2002 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 2002. 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.

An automatic in-lake monitoring system on Lake McCarrons that collects information on air temperature, wind direction and speed, and temperature throughout the lake's water column.

This highly successful program collects data on more than 100 lakes each year through the efforts of trained, dedicated volunteers. 2002 marked the 10th year of the Council's volunteer program. Fifteen watershed management organizations, nine cities, and two counties participated in CAMP in 2002, monitoring a total of 125 sites on 121 lakes. Combined with 12 lakes monitored by Council staff, a total of 137 area lakes were monitored in 2002.

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 water sheds 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 1.0 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.

2002 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	9.4	4.0	18.4	A
	19044600	Lac Lavon Lake	Apple Valley	10.2	2.6	11.2	A
	82004600	Square Lake	May Twp.	15.5	2.8	19.0	A
	82008000	Sylvan Lake	Forest Lake Twp.	19.8	2.5	15.1	A
	82001400	Little Carnelian Lake	Stillwater Twp.	14.1	3.5	15.1	A
	82015300	Sunset Lake	Hugo	19.3	4.0	11.8	A
	27010700	Parkers Lake	Plymouth	18.3	5.0	11.5	A
	82004400	West Boot Lake	May Twp.	17.5	5.8	10.8	A
	82004900	Big Carnelian Lake	May Twp.	25.1	8.2	9.5	B
	10001200	Lake Ann	Chanhassen	23.2	5.5	8.5	B
WORST TEN	02000500	George Watch Lake	Lino Lakes	153.6	76.1	2.0	F
	02000400	Peltier Lake	Lino Lakes	178.6	77.2	3.0	F
	27004203	Upper Twin Lake	Robbinsdale	113.1	178.1	2.0	F
	70007400	Dean Lake	Shakopee	165.0	55.8	1.6	F
	70007600	Pike Lake	Prior Lake	156.9	65.4	1.6	F
	70005400	Spring Lake	Spring Lake Twp.	148.4	116.6	2.0	F
	10012100	Eagle Lake	Camden Twp.	250.8	57.5	2.0	F
	19002300	Farquhar Lake	Apple Valley	198.5	204.3	1.3	F
	27012700	French Lake	Dayton	262.3	97.0	1.0	F
	27001500	Bass Lake	St. Louis Park	359.6	NA	0.7	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.

Metropolitan Council

RESULTS

Each lake monitored in 2002 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.

Twin Cities lakes are enjoyed by many, such as this young angler.

In 2002, 31% 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 30% of lakes received a water quality grade of "C". However, 39% of lakes received a water quality grade of "D" or "F", meaning that they have poor water quality.

The percentage of lakes receiving "Ds" or "Fs" is similar to that in 2001, but slightly higher than what has occurred over the last decade. There were 89 lakes monitored in both 2001 and 2002. Of these, lake grades were unchanged for 62%, decreased for 24%, and increased for 14%. It appears that lake water quality may have been slightly worse than usual in 2002.

Similar to past years, there is no distinct pattern as to where lakes with specific water quality were located. As was observed in the past, the only similarity between the majority of the "D" and "F"- grade lakes is their size and depth. They are generally shallow with small surface areas. In some cases, the lakes are nothing more than open water marshes with an excess of rooted aquatic vegetation. This distinction is important for three reasons: first, deeper lakes have a greater ability to incorporate nutrients and trap them in the sediments where they are not available for plant growth (macrophyte and/or algae); second, shallow lakes tend not to stratify during the summer months, allowing the potential release of phosphorus from bottom sediments to rise through the water column and become available for plant growth; and third, the small surface areas of these lakes generally result in larger watershed-to-lake ratios, which means the lakes have to handle greater potential runoff loads for their size than larger lakes in a similar-sized watershed.

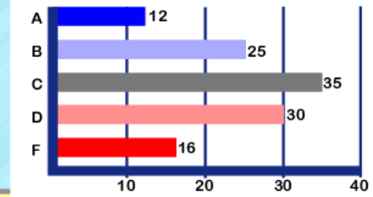
Posted signs like this one at Mitchell Lake in Eden Prairie, let lake users know that their lake is routinely being monitored and assessed.

The lakes with above-average water quality (grades of "A" and "B") similarly were not specific to any one part of the area. They were located in all seven of the region's counties (lakes receiving an "A" grade were found in five counties). Lakes receiving a grade of "A" or "B" tend to be deeper, thermally stratify in summer, have small contributing watersheds relative to the lakes' surface areas, and have little construction activity within the immediate watershed.

Water Quality Grading System

Grade	Total Phosphorus (ug/L)	Chlorophyll-a (ug/L)	Secchi Depth (m)	(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	(2.3-3.9)
F	>152	>77	<0.7	<(2.3)

The 2002 breakdown of overall lake water quality grades of area lakes.*



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

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