2003 Lake Water Quality

The Twin Cities Metropolitan Area (TCMA) is fortunate to have a large number of lakes. These lakes are important recreational, aesthetic, and ecological resources that add considerably to the quality of life and economic stability of the region. Protecting the water quality of our lakes is a significant citizen concern.

Many state and local agencies have a role in managing and monitoring lake water quality. The Metropolitan Council operates the most extensive lake monitoring program in the region. This regional report card summarizes the results of the Council's lake monitoring efforts for 2003. The Council has been monitoring lakes in the region since 1980. During the 1980s, the Council typically monitored about 10 to 30 lakes. In 1993, the Council initiated the Citizen-Assisted Monitoring Program (CAMP) to help provide a more complete picture of the water quality of the region's lakes and to provide information to support local water management efforts.

Seventy-nine percent (79%) of respondents to a 2003 Metropolitan Council survey of TCMA residents indicated that the Council's monitoring of the region's water quality (lakes, rivers, and streams) as "very" important for maintaining the region's quality of life.

This highly successful program collects data on more than 100 lakes each year through the efforts of trained, dedicated volunteers. 2003 marked the eleventh year of the Council's volunteer program. Fifteen watershed management organizations, eight cities, two counties and two individual lake groups participated in CAMP in 2003, monitoring a total of 128 lakes. Combined with 12 lakes monitored by Council staff, a total of 140 area lakes were monitored in 2003.

Most of this data collection effort focuses on assessment of lake eutrophication. Eutrophication is the process of accelerated plant growth, particularly algae fueled by nutrient enrichment. Eutrophication is one of the leading water quality concerns facing the region. Nutrients in lakes increase above natural levels as a result of human activities in the watersheds of lakes. Algae growth then increases and water clarity decreases. A variety of other problems may ensue, including increases in nuisance algae blooms, odor problems, decreased desirability for recreation, decreased dissolved oxygen, fish kills, and changes in the fish communities toward more pollution tolerant species such as carp and bullhead.

Why we monitor The Metropolitan Council is charged with developing a comprehensive regional development guide that minimizes the adverse impacts of growth, including adverse impacts on the environment. To help meet this goal, the Minnesota Legislature has mandated (Minnesota Statute 103F.721) the Council to conduct an assessment of the waters (lakes, streams, and rivers) in the TCMA that have been polluted or that have potential for water pollution caused by non-point sources. The monitoring data collected by the Council and its partners is used to support regional planning efforts, identify pollution problems, and meet federal and state regulations.

Methods

Lakes monitored by Council staff and volunteers are typically sampled at two-week intervals from mid-April through mid-October. Most lakes are sampled from one station located at the deepest spot near the center of the lake. Field measurements for lakes monitored by Council staff include temperature, dissolved oxygen, pH, and water clarity. Council staff collect water from the lake surface (0-2 m) using a two-meter depth-integrating sampler. Water samples are transported on ice in a dark cooler, processed, preserved, and submitted to the laboratory for analysis. Lab analyses include total phosphorus (TP), total Kjeldahl nitrogen(TKN), chlorophyll-a (Chl-a), and other variables.

Field measurements for CAMP lakes include water clarity (measured with the use of a Secchi disk) and temperature. Volunteers collect surface water samples using a clean one-gallon plastic milk jug. The sample is split into two sub-samples, one for total phosphorus and total Kjeldahl nitrogen. Another sub-sample is withdrawn from the jug for chlorophyll-a and filtered on-site through a 0.45 micrometer glass-fiber filter using a manual filtration apparatus. The filter is then placed in the sample container and wrapped in aluminum foil. Samples are then transported in a cooler and stored in a freezer until they are picked up and delivered to the laboratory for analysis. The routine chemical analyses are performed at the Metropolitan Council Environmental Services (MCES) laboratory following U.S. EPA approved methods.

2003 Water Quality
Best Ten and Worst Ten Lakes
for lakes larger than 50 acres

	Lake ID	Lake Name	City	Mean TP (ug/L)	Mean Chl-a (ug/L)	Mean SDT (ft)	Overall Grade
BEST TEN	27013700	Christmas Lake	Shorewood	11.8	3.2	16.1	A
	19044600	Lac Lavon Lake	Apple Valley	20.6	3.8	15.1	A
	82001400	Little Carnelian Lake	Stillwater Twp.	15.2	3.8	15.1	A
	82004600	Square Lake	May Twp.	11.2	3.0	19.7	A
	82008000	Sylvan Lake	Forest Lake Twp.	15.4	3.3	15.4	A
	27017002	Little Long Lake	Minnetrista	9.6	4.2	14.8	A
	82015300	Sunset Lake	Hugo	18.6	3.6	12.1	A
	10000900	Minnewashta Lake	Chanhassen	17.4	8.0	9.8	A
	82005200	Big Marine Lake	May Twp.	22.5	6.9	9.7	A
	82010300	Olson Lake	Lake Elmo	17.2	10.5	10.2	A
WORST TEN	70007600	Pike Lake	Prior Lake	225.6	120.3	2.6	F
	10002900	Miller Lake	Dahlgren Twp.	220.9	61.5	1.8	F
	82001500	Loon Lake	Stillwater Twp.	131.8	129.4	1.4	F
	10008900	Goose Lake	Waconia Twp.	170.2	88.3	1.4	F
	10009500	Swede Lake	Watertown Twp.	264.3	110.9	1.9	F
	19002300	Farquhar Lake	Apple Valley	347.1	87.2	1.8	F
	27011900	Cedar Island Lake	Maple Grove	248.6	103.6	1.5	F
	27012700	French Lake	Dayton	283.7	92.1	1.1	F
	10006900	Benton Lake	Benton Twp.	247.8	261.6	1.0	F
	10006600	Winkler Lake	Benton Twp.	460.0	120.0	1.3	F

