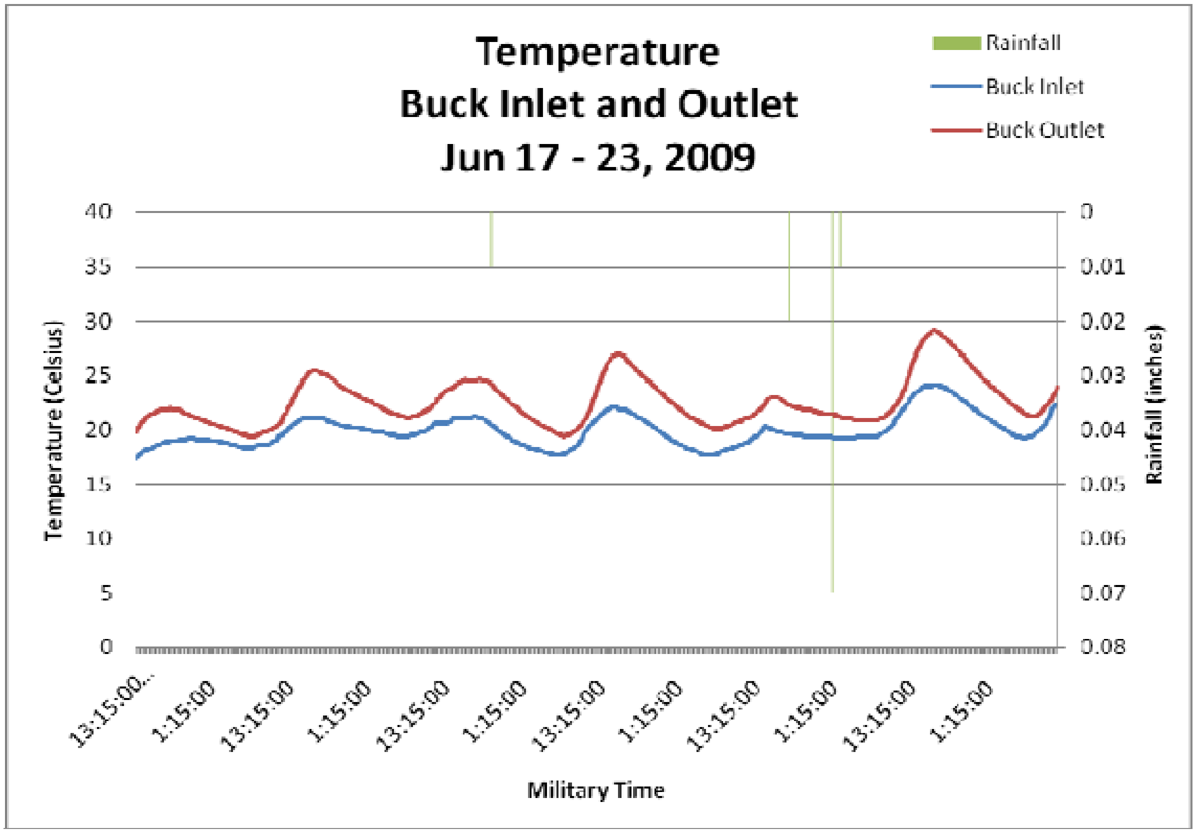
Conductivity
Buck Outlet and School
June 5-15, 2009
Rainfall
School
Buck Outlet
Conductivity (µmhos/cm)
Rainfall (inches)
1400
1200
1000
800
600
400
200
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
13:00:00...
1:00:00
13:00:00
Military Time

