9 Longview Lake

9.1 General Background

Longview Lake was impounded in 1983, and reached full pool on 23 September 1986. Urban development is occurring throughout the upper reaches of both major tributaries. The main threats to water quality in Longview Lake are nutrients, bacterial contamination, sediment / turbidity related to watershed development, and other contaminants related to an urban environment. The lake is listed on Missouri's 303(d) impaired waters list and an approved TMDL developed for mercury related to atmospheric deposition (MDNR 2004).

9.1.1 Location

A dam on the Little Blue River, located 68 river km (42.9 river miles) upstream of the confluence with the Missouri River, impounds Longview Lake. The lake is located approximately 13.8 km (8.6 miles) southeast of downtown Kansas City, in Jackson County, Missouri. Historic water quality sample sites at Longview Lake include 3 lake, 1 outflow, and 2 inflow sites (Figure 9.1).

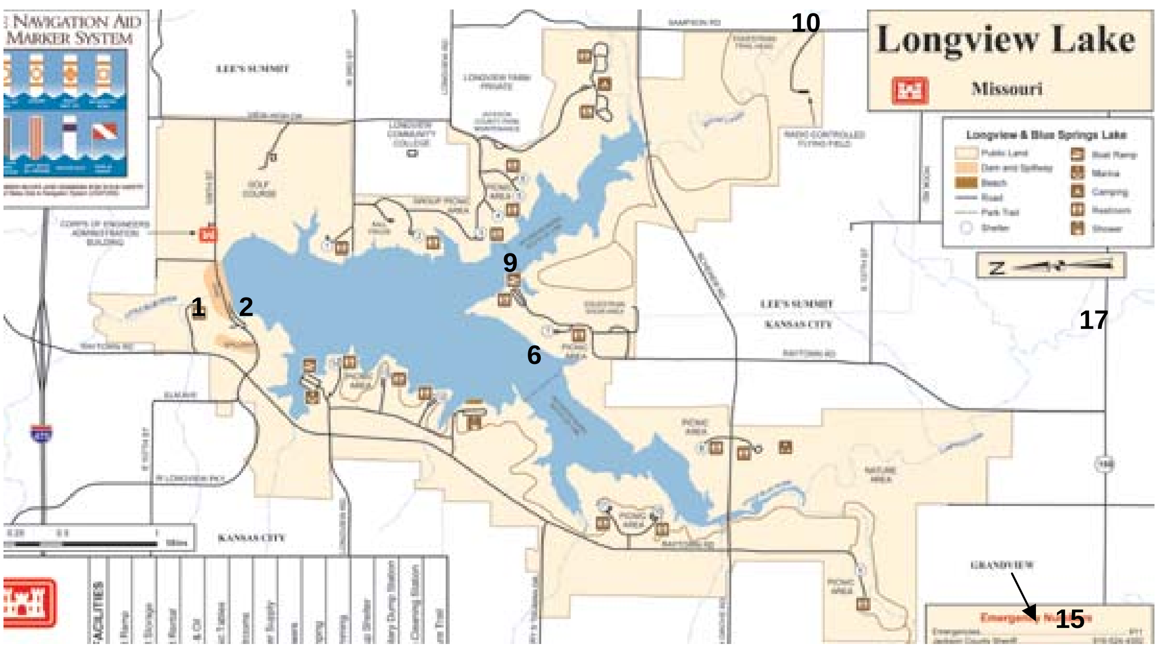


Figure 9.1. Longview Lake area map with sample site locations and site numbers.

9.1.2 **Authorized Purposes:** Flood control, recreation, fish and wildlife conservation, and water quality improvement.

9.1.3 **State Use Designations:** Livestock and wildlife watering, warmwater aquatic life and human health / fish consumption, whole-body contact recreation, boating and canoeing.

9.1.4 Lake and Watershed Data

Pools	Surface Elevation (ft. above m.s.l.)	Current Capacity (1000 AF)	Surface Area (A)	Shoreline (miles)
Flood Control	909.0	24.8	1,960	
Multipurpose	891.0	22.1	930	24
Total		46.9		

Total watershed area: 50 sq miles (32,000 A)

Watershed ratio: 16.3 FC / 34.4 MP

Average Annual Inflow: 34,423 acre-feet/yr (1982 – 2006)
Average Annual outflow: 000 acre-feet
Sediment inflow (measured): 20 acre-feet/yr (1948 – 1993)
Flushing rate: 0.64 years
Water management Plan: Approved 15 February 1994
Historic stage hydrograph: 1996 – 2006 (Figure 9.2)

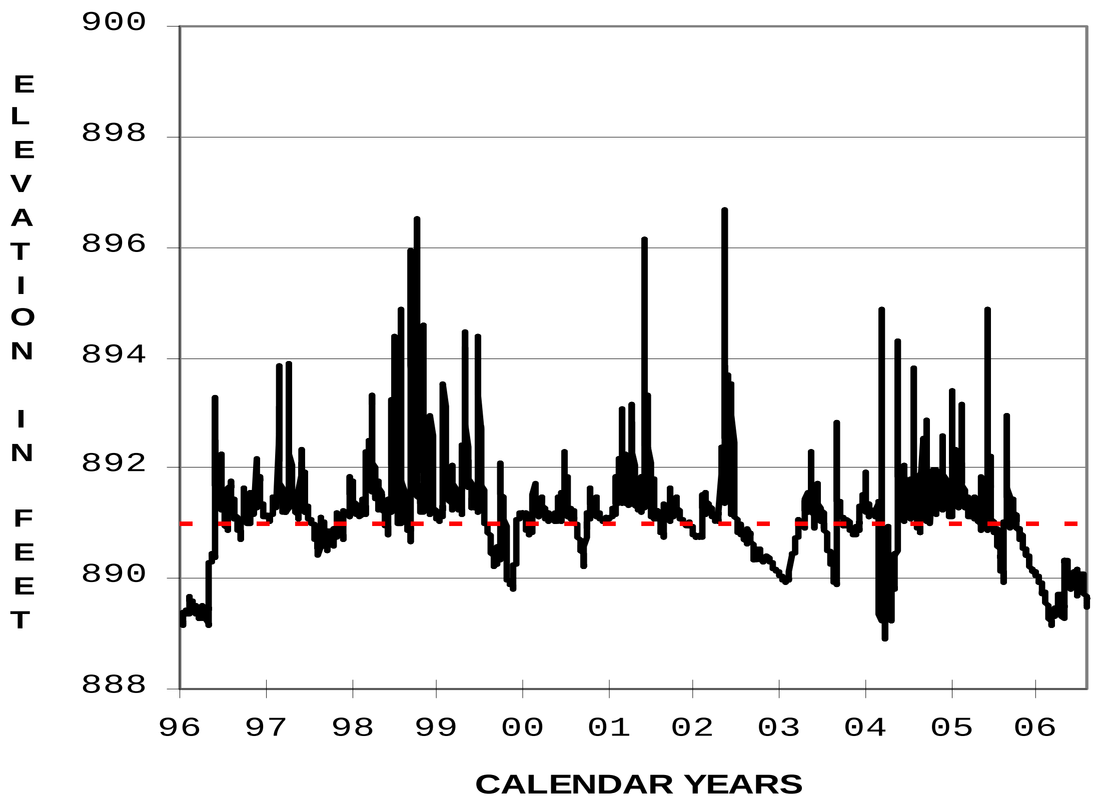


Figure 9.2. Pool elevation hydrograph from 1996 – 2006 (red-dashed line is multipurpose pool elevation – 891.0 ft)

9.2 2006 Activities

Longview Lake was categorized as an ‘intensive’ lake during 2006, thus lake and inflow / outflow sites were all sampled (see Figure 9.1). Samples were collected from April through September during 2006. Todd Gemeinhardt (MDC) provided field assistance at Longview Lake during 2006. Fecal bacteria (E. coli) samples were collected weekly at the swimming beach from mid-April through September by JCPRD. The lake was below multipurpose pool elevation throughout the sampling season, which is an indication of the regional drought conditions.

9.3 2006 Data

Comparative historic water quality data consists of a single sample collected during June 1999 and three sampling periods (June, July, and September) during 2005. Samples were collected from April though September during 2006.

9.3.1 Inflow

Longview Lake inflow samples were collected from two sites -- Sites 10 on Mouse Cr and Site 15 on Little Blue River -- during 2006.

9.3.2 Lake

Total nitrogen (TN) and chlorophyll *a* concentrations indicate Longview Lake is eutrophic. Nitrogen is an essential nutrient to aquatic life. However, excessive concentrations can result in algal blooms, low DO levels, taste and odor issues in drinking water, and even fish kills. Median TN concentrations from lake site surface samples range from 0.57 – 0.73 mg/L (Figure 9.3), which are above the proposed EPA nutrient criteria value of 0.36 mg/L total nitrogen. The highest median concentration (1.15 mg/L) for an inflow site occurs at Site 10 (Mouse Cr). This site is dominated by high organic-bound nitrogen, which is most likely the result of allochthonous inputs.

Phosphorus is another essential nutrient for aquatic life, and it limits algal growth. Although the median total phosphorus (TP) concentrations (0.023 – 0.04 mg/L) for all sites exceed the proposed EPA nutrient criteria value (0.02 mg/L), Longview has some of the lowest TP concentration within the district (Figure 9.4). The extensive aquatic vegetation introduction efforts by MDC within the littoral zone of Longview Lake is most likely responsible for the reduced TP concentrations. Once again, these results are from a very limited dataset.

The ratio of TN:TP can be used as a surrogate to determine the dominant algal community within a waterbody. Ratios ≥ 20:1 are indicative of desirable algal communities, whereas ratios ≤ 12:1 are indicative of bloom-forming cyanobacteria (blue green algae). Median TN:TP ratios at all three lake sites are > 20, indicating the lake is at low risk for cyanobacteria blooms (Figure 9.5). This was expected due to low TP concentrations within the lake.

Secchi depth (water clarity) was measured monthly at all three lake sites. When compared between years, secchi depth was slightly higher at both upper lake sites (Sites 6 & 9) during 2006 versus 2005 (Figure 9.6). Conversely, secchi depth measurements at Site 2 (Tower) were consistently lower in 2006 versus 2005. Both the

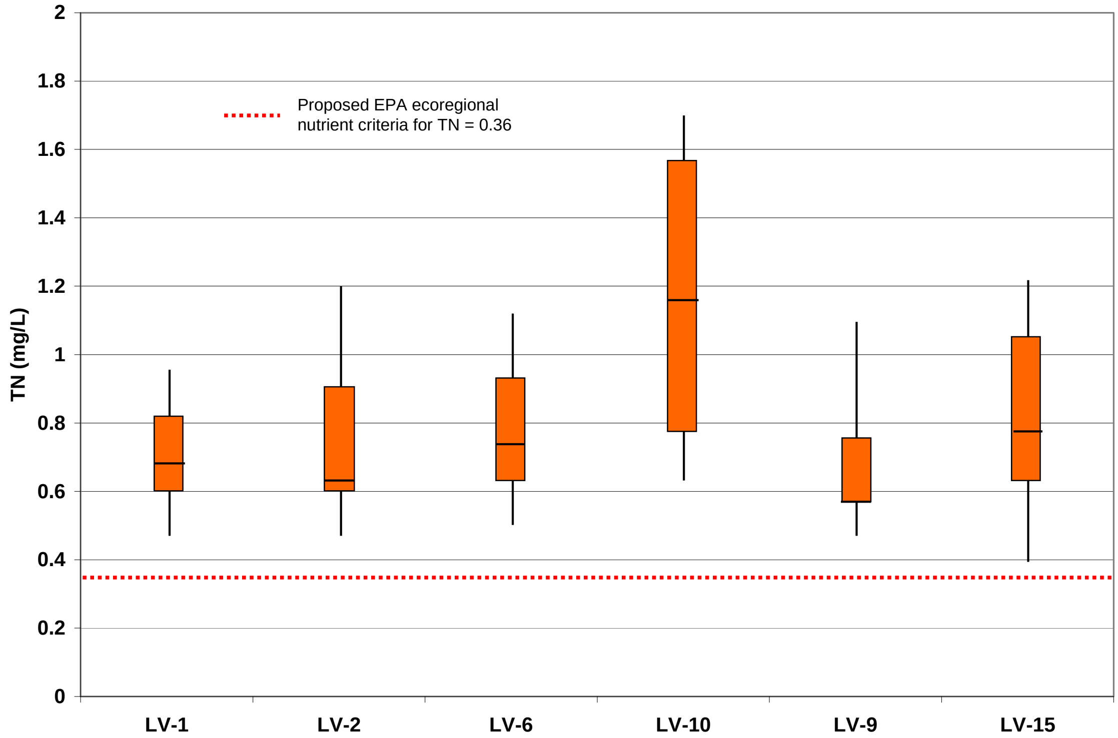


Figure 9.3. Box plots of surface water sample total nitrogen concentrations measured by site during 1999 and 2006 at Longview Lake.

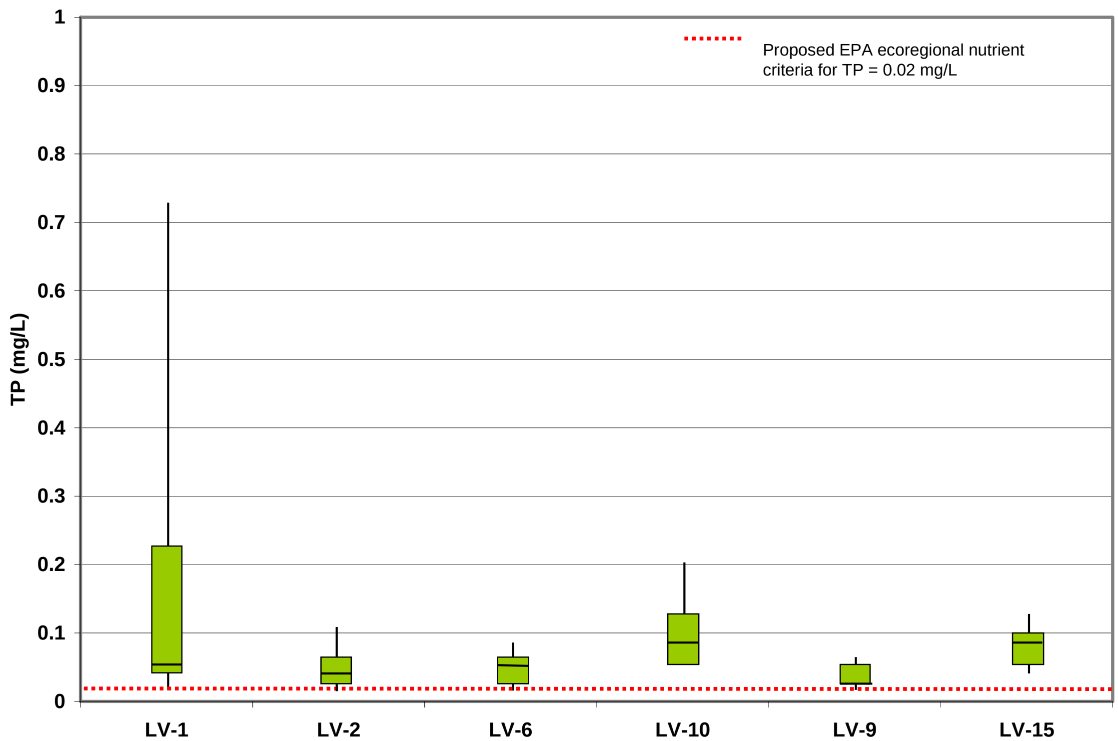


Figure 9.4. Box plots of surface water sample total phosphorus concentrations measured by site during 1999 and 2006 at Longview Lake.

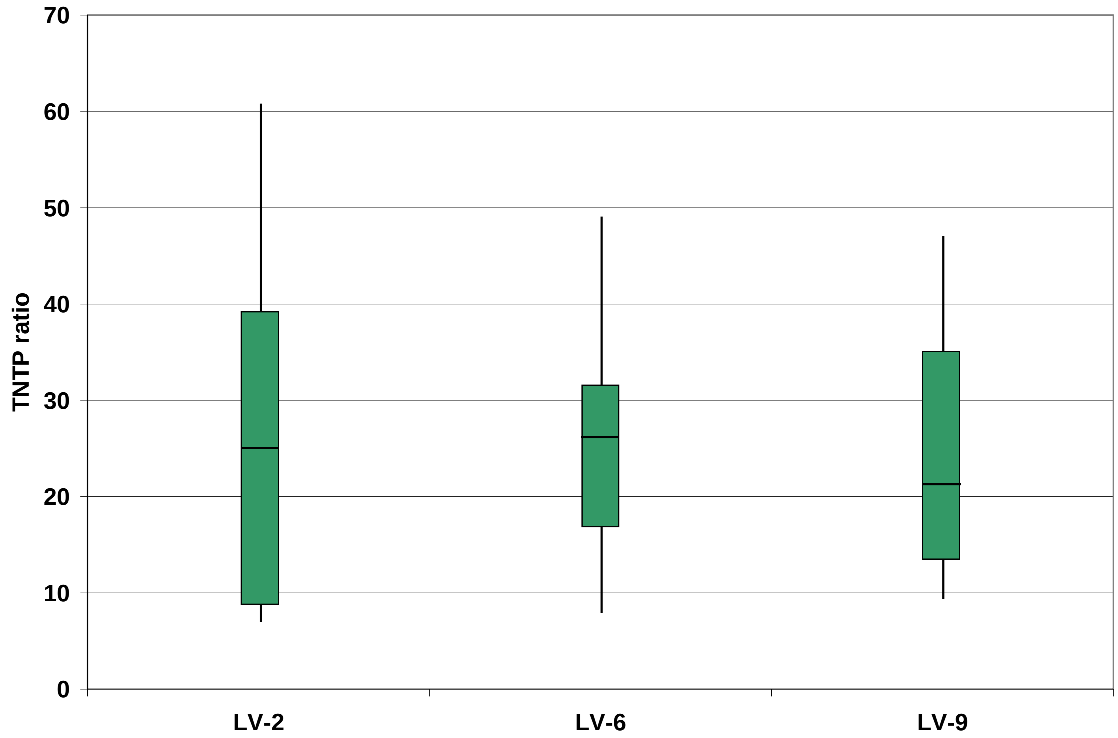


Figure 9.5. Box plots of total nitrogen : total phosphorus (TN : TP) ratios from surface water samples by site from 1999 and 2006 at Longview Lake.

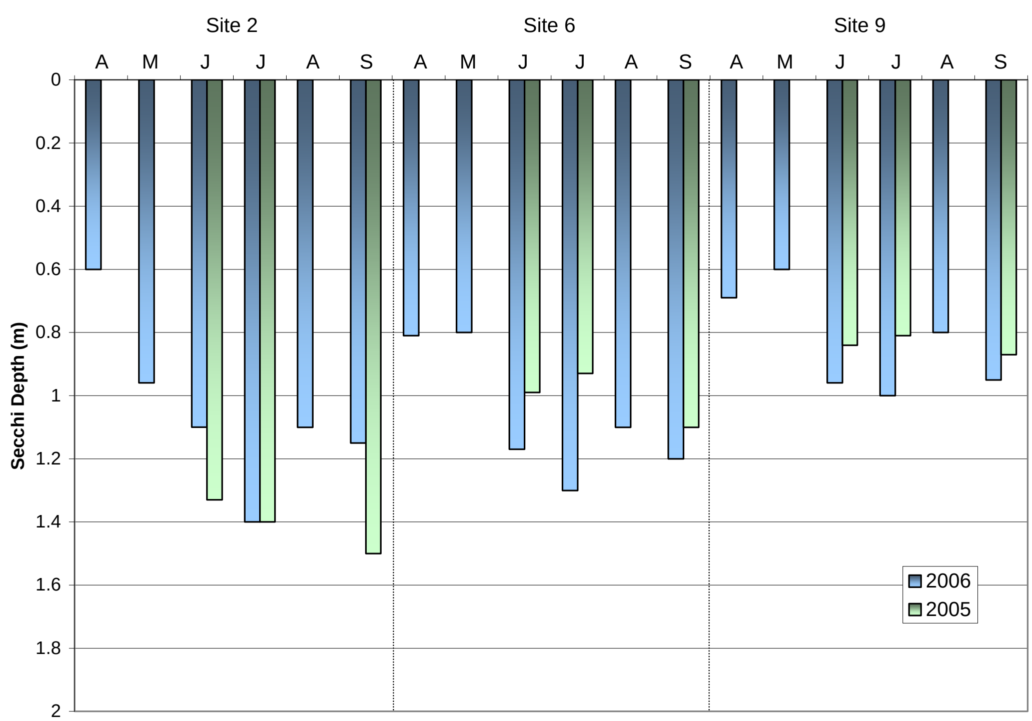


Figure 9.6. Comparison of secchi depth (m) measurements by lake site from 2005 and 2006 at Longview Lake.

main lake (Site 2; median = 1.13 m) and Mouse Creek arm site (Site 6; median = 1.05 m) exhibit good water clarity, while Lumpkin Fork arm (Site 9; median = 0.83 m) exhibits slightly lower water clarity (Figure 9.7).

Monthly variability in mean chlorophyll *a* was detected at all three lakes sites (Figure 9.8). Mean chlorophyll *a* concentrations from the three lake sites ranged from 15 – 18 ug/L during 2006. Median summer chlorophyll *a* concentrations range from 12 – 15.4 ug/L at lake sites during the past two summers (Figure 9.9).

Relative concentrations of phycocyanins, or bluegreen algae, were measured vertically throughout the water column during each monthly sample trip. Such profiles provided information on monthly as well as within lake distribution changes. Figure 9.10 depicts vertical distribution of phycocyanins measured at Site 2 (Tower) from May through September. Concentrations in the upper waters peaked in August, but distributions were more consistent throughout the water column during September. Phycocyanin concentrations are lower compared to other district lakes.

The median atrazine concentrations from surface water samples collected in 1999 (1 sample) and 2006 (0.07 – 0.15 ug/L) were all below EPA's drinking water maximum contaminant level of 3 ug/L (Figure 9.11). These concentrations are some of the lowest within the district, which is not unexpected due to the urbanized watershed. It is also important to note that drought conditions may have some impact concentrations measured this year.

Total iron exceeded EPA's Drinking Water Standard of Secondary Maximum Contaminant Levels (SMCL) of 300 ug/L from surface samples collected during August at both inflow sites (Site 10 = 699 ug/L; Site 15 = 855 ug/L). Total iron concentrations from bottom samples in the lake ranged from 824 – 2889 ug/L, which reflects anoxic conditions throughout the lake. Elevated levels are directed at drinking water facilities related to taste and staining issues. In addition, surface samples collected during August exceeded EPA's SMCL for manganese (50 ug/L) at both inflow sites (Site 10 = 811 ug/L; Site 15 = 576 ug/L). The SMCL for total manganese was exceeded in bottom samples from all three lake sites (range = 137 – 1584 ug/L). Implications are directed at drinking water facilities due to taste and stain issues.

Vertical profiles were recorded monthly from April through September. Parameters included temperature, dissolved oxygen, pH, conductivity, and turbidity. Typical of smaller eutrophic reservoirs in Missouri, the lake was strongly stratified both chemically and thermally after 7 m during June and August, while stratification began at a depth of 4 – 5 m during (Figure 9.12). Lake stratification had deepened to 7-8 m during September in response to cooling air temperatures.

