

2007 Lake Monitoring

Ardmore Lake

This was the first year Ardmore Lake was monitored as part of Metropolitan Council's Citizen Assisted Monitoring Program (CAMP). The lake is located in the City of Medina and has a surface area of 10.1 acres and a maximum depth of 6.1 m (20 feet). Most of the lake is considered littoral (approximately 9 acres of depth 0-15 feet). The lake has an average depth of 2.4 m (7.7 feet) and a volume of 78.0 acre-feet. There is no public access to the lake.

Ardmore Lake was monitored four times between mid-June and mid-August 2007. Secchi depth measurements were not recorded by the volunteer.

2007 summer (May-September) data summary

<i>Parameter</i>	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Grade</i>
TP ($\mu\text{g/l}$)	444.5	351.0	662.0	F
CLA ($\mu\text{g/l}$)	373.3	240.0	450.0	F
Secchi (m)				
TKN (mg/l)	5.50	2.10	6.90	
			Overall Grade	F

TP = Total Phosphorous; CLA = Chlorophyll A; TKN = Total Kjeldahl Nitrogen

The TP and chlorophyll means indicate that the water quality translates to a grade of F. The user perception rankings of physical condition and recreational suitability were not documented by the volunteer and, therefore, are not reported here.

Lake Independence

Lake Independence was monitored by the Three Rivers Park District in 2007. The Park District established an in-lake phosphorus concentration goal for Lake Independence of $36\mu\text{g/L}$ to support direct contact recreational use. Total phosphorus concentrations decreased from $82\mu\text{g/L}$ in 1995 to $35\mu\text{g/L}$ in 2001. Located in the cities of Independence and Medina, Lake Independence achieved the in-lake water quality goal in 2001 for the first time since 1988. However, water quality conditions degraded from 2001 through 2004. The mean phosphorus concentration increased from $35\mu\text{g/L}$ in 2002 to $83\mu\text{g/L}$ in 2004, then decreased again in 2005 and 2006. The mean phosphorus concentration for 2007 increased to $61\mu\text{g/L}$.

The increase in excessive nutrients within Lake Independence was conducive for the development of algae blooms. The average chlorophyll-a concentration was $28\mu\text{g/L}$ with values ranging between $11\mu\text{g/L}$ to $57\mu\text{g/L}$, which was much higher than the water quality goal of $12\mu\text{g/L}$. The abundance of algae contributed to poor water clarity conditions. The secchi depth transparency average was 1.39m with values ranging between 0.66 m to 2.78m.

The increase in phosphorus concentration in 2007 may be due to variations in precipitation relative to previous years. The amount of precipitation in 2006 was below average. Consequently, there may have been less watershed nutrient loading in 2006 resulting in

decreased in-lake phosphorus concentrations. Similarly the majority of the summer of 2007 was below average for precipitation, but at a record-setting high for the month of August and into the fall. This may explain the phosphorus concentration increase from 2006 to 2007. Since the watershed nutrient loading was not monitored, it is difficult to determine the potential impact it may have had on the water quality of Lake Independence.

Typically, the phosphorus concentrations in the spring are further impacted by the senescence of curlyleaf pondweed that occurs at the end of June through the beginning of July. Lake Independence can often have extensive growth of curlyleaf pondweed that potentially inhibits recreational use. The phosphorus concentration did not increase during senescence of curlyleaf pondweed in 2007. There was a slight increase in chlorophyll-a concentration and a decrease in water clarity that corresponded to the time period of curlyleaf pondweed senescence. However, the amount of curlyleaf pondweed may not have been as significant for 2007 in comparison to previous years. Consequently, variations in curlyleaf pondweed density may influence in-lake water quality conditions.

A *Lake Independence Diagnostic Feasibility Study* completed in 2004 identified potential nutrient sources that have contributed to poor in-lake water quality. There has been a considerable amount of nutrient loading from the watershed as well as an in-lake internal loading component. The Pioneer-Sarah Creek Watershed Management Commission implemented rules and regulations to limit the nutrient loading to Lake Independence. However, improving the water quality of the lake will require additional management efforts from both an in-lake and watershed perspective. The study identified several best management practices that could be implemented to further improve Lake Independence water quality.

Little Long Lake

Little Long Lake, located in Minnetrista, was also monitored as part of CAMP. It covers an area of 108 acres and has a maximum depth of 23.2 m (76 feet). Roughly 49 percent of the lake area is considered littoral (the area of aquatic plant dominance), and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lake.

This is the second year that Little Long Lake was enrolled in CAMP. The lake was monitored twice in 2007 for TP and CLA concentrations. Secchi transparency and user perception rankings were not provided by the volunteer.

2007 summer (May-September) data summary

<i>Parameter</i>	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Grade</i>
TP (µg/l)	13.0	10.0	16.0	A
CLA (µg/l)	2.0	1.9	2.0	A
Secchi (m)				
TKN (mg/l)	0.39	0.30	0.47	
			Overall Grade	A

TP = Total Phosphorous; CLA = Chlorophyll A; TKN = Total Kjeldahl Nitrogen

The lake's overall grade of A in 2007 is typical of grades received in past years, but better than last year's B overall grade. However, the 2007 overall grade is based on only two sampling dates and no Secchi transparency data. Therefore, the 2007 data does not provide a complete view of the year's water quality.

