A 2004 STUDY OF THE WATER QUALITY OF 145 METROPOLITAN AREA LAKES

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EXECUTIVE SUMMARY

To date, the Council's lake monitoring programs (including the staff- and volunteer- monitoring programs) and have provided an important tool for making informed lake management decisions. Data from our regional lake monitoring programs are frequently used to determine possible trends in in-lake water quality, estimate expected ranges in water quality of unmonitored lakes, examine intra-and inter-regional differences, determine potential impairments due to water quality, and investigate the relationships between landscape and water quality.

This report is the latest in a continuing series of reports summarizing results of the Metropolitan Council's (Council) annual lake monitoring program. The Council has collected water quality data on area lakes since 1980. This report contains data from 145 lake sites sampled in 2004, including 13 lake sites on 11 lakes monitored by the Council and 132 lakes monitored by volunteers.

The objectives of this study were to:

1. Provide lake water quality data to lake, watershed and water resource managers.
2. Advise managers of known or suspected threats to lake water quality.
3. Continue to compile a water quality database on the six area lakes that support a trout fishery.
4. Collect in-lake water quality data on, Lee, Northwood, Twin [Burnsville], and Valley lakes to determine the results of in-lake barley straw treatments on the lakes' algal population and resulting water clarity.
5. Support the Council's satellite lake assessment program by collecting "ground" measurements used to develop emphirical models inorder to predict water clarity on all the regions lakes. Information about, and results from, the Council's satellite lake assessment program can be found at http://www.metrocouncil.org/planning/environment/TCWaterClarity2004.pdf
6. Collect water quality data on Lake McCarron in order to evaluate the "success" of modifications to the Villa Park wetland treatment system and autumn of 2004 in-lake Alum treatment. The lake will again be monitored in 2005 to continue to assess the success of the lake and watershed projects and their effect on the lake's water quality.

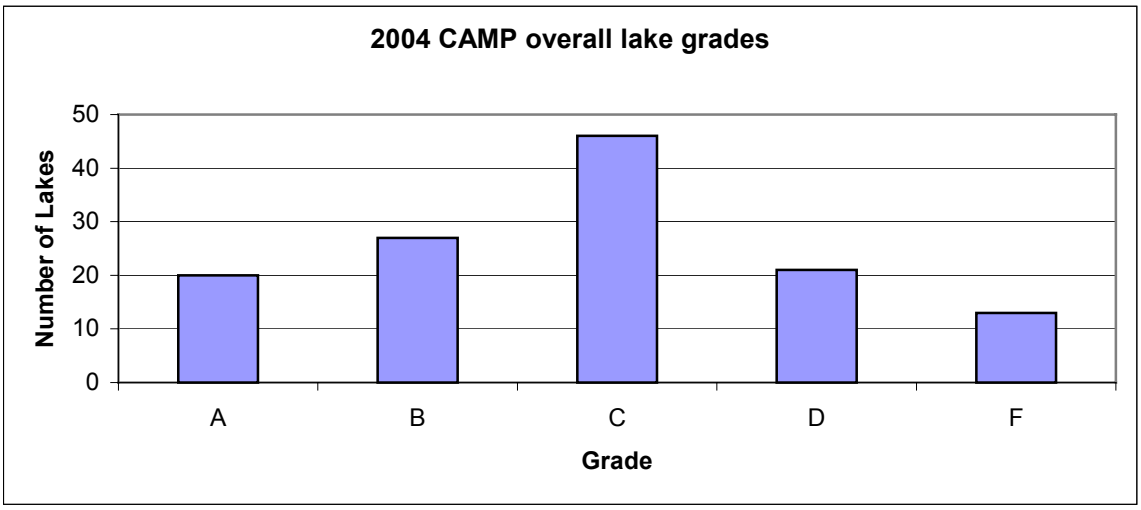
The year 2004 marked the twelveth year that the Council-sponsored volunteer monitoring program, entitled "The Citizen-Assisted Monitoring Program" (CAMP), was used to increase our knowledge of the water quality of area lakes. Once again volunteers measured surface water temperature and transparency, and collected surface water samples that were analyzed for total phosphorus, total Kjeldahl nitrogen, and chlorophyll-a on a biweekly basis from mid-April to mid-October (approximately 14 sampling events).

This year's volunteer monitoring program included 11 lakes never before monitored by the Council, and 114 lake sites returning from 2003 (7 of which only included Secchi transparency readings during one or the other, or both, years, and 5 which lacked a sufficient 2004 database to compare to 2003). The 2004 program included lake data from 26 of the 27 watersheds/municipalities/counties represented in the 2003 program. Additionally, the 2004 CAMP program added three new cities to its growing list of monitoring partners.

Of the 132 lake sites involved in CAMP in 2004 11 lake sites (Edina, Hart, Harvey, Herber's Pond, Libbs, MacDonald's Pond, Pamela, Schroeder's Pond, St. Joe, Terrapin, and Windsor lakes) had never been monitored by the Council prior to 2004. In fact, a broader search for <u>any</u> historic water quality data on

the lakes came up empty. The greatest percentage of the lakes monitored through CAMP in 2004 received an overall water quality grade of "C" (36.2 percent). The water quality of these lakes is considered average as compared to others in the seven-county metropolitan area.

When comparing the percentage of above-average lakes (those receiving grades of "A" or "B") to below-average lakes (those receiving "D" or "F"), more lakes were above average (37.1 percent to 26.7 percent). The complete 2004 CAMP lake report card grade tally (for those lakes with sufficient data) assigned "A's" to 20 lakes (15.8 percent) and "B's" to 27 lakes (21.3 percent). Forty-six lakes acquired "C's" (36.2 percent), 21 received "D's" (16.5 percent), and 13 obtained an "F" (10.2 percent).



Of the 109 repeat CAMP lakes which a sufficient database from 2004, 27 had a better overall water quality grade in 2004 (Bass [Washington County], Big Carnelian, Colby, East Boot, Forest [West Basin], Fish [Washington County], Goose [Waconia], Grace, Keller [Burnsville], Kingsley, Long [Stillwater], Long [Washington County], Long [Mahtomedi], Lotus, Maple Marsh, McDonald, McKusick, Mitchell, Mud, Northwood, Oak, Orchard, Pine Tree, Regional Park, Sand, South Rice, and Sunset Pond lakes), and 10 had worse overall water quality grades in 2004 (Downs, Earley, George Watch, Hay, Hyde, Louise, Powers, Prior [Upper], Spring, and Valley lakes), and 72 had the same overall water quality grade for both years. By further breaking down the 72 lakes that had identical overall grades in 2003 and 2004, 30 had similar summertime mean conditions in both 2003 and 2004 (mean TP, CLA and Secchi transparency), 24 had better means in 2004, and 18 had worse or somewhat worse means in 2004.

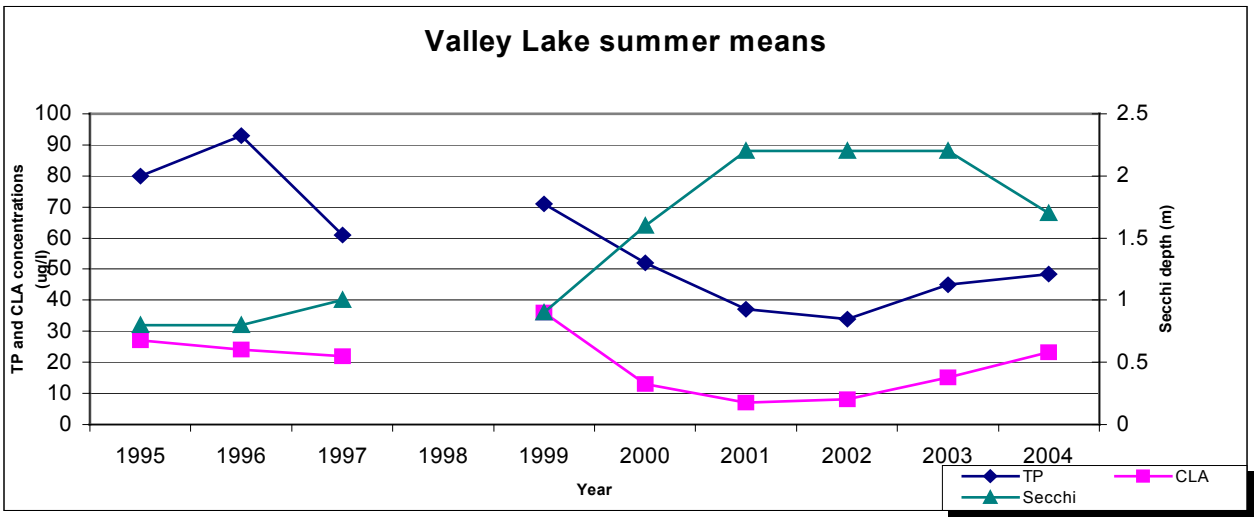
Water quality data from the 109 repeat CAMP lakes seem to indicate that the Metro Area lakes experienced better water quality conditions in 2004 as compared to 2003 (which was reported in 2003 to be slightly better than that recorded in 2002). Furthermore recently conducted trend analysis by MPCA on lakes with extensive Secchi transparency databases, revealed that while the majority of statistically assessed lakes showed no trends in water clarity (either negative or improving), more lakes showed an improving trend than a negative trend (MPCA 2003). Of the CAMP 2004 lakes assessed (those with sufficinet data), 12 showed an improving trend in water clarity (Big Marine, DeMontreville, Halfbreed/Sylvan, Little Carnelian, Lotus, Marion, Olson, Parkers, Sand, Silver, Sunset, and Valentine lakes) and four showed a negative trend (Farquhar, Long (Stillwater), Markgrafs, and Square lakes) (MPCA 2003).
After comparing the 2004 data to pre-2004 data on the remaining 11 lake sites, a few general comments and observations can be made. A review of each lakes' summertime TP, CLA and Secchi means and

water quality grades reveal that they seem to have water quality levels that fall within their normal fluctuation ranges of seasonal water quality. While a few of the 11 lake sites may show a slight degradation in one of the individual parameters, the other parameters either showed no real difference or a slight improvement. An example would be Lake Centerville, which recorded simproved TP and CLA conditions in 2004 (as compared to those of 2003), yet had much worse water clarity.

Overall, four of the 13 Council-staff monitored lake sites monitored in 2004 were also monitored in 2003. All four of the lakes that were monitored through Council programs in 2003 and 2004 received identical overall water quality grades in both years.

Similar to 1999-2003, a number lakes monitored through CAMP 2004 used barley straw in order to inhibit algal growth and improve water clarity (Jellum's Bay, Lee, Northwood, Twin [Burnsville], and Valley lakes). Barley straw has been used for algae control in the United Kingdom for many years. The mechanism, by which barley straw controls in-lake algal biomass, while not truly known, has historically focused on the decomposing straw releasing a chemical(s) that inhibits algal growth. In an attempt to identify the mechanism actually reducing in-lake phosphorus concentrations and reducing algal biomass, research has been underway on Valley Lake (and its associated sedimentation basin), since 2001.

Valley Lake was monitored through CAMP in 1995-1997 when barley straw treatments were not used in the lake and 1999-2004 when barley straw was used. This has provided an opportunity to compare the six years where barley straw has been used in the lake, to the three years where it was not. The Valley Lake data indicate that the barley straw not only inhibit algal growth on Valley Lake in 1999-2002 (and to a lesser degree 2003), but has also reduced total phosphorus in the lake's surface waters. The 2003-2004 summer mean TP, CLA and Secchi transparency, have shown some degradation compared to the 1999-2002 means.



One explaination for the recent dip in water quality could be directly linked to an escalating panfish population. Similar to that mentioned for Lee Lake, where a recent fish survey suggested that unusually high fish densities may be impacting the barley treatment on the lake. The Lee Lake survey revealed the lake's fishery being dominated by bluegill sunfish, black crappies, and black bullheads (with as much as

30+ times the areas average number of bluegills per net) (McComas 2004). For this reason an in-lake fisheries survey is scheduled for Valley Lake in 2005.

As part of the barley straw research on Valley Lake and its associated sedimentation basin (viewed as a control), past sampling centered on trying to identify the chemical compound released by the decaying barley straw. Samples within the lake and sedimentation basin were analyzed for a break down of phenol concentrations (one of the theories behind the barley straw inhibitor) as a part of 57 base neutral acids organic compounds (BNAs). Because the breakdown of BNA compounds for each of the collected samples came back below detection limit (< 2.0 μg/l), it is not thought that chemical compounds (such as phenols) released from the decomposing straw is the mechanism inhibiting the algal growth.

Because the release of a chemical compund such as a phenol is not thought to be the algal inhibitor (as a result of our research), recent Valley Lake research monitoring has centered on the decaying straw actually acting as a carbon source for carbon-limited microbial growth. With the carbon availability secure, the microbial community production soars and phosphorus uptake is shunted through the microbial loop ecosystem (McComas 2003). Therefore, the presence of decaying barley straw results in the lake's algal biomass actually being phosphorus-limited not inhibited by a released chemical compound. Initial analysis of the 2003-2004 carbon and chlorophyll data seems to support this is theory. Continued analyses of the 2003-2004 data are ongoing.

Since 1980, 284 area lakes have been monitored through the Council's Lake Program (including Council-staff monitoring and CAMP). Some of the lakes have multiple monitoring sites [299 sites]. The list of lakes in the Council's monitoring database is shown in Appendix C. The resulting data from the Council's lake monitoring program are permanently stored in the U.S. EPA's national water quality data bank, STORET (stands for STOrage and RETrievel). The majority of the 299 lake sites have been revisited on a rotating schedule throughout the past 25 years to develop a working baseline to help determine possible trends and to aid lake and watershed managers in their decision making. While the Council has done its best to enhance and expand the region's lake water quality database, it is apparent that one of the most economical and efficient method to expand knowledge of our lakes has been with the assistance of volunteers and cooperation and financial support of watershed management organizations, counties, and cities. So while the first 12 years of CAMP have been very successful, our future goal is to continue to expand the coverage of our lake monitoring program in order to better understand and manage the areas water resources.

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 mathmatical 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 lake's 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.

Results of the 2004 satellite assessment of the region revealed similar results to that found through the 2004 ground-based monitoring programs, that the region experienced better lake water quality in 2004 than that recorded in 2003. The complete results of the 2004 satellite analysis can be at http://www.metrocouncil.org/planning/environment/TCWaterClarity2004.pdf.

If you have questions pertaining to the lake data or descriptions contained in this report, inquiries about CAMP, or suggestions of lakes the Council should consider monitoring in the future, please contact Randy Anhorn at the Metropolitan Council (651) 602-8743 or randy.anhorn@metc.state.mn.us.

ACKNOWLEDGMENTS

This report represents the coordinated efforts of many individuals. I would like to acknowledge the following people for their technical and supportive contributions to the preparation of this report:

- The various watershed management organizations (WMOs), participating agencies, and volunteers involved in the citizen-assisted monitoring program (CAMP), for without their enthusiastic participation, CAMP would not be successful. A list of involved WMOs, agencies, and volunteer lake monitors is shown in Appendix B. The following of this years volunteers should be given added thanks for their multiple years of service:

12 years of service
Diane and Bob Coderre - Sunset Lake

11 years of service
Washington Co. SWCD- Multiple

10 years of service
Bill Aamadt- Wilmes Lake
Janet and Harvey Bartz- Seidl Lake
Carver Co. Env. Services- Multiple
Wayne LeBlanc- Lake Peltier

9 years of service
City of Circle Pines- Golden Lake
Mahle Family- La Lake
John Ritter - Lake Alimagnet
Wargo Nature Center- George Watch

8 years of service
Anoka Co. Parks- Multiple
City of Prior Lake- Markley Lake
Charles Robin- Fish Lake

7 years of service
Cottage Grove- Regional Park Lake
Glen Gramse- Keller Lake
Mona and David Hanson- Pike Lake
Wally Shaver- Lac Lavon Lake

6 years of service
Joel Buys- Clear Lake
Philip Goodrich- Pike Lake
Cindy and Beth Hvass- Colby Lake
Lakeville- Valley and Lee lakes
John Ryski- Bavaria Lake
Westwood Nature Center- Westwood

5 years of service
Steve Bur- Northwood Lake
Dale Wahlstrom- Schmidt Lake
Dave Hanson-Sweeney Lake
Henzler Family- Sunset Pond
Kristn Mann- Twin Lake (Upper)
Renay Leone-Virginia Lake

4 years of service
Arnett Family- Crystal Lake
Gene Berwald- Pine Tree Lake
Kevin Bjork- Cloverdale Lake
Madison Groves- Upper Prior Lake
Tom/Dorothy Goodwin- Orchard Lake
Green Family- Kingsley Lake
Deb Gutzman- Reshanau Lake
Candice Kraemer- Sunnybrook Lake
Ryan Opdahl- Little Johanna
Wally Potter- Marion Lake
Rice Creek WD- Multiple
Terry Riley- Markgrafs Lake
Mike Shouldrice- Tamarack and Schutz lakes
Sly Family- Downs Lake
Phillip Solseng- Long Lake
Streff Family- South Rice Lake
Bob Videen- Parkers Lake

3 years of service
Kathy Gerlach- Dean Lake
Nigel Linden- Twin Lake (Burnsville)
Mary Oaster- Earley lake
Serie/Kettlekamp- Long Lake (A.V.)
Tom Sletta- Cates Lake

- The Metropolitan Council Environmental Services - Environmental Planning and Evaluation department (MCES-EPE) for laboratory analysis of the lake samples.

- And, the members of the Metropolitan Council and its environmental staff, Jeffrey Jax, Scott Haire, and Craig Skone for support with lake monitoring, data management, and report preparation. Craig Skone deserves additional recognition for developing all the graphics for this report.

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Physical/chemical lake data and copies of the volunteer monitoring methods pilot study can be obtained upon request by contacting Randy Anhorn at (651) 602-8743 or randy.anhorn@metc.state.mn.us**.**

PART I - METROPOLITAN COUNCIL 2004 LAKE MONITORING PROGRAM

INTRODUCTION

The Metropolitan Council-staff sampled 13 lake sites on 11 lakes in 2004 as part of its continuing effort to manage lakes in the Twin Cities Metropolitan Area (TCMA) (Figure 1). This report follows a series of lake studies (Appendix C):

YEAR	NUMBER OF LAKES	REFERENCE
1980	60	Osgood (1981)
1981	30	Osgood (1982a)
1982	7	Osgood (1983)
1983	28	Osgood (1984a)
1984	43	Osgood (1984b)
1985	32	Osgood (1985)
1986/87	10	Osgood (1988a)
1988	6	Osgood (1989a)
1989	20	Osgood (1989b)
1990	21	Osgood (1990)
1991	17	Hartsoe and Osgood (1991)
1993	12 (+ 31 CAMP lakes)	Anhorn (1994)
1994	13 (+ 38 CAMP lakes)	Anhorn (1995)
1995	13 (+ 46 CAMP lakes)	Anhorn (1996)
1996	13 (+ 53 CAMP lakes)	Anhorn (1997)
1997	12 (+ 59 CAMP lakes)	Anhorn (1998)
1998	13 (+ 57 CAMP lakes)	Anhorn (1999)
1999	14 (+ 99 CAMP lakes)	Anhorn (2000)
2000	14 (+110 CAMP lakes)	Anhorn (2001)
2001	12 (+120 CAMP lakes)	Anhorn (2002)
2002	12 (+125 CAMP lakes)	Anhorn (2003)
2003	12 (+128 CAMP lakes)	Anhorn (2004)
2004	13 (+132 CAMP lakes)	Anhorn (This Study)

The long-term goal of the Council's lake studies has been to provide a comprehensive database to enable cities, counties and watershed management organizations (WMOs) to better manage area lakes. The Council believes that without such comprehensive lake data, the foundation of lake and watershed management plans is weakened. While the Council has provided a commendable lake data collection program, the data collection of others, specifically WMOs, is encouraged (Osgood 1989c). Several agencies and cities have taken initiative (for example, Ramsey County, Eagan, Maple Grove, and Minneapolis Park and Rec. Board), but for the most part the WMOs are not collecting adequate data.

To date, the Council's lake monitoring programs have provided an important tool for making informed lake management decisions. Data from our regional lake monitoring programs are frequently used to determine possible trends in in-lake water quality, estimate expected ranges in water quality of unmonitored lakes, examine intra-and inter-regional differences, and investigate the relationships between landscape and water quality. A comprehensive regional lake monitoring program should ensure adequate representation across both space and time. However, due to cost and logistical problems, ground-based monitoring programs usually sacrifice spatial coverage (fewer lakes) in favor of more frequent sampling.

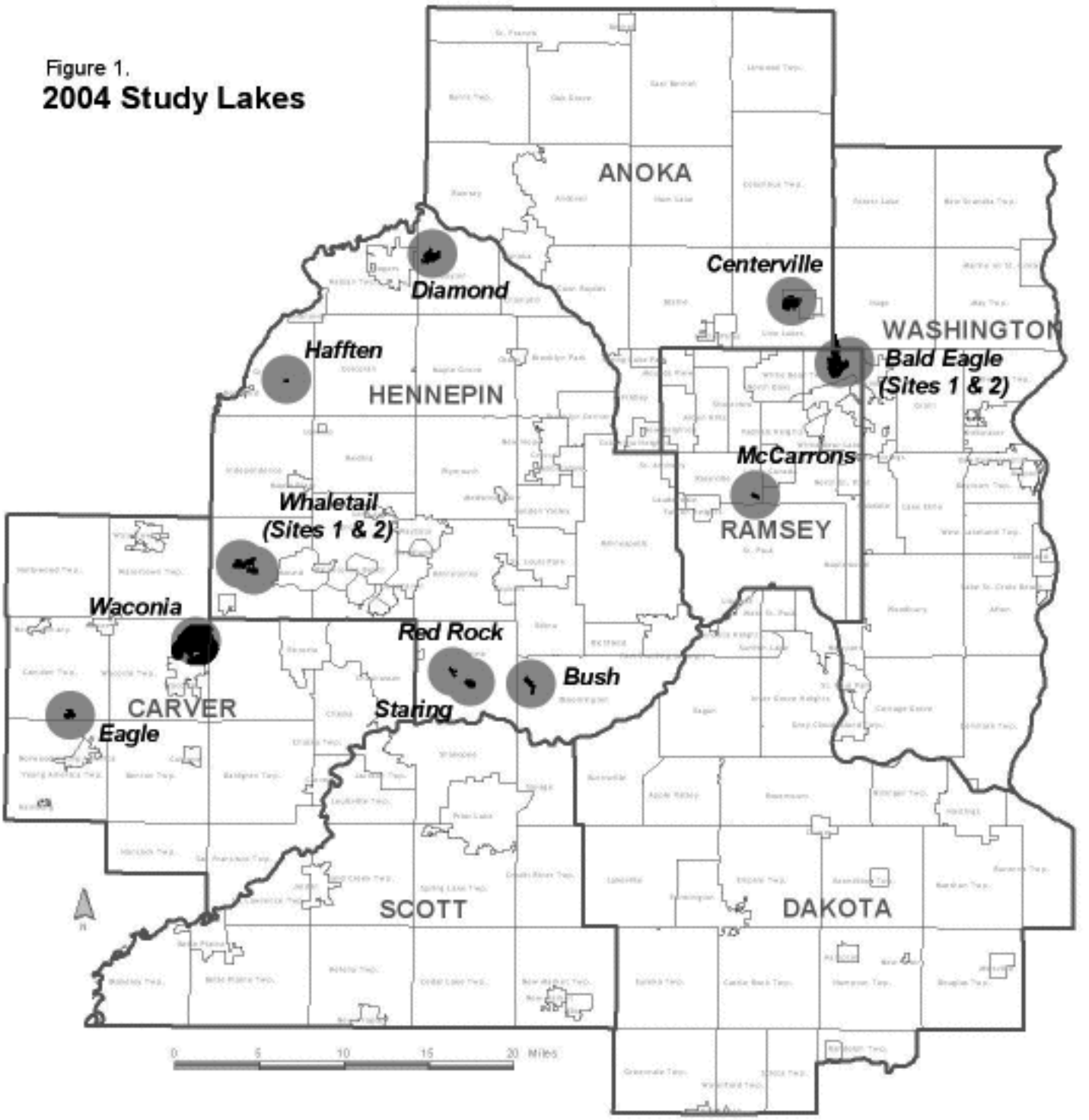
The Council addressed this lack of adequate data collection problem by initiating a citizen-assisted lake monitoring program (CAMP) in 1993. CAMP is funded in part by watershed districts (WDs), WMOs,

counties, and cities that are participating in the program. Through this program, citizens collect comprehensive data. To assure that the data collection methods used by citizen volunteers are credible; the Council conducted a pilot study along with its routine monitoring in 1991 (Hartsoe and Osgood 1991). The pilot study and its results are included in the 1993 lake report, and can be obtained by contacting Randy Anhorn at (651) 602-8743 or randy.anhorn@metc.state.mn.us. The methods and results of the CAMP for 2004 are described in Part II of this report.

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 mathmatical 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 lake's 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.

Results of the 2004 satellite assessment of the region revealed similar results to that found through the 2004 ground-based monitoring programs, that the region experienced better lake water quality in 2004 than that recorded in 2003. The complete results of the 2004 satellite analysis can be at http://www.metrocouncil.org/planning/environment/TCWaterClarity2004.pdf.

Figure 1.
2004 Study Lakes



METHODS

Thirteen sites on 11 lakes were sampled by Council-staff at two-week intervals from mid-April through mid-October, 2004. The lakes were normally visited between 8:00 a.m. and noon on the sampling days. Samples were collected from one station located over the deepest spot near the center of the lakes (the sampling location(s), as well as graphs of the seasonal data are shown on lake information sheets located in alphabetical order at the end of Part I of this report).

A hand-held Global Positioning System (GPS) was used to lock in sampling location coordinates (shown as latitude and longitude on the lake information sheets), and to aid in relocating sampling locations during each ensuing monitoring event. Time, surf and weather conditions, and station depth were recorded upon anchoring at the site. Temperature, dissolved oxygen, pH, specific conductivity, turbidity, chloride, and oxidation reduction potential were measured at one-meter intervals (additional readings are captured at half-meter intervals near the thermocline) using a Yellow Springs, Inc. (model 650 MDS) multiparameter field monitoring system. The YSI was calibrated in the morning, prior to the daily monitoring, and again after the last lake was monitored on that day. Water transparency was measured using a 20 cm black-and-white Secchi disk.

Water was collected from the lakes' surface (0-2 m) using a two-meter PVC pipe that held two liters of water. Two or three such samples were mixed in an 8-liter plastic jug. Subsurface samples (middle and near bottom) are drawn uing a 2-liter Van Dorn. All water samples were transported on ice in a dark cooler and processed and preserved within six hours of collection. Water from the surface jug was withdrawn for the following chemical analyses (depending on the lake): total phosphorus (TP), total dissolved phosphorus (TDP), total Kjeldahl nitrogen (TKN), chlorophyll-a (CLA), and chloride (Cl). Subsurface water samples were also drawn using a 2-liter Van Dorn. Subsurface samples were taken for TP and Cl analysis on all lakes deeper than 2.5 meters, and for TDP on Bald Eagle (sites 1 and 2), Centerville, and McCarrons lakes.

The routine chemical analyses were performed at the Metropolitan Council Environmental Services - Environmental Planning and Evaluation department (MCES-EPE) laboratory following U.S. EPA approved methods. Surface and subsurface water samples that were analyzed for TDP were filtered through a 0.45 µm membrane filter and analyzed for TP. Water samples tested for phosphorus and TKN were digested with the sulfates of hydrogen, potassium and mercury (H_2SO4, K_2SO_4 and $HgSO_4$). Following digestion, phosphorus was analyzed using a modified ascorbic acid reduction method (APHA 1980). Samples tested for TKN were chemically reduced the same way as the total phosphorus samples, then were color-intensified with sodium nitroprusside and assayed for ammonia colorimetrically. TKN and TP from the surface were periodically analyzed in duplicate to determine accuracy, at which time their average values were reported.

Water samples to be analyzed for CLA were filtered onto a 0.45 µm glass-fiber-filter, saturated with magnesium carbonate, and stored frozen in the dark until analyzed (within 30 days). Chlorophyll was extracted from the filters by homogenization in 90 percent aqueous acetone. The optical density of the extract was measured spectrophotometrically at 630, 647, 664 and 750 nm. CLA was calculated from a trichromatic equation that corrects for turbidity (APHA 1980).

RESULTS/ANALYSES

Tables 1, 2, and 3 show summertime average phosphorus concentration in micrograms per liter (µg/l), chlorophyll-a concentration in µg/l, and Secchi transparency in meters (m), for the 13 lake sites monitored by the Council-staff. Raw data will be input into the STORET database, or it can be obtained upon request by contacting Randy Anhorn at (651) 602-8743 or randy.anhorn@metc.state.mn.us. Tables 1, 2, and 3, also document summertime means (May through September) for any prior years the lake was monitored by the Council. Seasonal data is graphed for each lake at the end of Part I of this report.

Due to normal seasonal variability, insufficient data collection intensity for each lake, and changing climatological conditions, determining long-range water quality trends in area lakes is generally not statistically reliable. Accurate conclusions are difficult because one year's data may represent only one monitoring date or parameter, water quality may fluctuate greatly from year to year, and/or the lake may only be monitored once every ten years. Therefore, to fully determine if there truly is a change in the water quality of a lake, either additional years of data collection are needed in the future to accurately determine the present condition of the lake, and/or a broader, more complete historical baseline database is needed.

While an extensive database of a lake's present water quality is obtainable; a more extensive historical database is not. In other words, without a complete and accurate historical database, which is rare, it is difficult to determine if a lake's quality has changed because it is not known what its quality used to be. Therefore, an extensive baseline database needs to be constructed now so lake quality trends can be determined in the future. Many of 13 lake sites monitored by Council staff in 2004 have databases that are insufficient in size and quality to determine "statistically significant" long-range trends. Statistical trend analysis on the few lake databases which did contain sufficient data revealed improving water clarity trends in two of the lakes (Bald Eagle and Waconia lakes) (MPCA 2004).

After comparing the 2004 data to pre-2004 data on the remaining 11 lake sites, a few general comments and observations can be made. A review of each lakes' summertime TP, CLA and Secchi means and water quality grades reveal that they seem to have water quality levels that fall within their normal fluctuation ranges of seasonal water quality. While a few of the 11 lake sites may show a slight degradation in one of the individual parameters, the other parameters either showed no real difference or a slight improvement. An example would be Lake Centerville, which recorded simproved TP and CLA conditions in 2004 (as compared to those of 2003), yet had much worse water clarity.

Overall, four of the 13 Council-staff monitored lake sites monitored in 2004 were also monitored in 2003. All four of the lakes that were monitored through Council programs in 2003 and 2004 received identical overall water quality grades in both years.

Table 1
Trends in May - September average surface total phosphorus concentration (µg/l)

Lake	'80	'81	82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04
Bald Eagle (Site-1)	80	63	--	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	62
Bald Eagle (Site-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65
Bush	--	--	--	--	21	--	--	--	--	--	--	--	--	22	22	--	--	--	--	25	--	19	--	--	20
Centerville	137	111	--	136	--	--	--	--	133	--	--	106	--	--	--	--	--	--	--	49	50	45	--	59	48
Diamond	360*	--	--	--	--	--	--	--	--	--	--	--	--	--	144	--	--	--	--	--	--	--	--	--	84
Eagle (Carver Co.)	385	334	--	--	--	355	--	--	--	--	--	--	--	--	--	--	223	--	273	322	324	279	239	215	224
Hafften	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46	46	--	--	61
McCarrons	--	--	--	--	38	34	28	46	61	34	--	47	--	35	36	69	85	--	--	47	45	33	47	--	33
Red Rock	--	--	--	--	--	--	--	--	--	--	--	70	--	--	--	--	--	--	--	74	80	--	--	70	83
Staring	80	--	--	--	--	80	--	--	--	--	--	--	--	--	--	76	--	--	--	--	--	110	--	--	117
Waconia	50	24	--	--	--	35	--	--	--	--	--	--	--	--	21	21	29	30	39	35	32	32	30	35	30
Whaletail (Site-1)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	76
Whaletail (Site-2)	70	--	--	--	60	--	--	--	--	--	--	--	--	--	--	--	--	--	32	--	--	45	--	--	52

* Sampled only twice in 1980

Table 2
Trends in May - September average surface chlorophyll-a concentration (µg/l)

Lake	'80	'81	82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04
Bald Eagle (Site-1)	65	57	--	41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45
Bald Eagle (Site-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46
Bush	--	--	--	--	8	--	--	--	--	--	--	--	--	8	7	--	--	--	--	16	--	10	--	--	12
Centerville	61	43	--	48	--	--	--	--	38	--	--	30	--	--	--	--	--	--	--	10	22	30	--	47	33
Diamond	308*	--	--	--	--	--	--	--	--	--	--	--	--	--	46	--	--	--	--	--	--	--	--	--	84
Eagle (Carver Co.)	70	35	--	--	--	104	--	--	--	--	--	--	--	--	--	--	36	--	37	35	35	71	56	47	47
Hafften	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	36	--	--	43
McCarrons	--	--	--	--	20	16	14	26	30	17	18	30	--	15	13	28	16	--	--	19	29	19	28	--	17
Red Rock	--	--	--	--	--	--	--	--	--	--	--	50	--	--	--	--	--	--	--	62	41	--	--	51	70
Staring	48	--	--	--	--	50	--	--	--	--	--	--	--	--	--	36	--	--	--	68	--	71	--	--	106
Waconia	33	21	--	--	--	21	--	--	--	--	17	--	--	--	6	12	11	12	18	14	10	10	12	13	18
Whaletail (Site-1)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46
Whaletail (Site-2)	65	--	--	--	53	--	--	--	--	--	--	--	--	--	--	--	--	--	27	--	--	31	--	--	47

* Sampled only twice in 1980

Table 3
Trends in May - September average Secchi disk transparency (m)

Lake	'80	'81	82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04
Bald Eagle (Site-1)	0.8	1.2	--	1.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2
Bald Eagle (Site-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2
Bush	--	--	--	--	3.0	--	--	--	--	--	--	--	--	3.1	2.6	--	--	--	--	2.2	--	3.2	--	--	2.8
Centerville	1.5	1.6	--	1.4	--	--	--	--	0.8	--	--	1.4	--	--	--	--	--	--	--	1.0	1.8	1.3	--	1.5	1.1
Diamond	0.2*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	--	--	--	0.4
Eagle (Carver Co.)	2.2	1.9	--	--	--	0.4	--	--	--	--	--	--	--	--	--	--	2.4	--	1.7	2.3	2.2	1.1	0.6	0.8	0.9
Hafften	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6	1.3	--	--	1.0
McCarrons	--	--	--	--	2.3	2.1	2.8	1.8	1.4	1.8	3.1	1.5	--	2.1	2.3	1.8	1.7	--	--	1.8	2.2	3.1	2.0	--	2.1
Red Rock	--	--	--	--	--	--	--	--	--	--	--	0.7	--	--	--	--	--	--	--	1.2	1.5	--	--	1.6	1.3
Staring	0.6	--	--	--	--	0.9	--	--	--	--	--	--	--	--	--	0.8	--	--	--	0.5	--	0.7	--	--	0.5
Waconia	1.6	2.0	--	--	--	2.1	--	--	--	--	2.1	--	--	--	3.1	2.9	1.9	2.1	2.0	2.1	2.1	2.1	2.7	1.9	2.1
Whaletail (Site-1)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6
Whaletail (Site-2)	0.7	--	--	--	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--	1.0	--	--	0.9

* Sampled only twice in 1980

LAKE QUALITY REPORT CARD

The Metropolitan Council following its 1989 lake survey (Osgood 1989b) developed the lake quality report card. The idea is simply that lake water quality characteristics can be ranked by comparing measured values to those of other Metro Area lakes. In this way, technical information, which in the past had required professional analysis, can more easily be used by a less technical audience to visualize the water quality of their lake relative to other area lakes. The grading curve represents percentile ranges for three water quality indicators - the summertime (May - September) average values for total phosphorus, chlorophyll-a, and Secchi disk. These percentiles use ranked data from 120 lakes sampled from 1980 - 1988:

GRADE	PERCENTILE	TP(µg/l)	CLA(µg/l)	Secchi(m)
A	<10	<23	<10	>3.0
B	10-30	23-32	10-20	2.2-3.0
C	30-70	32-68	20-48	1.2-2.2
D	70-90	68-152	48-77	0.7-1.2
F	>90	>152	>77	<0.7

In 2000, the percentiles determined from the 1980-1988 water quality database of 120 lakes were compared to calculated percentiles from a more current and expanded 1980-1999 water quality database of 230 lakes. It was found that the percentiles from the expanded database were very similar to those determined from the 1980-1988 database. For this reason, and in an attempt to maintain commonality, the original 1980-1988 percentiles are continued to be used for lake quality grading purposes.

The three variables used in the grading system strongly relate to open-water nuisance-aspects of a lake (i.e. algal blooms), which can indicate accelerated aging (cultural eutrophication). For example, lake phosphorus concentration has been related to increased algal abundance, increased frequency of algal blooms, and to the increased abundance of blue-green algae (Osgood 1988b). Chlorophyll-a, which is a pigment in plants (including algae) essential in the photosynthesis process, is used to estimate the algal abundance of a lake. And finally, Secchi transparency relates to the appearance of a lake (generally the fewer algae, the better the transparency of a lake). TKN concentration was not included in the grading process because most lake nuisances in the area are related to the phosphorus concentration of the lake (Osgood 1988b).

These water quality grades, however, only characterize the open-water quality of lakes. Other nuisances, such as the abundance of aquatic macrophytes, are not indicated with these grades.

The percentile curve can be used to assign individual TP, CLA and Secchi grades to the monitored lakes. Therefore, a lake having a mean summertime Secchi transparency of 1.7 m would receive a “C” grade, or is considered average compared to other area lakes. Overall lake water quality grades were determined by averaging the individual grades. Grades will generally correspond to descriptive rankings and recreational-use impairments of lakes. Lakes receiving an “A” (<10-percentile) can be deemed exceptional as compared to other area lakes and as having no recreational use impairments. A “B” grade lake is considered to have very good water quality and some recreational use impairment, while lakes receiving a “C” are considered to have average water quality and are recreationally impaired. A “D” grade lake translates to a very poor ranking (severely impaired), and a lake receiving a grade of “F” would mean extremely poor quality compared to other area lakes and indicates no possible recreational use.

The report card for lakes sampled by Metropolitan Council-staff in 2004 is presented below. Grades for CAMP-monitored lakes will be addressed later in this report. The grades are based on all data from past studies, so that the grade represents an overall characterization. Pluses and minuses are assigned to indicate apparent trends, either improvement (+) (e.g., Bald Eagle [Site-1] and Waconia lakes) (MPCA 2003) or degradation (-) in the quality of the lake.

2004 LAKE QUALITY REPORT CARD

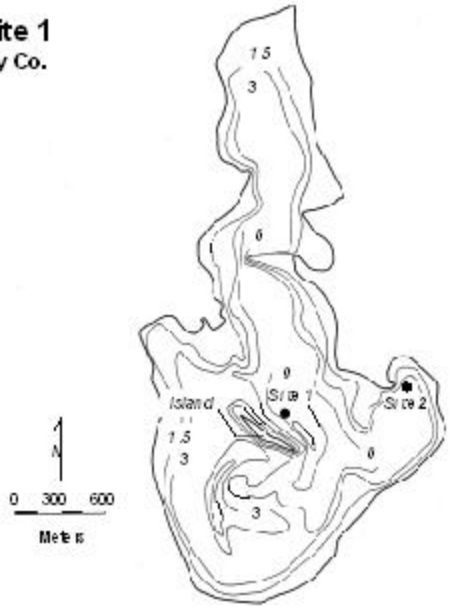
Bald Eagle (Site-1)	C+	McCarrons	C
Bald Eagle (Site-2)	C	Red Rock	D
Bush	B	Staring	F
Centerville	C	Waconia	B+
Diamond	F	Whaletail (Site-1)	D
Eagle (Carver Co.)	D	Whaletail (Site-2)	C
Hafften	C		

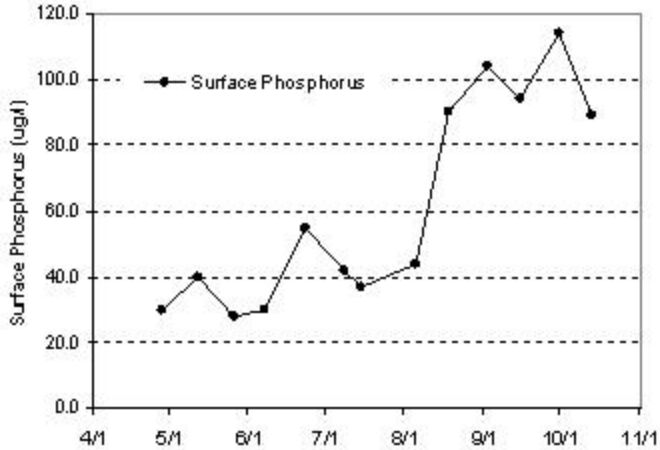
Bald Eagle Lake, Site 1

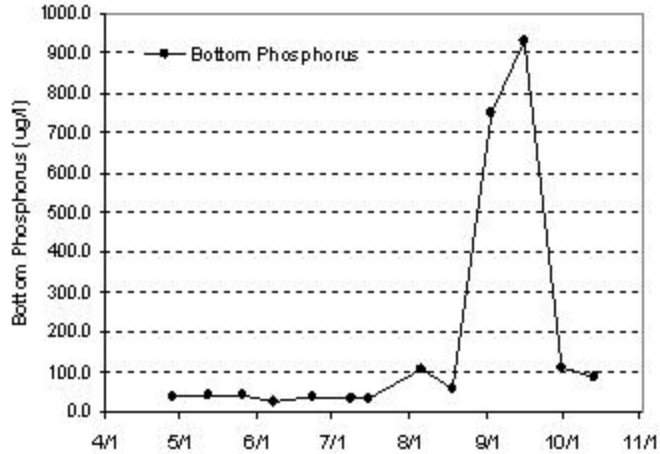
White Bear Twp., Ramsey Co.

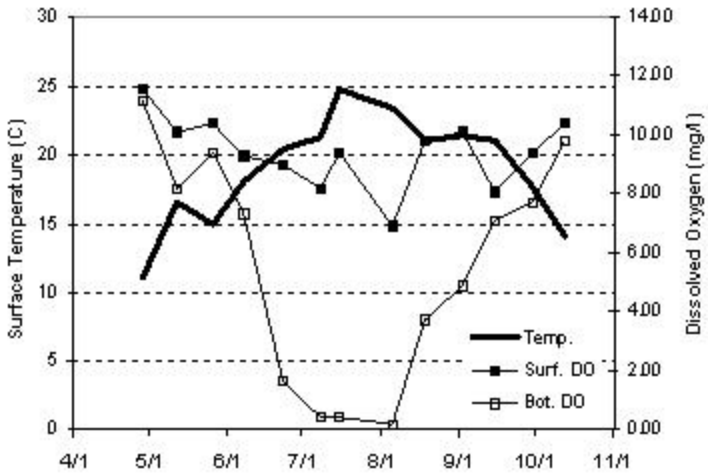
Lake ID: 62000 2
WD: Rice Creek

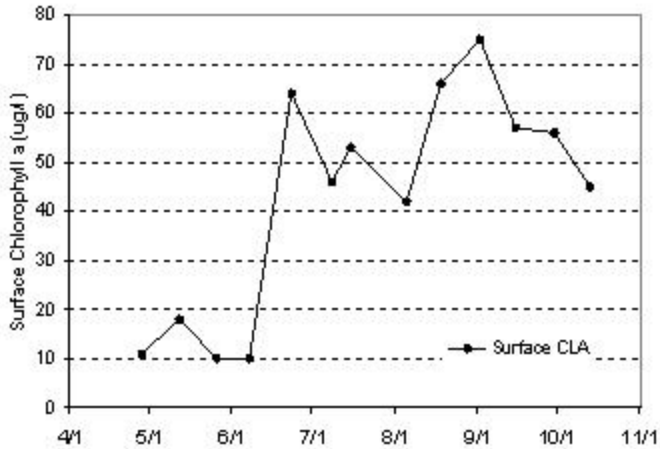
● Sampling site
Contours in meters











Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	D	C		C	C		D		D	C	C	C
Chlorophyll a	D	D		D	C		C		C	C	C	C
Secchi Depth	D	C		C	C		C	C	C	C	D	C
Overall	D	C		C	C		C		C	C	C	C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 Site 1	2004 Site 2
Total Phosphorus	D	C	C	C	C	D	D	D	D	D			C	C
Chlorophyll a	C	B	C	C	C	C	C	C	C	C			C	C
Secchi Depth	B	B	C	B	C	C	C	C	C	D	D	C	C	D
Overall	C	B	C	C	C	C	C	C	C	D			C	C

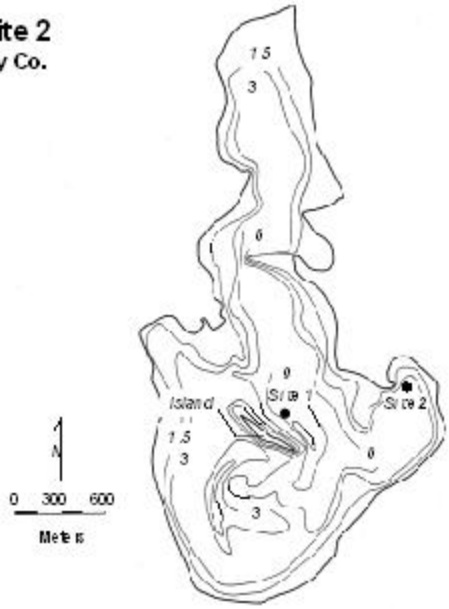
Source: Metropolitan Council and STORET data

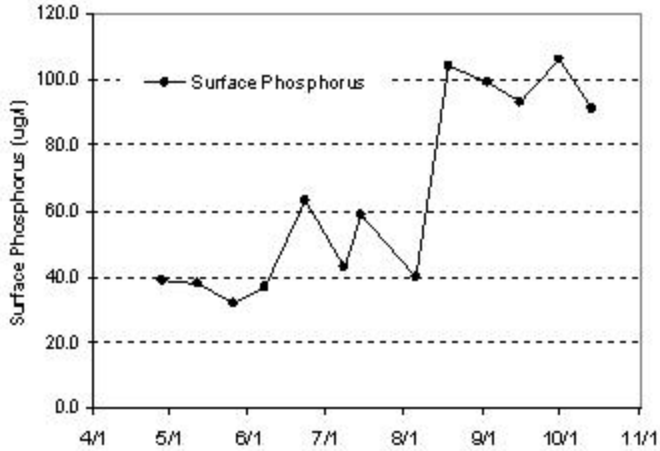
Bald Eagle Lake, Site 2

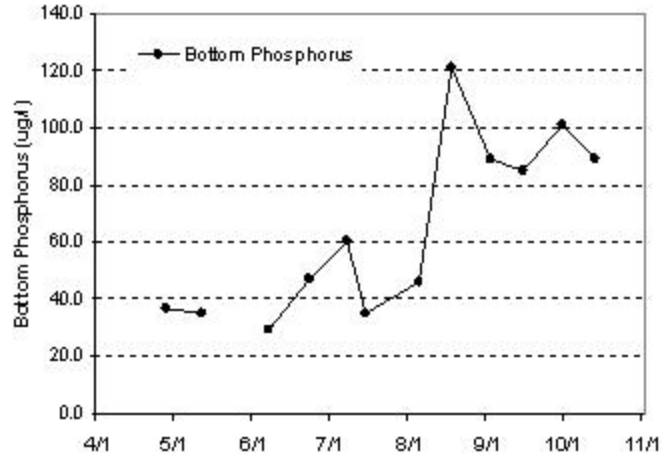
White Bear Twp., Ramsey Co.

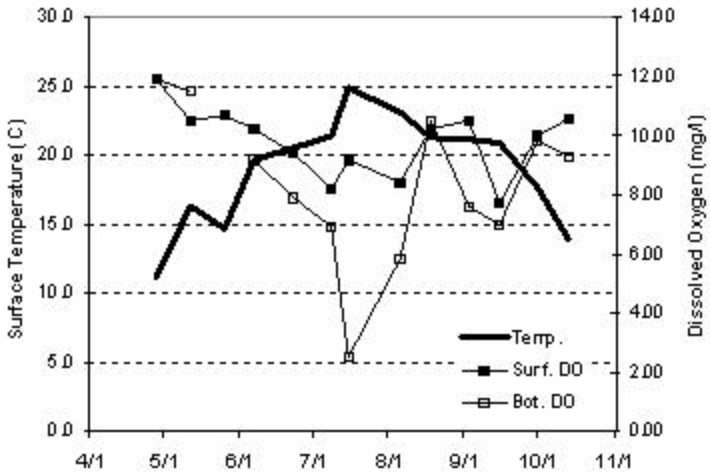
Lake ID: 62-0002
WD: Rice Creek

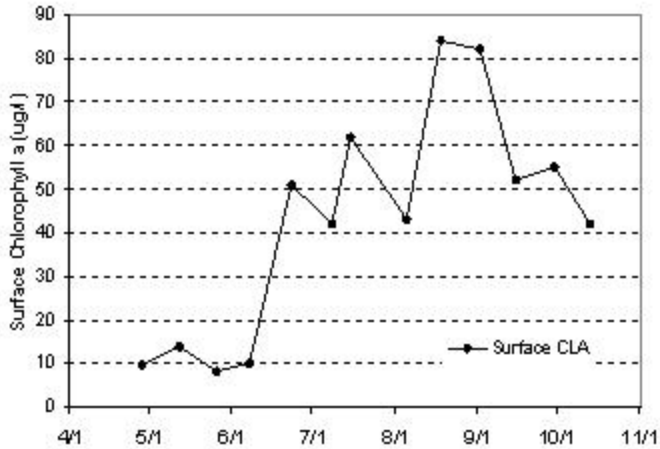
● Sampling site
Contours in meters

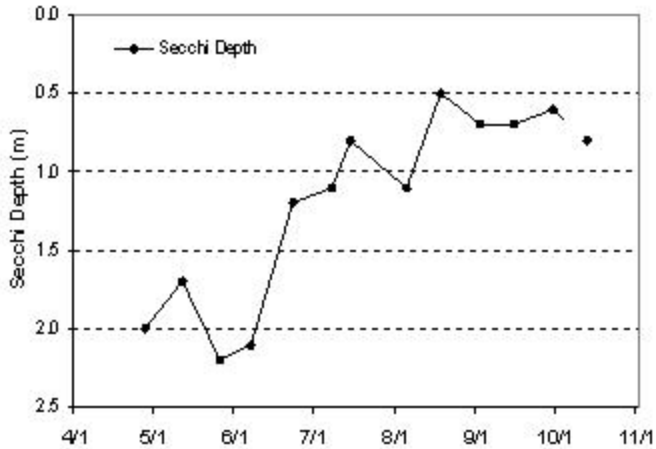












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	D	C		C	C		D		D	C	C	C
Chlorophyll a	D	D		D	C		C		C	C	C	C
Secchi Depth	D	C		C	C		C	C	C	C	D	C
Overall	D	C		C	C		C		C	C	C	C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 Site 1	2004 Site 2
Total Phosphorus	D	C	C	C	C	D	D	D	D	D			C	C
Chlorophyll a	C	B	C	C	C	C	C	C	C	C			C	C
Secchi Depth	B	B	C	B	C	C	C	C	C	D	D	C	C	D
Overall	C	B	C	C	C	C	C	C	C	D			C	C

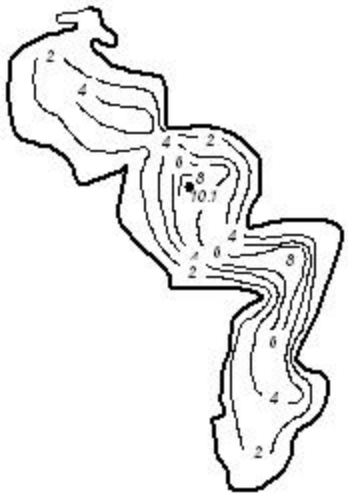
Source: Metropolitan Council and STORET data

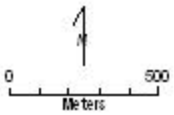
Bush Lake

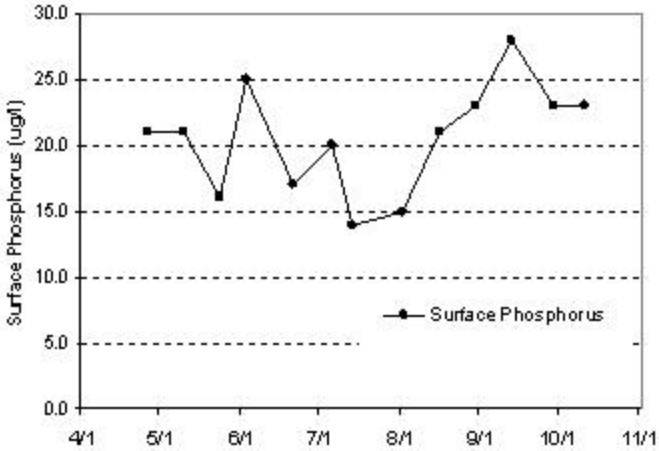
Bloomington, Hennepin Co.

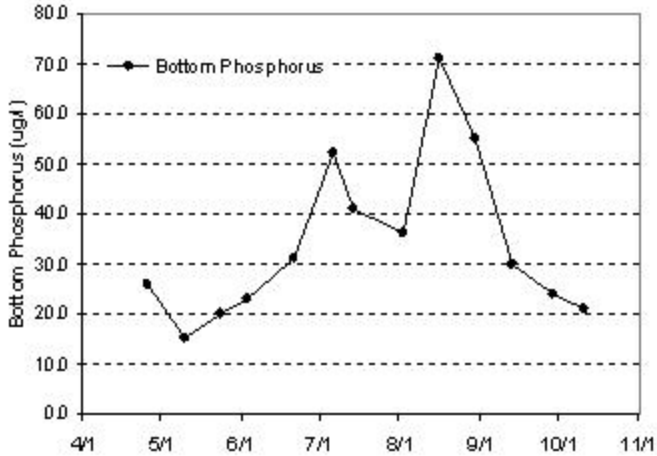
Lake ID: 270047
WD: Nine Mile Creek

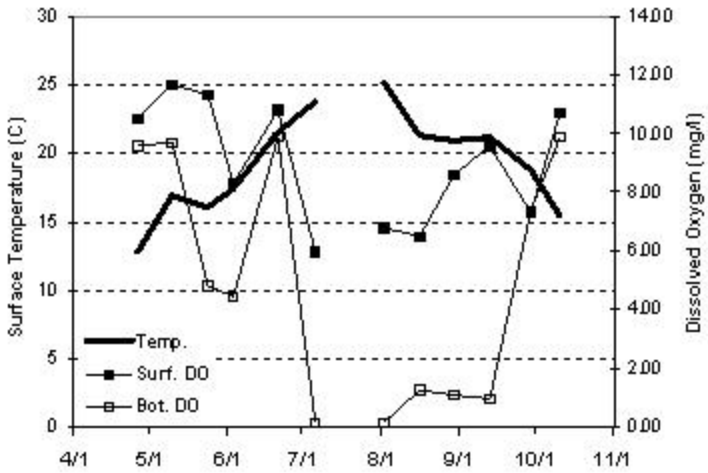
• Sampling site
Contours in meters

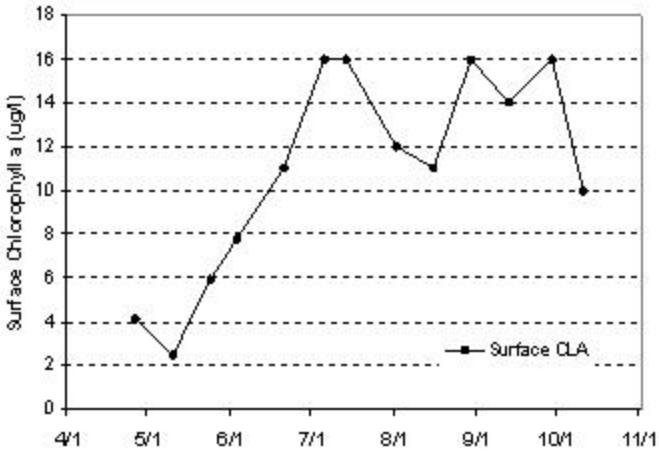


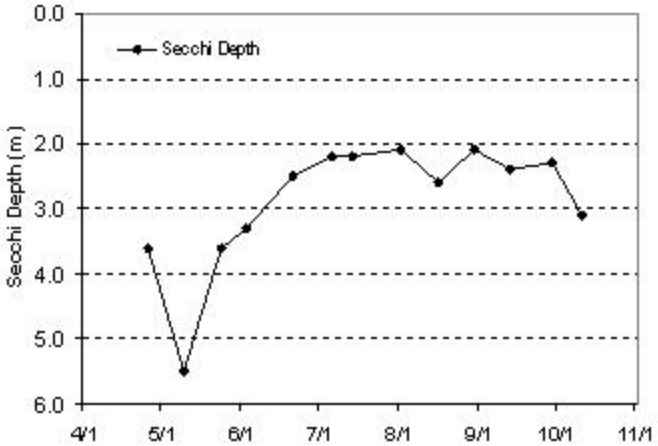












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus				B	A							
Chlorophyll a				B	A							
Secchi Depth				B	A	B	A	B	C			
Overall				B	A							

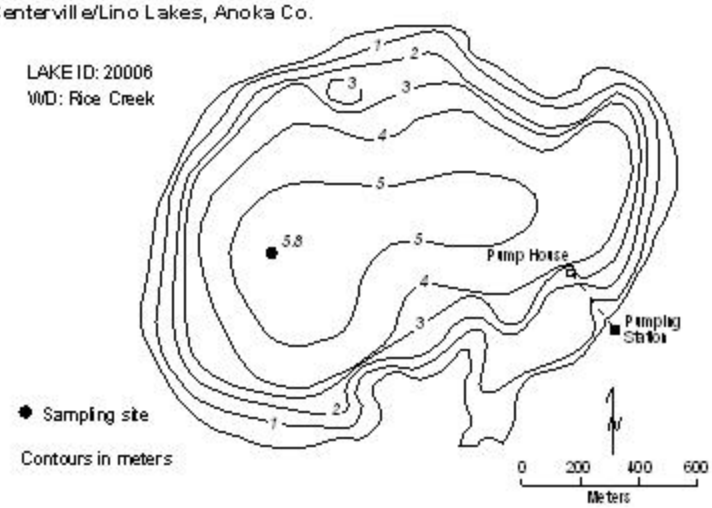
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		A	A					B		A			A
Chlorophyll a		A	A					B		B			B
Secchi Depth		A	B					B		A			B
Overall		A	A					B		A			B

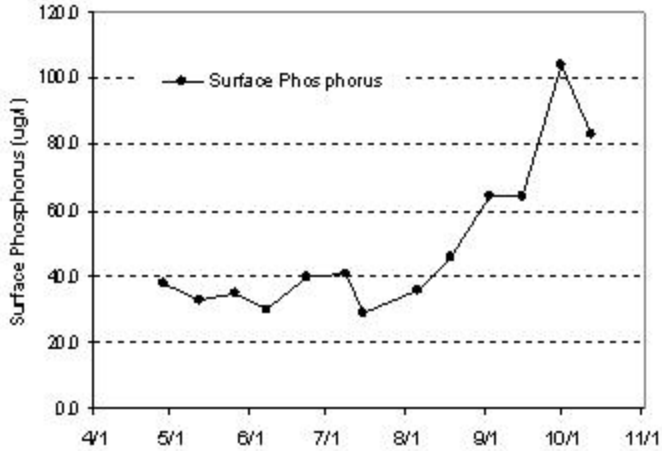
Source: Metropolitan Council and STORET data

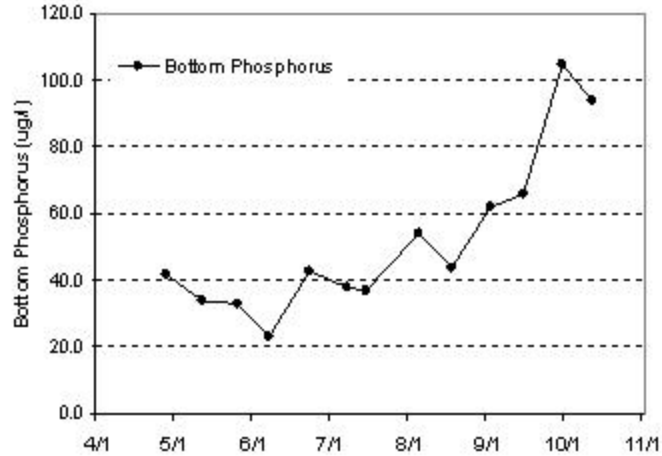
Centerville Lake

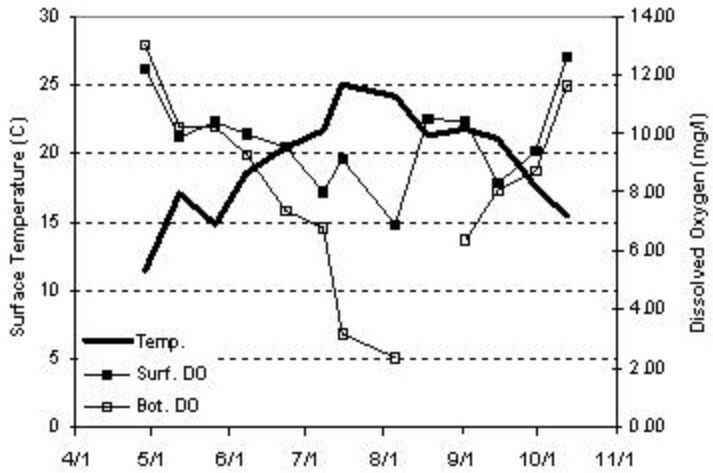
Centerville/Lino Lakes, Anoka Co.

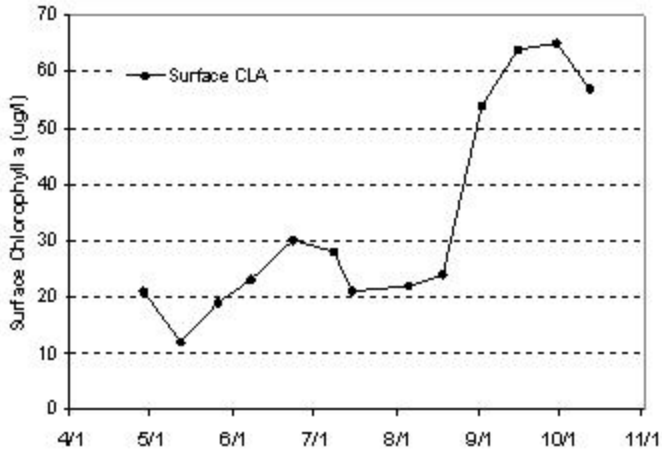
LAKE ID: 20006
WD: Rice Creek

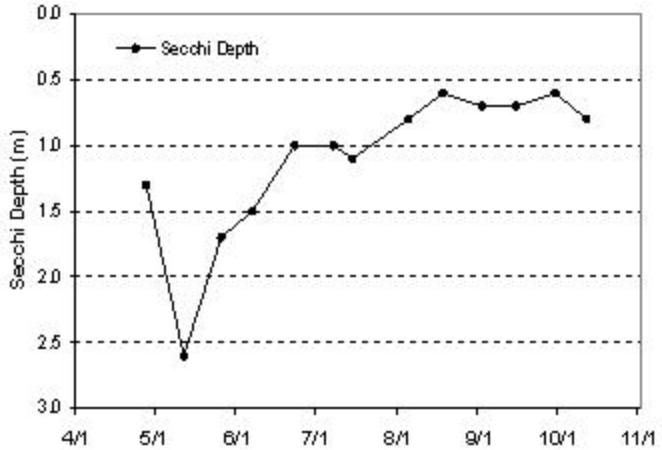












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	D	D		D					D			
Chlorophyll a	D	C		C					C			
Secchi Depth	C	C		C					D	D	C	
Overall	D	C		C					D			

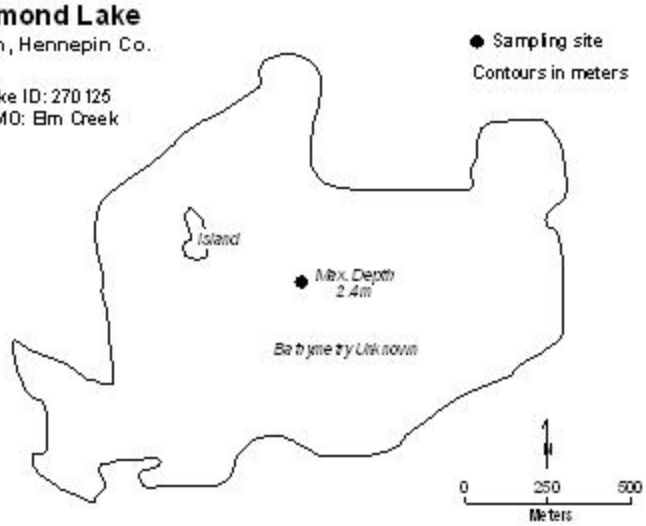
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									C	C		C	C
Chlorophyll a									C	C		C	C
Secchi Depth	D	D	C						C	C		C	D
Overall									C	C		C	C

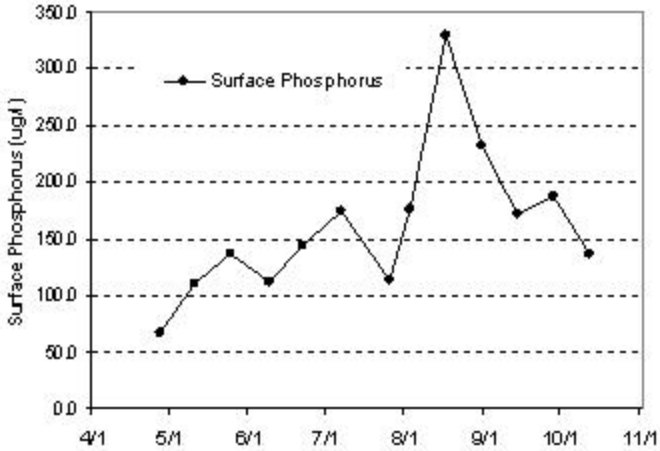
Source: Metropolitan Council and STORET data

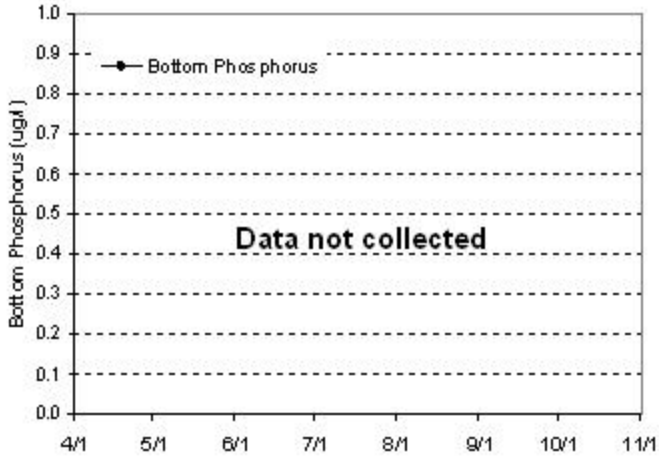
Diamond Lake

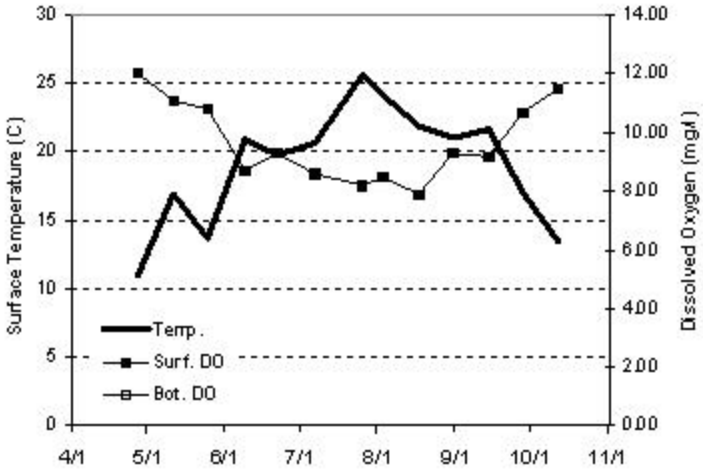
Dayton, Hennepin Co.

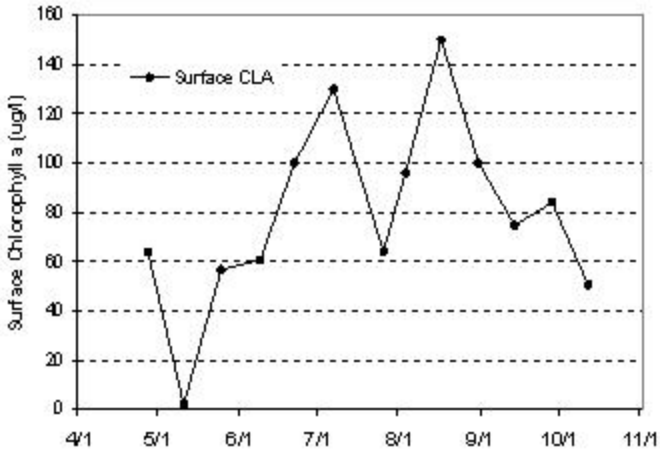
Lake ID: 270125
WMO: Elm Creek

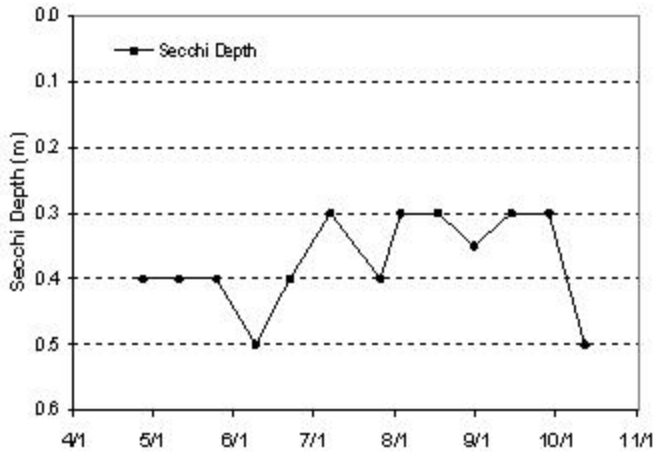












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	F											
Chlorophyll a	F											
Secchi Depth	F			F						F		
Overall	F											

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			D										F
Chlorophyll a			C										F
Secchi Depth	F		F										F
Overall			D										F

Source: Metropolitan Council and STORET data

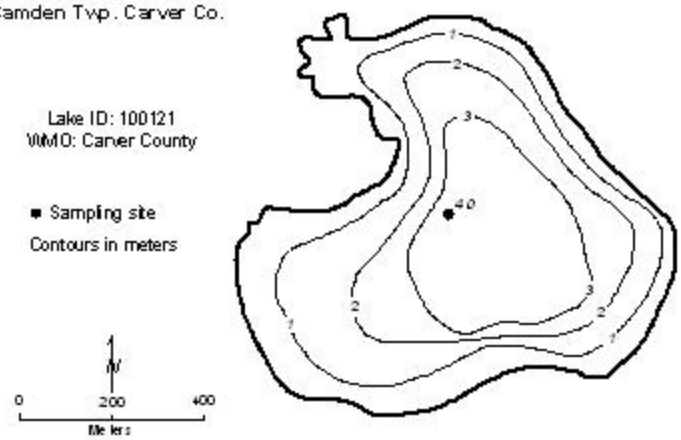
Eagle Lake,

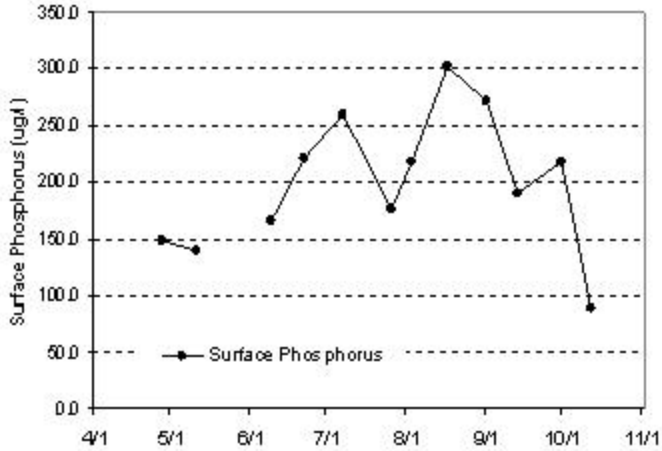
Camden Twp. Carver Co.

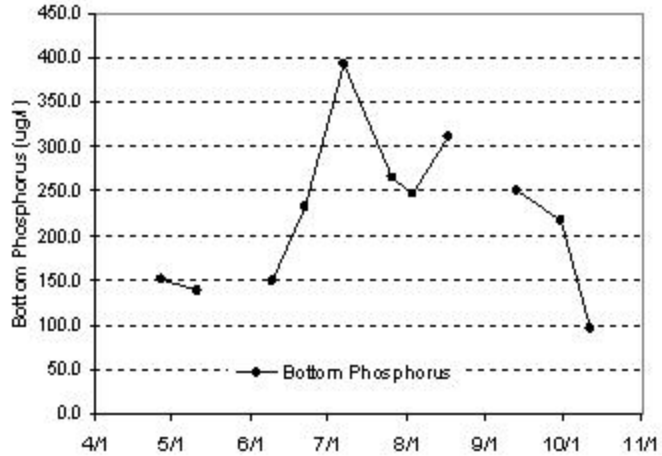
Lake ID: 100121
WMO: Carver County

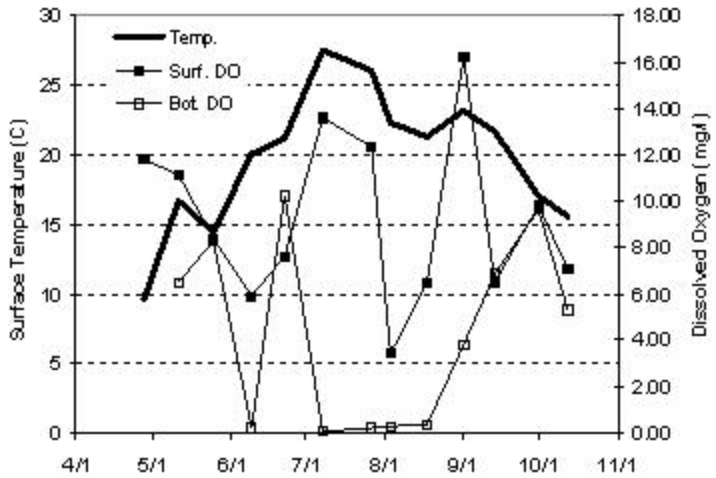
■ Sampling site

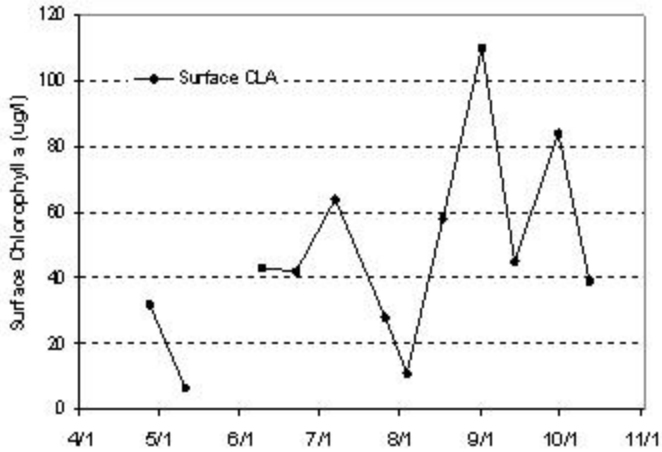
Contours in meters

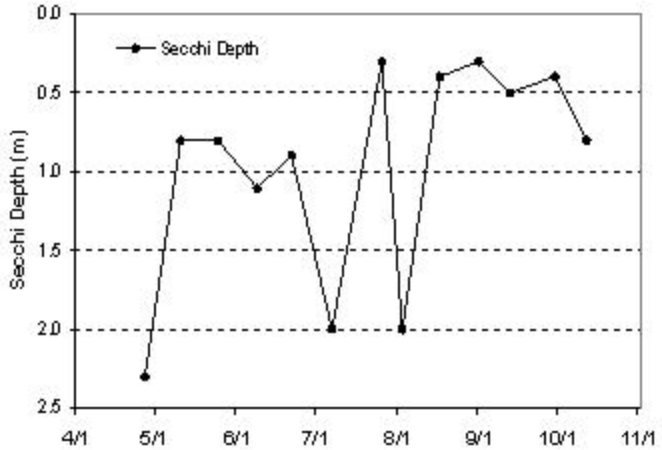












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	F	F				F						
Chlorophyll a	D	C				F						
Secchi Depth	C	C				F						
Overall	D	D				F						

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					F		F	F	F	F	F	F	F
Chlorophyll a					C		C	C	C	D	D	C	C
Secchi Depth					B		C	B	C	D	F	D	D
Overall					D		D	D	D	D	F	D	D

Source : Metropolitan Council and STORET data

Hafften Lake,

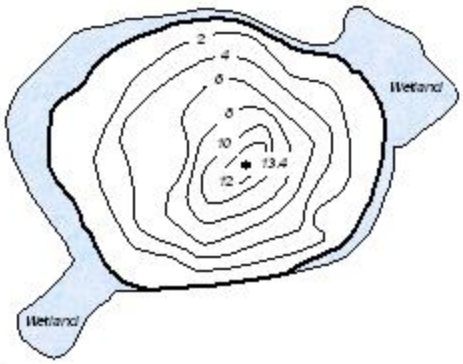
Greenfield, Hennepin Co.

LAKE ID: 270199

WD: Pioneer-Sarah Creek

● Sampling site

Contours in meters



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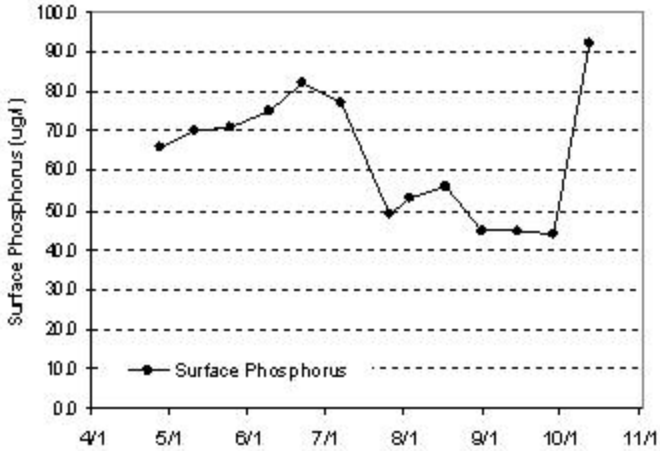
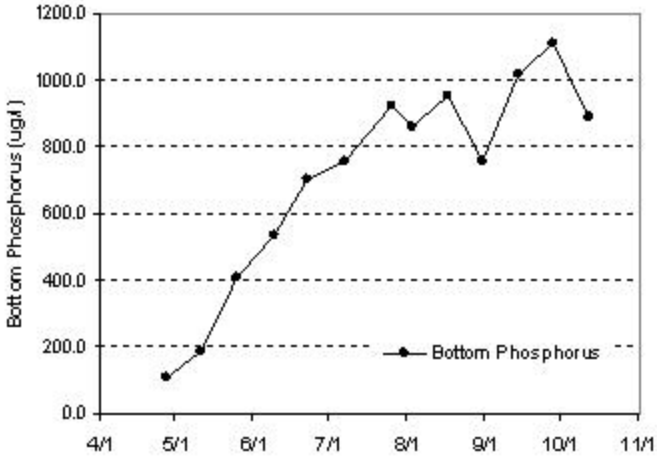
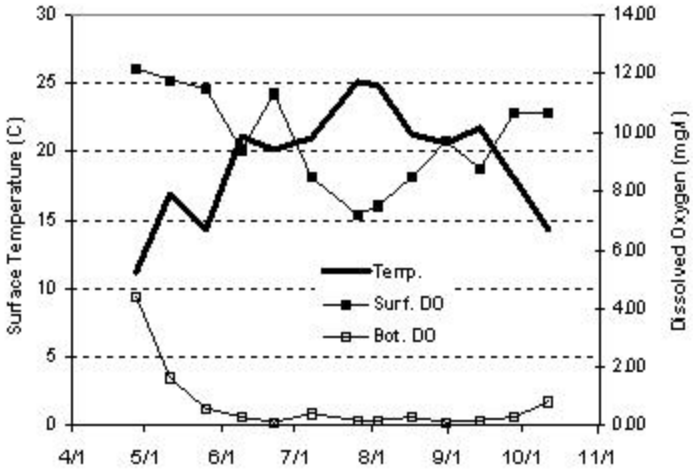
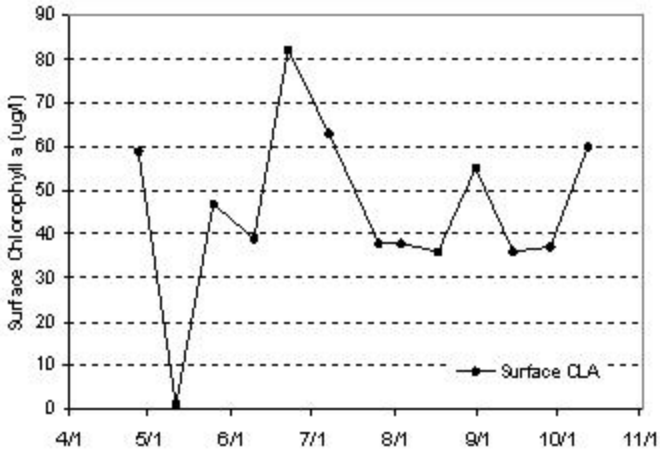
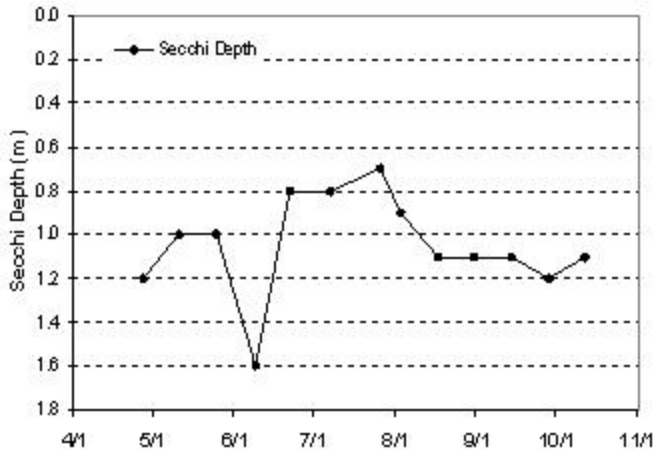
Meters











Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

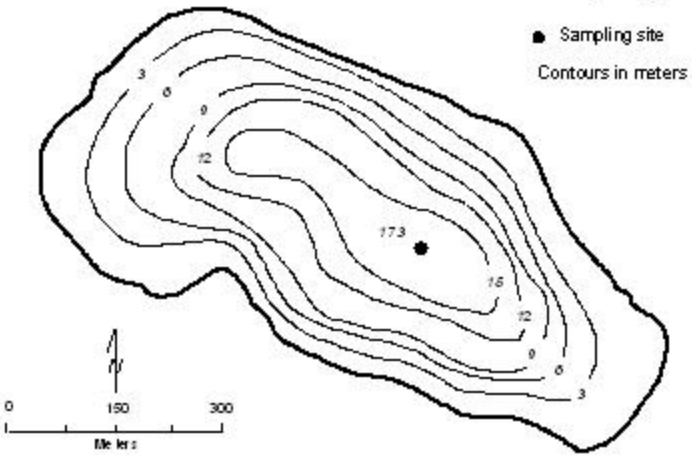
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									C	C			C
Chlorophyll a									C	C			C
Secchi Depth									C	C			D
Overall									C	C			C

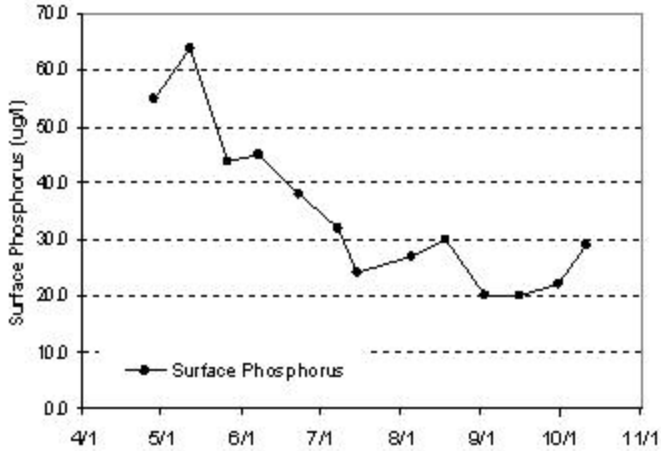
Source: Metropolitan Council and STORET data

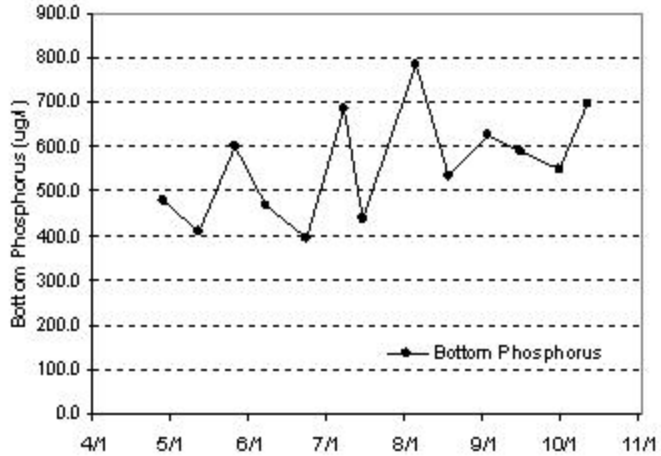
Lake McCarrons

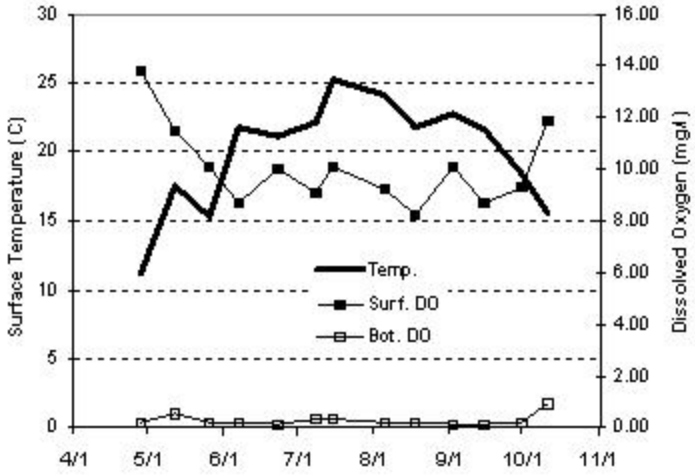
Roseville, Ramsey Co.

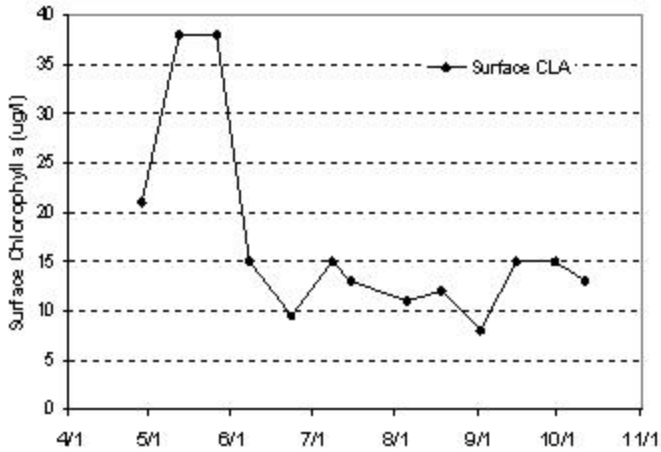
Lake ID: 620054
WD: Capitol Region

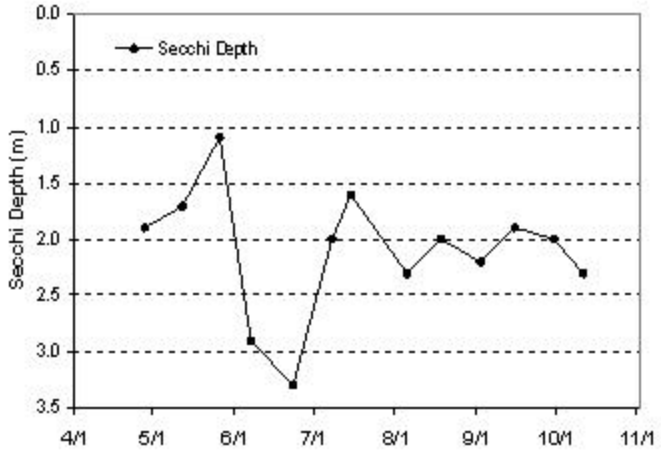










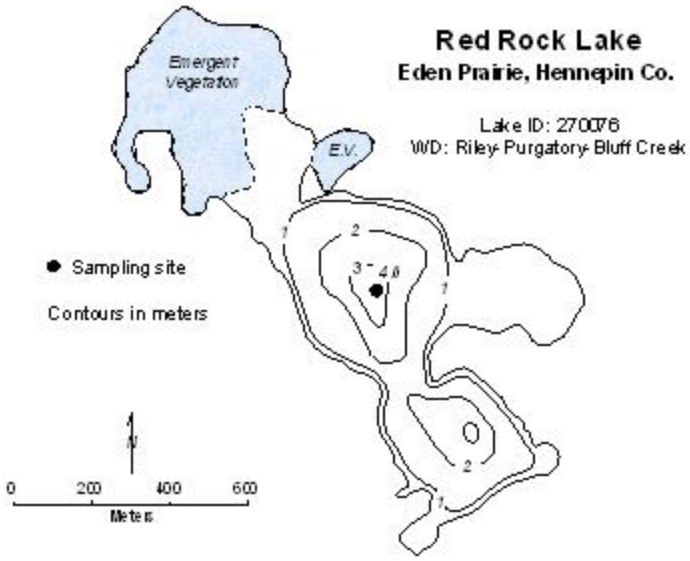


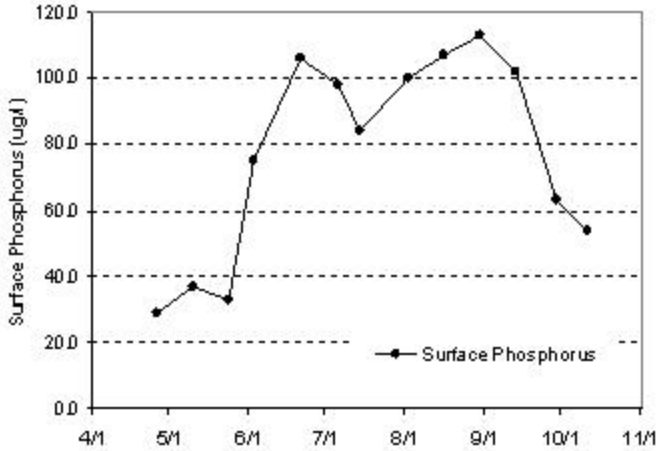
Lake Water Quality Grades Based on Summertime Averages

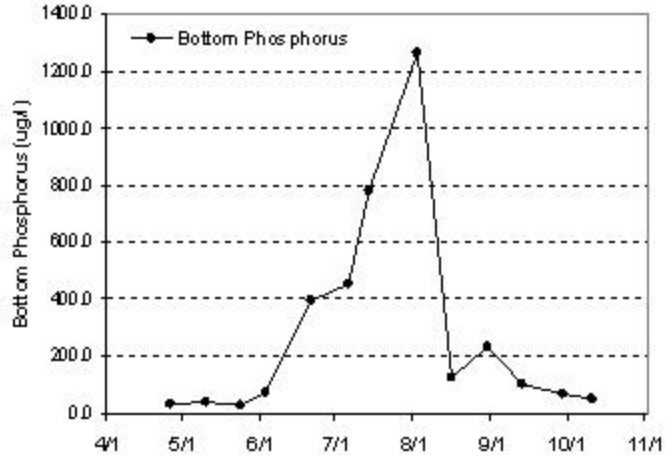
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					C	C	B	C	C	C		C
Chlorophyll a					B	B	B	C	C	B	B	C
Secchi Depth					B	C	B	C	C	C	A	C
Overall					B	C	B	C	C	C		C

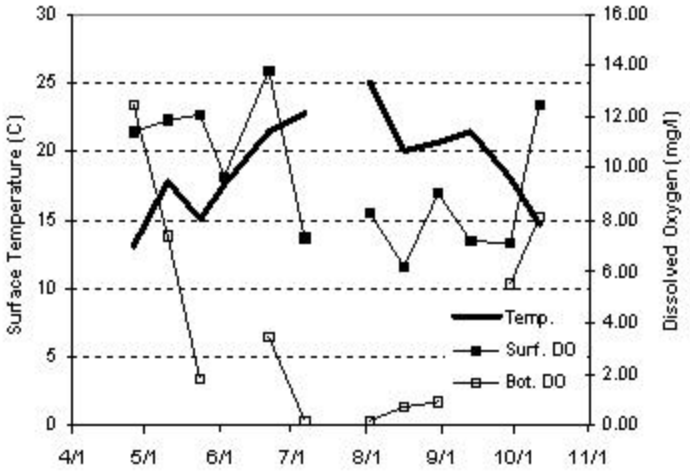
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C	C	D	D			C	C	C	C		C
Chlorophyll a		B	B	C	B			B	C	B	C		B
Secchi Depth		C	B	C	C			C	B	A	C		C
Overall		C	B	C	C			C	C	B	C		C

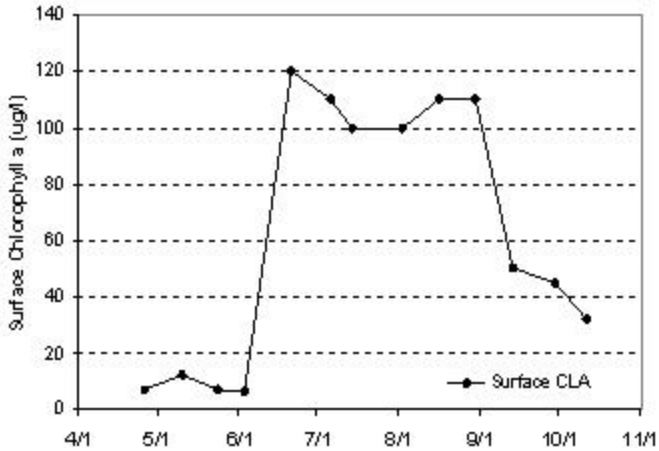
Source : Metropolitan Council and STORET data

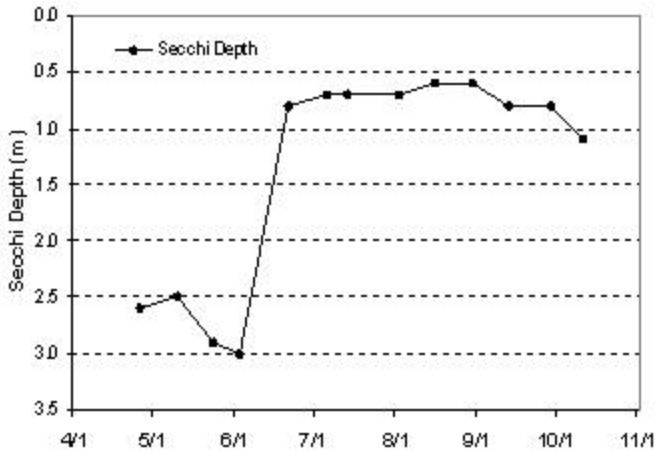












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

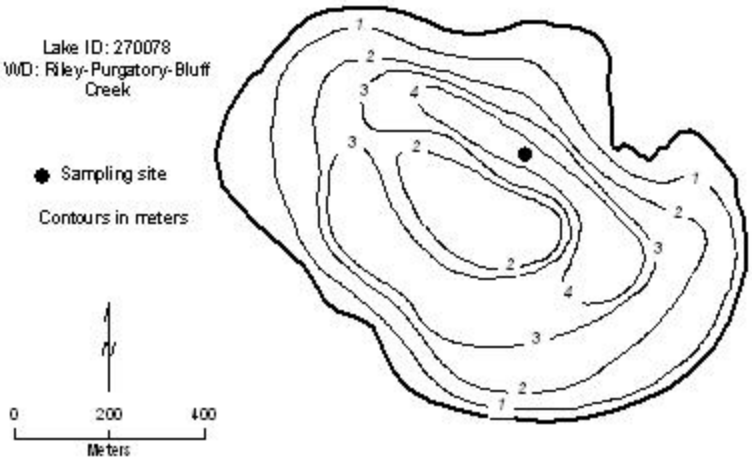
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D	D			D	D
Chlorophyll a								D	C			D	D
Secchi Depth								C	C			C	C
Overall								C	C			D	D

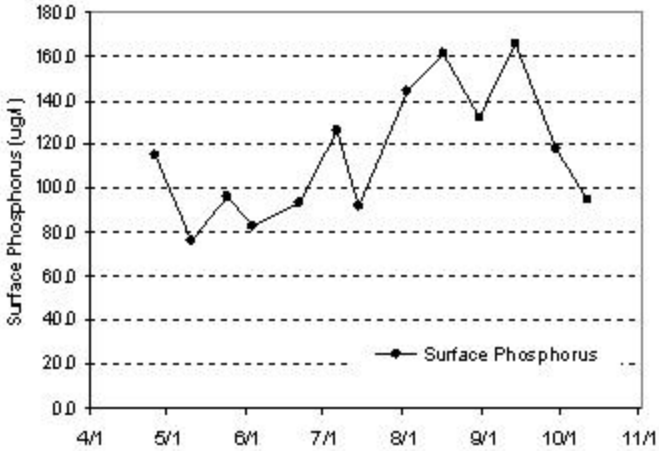
Source: Metropolitan Council and STORET data

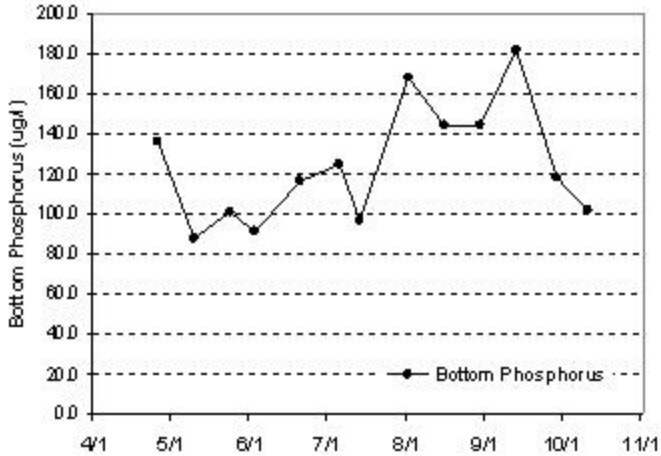
Staring Lake

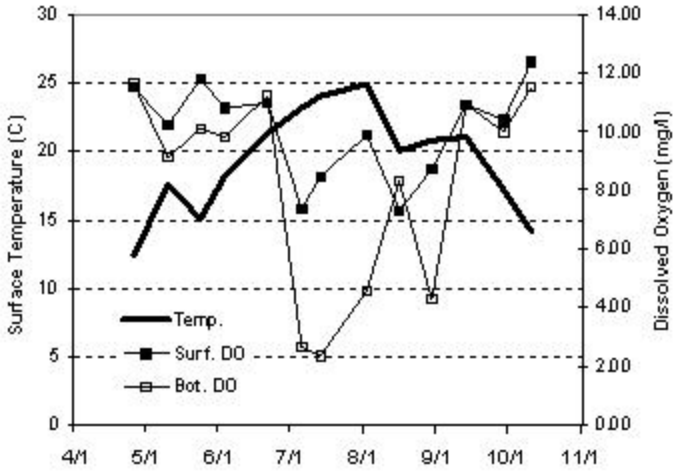
Eden Prairie, Hennepin Co.

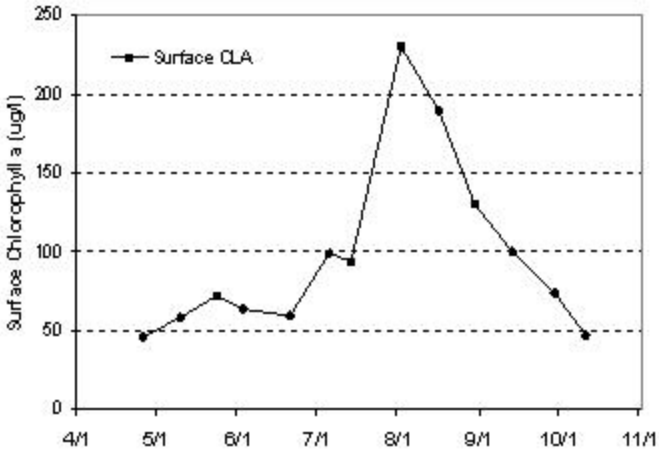
Lake ID: 270078
WD: Riley-Purgatory-Bluff Creek











Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	D					D						
Chlorophyll a	D					D						
Secchi Depth	F					D						
Overall	D					D						

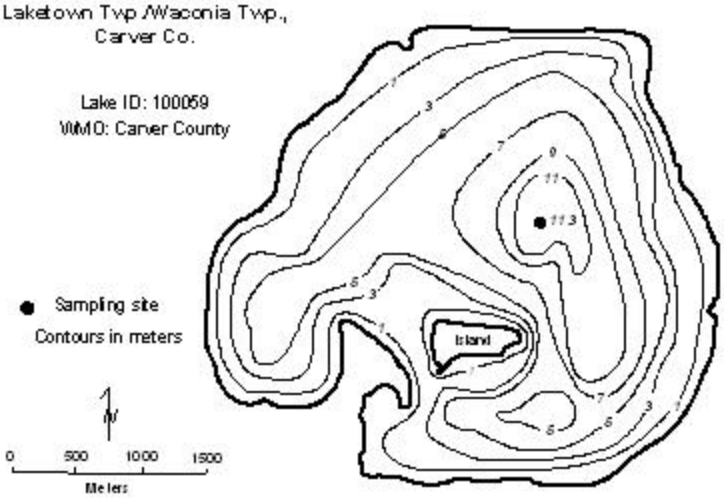
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				D				D		D			D
Chlorophyll a				C				D		D			F
Secchi Depth				D				F		D			F
Overall				D				D		D			F

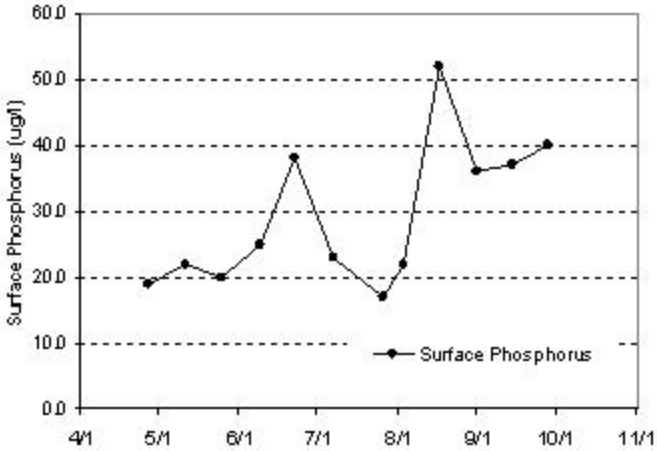
Source: Metropolitan Council and STORET data

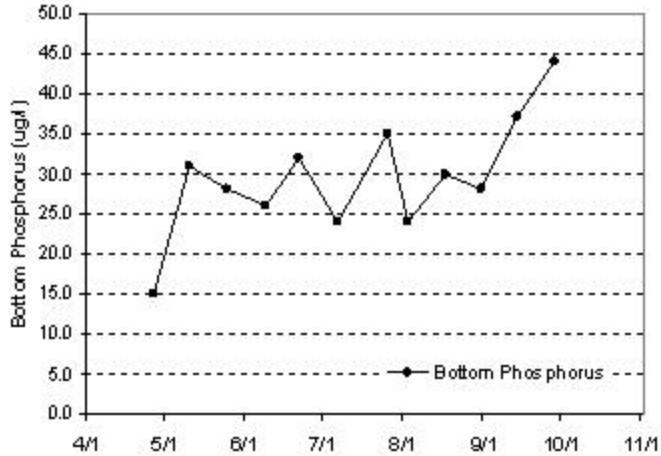
Lake Waconia

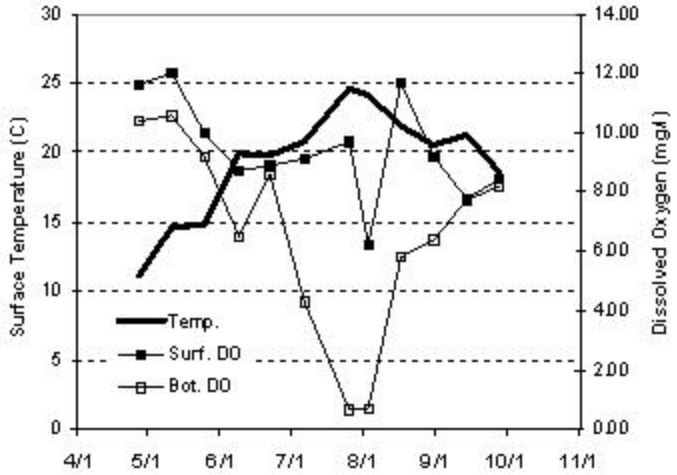
Laketown Twp./Waconia Twp.,
Carver Co.

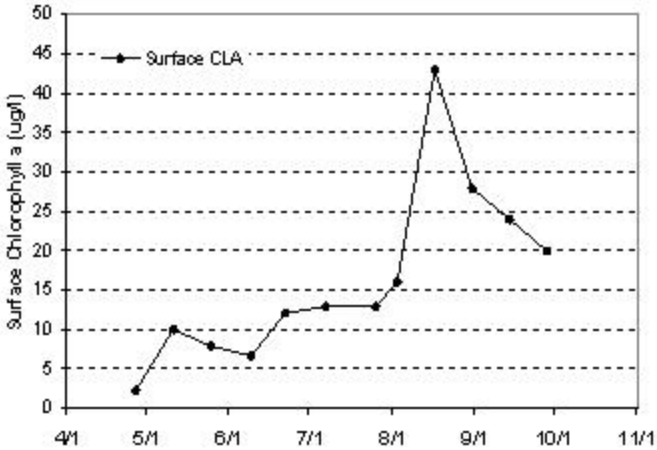
Lake ID: 100059
WMO: Carver County

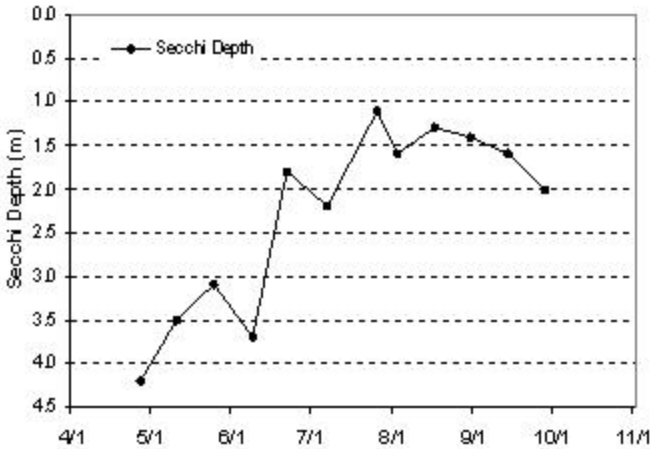












Lake Water Quality Grades Based on Summertime Averages

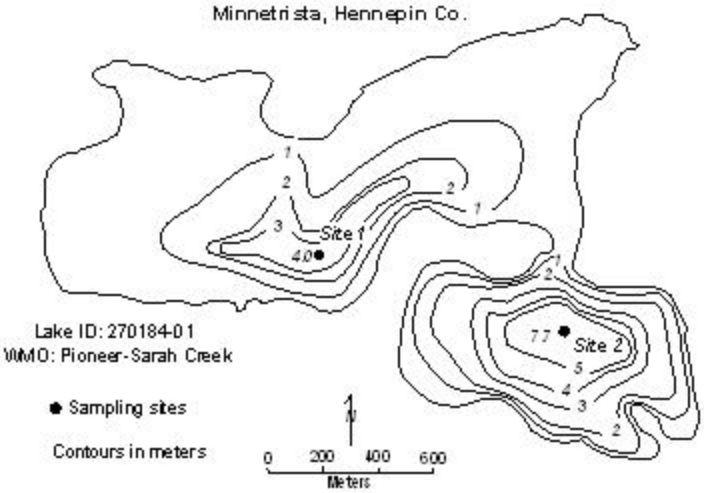
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C	B				B						
Chlorophyll a	C	B				B					C	
Secchi Depth	C	C	C	C	D	C	C	C	D	C	C	C
Overall	C	B				B						

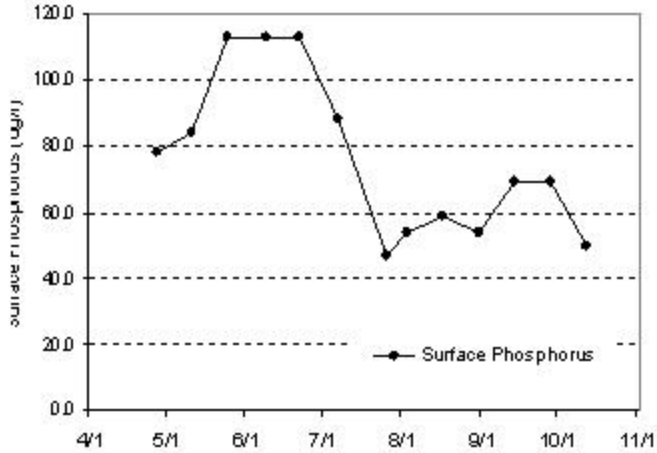
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			A	A	B	B	C	C	C	C	B	C	B
Chlorophyll a			A	B	B	B	B	B	B	B	B	B	B
Secchi Depth	C	C	A	B	C	C	C	C	C	B	B	C	C
Overall			A	B	B	B	C	C	C	B	B	C	B

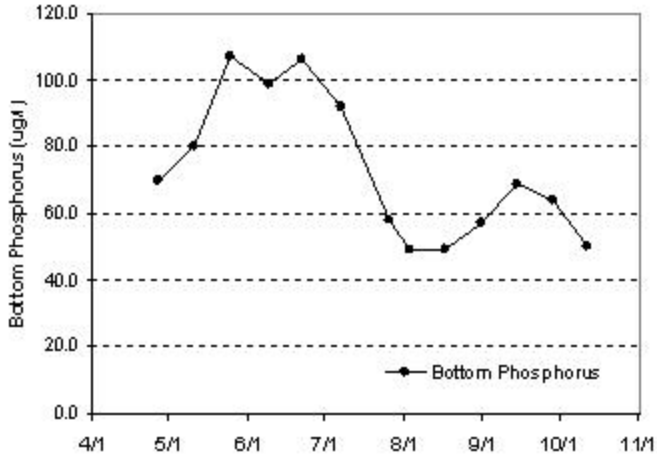
Source: Metropolitan Council and STORET data

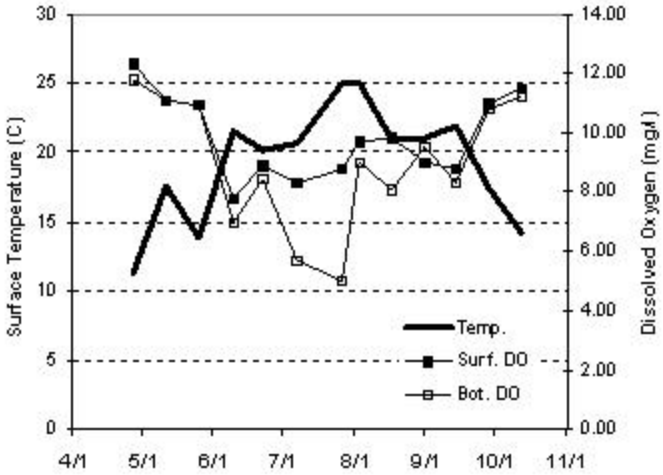
Whaletail Lake, Site 1

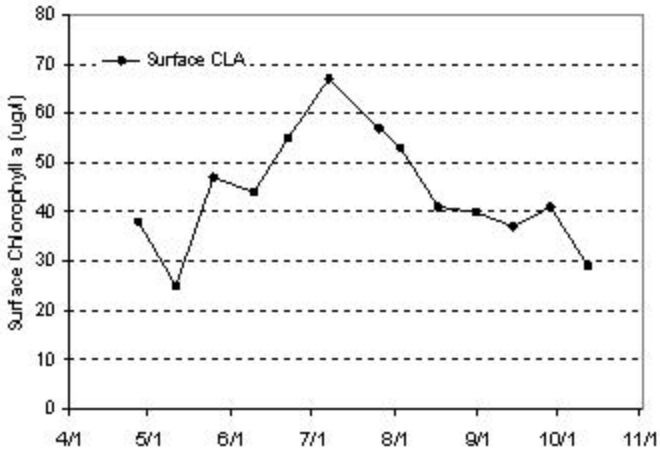
Minnetrista, Hennepin Co.

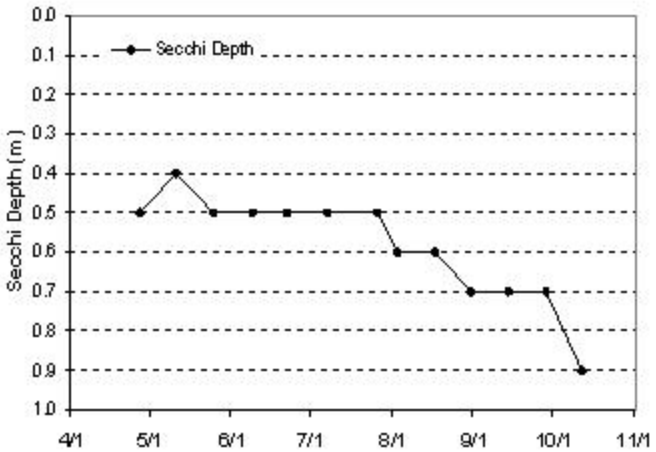












Lake Water Quality Grades Based on Summertime Averages

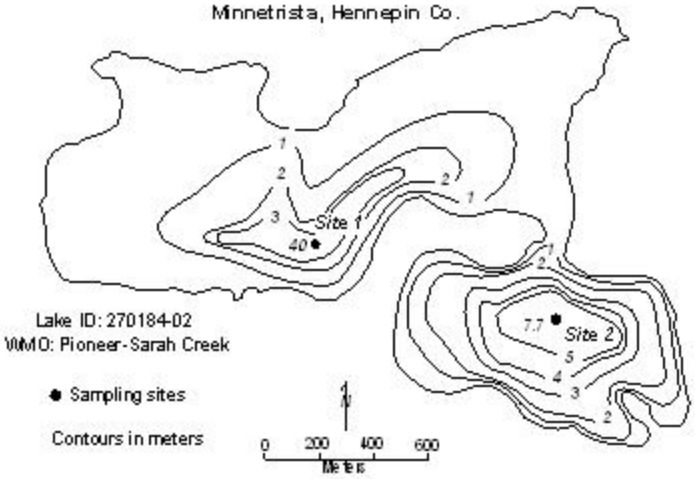
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	D					C						
Chlorophyll a	D					D						
Secchi Depth	D					D						
Overall	D					D						

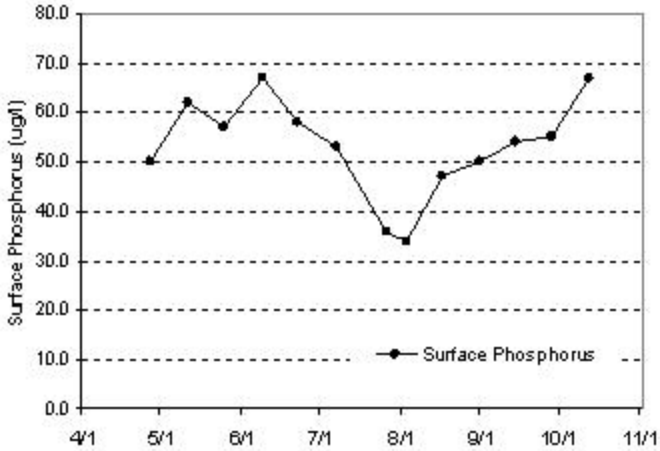
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 Site 1	2004 Site 2
Total Phosphorus							C			C			D	C
Chlorophyll a							C			C			C	C
Secchi Depth							D			D			F	D
Overall							C			C			D	C

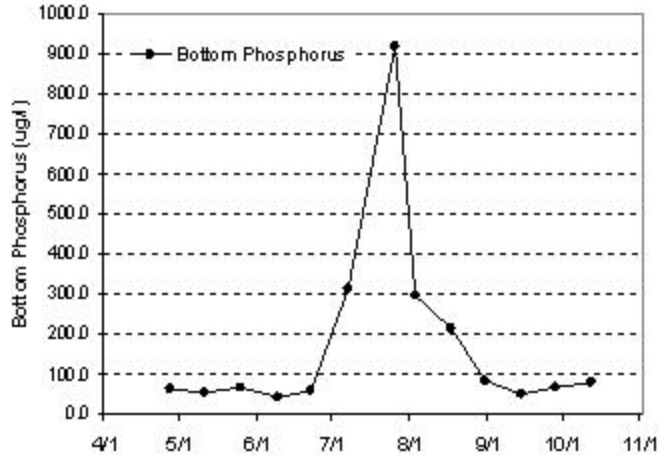
Source: Metropolitan Council and STORET data

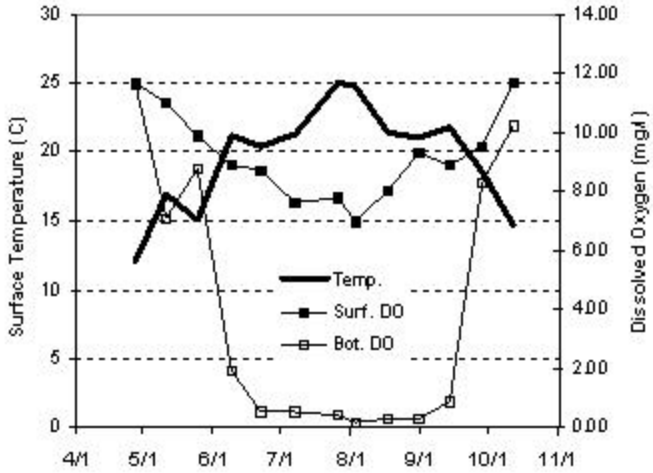
Whaletail Lake, Site 2

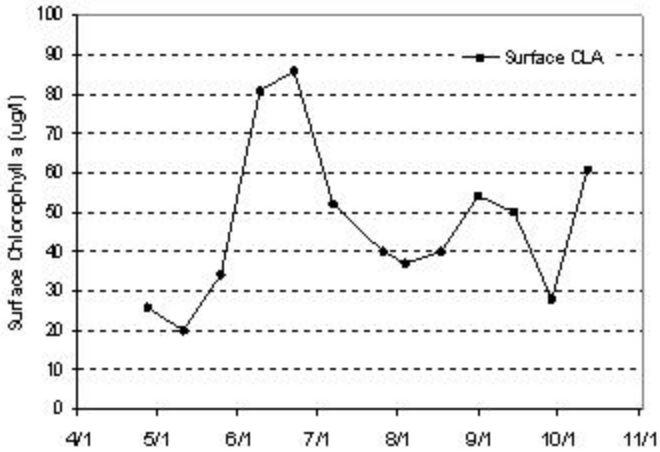
Minnetrista, Hennepin Co.

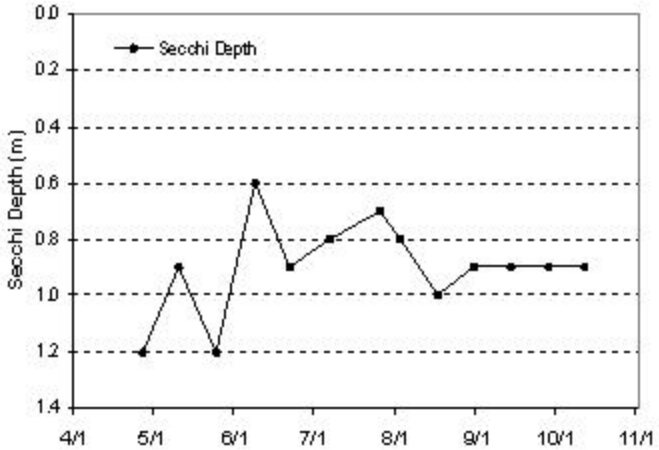












Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	D					C						
Chlorophyll a	D					D						
Secchi Depth	D					D						
Overall	D					D						

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 Site 1	2004 Site 2
Total Phosphorus							C			C			D	C
Chlorophyll a							C			C			C	C
Secchi Depth							D			D			F	D
Overall							C			C			D	C

Source: Metropolitan Council and STORET data

PART II - CITIZEN-ASSISTED LAKE MONITORING

ACKNOWLEDGMENTS

The success of the 2004 volunteer lake monitoring program would not have been possible without the greatly appreciated work done by volunteer monitors, and the support of the organizations that enrolled lakes in the program.

The enrolling organizations, which included 14 watershed management organizations/watershed districts (WMO/WD), 11 cities, two counties and one environmental group were involved in volunteer recruitment, training, and occasional follow up on the progress of their volunteer lake monitors. Without this help, the program would not have been as successful as it was.

However, those deserving the greatest appreciation, are the volunteers themselves. Their help has made this program successful. The list of the volunteers involved in the 2004 Citizen-Assisted Monitoring Program (CAMP) is shown in Appendix B. The Metropolitan Council and local WMO/WDs thank them for the sustained efforts contributed over six months and the quality of their work.

INTRODUCTION

Volunteer monitoring is a growing endeavor around the country. Citizens are finding that good information on the status of local water quality and the causes of water quality degradation is often not available from scientific research projects or government surveys. Therefore, the citizens themselves are collecting this information.

As is the case throughout the United States, the majority of lakes in the Twin Cities Metropolitan Area (TCMA) suffer from this lack of water quality data. Area lakes and watershed managers need a broad, comprehensive water quality database for regulatory and decision-making purposes. Because of the lack of public funding and the large ratio of area lakes to monitoring staff, very little data exist for the majority of the lakes in the area, and local decision-makers are forced to make management decisions lacking adequate information.

CAMP was initiated by the Metropolitan Council in 1993 to help bridge the data gaps for area lakes, provide a more complete and improved Metro database, give local decision makers a better idea of the water quality in the area, and assist them in decision making on water quality issues. The Council's goal for CAMP is to provide a means to gather as much information on area lakes, as is economically possible.

Previous volunteer programs conducted throughout the United States have shown that with proper equipment and instructions, volunteers can be trained to produce credible water quality data. Because most of the volunteers live near the lakes they are monitoring, they are very interested in determining any trends and/or changes in local water quality (Nichols 1992).

Not only does volunteer involvement in the lake monitoring process substantially reduce the cost of obtaining data, but it enhances the grass-root understanding of how lakes work and how certain lake conditions relate to the surrounding watershed.

PURPOSE OF THE VOLUNTEER PROGRAM

The main purpose of CAMP is to provide lake and watershed managers with water quality data that will not only support them in properly managing the resources, but also provide much needed historic baseline data to help document water quality impacts. As noted earlier, an additional function of the monitoring program is the volunteer's increased awareness of their lake's condition and workings throughout the summer, which may foster grass-roots initiatives to protect lakes and promote support for lake management.

CAMP involved the collection of in-lake samples by volunteers. Monitoring procedures and sample handling methods were determined through a pilot study during the summer of 1991. The pilot study was designed to evaluate the validity of data collected using several possible citizen monitoring and sample handling methods by comparing them to routine methods (Hartsoe and Osgood 1991). The pilot study and results are presented in Appendix D of the Council's 1993 lake monitoring report (Anhorn 1994) and can be obtained by contacting Randy Anhorn at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Volunteers collected surface water samples that were analyzed for total phosphorus (TP), total Kjeldahl nitrogen (TKN), and chlorophyll-a (CLA) [a select few of the lakes collected samples to be analyzed for chloride as well]. In addition, they measured surface water temperature, water transparency, and recorded user perceptions (some monitors also recorded dissolved oxygen). Most lakes were visited biweekly from April through October (fourteen sampling dates) and were sampled at the lake's deepest open-water location. Quite a few of the lakes, however, were not monitored each of the desired 14 sampling weeks. The reasons for the missed sampling dates varied. However, the majority of the lakes, even with the missed sampling dates, were sampled adequately and often enough to provide an annual overview of the water quality of each lake. Samples were submitted to Council-staff and then forwarded to the MCES-EPE laboratory.

CAMP METHODS

OBTAINING VOLUNTEERS

Active recruitment for lakes and interested volunteers for the 2004 volunteer monitoring program began in the winter months of 2003. Letters and registration forms were sent to various WMOs, counties, and cities to determine their interest in enrolling lakes within their jurisdiction in the program. The organizations were then encouraged to obtain volunteers for each lake they enrolled in the program. If there were problems finding willing volunteers the Council assisted in the search; however, the belief was that the supervising organization would benefit in the long run by having direct contact in recruiting its volunteers. This contact would hopefully open a two-way communication line between concerned citizens and the WMOs.

The year 2004 marked the twelveth year of the Council's volunteer program. Fourteen watershed management organizations/watershed districts (WMO/WD), 11 cities, two counties, and one environmental group participated in CAMP in 2004, enrolling a total of 133 lakes. This year's volunteer-monitoring program included 11 lake sites never before monitored by the Council and 116 lake sites which were also monitored in 2003. A map indicating the 2004 CAMP lakes and their affiliated enrolling entity is shown in Figure 2, while a list of the volunteer monitors for each lake is provided in Appendix B.

TRAINING VOLUNTEERS

Volunteer training was conducted by Council-staff at various locations throughout the seven- county metropolitan area. Volunteer training was scheduled between late-February and early-April 2004. At each training session, volunteers were given a handbook describing the program, outlining basics in the biology and ecology of lake systems, and containing detailed written instructions for the lake monitoring and data form completion procedures.

At each training session, volunteers received the necessary equipment for the lake monitoring. This equipment was purchased by the enrolling agency through the Council and loaned to the volunteers. At the end of the year's monitoring season, equipment was returned to the enrolling agency to be used in future years. Each lake's volunteer received:

- Chlorophyll hand pump, flask, and filters
- LCD thermometer
- Map of lake with sampling site(s)
- Sampling observation forms
- Sample jug
- Sample vials and labels
- Secchi disk
- Aluminum foil
- Tweezers (forceps)

During the training session, volunteers were given a brief description of the inner working of a lake system as described in their handbook, instructed on proper lake monitoring procedures, and shown how each piece of sampling equipment worked. After this discussion, the volunteers received a package containing the equipment, and the proper use of each piece of equipment was again described and practiced. Finally, each volunteer was asked to sign a waiver of liability stating that they were not an employee of either the Council or the agency enrolling the lake in the program (i.e. the watershed management organization), and that they would use proper safety equipment and observe boat operating methods specified by the State of Minnesota.

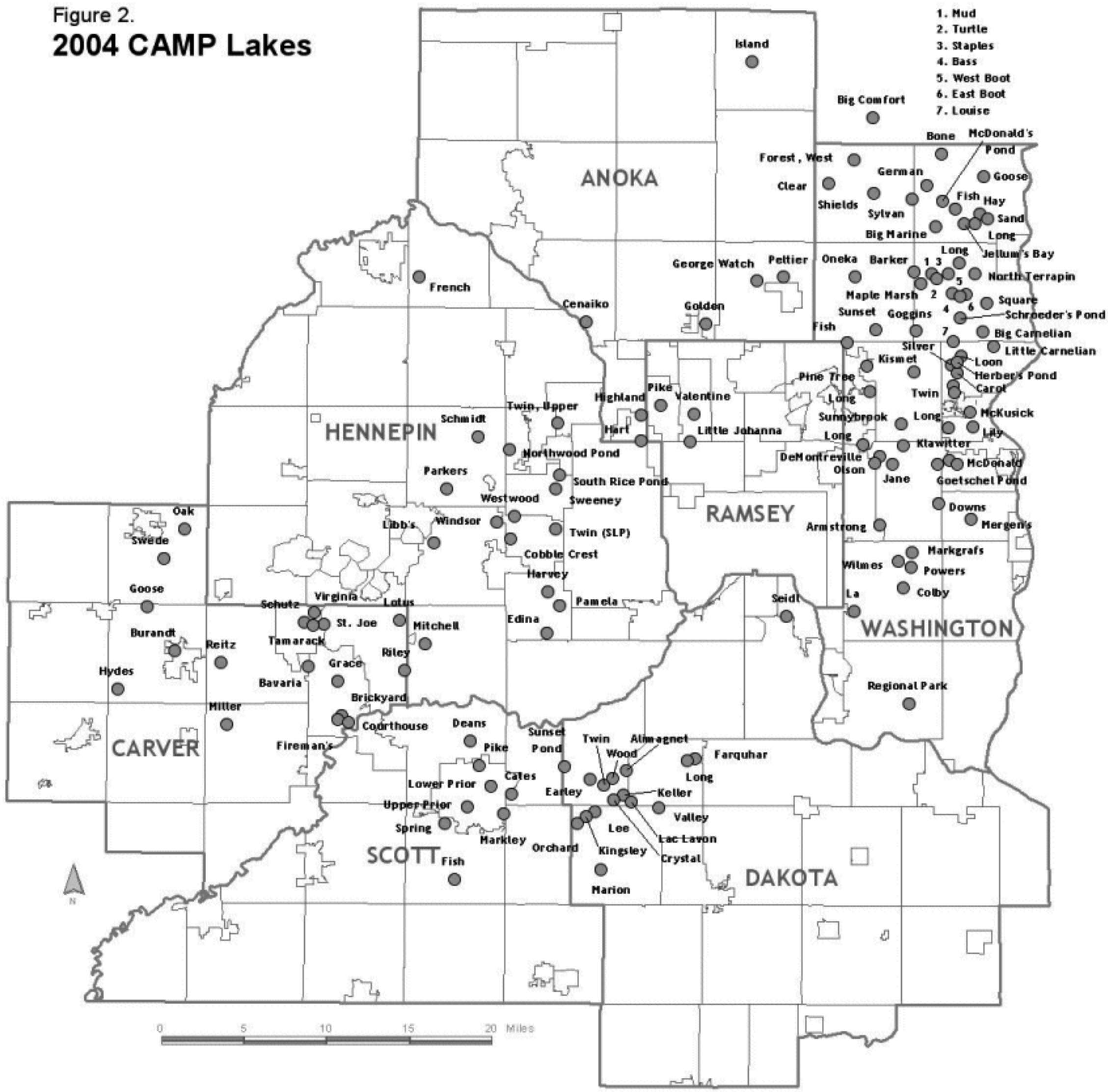
MONITORING METHODS

Volunteers were instructed to monitor their designated lake site(s) on a biweekly basis from mid-April to mid-October. Thus, there were 14 possible sampling periods. The methods they used were determined through a pilot study in 1991 that tested simplified methods for using volunteers to obtain credible water quality data (Anhorn 1994). The monitoring methods are detailed in the following paragraphs.

First, during pre-arranged sampling weeks, volunteers located and anchored their boat at pre-determined monitoring locations (the deep open-water area of the lake). Once at the monitoring location, an observation form for lake and meteorological conditions was completed. The form, shown in Figure 3, provided space to mention natural and cultural observations which may have influenced what was happening in the lake (i.e., heavy rains two days before monitoring), and an area to relate general perceptions of the lake's condition and suitability for recreation.

Figure 2.

2004 CAMP Lakes



Next, the volunteers took a water transparency reading by lowering a Secchi disk on the shaded side of the boat to the point at which it disappeared. The point where the disk reappears is the Secchi transparency depth that was recorded on the observation form. The next lake monitoring step involved the collection of the surface water sample.

Collecting a surface water sample. A surface water sample was collected in a clean one-gallon plastic milk jug. To begin, the volunteer pre-rinsed the jug three times with lake water. After rinsing, the jug was filled by submersing it upside down to forearm depth and turning it upright while still submersed. After filling the sample jug, volunteers tested and prepared it for the following parameters:

- **Temperature**. Surface water temperature was measured from the volunteer's sampling jug using a LCD thermometer that is readable to 0.1°C. The temperature was measured immediately following sample collection. Special care was taken to keep the sample out of direct sunlight in order to minimize temperature change.

- **Total Phosphorus (TP) and Total Kjeldahl Nitrogen (TKN)**. Two samples, one each for TP and TKN, were decanted from the volunteer's jug in the field into their respective triple pre-rinsed, pre-labeled (including lake name, date, time, and parameter) 50-milliliter (ml) vials. These samples were then placed in the cooler, taken home, and stored in the freezer until they were picked up and delivered to the laboratory for analysis.

- **Chlorophyll-a (CLA)**. CLA samples from the volunteer's jug were filtered in the field *(out of direct sunlight)* onto a 0.45 micrometer (µm) glass-fiber filter using a field filtration apparatus and a hand pump. Water from the sampling jug was measured and poured into the pump reservoir using a graduated cylinder. The pump reservoir holds approximately 250 ml. By squeezing the handle of the pump, the sample water was forced through the filter and the suspended planktonic algae became attached to the filter. The filtered water was then dumped back into the lake. If possible, this was repeated until a total of 1000 ml of sample water was allowed to pass through the filter. However, if the water sample was too green and the filter became clogged without allowing more water to pass through, the amount of water that did pass through the filter was calculated and recorded on the observation form. The filters were then removed from the filter holder with tweezers, and placed in a petri dish. The sample container was then labeled using the same methods used on the TP and TN sample vials (except the amount of water pumped through the filter was also included on the label), wrapped in tin foil, and frozen until pick-up and delivery to the lab.

The frozen samples were picked up within approximately 30-60 days by Council-staff and delivered to the MCES-EPE's laboratory for chemical analysis. Results from the 1991 pilot study reveal that the volunteer monitoring and handling methods chosen for use in the CAMP program yield results comparable to routine methods used by the Council (Hartsoe and Osgood 1991).

In addition, a few WMO/WDs had their volunteer(s) record dissolved oxygen (DO) and temperature profiles, as well as collect surface chloride and subsurface TP and CLA samples. Chloride samples were prepared in the field identical to the TP/TKN samples. The WMO/WDs provided their volunteers with supplementary equipment and training to use this equipment, as well as paying for the additional cost of laboratory analysis for the TP samples. The additional profiles, and subsurface samples were picked up by the Council along with the routine samples. Profiles obtained by the volunteers were then mailed to the WMO/WD, and the samples were delivered to the lab for analysis.

Figure 3. Example of Sampling Form

Lake Name and ID #:_____ Site #:_____

Sampling Date:_____ Time:_____

Name(s) of Volunteer(s):

_____

_____

Sample #s:

TP:_____
TKN:_____
CLA:_____

SECCHI DISK DEPTH:_____meters

SURFACE TEMPERATURE:_____°C

VOLUME OF FILTERED LAKE WATER (CLA) _____ml

GENERAL OBSERVATIONS
(Circle)

* Water Color

Clear Yellow
Green Gray
Brown Blue-Green
Comment:

* Odor of Water

None Rotten Egg-like
Fishy Septic-like
Musty _____
Comment:

* Wind Conditions

Calm Strong
Breezy
Direction:____

* Water Surface

Calm Moderate Waves
Ripple Whitecaps
Small Waves
Comment:

* Cloud Cover

0% 75%
25% 100%
50%

* Lake Level

Above Normal
Normal
Below Normal
Staff Gage Reading _____

* Amount of Aquatic Plants

None Moderate
Minimal Substantial
Slight

* Air Temperature (F)

< 40 81-90
41-60 > 90
61-80

* Unusual Conditions in the past week (storms, high winds, temp. extremes):

* Physical Condition

Crystal Clear(1)
Some Algae Present(2)
Definite Algae Present(3)
High Algal Color(4)
Severe Bloom (Odor, Scum)(5)

* Suitability For Recreation

Beautiful(1)
Minor Aesthetic Problem(2)
Swimming..Slightly Impaired(3)
No Swim..Boating OK(4)
No Aesthetics Possible(5)

DATA HANDLING AND ANALYSIS

Once each lake's sampling forms and lab analyses were delivered to the Council, the data were entered into a data management and statistical analysis program called Statistical Analysis System (SAS). This data handling system served three purposes:

1. Check-in of forms and tracking of volunteer participation;

2. Entry of nutrient, Secchi, and user perception data into a database for statistical, graphical, and tabular outputs; and

3. Entry into the U.S. Environmental Protection Agency's (U.S. EPA) national water quality data bank called STORET.

If there were questions concerning the data and/or lake observations, the volunteer was called by the Council-staff. The Council maintained contact with most volunteers throughout the season by telephone or in person during sample pick-up. Statistical analyses were performed, and tables and plots of the data were prepared.

PROGRAM QUALITY ASSURANCE/QUALITY CONTROL

The quality assurance/quality control (QA/QC) objective for CAMP is to prevent erroneous data from being produced and used. If by chance errors did occur, they were identified and corrected. Additionally, all suspect data were excluded in lake databases or conclusions.

The MCES-EPE's laboratory follows its own internal QA/QC program. The MCES-EPE lab uses an extensive internal and external check and balance system to ensure credible data. Documentation of the lab's QA/QC procedures can be obtained through the MCES-EPE.

To ensure that CAMP volunteer monitors were using proper sampling techniques and producing credible data, two QA/QC methods were used. Either Council-staff accompanied a volunteer on a sampling event to oversee their collection and preparation procedures, or staff monitored a CAMP lake site during the same week (although not necessarily the same day) that volunteers were to sample the lake site. The first method was used to simply observe the monitor's methods to determine if there were any problems that needed to be addressed. This procedure was usually undertaken when Council-staff was in a volunteer's area on a known sampling day, or when it seemed necessary.

The most common quality check method, however, involved monitoring of the lake by the Council during a scheduled monitoring week. For these sampling events, Council-staff used the same type of equipment and same methods as the volunteers. The Council-collected QA/QC samples were then treated just as the volunteer samples were so that the nutrient concentrations and Secchi transparencies of both sampling events could be compared to determine if any procedural problems existed. If there seemed to be discrepancies, Council-staff would accompany the volunteer on their next sampling event to observe their methods and, if necessary, re-train them. Data determined to be erroneous were thrown out of the database.

During the 2004-monitoring season, 40 percent of the CAMP lake sites monitored more than three times throughout the summer were monitored by Council staff during scheduled monitoring weeks to determine the credibility of the volunteer data. Many of the lakes that were 'checked' by Council-staff in 2003 were

monitored by volunteers (and 'checked') as part of past CAMP monitoring years. Council-sampled QA/QC measurements are presented along with volunteer samples in each lake's descriptive section. A regression analysis was performed on the QA/QC dataset to determine if a statistically significant difference was found between the volunteer and professionally collected data. The resulting statistical analysis of the quality check data revealed excellent agreement between volunteer and professionally-collected samples.

Regression analysis. The 2004and 1993-2004 QA/QC volunteer- and professional-collected TP, CLA and Secchi data were plotted on a scatterplot graph (Figures 4-9). A linear regression (shown on the graph as a solid line) was run on the resulting data. If the professional- (y) and volunteer-collected (x) data were identical, the data points would fall along the dashed line shown on the following graphs (x=y).

The graphs show that while the majority of the data points do not fall exactly on the x=y-line, they do, for the most part, fit the x=y-line well. The graphs also show that while the regression-lines for each parameter are nearly identical to the x=y-lines when the tested parameters are low, the regression-line begins to fall away from the x=y-line as the parameter levels increase. Because of the close fit of the regression-line to the x=y-line and because of the strong linear relationships of each parameters data (shown as a large R^2), it is determined that there is no statistically significant difference found between samples collected by volunteers and those collected by Council staff.

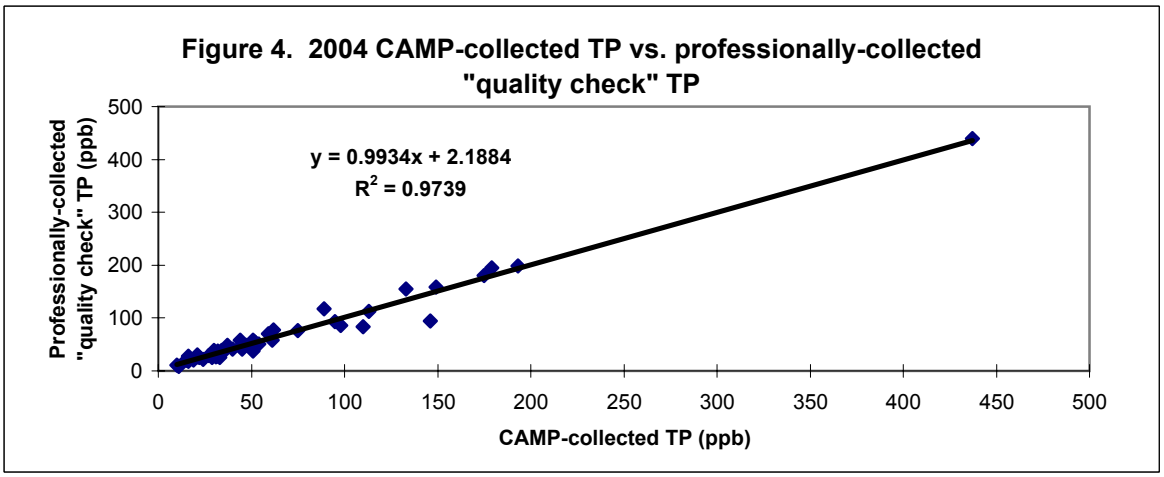


Figure 4. 2004 CAMP-collected TP vs. professionally-collected "quality check" TP
y = 0.9934x + 2.1884
R2 = 0.9739
Professionally-collected "quality check" TP (ppb)
CAMP-collected TP (ppb)
0
100
200
300
400
500
0
50
100
150
200
250
300
350
400
450
500

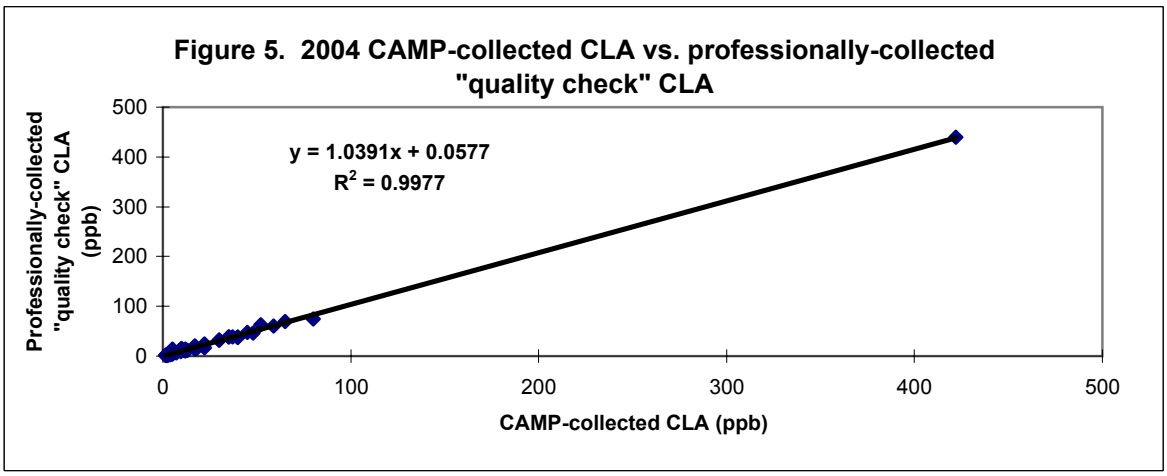


Figure 5. 2004 CAMP-collected CLA vs. professionally-collected "quality check" CLA
y = 1.0391x + 0.0577
R2 = 0.9977
Professionally-collected "quality check" CLA (ppb)
CAMP-collected CLA (ppb)
0
100
200
300
400
500
0
100
200
300
400
500

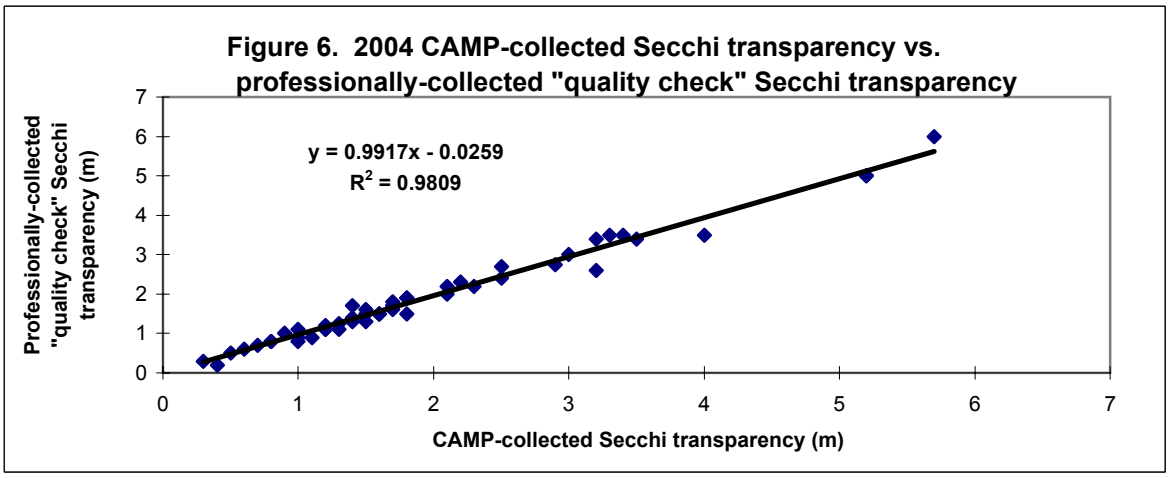


Figure 6. 2004 CAMP-collected Secchi transparency vs. professionally-collected "quality check" Secchi transparency
y = 0.9917x - 0.0259
R2 = 0.9809
Professionally-collected "quality check" Secchi transparency (m)
CAMP-collected Secchi transparency (m)
0
1
2
3
4
5
6
7
0
1
2
3
4
5
6
7

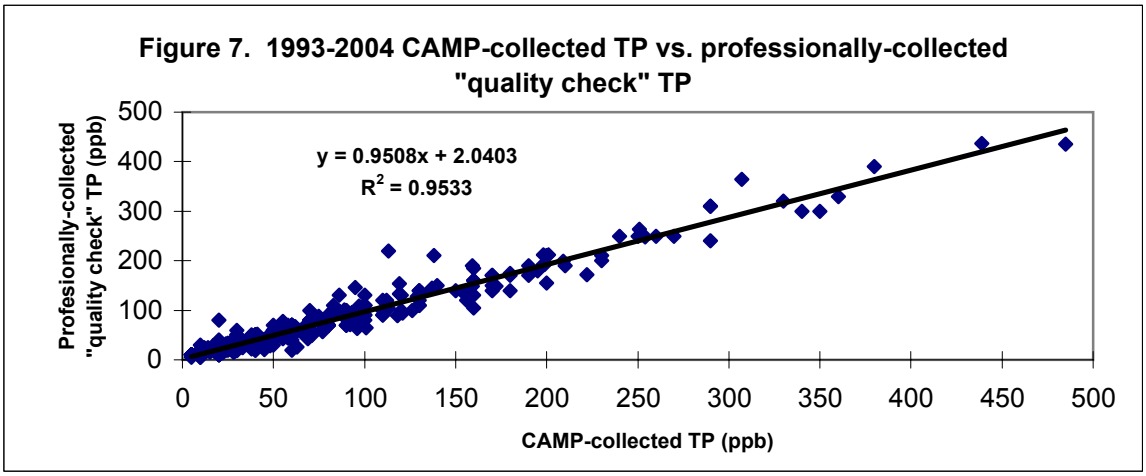


Figure 7. 1993-2004 CAMP-collected TP vs. professionally-collected "quality check" TP
y = 0.9508x + 2.0403
R2 = 0.9533
Profesionally-collected "quality check" TP (ppb)
CAMP-collected TP (ppb)
0
100
200
300
400
500
0
50
100
150
200
250
300
350
400
450
500

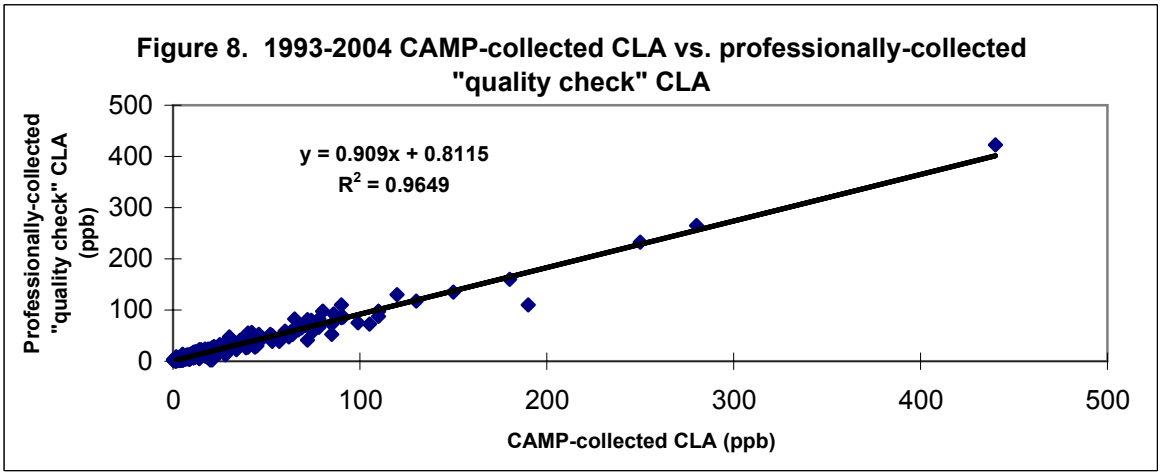


Figure 8. 1993-2004 CAMP-collected CLA vs. professionally-collected "quality check" CLA
y = 0.909x + 0.8115
R2 = 0.9649
Professionally-collected "quality check" CLA (ppb)
CAMP-collected CLA (ppb)
0
100
200
300
400
500
0
100
200
300
400
500

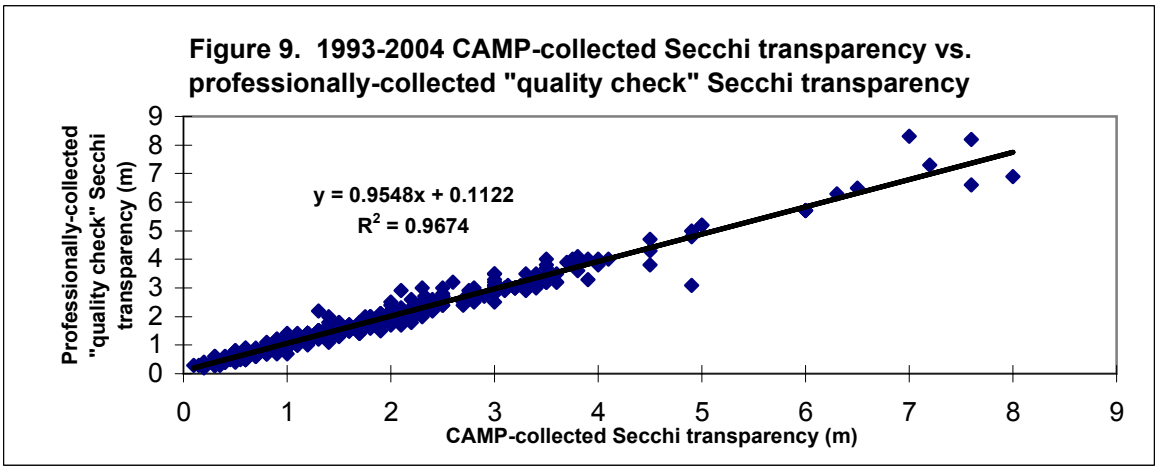


Figure 9. 1993-2004 CAMP-collected Secchi transparency vs. professionally-collected "quality check" Secchi transparency
y = 0.9548x + 0.1122
R2 = 0.9674
Professionally-collected "quality check" Secchi transparency (m)
CAMP-collected Secchi transparency (m)
0
1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9

RESULTS AND ANALYSIS

The water quality of the CAMP lakes will be discussed on a lake-by-lake basis in the following pages. *The Handbook for the Citizen-Assisted Lake Monitoring Program* (Anhorn 93), handed out at the volunteer training sessions, overviews the basic inner workings of lakes.

The results and subsequent analysis of the water quality of each lake includes a written section describing the lake's current condition as determined through the 2004 CAMP monitoring and a separate lake information sheet. Each information sheet includes current 2004 water quality data, shown in both tabular and graphic form, and all 1980-to-the-present lake water quality grades (the methodology and percentile ranges of the grading system were discussed in Part I of this report). To determine any water quality trends (i.e., whether the lake quality is improving, degrading, staying the same, or has no trend) each lake's 1980-to-the-present database was used.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Alimagnet Lake (19-0021) *City of Apple Valley*

Approximately half of Lake Alimagnet's 109-acre surface area is located within the City of Apple Valley, the other half in the City of Burnsville (Dakota County). The lake's shoreline is 3.2 miles. The lake has maximum and mean depths of 3.0 and 1.5 m (10 and five feet), respectively. Because the lake is relatively shallow, it does not develop and maintain a thermocline (a density gradient owed to changing water temperatures throughout the water column), and the entire lake is considered littoral, (the shallow [0-15 feet] area dominated by aquatic plants). The approximate lake volume is 545 acre-feet (ac-ft). The lake has a 1,288-acre watershed and a watershed-to-lake area ratio of 11.8:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

There are 12 inlets into the lake. A 1990 Clean Water Partnership Diagnostic-Feasibility Study on the lake estimated land use for the watershed at: 29 percent single-family residential, eight percent multi-family residential, three percent commercial/industrial, 19 percent wooded, 10 percent open waters/wetlands, and 31 percent open/undeveloped (Montgomery Watson 1990). Land use percentages have no doubt continued to shift from open/undeveloped to urban uses (single-family residential, multi-family residential, and commercial/industrial) since that study.

The lake, which has been monitored through CAMP since 1995, was sampled 10 times between mid-May and mid-October, 2004.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	106.5	45.0	184.0	D
CLA (µg/l)	52.5	13.0	120.0	D
Secchi (m)	0.5	0.3	0.8	F
TKN (mg/l)	1.39	0.80	2.20	
			Overall Grade	D

The 2004 overall grade is similar to that of 1990, 1996, and 1999-2003 and worse than those recorded in 1995, and 1997-1998.

The lake's historic overall water quality grades indicate that the lake fluctuates between a C and D. Most recently the lake's overall grade has consistently been D (1999-2004). The lake's water quality was at its best in 1995, 1997, and 1998 (overall grade of C) as compared to that of 1990, 1996, and 1999-2004 (overall grade of D). The lake's 2004 summertime TP, CLA, and Secchi means were similar to those recorded in 1999-2004 (which represent some of the lake's worst water quality).

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The summertime mean physical condition was 3.7 on a 1-to-5 scale shown on the lake information sheet (between 3- "definite algae present" and 4-"high algal color"). The mean suitability for recreation ranking, also on a 1-to-5 scale, was 3.0 (3-"swimming slightly impared").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

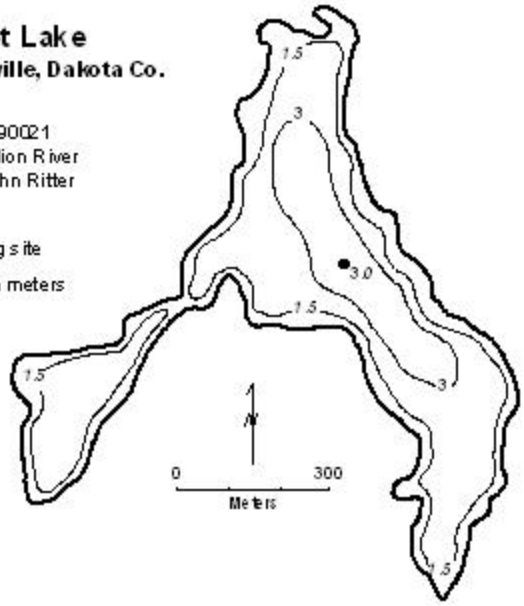
Alimagnet Lake

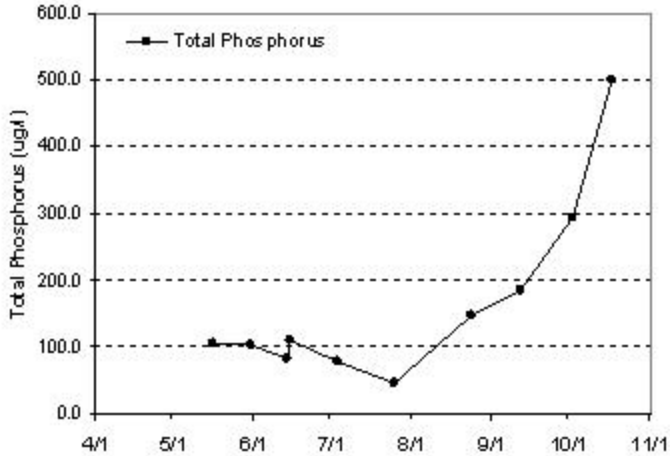
Apple Valley/Burnsville, Dakota Co.

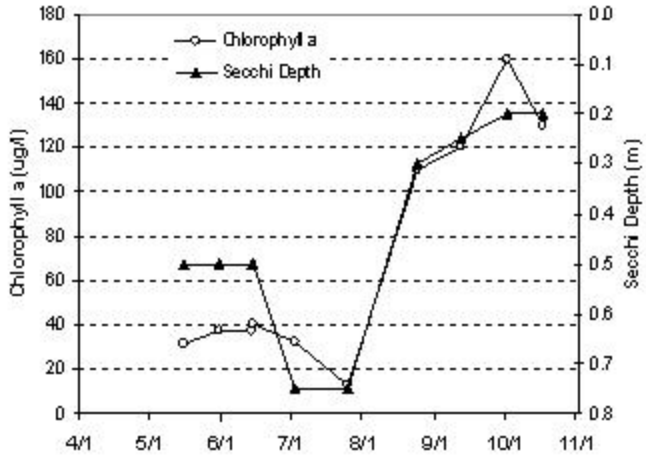
Lake ID: 190021
WMO: Vermillion River
Volunteer: John Ritter

● Sampling site

Contours in meters

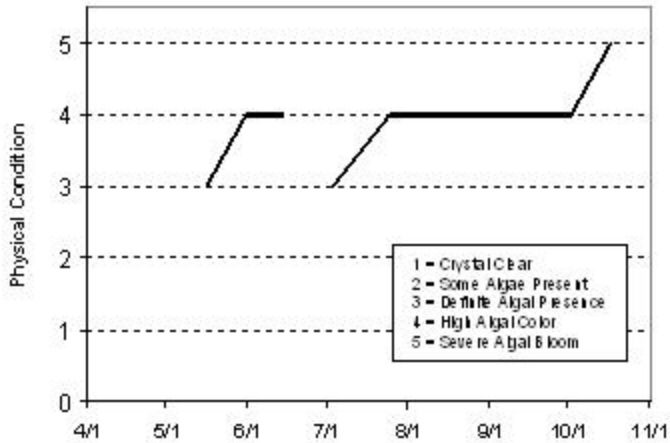






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/16/04	19				31	104.0		0.5	3	3
5/31/04	16.8				37	102.0		0.5	4	3
6/14/04	23.5				37	83.0		0.5	4	3
6/15/04	24				40	110.0		0.5		
7/3/04	24.6				32	76.0		0.8	3	3
7/25/04	25				13	45.0		0.8	4	3
8/24/04	21.2				110	148.0		0.3	4	3
9/12/04	20.7				120	184.0		0.3	4	3
10/2/04	14.6				160	293.0		0.2	4	3
10/17/04	7.8				130	500.0		0.2	5	3

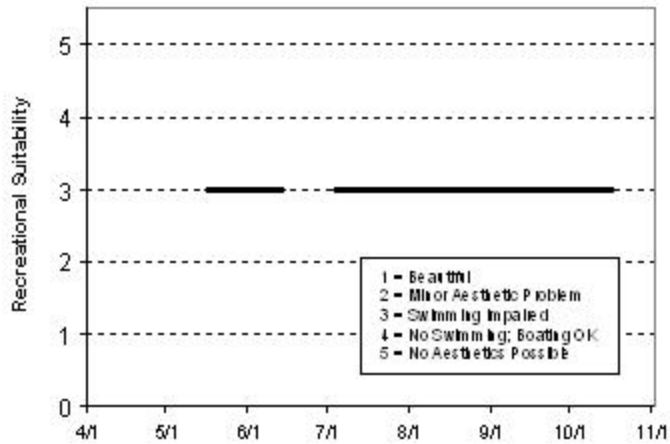


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	F	D									F	
Chlorophyll a											D	
Secchi Depth	F	F	D	D	C	D	F	F	F	F	D	C
Overall											D	

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				D	D	C	D	F	D	D	D	D	D
Chlorophyll a				B	C	C	C	D	D	C	C	C	D
Secchi Depth	D	C	C	C	D	C	C	D	F	D	F	F	F
Overall				C	D	C	C	D	D	D	D	D	D

Source: Metropolitan Council and STORET data



Armstrong Lake (82-0116-02) *South Washington Watershed District*

Armstrong Lake has been annually monitored through CAMP since 1998. There is very little physical information available on the lake or the lake's watershed. Located partially within the cities of Lake Elmo and Oakdale (Washington County), the 39-acre lake has a mean and maximum depth of 1.0 m (3.2 feet) and 1.5 m (roughly 5 feet), respectively. Because of the shallowness of the lake, its entire area is considered littoral (the shallow [0-15 foot depth] area dominated by aquatic vegetation), and it never maintains a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column) through the summer months. The lake's surface area and mean depth translate to a volume of roughly 128 ac-ft. There is no public access to the lake.

Armstrong Lake was monitored 14 times between mid-April and mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	54.7	32.0	86.0	C
CLA (µg/l)	8.3	4.5	18.0	A
Secchi (m)	1.0	0.9	1.2	D
TKN (mg/l)	0.92	0.54	1.40	
			Overall Grade	C

The lake's 2004 overall water quality grade was better than that recorded in 1998-1999 and 2001 (D), and similar to that of 2000 and 2002-2003. While the lake's 2004 overall grade is silimalar to 2000, and 2002-2003, the parameter means recorded in 2004 were the best to date. The main reason for the lake's improvement was the reduction in mean chlorophyll concentration as compared to previous years.

By comparing the lake's historic database TP (nutrient), CLA (algal biomass estimator), and Secchi (water clarity) grades, it is apparent that the TP and Secchi grades are quite a bit worse than the CLA grade. In a most cases, the three should be fairly comparable. One possible explanation for the lake's recent findings may be that the majority of the lake's TP comes from either in-lake suspended sediments (re-suspension), or the intrusion of sediment-laden runoff to the lake, which in turn lessens the clarity of the water and inhibits algal growth.

Statistical analysis of the lake's water quality database failed to produce any statistically significant long-term trends. To better understand the lake's current water quality condition, and which direction it may be heading, continued monitoring is suggested. In the short-tern, however, the lake's quality seems best described by a high D/low C grade.

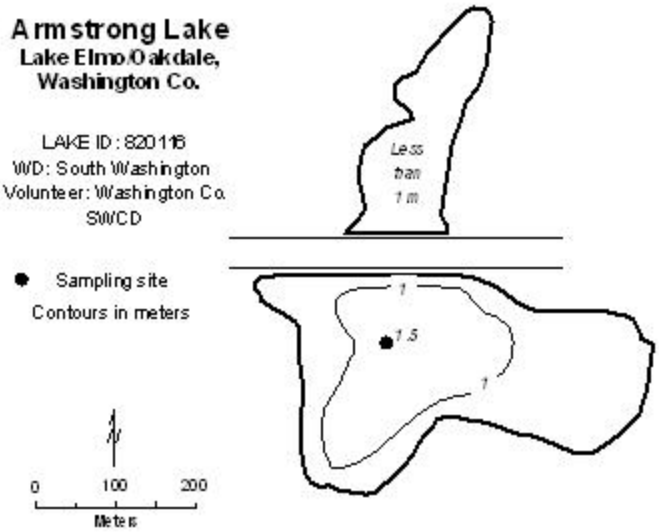
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 2.7 (ranking between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 5.0 (5- "no aesthetics possible").

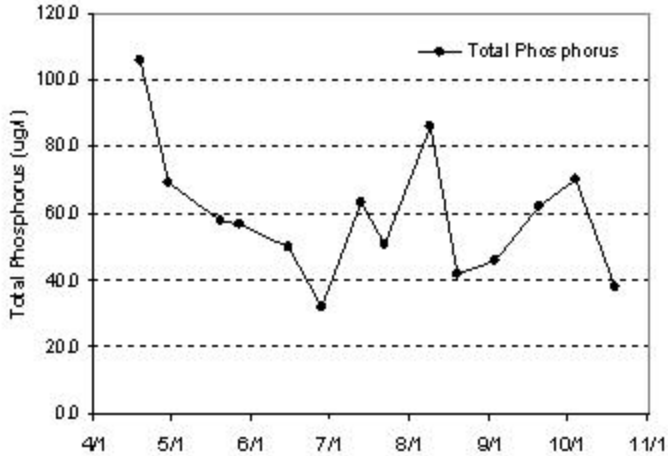
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

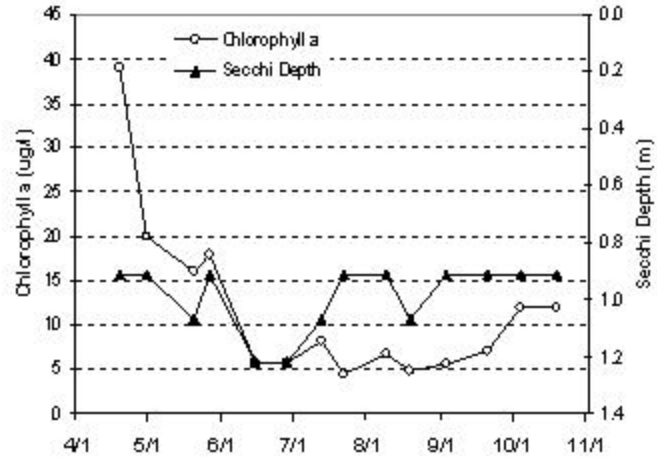
Armstrong Lake

Lake Elmo/Oakdale, Washington Co.

LAKE ID: 820116
WD: South Washington
Volunteer: Washington Co. SWCD

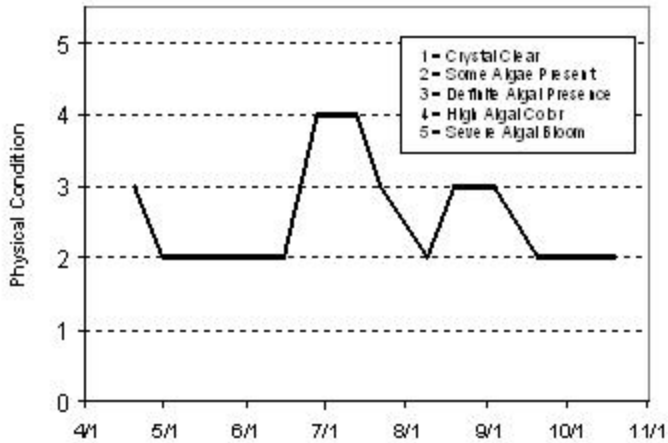






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	14.5	14.7	6.5	4.86	39	106.0		0.9	3	5
4/30/04	13.4	13.3	7.42	0.07	20	69.0		0.9	2	5
5/20/04	19	18.4	7.36	0.08	16	58.0		1.1	2	5
5/27/04	16.5	15.9	8.98	0.06	18	57.0		0.9	2	5
6/15/04	25.2	20.4	9.35	0.04	5.8	50.0		1.2	2	
6/28/04	21.8	18.1	9.91	0.18	5.7	32.0		1.2	4	
7/13/04	24.5	21.5	7.01	0.18	8.3	63.0		1.1	4	
7/22/04	28.6	23.7	8.18	0.06	4.5	51.0		0.9	3	
8/9/04	21	20.5	5.99	0.44	6.7	86.0		0.9	2	
8/19/04	19.1	17.3	8.11	0.08	4.9	42.0		1.1	3	
9/3/04	24.5	23.2	6.2	3.77	5.6	46.0		0.9	3	
9/20/04	20.6	20.1	6.61	5.3	7.1	62.0		0.9	2	
10/4/04	11.8	11.6	7.27	0.1	12	70.0		0.9	2	
10/19/04	6.1	6.2	8.15	1.01	12	38.0		0.9	2	

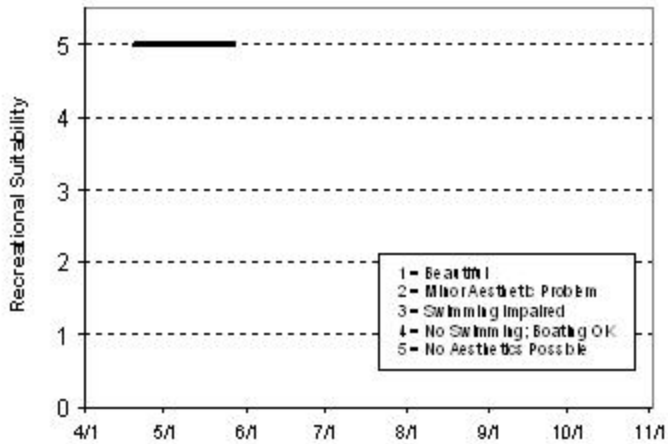


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus							D	F	C	D	D	D	C
Chlorophyll a							D	C	C	C	B	B	A
Secchi Depth							D	F	D	D	D	D	D
Overall							D	D	C	D	C	C	C

Source: Metropolitan Council and STORET data



Barker Lake (82-0076) *Carnelian - Marine Watershed District*

Barker Lake is a 45-acre lake located within May Township (Washington County). The mean and maximum depth of the lake is 4.4 m (14 feet) and 9.0 m (roughly 29 feet), respectively. Because of the shallowness of the lake, the entire area is considered littoral zone (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). Additionally, the surface area and mean depth of the lake result in a calculated volume of 648 ac-ft.). The lake has an 823-acre watershed and a rather large watershed-to-lake area ratio of 19:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

Two thousand and four marks the fifth year in which Barker Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake revealed a limited amount of data (1997-2003) collected over the past twenty years.

The lake's Secchi transparency was monitored seven times from late-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

Water samples to be analyzed for TP, TKN and chlorophyll were not collected for the lake in 2004. Because Secchi transparcy was the only data collected there are no nutrient of chlorophyll concentration means to compare to previous years. The lake's 2004 summertime (May through September) mean Secchi transparency was 1.3 m (minimum of 0.5 m and a maximum of 1.8 m). This translates to a grade of C for water clarity.

Statistical analysis on the lake's water quality database did not detect any long-term trends. To better understand the lake's current water quality and in which direction it may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.3 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 1.8 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

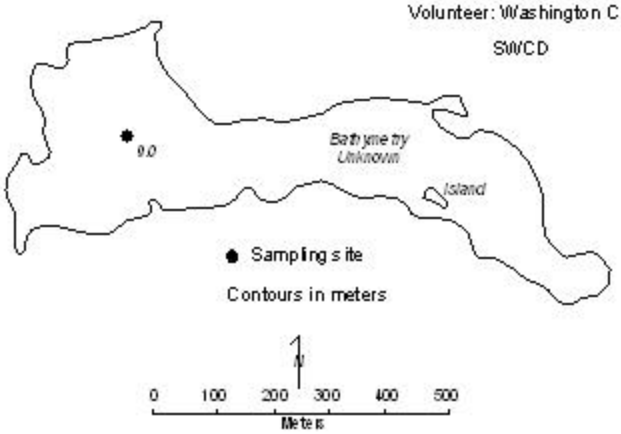
Barker Lake

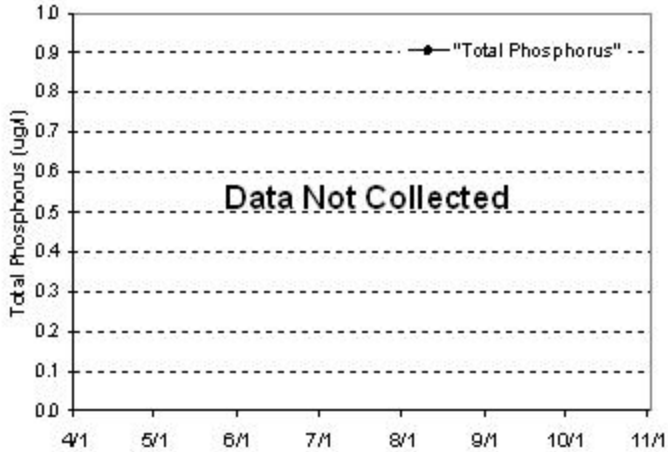
Hugo, May Twp., Washington Co.

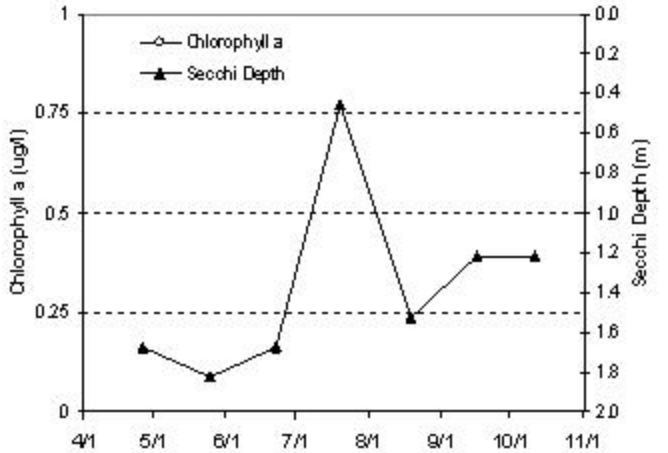
LAKE ID: 820076

WD: Carnelian-Marine

Volunteer: Washington Co. SWCD

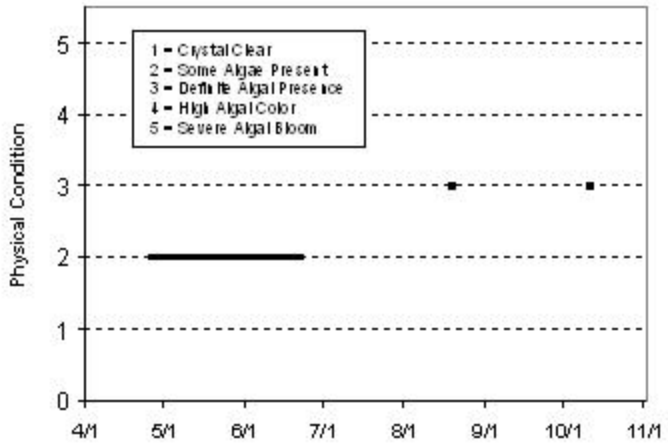






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.8	6	9.03	0.09				1.7	2	3
5/25/04	15.3	7.6	8.62	0.06				1.8	2	1
6/22/04	20.8	7.9	8.45	0.15				1.7	2	2
7/20/04	28.8	9.1	10.4	0.1				0.5		
8/19/04	19.6	9.2	4.44	0.09				1.5	3	2
9/16/04	19.8	10.1	5.27	0.14				1.2		2
10/11/04	16.3	10.5	7.17	0.05				1.2	3	2

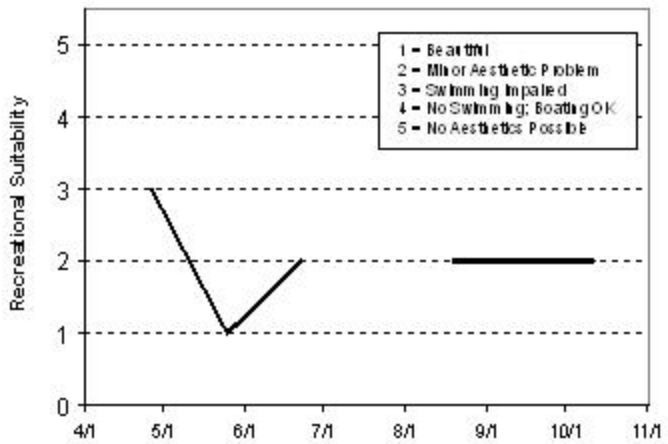


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						C	D	D	C	D			
Chlorophyll a						C	C	D	B	C			
Secchi Depth						D	C	C	C	C	C	C	C
Overall						C	C	D	C	C			

Source: Metropolitan Council and STORET data



Bass Lake (82-0035) *Carnelian - Marine Watershed District*

Bass Lake is an 81-acre lake located within May Township (Washington County). The maximum depth of the lake is 4.3 m (roughly 14 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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).

This was the fifth year that Bass Lake was monitored through CAMP. A search through the STORET nationwide water quality database provided a moderate amount of historic data including Secchi data from 1991-2003 and nutrient and CLA data in 1991-1992, 1996-2001, and 2003.

The lake was monitored seven times between late-April and mid-October, 2004. The resulting data and graphs appear on the next page. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	29.2	25.0	38.0	B
CLA (µg/l)	7.2	3.1	12.0	A
Secchi (m)	2.8	2.3	3.5	B
TKN (mg/l)	0.64	0.53	0.71	
			Overall Grade	B

The 2004 grade of B is similar to that of past years 1992, and better than the C's recorded in 1991, 1997-2001, and 2003. The 2004 summer means were the best recorded to date.

Statistical analysis on the lake's water quality database did not detect any long-term trends. The lake's water quality seems to be well represened by an overall grade of C. To better understand the lake's water quality and where it may be heading, more data are needed.

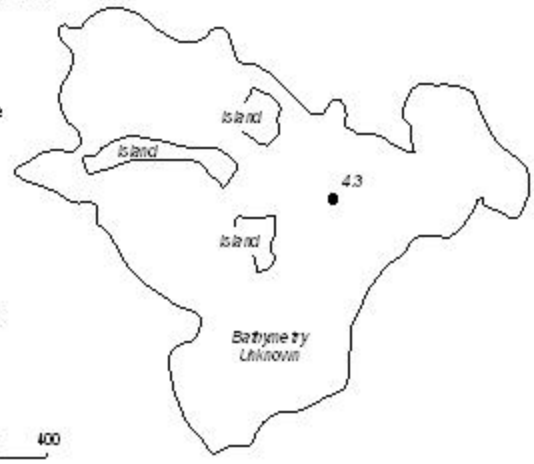
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-5-scale. The user perception rankings are shown on the lake's associated information sheet on the following page. The summertime mean physical condition was ranked 2.0 on a (2- "some algae present"). The mean suitability for recreation ranking, also on a 1-to-5 scale, was 1.8 (between 1- "beautiful" and 2- "minor aesthetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Bass Lake

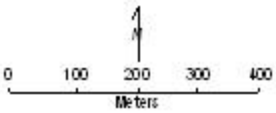
May Twp., Washington Co.

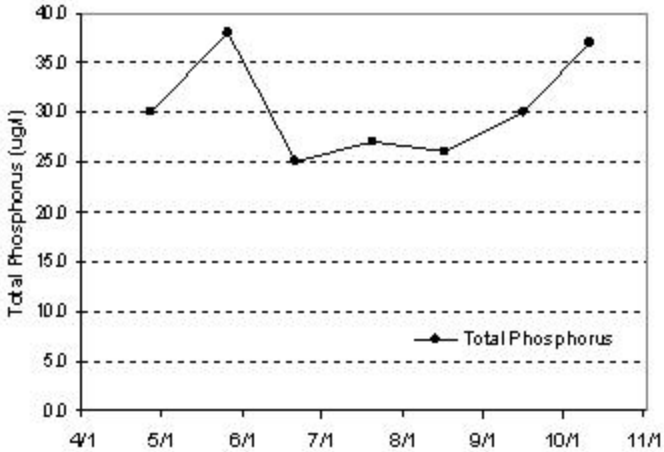
LAKE ID: 82003 5
WD: Carnelian-Marine
Volunteer:
Washington Co.
SWCD

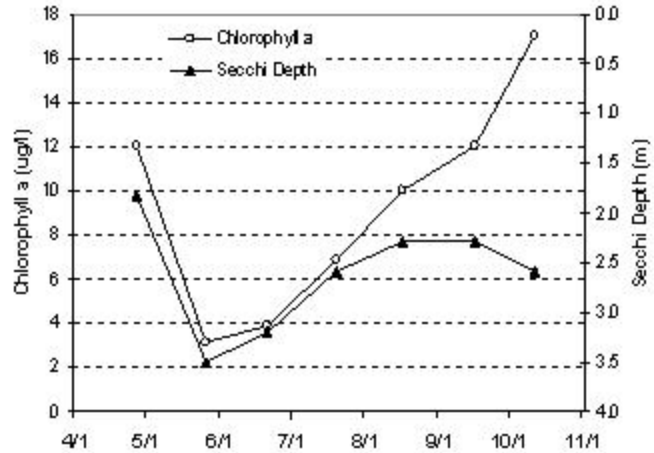


● Sampling site

Contours in meters

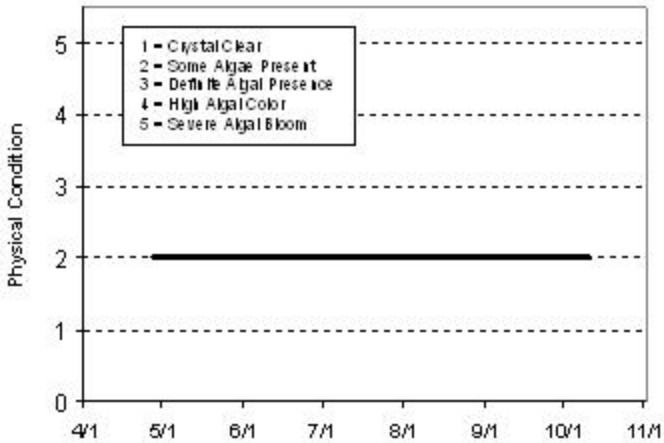






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.5	11	9.26	7.57	12	30.0		1.8	2	2
5/26/04	15	14	7.57	0.09	3.1	38.0		3.5	2	1
6/21/04	22.1	16.5	8.11	0.08	3.9	25.0		3.2	2	2
7/20/04	26.9	19.6	7.53	0.2	6.9	27.0		2.6	2	2
8/17/04	21.8	18.4	8.14	0.22	10	26.0		2.3	2	2
9/16/04	19.6	19.4	4.72	0.56	12	30.0		2.3	2	2
10/11/04	14.2	14	6.77	0.24	17	37.0		2.6	2	2

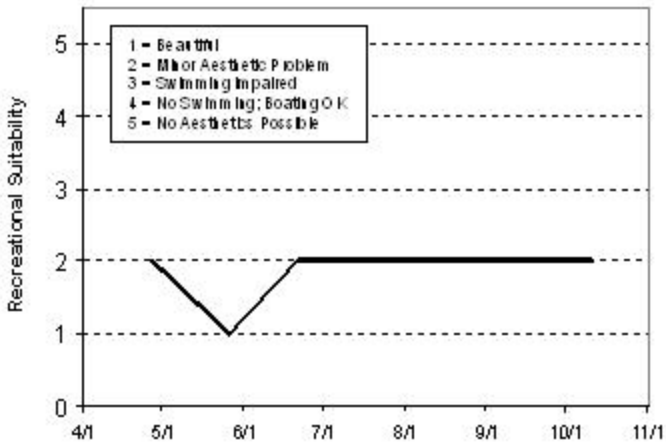


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												C
Chlorophyll a												B
Secchi Depth												C
Overall												C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus	B				C	C	C	C	C	C		C	B
Chlorophyll a	B				C	C	B	B	B	B		B	A
Secchi Depth	C	C	C	C	C	C	C	C	C	C	B	C	B
Overall	B					C	C	C	C	C		C	B

Source: Metropolitan Council and STORET data



Bavaria Lake (10-0019) *City of Chaska*

Bavaria Lake, located in the City of Chaska (Carver County), the 200-acre lake has a mean and maximum depth of 5.6 m (18.4 feet) and 18.3 m (60 feet), respectively. Roughly 65 percent of the lake is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation. Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lake.

The lake's surface area and mean depth translates to an approximate lake volume of 3,674 ac-ft. The lake has a 711-acre immediate watershed, which translates to a watershed-to-lake area ratio of 3.5:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff). A 1999 water quality report on water resources in Carver County estimates land use for the watershed at: 17.5 percent residential, 52.7 percent agricultural, 29.7 percent commercial/industrial, and 0.2 percent open/undeveloped (Carver County Planning 1999). A public access is located on the lake's western edge and because of its multi-recreational uses, it is considered a "Priority Lake" in the Metropolitan Area.

Lake Bavaria was monitored 16 times between mid-April and mid-October, 2004.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	30.1	21.0	43.0	B
CLA (µg/l)	17.0	2.6	76.0	B
Secchi (m)	2.1	1.3	3.5	C
TKN (mg/l)	1.02	0.63	1.30	
			Overall Grade	B

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake's associated information sheet on the following page. The mean physical condition ranking was 1.8 (between 1- crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking for the lake was 1.2 (between 1- "beautiful" and 2- "minor aesthetics problem").

While 2004 was the ninth year that Bavaria has been involved in CAMP, the lake has been monitored by Council staff in the past and has recently been involved in the MPCA's volunteer Secchi transparency program (included in the lake's report card grading system on the following page). Additionally, Lake Bavaria was included within the MPCA's Lake Assessment Program (LAP) in 2001. Through this program additional data, besides in-lake data through CAMP, was collected to help complete a more comprehensive study on the lake.

Available data for Bavaria Lake reveal that the lake water quality remained constant through the 1980's (C's) and improved through the mid-1990s (oveall grades of B in 1994 and 1996, and A in 1997-1998), before falling back to overall grades of B in 1999-2004. The lake's water quality report card shown on the information sheet indicates that the lake has received an overall grade of C during the 1980's, A and B grades throughout the 1990's and early-2000's. The best water quality year to date for the lake was 1997.

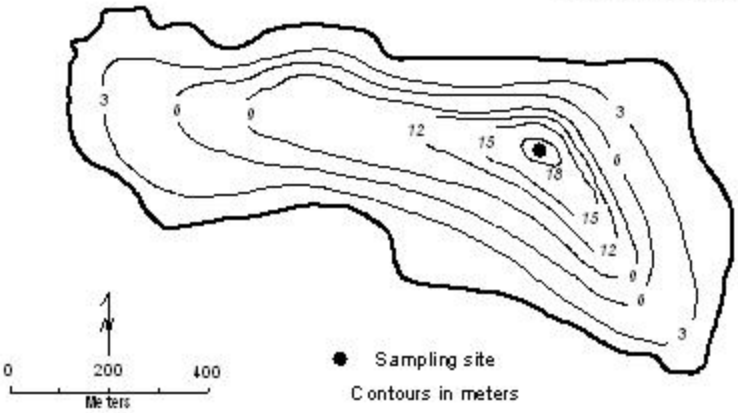
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

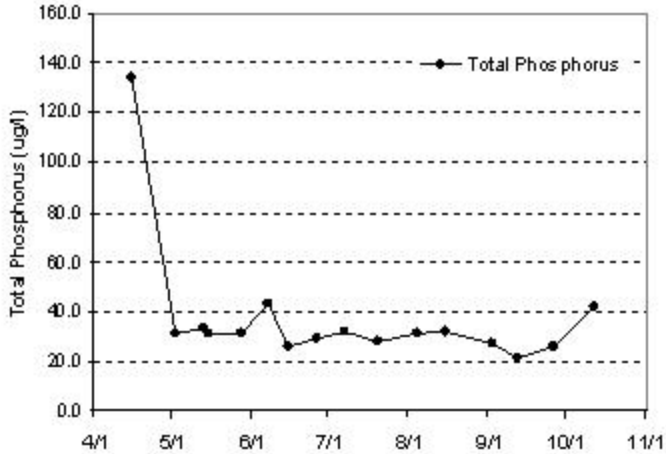
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

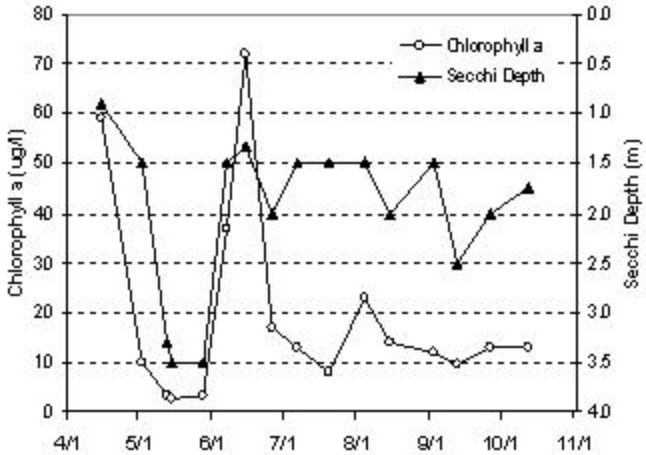
Lake Bavaria

Chaska/Laketown Twp., Carver Co.

LAKE ID: 100019
WMO: Carver County
Volunteer: John Ryski

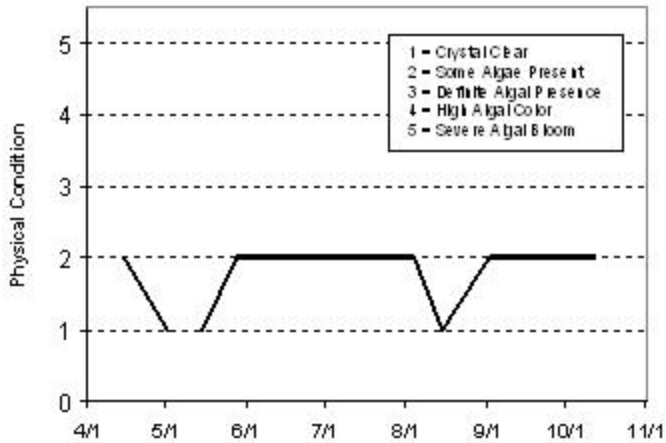






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	9.2				59	134.0		0.9	2	1
5/2/04	13				10	31.0		1.5	1	1
5/13/04	15				3.2	33.0		3.3		
5/15/04	13				2.6	31.0		3.5	1	1
5/28/04	15				3.3	31.0		3.5	2	1
6/7/04	22				37	43.0		1.5	2	1
6/15/04	21				72	26.0		1.3	2	1
6/26/04	18				17	29.0		2.0	2	1
7/7/04	21				13	32.0		1.5	2	1
7/20/04	26				8	28.0		1.5	2	2
8/4/04	23				23	31.0		1.5	2	2
8/15/04	19				14	32.0		2.0	1	1
9/2/04	22				12	27.0		1.5	2	1
9/12/04	20				9.5	21.0		2.5	2	2
9/26/04	18				13	26.0		2.0	2	1
10/12/04	14				13	42.0		1.8	2	2

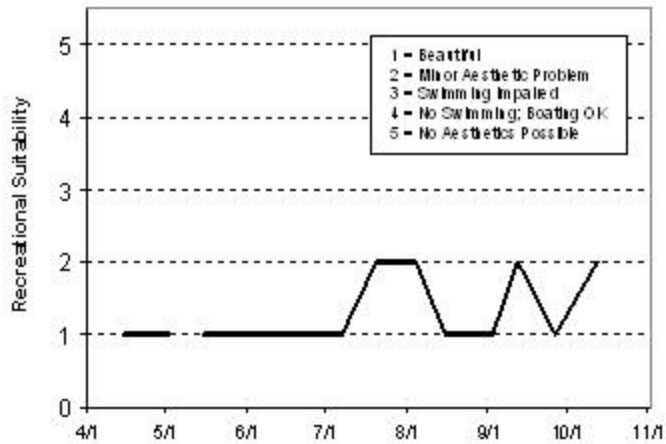


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus				C			C	C				
Chlorophyll a				C			C	C				
Secchi Depth				C			C	C				
Overall				C			C	C				

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			B		C	A	B	B	C	B	B	C	B
Chlorophyll a			A		A	A	A	B	B	B	B	A	B
Secchi Depth			B	B	C	A	A	B	B	B	C	B	C
Overall			B		B	A	A	B	B	B	B	B	B

Source: Metropolitan Council and STORET data



Big Carnelian Lake (82-0049) *Carnelian - Marine Watershed District*

Big Carnelian Lake, located within May Township (Washington County), has a public access on its southwestern side, and is considered a "Priority Lake" due to its multi-recreational uses. The lake covers an area of 455 acres and has a maximum and mean depth of 20 m (roughly 66 feet) and 9.8 m (32 feet). Roughly 28 percent of the lake's area is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation. The approximate volume of the lake is 14,560 acre-feet (ac-ft). The lake's watershed of 1,900 acres translates to a rather small watershed-to-lake size ratio of 4:1. The larger the ratio the greater the potential stress put on the lake from surface.

Big Carnelian Lake was monitored 14 times between late-April and mid-October, 2004. The data and related graphs are presented on the information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	21.7	10.0	35.0	A
CLA (µg/l)	6.3	3.5	13.0	A
Secchi (m)	3.9	2.9	5.5	A
TKN (mg/l)	0.59	0.46	0.74	
			Overall Grade	A

The lake received overall grades of A in 1980, 1989, 1991, 1994, 1996-1998, 2000-2002, and 2004, and a grade of B in 1984, 1999, and 2003.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The resulting user perception rankings are shown on the information sheet. The mean physical condition ranking was 2.3 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 1.9 (between 1- crystal clear" and 2- "minor aesthetic problem").

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of A.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Big Carnelian Lake
May Twp., Washington Co.

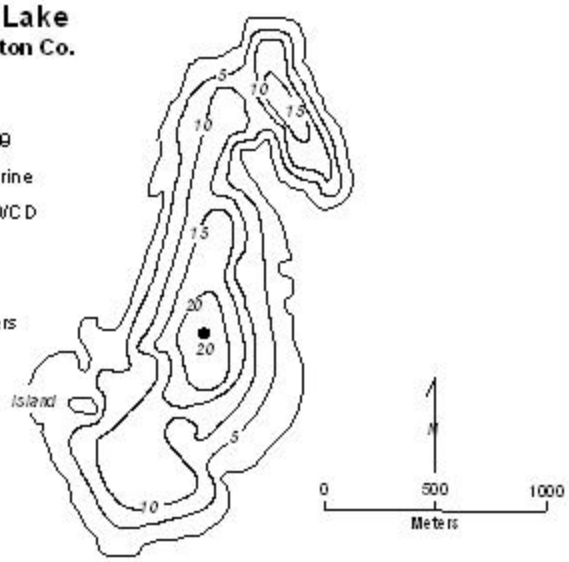
LAKE ID: 820049

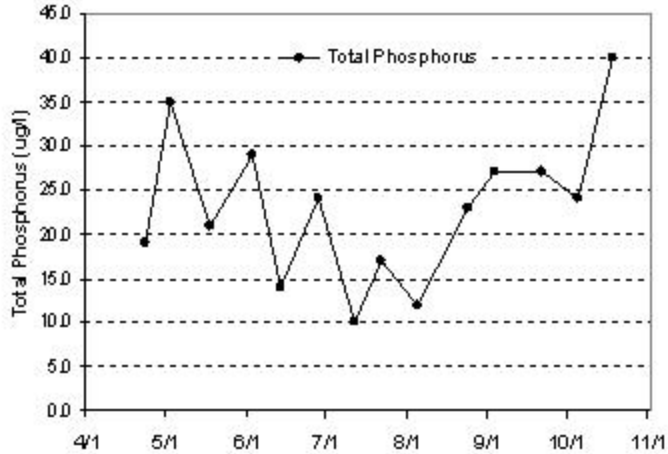
WD: Carnelian-Marine

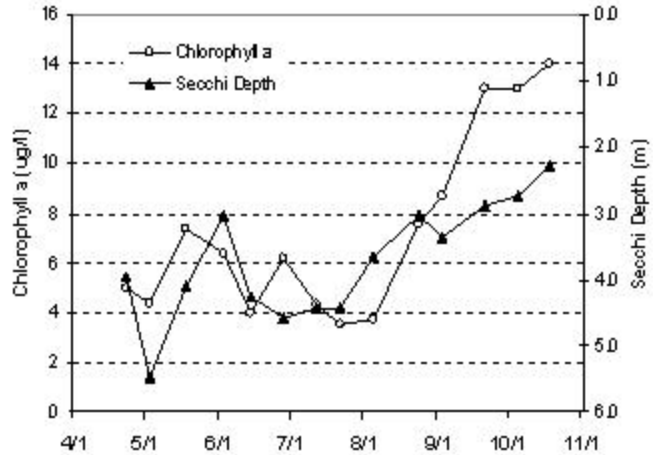
Washington Co. SWCD

● Sampling site

Contours in meters

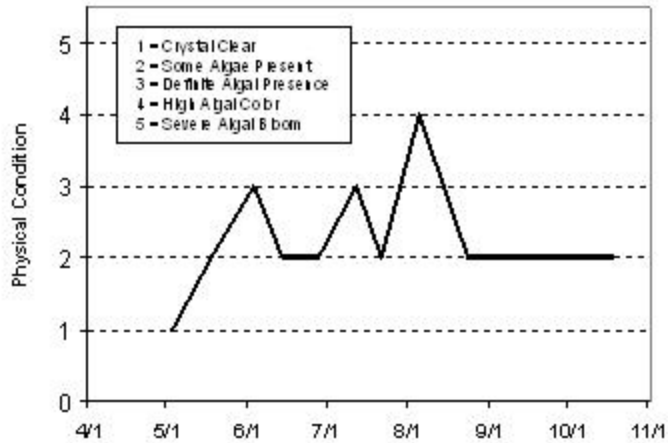






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/23/04	10.1	6.6	10.06	0.07	5	19.0		4.0		2
5/3/04	11.4	7.1	11.3	1.02	4.4	35.0		5.5	1	1
5/18/04	18.5	8.1	9.4	0.71	7.4	21.0		4.1	2	2
6/3/04	16.4	8.3	9.46	0.03	6.4	29.0		3.0	3	2
6/14/04	21.1		8.8		4	14.0		4.3	2	2
6/28/04	20	8.5	8.65	0.29	6.2	24.0		4.6	2	2
7/12/04	23.8	8.7	8.84	0.22	4.3	10.0		4.4	3	2
7/22/04	26.5	8.7	8.61	0.26	3.5	17.0		4.4	2	2
8/5/04	24.1	8.6	7.3	0.22	3.7	12.0		3.7	4	3
8/24/04	20.4	8.8	7.8	0.08	7.6	23.0		3.0	2	2
9/3/04	22	8.9	7.41	0.23	8.7	27.0		3.4	2	1
9/21/04	20.1	8.9	5.91	0.03	13	27.0		2.9	2	2
10/5/04	15.8	8.9	6.35	0.08	13	24.0		2.7	2	2
10/18/04	12.4	8.9	5.84	0.06	14	40.0		2.3	2	2

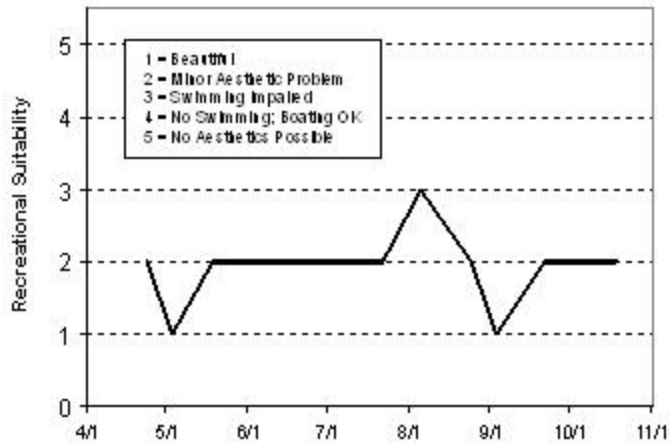


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	A				B					A		A
Chlorophyll a	A				B					A		A
Secchi Depth	A				B					A		B
Overall	A				B					A		A

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			A		A	A	A	A	A	A	B	A	A
Chlorophyll a			A		A	A	A	B	A	A	A	A	A
Secchi Depth	B	B	B	B	B	A	A	B	A	A	A	B	A
Overall			A		A	A	A	B	A	A	A	B	A

Source: Metropolitan Council and STORET data



Big Comfort Lake (13-0053) *Comfort Lake-Forest Lake Watershed District*

Big Comfort Lake is located just north east of the City of Forest Lake, in Isanti County. This year marked the sixth year that the 219-acre lake has been enrolled in CAMP (1998 [it was, however, only monitored a two times in October] and 2000-2002). The lake has a maximum depth of 14.3 m (47 feet). Roughly 41 percent of the lake's area is considered littoral, the shallow (0-15 foot) depth area dominated by aquatic vegetation.

An indepth lake assessment was undertaken on the lake by the MPCA in 1994.

Big Comfort Lake was monitored 14 times between late-April and late-October, 2004. The data and related graphs are presented on the information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	39.4	26.0	56.0	C
CLA (µg/l)	16.7	6.5	22.0	B
Secchi (m)	1.9	1.5	2.7	C
TKN (mg/l)	1.05	0.79	1.60	
			Overall Grade	C

The lakes 2004 overall grade is similar to that recorded in 2000 and 2002-2003, and worse than that of 2001.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The resulting user perception rankings are shown on the information sheet. The mean physical condition ranking was 2.2 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.1 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

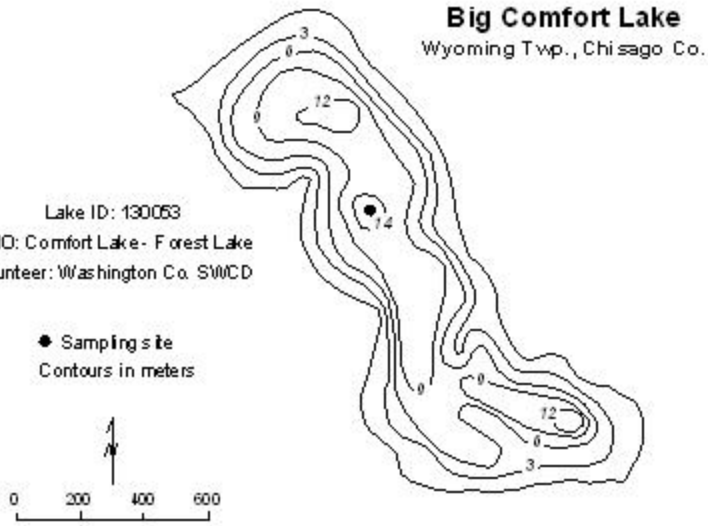
Statistical analysis on the lake's water quality database did not detect any long-term trends. In the short-term however, the lake seems well represented by an overall grade of C. To better understand the lake's current water quality and in which direction it may be heading, continued monitoring is suggested.

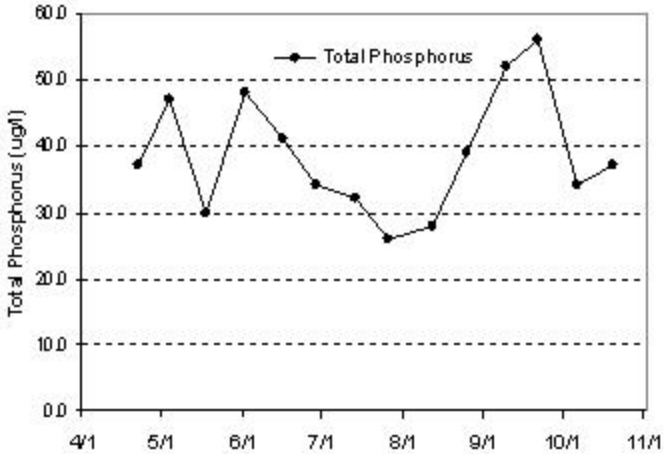
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

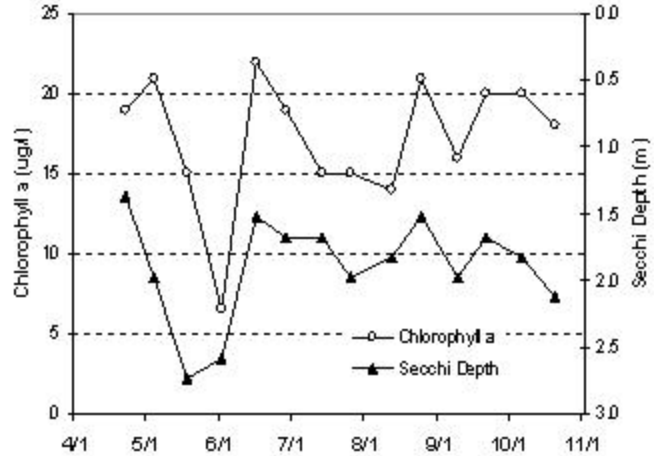
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Big Comfort Lake

Wyoming Twp., Chisago Co.

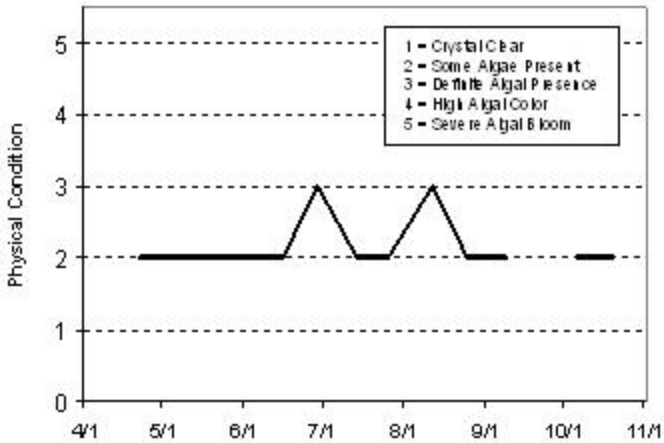






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	9.7	6.7	10.5	4.9	19	37.0		1.4	2	2
5/4/04	12	9.7	12.5	0.01	21	47.0		2.0	2	2
5/18/04	15.1	11	10.77	0.09	15	30.0		2.7	2	2
6/2/04	16.1	11.5	8.18	0.04	6.5	48.0		2.6	2	2
6/16/04	22.7	11.8	8.5	0.1	22	41.0		1.5	2	2
6/29/04	20.4	12.1	9.21	0.2	19	34.0		1.7	3	3
7/14/04	24	12.2	6.97	0.14	15	32.0		1.7	2	2
7/26/04	25.5	12.1	7.43	0.4	15	26.0		2.0	2	2
8/12/04	19.7	12.2	6.12	0.34	14	28.0		1.8	3	2
8/25/04	20.5	12.3	7.45	0.05	21	39.0		1.5	2	2
9/9/04	20.7	12.6	6.24	0.16	16	52.0		2.0	2	2
9/21/04	19.8	12.9	4.88	0.04	20	56.0		1.7		2
10/6/04	14.9	12.6	3.97	0.1	20	34.0		1.8	2	2
10/20/04	11.3	11	5.46	4.93	18	37.0		2.1	2	2

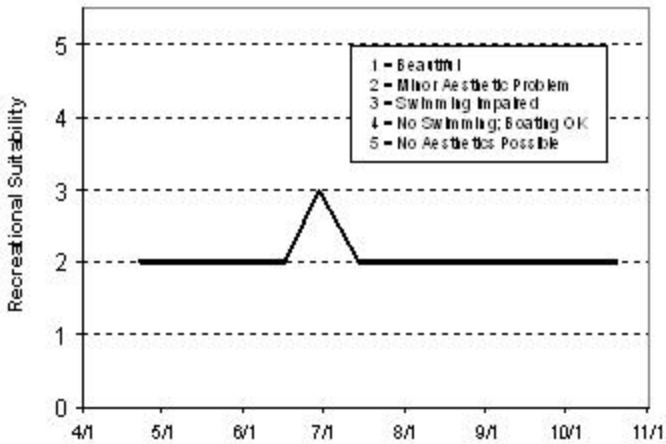


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth								B	B	B		
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			D						C	B	C	C	C
Chlorophyll a			B						C	B	C	C	B
Secchi Depth			C	C		C	C		C	C	C	C	C
Overall			C						C	B	C	C	C

Source: Metropolitan Council and STORET data



Big Marine Lake (82-0052) *Carnelian - Marine Watershed District*

Big Marine Lake, located within New Scandia Township (Washington County), has two public accesses, and is considered a "Priority Lake" due to its multi-recreational uses. The lake covers an area of 1,706 acres and has a maximum and mean depth of 15.2 m (roughly 50 feet) and 7.6 m (25 feet). Roughly 67 percent of the lake's area is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation. The approximate volume of the lake is 42,527 acre-feet (ac-ft). The lake's watershed of 2,659 acres translates to a small watershed-to-lake size ratio of 1.5:1. The larger the ratio the greater the potential stress put on the lake from surface runoff.

Big Marine Lake was monitored 14 times between late-April and mid-October, 2004. The data and related graphs are presented on the information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	18.6	11.0	28.0	A
CLA (µg/l)	5.6	2.8	9.5	A
Secchi (m)	3.4	2.4	4.1	A
TKN (mg/l)	0.54	0.39	0.67	
			Overall Grade	A

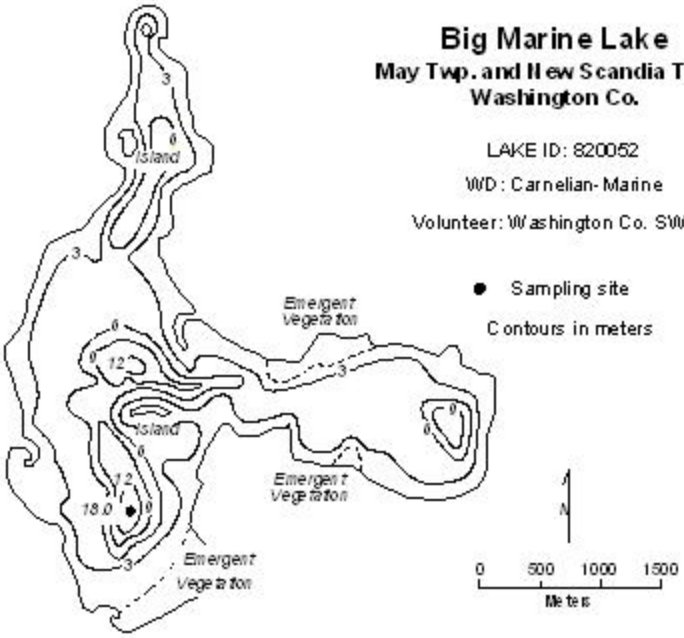
The lake received overall grades of A in 1989, 1994, 1996-1998, 2000-2001, and 2003-2004 and a grades of B in 1980, 1981, 1984, 1991, 1999, and 2002.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The resulting user perception rankings are shown on the information sheet. The mean physical condition ranking was 2.1 (roughly equal to 2- "some algae present"), while the mean recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

While no statistically significant long-term trend is evident from the lake's whole water quality database (including TP, CLA and Sechi data), a recent MPCA conducted trend analysis using just the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity. In the short-term, the lake's quality seems well represented by an overall grade of B+/A.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.



Big Marine Lake

May Twp. and New Scandia Twp., Washington Co.

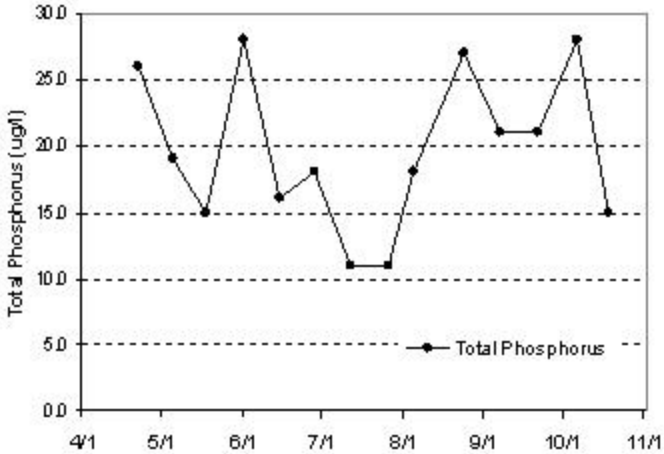
LAKE ID: 820052

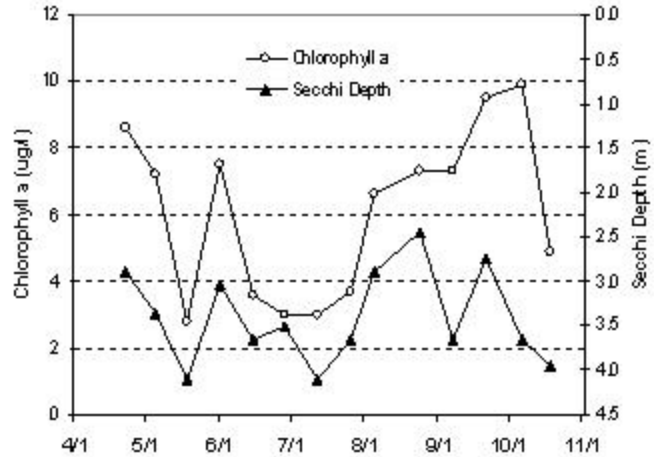
WD: Carnelian-Marine

Volunteer: Washington Co. SWCD

● Sampling site

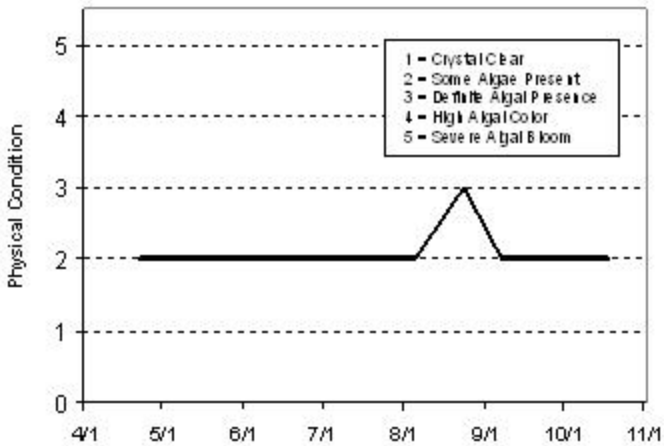
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	10.6	9.5	11.12	0.09	8.6	26.0		2.9	2	2
5/5/04	12	11.5	10.28	0.11	7.2	19.0		3.4	2	2
5/18/04	18.6	13.5	8.14	6.32	2.8	15.0		4.1	2	2
6/1/04	15.8	13.8	8.08	0.05	7.5	28.0		3.0	2	2
6/15/04	21	14.7	8.14	0.03	3.6	16.0		3.7	2	2
6/28/04	19.7	14.5	7.41	0.19	3	18.0		3.5	2	2
7/12/04	25.3	14.4	7.81	0.29	3	11.0		4.1	2	2
7/26/04	25.9	15.4	8.21	0.16	3.7	11.0		3.7	2	2
8/5/04	24.6	14.7	8.14	0.4	6.6	18.0		2.9	2	2
8/24/04	19.8	14.9	7.07	0.07	7.3	27.0		2.4	3	2
9/7/04	21.2	16	6.58	0.22	7.3	21.0		3.7	2	2
9/21/04	19.8	19.6	5.9	4.52	9.5	21.0		2.7	2	2
10/6/04	14.6	14.1	6.94	6.75	9.9	28.0		3.7	2	2
10/18/04	10.8	10.2	7.38	7.5	4.9	15.0		4.0	2	2

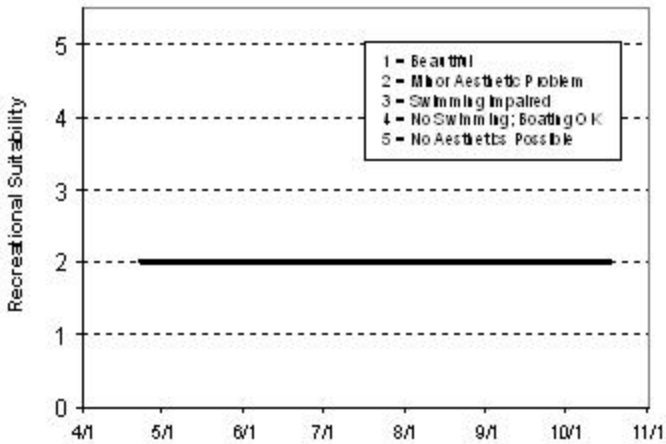


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	B	B			B					A		B
Chlorophyll a	B	B			B					A		A
Secchi Depth	B	B			B	B	B	B	C	A	C	B
Overall	B	B			B					A		B

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			A		B	A	A	A	A	A	B	A	A
Chlorophyll a			A		A	A	A	B	A	A	B	A	A
Secchi Depth	A	A	B		A	B	A	B	A	A	B	B	A
Overall			A		A	A	A	B	A	A	B	A	A

Source: Metropolitan Council and STORET data



Bone Lake (82-0054) *Comfort Lake-Forest Lake Watershed District*

Bone Lake was previously monitored as a part of CAMP in 1993, 1995, 1997-1999, and 2001-2003. In 2004, the lake was monitored 14 times between late-April and late-October. Results are presented on the information sheet on the following page.

The 212-acre lake is located within New Scandia Township (Washington County). It receives flow through three inlets. The lake has a public access on its northwestern side and has a maximum and mean depth of 9.8 m and 3.7 m (32 and 12 feet), respectively. The approximate lake volume of Bone Lake, which has been stocked with walleye by the MDNR in the 1990's, is 2,820 ac-ft. The lake's 5,177-acre watershed translates to a rather large watershed-to-lake size ratio of 24:1. The greater the ratio, the greater the potential stress on the lake from surface runoff. Roughly 59 percent of the lake is considered littoral zone, that is, the area of aquatic plant dominance. The lake is considered a Metropolitan Council "Priority Lake" due to its multi-recreational uses.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	59.0	37.0	132.0	C
CLA (µg/l)	32.2	2.8	79.0	C
Secchi (m)	1.6	0.9	3.0	C
TKN (mg/l)	1.46	1.10	1.80	
			Overall Grade	C

Based on the lake water quality grade, shown on the facing information page, the lake's quality throughout the mid-1980's, 1990's, and early-2000's seems to be consistently represented by an overall grade of C.

Throughout the summer, the volunteer(s) ranked the lake's perceived physical and recreational conditions on a 1-to-5 scale (see lake information sheet). The mean rankings were 3.2 for physical condition (between 3- "definite algae present" and 4- high algal color"), and 2.2 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of any erroneous lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

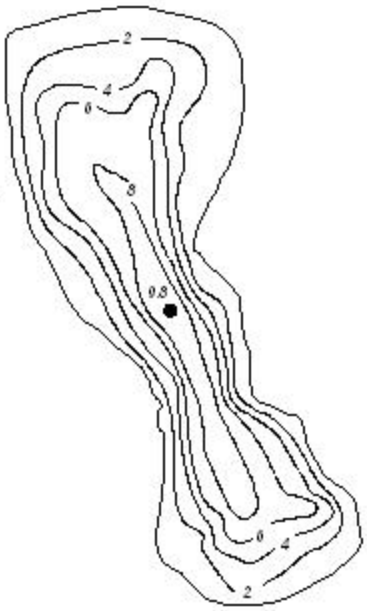
Bone Lake

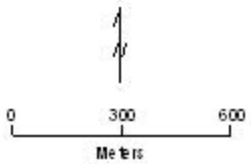
New Scandia Twp,
Washington Co.

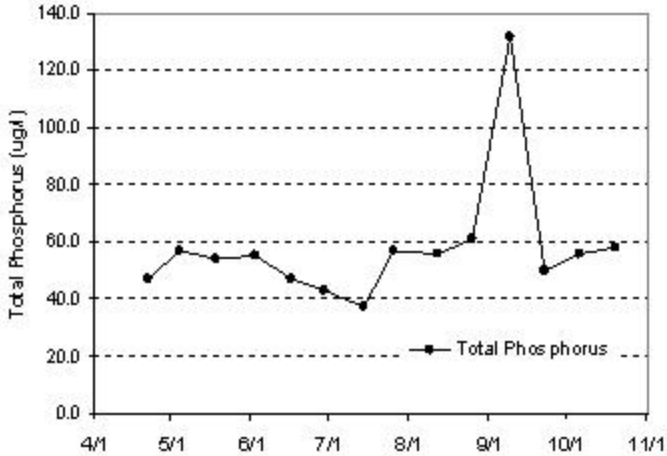
Lake ID: 820054
WMO: Comfort Lake Forest Lake
Volunteer: Washington Co. SWCD

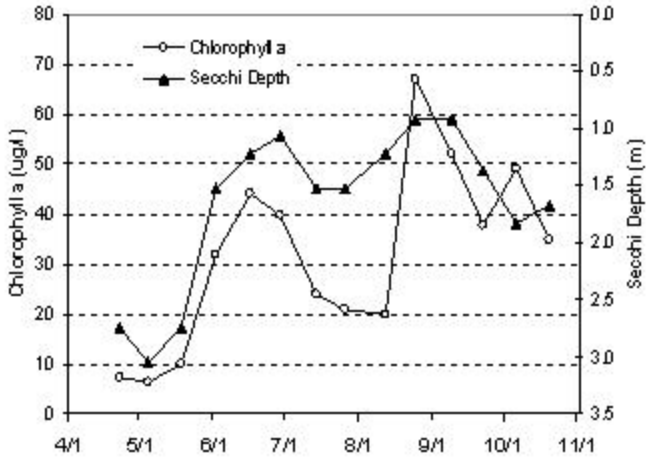
● Sampling site

Contours in meters



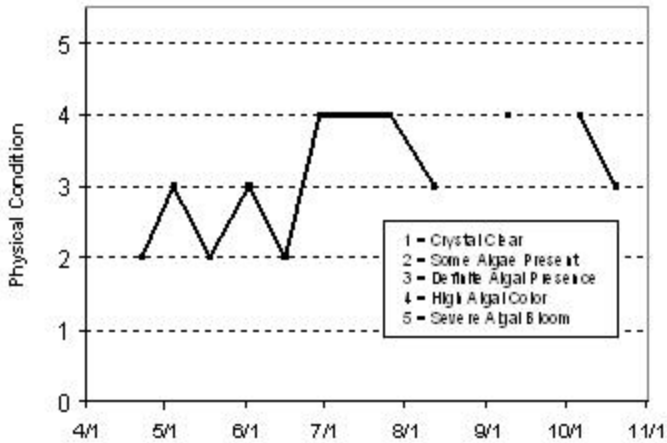






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	10.6	9.4	9.51	0.1	7.4	47.0		2.7	2	2
5/4/04	12.3	11.1	9.64	0.02	6.3	57.0		3.0	3	2
5/18/04	18.3	14.1	7.87	2.23	9.8	54.0		2.7	2	2
6/2/04	16.3	14.5	10.76	0.05	32	55.0		1.5	3	3
6/16/04	22.3	14.8	9.21	0.1	44	47.0		1.2	2	2
6/29/04	20.4	15.8	8.52	0.18	40	43.0		1.1	4	
7/14/04	24.3	15.1	8.23	0.16	24	37.0		1.5	4	3
7/26/04	26	15.2	7.59	0.35	21	57.0		1.5	4	2
8/12/04	19.7	15.5	4.11	0.25	20	56.0		1.2	3	2
8/25/04	21.3	17.4	9.52	0.06	67	61.0		0.9		2
9/9/04	20.8	18.5	6.17	0.15	52	132.0		0.9	4	2
9/22/04	20.1	19.3	5.42	0.11	38	50.0		1.4		2
10/6/04	14.4	13.9	7.2	0.1	49	56.0		1.8	4	2
10/20/04	10.3	10	6.89	6.41	35	58.0		1.7	3	2

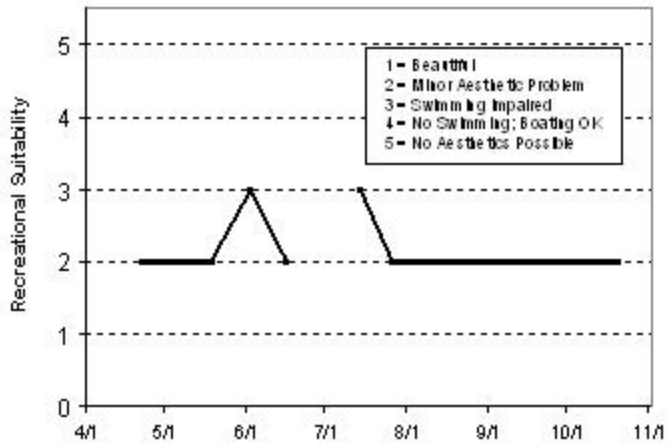


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					D			C	C	C		D
Chlorophyll a					C			B	C	C		C
Secchi Depth					C		D	C	D	C	C	C
Overall					C			C	C	C		C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C				C	C	C		C	C	D	C
Chlorophyll a		C				B	B	C		C	C	C	C
Secchi Depth		C	D	C		C	C	D		C	D	C	C
Overall		C				C	C	C		C	C	C	C

Source: Metropolitan Council and STORET data



Brickyard Lake (10-0225) *Carver County Environmental Services*

Brickyard Lake is a 17-acre lake located near the City of Chaska (Carver County). The maximum depth of the lake is 13.1 m (roughly 43 feet). Thirty-five percent of the lake's surface area is considered littoral zone (area of aquatic plant dominance).

This was the third year that Brickyard Lake has been involved in CAMP (2002 being the first). The lake was monitored 14 times between mid-April and mid-October, 2004. During each monitoring event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as its perceived physical condition and recreational suitability. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	15.6	10.0	20.0	A
CLA (µg/l)	4.4	1.3	24.0	A
Secchi (m)	4.7	3.0	6.2	A
TKN (mg/l)	0.31	0.20	0.48	
			Overall Grade	A

To the best of our knowledge, there are no water quality data available for Brickyard Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 1.1 for physical condition (between 1- "crystal clear" and 2- "some algae problem"), and 1.2 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problems").

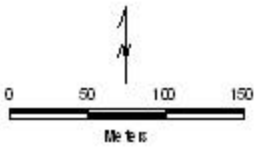
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

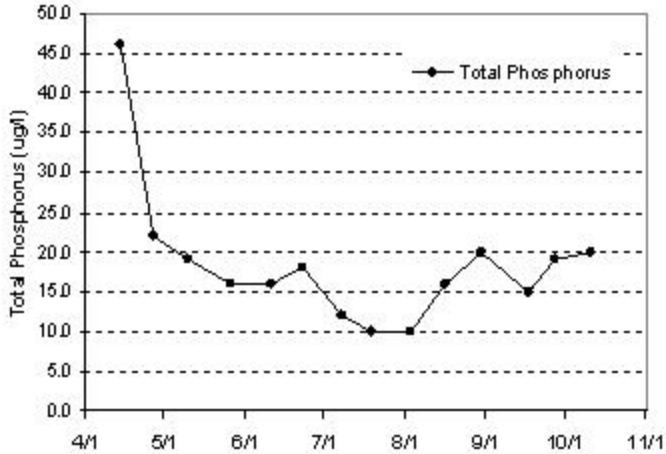
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

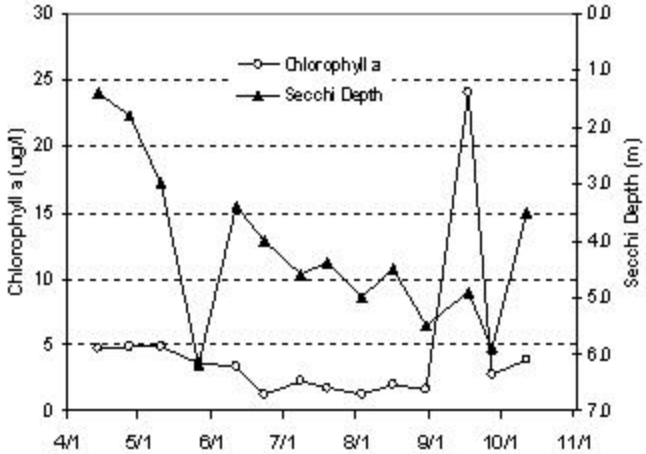
Brickyard Lake
Chaska, Carver Co.

Lake ID: 100225
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling site
Contours in meters

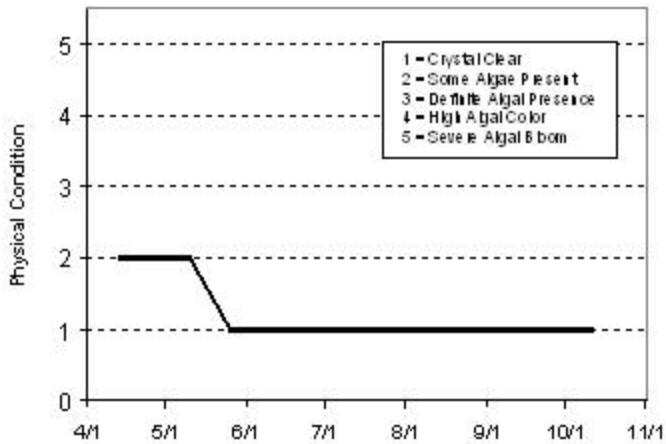






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	10.2		13.4		4.7	46.0		1.4	2	2
4/27/04	12.7		7.8		4.8	22.0		1.8	2	2
5/10/04	18.2		9.5		4.9	19.0		3.0	2	2
5/26/04	16.2		8.9		3.6	16.0		6.2	1	1
6/11/04	20.4		9.5		3.4	16.0		3.4	1	1
6/23/04	21.7		9.7		1.3	18.0		4.0	1	2
7/8/04	22.5		8.6		2.2	12.0		4.6	1	1
7/19/04	26.1		8.8		1.8	10.0		4.4	1	1
8/3/04	25.3		9		1.3	10.0		5.0	1	1
8/16/04	21.5		8.9		2	16.0		4.5	1	1
8/30/04	22.1		8.1		1.6	20.0		5.5	1	1
9/17/04	21		8.4		2.4	15.0		4.9	1	1
9/27/04	20.3		8.2		2.7	19.0		5.9	1	1
10/11/04	16.4		8.5		3.8	20.0		3.5	1	1

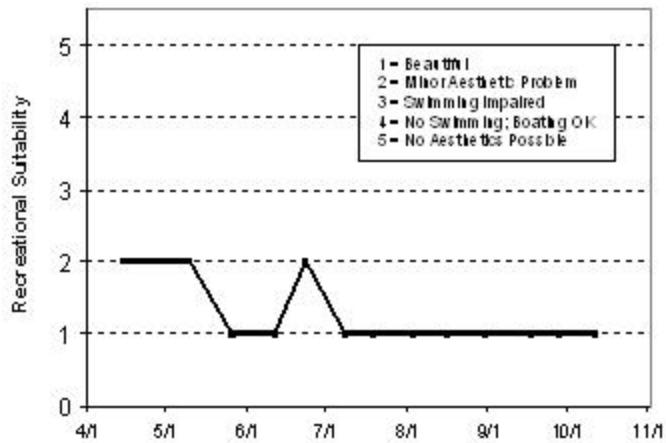


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											A	A	A
Chlorophyll a											A	A	A
Secchi Depth											A	A	A
Overall											A	A	A

Source: Metropolitan Council and STORET data



Burandt Lake (10-0084) *Carver County Environmental Services*

Burandt Lake is a 17-acre lake located near the City of Chaska (Carver County). The maximum depth of the lake is 13.1 m (roughly 43 feet). Thirty-five percent of the lake's surface area is considered littoral zone (area of aquatic plant dominance).

This was the fourth year that Burandt Lake has been involved in CAMP (1999-2001 being the others). The lake was monitored 18 times between mid-April and mid-October, 2004. During each monitoring event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as its perceived physical condition and recreational suitability. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	57.6	34.0	102.0	C
CLA (µg/l)	20.5	11.0	34.0	C
Secchi (m)	1.5	1.1	1.9	C
TKN (mg/l)	1.27	1.02	1.80	
			Overall Grade	C

To the best of our knowledge, there are no water quality data available for Burandt Lake other than the 1991-2001 and 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.3 for physical condition (between 3- "definite algae present" and 4- "high algae color"), and 2.9 for recreational suitability (between 2- "minor aesthetic problems" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

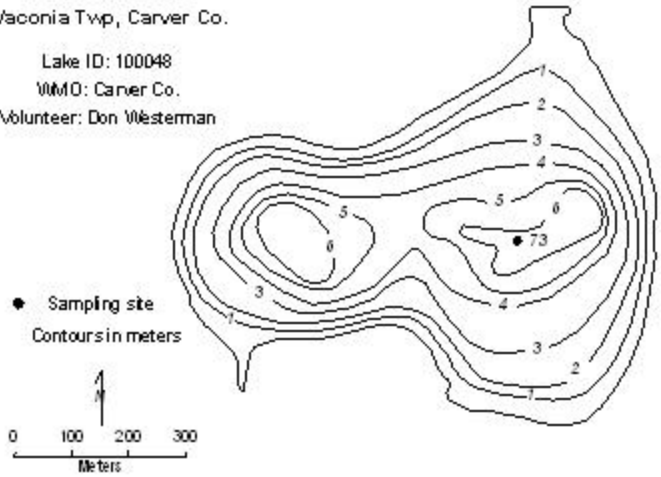
Burandt Lake

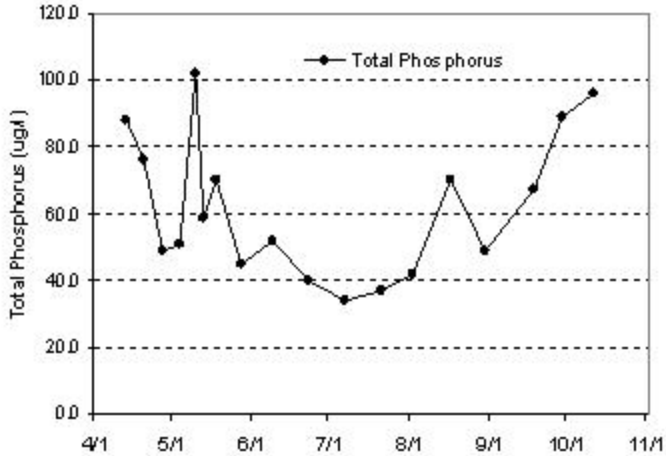
Waconia Twp, Carver Co.

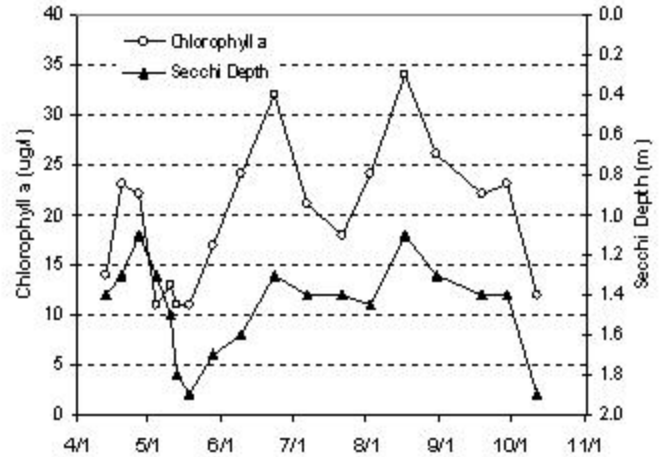
Lake ID: 100048

WMO: Carver Co.

Volunteer: Don Westerman

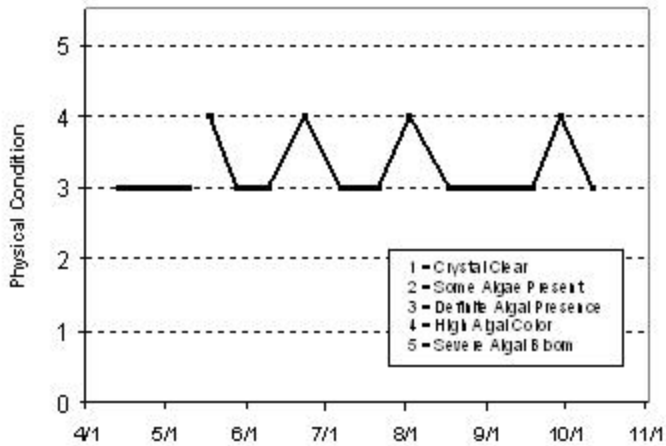






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	11				14	88.0		1.4	3	2
4/20/04	14.4				23	76.0		1.3	3	2
4/27/04	13				22	49.0		1.1	3	2
5/4/04	15				11	51.0		1.3	3	2
5/10/04	18.5				13	102.0		1.5	3	2
5/13/04	18				11	59.0		1.8		
5/18/04	18				11	70.0		1.9	4	3
5/28/04	18.3				17	45.0		1.7	3	3
6/9/04	21.5				24	52.0		1.6	3	3
6/23/04	23				32	40.0		1.3	4	3
7/7/04	23				21	34.0		1.4	3	3
7/21/04	26				18	37.0		1.4	3	3
8/2/04	26				24	42.0		1.5	4	3
8/17/04	23				34	70.0		1.1	3	3
8/30/04	22				26	49.0		1.3	3	3
9/18/04	22				22	67.0		1.4	3	3
9/29/04	19				23	89.0		1.4	4	3
10/11/04	17				12	96.0		1.9	3	4

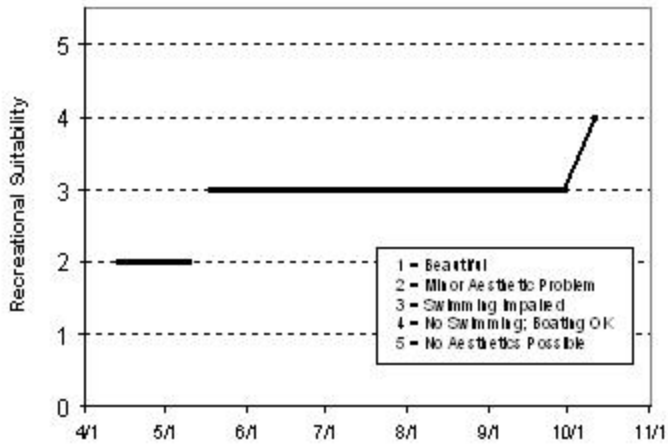


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D	C	C			C
Chlorophyll a								C	C	C			C
Secchi Depth								D	D	D			C
Overall								D	C	C			C

Source: Metropolitan Council and STORET data



Carol Lake (82-0017) *Carnelian - Marine Watershed District*

Carol Lake is located within Stillwater Township (Washington County). The lake covers an area of 63 acres and has a maximum and mean depth of 1.8 m (roughly 6 feet) and 0.9 m (3 feet). Because of the shallowness of the lake, the entire lake is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation, and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The approximate volume of the lake is 186 acre-feet (ac-ft). The lake's watershed of 375 acres translates to a watershed-to-lake size ratio of 6:1. The larger the ratio the greater the potential stress put on the lake from surface runoff.

This was the fifth year that Carol Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake revealed a fair amount of historic data (1996-2003).

The lake was monitored seven times from late-April to mid-October, 2004. The collected data and resulting graphs showing TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	37.4	27.0	55.0	C
CLA (µg/l)	10.4	5.9	20.0	B
Secchi (m)	1.0	0.6	1.4	D
TKN (mg/l)	0.75	0.53	1.00	
			Overall Grade	C

Although no "statistically significant" trend can be determined from the lake's water quality database, the 2003-2004 overall grades are the lake's worst to date. The lake had received overall grades of B in the earlier years of monitoring (1996-2001). In fact, the lake's Secchi transparency grade has steadily fallen from B's in 1996-1999, to C's in 200-2001, to D's in 2002-2003. This decrease in the lake's short-term water quality should cause some concern and a watchful eye should be kept on the lake's future quality. To better understand the lake's overall water quality and where it may truly be heading, more data are needed.

As mentioned in past reports, the lake's overall grade may be skewed due to the shallowness of the lake. When looking at the lake's 2000 and 2001 mean TP and CLA readings, it seems that the associated Secchi readings could have been limited by the shallowness of the lake rather than excessive nutrients and algal growth. So, while the lake only received an overall grade of B, the actual water quality may have been more representative of an A. This, however, does not explain the drop in mean clarity form grades of B in the late-1990's, to C in 2000-2001, and D in 2002-2004.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.0 for physical condition (3- "definite algae present"), and 4.0 for recreational suitability (between 4- "no swimming – boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Carol Lake

Stillwater Twp., Washington Co.

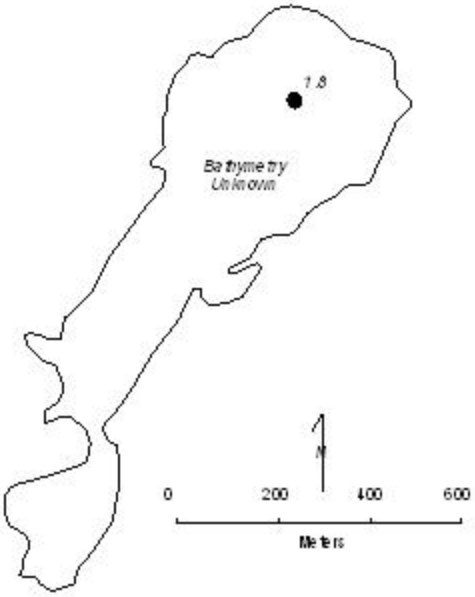
LAKE ID: 82001 7

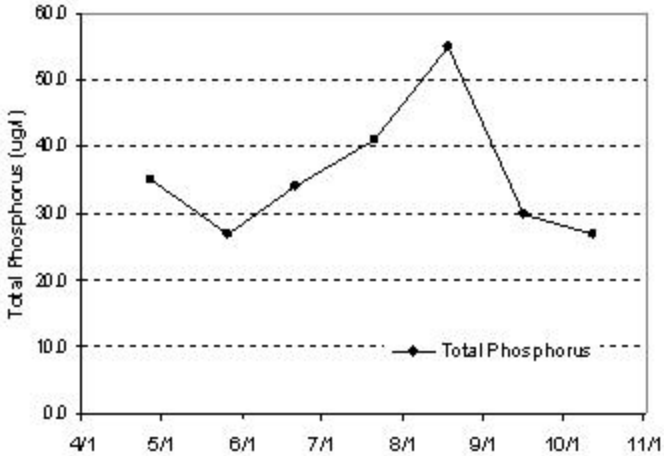
WD: Carnelian-Marine

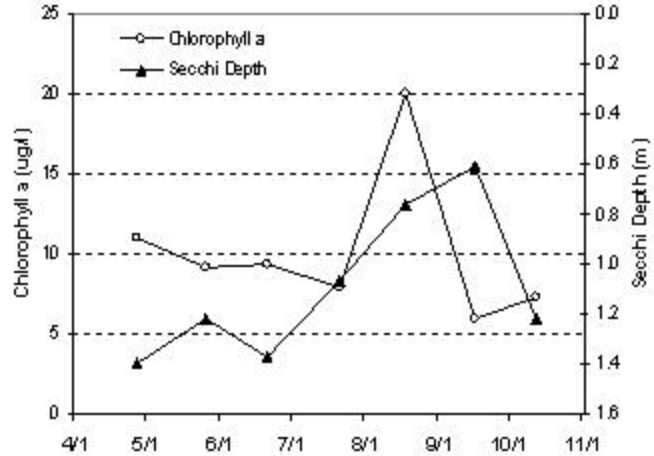
Volunteer: Washington Co. SWCD

● Sampling site

Contours in meters

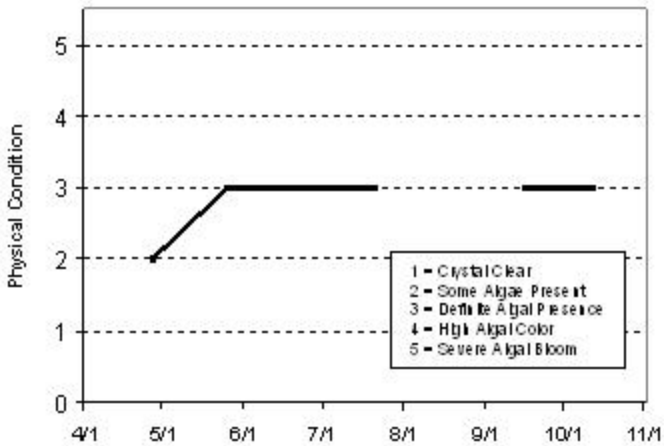






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	10.8	11.2	8.68	0.06	11	35.0		1.4	2	3
5/26/04	15.5	1.51	8.58	0.12	9.1	27.0		1.2	3	4
6/21/04	23.1	20.3	8.92	0.46	9.3	34.0		1.4	3	
7/21/04	27.4	26.4	4	0.4	7.9	41.0		1.1	3	
8/18/04	20.9	20.7	5.33	0.25	20	55.0		0.8		
9/16/04	18.9	19.1	4.83	0.08	5.9	30.0		0.6	3	
10/12/04	14.2	14	6.52	6.96	7.3	27.0		1.2	3	

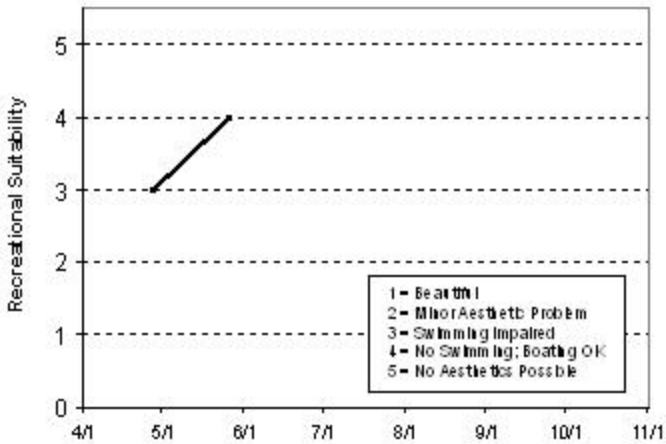


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					B	A	A	A	A	B		C	C
Chlorophyll a					B	C	C	C	A	A		B	B
Secchi Depth					B	B	B	B	C	C	D	D	D
Overall					B	B	B	B	B	B		C	C

Source: Metropolitan Council and STORET data



Cates Lake (70-0018) *Prior Lake – Spring Lake Watershed District*

Cates Lake is a 27-acre lake located in the City of Savage (Scott County). The maximum depth of the lake is 4.0 m (roughly 13 feet). Because of the shallowness of the lake, its entire area is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and the lake does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lak0+e's water column). The lake has no public access.

This was the third year that Cates Lake has been involved in CAMP (2002 being the first). The lake was monitored 15 times between early-May and late-October, 2004. During each monitoring event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as its perceived physical condition and recreational suitability. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	24.4	16.0	48.0	B
CLA (µg/l)	7.5	2.7	23.0	A
Secchi (m)	1.9	1.0	2.4	C
TKN (mg/l)	0.51	0.35	0.65	
			Overall Grade	B

To the best of our knowledge, there are no water quality data available for Cates Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

During each monitoring event, the volunteers' opinion of the lake condition was ranked on a 1-to-5 scale as shown on the lake information sheet. The average score for physical condition was 2.3 (between 2- "some algae present" and 3- "definite algae present"), and 4.0 for recreational suitability (4 - "no swimming – boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Cates Lake
Prior Lake, Scott Co.

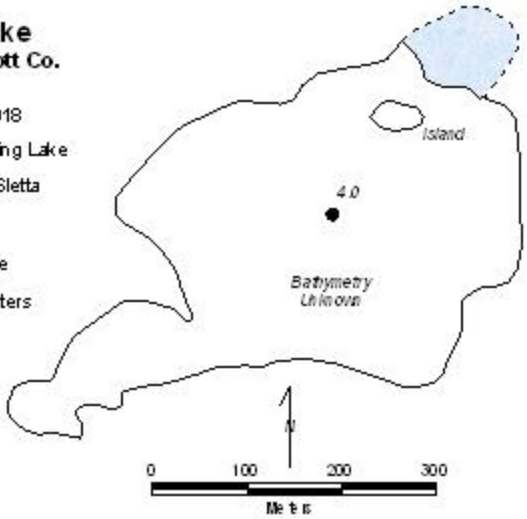
LAKE ID: 700018

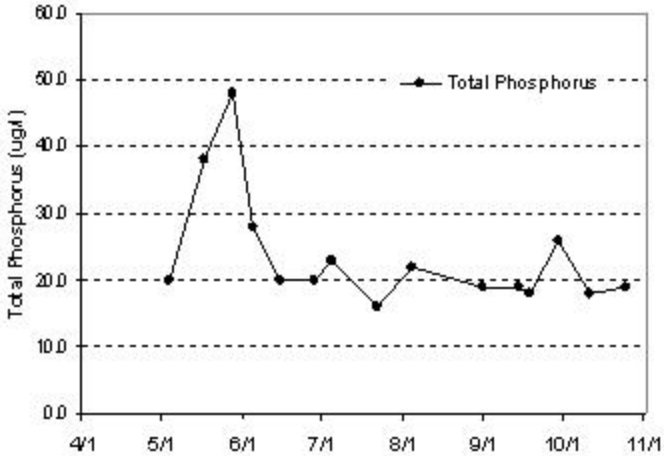
WD: Prior Lake-Spring Lake

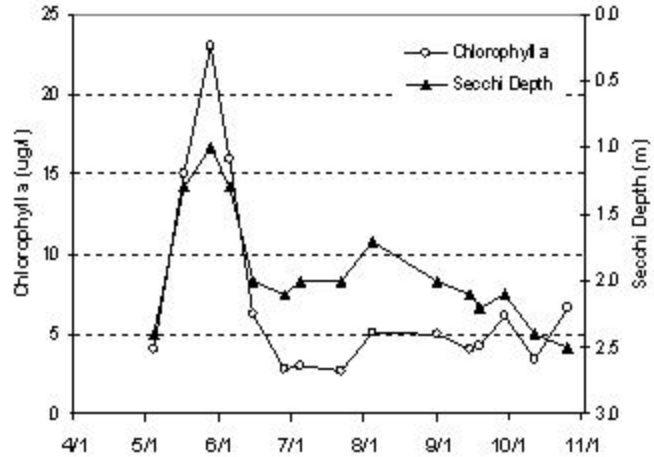
Volunteer: Tom Sletta

Sampling site

Contours in meters

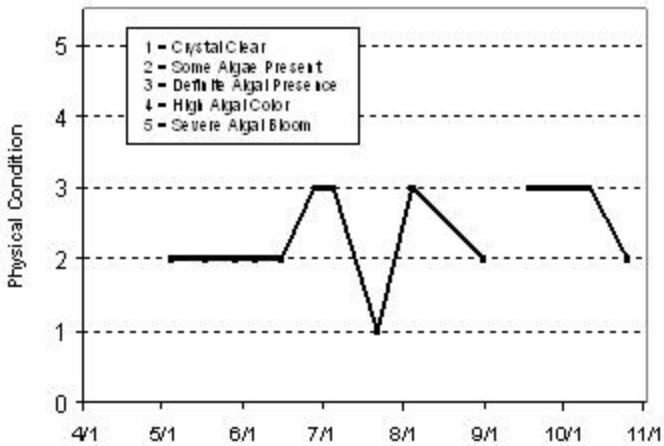






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/4/04	16.2				4	20.0		2.4	2	4
5/17/04	17.4				15	38.0		1.3	2	4
5/28/04	20.7				23	48.0		1.0	2	4
6/6/04	22				16	28.0		1.3	2	4
6/15/04	23.5				6.2	20.0		2.0	2	4
6/28/04	21.3				2.8	20.0		2.1	3	4
7/5/04	25				3	23.0		2.0	3	4
7/22/04	26.9				2.7	16.0		2.0	1	4
8/4/04	24.1				5.1	22.0		1.7	3	4
8/31/04	21.8				5	19.0		2.0	2	4
9/14/04	22				4	19.0		2.1		
9/18/04	20.4				4.3	18.0		2.2	3	4
9/29/04	17.4				6.1	26.0		2.1	3	4
10/11/04	15.7				3.4	18.0		2.4	3	4
10/25/04	11.2				6.6	19.0		2.5	2	4

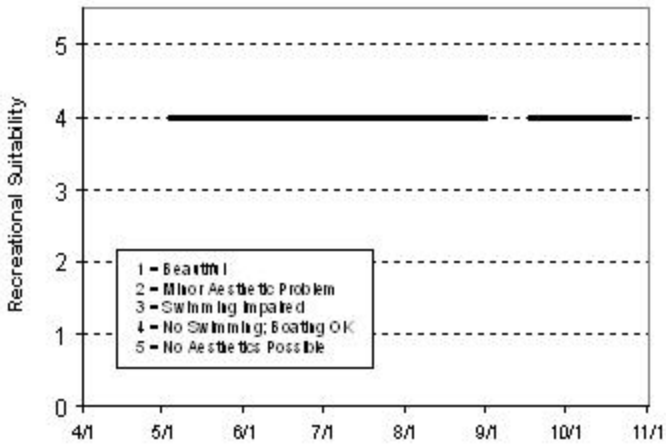


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											A	B	B
Chlorophyll a											A	A	A
Secchi Depth											C	C	C
Overall											B	B	B

Source: Metropolitan Council and STORET data



Cenaiko Lake (2-0654) *Anoka County Parks*

This was the eighth year in which Cenaiko Lake, located within Coon Rapids Dam Regional Park in the City of Coon Rapids in Anoka County, has been monitored through CAMP. Excvept for the eight years of CAMP data, a search through the STORET nationwide water quality database for historic data on the lake came up empty.

The lake is maintained by groundwater and has a very small watershed that is completely publicly owned (MDNR 1996). No boats, canoes, or floatables are allowed on the 29-acre man-made lake that is one of only six lakes in the seven-county metropolitan area that are stocked with trout (brook and rainbows). The only fishing access to the lake is two fishing docks and the lake's shoreline. The lake, which is 0.6 miles in circumference, has a maximum depth of 9.1 m (30 ft). Only 12 percent of the lake is considered littoral zone (the 0-15 foot depth zone of the lakeominated by aquatic vegetation). Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lake.

Cenaiko Lake was monitored 14 times between mid-April and mid-October, 2004. The data and resulting graphs showing seasonal variability in TP and CLA concentrations, Secchi transparency, and user perceptions are presented on the information sheet following these written comments.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	17.6	7.0	26.0	A
CLA (µg/l)	3.3	1.9	4.7	A
Secchi (m)	2.6	2.0	3.1	B
TKN (mg/l)	0.46	0.20	0.61	
			Overall Grade	A

No statistically significant trends are evident from the lake's water quality database. The lake seems weel represented by an overall grade of B+/A. To better understand the quality of the lake and what direction it may be heading, continued monitoring is recommended.

At each monitoring event, the volunteers' opinion of the lake condition was ranked on a 1-to-5 scale as shown on the lake information sheet. The average score for physical condition was 1.7 (between 1- "crystal clear" and 2- "some algae present"), and 1.0 for recreational suitability (1- "beautiful").

Cenaiko Lake was one of eight lakes in Minnesota and one in Wisconsin that where a part of a research project supported by the MDNR and conducted by researchers at the University of Minnesota has examined the possibilities of an aquatic weevil *Euryhchiopsis lecontei* as a biological control agent for EWM (U.S.EPA 1997). The following is an excerpt from a U.S.EPA document detailing research in weevils as a biological control:

> Of the nine sites, the most pronounced weevil infestation was found in Cenaiko Lake in Anoka County, Minnesota. Weevils caused severe damage to the EWM plants in Cenaiko Lake, most likely resulting in the plants' decreased abundance. EWM biomass (wet weight) at Cenaiko decline from 974 g/m^2 in July 1996, to 239 g/m^2 in September 1996 (Newman et al. 1996). Researchers estimate that the biomass in June 1996 (before sampling) was close to 2,000 g/m^2 (Newman we al. 1996). In July 1996, EWM was approximately 50 percent of the total plant biomass in the lake; by September 1996, this value had decreased to 14 percent.

> Monitoring of Cenaiko Lake did not begin until June 1996 when a dense population of weevils was discovered during reconnaissance studies for introduction sites (Newman et al. 1996). Cenaiko Lake was then added to the list of regular sampling sites. Plant samples collected at Cenaiko Lake, as well as at other sites, were processed for invertebrates, plant biomass, and stem damage.
>
> Because monitoring is still ongoing, sampling and data are limited for this study. However, the preliminary results indicate the weevils in Cenaiko Lake may be responsible for the natural decline of EWM.

Since that report however, the lake's biological make-up has changed slightly. The lake's Sunfish population has dramically increased, which has resulted in a reduced aquatic weevil population (the Sunfish feed on the weevils). The reduction in the aquatic weevil population has resulted in an increase in abundance of EWM within the lake.

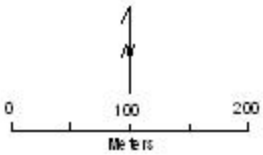
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

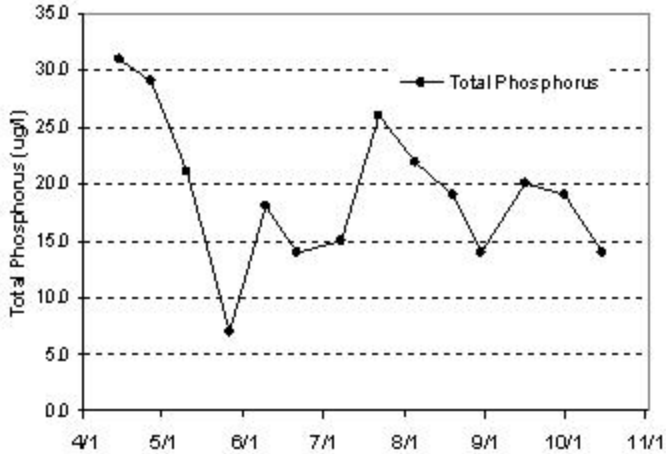
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

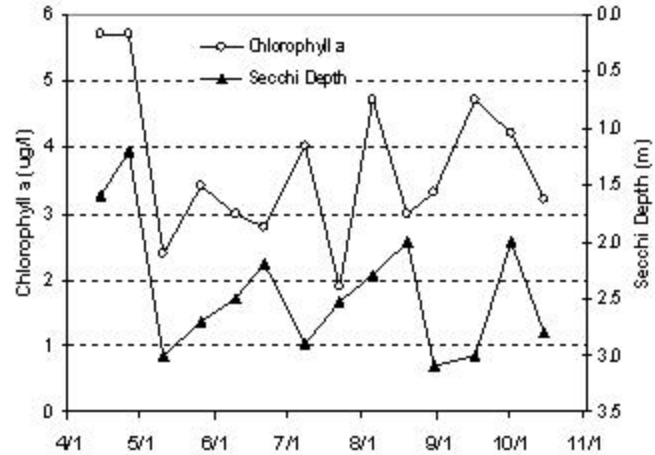
Lake Cenaiko
Coon Rapids, Anoka Co.

Lake ID : 20654
WD : Coon Creek
Volunteer: Anoka Co. Parks

● Sampling site
Contours in meters

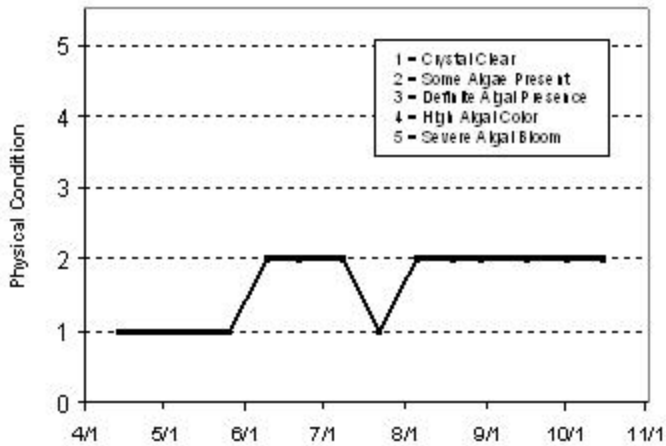






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	9				5.7	31.0		1.6	1	
4/26/04	12				5.7	29.0		1.2	1	1
5/10/04	16				2.4	21.0		3.0	1	1
5/26/04	15				3.4	7.0		2.7	1	1
6/9/04	22				3	18.0		2.5	2	
6/21/04	21				2.8	14.0		2.2	2	
7/8/04	23				4	15.0		2.9	2	
7/22/04	28				1.9	26.0		2.5	1	1
8/5/04	24				4.7	22.0		2.3	2	
8/19/04	21				3	19.0		2.0	2	
8/30/04	21				3.3	14.0		3.1	2	
9/16/04	21				4.7	20.0		3.0	2	
10/1/04	17				4.2	19.0		2.0	2	
10/15/04	14				3.2	14.0		2.8	2	

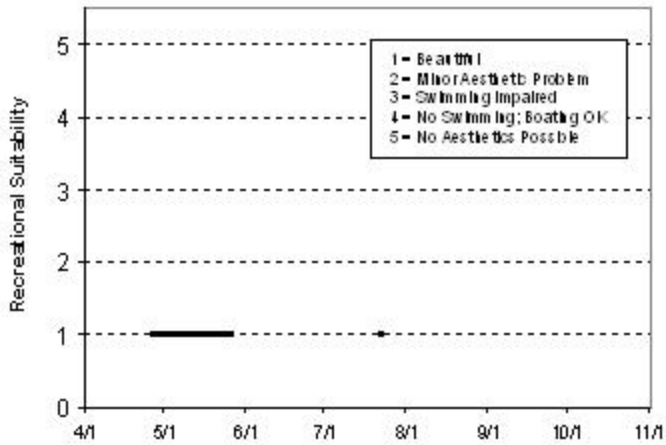


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						A	A	A	A	A	A	A	A
Chlorophyll a						A	A	A	A	A	A	A	A
Secchi Depth						C	A	A	B	C	A	A	B
Overall						B	A	A	A	B	A	A	A

Source : Metropolitan Council and STORET data



Clear Lake (82-0163) *Rice Creek Watershed District*

Clear Lake, located in Forest Lake Township (Washington County), has public access on its western side, and is considered a "Priority Lake" due to its multi-recreational uses. The approximate maximum and mean depths of the lake are 8.5 and 3.7 m (28 and 12 feet), respectively. The lake has a 400-acre surface area (a circumference of 3.9 miles) which, along with its mean depth, represents a volume of 4,800 ac-ft. Approximately 67 percent of the lake is considered littoral zone (the area of aquatic vegetation dominance).

In 2004, the lake was monitored six times between mid-April and late-May. During each monitoring event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as its perceived physical condition and recreational suitability.

Although there were six monitoring events for Clear Lake in 2004, the data collection was skewed to the early-summer (April and May). For this reason, the determination of a 2004 summer means and resulting grades would not provide a true picture of the lake's water quality in 2004. The lake's 2004 raw data and resulting graphs are presented on the associated lake information page.

The lake's early-summer monitoring results in 2004 were however, in line to those recorded over the past few years.

Clear Lake has a fairly large database with varying degrees of water quality data available for 19 of the last 23 years. Six of those years contain just Secchi transparency data, but the last 11 (1993-2004) contain TP, CLA and transparency data collected through CAMP.

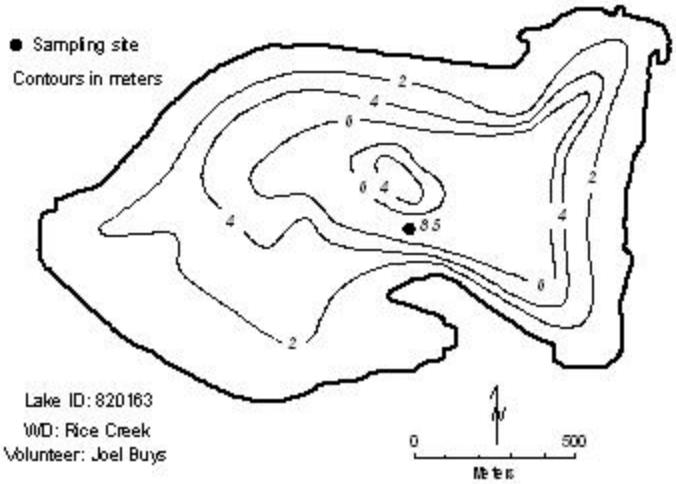
Available data show that Clear Lake's water quality has remained fairly constant over the past 20+ years. While there is some variability in its water quality grades from year to year, they seem to portray the lake's normal range of water quality conditions rather than any noticeable trend. The lake received an overall grade of B for 1994-1999, 2002 and 2003, as compared to receiving overall C grades during the 1993, 2000, and 2001 monitoring season as well as two years in the 1980's (1980 and 1984). The 1993-2003 Secchi transparency grades of C (with means ranging from 1.2 m to 1.8 m), however, remained consistent with the C or D grades recorded in 1980-1992.

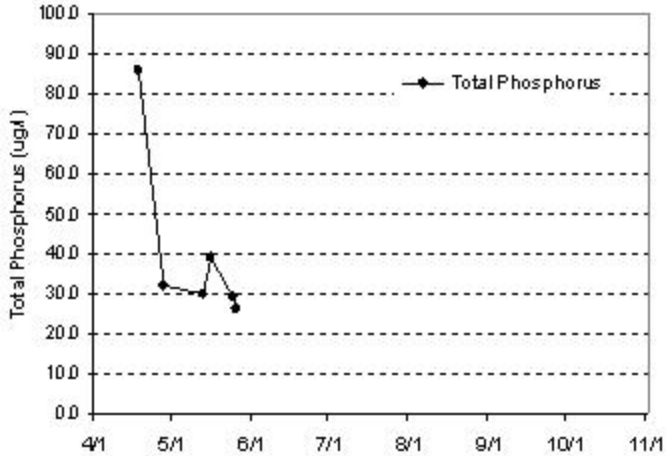
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

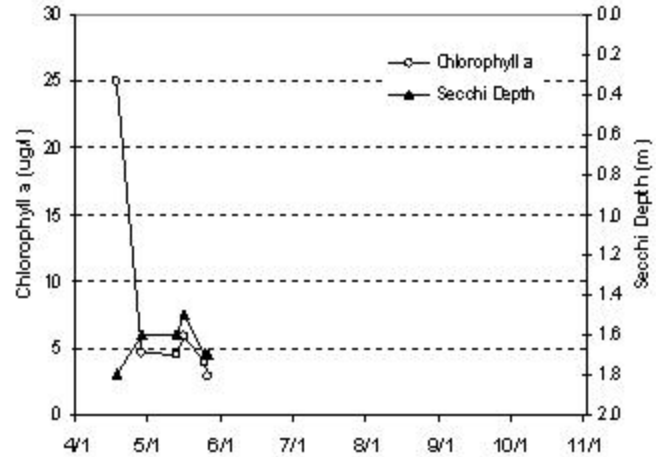
If you know of any errors in the lake's data or physical information, or are aware of additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Clear Lake

Columbus Twp., Anoka Co.

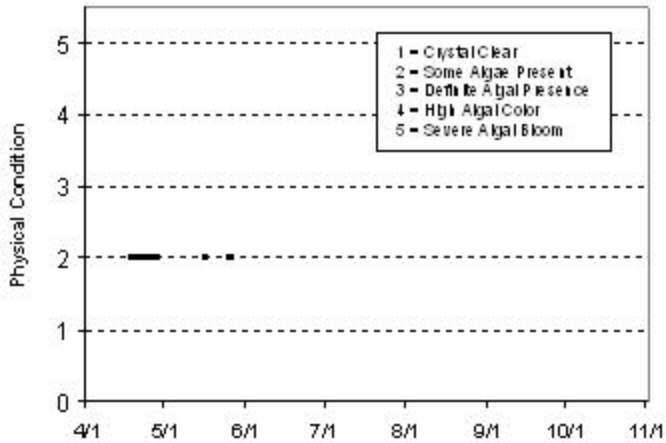






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	12				25	86.0		1.8	2	1
4/28/04	11				4.6	32.0		1.6	2	2
5/13/04	12				4.5	30.0		1.6		
5/16/04	10				5.9	39.0		1.5	2	2
5/25/04	14				3.8	29.0		1.7		
5/26/04	12				2.9	26.0		1.7	2	2

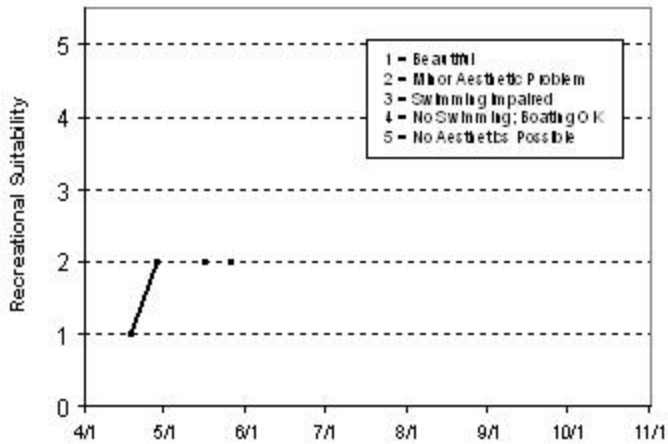


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C				C							
Chlorophyll a	C				B						B	
Secchi Depth	C				C	F		D	D	C	C	D
Overall	C				C							

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C	B	B	B	A	B	B	D	C	C	C	NA
Chlorophyll a		B	A	A	A	A	B	B	B	B	A	A	NA
Secchi Depth	D	C	C	C	C	C	C	C	C	C	C	C	NA
Overall		C	B	B	B	B	B	B	C	C	B	B	NA

Source: Metropolitan Council and STORET data



Cloverdale Lake (82-0009) *Valley Branch Watershed District*

Cloverdale Lake is a 37-acre landlocked lake located within Baytown Township (Washington County). The maximum depth of the lake is 8.5 m (almost 30 feet). The lake's surface area and watershed size (671 acres) translates to an 18:1 watershed-to-lake size ratio. Generally the larger the ratio, the greater the potential stress on the lake from surface runoff.

This was the fourth year that Cloverdale Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake came up empty. Thus, 2001-2004 are the only years of available nutrient data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 13 times between late-April and late-September, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	39.2	18.0	89.0	C
CLA (µg/l)	14.7	1.0	39.0	B
Secchi (m)	3.1	1.3	5.2	A
TKN (mg/l)	0.80	0.54	1.30	
			Overall Grade	B

The lake's overall 2004 lake quality grade of B (identical to that recorded in 2002-2003) is better than the C recorded in 2001.

As mentioned earlier, there are no nutrient data available for Cloverdale Lake other than the 2001-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 2.0 for physical condition (2- "some algae present"), and 1.5 for recreational suitability (between 1- "beautiful" and 2- "minor asthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Cloverdale Lake

Lake Elmo, Washington Co.

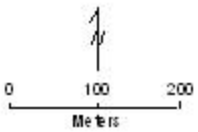
● Sampling site

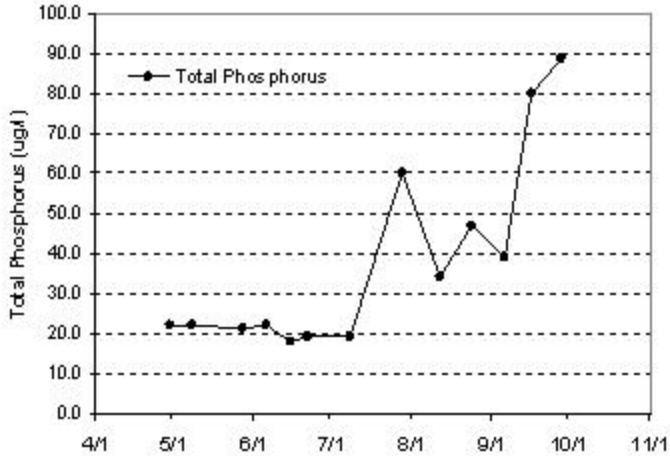
Contours in meters

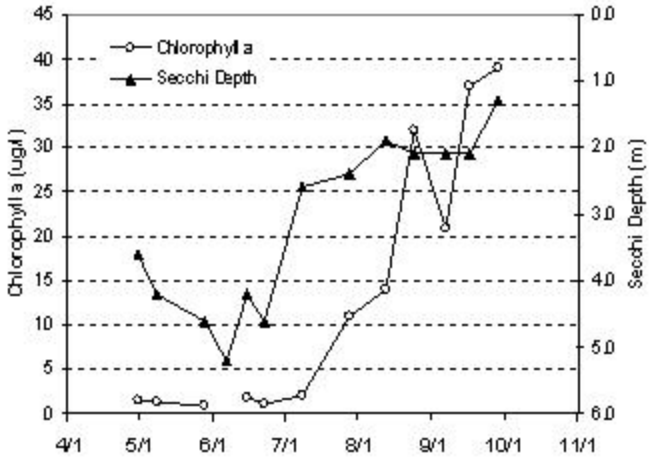
Lake ID: 820009

WD: Lower St. Croix Valley

Volunteer: Kevin Bjork

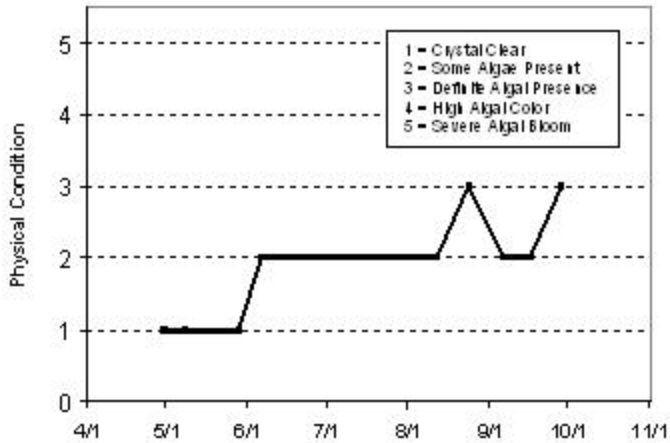






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/30/04	12.4				1.5	22.0		3.6	1	1
5/8/04	14.8				1.3	22.0		4.2	1	1
5/28/04	18.6				1	21.0		4.6	1	1
6/6/04	23.4					22.0		5.2	2	1
6/15/04	23.8				1.8	18.0		4.2	2	1
6/22/04	22.4				1.1	19.0		4.6	2	1
7/8/04	24				2.1	19.0		2.6	2	1
7/28/04	21.4				11	60.0		2.4	2	2
8/12/04	21.9				14	34.0		1.9	2	2
8/24/04	21.6				32	47.0		2.1	3	2
9/6/04	23.8				21	39.0		2.1	2	2
9/16/04	22.9				37	80.0		2.1	2	2
9/28/04	22.4				39	89.0		1.3	3	2

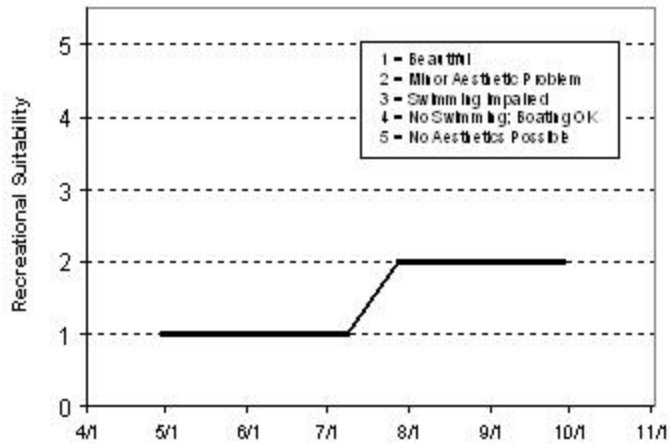


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus										C	C	C	C
Chlorophyll a										B	B	B	B
Secchi Depth										C	B	B	A
Overall										C	B	B	B

Source: Metropolitan Council and STORET data



Cobblecrest (27-0053) *City of St. Louis Park*

CobblecrestLake is a small shallow lake located within City of St. Louis Park (Hennepin County). There is very little known morphological data available for the lake.

Two thousand and four marks the second year in which Cobblecrest Lake has been involved in CAMP (2002 being the other). Other than for the 2002 CAMP sdata, a search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2002 and 2004 are the only complete, year of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 14 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	127.7	95.0	180.0	D
CLA (µg/l)	78.2	40.0	120.0	F
Secchi (m)	0.4	0.3	0.4	F
TKN (mg/l)	1.87	1.60	2.10	
			Overall Grade	F

As mentioned earlier, there are no water quality data available for Cobblecrest Lake other than the 2002 and 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 1.4 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 4.0 for recreational suitability (4- "no swimming – boating ok").

If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

Cobblecrest Lake

St. Louis Park, Hennepin Co.

Lake ID: 270053

WD: Minnehaha Creek

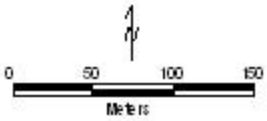
Volunteers:

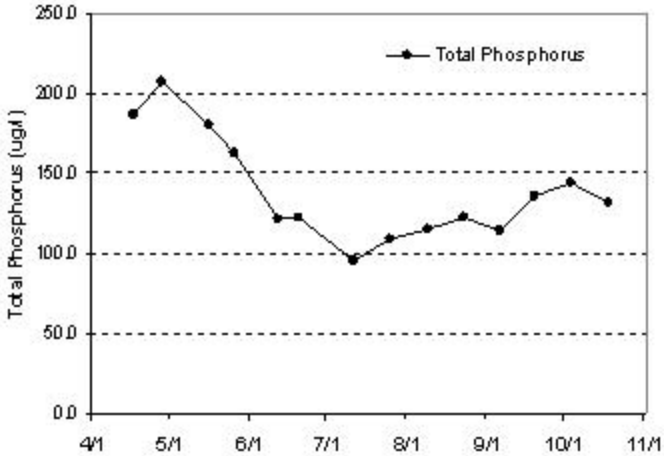
Jim and

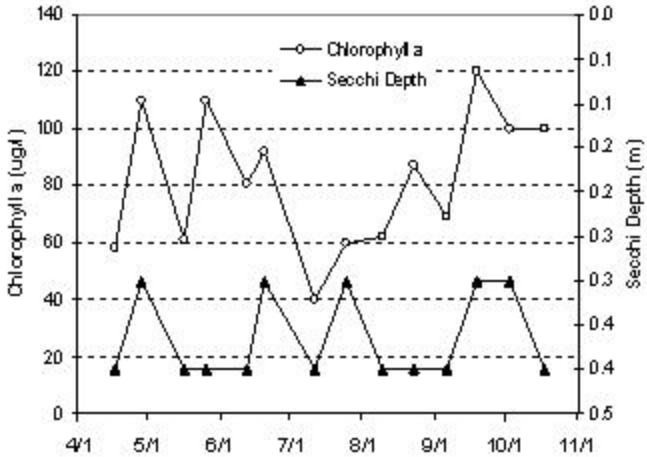
Grahamm Kellogg

● Sampling site

Contours in meters

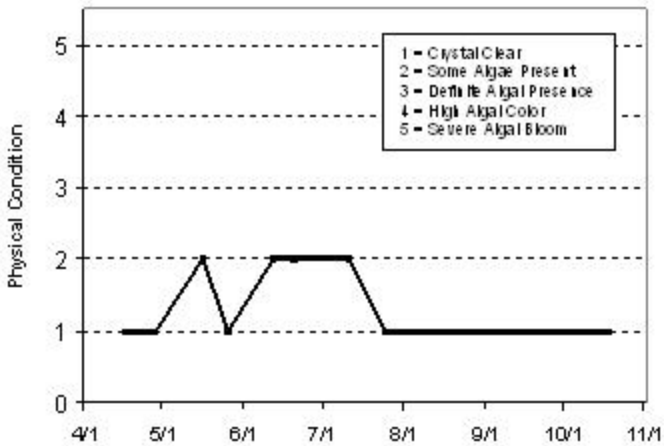






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	18				58	187.0		0.4	1	4
4/28/04	20				110	207.0		0.3	1	4
5/16/04	15.1				61	180.0		0.4	2	4
5/26/04	17				110	163.0		0.4	1	4
6/12/04	23.2				81	121.0		0.4	2	4
6/20/04	21.5				92	122.0		0.3	2	4
7/11/04	26.4				40	95.0		0.4	2	4
7/25/04	26.4				60	109.0		0.3	1	
8/9/04	20.7				62	115.0		0.4	1	4
8/23/04	21.5				87	122.0		0.4	1	4
9/6/04	22.4				69	114.0		0.4	1	4
9/19/04	20				120	136.0		0.3	1	4
10/3/04	18				100	144.0		0.3	1	4
10/18/04	10.2				100	132.0		0.4	1	4

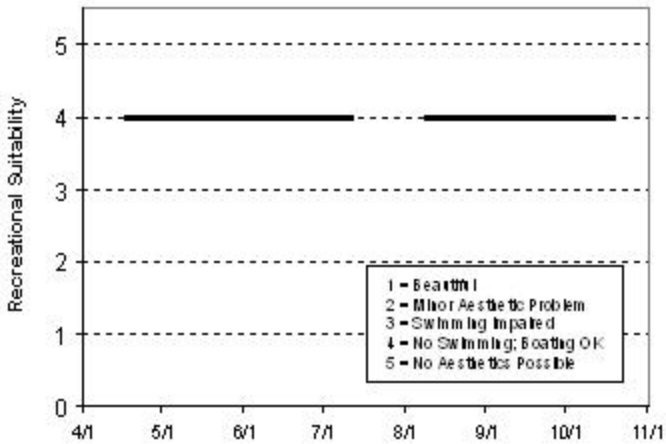


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											C		D
Chlorophyll a											C		F
Secchi Depth											C		F
Overall											C		F

Source: Metropolitan Council and STORET data



Colby Lake (82-0094) *City of Woodbury*

Colby Lake is located in the City of Woodbury in Washington County. A mid-1990's search for water quality data revealed no data prior to that collected as part of CAMP in 1994. Colby Lake's database now includes 10 data years (1994-2003). Analysis on the lake' water quality database reveals no statistically significant trend in its water quality (either improving or degrading). The lake's water quality seems well represented by an overall water quality grade of D/F.

Information from the City of Woodbury revealed that the lake has a surface area of 71 acres and a maximum depth of just 3.4 m (11 feet). The lake's large 8,088-acre contributing watershed results in a large 114:1 watershed-to-lake size ratio. The larger the ratio the greater the potential for stress on the lake from surface runoff. Because of the shallowness of the lake, its entire area is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and the lake does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The lake has no public access.

As part of the city's involvement in CAMP in 2004, the lake was monitored 10 times between late-April and late-October. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	127.7	42.0	476.0	D
CLA (µg/l)	35.8	8.7	55.0	C
Secchi (m)	0.6	0.5	0.8	F
TKN (mg/l)	1.30	0.59	2.10	
			Overall Grade	D

The lake's 2004 overall grade was similar to that of 1994, 1997, and, and better than that of 1999-2000 1995, 1996, 1998, 2001, and 2003 (F's).

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 2.0 (2- "some algae present"), while the mean recreational suitability ranking was 4.0 (4- "no swimming - boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Colby Lake
Woodbury, Washington Co.

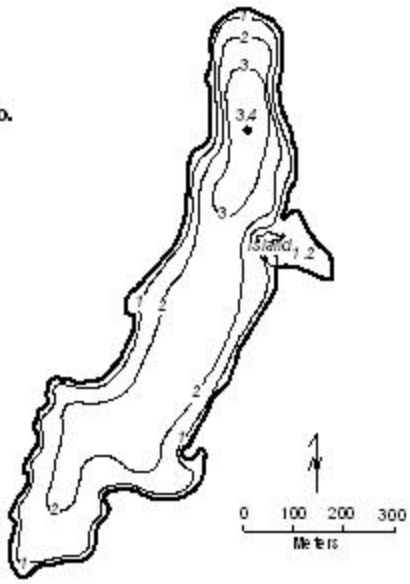
Lake ID: 820094

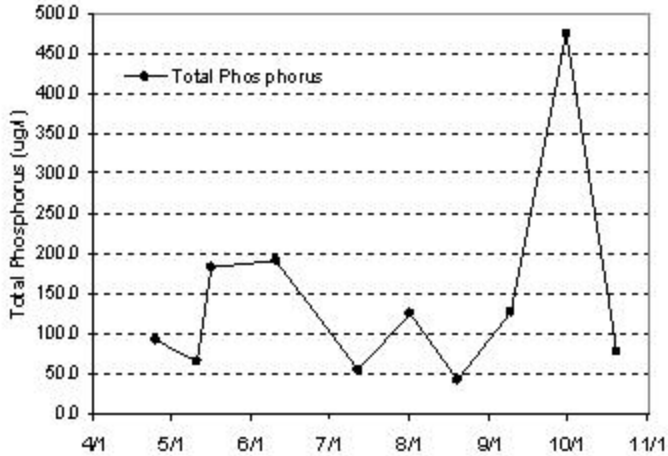
WD: South Washington

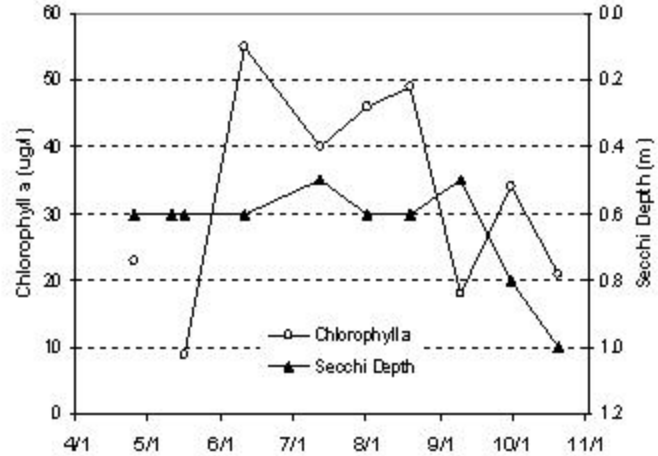
Volunteers: The Hvass Family

◆ Sampling site

Contours in meters

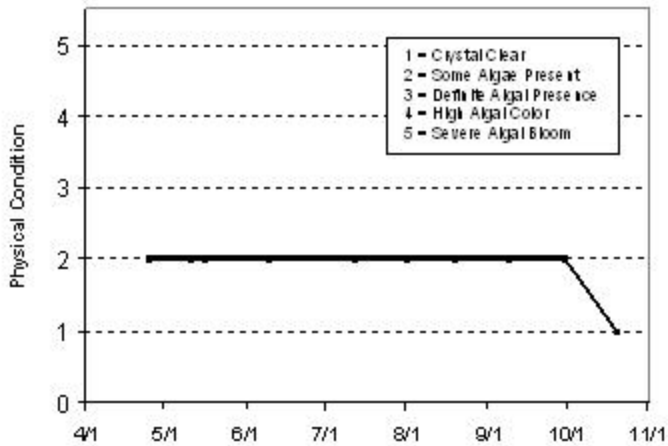






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/25/04	13.3				23	92.0		0.6	2	4
5/11/04	18					64.0		0.6	2	4
5/16/04	19				8.7	182.0		0.6	2	4
6/10/04	19				55	191.0		0.6	2	4
7/12/04	28				40	53.0		0.5	2	4
8/1/04	29.1				46	124.0		0.6	2	4
8/19/04	21.8				49	42.0		0.6	2	4
9/9/04	22.4				18	127.0		0.5	2	4
9/30/04	20.7				34	476.0		0.8	2	4
10/20/04	10				21	77.0		1.0	1	4

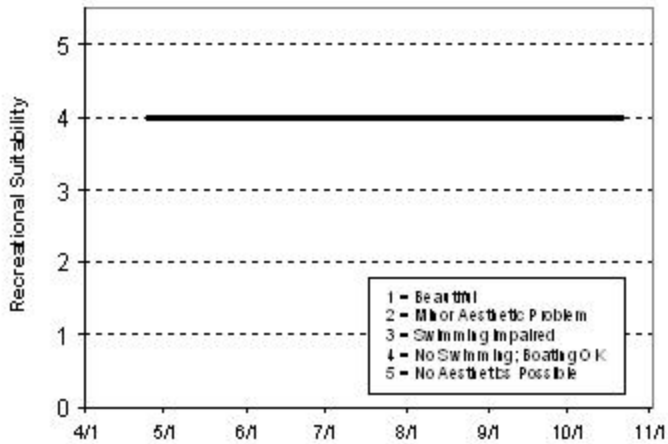


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			D	D	F	F	F	D	D	F	F	F	D
Chlorophylla			D	F	F	C	F	F	D	F	C	D	C
Secchi Depth			F	F	F	F	F	D	D	D	F	F	F
Overall			D	F	F	D	F	D	D	F	D	F	D

Source: Metropolitan Council and STORET data



Courthouse Lake (10-0005) *Carver County Environmental Services*

Courthouse Lake, located in the City of Chaska (Carver County) is a unique resource in the Twin Cities Metropolitan Area. The lake is only one of six lakes in the seven-county metropolitan area stocked with trout (rainbows). Very little lake data (or physical information) are available for Courthouse Lake. The 10-acre lake (0.6 miles in circumference) has a maximum depth of 17.4 m (57 feet) and only three percent of the lake is considered littoral zone (the 0-15 foot depth zone of the lake dominated by aquatic vegetation). The lake's level is maintained by groundwater. It has a very small watershed that is completely publicly owned (MDNR 1996).

The only data available for Courthouse Lake are a result of CAMP monitoring from 1996-2004.

Courthouse Lake was monitored biweekly from mid-April to mid-October 2004, for a total of 14 monitoring events. The data collected by volunteers showed seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability). Results are presented on the lake's information sheet.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	18.4	12.0	32.0	A
CLA (µg/l)	6.6	2.5	33.0	A
Secchi (m)	2.8	1.6	3.8	B
TKN (mg/l)	0.61	0.50	0.99	
			Overall Grade	A

The lake's 2004 overall grade was similar to that of 1996, 1998-2001, and 2003, and better than 1997 and 2002 (overall grades of B). When comparing the lake's historical summer means, it is apparent that 1998 was the lake's best overall water quality year (although the best Secchi transparency was recorded in 2003) and 1997 was the worst.

Analysis on the lake' water quality database reveals no statistically significant trend in its water quality (either improving or degrading). The lake's water quality seems well represented by an overall water quality grade of A/B+.

The average user perception rankings, on a 1-to-5 scale, were 1.3 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 1.2 for recreational suitability (between 1- "beautiful" and 2- "minor aesthic problem").

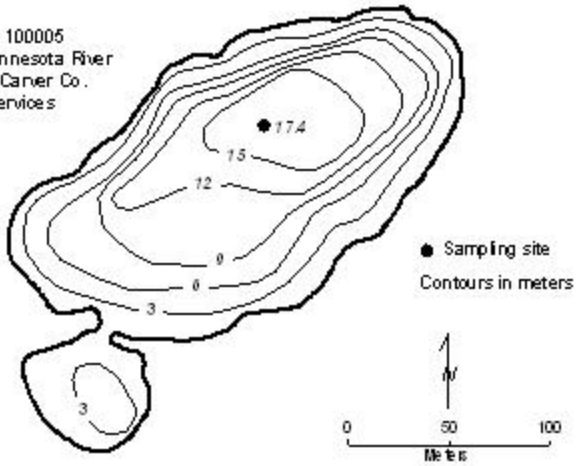
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

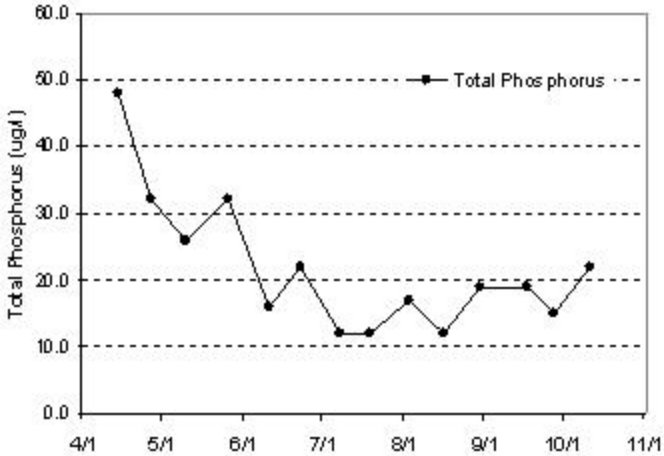
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

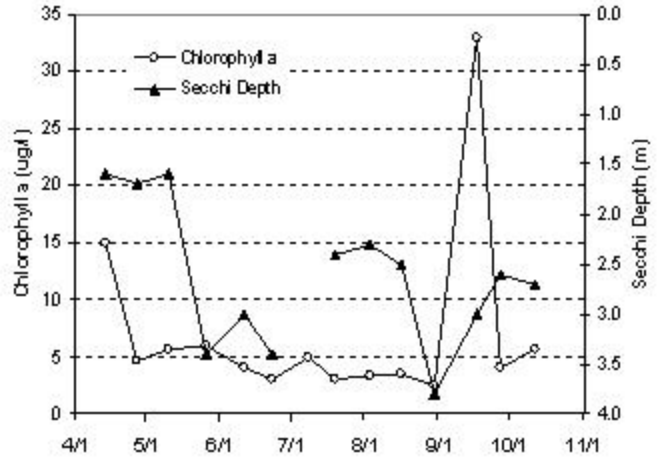
Courthouse Lake

Chaska, Carver Co.

Lake ID: 100005
WD: Lower Minnesota River
Volunteer: Carver Co. Env. Services

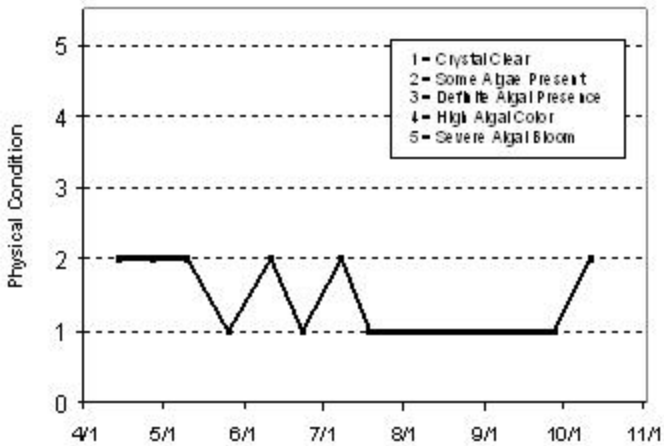






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	10.4		14.7		15	48.0		1.6	2	2
4/27/04	13		10.1		4.6	32.0		1.7	2	2
5/10/04	20.7		10.8		5.6	26.0		1.6	2	1
5/26/04	17		9.09		6	32.0		3.4	1	1
6/11/04	21.2				4	16.0		3.0	2	2
6/23/04	22.2		9.9		3	22.0		3.4	1	2
7/8/04	25.6		10.43		4.9	12.0			2	1
7/19/04	27		9.52		3.1	12.0		2.4	1	1
8/3/04	26.4		10		3.3	17.0		2.3	1	1
8/16/04	22.6		8.7		3.5	12.0		2.5	1	1
8/30/04	22.4		9.3		2.5	19.0		3.8	1	1
9/17/04	21.6		8.4		33	19.0		3.0	1	1
9/27/04	22		7.8		4	15.0		2.6	1	1
10/11/04	16.4		9.1		5.6	22.0		2.7	2	2

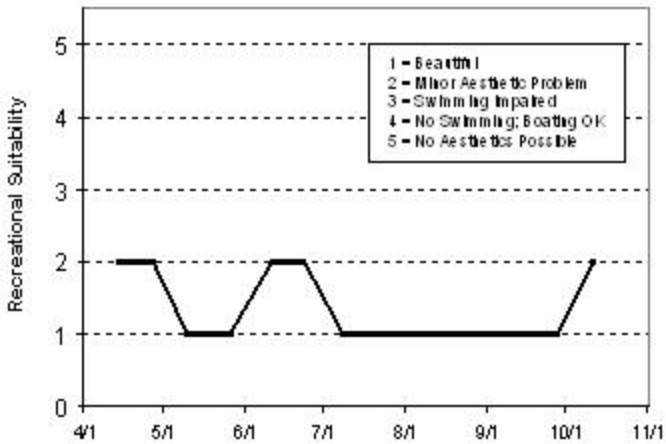


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					A	A	A	A	A	A	B	A	A
Chlorophyll a					A	A	A	A	A	A	A	A	A
Secchi Depth					A	C	A	B	A	A	B	A	B
Overall					A	B	A	A	A	A	B	A	A

Source: Metropolitan Council and STORET data



Crystal Lake [Burnsville] (19-0027) *Black Dog Watershed Management Commission*

Crystal Lake is located mainly in the City of Burnsville (Dakota County) covers an area of 292 acres, with 5.3 miles of shoreline. The maximum and mean depths of the lake are 11.3 m (37 feet) and 3.1 m (10 feet), respectively. The lake's surface area and mean depth translate to an approximate lake volume of 2,920 acre-feet. The lake's watershed covers approximately 2,001 acres of which roughly two-thirds is urban/developed. The watershed and lake surface areas translate to a moderate watershed-to-lake size ratio of 7:1 (the smaller the ratio the less stress on the lake from surface runoff).

Roughly 72 percent of the lake's area in considered littoral (the 0-15 foot depth area of aquatic vegetation dominance). Because of its multi-recreational uses, the lake is considered a "Priority Lake" in the Metropolitan Area. The lake, managed by the MDNR as a panfish lake and stocked with tiger muskellunge, has a public access and fishing pier on its north side and a public swimming beach on its eastern shore. One problem that may possibly hinder future recreational activity on the lake, however, is Eurasian Water Milfoil (*Myriophyllum spicatum*), which has been reported in the lake.

This was the sixth year that Crystal Lake has been involved in CAMP (1999-2004). The lake was monitored during each of the five years prior to 1999 by Council staff. A search of the STORET nationwide water quality database for data on the lake revealed an extensive database since the 1980's, with nutrient data available in 1980, 1983, 1989, and 1994-2004. Additionally, Secchi transparency data are available for all years between 1980 and 1999 except 1993.

The lake was monitored 15 times between mid-April and mid-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as its perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	39.2	20.0	52.0	C
CLA (µg/l)	18.2	3.5	48.0	B
Secchi (m)	1.9	1.0	2.7	C
TKN (mg/l)	0.66	0.40	0.88	
			Overall Grade	C

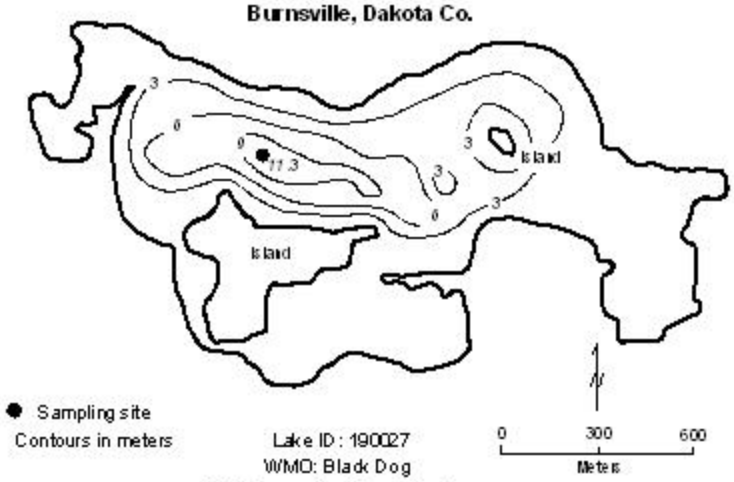
The 2004 grade is similar to those recorded from 1994-2000, and 2002-2003, and worse than 1983, 1989, and 2001. The 2004 summer mean, were better than those recorded in 2003 and similar to those similar than those recorded in 2001-2002. Analysis on the lake's water quality database reveals no statistically significant trend in its water quality (either improving or degrading). The lake's water quality seems well represented by an overall water quality grade of C/B-.

Throughout the monitoring period, the volunteer's opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The average user perception rankings, were 2.5 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 1.6 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

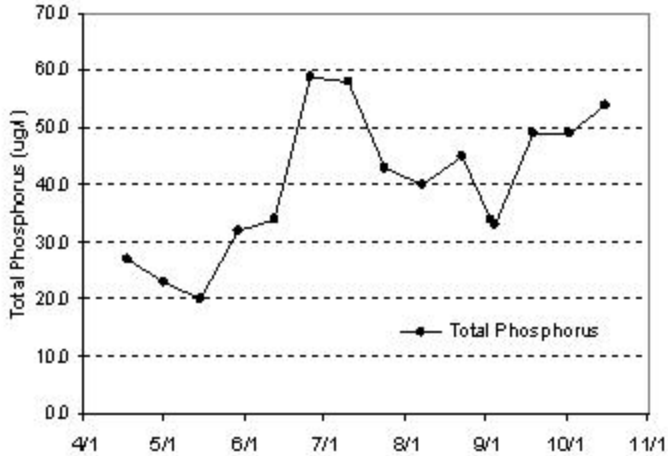
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

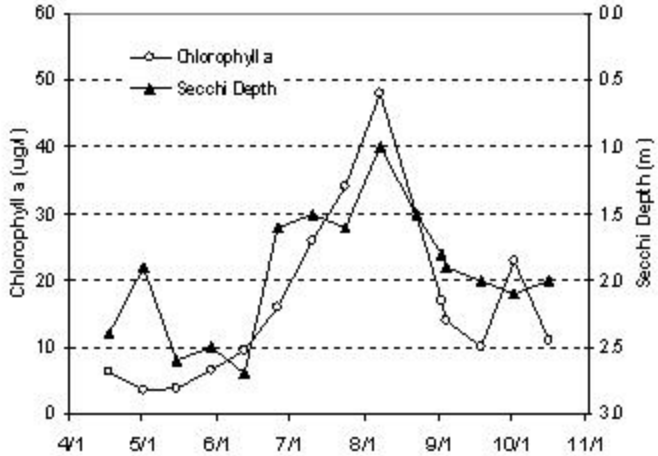
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Crystal Lake,
Burnsville, Dakota Co.



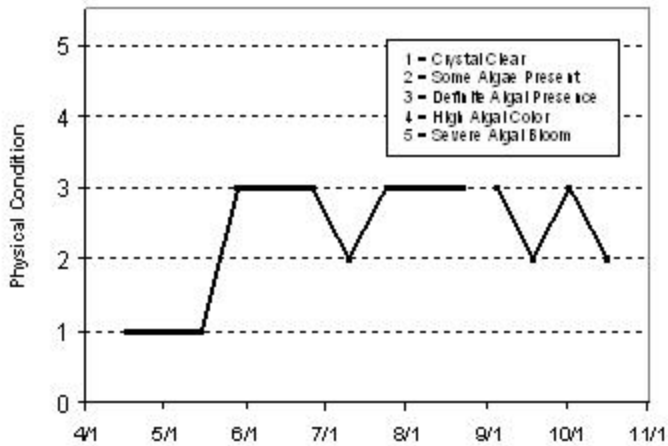
Lake ID: 190027
WMO: Black Dog
Volunteers: The Arnett Family





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	12.6				6.2	27.0		2.4	1	1
5/1/04	14.4				3.5	23.0		1.9	1	1
5/15/04	16.6				3.8	20.0		2.6	1	1
5/29/04	16.8				6.5	32.0		2.5	3	2
6/12/04	21.2				9.5	34.0		2.7	3	2
6/26/04	20.9				16	59.0		1.6	3	2
7/10/04	23.6				26	58.0		1.5	2	1
7/24/04	26.3				34	43.0		1.6	3	2
8/7/04	24.2				48	40.0		1.0	3	2
8/22/04	20.9				30	45.0		1.5	3	2
9/2/04	23				17	34.0		1.8		
9/4/04	24				14	33.0		1.9	3	2
9/18/04	20.7				10	49.0		2.0	2	1
10/2/04	16.7				23	49.0		2.1	3	2
10/16/04	12				11	54.0		2.0	2	1

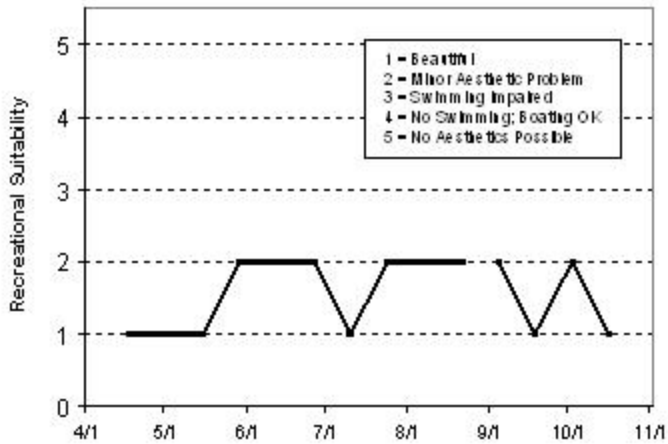


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C	C		C						B		
Chlorophyll a	C			B				C		B		
Secchi Depth	C	C	C	B	C	B	B	C	C	B	C	B
Overall	C			B						B		

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	C	C	C	C	C	C	B	C	C	C
Chlorophyll a			B	C	C	C	C	B	C	B	B	C	B
Secchi Depth	B		C	C	C	C	C	C	C	C	C	C	C
Overall			C	C	C	C	C	C	C	B	C	C	C

Source: Metropolitan Council and STORET data



Dean Lake (70-0074) *City of Shakopee*

Dean Lake is a small shallow lake located within City of Shakopee (Scott County). There is very little known morphological data available for the lake). Because of the shallowness of the lake, its entire area is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and the lake does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column).

Two thousand and four marks the third year in which Dean Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2002-2004 are the only years of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored six times between early-May and mid-September, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

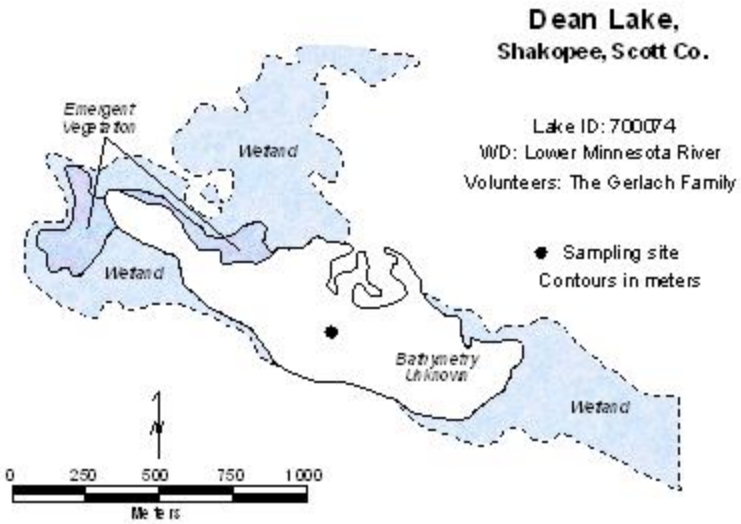
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	111.3	61.0	264.0	D
CLA (µg/l)	10.2	5.0	19.0	B
Secchi (m)	0.4	0.4	0.4	F
TKN (mg/l)	1.48	1.00	2.60	
			Overall Grade	D

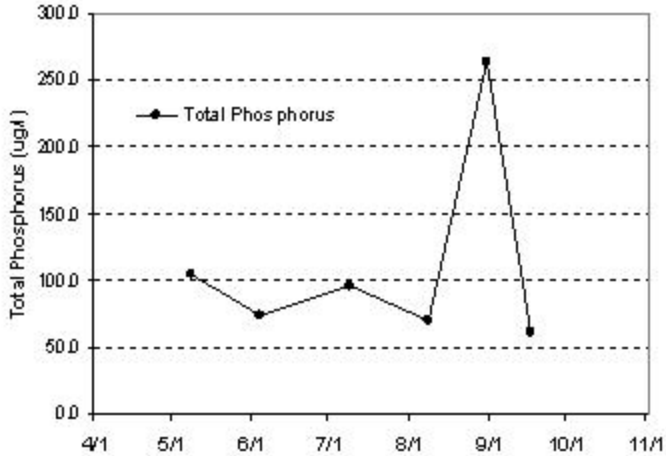
The difference between the TP, CLA and Secchi grades in current and past years (see report grade on the lake's information page), may indicate that suspended sediments may play a large role in the inner workings of the lake. This scenario can be fairly typical for shallow lakes where wind action and storm sewer inflow either increase the influx of sediments to the system or cause the re-suspension of existing bottom sediments. That is, the suspended sediments influence the lake's phosphorus make-up (a larger portion of the in-lake phosphorus in particulate form rather than a soluble form more readily available for algal uptake), reduce water clarity, and could actually be limiting the amount of light available for algal growth, thus keeping the CLA concentrations down (resulting in a better than expected grade).

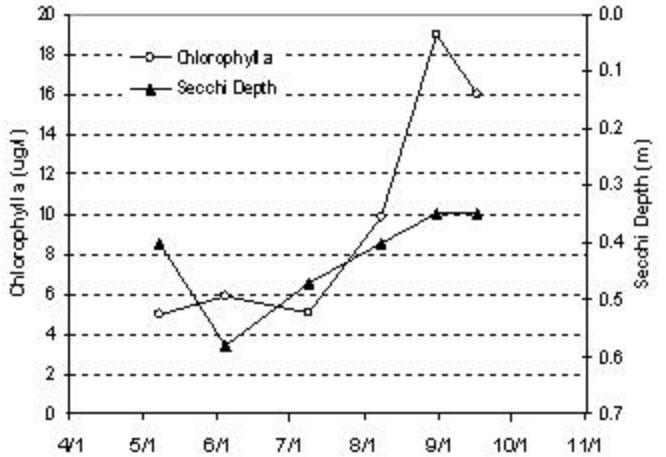
As mentioned earlier, there are no water quality data available for Dean Lake other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 2.2 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 4.0 for recreational suitability (4- "no swimming – boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

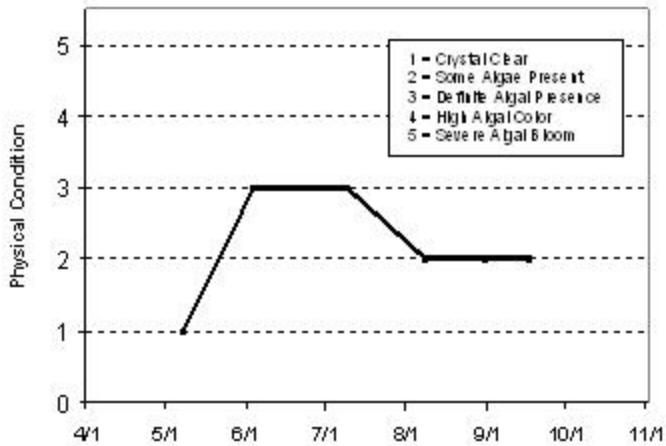






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/6/04	19.6				5	104.0		0.4	1	4
6/4/04	25.7				5.9	73.0		0.6	3	4
7/9/04	24.8				5.1	96.0		0.5	3	4
8/6/04	26.9				9.9	70.0		0.4	2	4
8/31/04	21.2				19	264.0		0.4	2	
9/17/04	21.2				16	61.0		0.4	2	

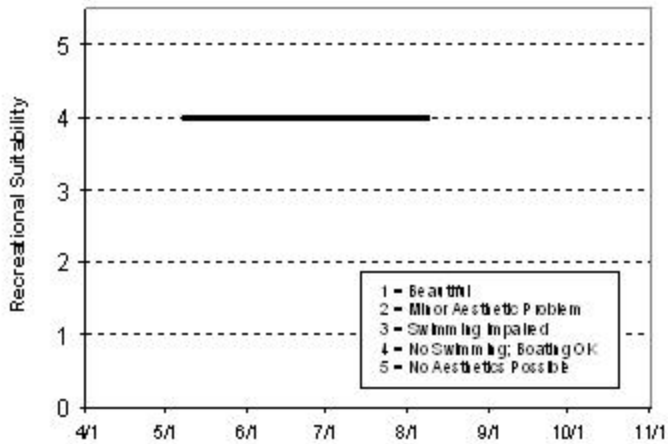


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											F	F	D
Chlorophyll a											D	C	B
Secchi Depth											F	F	F
Overall											F	D	D

Source: Metropolitan Council and STORET data



DeMontreville Lake (82-0101) *Valley Branch Watershed District*

Lake DeMontreville, located in Lake Elmo (Washington County), has public access on its northwestern side, and is considered a "Priority Lake" due to its multi-recreational uses. The 143-acre lake with a maximum depth of 7.3 m (24 feet), was monitored 14 times from mid-April to mid-September, 2004.

This was the second year that Lake DeMontreville has been involved in CAMP (the other being 1993). The lake has been monitored in the past by Council staff (most recently in 2003). A search of the STORET nationwide water quality database for data on the lake revealed a moderate database since the 1980's with nutrient and Secchi transparency data available in 1980, 1984, 1991, 1993, 1995, 2000 and 2003-2004. Additionally, Secchi transparency data are available for 1985-1986, and 1988-1989.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	20.5	12.0	33.0	A
CLA (µg/l)	8.5	1.7	17.0	A
Secchi (m)	2.8	1.6	4.5	B
TKN (mg/l)	0.77	0.56	0.99	
			Overall Grade	A

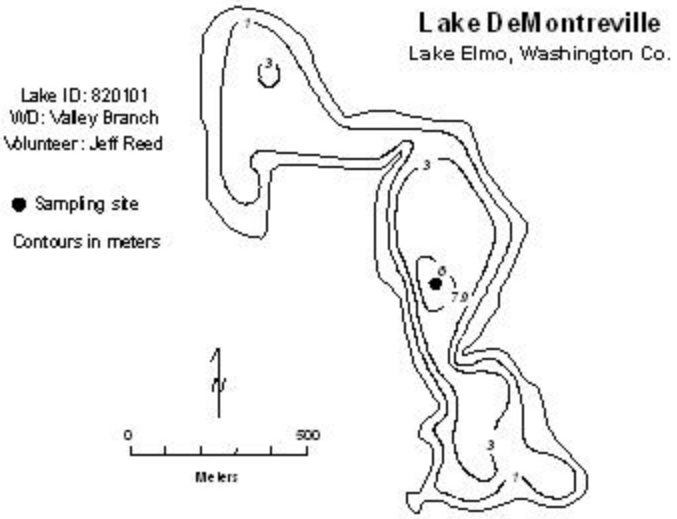
Historically, 1980-2004 lake quality grades for Lake DeMontreville (see lake information sheet on the following page) show that the quality of the lake has improved over the past 25 years. The overall grades in 1980, 1984, and 1991 were all C. The overall grades in 1993 and 1995 were B, and the overall grades for 200, and 2003-2004 were A. A recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity.

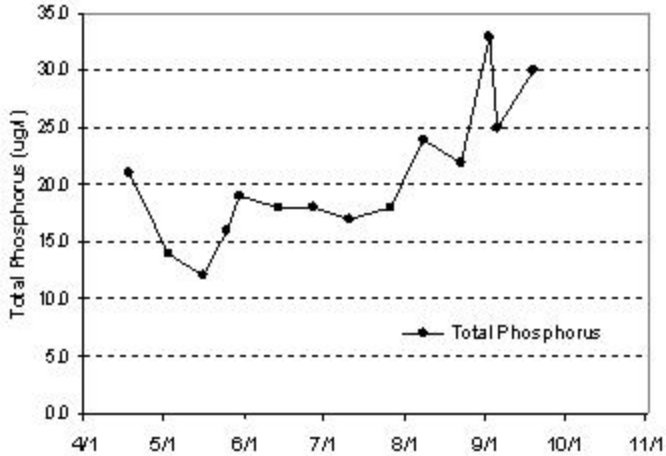
Graphs of the data show that TP and CLA concentrations, and Secchi transparency were strongly related in 2004. The raw data and graphs reveal that the highest TP and CLA concentrations were found in August and September. This was also the time of the worst Secchi transparencies (inversely, the best transparencies were recorded in the early-summer when TP and CLA concentrations were at their lowest). In fact, the graphs show that while TP and CLA concentrations get better or worse in harmony, the Secchi transparency has the direct opposite reaction. This indicates that the water clarity of the lake is dependent upon its algal abundance.

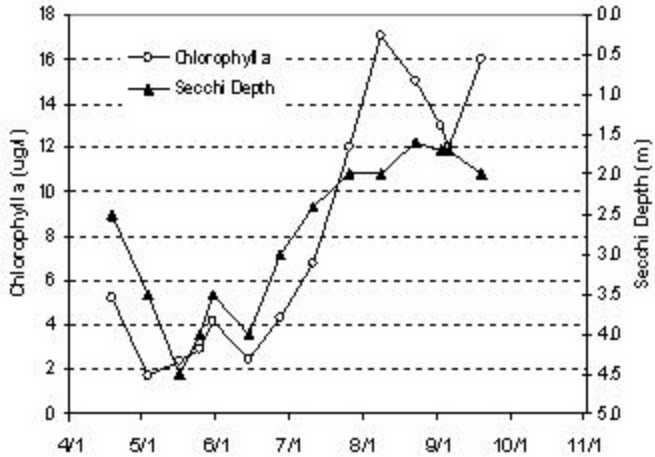
The graphs showing the volunteer's perceptions of the lake's physical condition and recreational suitability seem somewhat correlated to the other graphs for this lake. The better the lake's clarity (also relating to lower TP and CLA concentrations), the better the lake's perceived physical condition and recreational suitability. The summertime mean recorded physical condition was 1.9 on a 1 to 5 ranking scale shown on the lake information sheet (between 1- "crystal clear" and 2- "some algae present"). The mean suitability for recreation ranking, also on a 1-to-5 scale, was 1.3 (between 1- "beautiful" and 2- " minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MNDNR 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 lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

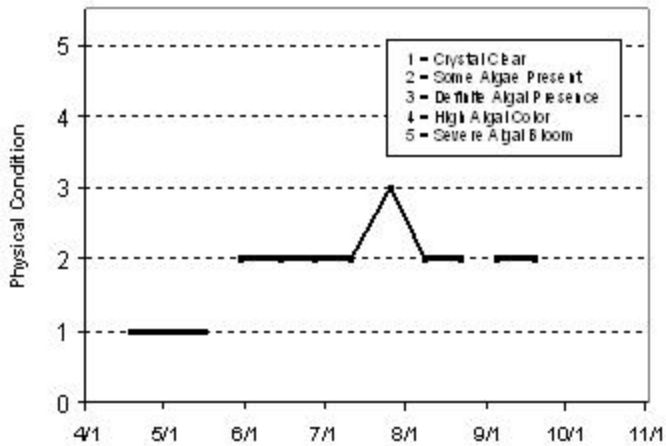






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	11.6				5.2	21.0		2.5	1	1
5/3/04	14.1				1.7	14.0		3.5	1	1
5/16/04	15.7				2.4	12.0		4.5	1	1
5/25/04	16				2.9	16.0		4.0		
5/30/04	16.3				4.2	19.0		3.5	2	1
6/14/04	22.3				2.5	18.0		4.0	2	1
6/27/04	20.4				4.3	18.0		3.0	2	1
7/11/04	25.5				6.8	17.0		2.4	2	1
7/26/04	26.4				12	18.0		2.0	3	2
8/8/04	21.3				17	24.0		2.0	2	2
8/22/04	21.8				15	22.0		1.6	2	2
9/2/04	22				13	33.0		1.7		
9/5/04	22.5				12	25.0		1.7	2	1
9/19/04	21.4				16	30.0		2.0	2	

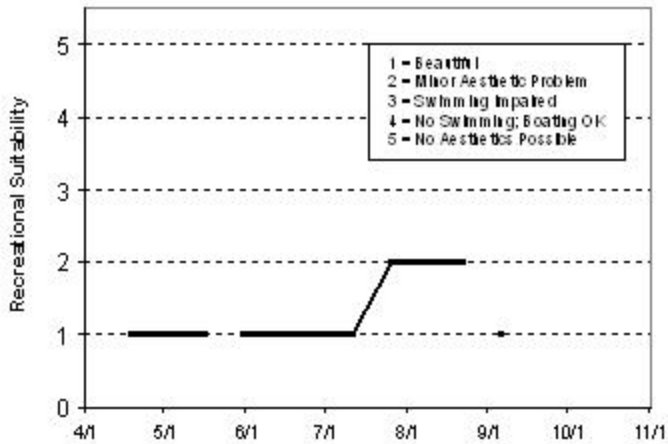


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C				C							B
Chlorophyll a	C				C							C
Secchi Depth	C				C	C	C		C	D		C
Overall	C				C							C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		B		C					A			A	A
Chlorophyll a		A		B					A			B	A
Secchi Depth		B		B					A			A	B
Overall		B		B					A			A	A

Source: Metropolitan Council and STORET data



Downs Lake (82-0110) *Valley Branch Watershed District*

Downs Lake, located in Lake Elmo (Washington County), was monitored seven times between early-May and early-October, 2004. The mean and maximum depths of the 35-acre lake are 1.5 m (5 feet) and 2.1 m (7 feet), respectively. The lake's size and mean depth results in an approximate lake volume of 175 ac-ft. Because of the shallowness of the lake, the entire lake is considered littoral zone (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).

The lake's 2,400-acre watershed translates to a large watershed-to-lake size ratio of 69:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the fifth year in which Downs Lake has been involved in CAMP (1999 and 2001-2003 being the others). A search through the STORET nationwide water quality database for data on the lake resulted in no data other than that collected through CAMP. Thus, 1999 and 2001-2004 are the only years where data are available. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	158.8	60.0	276.0	F
CLA (µg/l)	63.7	12.0	160.0	D
Secchi (m)	0.5	0.2	1.1	F
TKN (mg/l)	2.4	0.6	3.9	
			Overall Grade	F

The summertime means resulted in a TP grade of F, CLA grade of D, and Secchi transparency grade of F. The overall grade, calculated from all three parameters was F. The lake's 2004 overall water quality grade is similar to that recorded in 2001-2002, and worse than those of 1999 and 2003 (overall grade of D).

As mentioned earlier, there are no water quality data available for Downs Lake other than the 1999 and 2001-2004 CAMP data. Therefore it is not possible to determine any long-term. In the short-term, the lake seems to flucuate between overall grades of D/F. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer's opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The average user perception rankings, were 2.3 for physical condition (between 2- "some algae present" and 3- "defnite algae present"), and 3.3 for recreational suitability (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Downs Lake

Lake Elmo, Washington Co.

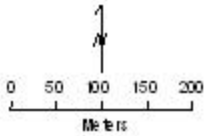
Lake ID: 820110

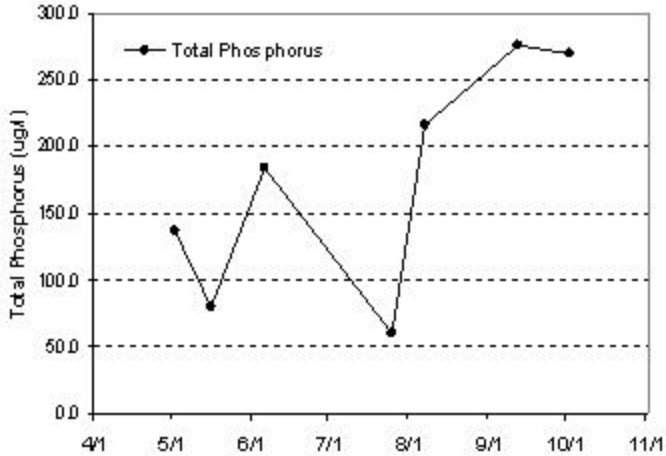
WD: Valley Branch

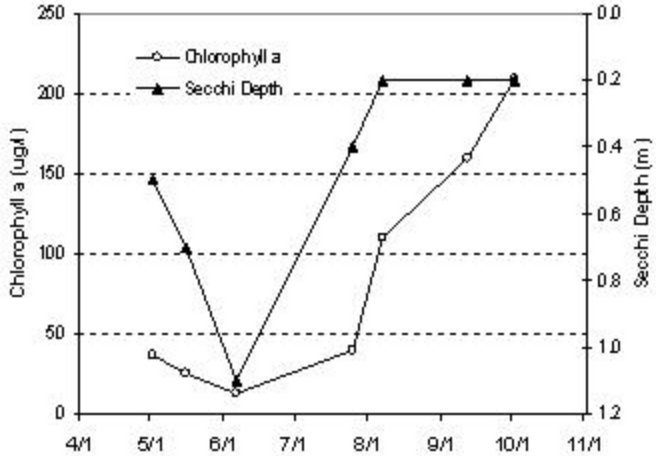
Volunteers: The Wesley Sly Family

● Sampling site

Contours in meters

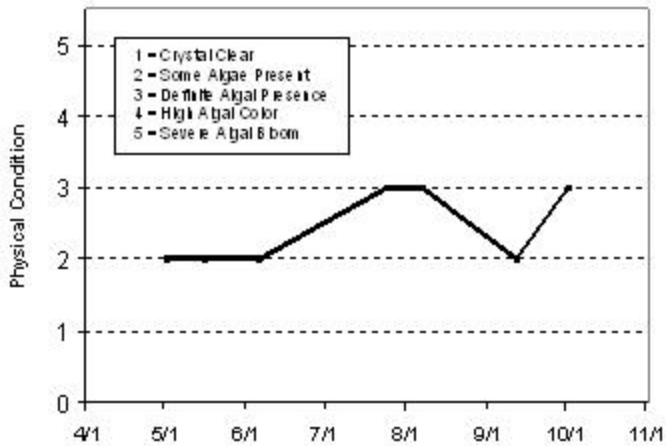






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/2/04	14.2				36	137.0		0.5	2	1
5/16/04	15.6				25	80.0		0.7	2	4
6/6/04	26.2				12	184.0		1.1	2	3
7/25/04	30.1				39	60.0		0.4	3	4
8/7/04	24.7				110	216.0		0.2	3	4
9/12/04	25				160	276.0		0.2	2	4
10/2/04	15				210	270.0		0.2	3	4

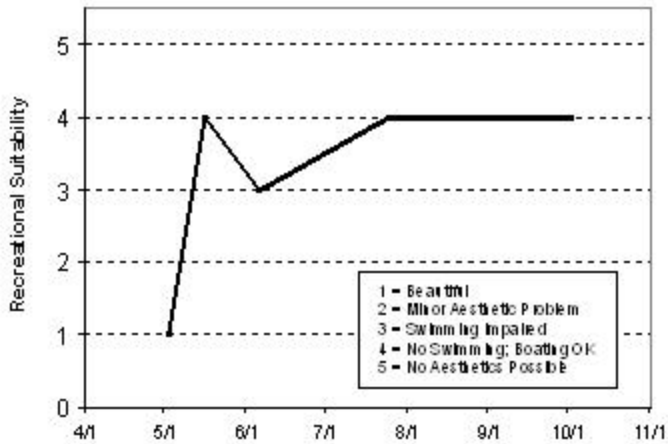


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D		D	F	D	F
Chlorophyll a								D		F	F	C	D
Secchi Depth								D		F	F	F	F
Overall								D		F	F	D	F

Source: Metropolitan Council and STORET data



Earley Lake (19-0033) *Black Dog Watershed Management Commission*

Earley Lake is located within the City of Burnsville in Dakota County. The 29-acre lake receives flow from Crystal Lake (Burnsville) and the Earley Lake watershed. Most of its 1,629-acre watershed is either parkland or open space. The watershed-to-lake size ratio is a rather large 56:1. Generally, the larger the ratio the greater the potential stress on the lake from surface runoff. Earley Lake outlets at its west end to Sunset Pond.

Earley Lake has been enrolled in CAMP since 1994. The lake was monitored six times between early-June and late-September, 2004. On each sampling date the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	60.7	24.0	82.0	C
CLA (µg/l)	12.6	2.3	25.0	B
Secchi (m)	1.7	1.5	1.9	C
TKN (mg/l)	0.63	0.35	0.80	
			Overall Grade	C

Individual and overall grades for 2004 are identical to those found in 1994-2003. While there has been slight variability in individual summer means from year to year, the lake's quality has remained fairly consistent. The lake's mean TP seems to generally fall within the 50.0-60.0 µg/l range, while the CLA and Secchi means generally range between 11.0-18.0 µg/l and 1.2-1.7 m, respectively. The lake's best water quality was recorded in 2003.

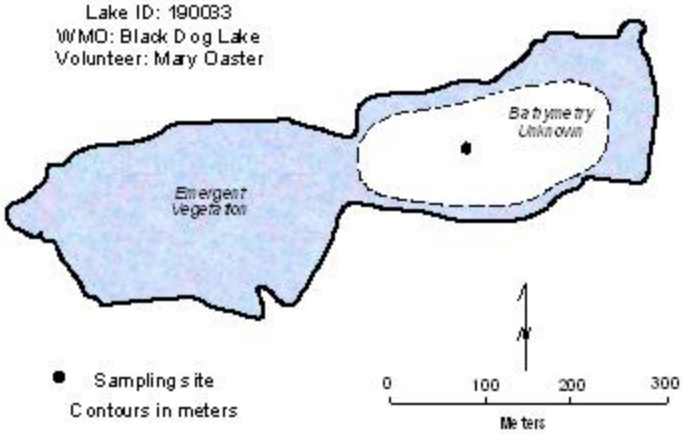
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean physical condition ranking was 3.0 (3- "definite algae present"), while the mean recreational suitability ranking was 4.0 (4- "no swimming – boating ok").

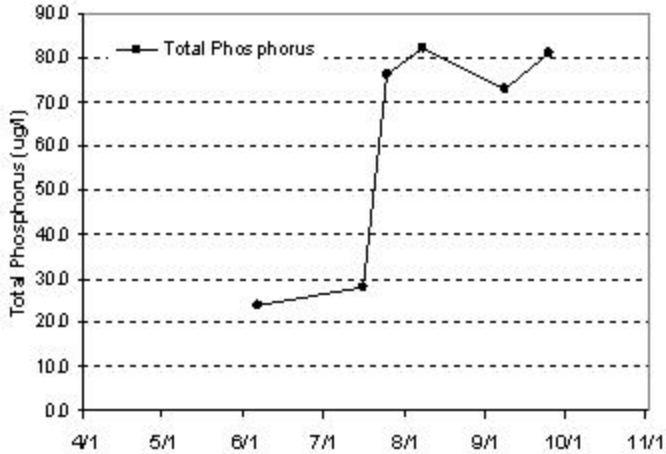
Statistical analysis on the lake's water quality database did not detect any long-term trends, in the short-term however, the lake seems to be very well represented by an overall water quality grade of C. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

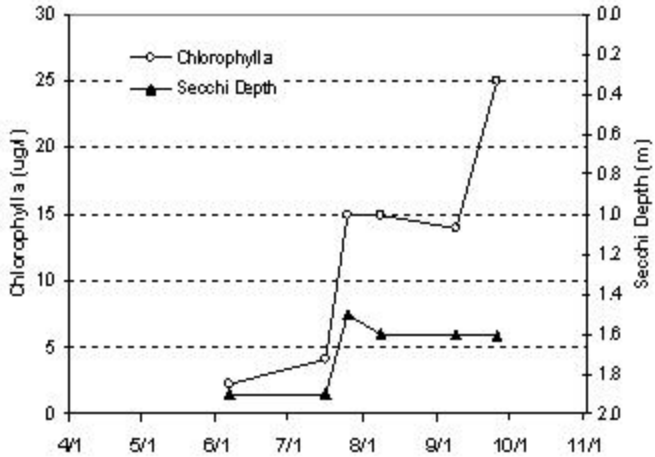
If you know of errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Earley Lake
Burnsville, Dakota Co.

Lake ID: 190033
WMO: Black Dog Lake
Volunteer: Mary Oaster

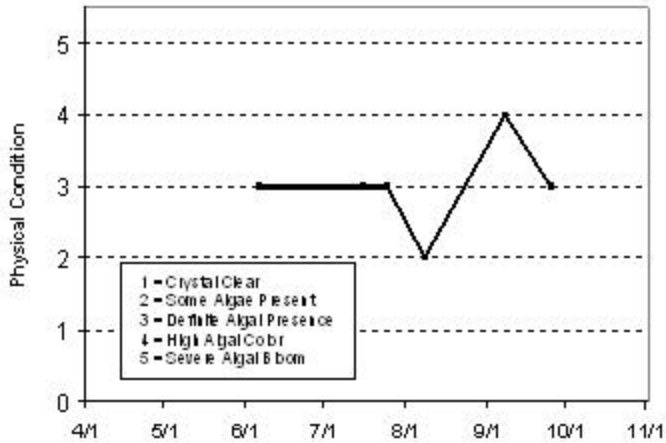






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
6/6/04	26				2.3	24.0		1.9	3	4
7/16/04	30				4.1	28.0		1.9	3	4
7/25/04	30				15	76.0		1.5	3	4
8/8/04	26				15	82.0		1.6	2	4
9/8/04	24				14	73.0		1.6	4	4
9/25/04	22				25	81.0		1.6	3	4

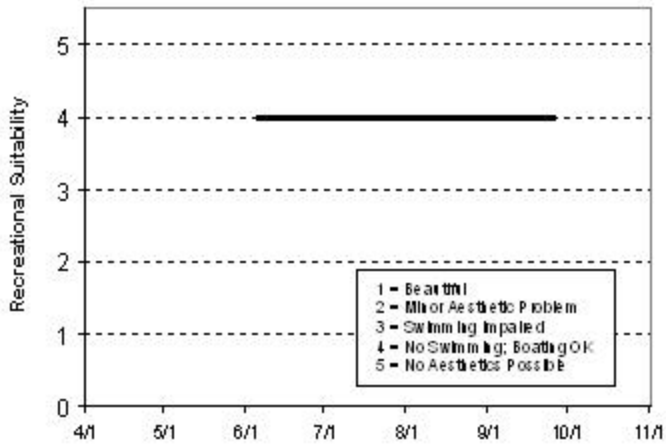


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	C	C	C	C	C	C	C	C	C	C
Chlorophylla			B	B	B	B	B	B	B	B	B	B	B
Secchi Depth			C	C	C	C	C	C	C	C	C	C	C
Overall			C	C	C	C	C	C	C	C	C	C	C

Source: Metropolitan Council and STORET data



East Boot Lake (82-0034) *Carnelian - Marine Watershed district*

East Boot Lake, located in May Township (Washington County), was monitored 14 times between mid-April and mid-October, 2004. The mean and maximum depths of the 47-acre lake are 8.2 m (27 feet) and 0.9 m (3 feet), respectively. The lake's size and mean depth results in an approximate lake volume of 282 ac-ft. Because of the overall shallowness of the lake, roughly 82 percent of the lake's surface area is considered littoral zone (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).

The lake's small 93-acre immediate watershed translates to a small watershed-to-lake size ratio of 2:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the fifth year that East Boot Lake Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake revealed a limited amount of data (1996-2003 and now 2004).

On each sampling date, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	33.3	19.0	49.0	C
CLA (µg/l)	14.5	1.7	37.0	B
Secchi (m)	3.5	1.2	6.4	A
TKN (mg/l)	0.85	0.51	1.20	
			Overall Grade	B

The minimum and maximum Secchi transparency readings represent the largest range in CAMP 2004. The lake's 2004 overall grade is identical to those recorded through CAMP in 1996-1998 and better than the recent grades posted in 1999-2003 (C).

Statistical analysis on the lake's water quality database did not detect any trends. With this in mind however, the lake's recent water quality seems to be well represented by an overall grade of C+/B-. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.0 for physical condition (3- "definite algae present"), and 2.1 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

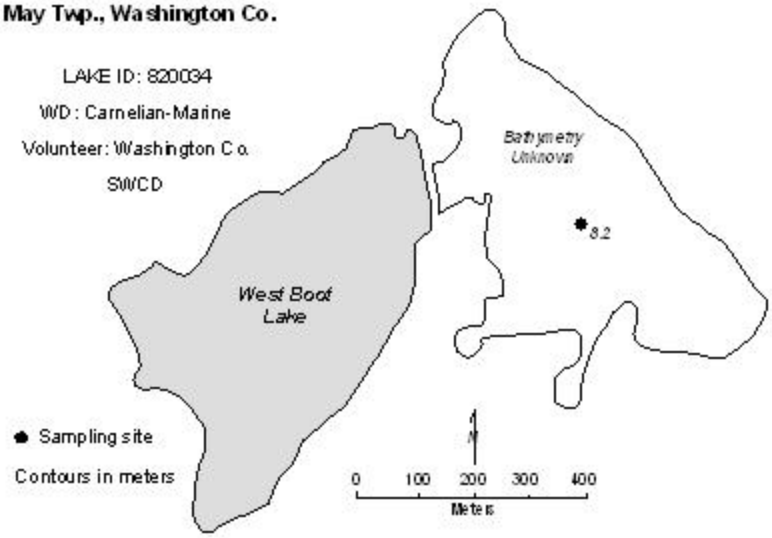
East Boot Lake

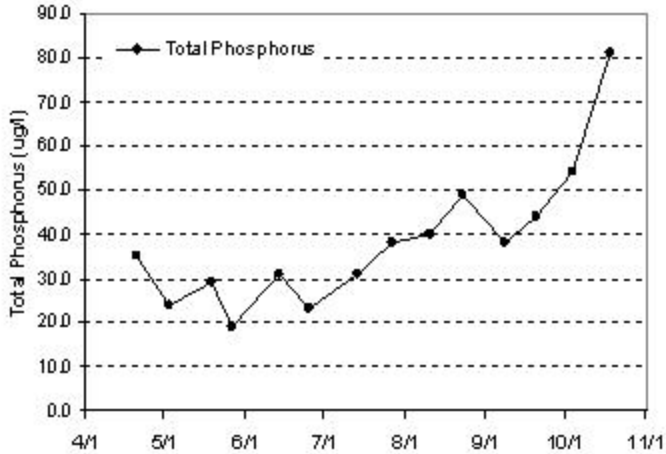
May Twp., Washington Co.

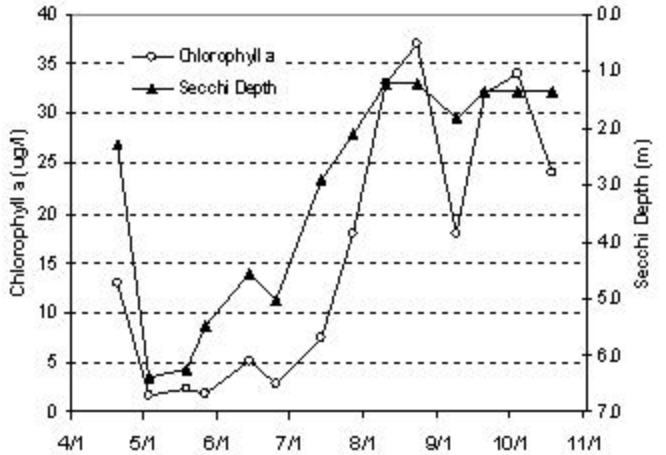
LAKE ID: 820034

WD: Carnelian-Marine

Volunteer: Washington Co. SWCD

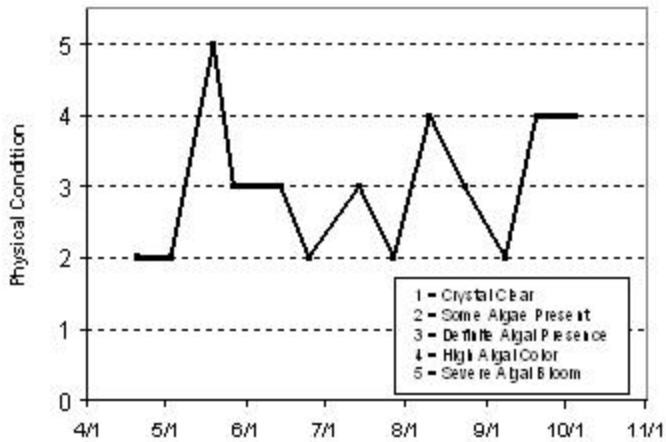






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	12.1	6.1	10.74	0.08	13	35.0		2.3	2	2
5/3/04	13	6.5	9.01	0.01	1.7	24.0		6.4	2	2
5/19/04	17	6.9	9.58	0.02	2.4	29.0		6.2	5	2
5/27/04	16.5	6.8	9.89	0.05	1.8	19.0		5.5	3	2
6/14/04	22.5	7	8.48	0.02	5.1	31.0		4.6	3	3
6/25/04	20.5	7.2	7.79	0.22	2.8	23.0		5.0	2	1
7/14/04	25.8	7.3	8.09	0.16	7.4	31.0		2.9	3	3
7/27/04	25.5	7.3	8.52	0.3	18	38.0		2.1	2	2
8/10/04	22.3	7.5	6.14	0.46	33	40.0		1.2	4	2
8/23/04	20.7	7.6	7.92	0.16	37	49.0		1.2	3	2
9/8/04	21.6	7.8	5.31	0.19	18	38.0		1.8	2	2
9/20/04	20.5	8.1	6.09	0.09	32	44.0		1.4	4	2
10/4/04	15.1	8.2	5.57	0.32	34	54.0		1.4	4	2
10/18/04	10.5	9.6	5.05	0.23	24	81.0		1.4		2

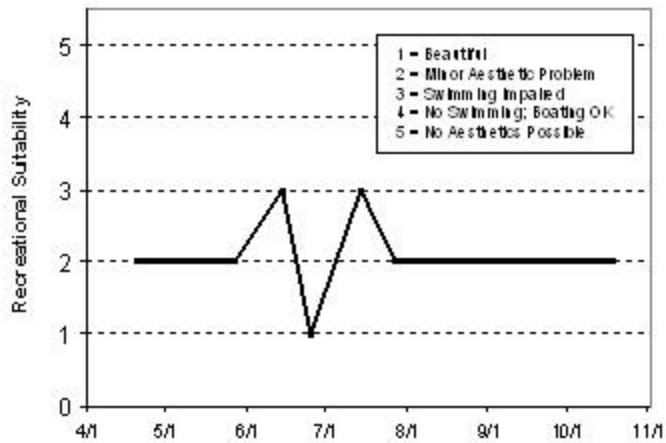


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					B	B	B	C	C	C	C	C	C
Chlorophyll a					B	C	C	C	C	C	C	C	B
Secchi Depth					B	A	B	C	C	C	B	B	A
Overall					B	B	B	C	C	C	C	C	B

Source: Metropolitan Council and STORET data



Edina Lake (27-0029) C*onservation League of Edina*

Edina Lake is a small shallow lake (a maximum depth of approximately 0.8 m (2.6 feet), located within Edina (Hennepin County). Because of the shallowness of the lake, the entire area is considered littoral zone (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). There is very little other known morphological data available for the lake.

Two thousand and four marks the first year in which Lake Edina has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2004 is the only complete, year of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 10 times between early-May and late-September, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	106.1	52.0	209.0	D
CLA (µg/l)	32.2	8.7	80.0	C
Secchi (m)	0.5	0.2	0.8	F
TKN (mg/l)	1.71	1.00	3.00	
			Overall Grade	D

When comparing the lakes TP (nutrient), CLA (algal biomass estimator), and Secchi (water clarity) grades, it is apparent that the TP and Secchi grades (and summer means) are quite a bit worse than the CLA grade. In a most cases, the three should be fairly comparable. One possible explanation for the lake's 2004 findings may be that the majority of the lake's TP comes from either in-lake suspended sediments (re-suspension), or the intrusion of sediment-laden runoff to the lake, which in turn lessens the clarity of the water and inhibits algal growth.

As mentioned earlier, there are no water quality data available for Lake Edina other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 3.0 for physical condition (3- "definite algae present"), and 3.6 for recreational suitability (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

Lake Edina

Edina, Hennepin Co.

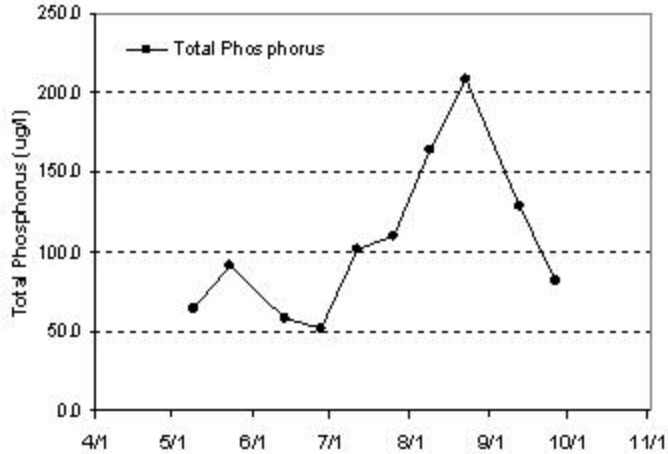
LAKE ID: 270029

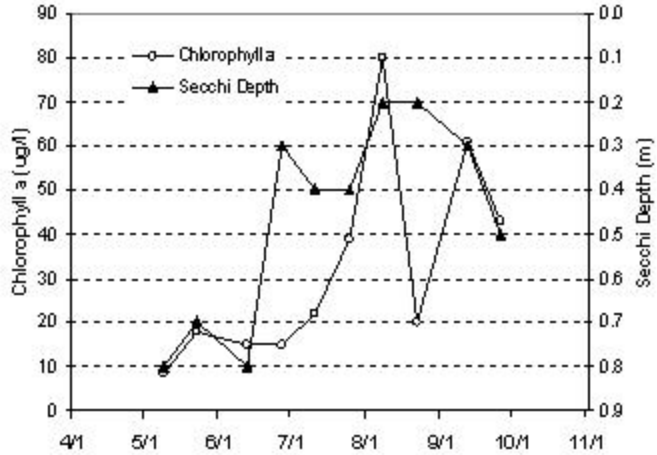
WD: Nine Mile Creek

Volunteer: Conservation League of Edina

◆ Sampling site

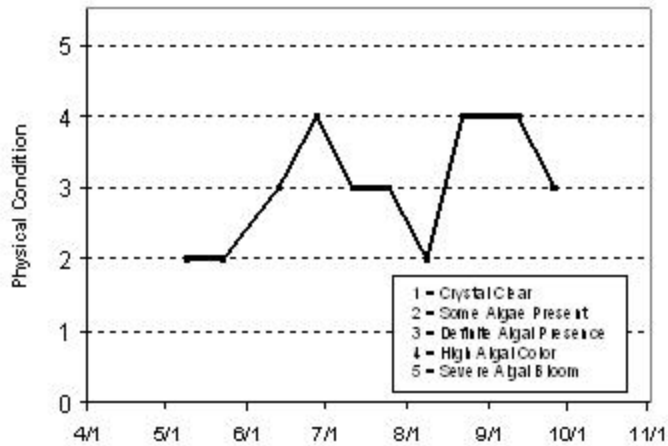
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/9/04	22				8.7	64.0		0.8	2	4
5/23/04	14.7				18	91.0		0.7	2	2
6/13/04	28				15	58.0		0.8	3	4
6/27/04	21.1				15	52.0		0.3	4	4
7/11/04	26.4				22	102.0		0.4	3	2
7/25/04	28.9				39	110.0		0.4	3	4
8/8/04	27.3				80	164.0		0.2	2	4
8/22/04	25.3				20	209.0		0.2	4	4
9/12/04	25.8				61	129.0		0.3	4	4
9/26/04	22				43	82.0		0.5	3	4

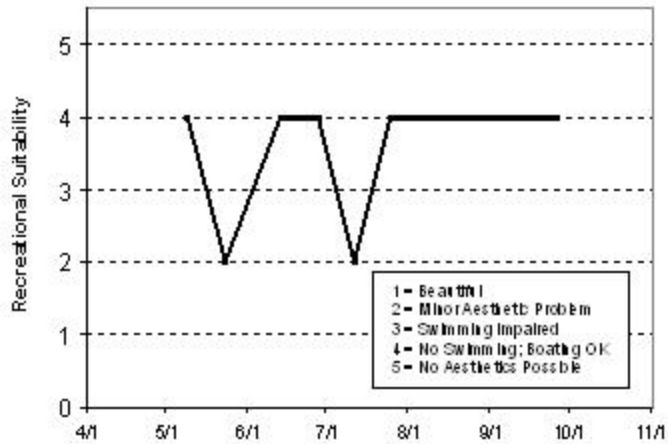


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													D
Chlorophyll a													C
Secchi Depth													F
Overall													D

Source: Metropolitan Council and STORET data



Farquhar Lake (19-0023) *City of Apple Valley*

Farquhar Lake, located in the City of Apple Valley (Dakota County), covers an area of 63 acres and has a maximum depth of 3.0 m (10 feet). The lake's mean depth of 1.4 m (4.6 feet) and surface area translates to an approximate lake volume of 290 ac-ft (the lake volume may have changed over the past couple years due to the lake level rising 1.5 to 2.0 feet above normal). Because the maximum depth is only 3.0 m, the entire 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).

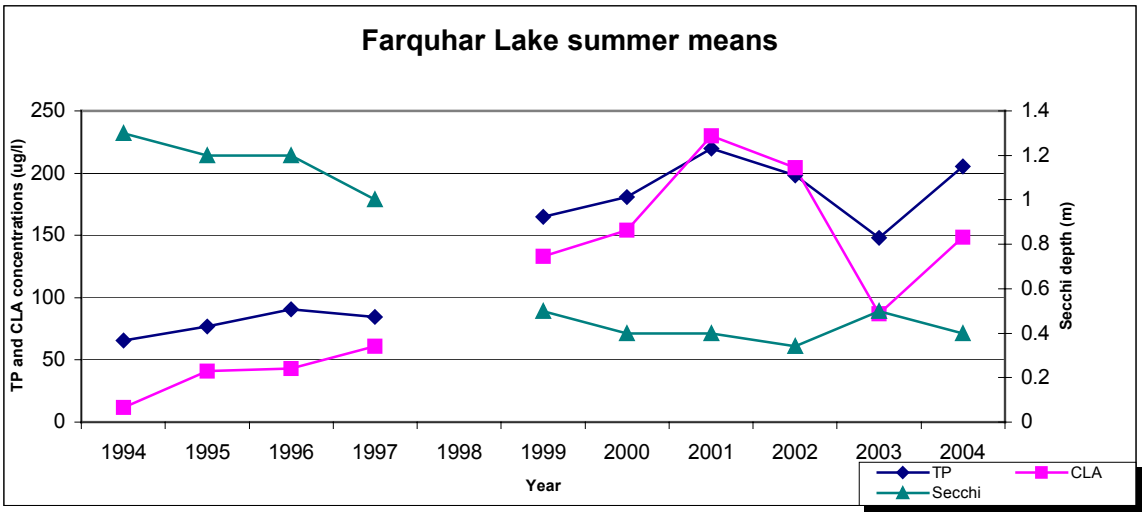
The land uses within the 353-acre contributing watershed to the lake are approximately split between agricultural uses and urban/residential. The watershed-to-lake size ratio is 6:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff).

This was the tenth year that Farquhar Lake has been enrolled in CAMP. The lake was monitored 14 times between mid-April and mid-October, 2004.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	205.6	78.0	377.0	F
CLA (µg/l)	148.5	12.0	360.0	F
Secchi (m)	0.4	0.1	0.9	F
TKN (mg/l)	3.97	1.60	10.0	
			Overall Grade	F

The lake's 2004 means are similar to those of 2000-2002 and worse than those recorded in 2003. The 2004 overall grade however, is identical to those recorded in 1999-2003, and worse than the C's recorded in 1994 and 1996, and the D's of 1995 and 1997.



The above graph clearly depicts the lakes recent (mid-1990s to present) degradation. In fact, a recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant decrease in recent water clarity. The reason for the degradation in the lake's water quality is not entirely

known. A more in-depth study combining watershed as well as in-lake monitoring may help determine the areas contributing the most to the lake's degradation.

Throughout the 2004 season, the volunteer monitor ranked their perceptions of the lake's physical and recreational condition on a 1-to-5 scale. The mean perceived physical condition was 3.6 (falling between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability was 3.3 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

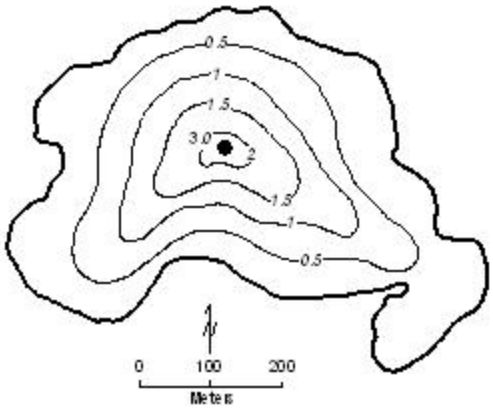
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

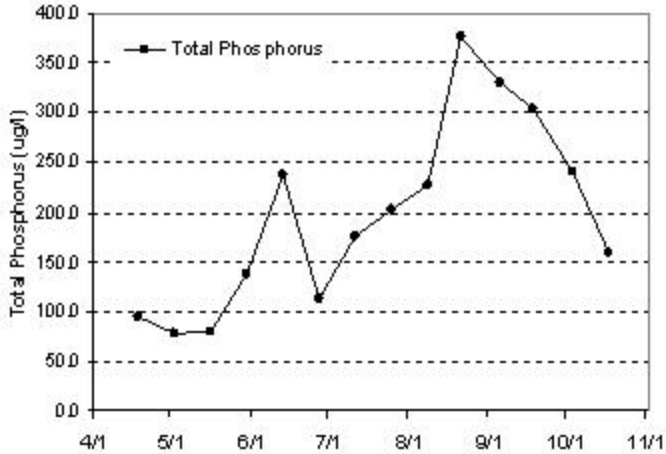
Farquhar Lake

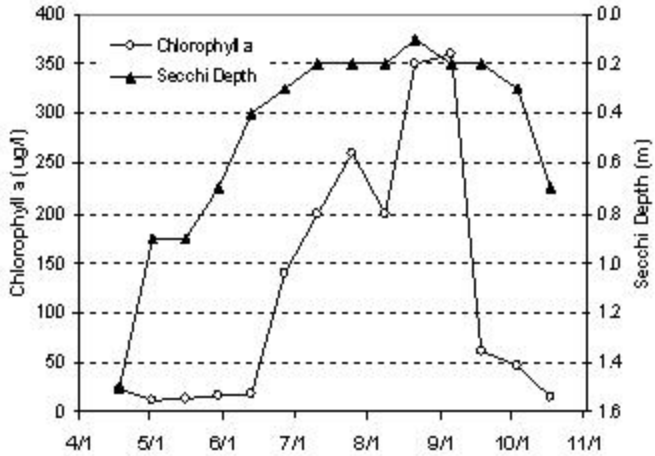
Apple Valley, Dakota Co.

Lake ID: 190023
WMO: Dakota County
Volunteer: Rick Bruneau

● Sampling site
Contours in meters

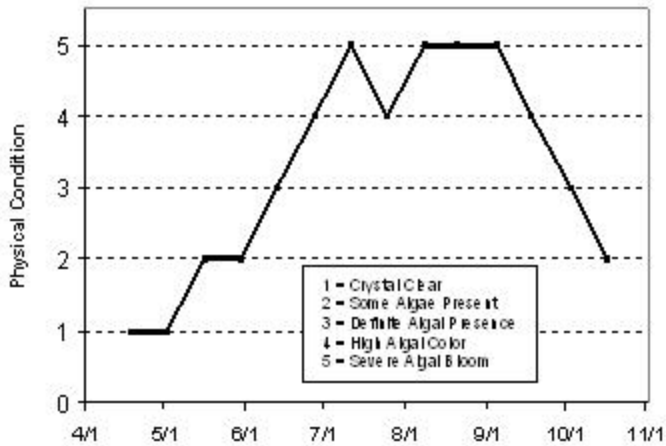






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	13.6				24	94.0		1.5	1	1
5/2/04	11.2				12	78.0		0.9	1	1
5/16/04	24.5				14	80.0		0.9	2	1
5/30/04	25				17	138.0		0.7	2	3
6/13/04	27				18	237.0		0.4	3	3
6/27/04	25.2				140	113.0		0.3	4	4
7/11/04	25.1				200	176.0		0.2	5	4
7/25/04	26.5				260	202.0		0.2	4	4
8/8/04	22.3				200	228.0		0.2	5	4
8/21/04	24.3				350	377.0		0.1	5	4
9/5/04	24.3				360	330.0		0.2	5	4
9/18/04	22				62	303.0		0.2	4	4
10/3/04	19.4				46	241.0		0.3	3	4
10/17/04	10.9				15	160.0		0.7	2	3

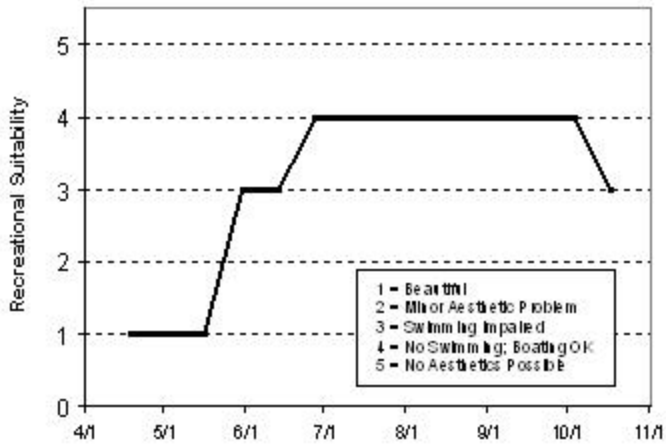


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	D	D	D		F	F	F	F	D	F
Chlorophyll a			B	C	C	D		F	F	F	F	F	F
Secchi Depth			C	D	C	D		F	F	F	F	F	F
Overall			C	D	C	D		F	F	F	F	F	F

Source: Metropolitan Council and STORET data



Fireman's Lake (10-0226) *Carver County Environmental Services*

This was the fourth year that Fireman's Lake (located within the City of Chaska [Carver County]), has been involved in CAMP (the lake was first enrolled in 2001). The 8-acre lake has a maximum depth of 7.0 m (23 feet). Roughly 88 percent of the lake's surface area is considered littoral zone (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.

A search through the STORET nationwide water quality database for data on the lake provided no data. Therefore, 2001-2004 are the only years of available water quality data for the lake.

The lake was monitored 14 times from mid-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	19.0	13.0	32.0	A
CLA (µg/l)	1.6	1.0	2.7	A
Secchi (m)	3.6	1.5	4.2	A
TKN (mg/l)	0.38	0.20	0.67	
			Overall Grade	A

While the lake's 2004 overall grade is identical to those of 2001-2003, the 2004 individual summer means were the best recorded to date.

As mentioned earlier, there are no water quality data available for Fireman's Lake other than the limited 2001-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, more data are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 1.2 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 1.4 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

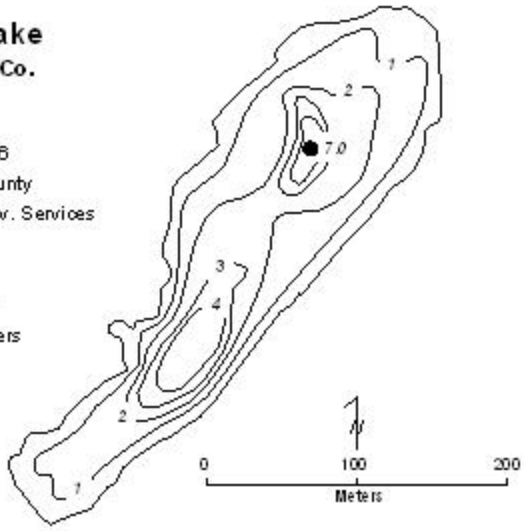
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

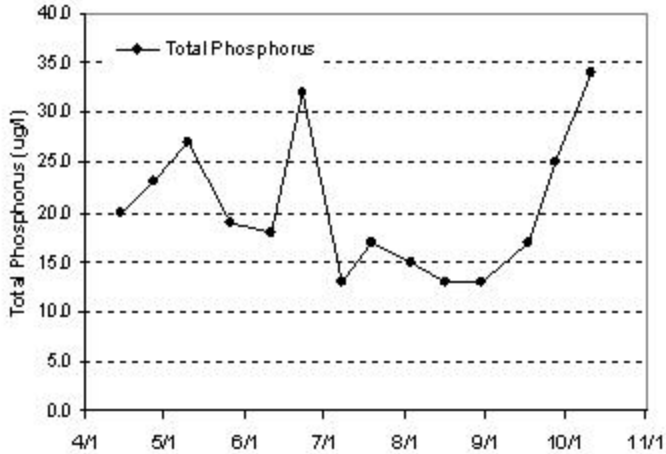
Fireman's Lake

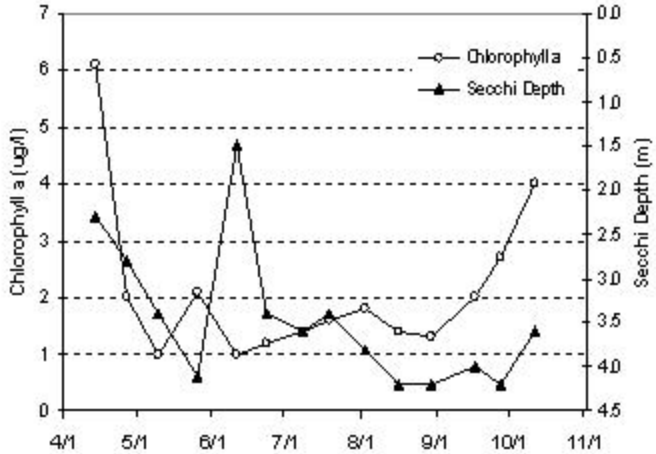
Chaska, Carver Co.

Lake ID: 100226
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling site
Contours in meters

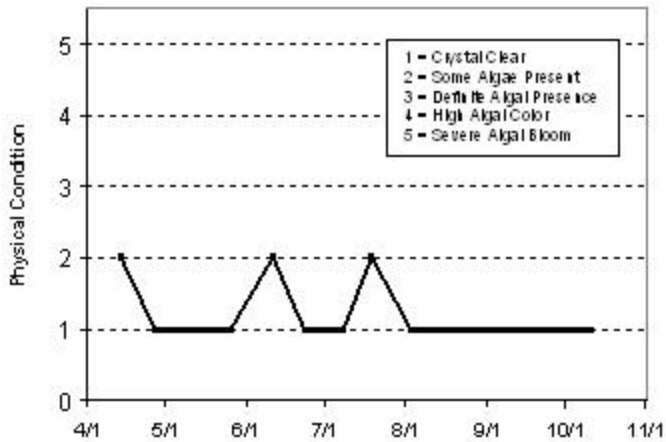






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	10.6		12.8		6.1	20.0		2.3	2	2
4/27/04	13.4		7.6		2	23.0		2.8	1	2
5/10/04	19.1		10.3		1	27.0		3.4	1	2
5/26/04	17.2		8.9		2.1	19.0		4.1	1	1
6/11/04	20.7		12		1	18.0		1.5	2	2
6/23/04	22.7		8.4		1.2	32.0		3.4	1	1
7/8/04	22.7		9.8		1.4	13.0		3.6	1	1
7/19/04	26.6		12.74		1.6	17.0		3.4	2	2
8/3/04	26		12.2		1.8	15.0		3.8	1	1
8/16/04	22.3		10.28		1.4	13.0		4.2	1	2
8/30/04	22.2		9		1.3	13.0		4.2	1	1
9/17/04	18.2		7.2		2	17.0		4.0	1	1
9/27/04	20.4		8.4		2.7	25.0		4.2	1	1
10/11/04	15.8				4	34.0		3.6	1	1

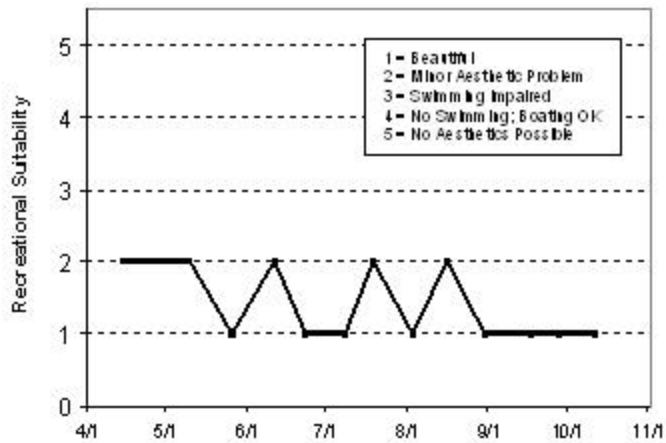


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus										A	A	B	A
Chlorophylla										A	A	A	A
Secchi Depth										B	A	A	A
Overall										A	A	A	A

Source: Metropolitan Council and STORET data



Fish Lake [Grant Township] (82-0137) *Rice Creek Watershed District*

Fish Lake is a 21-acre lake located within the Grant Township (Washington County). The maximum depth of the lake is 10.4 m (roughly 34 feet). Roughly 67 percent of the lake's surface area is considered littoral zone (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).

This was the third year that Fish Lake has been involved in CAMP (2002 being the first). A search through the STORET nationwide water quality database for data on the lake provided no historical data. Therefore 2002-2004 are the only years of available water quality data for the lake.

As part of the watershed's involvement in CAMP in 2004, the lake was monitored four times between early-May and late-June. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

Although there were four monitoring events for Fish Lake in 2004, the data collection was skewed to the early-summer (May and June). For this reason, the determination of a 2004 summer means and resulting grades would not provide a true picture of the lake's water quality in 2004. The lake's 2004 raw data and resulting graphs are presented on the associated lake information page.

The lake's early-summer monitoring results in 2004 were however, in line to those recorded over the past few years.

As mentioned earlier, there are no water quality data available for Fish Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

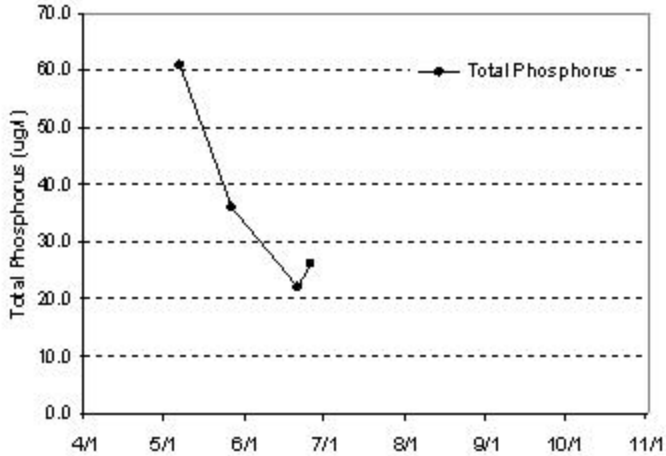
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

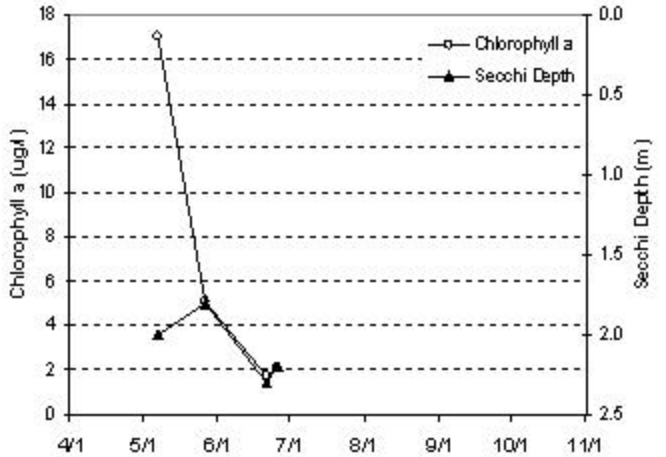
Fish Lake
Grant, Washington Co.

Lake ID: 820137
WD: Rice Creek

Volunteer: Rice Creek Watershed District

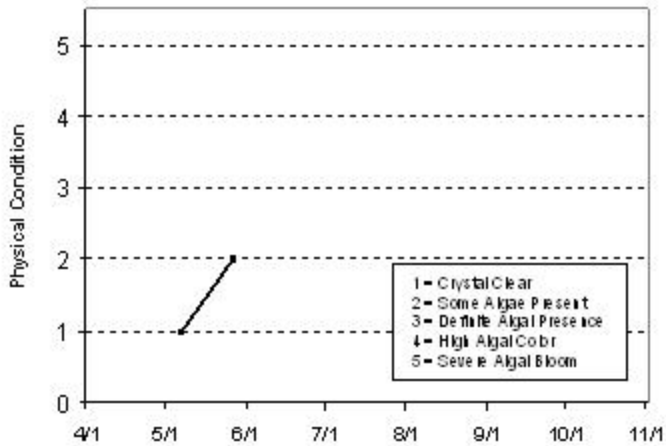
● Sampling site
Contours in meters





2004 Data

Date	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/l)	Bot. DO (mg/l)	CLA (ug/l)	Surf. TP (ug/l)	Bot. TP (ug/l)	Secchi (m)	PC (1-5)	RS (1-5)
5/11/04	14.5		15.1		17	61.0		2.0	1	1
5/27/04	16.6				5.1	36.0		1.8	2	4
6/21/04	22				1.7	22.0		2.3		
6/26/04					2.1	26.0		2.2		

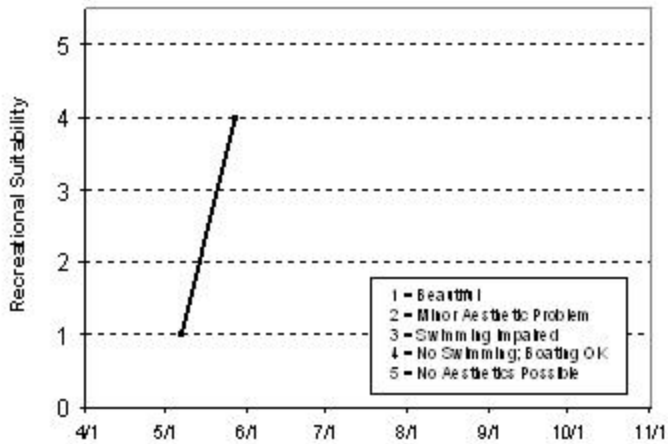


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											F	C	NA
Chlorophyll a											C	C	NA
Secchi Depth											D	C	NA
Overall											D	C	NA

Source: Metropolitan Council and STORET data



Fish Lake [Scott County] (70-0069) *Prior Lake - Spring Lake Watershed District*

Fish Lake is located in Spring Lake Township (Scott County). This was the eighth year that the 171-acre lake has been a part of CAMP. The lake's mean and maximum depth of 4.4 m (14 feet) and 8.5 m (28 feet) translates to an approximate volume of 2,468 ac-ft. Roughly 43 percent of the lake's surface area is considered littoral, that is, the 0-15 foot depth area of the lake dominated by aquatic vegetation. The lake has a 434-acre watershed that, when divided by the surface area of the lake results in a rather small watershed-to-lake size ratio of 2.5:1 (the larger the ratio the greater the potential stress on the lake from surface runoff). The lake is considered a Metropolitan Council "Priority Lake" due to its multi-recreational uses. The lake can be accessed on the northwestern end.

The lake was monitored 11 times between early-May and mid-October, 2004. A search for historic water quality data through Council, MPCA, and STORET files resulted in a few years of data (1980, 1984, 1990, 1995, 1997 [only two monitoring events], and 1998-2004).

The collected data and resulting graphs showing TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	53.6	41.0	104.0	C
CLA (µg/l)	21.0	6.9	32.0	C
Secchi (m)	1.5	0.7	2.3	C
TKN (mg/l)	1.31	1.20	1.50	
			Overall Grade	C

The lakes has received overall grades of C in 1980, 1995, 1997-2000 and 2003-2004, overall grade of B in 2001 and D's in 1984 and 2002.

During each visit, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean physical condition ranking was 2.9 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 3.0 (3- "swimming slightly impaired").

Statistical analysis on the lake's water quality database did not detect any long-term trends, in the short-term however, the lake seems to be very well represented by an overall lake water quality grade of C/C+. To better determine if this indicates a possible trend or is simply a flucuation within the lake's normal range, more data are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

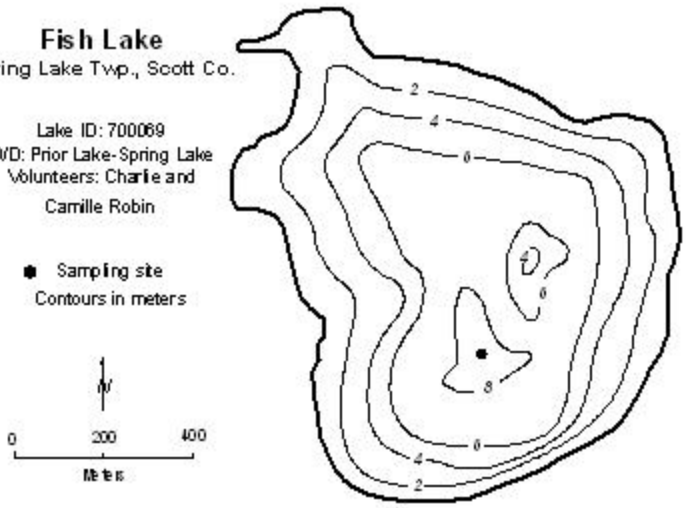
If you know of any erroneous lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

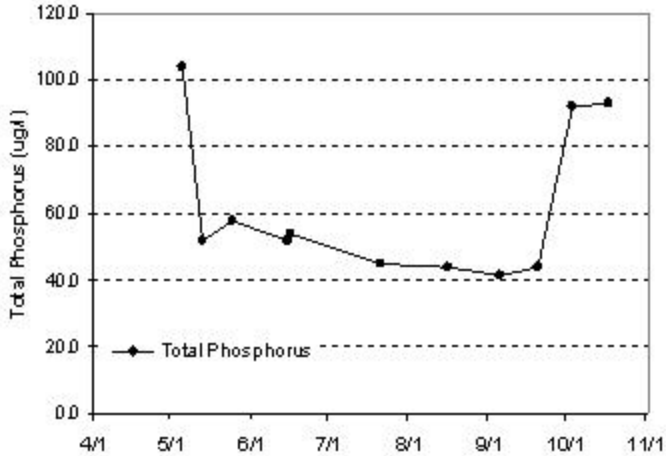
Fish Lake

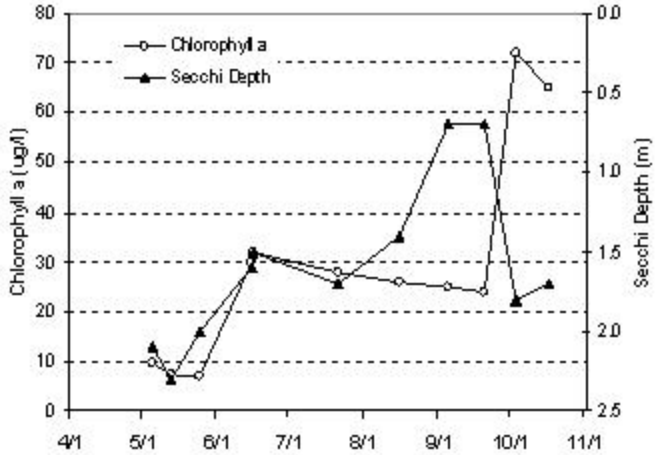
Spring Lake Twp., Scott Co.

Lake ID: 700069
WD: Prior Lake-Spring Lake
Volunteers: Charlie and Camille Robin

Sampling site
Contours in meters

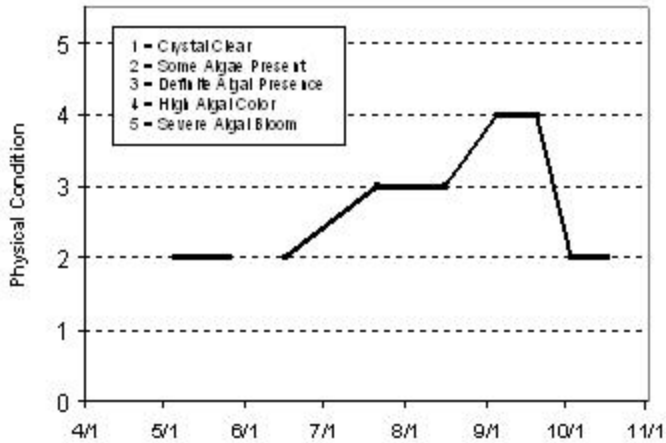






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/5/04	13				9.6	104.0		2.1	2	2
5/13/04	17.6				7.3	52.0		2.3	2	2
5/25/04	15.8				6.9	58.0		2.0	2	2
6/15/04	21				30	52.0		1.6		
6/16/04	22.5				32	54.0		1.5	2	3
7/21/04	23				28	45.0		1.7	3	3
8/16/04	22				26	44.0		1.4	3	3
9/5/04	23				25	41.5		0.7	4	4
9/20/04	23.5				24	44.0		0.7	4	4
10/3/04	11.3				72	92.0		1.8	2	3
10/17/04	10.9				65	93.0		1.7	2	2

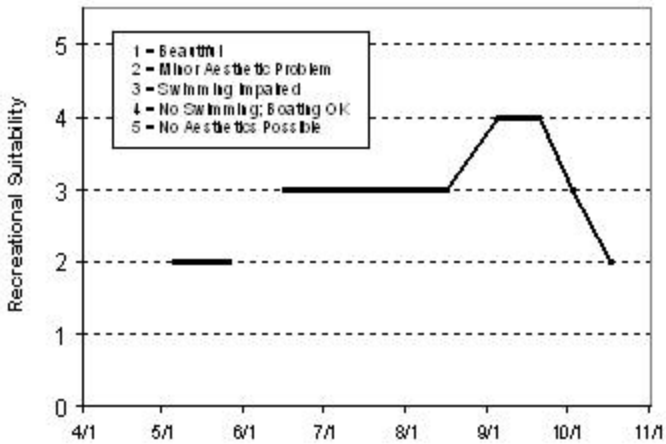


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C				D							
Chlorophyll a	C				D						C	
Secchi Depth	D				D						C	
Overall	C				D							

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				C		C	C	C	C	C	D	C	C
Chlorophyll a				C		C	C	C	C	B	C	C	C
Secchi Depth				D		C	C	C	B	B	D	B	C
Overall				C		C	C	C	C	B	D	C	C

Source: Metropolitan Council and STORET data



Fish Lake [Washington County] (82-0064) *Carnelian - Marine Watershed District*

Fish Lake is located in New Scandia Township in Washington County. The lake has a surface area of 72 acres, and a maximum and mean depth of 3.0 m (10 feet) and 1.5 m (5 feet), respectively. Because of the shallowness of the lake, its entire surface area is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation, and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The mean depth and surface area of the lake translates to an approximate volume of 360 ac-ft.

The lake's watershed area of 683 acres translates to a watershed-to-lake size ratio of 9.5:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff).

This was the fourth year that Fish Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake revealed a limited amount of data collected. Water quality data were found for 1998-2003 and now 2004.

The lake was monitored seven times between late-April and mid-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	108.6	64.0	180.0	D
CLA (µg/l)	87.8	23.0	180.0	F
Secchi (m)	0.9	0.3	1.4	D
TKN (mg/l)	2.16	1.40	3.20	
			Overall Grade	D

The resulting overall grade for 2004 is identical to that recorded in 2002, and better than those of 1998-2001 and 2003. The lake's 2004 nutrient concentrations and Secchi transparencies are graphed on the following page.

Because of the limitedness of the lake's water quality database, the determination of any long-term trends is not possible to determine. In the short-term, the lake seems well represent by the overall grade of F. To better understand the lake's water quality and what direction it may be heading, more years of data collection are needed.

The perceived physical and recreational conditions of the lake, recorded by the volunteers, were ranked on a 1-to-5 scale. The rankings are shown in both tabular and graphical form on the lake's associated information sheet. The mean physical condition ranking was 3.4 (between 3- "definite algae present" and 4- "high algae color"), while the mean recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Fish Lake

New Scandia Twp., Washington Co.

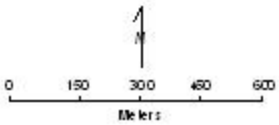
LAKE ID: 820064

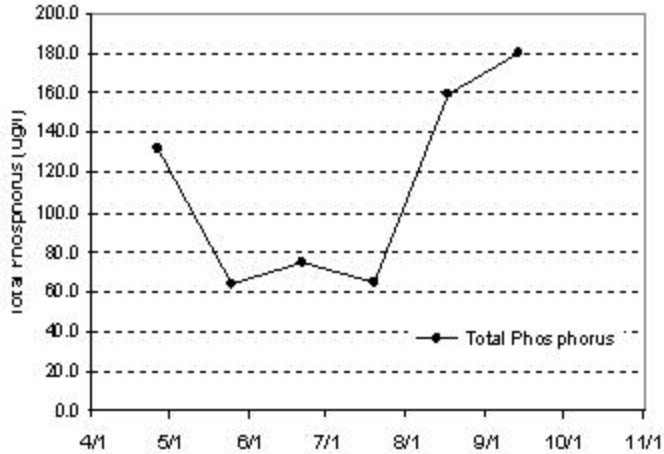
WD: Carnelian-Marine

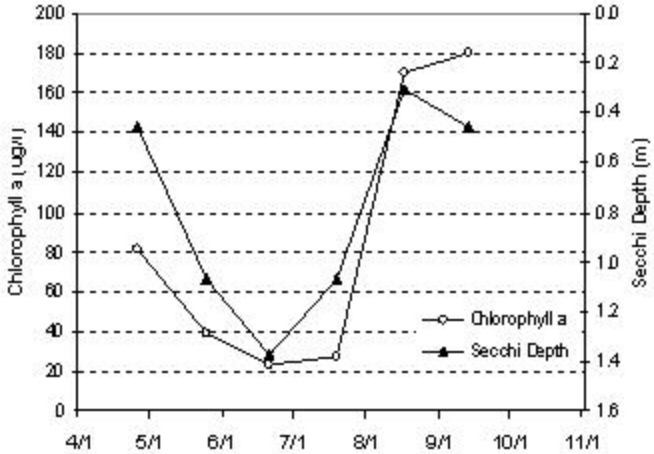
Volunteer: Washington Co. SWCD

● Sampling site

Contours in meters

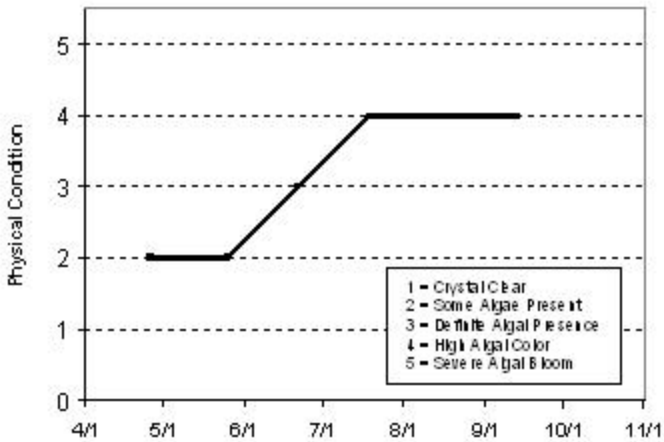






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.9	11.9	11.11	0.05	81	132.0		0.5	2	4
5/25/04	15.6	14.4	7.17	0.07	39	64.0		1.1	2	2
6/21/04	21.4	19.7	8.02	0.06	23	75.0		1.4	3	2
7/19/04	25.7	21.6	7.03	0.3	27	65.0		1.1	4	2
8/17/04	20.5	18.6	9.44	0.24	170	159.0		0.3	4	2
9/13/04	21	20.8	5.91	0.25	180	180.0		0.5	4	2

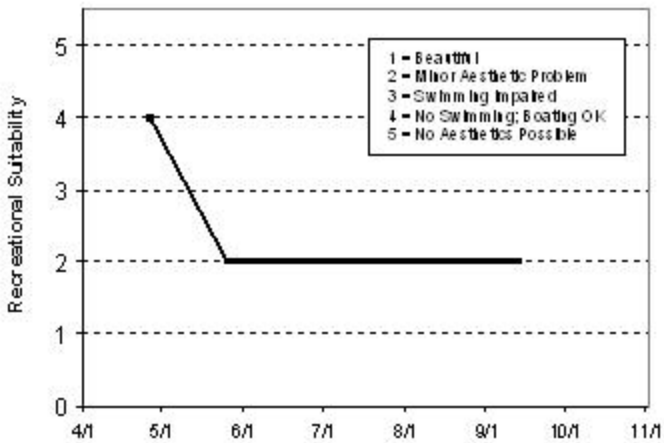


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus							F	F	D	D	D	D	D
Chlorophyll a							D	D	F	F	D	F	F
Secchi Depth							F	F	F	F	D	F	D
Overall							F	F	F	F	D	F	D

Source: Metropolitan Council and STORET data



Forest Lake [West Basin] (82-0159) *Comfort Lake-Forest Lake Watershed District*

Forest Lake is divided into three distinct basins; however, only the west basin was monitored through CAMP in 2004. Because of the lake's multi-recreational uses it is considered a "Priority Lake" in the Metropolitan Area. One problem that may possibly hinder future recreational activity on the lake, however, is Eurasian Water Milfoil (*Myriophyllum spicatum*), which has been reported in the lake.

The entire 2,249-acre lake is located within the City of Forest Lake (Washington County). The acreage of each basin is as follows: west basin= 1,109 acres, middle basin= 360 acres, and the east basin= 780 acres. While the lake as a whole has a maximum and mean depths of 11.5 and 3.4 m (38 and 11 feet), the western basin itself has a mean and maximum depth of 3.0 m and 6.7 m (10 and 22 feet). The total volume of the whole lake is 24,986 ac-ft, and depending on hydrologic conditions has an 8-12 year residence time. Roughly 68 percent of the lake's surface area is considered littoral, (the shallow [0-15 feet] area dominated by aquatic plants). The 4,285-acre watershed translates to a rather small watershed-to-lake area ratio of 2:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). The lake has nine public accesses, 14 inlets and one outlet.

This was the tenth year that the west basin of Forest Lake has been involved in CAMP (the previous being 1993, and 1996-2003). In 2004, the west basin of Forest Lake was monitored 14 times between late-April and late-October. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

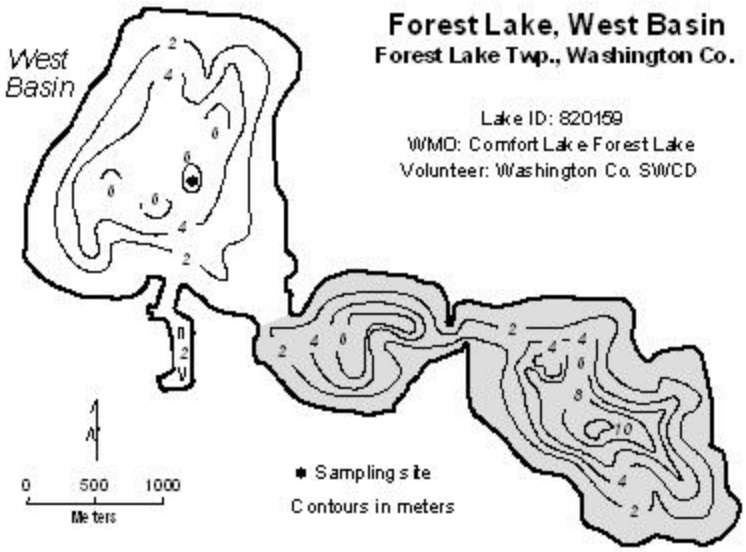
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	30.4	17.0	55.0	B
CLA (µg/l)	9.3	2.5	16.0	A
Secchi (m)	2.2	1.4	3.8	B
TKN (mg/l)	0.71	0.50	0.89	
			Overall Grade	B

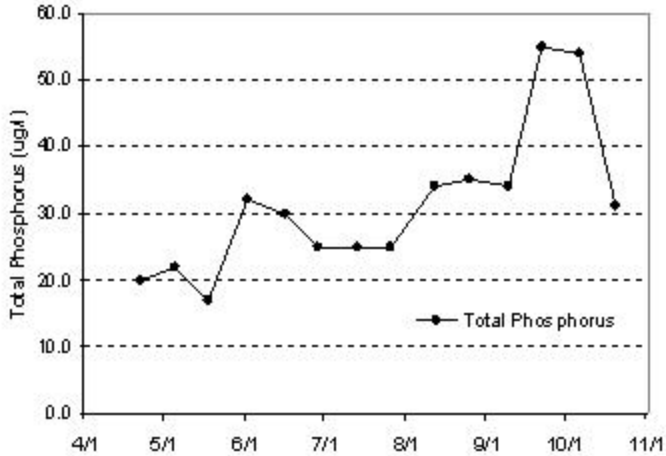
Given the volatility of the lake's annual water quality (the lake received overall water quality grades of C in 1984, 1986, 1988, 1991, 1992, 1999-2000, and 2002-2003 and B in 1989, 1997-1998, 2001 and 2004), no definitive long-trends can be determined at this time. The lake's water quality fluctuates between and B and C, depending on annual climatological conditions.

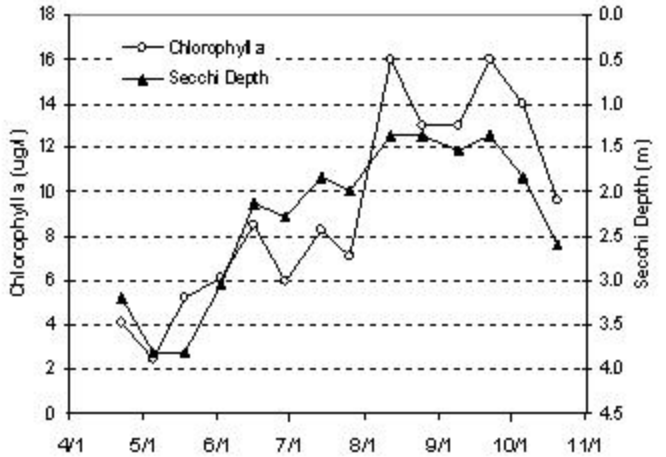
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean perceived physical condition of the west basin of Forest Lake was 2.3 (ranking between 2- " some algae present" and 3- "algae present"), while the mean recreational suitability was 1.9 (roughly equal to 2- "minor aesthetics problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

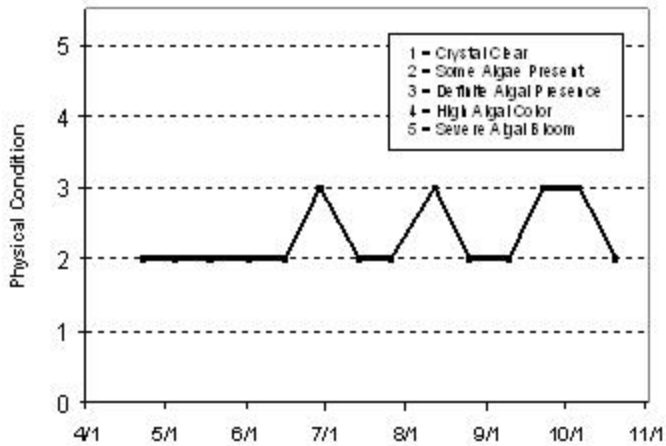






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	11.2	11.1	9.46	0.5	4.1	20.0		3.2	2	2
5/5/04	12.6	12.5	9.77	0.1	2.5	22.0		3.8	2	2
5/18/04	15	14.7	7.84	0.1	5.2	17.0		3.8	2	1
6/2/04	15.6	15.3	8.79	0.12	6.1	32.0		3.0	2	2
6/16/04	21.8	19.1	8.23	0.09	8.5	30.0		2.1	2	2
6/29/04	19.7	19.5	7.76	7.25	6	25.0		2.3	3	2
7/14/04	23.7	22.8	7.93	0.21	8.3	25.0		1.8	2	2
7/26/04	25.2	23.1	7.37	0.4	7.1	25.0		2.0	2	2
8/12/04	18.9	18.7	7.62	0.35	16	34.0		1.4	3	2
8/25/04	20	19.7	7.17	0.08	13	35.0		1.4	2	2
9/9/04	20.5	20.1	7.23	0.54	13	34.0		1.5	2	2
9/22/04	19.6	19.4	5.94	5.11	16	55.0		1.4	3	2
10/6/04	12.7	12.7	7.4	0.25	14	54.0		1.8	3	2
10/20/04	9	9.1	7.32	0.09	9.6	31.0		2.6	2	2

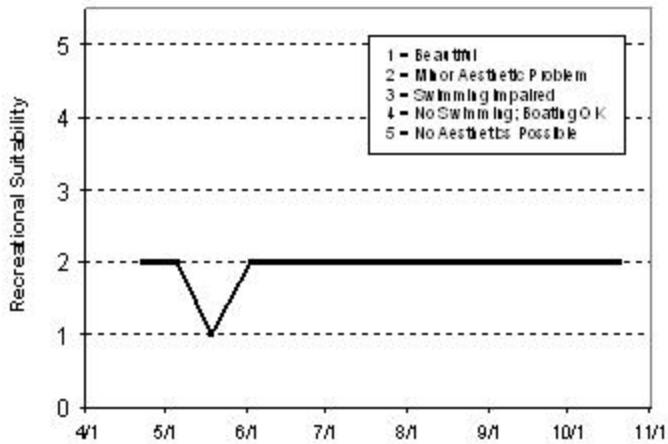


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					C		C	C	C	B		C
Chlorophyll a					C		C		C	B	C	B
Secchi Depth					C		C	C	C	C	C	C
Overall					C		C		C	B		C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C			C	B	B	C	C	B	C	C	B
Chlorophyll a		B			B	B	B	B	B	B	B	B	A
Secchi Depth		C			C	C	C	C	C	C	C	C	B
Overall		C			C	B	B	C	C	B	C	C	B

Source: Metropolitan Council and STORET data



French Lake (27-0127) *Elm Creek Watershed Management Commission*

This was the fourth year that the French Lake, located within the boundaries of Dayton (Hennepin County), has been involved in CAMP. The 352-acre lake has a maximum depth of 1.0 m (roughly 3 feet). A search through the STORET nationwide water quality database for data on the lake provided limited data (just Secchi data in 1985). Therefore, the 2001- 2004 CAMP data are the only known available nutrient water quality data for the lake.

The lake was monitored seven times from early-May to mid-October, 2004. Once again, the dry late-summer conditions resulted in the lake becoming un-navigable. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	164.5	32.0	577.0	F
CLA (µg/l)	107.2	5.0	610.0	F
Secchi (m)	0.7	0.5	1.1	D
TKN (mg/l)	2.73	1.40	8.50	
			Overall Grade	F

The lake's 2004 water quality grades are similar to those recorded in 2002-2003 and worse than that of 2001 [D]).

As mentioned earlier, there was little water quality data found for French Lake prior to the 2001 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, more data are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.8 for physical condition (between 2- "some algae present" and 3- "denfinite algae present"), and 4.7 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aesthics possible").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

French Lake
Dayton, Hennepin Co.

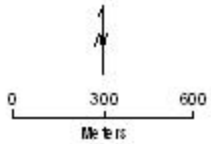
LAKE ID: 270127

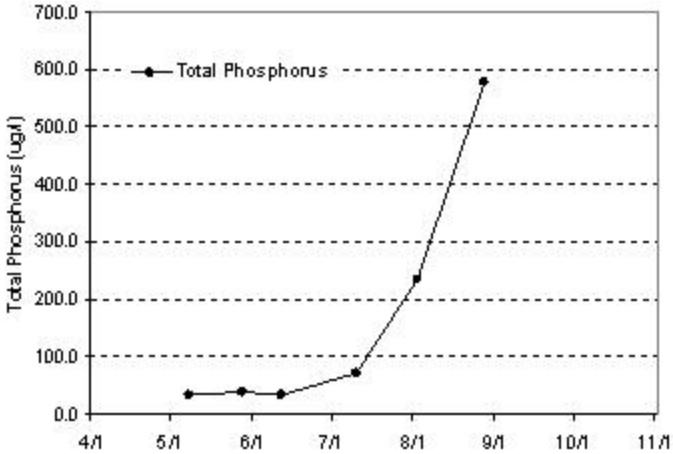
WMO: Elm Creek

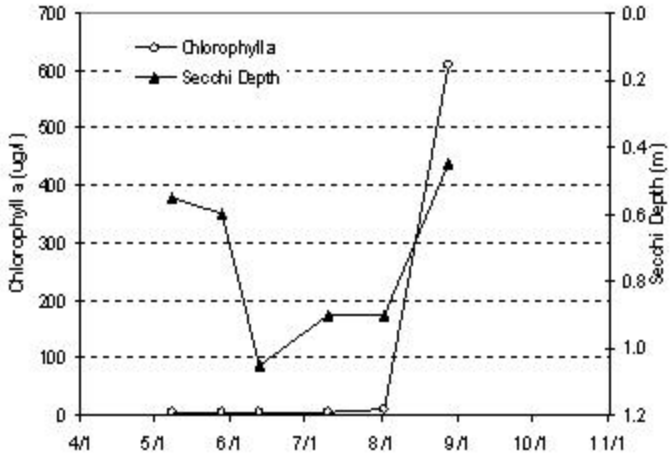
Volunteer: Steve Fowler

● Sampling site

Contours in meters

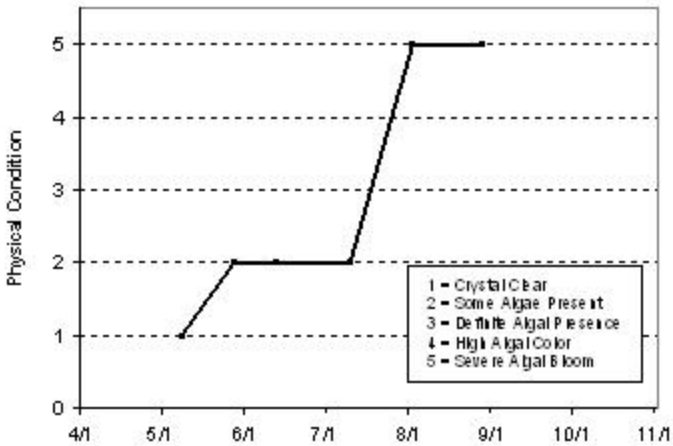






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/6/04	11.2				5.8	32.0		0.6	1	4
5/28/04	20.7				6.8	38.0		0.6	2	5
6/12/04	18.4				5	34.0		1.1	2	4
7/10/04	23.2				5.9	72.0		0.9	2	5
8/2/04	27.6				9.6	234.0		0.9	5	5
8/28/04	20.7				610	577.0		0.5	5	5
10/12/04	15.1				140	251.0		0.3	4	5

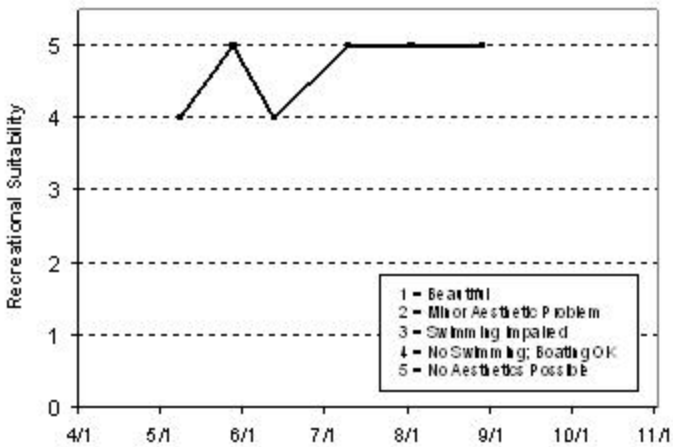


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth						F						
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus										F	F	F	F
Chlorophyll a										C	F	F	F
Secchi Depth										F	F	F	D
Overall										D	F	F	F

Source: Metropolitan Council and STORET data



George Watch Lake (2-0005) *Rice Creek Watershed District*

This was the ninth year that George Watch Lake, located in the City of Lino Lakes (Anoka County), has been enrolled in CAMP. The lake was monitored nine times from early-May to late-September, 2004. The 528-acre lake, which has a canoe access on its eastern side, has a mean and maximum depth of 1.5 m (5 feet) and 2.0 m (6.5 feet). The lake's approximate volume is 2,587 ac-ft and because of the shallowness of the lake, it is entirely littoral zone (the area of aquatic plant dominance) and never develops and maintains a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column) through the summer months. The major land use within the lake's immediate watershed is undeveloped/park.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	199.0	69.0	451.0	F
CLA (µg/l)	58.5	13.0	220.0	D
Secchi (m)	0.7	0.2	1.1	F
TKN (mg/l)	2.69	1.00	5.60	
			Overall Grade	F

The lake's data reveal overall grades of D in 1982-1983, 1985, 1987-1988, 1990, 1997, 1999-2000 and 2003, and F in 1981, 1989, 1991, 1996, 1998, 2001-2002, and 2004.

A search through the STORET database for historic data on George Watch showed that the lake has been monitored several times in the past. There are nutrient data available for 1981-1983, 1985-1991, and 1996-2004. The lake's overall lake water quality grades seem to indicate that the lake water quality has remained fairly constant fluctuating between an F and D grade throughout the 20+ years of data. The TP and Secchi data has remained fairly consistent throughout the monitoring years, but the CLA seems to fluctuate greatly. A reason for the fluctuating CLA means while the Secchi and TP numbers remain fairly constant could be the amount of sedimentation that could at times be limiting the amount of light available for algal growth thus keeping CLA low and vice versa

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The summertime mean physical condition was 3.0 (3- "definite algae present"). The mean suitability for recreation ranking was 3.9 (roughly equal to 4- "no swimming - boating ok").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

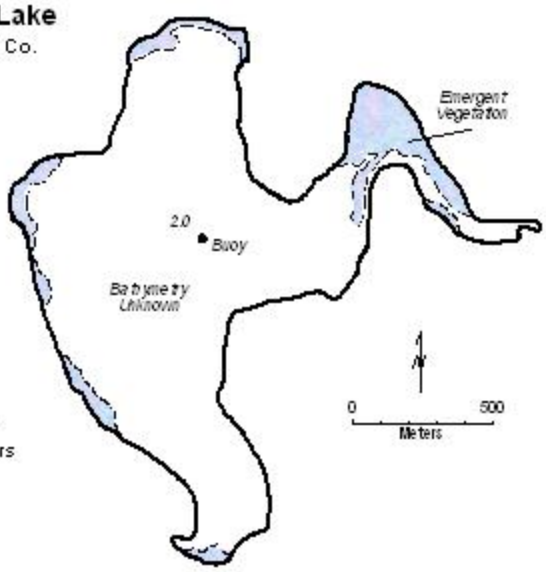
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

George Watch Lake

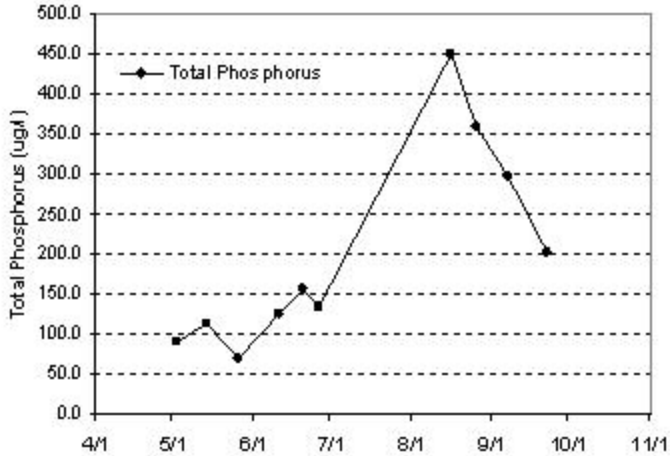
Lino Lakes, Anoka Co.

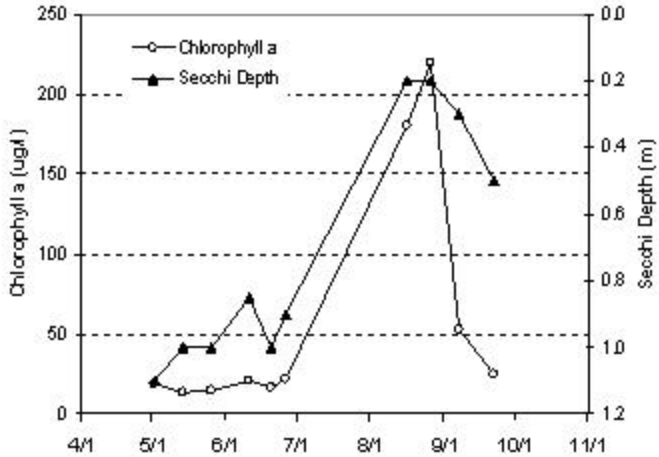
Lake ID: 20005
WD: Rice Creek

Volunteer:
Wargo Nature Center



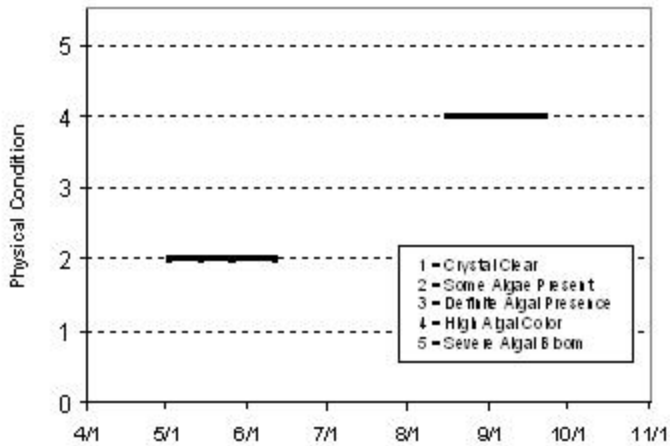
● Sampling site
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/2/04	18				19	89.0		1.1	2	3
5/14/04	20				13	111.0		1.0	2	4
5/26/04	18				15	69.0		1.0	2	4
6/11/04	22.5				21	125.0		0.9	2	4
6/20/04	24				17	155.0		1.0		4
6/26/04	21				22	133.0		0.9		
8/16/04	22				180	451.0		0.2	4	4
8/26/04	24				220	359.0		0.2	4	4
9/7/04	20.5				53	296.0		0.3	4	4
9/22/04	21				25	202.0		0.5	4	4

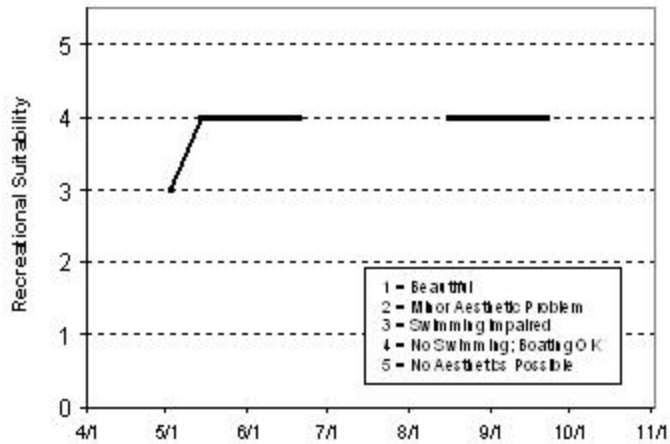


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus		F	F	F		F		F	F	F	F	F
Chlorophyll a		F	C	B		B		C	B	D	C	F
Secchi Depth		F	D	F		F		F	F	F	D	F
Overall		F	D	D		D		D	D	F	D	F

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					F	D	F	D	D	F	D	F	F
Chlorophyll a					D	C	D	C	C	F	D	C	D
Secchi Depth					F	F	F	D	F	D	F	D	F
Overall					F	D	F	D	D	F	D	D	F

Source: Metropolitan Council and STORET data



German Lake (82-0056) *Carnelian – Marine Watershed District*

German Lake is a 109-acre lake located in New Scandia Township (Washington County). There is very little known morphological data available for the lake.

This was the third year that German Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided no data, therefore 2002-2004 are the only years of available water quality data for the lake.

As part of the watershed's involvement in CAMP in 2004, the lake was monitored seven times between late-April and early-October. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	23.8	18.0	32.0	B
CLA (µg/l)	3.5	2.0	5.7	A
Secchi (m)	2.7	2.4	3.0	B
TKN (mg/l)	0.59	0.47	0.77	
			Overall Grade	B

The lake 2004 overall water quality grade is similar to those recorded in 2002 and 2003.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 1.8 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 2.6 (between 2- "minor aesthetic problems"and 3- "swimming slightly impaired").

As mentioned earlier, there are no water quality data available for German Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

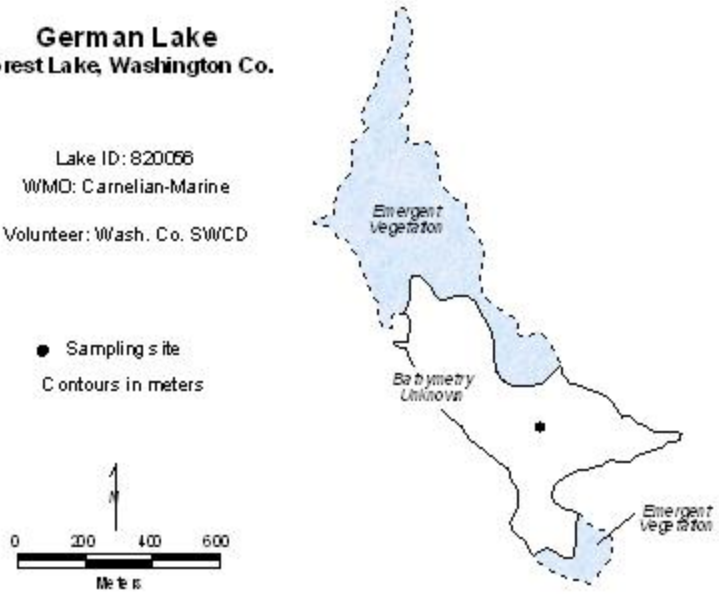
German Lake
Forest Lake, Washington Co.

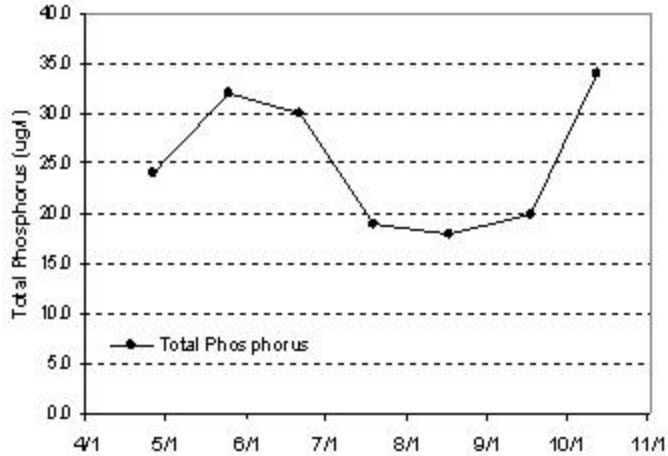
Lake ID: 820056
WMO: Carnelian-Marine

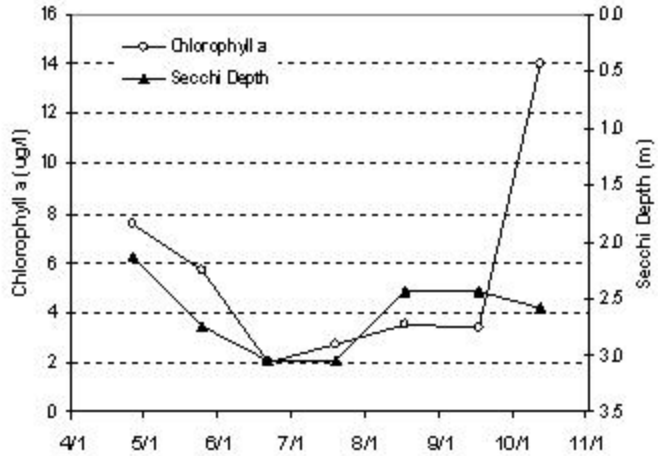
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

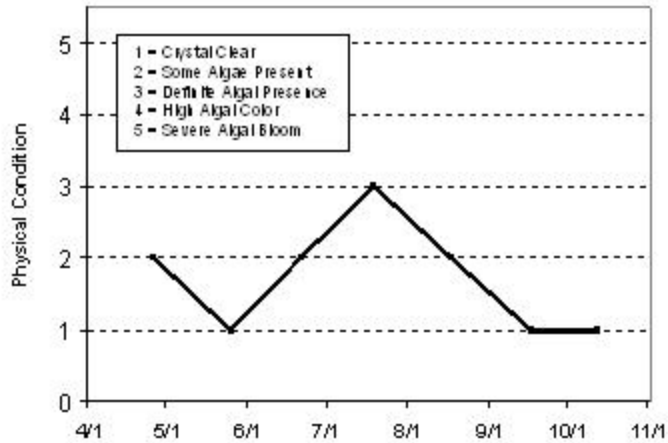






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	17.5	11.5	10.2	0.55	7.6	24.0		2.1	2	2
5/25/04	14.7	14.2	8.84	1.05	5.7	32.0		2.7	1	2
6/21/04	20.8	20.2	9.29	0.04	2	30.0		3.0	2	2
7/19/04	25.4	23.9	7.64	0.3	2.7	19.0		3.0	3	3
8/17/04	20.5	19.8	8.01	1.16	3.5	18.0		2.4	2	3
9/17/04	19.4	19.3	5.48	0.09	3.4	20.0		2.4	1	3
10/12/04	14.3	14	6.87	1.71	14	34.0		2.6	1	3

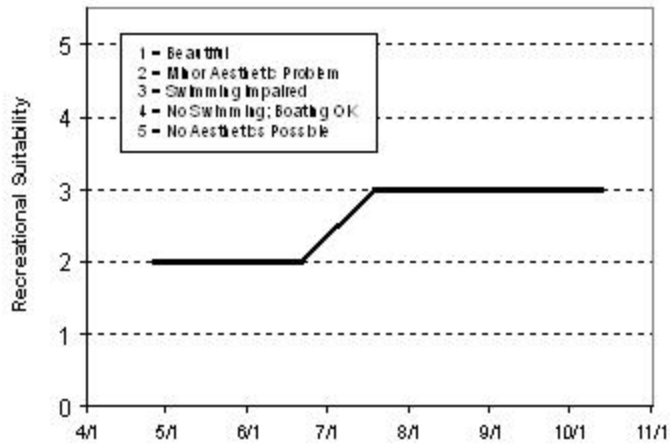


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											B	B	B
Chlorophyll a											A	A	A
Secchi Depth											C	B	B
Overall											B	B	B

Source: Metropolitan Council and STORET data



Goetschel Lake (82-0313) *Valley Branch Watershed District*

Goetschel Lake is located in Grant Township (Washington County). This was the second year that the 23-acre lake has been a part of CAMP. The lake's mean and maximum depth of 1.2 m (4 feet) and 4.2 m (14 feet) translates to an approximate volume of 92 ac-ft. Because of the shallowness of the lake, its entire surface area is considered littoral, that is, the 0-15 foot depth area of the lake dominated by aquatic vegetation. The lake has a 4,317-acre watershed that, when divided by the surface area of the lake results in a large watershed-to-lake size ratio of 188:1 (the larger the ratio the greater the potential stress on the lake from surface runoff).

A search through the STORET nationwide water quality database for data on the lake provided no data, therefore 2002-2004 are the only years of available water quality data for the lake.

As part of the watershed's involvement in CAMP in 2004, the lake was monitored four times between late-June and mid-August. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	28.5	18.0	56.0	B
CLA (µg/l)	12.7	6.9	21.0	B
Secchi (m)	1.5	1.4	1.7	C
TKN (mg/l)	0.59	0.54	0.93	
			Overall Grade	B

The lakes 2004 overall water quality grade is identical to those recorded in 2002 and 2003.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 2.3 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 3.5 (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

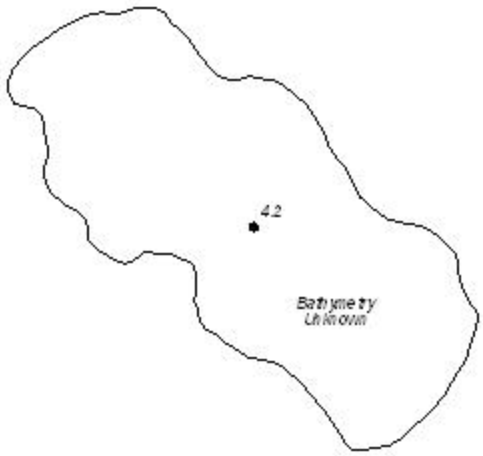
As mentioned earlier, there are no water quality data available for Goetschel Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Goetschel Pond
Lake Elmo, Washington Co.

Lake ID: 820313
WD: Valley Branch

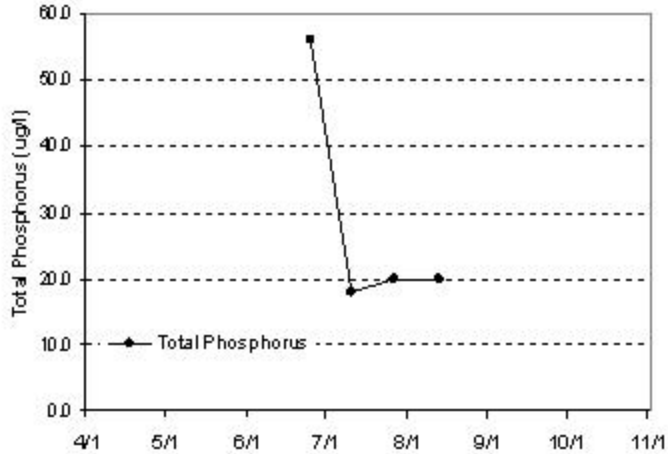
Volunteers: Allan and Linda Kellar

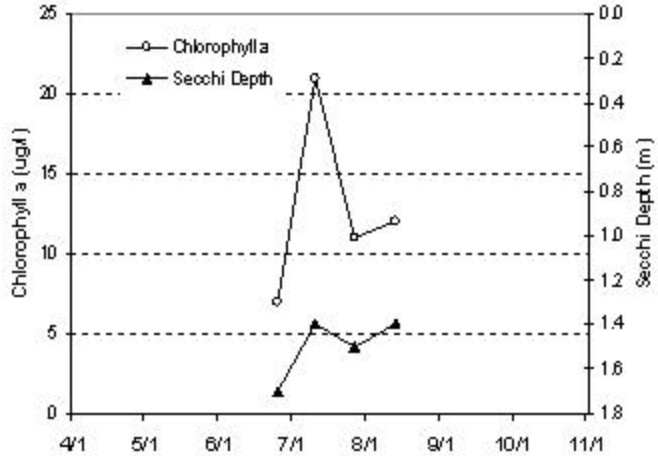


Sampling site
Contours in meters

N

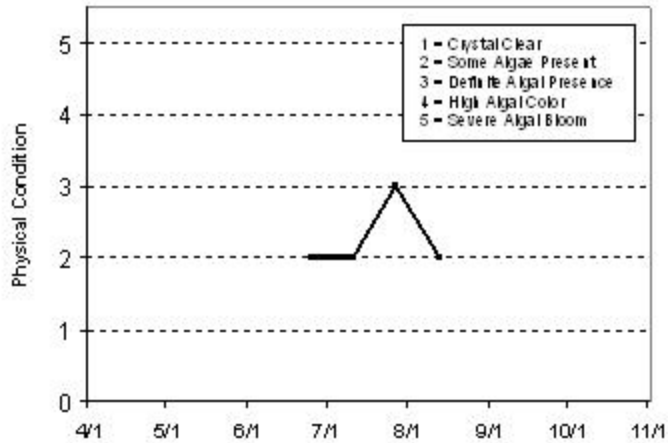
0 100 200
Meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
6/25/04	24.7				6.9	56.0		1.7	2	2
7/11/04	28.8				21	18.0		1.4	2	4
7/27/04	27.7				11	20.0		1.5	3	4
8/13/04	24.2				12	20.0		1.4	2	4

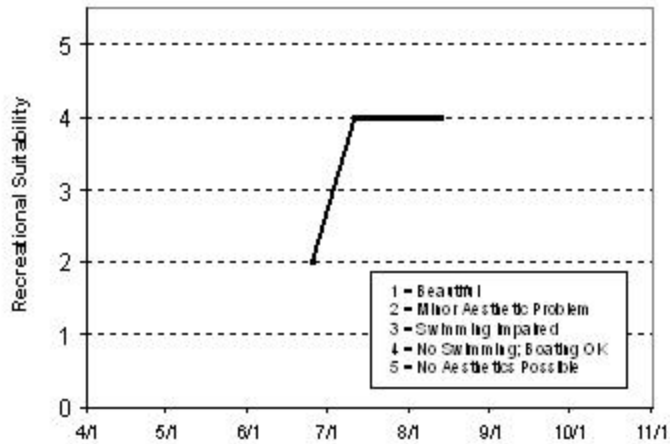


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											C	C	B
Chlorophyll a											A	A	B
Secchi Depth											C	B	C
Overall											B	B	B

Source: Metropolitan Council and STORET data



Goggins Lake (82-0077) *Browns Creek Watershed District*

Goggins Lake is an 11-acre lake located within May Township (Washington County). Because of the shallowness of the lake, the entire area is considered littoral zone (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).

This was the sixth year that Goggins Lake has been involved in CAMP (1999 being the first). Other than the CAMP data, a search through the STORET nationwide water quality database for historical water quality data for the lake came up empty. The lake was monitored 14 times between mid-April and mid-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	64.6	42.0	89.0	C
CLA (µg/l)	33.4	13.0	54.0	C
Secchi (m)	1.1	0.6	1.7	D
TKN (mg/l)	1.38	0.94	1.70	
			Overall Grade	C

The 2004 overall grade is identical to that recorded 1999 and 2003, and better that the D's recorded in 2000-2002. Results are presented on graphs and data tables on the following page.

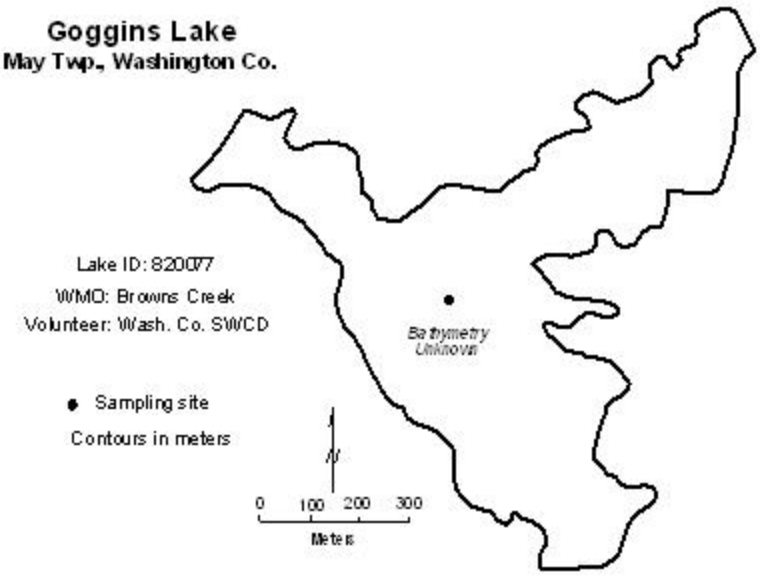
Statistical analysis on the lake's water quality database did not detect any long-term trends. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

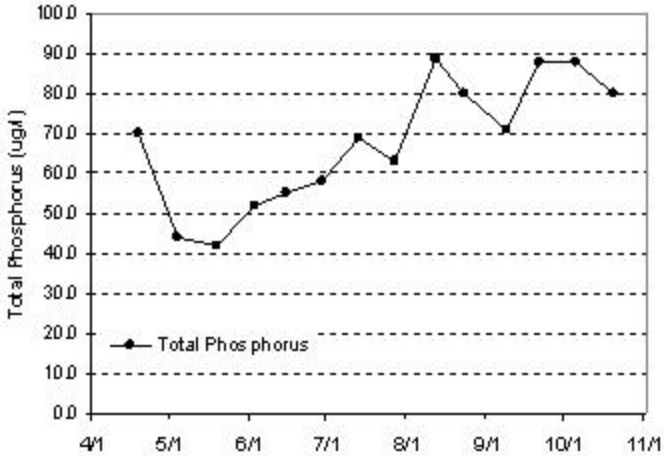
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.4 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 2.1 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

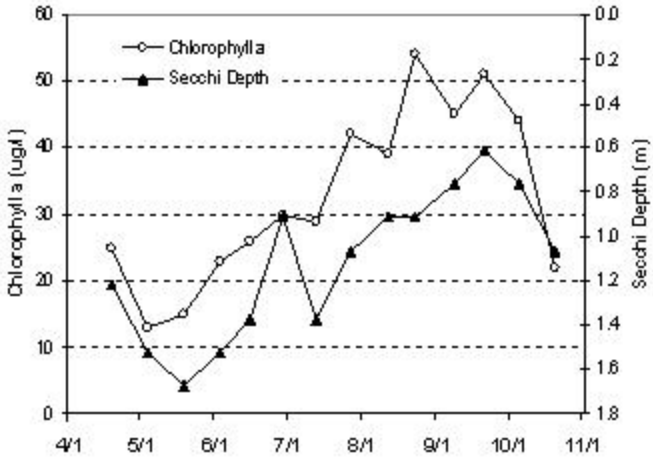
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Goggins Lake

May Twp., Washington Co.

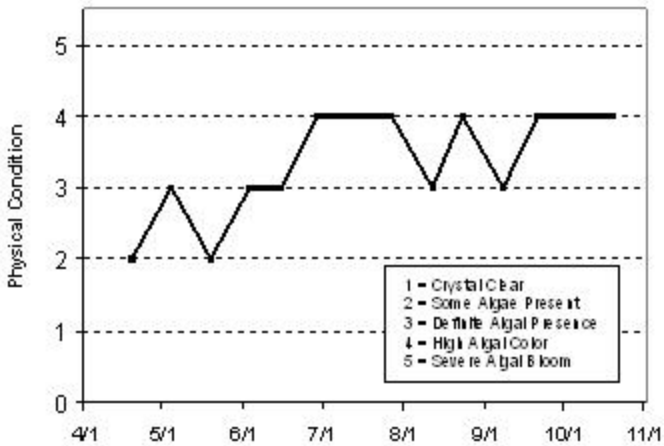






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	12.9	11.7	10.16	0.12	25	70.0		1.2	2	2
5/4/04	13.7	12.2	9.95	0.02	13	44.0		1.5	3	2
5/19/04	17.4	16.2	10.04	9.28	15	42.0		1.7	2	2
6/3/04	17.3	14.9	8.66	0.08	23	52.0		1.5	3	2
6/15/04	22.6	15	10.5	0.07	26	55.0		1.4	3	3
6/29/04	22.2	15.1	9.53	0.19	30	58.0		0.9	4	
7/13/04	26.4	16.5	10.3	0.14	29	69.0		1.4	4	
7/27/04	25.2	15.7	9.14	0.18	42	63.0		1.1	4	2
8/12/04	19.3	16.4	4.61	0.34	39	89.0		0.9	3	2
8/23/04	19.9	17.4	8.01	0.07	54	80.0		0.9	4	2
9/8/04	21.1	20.2	5.54	1.13	45	71.0		0.8	3	2
9/21/04	19.7	19.4	6.05	0.85	51	88.0		0.6	4	2
10/5/04	13.2	13.3	8	0.09	44	88.0		0.8	4	2
10/20/04	9.1	9.1	7.98	0.15	22	80.0		1.1	4	2

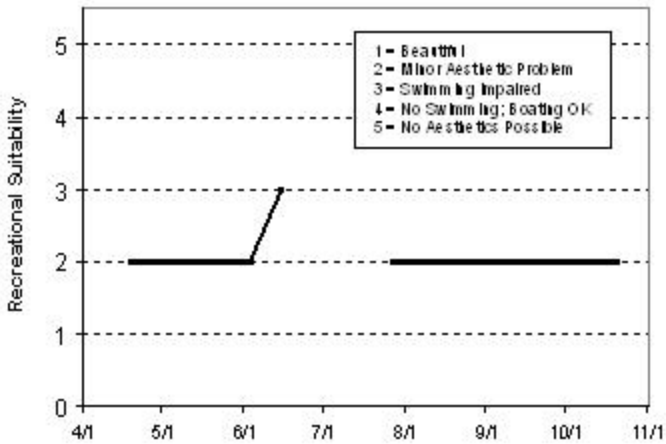


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D	D	D	D	C	C
Chlorophylla								C	C	C	C	C	C
Secchi Depth								C	D	D	D	C	D
Overall								C	D	D	D	C	C

Source: Metropolitan Council and STORET data



Golden Lake (2-0045) *Rice Creek Watershed District*

Golden Lake, located in the City of Circle Pines (Anoka County), was monitored 10 times between early-April and mid-October, 2004. Public access to the 57-acre lake (1.5 miles in circumference) is possible for non-motorized boats through Golden Lake County Park. The mean and maximum depths of the lake are 2.5 m (8 feet) and 7.3 m (24 feet), respectively. The lake's size and mean depth results in an approximate lake volume of 460 ac-ft. Roughly 42 percent of the lake is considered littoral zone, that is, an area of aquatic plant dominance.

The lake's 7,680-acre watershed translates to a large watershed-to-lake size ratio of 135:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

On each sampling date, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	86.1	38.0	120.0	D
CLA (µg/l)	41.8	3.6	71.0	C
Secchi (m)	1.1	0.7	2.1	D
TKN (mg/l)	2.38	1.30	2.90	
			Overall Grade	D

The physical and recreational conditions of Golden Lake as perceived by the volunteer(s) were ranked on a 1-to-5 scale. These rankings are shown on the lake's information sheet on the next page. The summertime mean physical condition was 1.7 (between 1- " crystal clear" and 2- "some algae present"). The mean suitability for recreation ranking, was 1.4 (between 1- "beautiful" and 2- "minor aesthetic problem").

Golden Lake has a fairly extensive water quality database with Secchi and nutrient data for 1980-1981, 1984-1991, and 1993-2004. Because the lake's water quality grade has fluctuated between C, D, and F (a C in 1985-1987, 1996, and 1998-2000, D in 1980-1981, 1993, 1997 and 2001-2004, and an F in 1988-1991) throughout these 20+ years of monitoring data, no long-trends can be determined. It seems that the lake has a very wide fluctuation range in its water quality. In order to detect any possible long-term trends, more years of data collection are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 recognize any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

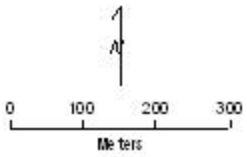
Golden Lake

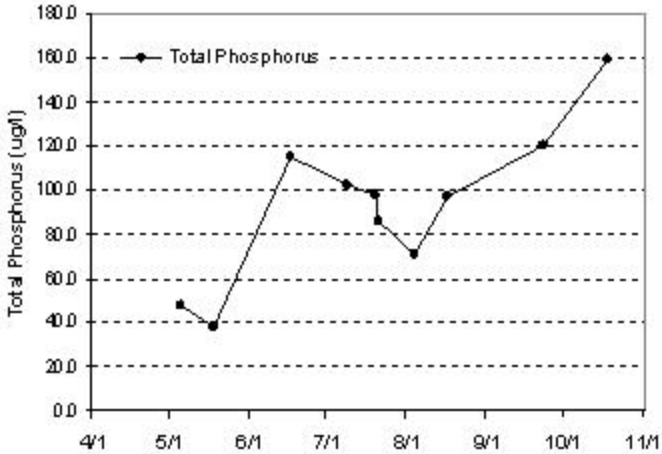
Circle Pines, Anoka Co.

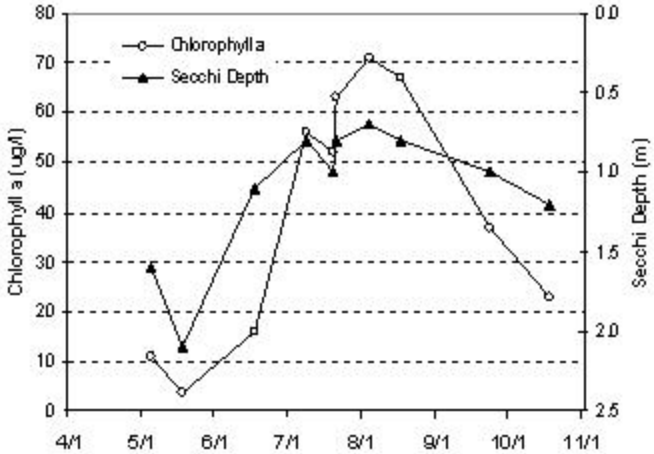
Lake ID: 20045
WD: Rice Creek
Volunteer: City of Circle Pines

Sampling site

Contours in meters

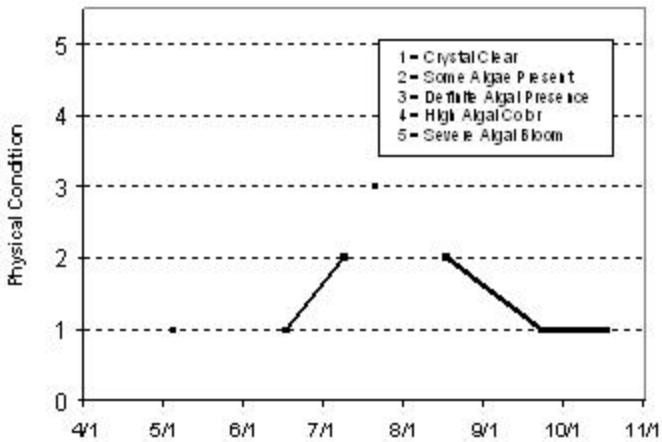






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/5/04	14.6				11	48.0		1.6	1	1
5/18/04	17.4				3.6	38.0		2.1		1
6/17/04	20.2				16	115.0		1.1	1	1
7/9/04	23				56	102.0		0.8	2	2
7/20/04	24				52	98.0		1.0		
7/21/04	29.1				63	86.0		0.8	3	2
8/4/04	24.1				71	71.0		0.7		
8/17/04	22.4				67	97.0		0.8	2	2
9/23/04	18				37	120.0		1.0	1	1
10/18/04	11.2				23	159.0		1.2	1	1

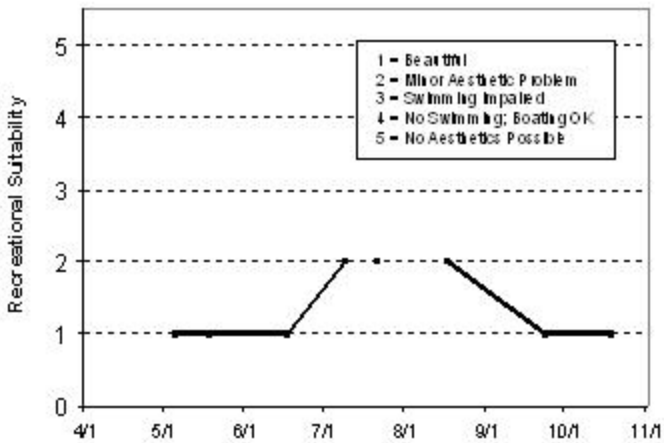


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C	D			D	F	C	F	D	D	D	D
Chlorophyll a	D					C	C	D	F	F	F	F
Secchi Depth	D	D				C	C	C	F	F	F	F
Overall	D					D	C	D	F	F	F	F

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		D			C	D	C	C	C	D	D	D	D
Chlorophyll a		D			C	C	C	C	C	D	D	C	C
Secchi Depth		D			D	D	D	D	C	D	D	D	D
Overall		D			C	D	C	C	C	D	D	D	D

Source: Metropolitan Council and STORET data



Goose Lake [Scandia] (82-0059) *Comfort Lake-Forest Lake Watershed District*

Goose Lake, an 83-acre lake (1.9 miles in circumference) located in New Scandia Township (Washington County), was monitored seven times from late-April to mid-October, 2004. Goose Lake, which was enrolled in CAMP in 1994-1998, has not been monitored as a part of CAMP since 1998. The lake has a maximum and mean depth of 7.6 m (25 feet) and 2.4 m (8 feet), respectively. The lake's mean depth and size translate to 7a lake volume of approximately, 664 ac-ft. Because of the shallowness of the lake, roughly 98 percent of the lake is considered littoral (the area of aquatic vegetation dominance). A Public access is located on the western side of the lake.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	51.2	30.0	77.0	C
CLA (µg/l)	31.8	5.9	89.0	C
Secchi (m)	2.3	0.8	3.4	B
TKN (mg/l)	1.27	0.84	2.30	
			Overall Grade	C

While the lake's 2004 overall grade was the same as 1994-1998, The 2004 Secchi mean was the best recorded to date.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions was ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 3.0 (3- "definite algae present"), while the mean recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

Because 1994-1998 and 2004 are the only years of available data, no long-term trends can be determined. On the short-term, however, the lake's overall water quality seems to be represented quite well by an overall grade of C. There is some normal fluctuation in each parameters annual means, however. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

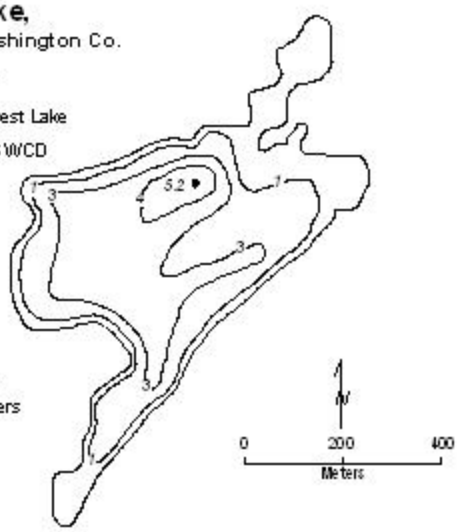
Goose Lake,

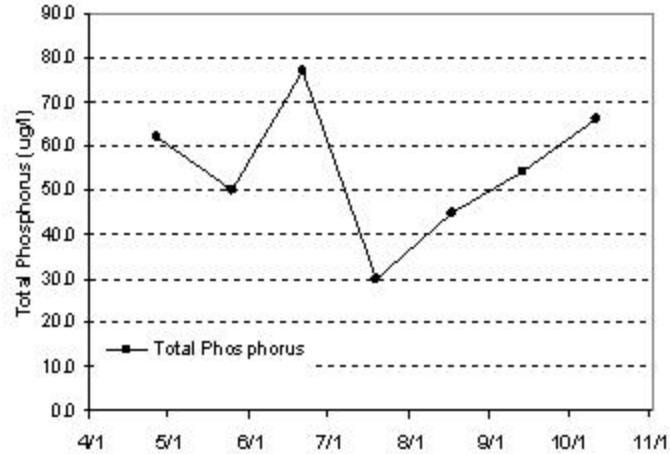
New Scandia Twp., Washington Co.

