2006

Lake Water Quality

Lakes add to the quality of life and economic stability of the region

Why We Monitor

Methods

Water Quality Grading System

2006 Lake Water Quality Grades

Monitored Lake Map

2006 Best and Worst Lakes

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. 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.

This highly successful program collects data on more than 100 lakes each year through the efforts of trained, dedicated volunteers. 2006 marked the fourteenth year of the Council's volunteer program. Eighteen watershed management organizations, fifteen cities, two counties, one basin planning group, and one lake association participated in CAMP in 2006, monitoring a total of 188 sites on 178 lakes. Combined with 13 sites on 11 lakes monitored by Council staff (three of the thirteen lakes were also monitored through the CAMP program), a total of 201 sites on 186 area lakes were monitored in 2006.

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.

Metropolitan Council

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 taken during each monitoring event include temperature, dissolved oxygen, and water clarity (measured with a Secchi disk). In addition, a surface water sample is collected for lab analyses that include total phosphorus (TP), total Kjeldahl nitrogen (TKN), and chlorophyll-a (Chl-a). The routine chemical analyses are performed at the Metropolitan Council Environmental Services (MCES) laboratory following U.S. EPA approved methods. A full description of each program's methodology can be found at: **http://www.metrocouncil.org/environment/RiversLakes/Lakes/index.htm**

Results

Each lake monitored in 2006 was assigned a water quality grade using an A through F grading system originally developed by Council staff in 1989 and "re-calibrated" with an expanded database, in 2000. 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.

In 2006, 24% of the lake sites assessed with sufficient data to assign an overall water quality grade received a grade of "A" or "B", meaning that they had relatively minor recreational use impairment due to eutrophication. Another 38% of lakes received a water quality grade of "C". However, 38% of lakes received a water quality grade of "D" or "F", meaning that they have poor water quality. Overall water quality grades were not calculated for several lakes due to lack of data needed for this calculation. There were 141 lake sites monitored in both 2005 and 2006. Of these, lake grades were unchanged for 64%, improved for 11%, and worsened for 25%. Analysis of the repeat lakes indicates that the region's lakes experienced slightly worse water quality in 2006 as compared to that in 2005. This continued the trend noted in 2005 when the lake monitoring program revealed slightly worse lake water quality than that recorded during the 2004 monitoring period.

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 2006 as compared to 2005.

The Council's lake monitoring program, especially the use of volunteer monitors through CAMP, has played a key role in the Council's recent efforts to use satellite images to assess annual lake water clarity for the region as a whole. The monitoring program provides "ground-based" measurements used to calibrate mathematical models, which in turn are used to interpret the satellite images. The use of satellite technology provides a cost-effective way to extend the analysis of the region's lake water quality from just the lakes involved in our ground-based programs to all the lakes in the region. Over time, the satellite-based information can be used to detect how lake trophic conditions (especially water clarity) have changed over time and space in relation to changes in land-use and land-cover conditions.

Satellite assessment of regional lake water quality could not be completed for 2006 due to the lack of a clear image.

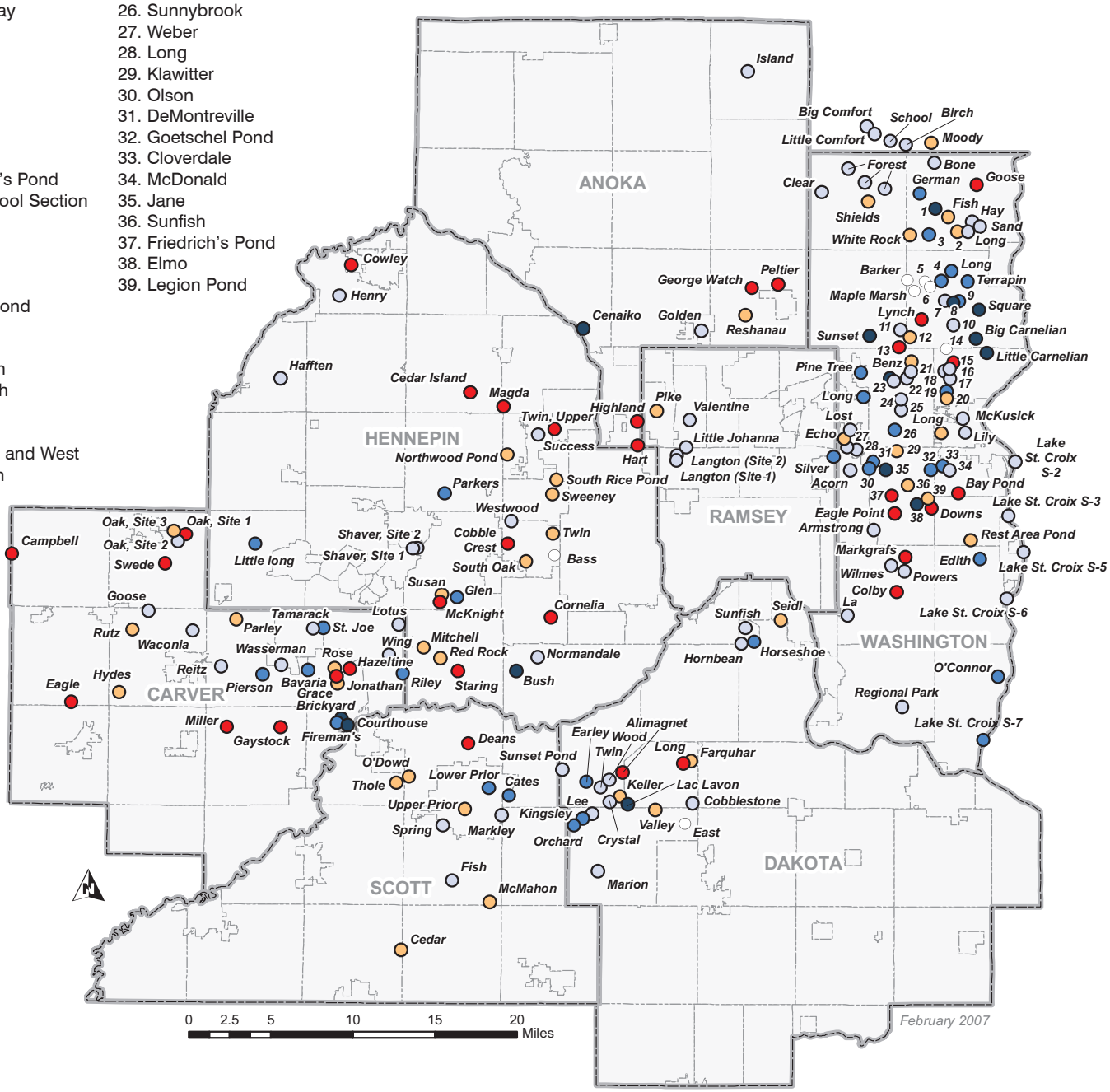
All of the Council's lake monitoring data can be accessed online at: **http://es.metc.state.mn.us/eims.**

