

# Lake Water Quality

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

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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 TCMA lakes each year through the efforts of trained, dedicated volunteers. 2007 marked the fifteenth year of the Council's volunteer program. Eighteen watershed management organizations, fifteen cities, two counties, and one basin planning group participated in CAMP in 2007, monitoring a total of 181 sites on 176 lakes.

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.



## 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 2007 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 of the summer-time (May-September) average values for three water quality indicators (total phosphorus, chlorophyll-a, and Secchi depth transparency). The percentile ranges were 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. The lake's water quality 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 2007, 31% of the lake sites assessed with sufficient data to assign a water quality grade received a grade of "A" or "B", meaning that they had relatively minor recreational use impairment due to eutrophication. Another 34% of lakes received a water quality grade of "C". However, 35% of lakes received a water quality grade of "D" or "F", meaning that they have poor water quality. There were 159 lake sites that were monitored in both 2006 and 2007. Of these, lake grades were unchanged for 67%, improved for 21%, and worsened for 12%. These water quality grades from the 159 sites seem to indicate that the region's lakes experienced slightly better water quality in 2007 as compared to that in 2006. This observation indicates a reversal of a previous trend in which more lakes saw degradation in their water quality grades from 2004 to 2006.

Similar to that of past years, there was 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 2007 as compared to 2006.

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.

All of the Council's lake monitoring data can be accessed online at:

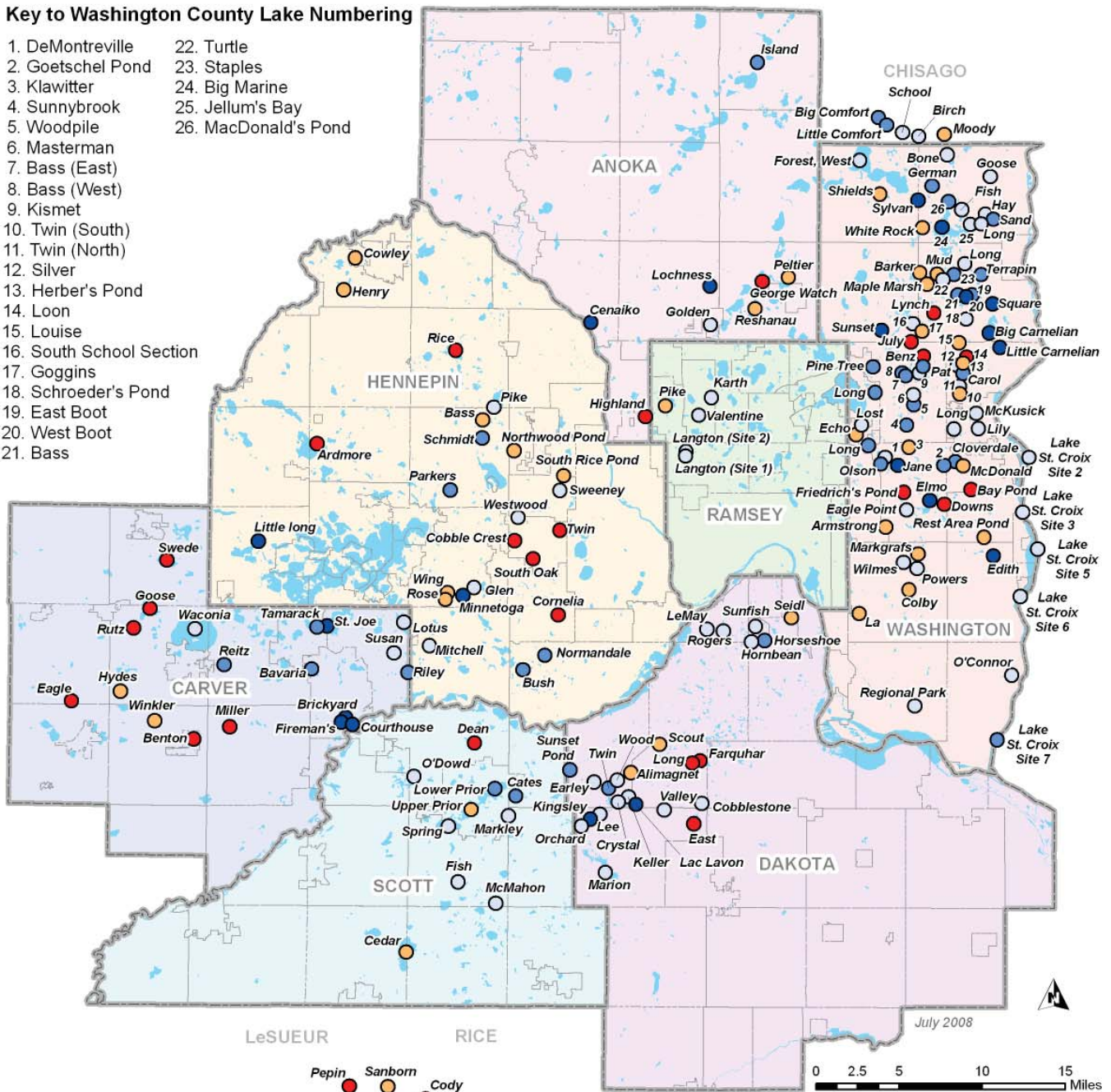
<http://es.metc.state.mn.us/eims>

## 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.

### Key to Washington County Lake Numbering

- |                          |                      |
|--------------------------|----------------------|
| 1. DeMonteville          | 22. Turtle           |
| 2. Goetschel Pond        | 23. Staples          |
| 3. Klawitter             | 24. Big Marine       |
| 4. Sunnybrook            | 25. Jellum's Bay     |
| 5. Woodpile              | 26. MacDonald's Pond |
| 6. Masterman             |                      |
| 7. Bass (East)           |                      |
| 8. Bass (West)           |                      |
| 9. Kismet                |                      |
| 10. Twin (South)         |                      |
| 11. Twin (North)         |                      |
| 12. Silver               |                      |
| 13. Herber's Pond        |                      |
| 14. Loon                 |                      |
| 15. Louise               |                      |
| 16. South School Section |                      |
| 17. Goggins              |                      |
| 18. Schroeder's Pond     |                      |
| 19. East Boot            |                      |
| 20. West Boot            |                      |
| 21. Bass                 |                      |

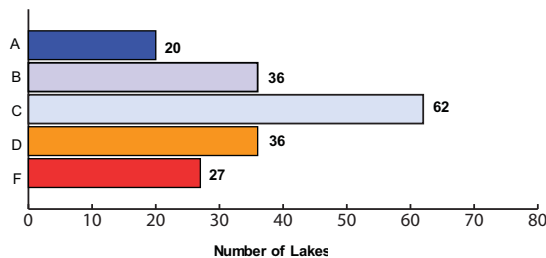


WATER QUALITY GRADING SYSTEM			
Grade	Total Phosphorus (ug/l)	Chlorophyll -a (ug/l)	Secchi Depth (m) (ft)
A	<23	<10	>3 (9.8)
B	23-32	10-20	3.0-2.2 (9.8-7.2)
C	32-68	20-48	2.2-1.2 (7.2-3.9)
D	68-152	48-77	1.2-0.7 (3.9-2.3)
F	>152	>77	<0.7 <(2.3)

(ug/l) is an abbreviation for microgram/liter

### 2007 Lake Grades

- A (n=20)
- B (n=36)
- C (n=62)
- D (n=36)
- F (n=27)



Breakdown of overall lake water quality grades of area lakes for 2007.\*  
 \* Assessment was completed only for lakes with an adequate database.

2007 LAKE WATER QUALITY GRADES (For lakes over 50 acres)				Summertime			Overall Grade
Lake ID	Lake Name	City	TP (ug/l)	Chl-a (ug/l)	SDT (m)		
<b>Best Ten</b>	82-0014	Little Carnelian	Stillwater Twp.	16.4	2.7	7.2	A
	82-0046	Square Lake	May Twp.	14	3.5	5.4	A
	82-0104	Jane Lake	Lake Elmo	14.1	2.8	4.7	A
	82-0049	Big Carnelian Lake	May Twp.	18	5.2	4.5	A
	82-0080	Half Breed Lake	Forest Lake	13.8	5.4	4.5	A
	82-0044	West Boot Lake	May Twp.	24.4	3.6	3.7	A
	19-0446	Lac Lavon Lake	Apple Valley	20.7	5.3	3.7	A
	82-0106	Elmo Lake	Lake Elmo	14.5	2.3	3.6	A
	82-0052	Big Marine Lake	Scandia	22.8	8.5	3.2	A
	82-0153	Sunset Lake	Hugo	22.1	3.4	2.9	A
<b>Worst Ten</b>	19-0023	Farquar Lake	Apple Valley	163.3	73.2	0.6	F
	10-0121	Eagle Lake	Young America Twp.	199	87.2	0.6	F
	27-0116	Rice Lake	Maple Grove	222.1	97.7	0.6	F
	2-0005	George Watch Lake	Lino Lakes	211.1	58.2	0.5	F
	10-0029	Miller Lake	Dahlgren Twp.	216.6	82.1	0.5	F
	82-0015-02	Loon Lake	Stillwater Twp.	150.2	115.4	0.5	F
	10-0089	Goose Lake	Waconia Twp.	103.1	137.7	0.4	F
	10-0095	Swede Lake	Watertown Twp.	303.9	101.6	0.3	F
	40-0028	Pepin Lake	Lanesburg Twp.	296.4	119.7	0.2	F
	10-0069	Benton Lake	Benton Twp.	375.2	248	0.2	F

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