TP - total phosphorus **SDT - Secchi disk transparency**
Chl-a - chlorophyll-a

What is a ug/L? This is an abbreviation for micrograms per liter, which is a way to describe how much of a substance is contained in a sample. One ug/L is approximately equal to 1 part per billion. For illustration, if you wanted to increase the chloride level in an Olympic-sized swimming pool by 1 ug/L you would have to add slightly less than one teaspoon of table salt.

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RESULTS

Each lake monitored in 2003 was assigned a water quality grade using an A though F grading system developed by Council staff in 1989. The grading system uses percentile ranges for three water quality indicators—summertime (May-September) average values for total phosphorus, chlorophyll-a, and Secchi depth transparency—developed from the Council's TCMA lake water quality database. Total phosphorus is a key nutrient measure, chlorophyll-a is a measure of algae abundance, and Secchi depth transparency is a measure of water clarity. An overall grade is calculated as the average grade for the three individual grades. The grading system allows comparisons of lake water quality across the TCMA.

Lakes receiving an "A" are deemed exceptional compared to other area lakes and have no recreational use impairment. Lakes with a "B" grade have very good water quality and only modest recreational use impairment, while lakes receiving a "C" are considered to have average water quality for the region and are somewhat impaired for recreational use. "D" grade lakes have poor water quality and lakes receiving an "F" grade have extremely poor quality compared with other area lakes and do not support recreational use.

Lakes are one of the region's most important resources. They provide great recreational and economic value to Metro area residents.

In 2003, 30% of the assessed lakes had overall water quality grades of "A" or "B", meaning that they had relatively minor recreational use impairment due to eutrophication. Another 37% of lakes received a water quality grade of "C". However, 33% of lakes received a water quality grade of "D" or "F", meaning that they have poor water quality. There were 112 lakes monitored in both 2002 and 2003. Of these, lake grades were unchanged for 64%, increased for 21%, and decreased for 16%. Analysis of the 112 repeat lakes seems to indicate that the areas lake water quality may have been similar to slightly better in 2003 as compared to that recorded in 2002.

Similar to that of past years, analysis revealed no distinct pattern within the region as to where lakes with specific water quality are located. Nor were there clear-cut areas within the TCMA of better or worse water quality in 2003 as compared to 2002.

Posted signs like this one at Mitchell Lake in Eden Prairie, let lake users know that their lake is routinely being monitored and assessed.

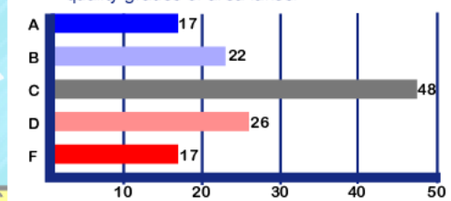
Furthermore statistical analysis of the current and historical water quality data revealed no significant trends. There are two factors that are likely responsible for this lack of trends. First, due to the nature of the monitoring program, there are frequent gaps in the monitoring record. These gaps adversely affect the ability of statistical tests to detect trends. Second, the magnitude of the potential trends are probably small with respect to the natural year-to-year variability of lake water quality. However, if we combine the data from other agencies' monitoring programs, more lakes have a somewhat more complete record for Secchi transparency. As such, more lakes have data sufficient enough to support a reasonable trend analysis.

Using the combined Secchi transparency data, the majority of the lakes monitored as part of the Council's 2003 lake program showed no trends in water clarity (either increasing or decreasing). Of the lakes that did show a trend, more lakes showed an increasing trend than a decreasing trend. Thirteen lakes showed an increasing trend in water clarity (Big Marine, DeMontreville, Halfbreed/Sylvan, Little Carnelian, Lotus, Marion, Olson, Parkers, Sand, Silver, Sunset, Valentine, and Waconia lakes). Four of the lakes had decreasing water clarity trends (Farquhar, Markgrafs, Square, and Sullivan lakes).

Water Quality Grading System

Grade	Total Phosphorus (ug/L)	Chlorophyll-a (ug/L)	Secchi Depth (m)	Secchi Depth (ft)
A	<23	<10	>3.0	(9.8)
B	23-32	10-20	3.0-2.2	(9.8-7.2)
C	32-68	20-48	2.2-1.2	(7.2-3.9)
D	68-152	48-77	1.2-0.7	(3.9-2.3)
F	>152	>77	<0.7	<(2.3)
NA				

The 2003 breakdown of overall lake water quality grades of area lakes.*



*Assessment was completed only for lakes with an adequate database.

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