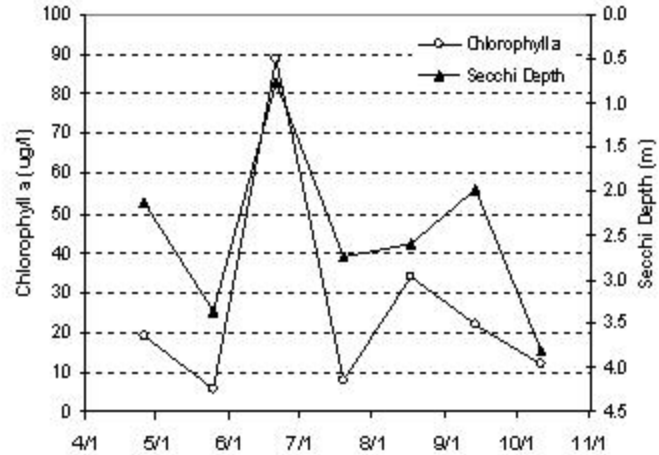
Lake ID: 820059

WMO: Comfort Lake - Forest Lake

Volunteer: Wash. Co. SWCD

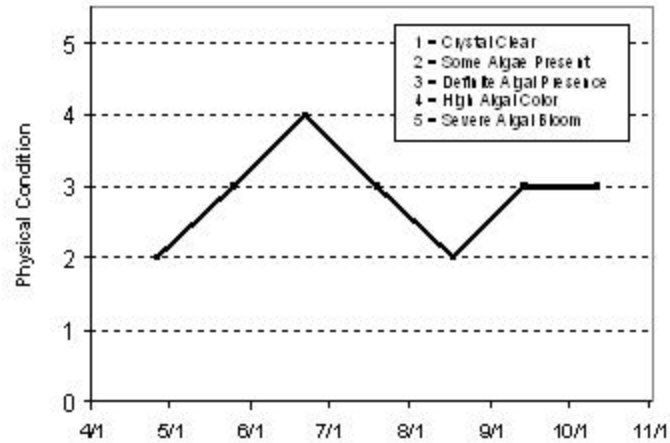






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11	9.4	10.17	0.07	19	62.0		2.1	2	3
5/25/04	15	13.4	7.96	0.04	5.9	50.0		3.4	3	2
6/21/04	20.8	13.9	9.94	0.09	89	77.0		0.8	4	2
7/19/04	26	13.7	5.07	0.15	7.9	30.0		2.7	3	2
8/17/04	20.8	13.8	7.78	0.17	34	45.0		2.6	2	2
9/13/04	21	16	5.63	0.22	22	54.0		2.0	3	2
10/11/04	15.5	14.3	5.6	2.02	12	66.0		3.8	3	2

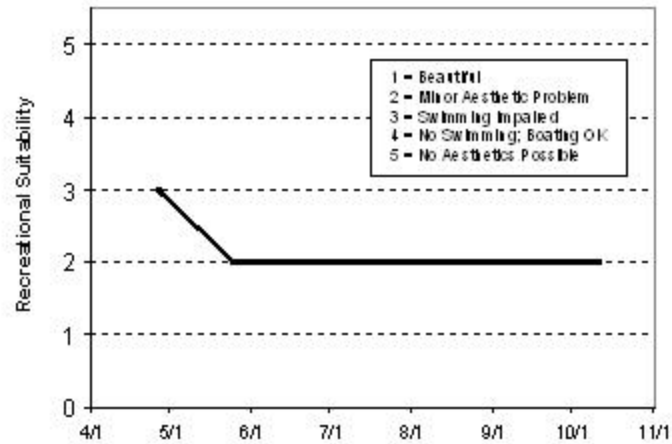


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	D	C	C	C						C
Chlorophylla			C	B	C	C	C						C
Secchi Depth			D	C	C	C	C						B
Overall			C	C	C	C	C						C

Source: Metropolitan Council and STORET data



Goose Lake [Waconia] (10-0089) *Carver County Environmental Services*

Goose Lake, located in Waconia Township in Carver County, was monitored 14 times between mid-April and mid-October, 2004. The lake has been involved in CAMP since 1995. Because the maximum depth of the 407-acre lake is only 3.0 m (10 feet), the entire lake area is considered littoral zone (the 0-15 foot depth area of the lake dominated by aquatic vegetation). Additionally, because of the lake's shallowness it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The lake's mean depth of 1.5 m (roughly 5 feet) and its surface area translate to an approximate lake volume of 2,035 ac-ft.

The lake has a 1,100-acre immediate watershed, which translates to a watershed-to-lake area ratio of 27:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff). A 1999 water quality report on water resources in Carver County estimates land use for the watershed at: four percent residential, 61.0 percent agricultural, and 35.0 percent open/undeveloped (Carver County Planning 1999).

On each sampling date, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. T

2004 summer (May-September) data summary

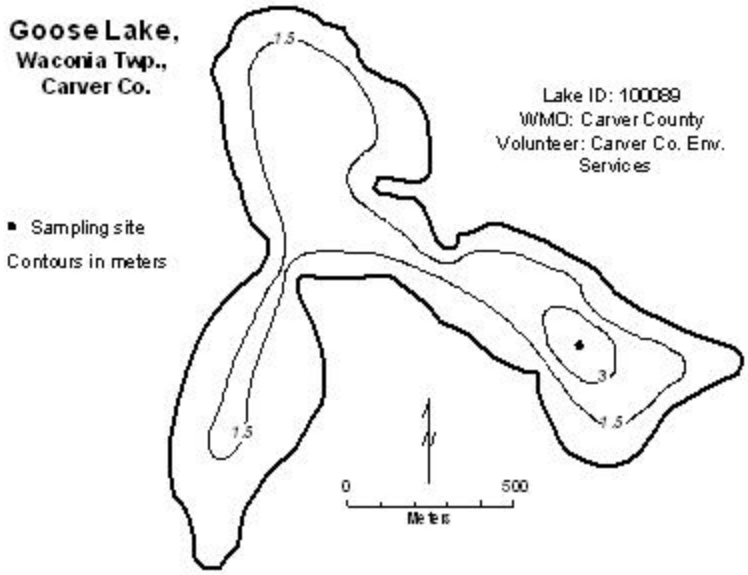
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	140.2	83.0	195.0	D
CLA (µg/l)	59.9	9.5	99.0	D
Secchi (m)	0.4	0.3	0.6	F
TKN (mg/l)	2.27	1.80	2.60	
			Overall Grade	D

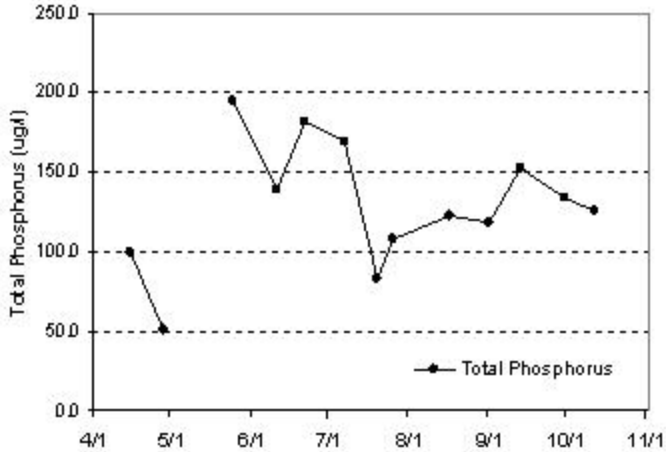
The physical and recreational conditions of Goose Lake as perceived by the volunteer were ranked on a 1-to-5 scale. These rankings are shown on the lake's information sheet on the next page. The mean physical condition ranking was 3.1 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.3, (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

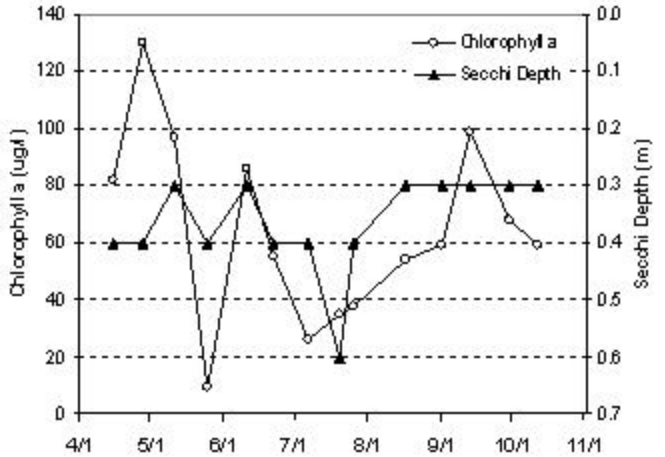
Because of the variability among the nine years of data (grades ranging from C to F), no long-term trends can be determined. In the short-term however, the lake flucuates greatly, with an overall grade of C in 1996 and 1998, D in 1995, 1999, 2001-2002, and 2004, and an overall grade of F in 1997, 2000 and 2003.
To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

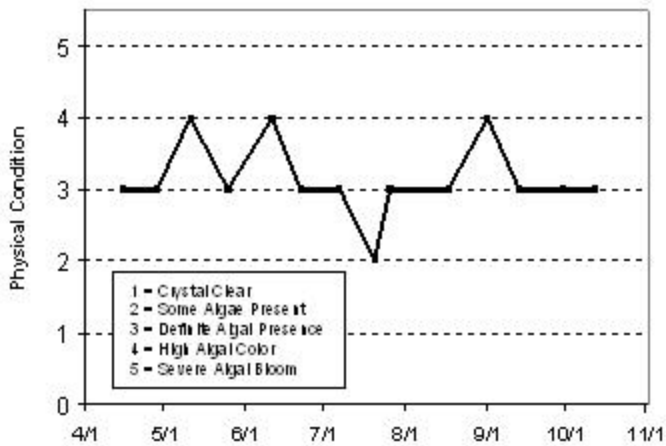






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	11.3		14.6		82	100.0		0.4	3	4
4/28/04	12.7		11.6		130	51.0		0.4	3	4
5/11/04	17.4		9.1		97			0.3	4	4
5/25/04	14		6.8		9.5	195.0		0.4	3	3
6/11/04	20.5		5.1		86	139.0		0.3	4	5
6/22/04	20.5		6.3		55	182.0		0.4	3	3
7/7/04	21.3		8.9		26	169.0		0.4	3	3
7/20/04	28		10.6		35	83.0		0.6	2	3
7/26/04	25.2		8.1		38	108.0		0.4	3	3
8/17/04	21.8		8		54	122.0		0.3	3	3
9/1/04	25.5				59	118.0		0.3	4	4
9/13/04	21.2				99	152.0		0.3	3	3
9/30/04	17				68	134.0		0.3	3	3
10/12/04	14.7		11.7		59	126.0		0.3	3	3

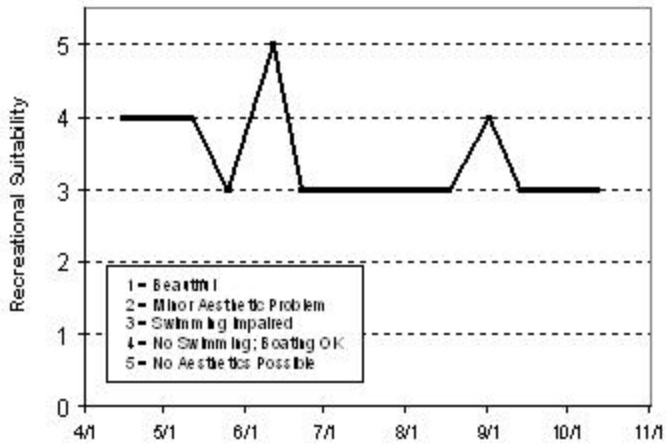


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				D	C	F	D	D	F	D	D	F	D
Chlorophyll a				C	C	D	C	D	F	C	C	F	D
Secchi Depth				F	C	F	C	F	F	D	F	F	F
Overall				D	C	F	C	D	F	D	D	F	D

Source: Metropolitan Council and STORET data



Grace Lake (10-0218) *Carver County Environmental Services*

Grace Lake is a 22-acre lake located near the City of Chaska (Washington County). The lake has a maximum depth of 6.7 m (22 feet). Roughly 79 percent of the lake's surface area is considered littoral zone (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).

This was the third year that Grace Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided no data, therefore 2002-2004 are the only years of available water quality data for the lake.

As part of the county's involvement in CAMP in 2004, the lake was monitored 14 times between mid-April and mid-October. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	100.1	59.0	213.0	D
CLA (µg/l)	17.8	2.5	40.0	B
Secchi (m)	1.2	0.4	3.0	D
TKN (mg/l)	1.25	0.20	1.90	
			Overall Grade	D

The lakes 2004 overall water quality grade is better than the D's recorded in 2002-2003.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 2.6 (between 2- "some algae present" and 3- "high algal color"), while the mean recreational suitability ranking was 2.4 (between 2- "minor aesthetic problems" and 3- "swimming slightly impaired").

As mentioned earlier, there are no water quality data available for Grace Lake other than the limited 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

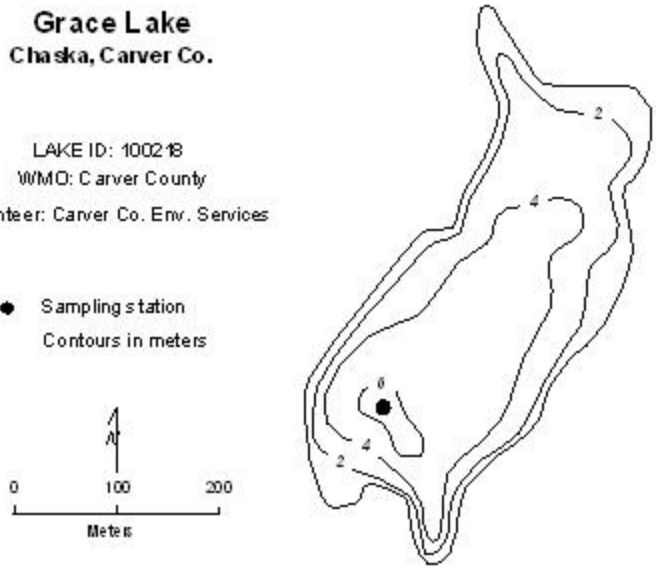
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

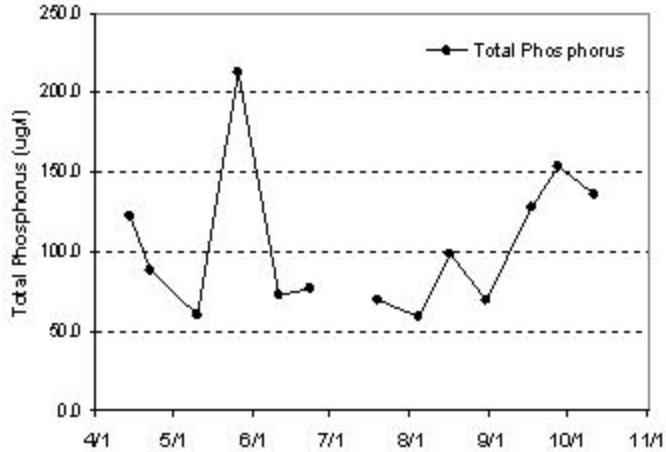
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

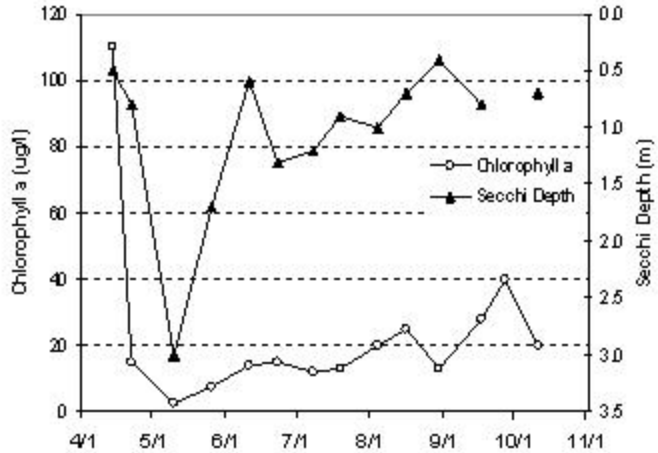
Grace Lake
Chaska, Carver Co.

LAKE ID: 100218
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling station
Contours in meters

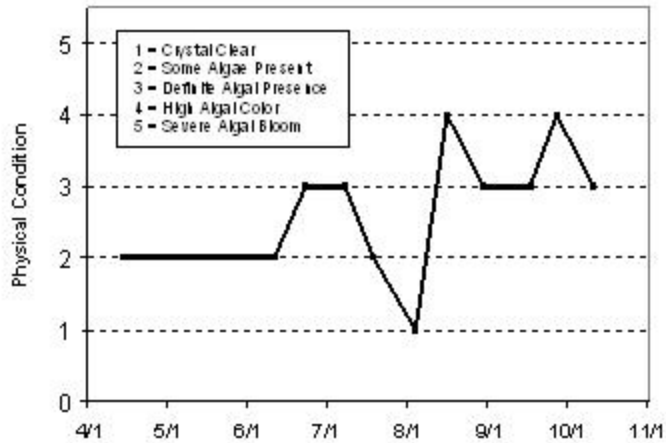






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	11.1		17		110	122.0		0.5	2	2
4/22/04	12		6.8		15	88.0		0.8	2	2
5/10/04	20.6		7.6		2.5	60.0		3.0	2	2
5/26/04	15.5		6.91		7.6	213.0		1.7	2	2
6/11/04	19.7		6.5		14	73.0		0.6	2	2
6/23/04	22.6		8.9		15	77.0		1.3	3	2
7/8/04	22.9		7.9		12			1.2	3	3
7/19/04	27		8.4		13	69.0		0.9	2	2
8/4/04	23.5		6.3		20	59.0		1.0	1	1
8/16/04	22.4		10.8		25	99.0		0.7	4	4
8/30/04	16.5		9.5		13	69.0		0.4	3	3
9/17/04	20.2		6.9		28	128.0		0.8	3	3
9/27/04	19.8		9.1		40	154.0			4	3
10/11/04	15.3		9.4		20	136.0		0.7	3	2

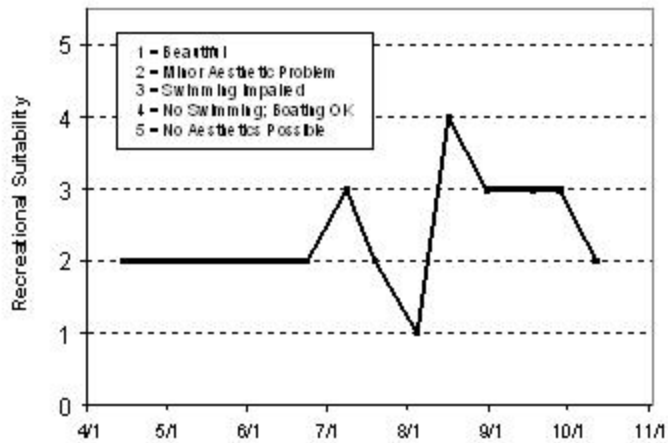


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											F	D	D
Chlorophyll a											C	C	B
Secchi Depth											D	D	D
Overall											D	D	C

Source: Metropolitan Council and STORET data



Half Breed Lake [Sylvan] (82-0080) *Comfort Lake-Forest Lake Watershed District*

Half Breed Lake (also known as Sylvan Lake) is a 75-acre lake located in Forest Lake Township (Washington County). The lake's mean and maximum depth of 1.7 m (5.6 feet) and 10.3 m (34 feet) translates to an approximate volume of 420 ac-ft. Roughly 67 percent of the lake's surface area is considered littoral, that is, the area dominated by aquatic vegetation. The lake has a 303-acre watershed which, when divided by the surface area of the lake results in a rather small watershed-to-lake size ratio of 4:1 (the larger the ratio the greater the potential stress on the lake from surface runoff). The lake has no inlets and no public access to the lake.

Half Breed Lake was monitored 14 times from late-April to mid-October, 2004. The collected data and resulting graphs showing the seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

Similar to prior years, the lake's data and graphs reveal that the water quality of Half Breed Lake rates in the top 10 percent of lakes again in the area in 2004.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	19.9	12.0	29.0	A
CLA (µg/l)	3.3	2.3	4.1	A
Secchi (m)	5.1	4.4	6.4	A
TKN (mg/l)	0.54	0.37	0.86	
			Overall Grade	A

The lake's 2004 overall grade is identical to those recorded in 1987-1989, 1991, 1993, 1996, and 1998-2002-2003, and better than the overall grade of B recorded in 1986. The lakes 2004 Secchi transparency mean was the best recorded to date. Historic water quality data and resulting lake quality grades indicate that the lake has maintained its high quality over the past 20+ years. Additionally, the MPCA recently conducted a trend analysis on the lake's Secchi transparency data, which revealed a statistically significant improvement in recent water clarity.

Throughout the monitoring period, the volunteer's opinion of the lake's physica.l and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 1.8 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.stat.mn.us.

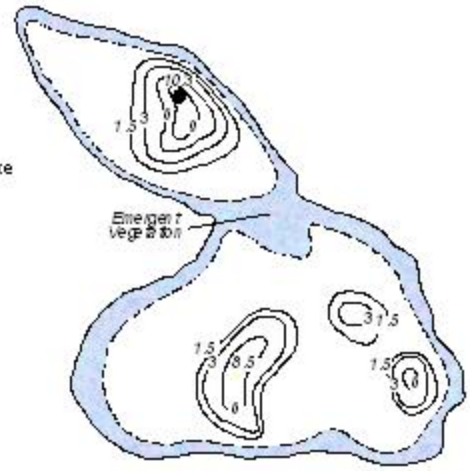
Half Breed Lake

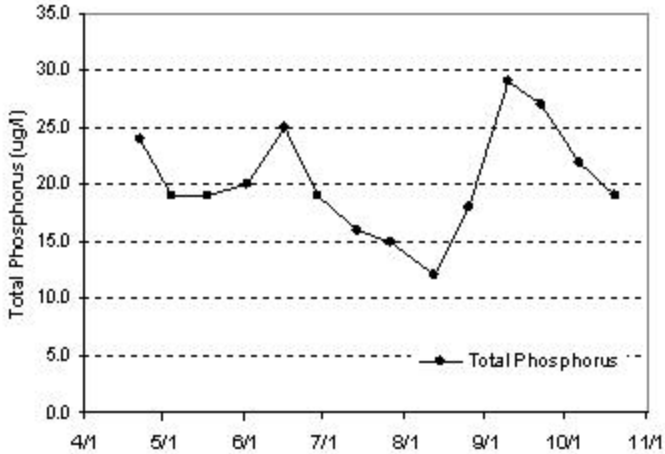
(Sylvan Lake)

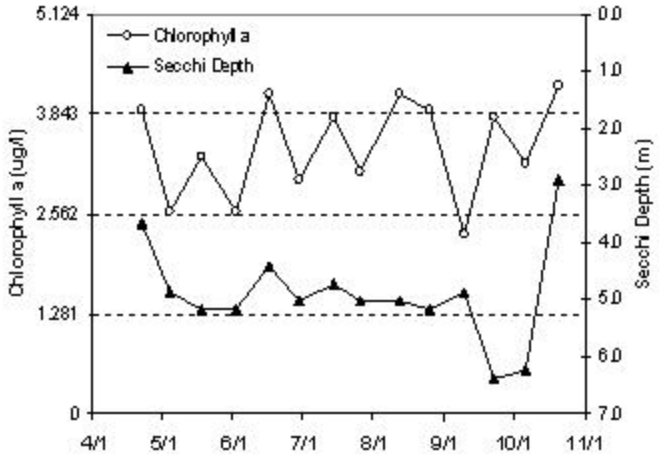
Forest Lake Twp./
New Scandia Twp.,
Washington Co.

LAKE ID: 820080
WMO: Comfort Lake - Forest Lake
Volunteer: Washington Co. SWCD

● Sampling station
Contours in meters

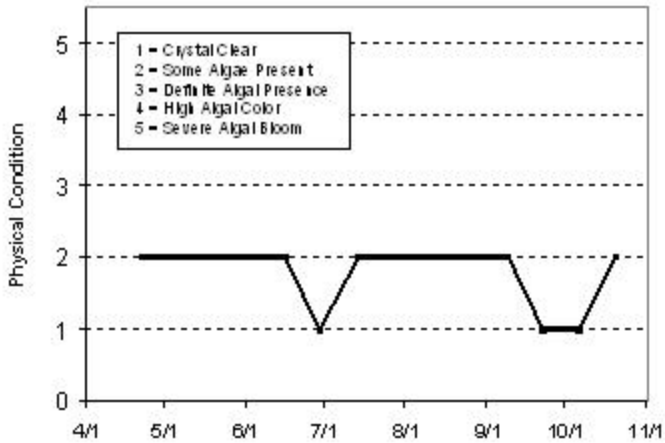






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	12.2	4.7	9.17	0.02	3.9	24.0		3.7	2	1
5/4/04	13	4.8	9.92	0.02	2.6	19.0		4.9	2	2
5/18/04	17	5.1	7.8	0.03	3.3	19.0		5.2	2	2
6/2/04	17	5.3	8.5	0.03	2.6	20.0		5.2	2	3
6/16/04	22.7	5.4	8.91	0.11	4.1	25.0		4.4	2	2
6/29/04	20.8	5.5	8.57	0.23	3	19.0		5.0	1	1
7/14/04	25.1	5.6	8.81	0.14	3.8	16.0		4.7	2	2
7/26/04	25.8	5.7	7.8	0.38	3.1	15.0		5.0	2	2
8/12/04	19.5	5.9	6.75	0.3	4.1	12.0		5.0	2	2
8/25/04	20.4	6	7.13	0.06	3.9	18.0		5.2	2	2
9/9/04	20.6	6.5	6.11	0.38	2.3	29.0		4.9	2	2
9/22/04	19.9	6.4	6.12	0.05	3.8	27.0		6.4	1	2
10/6/04	13.8	6.5	7.09	0.08	3.2	22.0		6.2	1	2
10/20/04	9.3	6.5	6.68	0.11	4.2	19.0		2.9	2	2

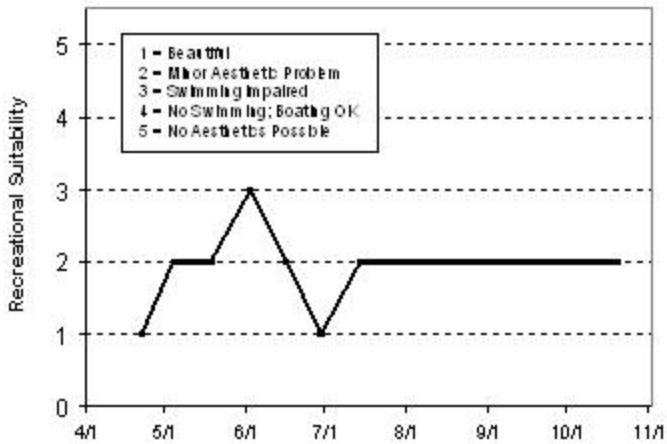


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	B	A					C	B	A	A		A
Chlorophyll a							B	A	A	A		A
Secchi Depth	A	A	A	A	A	A	A	A	A	A	A	A
Overall							B	A	A	A		A

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		A			A		A	A	A	A	A	A	A
Chlorophyll a		A			A		A	A	A	A	A	A	A
Secchi Depth	A	A			A		A	A	A	A	A	A	A
Overall		A			A		A	A	A	A	A	A	A

Source: Metropolitan Council and STORET data



Hart Lake (02-0081) *Rice Creek Watershed District*

Hart Lake is an eight-acre lake located within the city of Columbia Heights (Anoka County). There is very little known morphological data available for the lake.

Two thousand and four marks the first year in which Hart Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2004 is the only complete, year of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored six times between mid-May and mid-October, 2004. The resulting data and graphs appear on the next page.

Because the lake was only monitored in May, June, and October, a well represented summer mean could not truly be determined. The reason being that the summer mean should include samples from May-September. Because the mean is skewed to the early part of the season, water quality grades for the lake, as shown on the corresponding lake information page, are shown as NA (not available). Because, however, this is the first year that data on the lake were collected, means and grades were calculated and shown in the table below simply as an indicator of what was observed. Caution should be taken in using the grades as the lakes true 2004 summer-long water quality.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	114.8	75.0	183.0	D
CLA (µg/l)	28.3	15.0	48.0	C
Secchi (m)	0.65	0.50	0.80	F
TKN (mg/l)	2.00	1.40	2.60	
			Overall Grade	D

By comparing the lakes TP (nutrient), CLA (algal biomass estimator), and Secchi (water clarity) grades, it is apparent that the TP and Secchi grades (and summer means) are quite a bit worse than the CLA grade. In a most cases, the three should be fairly comparable. One possible explanation for the lake's 2004 findings may be that the majority of the lake's TP comes from either in-lake suspended sediments (re-suspension), or the intrusion of sediment-laden runoff to the lake, which in turn lessens the clarity of the water and inhibits algal growth.

As mentioned earlier, there are no water quality data available for Hart Lake other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

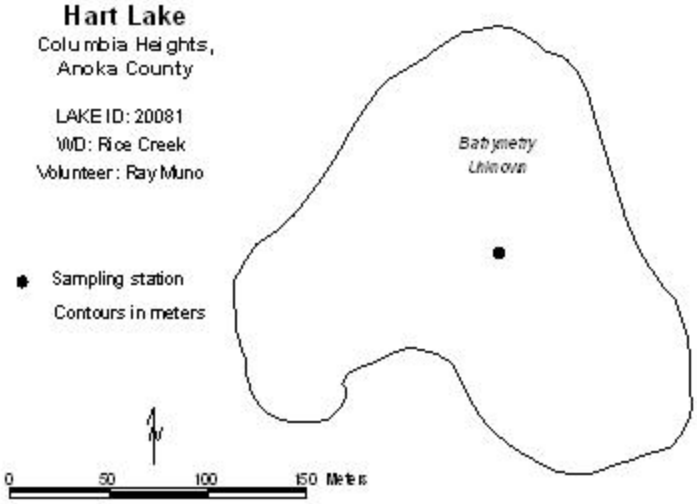
Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 4.0 for physical condition (4- "high algal color"), and 4.0 for recreational suitability (4- "no swimming – boating ok").

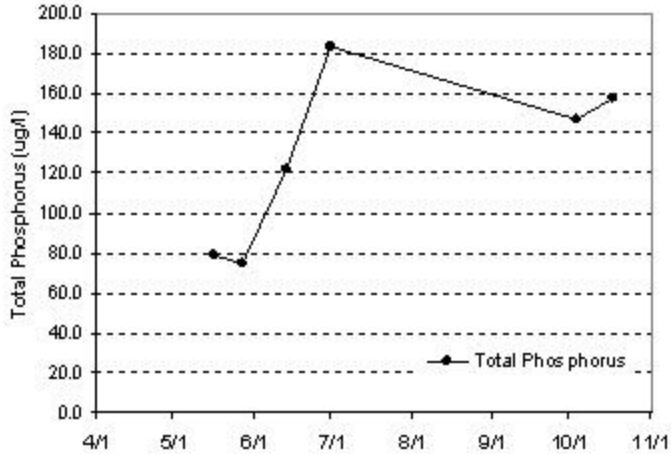
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

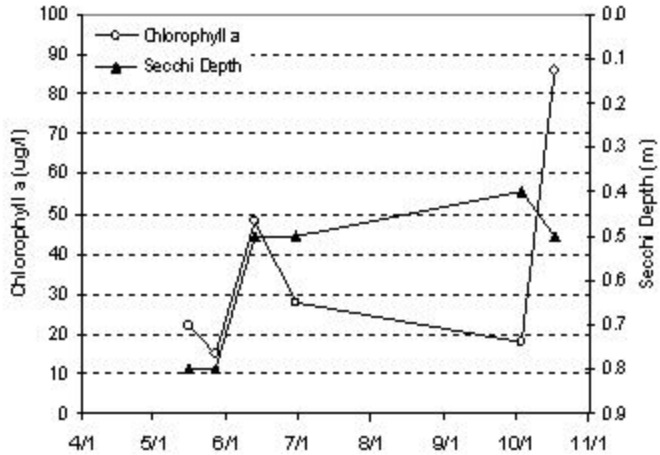
Hart Lake

Columbia Heights,
Anoka County

LAKE ID: 20081
WD: Rice Creek
Volunteer: Ray Muno

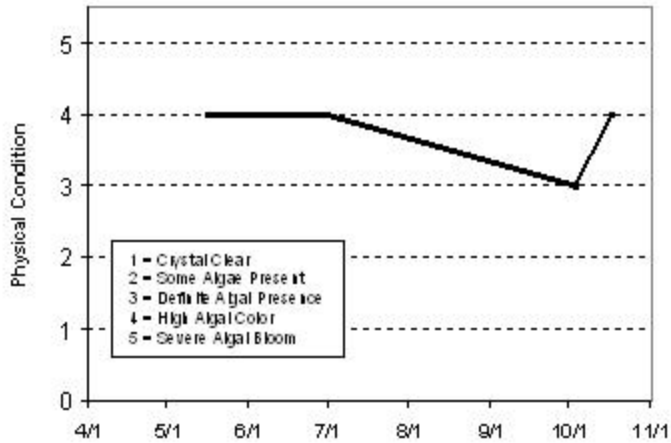






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/16/04	21				22	79.0		0.8	4	4
5/27/04	19.5				15	75.0		0.8	4	4
6/13/04	26.9				48	122.0		0.5	4	4
6/30/04	22.4				28	183.0		0.5	4	4
10/3/04	16.8				18	147.0		0.4	3	4
10/17/04	11.2				86	158.0		0.5	4	4

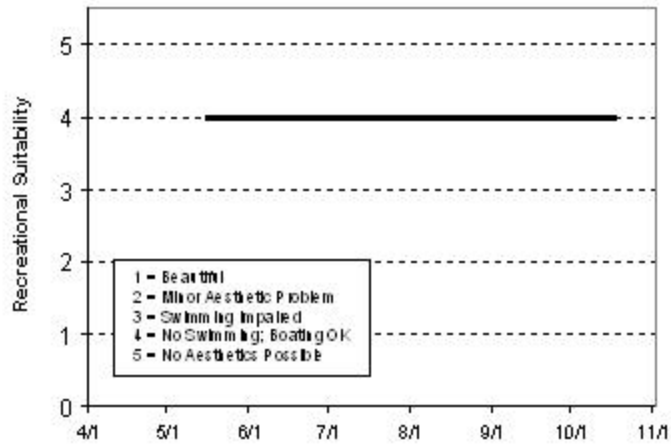


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													NA
Chlorophyll a													NA
Secchi Depth													NA
Overall													NA

Source: Metropolitan Council and STORET data



Harvey Lake (27-00??) *Conservation League of Edina*

Harvey Lake is a small shallow lake (a maximum depth of approximately 0.7 m (2.3 feet), located within Edina (Hennepin County). Because of the shallowness of the lake, the entire area is considered littoral zone (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). There is very little other known morphological data available for the lake.

Two thousand and four marks the first year in which Harvey Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2004 is the only complete, year of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 10 times between early-May and late-September, 2004. The resulting data and graphs appear on the next page.

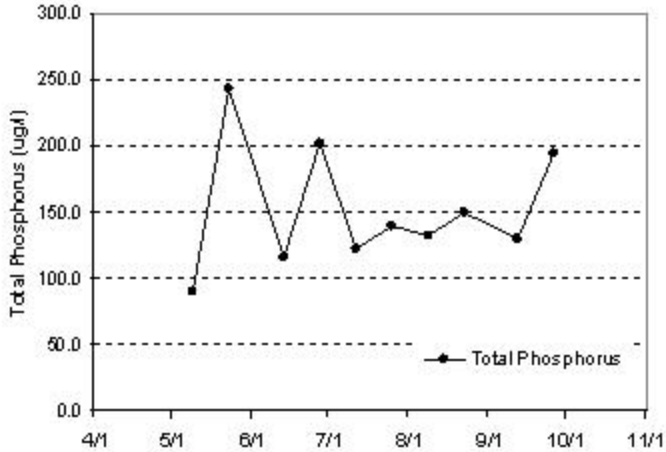
2004 summer (May-September) data summary

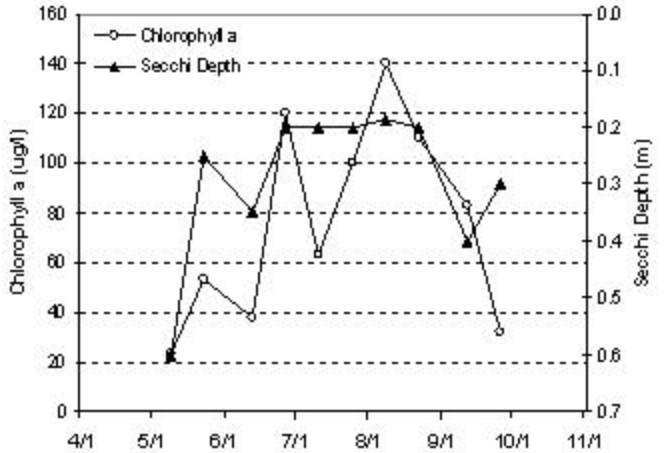
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	151.9	90.0	243.0	D
CLA (µg/l)	76.2	23.0	140.0	D
Secchi (m)	0.3	0.2	0.6	F
TKN (mg/l)	2.91	1.90	3.70	
			Overall Grade	D

As mentioned earlier, there are no water quality data available for Harvey Lake other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 3.6 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 4.0 for recreational suitability (between 4- "no swimming – boating ok").

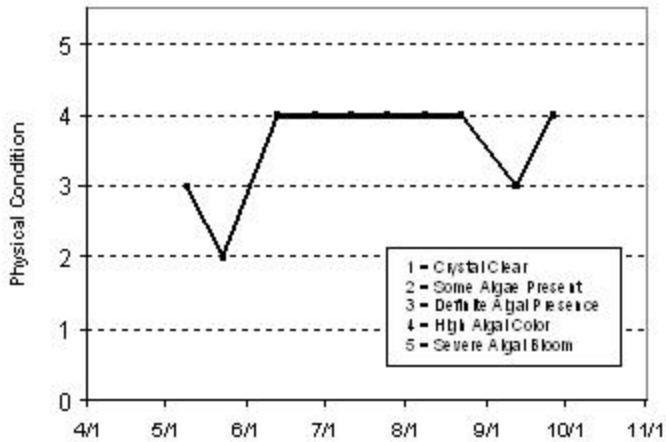
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/9/04	22.4				23	90.0		0.6	3	4
5/23/04	14.6				53	243.0		0.3	2	2
6/13/04	26.9				38	116.0		0.4	4	4
6/27/04	20.7				120	202.0		0.2	4	5
7/11/04	26.58				63	122.0		0.2	4	4
7/25/04	29.4				100	140.0		0.2	4	5
8/8/04	28				140	132.0		0.2	4	4
8/22/04	26				110	150.0		0.2	4	4
9/12/04	25.7				83	130.0		0.4	3	4
9/26/04	21.7				32	194.0		0.3	4	4

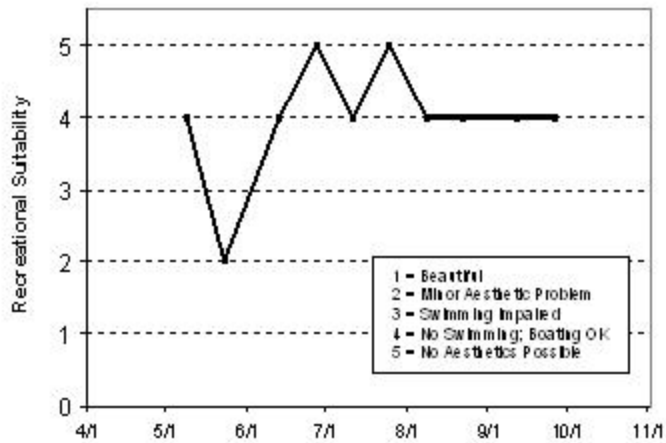


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													D
Chlorophyll a													D
Secchi Depth													F
Overall													D

Source: Metropolitan Council and STORET data



Hay Lake (82-0065) *Marine on St. Croix Watershed Management Organization*

This was the sixth year of CAMP monitoring on Hay Lake, located in New Scandia Township (Washington County). The lake was monitored seven times between late-April and mid-October, 2004. The only known morphological data available for the 33-acre lake is its maximum depth (6.1 m [20 feet]). Other than the 1998-2001 and 2003 CAMP data for the lake, a search for historical water quality data and any physical information came up empty.

During each monitoring event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	88.6	76.0	110.0	D
CLA (µg/l)	54.2	18.0	160.0	D
Secchi (m)	1.1	1.4	1.5	D
TKN (mg/l)	1.23	0.96	1.90	
			Overall Grade	D

The lake's overall 2004 lake quality grade of D was worse than that recorded in 2003 (C), but identical to those recorded in 1998-2001 (D).

Statistical analysis on the lake's water quality database did not detect any long-term trends. In the short-term however, the lake seems well represented with an overall water quality grade of D/C. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

Throughout the monitoring period, the volunteer(s) ranked the perceived physical condition of the lake on a 1-to-5 scale. The mean perceived physical condition of Hay Lake was 2.4 (between 2- "some algae present" and 3- "definite algal presence"), while the mean recreational suitability was 2.0 (between 2- "minor aesthetic problem").

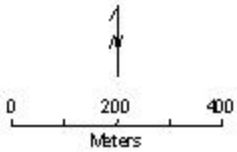
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

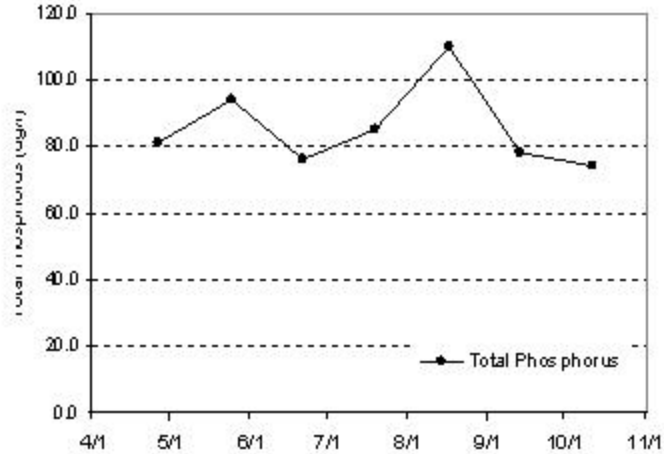
Hay Lake

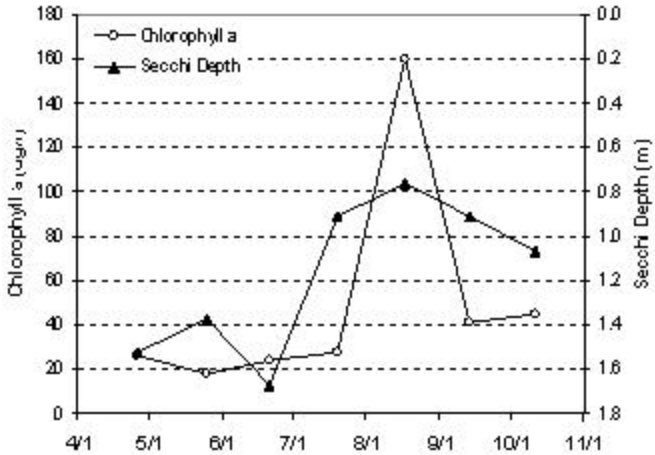
New Scandia Twp.,
Washington Co.

LAKE ID: 820065
WMO: Marine-on-St. Croix
Volunteer: Washington Co. SWCD

● Sampling site
Contours in meters

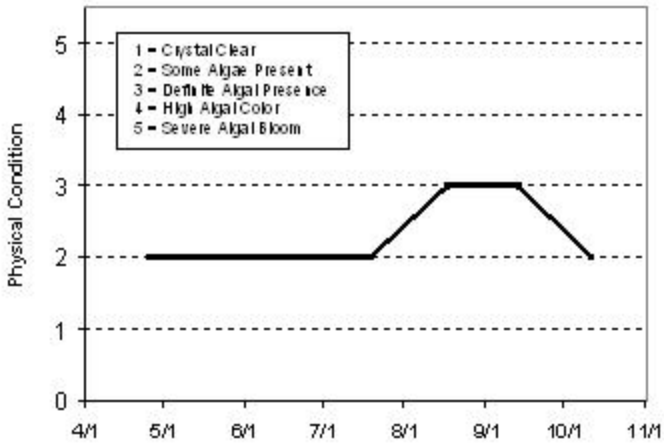






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.9	12	8.18	0.09	26	81.0		1.5	2	2
5/25/04	14.9	14.6	8.08	0.56	18	94.0		1.4	2	2
6/21/04	20.9	20.4	6.95	0.09	24	76.0		1.7	2	2
7/19/04	25	22.1	6.31	0.3	28	85.0		0.9	2	2
8/17/04	20.4	18.5	8.59	0.14	160	110.0		0.8	3	2
9/13/04	20.8	20.5	5.25	0.5	41	78.0		0.9	3	2
10/11/04	14.8	13.8	6.13	0.09	45	74.0		1.1	2	2

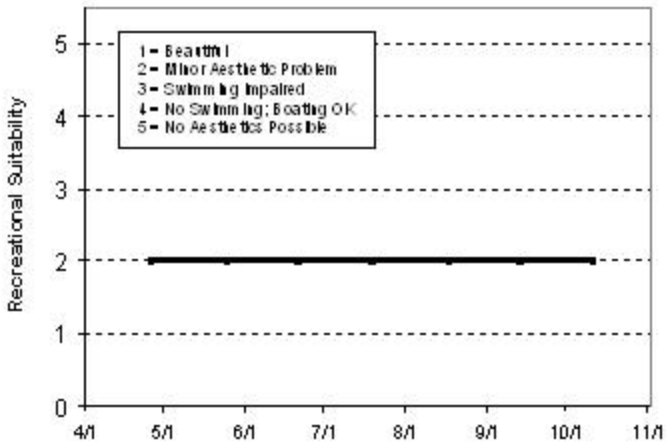


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus							D	D	D	D		D	D
Chlorophyll a							F	F	F	F		C	D
Secchi Depth							D	D	D	D		C	D
Overall							D	D	D	D		C	D

Source: Metropolitan Council and STORET data



Herber's Pond (82-0015-01) *Carnelian – Marine Watershed District*

Herber's Pond is a small (13-acre) shallow lake (a maximum depth of approximately 2.0 m (6.6 feet), located in Hugo (Washington County). Because of the shallowness of the lake, the entire area is considered littoral zone (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). There is very little other known morphological data available for the waterbody.

This was the first year that Herber's Pond has been involved in CAMP. The lake was monitored 14 times between mid-April and mid-October, 2004. On each of the sampling days the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	68.6	50.0	112.0	D
CLA (µg/l)	25.6	9.2	74.0	C
Secchi (m)	1.5	0.9	1.7	C
TKN (mg/l)	1.06	0.69	1.40	
			Overall Grade	C

As mentioned earlier, there are no known nutrient data available for Herber's Pond other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 2.2 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 2.6 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

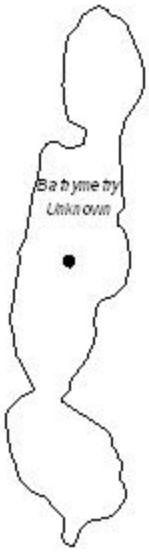
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

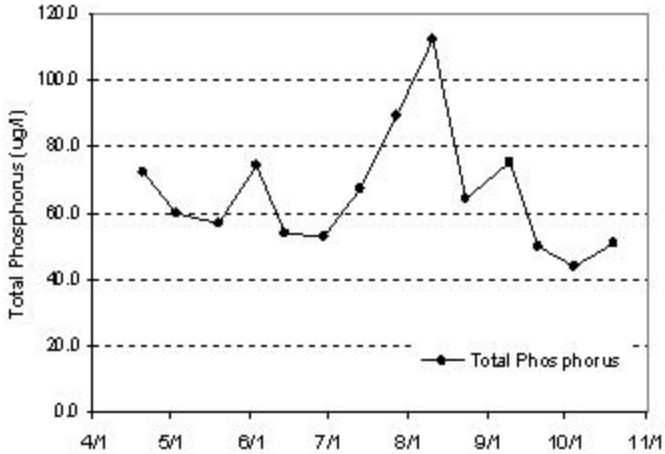
Herber's Pond

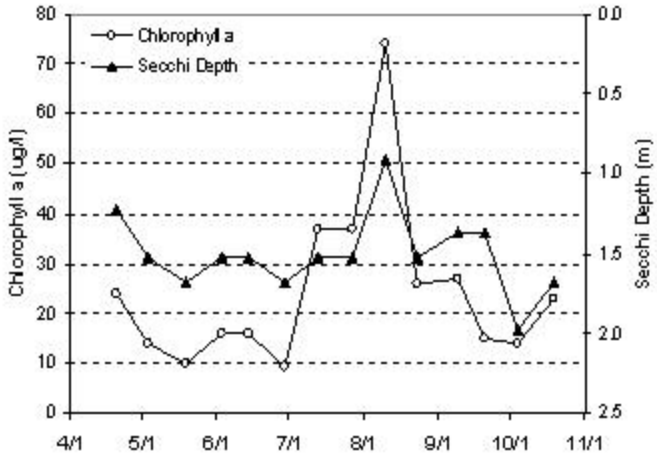
Stillwater Twp.,
Washington Co.

LAKE ID: 82001 5-01
WD: Carnelian-Marine
Volunteer: Washington Co. SWCD

● Sampling site
Contours in meters

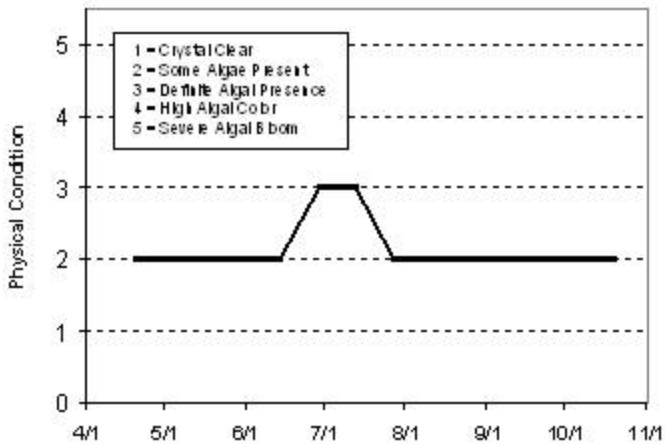






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	14.5	13.8	9.58	0.03	24	72.0		1.2	2	2
5/3/04	14.9	14.5	9.4	0.03	14	60.0		1.5	2	3
5/19/04	19.3	16.5	9.25	3.3	10	57.0		1.7	2	2
6/3/04	19.9	16.2	9.01	0.02	16	74.0		1.5	2	3
6/14/04	24.6	17.6	8.35	0.02	16	54.0		1.5	2	3
6/29/04	24	18.9	8.11	5.52	9.2	53.0		1.7	3	
7/13/04	25.9	20.3	8.75	0.23	37	67.0		1.5	3	
7/27/04	23.1	21.1	5.56	0.29	37	89.0		1.5	2	3
8/10/04	20.4	19.6	4.8	0.4	74	112.0		0.9	2	3
8/23/04	21.1	17.6	8.37	0.3	26	64.0		1.5	2	2
9/9/04	20.7	18.3	4.26	0.28	27	75.0		1.4	2	2
9/20/04	20	18.6	4.53	0.13	15	50.0		1.4	2	2
10/4/04	12.5	11.8	5.64	5.35	14	44.0		2.0	2	2
10/19/04	7.5	7.5	5.82	5.85	23	51.0		1.7	2	3

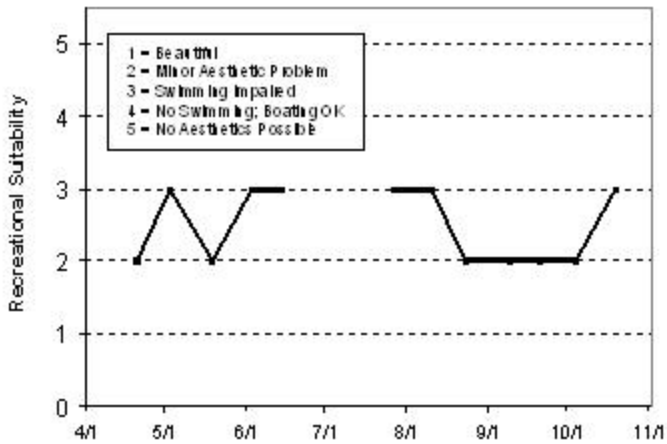


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													D
Chlorophyll a													C
Secchi Depth													C
Overall													C

Source: Metropolitan Council and STORET data



Highland Lake (2-0079) *Anoka County Parks*

Highland Lake is a 22-acre lake located within the City of Columbia Heights (Anoka County). The maximum depth of the lake is approximately only 1.0 m (roughly 3 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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).

This was the sixth year that Highland Lake has been involved in CAMP (the lake was initially enrolled in 1999). Other than the past CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty.

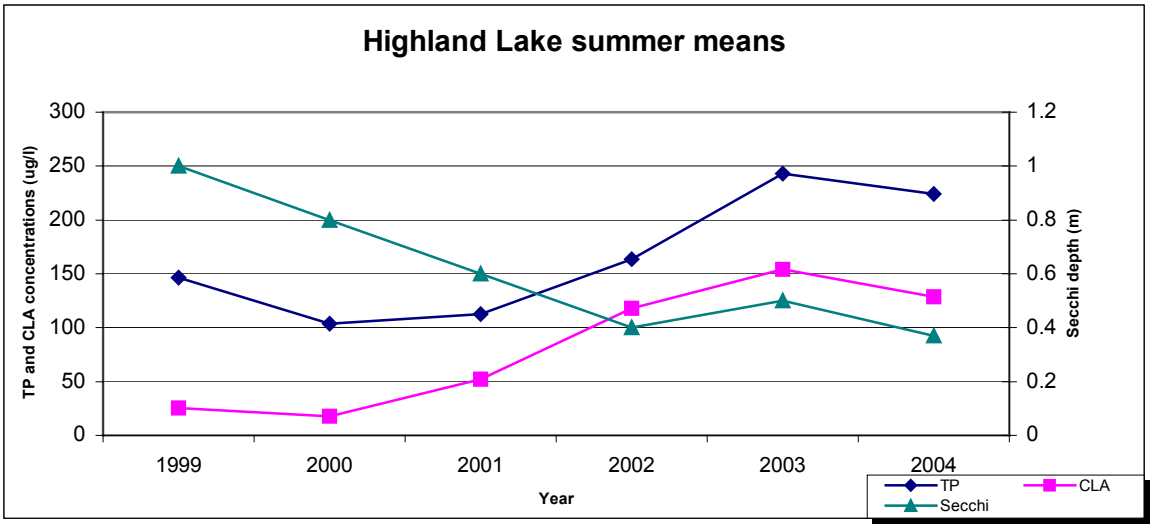
The lake was monitored 14 times between mid-April and mid-October, 2004. During each monitoring event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	223.9	144.0	365.0	F
CLA (µg/l)	128.6	27.0	250.0	F
Secchi (m)	0.4	0.1	0.5	F
TKN (mg/l)	2.46	1.40	3.80	
			Overall Grade	F

The lake's recent water quality (2002-2004), is quite a bit worse than that recorded in 1999-2001.

As mentioned earlier, there are no water quality data available for Highland Lake other than the 1999-2004 CAMP data. Therefore it is not possible to determine any long-term trends. In the short-term, however, the lake's water quality seems to be degrading. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.



The above graph clearly depicts the lakes recent degradation. The reason for the degradation in the lake's water quality is not entirely known. A more in-depth study combining watershed as well as in-lake monitoring may help determine the areas contributing the most to the lake's degradation.

The last two graphs on the information sheet show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, was 3.0 for physical condition (3- "definite algae present") and 5.0 for recreational suitability (5- "no aesthetics possible").

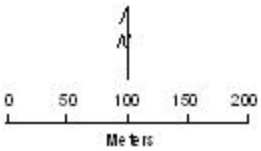
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

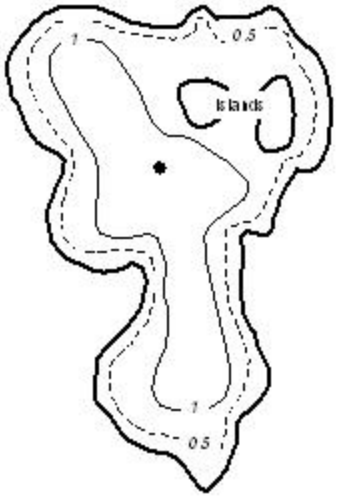
Highland Lake

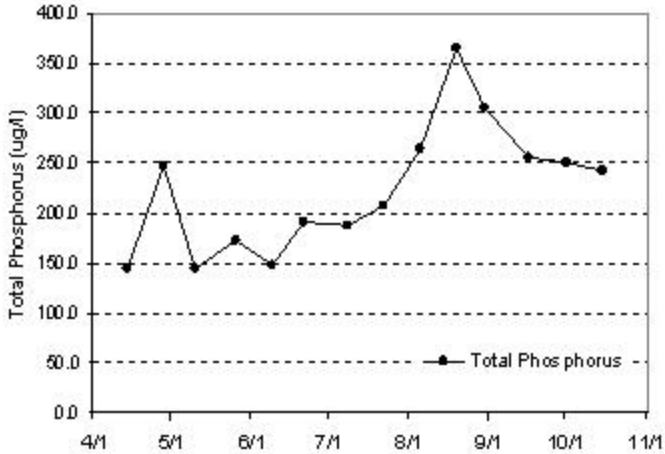
Columbia Heights, Anoka Co.

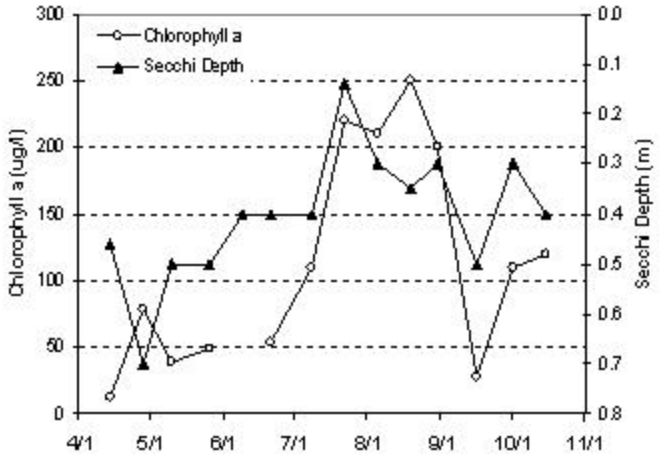
Lake ID: 20079
WMO: Six Cities
Volunteer: Anoka Co. Parks

● Sampling site
Contours in meters



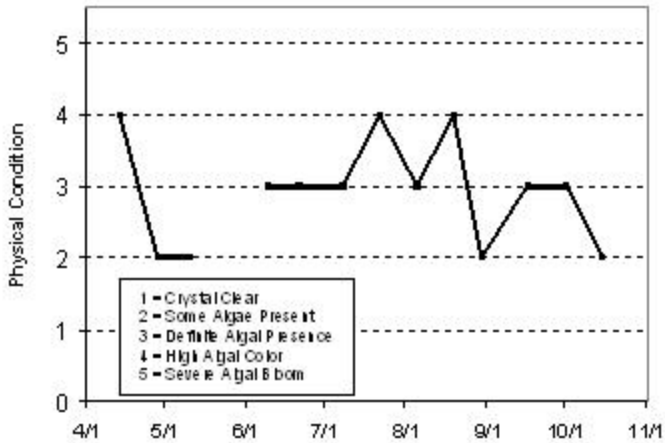






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	10				13	145.0		0.5	4	5
4/28/04	10				78	247.0		0.7	2	
5/10/04	19				39	144.0		0.5	2	
5/26/04	15				48	172.0		0.5		
6/9/04	21					148.0		0.4	3	
6/21/04	22				53	191.0		0.4	3	
7/6/04	21				110	188.0		0.4	3	
7/22/04	29				220	207.0		0.1	4	5
8/5/04	24				210	264.0		0.3	3	
8/19/04	20				250	365.0		0.4	4	
8/30/04	20				200	305.0		0.3	2	
9/16/04	20				27	255.0		0.5	3	
10/1/04	18				110	251.0		0.3	3	
10/15/04	10				120	242.0		0.4	2	

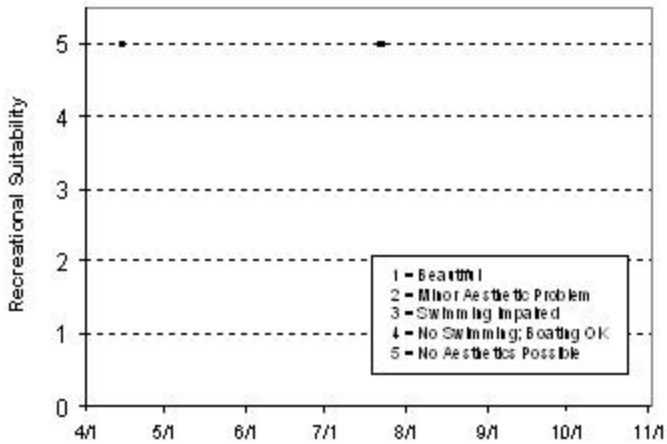


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D	D	D	F	F	F
Chlorophyll a								C	B	D	F	F	F
Secchi Depth								D	D	F	F	F	F
Overall								D	C	D	F	F	F

Source: Metropolitan Council and STORET data



Hydes Lake (10-0088) *Carver County Environmental Services*

Hydes Lake, a 215-acre lake located within Waconia Township (Carver County) is considered a Metropolitan Area "Priority Lake" because of its multi-recreational uses. A public access is located on the lake's northeastern shore. The mean and maximum depth of the lake is 3.0 (roughly 10 feet) and 5.5 m (18 feet). Because of the shallowness of the lake, 88 percent of the total lake area is considered littoral zone (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). The lake's surface area and mean depth result in an approximate lake volume of 2,150 ac-ft.

The lake has a 430-acre immediate watershed, which translates to a watershed-to-lake area ratio of 2:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff). A 1999 water quality report on water resources in Carver County estimates land use for the watershed at: seven percent residential, 76 percent agricultural, and 17 percent open/undeveloped (Carver County Planning 1999).

This was the sixth year that Hydes Lake has been involved in CAMP (the lake was initially enrolled in 1999). The lake has been monitored by Council staff in the past (the last year being 1996). A search of the STORET nationwide water quality database for data on the lake revealed a moderate database throughout the 1990's with nutrient data available in 1985, 1991, 1993, 1996 and now 1999-2004.

The lake was monitored 14 times between mid-April and mid-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	127.2	38.0	229.0	D
CLA (µg/l)	51.8	1.4	120.0	D
Secchi (m)	1.0	0.3	1.8	D
TKN (mg/l)	2.00	0.79	3.30	
			Overall Grade	D

The lake's 2004 overall grade is identical to those of worse recorded in 1985, 1991, 1993, 1996, 1999-2000, and 2002, and worse than that of 2001 and 2003 (C).

Statistical analysis on the lake's water quality database did not detect any long-term trends. In the short-term however, the lake's water quality seems to be well represented by an overall grade of D. In order to detect any possible long-term trends, additional years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.4 for physical condition (between 3- "definite algae present" and 4- "high algal color") and 3.4 for recreational suitability (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

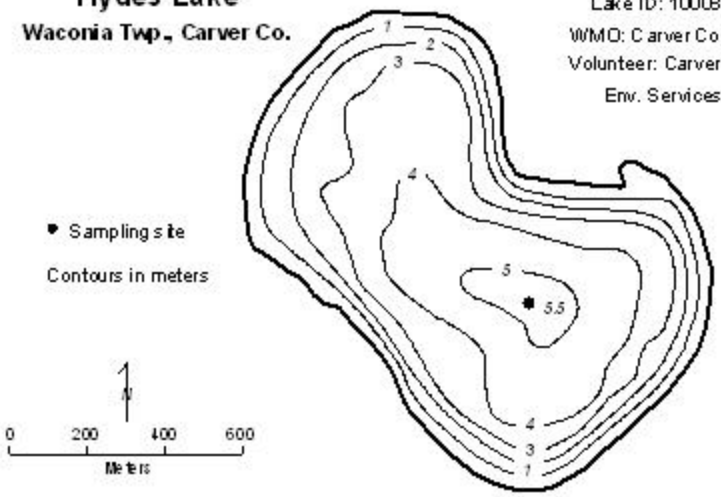
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

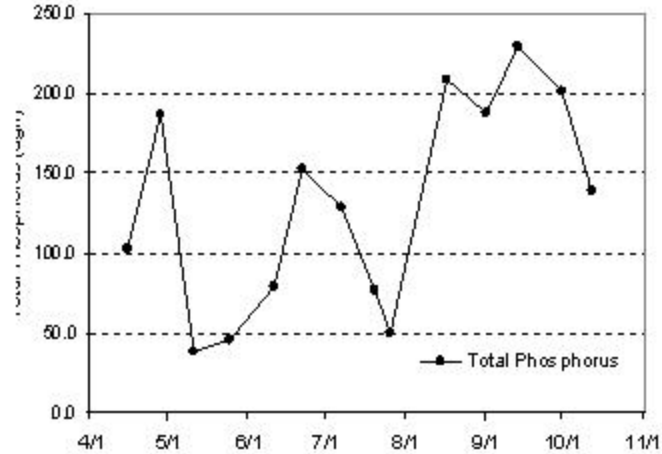
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

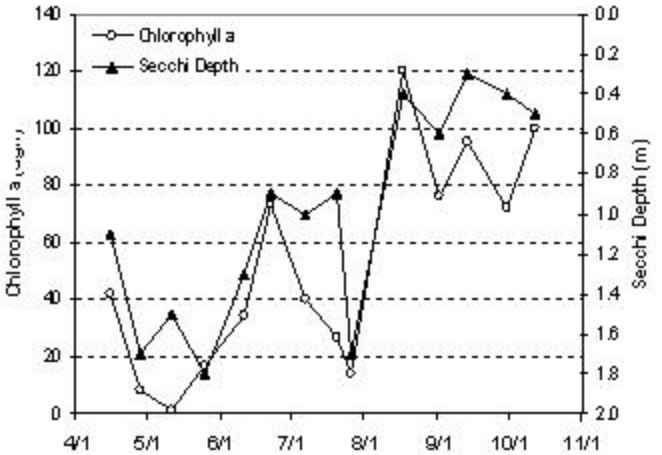
Hydes Lake

Waconia Twp., Carver Co.

Lake ID: 100088
WMO: Carver County
Volunteer: Carver Co.
Env. Services

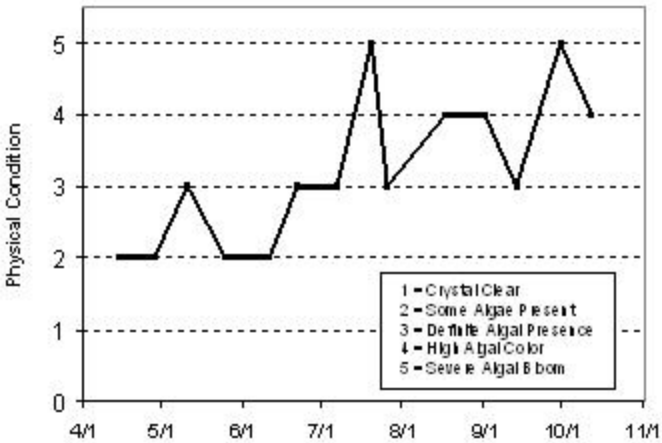






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	9.8		14.42		42	103.0		1.1	2	2
4/28/04	12.3		11.1		8.2	187.0		1.7	2	2
5/11/04	16.9		9.5		1.4	38.0		1.5	3	2
5/25/04	14.6		7.8		17	46.0		1.8	2	2
6/11/04	20.3		7		34	79.0		1.3	2	2
6/22/04	20.5		8		73	153.0		0.9	3	3
7/7/04	20.7		8.1		40	129.0		1.0	3	3
7/20/04	27.6		7.7		27	77.0		0.9	5	5
7/26/04	25.8		9.8		14	50.0		1.7	3	3
8/17/04	21		6.9		120	209.0		0.4	4	5
9/1/04	22.7		13.1		76	188.0		0.6	4	4
9/13/04	21.4		7.9		95	229.0		0.3	3	3
9/30/04	17.5		9.5		72	201.0		0.4	5	5
10/12/04	15.4		15.1		100	139.0		0.5	4	4

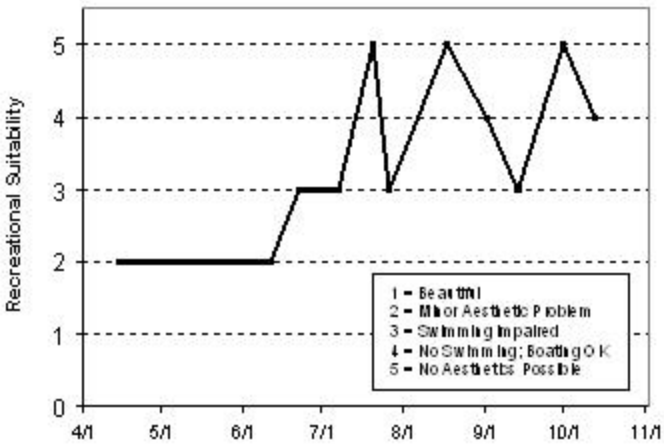


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus						F						F
Chlorophyll a						D						D
Secchi Depth						D						D
Overall						D						D

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		F			F			F	F	D	D	D	D
Chlorophyll a		C			C			C	C	C	C	C	D
Secchi Depth		C			C			C	C	A	F	C	D
Overall		D			D			D	D	C	D	C	D

Source: Metropolitan Council and STORET data



Island Lake (2-0022) *Anoka County Parks*

This was the second year of CAMP monitoring on Island Lake, which is located in Linwood Township (Anoka County). The lake has a surface area of 67 acres and a maximum depth of 6.7 m (22 feet). Roughly 87 percent of the lake's surface area is considered littoral zone (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).

A search through the STORET nationwide water quality database for data on the lake provided only one prior year of water quality data for the lake (1983) prior to the 2003-2004 CAMP data.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	34.6	18.0	72.0	C
CLA (µg/l)	9.4	3.5	17.0	A
Secchi (m)	1.8	1.3	2.2	C
TKN (mg/l)	0.88	0.34	1.40	
			Overall Grade	B

The lake's overall 2004 lake quality grade of B is identical to that recorded in 2003 and better than the C calculated from the 1983 data.

Because 2004 is only the third year of available data, no long- or short-term trends can be determined. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 1.8 for physical condition (between 1- "crystal clear" and 2- " some algae present") and 1.0 for recreational suitability (1- "beautiful").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of any errors in the lake's data/physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Island Lake

Linwood Twp., Anoka Co.

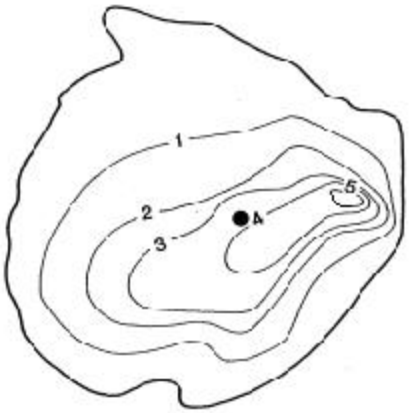
Lake ID: 20022

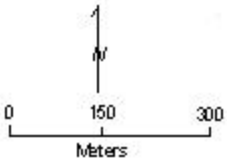
WMO: Sunrise River

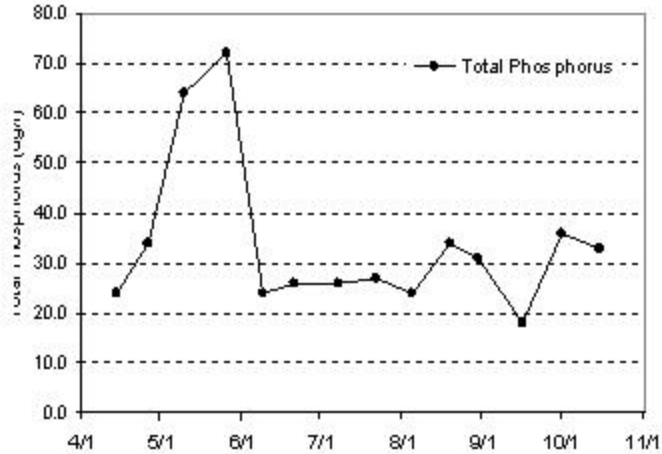
Volunteer: Anoka Co. Parks

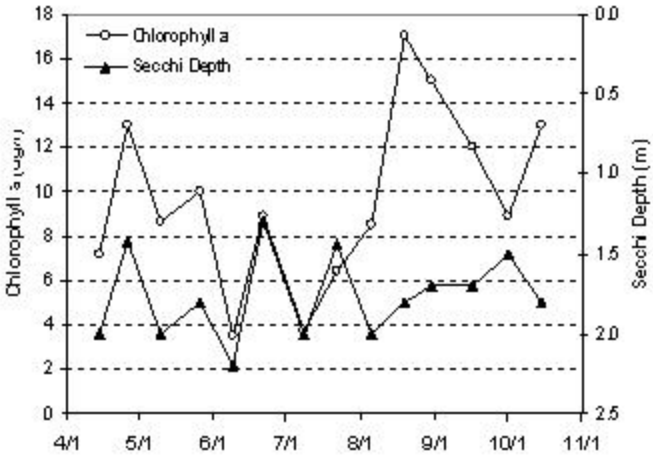
Sampling site

Contours in meters



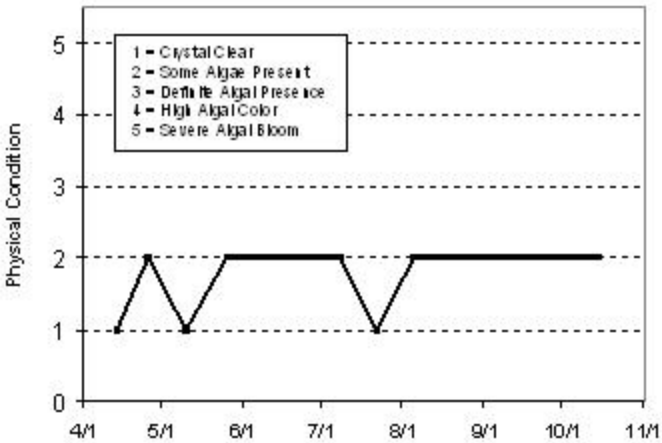






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	10				7.2	24.0		2.0	1	
4/26/04	11				13	34.0		1.4	2	2
5/10/04	17				8.7	64.0		2.0	1	
5/26/04	15				10	72.0		1.8	2	
6/9/04	21				3.5	24.0		2.2	2	
6/21/04	20				8.9	26.0		1.3	2	
7/8/04	22				3.7	26.0		2.0	2	
7/22/04	31				6.4	27.0		1.4	1	1
8/5/04	25				8.5	24.0		2.0	2	
8/19/04	21				17	34.0		1.8	2	
8/30/04	21				15	31.0		1.7	2	
9/16/04	20				12	18.0		1.7	2	
10/1/04	18				8.9	36.0		1.5	2	
10/15/04	12				13	33.0		1.8	2	

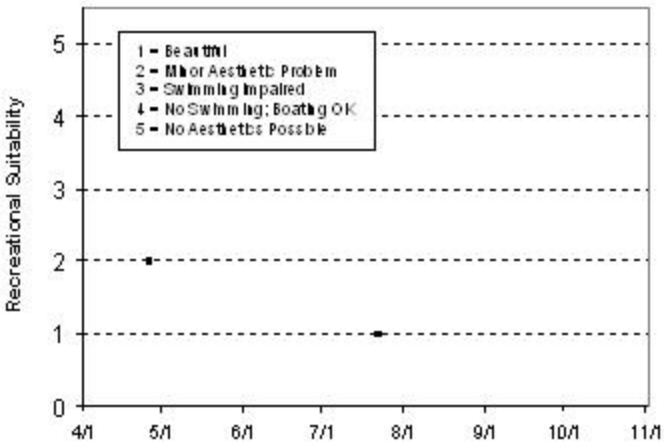


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus				C								
Chlorophyll a				C								
Secchi Depth				D								
Overall				C								

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus												B	C
Chlorophyll a												B	A
Secchi Depth												C	C
Overall												B	B

Source: Metropolitan Council and STORET data



Jane Lake (82-0080) *Valley Branch Watershed District*

Lake Jane, which has a surface area of roughly 160 acres, is located in the northwest corner of the City of Lake Elmo (Washington County). The maximum and mean depths of the lake are 10.7 and 3.7 m (35 and 12 feet), respectively (roughly 69 % of the lake is considered littoral; the area of aquatic plant dominance). The approximate volume of the lake is 1,920 acre-feet (ac-ft) and its residence time (the estimated time it would take the lake to replenish itself if it were drained), is roughly 1.4 years. The size of the lake's immediate watershed is approximately 921 acres. 1990 land use estimates indicate that approximately 25 % of the watershed is agricultural, 19 % is urban, 10 % is forested, 6 % is public waters/wetlands, and 39 % is undeveloped (VBWD 1994).

The lake has a public access located on its south end, which gets heavy use by area fishermen (the MNDNR manages the lake for largemouth bass, bluegill and crappie, and reports good reproduction) and boaters during the summer months. Furthermore, Lake Jane is considered a "Priority Lake" in the Metropolitan Area by the Metropolitan Council because of its multi-recreational uses.

This is the second year the lake has been a part of CAMP (1994 being the first). In addition to the CAMP monitoring, the lake has been monitored in past years by Council staff. As part of the 2004 volunteer monitoring program, Lake Jane was monitored 15 times from mid-April to mid-October. Graphs as well as the actual data collected by volunteers show the seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability). The graphs and data tables are presented on the information sheet on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	10.6	3.0	14.0	A
CLA (µg/l)	3.1	1.6	5.6	A
Secchi (m)	4.9	4.0	5.6	A
TKN (mg/l)	0.49	0.27	0.67	
			Overall Grade	A

Data retrieved from the MPCA's STORET water quality database revealed an extensive historical database for Lake Jane. Varying amounts of water quality data were available representing each year since 1980. Out of the 17 years of data, Secchi transparencies were recorded annually, phosphorus was measured in nine of those 17 years, and CLA seven years. The lake's best water quality has been recorded in 2000 and 2004.

The average user perception rankings of Lake Jane correspond to the overall good quality of the lake. On a 1 to 5 ranking scale, the mean physical condition ranking was 1.0 (1- "crystal clear"), while the mean recreational suitability was 1.0 (1- "beautiful").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of any errors in the lake's data/physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

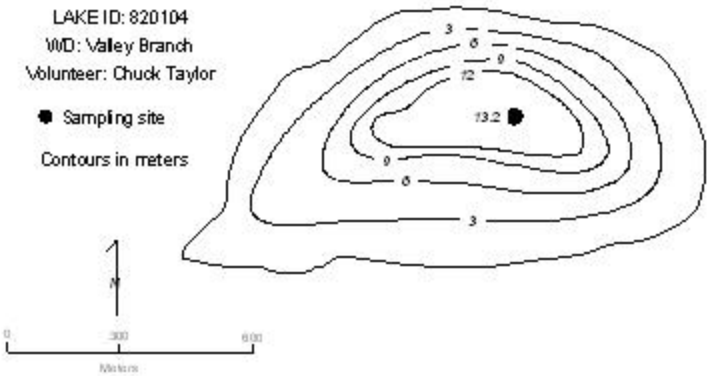
Lake Jane

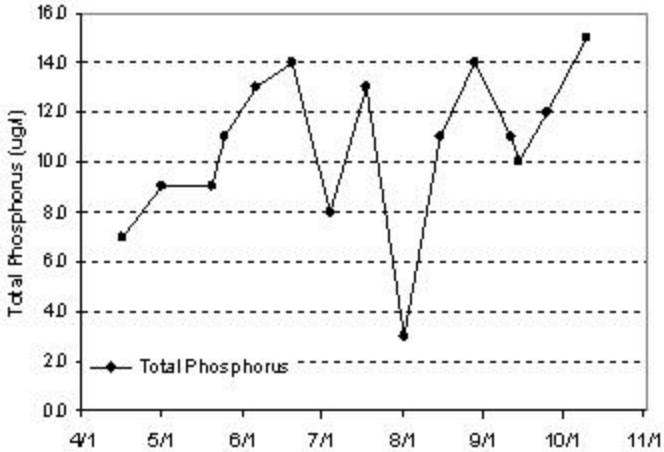
Lake Elmo, Washington Co.

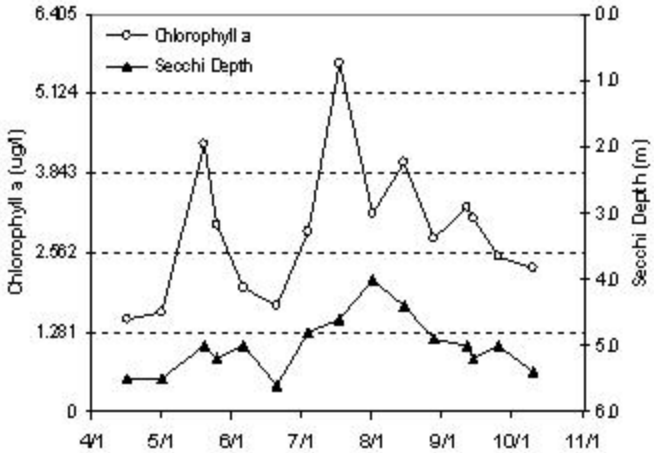
LAKE ID: 820104
WD: Valley Branch
Volunteer: Chuck Taylor

● Sampling site

Contours in meters

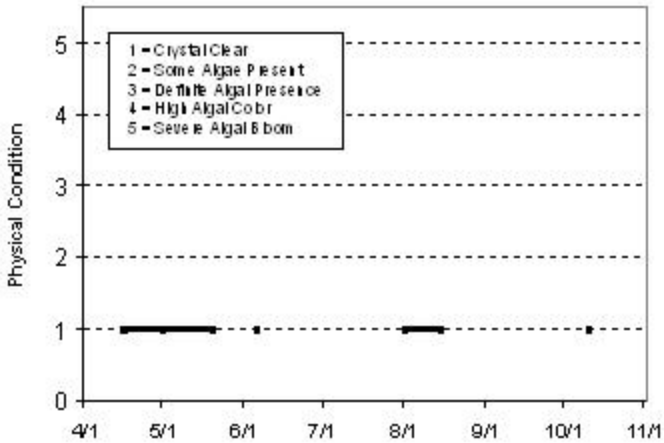






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/16/04	10.4				1.5	7.0		5.5	1	1
5/1/04	13.6				1.6	9.0		5.5	1	1
5/20/04	18.4				4.3	9.0		5.0	1	1
5/25/04	21				3	11.0		5.2		
6/6/04	22.9				2	13.0		5.0	1	1
6/20/04	21.7				1.7	14.0		5.6		
7/4/04	24.3				2.9	8.0		4.8		
7/18/04	27.3				5.6	13.0		4.6		
8/1/04	24.7				3.2	3.0		4.0	1	
8/15/04	22.6				4	11.0		4.4	1	1
8/28/04	21.8				2.8	14.0		4.9		
9/11/04	23.2				3.3	11.0		5.0		
9/14/04	24				3.1	10.0		5.2		
9/25/04	20.1				2.5	12.0		5.0		
10/10/04	16.2				2.3	15.0		5.4	1	1

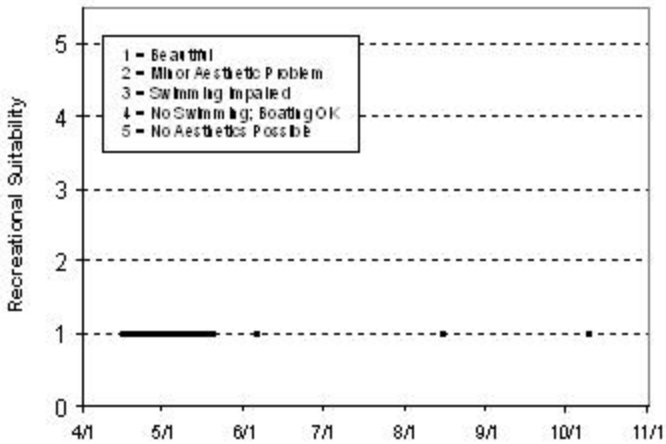


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	B	B			C		B	B				B
Chlorophyll a					C		B	B				B
Secchi Depth	A	A	A	A	B	B	B	B	B	B	B	B
Overall					C		B	B				B

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			A						A				A
Chlorophyll a			A						A				A
Secchi Depth	C	B	B						A				A
Overall			A						A				A

Source: Metropolitan Council and STORET data



Jellum's Bay [Site-1] (82-0052-02) *Carnelian - Marine Watershed District*

Jellum's Bay, located in New Scandia Township in Washington County. This was the second year the lake has been involved in CAMP. Because the maximum depth of the 72-acre lake is only 4.9 m (16 feet), the majority of the lake's area is considered littoral zone (the 0-15 foot depth area of the lake dominated by aquatic vegetation). Additionally, because of the lake's shallowness it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The lake's mean depth of 2.4 m (roughly 8 feet) and its surface area translate to an approximate lake volume of 569 ac-ft. The lake has a 333-acre immediate watershed, which translates to a watershed-to-lake area ratio of 4.6:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff).

A search through the STORET nationwide water quality database for data on the lake provided historical water quality data on the lake for years 1996-2003. The resulting data and graphs appear on the next page.

The lake was monitored 14 times between mid-April and mid-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	73.1	49.0	91.0	D
CLA (µg/l)	34.5	15.0	53.0	C
Secchi (m)	1.1	0.9	1.8	D
TKN (mg/l)	1.48	1.20	1.80	
			Overall Grade	D

The lake's 2004 overall grade of D (calculated from the three idividual grades) is identical to those recorded in 1996-1999, and 2001-2003, and better than that of 2000 (F). The lakes individual summer means in 2004, however were much better than those recorded in 2003.

Statistical analysis on the lake's water quality database did not detect any long-term trends. In the short-term however, the lake's water quality seems to be well represented by an overall grade of D. In order to detect any possible long-term trends, additional years of data collection are needed.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean perceived physical condition of Jellum's Bay was 2.2 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability was 2.1 (between 2- minor aesthetic problem" and 3- "swimming slightly impaired").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Jellum's Lake, Site 1

New Scandia Twp.,
Washington Co.

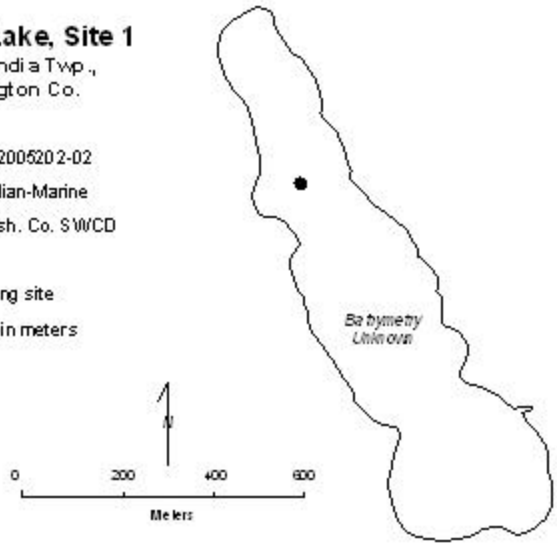
LAKE ID: 82005202-02

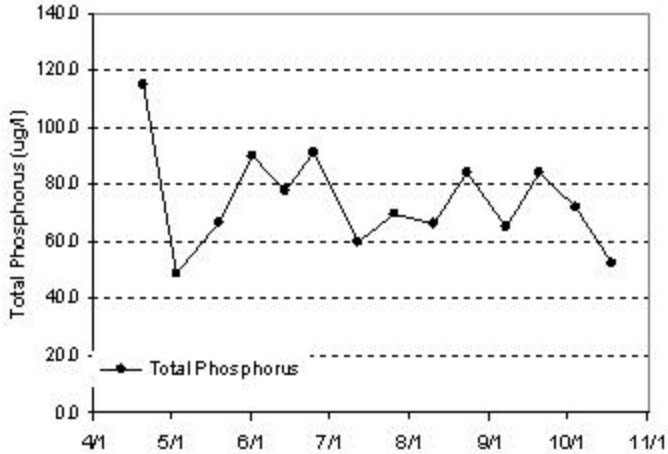
WD: Carnelian-Marine

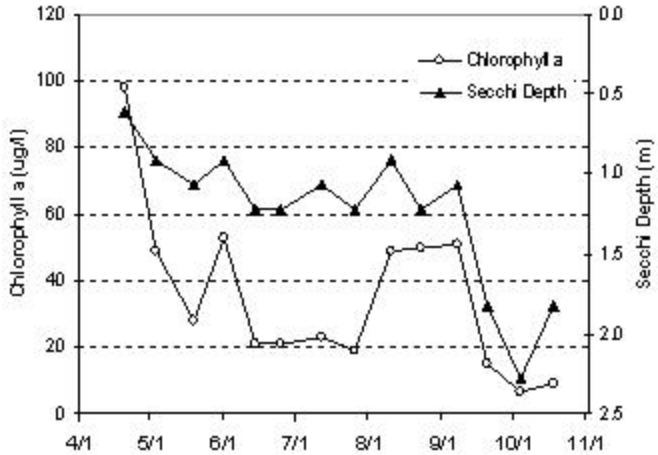
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

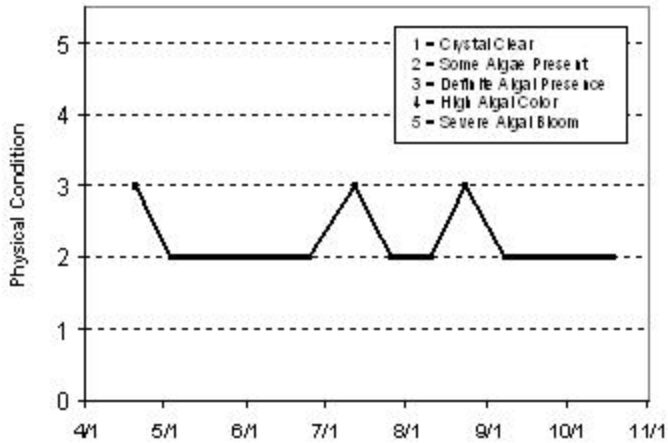






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	12.05	12.1	12.03	0.09	98	115.0		0.6	3	4
5/3/04	13.6	12.1	10.3	0.04	49	49.0		0.9	2	2
5/19/04	17.2	15.5	9.26	7.3	28	67.0		1.1	2	2
6/1/04	17	15	9.2	0.07	53	90.0		0.9	2	2
6/14/04	23.3	15.5	9.24	0.19	21	78.0		1.2	2	2
6/25/04	20	17	6.73	0.22	21	91.0		1.2	2	2
7/12/04	27	15.7	8.1	0.22	23	60.0		1.1	3	3
7/26/04	26.6	15.6	8.09	0.14	19	70.0		1.2	2	2
8/10/04	21	16	4.11	0.4	49	66.0		0.9	2	2
8/23/04	19.8	17.2	7.27	0.12	50	84.0		1.2	3	2
9/7/04	21.6	18.8	4.74	0.28	51	65.0		1.1	2	2
9/20/04	20.1	19.9	4.66	0.11	15	84.0		1.8	2	2
10/4/04	13.7	13.9	4.59	0.25	6.7	72.0		2.3	2	2
10/18/04	9.4	9.4	4.86	4.54	9.1	52.0		1.8	2	2

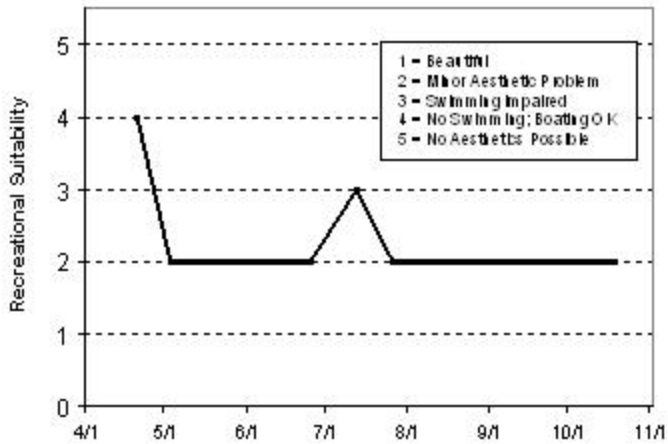


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					F	D	D	D	D	D	C	D	D
Chlorophyll a					D	D	D	D	F	D	D	F	C
Secchi Depth					D	D	F	F	F	D	D	D	D
Overall					D	D	D	D	F	D	D	D	D

Source: Metropolitan Council and STORET data



Keller Lake [Burnsville] (19-0025) *Black Dog Watershed Management Commission*

Keller Lake, located in both the cities of Apple Valley and Burnsville (Dakota County), covers an area of 63 acres and has a maximum depth of 3.0 m (10 feet). The lake's mean depth of 1.4 m (4.6 feet) and surface area translates to an approximate lake volume of 290 ac-ft (the lake volume may have changed over the past couple years due to the lake level rising 1.5 to 2.0 feet above normal). Because the maximum depth is only 3.0 m, the entire 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).

The land uses within the 353-acre contributing watershed to the lake are approximately split between agricultural uses and urban/residential. The watershed-to-lake size ratio is 6:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff).

This was the sixth year that Keller Lake has been enrolled in CAMP. The lake had been monitored by Council-staff in the past as part of a study on Crystal Lake (which Keller flows into). In 2004, the lake was monitored 15 times between mid-April and mid-October. The collected data and resulting graphs showing TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	40.8	30.0	81.0	C
CLA (µg/l)	14.1	5.6	35.0	B
Secchi (m)	1.5	0.7	2.4	C
TKN (mg/l)	0.66	0.37	1.10	
			Overall Grade	C

The lake's overall grade in 2004 (C) is similar to that recorded in 2002, better than those recorded in 1996-1997, 1999-2001 (D), and worse than the B recorded in 1998. Because of the variability of the lake's grades, no statistically significant long-term trend is evident from the lake's water quality database. The lakes water quality does seem to best represented by an overall grade of D+/C.

Throughout the 2004 season, the volunteer monitor ranked their perceptions of the lake's physical and recreational condition on a 1-to-5 scale. The mean perceived physical condition was 2.8 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability was 3.6 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

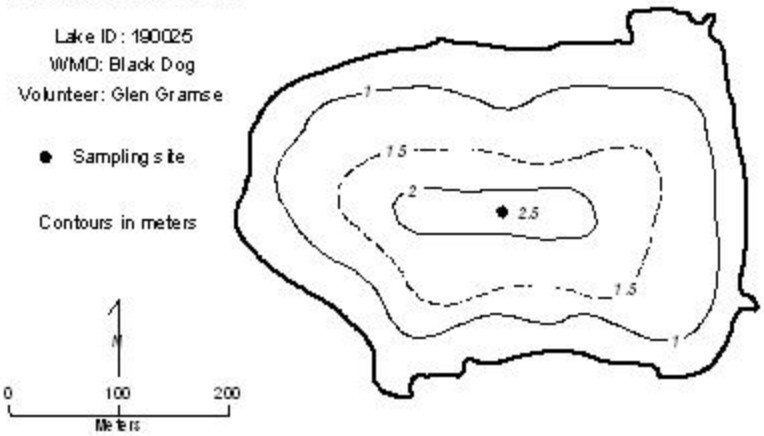
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

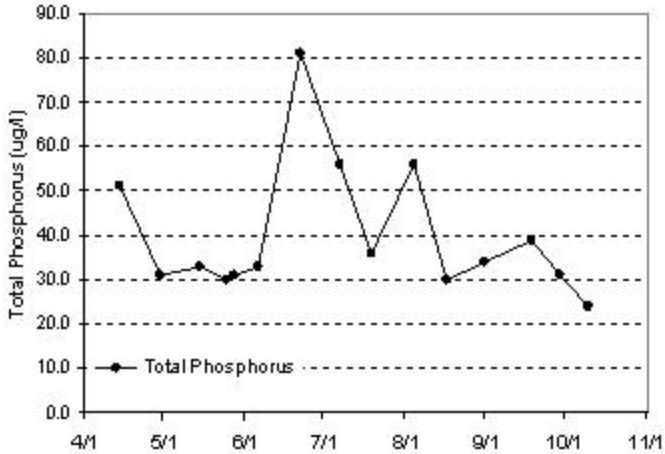
Keller Lake
Burnsville, Dakota Co.

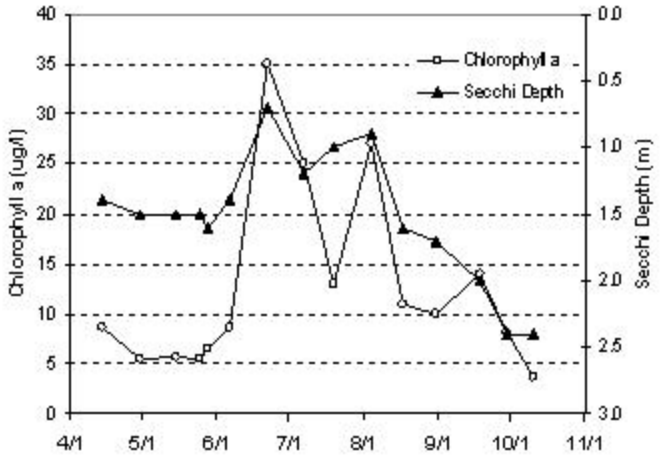
Lake ID: 190025
WMO: Black Dog
Volunteer: Glen Gramse

● Sampling site

Contours in meters

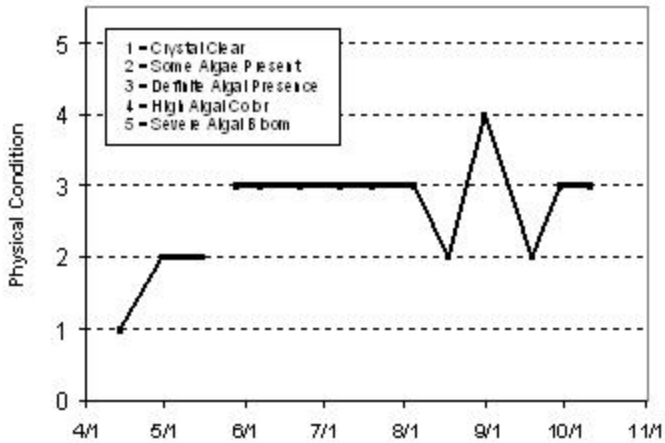






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	13.3				8.6	51.0		1.4	1	1
4/30/04	15.6				5.5	31.0		1.5	2	4
5/15/04	17.6				5.6	33.0		1.5	2	4
5/25/04	19.2				5.4	30.0		1.5		
5/28/04	20.7				6.4	31.0		1.6	3	4
6/6/04	22.4				8.7	33.0		1.4	3	4
6/22/04	22.8				35	81.0		0.7	3	4
7/7/04	23.7				25	56.0		1.2	3	4
7/19/04	26.5				13	36.0		1.0	3	4
8/4/04	25.7				27	56.0		0.9	3	4
8/17/04	22.7				11	30.0		1.6	2	4
8/31/04	22.4				9.9	34.0		1.7	4	4
9/18/04					14	39.0		2.0	2	2
9/29/04					8.2	31.0		2.4	3	2
10/10/04					3.6	24.0		2.4	3	4

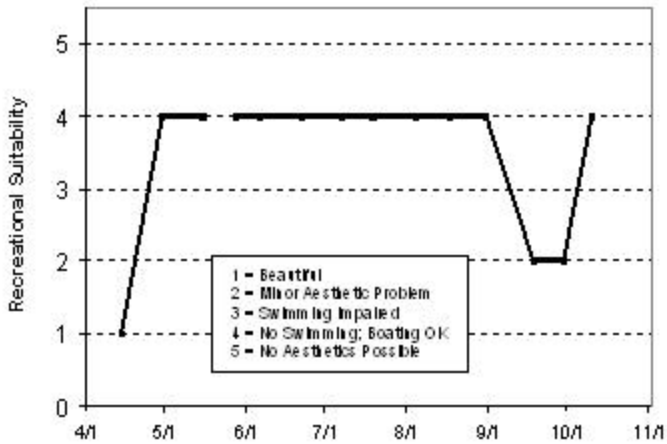


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					D	D	C	D	D	D	C	D	C
Chlorophyll a					F	C	A	C	C	C	B	C	B
Secchi Depth					D	D	C	D	D	D	D	D	C
Overall					D	D	B	D	D	D	C	D	C

Source: Metropolitan Council and STORET data



Kingsley Lake (19-0030) *Black Dog Watershed Management Commission*

This was the seventh year that Kingsley Lake has been monitored as part of CAMP (1995-1997 and 2000-2004). Additionally, the lake was monitored by Council-staff in 1993. The lake is located in the northwestern corner of the City of Lakeville in Dakota County. The lake has a surface area of 44 acres (shoreline length of 1.7 miles), a maximum depth of 4.0 m (13 feet), and a contributing watershed of 193 acres. The resulting watershed-to-lake size ratio is a rather small 4:1, that no doubt contributes to the good water quality of the lake. Because of the shallowness of the lake, the entire lake is considered littoral (area of aquatic vegetation dominance), and never develops and maintains a thermocline.

Kingsley Lake was monitored 15 times between mid-April and early-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

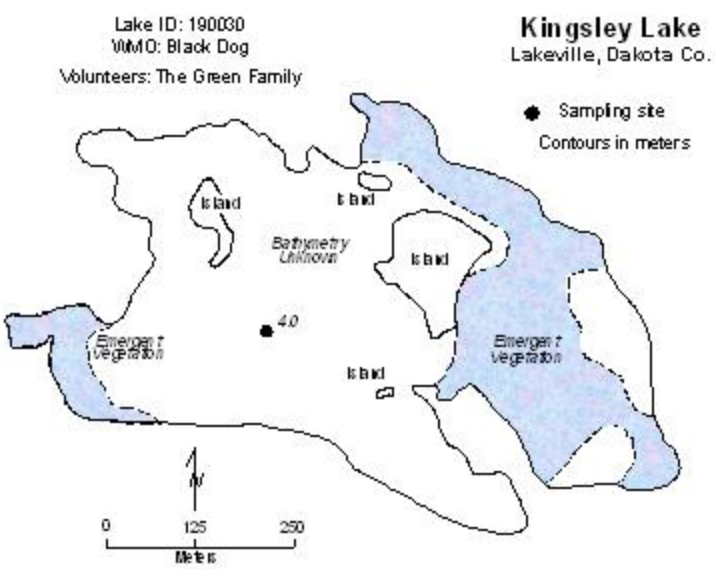
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	20.6	13.0	30.0	A
CLA (µg/l)	3.4	1.8	4.8	A
Secchi (m)	2.5	1.9	3.4	B
TKN (mg/l)	0.49	0.37	0.64	
			Overall Grade	A

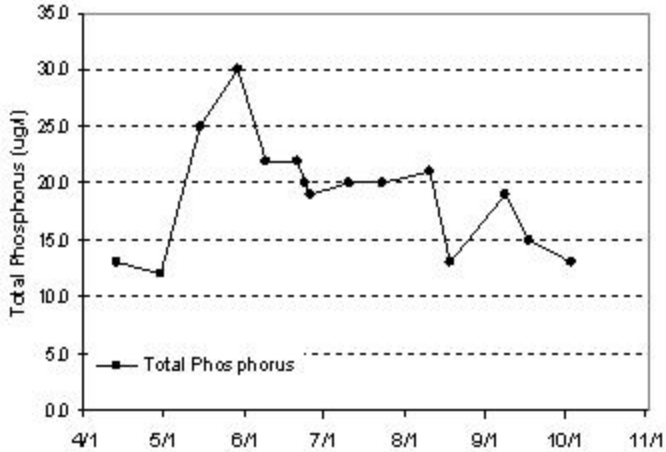
Similar to past years, the Secchi transparency in 2004 would have been greater except on many monitoring events the lake's excessive submergent macrophyte growth got in the way. For this reason, if it weren't for the macrophyte interference, the water clarity conditions may have actually been that of an A grade.

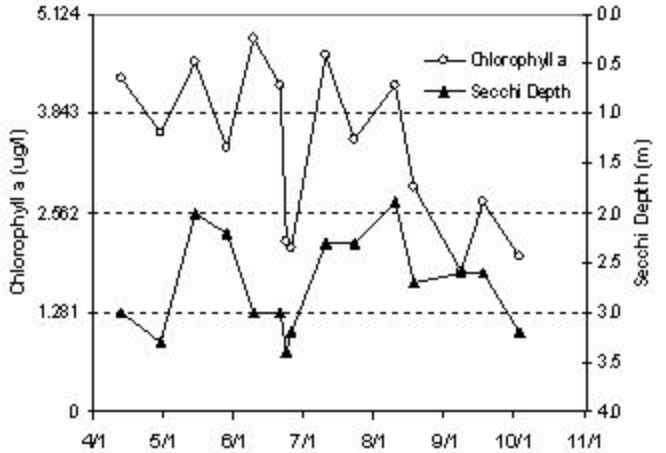
The physical and recreational conditions of Kingsley Lake as perceived by the volunteer(s) were ranked on a 1-to-5 scale. The mean physical condition ranking was 2.0 (2- "some algae present"), while the mean recreational suitability ranking was 2.2 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's water quality seems to be represented by a water quality grade of A/high B.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

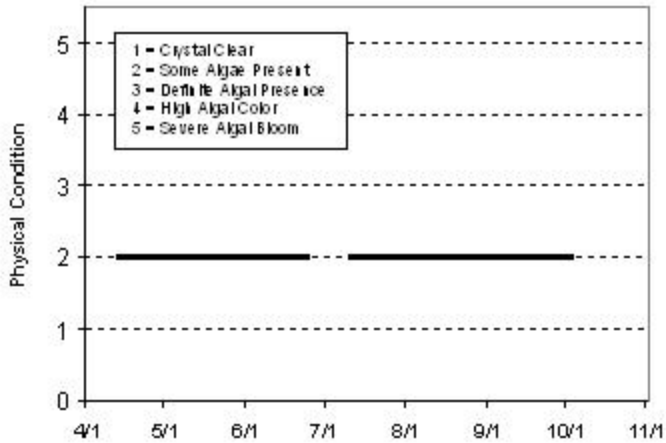






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	10.6				4.3	13.0		3.0	2	1
4/30/04	15				3.6	12.0		3.3	2	1
5/15/04	15				4.5	25.0		2.0	2	1
5/29/04	15				3.4	30.0		2.2	2	1
6/9/04	21				4.8	22.0		3.0	2	1
6/21/04	22.4				4.2	22.0		3.0	2	1
6/24/04	20				2.2	20.0		3.4	2	1
6/26/04	21				2.1	19.0		3.2		
7/11/04	23				4.6	20.0		2.3	2	3
7/23/04	26				3.5	20.0		2.3	2	3
8/10/04	20				4.2	21.0		1.9	2	3
8/18/04	20				2.9	13.0		2.7	2	3
9/8/04	20				1.8	19.0		2.6	2	3
9/17/04	20				2.7	15.0		2.6	2	3
10/3/04	12				2	13.0		3.2	2	1

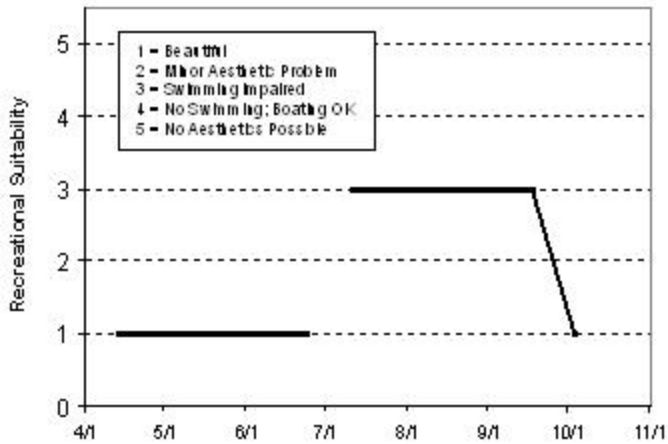


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		B		B	A	A			A	A	A	B	A
Chlorophyll a		A		A	A	A			A	A	A	A	A
Secchi Depth		A		B	B	B			B	C	B	B	B
Overall		A		B	A	A			A	B	A	B	A

Source: Metropolitan Council and STORET data



Kismet Lake (82-0333) *Browns Creek Watershed District*

Kismet Lake is located in Washington County. The relatively small lake has a maximum depth of approximately 3.7 m (12 feet). Because of the shallowness of the lake the whole lake is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation.

This was the seventh year that Kismet Lake has been involved in CAMP (in was initially enrolled in 1998). The only available lake data found through a search for historical water quality was the 1998-2004 CAMP data. The lake was monitored 14 times between mid-April and mid-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	31.1	19.0	48.0	B
CLA (µg/l)	9.1	3.8	17.0	A
Secchi (m)	2.5	2.0	2.7	B
TKN (mg/l)	0.79	0.58	1.20	
			Overall Grade	B

Results are presented on graphs and data tables on the following page.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of B+/C. Recent water quality, however, has been slightly improved. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

The perceived physical and recreational conditions of the lake, recorded by the volunteers, were ranked on a 1-to-5 scale. The rankings are shown in both tabular and graphical form on the lake's associated information sheet. The mean physical condition ranking was 2.0 (between 2- "some algae present"), while the mean recreational suitability ranking was 2.3 (2- "minor aesthetic problem" and 3- "swimming slightly impaired").

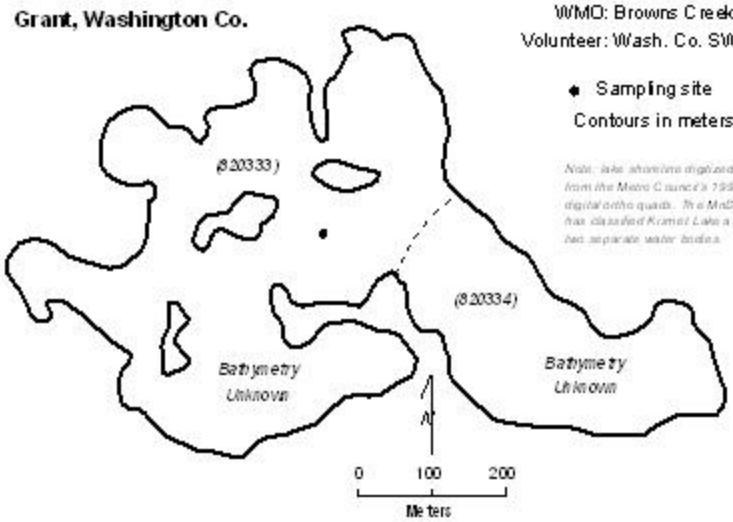
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

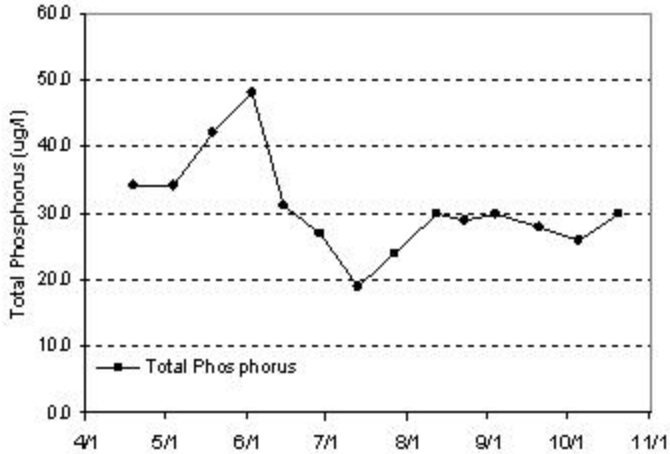
Kismet Lake

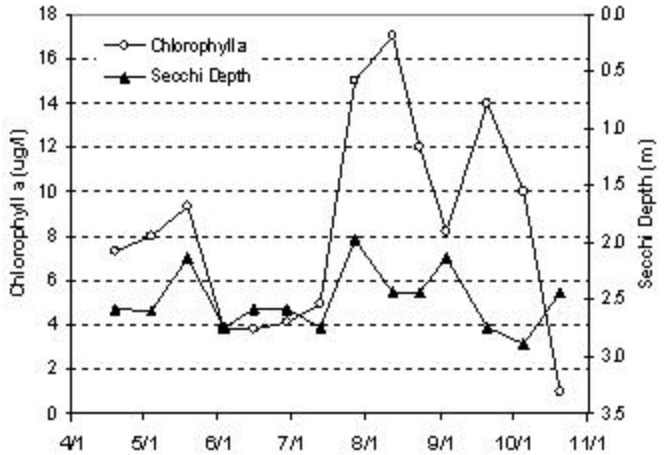
Grant, Washington Co.

Lake IDs: 820333 and 820334
WMO: Browns Creek
Volunteer: Wash. Co. SWCD



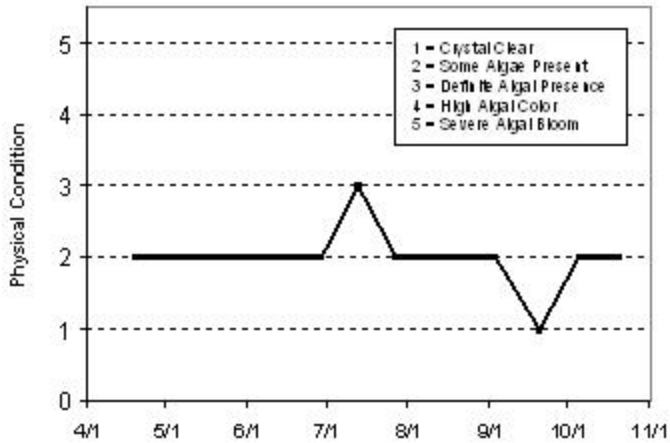
Note: lake shoreline digitized from the Metro Council's 1997 digital ortho quads. The MnDNR has classified Kismet Lake as a two separate water bodies.





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	14.6	10.9	9.09	0.02	7.3	34.0		2.6	2	2
5/4/04	14.9	14.1	9.58	0.55	8	34.0		2.6	2	3
5/19/04	18.8	15.6	8.62	1.75	9.3	42.0		2.1	2	
6/3/04	18.4	16.4	8.53	0.05	3.8	48.0		2.7	2	2
6/15/04	23.4	18.7	7.76	0.22	3.8	31.0		2.6	2	2
6/29/04	22.4	19.5	7.2	1.57	4.1	27.0		2.6	2	2
7/13/04	25.7	20.9	7.54	0.13	4.9	19.0		2.7	3	3
7/27/04	25.4	22.7	5.97	0.13	15	24.0		2.0	2	2
8/12/04	20	18.9	5.7	0.21	17	30.0		2.4	2	2
8/23/04	21	19.3	7.25	0.07	12	29.0		2.4	2	2
9/3/04	24.8	19.8	7.12	0.16	8.2	30.0		2.1	2	3
9/20/04	20.5	19.3	5.48	0.04	14	28.0		2.7	1	2
10/5/04	12.4	12.5	6.03	0.07	10	26.0		2.9	2	2
10/20/04	8.8	8.5	7.49	0.07	1	30.0		2.4	2	2

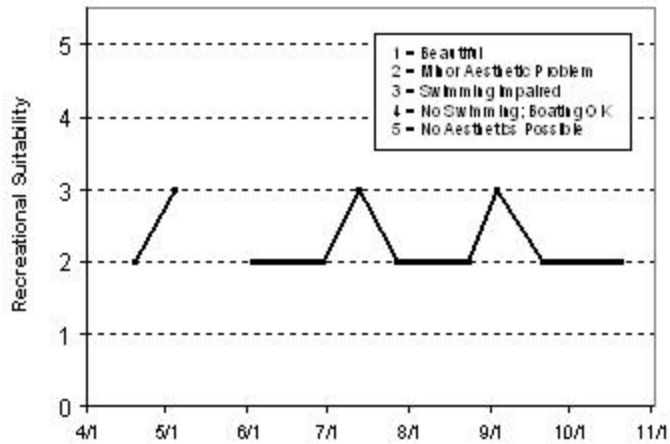


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus							C	C	D	C	C	B	B
Chlorophyll a							C	C	C	B	B	B	A
Secchi Depth							C	C	C	C	C	B	B
Overall							C	C	C	C	C	B	B

Source: Metropolitan Council and STORET data



Klawitter Lake (82-0368) *Valley Branch Watershed District*

Klawitter Lake is a small lake located within the boundaries of Lake Elmo (Washington County). There is very little known morphological data available for the lake.

This was the second year that Klawitter Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake came up empty, therefore 2002-2004 are the only years of available water quality data for the lake.

As part of the watershed's involvement in CAMP in 2004, the lake was monitored 14 times between mid-April and mid-October. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	110.4	80.0	176.0	D
CLA (µg/l)	21.1	10.0	35.0	C
Secchi (m)	0.8	0.5	1.1	D
TKN (mg/l)	1.55	1.20	2.00	
			Overall Grade	D

The 2004 overall grade determined through the calculation of all three parameters was D, is similar to that recorded in 2003, and worse than the overall grade of C of 2002.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 2.8 (between 2- "some algae present" 3- "definite algae present"), while the mean recreational suitability ranking was 2.8 (between 2- "minor aesthetic problems" and 3- "swimming slightly impaired").

As mentioned earlier, there are no water quality data available for Klawitter Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Klawitter Pond

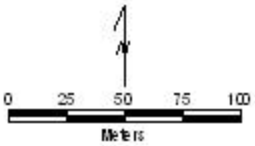
Lake Elmo, Washington Co.

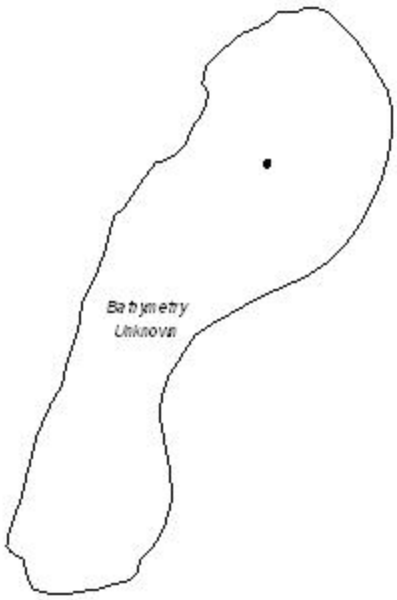
Lake ID: 820368
WD: Valley Branch

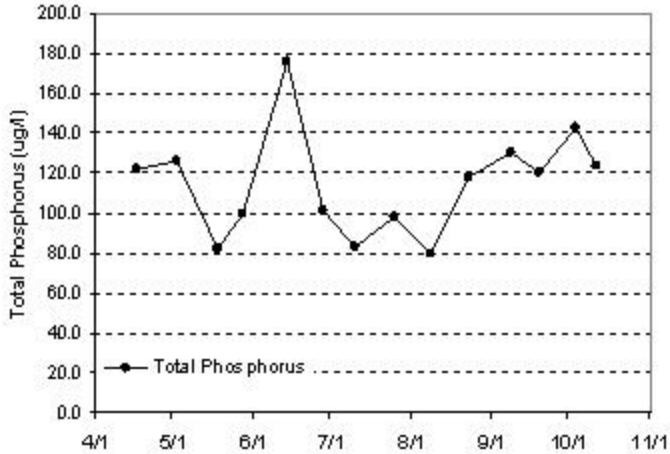
Volunteer: Bonnie Jurand

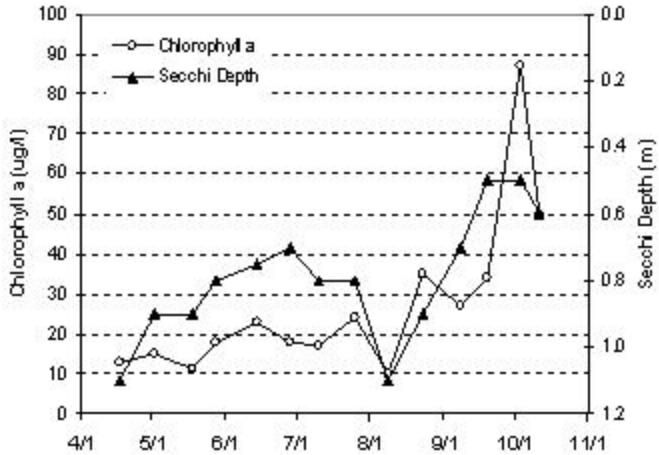
• Sampling site

Contours in meters



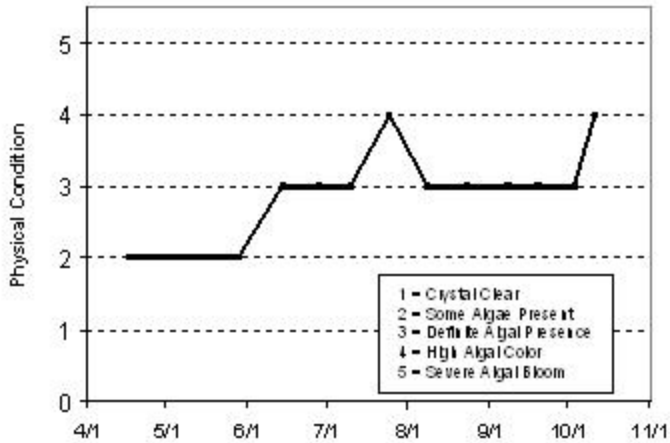






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	16.3				13	122.0		1.1	2	2
5/2/04	17.1				15	126.0		0.9	2	2
5/18/04	21.1				11	82.0		0.9	2	2
5/28/04	19.4				18	100.0		0.8	2	2
6/14/04	24.8				23	176.0		0.8	3	3
6/28/04	24.1				18	101.0		0.7	3	3
7/10/04	25.2				17	83.0		0.8	3	3
7/25/04	26.8				24	98.0		0.8	4	3
8/8/04	24.8				10	80.0		1.1	3	3
8/23/04	21.8				35	118.0		0.9	3	3
9/8/04	21.4				27	130.0		0.7	3	3
9/19/04	23.5				34	120.0		0.5	3	4
10/3/04	16.8				87	143.0		0.5	3	4
10/11/04	16				50	124.0		0.6	4	4

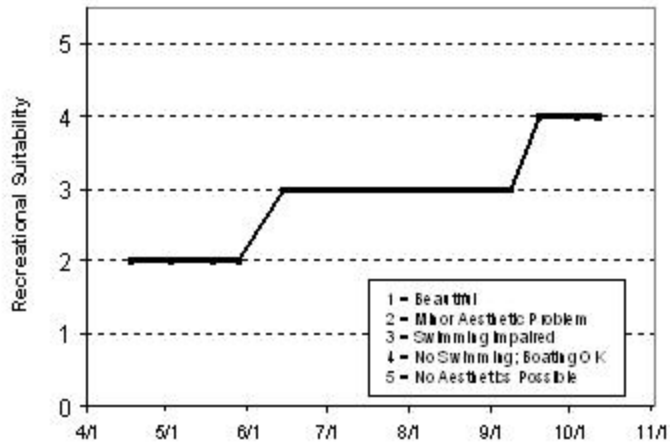


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											D	D	D
Chlorophyll a											B	C	C
Secchi Depth											D	F	D
Overall											C	D	D

Source: Metropolitan Council and STORET data



La Lake (82-0097) *City of Woodbury*

La Lake, located in the City of Woodbury (Washington County), has been monitored through CAMP since 1994. The lake has a surface area of approximately 35 acres (1.3 miles around) and a maximum depth of 3.5 m (11 feet). Because of the shallowness of the lake, it is considered entirely littoral (the 0-15 foot depth zone of a lake dominated by aquatic vegetation), and does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column).

As part of the lake's involvement in CAMP in 2004, the lake was monitored three times between early-May and mid-August. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

Because there were only three monitoring events for La Lake in 2004, the determination of a 2004 summer means and resulting grades would not provide a true picture of the lake's water quality in 2004. The lake's 2004 raw data and resulting graphs are presented on the associated lake information page.

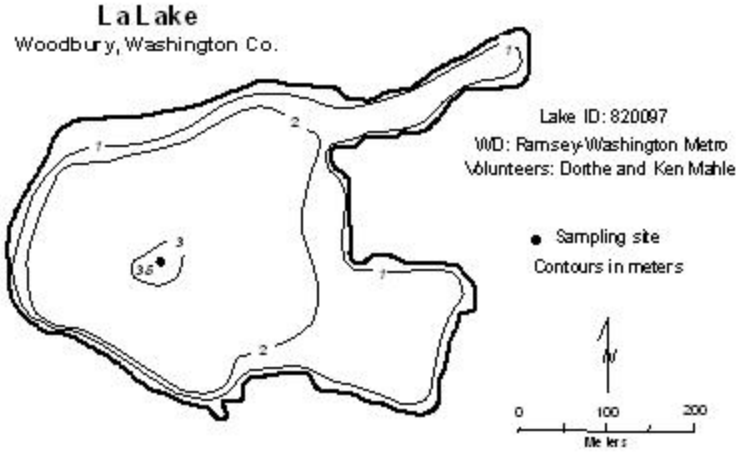
The lake's early-summer monitoring results in 2004 were however, in line to those recorded over the past few years.

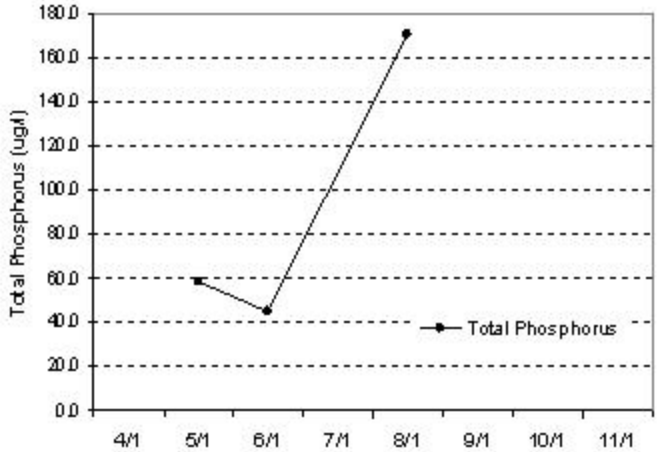
No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's overall water quality seems to be well represented by a water quality grade of high-C/low-B. With this in mind, however, some concern should be given to the recent (late-1990's and early-2000's) poor water quality years.

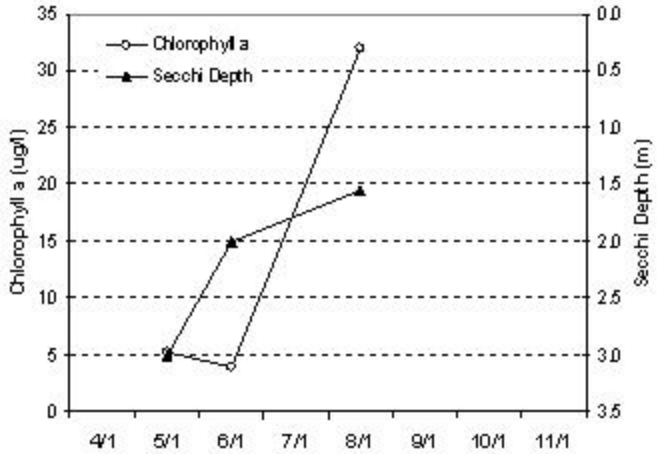
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

La Lake

Woodbury, Washington Co.

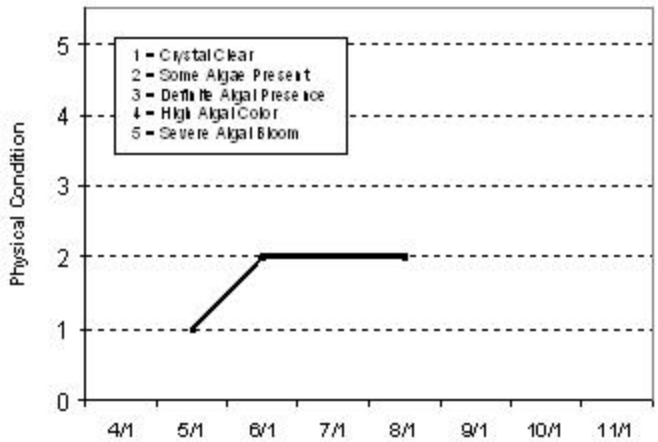






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/18/04	14.6				6.2	60.0		3.0	1	1
6/30/04	23.5				3.9	45.0		2.0	2	2
8/16/04	26				32	170.0		1.6	2	2

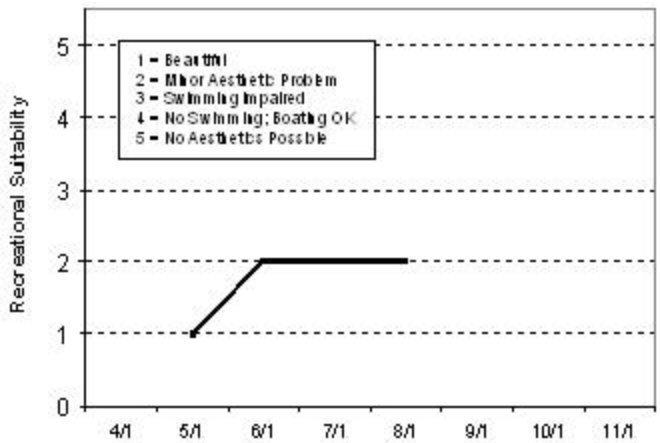


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	C	D	D	C	D	D	D	D	C	NA
Chlorophyll a			B	A	B	C	B	C	C	C	B	C	NA
Secchi Depth			C	B	C	C	B	C	C	C	C	B	NA
Overall			C	B	C	C	B	C	C	C	C	C	NA

Source: Metropolitan Council and STORET data



Lac Lavon Lake (19-0446) *Black Dog Watershed Management Commission*

This was the eighth year that Lac Lavon has been involved in CAMP. A data search on the lake came up fairly empty. The only water quality data found for the lake were Secchi transparency data in 1989-1991 and CAMP data for 1997-2004.

The lake, located within the City of Apple Valley in Dakota County, is actually an abandoned gravel pit maintained by groundwater (MDNR 1996). The lake is a unique resource in the Twin Cities Metropolitan Area because it is one of only six lakes in the seven-county area stocked with trout (rainbows). The 55-acre lake (2.3 miles in circumference) has a maximum depth of 9.8 m (32 feet) and 65 percent of the lake is considered littoral zone (the 0-15 foot depth zone of the lake dominated by aquatic vegetation). The lake's fishing pier is located on the eastern end of the lake. An area of concern and need for future management is the recent detection of Eurasian Water Milfoil (*Myriophyllum spicatum*) in the lake.

Lac Lavon was monitored 12 times between mid-May and mid-October, 2004. The data and resulting graphs showing seasonal variability in TP and CLA concentrations, Secchi transparency, and user perceptions are presented on the information sheet following these written comments.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	12.9	8.0	18.0	A
CLA (µg/l)	3.1	1.6	5.6	A
Secchi (m)	3.4	2.6	4.2	A
TKN (mg/l)	0.42	0.34	0.54	
			Overall Grade	A

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 1.0 (1-"crystal clear"), while the mean recreational suitability ranking was 1.0 (1- "beautiful").

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's water quality seems well represented by an overall grade of A. In order to detect any possible long-term trends, more years of data collection are needed.

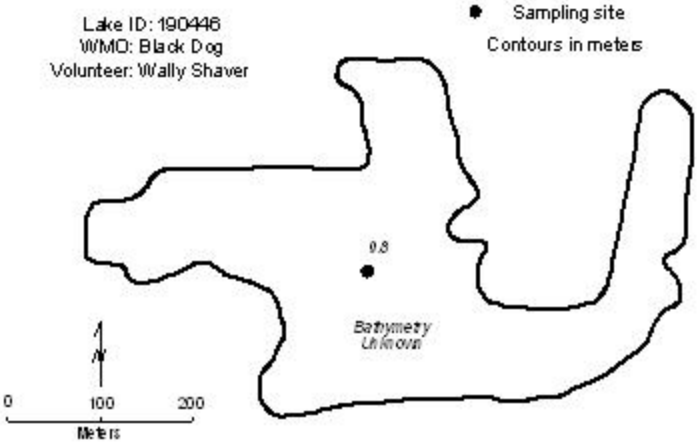
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

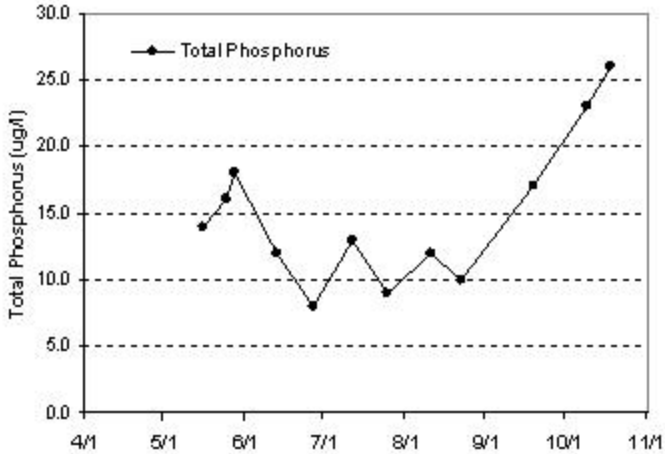
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

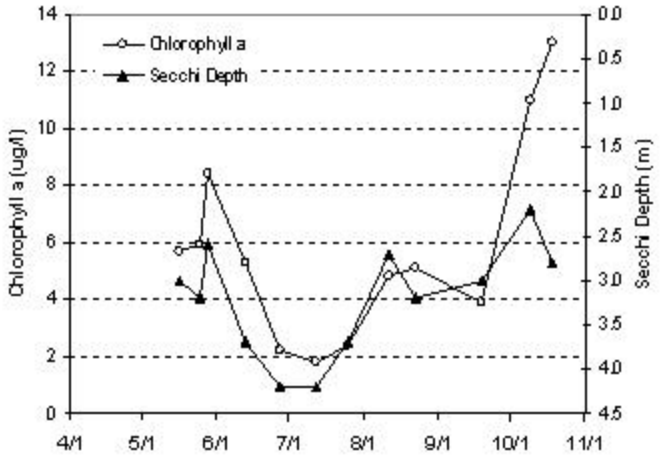
Lac Lavon

Apple Valley/Burnsville, Dakota Co.

Lake ID: 190446
WMO: Black Dog
Volunteer: Wally Shaver

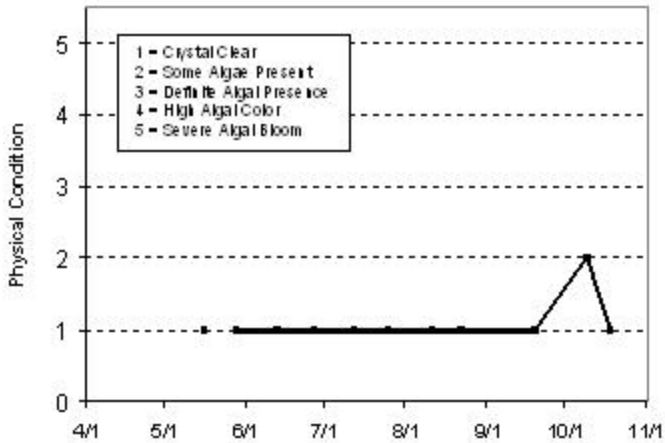






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/16/04	16.5				5.7	14.0		3.0	1	1
5/25/04	17				5.9	16.0		3.2		
5/28/04	16.9				8.4	18.0		2.6	1	1
6/13/04	22.1				5.3	12.0		3.7	1	1
6/27/04	22.4				2.2	8.0		4.2	1	1
7/12/04	26.1				1.8	13.0		4.2	1	1
7/25/04	26.2				2.4	9.0		3.7	1	1
8/11/04	21.7				4.8	12.0		2.7	1	1
8/22/04	21.2				5.1	10.0		3.2	1	1
9/19/04	21.4				3.9	17.0		3.0	1	1
10/9/04	15.9				11	23.0		2.2	2	1
10/18/04	11.3				13	26.0		2.8	1	1

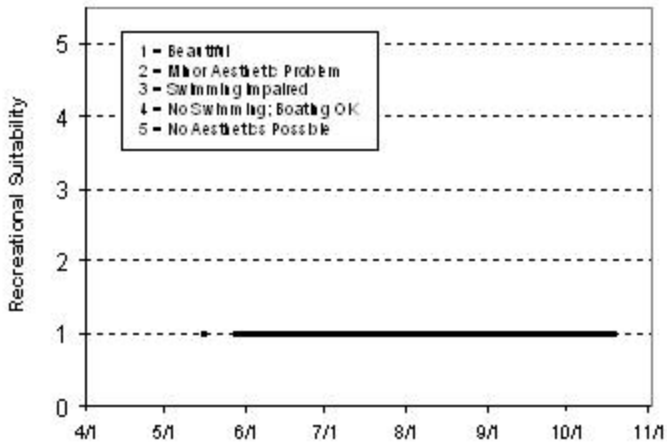


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth										A	A	A
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						A	A	A	A	B	A	A	A
Chlorophyll a						A	A	A	A	A	A	A	A
Secchi Depth						A	A	A	A	A	A	A	A
Overall						A	A	A	A	A	A	A	A

Source: Metropolitan Council and STORET data



Lee Lake (19-0029) *Black Dog Watershed Management Commission*

Lee Lake, a 25-acre land-locked lake with a maximum depth of 5.2 m (17 feet), is located in Lakeville (Dakota County). The shoreline length of the lake is 1.0 miles. The majority of its 324-acre watershed (which translates to a watershed-to-lake size ratio of 13:1) is now developed with urban uses; however, past cattle farming is the primary phosphorus source to the lake and may have left behind an internal loading problem. To determine if this is the case, a more in-depth monitoring program is needed. An abundance of submerged aquatic vegetation (Curlyleaf pondweed) has been a continuing problem in the lake. Not only is it an aesthetic and recreational problem, but the decaying of plants in late-summer adds to concentrations of phosphorus in the water column.

The lake has been involved in CAMP in 1994-1997 and 2000-2004. In an attempt to inhibit algal populations within the lake, barley straw has been added. Barley straw has been used for algal control in the United Kingdom for many years. The principal behind the use of barley straw to control algae, while not truly known, has been thought to involve the release of a chemical(s) (which inhibit algal growth) as the submerged straw decomposes. Therefore, in an attempt to determine if the straw method successfully reduced algal biomass on Lee Lake in 2003, TP, TKN, CLA and Secchi transparency were tested 15 times between mid-April and mid-October. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	59.0	30.0	90.0	C
CLA (µg/l)	30.3	5.5	66.0	C
Secchi (m)	1.1	0.8	1.8	D
TKN (mg/l)	0.92	0.29	1.50	
			Overall Grade	C

The in-lake scenario noticed in 2002—where the lake's mean Secchi transparency and TP concentration were worse than what the lake's mean CLA concentration would have suggested—was not as apparent in 2003 and 2004. Continual years of data will provide a better picture of the barley straws influence on the lake's algal population and water clarity.

A recent fish survey suggests that unusually high fish densities may be impacting the barley treatment on the lake. The survey revealed the lake's fishery being dominated by bluegill sunfish, black crappies, and black bullheads. In fact, the number of bluegills caught per net was high, with the average haul of bluegills per net averaging 465 per net. The local average range for bluegills per net is 3-25 bluegills (McComas 2004).

The lake's 2004 water quality was similar to that recorded in the previous years of CAMP (where the lake consistently received an overall grade of C) and better than that recorded in 2000 (D). No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake seems well represented by an overall grade of C. In order to determine any long-term trends or to better define the lake's normal water quality range, more data are needed.

Throughout the course of the study, the volunteer monitors ranked their perceptions of the lake's physical and recreational condition on a 1-to-5 scale. These rankings, as well as the data and graphs discussed above, are shown on the lake's information sheet on the following page. The mean physical condition ranking was 3.2 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.0 (3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) conducted a fisheries survey on the lake. 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 know of any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Lee Lake

Lakeville, Dakota Co.

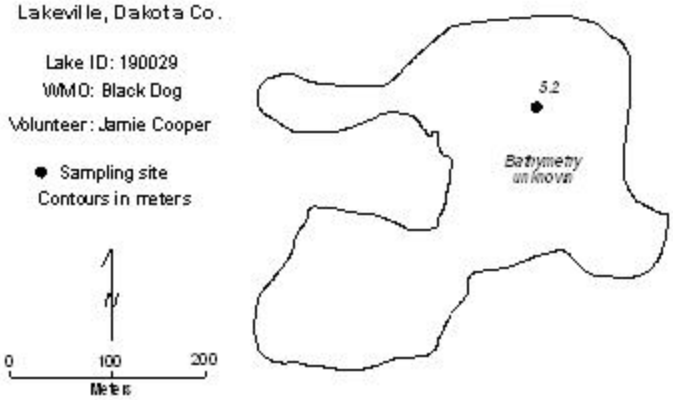
Lake ID: 190029

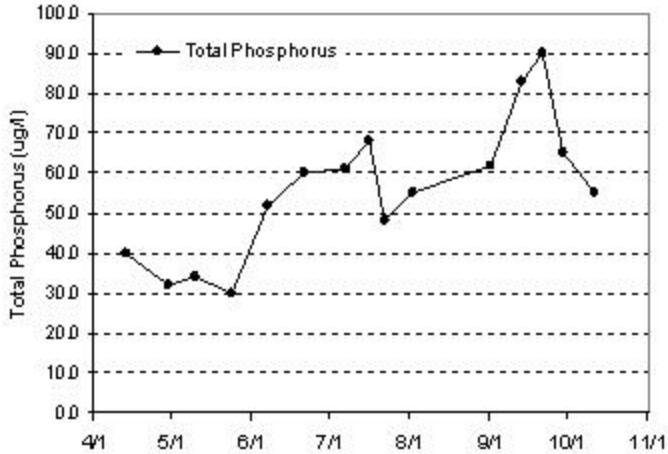
WMO: Black Dog

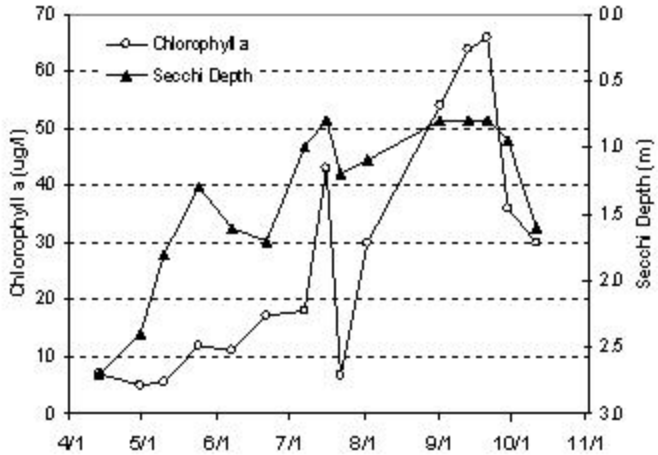
Volunteer: Jamie Cooper

● Sampling site

Contours in meters

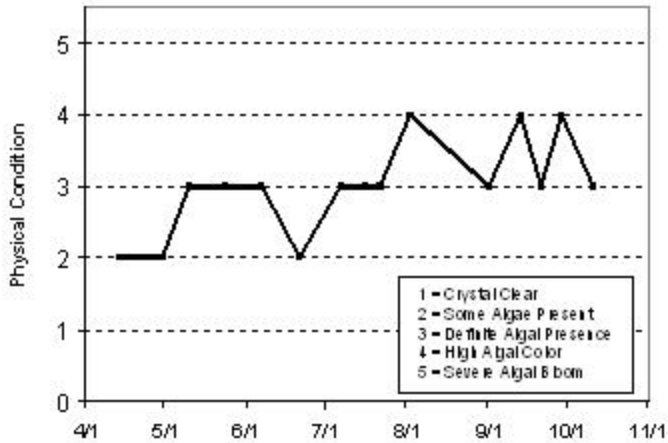






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	14.6				7	40.0		2.7	2	
4/30/04	15				5	32.0		2.4	2	1
5/10/04	17.9				5.5	34.0		1.8	3	1
5/24/04	16.2				12	30.0		1.3	3	3
6/7/04	23.5				11	52.0		1.6	3	3
6/21/04	23				17	60.0		1.7	2	2
7/7/04	23.5				18	61.0		1.0	3	4
7/16/04	21.3				43	68.0		0.8	3	3
7/22/04	28.6				6.8	48.0		1.2	3	3
8/2/04	27.9				30	55.0		1.1	4	3
9/1/04	22.4				54	62.0		0.8	3	3
9/13/04	21.8				64	83.0		0.8	4	4
9/21/04	20.7				66	90.0		0.8	3	4
9/29/04	18.5				36	65.0		1.0	4	3
10/11/04	15.1				30	55.0		1.6	3	2

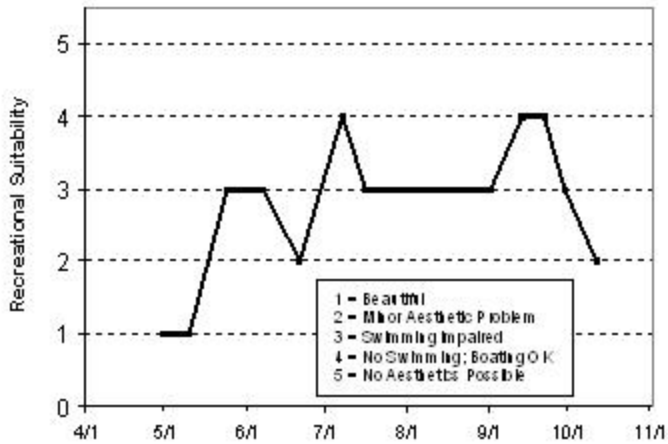


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	C	C	C			D	C	C	C	C
Chlorophyll a			C	B	B	B			C	B	B	C	C
Secchi Depth			C	C	C	C			D	C	C	C	D
Overall			C	C	C	C			D	C	C	C	C

Source: Metropolitan Council and STORET data



Libbs Lake (27-0085) *City of Minnetonka*

Libbs Lake is a 23-acre land-locked lake located within the City of Minnetonka (Hennepin County). The maximum depth of the lake is 2.1 m (roughly 7 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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 was the first year that Libbs Lake has been involved in CAMP. On each of the sampling days the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The lake was monitored 10 times between mid-April and early-October, 2004. The following are the averages of the three events for each of the parameters tested.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	20.5	12.0	27.0	A
CLA (µg/l)	2.0	1.0	3.6	A
Secchi (m)	1.8	1.5	2.0	C
TKN (mg/l)	0.68	0.52	1.30	
			Overall Grade	B

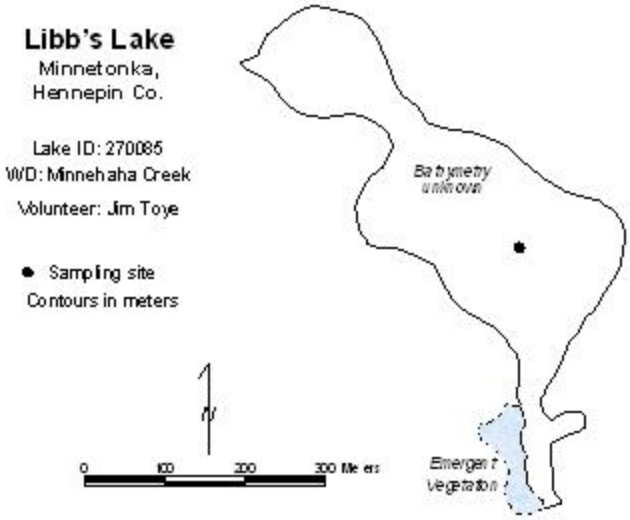
By comparing the lakes TP (nutrient), CLA (algal biomass estimator), and Secchi (water clarity) grades, it is apparent that the TP and CLA grades are quite a bit better than the Secchi grade. The main reason for this is the oveall shallowness of the lake (maximum depth of just 2.1 meters).