Weekly samples (April – September) of fecal bacteria (*E. coli*) were collected during 2004 and 2005 (Figure 9.13). Although Longview Lake has a history of elevated fecal samples, the geometric mean from samples collected in 2006 (38 colonies / 100 mg/L) was below the state standard for whole-body contact (200 colonies / 100 ml). Drought conditions could have been responsible for low concentrations measured during 2006.

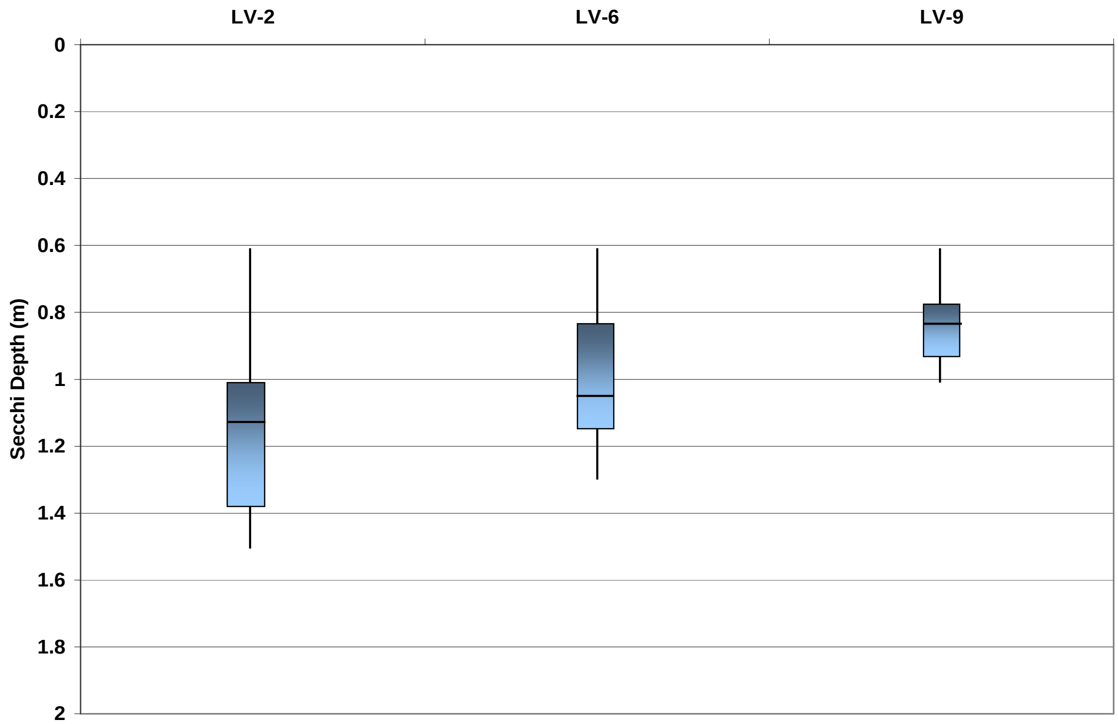


Figure 9.7. Box plots of secchi depth (water clarity) measured at lake sites from 2005 - 2006 at Longview Lake.

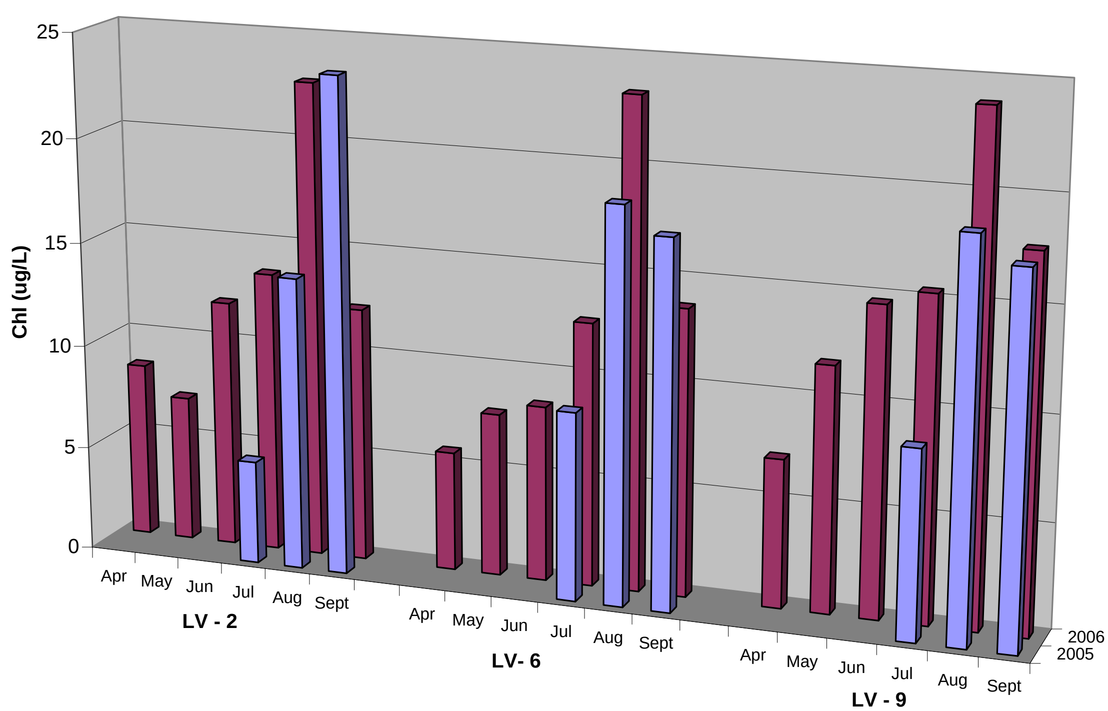


Figure 9.8. Comparison of mean chlorophyll a concentrations (ug/L) by date and site (2 = Tower; 6 = Mouse Cr; 9 = Little Blue arm) at Longview Lake during 2005 and 2006.