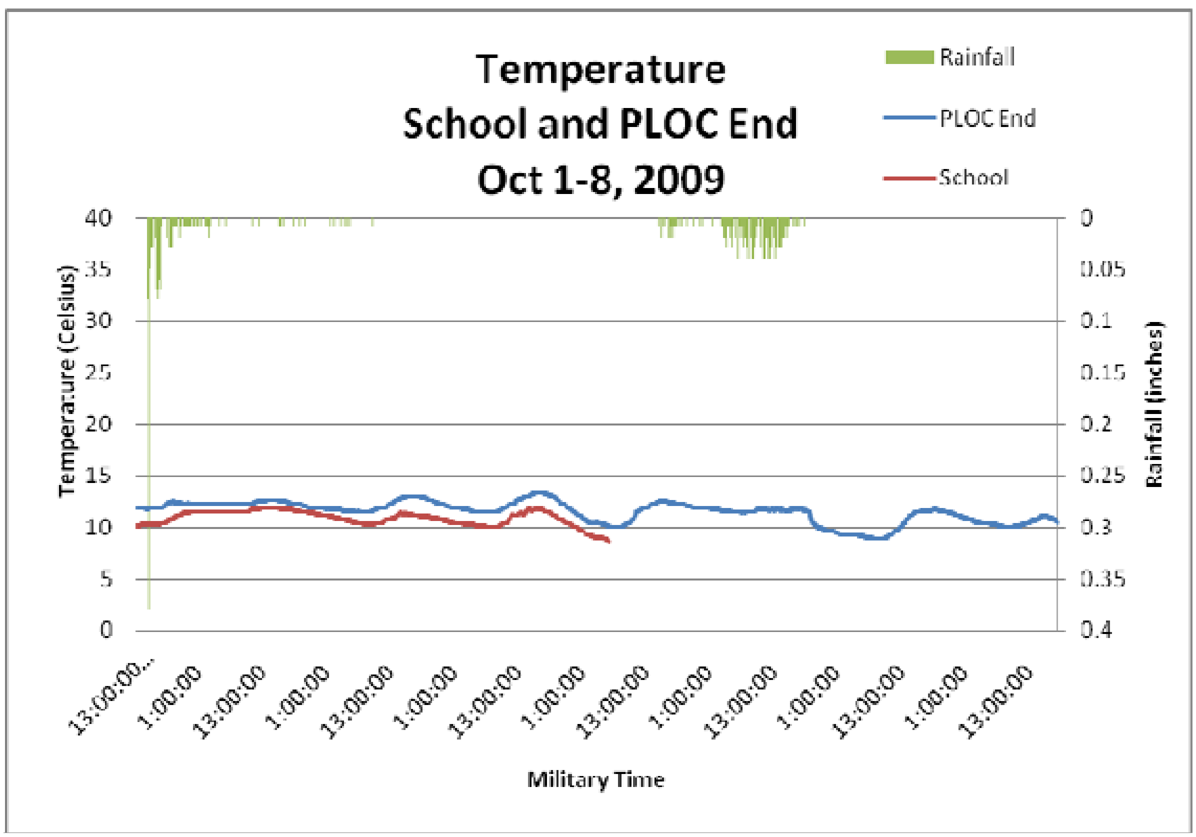


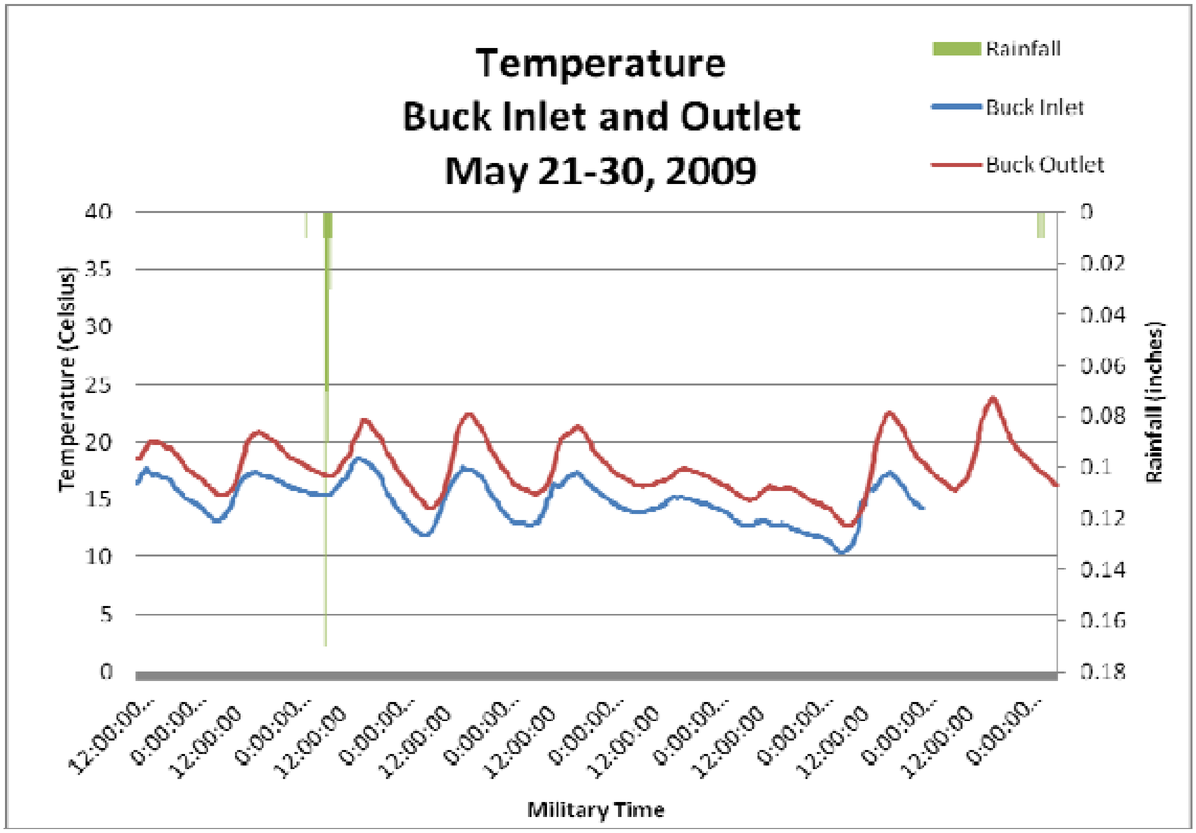
Temperature
Buck Inlet and Outlet
Aug 18 - 24, 2009
Rainfall
Buck Inlet
Buck Outlet
Temperature (Celsius)
Rainfall (inches)
40
35
30
25
20
15
10
5
0
0
0.05
0.1
0.15
0.2
0.25
15:00:00...
3:00:00
15:00:00
Military Time


Temperature
Buck Outlet and School
June 5-15, 2009
Rainfall
School
Buck Outlet
Temperature (Celsius)
Rainfall (inches)
Military Time
0
5
10
15
20
25
30
35
40
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
13:00:00...
1:00:00
13:00:00


Temperature
CR 16 and Hwy 169
Oct 19 - 25, 2009
Rainfall
CR 16
Hwy 169
Temperature (Celsius)
Rainfall (inches)
Military Time
0
5
10
15
20
25
30
35
40
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
12:00:00...
0:00:00...
12:00:00


Temperature
Buck Inlet and Outlet
Jun 17 - 23, 2009
Rainfall
Buck Inlet
Buck Outlet
Temperature (Celsius)
40
35
30
25
20
15
10
5
0
Rainfall (inches)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
13:15:00...
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
13:15:00
1:15:00
Military Time


Temperature
School and PLOC End
Oct 1-8, 2009
Rainfall
PLOC End
School
Temperature (Celsius)
40
35
30
25
20
15
10
5
0
Rainfall (inches)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
13:00:00...
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
1:00:00
13:00:00
Military Time


Temperature
Buck Inlet and Outlet
May 21-30, 2009
Rainfall
Buck Inlet
Buck Outlet
Temperature (Celsius)
Rainfall (inches)
40
35
30
25
20
15
10
5
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
12:00:00...
0:00:00...
12:00:00
Military Time

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