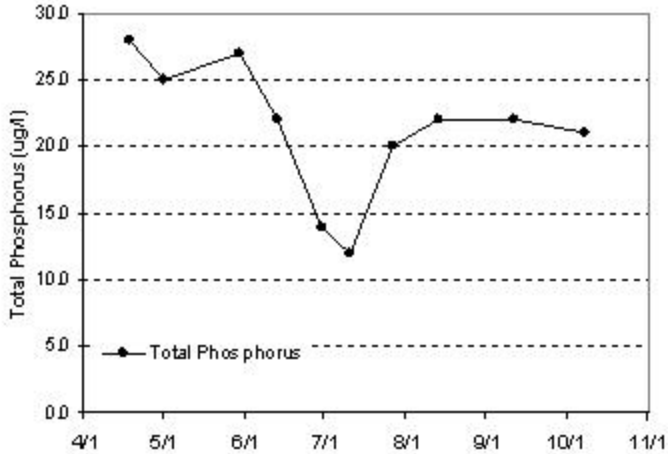
Because of the limitedness of the lake's water quality database, it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

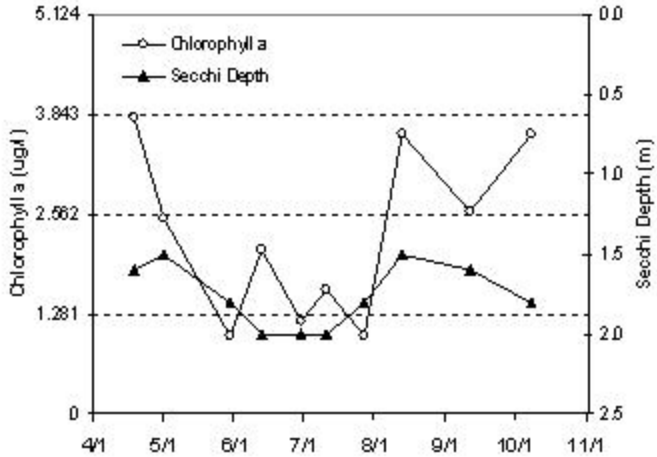
The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 2.4 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 2.7 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

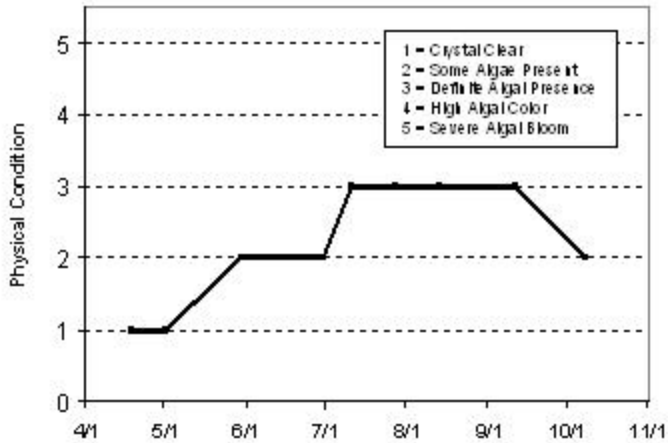






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	17.4				3.8	28.0		1.6	1	
5/1/04	15.1				2.5	25.0		1.5	1	
5/30/04	18.8				1	27.0		1.8	2	3
6/13/04	23.6				2.1	22.0		2.0	2	
6/30/04	22				1.2	14.0		2.0	2	2
7/11/04	27.6				1.6	12.0		2.0	3	3
7/27/04	25.9				1	20.0		1.8	3	2
8/13/04	20.7				3.6	22.0		1.5	3	3
9/11/04	23.8				2.6	22.0		1.6	3	3
10/6/04	15.8				3.6	21.0		1.8	2	2

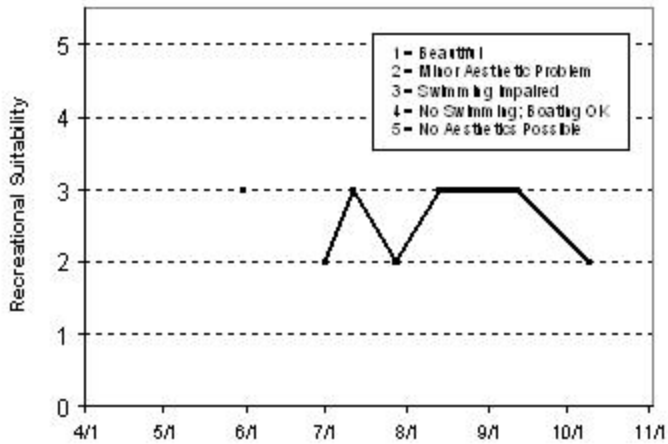


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													A
Chlorophyll a													A
Secchi Depth													C
Overall													B

Source: Metropolitan Council and STORET data



Lily Lake (82-0023) *City of Stillwater*

Lily Lake, located in the City of Stillwater in Washington County, was monitored seven times between late-April and mid-October, 2004. The lake has been monitored through CAMP since 1995.

The 52-acre lake has a maximum depth of 17.4 m (57 feet), and has public access located on the lake's northern shore and a fishing pier on its southern shore. On each sampling date Lily Lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	43.2	37.0	48.0	C
CLA (µg/l)	10.8	4.7	21.0	B
Secchi (m)	1.8	1.5	2.1	C
TKN (mg/l)	0.74	0.48	1.20	
			Overall Grade	C

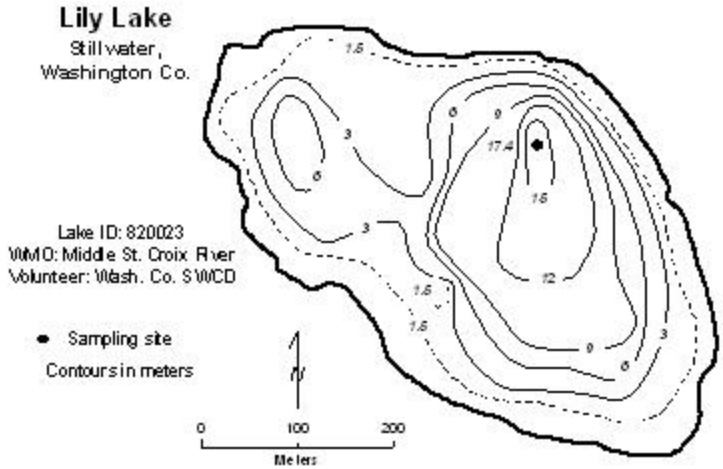
The lake's 2004 overall water quality grade is similar to those recorded in 1996-2000 and 2002-2003, and worse than those of 1995 and 2001 (B).

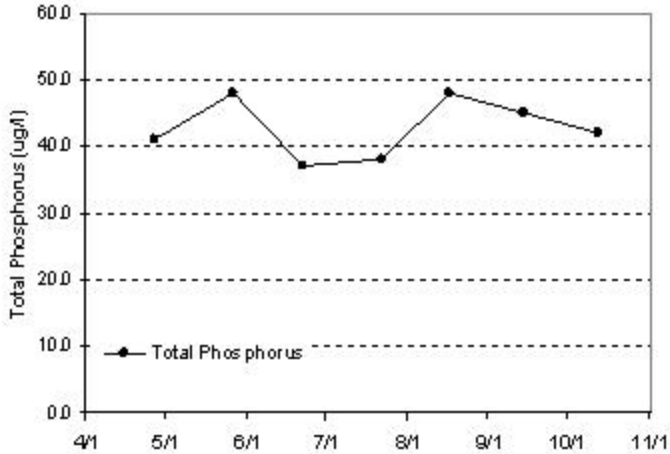
The physical and recreational conditions of Lily Lake as perceived by the volunteer(s) were ranked on a 1-to-5 scale. These rankings are also graphed on the lake's information sheet. The mean physical condition ranking was 2.0 (2- "some algae present"), while the mean recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

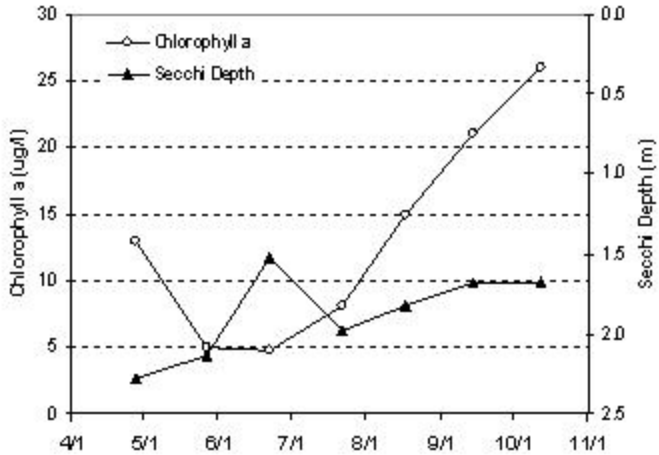
A search for water quality data through Council, MPCA, and STORET files resulted in a moderate amount of data. While 1995-2004 are the only years for which nutrient data are available, Secchi transparencies were collected through the MPCA's Citizen Lake Monitoring Program in 1985, and 1987-1992. The data seem to show a wide fluctuation in the lake's mean CLA concentration and water clarity. The best conditions were recorded in 1995 and 2001 (A's and B's), while 1996-2000 and 2002-2004 conditions were mainly represented by C's.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

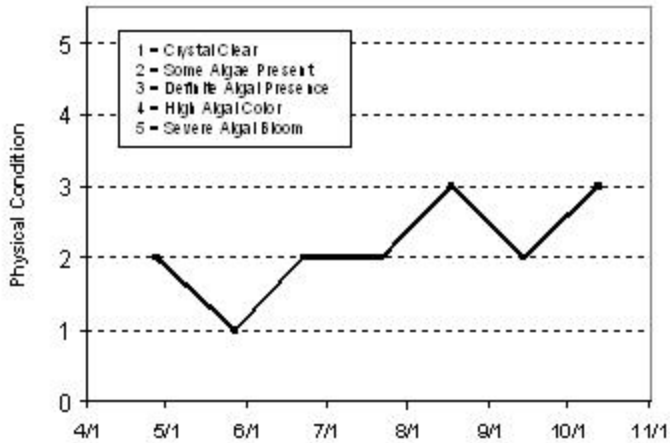






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.7	3.9	10.7	0.02	13	41.0		2.3	2	2
5/27/04	16.7	4.2	9.03	0.04	5	48.0		2.1	1	2
6/22/04	21.4	4.4	6.94	0.24	4.7	37.0		1.5	2	2
7/22/04	27.7	4.6	7.94	0.2	8.1	38.0		2.0	2	2
8/17/04	22.7	4.7	8.22	0.12	15	48.0		1.8	3	2
9/14/04	21.6	4.8	8.57	1.5	21	45.0		1.7	2	2
10/12/04	15.9	5	6.95	0.04	26	42.0		1.7	3	2

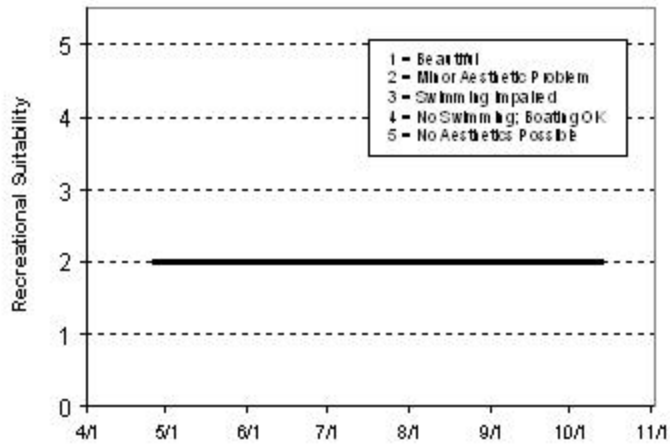


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth						D		C	C	C	C	C
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				C	C	C	C	C	C	C	C	C	C
Chlorophyll a				B	C	B	C	C	C	A	B	B	B
Secchi Depth	B			A	B	C	C	C	C	B	C	C	C
Overall				B	C	C	C	C	C	B	C	C	C

Source: Metropolitan Council and STORET data



Little Carnelian Lake (82-0014) *Carnelian - Marine Watershed District*

This was the the fifth year of CAMP monitoring in Little Carnelian Lake which is located in Stillwater Township (Washington County). The lake was first enrolled in the program in 2000. The 162-acre lake (which has a shoreline length of 1.7 miles), has a mean and maximum depth of 10.7 m (35 feet) and 21.3 m (70 feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 5,686 ac-ft. The lake does not have a public access and its 565-acre watershed translates to a meager 3.5:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff).

The lake was monitored 14 times between late-April and mid-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	12.6	6.0	32.0	A
CLA (µg/l)	2.5	1.5	4.9	A
Secchi (m)	6.1	4.3	7.6	A
TKN (mg/l)	0.51	0.39	0.61	
			Overall Grade	A

Similar to all past years of CAMP monitoring, the individual grades result in overall lake grade of A for Little Carnelian Lake. This places the lakes water quality within the top 10 percent of Metro Area lakes for the years 2000-2004. In fact, the lake's 2004 Secchi mean was the best mean water clarity in CAMP this year.

The collected data and resulting graphs showing TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 1.3 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 1.0 (1- "beautiful").

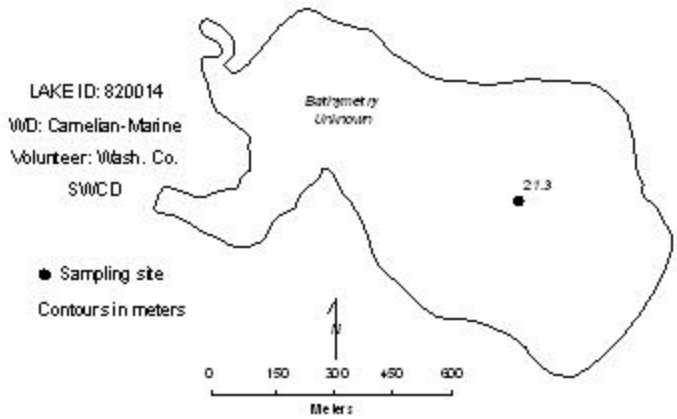
A search of the STORET nationwide water quality database for data on the lake revealed a moderate database throughout the 1990's with nutrient data available in 1991-1996 and 1998-2004. The lake's database indicates that the lake's water quality is well represented by an overall grade of A. Furthermore, a recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity.

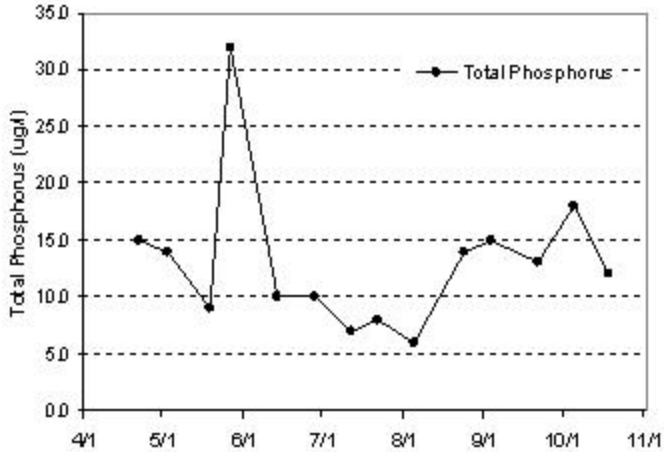
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) conducted a fisheries survey on the lake in 1991. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

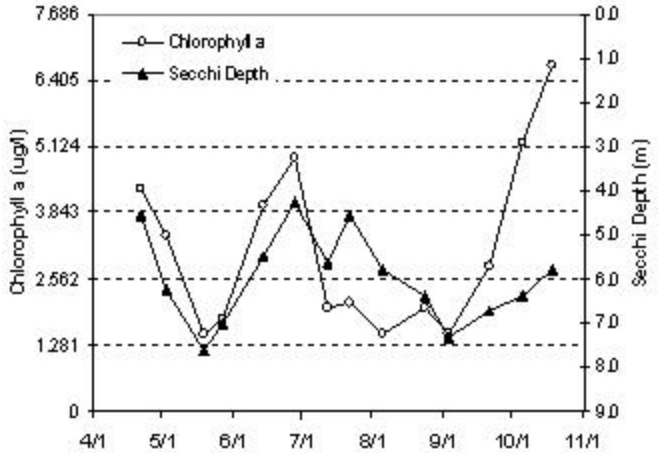
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Little Carnelian Lake

Stillwater Twp., Washington Co.

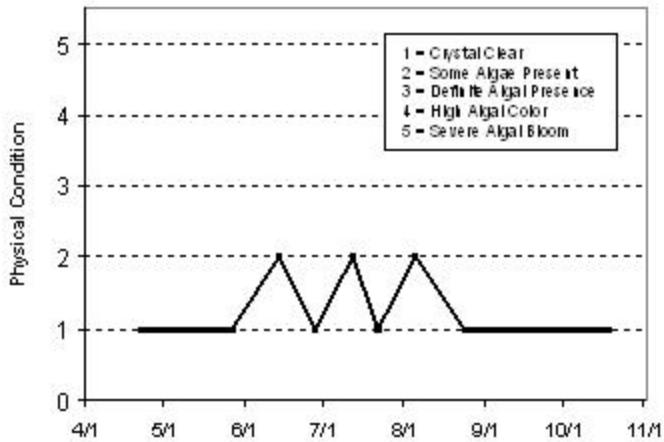






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	10.7	5	11.01	7.6	4.3	15.0		4.6	1	1
5/3/04	11.7	5.2	11.11	0.17	3.4	14.0		6.2	1	1
5/19/04	16.1	5.3	9.55	0.04	1.5	9.0		7.6	1	1
5/27/04	15.7	5.5	10.73	0.12	1.8	32.0		7.0	1	1
6/14/04	21.2	5.7	9.25	0.03	4	10.0		5.5	2	1
6/28/04	20.1	5.7	9.45	0.31	4.9	10.0		4.3	1	1
7/12/04	24.1	5.8	8.73	0.39	2	7.0		5.6	2	1
7/22/04	26.8	5.8	8.08	0.22	2.1	8.0		4.6	1	1
8/5/04	24.6	5.9	8	0.48	1.5	6.0		5.8	2	1
8/24/04	20.7	5.9	8.24	0.14	2	14.0		6.4	1	1
9/3/04	22.6	6	6.92	0.1	1.5	15.0		7.3	1	1
9/21/04	20.5	6.1	6.26	0.03	2.8	13.0		6.7	1	1
10/5/04	16.1	6.1	6.55	0.06	5.2	18.0		6.4	1	1
10/18/04	12.5	6.2	6.58	0.06	6.7	12.0		5.8	1	1

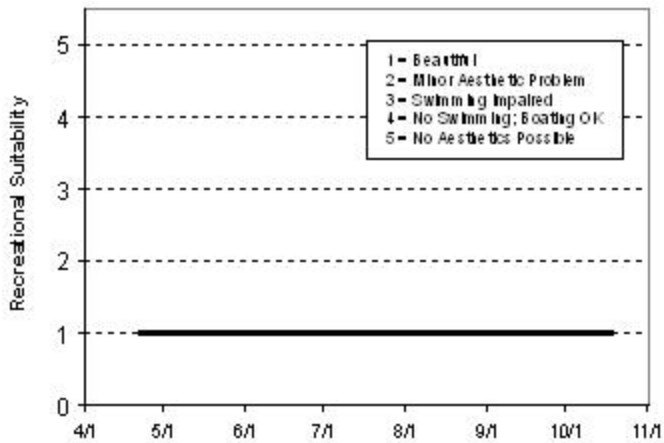


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												A
Chlorophyll a												A
Secchi Depth												A
Overall												A

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus	A				A	A			A	B	A	A	A
Chlorophyll a	A				A	A			A	A	A	A	A
Secchi Depth	A	A	A	A	A	A	A		A	A	A	A	A
Overall	A				A	A			A	A	A	A	A

Source: Metropolitan Council and STORET data



Little Johanna Lake (62-0058) *Rice Creek Watershed District*

This was the fourth year that Little Johanna Lake, which is located on the boundary between the Cities of Arden Hills and Roseville (Ramsey County), was monitored as part of CAMP. The 35-acre lake has a maximum depth of 12.0 m (39 feet). A search through the STORET nationwide water quality database for data on the lake came up empty other than for the 2001-2004 CAMP data.

The lake was monitored eight times from late-April to late-September, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	57.0	41.0	92.0	C
CLA (µg/l)	17.7	6.3	48.0	B
Secchi (m)	1.7	0.8	2.7	C
TKN (mg/l)	0.78	0.56	1.00	
			Overall Grade	C

While the 2004 overall grade is identical to those of 2001-2003, the 2004 individual parameter means were their best recorded to date.

Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 3.0 (3- "definite algae present"), while the mean recreational suitability ranking was 4.0 (4- "no swimming – boating ok").

As mentioned earlier, there are no water quality data available for Little Johanna Lake other than the recent 2001-2004 data. Therefore it is not possible to determine any long-term trends. In the short-term, however, the lake seems well represented by an overall grade of C. To better understand the lake's water quality and where it may be heading, more data are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

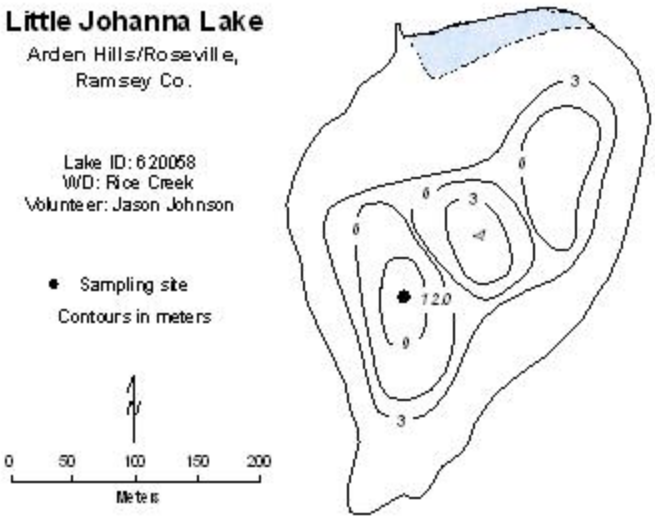
Little Johanna Lake

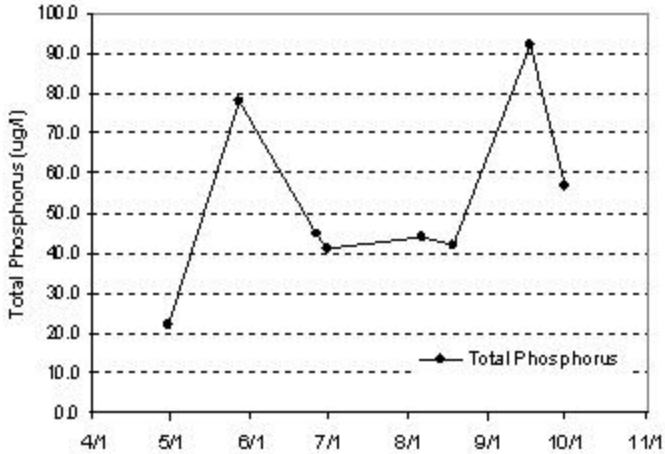
Arden Hills/Roseville,
Ramsey Co.

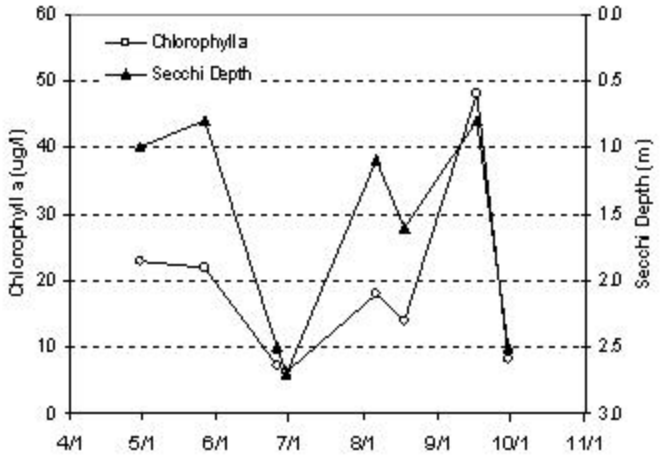
Lake ID: 620058
WD: Rice Creek
Volunteer: Jason Johnson

● Sampling site

Contours in meters

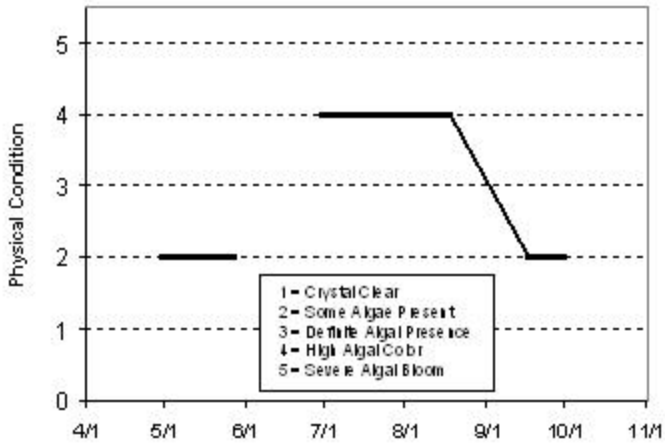






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/30/04	15				23	22.0		1.0	2	4
5/27/04	15				22	78.0		0.8	2	4
6/26/04	22				7.2	45.0		2.5		
6/30/04	24				6.3	41.0		2.7	4	4
8/6/04	25				18	44.0		1.1	4	4
8/18/04	20				14	42.0		1.6	4	4
9/17/04	19				48	92.0		0.8	2	4
9/30/04	17				8.1	57.0		2.5	2	4

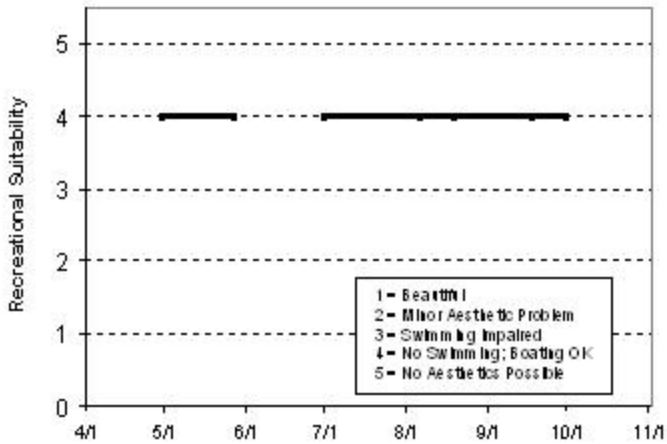


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus										C	D	D	C
Chlorophyll a										C	C	C	B
Secchi Depth										C	C	C	C
Overall										C	C	C	C

Source: Metropolitan Council and STORET data



Long Lake [Apple Valley] (19-0022) *Vermillion River Watershed Management Commission*

Long Lake, which has a surface area of roughly 36 acres, is located within the City of Apple Valley (Dakota County). Other than the fact that the maximum depth of the lake is approximately 3.5 m (10 feet), there is no known morphological data available for the lake. Because the lake is relatively shallow, it does not develop and maintain a thermocline (a density gradient owed to changing water temperatures throughout the water column), and the entire lake is considered littoral, (the shallow [0-15 feet] area dominated by aquatic plants).

This is the fourth year in which Long Lake was involved in CAMP (1997 and 2002-2003 being the others). A search for historical water quality data for the lake came up empty.

As part of the 2004 volunteer monitoring program, Long Lake was monitored 12 times from mid-April to mid-October. Graphs as well as the actual data collected by the volunteer(s) show the seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability). The graphs and data tables are presented on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	223.7	124.0	387.0	F
CLA (µg/l)	121.9	40.0	280.0	F
Secchi (m)	0.3	0.1	0.5	F
TKN (mg/l)	3.04	1.40	7.10	
			Overall Grade	F

Because 2004 is only the fourth year of available data, no long-term trends can be determined. More, recently, however, the lake's overall water quality is well represented by an overall grade of F. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed.

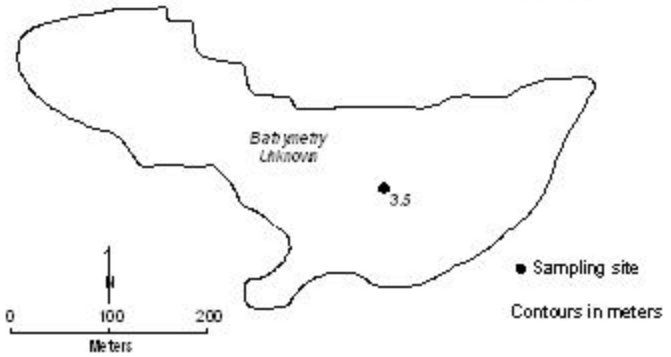
Throughout the course of the study, the volunteer monitors ranked their perceptions of the lake's physical and recreational condition on a 1-to-5 scale. These user perception rankings are shown on the lake's information sheet on the following page. The mean physical condition ranking was 2.8 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability was 3.4 (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

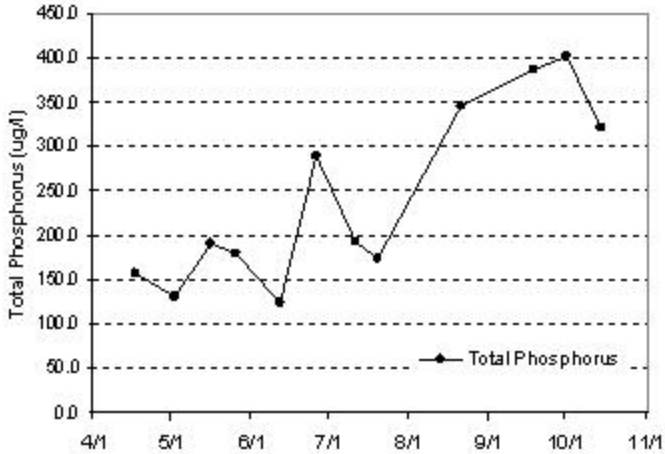
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

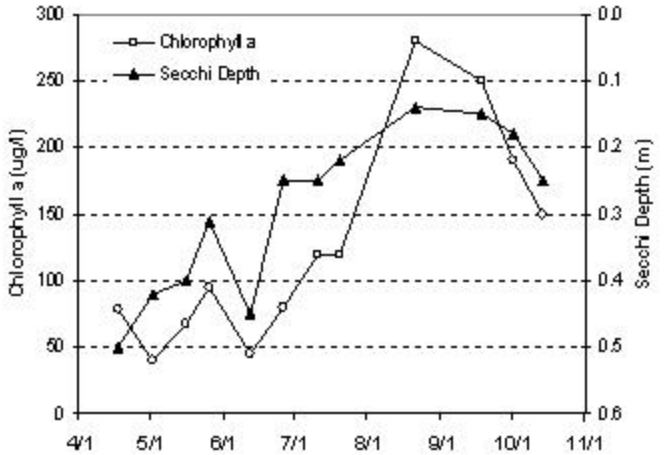
Long Lake

Apple Valley, Dakota Co.

Lake ID: 190022
WMO: Dakota County
Volunteers: Cherie Serie and Al Kettelkamp

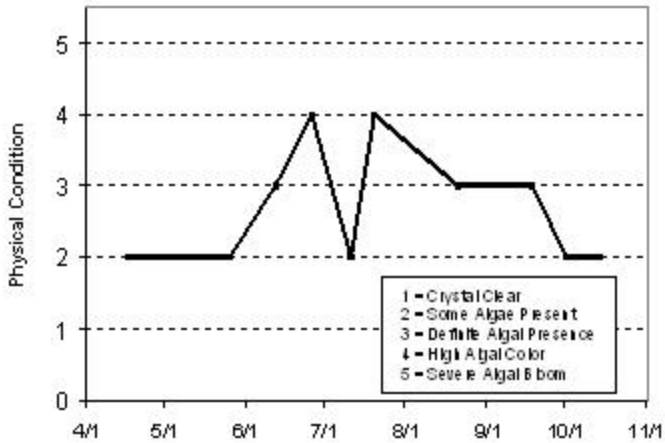






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	17.2				78	156.0		0.5	2	2
5/2/04	16.7				40	131.0		0.4	2	4
5/16/04	17.2				67	191.0		0.4	2	2
5/26/04	18.6				95	180.0		0.3	2	2
6/12/04	26.5				45	124.0		0.5	3	4
6/26/04	22.7				80	289.0		0.3	4	4
7/11/04	26				120	192.0		0.3	2	4
7/29/04	31				120	173.0		0.2	4	4
8/21/04	19.7				280	346.0		0.1	3	4
9/18/04	20.7				250	387.0		0.2	3	3
10/1/04	16.1				190	401.0		0.2	2	4
10/14/04	10.8				150	322.0		0.3	2	3

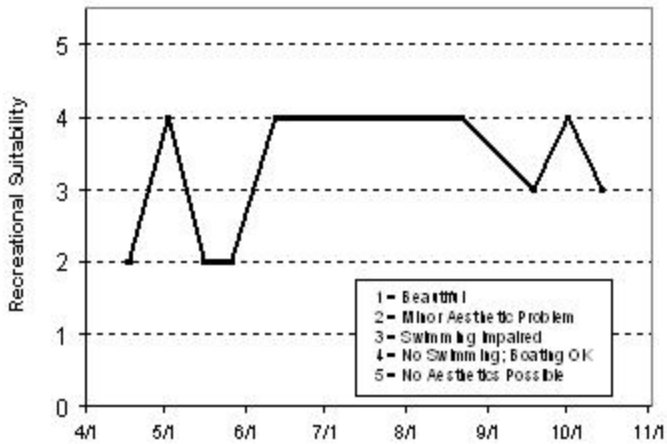


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						D					F	F	F
Chlorophyll a						D					F	F	F
Secchi Depth						F					F	F	F
Overall						D					F	F	F

Source: Metropolitan Council and STORET data



Long Lake [Mahtomedi] (82-0130) *Rice Creek Watershed District*

Long Lake, a 48-acre lake with a maximum depth of 7.7 m (25 freet), is located within City of Mahtomedi (Washington County). Roughly 92 percent of the lake's surface area is considered littoral zone (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).

Two thousand and four marks the second year in which Long Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2003 and 2004 are the only complete years of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored nine times between late-April and mid-September, 2004. The resulting data and graphs appear on the next page.

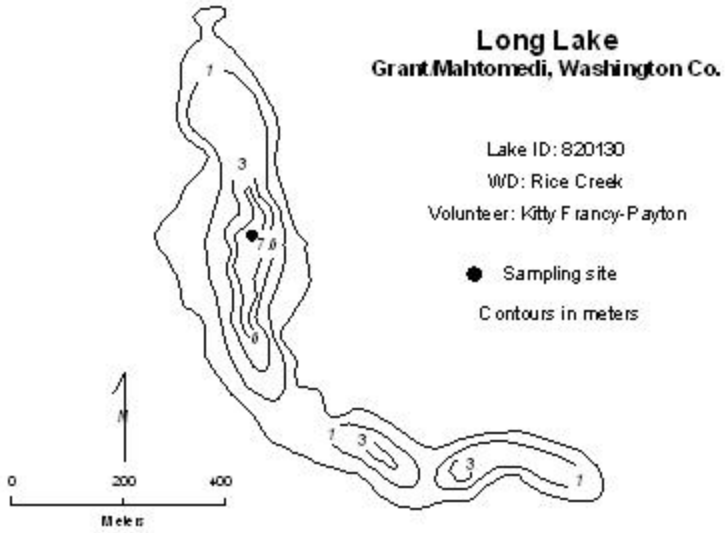
2004 summer (May-September) data summary

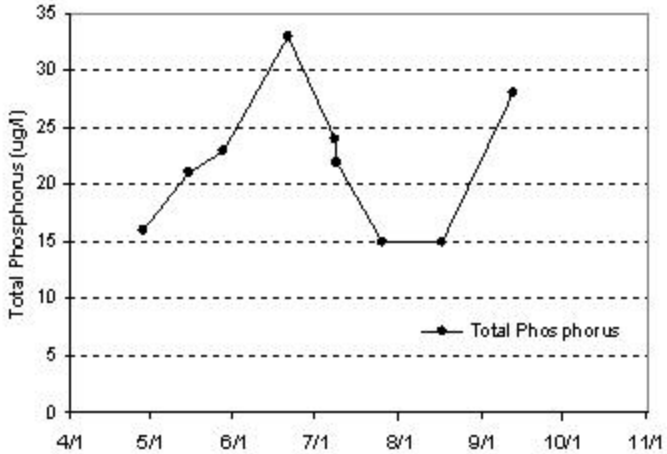
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	22.6	15.0	33.0	A
CLA (µg/l)	4.0	2.1	5.8	A
Secchi (m)	2.5	2.1	3.2	B
TKN (mg/l)	0.52	0.35	0.67	
			Overall Grade	A

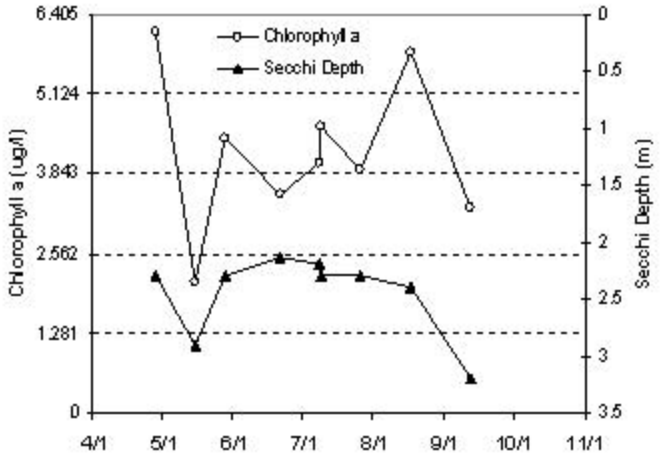
As mentioned earlier, there are no water quality data available for Long Lake other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 1.9 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.3 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

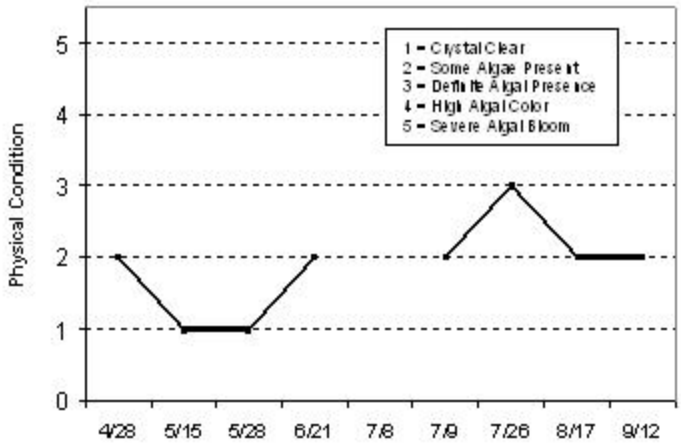






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/28/04	11.8				6.1	16.0		2.3	2	2
5/15/04	14.6				2.1	21.0		2.9	1	1
5/28/04	17.4				4.4	23.0		2.3	1	1
6/21/04	20.7				3.5	33.0		2.1	2	3
7/8/04	21				4	24.0		2.2		
7/9/04	22				4.6	22.0		2.3	2	3
7/26/04	25.2				3.9	15.0		2.3	3	3
8/17/04	20.2				5.8	15.0		2.4	2	3
9/12/04	21.8				3.3	28.0		3.2	2	2

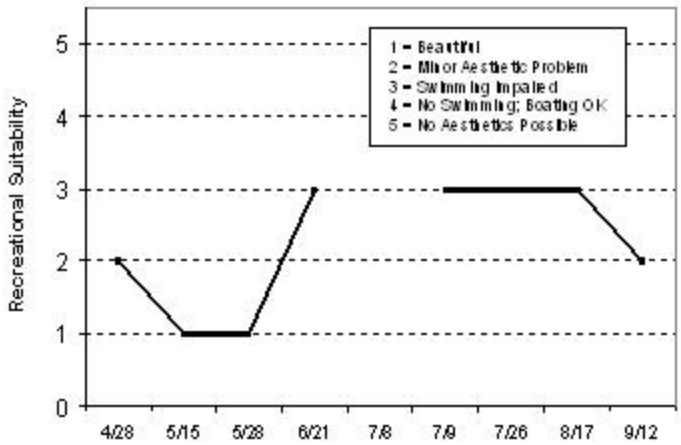


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus												B	A
Chlorophyll a												A	A
Secchi Depth												B	B
Overall												B	A

Source: Metropolitan Council and STORET data



Long Lake [May Township] (82-0030) *Marine on St. Croix WMO*

Long Lake is an 88-acre lake located in May Township (Washington County). There is little morphological data available for the lake. Because the maximum depth is only 3.7 m (12 feet), the entire 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). The lake, which was monitored through CAMP in 1993-1997 and 1999-2003, was sampled seven times between late-April and mid-October, 2004.

2004 summer (May-September) data summary

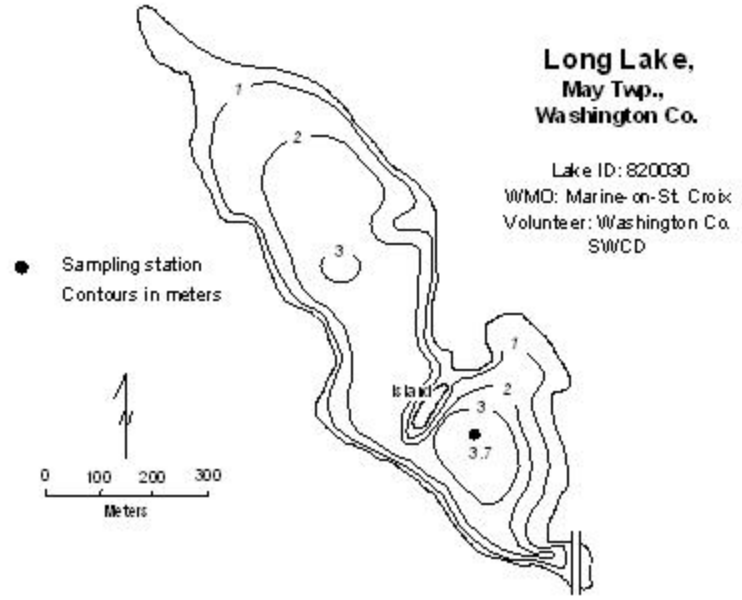
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	28.0	24.0	39.0	B
CLA (µg/l)	4.0	1.7	5.2	A
Secchi (m)	2.5	2.1	3.2	B
TKN (mg/l)	0.60	0.44	0.80	
			Overall Grade	B

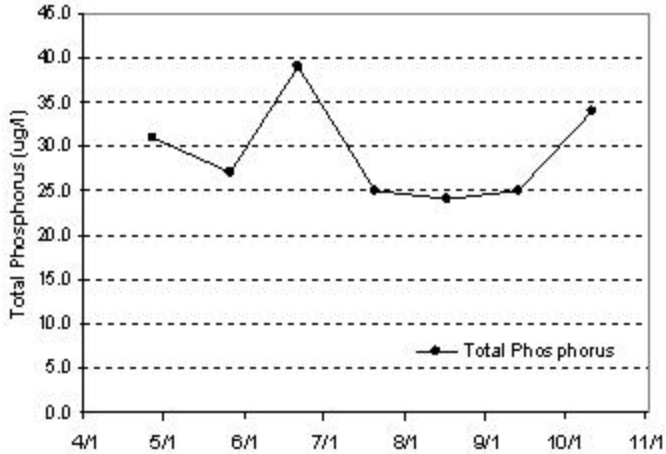
Statistical analysis on the lake's database fails to reveal any "statistically significant" long-term trends. The lake's 2004 overall grade was identical to those recorded in 2000-2001 and 2003, and better than those of 1993-1997, 1999, and 2002 (C). In fact, th elakes individual parameter means in 2004 were the best recorded to date. Overall, the lake's water quality is representative of a high-C/B grade.

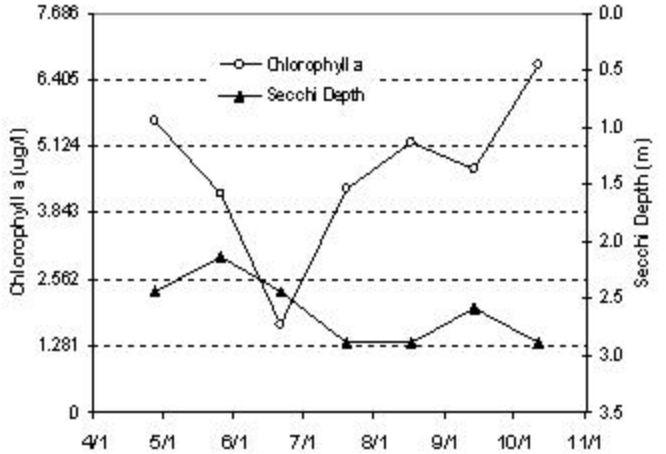
Throughout the course of the study, the volunteer monitor ranked their perceptions of the lake's physical and recreational condition on a 1-to-5 scale. These rankings as well as the data and graphs discussed above are shown on the lake's information sheet on the following page. The mean physical condition ranking was 2.2 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.0 (between 2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

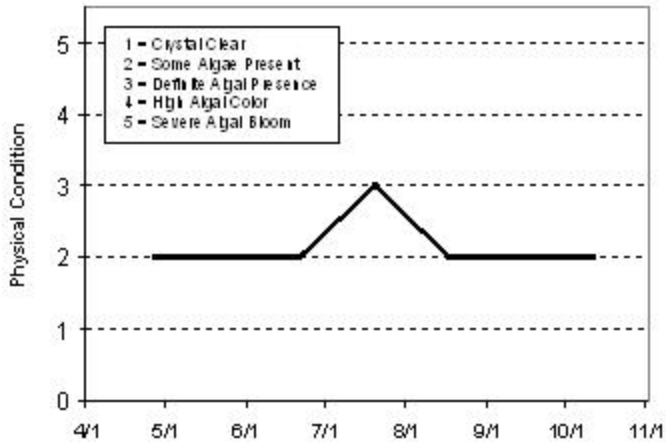






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.3	11.1	9.16	0.03	5.6	31.0		2.4	2	2
5/26/04	15.2	15	7.86	0.18	4.2	27.0		2.1	2	2
6/21/04	21.9	18.3	7.35	0.08	1.7	39.0		2.4	2	2
7/20/04	28.1	21.1	8.33	0.12	4.3	25.0		2.9	3	2
8/17/04	21.3	19.2	9.15	0.14	5.2	24.0		2.9	2	2
9/13/04	21	19.6	4.94	0.13	4.7	25.0		2.6	2	2
10/11/04	14.2	13.9	6.12	0.68	6.7	34.0		2.9	2	2

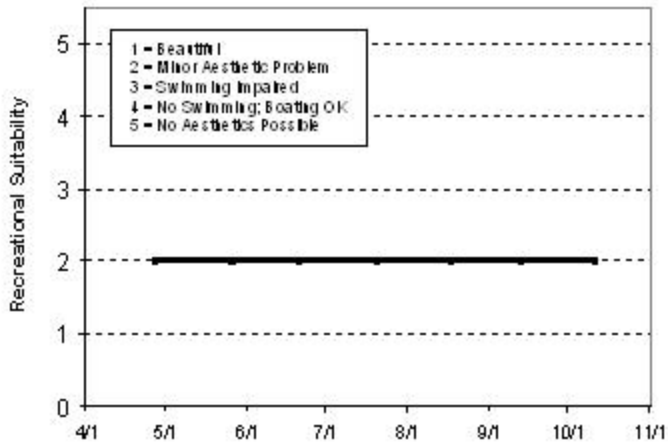


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C	C	C	C	C		C	C	C	C	C	B
Chlorophyll a		C	C	C	B	C		B	B	B	B	A	A
Secchi Depth		B	C	C	C	C		C	B	B	C	B	B
Overall		C	C	C	C	C		C	B	B	C	B	B

Source: Metropolitan Council and STORET data



Long Lake [Pine Springs] (82-0118) *Valley Branch Watershed District*

Long Lake is a 43-acre lake located in Pine Springs Township (Washington County). Other than the lakes maximum depth being 7.3 m (24 feet), there is little morphological data available for the lake

This was the second year that Long Lake has been involved in CAMP (the other being 1993). The lake has been monitored in the past by Council staff (most recently in 2003). The lake was monitored 15 times between mid-April and mid October, 2004. The volunteer data and resulting graphs showing the seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	34.1	22.0	46.0	C
CLA (µg/l)	19.4	11.0	48.0	B
Secchi (m)	1.5	0.8	2.4	C
TKN (mg/l)	0.94	0.63	1.20	
			Overall Grade	C

A search for water quality data on Long Lake uncovered a very small database. The only year other than 2004 where water quality data was available was 1984, 1993, and 2003. While the limited database restricts the ability to determine long-term trends, the lake seems to fluctuate betweem an overall grade of B and C. The lake's best recorded water quality was observed in 2003. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

The average user perception rankings, on a 1-to-5 scale, was 2.0 for physical condition (which fell between 2- "some algae present" and 3- "definite algal presence), and 2.2 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired"). Graphs of each show how user perception of a lake's physical condition or recreational suitability relate to actual analyzed water quality conditions.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Long Lake

Pine Springs, Washington Co.

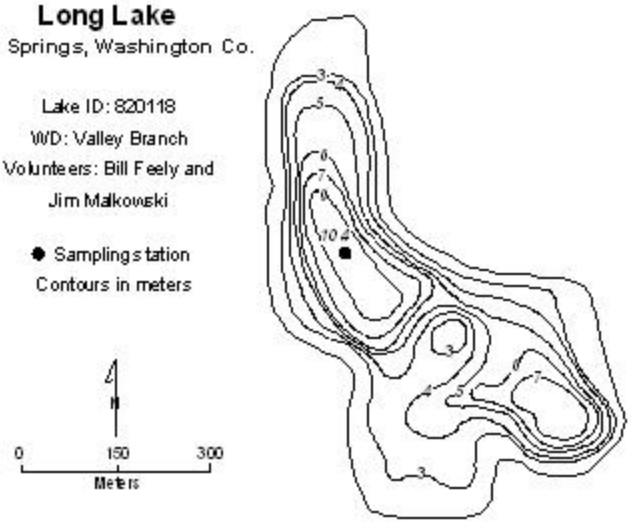
Lake ID: 820118

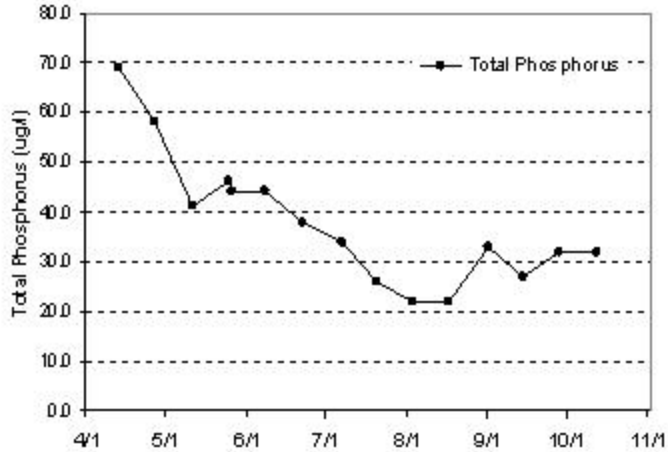
WD: Valley Branch

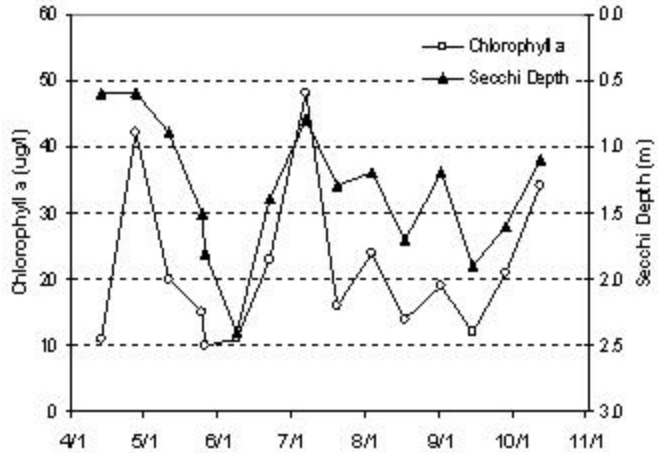
Volunteers: Bill Feely and Jim Malkowski

● Sampling station

Contours in meters

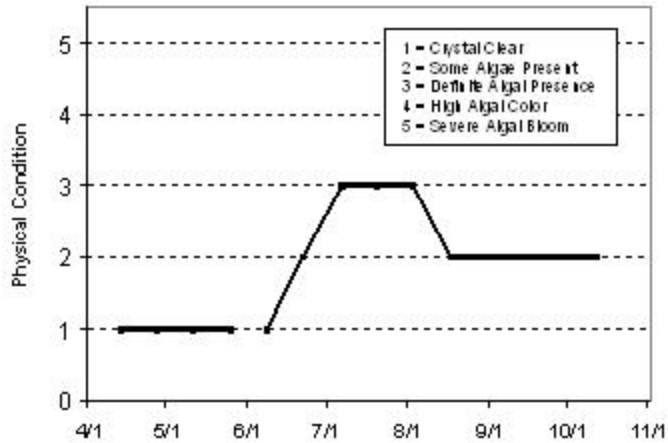






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	7				11	69.0		0.6	1	2
4/27/04	10.4				42	58.0		0.6	1	2
5/11/04	16				20	41.0		0.9	1	2
5/25/04	15				15	46.0		1.5	1	2
5/26/04	18				10	44.0		1.8		
6/8/04	22.6				11	44.0		2.4	1	1
6/22/04	21.1				23	38.0		1.4	2	1
7/7/04	21.5				48	34.0		0.8	3	3
7/20/04	26.6				16	26.0		1.3	3	2
8/3/04	24.8				24	22.0		1.2	3	3
8/17/04	20.6				14	22.0		1.7	2	3
9/1/04	20.8				19	33.0		1.2	2	3
9/14/04	21.1				12	27.0		1.9	2	2
9/28/04	17.4				21	32.0		1.6	2	2
10/12/04	14				34	32.0		1.1	2	3

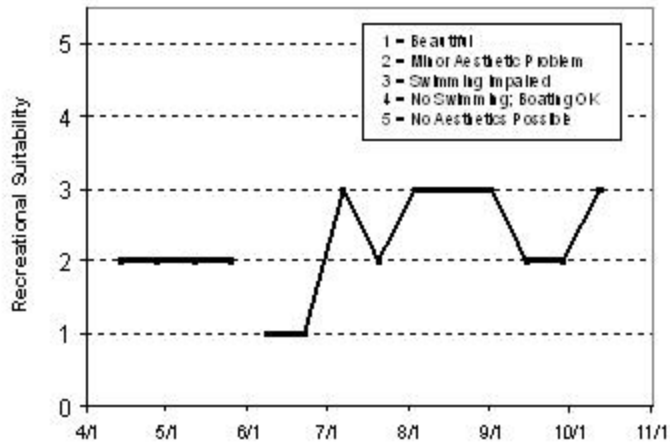


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					C							
Chlorophyll a					B							
Secchi Depth					C							
Overall					C							

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		B										B	C
Chlorophyll a		B										A	B
Secchi Depth		C										B	C
Overall		B										B	C

Source: Metropolitan Council and STORET data



Long Lake [Stillwater] (82-0021) *Browns Creek Watershed District*

Long Lake, which has a surface area of roughly 96 acres, is located on the western boundary of the City of Stillwater (Washington County). Its maximum depth is 6.7 m (22 feet).

As part of the 2004 volunteer monitoring program, Long Lake was monitored 14 times from mid-April to mid-October. This was the eigth year that Long Lake has been involved in CAMP. The lake was also involved in the program in 1995-1996, and 1998-2003. Graphs as well as the actual data collected by volunteers show the seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability). The graphs and data tables are presented on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	55.8	45.0	67.0	C
CLA (µg/l)	25.1	6.4	50.0	C
Secchi (m)	1.3	0.6	2.4	C
TKN (mg/l)	1.27	0.85	1.80	
			Overall Grade	C

A search for water quality data through Council, MPCA, and STORET files resulted in a moderate amount of data. Nutrient data are available for the lake in 1995-1996, and 1998-2004. Additionally, Secchi transparencies collected through the MPCA's Citizen Lake Monitoring Program are available for 1987, 1989, and 1991-1994. When these data are analyzed, it reveals that the lake's water clarity, prior to the C recorded in 2004, had been fairly constant with grades of F in 1987, 1991-1995, 1998-2003, and D in 1989 and 1996 (although the 1996 database is limited).

Contrary to that experienced in 2004, a recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant decrease in recent water clarity. In addition to the decreasing pattern in the lake's clarity, the lake's nutrient concentrations, until decreasing in 2002 and 2004 seemed to be increasing from 1998-2001. To better determine if the increasing nutrient concentrations are indeed a possible trend or is simply a flucuation within the lake's normal range (as shown from the 2002 and 2004 data), more data are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The mean physical condition ranking was 2.6 (between 2- "swimming slightly impaired" and 3- "definite algae present"), while the mean recreational suitability was 2.0 (2- "some algae present").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

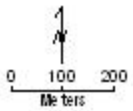
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

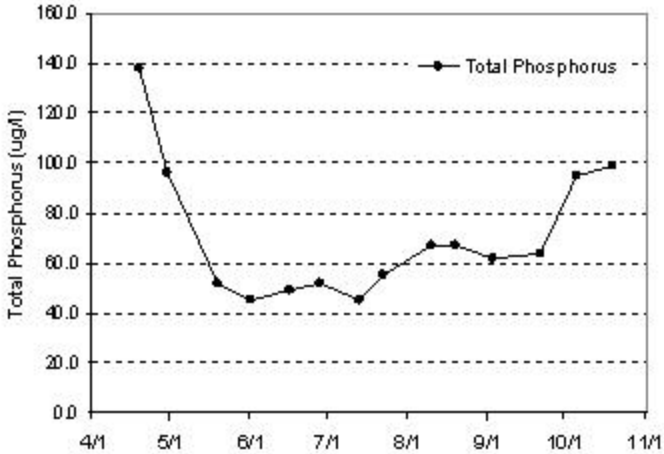
Long Lake,
Stillwater, Washington Co.

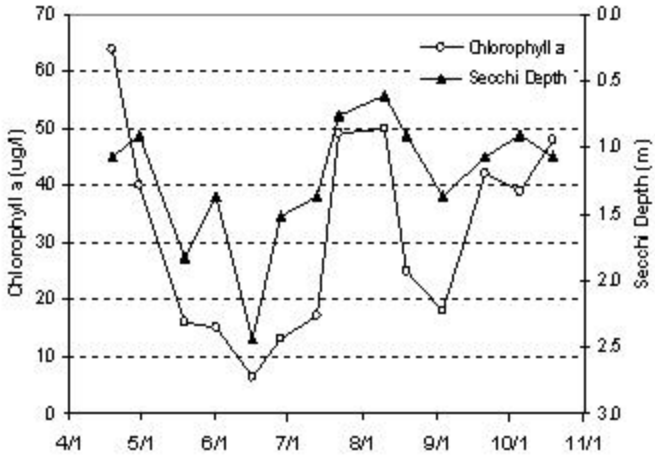
Lake ID: 820021
WMO: Browns Creek
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

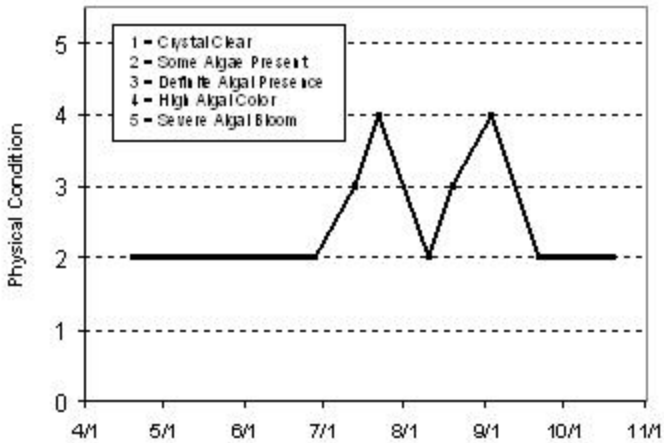






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	13	5	9.01	0.03	64	138.0		1.1	2	3
4/30/04	14.1	6	9.52	0.01	40	96.0		0.9	2	2
5/19/04	18.6	7.4	10.78	0.03	16	52.0		1.8	2	2
6/1/04	17.3	8.1	8.07	0.06	15	45.0		1.4	2	2
6/16/04	23.9	8	7.6	0.12	6.4	49.0		2.4	2	2
6/28/04	22.9	8.7	7.03	0.17	13	52.0		1.5	2	2
7/13/04	25.7	8.8	8.82	0.27	17	45.0		1.4	3	2
7/22/04	29.2	9.5	10.86	0.15	49	55.0		0.8	4	2
8/10/04	21.6	10	6.08	0.36	50	67.0		0.6	2	2
8/19/04	21.3	9.9	7.34	0.06	25	67.0		0.9	3	2
9/3/04	24.4	17.7	6.95	0.07	18	62.0		1.4	4	
9/21/04	20.3	12.6	5.21	0.08	42	64.0		1.1	2	2
10/5/04	13.4	13.3	4.68	4.36	39	95.0		0.9	2	2
10/19/04	9.5	9.4	5.57	4.51	48	99.0		1.1	2	2

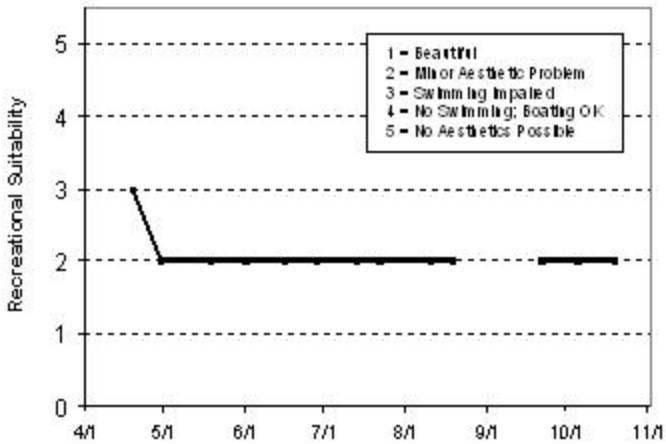


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth								F		D		F
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				D	D		D	D	F	D	D	D	C
Chlorophyll a				D	D		F	F	F	F	D	D	C
Secchi Depth	F	F	F	F	D		F	F	F	F	F	F	C
Overall				D	D		F	F	F	F	D	D	C

Source: Metropolitan Council and STORET data



Long Lake [Washington Co.] (82-0068) *Carnelian - Marine Watershed District*

Long Lake is a 35-acre lake located within New Scandia Township (Washington County). The maximum and mean depths of the lake are 2.1 m (roughly seven feet) and 1.1 m (three-and-a-half feet), respectively. Because of the shallowness of the lake, the entire area is considered littoral zone (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). The lake's surface area and mean depth translates to an approximate volume of 126 ac-ft.

The majority of the land within the 381-acre watershed is undeveloped. The watershed-to-lake size ratio is 11:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake.

This was the fifth year that Long Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake was very limited. The only years in which data are available other than the 2000-2004 CAMP data, were 1998-1999. The lake was monitored seven times between late-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	83.4	64.0	107.0	D
CLA (µg/l)	74.8	16.0	180.0	D
Secchi (m)	0.9	0.3	1.5	D
TKN (mg/l)	2.04	1.40	2.90	
			Overall Grade	D

The lake's 2004 overall grade, which is identical to that recorded in 2001, is better than those recorded in 1998-2000 and 2003(F), and worse than the C observed in 2002.

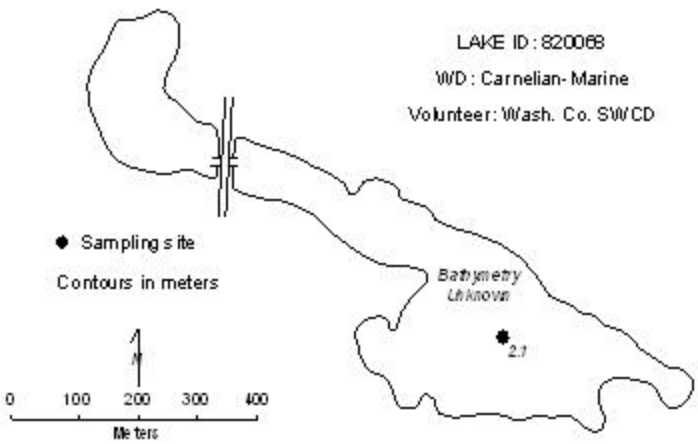
As mentioned earlier, there is a limited amount of water quality data available for Long Lake. Therefore it is not possible to determine any long-term or short-term trends. The lake's quality has fluctuated between an overall grade of C and F. To better understand the lake's water quality and where it may be heading, more data are needed.

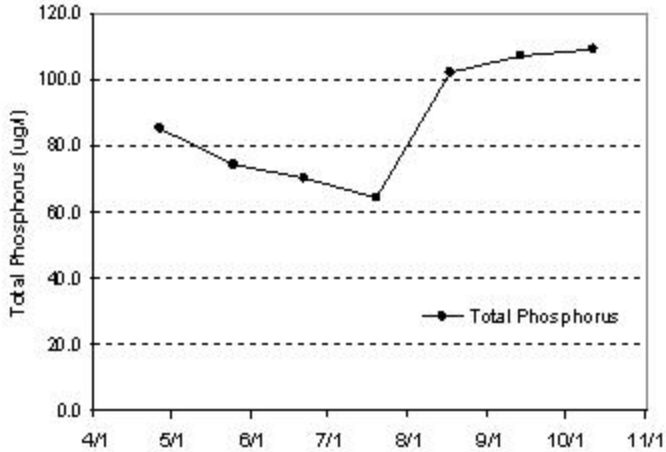
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.8 for physical condition (between 2- "some algae presnt" and 3- "definite algae present"), and 2.0 for recreational suitability (2- "minor aesthetic problem").

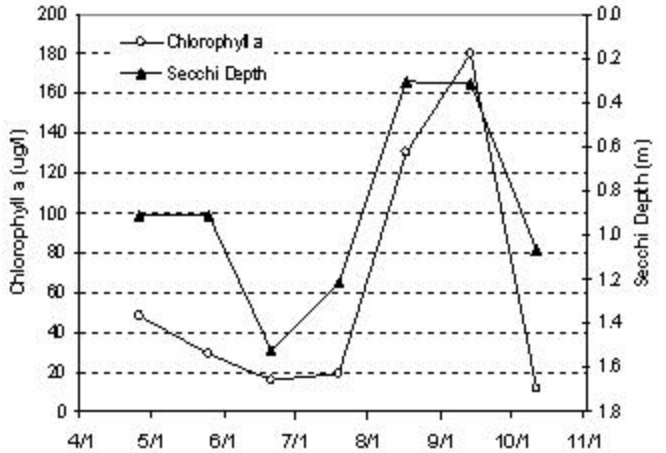
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Long Lake

New Scandia Twp., Washington Co.

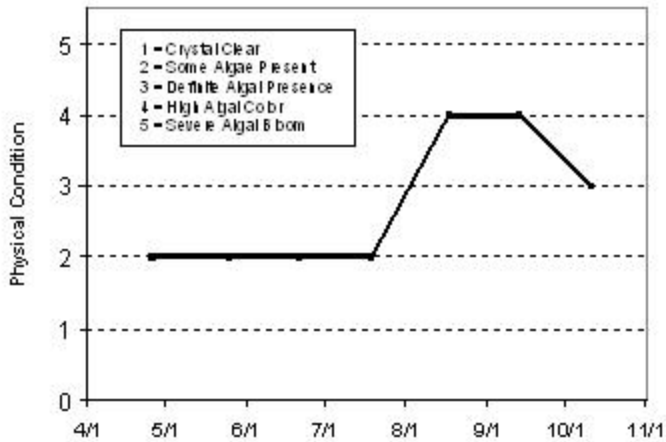






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.5	11.8	10.74	0.04	48	85.0		0.9	2	3
5/25/04	15.6	15	7.98	0.16	29	74.0		0.9	2	2
6/21/04	21.7	18.1	7.62	0.04	16	70.0		1.5	2	2
7/19/04	26.3	21.2	7.6	0.32	19	64.0		1.2	2	2
8/17/04	21.1	18.3	8.32	0.29	130	102.0		0.3	4	2
9/13/04	22.1	19.4	7.64	0.28	180	107.0		0.3	4	2
10/11/04	14.4	14.1	2.85	0.09	12	109.0		1.1	3	2

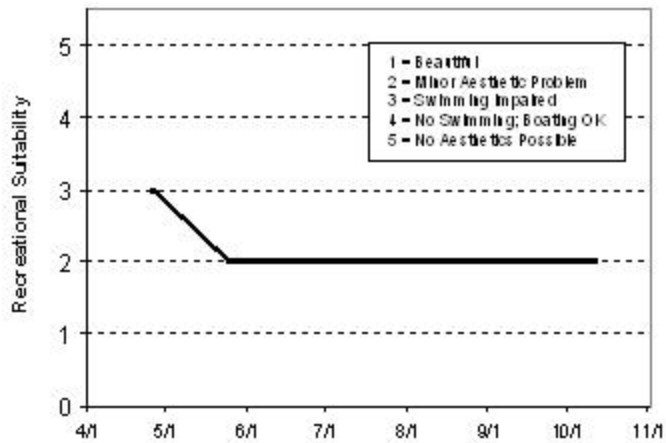


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus							D	D	D	C	C	D	D
Chlorophyll a							F	F	F	D	C	F	D
Secchi Depth							F	F	F	D	D	F	D
Overall							F	F	F	D	C	F	D

Source: Metropolitan Council and STORET data



Loon Lake (82-0015-02) *Carnelian - Marine Watershed District*

This was the fifth year of CAMP monitoring in Loon Lake, which is located in the Stillwater Township (Washington County). A search for any historical water quality data provided limited water quality data (1996-2000). The 64-acre lake has a mean and maximum depth of 2.4 m (eight feet) and 4.9 m (16 feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 206 ac-ft. Because of the shallowness of the lake, the majority of its area is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The lake does not have a public access and its 407-acre watershed translates to a 6.4:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff).

The lake was monitored seven times between late-April and mid-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	128.8	91.0	161 .0	D
CLA (µg/l)	95.2	72.0	110.0	F
Secchi (m)	0.5	0.5	0.6	F
TKN (mg/l)	2.56	2.00	3.20	
			Overall Grade	F

The lake's 2004 overall grade was identical to those recorded in 1996-1998 and 2003, and worse than those in 2000-2002 (D).

The collected data and resulting graphs showing TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

Throughout the summer, the volunteer ranked the lake's physical and recreational conditions on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 3.8 (between 3- "definite agale present" and 4- "high algal color"), while the mean recreational suitability ranking was 2.4 (between 2- "minor aesthetic problem" and 3-"swimming slightly impaired").

Because of the limitedness of the lake's water quality database, no long-trend can be determined. In the short-term however, the lake's water quality seems to be well represented by D/F+. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) conducted a fisheries survey on the lake in 1991. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Loon Lake

Stillwater Twp., Washington Co.

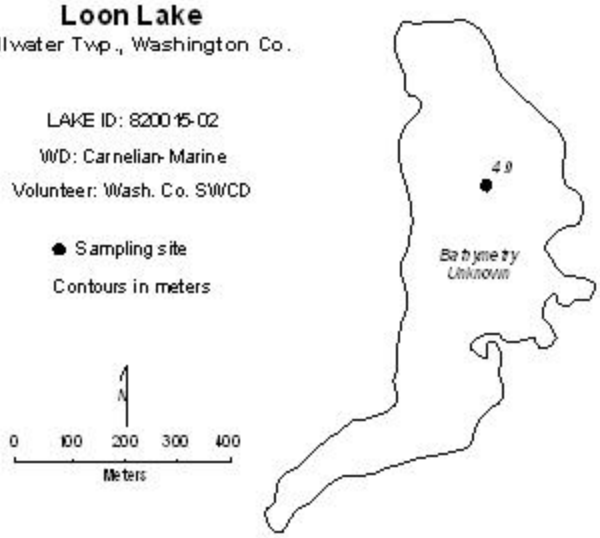
LAKE ID: 82001502

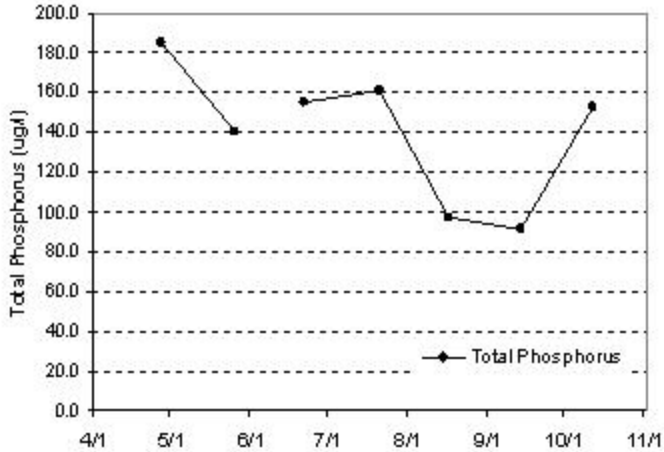
WD: Carnelian-Marine

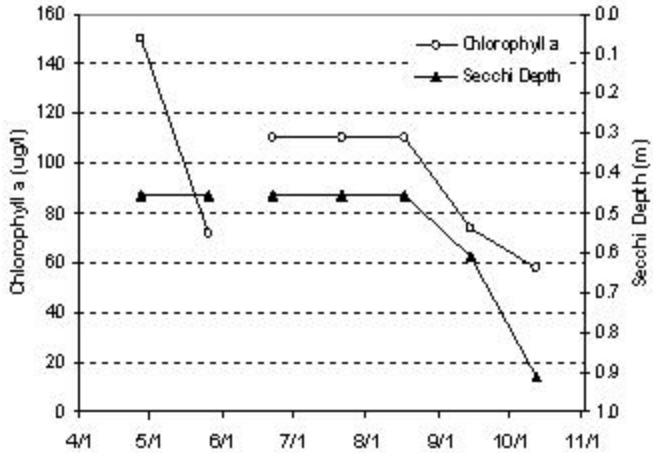
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

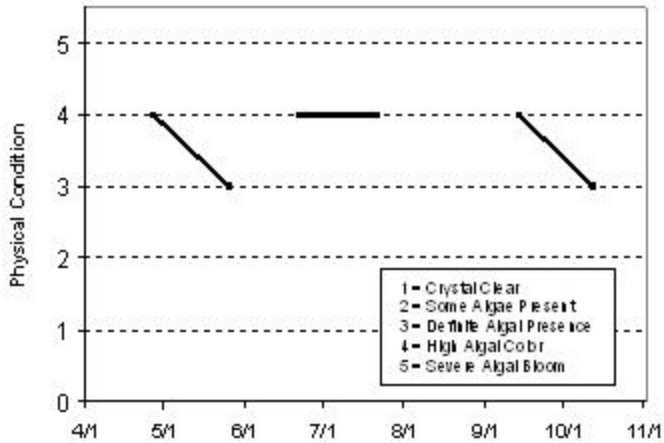






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.6	11.4	10.29	0.05	150	185.0		0.5	4	4
5/26/04	15.9	14.7	7.71	0.06	72	140.0		0.5	3	3
5/26/04	15.7	14.7	7.72	0.06						
6/22/04	20.8	15.1	5.78	0.13	110	155.0		0.5	4	3
7/21/04	28.6	16.7	8.59	0.11	110	161.0		0.5	4	2
8/17/04	22.2	18.1	8.18	0.15	110	97.0		0.5		2
9/14/04	21.9	21.6	5.29	0.06	74	91.0		0.6	4	2
10/12/04	14.4	14.3	4.44	0.13	58	153.0		0.9	3	2

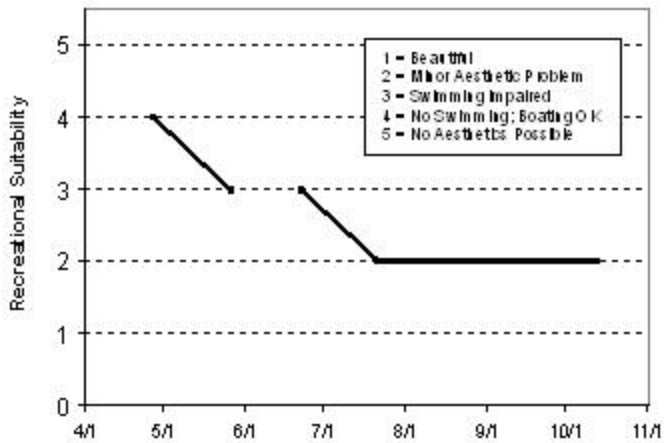


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					F	F	F	F	D	D	D	D	D
Chlorophyll a					D	D	D	D	D	D	D	F	F
Secchi Depth					F	F	F	F	D	D	F	F	F
Overall					F	F	F	F	D	D	D	F	F

Source: Metropolitan Council and STORET data



Lotus Lake (10-0006) *City of Chanhassen*

While Lotus Lake has previously been monitored by Council staff (1985, 1990 and 1999-2000) and the MPCA's volunteer Secchi program (1980, 1988-1991), 2004 marks the second year the lake has been monitored through CAMP. Lotus Lake, with a surface area of 246 acres, is located within the City of Chanhassen (Carver County) [public access to the lake is possible on the southern end of the lake]. The lake's surface area and its 1,033-acre watershed translates to a 4:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff).

The lake's maximum and mean depths of 8.9 and 4.3 (29.2 and 14.2 feet), along with its surface area, translates to a lake volume of approximately 3,500 ac-ft. Roughly 74 percent of the lake's surface area is considered littoral zone (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). The lake is considered a "Priority Lake" due to its multi-recreational uses. Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lake.

In 2004, Lotus Lake was monitored 10 times between mid-May and mid-September. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	44.0	26.0	56.0	C
CLA (µg/l)	26.2	4.2	53.0	C
Secchi (m)	1.2	0.8	2.3	C
TKN (mg/l)	1.05	0.63	1.40	
			Overall Grade	C

The lake's 2004 overall grade of C is identical to those recorded in 1985, 1999 and 2000, and worse than the D recorded in the minimal monitoring of 2003 (D).

A recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity.

Throughout the summer, the volunteer ranked their opinion of the lake's physical and recreational condtions on a 1-to-5 scale (see lake information sheet). The mean physical condition was 2.0 (2- "some algae present"), while the recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Lotus Lake

Chanhassen, Carver Co.

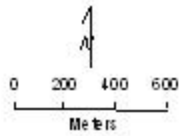
Lake ID: 100006

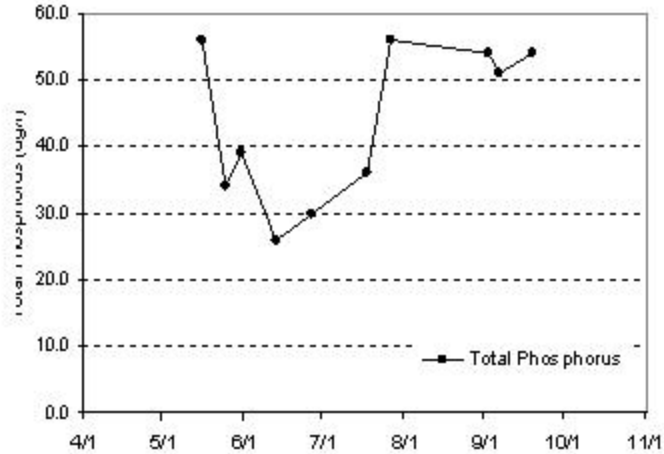
WD: Riley-Purgatory-Bluff Creek

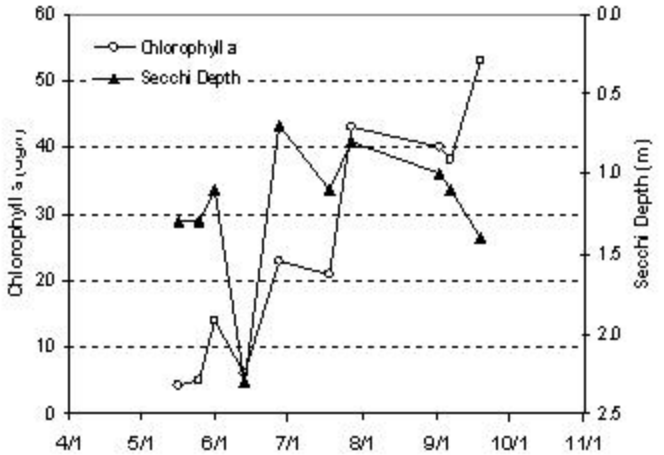
Volunteer: Shelly Strohmaier

● Sampling site

Contours in meters

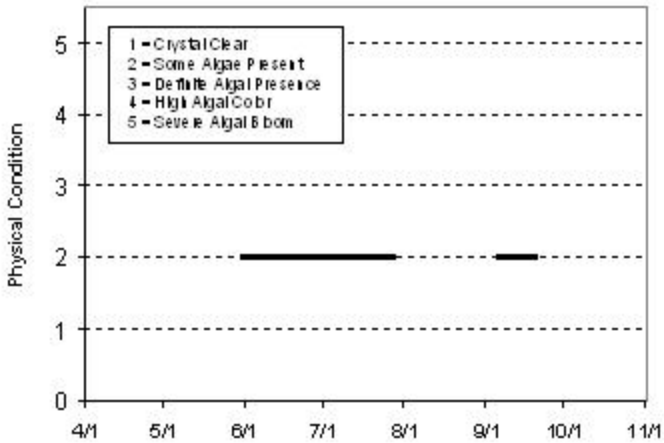






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/16/04	15.7				4.2	56.0		1.3		2
5/25/04	17				5	34.0		1.3		
5/31/04	18				14	39.0		1.1	2	2
6/13/04	23				6	26.0		2.3	2	2
6/27/04	22				23	30.0		0.7	2	2
7/18/04	26.5				21	36.0		1.1	2	2
7/27/04	25.4				43	56.0		0.8	2	2
9/2/04	24				40	54.0		1.0		
9/6/04	23.3				38	51.0		1.1	2	2
9/19/04	21.3				53	54.0		1.4	2	2

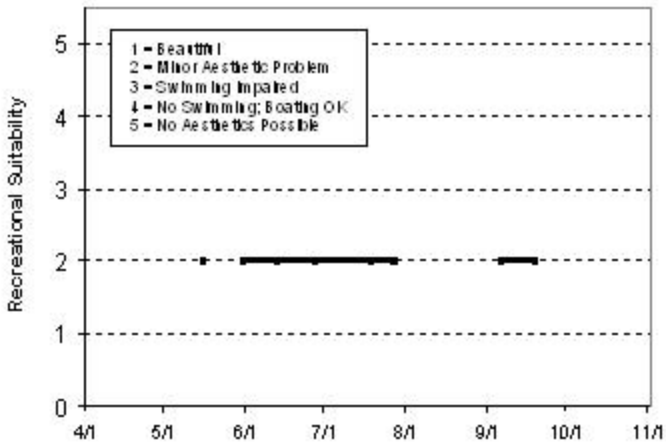


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus						C						
Chlorophyll a						C					C	
Secchi Depth	D					C			D	C	C	C
Overall						C						

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								C	C			D	C
Chlorophyll a								C	C			C	C
Secchi Depth								C	C			D	C
Overall								C	C			D	C

Source: Metropolitan Council and STORET data



Louise Lake (82-0025) *Carnelian - Marine Watershed District*

Louise Lake is a 48-acre lake located within Stillwater Township (Washington County). The maximum and mean depths of the lake are 3.7 m (roughly 12 feet) and 1.8 m (six feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 283 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's 616-acre watershed and surface area translates to a watershed-to-lake size ratio of 13:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake.

This was the fifth year that Louise Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided limited information (1996-2003).

The lake's Secchi transparency was monitored seven times from late-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

Water samples to be analyzed for TP, TKN and chlorophyll were not collected for the lake in 2004. Because Secchi transparcy was the only data collected there are no nutrient of chlorophyll concentration means to compare to previous years. The lake's 2004 summertime (May through September) mean Secchi transparency was 2.0 m (minimum of 1.1 m and a maximum of 2.7 m). This translates to a grade of C for water clarity. The lake's 2004 water clarity, although less than that observed in 2003, was dramatically better than that recorded in 2002 (1.2 m) and 2001 (0.9 m).

Because of the limitedness of the lake's water quality database, no long-term can be determined. In the short-term however, the data seems to show that the lake, consistantly flucuates between an overall C and D grade. To better understand the lake's water quality and where it may be heading, more data are needed.

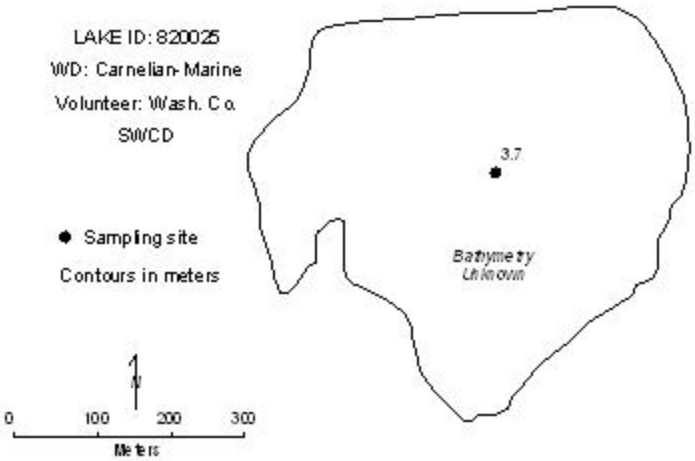
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.5 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 2.0 for recreational suitability (2- "minor aesthetic problem").

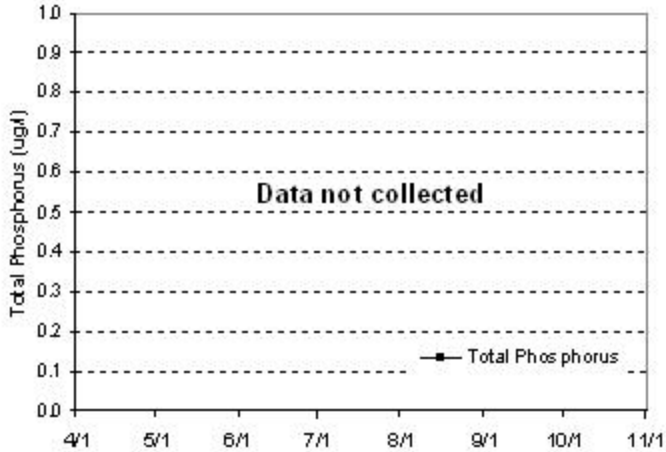
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

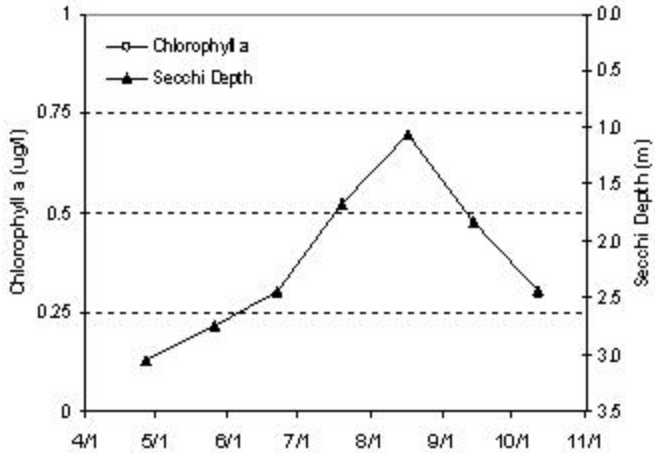
Lake Louise

Stillwater Twp., Washington Co.

LAKE ID: 82002S
WD: Carnelian-Marine
Volunteer: Wash. Co. SWCD

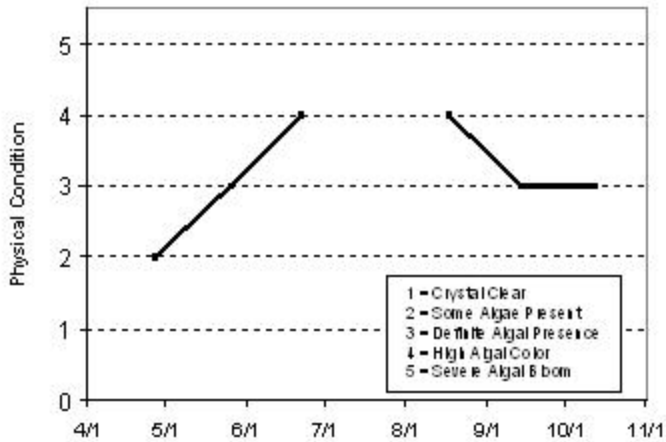






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.3	11.4	10.1	0.09				3.0	2	3
5/26/04	15.6	14.5	9.51	0.06				2.7	3	
6/22/04	20.8	20	8.76	0.07				2.4	4	2
7/20/04	29.2	20.9	8.83	0.06				1.7		
8/17/04	22.3	18.7	9.81	0.21				1.1	4	2
9/14/04	21.7	20.9	4.17	0.1				1.8	3	2
10/12/04	14.4	14.3	7.01	0.33				2.4	3	2

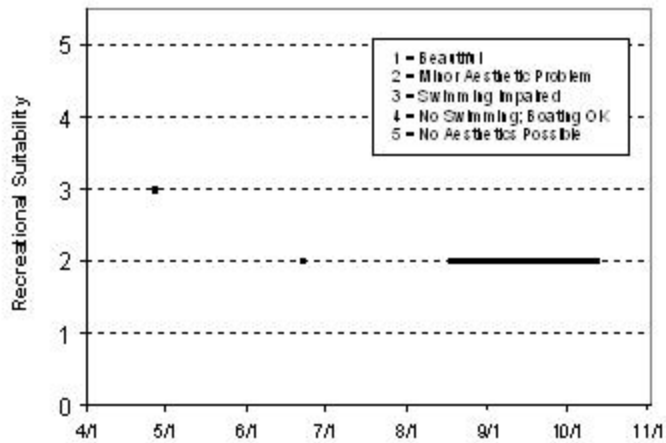


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					D	D	B	C	D	D	D		
Chlorophyll a					D	D	D	F	B	D	C		
Secchi Depth					B	C	C	C	C	D	D	B	C
Overall					C	D	C	D	C	D	D		

Source: Metropolitan Council and STORET data



MacDonald's Pond (82-0062) *Carnelian – Marine Watershed District*

MacDonald's Pond is an approximate 12-acre land-locked lake located within New Scandia Township (Washington County). The maximum depth of the lake is 2.7 m (roughly 9 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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). There is very little other known morphological data available for the waterbody.

This was the first year that MacDonald's Pond has been involved in CAMP. On each of the sampling days the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The lake was monitored 14 times between mid-April and mid-October, 2004.

The following are the averages of the three events for each of the parameters tested.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	20.7	12.0	28.0	A
CLA (µg/l)	2.83	1.30	6.7	A
Secchi (m)	3.2	2.3	3.8	A
TKN (mg/l)	0.60	0.38	0.85	
			Overall Grade	A

Other than for the 2004 CAMP data, there are no known water quality data available for MacDonald's Pond. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

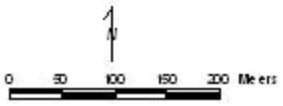
The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 1.8 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.5 for recreational suitability (between 2- "minor aesthetic problem" and 3- " swimming slightly impaired").

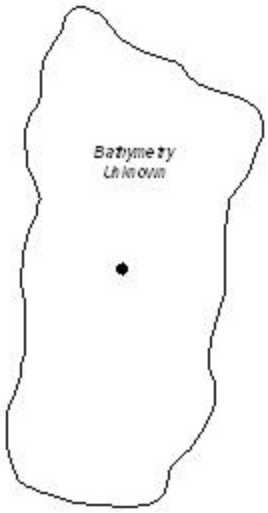
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

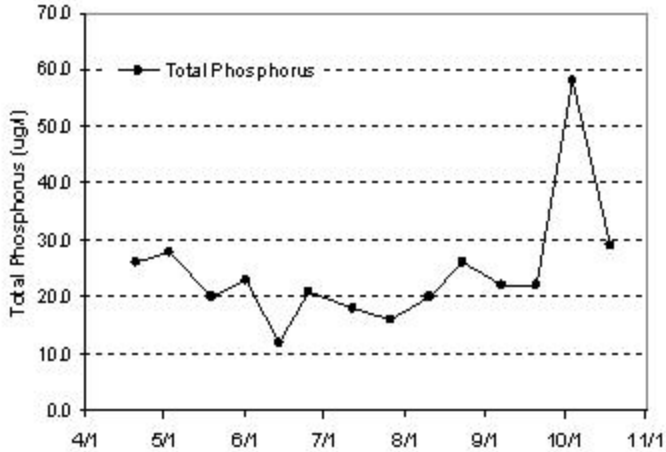
MacDonald's Pond
New Scandia Twp., Washington Co.

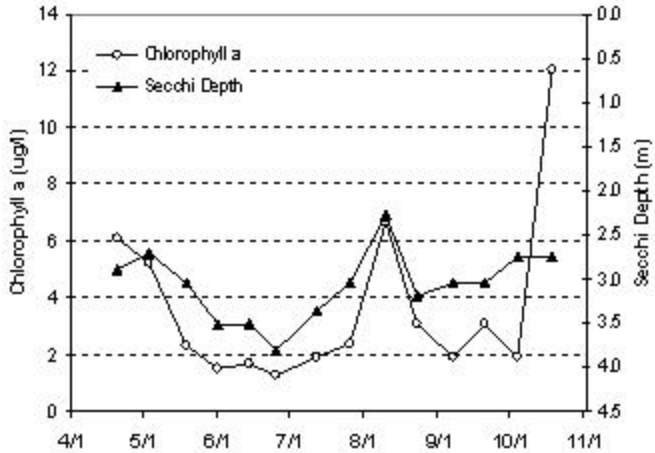
LAKE ID: 820062
WD: Carnelian-Marine
Volunteer: Wash. Co. SWCD

● Sampling site
Contours in meters



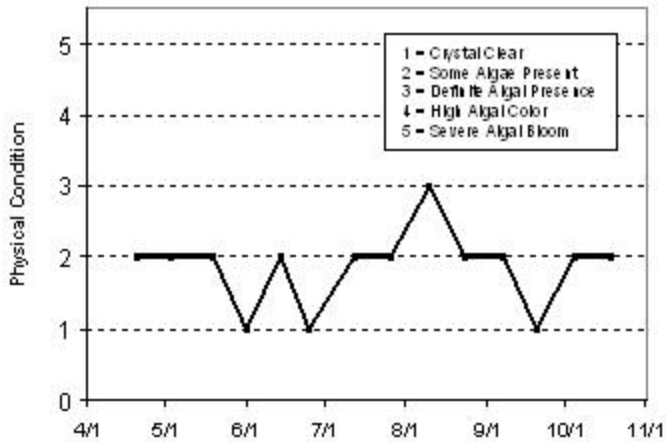






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	13.7	8.3	10.72	0.36	6.1	26.0		2.9	2	2
5/3/04	13.7	10.5	9.62	0.41	5.2	28.0		2.7	2	2
5/19/04	17.6	15.7	9.23	8.22	2.3	20.0		3.0	2	3
6/1/04	17.1	15.5	8.39	0.22	1.5	23.0		3.5	1	2
6/14/04	24.1	17.1	7.17	0.15	1.7	12.0		3.5	2	3
6/25/04	22.4	18.8	8.33	0.78	1.3	21.0		3.8	1	1
7/12/04	25.7	20.6	8.31	0.52	1.9	18.0		3.4	2	3
7/26/04	27.3	21	7.93	0.34	2.4	16.0		3.0	2	2
8/10/04	22.2	22.2	5.47	4.39	6.7	20.0		2.3	3	3
8/23/04	20.8	19.6	8.12	0.2	3.1	26.0		3.2	2	3
9/7/04	22.6	18.4	6.21	0.26	1.9	22.0		3.0	2	3
9/20/04	20.5	19.7	6.35	0.05	3.1	22.0		3.0	1	2
10/4/04	14	13.8	6.53	3.2	1.9	58.0		2.7	2	2
10/18/04	9.2	9	7.61	7.09	12	29.0		2.7	2	2

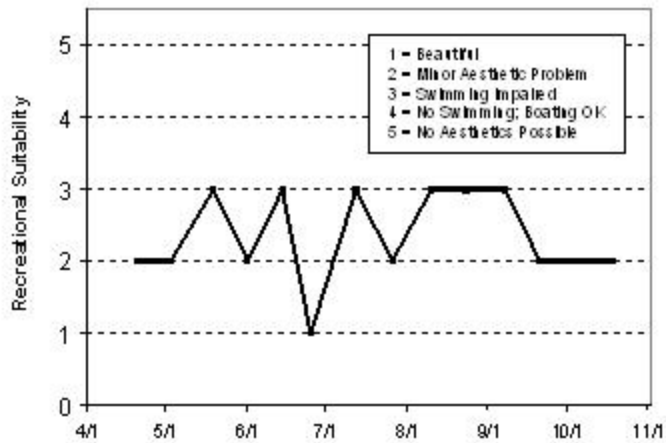


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													A
Chlorophyll a													A
Secchi Depth													A
Overall													A

Source: Metropolitan Council and STORET data



Maple Marsh (82-0038) *Carnelian - Marine Watershed District*

Maple Marsh Lake is a 38-acre lake located within May Township (Washington County). The maximum and mean depths of the lake are 3.4 m (roughly 11 feet) and 1.7 m (five-and-a-half feet), respectively. Because of the shallowness of the lake, the entire area is considered littoral zone (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). The lake's surface area and mean depth translates to an approximate volume of 126 ac-ft.

The majority of the land within the 148-acre watershed is undeveloped. The watershed-to-lake size ratio is 4:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff).

This was the fourth year that Maple Marsh Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided limited information (1997-2003).

The lake's Secchi transparency was monitored seven times from late-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

Water samples to be analyzed for TP, TKN and chlorophyll were not collected for the lake in 2004. Because Secchi transparcy was the only data collected there are no nutrient of chlorophyll concentration means to compare to previous years. The lake's 2004 summertime (May through September) mean Secchi transparency was 1.3 m (minimum of 0.8 m and a maximum of 2.1 m). This translates to a grade of C for water clarity. The lake's 2004 Secchi grade is identical to that recorded in 2002 and better than the D's recorded in 1997 and 1999-2001 and the F in 1998.

Because of the limited nature of the lake's water quality database the determination of any statistically significant long-term trend is not possible. With this in mind, the lake's water quality data seems to show a consistant fluctuation between an overall grade of C and D. To better understand the lake's overall water quality and where it may be heading, more monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.2 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 2.0 for recreational suitability (2- "minor aesthetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Maple Marsh
May Twp., Washington Co.

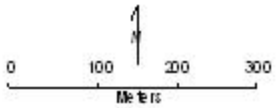
LAKE ID: 820038

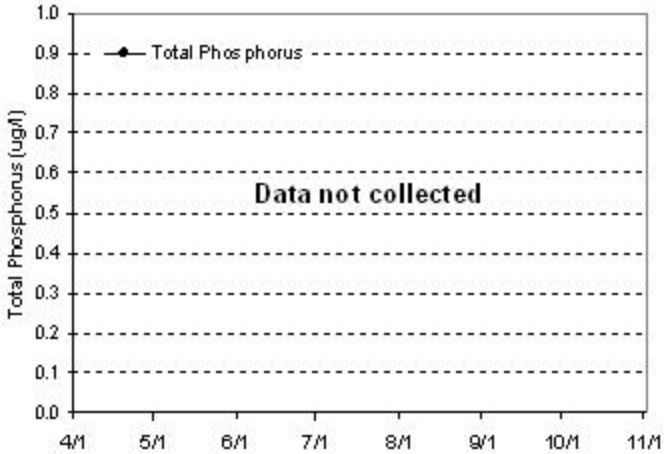
WD: Carnelian-Marine

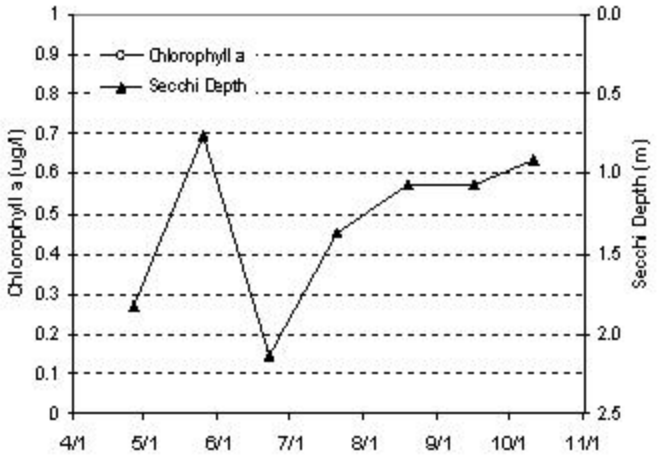
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

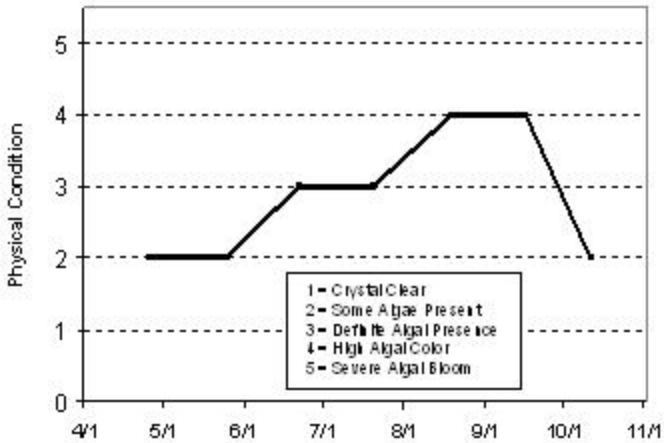






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.4	11.5	10.24	0.8				1.8	2	3
5/25/04	14.3	14.2	9.42	0.09				0.8	2	
6/22/04	20.4	20	6.35	0.11				2.1	3	2
7/20/04	28.3	23.8	8.39	0.1				1.4	3	2
8/19/04	19.1	19.1	7.09	0.14				1.1	4	2
9/16/04	18.5	18.4	6.26	0.75				1.1	4	2
10/11/04	14.8	13.7	7.81	0.11				0.9	2	3

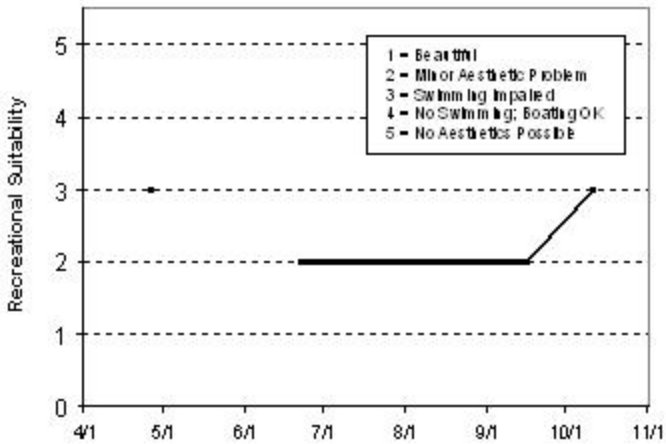


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						F	F	C	D	F			
Chlorophyll a						D	F	F	C	D			
Secchi Depth						D	F	D	D	D	C	D	C
Overall						D	F	D	D	D			

Source: Metropolitan Council and STORET data



Marion Lake (19-0026) *City of Lakeville*

This was the seventh year that Marion Lake has been a part of CAMP (the others were 1994 and 1999-2003). The area around Lake Marion, located in the City of Lakeville (Dakota County), is rapidly developing. The lake covers an area of roughly 560 acres and has a maximum depth of 6.4 m (21 feet). There are two public accesses to the lake. One access is located in the park while the other is located on the western side of the lake off of 195th Street West. Lake Marion is considered a "Priority Lake" by the Metropolitan Council because of its multi-recreational uses. One problem that may possibly hinder future recreational activity on the lake, however, is Eurasian Water Milfoil (*Myriophyllum spicatum*), which has been reported in the lake.

The lake gets heavy use by area fishermen and other lake users during the winter and summer months. The MDNR manages the lake for northern pike-panfish, and has stocked the lake with walleye over the past decade. Because of past winterkills, the lake's oxygen levels are monitored throughout the winter, and the lake is aerated when needed.

As part of the 2004 volunteer monitoring program, Lake Marion was monitored 15 times from mid-April to mid-October. During each monitoring event the lake was monitored for TP, CLA, TKN, and Secchi transparency, and the lake's perceived physical condition and recreational suitability. Graphs as well as the actual data collected by volunteers, show the seasonal variability of the collected data (see lake information sheet on the next page).

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	42.8	19.0	77.0	C
CLA (µg/l)	25.0	3.0	53.0	C
Secchi (m)	1.8	1.1	2.8	C
TKN (mg/l)	0.73	0.57	0.96	
			Overall Grade	C

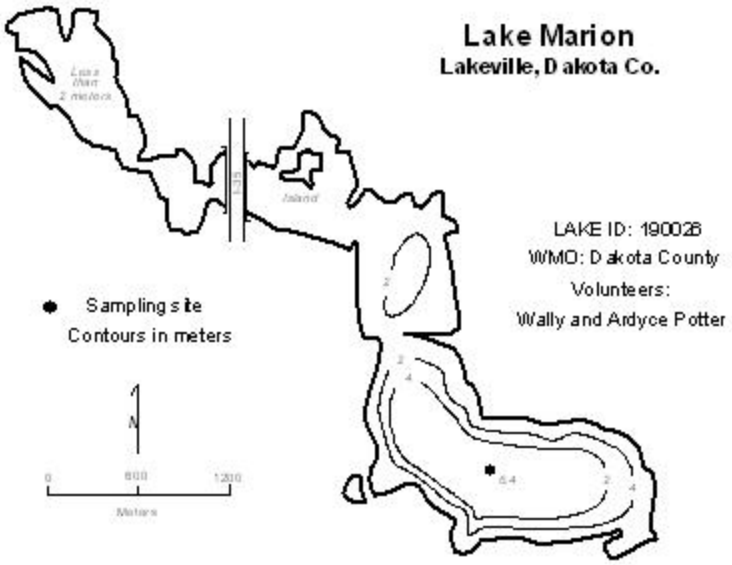
The resulting overall grade in 2004 (C) (similar to those recorded in 2002-2003), represents a decrease in water quality as compared to the overall grade of B the lake received in 1994, and 1999-2001.

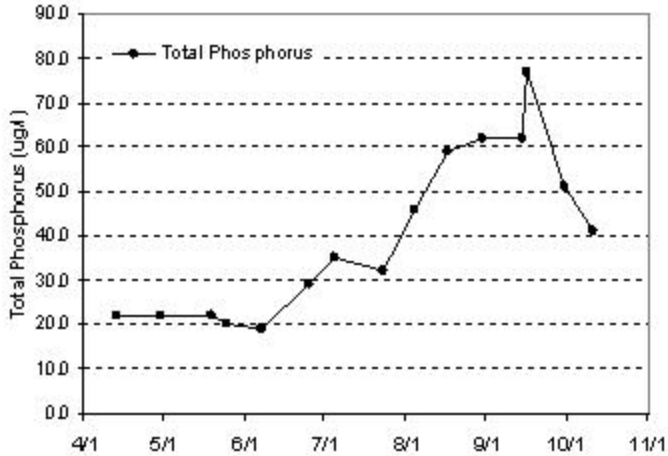
The physical and recreational conditions of the lake, as observed by the volunteer monitors, were ranked on a 1 to 5 ranking scale. The volunteer's user perception rankings are shown on the lake's information sheet. The mean physical condition ranking was 1.8 (between 1- "crystal clear" and 2- "some algae present"), while the lake's mean recreational suitability ranking was 1.3 (between 1- "beautiful" and 2- "minor aesthetic problem").

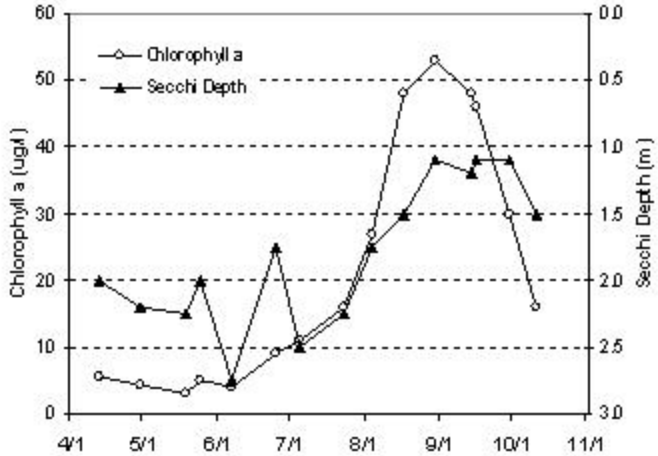
While Lake Marion does have 14 years of data (12 of which contain some nutrient measurements) over the past 25 years, it is difficult to determine what is happening with the lake's water quality. The available data shows a wide range in the lake's quality with the water quality showing an improvement in the 1990's as compared to the 1980's. The lake received an overall water quality grade of D in 1981; C in 1980, 1983, 1987, and 2002-2004; and finally received a B in 1994, and 1999-2001. A recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

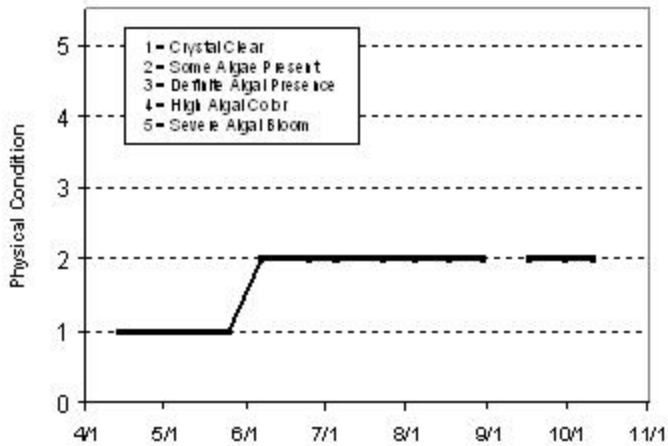






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	5				5.6	22.0		2.0	1	1
4/30/04	10				4.2	22.0		2.2	1	1
5/19/04	14				3	22.0		2.3	1	1
5/25/04	13				5	20.0		2.0	1	1
6/7/04	18				3.9	19.0		2.8	2	1
6/25/04	17				9	29.0		1.8	2	1
7/5/04	20				11	35.0		2.5	2	1
7/23/04	23				16	32.0		2.3	2	
8/4/04	22				27	46.0		1.8	2	1
8/17/04	18				48	59.0		1.5	2	1
8/30/04	18				53	62.0		1.1	2	2
9/14/04	18				48	62.0		1.2		
9/16/04	17				46	77.0		1.1	2	2
9/30/04	15				30	51.0		1.1	2	2
10/11/04	12				16	41.0		1.5	2	1

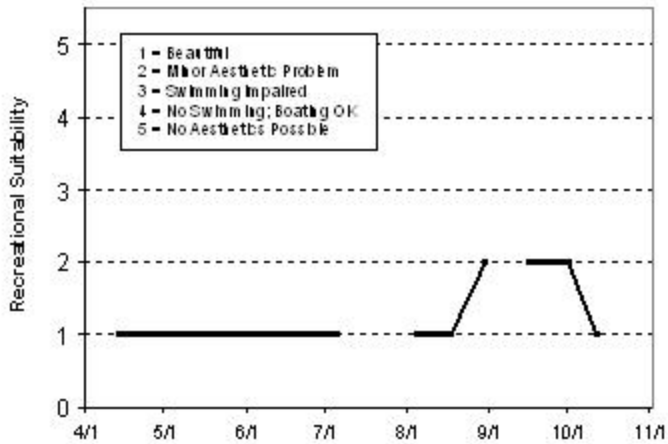


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C	C		C				C		C		
Chlorophyll a	C	D		C				C		C		
Secchi Depth	C	D		B				C		C	C	C
Overall	C	D		C				C		C		

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			B					B	B	B	C	B	C
Chlorophyll a			A					B	A	B	B	C	C
Secchi Depth			B					C	B	B	C	C	C
Overall			B					B	B	B	C	C	C

Source: Metropolitan Council and STORET data



Markgrafs Lake (82-0089) *City of Woodbury*

Markgrafs Lake, located within the City of Woodbury (Washington County), has a surface area of approximately 46 acres (2.6 miles around), and a maximum depth of 2.4 m (8 feet). The lake, which is used by the MDNR Fisheries as a rearing pond for walleyes, has a piped outlet on the southern end. Downstream from the outlet is a valve that can direct the overflow to either Powers or Wilmes lakes.

The 413-acre drainage area to the lake is presently made up of open/undeveloped areas. Future land uses are projected to be 11.5 percent single-family residential, 14.8 percent multi-family residential, 51.8 percent commercial/retail, 15.1 percent parks/open space, and 6.8 percent ponds/wetlands. The lake's watershed-to-lake size ratio is 10:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). Because of the lake's shallowness, much of the lake is considered littoral zone (the 0-15 foot depth area of the lake dominated by aquatic vegetation). It does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column).

The lake has been involved in CAMP since 1994. Between mid-April and mid-October 2004, the lake was monitored 14 times. During each monitoring event; TP, CLA, TKN, and Secchi transparency were measured, as was the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	136.3	50.0	262.0	D
CLA (µg/l)	49.5	21.0	100.0	D
Secchi (m)	0.5	0.3	0.9	F
TKN (mg/l)	1.54	0.66	2.30	
			Overall Grade	D

The lake's 2004 overall lake quality report card gradeis identical to those recorded in 1994, 1997, 1999, and 2001-2003, better than the F of 1998, and worse than the C's observed in 1995-1996.

A moderate amount historical water quality data is available for Markgrafs Lake. Data found were collected through CAMP in 1994-2004. While no statistically significant long-term trend is evident from the lake's whole water quality database (including TP, CLA and Secchi data), a recent MPCA conducted trend analysis using just the lake's Secchi transparency data, revealed a statistically significant decrease in recent water clarity. The lake's overall quality generally fluctuates between a low C (1995-1996, and 2000) and a D (1994, 1997, 1999, and 2001-2004). The lake experienced its worst recorded overall water quality (F) in 1998 and its best water quality in 1995.

Throughout the course of the monitoring season the volunteer monitor ranked the lake's perceived physical and recreational conditions on a 1-to-5 scale. The mean physical condition was 3.7 (between 3- "definite algae present" and 4- "high algal color") while the mean recreational suitability was 4.0 (4- "no swimming – boating ok").

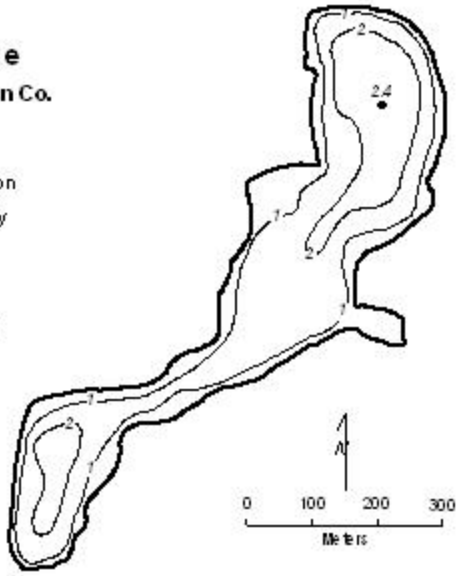
If you know of any errors in the lake's data/physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

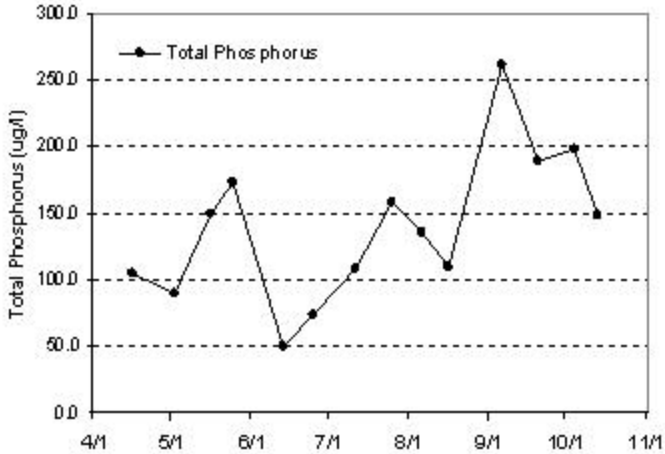
Markgrafs Lake

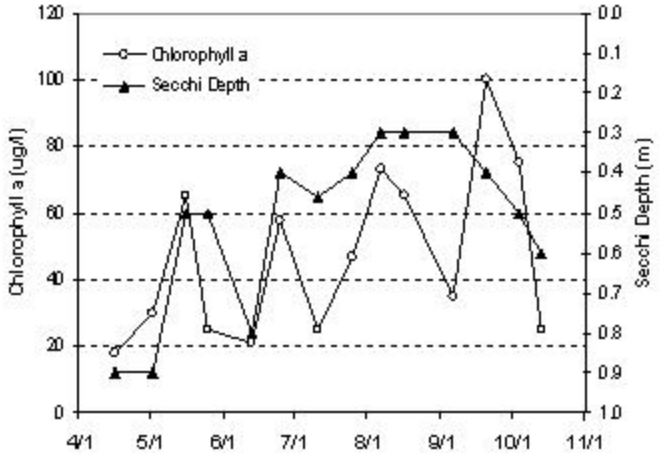
Woodbury, Washington Co.

Lake ID: 820089
WD: South Washington
Volunteer: Terry Riley

● Sampling site
Contours in meters

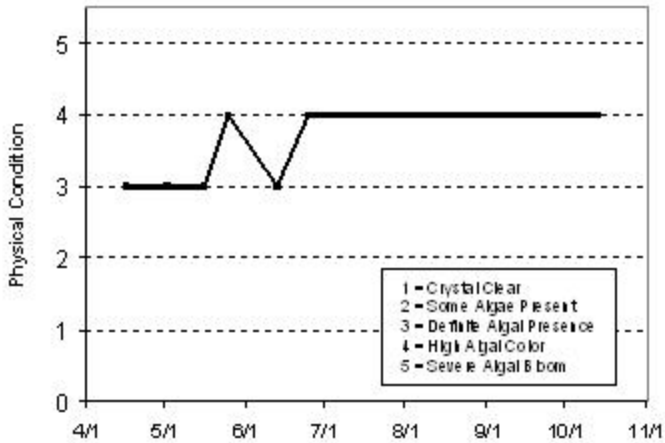






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/16/04	12.9				18	105.0		0.9	3	4
5/2/04	15.1				30	90.0		0.9	3	4
5/16/04	16.8				65	150.0		0.5	3	4
5/25/04	15.7				25	173.0		0.5	4	4
6/13/04	23.5				21	50.0		0.8	3	4
6/25/04	21.8				58	73.0		0.4	4	4
7/11/04	26.3				25	108.0		0.5	4	4
7/25/04	28				47	158.0		0.4	4	4
8/6/04	24.1				73	136.0		0.3	4	4
8/16/04	25.2				65	110.0		0.3	4	4
9/6/04	24.1				35	262.0		0.3	4	4
9/20/04	21.3				100	189.0		0.4	4	4
10/4/04	14				75	198.0		0.5	4	4
10/13/04	14.6				25	148.0		0.6	4	4

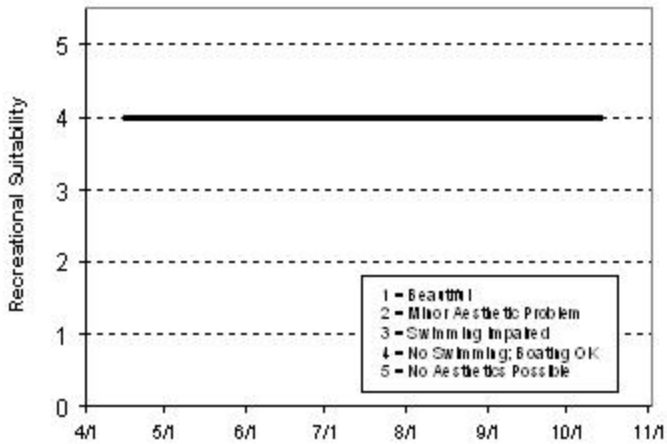


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			D	C	D	D	F	D	D	F	F	D	D
Chlorophyll a			C	B	B	C	F	C	C	C	C	C	D
Secchi Depth			D	C	C	D	F	D	C	D	F	D	F
Overall			D	C	C	D	F	D	C	D	D	D	D

Source: Metropolitan Council and STORET data



Markley Lake (70-0021) *City of Prior Lake*

This was the eighth year that Markley Lake has been monitored for lake water quality through CAMP. The lake, which has a surface area of roughly 27 acres (because of high water, the actual surface area of the lake may be slightly larger) is located within the City of Prior Lake (Scott County). Its maximum depth is 3.7 m (22 feet). Because of the lake's shallowness the entire 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).

As part of the 2004 volunteer monitoring program, Markley Lake was only monitored four times from early-May to late-July. Graphs as well as the actual data collected by volunteers show the seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	54.3	52.0	58.0	C
CLA (µg/l)	12.6	7.4	23.0	B
Secchi (m)	1.2	0.9	1.50	C
TKN (mg/l)	1.20	1.00	1.40	
			Overall Grade	C

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's water quality seems to be well represented by an overall grade of C. In order to detect any possible long-term water quality trends, continued monitoring is suggested.

The average user perception rankings of Markley Lake correspond to the overall quality of the lake. On a 1-to-5 ranking scale, the mean physical condition ranking was 2.5 (between 2- "some algae present" and 3- "swimming slightly impaired"), while the mean recreational suitability was 3.8 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

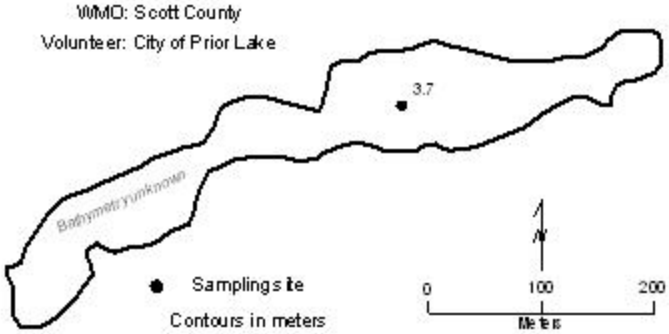
Markley Lake

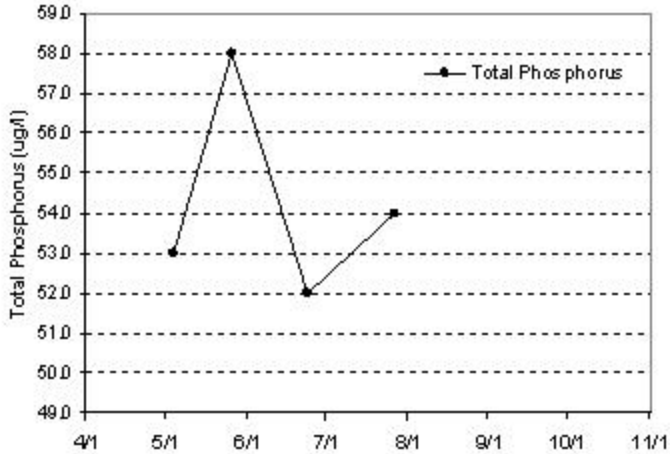
Credit River Twp./Prior Lake, Scott Co.

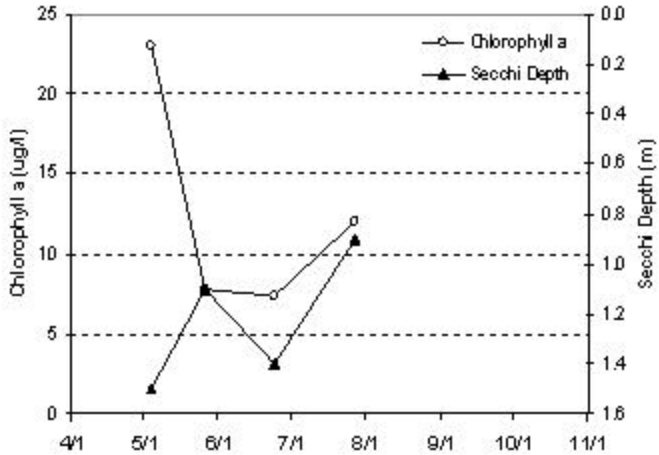
Lake ID: 700021

WMO: Scott County

Volunteer: City of Prior Lake

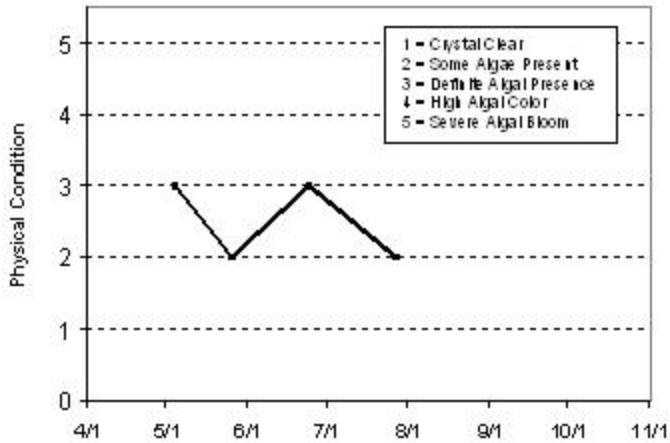






2004 Data

Date	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	PS (1-5)
5/11/04	17				23	53.0		1.5	3	3
5/26/04	12				7.8	58.0		1.1	2	4
6/24/04	23				7.4	52.0		1.4	3	4
7/27/04	26				12	54.0		0.9	2	4

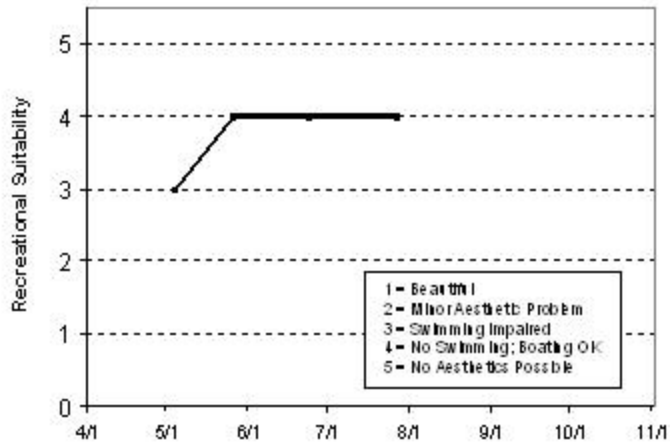


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						C	C	C	C	C	C	C	C
Chlorophyll a						B	B	B	C	B	B	B	B
Secchi Depth						C	C	C	C	C	C	C	C
Overall						C	C	C	C	C	C	C	C

Source: Metropolitan Council and STORET data



McDonald Lake (82-0010) *Valley Branch Watershed District*

McDonald Lake is a 36-acre land-locked (no outlet) lake located within Baytown Township (Washington County). The maximum depth of the lake is 3.7 m (roughly 12 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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). Additionally, approximately 60 percent of the lake's 424-acre immediate watershed is either developed or under development. The lake's surface area and watershed size translates to a 12:1 watershed-to-lake size ratio. Generally the larger the ratio, the greater the potential stress on the lake from surface runoff.

This was the fifth year in which McDonald Lake has been involved in CAMP (the lake was enrolled in the program in 1999 and 2001-2003 as well). The only historical water quality data found for McDonald Lake were Secchi transparency data for 1998 and CAMP data from 1999 and 2001-2003. Thus, 1999 and 2001-2004 are the only year of available nutrient data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 12 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	38.6	27.0	53.0	C
CLA (µg/l)	18.3	2.7	49.0	B
Secchi (m)	2.3	0.8	5.0	B
TKN (mg/l)	0.94	0.65	1.50	
			Overall Grade	B

The lake's 2004 overall grade is the best rcorded to date.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of C. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 1.9 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.0 for recreational suitability (2—"minor aesthetic problem").

If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

McDonald Lake

Baytown Twp., Washington Co.

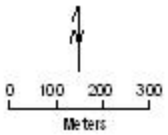
Lake ID: 820010

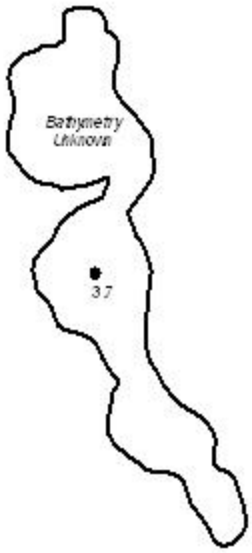
WD: Valley Branch

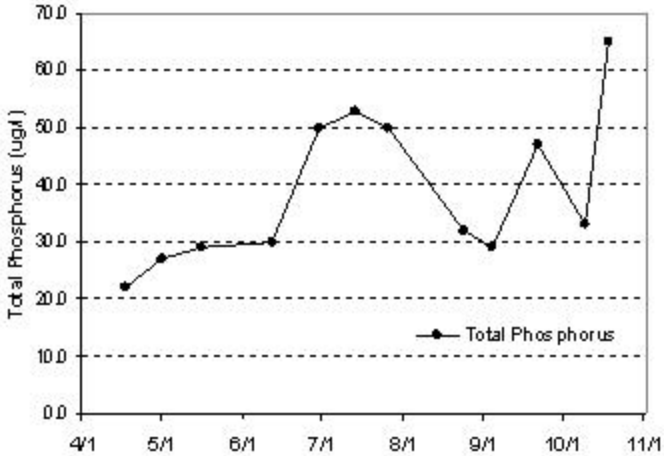
Volunteer: Steve Groves

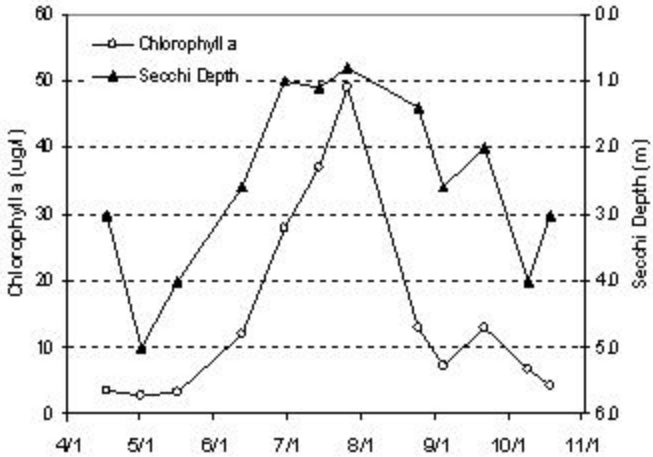
● Sampling site

Contours in meters



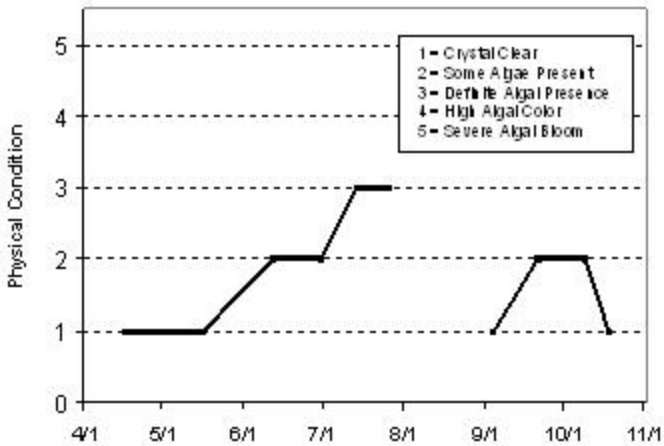






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	18.2				3.4	22.0		3.0	1	1
5/1/04	14.5				2.7	27.0		5.0	1	1
5/16/04	16.6				3.2	29.0		4.0	1	1
6/12/04	22.2				12	30.0		2.6	2	2
6/30/04	26.1				28	50.0		1.0	2	3
7/14/04	26.7				37	53.0		1.1	3	2
7/26/04	27.1				49	50.0		0.8	3	3
8/24/04	21.1				13	32.0		1.4		
9/4/04	24.2				7.2	29.0		2.6	1	2
9/21/04	20				13	47.0		2.0	2	2
10/9/04	16.7				6.8	33.0		4.0	2	1
10/18/04	9.4				4.2	65.0		3.0	1	1

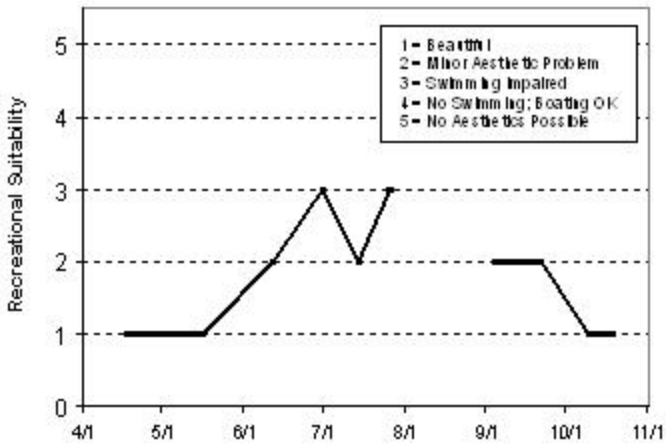


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								C		C	C	C	C
Chlorophyll a								B		C	C	C	B
Secchi Depth							C	C	C	C	C	C	B
Overall								C		C	C	C	B

Source: Metropolitan Council and STORET data



McKusick Lake (82-0020) *Middle St. Croix Watershed Management Organization*

Lake McKusick, a 46-acre lake located within the City of Stillwater (Washington County) has a maximum depth of 4.7 m (roughly 15.5 feet). The lake has been involved in CAMP since 1994. In 2004, the lake was monitored 14 times between mid-April and early-October.

On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

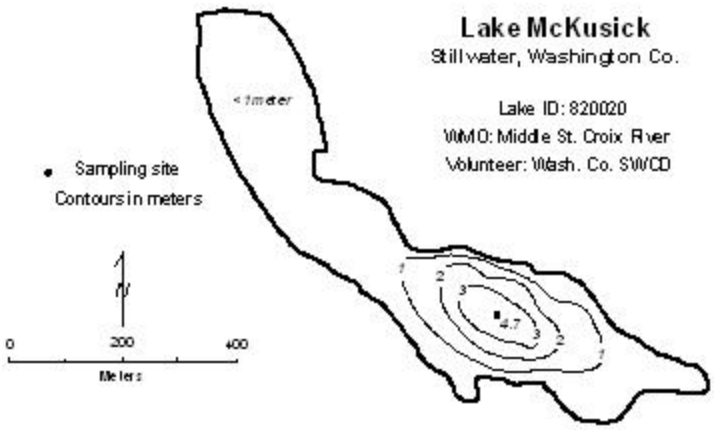
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	36.7	23.0	62.0	C
CLA (µg/l)	6.0	2.5	17.0	A
Secchi (m)	2.6	1.8	3.4	B
TKN (mg/l)	0.75	0.65	1.00	
			Overall Grade	B

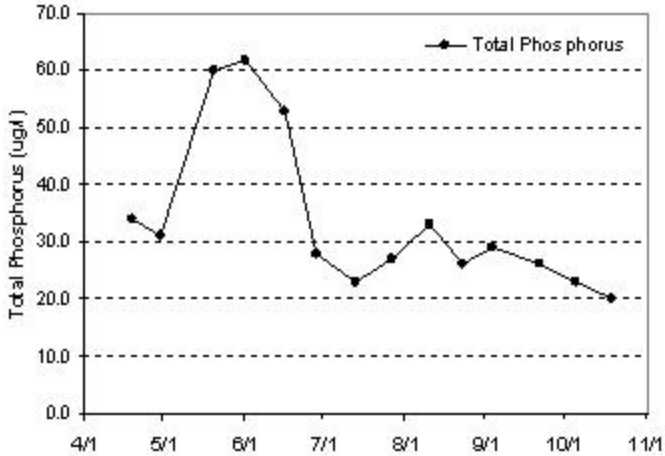
The lake's 2004 overall grade of B is identical to those recorded in 2000-2001 and better than the C's of 1997 and 2002, and D's of 1994-1996 and 1998-1999. The overall grade of B recorded in 2000 and 2001 is the lake's best-recorded overall grade to date. A closer look at the three years that the lake received an overall grade of B, reveals that the best parameter means were recorded in 2004.

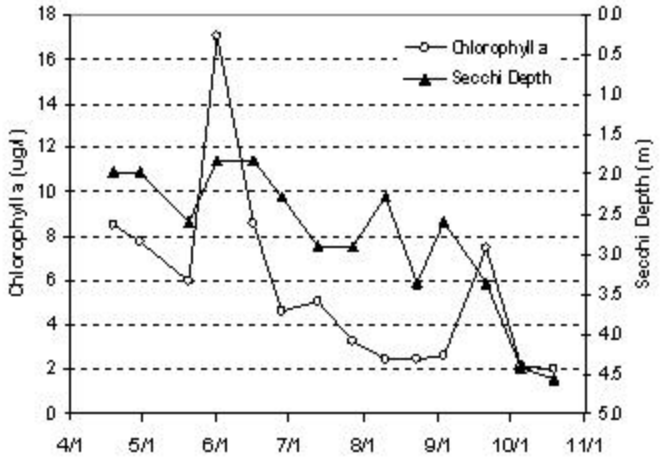
Throughout the monitoring period, the volunteer(s) ranked their opinions of physical and recreational conditions of the lake on a 1-to-5 scale. The resulting user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 2.1 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.6 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

Because of the wide variation in the lake's 1994-2004 water quality database, no long-term trends can be determined. In the short-term however, it seems that the lake was well represented by an overall grade of D/C until recently (2000-2004) when the lake's overall grade has improved to C+/B. In order to detect any possible long-term water quality trends, additional years of data collection are needed.

If you know of any errors in the lake's data/physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

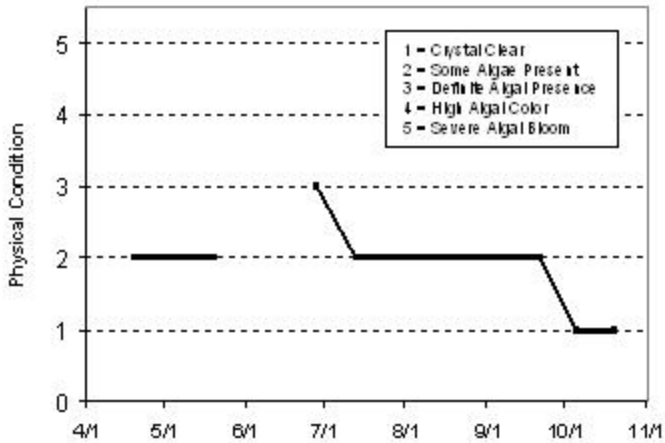






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	14.5	8.7	9.36	0.03	8.5	34.0		2.0	2	3
4/30/04	14	11.3	10.09	0.05	7.8	31.0		2.0	2	2
5/20/04	19.2	13.2	8.95	0.11	6	60.0		2.6	2	2
6/1/04	17	14.6	8.37	0.25	17	62.0		1.8		3
6/16/04	23.1	15	8.14	0.14	8.6	53.0		1.8		3
6/28/04	21.1	14.2	8.1	0.2	4.6	28.0		2.3	3	3
7/13/04	25.4	14.6	9.47	0.19	5.1	23.0		2.9	2	
7/27/04	25.1	16.5	6.56	0.3	3.3	27.0		2.9	2	3
8/10/04	20.6	15.5	5.83	0.3	2.5	33.0		2.3	2	3
8/23/04	21.2	16	8.97	0.05	2.5	26.0		3.4	2	2
9/3/04	23.7	16.8	7.4	0.08	2.6	29.0		2.6	2	
9/21/04	20.1	17	6.93	0.04	7.5	26.0		3.4	2	2
10/5/04	12.6	12.2	8.03	8.2	2.2	23.0		4.4	1	3
10/19/04	7.5	7.5	8.62	7.9	2	20.0		4.6	1	2

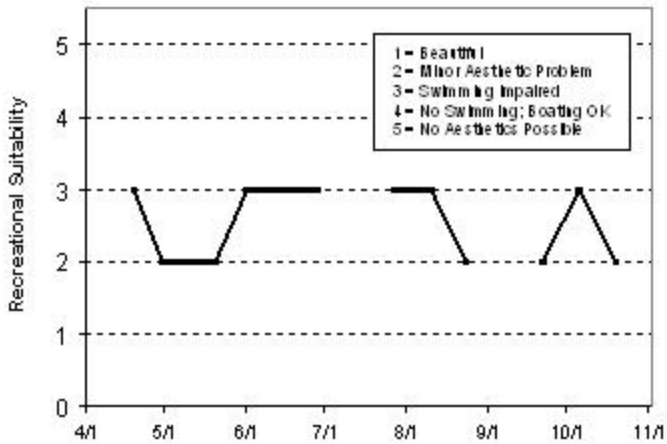


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			D	D	D	C	D	D	C	C	C	C	C
Chlorophyll a			D	C	C	C	D	D	B	B	C	B	A
Secchi Depth			D	D	D	C	D	D	B	B	D	C	B
Overall			D	D	D	C	D	D	B	B	C	C	B

Source: Metropolitan Council and STORET data



Mergen's Lake (82-0482) *Valley Branch Watershed District*

Mergen's Lake is a 20-acre land-locked lake located within West Lakeland Township (Washington County). The maximum depth of the lake is 1.3 m (roughly 4 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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). The lake's surface area and watershed size (424 acres) translates to a 12:1 watershed-to-lake size ratio. Generally the larger the ratio, the greater the potential stress on the lake from surface runoff.

This was the third year that Mergen's Lake has been involved in CAMP. On each of the sampling days the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Unfortunately, the lake was only monitored two times in 2004 (once in May, and once in June). For this reason, the determination of a 2004 summer means and resulting grades would not provide a true picture of the lake's water quality in 2004. The lake's 2004 raw data and resulting graphs are presented on the associated lake information page.

The lake's early-summer monitoring results in 2004 were however, in line to those recorded over the past few years.

Because of the limited nature of the Mergen's Lake watrer quality database, it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

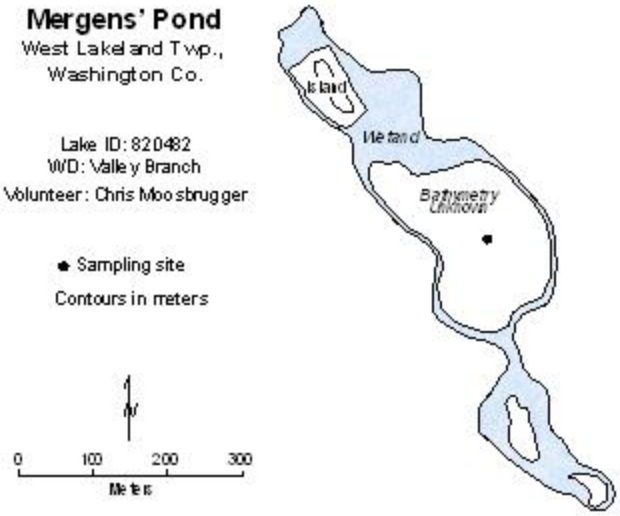
Mergens' Pond

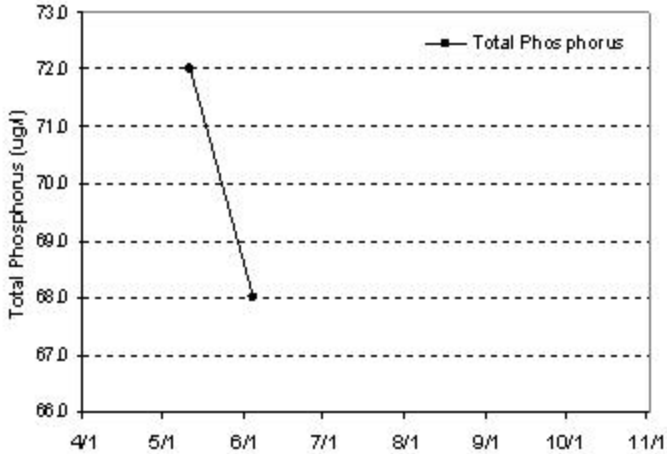
West Lakeland Twp.,
Washington Co.

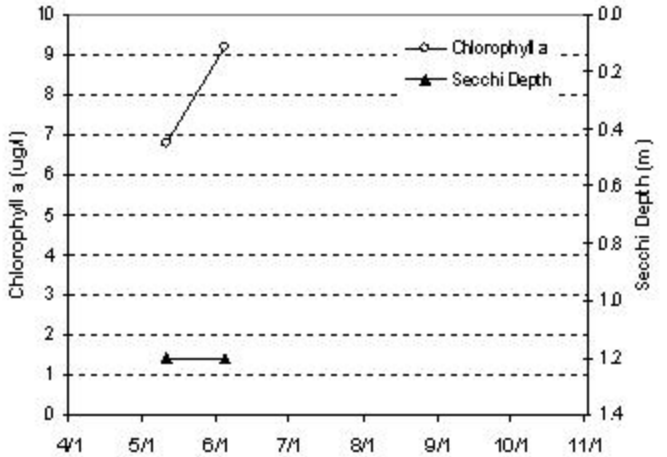
Lake ID: 820482
WD: Valley Branch
Volunteer: Chris Moosbrugger

● Sampling site

Contours in meters

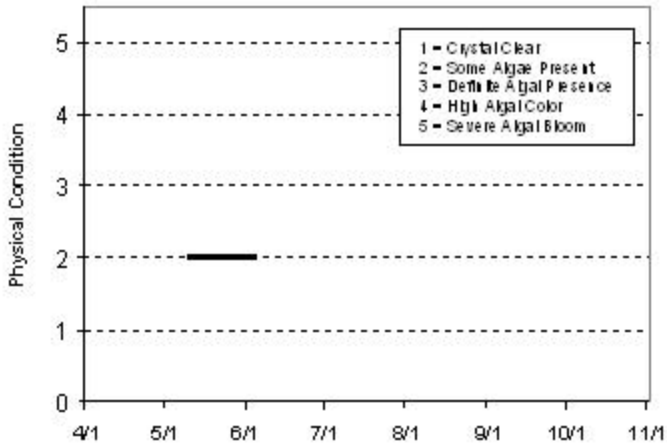






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/11/04	22				6.8	72.0		1.2	2	1
6/4/04	25.5				9.2	68.0		1.2	2	2

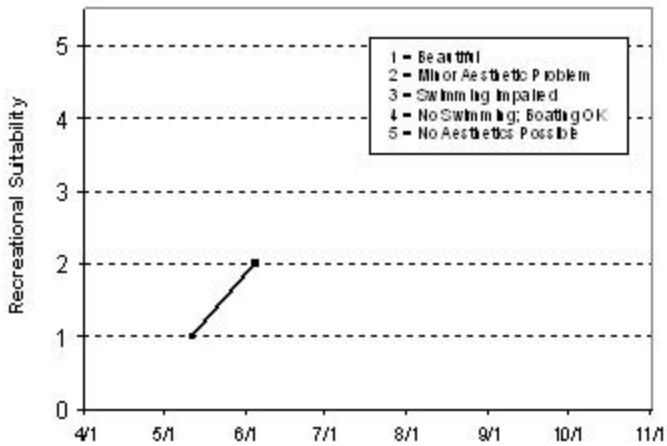


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									D			NA	NA
Chlorophyll a									C			NA	NA
Secchi Depth									D			NA	NA
Overall									D			NA	NA

Source: Metropolitan Council and STORET data



Miller Lake (10-0029) *Carver County Environmental Services*

Miller Lake, a 145-acre lake located within Dahlgren Township (Carver County) is considered a Metropolitan Area "Priority Lake" because of its multi-recreational uses. The mean and maximum depths of the lake are 3.1 m (10 feet) and 4.3 m (roughly 14 feet), respectively. The lake's mean depth and surface area translate to an approximate lake volume of 1,479 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake has a 16,701-acre immediate watershed, which translates to a watershed-to-lake area ratio of 115:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff). A 1999 water quality report on water resources in Carver County estimates land use for the watershed at: four percent residential, 71 percent agricultural, two percent commercial/industrial, and 23 percent open/undeveloped (Carver County Planning 1999).

This was the ninth year that Miller Lake has been involved in CAMP. A search through the STORET nationwide water quality database revealed a limited water quality database with water quality data available for 1995-1997, and 1999-2003.

The lake was monitored 14 times between mid-April and mid-October, 2004. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	191.2	144.0	268.0	F
CLA (µg/l)	49.0	3.70	96.0	D
Secchi (m)	0.66	0.35	1.60	F
TKN (mg/l)	1.86	1.30	2.50	
			Overall Grade	F

The lake's 2004 overall grade is identical to those recorded in 1995-1996 and 2003, and worse than the D's recorded in 1997, and 1999-2002.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, it seems that the lake is well represented by an overall D/F grade. Also, the lake's CLA grade had steadly improved from F's in 1995-1996, D's in 1997 and 1999, to C'sin 2000-2002 before falling back to a D in 2003-2004.

Throughout the monitoring period, the volunteer(s) ranked the perceived physical condition of the lake on a 1-to-5 scale. The mean perceived physical condition of Miller Lake was 3.1 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability was 3.3 (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

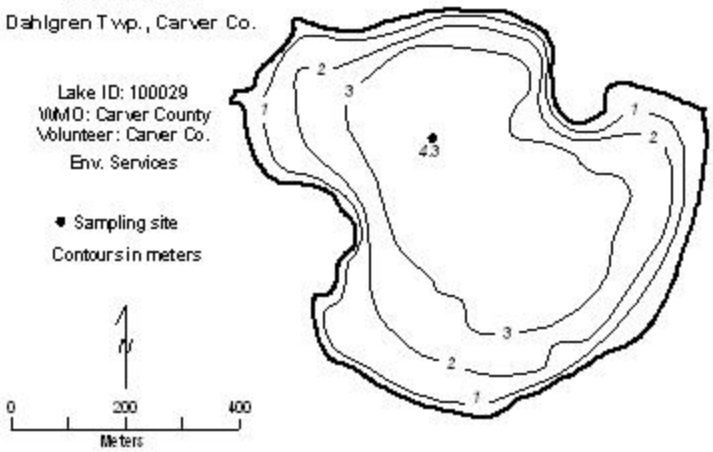
Miller Lake

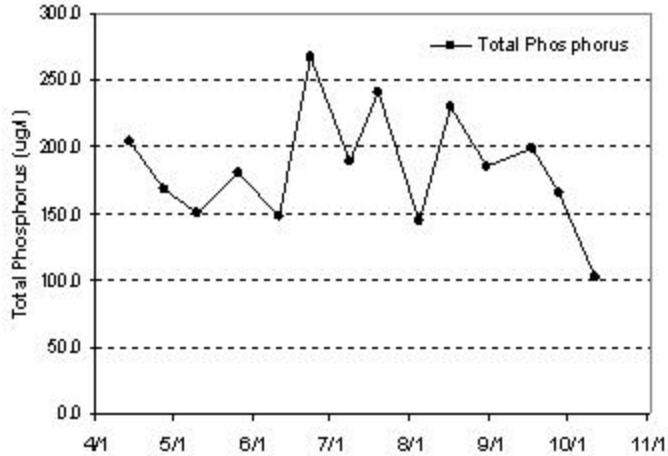
Dahlgren Twp., Carver Co.

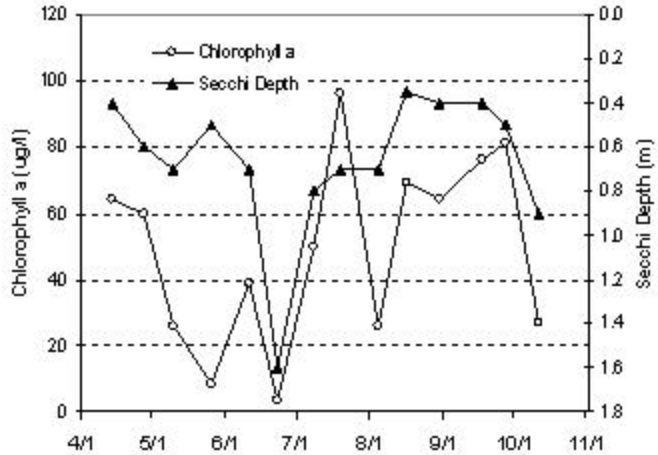
Lake ID: 100029
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling site

Contours in meters

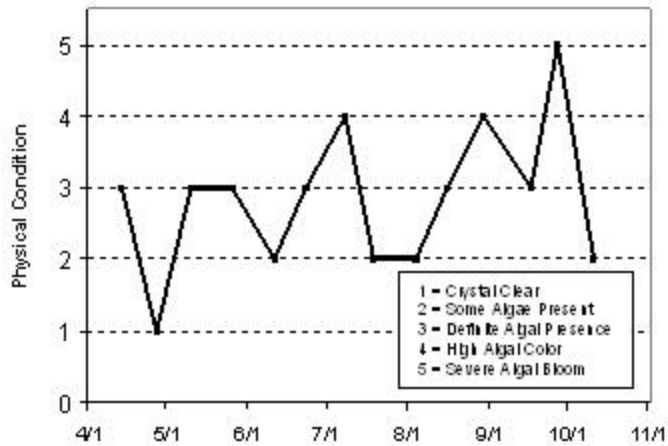






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	10.6		8.8		64	204.0		0.4	3	2
4/27/04	11.5		9.1		60	168.0		0.6	1	
5/10/04	16.9		9.4		26	151.0		0.7	3	3
5/26/04	14.2		8.7		8.3	181.0		0.5	3	5
6/11/04	18.3		8.3		39	148.0		0.7	2	2
6/23/04	20.8		4.34		3.7	268.0		1.6	3	2
7/8/04	21.3		9.7		50	189.0		0.8	4	4
7/19/04	26.7		16.5		96	241.0		0.7	2	3
8/4/04	23.3		6.2		26	144.0		0.7	2	2
8/16/04	21.6		13.7		69	230.0		0.4	3	4
8/30/04	21.2		9.2		64	186.0		0.4	4	3
9/17/04	19.3		8.9		76	199.0		0.4	3	3
9/27/04	18.8		13		81	166.0		0.5	5	5
10/11/04	15.4		12.5		27	102.0		0.9	2	2

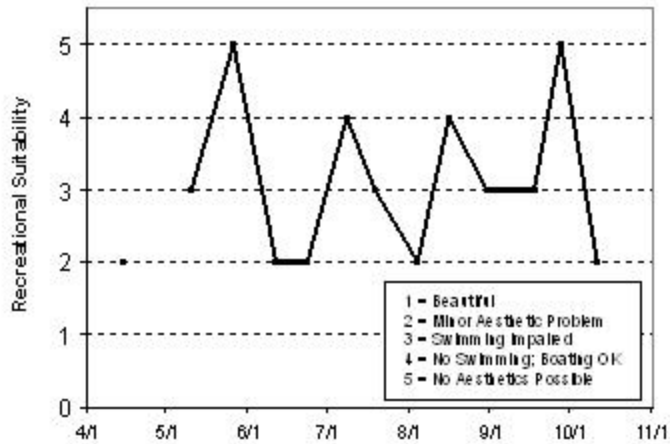


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				F	F	F		F	F	F	F	F	F
Chlorophyll a				F	F	D		D	C	C	C	D	D
Secchi Depth				F	F	D		D	D	C	C	F	F
Overall				F	F	D		D	D	D	D	F	F

Source: Metropolitan Council and STORET data



Mitchell Lake (27-0070) *City of Eden Prairie*

While Mitchell Lake has previously been monitored by Council staff, 2004 marks the first year the lake has been monitored through CAMP. Mitchell Lake, with a surface area of 112 acres, is located with the City of Eden Prairie (Hennepin County). The maximum and depths of the lake are 5.8 (19 feet), respectively. Because of the shallowness of the lake, roughly 97 percent of the lake's surface area is considered littoral zone (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).

Because of its multi-recreational uses, the lake is considered a "Priority Lake" in the Metropolitan Area. The lake has a public access and fishing pier on its southern end. One problem that may possibly hinder future recreational activity on the lake, however, is Eurasian Water Milfoil (*Myriophyllum spicatum*), which has been reported in the lake.

In 2004, Mitchell Lake was monitored 14 times between early-May and early-October. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	65.5	27.0	119.0	C
CLA (µg/l)	32.6	2.5	110.0	C
Secchi (m)	1.6	0.4	3.5	C
TKN (mg/l)	1.33	0.76	2.00	
			Overall Grade	C

The lake's 2004 overall grade of C is identical to those recorded in 1991 and 1995, and better than the D's recorded in 1999-2000 and 2003.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of C/D+. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

The average user perception rankings, on a 1-to-5 scale, were 1.8 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 1.3 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

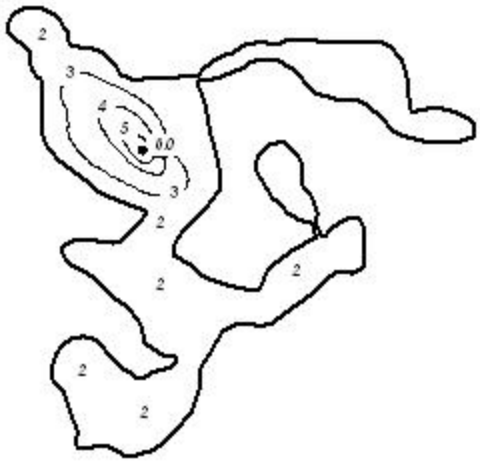
Lake Mitchell

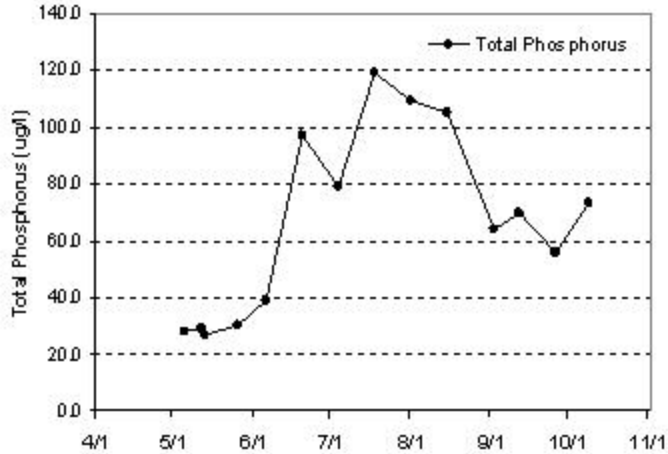
Eden Prairie, Hennepin Co.

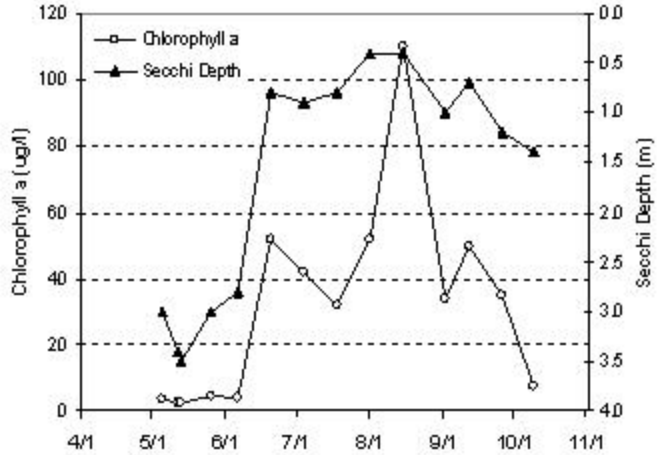
Lake ID: 270070
WD: Riley-Purgatory-Bluff Creek
Volunteer: Gordon Warner

● Sampling site

Contours in meters

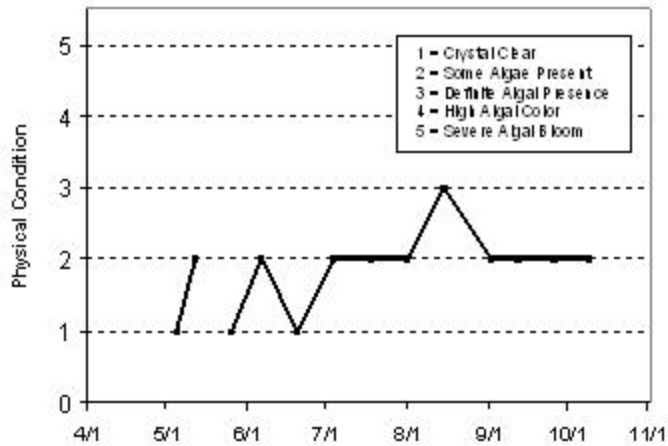






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/5/04	14.3				3.5	28.0		3.0	1	1
5/12/04	18.8				2.7	29.0		3.4	2	2
5/13/04	17				2.5	27.0		3.5		
5/26/04	15				4.6	30.0		3.0	1	1
6/6/04	14.6				3.9	39.0		2.8	2	1
6/20/04					52	97.0		0.8	1	1
7/4/04					42	79.0		0.9	2	1
7/18/04	26.9				32	119.0		0.8	2	2
8/1/04	27.2				52	109.0		0.4	2	2
8/15/04	21.8				110	105.0		0.4	3	2
9/2/04	24.3				34	64.0		1.0	2	1
9/12/04	22.5				50	70.0		0.7	2	1
9/26/04	20				35	56.0		1.2	2	1
10/9/04	16.6				7.4	73.0		1.4	2	1

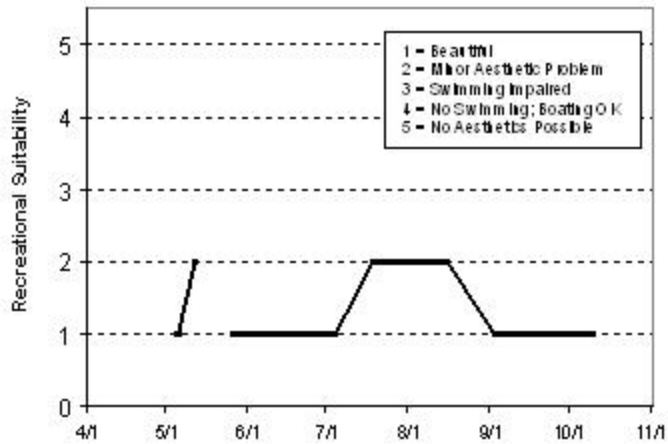


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												D
Chlorophyll a												C
Secchi Depth												C
Overall												C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				C				D	D			D	C
Chlorophyll a				C				D	D			D	C
Secchi Depth				C				D	C			C	C
Overall				C				D	D			D	C

Source: Metropolitan Council and STORET data



Mud Lake (82-0026) *Carnelian - Marine Watershed District*

Mud Lake is a 62-acre lake located within May Township (Washington County). The maximum and mean depths of the lake are 2.1 m (roughly seven feet) and 1.1 m (three-and-a-half feet), respectively. The lake's size and mean depth results in an approximate lake volume of 224 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's small 93-acre immediate watershed translates to a small watershed-to-lake size ratio of 2:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the fifth year that Mud Lake has been involved in CAMP (2000-2003 being the others). A search through the STORET nationwide water quality database for historical data on Mud Lake provided data for eight years (1995-2003).

The lake's Secchi transparency was monitored seven times from late-April to mid-October 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

Water samples to be analyzed for TP, TKN and chlorophyll were not collected for the lake in 2004. Because Secchi transparcy was the only data collected there are no nutrient of chlorophyll concentration means to compare to previous years. The lake's 2004 summertime (May through September) mean Secchi transparency was 1.2 m (minimum of 0.9 m and a maximum of 1.5 m). This translates to a grade of C for water clarity. The 2004 grade of C is the lake's best-recorded water clarity grade to date.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's water quality seems to be well represented by a overall grade of F. To better understand the lake's water quality and where it may be heading, more data are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.8 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 3.0 for recreational suitability (3- "swimming slightly impaired").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Mud Lake

May Twp., Washington Co.

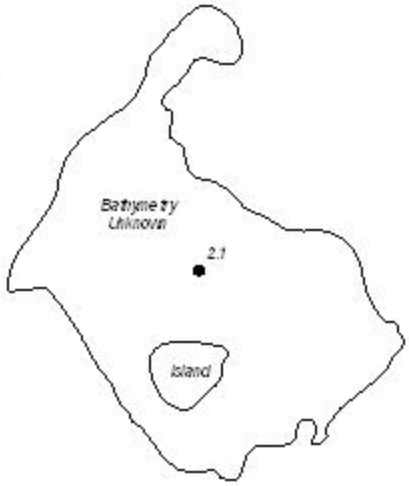
LAKE ID: 82002B

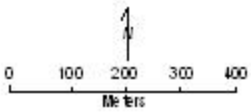
WD: Carnelian-Marine

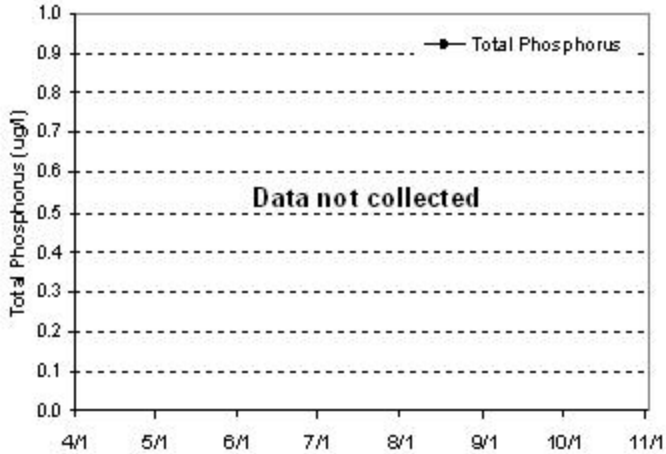
Volunteer: Wash. Co. SWCD

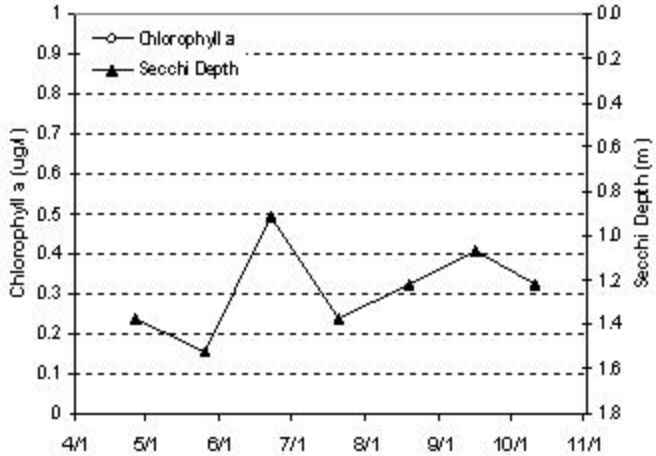
● Sampling site

Contours in meters



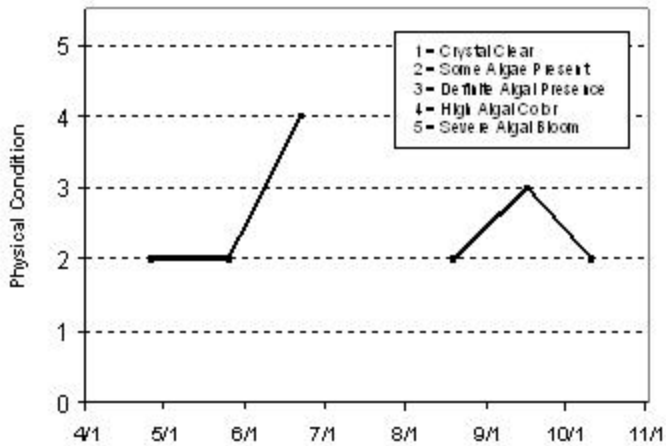






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.7	12	9.93	0.04				1.4	2	
5/25/04	15.3	15.2	10.9	1.42				1.5	2	
6/22/04	20.2	18.6	10.13	0.15				0.9	4	3
7/20/04	27.2	23.2	6.8	0.12				1.4		
8/19/04	18.5	18.5	8.07	0.12				1.2	2	
9/16/04	18	17.2	4.77	2.79				1.1	3	
10/11/04	14.9	14.3	9.45	0.22				1.2	2	3

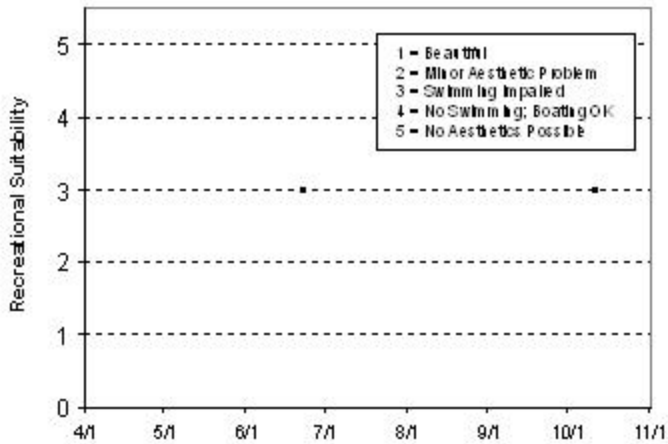


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					D	F	F	F	F	D			
Chlorophyll a					D	D	F	D	F	F			
Secchi Depth				F	F	F	F	F	F	F	D	D	C
Overall					D	F	F	F	F	F			

Source: Metropolitan Council and STORET data



North Twin Lake (82-0018) *Carnelian - Marine Watershed District*

North Twin Lake is a 69-acre lake located in Stillwater Township (Washington County). The maximum and mean depths of the lake are 1.8 m (roughly six feet) and 0.9 m (three feet), respectively. The lake's size and mean depth results in an approximate lake volume of 207 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's 187-acre immediate watershed translates to a small watershed-to-lake size ratio of 3:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the fifth year that North Twin Lake has been involved in CAMP (2000-2003 being the others). A search through the STORET nationwide water quality database for data on the lake provided limited information (1996-2003).

The lake's was monitored seven times from late-April to mid-October 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	21.8	15.0	31.0	A
CLA (µg/l)	3.3	1.3	5.8	A
Secchi (m)	1.2	1.1	1.5	C
TKN (mg/l)	0.73	0.59	0.84	
			Overall Grade	B

The 2004 overall grade was identical to those recorded in 1997, 1999-2001, and 2003, and better than the C's recorded in 1996 and 1998.

This overall grade is skewed however, due to the shallowness of the lake. When examining the lake's mean TP and CLA concentrations, it seems that the lake's Secchi readings were limited by the shallowness rather than algal abundance. So, while the lake only received an overall grade of B, the actual water quality may have been better.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of B. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 1.5 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.0 for recreational suitability (2- "minor aesthetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

North Twin Lake
Stillwater Twp., Washington Co.

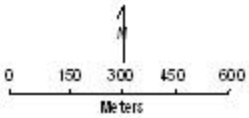
LAKE ID: 820018

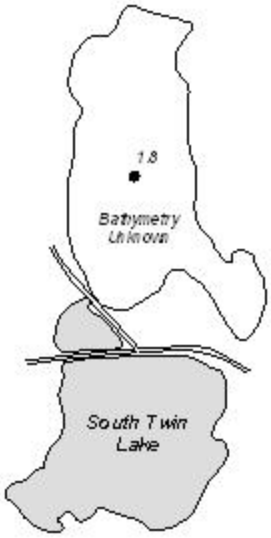
WD: Carnelian- Marine

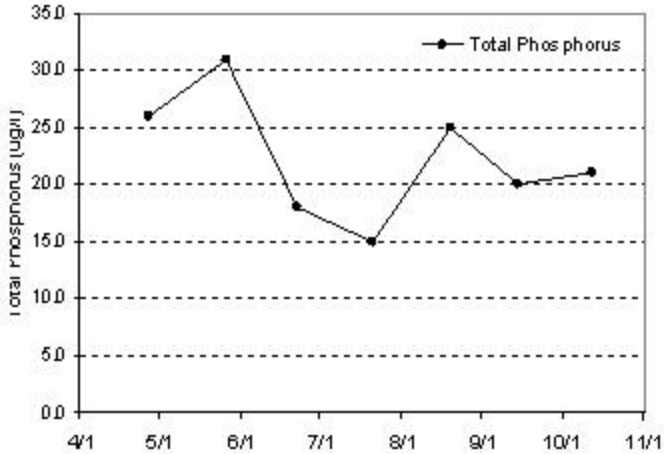
Volunteer: Wash. Co. SWCD

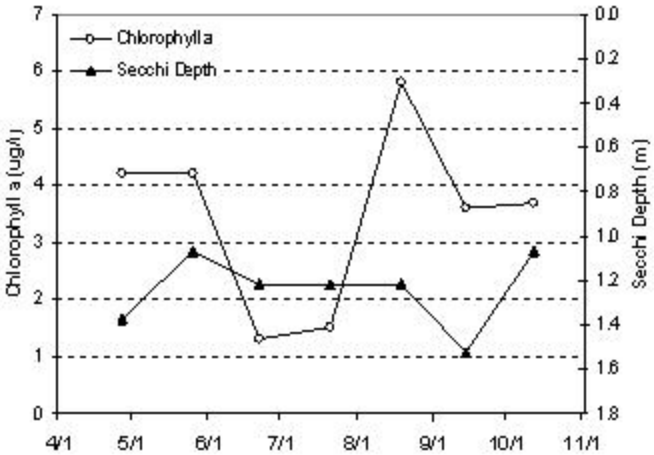
● Sampling site

Contours in meters



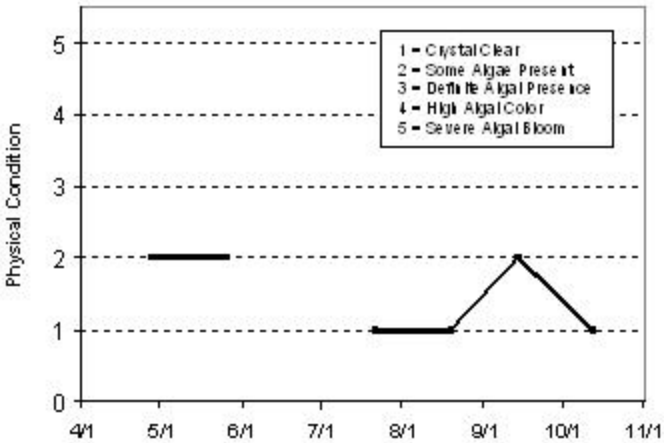






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	10.9	10.8	9.67	6.5	4.2	26.0		1.4	2	2
5/26/04	16.8	15	10.25	6.3	4.2	31.0		1.1	2	2
6/22/04	20.6	19	7.51	0.44	1.3	18.0		1.2		
7/21/04	28.9	24.4	6.78	0.42	1.5	15.0		1.2	1	
8/19/04	18.6	18.6	5.01	2.22	5.8	25.0		1.2	1	
9/14/04	21.2	20.5	3.86	0.56	3.6	20.0		1.5	2	
10/12/04	14.3	14.1	6.35	5.62	3.7	21.0		1.1	1	3

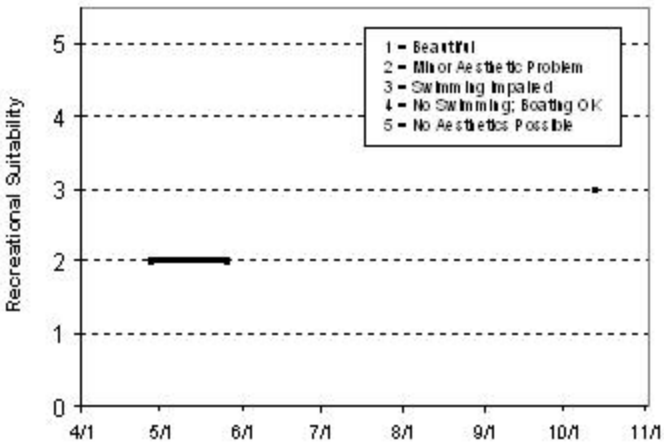


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					C	B	B	A	B	B		B	A
Chlorophylla					D	C	D	B	A	B		A	A
Secchi Depth					B	B	B	B	C	C	C	C	C
Overall					C	B	C	B	B	B		B	B

Source: Metropolitan Council and STORET data



Northwood Lake (27-0627) *Bassett Creek Watershed Management Organization*

Northwood Lake is a 15-acre lake located within the City of New Hope (Hennepin County). The mean and maximum depths of the lake are 0.8 m (roughly 2.5 feet) and 1.5 m (roughly five feet), respectively. The lake's size and mean depth results in an approximate lake volume of 41 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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). The lake's 1,341-acre immediate watershed translates to a small watershed-to-lake size ratio of 89:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the fifth year that Northwood Lake has been involved in CAMP. The lake was also enrolled in the program in 2000-2003. Other than the 2000-2003 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 2000-2004 are the only years of available data.

The lake has been involved in CAMP in 2000-2004 as part of a barley straw project on the lake. In an attempt to inhibit algal populations within the lake, barley straw has been added. Barley straw has been used for algal control in the United Kingdom for many years. The principal behind the use of barley straw to control algae, while not truly known, has been thought to involve the release of a chemical(s) (which inhibit algal growth) as the submerged straw decomposes. Therefore, in order to determine if the straw method successfully reduced algal biomass within Northwood Lake in 2004, TP, TKN, CLA and Secchi transparency were tested 12 times between mid-April and early-October. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	151.0	115.0	214.0	D
CLA (µg/l)	19.4	6.7	50.0	B
Secchi (m)	0.9	0.5	1.3	D
TKN (mg/l)	1.32	0.83	1.80	
			Overall Grade	C

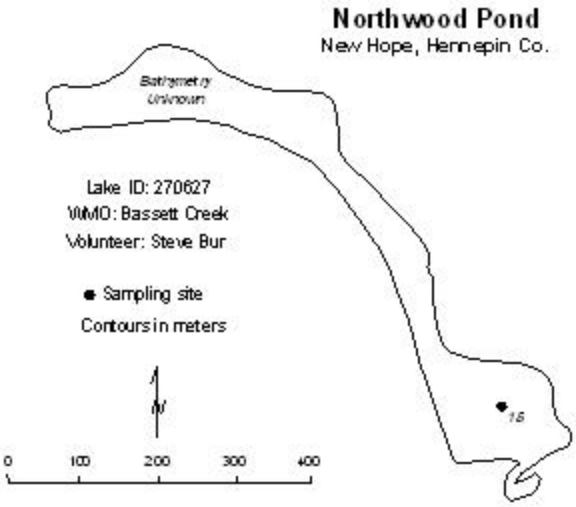
The lake's 2004 overall grade is similar to that recorded in 2002, and better than those of 2000-2001 and 2003 (D).

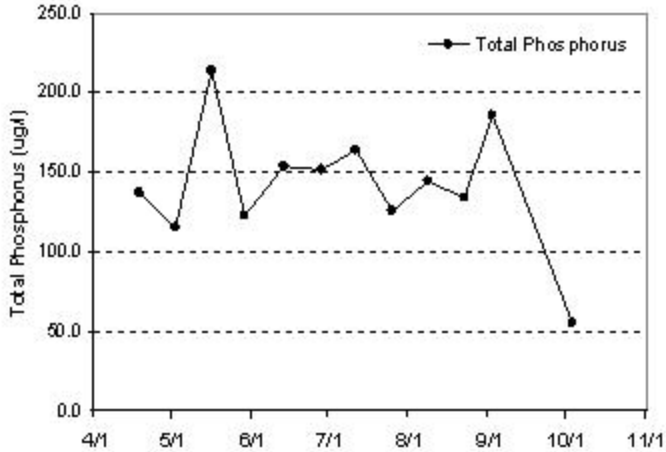
Similar to that record in 2001-2003, the lake's 2004 CLA grade was better than the TP and Secchi grade. This may indicate that the barley straw did indeed somewhat inhibit algal growth over the summer months (continual years of data will provide a better picture of the barley straws influence on the lake's algal population). The reason that the reduced CLA mean did not result in an improved Secchi transparency mean is due the shallowness of the lake. There were many times throughout the summer, that the Secchi disk could be seen on or near the lake's bottom (at the sampling site). Therefore the lake's Secchi mean was actually limited by its shallow depth rather than the amount of algae in the water.

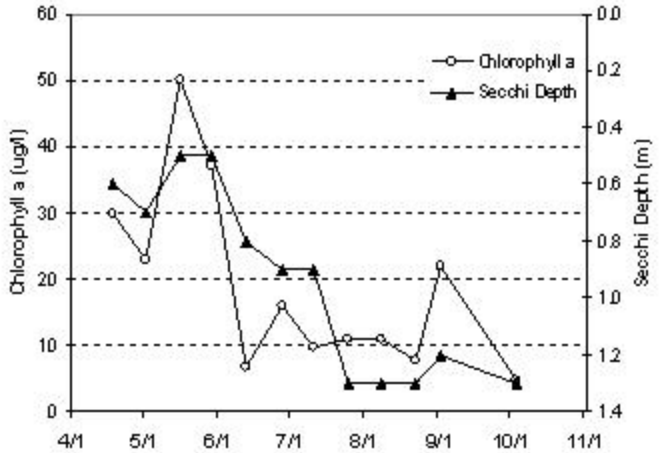
No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of D/C. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.1 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 4.0 for recreational suitability (between 4- "no swimming - boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

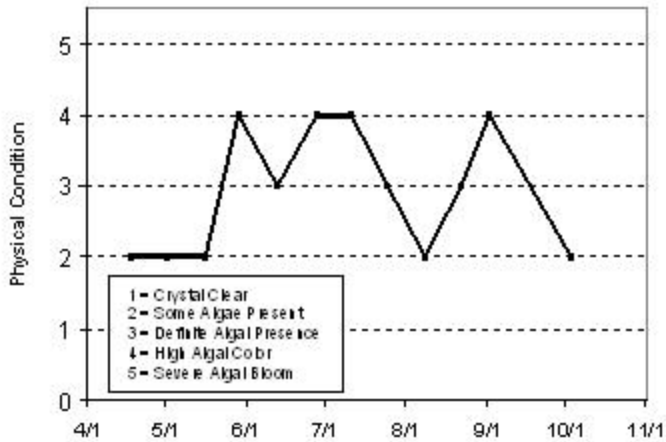






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	15.5				30	137.0		0.6	2	1
5/2/04	13.7				23	115.0		0.7	2	4
5/16/04	17.4				50	214.0		0.5	2	4
5/29/04	16.5				37	122.0		0.5	4	4
6/13/04	21.1				6.7	154.0		0.8	3	4
6/28/04	23.5				16	151.0		0.9	4	4
7/11/04	25.8				9.8	164.0		0.9	4	4
7/25/04	24.5				11	126.0		1.3	3	4
8/8/04	25				11	144.0		1.3	2	4
8/22/04	23.9				7.6	134.0		1.3	3	4
9/2/04	26.2				22	186.0		1.2	4	4
10/3/04	14.4				4.7	55.0		1.3	2	4

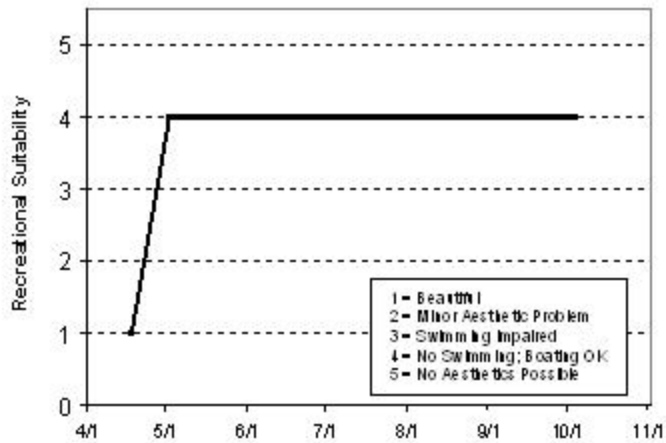


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									F	F	D	F	D
Chlorophyll a									B	C	B	C	B
Secchi Depth									D	D	D	D	D
Overall									D	D	C	D	C

Source: Metropolitan Council and STORET data



Oak Lake (10-0093) *Carver County Environmental Services*

Oak Lake is 339-acre lake located within Watertown Township (Carver County). The maximum depth of the lake is 3.4 m (roughly 11 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (area of aquatic plant dominance) and it does not maintain a therm ocline (a density gradient owed to changing water temperatures throughout the lake's water column).

This was the fourth year in which Oak Lake has been involved in CAMP (2001-2003 being the others). A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2001-2004 are the only complete years of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 14 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	89.8	22.0	189.0	D
CLA (µg/l)	47.8	1.4	150.0	C
Secchi (m)	1.5	0.4	3.0	C
TKN (mg/l)	1.50	0.76	2.70	
			Overall Grade	C

The lake's 2004 overall grade was identical to those of 2001-2002 and better than the D recorded in 2003.

As mentioned earlier, there are no water quality data available for Oak Lake other than 2001-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

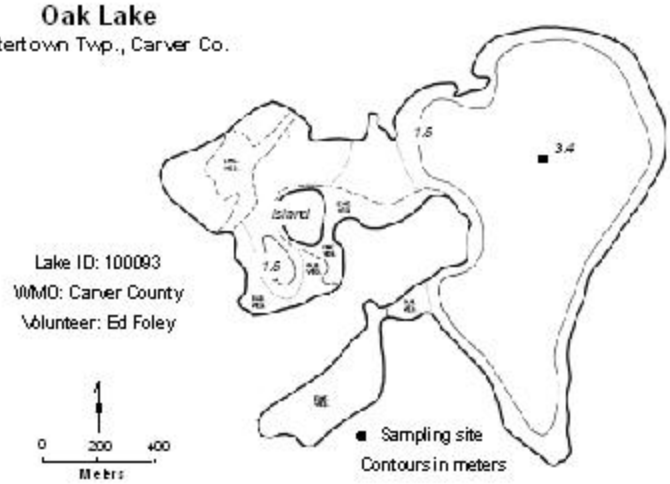
Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 3.2 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 3.2 for recreational suitability (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

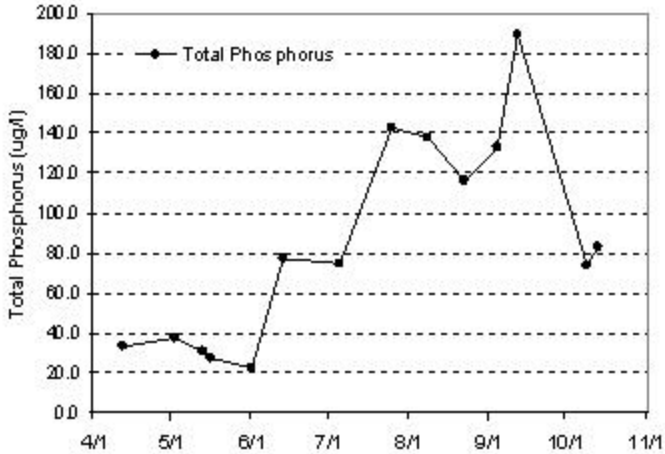
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

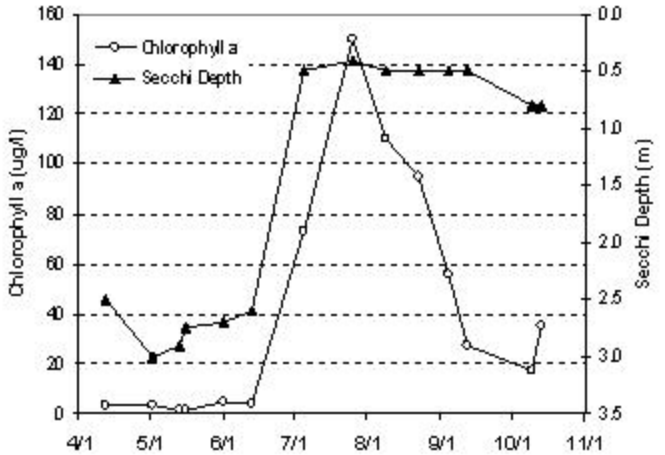
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Oak Lake

Watertown Twp., Carver Co.

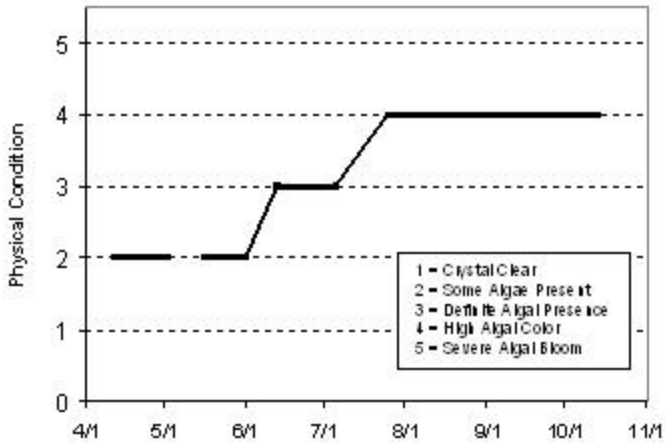






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/12/04	10				3.2	33.0		2.5	2	2
5/2/04	14				3.1	37.0		3.0	2	2
5/13/04	15				1.5	31.0		2.9		
5/16/04	16				1.4	27.0		2.8	2	2
6/1/04	16				4.8	22.0		2.7	2	2
6/13/04	21				3.8	77.0		2.6	3	5
7/5/04	23				7.3	75.0		0.5	3	3
7/25/04	27				150	143.0		0.4	4	4
8/8/04	23				110	138.0		0.5	4	3
8/22/04	23				95	116.0		0.5	4	3
9/4/04	23				56	133.0		0.5	4	4
9/12/04	22				27	189.0		0.5	4	4
10/9/04	15				17	74.0		0.8	4	3
10/13/04	12				35	83.0		0.8	4	3

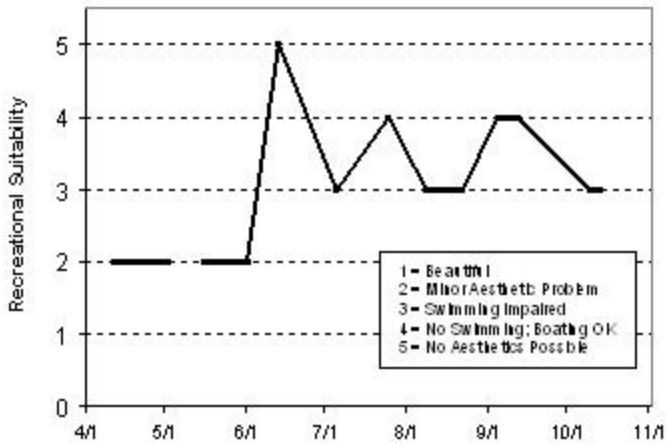


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus										D	D	F	D
Chlorophyll a										C	C	C	C
Secchi Depth										C	C	C	C
Overall										C	C	D	C

Source: Metropolitan Council and STORET data



Olson Lake (82-0103) *Valley Branch Watershed District*

While Olson Lake has previously been monitored by Council staff, 2004 marks only the second year the lake has been monitored through CAMP (1993 being the first). The 79-acre lake with a maximum depth of 4.5 m (14.8 feet), was monitored 14 times from mid-April to mid-October 2004. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

During each monitoring event the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	17.8	7.0	30.0	A
CLA (µg/l)	7.2	2.9	17.0	A
Secchi (m)	3.0	1.6	5.0	A
TKN (mg/l)	0.73	0.40	0.94	
			Overall Grade	A

The physical and recreational conditions of the lake, as perceived by the volunteer monitor, were ranked on a 1-to-5 scale. The rankings are shown on the lake's information sheet on the next page. The mean physical condition ranking was 1.2 (between 1- "crystal clear" and 2- "some algae present)", while the mean recreational suitability ranking was 1.0 (1- "beautiful").

Available data for Olson Lake reveals that lake water quality grades have improved since the 1980's. The lake water quality report card shown on the information sheet indicates that the lake received an overall C grade in 1984, as well as receiving Secchi grades of C in 1984-86, 88, 89, and 90, before receiving overall grades of B in 1991, 1993, and 1995. More recently, the lake has recorded overall grades of A in 2000 and 2003-2004. In fact, a recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

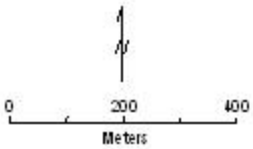
Lake Olson

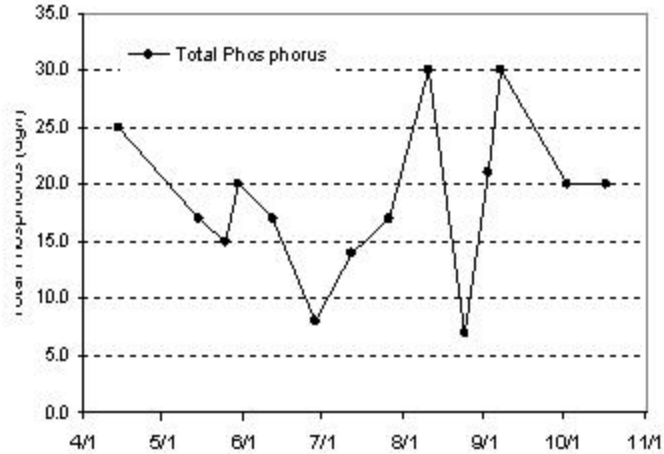
Lake Elmo, Washington Co.

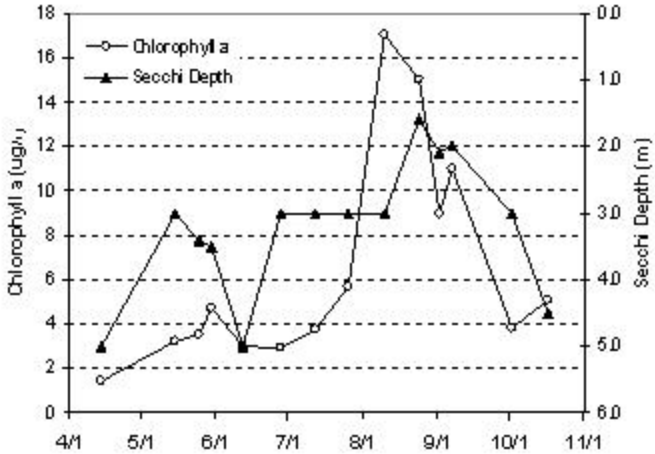
Lake ID : 820103
WD: Valley Branch
Volunteer: Charlie Schultz

● Sampling site

Contours in meters

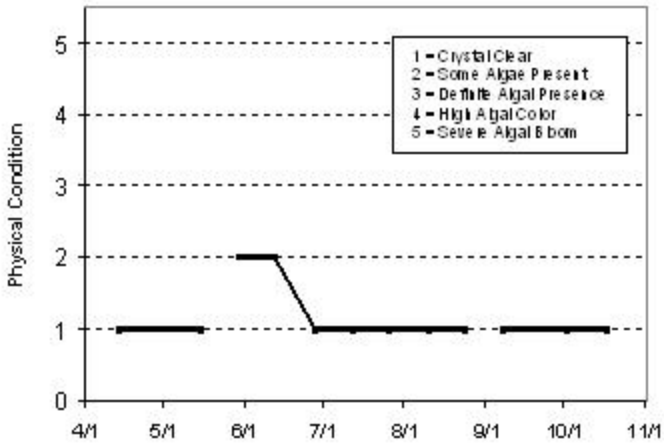






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	11.3				1.4	25.0		5.0	1	1
5/15/04	16				3.2	17.0		3.0	1	1
5/25/04	17				3.5	15.0		3.4		
5/30/04	16.3				4.7	20.0		3.5	2	1
6/12/04	20.1				3	17.0		5.0	2	1
6/28/04	21.6				2.9	8.0		3.0	1	1
7/12/04	25.8				3.7	14.0		3.0	1	1
7/26/04	26.1				5.7	17.0		3.0	1	1
8/10/04	22.6				17	30.0		3.0	1	1
8/24/04	21				15	7.0		1.6	1	1
9/2/04	22				9	21.0		2.1		
9/7/04	22.4				11	30.0		2.0	1	1
10/2/04	16.7				3.8	20.0		3.0	1	1
10/17/04	10.6				5.1	20.0		4.5	1	1

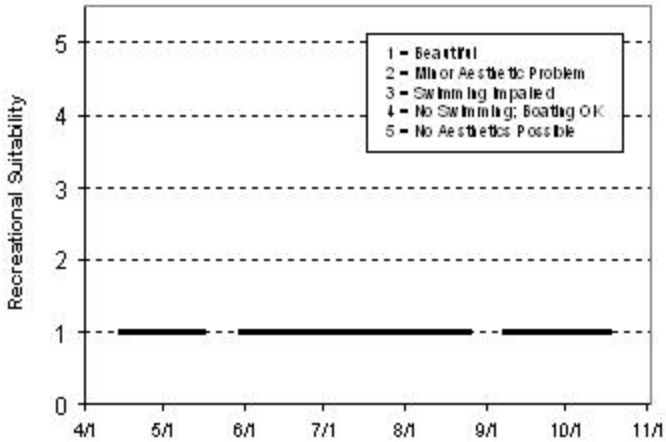


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					C							B
Chlorophyll a					C							B
Secchi Depth					C	C	C		C	C	C	B
Overall					C							B

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		B		C					A			A	A
Chlorophyll a		A		B					A			B	A
Secchi Depth		B		B					A			A	A
Overall		B		B					A			A	A

Source : Metropolitan Council and STORET data



Oneka Lake (82-0140) *Rice Creek Watershed District*

This was the sixth year that Oneka Lake has been involved in CAMP. The 381-acre lake is located in the City of Hugo (Washington County). The lake has a mean and maximum depth of 1.2 m (4 feet) and 2.1 m (7 feet), respectively. The lake's surface area and mean depth translates to an approximate lake volume of 1,524 ac-ft. Because of the shallowness of the lake the entire area is considered littoral zone (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). A canoe access is located on the lake's southern shore.

A search through the STORET nationwide water quality database revealed that data were collected on the lake in 1981-1983, 1985, 1987, 1990-1992 (the majority of the years only had one or two sampling events however) and 1999-2003. Because of the lack of monitoring frequency resulting in a limited database, no short- or long-term trends can be determined. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Oneka Lake was monitored five times between early-May and early-September, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	17.6	14.0	21.0	A
CLA (µg/l)	6.1	2.4	12.0	A
Secchi (m)	1.5	1.5	1.5	C
TKN (mg/l)	0.62	0.36	0.79	
			Overall Grade	B

The 2004 overall grade may well be skewed however, due to the shallowness of the lake. When examining the lake's mean TP and CLA concentrations, it seems that the lake's Secchi readings were limited by the shallowness rather than algal abundance. So, while the lake only received an overall grade of B, the actual water quality may have been better.

The 2004 individual and overall grades are identical to those recorded in 1999 and 2003. In fact, overall grade of B was also recorded in 1981, 1985, 1987, 1992, 1999-2000, and 2003. The lake recently had received overall grades of C in 2001 and 2002.

The physical and recreational conditions of Oneka Lake as perceived by the volunteer(s) were ranked on a 1-to-5 scale. These rankings are also graphed on the lake's information sheet. The average user perception rankings, on a 1-to-5 scale, were 1.0 for physical condition (1- "crystal clear"), and 1.3 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problems").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

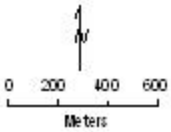
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

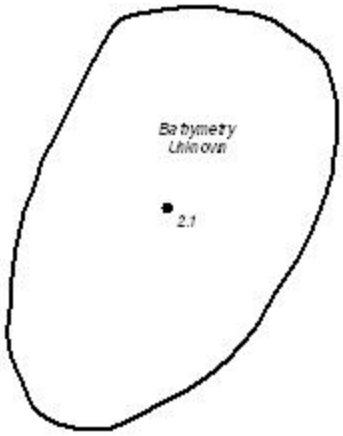
Oneka Lake

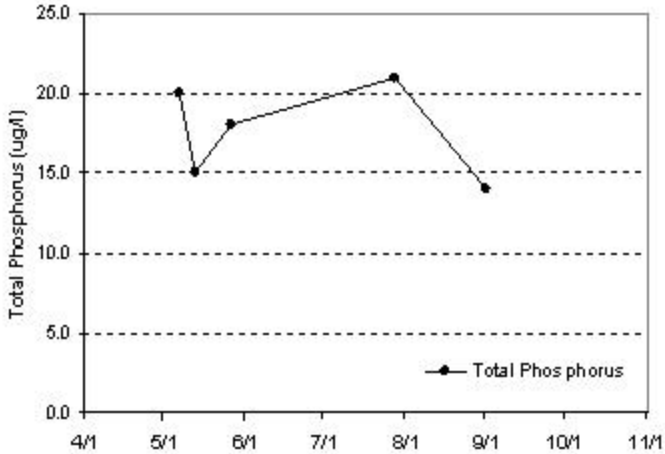
Hugo, Washington Co.

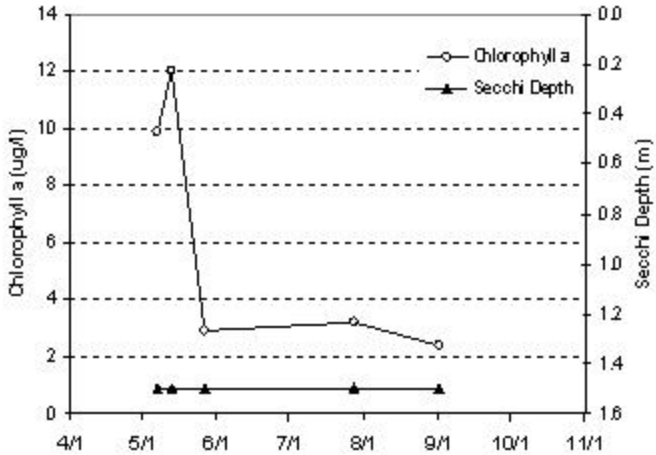
Lake ID: 820140
WD: Rice Creek
Volunteer: Rice Creek WD

● Sampling site
Contours in meters



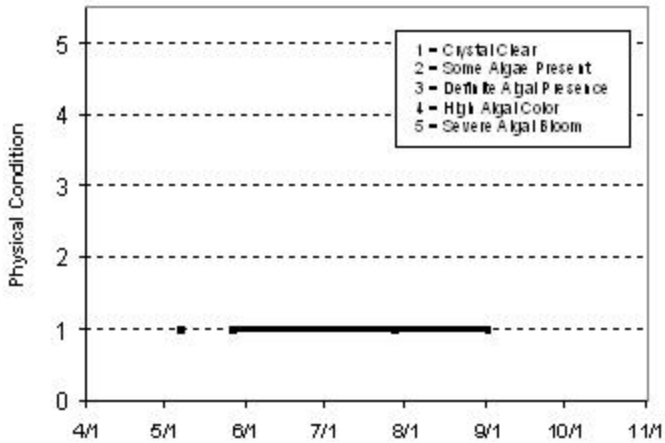






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/7/04	14.2		11		9.9	20.0		1.5	1	1
5/13/04	15				12	15.0		1.5		
5/27/04	15.8		9.1		2.9	18.0		1.5	1	1
7/28/04	25				3.2	21.0		1.5	1	2
9/1/04	22.8				2.4	14.0		1.5	1	1

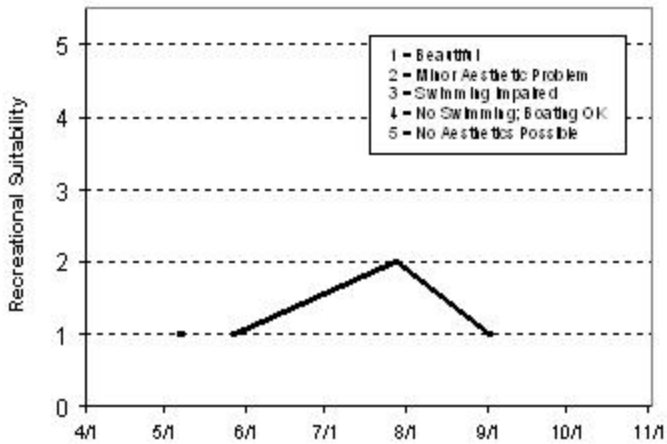


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus		C	D	D		C		B			D	D
Chlorophyll a		A	A	A		A		A			B	B
Secchi Depth		C		C		C		C			C	C
Overall		B		C		B		B			C	C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus	C							A	B	C	C	A	A
Chlorophyll a	A							A	A	B	B	A	A
Secchi Depth	C							C	C	C	C	C	C
Overall	B							B	B	C	C	B	B

Source: Metropolitan Council and STORET data



Orchard Lake (19-0031) *City of Lakeville*

Orchard Lake, managed by the MDNR as a centrachid lake (bass and panfish), is lake located within the City of Lakeville (Dakota County). The 250-acre lake has a 2,012-acre watershed, which translates to a 8:1 watershed-to-lake size ratio (generally the larger the ratio, the greater the potential stress on the lake from surface runoff). The maximum and mean depths of the lake are 10.0 m (roughly 33 feet) and 3.0 m (10 feet), respectively. The lake's surface area and mean depth translate to an approximate volume of 2,500 acre-feet. Approximately 75 percent of the lake's surface area are considered littoral zone (area of aquatic plant dominance). A public access is located within the City Park on the lake's southeastern end, and because of its multi-recreational uses, it is considered a "Priority Lake" in the Metropolitan Area.

This was the fifth year that Orchard Lake has been involved in CAMP (also invovled in 1999-2001 and 2003). Council staff has also monitored the lake in the past. A search through the STORET nationwide water quality database for data on the lake resulted in nutrient and Secchi transparency information for 1980-1981, 1983, 1989, 1993, 1998-2001, and 2003, as well as just Secchi data for 1987-1988.

As part of the city's involvement in CAMP in 2004, the lake was monitored 14 times between mid-April and mid-October. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	37.6	19.0	66.0	C
CLA (µg/l)	16.8	1.2	46.0	B
Secchi (m)	2.6	1.0	6.8	B
TKN (mg/l)	0.82	0.55	1.10	
			Overall Grade	B

The lake's 2004 overall grade was similar to those recorded in 1981, 1983, 1989 and 2001, and better than the C's recorded in 1980, 1993, 1998-2000. The lake's water quality seems to be well represented by an overall grade of high-C/low-B.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 1.7 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 1.3 (between 1- "beautiful" and 2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

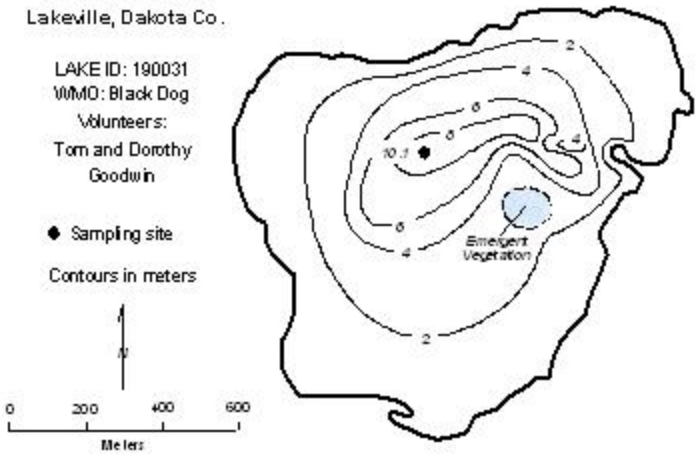
Orchard Lake

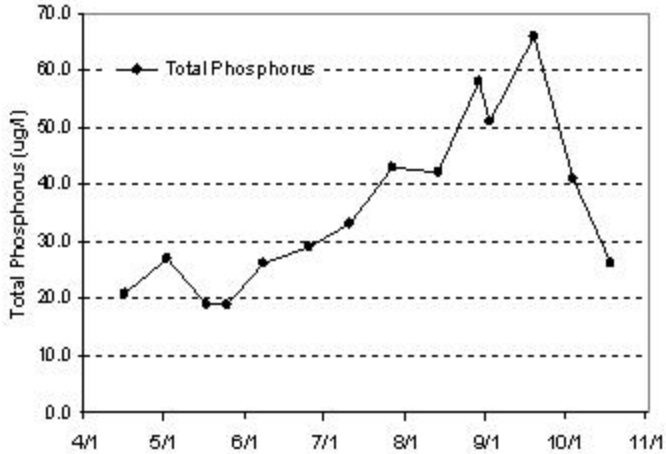
Lakeville, Dakota Co.

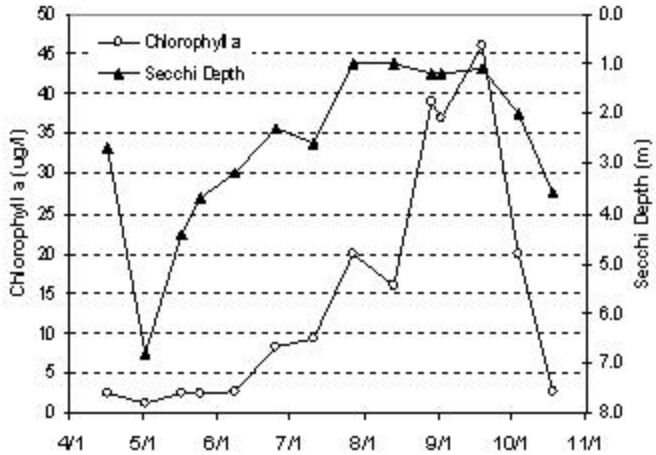
LAKE ID: 190031
WMO: Black Dog
Volunteers:
Tom and Dorothy Goodwin

● Sampling site

Contours in meters

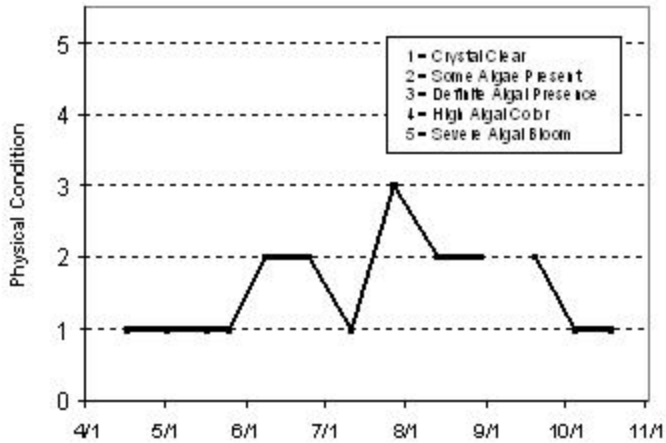






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/16/04	10.1				2.5	21.0		2.7	1	1
5/2/04	12				1.2	27.0		6.8	1	1
5/17/04	15				2.5	19.0		4.4	1	1
5/25/04	13				2.4	19.0		3.7	1	1
6/8/04	21				2.6	26.0		3.2	2	1
6/25/04	19				8.3	29.0		2.3	2	1
7/11/04	23				9.4	33.0		2.6	1	1
7/27/04	25				20	43.0		1.0	3	2
8/13/04	19				16	42.0		1.0	2	2
8/29/04	19.5				39	58.0		1.2	2	2
9/2/04	20				37	51.0		1.2		
9/19/04	19				46	66.0		1.1	2	2
10/4/04	12.3				20	41.0		2.0	1	1
10/18/04	8				2.7	26.0		3.6	1	1

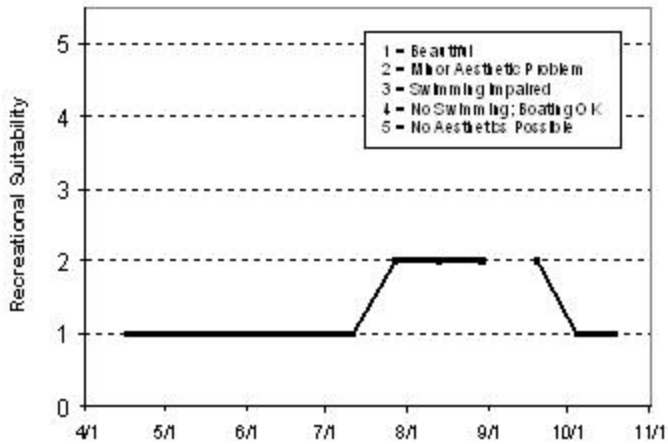


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C	B		B						B		
Chlorophyll a	B	B		B						B		
Secchi Depth	C	B		B				C	C	C	D	C
Overall	C	B		B						B		

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C					C	C	C	B		C	C
Chlorophyll a		B					C	C	C	B		C	B
Secchi Depth		C					C	C	C	B		C	B
Overall		C					C	C	C	B		C	B

Source: Metropolitan Council and STORET data



Pamela Lake (27-0028) *Conservation League of Edina*

Pamela Lake is a 18-acre shallow lake (maximum depth of a 1.5 m [roughly 5 feet], located within Edina (Hennepin County). Because of the shallowness of the lake, the entire area is considered littoral zone (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).

Two thousand and four marks the first year in which Pamela Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2004 is the only complete, year of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 10 times between early-May and late-September, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	84.5	49.0	163.0	D
CLA (µg/l)	11.7	3.0	41.0	B
Secchi (m)	1.2	0.9	1.6	C
TKN (mg/l)	0.85	0.42	1.50	
			Overall Grade	C

As mentioned earlier, there are no water quality data available for Pamela Lake other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 2.4 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 3.5 for recreational suitability (between 3- "swimming slightly impaired and 4- "no swimming – boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

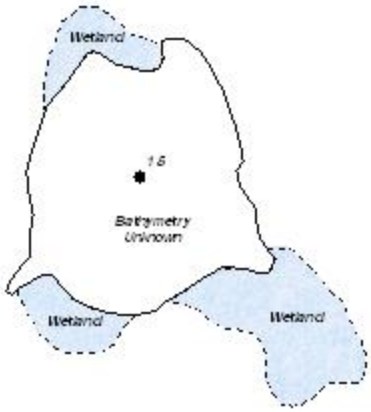
Pamela Lake

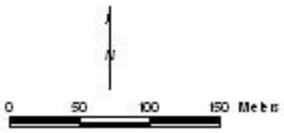
Edina, Hennepin Co.

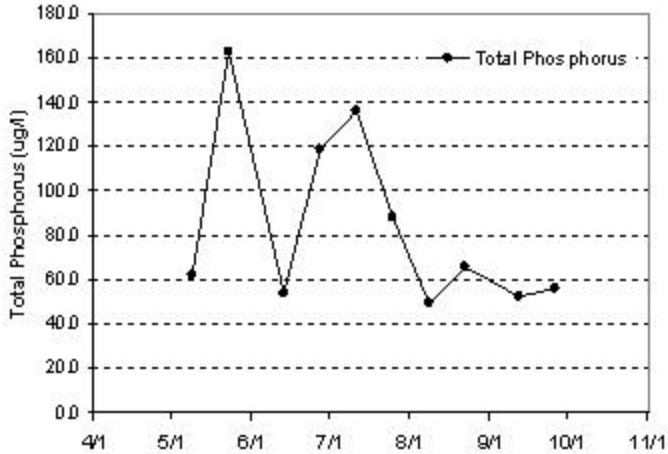
LAKE ID: 270675
WD: Minnehaha Creek
Volunteer: Conservation League of Edina

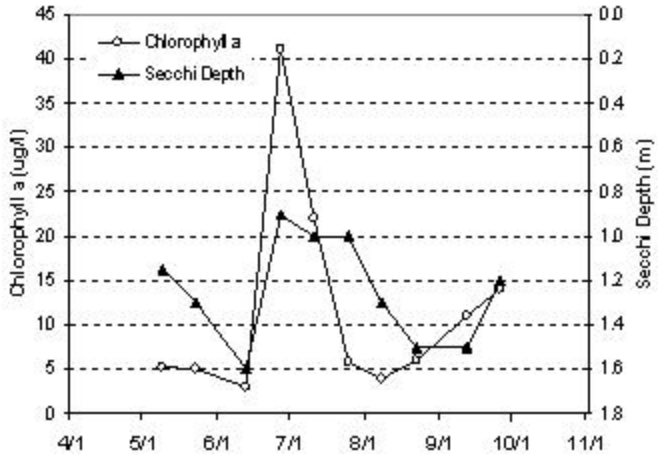
● Sampling site

Contours in meters



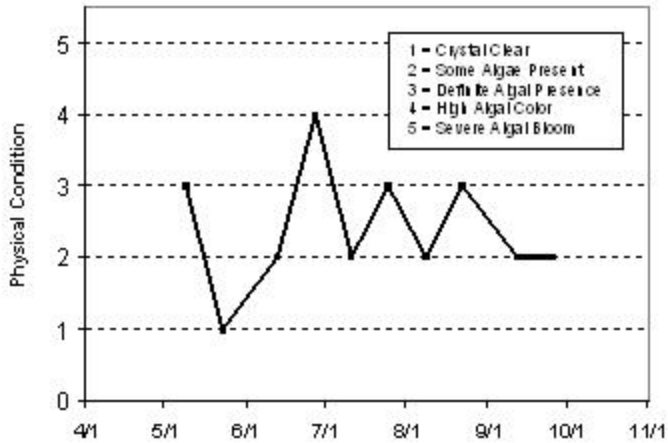






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/9/04	21.7				5.3	62.0		1.2	3	4
5/23/04	14.6				5	163.0		1.3	1	1
6/13/04	27				3	54.0		1.6	2	2
6/27/04	20.7				41	119.0		0.9	4	4
7/11/04	27.4				22	136.0		1.0	2	3
7/25/04	29				5.7	88.0		1.0	3	4
8/8/04	27				4	49.0		1.3	2	5
8/22/04	25.7				6	66.0		1.5	3	4
9/12/04	24.2				11	52.0		1.5	2	4
9/26/04	21.6				14	56.0		1.2	2	4

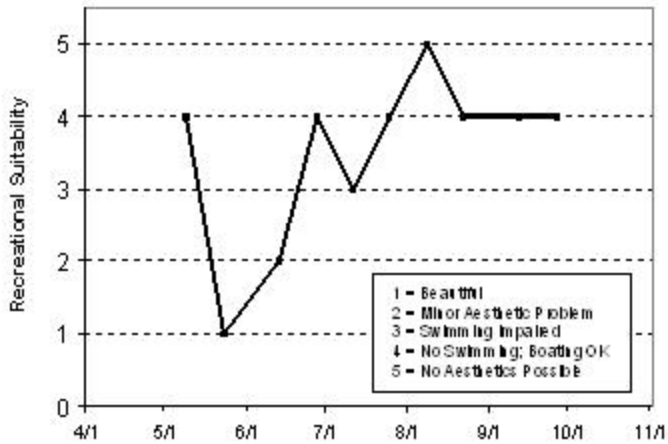


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													D
Chlorophyll a													B
Secchi Depth													C
Overall													C

Source: Metropolitan Council and STORET data



Parkers Lake (27-0107) *Bassett Creek Watershed Management Organization*

This was the fourth year that Parkers Lake has been involved in CAMP (it was first enrolled in 2000). The 97-acre lake, located within the City of Plymouth (Hennepin County), has a public access located within a city park on the lake's north end. One problem that may possibly hinder future recreational activity on the lake, however, is Eurasian Water Milfoil (*Myriophyllum spicatum*), which has been reported in the lake.

The mean and maximum depths of the lake are 3.7 m (roughly 12 feet) and 11.3 m (roughly 37 feet), respectively. The lake's size and mean depth result in an approximate lake volume of 1,164 ac-ft. Approximately 70 percent of the lake's surface area is considered littoral zone (area of aquatic plant dominance). The lake's 950-acre immediate watershed translates to a moderate watershed-to-lake size ratio of 10:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

The lake was monitored 15 times from late-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	26.8	17.0	40.0	B
CLA (µg/l)	8.4	1.0	20.0	A
Secchi (m)	2.1	1.2	3.5	C
TKN (mg/l)	0.63	0.39	0.91	
			Overall Grade	B

While the lake's 2004 overall grade (identical to that recorded in 2003) is better than the C's recorded in 1980, 1995, and 1999, it is worse than the recent A'a recorded in 2000 and 2002,

A search through the STORET nationwide water quality database for data on the lake resulted in nutrient and Secchi transparency information for 1980, 1990, 1995, and 1999. The 2000 and 2002-2004 water quality years represent the lake's best-monitored water quality. The lake's water quality shows a markable improvement in water quality from 2000 to 2002, before slipping a little in 2003 and 2004. In fact, a recent MPCA conducted trend analysis on the lake's Secchi transparency data, revealed a statistically significant improvement in recent water clarity (MPCA 2002). To better understand the lake's water quality and where it truely may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.9 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 2.7 for recreational suitability (between 2- "minor aesthetic problem" and 3- swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Parkers Lake

Plymouth, Hennepin Co.

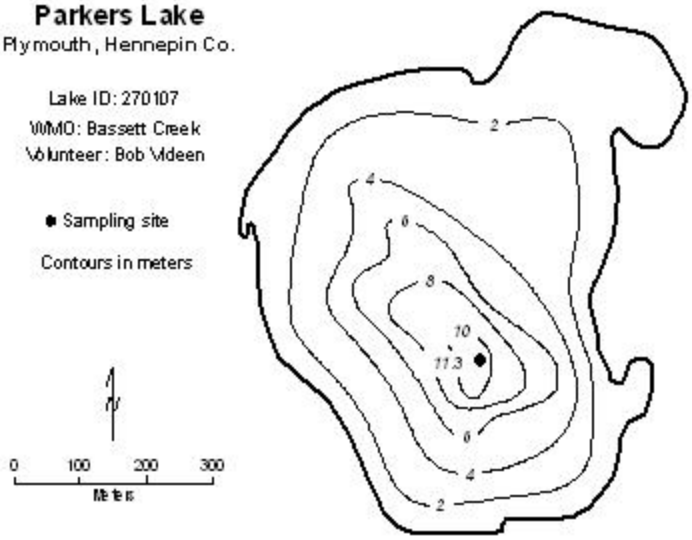
Lake ID: 270107

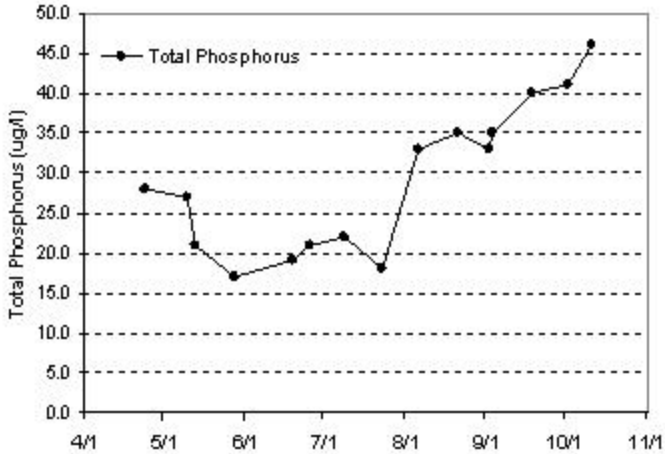
WMO: Bassett Creek

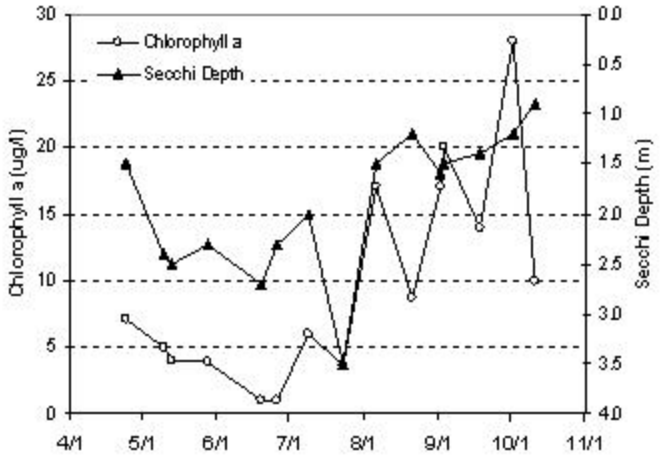
Volunteer: Bob Videen

● Sampling site

Contours in meters

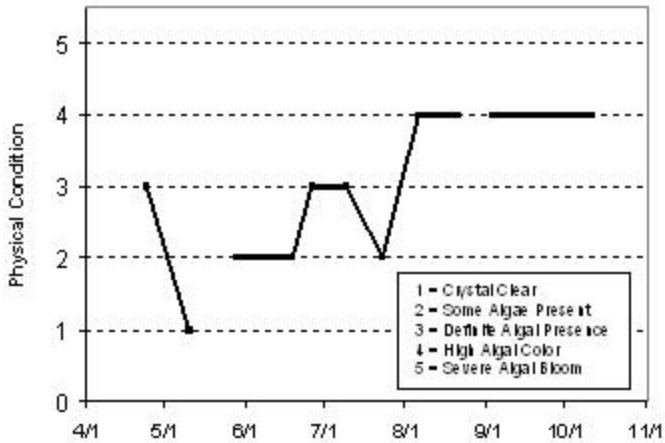






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/24/04	13.3				7.1	28.0		1.5	3	4
5/10/04	15.5				5	27.0		2.4	1	2
5/13/04	17				4	21.0		2.5		
5/28/04	17.8				3.9	17.0		2.3	2	2
6/19/04	21.5				1	19.0		2.7	2	2
6/26/04	21				1	21.0		2.3	3	2
7/9/04	23				6	22.0		2.0	3	3
7/23/04	26.5				3.6	18.0		3.5	2	1
8/6/04	24.5				17	33.0		1.5	4	3
8/21/04	20.5				8.7	35.0		1.2	4	4
9/2/04	23				17	33.0		1.6		
9/3/04	23.5				20	35.0		1.5	4	4
9/18/04	21				14	40.0		1.4	4	4
10/2/04	16.5				28	41.0		1.2	4	4
10/11/04	15.5				10	46.0		0.9	4	4

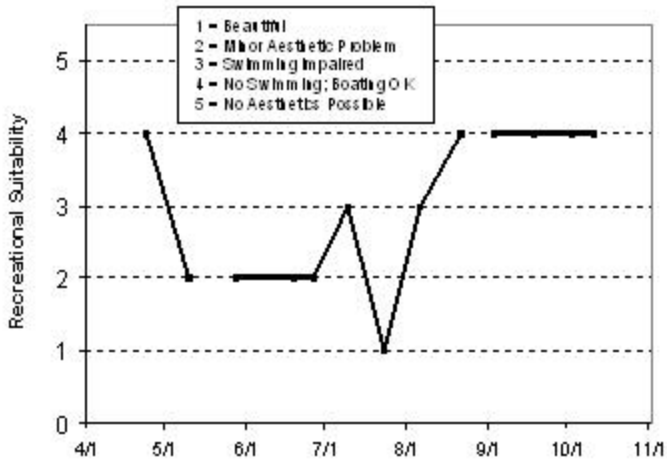


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C											
Chlorophyll a	C										B	
Secchi Depth	C										B	
Overall	C											

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				C				C	A		A	B	B
Chlorophyll a				B				B	A		A	B	A
Secchi Depth				C				C	B		A	B	C
Overall				C				C	A		A	B	B

Source: Metropolitan Council and STORET data



Peltier Lake (2-0004) *Rice Creek Watershed District*

Lake Peltier, with a surface area of 465 acres, is located one mile north of the City of Centerville (Anoka County). The maximum and mean depths of the lake are 4.9 and 2.1 m (16 and seven feet), respectively. The approximate volume of the lake is 3,255 ac-ft. The lake has a drainage area of roughly 68,082 acres, which translates to a extremely large watershed-to-lake size ratio of 391:1. The greater the ratio, the greater the potential stress on the lake from surface runoff. Public access is possible on the southwestern end of the lake through the Rice Creek Chain of Lakes Regional Park.

Peltier Lake is managed by the St. Paul Water Utility as a back-up water supply, and due to its multi-recreational uses, is considered a "Priority Lake" in the area by the Metropolitan Council. One aspect which may hinder recreational uses on the lake is the recent discovery of Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM]. Additionally, the lake, which is managed by the MDNR as a gamefish lake, experiences frequent winterkills.

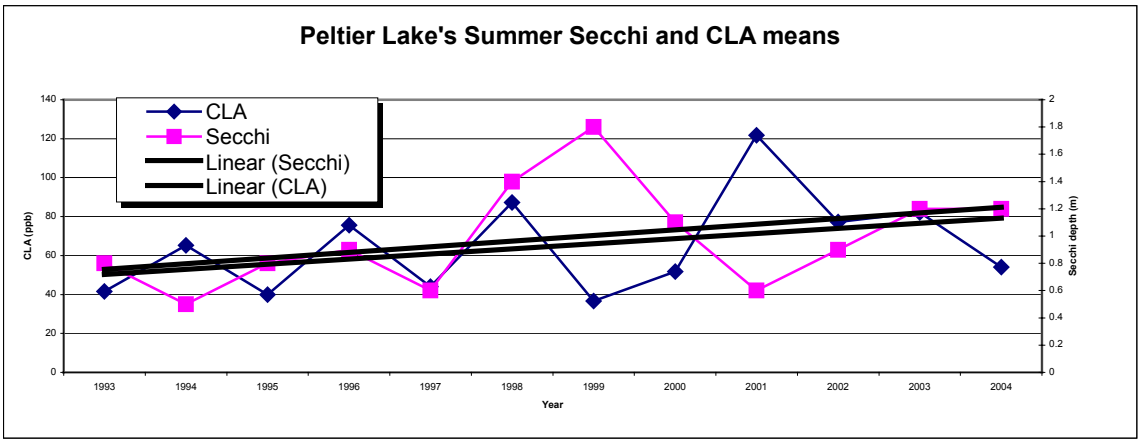
Lake Peltier has been involved in CAMP since 1993 and was monitored 15 times from mid-April to mid-October, 2004. Results are presented in graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	187.0	60.0	433.0	F
CLA (µg/l)	54.1	1.40	230.0	D
Secchi (m)	1.2	0.5	3.0	C
TKN (mg/l)	1.76	0.60	3.60	
			Overall Grade	D

The 2004 overall grade of D is similar to those recorded in 1993, 1995-1997, 1999-2000, and 2003. This is better than the overall grade of F recorded in 1994, and 2001-2002.

Of the 12 years of CAMP data the best water quality was in 1995 and 1999, while the worst was 2001 (1994 was the second worst). Other than the 1993-2004 CAMP data, the only other data found through a search of the STORET database was from 1983. While statistical analysis on the lake's water quality



database revealed no "statistically significant" trends, and grades seems to promote the idea that the lake's overall quality has remained fairly constant over the past decade [fluctuating between a low D and F], a

simple trend line calculated from the annual summer means shows a slight degradation in the lake's Secchi and chlorophyll-a means (see graph).

The average user perception rankings, on a 1-to-5 scale, was 2.9 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 2.2 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

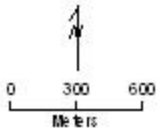
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

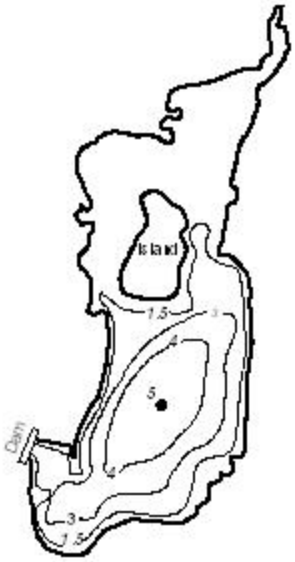
Peltier Lake

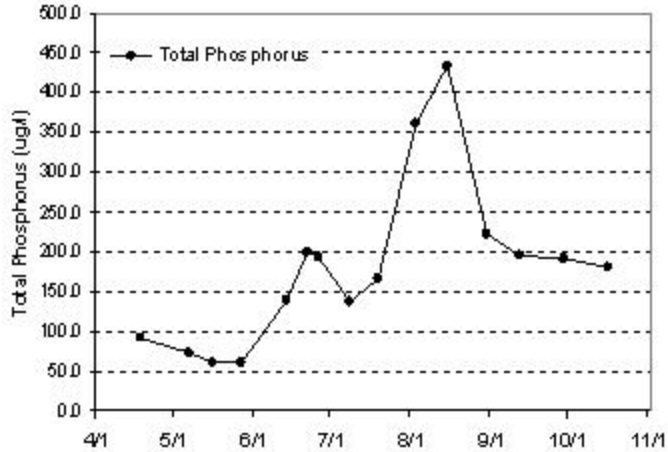
Centerville/Lino Lakes, Anoka Co.

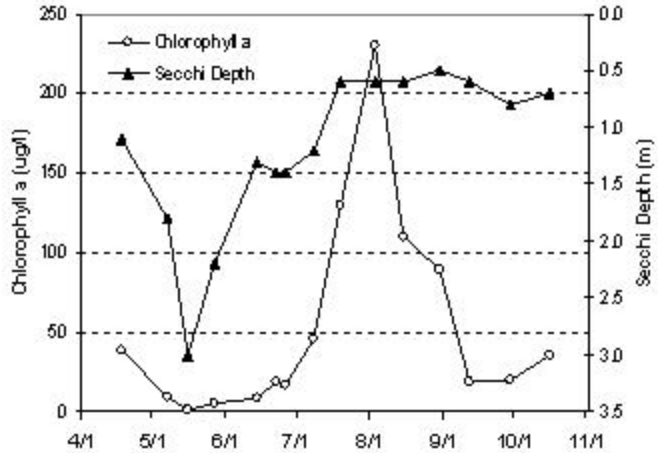
Lake ID: 20004
WD: Rice Creek
Volunteer: Wayne LeBlanc

● Sampling site
Contours in meters



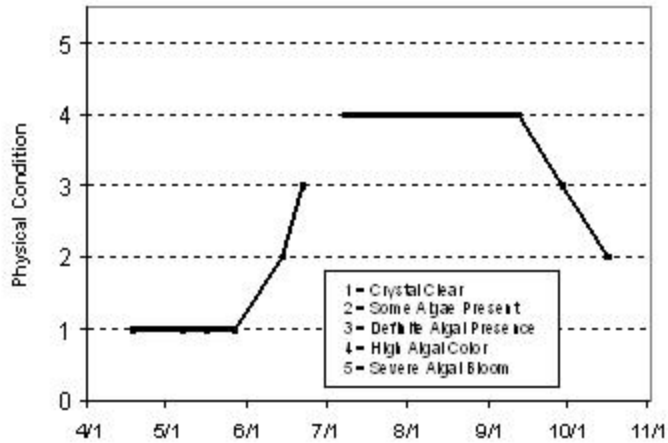






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	12				38	91.0		1.1	1	1
5/7/04	11				8.9	73.0		1.8	1	1
5/16/04	15				1.4	61.0		3.0	1	1
5/27/04	15				4.8	60.0		2.2	1	1
6/14/04	21				8.3	140.0		1.3	2	1
6/22/04	20				19	199.0		1.4	3	2
6/26/04	21				17	193.0		1.4		
7/8/04	21				46	136.0		1.2	4	3
7/19/04	27				130	166.0		0.6	4	4
8/3/04	21				230	361.0		0.6	4	3
8/15/04	20				110	433.0		0.6	4	3
8/30/04	20				89	222.0		0.5	4	3
9/12/04	20				19	196.0		0.6	4	2
9/29/04	15				20	191.0		0.8	3	2
10/16/04	8				35	180.0		0.7	2	1

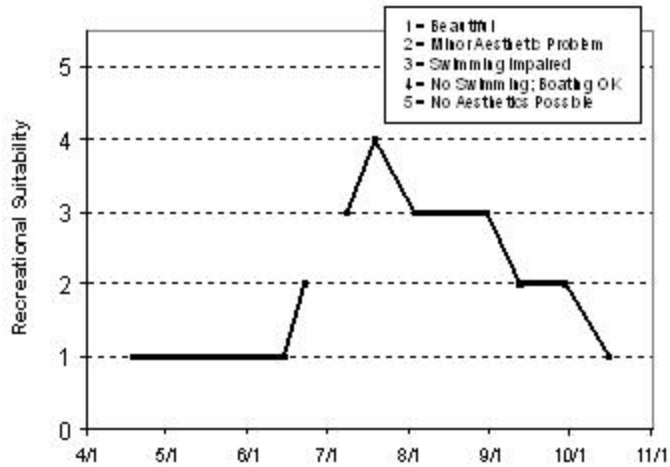


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus				F								
Chlorophyll a				D								
Secchi Depth				D								
Overall				D								

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		F	F	D	F	D	F	F	F	F	F	D	F
Chlorophyll a		C	D	C	D	C	F	C	D	F	F	D	D
Secchi Depth		D	F	D	D	F	C	C	D	F	D	D	C
Overall		D	F	D	D	D	D	D	D	F	F	D	D

Source: Metropolitan Council and STORET data



Pike Lake [Ramsey Co.] (62-0069) *Rice Creek Watershed District*

Pike Lake is a 35-acre lake located within the City of New Brighton (Ramsey County). The mean and maximum depths of the lake are 2.1 m (7 feet) and 4.9 m (16 feet). The lake's mean depth and surface area translate to a lake volume of 245 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

This was the sixth year that Pike Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake resulted in nutrient and Secchi transparency information for 1981-1983, 1985-1991, and 1999-2003, as well as just Secchi data for 1992-1993.

As part of the watershed district's involvement in CAMP in 2004, the lake was monitored 15 times between mid-April and mid-October. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	83.0	55.0	102.0	D
CLA (µg/l)	37.0	9.6	69.0	C
Secchi (m)	0.8	0.5	1.6	D
TKN (mg/l)	1.13	0.77	1.60	
			Overall Grade	D

The lake's 2004 overall grade was similar to that of 1981-1982, 1987-1990, and 1999-2003, better than 1991 (F), and worse than that of 1983, and 1985-1986 (all of which were B's). Thus, the lake's quality seems fluctuate quite a bit, but mostly falls with the overall grade range of low-C/high-D. Further, when comparing the lake's 2003 and 2004 summer means to historic summer means it is apparent that lake's 2003 and 2004 water quality was slightly worse that that recorded in 1999-2002.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page. The mean physical condition ranking was 2.9 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.0 (2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

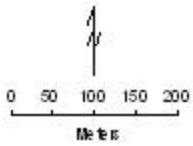
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

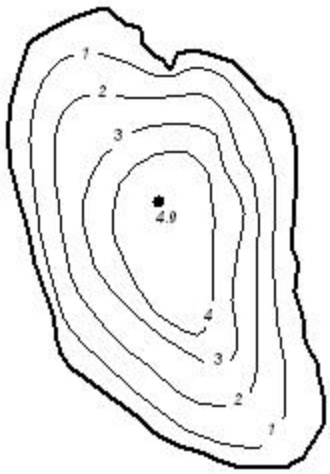
Pike Lake

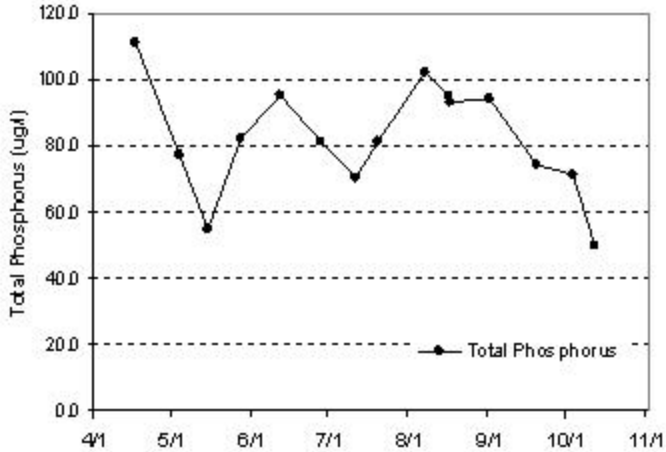
New Brighton, Ramsey Co.

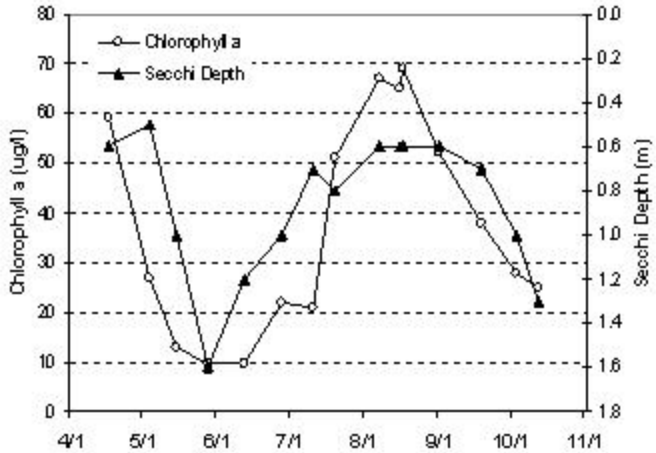
Lake ID: 620069
WD: Rice Creek
Volunteer: Philip Goodrich

● Sampling site
Contours in meters



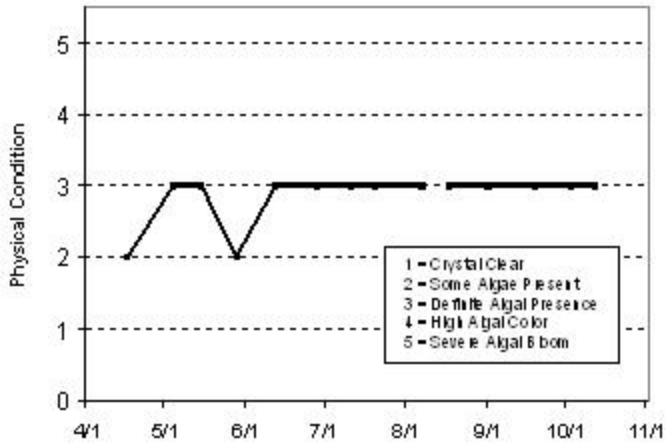






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	15.5				59	111.0		0.6	2	2
5/4/04	12				27	77.0		0.5	3	2
5/15/04	16				13	55.0		1.0	3	2
5/28/04	20				9.6	82.0		1.6	2	2
6/12/04	21.5				9.7	95.0		1.2	3	2
6/28/04	20				22	81.0		1.0	3	2
7/11/04	22				21	70.0		0.7	3	2
7/29/04	27.5				51	81.0		0.8	3	2
8/7/04	24				67	102.0		0.6	3	2
8/16/04	22				65	95.0		0.6		
8/17/04	22				69	93.0		0.6	3	2
9/1/04	26				52	94.0		0.6	3	2
9/19/04	22				38	74.0		0.7	3	2
10/3/04	15				28	71.0		1.0	3	3
10/12/04	15				25	50.0		1.3	3	2

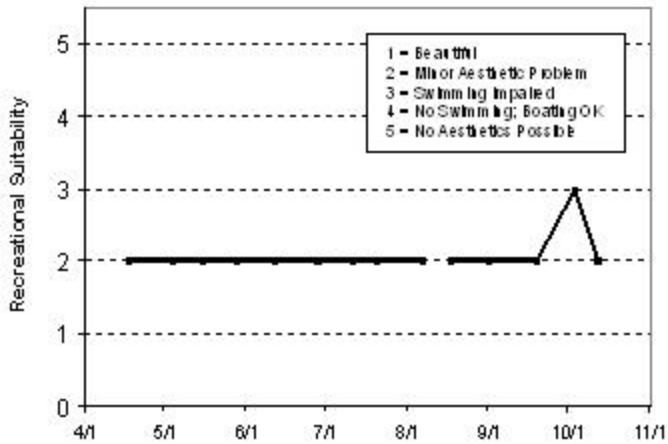


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus		C	C	D		C	C	D	D	D	D	D
Chlorophyll a		C	D	A		A	C	C	C	D	C	F
Secchi Depth		F	D	D		F	D	D	D	D	F	F
Overall		D	D	C		C	C	D	D	D	D	F

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D	D	D	D	D	D
Chlorophyll a								C	C	D	C	D	C
Secchi Depth	D	D						D	D	C	D	D	D
Overall								D	D	D	D	D	D

Source: Metropolitan Council and STORET data



Pike Lake [Scott County] [Site-1] (70-0076) *Prior Lake - Spring Lake Watershed District*

Pike Lake is a 57-acre lake located within the City of Prior Lake (Scott County). The maximum depth of the lake is 2.7 m (roughly 9 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The majority of the land within the 1,991-acre watershed is undeveloped. The watershed-to-lake size ratio is 35:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the sixth year that Pike Lake has been involved in CAMP (the lake was also involved in 1997 and 1999-2003). A search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 1997 and 1999-2003 are the only years of available data. The resulting data and graphs appear on the next page.

Pike Lake was monitored 14 times from mid-April to late-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	302.8	144.0	472.0	F
CLA (µg/l)	172.5	1.20	550.0	F
Secchi (m)	0.8	0.2	2.4	D
TKN (mg/l)	3.57	1.50	6.60	
			Overall Grade	F

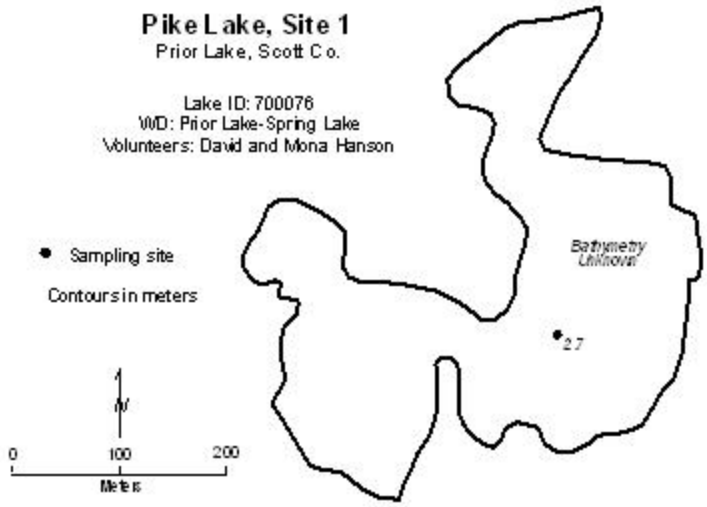
The lake's 2004 overall water quality grade was identical to that recorded in 2002-2003, and worse than the D's recorded in 1999-2001 and C recorded in 1997.

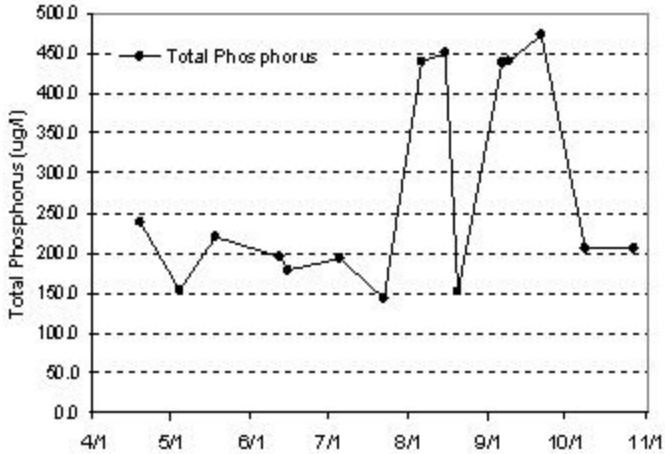
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean perceived physical condition of Pike Lake was 3.4 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability was 4.0 (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

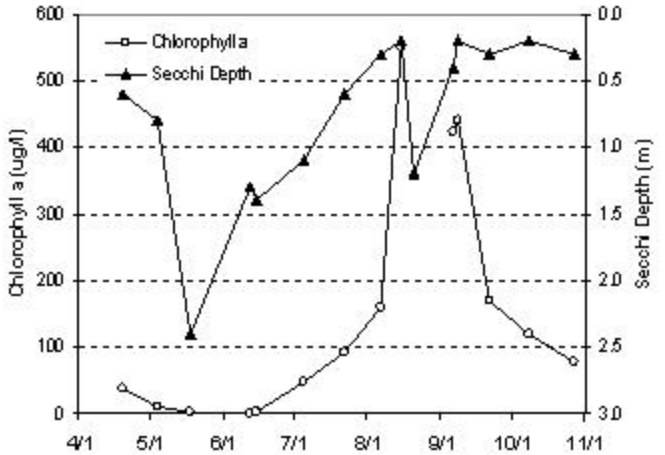
As mentioned earlier, there are no water quality data available for Pike Lake other than the 1997, and 1999-2004 CAMP data. While there is no "statistically significant" trend evident from the lake's database, the compilation of lake's grades does seem as though the lake's overall quality may be slipping. To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

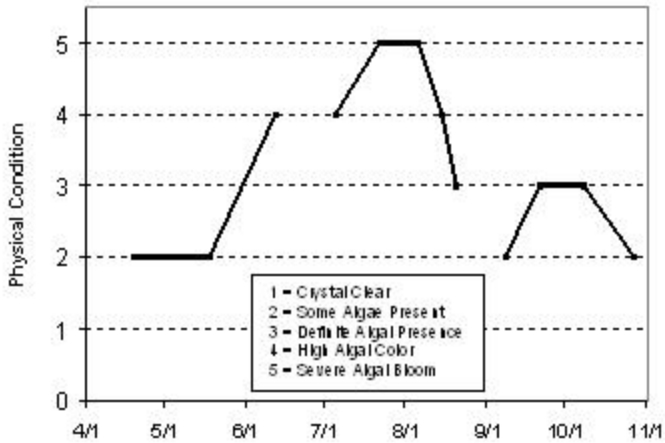






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	20.2				37	239.0		0.6	2	4
5/4/04	20.2				10	153.0		0.8	2	4
5/18/04	23.5				1.5	219.0		2.4	2	4
6/12/04	26.9				1.2	195.0		1.3	4	4
6/15/04	26				2.5	179.0		1.4		
7/5/04	26				48	192.0		1.1	4	4
7/22/04	31				92	144.0		0.6	5	4
8/6/04	25.8				160	440.0		0.3	5	4
8/15/04	24.6				550	450.0		0.2	4	4
8/20/04	19					151.0		1.2	3	
9/6/04	24				422	437.0		0.4		
9/8/04	24.1				440	439.0		0.2	2	4
9/21/04	21.8				170	472.0		0.3	3	4
10/8/04	14.6				120	206.0		0.2	3	4
10/27/04	10.1				77	206.0		0.3	2	4

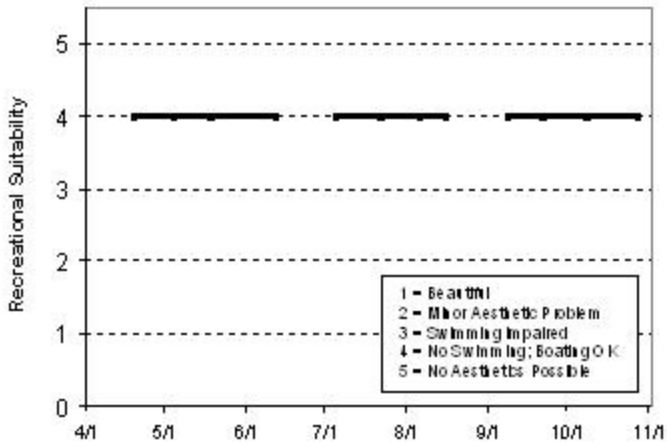


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophylla												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						D		D	D	D	F	F	F
Chlorophylla						B		C	C	F	D	F	F
Secchi Depth						D		F	F	C	F	D	D
Overall						C		D	D	D	F	F	F

Source: Metropolitan Council and STORET data



Pine Tree Lake (82-0122) *Rice Creek Watershed District*

Pine Tree Lake, located on the eastern edge of the City of Dellwood (Washington County), covers an area of 174 acres and has a maximum depth of 7.9 m (26 feet). The mean depth of the lake, 3.0 m (10 feet), and its surface area translate to an approximate lake volume of 1,740 ac-ft. Because of its multi-recreational uses, it is considered a "Priority Lake" in the Metropolitan Area.

Pine Tree Lake has been a part of CAMP since 1993. In 2004, the lake was monitored eight times between early-May and early-October. On each outing, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	27.6	16.0	36.0	B
CLA (µg/l)	9.2	3.6	19.0	A
Secchi (m)	2.3	1.3	3.0	B
TKN (mg/l)	0.67	0.51	0.78	
			Overall Grade	B

The lake's 2004 overall is identical to those recorded in 1997-2001 and better than the B's of 2002-2003. No statistically significant long-term trend is evident from the lake's overall water quality database (including TP, CLA, and Secchi data), in the short-term however, it seems that the lake's overall water quality is well represented by a B/C grade. A recent trend analysis (by the MPCA) on just the lake's Secchi transparency data, however, revealed a statistically significant improvement in recent water clarity.

The physical and recreational conditions of the lake, as perceived by the volunteer(s), were ranked on a 1-to-5 scale. These rankings are shown in both table and graphic form on the following page. The mean physical condition ranking was 2.6 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.4 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

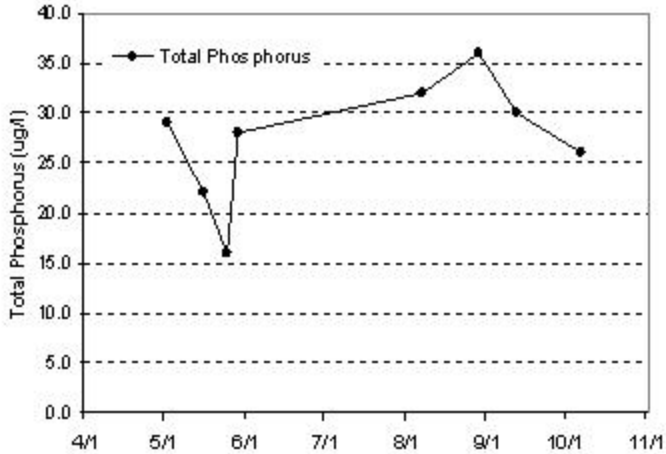
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

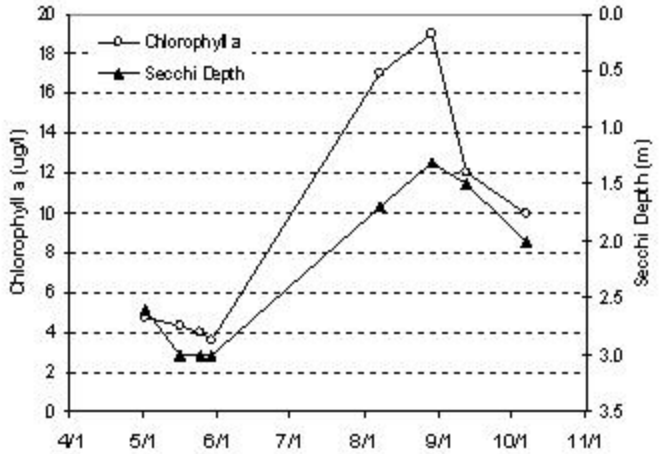
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Pine Tree Lake

Dellwood/Grant,
Washington Co.

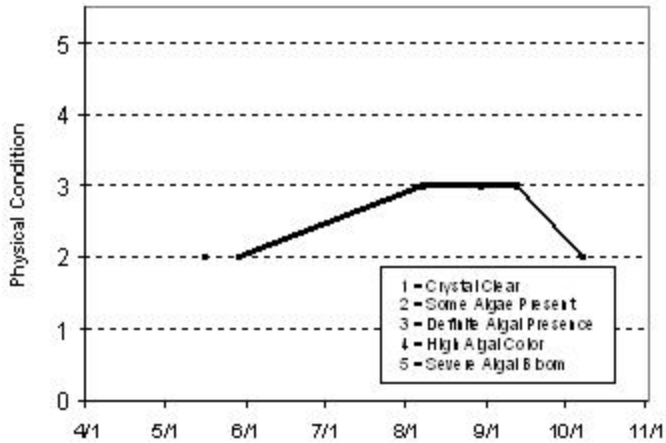
Lake ID: 820122
WD: Rice Creek
Volunteer: Gene Berwald





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/2/04	13				4.7	29.0		2.6		
5/16/04	16				4.3	22.0		3.0	2	1
5/25/04	18				4	16.0		3.0		
5/29/04	17				3.6	28.0		3.0	2	2
8/7/04	24.1				17	32.0		1.7	3	3
8/29/04	20				19	36.0		1.3	3	3
9/12/04	20				12	30.0		1.5	3	3
10/7/04	14				10	26.0		2.0	2	3

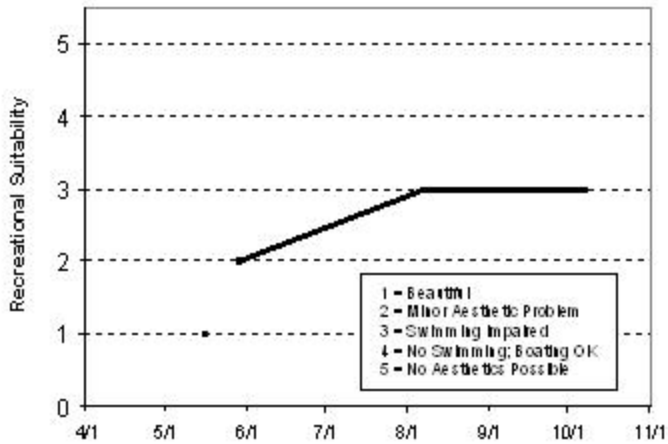


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus						C						
Chlorophyll a						D						
Secchi Depth						D						
Overall						D						

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		B	B	C	C	B	B	B	C	C	C	C	B
Chlorophyll a		A	A	C	B	A	B	B	A	A	B	C	A
Secchi Depth		C	B	C	C	B	C	C	A	B	C	C	B
Overall		B	B	C	C	B	B	B	B	B	C	C	B

Source: Metropolitan Council and STORET data



Powers Lake (82-0092) *City of Woodbury*

Powers Lake, located within the City of Woodbury (Washington County), has a surface area of approximately 57 acres (a shoreline length of 1.75 miles), and maximum depth of 12.5 m (41.0 feet). Approximately 50 percent of the lake's surface area is considered littoral, the shallow (0-15 feet) area dominated by aquatic vegetation. There is a public (canoe only) access on the northwest end of the lake near one of its two inlets. The lake has no outlet. Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lake.

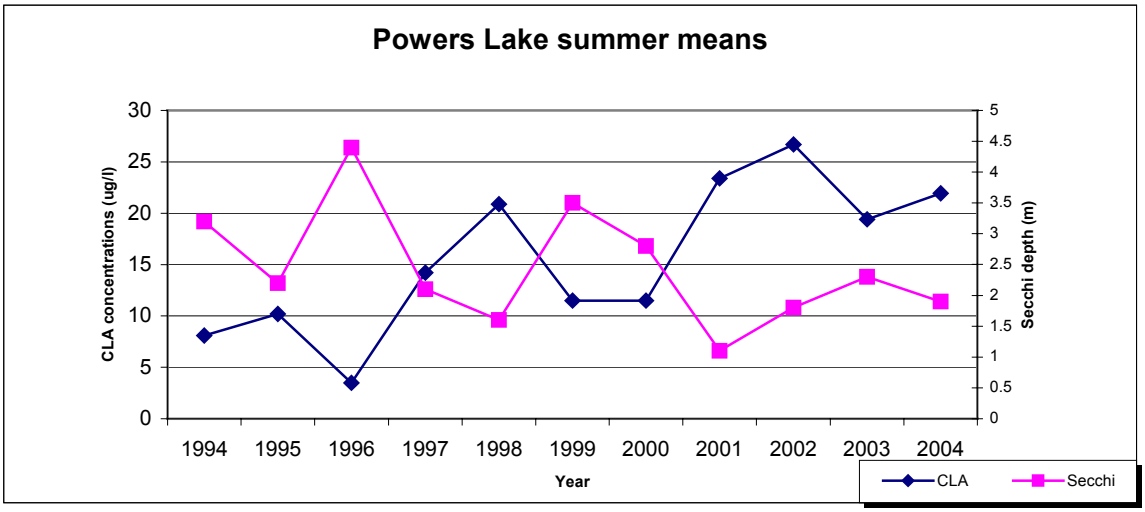
Currently, about 47 percent of the lake's 1,238-acre watershed is open/undeveloped land with the rest either residential or open water/wetlands. Eventually nearly 84 percent of the lake's watershed will be developed as single-family and multi-family residential units. The lake's watershed-to-lake size ratio is 22:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

Powers Lake has been involved in CAMP since 1994. Between mid-April and mid-October, 2004, the lake was monitored 14 times. Similar to past years, the lake was monitored on each sampling date for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	34.4	26.0	54.0	C
CLA (µg/l)	22.0	5.3	56.0	C
Secchi (m)	1.9	0.9	3.0	C
TKN (mg/l)	1.09	0.85	1.60	
			Overall Grade	C

The lake's 2004 water quality continues to be inferior to that recorded in 1994-1997 and 1999-2000. The lake has received overall grades of A in 1994, 1996, and 1999, B in 1995, 1997, 2000 and 2003, and C in 1998, 2001-2002 and 2004.

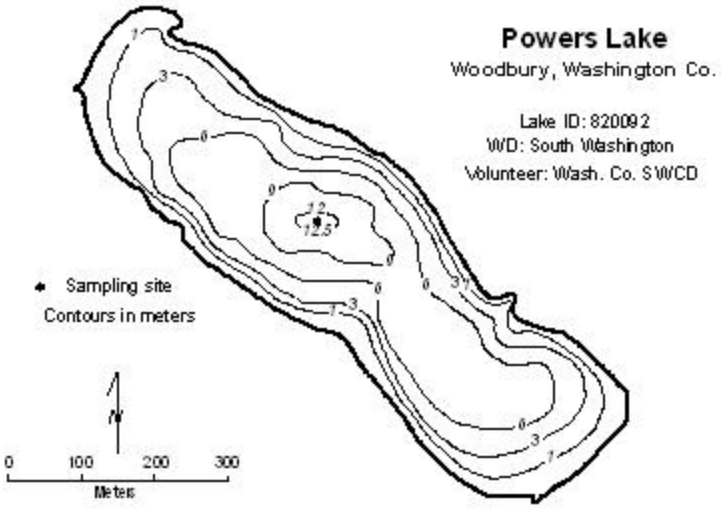


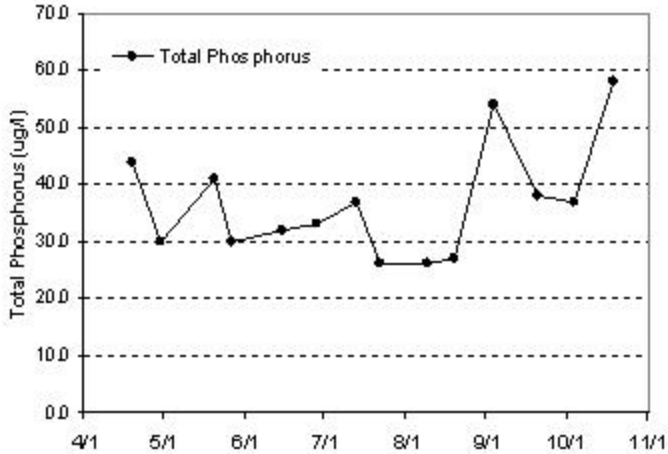
Because of the wide flucuation in the available data, no "statistically significant" long-term trend was determined. In the short-term however, the lates recent overall grades of C is worse than the A/B recorded in the 1990's. More data are needed, however, to determine if this flucuation is falls within the lake's normal range, or if the increased development around the lake has added to the lake's nutrient load resulting in an increase in algal abundance and reduced clarity. Continued monitoring is suggested.

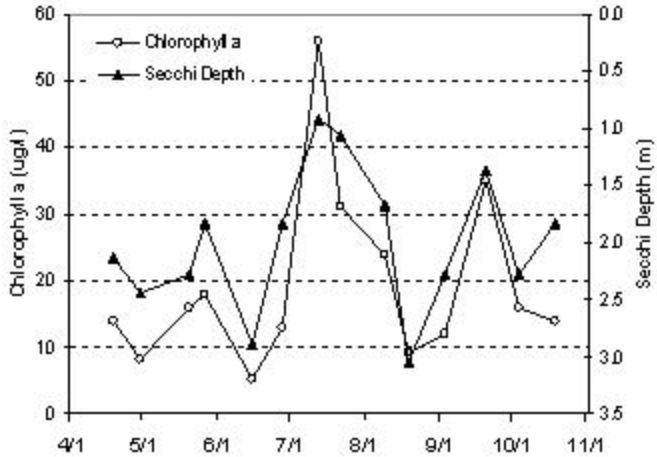
The physical and recreational conditions of the lake, as perceived by the volunteer, were ranked on a 1-to-5 scale and are displayed on the next page. The mean physical condition ranking was 3.2 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.0 (3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

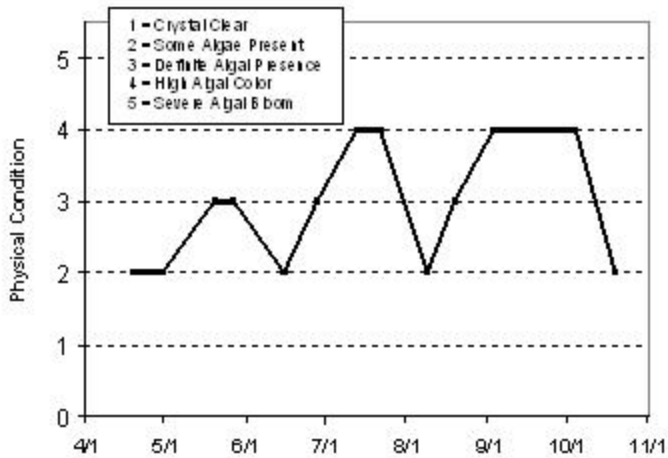






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/19/04	11.7	6.4	11.04	0.02	14	44.0		2.1	2	4
4/30/04	12.5	6.6	10.09	0.03	8.2	30.0		2.4	2	2
5/20/04	17.7	7.8	10.71	0.05	16	41.0		2.3	3	4
5/27/04	16.9	8.1	10.85	0.05	18	30.0		1.8	3	4
6/15/04	23.3	8.9	8.43	0.06	5.3	32.0		2.9	2	3
6/28/04	20.4	8.8	8.01	0.17	13	33.0		1.8	3	3
7/13/04	25.6	9.2	11.74	0.25	56	37.0		0.9	4	
7/22/04	27.7	9.4	7.8	0.15	31	26.0		1.1	4	
8/9/04	23.7	9.7	8.36	0.4	24	26.0		1.7	2	
8/19/04	20.6	9.6	6.65	0.06	9.2	27.0		3.0	3	2
9/3/04	23.7	13.5	7.75	0.09	12	54.0		2.3	4	
9/20/04	20.9	10.1	7.33	0.04	35	38.0		1.4	4	2
10/4/04	15.7	10	5.38	0.07	16	37.0		2.3	4	2
10/19/04	11.1	10.9	4.37	2.06	14	58.0		1.8	2	2

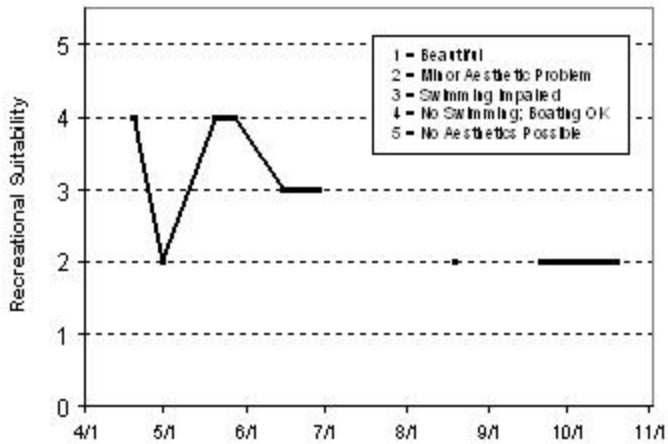


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			B	B	A	A	C	A	B	C	B	C	C
Chlorophyll a			A	B	A	B	C	B	B	C	C	B	C
Secchi Depth			A	B	A	C	C	A	B	C	C	B	C
Overall			A	B	A	B	C	A	B	C	C	B	C

Source: Metropolitan Council and STORET data



Prior Lake [Lower Basin] [Site-1] (70-0026) *Prior Lake - Spring Lake Watershed District*

Prior Lake is divided into two distinct basins (the results of the 2004 monitoring on Prior Lake will be discussed as individual basins, Lower Prior and Upper Prior). Because of the lake's multi-recreational uses it is considered a "Priority Lake" in the Metropolitan Area.

The entire 1,167-acre lake is located within the City of Prior Lake (Scott County). The acreage of each basin is as follows: lower basin= 827 acres, and upper basin= 340 acres. The maximum and mean depths of the lower basin are 18.3 and 4.1 m (60 and 13 feet), which along with the surface area, translate to a lower basin volume of approximately 11,120 ac-ft. Roughly 46 percent of the lake's surface area is considered littoral, (the shallow [0-15 feet] area dominated by aquatic plants). The lower basin's 2,090-acre watershed translates to a rather small watershed-to-lake area ratio of 2.5:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff).

The lower basin's public access is located at the southern end of the lake. The lower basin of Prior Lake has one inlet (that from the upper basin of Prior Lake), and one outlet. The outlet structure, located on the southwestern portion of the basin, is a man-made structure that was installed to regulate surface water elevations. Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lower basin of the lake.

In an attempt to address issues either contributing to the eutrophication of Prior Lake or the symptoms from the rsulting eutrophication, the Prior Lake - Spring Lake Watershed District has recently completed a Sustainable Water Quality Mangement Plan for its lakes (including Spring and Prior Lakes). The Plan sets goals addressing the lakes' biological and chemical make-up and developed implementation strategies enabling the lakes' goals to be met (PLSLWD 2004).

While the Metropolitan Council has monitored the lower and upper basins of Prior Lake in the past, both basins have been a part of CAMP since 1997.

Lower Prior was monitored 12 times from late-April to early-October, 2004. On each sampling date the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	23.5	13.0	36.0	B
CLA (µg/l)	3.1	1.6	5.6	B
Secchi (m)	2.7	1.8	5.0	B
TKN (mg/l)	0.78	0.52	0.91	
			Overall Grade	B

The 2004 overall grade is similar to that recorded in 1996, 1998 and 2000-2003, and worse than the A's recorded in 1997 and 1999.

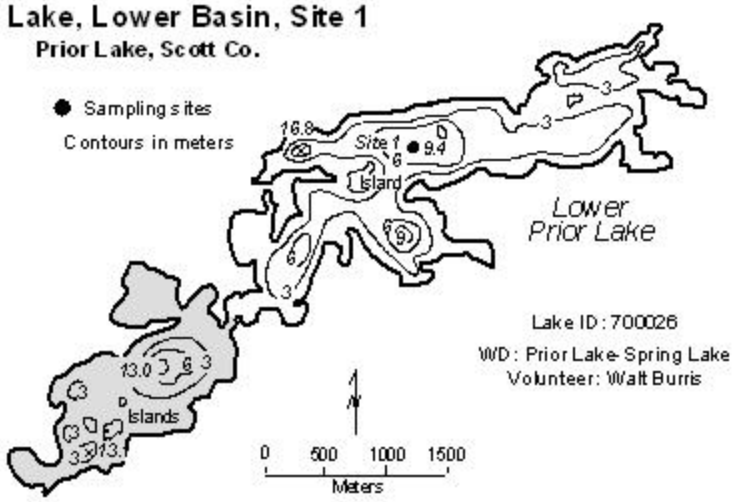
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean perceived physical condition of Lower Prior Lake was 1.9 (roughly equal to 2- "some algae present"), while the mean recreational suitability was 1.4 (falling between 1- "beautiful" and 2- "minor aesthetics problem").

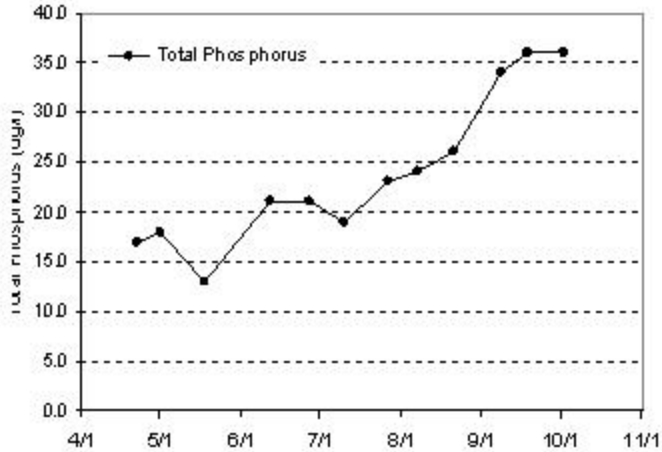
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

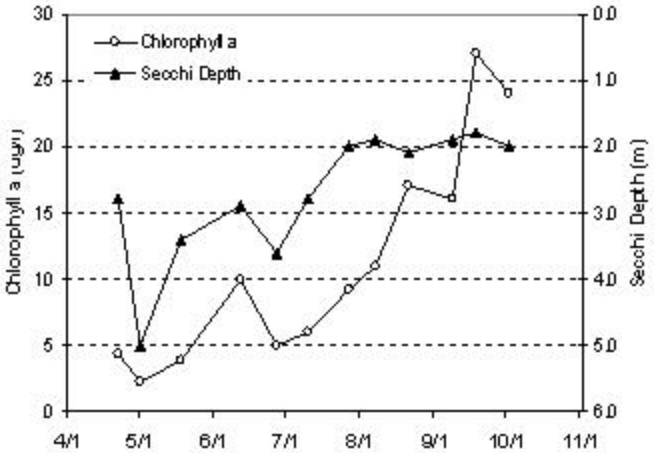
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Prior Lake, Lower Basin, Site 1

Prior Lake, Scott Co.

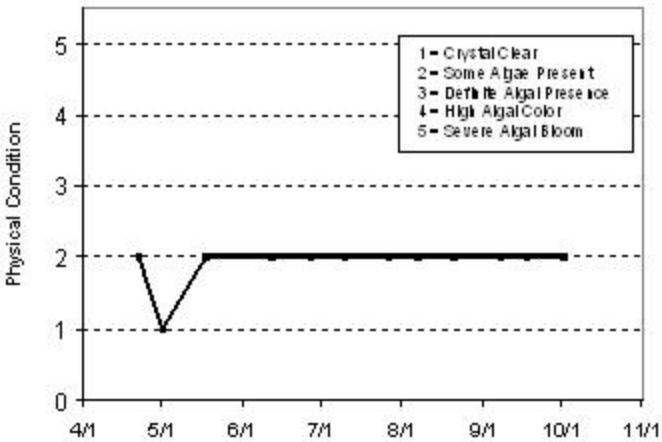


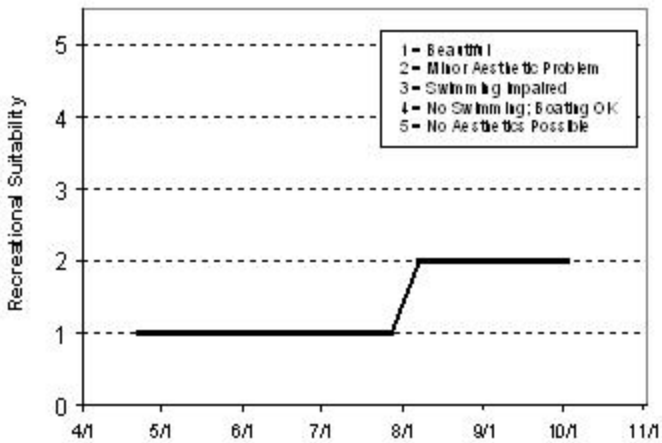




2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	12				4.4	17.0		2.8	2	1
5/1/04	13				2.3	18.0		5.0	1	1
5/18/04	18				3.8	13.0		3.4	2	1
6/12/04	22				10	21.0		2.9	2	1
6/27/04	20				5	21.0		3.6	2	1
7/10/04	23				6	19.0		2.8	2	1
7/27/04	24				9.2	23.0		2.0	2	1
8/7/04	24				11	24.0		1.9	2	2
8/21/04	20				17	26.0		2.1	2	2
9/8/04	21				16	34.0		1.9	2	2
9/18/04	21				27	36.0		2.0	2	2
10/2/04	16				24	36.0		2.0	2	2





Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total Phosphorus	C	A			B								C		
Chlorophyll a	B				B					A	B		B		
Secchi Depth	C	C	B	C	B	C	B	C	C	B	B	C	C	B	B
Overall	C				B								C		

Year	1995	1996	1997	1998 Site 1	1998 Site 2	1999 Site 1	1999 Site 2	2000 Site 1	2000 Site 2	2001 Site 1	2001 Site 2	2002 Site 1	2002 Site 2	2003 Site 1	2003 Site 2	2004 Site 1	2004 Site 2
Total Phosphorus		C	A	A	B	A	C	B	B	A	B	B	C	C		B	
Chlorophyll a		A	A	B	C	A	B	B	B	B	C	B	C	A		B	
Secchi Depth	B	B	B	C	C	B	C	B	C	B	C	B	C	A		B	
Overall		B	A	B	C	A	C	B	B	B	C	B	C	B		B	

Source: Metropolitan Council and STORET data

Prior Lake [Upper Basin] [Site-1] (70-0072) *Prior Lake - Spring Lake Watershed District*

The maximum and mean depths of the upper basin of Prior Lake are 15.2 and 3.1 m (50 and 10 feet), respectively. The resulting water volume of the 340-acre upper basin is 3,460 ac-ft. About 93 percent of the lake's surface area is considered littoral, (the shallow [0-15 feet] area dominated by aquatic plants). The upper basin's 3,430-acre watershed translates to a watershed-to-lake area ratio of 10:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). The upper basin's public access is located at the northwestern end of the lake.

The upper basin of Prior Lake has two natural inlets, inflow from Spring Lake and the inlet from Rice and Crystal Lake drainage. Agriculturally derived non-point source nutrient loading released through the Spring Lake outlet heavily impacts water quality of the upper basin of Prior Lake.

The upper basin of Prior Lake were monitored 10 times from mid-May to late-September, 2004. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	74.0	45.0	120.0	D
CLA (µg/l)	51.6	10.0	86.0	D
Secchi (m)	1.1	0.6	3.0	D
TKN (mg/l)	1.41	0.89	1.70	
			Overall Grade	D

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean perceived physical condition of Upper Prior Lake was 3.3 (ranking between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability was 2.6 (falling between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

Historical data for the upper basin of Prior Lake indicate that the water quality of the basin has remained fairly constant over the past decade fluctuating between overall grades of C and D. Lake quality grades (see the lake's information sheet on the following page) show that when nutrient data were collected on the upper basin of Prior Lake, overall grades ranged from C in 1981, 1990, 1996-1997 and 2003, and a D in 1980, 1984, 1989, 1998-2002, and 2004.

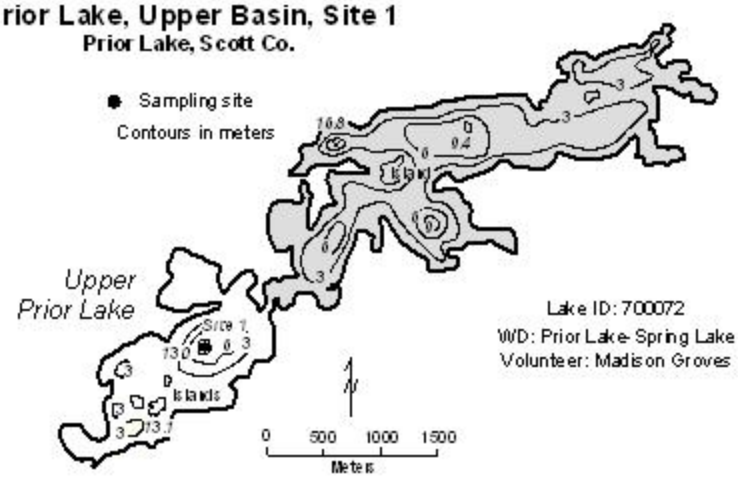
As apparent by the historic lake water quality grades, the lower basin of Prior Lake has better water quality than the upper basin. The reason being that the upper basin actually acts as a sort of detention basin for the lower basin. That is, the majority of the water entering the lakes goes through the upper basin first, allowing the settlement of sediments and associated nutrients before it enters the lower basin of the lake. The result is better quality water entering the lower basin of Prior Lake than is entering the upper basin.

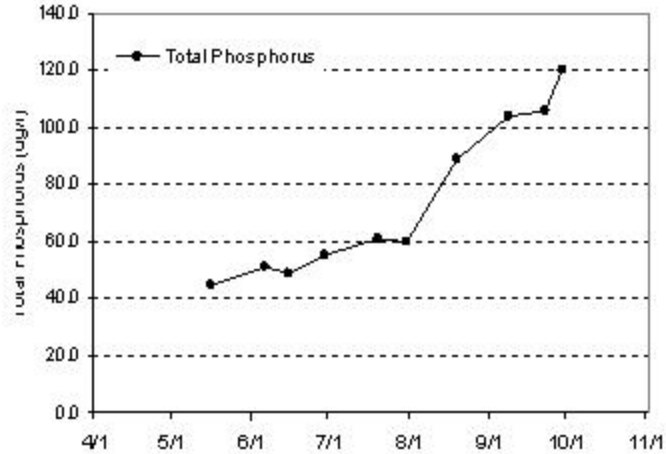
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

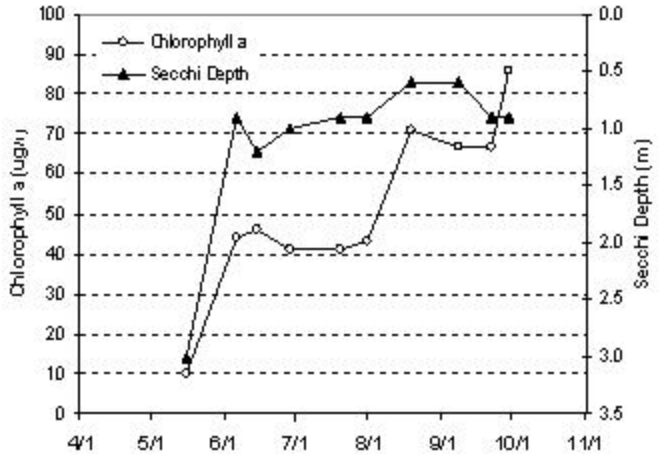
If you recognize any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Prior Lake, Upper Basin, Site 1

Prior Lake, Scott Co.

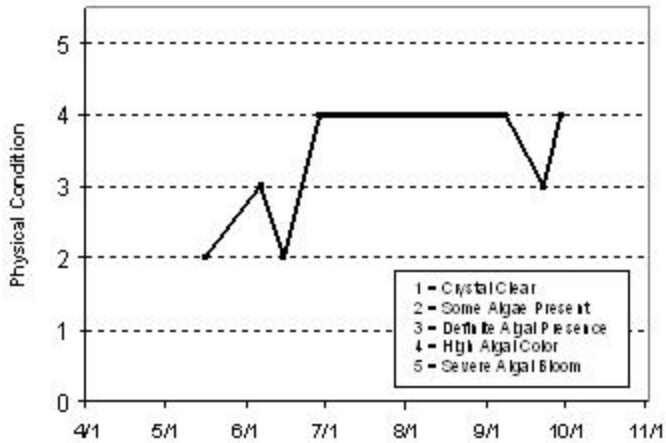






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/16/04	16.2				10	45.0		3.0	2	1
6/6/04	22.6				44	51.0		0.9	3	3
6/15/04	23.5				46	49.0		1.2	2	2
6/29/04	21.3				41	55.0		1.0	4	3
7/20/04	29.3				41	61.0		0.9	4	3
7/31/04	24.1				43	60.0		0.9	4	3
8/19/04	21.5				71	89.0		0.6	4	3
9/8/04	22				67	104.0		0.6	4	3
9/22/04	20.7				67	106.0		0.9	3	2
9/29/04	19				86	120.0		0.9	4	3

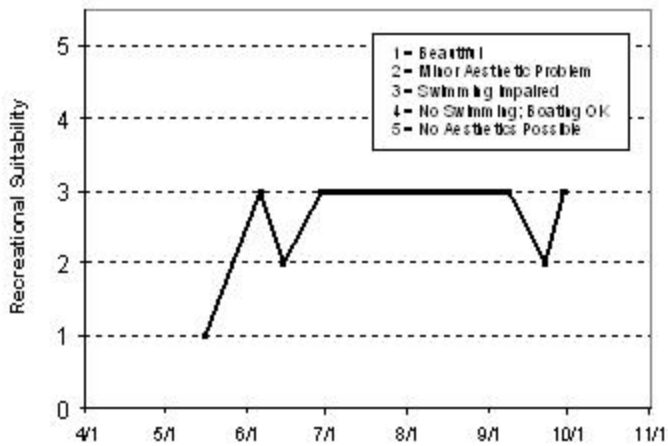


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total Phosphorus	C	C			D					D					
Chlorophyll a	D	D			D					C	C				
Secchi Depth	D	C	D	F	D	D	D	F	F	D	C	D	D	D	D
Overall	D	D			D					D					

Year	1995	1996	1997	1998 Site 1	1998 Site 2	1999 Site 1	1999 Site 2	2000 Site 1	2000 Site 2	2001 Site 1	2001 Site 2	2002 Site 1	2002 Site 2	2003 Site 1	2003 Site 2	2004 Site 1	2004 Site 2
Total Phosphorus		C	C	C		D		D		D		D	D	C		D	
Chlorophyll a		C	C	D		D		D		F		D	D	D		D	
Secchi Depth	C	C	D	D		D		C		D		D	D	C		D	
Overall		C	C	D		D		D		D		D	D	C		D	

Source: Metropolitan Council and STORET data



Regional Park Lake (82-0086) *South Washington Watershed District*

Regional Park Lake is a 16-acre lake located within the City of Cottage Grove (Washington County). The maximum depth of the lake is 5.8 m (roughly 19 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The majority of the land within the 600-acre watershed is undeveloped. The watershed-to-lake size ratio is 38:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake.

This was the seventh year that Regional Park Lake has been involved in CAMP. Other than the 1998-2004 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. The lake was monitored 15 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page. On each sampling date the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	59.7	37.0	101.0	C
CLA (µg/l)	28.9	9.3	80.0	C
Secchi (m)	0.8	0.3	1.7	D
TKN (mg/l)	1.09	0.82	2.00	
			Overall Grade	C

The lake's 2004 overall grade is identical to that recorded in 1999 and better than the D's of 1998 and 2000-2003.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's water quality seems well represented by an overall grade of D+/C. To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.0 for physical condition (3- "definite algae present"), and 4.0 for recreational suitability (4- "no swimming - boating ok").

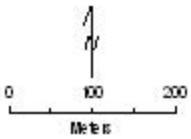
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

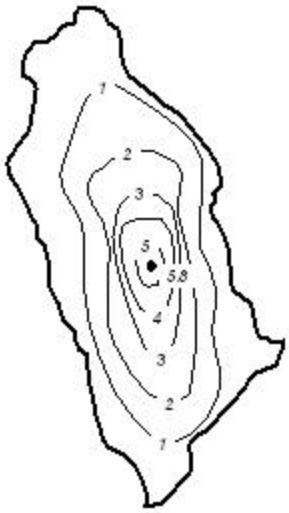
Regional Park Lake

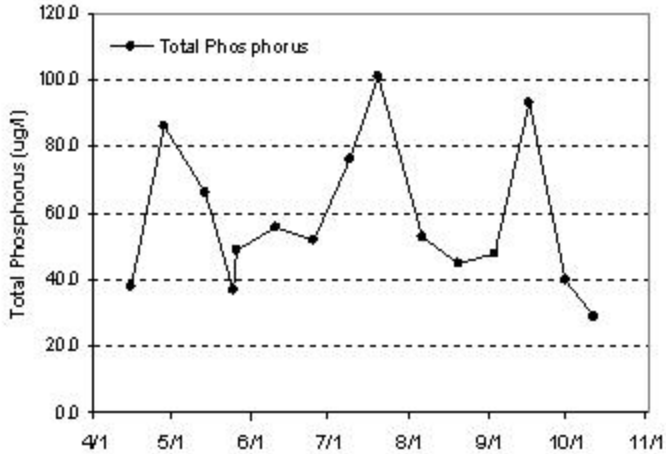
Cottage Grove, Washington Co.

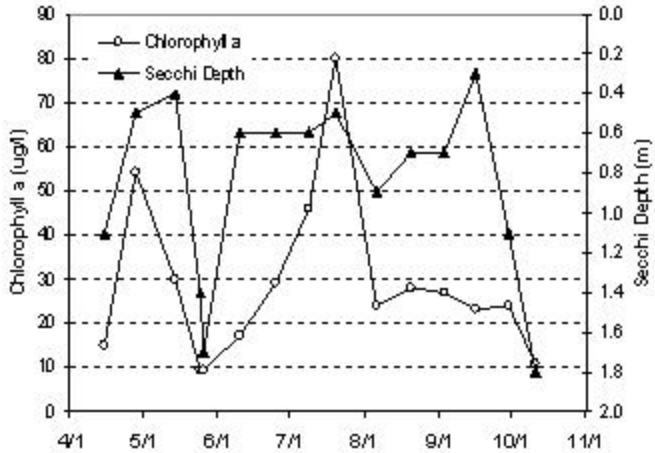
Lake ID: 820086
WD: South Washington
Volunteer: City of Cottage Grove

● Sampling site
Contours in meters



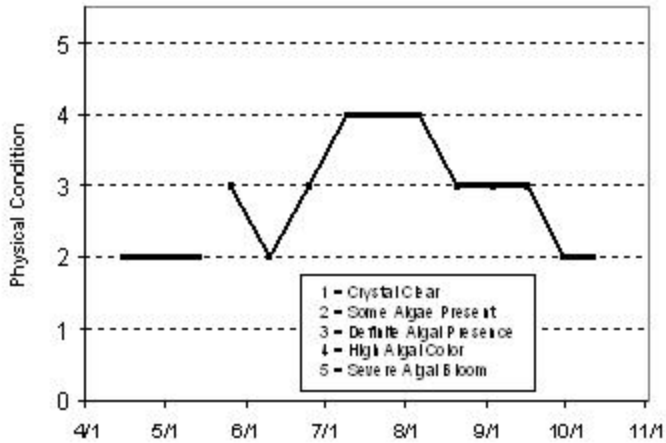






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	13.2				15	38.0		1.1	2	4
4/28/04	13				54	86.0		0.5	2	4
5/14/04					30	66.0		0.4	2	4
5/25/04	18				9.5	37.0		1.4		
5/26/04	17.2				9.3	49.0		1.7	3	4
6/10/04	22.7				17	56.0		0.6	2	4
6/25/04	21.5				29	52.0		0.6	3	4
7/9/04	23.5				46	76.0		0.6	4	4
7/20/04	26.8				80	101.0		0.5	4	4
8/6/04	23.8				24	53.0		0.9	4	4
8/20/04	20.8				28	45.0		0.7	3	4
9/3/04	24.3				27	48.0		0.7	3	4
9/16/04	21.8				23	93.0		0.3	3	4
9/30/04	18.3				24	40.0		1.1	2	4
10/11/04	16				11	29.0		1.8	2	4

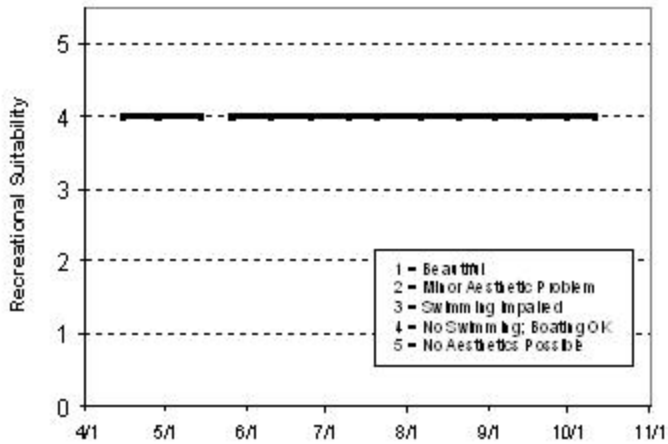


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus							F	C	D	D	D	D	C
Chlorophyll a							B	B	C	C	D	C	C
Secchi Depth							F	D	F	F	F	F	D
Overall							D	C	D	D	D	D	C

Source: Metropolitan Council and STORET data



Reitz Lake (10-0052) *Carver County Environmental Services*

Reitz Lake, a 79-acre lake located within Laketown Township (Carver County), is considered a Metropolitan Area "Priority Lake" because of its multi-recreational uses. A public access is located on its northeastern shore. The mean and maximum depths of the lake are 4.0 m (13 feet) and 11.0 m (36 feet). Roughly 58 percent of the lake area is considered littoral zone (area of aquatic plant dominance). The lake's mean depth and surface area translate to an approximate volume of 1,027 ac-ft.