Lake Sarah

The Three Rivers Park District monitored Lake Sarah in 2007. Located in the cities of Greenfield and Independence, the Park District established an in-lake phosphorus concentration goal for Lake Sarah of 36µg/L to support direct contact recreational use. The average phosphorus concentration for Lake Sarah has been considerably higher than the in-lake water quality goal during the past ten years. There appears to be an increase in the average phosphorus concentration from 2000 (74µg/L) to 2004 (138.6µg/L). These phosphorus concentrations are similar to those observed in 2007 (89µg/L).

The high phosphorus concentrations are partially due to the senescence of curlyleaf pondweed. Lake Sarah has a considerable amount of curlyleaf pondweed that inhibits potential recreational use. The phosphorus concentration data suggests that in 2007 curlyleaf senescence played a smaller role than in previous years. There was little to no increase in phosphorus concentrations during the typical month of curlyleaf senescence. However, in 2007 the phosphorus concentrations changed the most in late September with concentrations as high as 158µg/L. These changes are typical of lake turn-over cycles in the spring and fall months. The process of lake turn-over re-suspended nutrients throughout the water column and contributed to the high total phosphorus concentrations. The phosphorus concentrations through the summer months ranged from 63µg/L to 119µg/L.

The high phosphorus concentration throughout the summer months caused severe algae blooms. Consequently, the chlorophyll-a concentrations followed these same trends, gradually increasing with the highest concentrations in July (119µg/L). The severe algae blooms resulted in poor water clarity conditions.

Secchi depth transparency ranged between 0.5m to 0.8m throughout the remaining portion of the summer. Water clarity conditions were worse in 2007 compared to previous years with an average secchi depth transparency of 1.17 m. For the first time since 1996 the average secchi depth transparency did not meet its goal of 1.2m. Additionally, the average secchi depth transparency for 2007 was to some extent high because of a clear water phase that occurred in early May that contributed to a secchi depth transparency of 3.15m. Typically, the clear water phase occurs within lakes that have similar eutrophic conditions. This clear water phase often occurs in the spring during periods of high zooplankton density that reduces the amount of algae within the lake.

Spurzem Lake

The *Lake Independence Diagnostic Feasibility Study* identified Spurzem Lake as a potential source of nutrients that may affect downstream water quality. Located in Medina, Three Rivers Park District found Spurzem Lake to have excessive nutrients that contribute to poor water quality conditions. The average total phosphorus concentration in 2007 was 136µg/L, with values ranging between 79µg/L and 212µg/L. These concentrations are the highest within the

past five years. The high phosphorus concentrations are heavily influenced by the senescence of curlyleaf pondweed. The phosphorus concentrations increased by 114µg/L during the time-period of curlyleaf pondweed senescence. The increase in the amount of phosphorus caused algae blooms that persisted throughout the summer. The average chlorophyll-a concentration in 2007 was 66µg/L. The severe algae blooms on Spurzem Lake resulted in poor water clarity conditions. The water clarity conditions ranged between 0.5 to 2.98m with an average secchi depth transparency of 1.08m. The water clarity conditions in 2007 slightly improved compared to the conditions observed in 2006.

The Three Rivers Park District established water quality goals for Spurzem Lake to support indirect contact recreational use. Currently, the water quality conditions are considerably higher than these water quality goals. The excess nutrients in Spurzem Lake have caused poor water quality conditions that potentially inhibit recreational use. The water quality conditions in 2007 are similar to those observed in previous years. Consequently, it is important to improve the water quality of Spurzem Lake to improve recreational use, and reduce potential downstream impacts to Lake Independence. The *Lake Independence Diagnostic Feasibility Study* identifies potential sources that affect the water quality of Spurzem Lake and should be considered relative to implementing best management practices to improve water quality.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on Ardmore and Little Long lakes. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at <http://www.dnr.state.mn.us/lakefind/>.

If you notice any errors in the data or physical information for Ardmore and Little Long lakes, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us. For Lake Independence, Lake Sarah and Spurzem Lake, please contact John Barten of Three Rivers Park District at (763) 694-7841 or jbarten@threeriversparkdistrict.com.

Lake Monitoring History

Lake	City	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	
Ardmore	Loretto	*																X				
Haften	Greenfield	*	*		◆			◆	◆		X		X									
Haughey	Independence						*															
Independence	Independence Medina	X	X	X	X		X								*	*						X
Little Long	Minnetrista	*	*		X	◆	X	◆	X	X	◆					X		X			X	
Peter	Medina									X			X		X		X					X
Rebecca	Greenfield Independence						X															
Robina	Independence										X											
Sarah	Greenfield Independence	X	X	X	X		X		X		X				X		X				X	X
Schandel	Greenfield									X												
Spurzern	Medina	X	X	X	X																	X
Swede Lake	Watertown				*	*	*	◆	X													
Whaletail	Minnetrista				◆	X		◆	X		◆		X			X					X	
Winterhalter	Medina																					X

X = monitored by Three Rivers Park District/Hennepin Parks * = monitored through the CAMP program ◆ = monitored by Metropolitan Council