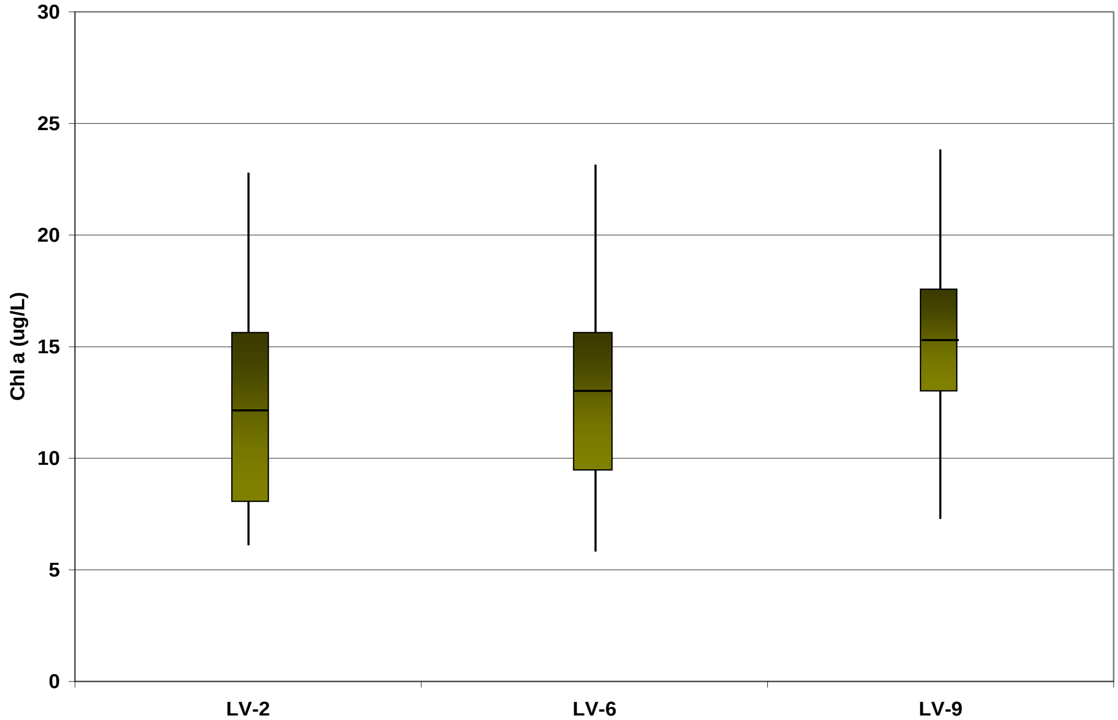


Figure 9.9. Box plots of chlorophyll a concentrations measured at lake sites from 1999 and 2006 at Longview Lake.

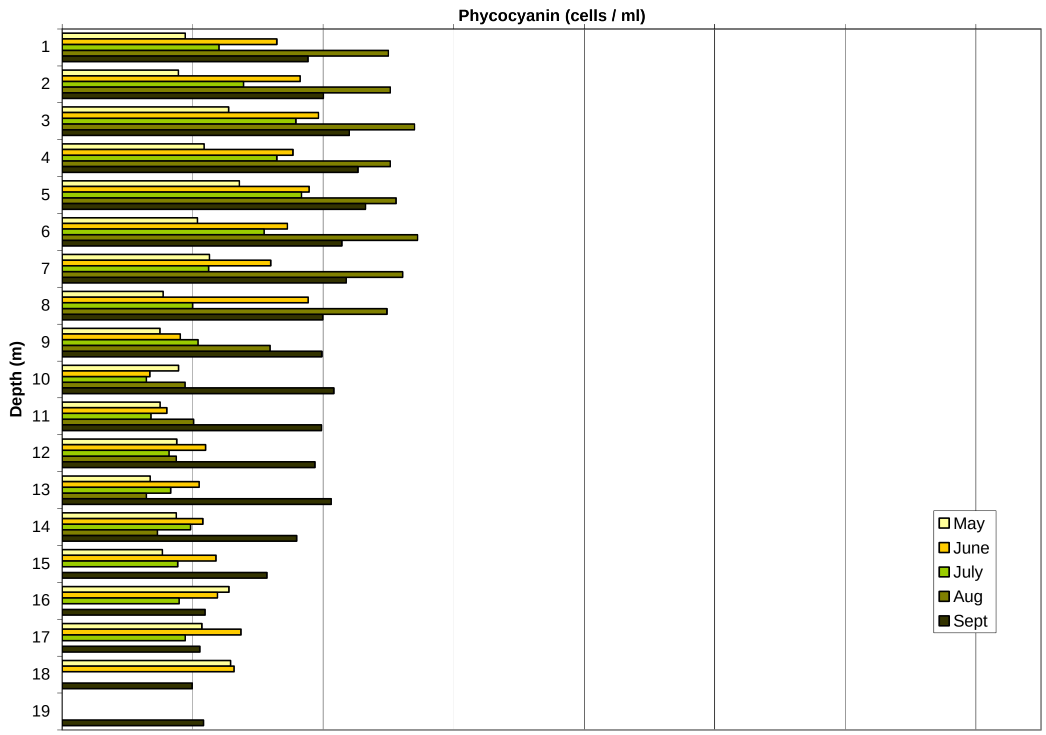


Figure 9.10. Relative concentrations of phycocyanin (bluegreen algae) (cells / ml) measured monthly by depth at Longview Lake Site 2 (Tower) during 2006.

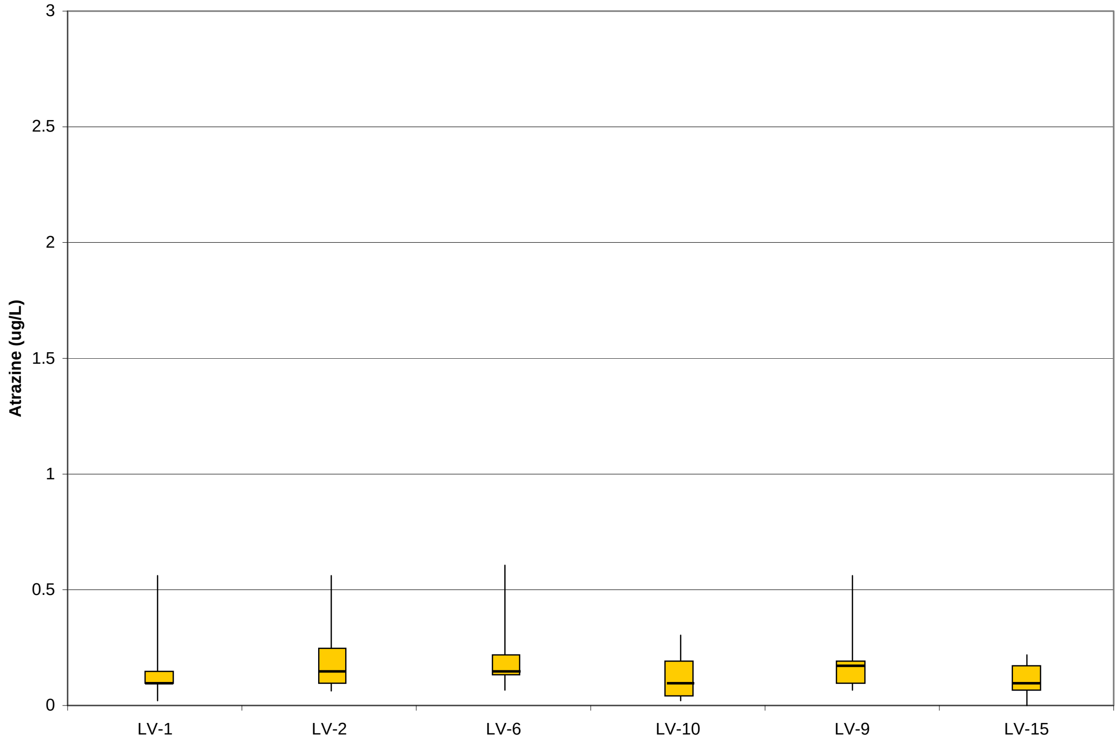
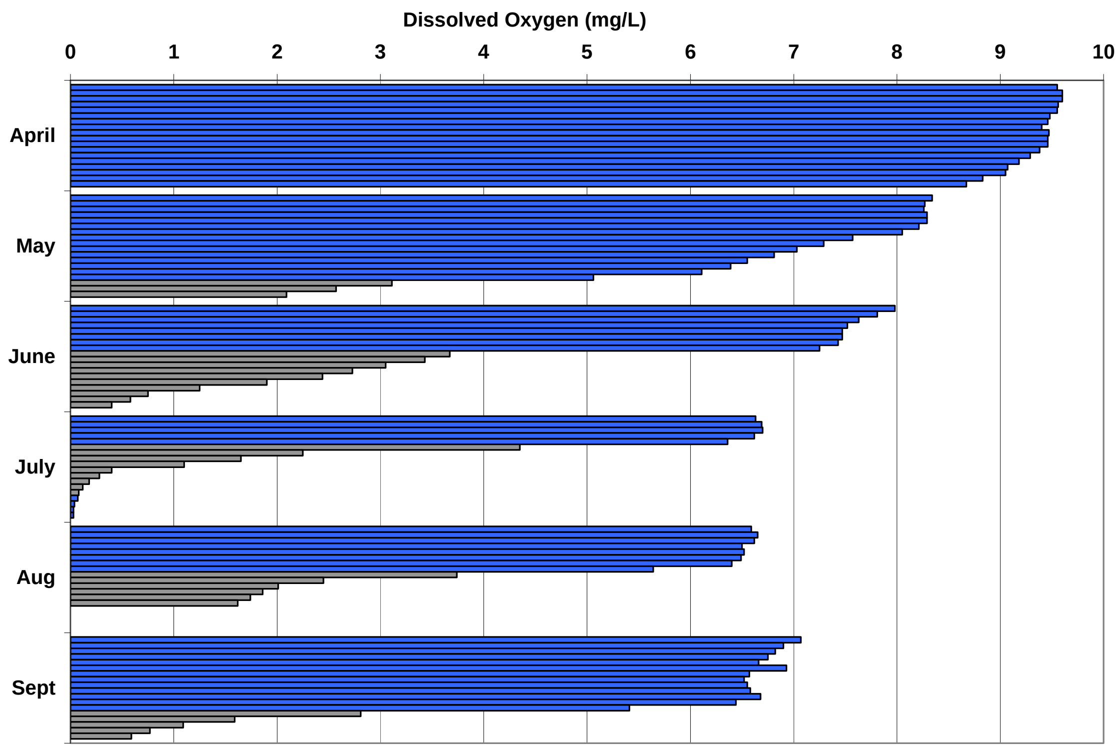


Figure 9.11. Box plots of atrazine concentrations measured by site 1999 and 2006 at Longview Lake.



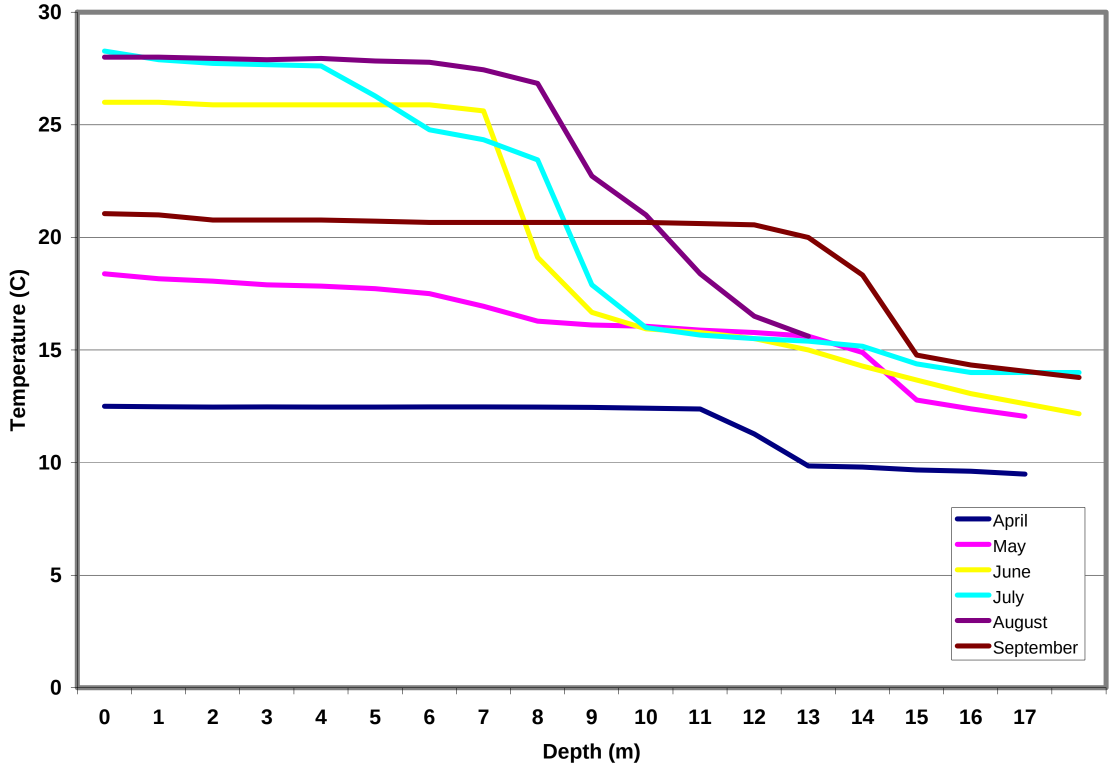


Figure 9.12. Temperature (°C) plots and dissolved oxygen concentration (mg/L) histogram from vertical profiles recorded at Site 2 (dam) from April through September 2006 at Longview Lake.

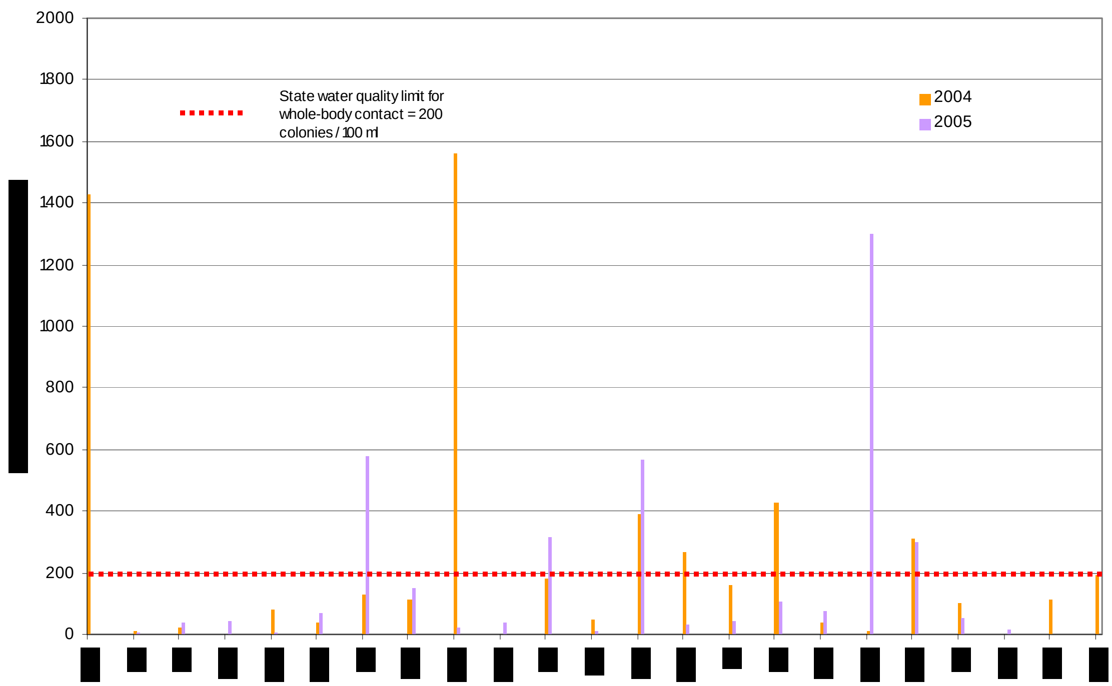


Figure 9.13. Fecal bacteria (E. coli) (colonies per 100 ml) swimming beach samples collected from April through September during 2004 and 2005 at Longview Lake.

9.3.3 Outflow

Outflow samples were collected from Longview Lake during 2006. Summarized data on Site 2 is included in discussions of lakes sites listed above.

9.4 Future Activities and Recommendations

Sampling activities for 2007 will include transition to ‘ambient’ monitoring from May through September, as well as conducting a single vertical profile at each of the two lake sites during July or August. In an effort to gather baseline phycocyanin data, the lake will be monitored for the cyanotoxin microcystin during August and September. Geosmin, associated with taste and odor issues in drinking water, will be examined from samples collected near the tower from July through September. Due to the urban setting of this lake, sediment contaminant analyses should be conducted when programmatic funds become available in the future to provide status and trend information. Suggest adding Site 17 (Lumpkin Fork) as an inflow monitoring site during next ‘intensive’ sampling period. Extensive land disturbance due to urban sprawl is occurring upstream of this segment, and baseline / trend data will be beneficial to understanding future changes within the lake. Caffeine will be measured at several sites around the lake as a surrogate for human impacts resulting from failing septic systems, WWTP’s, illicit dumping from boats, etc. A contaminant group of interest is polyaromatic hydrocarbons (PAHs). These compounds are components of asphalt, fuels, oils, and greases. They enter receiving waters from stormwater runoff, industrial and wastewater treatment discharges, and through atmospheric deposition. They do not dissolve, but attach to particulate material and eventually settle out to the substrate. These compounds are highly toxic to aquatic biota, and thus baseline data is desired to track within district lakes. This is a high priority item when future funding becomes available.