The lake has a 3,711-acre immediate watershed, which translates to a watershed-to-lake area ratio of 47:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff). A 1999 water quality report on water resources in Carver County estimates land use for the watershed at: two percent residential, 69 percent agricultural, one percent commercial/industrial, and 28 percent open/undeveloped (Carver County Planning 1999).

This was the sixth year that Reitz Lake has been involved in CAMP. Council staff, however, has monitored the lake, in the past. A search through the STORET nationwide water quality database for historical data on the lake, provided only three years of data (1985, 1991 and 1993) prior to the 1999-2004 CAMP data.

The lake was monitored 14 times between mid-April and mid-October, 2004. On each outing, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Lake samples were also analyazed for additional parameters as part of a Total Maximum Daily Load (TMDL) study on the lake.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	106.5	76.0	150.0	D
CLA (µg/l)	38.9	1.9	85.0	C
Secchi (m)	2.0	0.5	5.5	C
TKN (mg/l)	2.10	1.60	2.80	
			Overall Grade	C

The 2004 overall grade is similar to those recorded in 1999-2000 and 2002-2003, and better than the D's of 1985, 1991, 1993, and 2001.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, in the short-term however, the lake's water quality seems to be well represented by an overall grade of D/low-C. In order to detect any possible long-term trends, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.9 for physical condition (between 2- "some algae present and 3- "definite algae present"), and 2.7 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

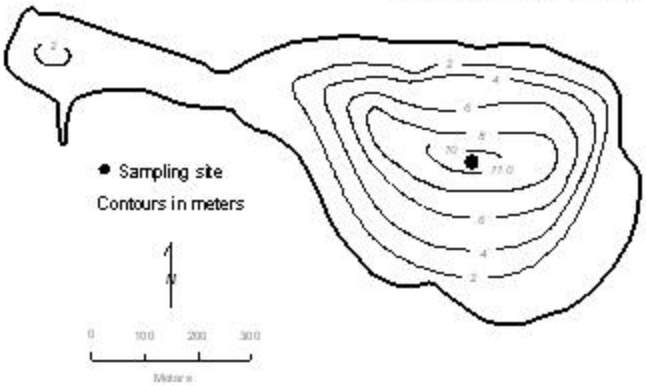
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

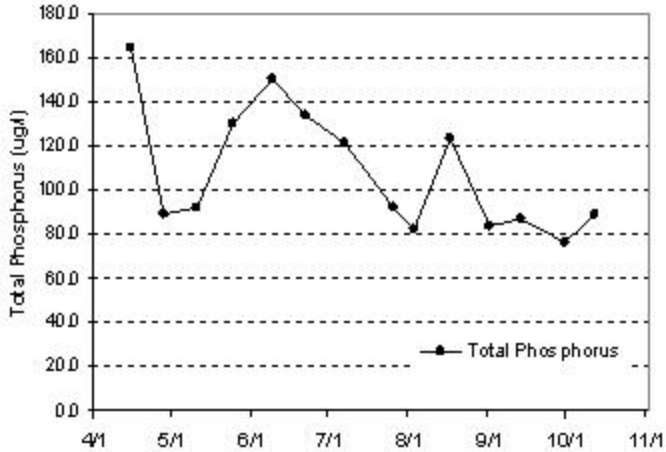
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

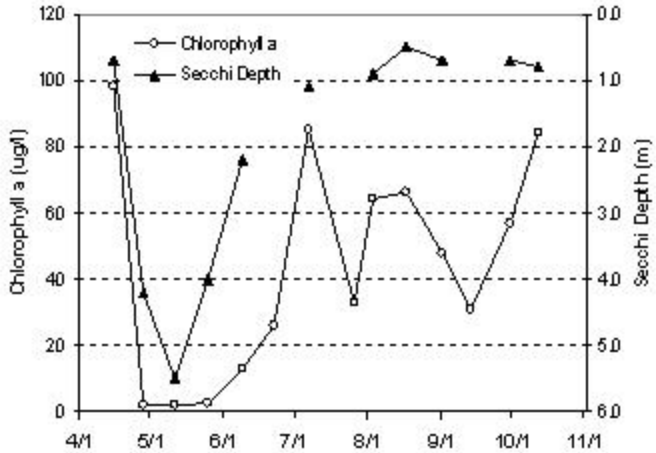
Reitz Lake

Laketown Twp., Carver Co.

Lake ID: 100052
WMO: Carver County
Volunteer: Carver Co. Env. Services

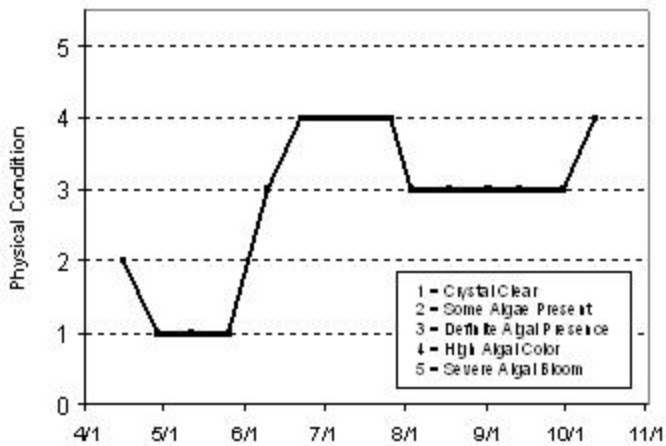






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	10.2				98	164.0		0.7	2	2
4/28/04	12.5		9.2		2.2	89.0	256.0	4.2	1	1
5/11/04	17.1	7.1	8	0	1.9	92.0	507.0	5.5	1	1
5/25/04	15.6	8.6	6.86	0.1	2.5	130.0	368.0	4.0	1	1
6/9/04	19.3	8.4	8.7	0.1	13	150.0	673.0	2.2	3	2
6/22/04	20.2	9.6	9	0.1	26	134.0	784.0		4	4
7/7/04	21.4	9.8	12.5	0.1	85	121.0	136.0	1.1	4	3
7/26/04	24.7	9.5	9.64	0.1	33	92.0	1130.0		4	4
8/3/04	25.4	9.6	12.7	0.1	64	82.0	1350.0	0.9	3	3
8/17/04	22	9.6	10.1	0.1	66	123.0		0.5	3	4
9/1/04	22.9	10.7	11.92	0.1	48	84.0		0.7	3	3
9/13/04	21.6	14.9	8.4	0.1	31	87.0			3	3
9/30/04	18.1	12.5	9.1	0.1	57	76.0		0.7	3	2
10/12/04	14.9	10	14.5	0.1	84	89.0	1080.0	0.8	4	4

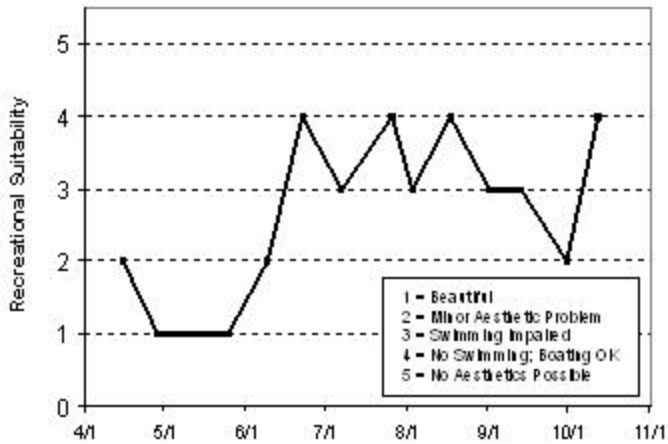


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus						D						D
Chlorophyll a						F						D
Secchi Depth						D						C
Overall						D						D

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		D						C	C	D	D	D	D
Chlorophyll a		C						B	C	D	C	D	C
Secchi Depth		D						C	C	F	C	B	C
Overall		D						C	C	D	C	C	C

Source: Metropolitan Council and STORET data



Riley Lake (10-0002) *City of Chanhassen*

While Riley Lake has previously been monitored by Council staff, 2004 marks the second year the lake has been monitored through CAMP. Riley Lake, with a surface area of 297 acres (2.9 miles in circumference), is located with the cities of Chanhassen and Eden Prairie (Carver and Hennepin counties). The maximum and mean depths of the lake are 15.0 and 6.6 m (49 and 21.6 feet), respectively. Roughly 34 percent of the lake's surface area is considered littoral zone (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). The approximate volume of the lake is 6,429 ac-ft.

The lake has a 4,796-acre immediate watershed, which translates to a watershed-to-lake area ratio of 16:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff). Public access is possible on the southeasternern end of the lake. The lake is considered a "Priority Lake" due to its multi-recreational uses. Eurasian Water Milfoil (*Myriophyllum spicatum*) [EWM] has been reported on the lake.

In 2004, Riley Lake was monitored 15 times from late-April to mid-October. On each outing, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

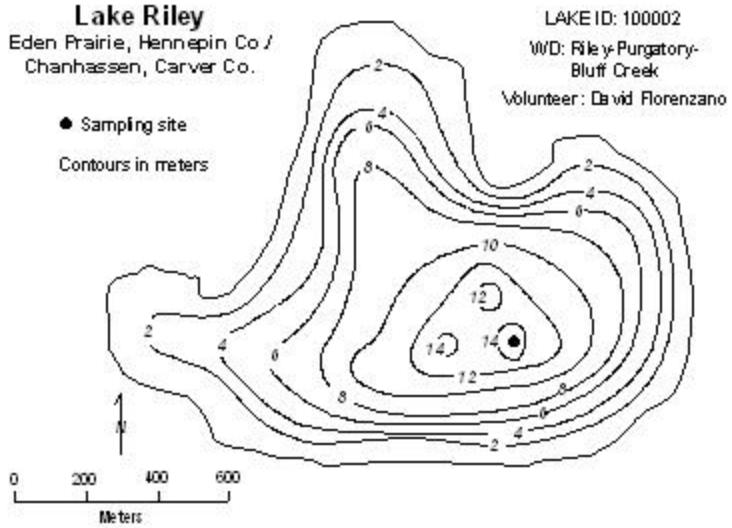
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	44.3	17.0	141.0	C
CLA (µg/l)	25.6	1.9	89.0	C
Secchi (m)	2.4	1.1	6.0	B
TKN (mg/l)	1.05	0.51	2.20	
			Overall Grade	C

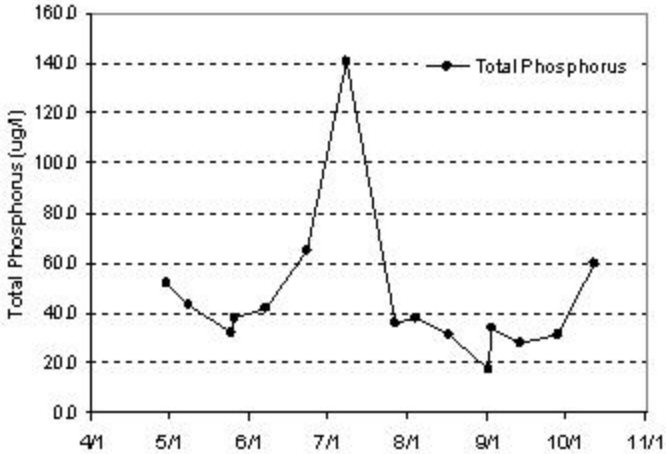
The lake's 2004 overall grade of C is identical to those recorded in each of the past years of monitoring. Therefore, the lake seems well represent by an overall grade of C. When looking at the lake's 2004 individual means, however, the water clarity mean was the best recorded to date, while the TP and CLA means were near their best.

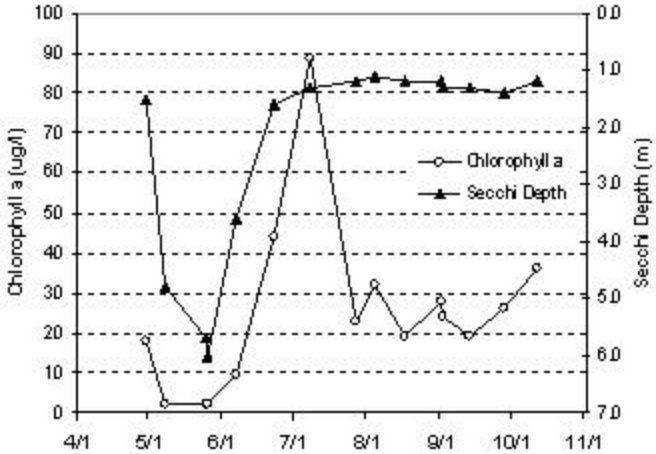
The 2004 average user perception rankings, on a 1-to-5 scale, were 3.5 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 2.5 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

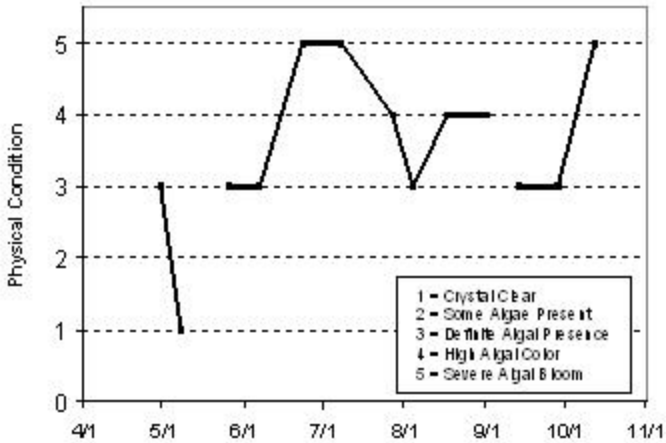






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/30/04	12.6				18	52.0		1.5	3	2
5/6/04	14.1				2	43.0		4.8	1	1
5/25/04	20				2	32.0		5.7		
5/26/04					1.9	38.0		6.0	3	2
6/7/04	21.1				9.7	42.0		3.6	3	3
6/23/04	20.8				44	65.0		1.6	5	4
7/6/04	22.4				89	141.0		1.3	5	3
7/27/04	24.9				23	36.0		1.2	4	2
8/4/04	24.4				32	38.0		1.1	3	2
8/17/04	21.2				19	31.0		1.2	4	2
9/1/04	23.3				28	17.0		1.2	4	3
9/2/04	22				24	34.0		1.3		
9/13/04	21.4				19	28.0		1.3	3	2
9/28/04	19.6				26	31.0		1.4	3	3
10/12/04	16.3				36	60.0		1.2	5	3

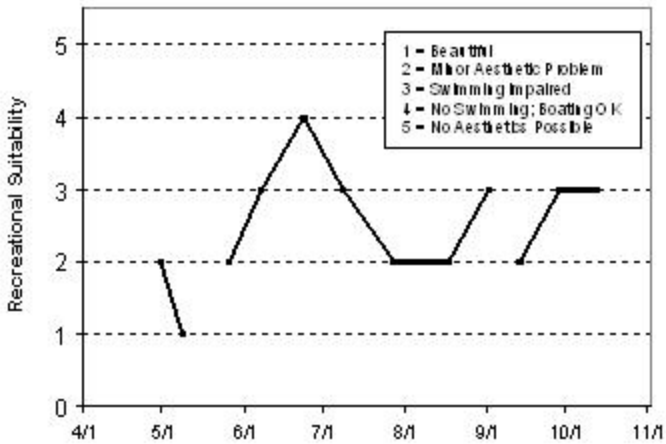


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	C	B	C	C	C	C	C	C				C
Chlorophyll a	C	C	C	C	C	C	C	D			C	C
Secchi Depth	C	C	C	C	C	C	C	C	C		C	C
Overall	C	C	C	C	C	C	C	C				C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C				C			C		C	C	C
Chlorophyll a		C				C			C		C	D	C
Secchi Depth		C				C			C		C	C	B
Overall		C				C			C		C	C	C

Source: Metropolitan Council and STORET data



Sand Lake (82-0067) *Marine on St. Croix Watershed Management Organization*

Sand Lake is a 46-acre lake located within New Scandia Township (Washington County). The lake has a surface area of 46 acres (1.8 miles in circumference) and a mean and maximum depth of 2.4 m (8 feet) and 5.5 m (18 feet), respectively. The lake, which has two inlets has an approximate volume of 368 ac-ft. Approximately 46 percent of the lake's surface area is considered littoral, the shallow (0-15 foot) area dominated by aquatic vegetation.

This was the seventh year that Sand Lake has been involved in CAMP (the lake was previously enrolled in 1993-1996 and 2002-2003). The 1993-1996 and 2002-2003 CAMP data were the only historic water quality data found for the lake. In 2004, the lake was monitored seven times from late-April to mid-October. During each event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	29.2	20.0	42.0	B
CLA (µg/l)	15.7	1.8	35.0	B
Secchi (m)	2.1	1.2	2.7	C
TKN (mg/l)	0.74	0.53	0.96	
			Overall Grade	B

The lake's 2004 overall grade is the best to date. The lake rececieved overall grades of C from 1993-1996 and 2002-2003. The lake's worst water quality was recorded in 1993.

The perceived conditions of the lake (both physical and recreational) were ranked on a 1-to-5 scale by the volunteer monitors. These user perception rankings are shown on the lake's information sheet. The mean physical condition ranking was 2.8 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.0 (between 2- "minor aesthetic problem").

Limited amount of water quality data exists for Sand Lake. The database consists of seven years of CAMP monitoring information for 1993-1996, and 2002-2004. Because of its limited water quality database, the determination of any long-term trends is not possible. In the short-term however, it seems apparent that the lake's water quality has remained fairly constant since 1993 continually receiving overall grades of C (until the improving grade of B in 2004).

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

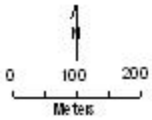
Sand Lake

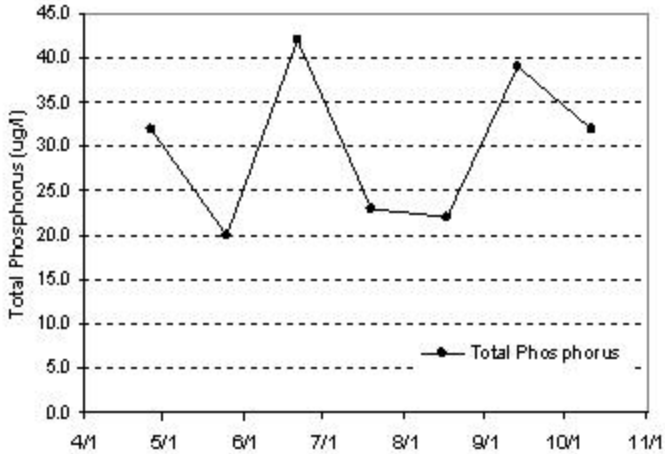
New Scandia Twp., Washington Co.

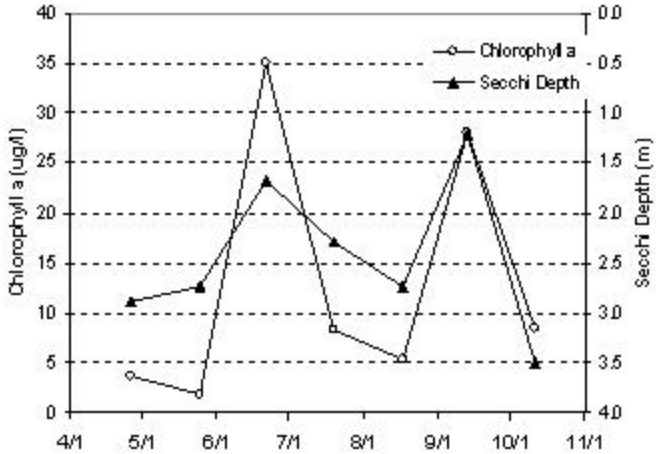
Lake ID: 820067
WMO: Marine-on-St. Croix
Volunteer: Wash. Co. SWCD

Sampling site

Contours in meters

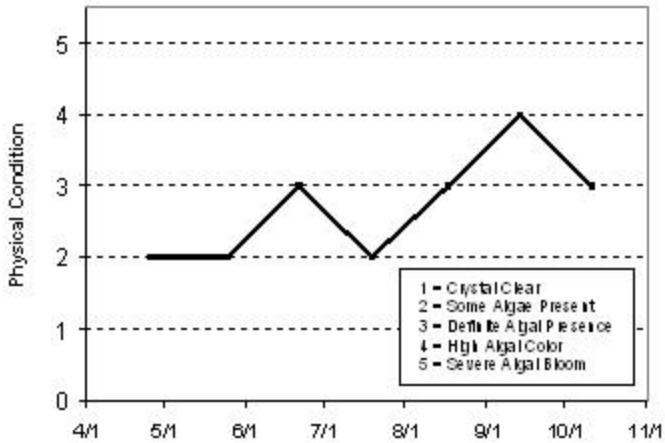






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	12.1	9.1	9.3	0.04	3.7	32.0		2.9	2	2
5/25/04	15.5	14.2	7.5	1.52	1.8	20.0		2.7	2	2
6/21/04	22	14	8.07	0.13	35	42.0		1.7	3	2
7/19/04	25.8	14.7	7.49	0.36	8.3	23.0		2.3	2	2
8/17/04	21.1	16.4	7.59	0.2	5.3	22.0		2.7	3	2
9/13/04	21.3	17.5	7.18	0.19	28	39.0		1.2	4	2
10/11/04	15.1	14.3	7.18	0.1	8.5	32.0		3.5	3	2

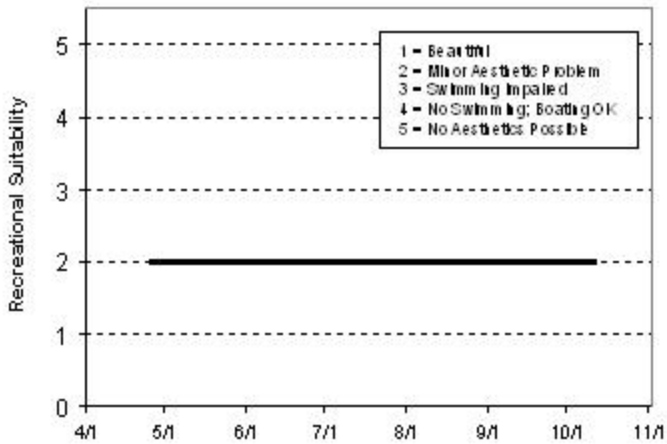


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C	C	C	C						C	C	B
Chlorophyll a		C	C	B	C						B	C	B
Secchi Depth		D	D	C	C						C	C	C
Overall		C	C	C	C						C	C	B

Source: Metropolitan Council and STORET data



Schmidt Lake (27-0102) *Shingle Creek Watershed Management Commission*

This was the fifth year that the 47-acre lake has been enrolled in CAMP. In fact, a search through Metropolitan Council and STORET databases indicated that the only other year besides 1995, 1998, 2000-2001 and 2004 (CAMP data) for which data are available was 1994, when Secchi transparencies were taken as part of the MPCA's volunteer lake monitoring program.

The land uses within the lake's 190-acre immediate watershed are 77 percent low density residential and 23 percent wetland/water. The lake's watershed area to surface area ratio is 4:1. An area of concern and need for future management is the recent detection of Eurasian Water Milfoil (*Myriophyllum spicatum*) in the lake.

In an attempt to reduce the lake's algal population and improve the lak's water quality, an experimental bacterial treatment took place on Schmidt Lake in 2004.

Schmidt Lake was monitored 14 times between mid-April and early-October, 2004. During each event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The data and related graphs are presented on the information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	39.5	23.0	52.0	C
CLA (µg/l)	12.1	2.1	33.0	B
Secchi (m)	1.8	1.0	26	C
TKN (mg/l)	0.74	0.35	1.00	
			Overall Grade	C

While the lakes overall grade for 2004 of C is identical to those for 1995, 1998, and 2000-2001, the individual pararmeter means indicate that the 2004 water quality was the seconded best on record. The best water quality was recorded in 1995, while the worst was 2001.

Throughout the monitoring period, the volunteers ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The resulting user perception rankings are shown on the information sheet. The mean physical condition ranking was 2.4(between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.3 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

Because of the limited size of the database (just Secchi data in 1994, and CAMP data in 1995, 1998, 2000-2001, and 2004), no long- or short-term trends can realistically be determined. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed. In the very short-term however, the lake's current condition seems to be well represented by an overall lake water quality grade of C.

The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MNDNR 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

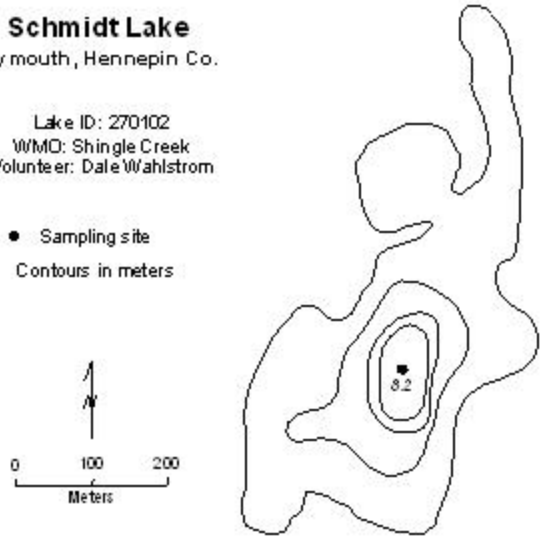
Schmidt Lake

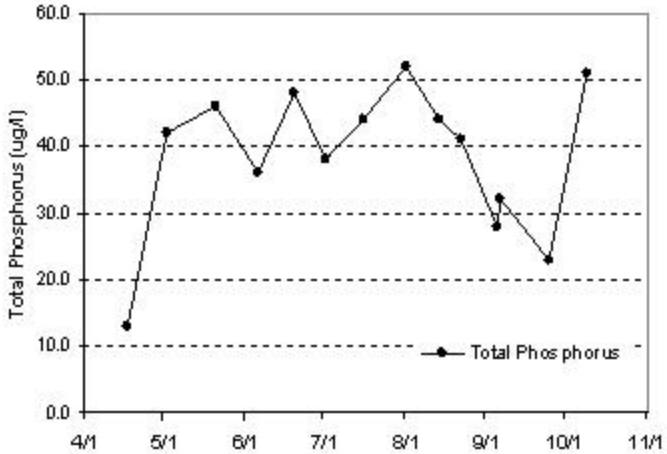
Plymouth, Hennepin Co.

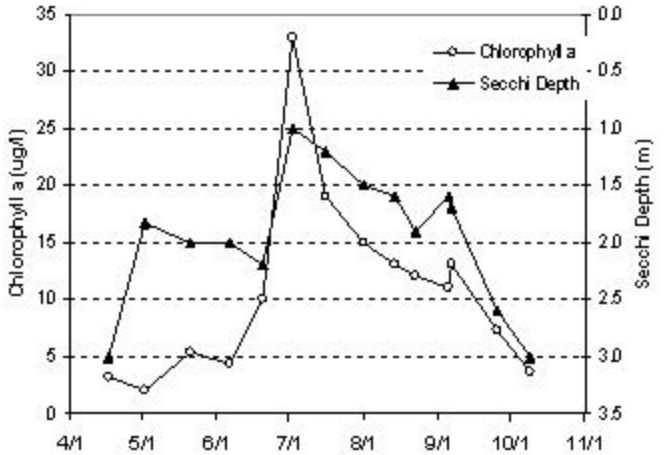
Lake ID: 270102
WMO: Shingle Creek
Volunteer: Dale Wahlstrom

● Sampling site

Contours in meters

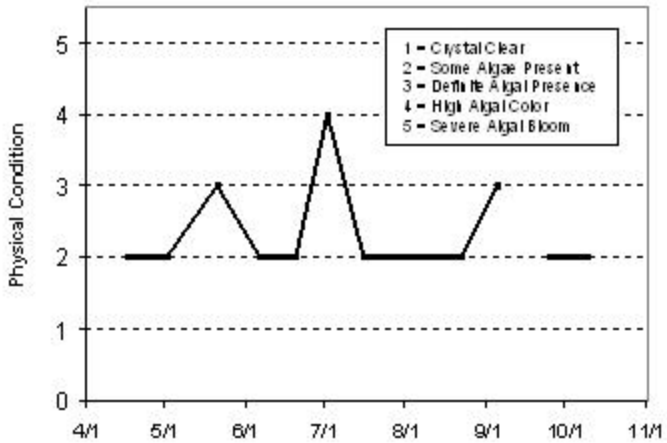






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/17/04	12.5				3.2	13.0		3.0	2	1
5/2/04	16.9				2.1	42.0		1.8	2	2
5/21/04	20.9				5.4	46.0		2.0	3	3
6/6/04	22.1				4.3	36.0		2.0	2	2
6/20/04	22.4				10	48.0		2.2	2	2
7/2/04	25.3				33	38.0		1.0	4	4
7/16/04	27.7				19	44.0		1.2	2	2
8/1/04					15	52.0		1.5	2	2
8/14/04	22				13	44.0		1.6	2	2
8/22/04	21.4				12	41.0		1.9	2	1
9/5/04	23.8				11	28.0		1.6	3	3
9/6/04	24				13	32.0		1.7		
9/25/04	21				7.3	23.0		2.6	2	2
10/9/04	17.8				3.7	51.0		3.0	2	2

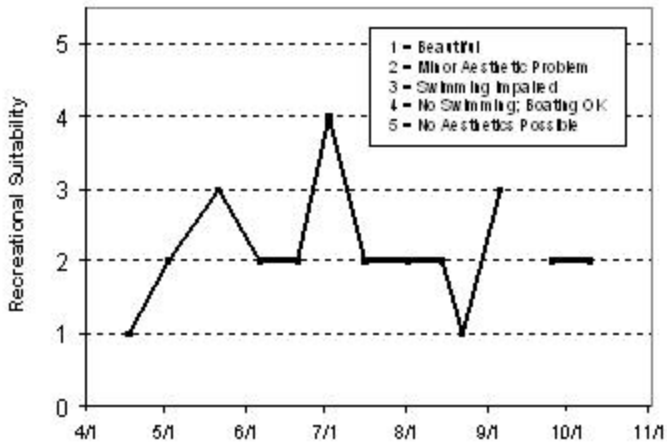


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				C			C		C	C			C
Chlorophyll a				B			C		C	C			B
Secchi Depth			C	C			C		C	D			C
Overall				C			C		C	C			C

Source: Metropolitan Council and STORET data



Schroeder's Pond (82-0301) *Carnelian - Marine Watershed District*

Schroeder's Pond is a small land-locked lake located within May Township (Washington County). The maximum depth of the lake is 3.0 m (roughly 10 feet). Because of the shallowness of the lake, the entire area is considered littoral zone (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

This was the first year that Schroeder's Pond has been involved in CAMP. On each of the sampling days the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The lake was monitored 14 times between mid-April and mid-October, 2004.

The following are the averages for each of the parameters tested.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	49.7	37.0	64.0	C
CLA (µg/l)	6.8	2.6	15.0	A
Secchi (m)	2.1	1.2	2.6	C
TKN (mg/l)	0.71	0.54	1.20	
			Overall Grade	B

Other than for the 2004 CAMP data, there are no known water quality data available for Schroeder's Pond. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 2.0 for physical condition (2- "some algae present"), and 2.2 for recreational suitability (between 2- "minor aesthetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

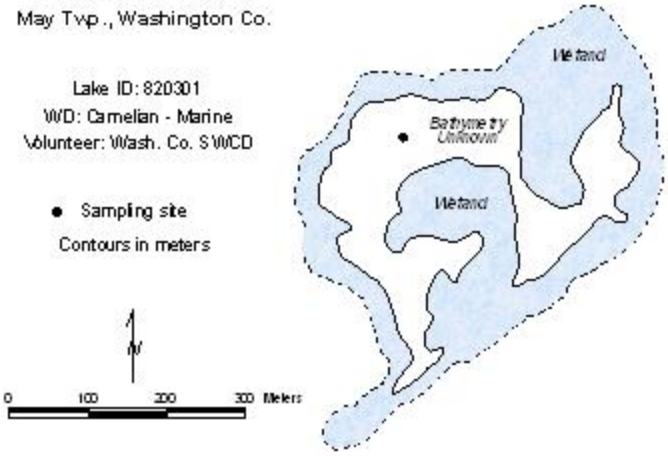
Schroeder's Pond

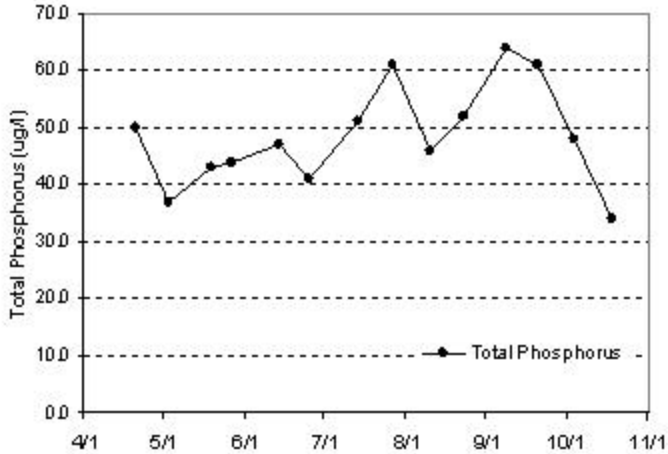
May Twp., Washington Co.

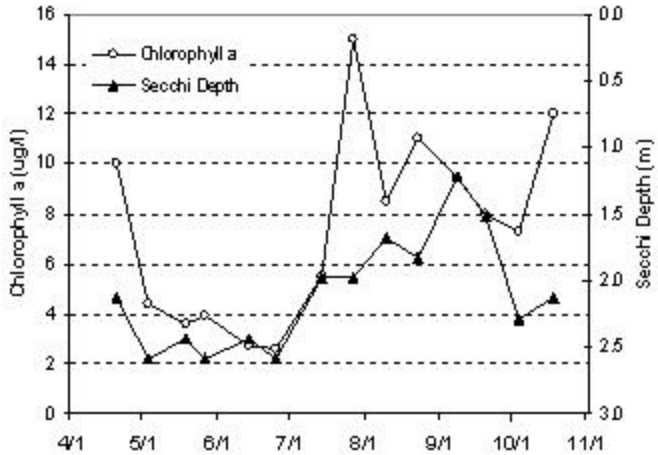
Lake ID: 820301
WD: Carnelian - Marine
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

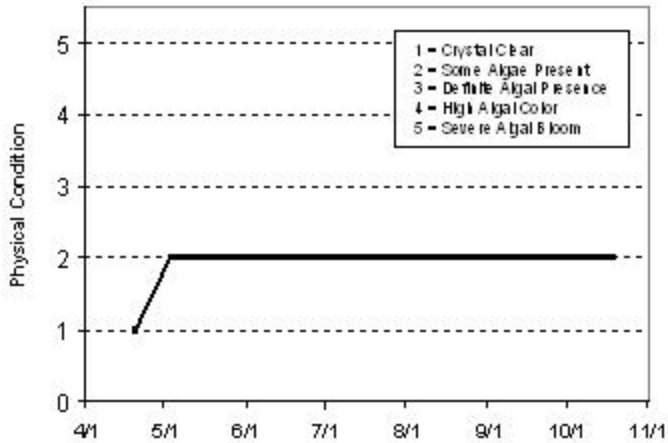






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	13.7	10.1	6.25	0.09	10	50.0		2.1	1	2
5/3/04	13	10.9	7.6	2.3	4.4	37.0		2.6	2	2
5/19/04	18.4	12.3	6.64	1.67	3.6	43.0		2.4	2	3
5/27/04	16.5	12	7	0.99	3.9	44.0		2.6	2	2
6/14/04	22.7	13.8	5.31	0.14	2.7	47.0		2.4	2	2
6/25/04	17.8	15.3	8.14	0.25	2.6	41.0		2.6	2	2
7/14/04	27.1	15	8.82	0.2	5.5	51.0		2.0	2	
7/27/04	20.5	15.6	3.56	0.24	15	61.0		2.0	2	
8/10/04	18.4	15	1.68	0.39	8.5	46.0		1.7	2	
8/23/04	16.8	13.8	4.08	0.19	11	52.0		1.8	2	
9/8/04	18.4	15.1	1.53	0.31	9.4	64.0		1.2	2	
9/20/04	17.9	15	2.21	0.21	8	61.0		1.5	2	
10/4/04	10.4	10.7	2.24	0.61	7.3	48.0		2.3	2	3
10/18/04	6.9	6.2	4.46	4.38	12	34.0		2.1	2	3

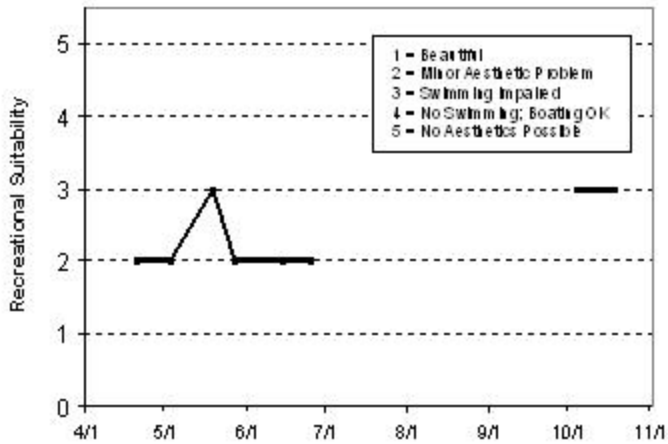


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													C
Chlorophyll a													A
Secchi Depth													C
Overall													B

Source: Metropolitan Council and STORET data



Schutz Lake (10-0018) *Minnehaha Creek Watershed District*

Schutz Lake is a 105-acre lake located within the City of Victoria (Carver County). The maximum and mean depths of the lake are 15.0 m (roughly 49.2 feet) and 6.0 m (19.5 feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 2,100 ac-ft. Approximately 27 percent of the lake's area is considered littoral zone (area of aquatic plant dominance).

The lake's 943-acre immediate watershed and surface area translates to a watershed-to-lake size ratio of 9:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake. An area of concern and need for future management is the presence of Eurasian Water Milfoil (*Myriophyllum spicatum*) in the lake. The MNDNR has been conducting a 2001-2003 study on the use of a herbicide (fluridone) for selective control of EWM on Schutz Lake (as well as five other area lakes). While the draft results of the study seem to indicate that the fluridone treatment completely controlled the EWM (immediately after treatment in mid-summer 2002 through 2003), the abundance of native submersed vegetation also declined dramatically (MNDNR 2004). On the flip side, however, the frequency of curly-leaf pondweed increased (MNDNR 2004)

This was the fifth year that Schutz Lake has been involved in CAMP (the lake was also monitored by Council staff back in 1984). Other than the 1984 and 2000-2004 data, a search through the STORET nationwide water quality database solely includes Secchi data (1981-1988 and 1990-1991). Thus, 1984 and 2000-2004 are the only years of available nutrient data.

The lake was monitored nine times from mid-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	49.2	22.0	107.0	C
CLA (µg/l)	25.5	15.0	34.0	C
Secchi (m)	1.3	0.8	1.5	C
TKN (mg/l)	0.94	0.62	1.30	
			Overall Grade	C

The lakes 2004 overall grade is identical to that recorded in 2003 and worse than the C's recorded in 1984 and 2000-2002.

As mentioned earlier, other then the 1984 and 2000-2003 Council data, the lake's historic database includes Secchi readings from 1981-1988 and 1990-1991. The lake does not seem to show any long-term water clarity trends and seems to be represented with a water quality grade of C. There is limited TP and CLA data available however, and to better understand the lake's TP and CLA conditions and to determine any possible trends, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.2 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 1.3 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Schutz Lake

Victoria, Carver Co.

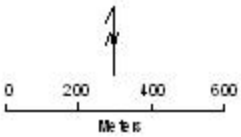
Lake ID: 100018

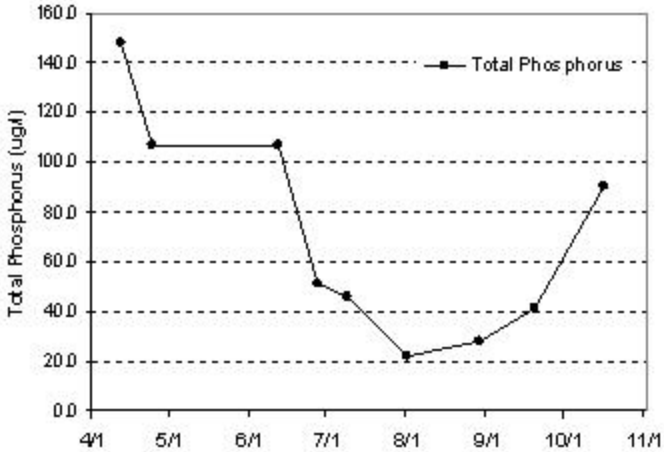
WD: Minnehaha Creek

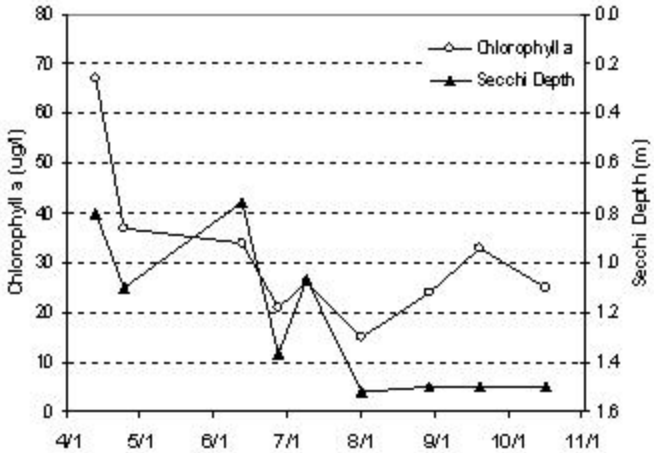
Volunteer: Mike Shouldice

● Sampling site

Contours in meters

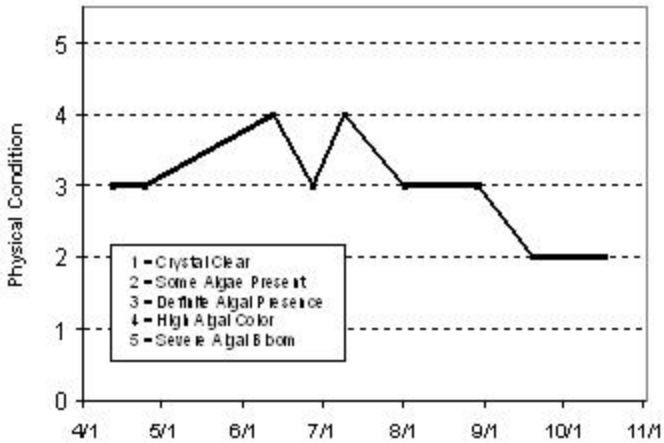






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/12/04	5.6				67	148.0		0.8	3	1
4/24/04	11.2				37	107.0		1.1	3	1
6/12/04	24.6				34	107.0		0.8	4	3
6/27/04	19.6				21	51.0		1.4	3	1
7/9/04	24.6				26	46.0		1.1	4	1
8/1/04	25.2				15	22.0		1.5	3	1
8/29/04	20.2				24	28.0		1.5	3	1
9/19/04	21.3				33	41.0		1.5	2	1
10/16/04	10.1				25	90.0		1.5	2	1

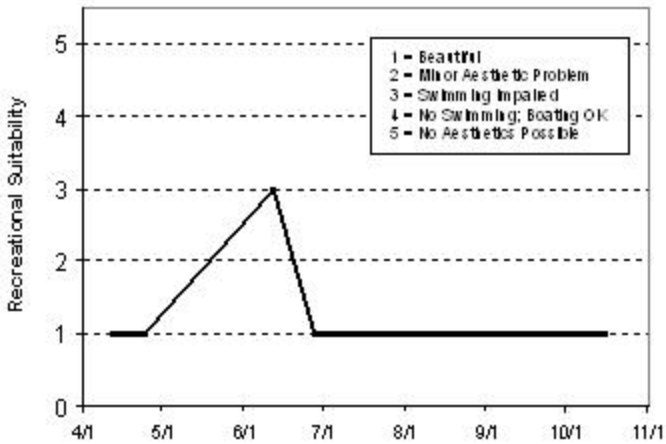


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					C							
Chlorophyll a					A							
Secchi Depth		C	C	C	C		C	C	C		C	D
Overall					B							

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									B	B	B	C	C
Chlorophyll a									A	B	B	B	C
Secchi Depth									C	C	B	C	C
Overall									B	B	B	C	C

Source: Metropolitan Council and STORET data



Seidl Lake (19-0095) Cities of ***Inver Grove Heights and South St. Paul***

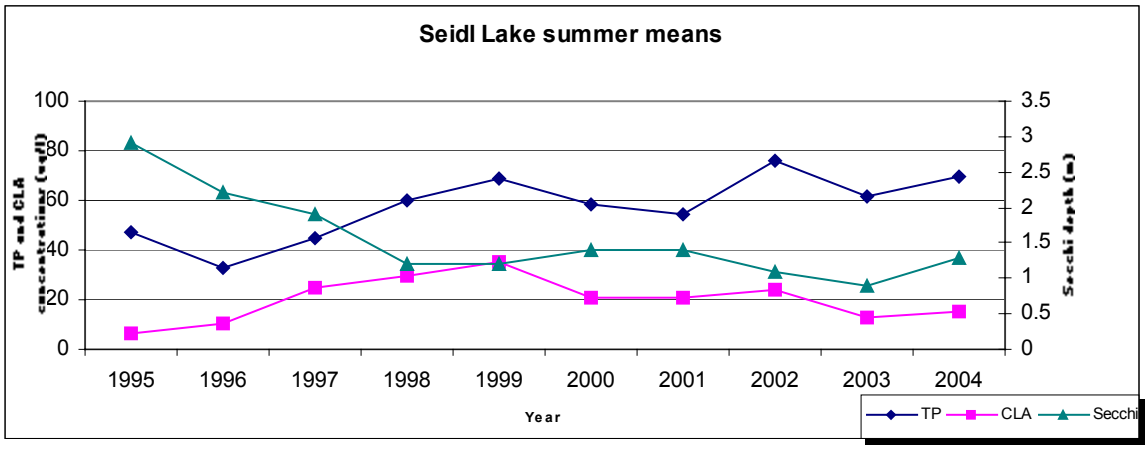
Seidl Lake is a 14-acre lake located in the City of Inver Grove Heights (Dakota County) which receives inflow from five inlets. Other than the fact that the maximum depth of the lake is approximately 5.0 m (17 feet), there is very little known morphological data available. The lake has been enrolled in CAMP since 1995. In 2004 it was monitored 14 times from mid-April to mid-October. On each sampling date the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	69.9	39.0	191.0	D
CLA (µg/l)	15.6	3.6	25.0	B
Secchi (m)	1.3	0.5	2.0	C
TKN (mg/l)	0.80	0.66	1.00	
			Overall Grade	C

Similar to that reported in past lake reports (and noticed again in 2004), the difference between the TP, CLA and Secchi grades in current and past years (see report grade on the lake's information page), may indicate that suspended sediments may play a large role in the inner workings of the lake. This scenario can be fairly typical for small shallow lakes where wind action and storm sewer inflow either increase the influx of sediments to the system or cause the re-suspension of existing bottom sediments. That is, the suspended sediments influence the lake's phosphorus make-up (a larger portion of the in-lake phosphorus in particulate form rather than a soluble form more readily available for algal uptake), reduce water clarity, and could actually be limiting the amount of light available for algal growth, thus keeping the CLA concentrations down (resulting in a better than expected grade).

The water quality database for Seidl Lake consists of nutrients and Secchi data in 1991, Secchi data in 1993-1994, and CAMP data in 1995-2004. While the lake's database is expanding, it is lacking in pre-1995 data. Statistical analysis on the lake's water quality database revealed, no "statistically significant" long-trends are evident. A simple regression on the lake's available water quality data, does reveal a slight decrease in the lakes qualiity. Over this time span, The lake's oveal water quality grades fluctuated between an overall C and low-B grade in 1991-1998, 2000-2001 and 2003, and a low grade of D in 1999 and 2002.



In an attempt to address the lake's possible degradation concerns and watershed influences on said degradation, lake area homeowners have been trying to work with the local communities to address areas of concern to the lake's future management. They are currently working on garnering city involvement and outside funding to further initiate the lake planning/improvement process.

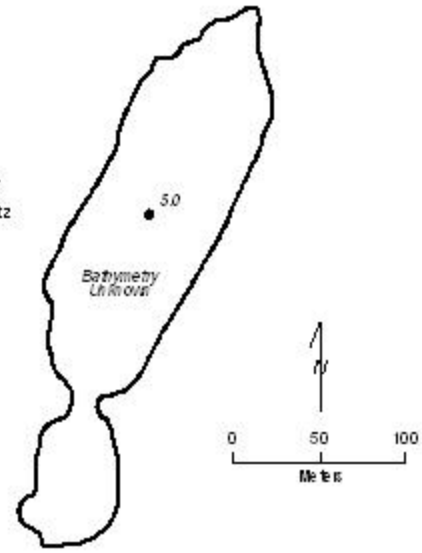
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The summertime mean recorded physical condition was 2.9 (roughly equal to 3- "definite algae present"), while the mean suitability for recreation ranking was 4.0 (4- "no swimming - boating ok").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Seidl Lake

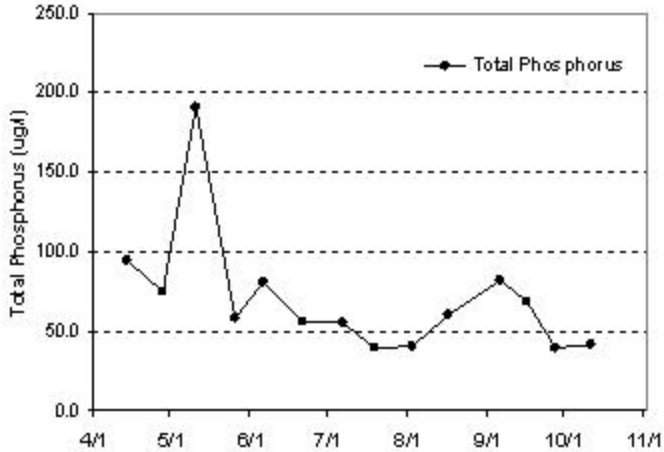
Inver Grove Heights,
Dakota Co.

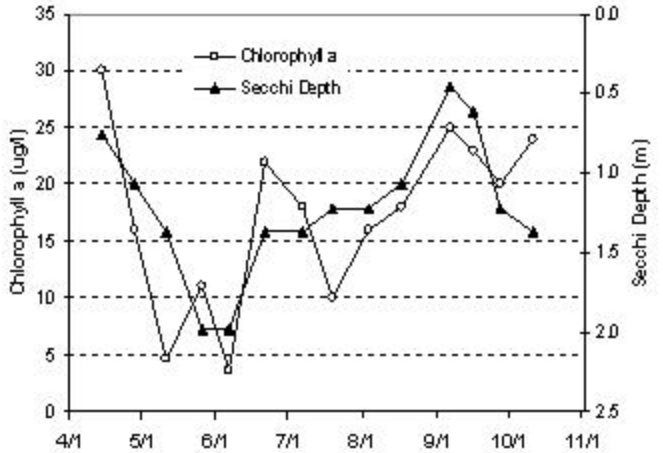
Lake ID: 190095
WMO: Lower Mississippi River
Volunteers: Janet and Harv Bartz



● Sampling site

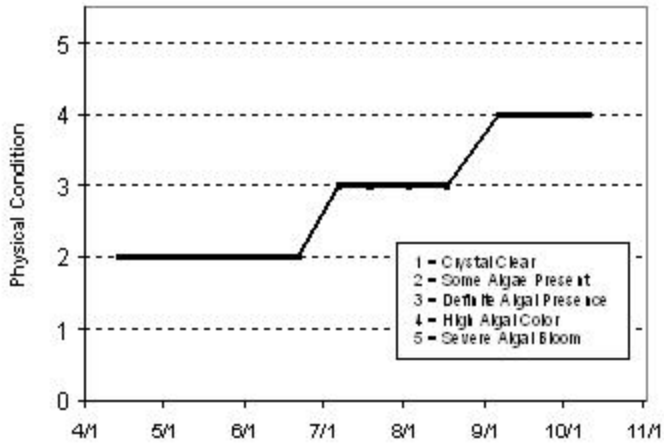
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	13				30	94.0		0.8	2	4
4/28/04	14				16	75.0		1.1	2	4
5/11/04	21				4.6	191.0		1.4	2	4
5/26/04	16				11	58.0		2.0	2	4
6/6/04	21				3.6	81.0		2.0	2	4
6/21/04	22				22	56.0		1.4	2	4
7/7/04	23				18	55.0		1.4	3	4
7/19/04	27				10	39.0		1.2	3	4
8/3/04	26				16	40.0		1.2	3	4
8/17/04	22				18	60.0		1.1	3	4
9/6/04	24				25	82.0		0.5	4	4
9/16/04	22				23	68.0		0.6	4	4
9/27/04	21				20	39.0		1.2	4	4
10/11/04	15				24	42.0		1.4	4	4

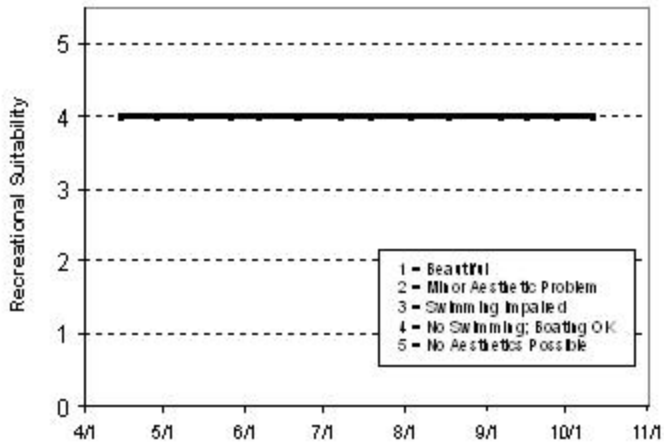


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												C
Chlorophyll a												C
Secchi Depth												D
Overall												C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				C	C	C	C	D	C	C	D	C	D
Chlorophyll a				A	B	B	C	C	C	C	C	B	B
Secchi Depth		D	D	B	B	C	D	D	C	C	D	D	C
Overall				B	B	C	C	D	C	C	D	C	C

Source: Metropolitan Council and STORET data



Shields Lake (82-0162) *Comfort Lake-Forest Lake Watershed District*

Shields Lake is located in the City of Forest Lake in Washington County. The lake has a surface area of 27 acres (0.8 miles in circumference) and a maximum depth of 8.2 m (27 feet). About 85 percent of the lake's area is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation.

Shields Lake has been involved in CAMP since 1993. The lake was monitored 14 times between late-April and late-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	199.5	64.0	362.0	F
CLA (µg/l)	41.0	3.9	130.0	C
Secchi (m)	1.4	0.5	3.5	C
TKN (mg/l)	1.95	1.20	2.60	
			Overall Grade	D

The lake's worst water quality was recorded in 1999, 2002 and 2003, while the best water quality year was 1997. Nineteen hundred and ninety-seven, had a TP mean of 159.0 µg/l, CLA mean of 7.0 µg/l, and a Secchi mean of 2.8 m (which resulted in individual grades of F, A, and B, for an overall grade of C).

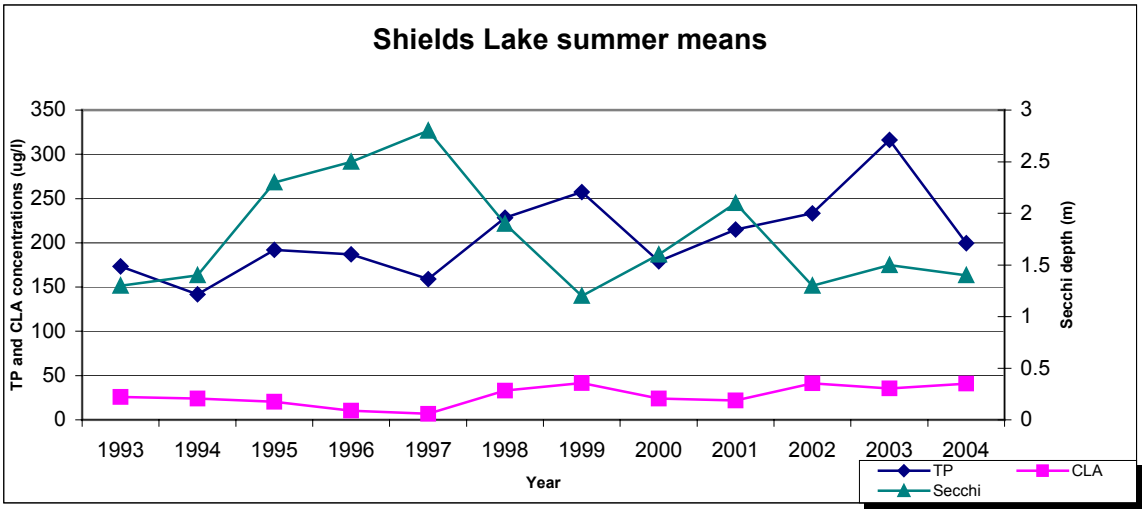
Typical of what has been shown in past years, the lake's CLA and water clarity conditions are better than expected due to very high TP concentrations. Generally such elevated TP concentrations would result in an equal increase in CLA and decrease in water clarity. A reason for this scenario continues to be the biomanipulation project undertaken on the lake in 1994. As part of the project, rotenone (a piscicide) was used to eliminate the lake's large population of roughfish in order to allow a more dense and diverse macrophyte population. This project switched the lake from being phytoplankton (algae) dominant to being macrophyte dominant. The result has been a very desirable littoral macrophtye population, which filters sediments from the water column (reducing turbidity) and acts a refuge for zooplankton. Zooplankton are beneficial to the water quality of the lake because they graze on the lake's algal population, thus reducing CLA and increasing water clarity.

The Shield Lake water quality database includes thirteen years (1991, 1993-2004) of TP, CLA, and Secchi transparency data are available to calculate annual grades. Overall grades were C in 1991, and 1994-1997, D in 1993 and 1998-2004. Additional data found for 1988-1989 had only TP and CLA concentrations, and 1990 had only Secchi depth information.

A quick look at the lake's database seems to show that the its TP concentrations have remained consistently high (between D and F). The CLA and Secchi numbers, which improved slightly after the biomanipulation of 1994, degraded in 1998 and 1999 and, until 2002-2004, had shown some improvement in 2000-2001. However, because of the absence of historic data and the great variability of existing data, statistically accurate long-trend analysis is difficult. To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

While the lake's CLA concentrations (corresponding to algal abundance) and Secchi transparencies had shown some improvement in 2000-2001, the recent 2002-2004 data show conditions similar to those of 1998-1999. It was mentioned in the 1998 and 1999 lake reports that TP, CLA, and Secchi transparency conditions in 1998 were similar to that of 1994 and 1995 until early-July, and after the big storms (extreme winds, heavy rains) of late-June, when the lake started to experience below normal water quality conditions. It was further mentioned that, during the July 7, 1998 monitoring event 12 dead turtles were seen at the lake's inlet, no "freshwater shrimp" (zooplankton) were seen in the water samples, and the lake had no oxygen in the water below one meter (approximately three feet). At this point the lake's TP concentrations rose, but more abnormally, the lake's CLA and Secchi readings dramatically worsened. The lake's CLA and Secchi readings did not start to rebound until again until late-September of that year.

It is thought that the 1998 storms started the degradation of the lake's water quality by increasing runoff from the surrounding watershed, and riling up the lake's sediments. This potentially resulted in an increased TP and sediment load to the lake, increasing turbidity, TP concentrations, algal populations, and reducing water clarity and in-lake oxygen levels (Anhorn 1999).



The perceived physical and recreational conditions of the lake, recorded by the volunteer(s), were ranked on a 1-to-5 scale. The rankings are shown in both tabular and graphical form on the lake's associated information sheet. The mean physical condition ranking was 3.3 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.4 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Shields Lake

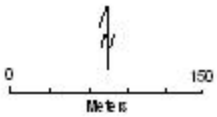
Forest Lake,
Washington Co.

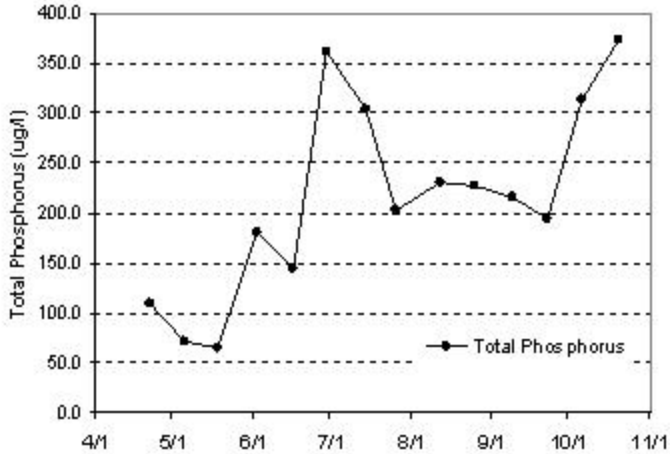
Lake ID: 820162

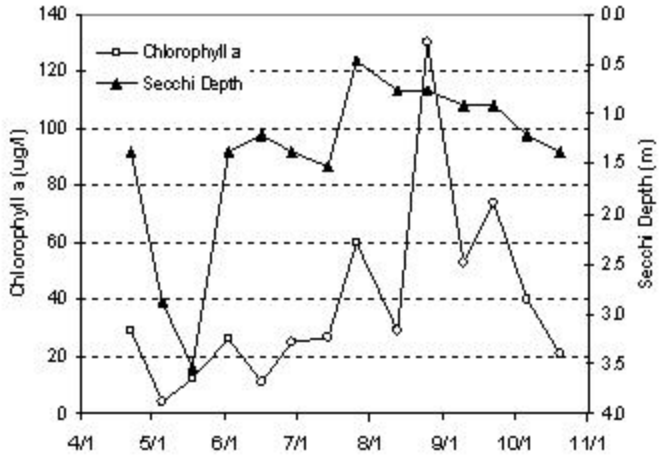
WMO: Comfort Lake - Forest Lake
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

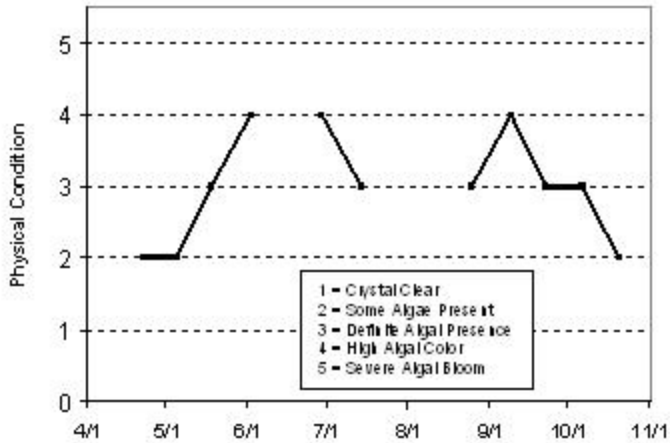






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/22/04	12.3	4.6	11.6	0.25	29	110.0		1.4	2	2
5/5/04	13	4.9	10.3	0.04	3.9	72.0		2.9	2	4
5/18/04	16.4	5.8	9.8	0.03	12	64.0		3.5	3	5
6/2/04	16.5	6.4	9.36	0.05	26	181.0		1.4	4	
6/16/04	21.9	6.8	5.02	0.11	11	145.0		1.2		
6/29/04	21.5	7.3	7.29	0.22	25	362.0		1.4	4	
7/14/04	26	8	5.93	0.2	27	303.0		1.5	3	3
7/26/04	25.8	8.8	13.5	0.31	60	202.0		0.5		
8/12/04	18.9	8.1	9.04	0.26	29	230.0		0.8		
8/25/04	21.6	8.6	8.9	0.06	130	227.0		0.8	3	3
9/9/04	21.3	9.1	4.45	0.23	53	215.0		0.9	4	
9/22/04	20.8	8.9	4.92	0.04	74	194.0		0.9	3	2
10/6/04	13.6	9.2	5.89	0.07	40	314.0		1.2	3	2
10/20/04	9	8.4	4.65	4.02	21	374.0		1.4	2	2

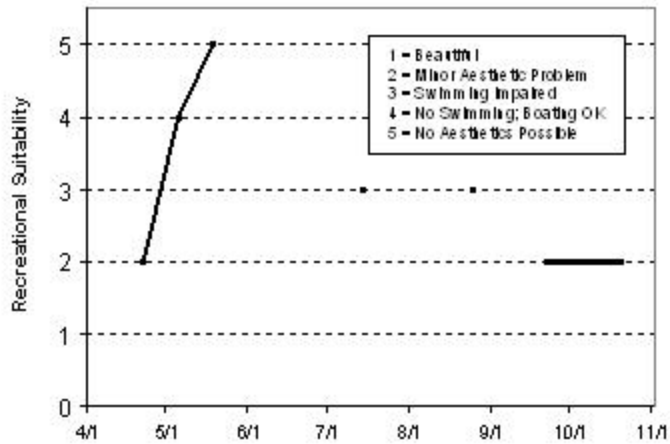


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus									F	D		D
Chlorophyll a									D	D		C
Secchi Depth											F	C
Overall												C

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		F	D	F	F	F	F	F	F	F	F	F	F
Chlorophyll a		C	C	C	B	A	C	C	C	C	C	C	C
Secchi Depth		C	C	B	B	B	C	C	C	C	C	C	C
Overall		D	C	C	C	C	D	D	D	D	D	D	D

Source: Metropolitan Council and STORET data



Silver Lake (82-0016) *Carnelian - Marine Watershed District*

Silver Lake is a 98-acre lake located within Stillwater Township (Washington County). The maximum and mean depths of the lake are 3.4 m (roughly 11 feet) and 1.7 m (five-and-a-half feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 549 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's 455-acre watershed and surface area translates to a watershed-to-lake size ratio of 4.6:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake.

This was the fifth year that Silver Lake has been involved in CAMP (although just Secchi transparenies were collected in three of those years). A search through the STORET nationwide water quality database for data on the lake produced a limited amount of data. The only years in which data were found, other than the 2000-2003 CAMP data, was 1997-1999. The only years of which included TP, CLA and Secchi transparency data were 1997-2000 and 2004.

The lake was monitored seven times between late-April and mid-October 2004. During each event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	29.6	20.0	40.0	B
CLA (µg/l)	8.8	1.3	15.0	A
Secchi (m)	2.2	1.5	2.9	B
TKN (mg/l)	0.66	0.47	0.99	
			Overall Grade	B

The lake's 2004 TP and CLA grades are the best recorded to date. This results in the lake having its best recorded overall water quality (shown as overall grade) in 2004.

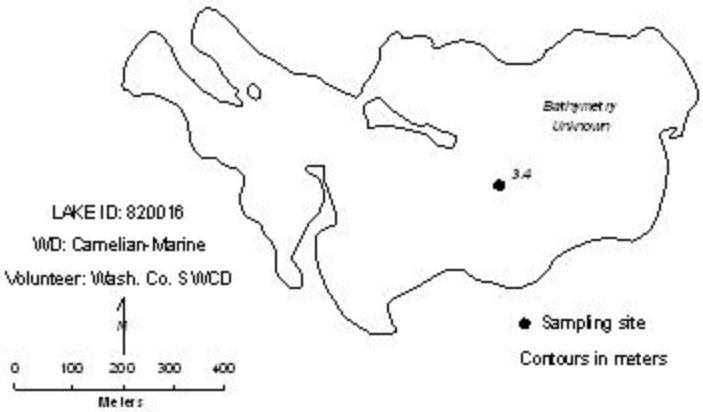
Because of the nature of the lake's water quality database the determination of any statistically significant long-term trend detection is not possible. In the short-term however, the lake's water quality seems to be well represened by an overall grade of C, with an overall grade of D in 1999 and B in 2004. To better understand the lake's overall water quality and where it may be heading, continued monitoring is suggested.

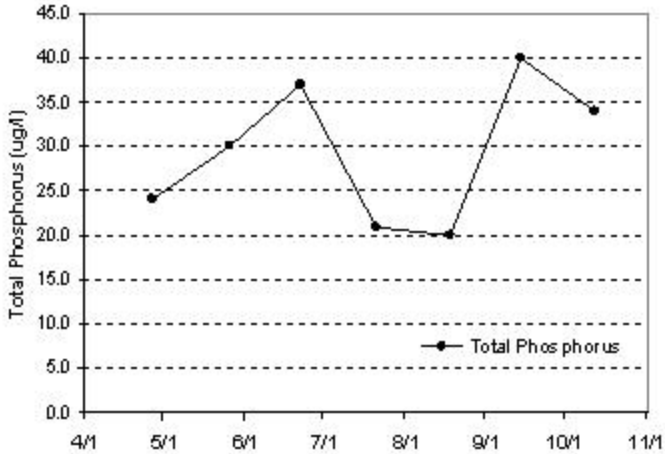
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.4 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 2.2 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

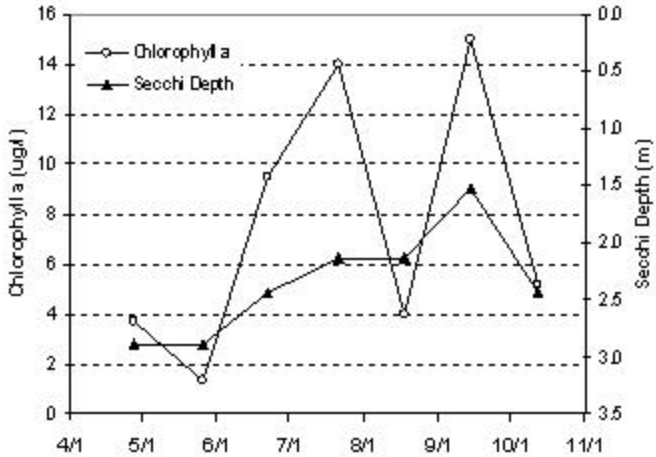
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Silver Lake

Stillwater Twp., Washington Co.

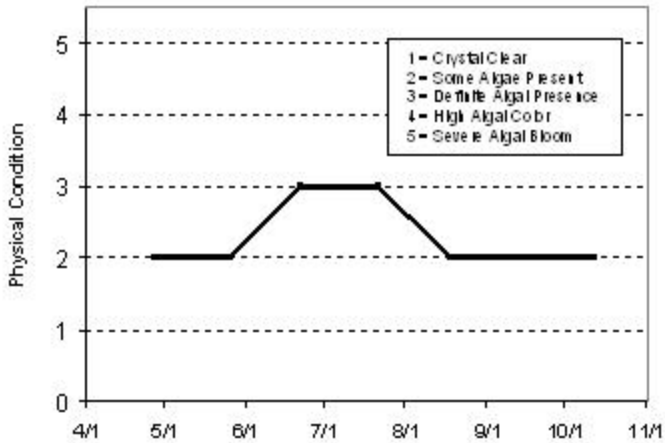






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.6	11.8	9.86	6.5	3.7	24.0		2.9	2	2
5/26/04	16.8	15.6	9.25	3.5	1.3	30.0		2.9	2	2
6/22/04	22.4	19.9	9.55	0.12	9.5	37.0		2.4	3	2
7/21/04	27.4	21.5	8.83	0.17	14	21.0		2.1	3	2
8/18/04	21.7	19.2	8.32	0.17	4	20.0		2.1	2	3
9/14/04	21.6	21.2	5.15	0.37	15	40.0		1.5	2	2
10/12/04	14.6	14.4	6.47	5.34	5.2	34.0		2.4	2	2

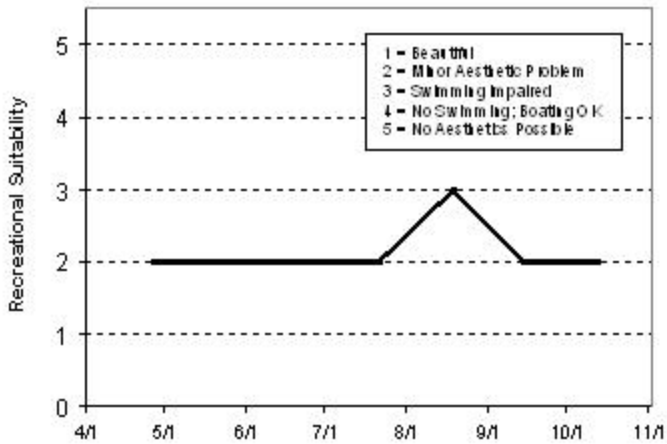


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					C	C	C	D	C	C			B
Chlorophyll a					C	C	C	D	B	B			A
Secchi Depth					C	D	D	D	C	C	C	B	B
Overall					C	C	C	D	C	C			B

Source: Metropolitan Council and STORET data



South Rice Lake (27-0645) *Bassett Creek Watershed Management Organization*

South Rice Lake is a 3.2-acre lake located within the City of Golden Valley (Hennepin County). The maximum and mean depths of the lake are 2.5 m (roughly 8 feet) and 0.5 m (one-and-a-half feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 5.4 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's 63-acre immediate watershed and surface area translates to a watershed-to-lake size ratio of 20:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). When including the lake's whole contributing watershed (including flow from Grimes Pond and North Rice Lake), however, the size increases to 514 acres (160:1) (Barr 1997).

This was the fifth year that South Rice Lake has been involved in CAMP (it was also involved in 2000-2003). Other than the 2000-2004 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. The lake was monitored 14 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	127.6	36.0	202.0	D
CLA (µg/l)	9.1	1.9	28.0	A
Secchi (m)	0.8	0.5	1.2	D
TKN (mg/l)	1.05	0.40	1.90	
			Overall Grade	C

Of the five years of monitoring data available for the lake, it is apparent that the lake experienced its best water quality in 2004 (the worst was recorded in 2000). The lake received overall grades of F in 2000, D in 2001-2003, and C in 2004.

A recent in-lake alum treatment (applied at ice-off in mid-April, 2002) was meant to lower phosphorus levels, control algal growth and improve water clarity. It was reported in the 2002 report that the alum treatment was successful in the reducting of in-lake TP and CLA (indicating a reduction in algal biomass) in 2002. While the lake's 2004 water quality was slightly better than that of 2002, the 2003 water quality was much worse. The 2003 summer mean TP concentration more than doubled those recorded in 2002 and 2004. Additional years of monitoring are needed to truly determine the effectiveness and long-term efficiency of the alum treatment.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.2 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 4.0 for recreational suitability (4- "no swimming - boating ok").

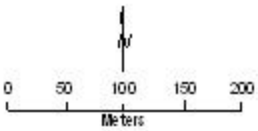
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

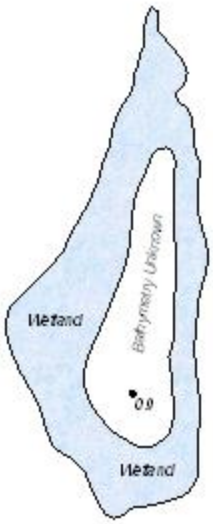
South Rice Pond

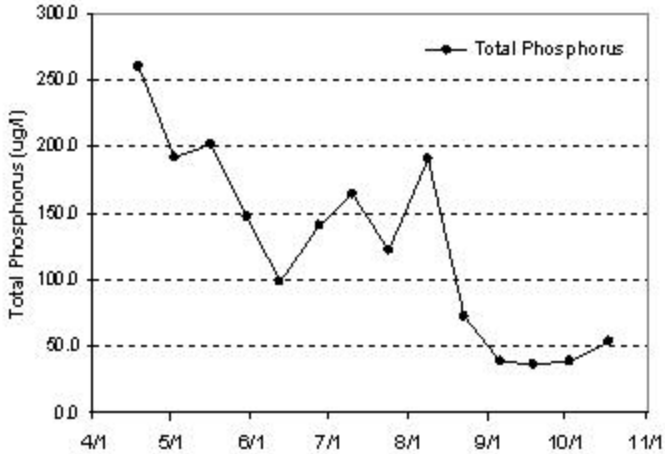
Golden Valley, Robbinsdale,
Hennepin Co.

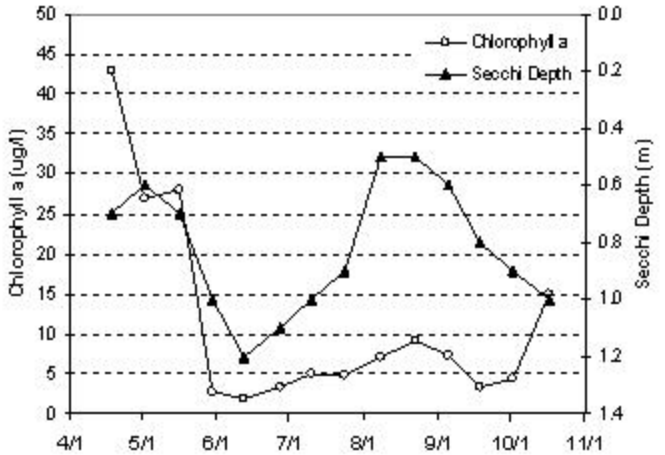
Lake ID: 270645
WMO: Bassett Creek
Volunteer: Steve Streff

• Sampling site
Contours in meters



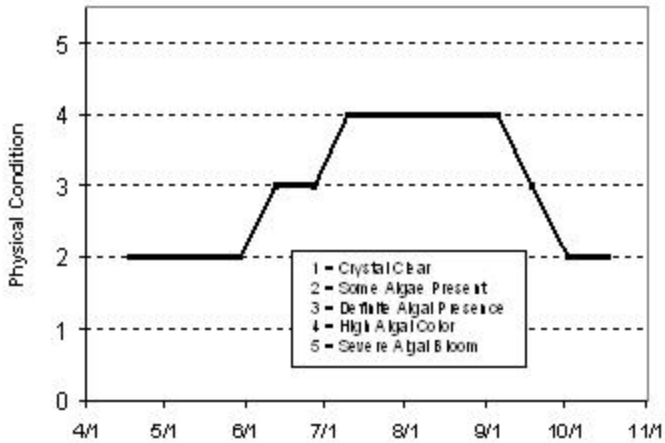






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	18.5				43	260.0		0.7	2	3
5/2/04	15.7				27	192.0		0.6	2	4
5/16/04	16.8				28	202.0		0.7	2	4
5/30/04	17.9				2.8	147.0		1.0	2	4
6/12/04	19				1.9	96.0		1.2	3	4
6/27/04	20.7				3.4	141.0		1.1	3	4
7/10/04	22.4				5	164.0		1.0	4	4
7/24/04	28				4.7	122.0		0.9	4	4
8/8/04	21.8				7	190.0		0.5	4	4
8/22/04	22.4				9.2	72.0		0.5	4	4
9/5/04	26.9				7.3	39.0		0.6	4	4
9/18/04	23				3.4	36.0		0.8	3	4
10/2/04	12.9				4.3	38.0		0.9	2	4
10/17/04	6.7				15	53.0		1.0	2	4

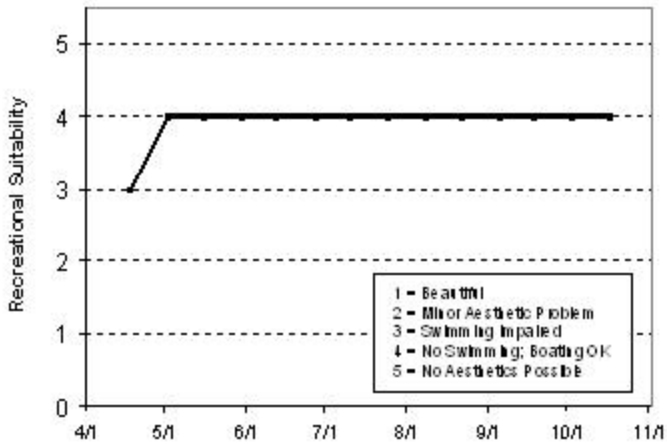


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									F	F	D	F	D
Chlorophyll a									F	B	B	C	A
Secchi Depth									F	F	F	F	D
Overall									F	D	D	D	C

Source: Metropolitan Council and STORET data



South Twin Lake (82-0019) *Carnelian - Marine Watershed District*

South Twin Lake is a 54-acre lake located within Stillwater Township (Washington County). The maximum and mean depths of the lake are 4.0 m (roughly 13 feet) and 2.0 m (six-and-a-half feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 356 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's 63-acre immediate watershed and surface area translates to a very small watershed-to-lake size ratio of 1.2:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake.

This was the fifth year that South Twin Lake has been involved in CAMP (although just Secchi transparenies were collected in two of those years). A search through the STORET nationwide water quality database for data on the lake produced a limited amount of data. The only years in which data were found, other than the 2000-2004 CAMP data, was 1996-1999. The years of which included TP, CLA and Secchi transparency data were 1996-2001 and 2004.

The lake was monitored seven times between late-April and mid-October 2004. During each event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	45.2	34.0	55.0	C
CLA (µg/l)	16.0	4.8	27.0	B
Secchi (m)	1.9	1.2	2.6	C
TKN (mg/l)	1.10	1.00	1.20	
			Overall Grade	C

The lake's 2004 TP and CLA means are the best recorded to date. This results in the lake having its best recorded overall water quality (shown as overall grade) in 2004.

Because of the variability in the lake's water quality database, the determination of any statistically significant long-term trend detection is not possible. In the short-term however, the lake's water quality seems to be well represened by an overall grade of D+/C, with overall grades of F in 1999, D in 1996-1998 and 2001, and C in 2000 and 2004. To better understand the lake's overall water quality and where it may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.7 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 2.7 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

South Twin Lake

Stillwater Twp., Washington Co.

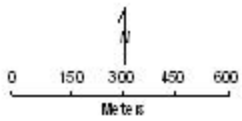
LAKE ID: 820019

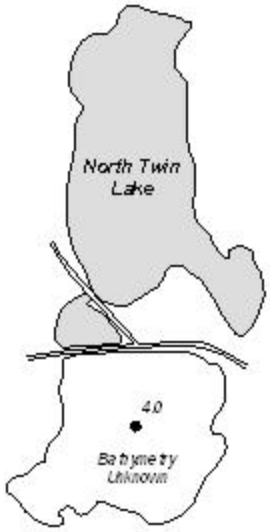
WD: Carnelian-Marine

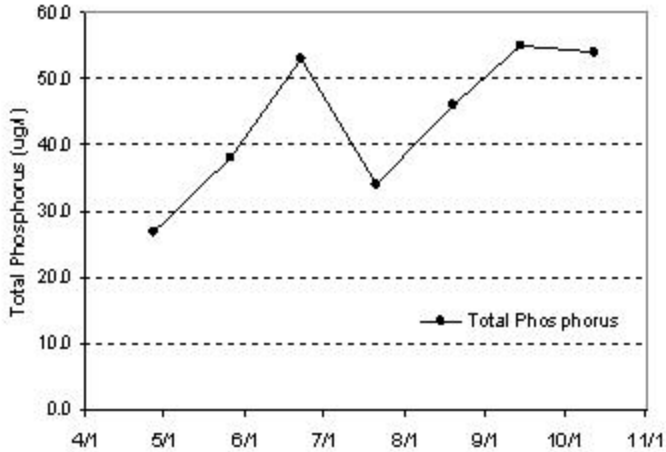
Volunteer: Wash. Co. SWCD

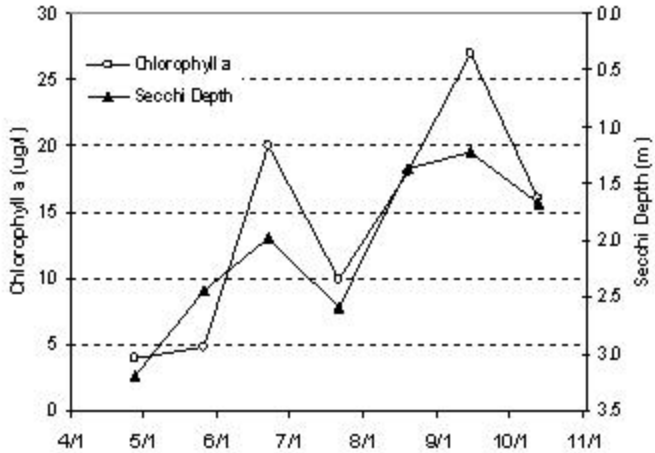
● Sampling site

Contours in meters



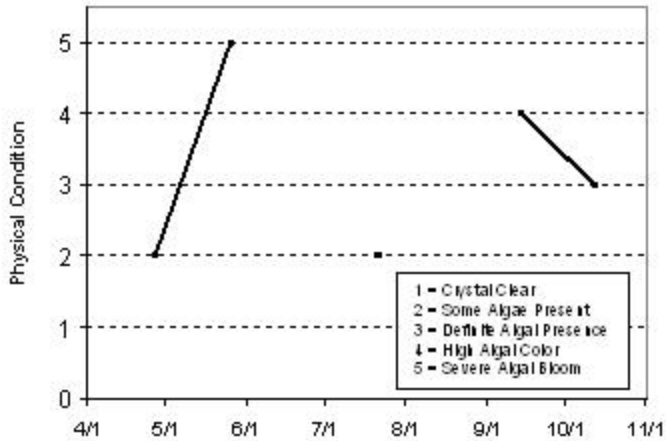






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.8	11.9	9.89	0.08	4	27.0		3.2	2	3
5/26/04	16.9	15.8	9.53	0.03	4.8	38.0		2.4	5	2
6/22/04	21.7	20.7	7.83	0.12	20	53.0		2.0		
7/21/04	27.6	21.4	7.48	0.12	10	34.0		2.6	2	
8/19/04	20.1	20.1	7.07	0.2	18	46.0		1.4		3
9/14/04	21.8	21.4	5.39	0.12	27	55.0		1.2	4	3
10/12/04	14.9	14.1	6.51	0.12	16	54.0		1.7	3	2

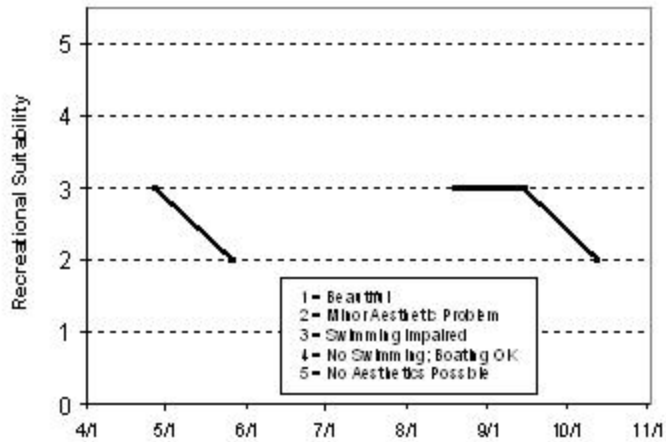


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					C	C	D	D	C	D			C
Chlorophyll a					D	D	D	F	C	D			B
Secchi Depth					D	D	F	F	D	F	D	C	C
Overall					D	D	D	F	C	D			C

Source: Metropolitan Council and STORET data



Spring Lake [Scott County] (70-0054) *Prior Lake - Spring Lake Watershed District*

Spring Lake, located in southeastern Spring Lake Township in Scott County, was monitored 14 times between early-May and mid-October, 2004. The 630-acre lake (5.0 miles in circumference) is considered a "Priority Lake" by the Metropolitan Council because of its multi-recreational uses.

The lake has a large 13,500-acre watershed. The lake and watershed areas translate to a large watershed-to-lake area ratio of 21:1. The larger the ratio, the greater the potential stress on the lake's quality from surface runoff. The majority of the lake's watershed is agricultural.

The maximum and mean depths of the lake are 11.3 and 5.6 m (37 and 18 feet), respectively. About 50 percent of the lake's area is considered littoral (the 0-15 foot depth area dominated by aquatic vegetation). The approximate volume of the lake is approximately 11,500 acre-feet (ac-ft) and a public access to the lake is located on its southwestern shores.

Spring Lake is very fertile, receiving nutrients from runoff and from internal sources. The great fertility causes legendary algal growths. The blue-green algal blooms are a serious nuisance, and purportedly have been the cause of the death of four dogs, which died after drinking the water in 1980.

In an attempt to improve the lake's water quality, a ferric chloride addition system was constructed at the outlet of the Highway 13 wetland in 1998 with continuous operation starting in 1999. The system, which consists of a dosing station at the outlet of the wetland, followed by a desiltation (settling) basin, meters ferric chloride into stormwater to enhance phosphorus removal prior to entering the lake. The ferric chloride removes nutrients from the water column, thereby reducing their availability to algal growth. As the ferric chloride dosed stormwater enters the desiltation basin the ferric chloride rapidly dissociates to form free iron which reacts with soluble phosphorus to form relatively insoluble iron-phosphorus complex (referred to as floc). The desiltation basin then provides an area where the floc can settle out through the water column and can be eventually removed.

The results from the monitoring of the system in 1999 indicate that there is significant reductions in the ortho-phosphorus load (41 percent) and some reduction in the total phosphorus load (21 percent) from the ditch prior to entering the lake (Prior Lake – Spring Lake Watershed District 2001). The watershed district has continued to monitor the effectiveness of the system

While Spring Lake has been monitored by Metropolitan Council staff in the past, 2004 was the sixth year it has been involved in CAMP (the others being 1997 and 2000-2003). On each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	123.3	78.0	191.0	D
CLA (µg/l)	52.7	19.0	110.0	D
Secchi (m)	1.1	0.7	2.1	D
TKN (mg/l)	1.68	1.20	2.20	
			Overall Grade	D

Historical data for the Spring Lake indicates that the water quality of the basin has remained fairly constant over the past decade fluctuating between overall grades of C and D (before the F the lake recevied this

year). Lake quality grades (see the lake's information sheet on the following page) show that when nutrient data were collected on the lake it corresponded to overall grades of C in 1981-1982 and 2003, and a D in 1980, 1984, 1996-1997, 2000-2001, and 2004, and F in 2002. Because of the fluctuation in the lake's overall grades, no long-term trends are apparent. Annual Secchi transparency means, however, seem to indicate a slight decreasing trend in water clarity since 1980 (although the 2003 Secchi mean represents an improvement over recent means). To better understand all aspects of the lake's water quality and what direction it may be heading, continued monitoring is suggested.

In an attempt to address issues either contributing to the eutrophication of Spring Lake or the symptoms from the rsulting eutrophication, the Prior Lake - Spring Lake Watershed District has recently completed a Sustainable Water Quality Mangement Plan for its lakes (including Spring Lake). The Plan sets goals addressing the lakes' biological and chemical make-up and developed implementation strategies enabling the lakes' goals to be met (PLSLWD 2004).

The physical and recreational conditions of Spring Lake as perceived by the volunteer(s) were ranked on a 1-to-5 scale. These rankings are shown on the lake's information sheet on the next page. The summertime mean physical condition was 3.3 (between 3- "definite algae present" and 4- "high algal color"). The mean suitability for recreation ranking was 2.3 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

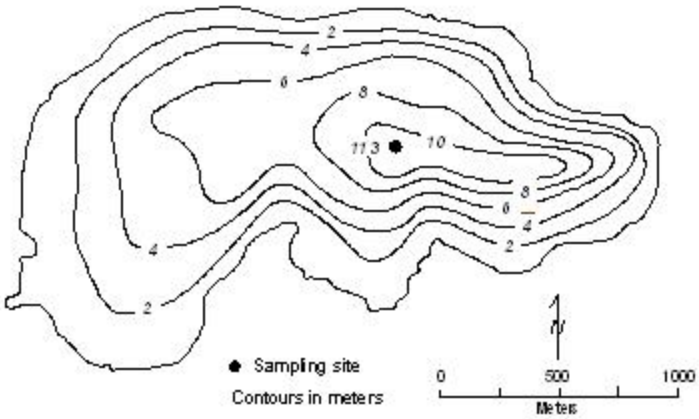
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

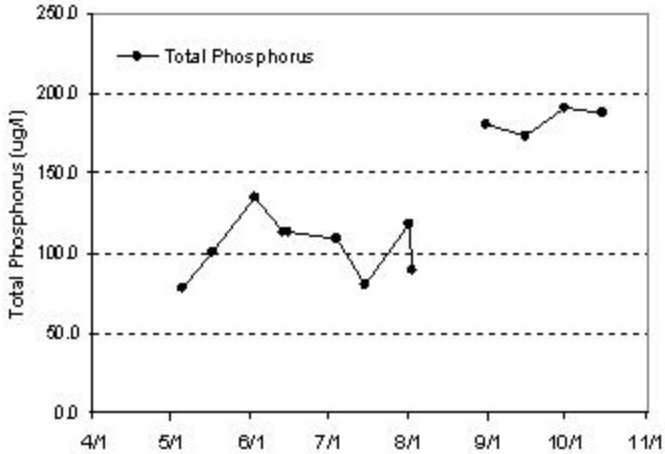
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

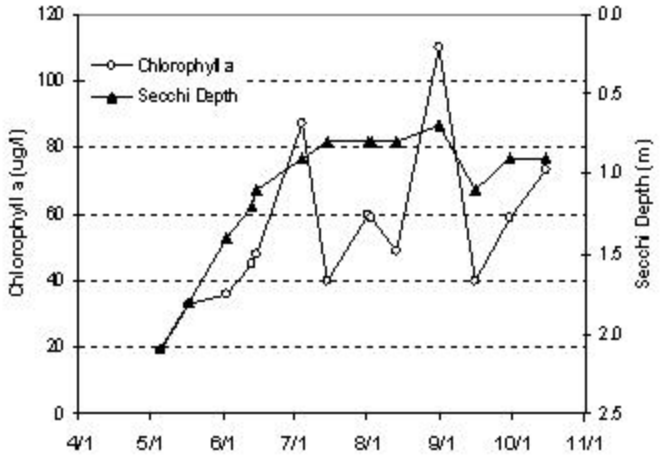
Spring Lake

Prior Lake/Spring Lake Twp., Scott Co.

Lake ID: 700054
WD: Prior Lake-Spring Lake
Volunteer: Bill Tisdell

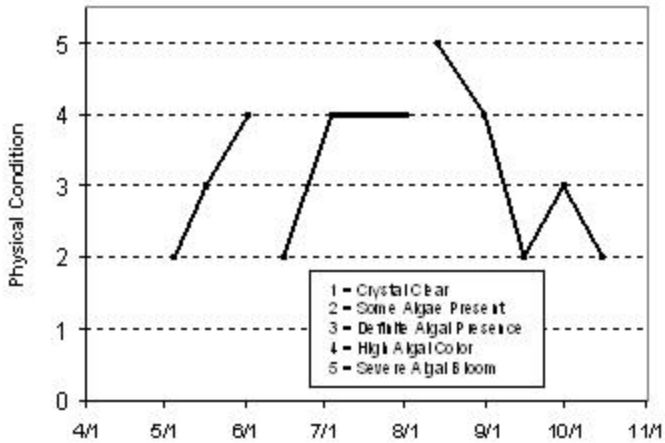






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/5/04	12				19	78.0		2.1	2	1
5/17/04	16.3				33	101.0		1.8	3	2
6/2/04	18.6				36	135.0		1.4	4	3
6/13/04	23				45	113.0		1.2		
6/15/04	23.4				48	113.0		1.1	2	1
7/4/04	24.2				87	109.0		0.9	4	3
7/15/04	27.2				40	80.0		0.8	4	3
8/1/04	25.2				60	118.0		0.8	4	3
8/2/04	22				59	89.0		0.8		
8/13/04	21.4				49			0.8	5	4
8/31/04	22.4				110	180.0		0.7	4	3
9/15/04	21.7				40	173.0		1.1	2	1
9/30/04	18.9				59	191.0		0.9	3	2
10/15/04	13.6				73	188.0		0.9	2	1

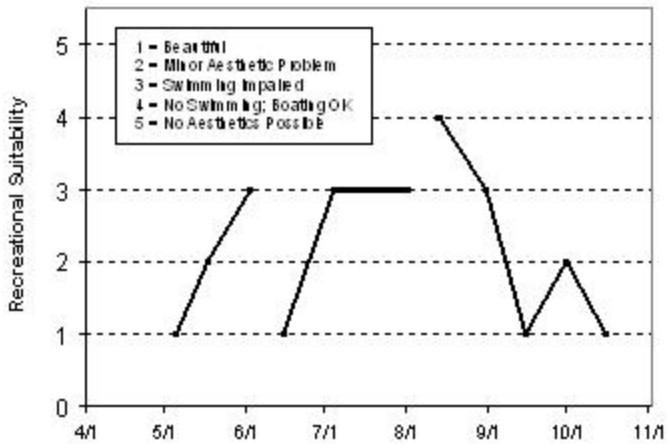


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	F	D	D		D							
Chlorophyll a	C	C	C		D						C	
Secchi Depth	C	B	C	C	C	D	D	D	D	C	B	D
Overall	D	C	C		D							

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					D	D			F	D	D	D	D
Chlorophyll a					C	C			D	D	F	C	D
Secchi Depth	C	C	C	C	D	D			C	D	F	C	D
Overall					D	D			D	D	F	C	D

Source: Metropolitan Council and STORET data



Square Lake (82-0046) *Marine on St. Croix Watershed Management Organization*

Square Lake, located in eastern May Township (Washington County), is a 193-acre lake (shoreline length of about 2.2 miles) with a maximum and mean depth of 20.7 and 9.0 m (68.0 and 29.5 feet), respectively, for an approximate lake volume of 5,694 ac-ft. About 65 percent of the lake's area is considered littoral (the 0-15 foot depth area dominated by aquatic vegetation). The lake can be accessed through the county park on the southeastern end of the lake. Because of its multi-recreational uses, it is considered a metropolitan "Priority Lake."

The lake is only one of six lakes in the seven-county metropolitan area stocked with trout (rainbows). The lake's level is maintained by a combination of groundwater/ and runoff from the lake's watershed (MDNR 1996).

The lake's watershed is small (about 782 acres) and rural. The watershed and lake size translate to a very small watershed-to-lake size ratio of 4:1 (the smaller the ratio the less the stress on the lake from surface runoff). The watershed is largely undeveloped; wetlands, parks and open spaces, grasslands and woodlands comprise about 70 percent of the watershed's area.

Square Lake, which was involved in CAMP in 1993-1997, and monitored by Council staff in 1998 (as an in-kind contribution to a Clean Water Partnership project on the lake), was a part of CAMP again from 1999-2004. The lake was monitored 14 times from mid-April to mid-October, 2004.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	12.6	9.0	19.0	A
CLA (µg/l)	2.4	1.6	4.1	A
Secchi (m)	5.4	4.7	6.7	A
TKN (mg/l)	0.41	0.29	0.56	
			Overall Grade	A

The lake's 2004 overall water quality grade calculated from the TP, CLA, and Secchi grades is identical to those recorded in 1993-2003. That said, a recent trend analysis by the MPCA on the lake's historical (1970-present) Secchi transparency database, revealed a statistically significant decline in recent water clarity.

The water quality graphs show seasonal trends in TP and CLA concentrations, and Secchi transparency for 2004, which closely resemble those of past years. In most metro area lakes, TP, CLA and Secchi transparency generally have a tightly linked relationship such that as TP concentrations increase, algal biomass increases resulting in higher CLA concentrations and lower water clarity. This issue is one that has been addressed as part of the Clean Water Partnership on the lake (Square Lake 2001).

As was mentioned in the previous Council lake reports, the data for Square Lake, shows that the above mentioned relationships are not exclusively dependent on each other. While the graphs show a correlation between CLA and Secchi transparency (clarity increases as CLA decreases and vice versa), TP seemed independent of the other two. An increase or decrease in TP does not automatically result in the same reaction in CLA concentration, which means that phosphorus is not the limiting factor in Square Lake's algal abundance. In fact, earlier Council studies have noted that the lake has lower CLA concentrations than would be expected based on its nutrient levels (Osgood 1981). The reason was discussed in a 1980 Council report and a more recent Clean Water Partnership report on Square Lake which both state that CLA

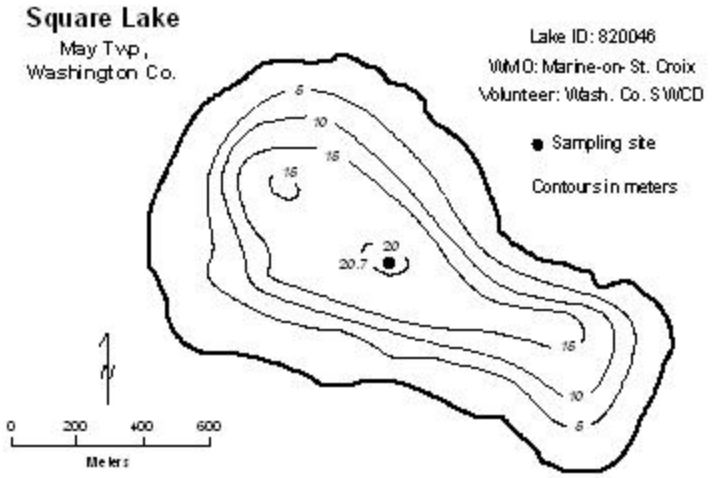
is limited by the presence of large zooplankton (*Daphnia pulicaria*) which are herbivores that graze on algae and keep the lake's CLA concentrations in check. Therefore, the lake's excellent clarity of Square Lake is due to the presence of *Daphnia* rather than limited by nutrients.

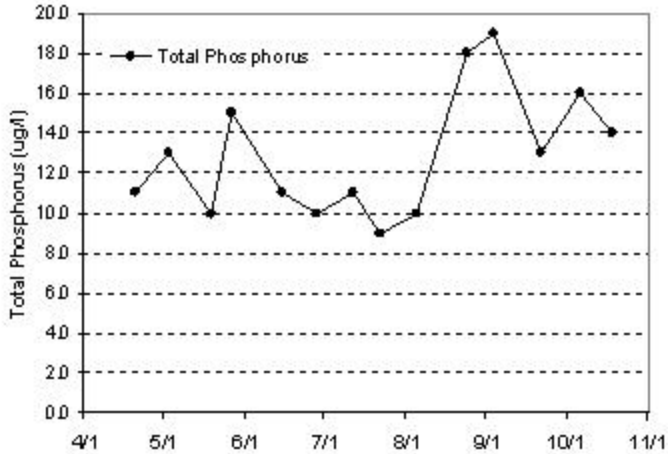
More detailed discussions on the lake, its water chemistry, biological make-up, and hydrologic and nutrient influence the lake's watershed has on the lake can be found in the recent diagnostic-feasibility study completed on the lake as part of a Clean Water Partnership (Square Lake 2001). The complete report highlights the concern of a degrading water clarity trend, the importance of the lake's biological make-up on its overall water quality, the and influence the lake's surface and groundwater watersheds have on the lake's phosphorous load. The Clean Water Partnership report also includes proposed watershed, shoreland, and in-lake projects designed to address issues affecting the lake's quality. An addtional resource is an October 2002 report summarizing the lakes recent zooplanton population from monitoring conducted from August 2001-July 2002 (Washington Coservation District 2002)

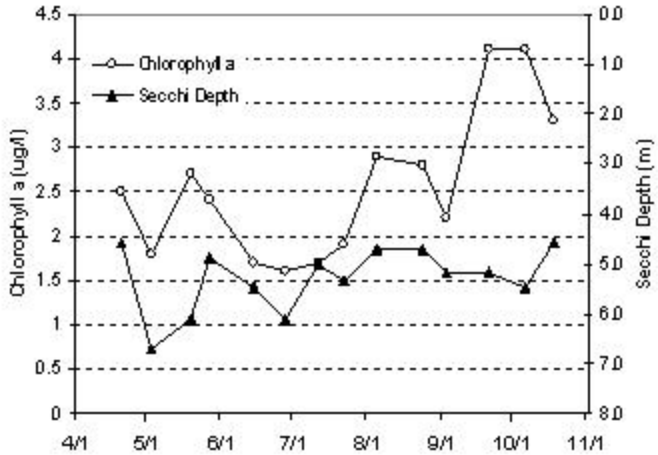
On each monitoring date, volunteers ranked their opinions of physical and recreational conditions of the lake on a 1-to-5 scale, which are graphed on the lake information sheet. The summertime mean recorded physical condition was 1.2 (between 1- "crystal clear" and 2- "some algae present"). The mean suitability for recreation ranking was 1.0 (1- "beautiful").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

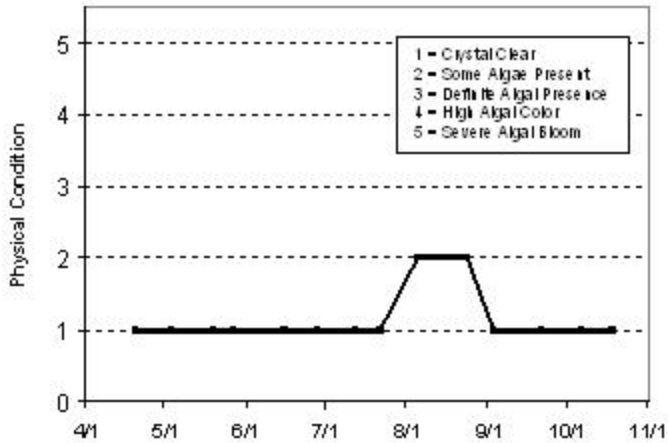






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	9.9	4.9	11.3	0.04	2.5	11.0		4.6	1	1
5/3/04	11.6	5.2	10.88	3.72	1.8	13.0		6.7	1	1
5/19/04	16.5	5.6	9.58	1.84	2.7	10.0		6.1	1	1
5/27/04	15.8	5.7	10.21	0.07	2.4	15.0		4.9	1	1
6/15/04	21.5	5.9	9.17	0.04	1.7	11.0		5.5	1	1
6/28/04	19.8	6	8.53	0.25	1.6	10.0		6.1	1	1
7/12/04	24.3	6.1	8.23	0.37	1.7	11.0		5.0	1	1
7/22/04	27	6.2	8.39	0.2	1.9	9.0		5.3	1	1
8/5/04	25.1	6.2	8.6	0.57	2.9	10.0		4.7	2	1
8/24/04	20.6	6.3	7.6	0.06	2.8	18.0		4.7	2	1
9/3/04	22.3	6.3	7.2	0.5	2.2	19.0		5.2	1	1
9/21/04	20.4	6.5	5.95	0.03	4.1	13.0		5.2	1	1
10/6/04	15.5	6.6	5.98	0.08	4.1	16.0		5.5	1	1
10/18/04	12.1	6.7	6.55	0.05	3.3	14.0		4.6	1	1

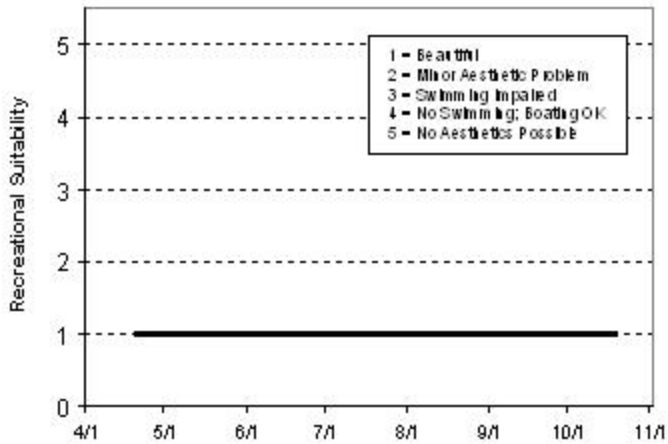


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus	B	A	A	A	A	A				A		
Chlorophyll a	A	A	A	A	A	A				A		
Secchi Depth	A	A	A	A	A	A	A	A	A	A	A	
Overall	A	A	A	A	A	A				A		

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		A	A	A	A	A	A	A	A	A	A	A	A
Chlorophyll a		A	A	A	A	A	A	A	A	A	A	A	A
Secchi Depth		A	A	A	A	A	A	A	A	A	A	A	A
Overall		A	A	A	A	A	A	A	A	A	A	A	A

Source: Metropolitan Council and STORET data



Staples Lake (82-0028) *Carnelian - Marine Watershed District*

Staples Lake is a 24-acre lake located within May Township (Washington County). The maximum and mean depths of the lake are 4.3 m (roughly 14 feet) and 2.1 m (seven feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 165 ac-ft. Because of the shallowness of the lake, the entire area is considered littoral zone (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).

The lake's 127-acre watershed and surface area translates to a watershed-to-lake size ratio of 5.3:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff). There is no formal boat access point on the lake.

This was the fifth year that Staples Lake has been involved in CAMP (although just Secchi transparenies were collected in two of those years). A search through the STORET nationwide water quality database for data on the lake produced a limited amount of data. The only years in which data were found, other than the 2000-2004 CAMP data, was 1997-1999. The years of which included TP, CLA and Secchi transparency data were 1997-2001 and 2004.

The lake was monitored seven times between late-April and mid-October 2004. During each event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	32.2	22.0	45.0	C
CLA (µg/l)	6.2	1.7	17.0	A
Secchi (m)	2.7	1.7	3.7	B
TKN (mg/l)	0.69	0.59	0.78	
			Overall Grade	B

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of B. To better understand the lake's overall water quality and where it may be heading, continued monitoring is suggested.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 1.8 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.0 for recreational suitability (between 2- "minor aesthetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

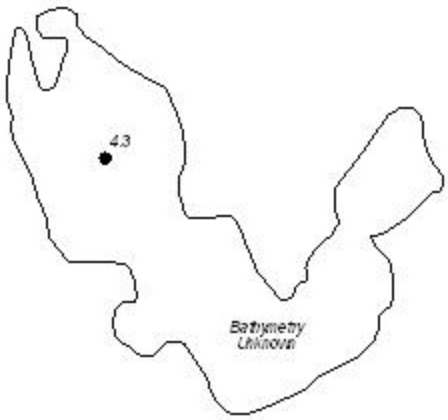
Staples Lake

May Twp., Washington Co.

LAKE ID: 820028

WD: Carnelian-Marine

Volunteer: Wash. Co. SWCD



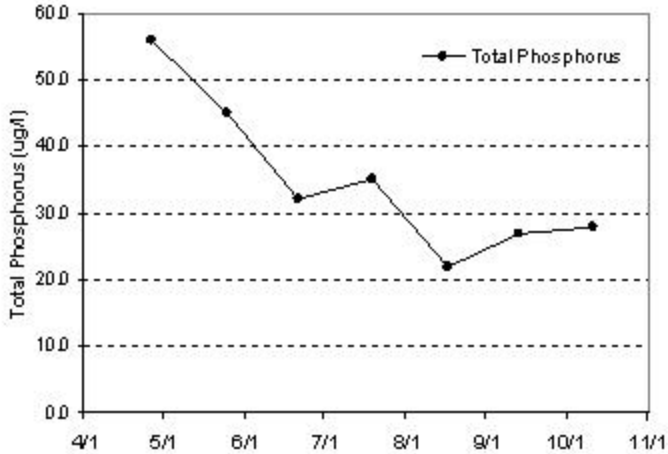
◆ Sampling site

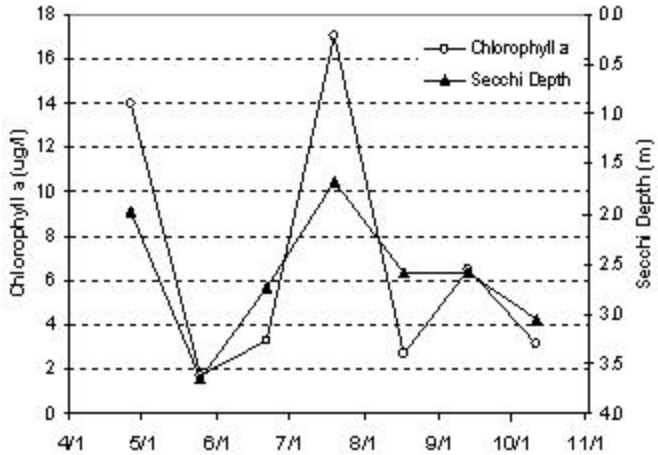
Contours in meters

N

0 100 200

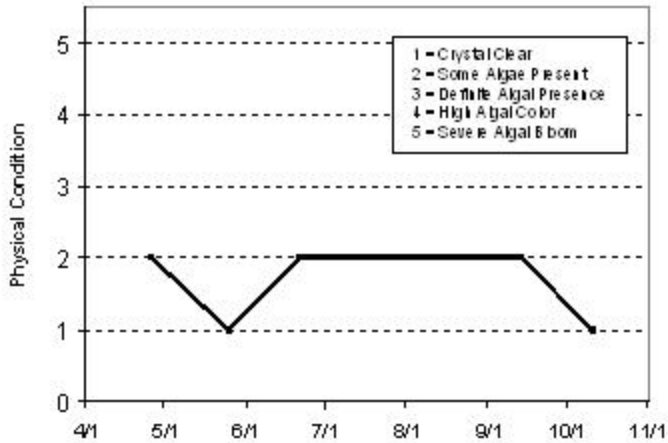
Meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.9	9.3	9.09	0.07	14	56.0		2.0	2	2
5/25/04	15.5	14.6	6.04	0.3	1.7	45.0		3.7	1	2
6/21/04	21.6	15.7	5.75	0.07	3.3	32.0		2.7	2	2
7/19/04	26.9	16.1	6.28	0.13	17	35.0		1.7	2	2
8/17/04	20.1	16.2	4.76	0.36	2.7	22.0		2.6	2	2
9/13/04	20.7	16.2	5.74	0.48	6.5	27.0		2.6	2	2
10/11/04	13.8	13.3	5.47	1	3.1	28.0		3.0	1	2

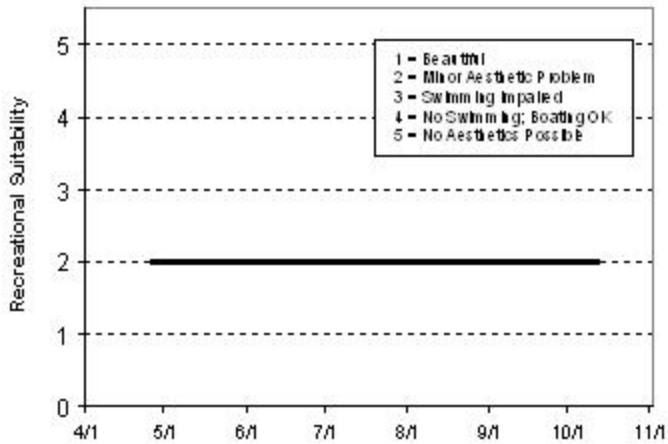


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus						B	A	A	C	B			C
Chlorophyll a						C	B	B	B	B			A
Secchi Depth						B	B	B	B	B	B	C	B
Overall						B	B	B	B	B			B

Source: Metropolitan Council and STORET data



St. Joe Lake (10-0011) *City of Chanhassen*

St. Joe Lake is a 14-acre lake located within the City of Chanhassen (Carver County), with a maximum depth of 15.9 m (roughly 52 feet). There is very little other known morphological data available for the lake.

Two thousand and four marks the first year in which St. Joe Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was provided only two years of Secchi transparency data (1994 and 1996). Thus, 2004 is the only complete year of nutrient data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 17 times between mid-May and early-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	22.4	13.0	34.0	A
CLA (µg/l)	5.8	3.2	8.8	A
Secchi (m)	2.8	1.8	3.7	B
TKN (mg/l)	0.58	0.20	0.94	
			Overall Grade	A

As mentioned earlier, there is very little water quality data available for other than the two years of mid-1990's Secchi data and the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 2.5 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 2.2 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

St. Joe's Lake
Chanhassen, Carver Co.

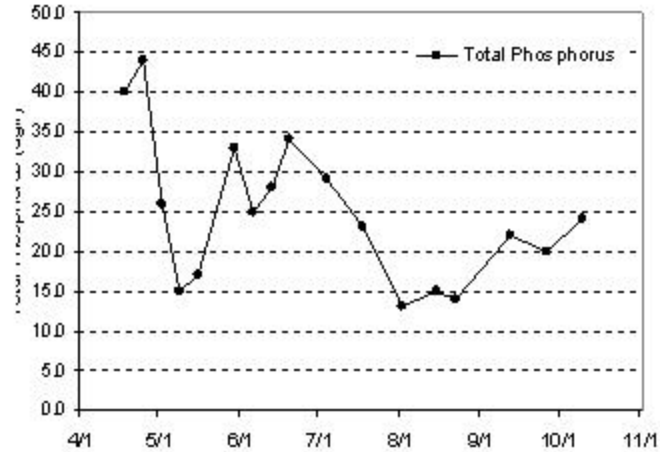
LAKE ID: 100011

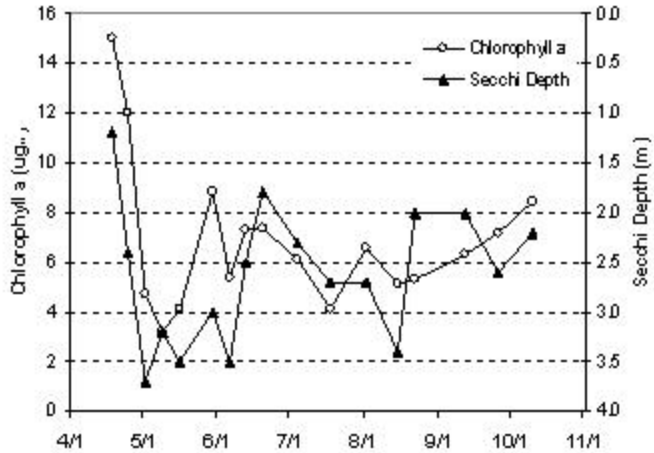
WD: Minnehaha Creek

Volunteers: Sue Morgan and Linda Scott

● Sampling site

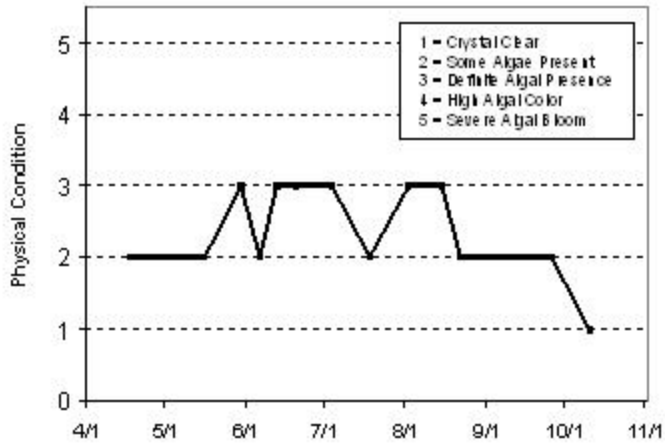
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	11.8				15	40.0		1.2	2	4
4/25/04	11.8				12	44.0		2.4	2	4
5/2/04	12.9				4.7	26.0		3.7	2	4
5/9/04	15.6				3.2	15.0		3.2	2	4
5/16/04	15				4.1	17.0		3.5	2	4
5/30/04	16.7				8.8	33.0		3.0	3	3
6/6/04	20.3				5.4	25.0		3.5	2	3
6/13/04	21.6				7.3	28.0		2.5	3	3
6/20/04	20.7				7.4	34.0		1.8	3	3
7/4/04	23.7				6.1	29.0		2.3	3	
7/18/04	24.8				4.1	23.0		2.7	2	1
8/2/04	23.4				6.6	13.0		2.7	3	1
8/15/04	20.5				5.1	15.0		3.4	3	1
8/22/04	20.2				5.3	14.0		2.0	2	1
9/12/04	21.2				6.3	22.0		2.0	2	1
9/26/04	18.2				7.2	20.0		2.6	2	1
10/10/04	14.2				8.4	24.0		2.2	1	1

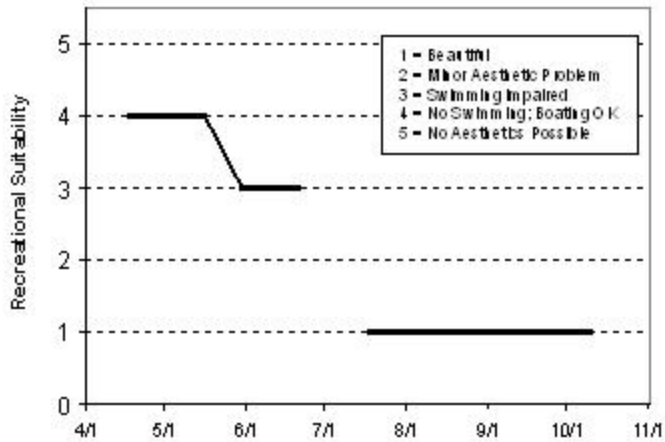


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													A
Chlorophyll a													A
Secchi Depth			C		B								B
Overall													A

Source: Metropolitan Council and STORET data



Sunnybrook Lake (82-0133) *Valley Branch Watershed District*

Sunnybrook Lake is a 16-acre lake located within Grant Township (Washington County). The maximum and mean depths of the lake are 6.1 and 2.0 m (20.0 and 6.5 feet), respectively, and the approximate volume of the lake is 104 ac-ft. The majority of the lake's area is considered littoral zone (the area of aquatic vegetation dominance). The lake has a 666-acre immediate watershed, which translates to a watershed-to-lake area ratio of 42:1 (the larger the ratio the greater the potential stress put on the lake from surface runoff).

This was the fifth year in which Sunnybrook Lake has been involved in CAMP (1999 and 2001-2003 being the others). The lake was monitored 10 times between early-May and mid-October, 2004. Other than for the 1999 and 2001-2003 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 1999 and 2001-2004 is the only year of available data.

During each monitoring event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	26.2	19.0	42.0	B
CLA (µg/l)	6.7	1.8	19.0	A
Secchi (m)	2.3	0.3	4.0	B
TKN (mg/l)	0.82	0.64	1.1	
			Overall Grade	B

The lake's 2004 overall lake quality grade is identical to those recorded in 2001-2003, and better than the C in 1999.

As mentioned earlier, there are no water quality data available for Sunnybrook Lake other than the 1999 and 2001-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

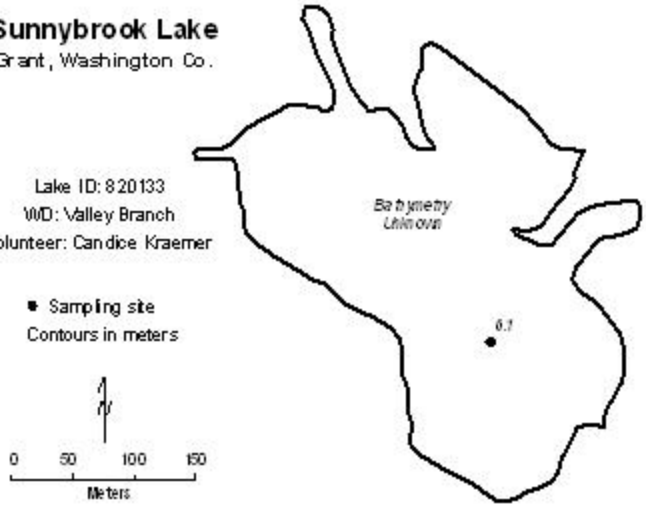
The average user perception rankings, on a 1-to-5 scale, were 1.9 for physical condition (roughly equal to 2- "some algae present"), and 1.1 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

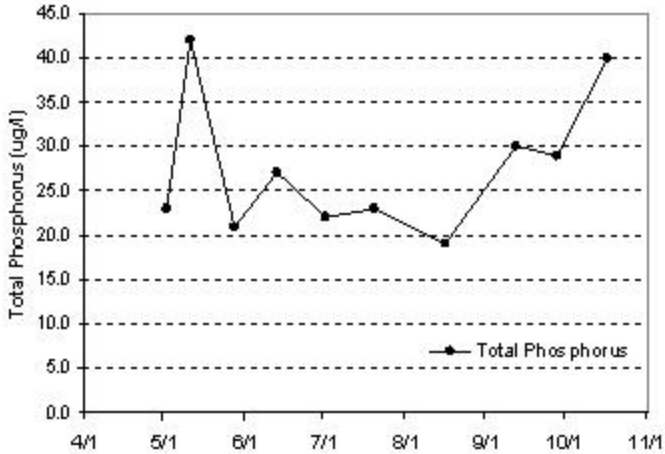
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

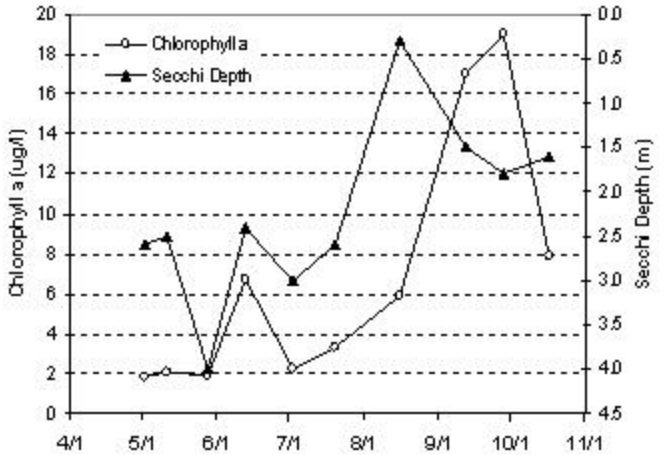
Sunnybrook Lake

Grant, Washington Co.

Lake ID: 820133
WD: Valley Branch
Volunteer: Candice Kraemer

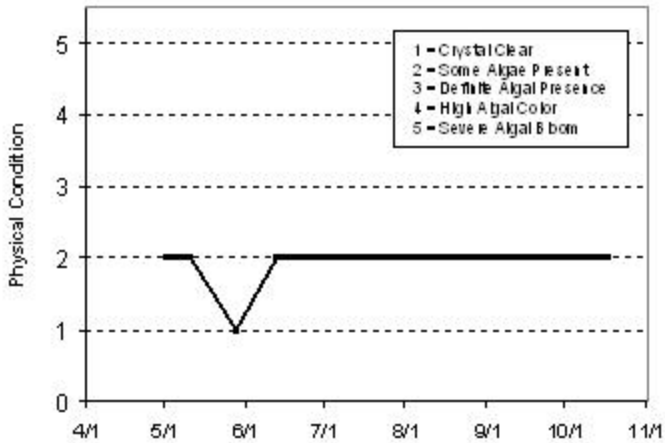






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/2/04	18				1.8	23.0		2.6	2	1
5/11/04	18.5				2.1	42.0		2.5	2	1
5/28/04	16.5				1.9	21.0		4.0	1	1
6/13/04	24.7				6.7	27.0		2.4	2	1
7/2/04	26.3				2.2	22.0		3.0	2	1
7/20/04	27.4				3.3	23.0		2.6	2	2
8/16/04	22.5				5.9	19.0		0.3	2	1
9/12/04	22.2				17	30.0		1.5	2	1
9/28/04	19.7				19	29.0		1.8	2	1
10/17/04	9.4				7.9	40.0		1.6	2	1

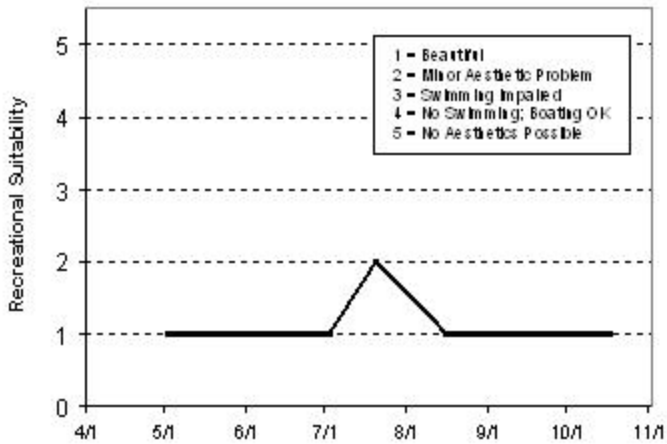


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								C		B	B	C	B
Chlorophyll a								B		A	A	A	A
Secchi Depth								C		B	B	C	B
Overall								C		B	B	B	B

Source: Metropolitan Council and STORET data



Sunset Lake (82-0153) *Rice Creek Watershed District*

Sunset Lake, with a surface area of about 124 acres (2.3 miles in circumference), is located in the southern portion of the City of Hugo (Washington County). The lake is considered a "Priority Lake" by the Metropolitan Council due to its multi-recreational uses. One problem that may possibly hinder future recreational activity on the lake, however, is Eurasian Water Milfoil (*Myriophyllum spicatum*), which has been reported in the lake. Its deepest point is approximately 5.2 m (17 feet).

Sunset Lake has been involved in CAMP since 1993. The lake was monitored 15 times from early-May to early-October, 2004. The data and resulting graphs showing seasonal variability in TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake information sheet.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	21.1	15.0	34.0	A
CLA (µg/l)	3.3	1.9	5.2	A
Secchi (m)	3.6	2.8	4.6	A
TKN (mg/l)	0.47	0.30	1.10	
			Overall Grade	A

When comparing the 2004 overall grade to those of previously monitored years it becomes apparent that the lake's 2001-2004 overall water quality grade (A) were the best monitored years to date (compared to B's in 1994 and 2000, and C's in 1993 and 1995-1999).

Besides the lake's CAMP data, Secchi transparencies had been measured throughout the mid- and late-1980's as part of the MPCA's volunteer program. The lake's historic individual parameter and overall water quality grades (shown on the following information sheet) indicate that the lake's water quality has fluctuated over the years. Because of the range in the lake's quality, a baseline quality for the lake as well as an overall water quality trend is difficult to determine. With this in mind, however, a primitive interpretation of the data seems to show that recently the lake has maintained a B+/A grade average (with normal fluctuations). In fact, a recent trend analysis on the lake's Secchi transparency data by the MPCA, revealed a statistically significant improvement in recent water clarity.

The average user perception rankings on a 1-to-5 scale were 2.0 for physical condition (2- "some algae present"), and 1.9 for recreational suitability (between 1- " beautiful" and 2- "minor aesthetic problem").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 know of errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Sunset Lake

Hugo, Washington Co.

Lake ID: 820153

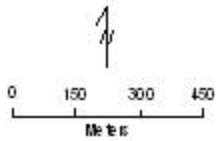
WD: Rice Creek

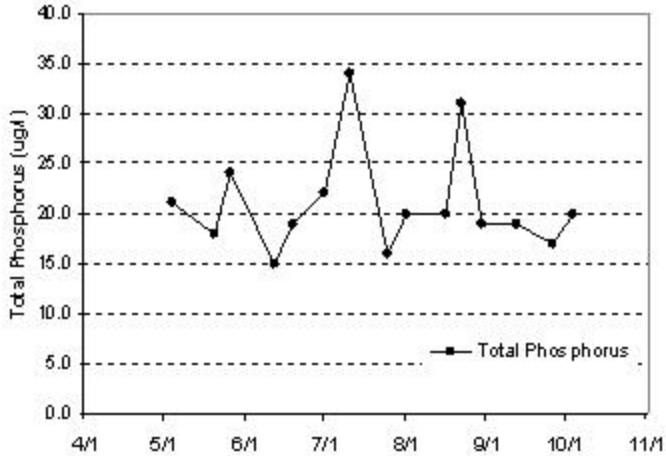
Volunteers:

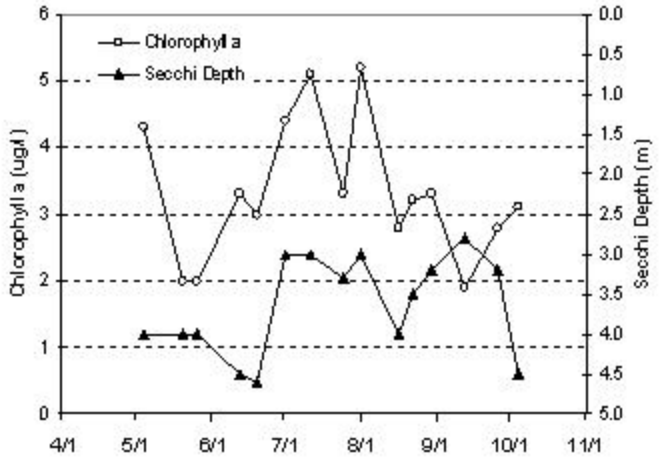
Diane and Bob Coderre

● Sampling site

Contours in meters

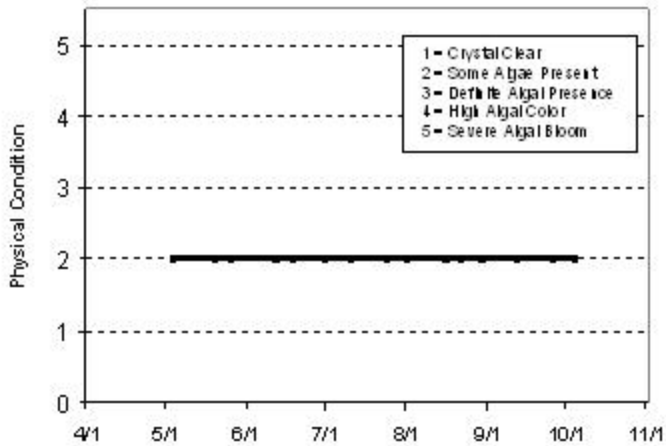






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/4/04	15				4.3	21.0		4.0	2	1
5/20/04	19				2	18.0		4.0	2	1
5/26/04	16				2	24.0		4.0	2	2
6/12/04	23				3.3	15.0		4.5	2	2
6/19/04	22				3	19.0		4.6	2	2
7/1/04	31				4.4	22.0		3.0	2	2
7/11/04	25				5.1	34.0		3.0	2	2
7/25/04	26				3.3	16.0		3.3	2	2
8/1/04	26				5.2	20.0		3.0	2	2
8/16/04	22				2.8	20.0		4.0	2	2
8/22/04	23				3.2	31.0		3.5	2	2
8/30/04	23				3.3	19.0		3.2	2	2
9/12/04	24				1.9	19.0		2.8	2	2
9/26/04	20				2.8	17.0		3.2	2	2
10/4/04	11				3.1	20.0		4.5	2	2

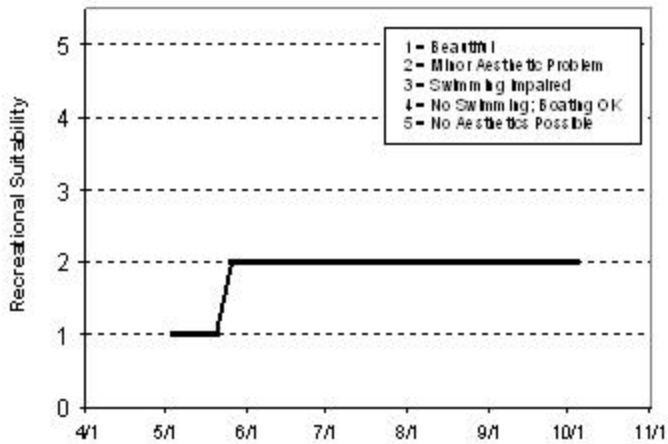


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus					D							
Chlorophyll a					C							
Secchi Depth					C	D	C	D	D	C	C	
Overall					C							

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C	B	C	C	C	C	C	B	A	A	A	A
Chlorophyll a		B	B	B	C	C	B	B	A	A	A	A	A
Secchi Depth		C	B	C	B	C	C	C	B	A	A	A	A
Overall		C	B	C	C	C	C	C	B	A	A	A	A

Source: Metropolitan Council and STORET data



Sunset Pond Lake (19-0364) *Black Dog Watershed Management Commission*

Sunset Pond, a 60-acre man-made lake (1.9 miles in circumference) located in the City of Burnsville (Dakota County), has been involved in CAMP since 1994 (with an omission in 1999). In 2004, the lake was monitored 10 times between early-May and late-October.

Because of the shallow depth of the lake ("normal" maximum depth of 3.7 m [about 12 feet]), the entire lake is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). Because the lake was created to detain stromwater, it collects drainage from a portion of the city of Burnsville and Savage's stormwater conveyance systems, including outflow from Crystal and Earley lakes, it can experience extreme bounce in its water level during wet conditions. An area of concern and need for future management is the recent detection of Eurasian Water Milfoil (*Myriophyllum spicatum*) in the lake.

During each sampling event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as perceived physical condition and recreational suitability. Results are presented on graphs and data tables on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	75.9	53.0	162.0	D
CLA (µg/l)	8.5	5.0	11.0	A
Secchi (m)	2.6	2.0	3.0	B
TKN (mg/l)	0.91	0.63	1.50	
			Overall Grade	B

While the lake's 2004 overall lake grade is identical to those recorded in 1998 and 2000-2002, and better than the C's of 1995-1997 and 2003. A review of the lake's past and present individual parameter means reveal that 2002 represents the lake's best-monitored water quality year to date

No statistically significant long-term trends can be determined from the lake's water quality database, in the short-term however, the lake seems to be well represent by an overall grade of C+/B. To better understand the long-term quality of the lake and what direction it may be heading, more years of sampling data are needed.

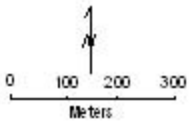
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 3.9 (roughly equal to 4- "high algal color").

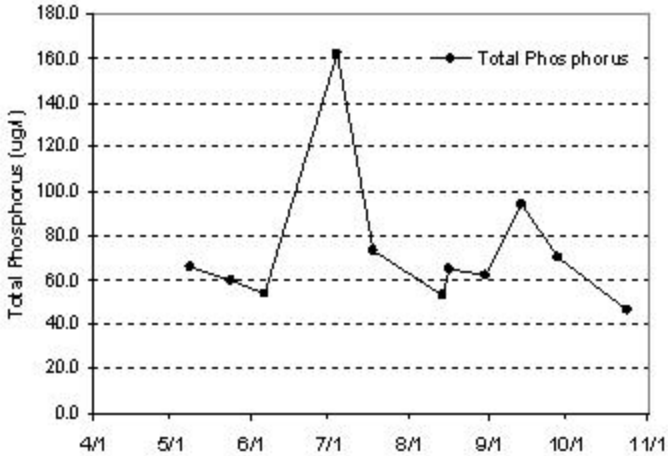
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

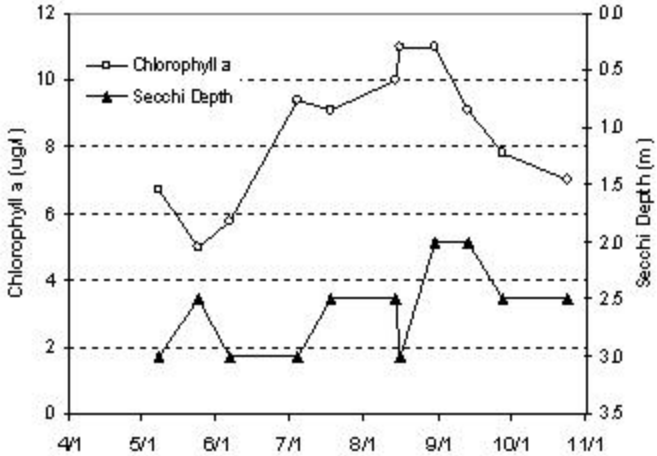
Sunset Pond
Burnsville, Dakota Co.

Lake ID: 190364
WMO: Black Dog
Volunteer: Bill Henzler

● Sampling site
Contours in meters

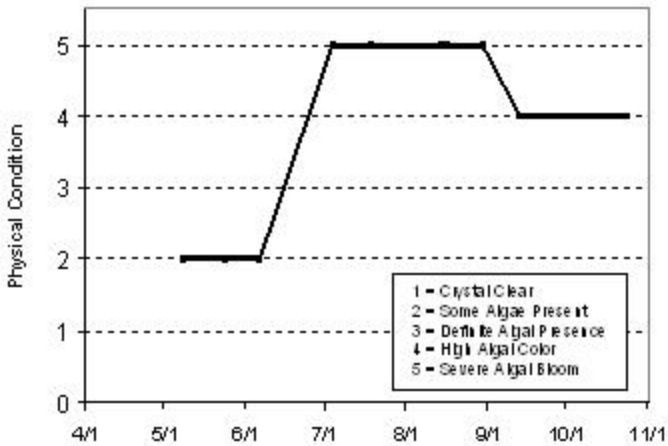






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/6/04	19				6.7	66.0		3.0	2	
5/24/04	22				5	60.0		2.5	2	
6/6/04	26				5.8	54.0		3.0	2	
7/4/04	26				9.4	162.0		3.0	5	
7/18/04	28				9.1	73.0		2.5	5	
8/14/04	23				10	53.0		2.5	5	
8/16/04	24				11	65.0		3.0	5	
8/30/04	22				11	62.0		2.0	5	
9/13/04	22				9.1	94.0		2.0	4	
9/27/04	20				7.8	70.0		2.5	4	
10/24/04	20				7	46.0		2.5	4	

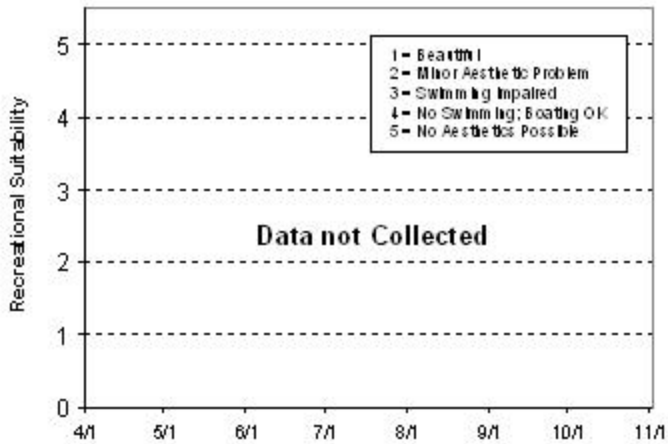


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	C	C	C	C		C	C	C	D	D
Chlorophyll a			A	B	B	B	A		A	A	A	B	A
Secchi Depth			C	C	C	C	C		C	B	B	C	B
Overall			B	C	C	C	B		B	B	B	C	B

Source: Metropolitan Council and STORET data



Swede Lake (10-0095) *Carver County Environmental Services*

Swede Lake is a 376-acre lake located in Watertown Township (Carver County) with a maximum depth of approximately 4.0 m (13.1 feet). Because of the shallowness of the lake, its entire surface area is considered littoral (the shallow [0-15 foot depth] area dominated by aquatic vegetation).

The year 2004 marks the third year that Swede Lake has been involved in CAMP (2002 being the first). Additionally, Metropolitan Council staff has monitored the lake in 1996 and 2001. The 1996, and 2001-2004 data are the only water quality data found for the lake.

On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The lake was monitored 13 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	217.8	110.0	380.0	F
CLA (µg/l)	59.4	15.0	130.0	D
Secchi (m)	0.6	0.3	0.8	F
TKN (mg/l)	2.76	2.00	4.40	
			Overall Grade	F

The lake's 2004 overall grade is similar to that of 1996 and 2003, and worse than those of 2001-2002. A review of past and present parameter means, reveal that 2003 represented the lake's worst monitored water quality to date.

As mentioned earlier, there is a limited amount of water quality data available for Swede Lake. Therefore it is not possible to determine any long-term trend. In the short-term however, the lake's quality seems well represented by an overall grade of D/F. To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 2.4 for physical condition (between 2- " some algae present" and 3- "definite algae present"), and 4.0 for recreational suitability (4- "no swimming - boating ok").

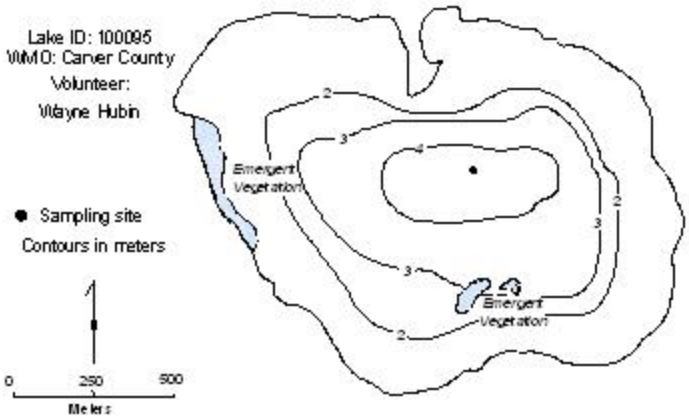
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

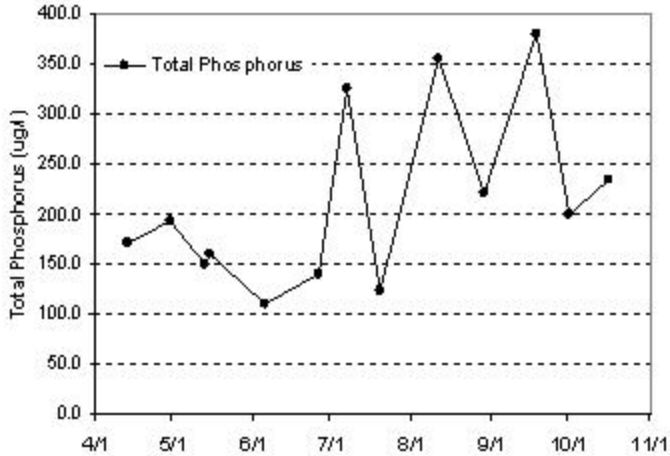
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

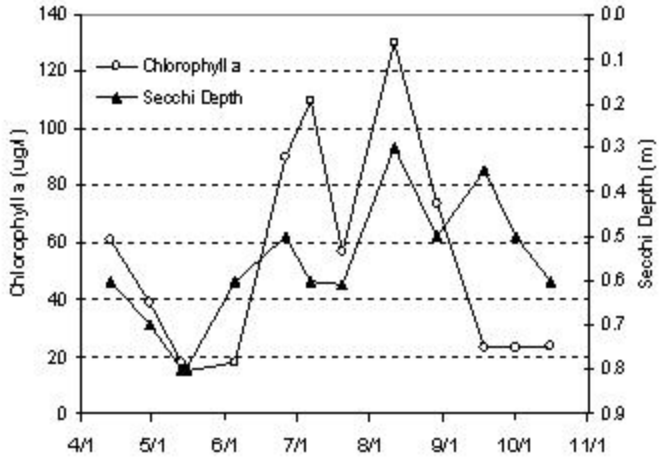
Swede Lake

Watertown Twp., Carver Co.

Lake ID: 100095
WMO: Carver County
Volunteer:
Wayne Hubin

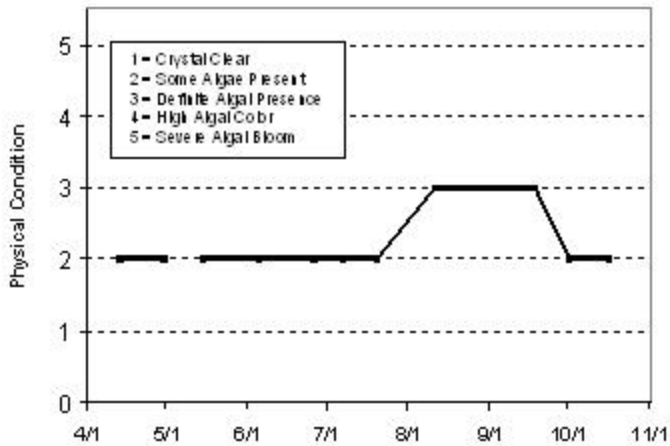






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	5.6				61	171.0		0.6	2	2
4/30/04	12.2				39	193.0		0.7	2	4
5/13/04	14				18	149.0		0.8		
5/15/04	13.9				15	159.0		0.8	2	4
6/5/04	21.1				18	110.0		0.6	2	4
6/26/04	20				90	139.0		0.5	2	4
7/7/04	20.6				110	325.0		0.6	2	4
7/20/04	28				57	122.0		0.6	2	4
8/11/04	18.5				130	356.0		0.3	3	4
8/29/04	20.2				74	220.0		0.5	3	4
9/18/04	20				23	380.0		0.4	3	4
10/1/04	15				23	200.0		0.5	2	4
10/16/04	7.8				24	234.0		0.6	2	4

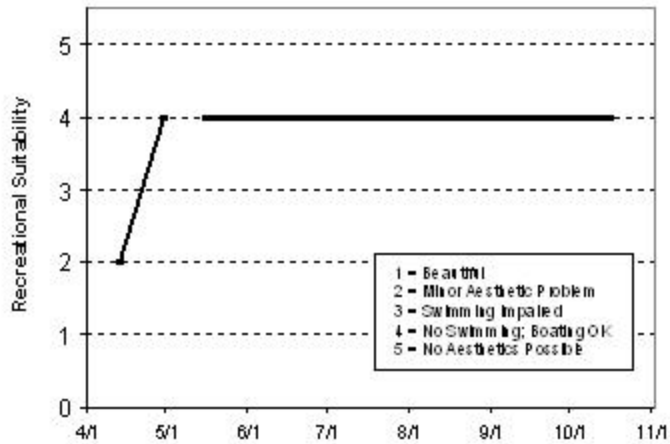


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					D					D	F	F	F
Chlorophyll a					F					D	C	F	D
Secchi Depth					F					D	C	F	F
Overall					F					D	D	F	F

Source: Metropolitan Council and STORET data



Sweeney Lake (27-0035) *Bassett Creek Watershed Management Organization*

The 66-acre lake has a mean and maximum depth of 3.6 m (11.8 feet) and 8.0 m (26.0 feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 790 ac-ft. Because of the shallowness of the lake, and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column) it is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation),

This was the fifth year of CAMP monitoring in Sweeney Lake, which is located in the City of Golden Valley (Henepin County). The lake has two seperate depressions each reaching a maximum depth of approximately 8 meters (26 feet). Roughly 52 percent of the lake's area is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation). Additionally, the lake's surface area and 2,400-acre watershed translates to a rather large 36:1 watershed-to-lake size ratio. The greater the ratio, the greater the potential stress on the lake from surface runoff.

The Sweeney Lake branch of the Bassett Creek flows into the lake on the south and outlets at the north over a dam. Sweeny Lake is connected to Twin Lake during periods of high lake levels by a meandering channel through a cattail marsh between the northeast shore of Sweeny and the north shore of Twin Lake. The surface elevations of the two lakes are about the same, indicating a minimal flow between the two lakes except during periods of heavy runoff when transfer of water between the two lakes increases. The west and south shoreline of Sweeny Lake consists of privately owned single family homes. The east shore is bordered by the Glenwood Hills Hospital and park consisting of a lawn, a golf course, and a wooded area (Barr, 1994).

While the lake has been monitored at two separate sites (north end and south end) in the past, only one site (the southern site) was monitored in 2004. The lake was monitored 13 times between mid-April and early-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	59.3	29.0	94.0	C
CLA (µg/l)	18.3	3.9	31.0	B
Secchi (m)	1.4	1.2	1.9	C
TKN (mg/l)	1.12	0.54	1.90	
			Overall Grade	C

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems well represented by an overall grade of C (recorded in 2000-2004). To better understand the quality of the lake and what direction it may be heading, continued monitoring is suggested.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The 2004 mean perceived physical condition of the lake was 1.0 (1- "crystal clear"), while the mean recreational suitability was 1.0 (1- "beautiful").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a

fisheries survey on the lake. 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/.

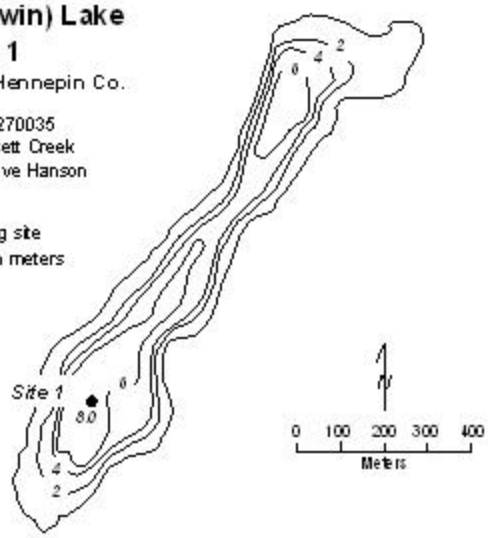
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

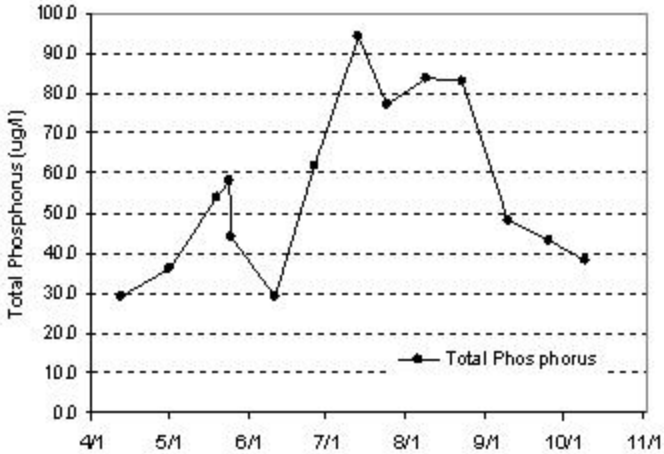
Sweeney (Twin) Lake
Site 1

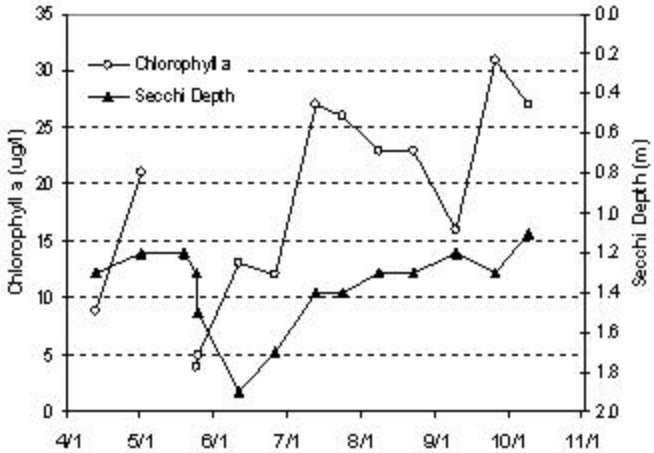
Golden Valley, Hennepin Co.

Lake ID: 270035
WMO: Bassett Creek
Volunteer: Dave Hanson

● Sampling site
Contours in meters

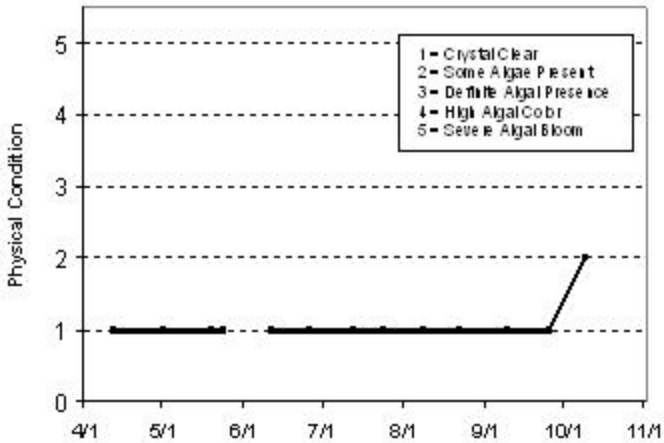






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/12/04	8.3		14.2		8.8	29.0		1.3	1	1
5/1/04	13.4		12.4		21	36.0		1.2	1	1
5/19/04	17.7		10.1			54.0		1.2	1	1
5/24/04	15.1				3.9	58.0		1.3	1	1
5/25/04	16				5	44.0		1.5		
6/11/04	20.5		10.5		13	29.0		1.9	1	1
6/26/04	21.1		10.6		12	62.0		1.7	1	1
7/13/04	24.5		10.5		27	94.0		1.4	1	1
7/24/04	26.2		10.2		26	77.0		1.4	1	1
8/8/04	24.7		6.8		23	84.0		1.3	1	1
8/22/04	21.9		9.6		23	83.0		1.3	1	1
9/9/04	22		8.3		16	48.0		1.2	1	1
9/25/04	20.6		8.3		31	43.0		1.3	1	1
10/9/04	17.3		9.8		27	38.0		1.1	2	1

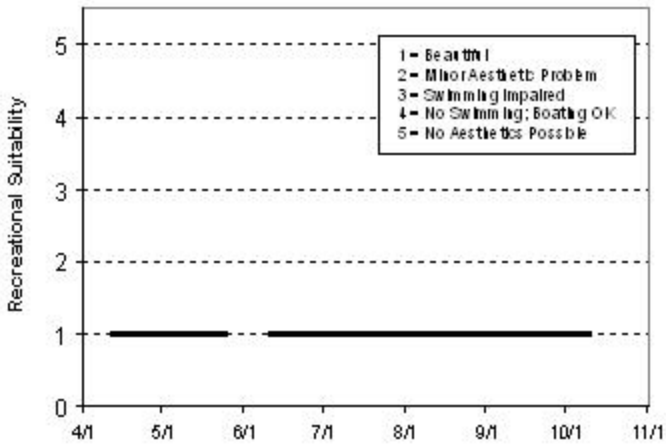


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total Phosphorus														
Chlorophyll a														
Secchi Depth														
Overall														

Year	1994	1995	1996	1997	1998	1999	2000 Site 1	2000 Site 2	2001 Site 1	2001 Site 2	2002 Site 1	2002 Site 2	2003 Site 1	2003 Site 2	2004 Site 1	2004 Site 2
Total Phosphorus							C	C	C	C	C		C		C	
Chlorophyll a							C	C	B	C	B		B		B	
Secchi Depth							D	D	C	C	C		C		C	
Overall							C	C	C	C	C		C		C	

Source: Metropolitan Council and STORET data



Tamarack Lake (10-0010) *Minnehaha Creek Watershed Dirtrict*

This was the fourth year that Tamarack Lake has been involved in CAMP (the lake was initially enrolled in 2001). While the 24-acre lake has an unexpected maximum depth of roughly 20.0 m (66 feet), the majority of the lake surface area is considered littoral zone (the shallow 0-15 foot area dominated by aquatic plants. A search through the STORET nationwide water quality database for data on the lake provided limited data (just Secchi data in 1985 and Secchi and nutrient data for 2000-2003).

The lake was monitored 11 times from mid-April to mid-October, 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	71.8	40.0	161.0	D
CLA (µg/l)	34.0	12.0	92.0	C
Secchi (m)	1.3	0.5	1.8	C
TKN (mg/l)	1.24	0.66	1.90	
			Overall Grade	C

The lake's 2004 overall grade is identical to that of 2000 and 2003, and worse than the overall grade of B recorded in 2001-2002.

As mentioned earlier, there are very limited amounts of water quality data available for Tamarack Lake. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.9 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 1.1 for recreational suitability (roughly equal to 1- "beautiful").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

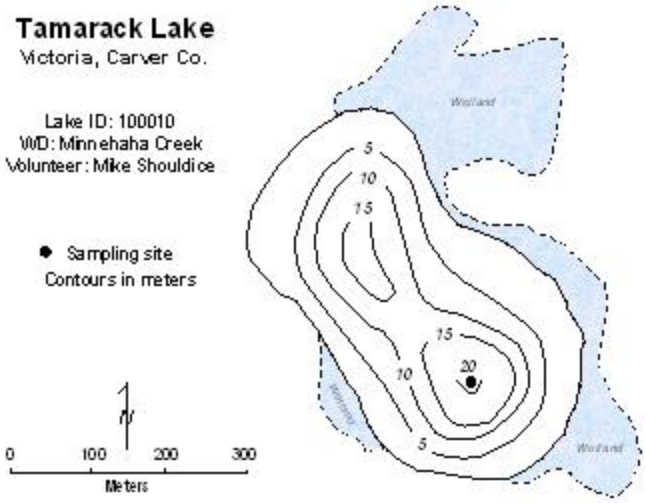
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

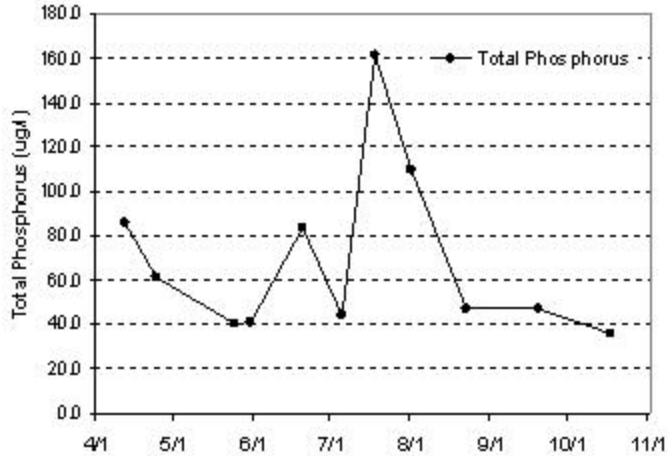
Tamarack Lake

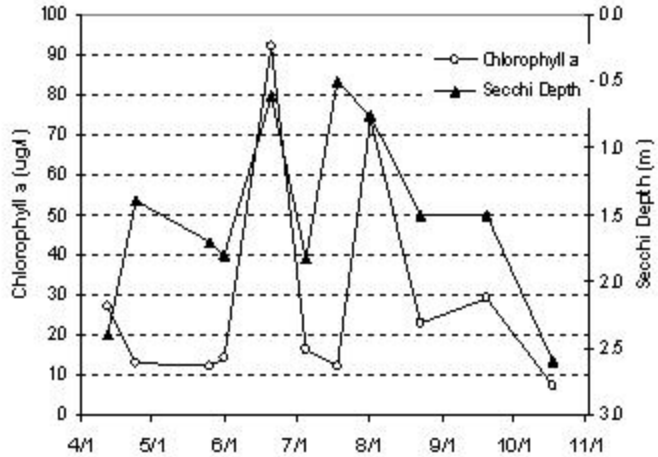
Victoria, Carver Co.

Lake ID: 100010
WD: Minnehaha Creek
Volunteer: Mike Shouldice

● Sampling site
Contours in meters

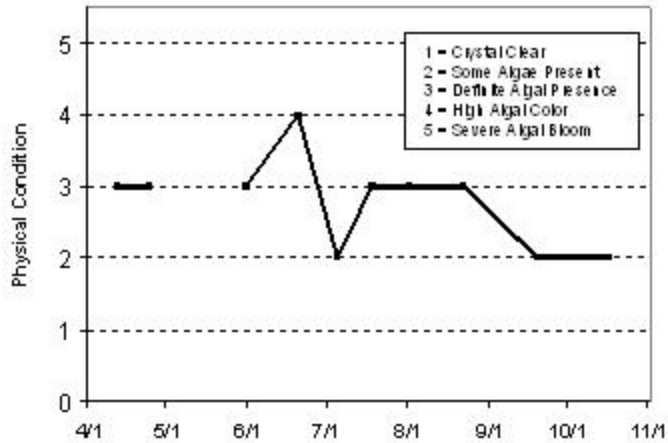






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/12/04	5.6				27	86.0		2.4	3	1
4/24/04	11.2				13	61.0		1.4	3	1
5/25/04	16				12	40.0		1.7		
5/31/04	16.2				14	41.0		1.8	3	1
6/20/04	21.3				92	84.0		0.6	4	1
7/5/04	23.5				16	44.0		1.8	2	1
7/18/04	26.3				12	161.0		0.5	3	2
8/1/04	25.9				74	110.0		0.8	3	1
8/22/04	19				23	47.0		1.5	3	1
9/19/04	19				29	47.0		1.5	2	1
10/17/04	9				7	36.0		2.6	2	1

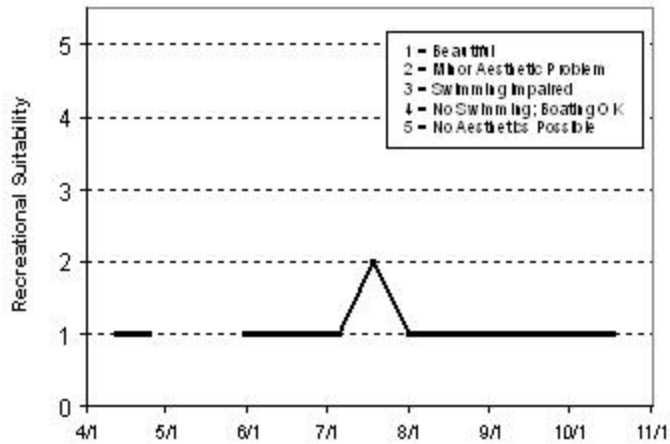


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									C	B	B	C	D
Chlorophyll a									C	A	B	B	C
Secchi Depth					A				C	B	C	C	C
Overall									C	B	B	C	C

Source: Metropolitan Council and STORET data



Terrapin Lake (82-031) *Marine on St. Croix Watershed Management Organization*

Terrapin Lake is a 86-acre lake located within the May Township (Washington County), with a maximum depth of 4.6 m (roughly 15 feet). Because of the shallowness of the lake, its entire surface area is considered littoral (the shallow [0-15 foot depth] area dominated by aquatic vegetation). There is very little other known morphological data available for the lake.

Two thousand and four marks the first year in which Terrapin Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake came up empty. Therefore, 2004 is the only complete year of water quality data available. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 11 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

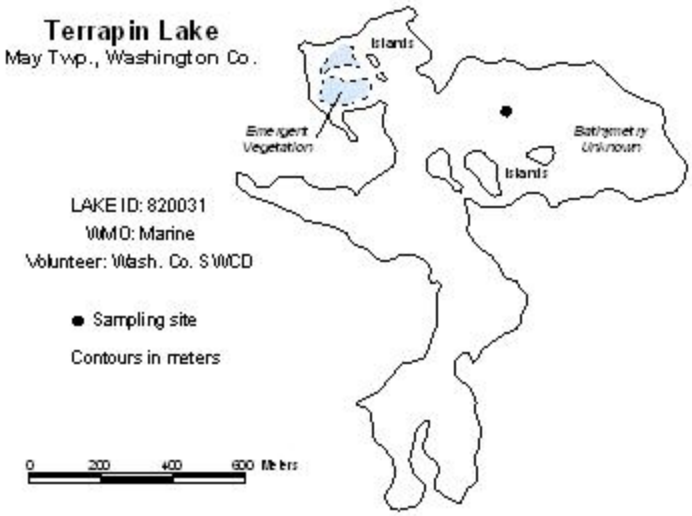
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	26.6	16.0	38.0	B
CLA (µg/l)	3.2	2.3	4.1	A
Secchi (m)	3.4	2.4	4.4	A
TKN (mg/l)	0.68	0.55	0.88	
			Overall Grade	A

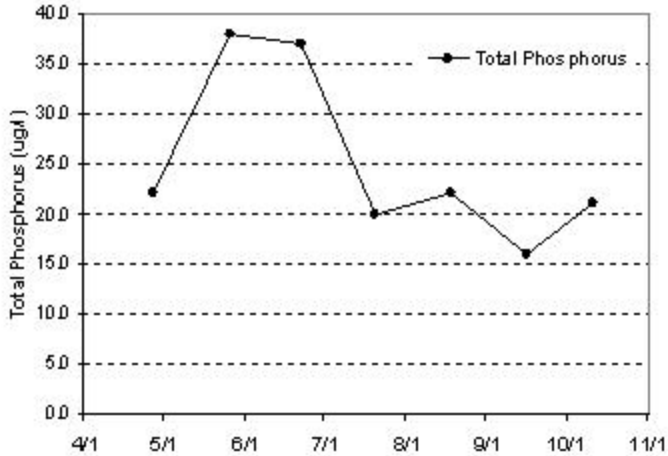
Throughout the monitoring period, the volunteers ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The resulting user perception rankings are shown on the information sheet. The mean physical condition ranking was 2.2 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 3.0 (3- "swimming slightly impaired").

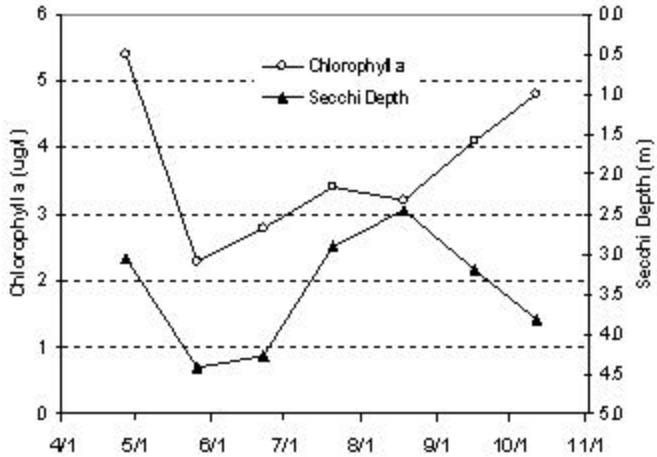
Because of the limitedness of the lake's water quality database, it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MNDNR 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

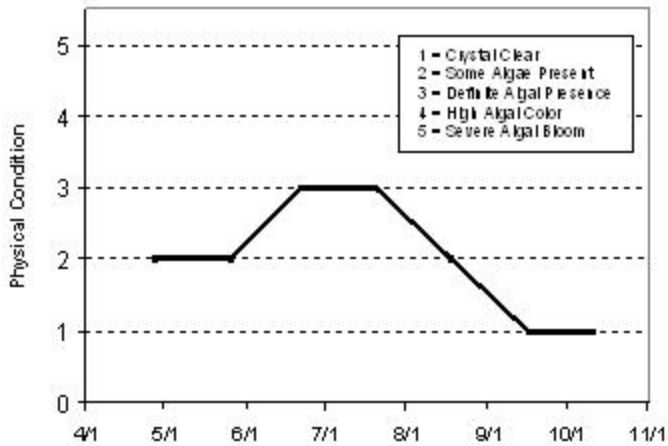






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/27/04	11.6	10.8	9.35	0.35	5.4	22.0		3.1	2	2
5/26/04	15.8	14.4	8.34	0.36	2.3	38.0		4.4	2	4
6/22/04	21.7	18.4	9.84	0.6	2.8	37.0		4.3	3	3
7/20/04	26.7	22	8.86	0.55	3.4	20.0		2.9	3	
8/18/04	21.5	19.2	7.02	0.12	3.2	22.0		2.4	2	2
9/16/04	19.8	19.5	5.34	1.24	4.1	16.0		3.2	1	3
10/11/04	14.6	14.3	6.31	0.63	4.8	21.0		3.8	1	2

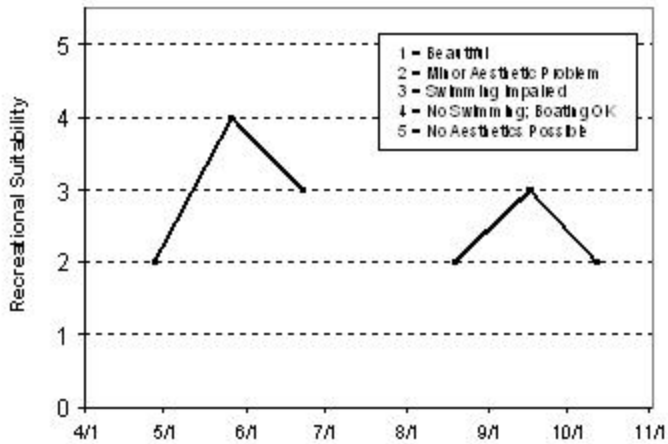


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													B
Chlorophyll a													A
Secchi Depth													A
Overall													A

Source: Metropolitan Council and STORET data



Turtle Lake (82-0036) *Carnelian - Marine Watershed District*

This was the fiftth year of CAMP monitoring in Turtle Lake which is located in the May Township (Washington County). A search through the STORET nationwide water quality database revealed a moderate amount of recent data on the lake. Other than for the 2000-2004 CAMP data (only Secchi transperncies were collected in 2002 and 2004), data were found for 1991-1999 (just Secchi data) and nutrient data from 1991-1992 and 1996-1999.

The 44-acre lake has a mean and maximum depth of 2.4 m (eight feet) and 1.2 m (four feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 172 ac-ft. Because of the shallowness of the lake, it is entirely considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The lake does not have a public access and its 699-acre watershed translates to a 16:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff).

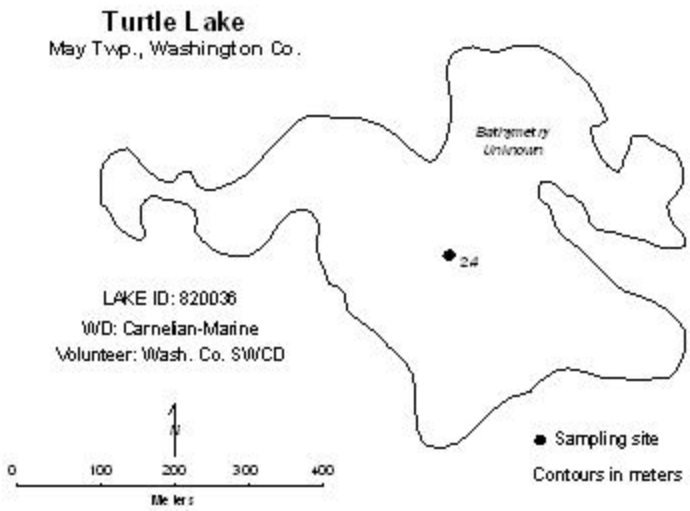
The lake's Secchi transparency was monitored seven times from late-April to early-October 2004. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

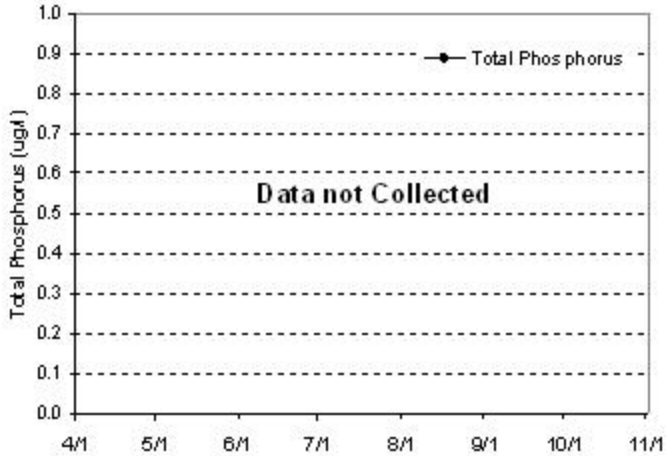
Water samples to be analyzed for TP, TKN and chlorophyll were not collected for the lake in 2004. Because Secchi transparcy was the only data collected there are no nutrient of chlorophyll concentration means to compare to previous years. The lake's 2004 summertime (May through September) mean Secchi transparency was 1.4 m (minimum of 1.1 m and a maximum of 1.8 m). This translates to a grade of C for water clarity. The lake's 2004 water clarity grade is identical to those recorded in 1999-2003.

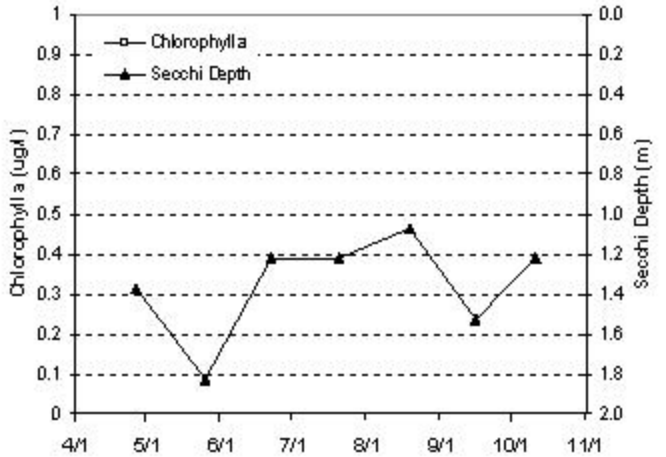
As mentioned earlier, there is a moderate amount of historic data available for Turtle Lake recent data collected in the 1990's and early-to-mid-2000's. While no "statistically significant" long-term trends were determined through statistical analysis, a glance at the lake's overall grades from 1991-2004 seems to indicate that the lake's water quality has improved. In the short-term, the lake seems well represented by an overall grade of C. To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 3.4 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.0 (3- "swimming slightly impaired").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

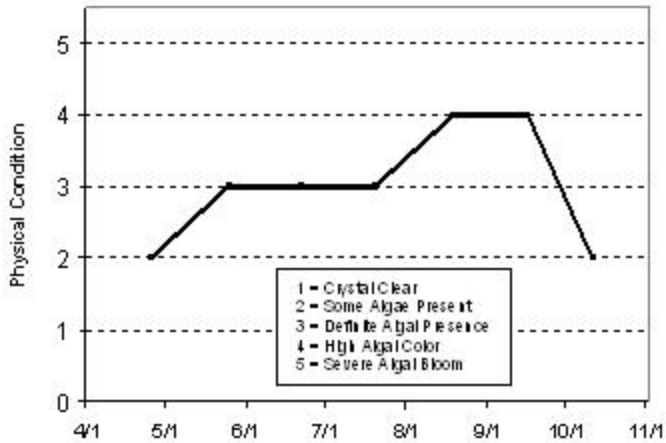






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/26/04	11.4	11.3	9.52	0.04				1.4	2	
5/25/04	14.9	14.9	8.13	3.78				1.8	3	
6/22/04	20	19.7	7.46	0.61				1.2	3	3
7/20/04	27	22.1	6.04	0.07				1.2	3	
8/19/04	17.5	17.4	5.09	3.65				1.1	4	
9/16/04	18.4	18.2	4.26	2.86				1.5	4	
10/11/04	15.5	14	8.75	8.22				1.2	2	3

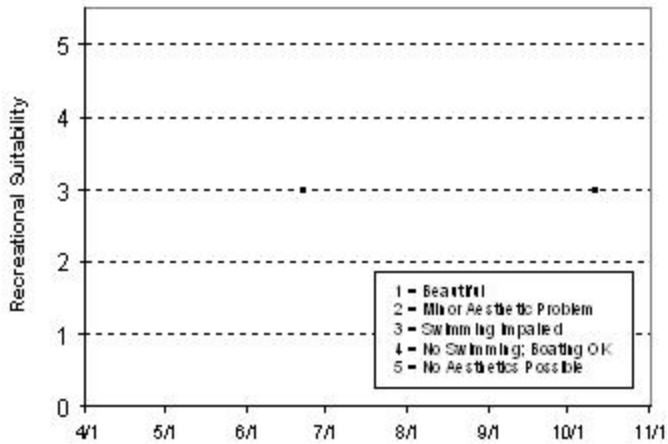


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												F
Chlorophylla												F
Secchi Depth												F
Overall												F

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus	F				C	C	C	B	D	C		D	
Chlorophylla	F				D	D	D	C	B	B		B	
Secchi Depth	F	D	C	D	D	D	D	C	C	C	C	C	C
Overall	F				D	D	D	C	C	C		C	

Source: Metropolitan Council and STORET data



Twin Lake (Crystal) [Upper Basin] (27-0042) *Shingle Creek Watershed Man. Comm.*

Two thousand and four was the fifth year that the upper basin of Twin Lake, which is located in the City of Crystal (Hennepin County), was monitored as part of CAMP. The lake has also been monitored by Council-staff in the past. As part of the volunteer monitoring program the upper basin of Twin Lake was sampled 14 times from late-April to mid-October, 2004.

The entire 212-acre lake has maximum and mean depth of 14.0 and 2.1 m (46 and 7 feet), respectively. The acreage of each basin is as follows: lower basin= 46 acres, middle basin= 69 acres, and the upper basin= 137 acres. The upper basin itself has a mean and maximum depth of 2.4 m and 0.9 m (8 and 3 feet). The total volume of the whole lake is approximately 1,490 ac-ft (397 ac-ft of which is contained within the upper basin). About 81 percent of the whole lake's area is considered littoral (the 0-15 foot depth area dominated by aquatic vegetation). Access to the lake can be obtain at two locations, the southern end of the lake and the lake's eastern shore.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	165.2	66.0	283.0	F
CLA (µg/l)	85.3	18.0	160.0	F
Secchi (m)	0.5	0.3	1.0	F
TKN (mg/l)	1.91	0.80	3.20	
			Overall Grade	F

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's quality seems to fluculate between a low-D and F grade. To better understand the quality of the lake and what direction it may be heading, continued monitorinf is suggested.

Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 2.6 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.4 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

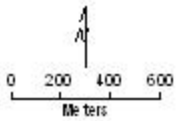
Twin Lake, Upper Basin,

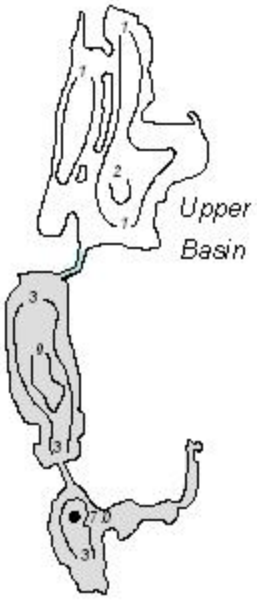
Robbinsdale, Hennepin Co.

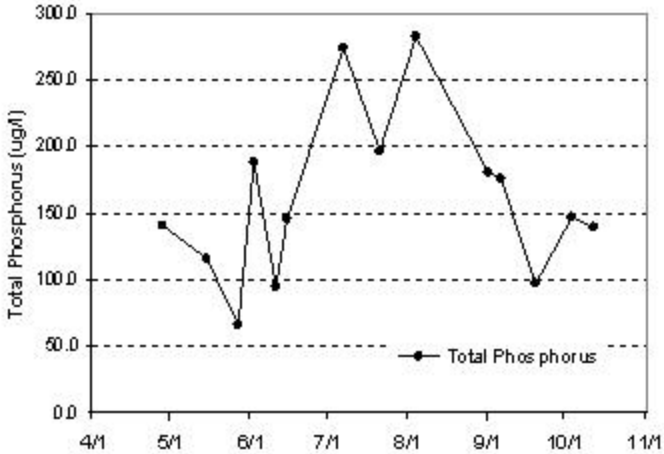
Lake ID: 270042-01
WMO: Shingle Creek
Volunteer: Kristen Mann

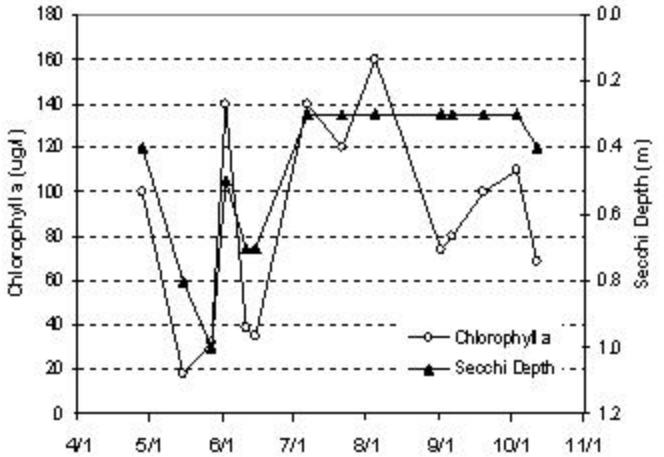
● Sampling site

Contours in meters



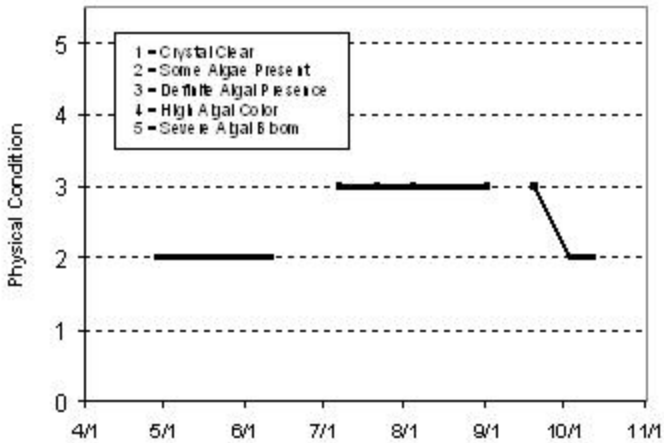






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/28/04	14				100	141.0		0.4	2	1
5/15/04	15				18	116.0		0.8	2	1
5/27/04	18				32	66.0		1.0	2	2
6/2/04	22				140	188.0		0.5	2	2
6/11/04	20				39	95.0		0.7	2	2
6/15/04	21				35	146.0		0.7		
7/7/04	22				140	274.0		0.3	3	3
7/21/04	30				120	197.0		0.3	3	3
8/4/04	25				160	283.0		0.3	3	3
9/1/04	24				74	180.0		0.3	3	3
9/6/04	23				80	175.0		0.3		
9/19/04	22				100	97.0		0.3	3	3
10/3/04	15				110	147.0		0.3	2	3
10/12/04	15				69	140.0		0.4	2	2

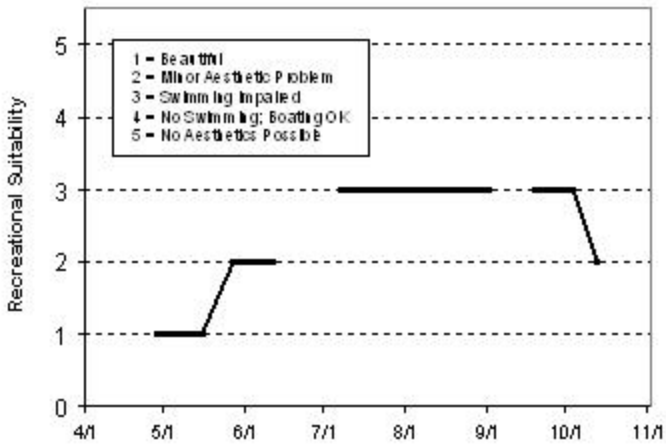


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												D
Chlorophyll a												D
Secchi Depth											F	F
Overall												D

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		D			F		D		F		D		F
Chlorophyll a		D			D		D		F		F		F
Secchi Depth		F			F		F		F		F		F
Overall		D			F		D		F		F		F

Source: Metropolitan Council and STORET data



Twin Lake [Burnsville] (19-0028) Black Dog Watershed Management Commission

Twin Lake, an 11-acre lake located in the City of Burnsville (Dakota County). Because of the shallowness of the lake, its entire area is considered littoral zone (the area of aquatic vegetation dominance) and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). There is very little known morphological data available for the lake. An area of concern and need for future management is the recent detection of Eurasian Water Milfoil (*Myriophyllum spicatum*) in the lake.

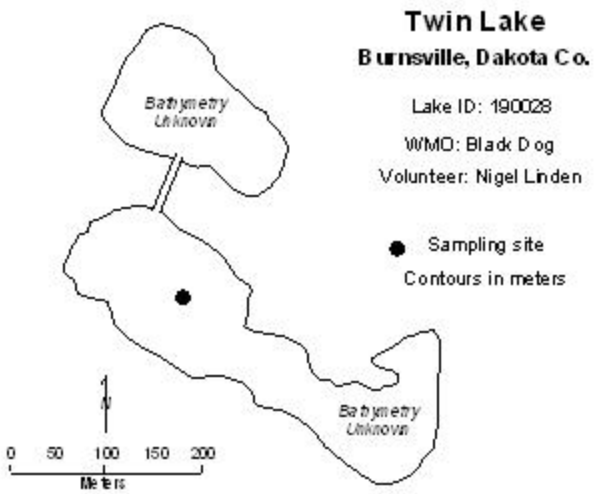
As part of the lake's involvement in CAMP in 2004, the lake was monitored two times between early-June and mid-July. During each sampling event the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

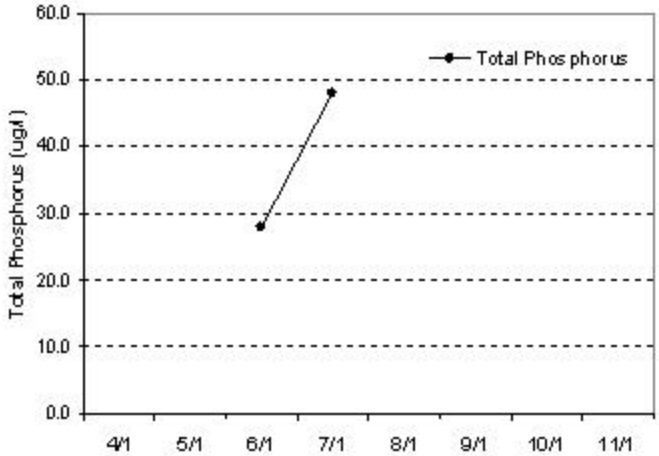
Because there were only two monitoring events for Twin Lake in 2004, the determination of a 2004 summer means and resulting grades would not provide a true picture of the lake's water quality in 2004. The lake's 2004 raw data and resulting graphs are presented on the associated lake information page.

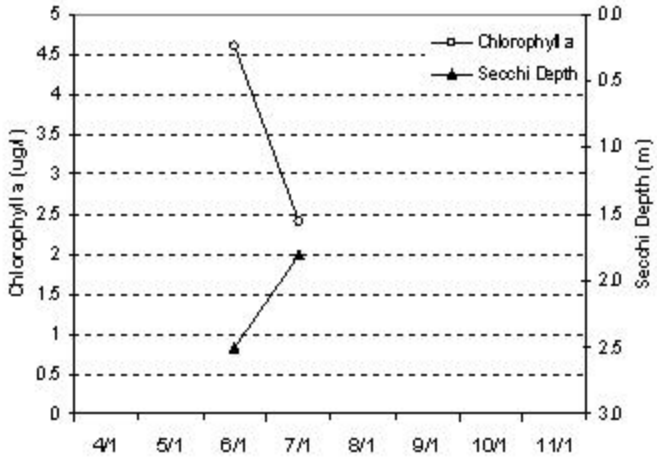
The lake's early-summer monitoring results in 2004 were however, in line to those recorded over the past few years.

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's overall water quality seems to be well represented by a water quality grade of high-C/low-B

If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

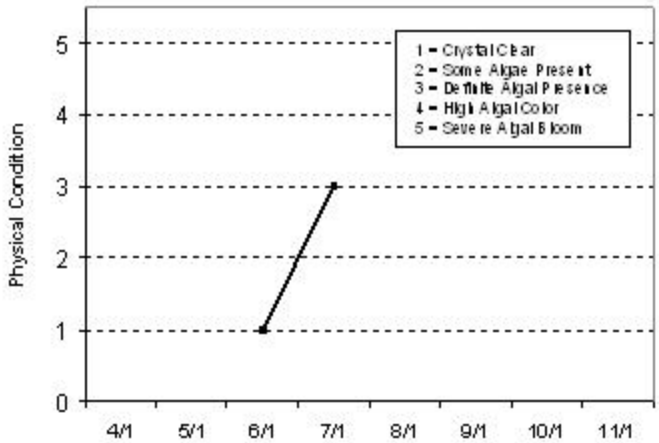






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
6/5/04	20.8				4.6	28.0		2.5	1	2
7/14/04	27.7				2.4	48.0		1.8	3	4

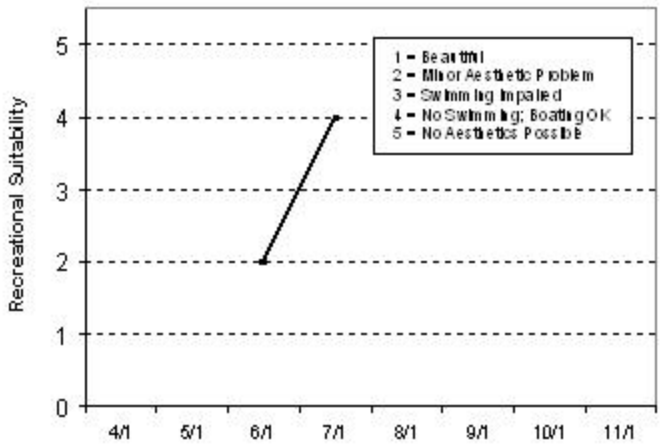


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus								D		C	C	C	NA
Chlorophyll a								B		A	A	A	NA
Secchi Depth								D		C	C	C	NA
Overall								C		B	B	B	NA

Source: Metropolitan Council and STORET data



Twin Lake [St. Louis Park] (27-0656) *City of St. Louis Park*

Twin Lake is a small shallow lake located within City of St. Louis Park (Hennepin County). There is very little known morphological data available for the lake.

Two thousand and four marks the third year in which Twin Lake has been involved in CAMP (2002-2003 being the others). Other than for the 2002-2003 CAMP data, a search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2002-2004 are the only complete, year of available data. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 14 times between late-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	174.1	93.0	318.0	F
CLA (µg/l)	51.3	15.0	140.0	D
Secchi (m)	0.7	0.5	1.1	D
TKN (mg/l)	1.58	0.77	2.60	
			Overall Grade	D

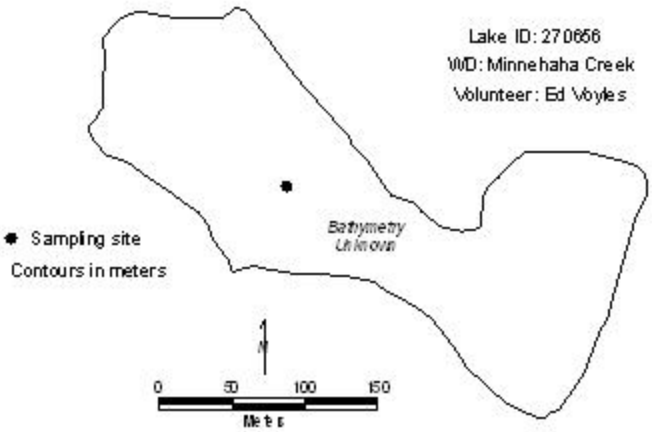
As mentioned earlier, there are no water quality data available for Twin Lake other than the 2002-2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

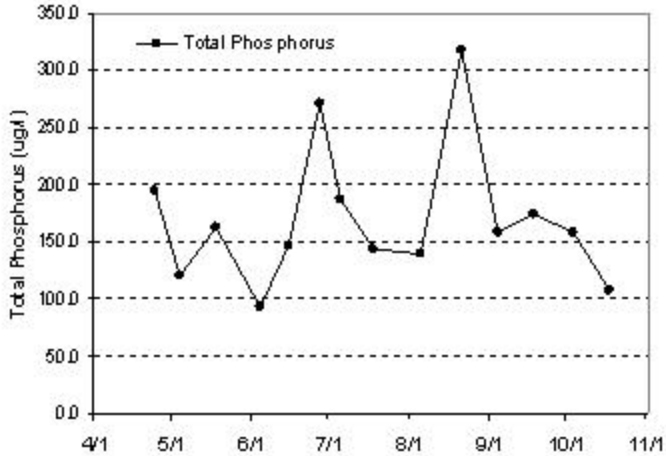
Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 3.5 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 4.0 for recreational suitability (4- "no swimming – boating ok").

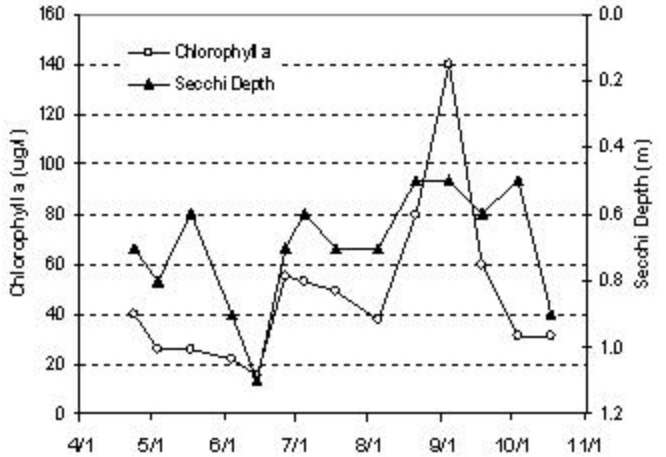
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

Twin Lake

St. Louis Park, Hennepin Co.

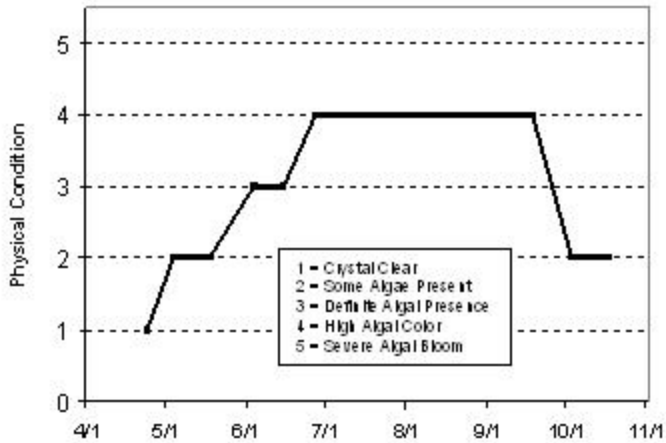






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/24/04	13.8				40	195.0		0.7	1	4
5/4/04	13.8				26	121.0		0.8	2	4
5/18/04	15.9				26	162.0		0.6	2	4
6/4/04	19.4				22	93.0		0.9	3	4
6/15/04	21.8				15	146.0		1.1	3	4
6/27/04	20.8				55	272.0		0.7	4	4
7/6/04	23.9				53	188.0		0.6	4	4
7/18/04	24.8				49	144.0		0.7	4	4
8/5/04	23.3				38	140.0		0.7	4	4
8/21/04	19.6				80	318.0		0.5	4	4
9/4/04	26.5				140	158.0		0.5	4	4
9/18/04	21.4				60	174.0		0.6	4	4
10/3/04	14				31	158.0		0.5	2	4
10/17/04	8.1				31	108.0		0.9	2	4

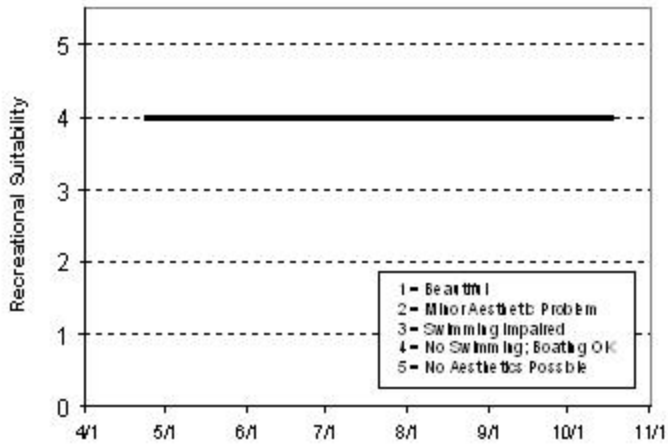


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus											F	F	F
Chlorophyll a											B	C	D
Secchi Depth											D	D	D
Overall											D	D	D

Source: Metropolitan Council and STORET data



Valentine Lake (62-0071) *Rice Creek Watershed District*

Valentine Lake is located within the City of Arden Hills in Ramsey County. The lake has a surface area of 60-acres, and a maximum and mean depth of 4.0 m (13.1 feet) and 1.5 m (4.9 feet), respectively. Because of the shallowness of the lake, its entire surface area is considered littoral, the shallow (0-15 foot depth) area dominated by aquatic vegetation, and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column). The mean depth and surface area of the lake translates to an approximate volume of 300 ac-ft. The result of comparing the lake's surface area to its 2,237-acre drainage area (watershed) is a rather large 37:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff).

This was the fourth year that Valentine Lake has been involved in CAMP (2001-2003 being the others). In fact, the 2001-2003 CAMP data were the only data found through STORET nationwide water quality database search. Therefore 2001-2004 represents the only water quality data readily available for the lake.

The lake was monitored 12 times between mid-April and mid-October, 2004. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	56.4	40.0	76.0	C
CLA (µg/l)	24.3	13.0	41.0	C
Secchi (m)	1.3	1.1	1.6	C
TKN (mg/l)	0.77	0.57	0.96	
			Overall Grade	C

While the resulting overall grade for 2004 (C) is identical to those of 2001-2003, the individual grades of 2001-2002 were better. The lake's 2004 nutrient concentrations and Secchi transparencies are graphed on the following page.

Because of the limitedness of the lake's water quality database, the determination of any only long- or short-term trends are not possible to determine. It is reported on the MPCA website, however, that a recently conducted trend analysis on the lake's Secchi transparency data revealed a statistically significant improvement in recent water clarity. To better understand the lake's water quality and what direction it may be heading, more years of data collection are needed.

The perceived physical and recreational conditions of the lake, recorded by the volunteers, were ranked on a 1-to-5 scale. The rankings are shown in both tabular and graphical form on the lake's associated information sheet. The mean physical condition ranking was 2.1 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 1.4 (between 1- "beautiful" and 2- "minor asethetic problem").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

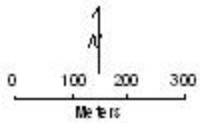
Valentine Lake

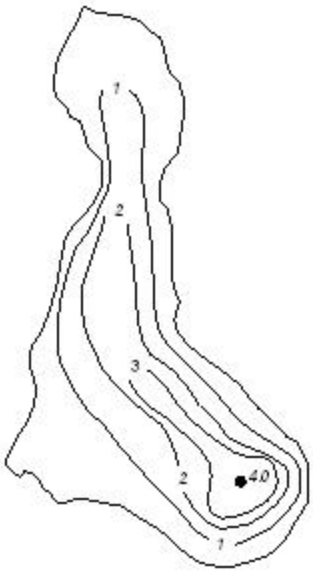
Arden Hills, Ramsey Co.

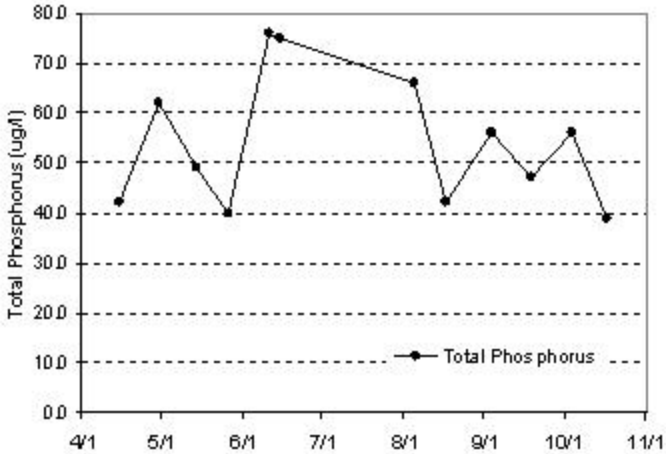
Lake ID: 6200071
WD: Rice Creek
Volunteer: Bob Kistler

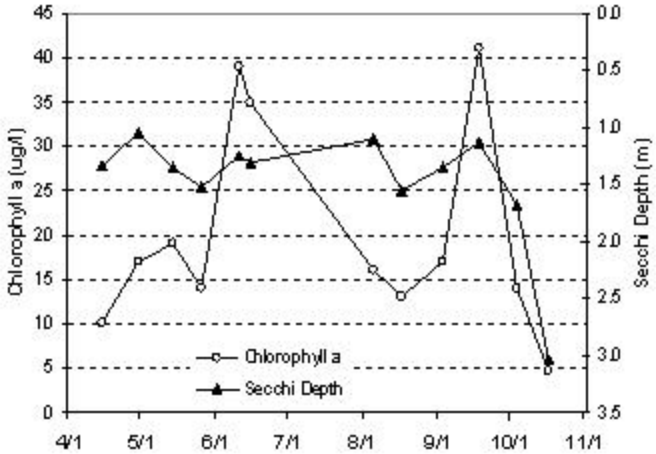
Sampling site

Contours in meters



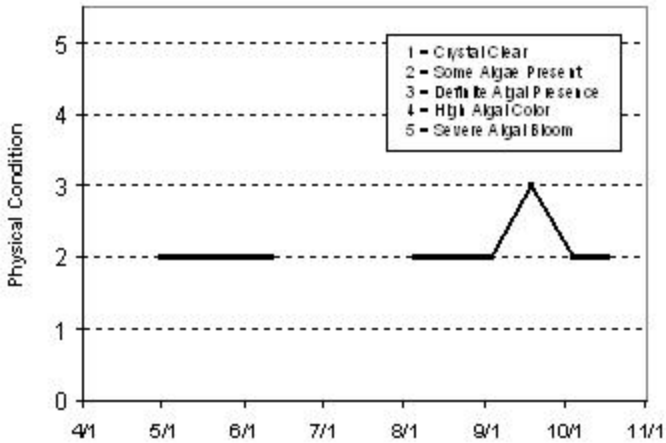






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	11		11.4		10	42.0		1.3		
4/30/04	14.2		10.5		17	62.0		1.1	2	1
5/14/04	15.4		8.76		19	49.0		1.4	2	1
5/26/04	16.1		10.23		14	40.0		1.5	2	1
6/11/04	19				39	76.0		1.3	2	1
6/15/04	21				35	75.0		1.3		
8/5/04	24		7.89		16	66.0		1.1	2	2
8/17/04	21.5				13	42.0		1.6	2	2
9/3/04	23		8.38		17	56.0		1.4	2	1
9/18/04	20		8.3		41	47.0		1.1	3	2
10/4/04	13.4				14	56.0		1.7	2	2
10/17/04	9				4.6	39.0		3.0	2	2

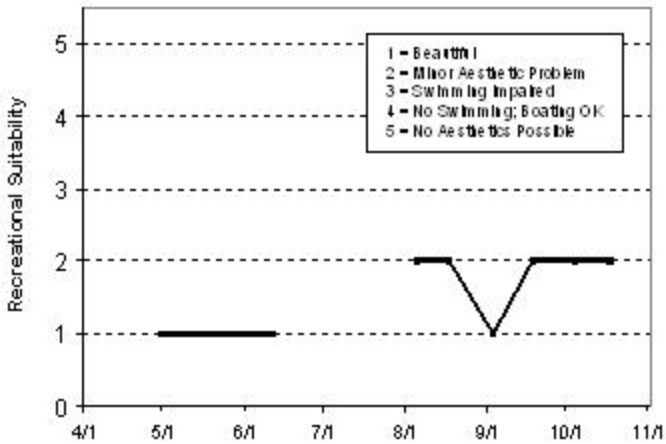


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus										C	C	C	C
Chlorophyll a										B	B	C	C
Secchi Depth										C	C	D	C
Overall										C	C	C	C

Source: Metropolitan Council and STORET data



Valley Lake (19-0348) *City of Lakeville*

This was the ninth year that Valley Lake, located in the City of Lakeville (Dakota County), has been involved in CAMP. The lake had been monitored through CAMP in 1995-1997 and 1999-2004. A search through the nationwide water quality database (STORET) found no water quality data on the lake prior to the 1995 CAMP data.

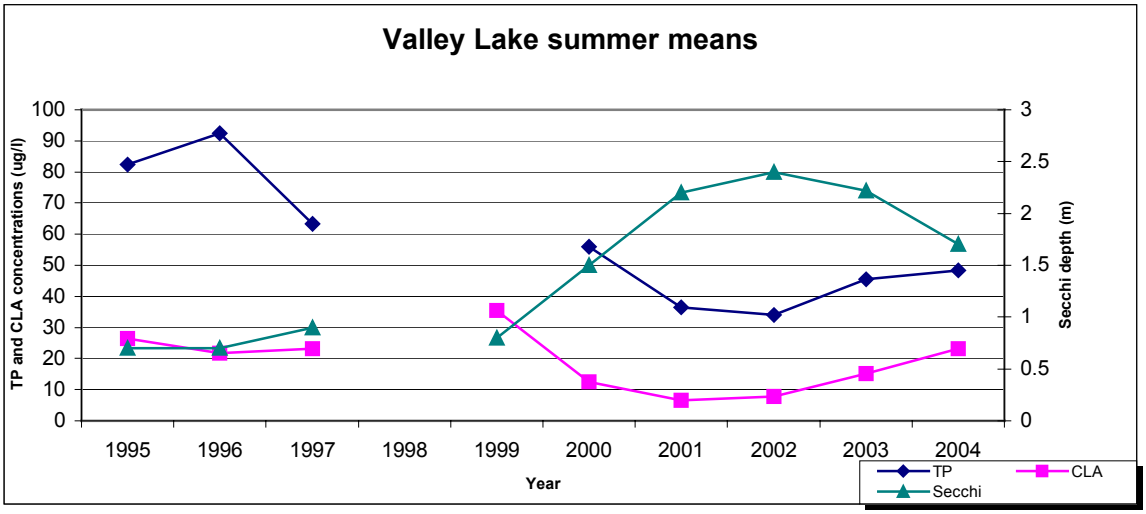
The 15-acre lake has a maximum depth of 3.2 m (10 feet). Because of the shallowness of the lake, the entire lake is considered littoral (the area of dominated by aquatic vegetation). The majority of the land within the lake's 117-acre watershed is parkland or single-family residential homes. The watershed-to-lake size ratio is 8:1 (the greater the ratio, the greater the potential stress on the lake from surface runoff).

The lake has been involved in CAMP in 1999-2004 as part of a barley straw project on the lake. In an attempt to inhibit algal populations within the lake, barley straw has been added. Barley straw has been used for algal control in the United Kingdom for many years, although the controlling mechanism is not truly known. In order to determine the success of the straw method (as well as trying to clarify the contolling mechanism), TP, TKN, CLA, Secchi transparency as well as total and dissolved carbon were tested 14 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	48.4	34.0	63.0	C
CLA (µg/l)	23.2	5.3	59.0	C
Secchi (m)	1.7	1.1	2.4	C
TKN (mg/l)	0.87	0.63	1.10	
			Overall Grade	C

The lake's water quality grades (and associated parameter means), were worse than those recorded in 2000-2003 (2002 was the lake's best recorded water quality year).



While the above graph shows a definite improvement in lake water quality since the use of barley straw first began in 1999, the lake's quality has shown some degradation over the last two years (2003-2004).

One explaination for the recent dip in water quality could be directly linked to an escalating panfish population. Similar to that mentioned for Lee Lake, where a recent fish survey suggested that unusually high fish densities may be impacting the barley treatment on the lake. The Lee Lake survey revealed the lake's fishery being dominated by bluegill sunfish, black crappies, and black bullheads (with as much as 30+ times the areas average number of bluegills per net) (McComas 2004). For this reason an in-lake fisheries survey is scheduled for Valley Lake in 2005.

While barley straw seems to inhibit algal growth, which in turn results in improved water clarity, the reason is not truly understood. In an attempt to identify the algal inhibitor released by the decaying barley straw, additional in-lake water samples were taken in 2001-2004 in Valley Lake along with monthly samples in a nearby sediment basin where barley straw was not used (viewed as a control). These additional samples, which in the past had centered around the break down of phenols concentrations (one of the theories behind the barley straw inhibitor) as a part of 57 base neutral acids organic compounds (BNAs), as well as total and dissolved carbon. Because the breakdown of BNA compounds for each of the collected samples in 2002 came back below detection limit (< 2.0 μg/l), it is not thought that chemical compounds (such as phenols) released from the decomposing straw is the mechanism inhibiting the algal growth.

The examination of the Valley Lake and sedimentation basin carbon data was the focus of the additional monitoring in 2003-2004. The thought is that the carbon may aid another potential algal inhibiting process, that is the microbial competition for phosphorus (McComas 2003). Therefore, the presence of decaying barley straw results in the lake's algal biomass actually being phosphorus-limited not inhibited by a released chemical compound. Initial analysis of the 2003-2004 carbon and chlorophyll data seems to support this theory.

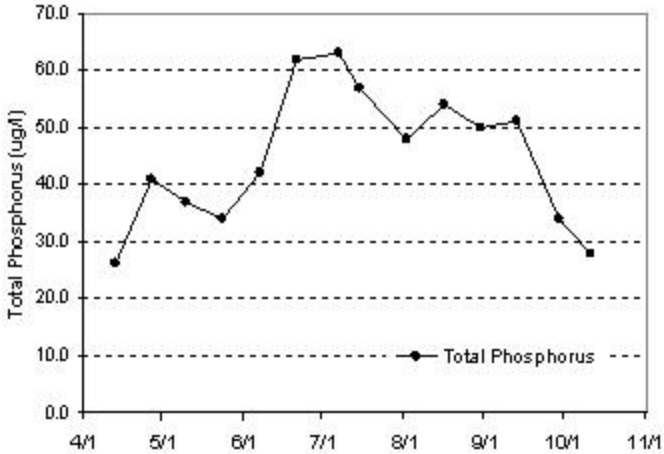
In addition to the collection of TP, TKN, CLA and Secchi information during each monitoring event in 2004, the volunteer(s) ranked their perception of the lake's physical and recreational conditions on a 1-to-5 scale as shown on the attached information sheet. The summertime mean recorded physical condition was 2.8 (between 2- "some algae present" and 3- "definite algae present"). The mean suitability for recreation ranking was 2.1 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

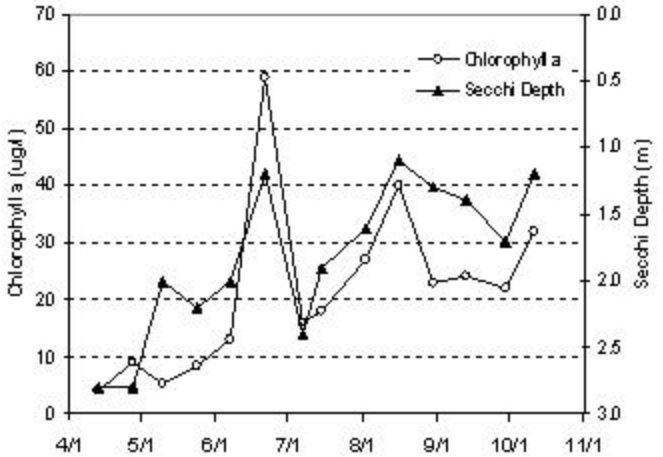
If you know of any errors in the lake's data, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Valley Lake
Lakeville, Dakota Co.

Lake ID: 190348
WMO: Dakota County
Volunteer: City of Lakeville

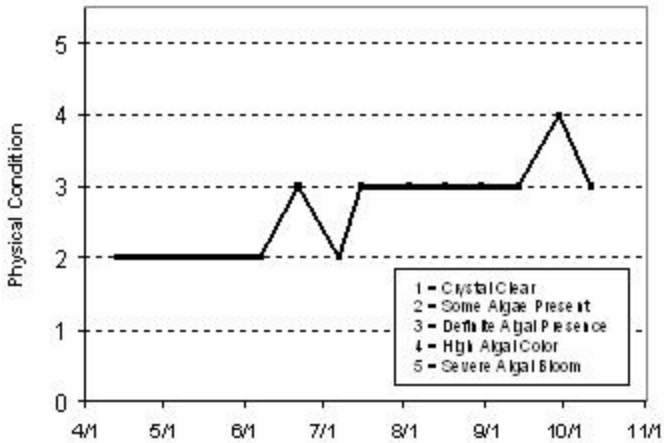
Sampling site
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/13/04	8.4				4.2	26.0		2.8	2	1
4/27/04	14.5				9.1	41.0		2.8	2	1
5/10/04	17.9				5.3	37.0		2.0	2	1
5/24/04	15.7				8.3	34.0		2.2	2	2
6/7/04	71				13	42.0		2.0	2	1
6/21/04	21.3				59	62.0		1.2	3	3
7/7/04	23				16	63.0		2.4	2	2
7/15/04	25.2				18	57.0		1.9	3	2
8/2/04	24.6				27	48.0		1.6	3	2
8/16/04	20.2				40	54.0		1.1	3	2
8/30/04	20.7				23	50.0		1.3	3	3
9/13/04	21.8				24	51.0		1.4	3	2
9/29/04	17.9				22	34.0		1.7	4	3
10/11/04	14.6				32	28.0		1.2	3	2

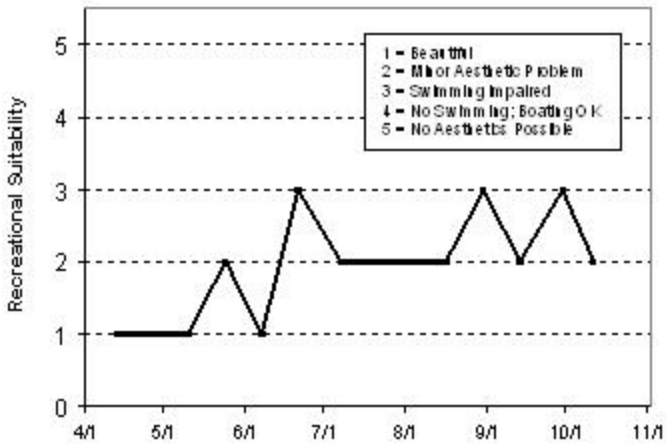


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus				D	D	C			C	C	C	C	C
Chlorophyll a				C	C	C		C	B	A	A	B	C
Secchi Depth				D	D	D		D	C	C	B	B	C
Overall				D	D	C			C	B	B	B	C

Source: Metropolitan Council and STORET data



Virginia Lake (10-0015) *Minnehaha Creek Watershed District*

This was the fifth year of CAMP monitoring in Virginia Lake, which is located in the City of Victoria (Carver County). A search through the STORET nationwide water quality database revealed a limited amount of historic data on the lake (1988-1991[consisting of just a single monitoring event] and 2000-2002). The 110-acre lake has a mean and maximum depth of 3.3 m (11 feet) and 10.4 m (34 feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 1,210 ac-ft. Roughly 88 percent of the lake's area is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation). Additionally, the lake's 450-acre immediate watershed translates to a 7:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff). An area of concern and need for future management is the presence of Eurasian Water Milfoil (*Myriophyllum spicatum*) in the lake.

The lake was monitored 15 times between early-May and mid-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability. The collected data and resulting graphs showing TP and CLA concentrations, Secchi transparency, and user perception (physical condition and recreational suitability) are presented on the lake's information sheet on the following page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	62.6	44.0	134.0	C
CLA (µg/l)	35.4	3.2	91.0	C
Secchi (m)	1.19	0.90	2.10	D
TKN (mg/l)	1.13	0.75	1.60	
			Overall Grade	C

While the lake's 2004 overall grade is identical to those recorded in 2000-2003, the 2004 Secchi mean (and associated grade) was slightly worse.

Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 2.8 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.7 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

As mentioned earlier, there is a limited amount of historic data available for Virginia Lake other then the single event monitoring of 1988-1991 (no grades are shown for these data due the limited number of events) and 2000-2004 CAMP data. Therefore it is not possible to determine any long-term trends. In the short-term however, the lake seem well represented by an overall water quality grade of C. To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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/.

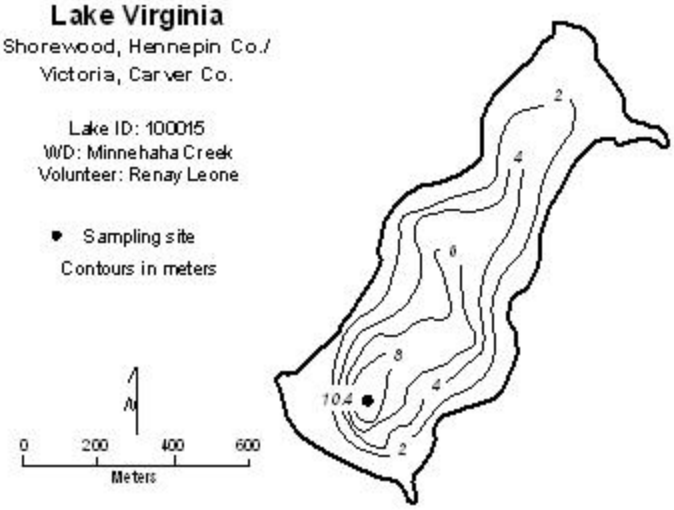
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

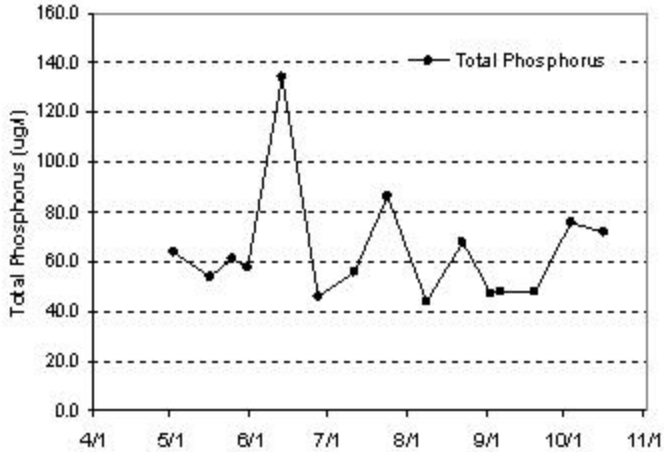
Lake Virginia

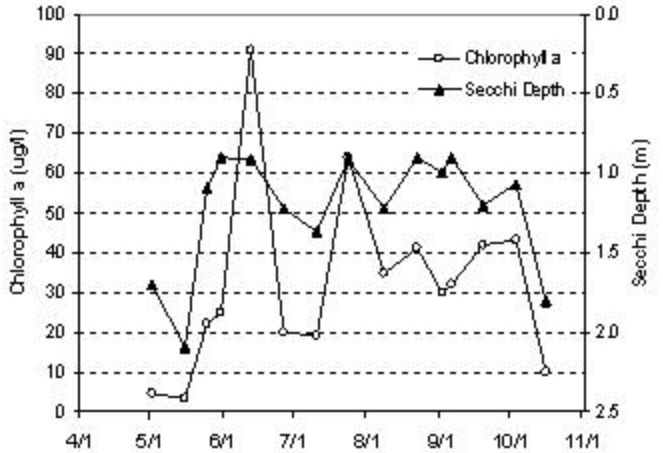
Shorewood, Hennepin Co./
Victoria, Carver Co.

Lake ID: 100015
WD: Minnehaha Creek
Volunteer: Renay Leone

● Sampling site
Contours in meters

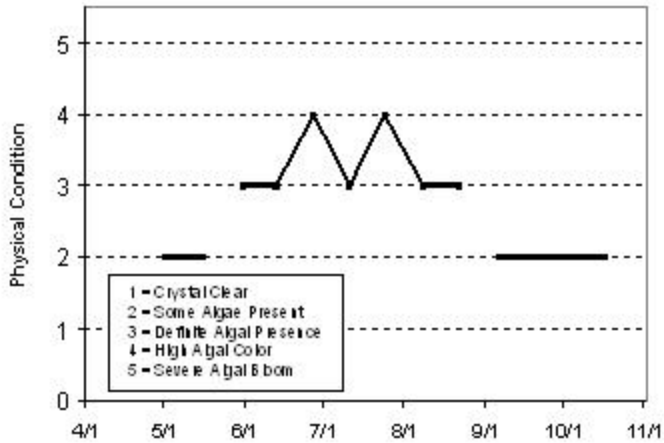






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/2/04	12.9				4.6	64.0		1.7	2	2
5/16/04	14.6				3.2	54.0		2.1	2	2
5/25/04	15				22	61.0		1.1		
5/31/04	15.1				25	58.0		0.9	3	3
6/13/04	20.7				91	134.0		0.9	3	3
6/27/04	19				20	46.0		1.2	4	4
7/11/04	23.5				19	56.0		1.4	3	3
7/24/04	25.8				64	86.0		0.9	4	3
8/8/04	22.4				35	44.0		1.2	3	3
8/22/04	19.6				41	68.0		0.9	3	3
9/2/04	21				30	47.0		1.0		
9/6/04	20.7				32	48.0		0.9	2	2
9/19/04	19				42	48.0		1.2	2	2
10/3/04	13.4				43	76.0		1.1	2	2
10/16/04	9				9.8	72.0		1.8	2	2

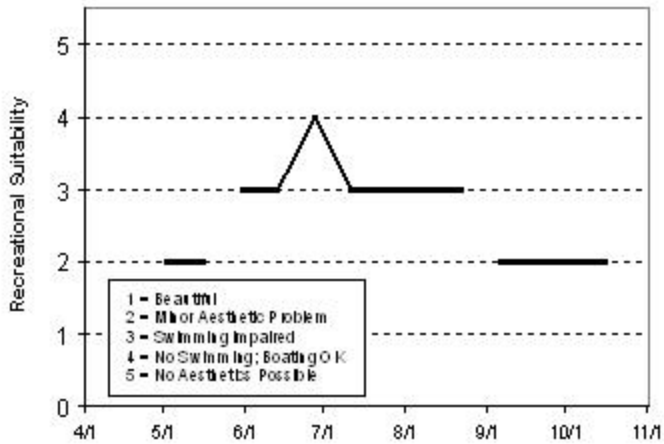


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus									C	C	C	C	C
Chlorophyll a									C	C	C	C	C
Secchi Depth									C	C	C	C	D
Overall									C	C	C	C	C

Source: Metropolitan Council and STORET data



West Boot Lake (82-0044) *Carnelian - Marine Watershed District*

This was the fourth year of CAMP monitoring in West Boot Lake which is located in May Township (Washington County). A search through the STORET nationwide water quality database revealed a moderate amount of data on the lake over the past 10+ years (1991 and 1996-1999 and the 2000-2003 CAMP data). The 110-acre lake has a mean and maximum depth of 5.9 m (19 feet) and 11.9 m (39 feet), respectively. The mean depth of the lake and its surface area translate to an approximate lake volume of 2,090 ac-ft. Roughly 56 percent of the lake's ares is considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation). The lake's 209-acre immediate watershed translates to a 2:1 watershed-to-lake size ratio (the greater the ratio, the greater the potential stress on the lake from surface runoff).

The lake was monitored 14 times between mid-April and mid-October, 2004. Results are presented on graphs and data tables on the following page. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	19.4	12.0	29.0	A
CLA (µg/l)	2.9	1.3	8.2	A
Secchi (m)	4.5	2.9	5.8	A
TKN (mg/l)	0.62	0.42	0.83	
			Overall Grade	A

The lake's 2004 overall grade is identical to those recorded in 1999-2003.

Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 1.9 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 1.8 (between 1- "beautiful" and 2- "minor aesthetic problem").

No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake seems to have a wide range of fluctuation (overall grade of B in 1996, C in 1997, B in 1998 and A's in 1999-2003). To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. 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 lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

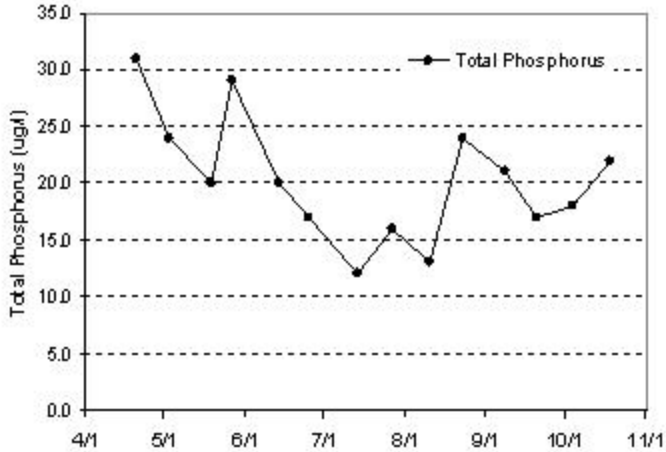
West Boot Lake

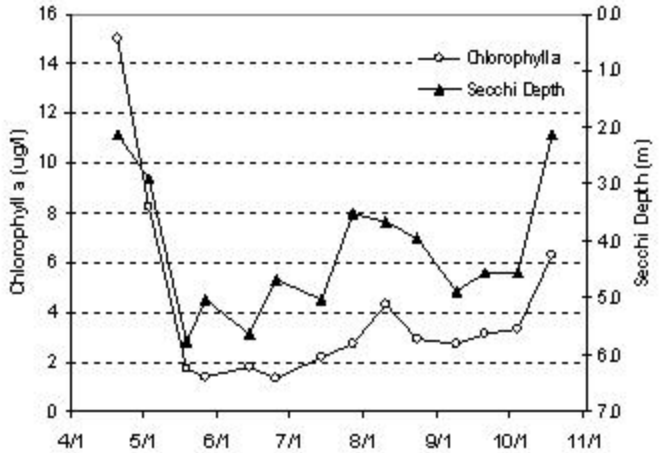
May Twp., Washington Co.

LAKE ID: 820044

WD: Carnelian-Marine

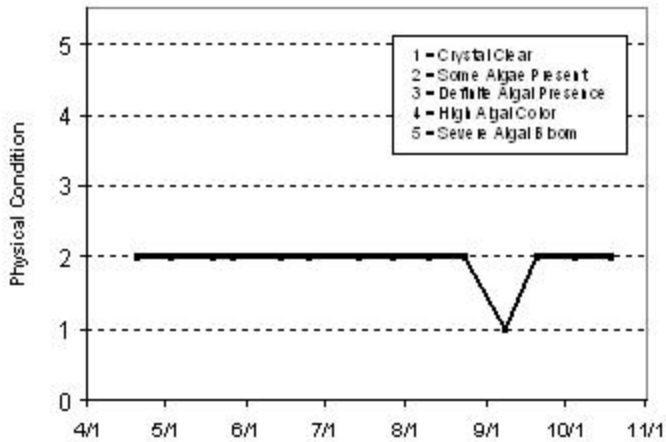
Volunteer: Wash. Co. SWCD





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/20/04	12.7	4.4	10.84	0.02	15	31.0		2.1	2	2
5/3/04	13.3	4.5	10	0.02	8.2	24.0		2.9	2	2
5/19/04	17.3	4.5	7.75	0.02	1.7	20.0		5.8	2	2
5/27/04	16.2	4.5	8.41	0.04	1.4	29.0		5.0	2	2
6/14/04	23.3	4.6	7.21	0.03	1.8	20.0		5.6	2	2
6/25/04	20.9	4.7	7.46	0.23	1.3	17.0		4.7	2	1
7/14/04	26.3	4.8	7.6	0.2	2.2	12.0		5.0	2	2
7/27/04	25.5	4.9	7.29	0.34	2.7	16.0		3.5	2	2
8/10/04	22.2	5	6.77	0.5	4.3	13.0		3.7	2	2
8/23/04	20.3	5.1	8.27	0.19	2.9	24.0		4.0	2	2
9/8/04	21.8	5.4	6.2	0.27	2.7	21.0		4.9	1	1
9/20/04	20.3	5.5	6.17	0.11	3.1	17.0		4.6	2	2
10/4/04	14.8	5.6	6.26	0.36	3.3	18.0		4.6	2	2
10/18/04	10.3	5.6	6.37	0.08	6.3	22.0		2.1	2	2

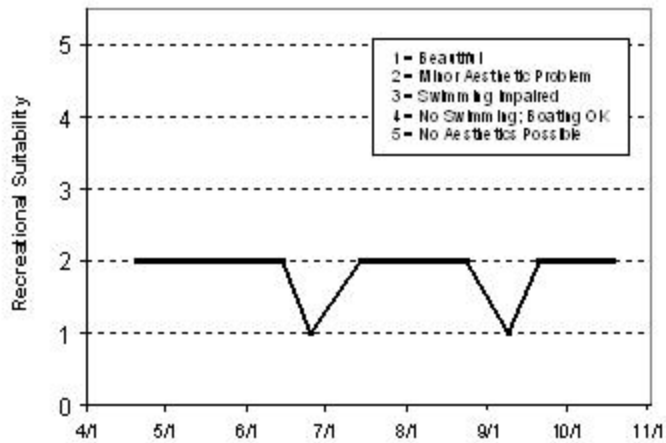


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												C
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					B	C	A	A	A	A	A	B	A
Chlorophyll a					A	B	C	A	A	A	A	A	A
Secchi Depth					B	C	B	A	A	A	A	A	A
Overall					B	C	B	A	A	A	A	A	A

Source: Metropolitan Council and STORET data



Westwood Lake (27-0711) *Bassett Creek Watershed Management Organization*

This was the sixth year of CAMP monitoring in Westwood Lake (1993 and 2000-2003 being the others), which is located in the City of St. Louis Park (Washington County). The 41-acre lake has a maximum depth of 2.0 m (six-and-a half feet). Because of the shallowness of the lake, it is entirely considered littoral zone (the 0-15 foot depth area dominated by aquatic vegetation), and it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column).

Westwood Lake was monitored seven times between late-May and mid-September, 2004. Results from the monitoring are presented on the information sheet on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	37.5	19.0	67.0	C
CLA (µg/l)	5.8	1.0	13.0	A
Secchi (m)	1.3	0.9	1.7	C
TKN (mg/l)	0.91	0.42	1.50	
			Overall Grade	B

By comparing the lake's historic database TP (nutrient), CLA (algal biomass estimator), and Secchi (water clarity) grades, it is apparent that the TP and Secchi grades are quite a bit worse than the CLA grade. In a most cases, the three should be fairly comparable. One possible explanation for the lake's recent findings may be that the majority of the lake's TP comes from either in-lake suspended sediments (re-suspension), or the intrusion of sediment-laden runoff to the lake, which in turn lessens the clarity of the water and inhibits algal growth.

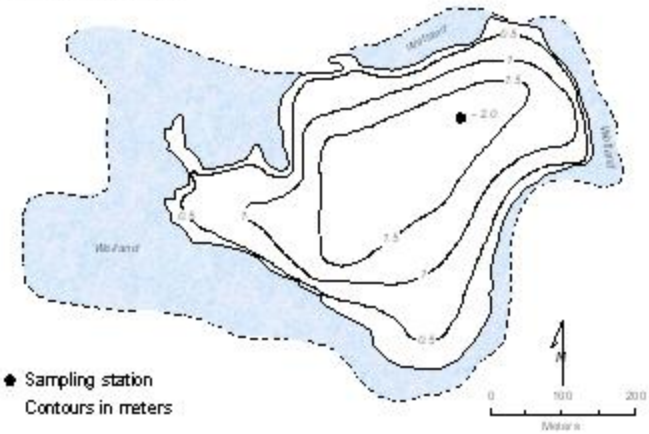
Since there is a limited amount of historic data available for Westwood Lake, it is not possible to determine any long-term trends. In the short-term however, the lake seems to have a wide range of fluctuation (overall grade of D in 1982, C in 1993 and 2001-2002, and B in 2000 and 2003-2004). To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The average user perception rankings, on a 1-to-5 scale, were 2.3 for physical condition (between 2- "some algae present" and 3- "definite algae present"), and 3.6 for recreational suitability (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

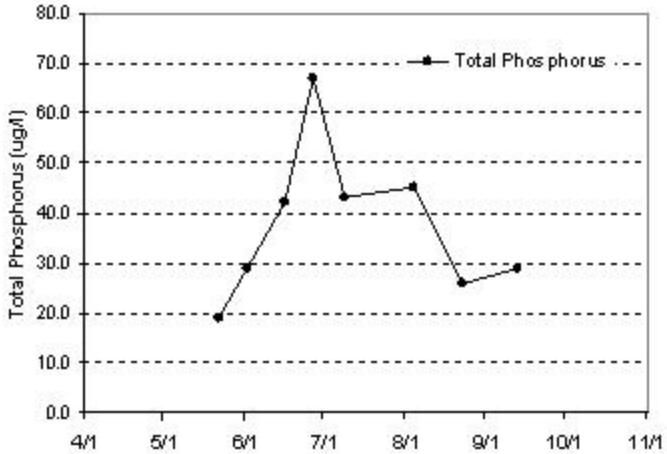
If you know of any errors in the lake's data or physical information, or are aware of any additional information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

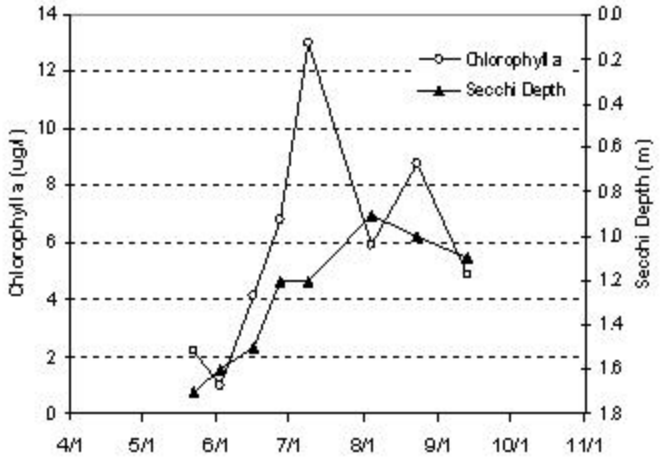
Lake ID: 270711
WMO: Bassett Creek
Volunteers: The Carlson Family

Westwood Lake,
St. Louis Park, Hennepin Co.



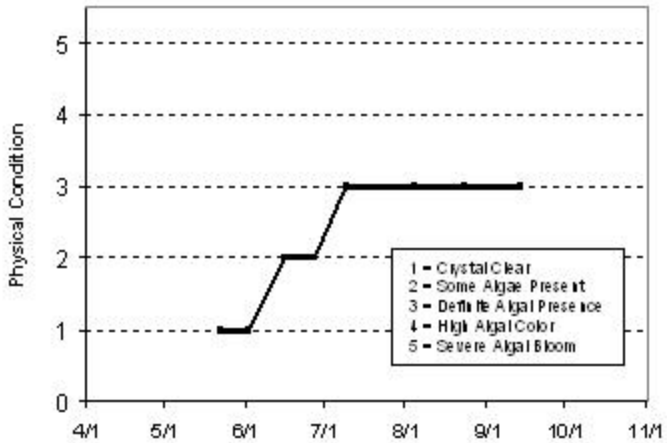
Sampling station
Contours in meters





2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/22/04	17				2.2	19.0		1.7	1	4
6/2/04	19				1	29.0		1.6	1	2
6/16/04	23.7				4.1	42.0		1.5	2	4
6/27/04	21				6.8	67.0		1.2	2	4
7/9/04	25.9				13	43.0		1.2	3	4
8/4/04	25.3				5.9	45.0		0.9	3	3
8/23/04	22.7				8.8	26.0		1.0	3	4
9/13/04	23.5				4.9	29.0		1.1	3	4

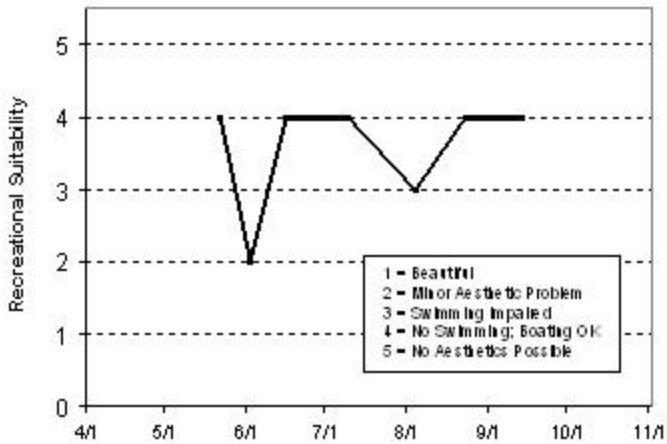


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus			F									
Chlorophyll a			C									
Secchi Depth			D									
Overall			D									

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus		C							B	B	C	C	C
Chlorophyll a		C							B	C	B	A	A
Secchi Depth		C							C	C	C	C	C
Overall		C							B	C	C	B	B

Source: Metropolitan Council and STORET data



Wilmes Lake (82-0090) *City of Woodbury*

Wilmes Lake, located in the City of Woodbury (Washington County) is classified as a minnow lake that experiences frequent fish kills. The lake has a surface area of 41 acres (1.3 miles around) and a maximum depth of 5.5 m (18 feet). While there is currently no public access to the lake, one is planned at the northern end of the lake. The lake's 2,247-acre watershed translates to a large watershed-to-lake size ratio of 55:1. The larger the ratio, the greater the potential stress on the lake quality from surface runoff.

The future "ultimate" land uses within the lake's contributing watershed are expected to be: 16.4 percent single-family residential, 4.5 percent multi-family residential, 10.5 percent commercial/retail, 3.7 percent parks/open space, 1.0 percent ponds/wetlands, and 63.9 percent indirect drainage (City of Woodbury 1994).

Wilmes Lake has been involved in CAMP since 1994. In 2004, the lake was monitored 12 times between mid-April and mid-October. During each monitoring event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the perceived physical condition and recreational suitability. Results are presented on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	60.6	40.0	89.0	C
CLA (µg/l)	22.8	4.9	48.0	C
Secchi (m)	1.6	0.9	3.0	C
TKN (mg/l)	1.22	0.95	1.50	
			Overall Grade	C

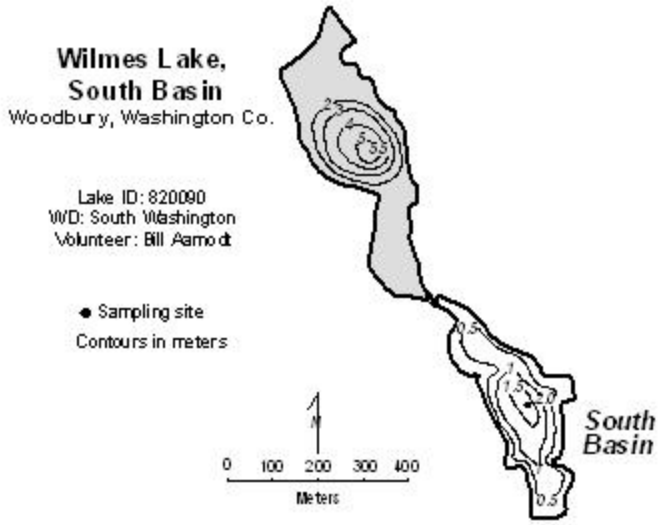
The lake's 2004 overall water quality grade of C is identical to those of 1995-1996, 1999-2000 and 2003. The 2004 overall grade is better than the overall grade of D recorded in 1997-1998 and 2001, and worse than 1994 (B). That said, the 1994 and 1995 CAMP data were actually collected in the northern basin of Wilmes Lake, while the 1996-2004 data were collected in the lake's south basin. For this reason, comparisons between the 1994-1995 database and the 1996-2004 should not be made.

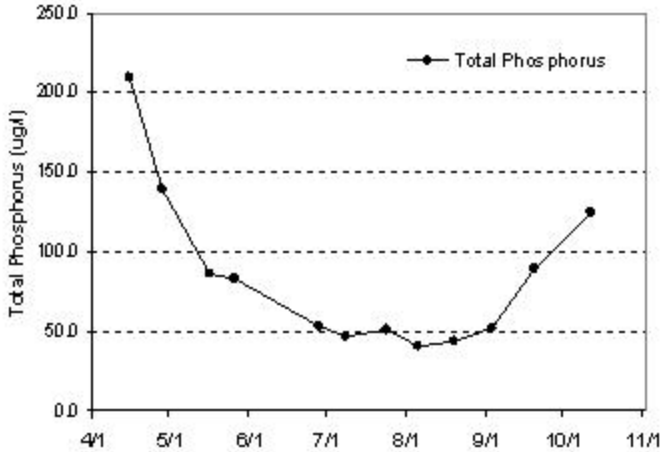
When strictly looking at the lake's 1996-2004 water quality database (south baisn), it is apparent that the lake's 2004 water quality water was the best recorded to date.

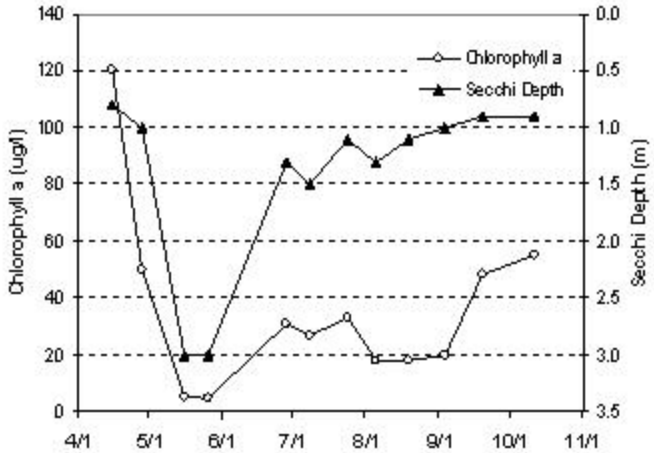
No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the overall lake grade in the north basin seems to be C/B, while the overall grade of the south basin seems to be C/D+. To better understand the lake's water quality and where it may be heading, continued monitoring is suggested.

Throughout the monitoring period, the perceived physical condition and recreational suitability of the lake were ranked on a 1-to-5 scale by the volunteer monitors. These user perception rankings are presented in data tables and graphs on the information sheet. The mean physical condition ranking was 2.9 (between 2- "some algae present" and 3-"definite algae present"). The mean recreational suitability ranking was 2.6 (between 2- " minor aesthetic problem" and 3- "swimming slightly impaired").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

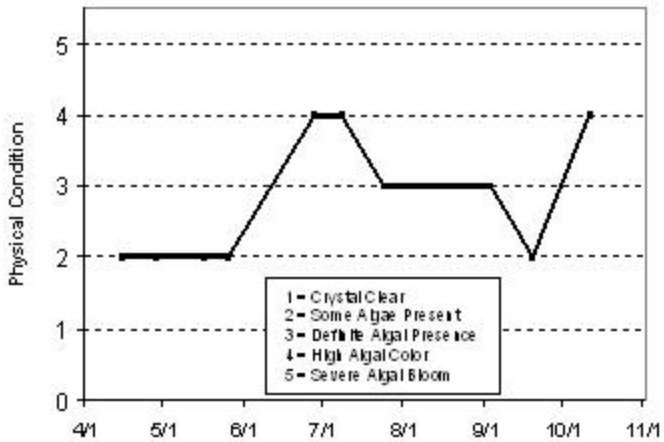






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/15/04	11				120	210.0		0.8	2	2
4/28/04	12.5				50	139.0		1.0	2	2
5/16/04	16				5.5	86.0		3.0	2	1
5/26/04	17				4.9	83.0		3.0	2	2
6/28/04	20				31	53.0		1.3	4	3
7/8/04	23				27	47.0		1.5	4	3
7/24/04	25				33	51.0		1.1	3	3
8/5/04	25				18	40.0		1.3	3	3
8/19/04	21				18	44.0		1.1	3	3
9/3/04	24.5				20	52.0		1.0	3	3
9/19/04	21.5				48	89.0		0.9	2	2
10/11/04	16				55	125.0		0.9	4	3

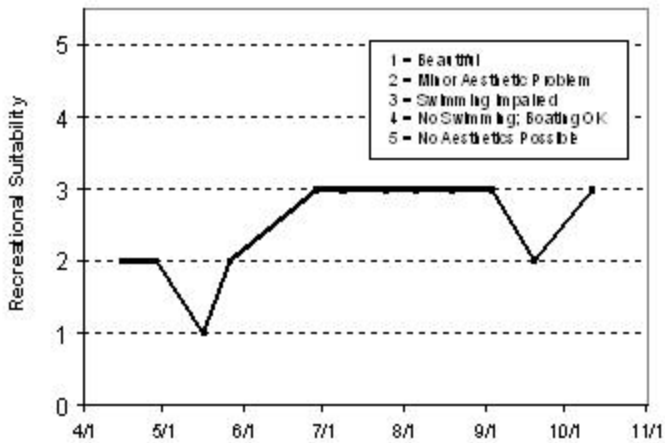


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus			C	D	D	D	D	D	D	D	D	D	C
Chlorophyll a			B	B	C	C	C	C	C	C	D	C	C
Secchi Depth			B	C	C	D	D	C	C	D	D	C	C
Overall			B	C	C	D	D	C	C	D	D	C	C

Source: Metropolitan Council and STORET data



Windsor Lake (27-0082) *City of Minnetonka*

Windsor Lake is a shallow 14-acre land-locked lake located within the City of Minnetonka (Hennepin County). Because of the shallowness of the lake, the entire area is considered littoral zone (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). There is very little other known morphological data available for the lake.

This was the first year that Windsor Lake has been involved in CAMP. On each of the sampling days the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 12 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	Mean	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	193.0	117.0	2.81.0	F
CLA (µg/l)	49.1	4.9	100.0	D
Secchi (m)	0.69	0.35	1.10	F
TKN (mg/l)	2.02	1.20	3.70	
			Overall Grade	F

As mentioned earlier, there are no water quality data available for Windsor Lake other than the 2004 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 3.5 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 4.6 for recreational suitability (between 4- "no swimming – boating ok" and 5- "no aesthetics possible").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

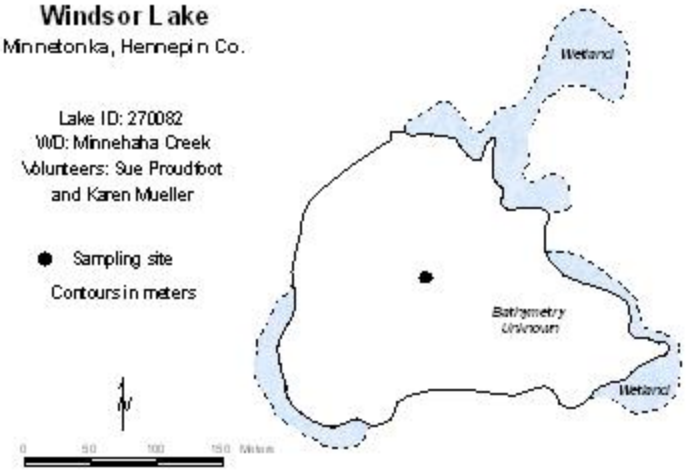
Windsor Lake

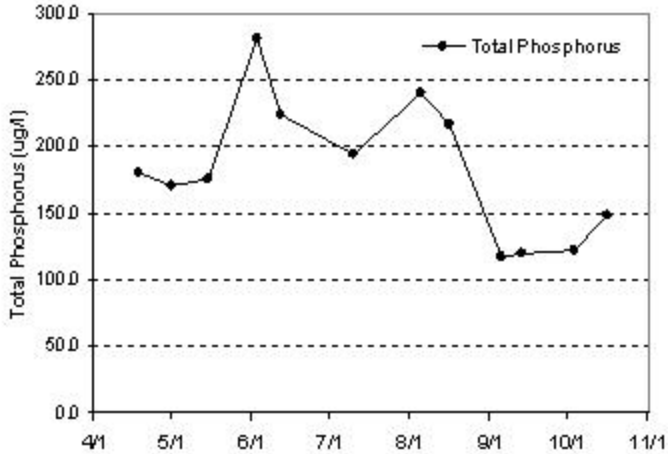
Minnetonka, Hennepin Co.

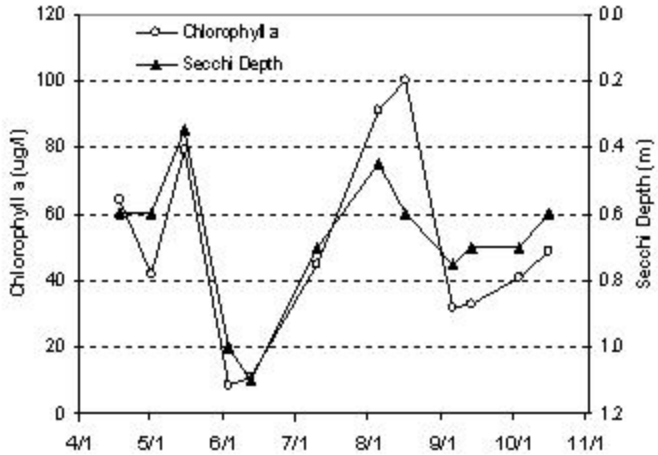
Lake ID: 270082
WD: Minnehaha Creek
Volunteers: Sue Proudfoot and Karen Mueller

● Sampling site

Contours in meters

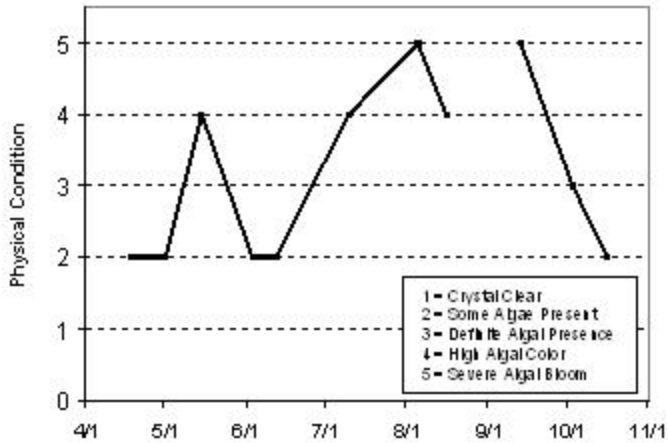






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/18/04	16.2				64	180.0		0.6	2	4
5/1/04	16.2				42	171.0		0.6	2	4
5/15/04	15.7				79	175.0		0.4	4	4
6/3/04	18.5				8.5	281.0		1.0	2	4
6/12/04	24.1				11	224.0		1.1	2	4
7/10/04	23.2				45	194.0		0.7	4	5
8/5/04	27				91	240.0		0.5	5	5
8/16/04	25				100	216.0		0.6	4	5
9/5/04	24.6				32	117.0		0.8		5
9/13/04	25.2				33	119.0		0.7	5	5
10/3/04	15.7				41	122.0		0.7	3	4
10/16/04	7.8				49	148.0		0.6	2	4

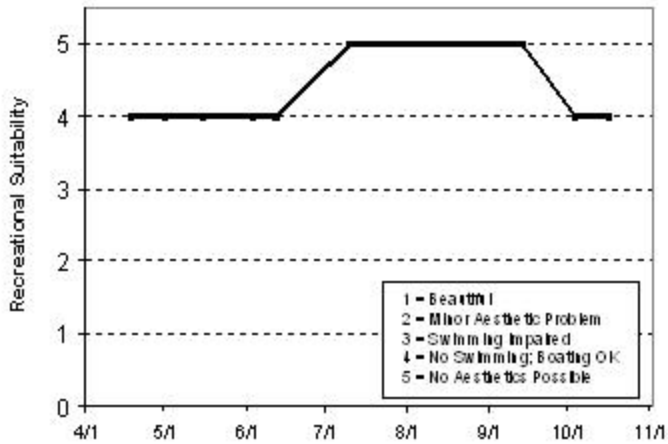


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus													F
Chlorophyll a													D
Secchi Depth													F
Overall													F

Source: Metropolitan Council and STORET data



Wood Lake [Burnsville] (19-0024) *Black Dog Watershed Management Commission*

Wood Lake is a 9-acre lake located within the City of Burnsville (Dakota County). The maximum depth of the lake is 4.5 m (14.7 feet). Because the maximum depth is only 4.5 m (almost 15 feet), the entire lake area is considered littoral zone (the area of aquatic vegetation dominance). The majority of the land within the lake's 157-acre immediate watershed is urban/developed. The resulting watershed-to-lake size ratio is 17:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the ninth year that Wood Lake has been involved in CAMP. The lake (which has been enrolled in CAMP since 1996) was monitored 14 times between mid-April and mid-October, 2004. The resulting data and graphs appear on the next page.

2004 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	48.3	28.0	79.0	C
CLA (µg/l)	18.8	3.1	48.0	B
Secchi (m)	1.4	0.7	2.5	C
TKN (mg/l)	1.16	0.70	2.00	
			Overall Grade	C

The 2004 overall lake quality grade for Wood Lake, calculated from the individual parameter grades, is C (similar to 1996, 1997, and 1999-2003, but worse than the B of 1998).

As mentioned in previous reports, an alum sulfate (alum) treatment in October of 1997 resulted in the lake's best water quality year in 1998. An alum treatment to a lake involves adding the chemical to bind and precipitate phosphorus, removing it from the water column, and sealing the bound phosphorus in the sediment rendering it inactive for release to the overlying water. By removing the phosphorus from the water column and locking it in the sediments, its availability for plant growth is reduced. The success of this treatment depends on the lake's residence time (the time it would take to entirely refill the lake basin with water if it were empty) and external phosphorus load. The shorter the residence time and the larger the external phosphorus load, the quicker new sources of phosphorus will replenish the water column. Since 1998, however, the lake's water quality has been more comparable to that of the pre-alum treatment years of 1996 and 1997 as opposed to that of 1998. For this reason it seems that the alum treatment has not been wholly successful.

Other than the data collected through CAMP, there are no historical water quality data available for Wood Lake. A search through STORET (EPA's nationwide water quality database) came up empty. Therefore the only summertime data available are those from 1996-2004. No statistically significant long-term trend is evident from the lake's water quality database, in the short-term however, the lake's water quality seems well represented by an overall grade of C. To better understand the water quality of the lake and determine in what direction the water quality is heading, additional years of data collection are needed.

The volunteer monitor's perception of the lake's physical and recreational conditions were ranked on a 1-to-5 scale during each monitoring event. The rankings are shown on the information sheet on the next page. The average user perception rankings were 3.3 for physical condition (which falls between 3- "definite algae present" and 4- "high algal color"), and 3.2 for recreational suitability (between 3-"swimming slightly impaired " and 4- "no swimming: boating ok").

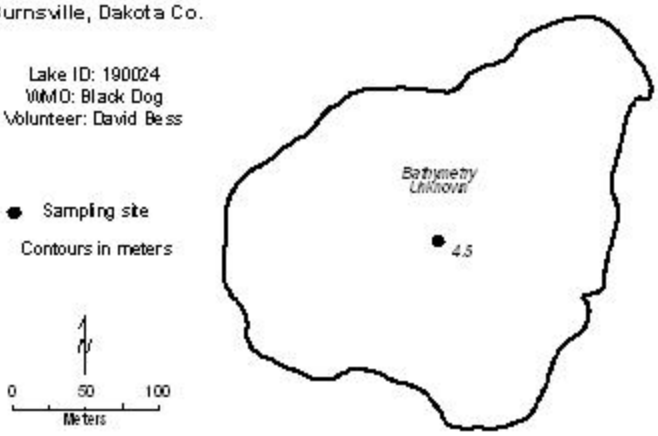
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

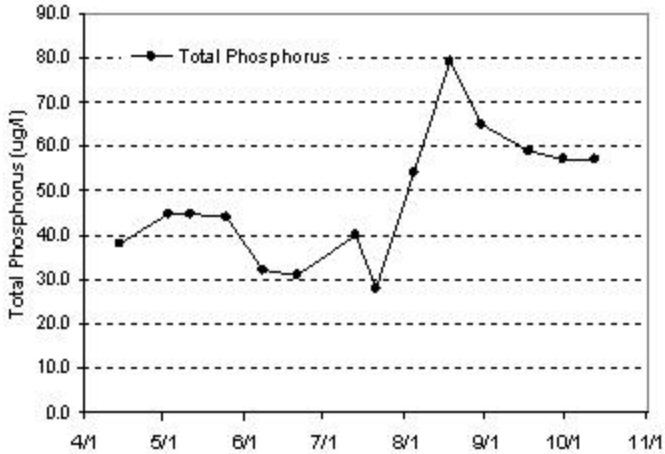
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

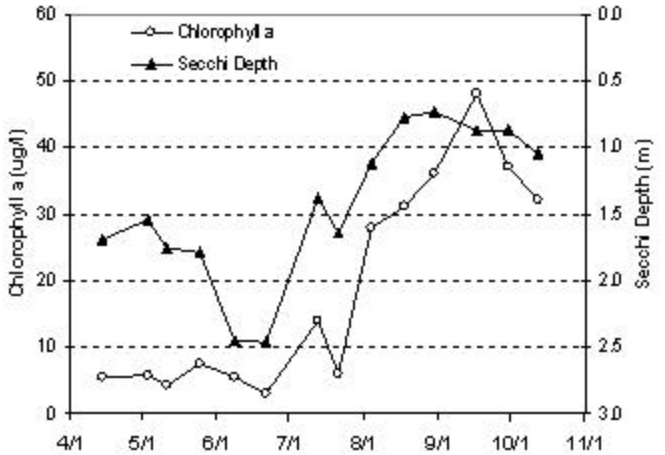
Wood Lake

Burnsville, Dakota Co.

Lake ID: 190024
WMO: Black Dog
Volunteer: David Bess

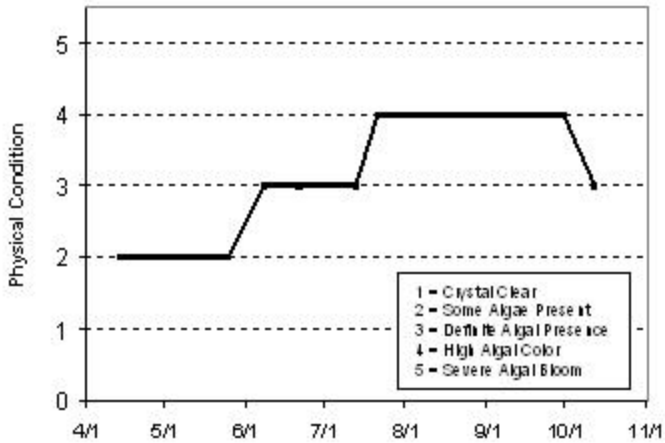






2004 Data

DATE	Surf. Tmp (C)	Bot. Tmp (C)	Surf. DO (mg/L)	Bot. DO (mg/L)	CLA (ug/L)	Surf. TP (ug/L)	Bot. TP (ug/L)	Secchi (m)	PC (1-5)	RS (1-5)
4/14/04	11.6				5.5	38.0		1.7	2	2
5/3/04	14.4				5.7	45.0		1.5	2	2
5/11/04	20.3				4.3	45.0		1.8	2	2
5/25/04	16.2				7.4	44.0		1.8	2	2
6/8/04	24.9				5.4	32.0		2.5	3	2
6/21/04	22.2				3.1	31.0		2.5	3	3
7/13/04	27.1				14	40.0		1.4	3	3
7/21/04	28.8				6	28.0		1.6	4	4
8/4/04	25.6				28	54.0		1.1	4	4
8/18/04	21.8				31	79.0		0.8	4	4
8/30/04	22.3				36	65.0		0.7	4	4
9/17/04	21.1				48	59.0		0.9	4	4
9/30/04	20				37	57.0		0.9	4	4
10/12/04	15.6				32	57.0		1.1	3	4

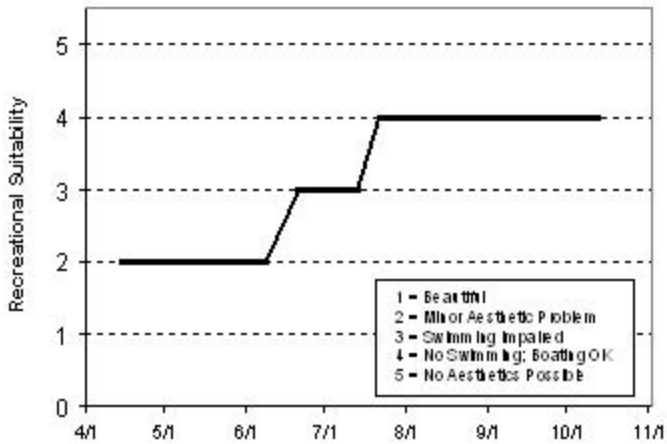


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Overall												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Phosphorus					C	C	B	C	C	C	C	C	C
Chlorophyll a					B	B	B	B	B	C	C	B	B
Secchi Depth					C	C	C	C	C	C	C	C	C
Overall					C	C	B	C	C	C	C	C	C

Source: Metropolitan Council and STORET data



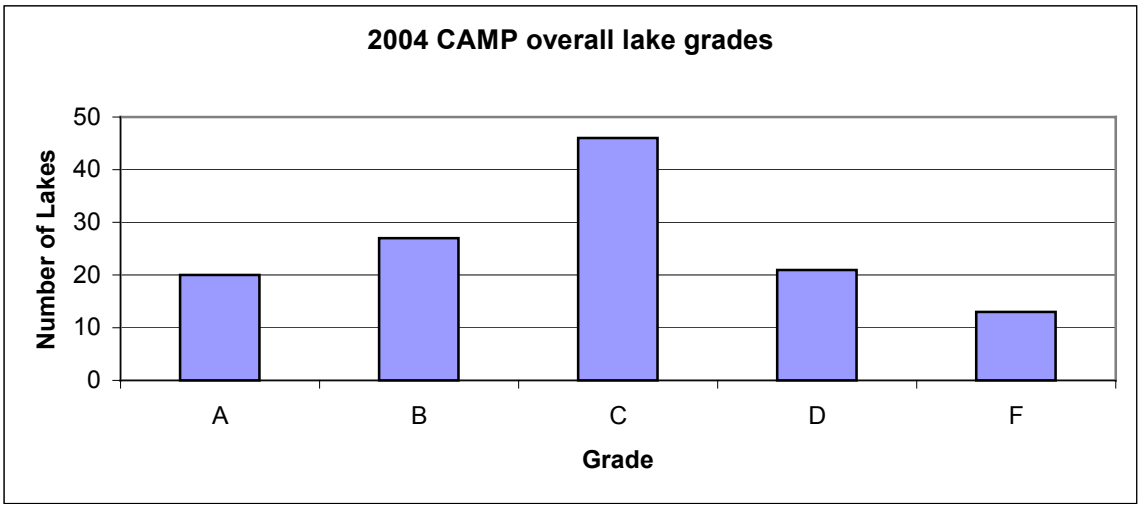
CONCLUSIONS

The year 2004 marked the twelveth year that the Council-sponsored volunteer monitoring program, entitled "The Citizen-Assisted Monitoring Program" (CAMP), was used to increase our knowledge of the water quality of area lakes. Once again volunteers measured surface water temperature and transparency, and collected surface water samples that were analyzed for total phosphorus, total Kjeldahl nitrogen, and chlorophyll-a on a biweekly basis from mid-April to mid-October (approximately 14 sampling events).

This year's volunteer monitoring program included 11 lakes never before monitored by the Council, and 114 lake sites returning from 2003. Seven or the returning 114 only included Secchi transparency readings during one or the other, or both, years, and 5 lacked a sufficient 2004 database to calculate a water quality grade or compare its current quality to that of 2003. The 2004 program included lake data from 26 of the 27 watersheds/municipalities/counties represented in the 2003 program. Additionally, the 2004 CAMP program added three new cities to its growing list of monitoring partners.

Of the 132 lake sites involved in CAMP in 2004 11 lake sites (Edina, Hart, Harvey, Herber's Pond, Libbs, MacDonald's Pond, Pamela, Schroeder's Pond, St. Joe, Terrapin, and Windsor lakes) had never been monitored by the Council prior to 2004. In fact, a broader search for <u>any</u> historic water quality data on the lakes came up empty. The greatest percentage of the lakes monitored through CAMP in 2004 received an overall water quality grade of "C" (36.2 percent). The water quality of these lakes is considered average as compared to others in the seven-county metropoitan area.

When comparing the percentage of above-average lakes (those receiving grades of "A" or "B") to below-average lakes (those receiving "D" or "F"), more lakes were above average (37.1 percent to 26.7 percent). The complete 2004 CAMP lake report card grade tally (for those lakes with sufficient data) assigned "A's" to 20 lakes (15.8 percent) and "B's" to 27 lakes (21.3 percent). Forty-six lakes acquired "C's" (36.2 percent), 21 received "D's" (16.5 percent), and 13 obtained an "F" (10.2 percent).



The 20 lakes that received "A" grades, within the top 10-percentile range for Metro Area lakes include: Big Carnelian, Big Marine, Brickyard, Cenaiko, Courthouse, DeMontreville, Fireman's, Half Breed (Sylvan),

Jane, Kingsley, Lac Lavon Lake, Little Carnelian, Long (Mahtomedi), MacDonald's Pond, Olson, Square, St. Joe, Sunset, Terrapin, and West Boot lakes.

The lakes receiving the lowest water quality grade "F" include: Downs, Farquhar, French, George Watch, Highland, Long (Apple Valley), Loon, Miller Lake, Pike (Scott County), Swede, Upper Twin, and Windsor lakes.

Pike Lake (Scott County) recorded the worst summertime TP and CLA means in 2004 (**279.6** and **172.5** µg/l). And finally, the lowest Secchi transparency mean of **0.3** m was recorded on Harvey (City of Edina), and Long (Apple Valley) lakes.

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 mean depth. These lakes are generally shallow with small surface areas. In some cases, the lakes are nothing more than deep marshes with an excess of emergent and submergent vegetation. As was mentioned in past reports, this distinction is important for three reasons: 1) 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), 2) 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 3) the small surface areas of these lakes generally result in larger watershed-to-lake ratios. Lakes with large watershed-to-lake ratios, have to handle larger runoff loads for their size than do larger lakes in a similar-sized watershed.

The lakes with above-average water quality (grades of "A" and "B") similarly were not area specific. They were located in all seven of the region's counties (lakes receiving an "A" grade were found in six counties). Common characteristics of the above-average lakes were: they have deeper maximum and mean depths, they develop and maintain a thermocline, they have small contributing watersheds relative to the lakes' surface area, and there was little construction within the lakes' watershed.

Similar to that mentioned in past reports, analysis of The 2004 CAMP lake water quality nutrient data (TP and CLA) produced no "statistically significant" long-term water quality trends. The major reasons for not being able to determine trends are: 1) the majority of lakes in the Metropolitan Area have limited and/or fluctuating databases, or 2) if a sufficient database does exist, analysis revealed no "statistically significant" trend.

In many cases, however, lakes' Secchi transparency databases are much more extensive than their related nutrient database. The reasons being that: 1) it is much less expensive to do Secchi readings than it is to have water samples analyzed at a laboratory, and 2) the development of the MPCA coordinated a volunteer Secchi transparency monitoring program in the early-1970's. For these reasons, a few CAMP lakes do have sufficient information to determine statistically significant trends in Secchi transparency. Of the CAMP 2004 lakes assessed (those with sufficinet data), 12 showed an improving trend in water clarity (Big Marine, DeMontreville, Halfbreed/Sylvan, Little Carnelian, Lotus, Marion, Olson, Parkers, Sand, Silver, Sunset, and Valentine lakes) and four showed a negative trend (Farquhar, Long (Stillwater), Markgrafs, and Square lakes) (MPCA 2003).

Of the 109 repeat CAMP lakes which a sufficient database from 2004, 27 had a better overall water quality grade in 2004 (Bass [Washington County], Big Carnelian, Colby, East Boot, Forest [West Basin], Fish [Washington County], Goose [Waconia], Grace, Keller [Burnsville], Kingsley, Long [Stillwater], Long

[Washington County], Long [Mahtomedi], Lotus, Maple Marsh, McDonald, McKusick, Mitchell, Mud, Northwood, Oak, Orchard, Pine Tree, Regional Park, Sand, South Rice, and Sunset Pond lakes), and 10 had worse overall water quality grades in 2004 (Downs, Earley, George Watch, Hay, Hyde, Louise, Powers, Prior [Upper], Spring, and Valley lakes), and 72 had the same overall water quality grade for both years. By further breaking down the 72 lakes that had identical overall grades in 2003 and 2004, 30 had similar summertime mean conditions in both 2003 and 2004 (mean TP, CLA and Secchi transparency), 24 had better means in 2004, and 18 had worse or somewhat worse means in 2004.

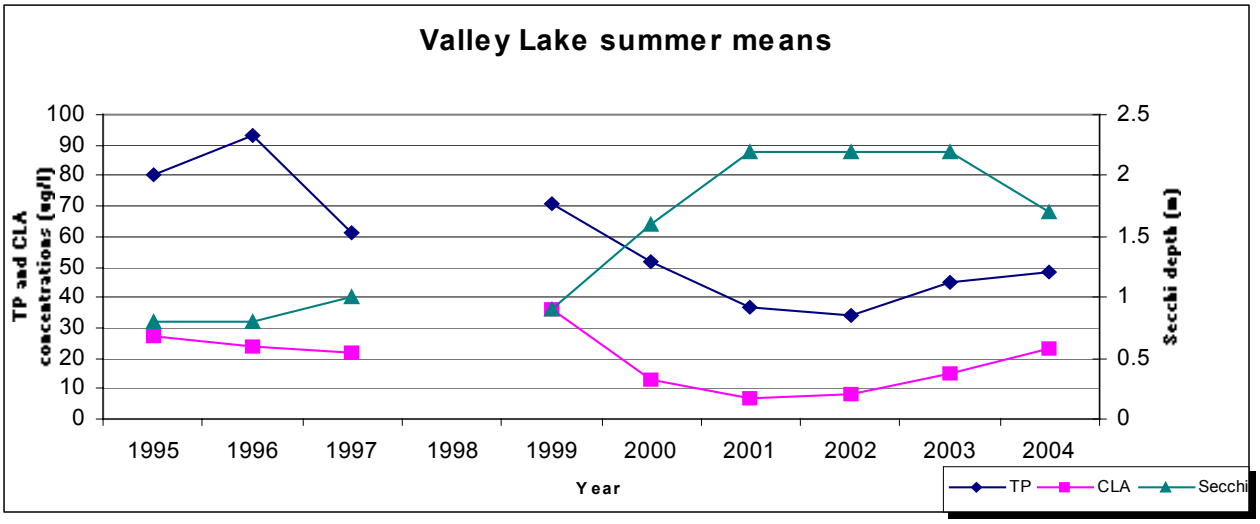
The location breakdown of the 27 lakes with better overall water quality grades in 2004 as compared to 2003 was: three in Carver County, four in Dakota County, three in Hennepin County, and 17 in Washington County. The 10 lakes with worse water quality in 2004 were located in Anoka County (one), Carver County (one), Dakota County (two), Scott Countu (two), and Washington County (four).

Water quality data from the 109 repeat CAMP lakes seem to indicate that the Metro Area lakes experienced better water quality conditions in 2004 as compared to 2003 (which was reported in 2003 to be slightly better than that recorded in 2002). Furthermore recently conducted trend analysis by MPCA on lakes with extensive Secchi transparency databases, revealed that while the majority of statistically assessed lakes showed no trends in water clarity (either negative or improving), more lakes showed an improving trend than a negative trend (MPCA 2003).

Similar to 1999-2003, a number lakes monitored through CAMP 2004 used barley straw in order to inhibit algal growth and improve water clarity (Jellum's Bay, Lee, Northwood, Twin [Burnsville], and Valley lakes). Barley straw has been used for algae control in the United Kingdom for many years. The mechanism, by which barley straw controls in-lake algal biomass, while not truly known, has historically focused on the decomposing straw releasing a chemical(s) that inhibits algal growth. In an attempt to identify the mechanism actually reducing in-lake phosphorus concentrations and reducing algal biomass, research has been underway on Valley Lake (and its associated sedimentation basin), since 2001.

Valley Lake was monitored through CAMP in 1995-1997 when barley straw treatments were not used in the lake and 1999-2004 when barley straw was used. This has provided an opportunity to compare the six years where barley straw has been used in the lake, to the three years where it was not. The Valley Lake data indicate that the barley straw not only inhibit algal growth on Valley Lake in 1999-2002 (and to a lesser degree 2003), but has also reduced total phosphorus in the lake's surface waters. The 2003-2004 summer mean TP, CLA and Secchi transparency, have shown some degradation compared to the 1999-2002 means.

One explaination for the recent dip in water quality could be an exploding panfish population. Similar to that mentioned for Lee Lake, where a recent fish survey suggested that unusually high fish densities may be impacting the barley treatment on the lake. The Lee Lake survey revealed the lake's fishery being dominated by bluegill sunfish, black crappies, and black bullheads (with as much as 30+ times the areas average number of bluegills per net) (McComas 2004). For this reason an in-lake fisheries survey is scheduled for Valley Lake in 2005.



As part of the barley straw research on Valley Lake and its associated sedimentation basin (viewed as a control), past sampling centered on trying to identify the chemical compound released by the decaying barley straw. Samples within the lake and sedimentation basin were analyzed for a break down of phenol concentrations (one of the theories behind the barley straw inhibitor) as a part of 57 base neutral acids organic compounds (BNAs). Because the breakdown of BNA compounds for each of the collected samples came back below detection limit (< 2.0 µg/l), it is not thought that chemical compounds (such as phenols) released from the decomposing straw is the mechanism inhibiting the algal growth.

Because the release of a chemical compund such as a phenol is not thought to be the algal inhibitor (as a result of our research), recent Valley Lake research monitoring has centered on the decaying straw actually acting as a carbon source for carbon-limited microbial growth. With the carbon availability secure, the microbial community production soars and phosphorus uptake is shunted through the microbial loop ecosystem (McComas 2003). Therefore, the presence of decaying barley straw results in the lake's algal biomass actually being phosphorus-limited not inhibited by a released chemical compound. Initial analysis of the 2003-2004 carbon and chlorophyll data seems to support this is theory. Continued analyses of the 2003-2004 data are ongoing.

Since 1980, 284 area lakes have been monitored through the Council's Lake Program (including Council-staff monitoring and CAMP). Some of the lakes have multiple monitoring sites [299 sites]. The list of lakes in the Council's monitoring database is shown in Appendix C. The resulting data from the Council's lake monitoring program are permanently stored in the U.S. EPA's national water quality data bank, STORET (stands for STOrage and RETrievel). The majority of the 299 lake sites have been revisited on a rotating schedule throughout the past 25 years to develop a working baseline to help determine possible trends and to aid lake and watershed managers in their decision making. While the Council has done its best to enhance and expand the region's lake water quality database, it is apparent that one of the most economical and efficient method to expand knowledge of our lakes has been with the assistance of volunteers and cooperation and financial support of watershed management organizations, counties, and cities. So while the first 12 years of CAMP have been very successful, our future goal is to continue to expand the coverage of our lake monitoring program in order to better understand and manage the areas water resources.

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 mathmatical 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 lake's 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.

Results of the 2004 satellite assessment of the region revealed similar results to that found through the 2004 ground-based monitoring programs, that the region experienced better lake water quality in 2004 than that recorded in 2003. The complete results of the 2004 satellite analysis can be at http://www.metrocouncil.org/planning/environment/TCWaterClarity2004.pdf.

If you have questions pertaining to the lake data or descriptions contained in this report, inquiries about CAMP, or suggestions of lakes the Council should consider monitoring in the future, please contact Randy Anhorn at the Metropolitan Council (651) 602-8743 or randy.anhorn@metc.state.mn.us.

REFERENCES

American Public Health Association. 1992. *Standard Methods for the Examination of Water and Wastewater*. 18th ed.

Anhorn, R.J. 1993. *Handbook for the Citizen-Assisted Lake Monitoring Program*. Metropolitan Council. St. Paul, MN.

Anhorn, R.J. 1994. *A 1993 Study of the Water Quality of 43 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-94-012.

Anhorn, R.J. 1995. *A 1994 Study of the Water Quality of 51 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-95-011.

Anhorn, R.J. 1996. *A 1995 Study of the Water Quality of 59 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-96-014.

Anhorn, R.J. 1997. *A 1996 Study of the Water Quality of 66 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-97-004.

Anhorn, R.J. 1998. *A 1997 Study of the Water Quality of 71 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-98-007.

Anhorn, R.J. 1999. *A 1998 Study of the Water Quality of 70 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-99-008.

Anhorn, R.J. 2000. *A 1999 Study of the Water Quality of 113 Metropolitan Area Lakes*. Metropolitan Council Publ. No. EPE-00-479.

Anhorn, R.J. 2001. *A 2000 Study of the Water Quality of 124 Metropolitan Area Lakes*. Metropolitan Council Publ. No. EPE-01-502.

Anhorn, R.J. 2002. *A 2001 Study of the Water Quality of 132 Metropolitan Area Lakes*. Metropolitan Council Publ. No. EPE-02-516.

Anhorn, R.J. 2003. *A 2002 Study of the Water Quality of 137 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 32-03-019.

Barr Engineering. 1993. *1993 Marcott Lakes Water Quality Study: EP-78 and EP-80*. Barr Engineering. Minneapolis, MN.

Barr Engineering. 1993. *1990 and 1991 Lake water Quality Inventory and Historical Water Quality Trend Analysis: Lakes Ann, Duck, Hyland, Lotus, Lucy, Mitchell, Red Rock, Rice Marsh, Riley, Round, Staring and Susan*. Barr Engineering. Minneapolis, MN.

Barr Engineering. 1994. *Sweeney Lake: Watershed and Lake Management Plan*. Barr Engineering. Minneapolis, MN.

Barr Engineering. 1997. *Project Assessment and Evaluation for the Crystal/Keller Lake Water Quality Improvement Project*. Barr Engineering. Minneapolis, MN.

Barr Engineering. 1997. *North Rice, South Rice, and Grimes Ponds Watershed and Lake Management Plan*. Barr Engineering. Minneapolis, MN.

Barr Engineering. 2001. *2000 Lake Water Quality Study: Northwood Lake, Parkers Lake, Sweeney Lake, and Twin Lake*. Barr Engineering. Minneapolis, MN.

Barr Engineering. *Personal Communication*. Barr Engineering. Minneapolis, MN.

Beduhn, R.J. 1993. *LCMR Lake Monitoring Study: The Effects of Aeration/Circulation on Lake and Reservoirs*. Prepared for the Legislative Commission on Minnesota Resources.

Black Dog Watershed Management Commission. 1987. *Watershed Management Plan*. Orr, Schelen, Mayeron and Associates. St. Paul, MN.

Bokenmeier, D. 1989. *Staying Ahead of the Game*. North American Lake Management Society: Lake Line. 9(8): 2-16.

Browns Creek Watershed Management Organization . 1990. *Watershed Management Plan*. Washington County Soil and Water Conservation District.

Carlson, R.E. 1977. *Trophic Status Index Indicator of Lakes*. Limnology Oceanography 22:361-369.

Capital Region Watershed District. 2003. *Lake McCarrons Management Plan*. The Osgood Group. Shorewood, MN.

Carver County Planning and Zoning Department. 1999. *Carver County 1999 Water QualityReport*. Carver County Planning and Zoning Department.

Carver Creek Watershed Management Organization. 1990. *Water Management Plan*. Carver County Soil and Water Conservation District.

City of Inver Grove Heights. 1993. *Simley Lake Water Quality Study*. Orr, Schelen, Mayeron and Associates.

City of Woodbury. 1994. *Surface Water Management Plan*. Bonestroo Rosene Andelik & Associates. St. Paul, MN.

Cole, G.A. 1983. *Textbook of Limnology: 3rd ed*. C.V. Mosby Company. St. Louis, MI.

Coon Creek Watershed District. 1985. *MSA-509 Plan*. Israelson and Associates, Inc Bloomington, MN.

Environmental Research Group, Inc. 1986. *Management Alternatives Report on the Diagnostic-Feasibility Study for Golden Lake. Anoka County, MN.* Environmental Research Group, Inc.

Forest Lake Watershed Management Organization. 1988. *Surface Water Management Plan*. Washington County Soil and Water Conservation District.

Gersmehl, C., J. Drake and D. Brown. 1986. *Minnesota Water: A Geographical Perspective*. Water Resources Research Center. Public Report Series No. 4.

Gun Club Lake WMO. 1989. *Management Plan*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

Hartsoe, J.A. and R.A Osgood. 1991. *A 1991 Study of the Water Quality of 17 Metropolitan Area Lakes*. Metropolitan Council Publ. 590-92-006.

Hanson, K. 1995. *Personal Communication*. City of Inver Grove Heights, MN.

Kernik, S. 1995-1999. *Personal Communication*. City of Woodbury, MN.

Ludvig, M. 1994. *Lake Waconia Surface Water Report*. Carver County Environmental Services. Chaska, MN.

Maloney, T.E. (ed.). 1979. *Lake and Reservoir Classification Systems*. U.S. EPA Environmental Research Lab. Corvallis, OR. EPA-600/3-79-074.

Marine on St. Croix Watershed Management Organization. 1991. *Water Management Plan*. Washington County Soil and Water Conservation District.

McComas, S. 2003. *Using Barley Straw to Improve Water Clarity in Valley Lake, in 2002, Lakeville Minnesota.* Blue Water science. St. Paul, MN.

Metropolitan Council. 1986. *Water Resources Management: Development Guide/Policy Plan*. St. Paul, MN.

Metropolitan Council. 1997. *Lake McCarrons Wetland Treatment System—Phase III Study Report*. St. Paul, MN.

Middle St. Croix Watershed Management Organization. 1991. *Watershed Management Plan*. Washington County Soil and Water Conservation District.

Minnehaha Creek Watershed District. 1987. *Water Resources Management Plan*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

Minnehaha Creek Watershed District. 1996. *Water Resources Management Plan*. Wenck Associates. Maple Plain, MN.

Minnesota Department of Conservation. 1967. *Metropolitan Lake Inventory*. Minnesota Department of Conservation. St. Paul, MN.

Minnesota Department of Conservation. 1968. *Inventory of Minnesota Lakes*. Minnesota Department of Conservation. St. Paul, MN.

Minnesota Department of Natural Resources. Various years. *Lake Fishery Surveys*. Minnesota Department of Natural Resources. St. Paul, MN.

Minnesota Department of Natural Resources. 1996. *Report on the Status of the DNR Metro Region Trout Resources*. A Metro Region Trout Committee Report. Minnesota Department of Natural Resources. St. Paul, MN.

Minnesota Department of Natural Resources. 2004. ***Draft***: *Evaluation of the poential to selectively control Eurasian watermilfoil with fluridone herbicide in Minnesota 2001-2003*. Minnesota Department of Natural Resources. St. Paul, MN.

Minnesota Pollution Control Agency. 1985. *A Citizens' Guide to Lake Protection*. Minnesota Pollution Control Agency. St. Paul, MN.

Minnesota Pollution Control Agency. 1994. *Lake Assessment Program: Lake Waconia*. Minnesota Pollution Control Agency. St. Paul, MN.

Minnesota Pollution Control Agency. 2003. *Fact Sheets on Lake Transparency Trends*. Minnesota Pollution Control Agency. St. Paul, MN.

Montgomery Watson. 1990. *Lake Alimagnet Diagnostic - Feasibility Study*. Montgomery Watson. Wayzata, MN.

Montgomery Watson. 1994-1998. *Personal Communication*. Montgomery Watson. Wayzata, MN.

Newman, R.M., D.W. Ragsdale, and D.D. Biesboer. 1996. *Can Eurasian Watermilfoil be Managed in Minnesota by Biological Control with Native or Naturalized Insects?* Third progress report to the Minnesota Department of Natural Resources, Ecological Services, St. Paul, MN.

Nichols, A.B. 1992. *Citizens Monitor Water Quality*. Water Environment and Technology. March, 1993. pp.55-59.

Oberts, G.L. 1982. *Nonpoint Source Pollution in the Metropolitan Area: Technical Completion Report*. Metropolitan Council Publ. No. 10-82-016.

Oberts, G.L and R.A Osgood. 1988. *Lake McCarrons Wetland Treatment System: Final Report the Function of the Wetland Treatment System and the Impacts on Lake McCarrons*. Metropolitan Council Publ. No. 590-88-095.

Osgood, R. 1981. *A Study of the Water Quality of 60 Lakes in the Seven-County Metropolitan Area*. Metropolitan Council Publ. No. 01-81-047.

Osgood, R. 1982a. *A 1981 Study of the Water Quality of 30 Lakes in the Seven-County Metropolitan Area*. Metropolitan Council Publ. No. 10-82-005.

Osgood, R.A. 1982b. *Using Carlson's Trophic State Indices in Regional Water Quality Assessment*. Water Resources Bulletin 18:67-74.

Osgood, R.A. 1983. *Diagnostic-Feasibility Study of Seven Metropolitan Area Lakes. Part One: General Overview*. Metropolitan Council Publ. No. 10-83-092. *Part Two: Bryant, Elmo, Fish, George, Riley, Spring and Square Lakes*. Metropolitan Council Publ. Nos. 10-83-093 a-g.

Osgood, R.A. 1984a. *A 1983 Study of the Water Quality of 28 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 10-84-037.

Osgood, R.A. 1984b. *A 1984 Study of the Water Quality of 43 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 10-84-172.

Osgood, R.A. 1985. *A 1985 Study of the Water Quality of 32 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 10-85-156.

Osgood, R.A. 1988a. *A 1986/1987 Study of the Water Quality of 10 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 590-88-037.

Osgood, R.A. 1988b. *The Limnology, Ecology and Management of Twin Cities Metropolitan Area Lakes*. Metropolitan Council Publ. No. 590-88-123.

Osgood, R.A. 1989a. *An Evaluation of the Effects of Watershed Treatment Systems on the Summertime Phosphorus Concentration in Metropolitan Area Lakes*. Metropolitan Council Publ. No. 590-89-062b.

Osgood, R.A. 1989b. *A 1989 Study of the Water Quality of 20 Metropolitan Area Lakes*. Metropolitan Council Publ. No. 590-89-129.

Osgood, R.A. 1989c. *An Evaluation of Lake and Stream Monitoring Programs in the Twin Cities Metropolitan Area*. Metropolitan Council Publ. 590-89-128.

Osgood, R.A. 1989d. *Assessment of Lake Use-Impairment in the Twin Cities Metropolitan Area*. Metropolitan Council Publ. No. 590-89-130.

Osgood, R.A. 1990. *A 1990 Study of the Water Quality of 21 Lakes in the Twin Cities Metropolitan Area*. Metropolitan Council Publ. No. 590-90-182.

Osgood, R.A. and J.E. Stiegler. 1990. *The Effects of Artificial Circulation on a Hypereutrophic Lake*. Water Resource Bulletin 26:209-217.

Osgood, R.A. 2000. *City of Victoria Local Water Resources Management Plan: Victoria Lakes – 2000*. Ecosystem Strategies. Shorewood, MN.

Prior Lake - Spring Lake Watershed District. 1991. *Water Resources Management Plan*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

Prior Lake - Spring Lake Watershed District. 1998. *Draft-Water Resources Management Plan*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

Prior Lake - Spring Lake Watershed District. 2001. *Final Report on the Prior-Sprin Lake Improvement Project*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

Prior Lake - Spring Lake Watershed District. 2004. *A Sustainable Water Quality Management Plan for Spring and Prior Lakes*. PLSLWD, Prior Lake, MN.

Rice Creek Watershed District. 1987. *Water Resources Management Plan*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

Riley-Purgatory-Bluff Creek Watershed District. 1982. *Management Plan*. Barr Engineering. Minneapolis, MN.

Short Elliot Hendrickson Inc. 1998. *How's the Water? Plymouth, Minnesota Water Resources Management Plan*. Short Elliot Hendrickson. St. Paul, MN.

Shingle Creek Watershed Management Organization. 1988. *Watershed Management Plan*. James M. Montgomery Engineers (Montgomery Watson). Wayzata, MN.

South Washington Watershed District. 1997. *Watershed Management Plan*. Bonestrro, Rosene, Anderlik and Associates. St. Paul, MN.

Simpson, J.T. 1991. *Volunteer Lake Monitoring: A Methods Manual*. EPA 440/4-91-002.

Six Cities Watershed Management Organization. 1988. *Water Management Plan*. Barr Engineering. Minneapolis, MN.

Square Lake Clean Water Partnership Report. 2001. *Square Lake, Washington County Phase I Resource Investigation.*. Washington County Soil and Water Conservation District. Stillwater, MN.

U.S. Environmental Protection Agency. 1990. *Volunteer Water Monitoring: A Guide For State Managers.* EPA-440/4-90-010.

U.S. Environmental Protection Agency. 1997. *Watershed Protection: Clean Lakes Case Study. Use of Aquatic Weevils to Control a Nuisance Weed in Lake Bomoseen, Vermont*. EPA-841-F-97-002.

U.S. Geological Survey. 1976. *Hydrology of the Lakes in the Minneapolis-St.Paul Metropolitan Area: A Summary of Available Data.* Water-Resources Investigations 76-85.

Valley Branch Watershed District. 1995. *Watershed Management Plan*. Valley Branch Watershed District. Lake Elmo, MN.

Vermillion River Watershed Management Commission. 1989. *Watershed Management Plan*. James M. Montgomery Engineering. Wayzata, MN.

Washington Conservation District. 2002. *August 2001-July 2002 Zooplanton Monitirng Summary Report for Square Lake in Washington County, MN*. Washington Conservation District. Stillwater, MN.

Wenck Associates, Inc. 1987. *Lake Diagnostic/Feasibility Study: Prepared for Forest Lake Watershed Management Organization*. Wenck Associates Inc. Wayzata, MN.

Wenck Associates, Inc. 1987. *Diagnostic/Feasibility Study for Crooked Lake, Anoka County*. Wenck Associates Inc. Wayzata, MN.

Wetzel, R.G. 1983. *Limnology*. Saunders College Publishing. Chicago, IL.

Wilson, B. 1990. *Lake Water Quality Summary of Shields, Bone, Half Breed, and Forest Lakes*. Forest Lake Watershed Management Organization.

APPENDIX A
2004 CAMP Lake/Watershed Characteristics

Lake DNR #	Surface Area(ac)	Watershed Area(ac)	Ratio	Max Depth(m)	Mean Depth(m)	Volume (ac-ft)	% Littoral	# Inlets	Termo-cline?	Public Access	Shr Length (miles)	DNR Classification
Alimagnet 19-21	109	1,288	12:1	3.0	1.5	545	100	12	N	C	3.2	
Armstrong 82-116-02	39			1.5	1.0	128	100		N	N		
Barker 82-76	45	823	19:1	9.0	4.4	648			Y	N		
Bass (Wash)82-35	81			4.3			100		N	N		
Bavaria 10-19	200	711	3.5:1	18.3	5.6	3,674	40		Y	Y		Centrachid
Benton 10-69	115	322	3:1	2.0			100		N	N		
Big Carnelian 82-49	455	1,900	4:1	20.0	9.8	14,560	28		Y	Y		
Big Comfort 13-53	219			14.3			41		Y	Y		
Big Marine 82-52	1,706	2,659	1.5:1	15.2	7.6	42,527	67		Y	Y		
Bone 82-54	212	5,177	24:1	9.8	3.7	2,820	59	3	Y	Y		
Brickyard 10-225	17			13.1			35		Y	N		
Carol 82-17	63	375	6:1	1.8	0.9	186	100		N	N		
Cates 70-18	27			4.0			100		N	N		
Cenaiko 2-654	29			9.1			40		Y	N	0.6	Stocked w/Trout - Fishing Pier
Clear 82-163	400			8.5	3.7	4,800	67		Y	Y	3.9	Walleye
Cloverdale 82-9	37	671	18:1	8.5			86		N	N		
Cobblecrest 27-53	10									N		