2006 Lake Grades

CAMP & Metropolitan Council Monitored Lakes

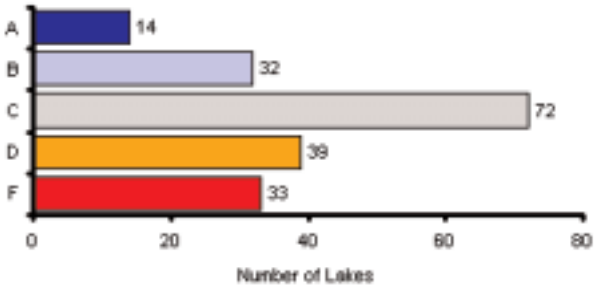
Key to lake numbering

1. MacDonald's Pond
2. Jellum's Bay
3. Big Marine
4. Staples
5. Mud
6. Turtle
7. Bass
8. West Boot
9. East Boot
10. Schroeder's Pond
11. South School Section
12. Goggins
13. July
14. Louise
15. Loon
16. Herber's Pond
17. Carol
18. Silver
19. Twin, North
20. Twin, South
21. Pat
22. Kismet
23. Bass, East and West
24. Masterman
25. Woodpile
26. Sunnybrook
27. Weber
28. Long
29. Klawitter
30. Olson
31. DeMontreville
32. Goetschel Pond
33. Cloverdale
34. McDonald
35. Jane
36. Sunfish
37. Friedrich's Pond
38. Elmo
39. Legion Pond



Water Quality Grading System				
Grade	Total Phosphorus (ug/L)	Chlorophyll-a (ug/L)	Secchi Depth (m)	(ft)
A	<23	<10	>3	(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)

(ug/L) is an abbreviation for micrograms/liter



Breakdown of overall lake water quality grades in 2006.*
* Assessment was completed only for lakes with an adequate database.

2006 Lake Grades

- A (n=14)
- B (n=32)
- C (n=72)
- D (n=39)
- F (n=33)
- NA (n=7)

For more information visit

http://www.metrocouncil.org/environment/RiversLakes/Lakes/index.htm or call Kent Johnson at 651-602-8117

2006 Lake Water Quality Grades (For lakes over 50 acres)				Summertime			
				TP	Chl-a	SDT	Overall
	Lake ID	Lake Name	City	(ug/L)	(ug/L)	(ft)	Grade
Best Ten	82001400	Little Carnelian Lake	Stillwater Twp.	19.0	2.2	22.0	A
	82004600	Square Lake	May Twp.	19.4	3.5	17.0	A
	82010400	Jane Lake	Lake Elmo	14.0	2.4	16.3	A
	82004400	West Boot Lake	May Twp.	21.2	4.4	11.3	A
	82010600	Elmo Lake	Lake Elmo	17.0	2.4	10.8	A
	82015300	Sunset Lake	Hugo	20.9	3.9	10.8	A
	19044600	Lac Lavon Lake	Apple Valley	20.9	5.2	10.8	A
	82004900	Big Carnelian Lake	May Twp.	31.8	7.1	11.4	A
	27004700	Bush Lake	Bloomington	20.0	6.3	9.6	A
	82003100	Terrapin Lake	May Twp.	39.8	3.7	12.0	B
Worst Ten	2000500	George Watch Lake	Lino Lakes	171.0	213.3	2.2	F
	82009400	Colby Lake	Woodbury	282.0	82.3	2.2	F
	82001502	Loon Lake	Stillwater Twp.	165.2	107.7	2.2	F
	10003100	Swede Lake	Watertown Twp.	313.3	80.3	1.7	F
	10003100	Gaystock Lake	Dahlgren	190.9	146.3	1.4	F
	27011900	Cedar Island Lake	Maple Grove	214.4	111.7	1.3	F
	10001400	Hazeltine Lake	Chaska	205.1	301.0	1.2	F
	27004200	Twin Lake Upper	Crystal	199.7	90.1	1.2	F
	10012700	Campbell Lake	Hollywood Twp.	392.9	180.8	0.8	F
	82010900	Eagle Point Lake	Lake Elmo	859.8	115.4	0.4	F

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FIRST CLASS POSTAGE

TO: