A 2001 STUDY OF THE WATER QUALITY OF 132 METROPOLITAN AREA LAKES

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EXECUTIVE SUMMARY

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 132 lakes sampled in 2001, including 12 lakes monitored by the Council and 120 sites on 118 lakes monitored by volunteers.

The objectives of this study were to:

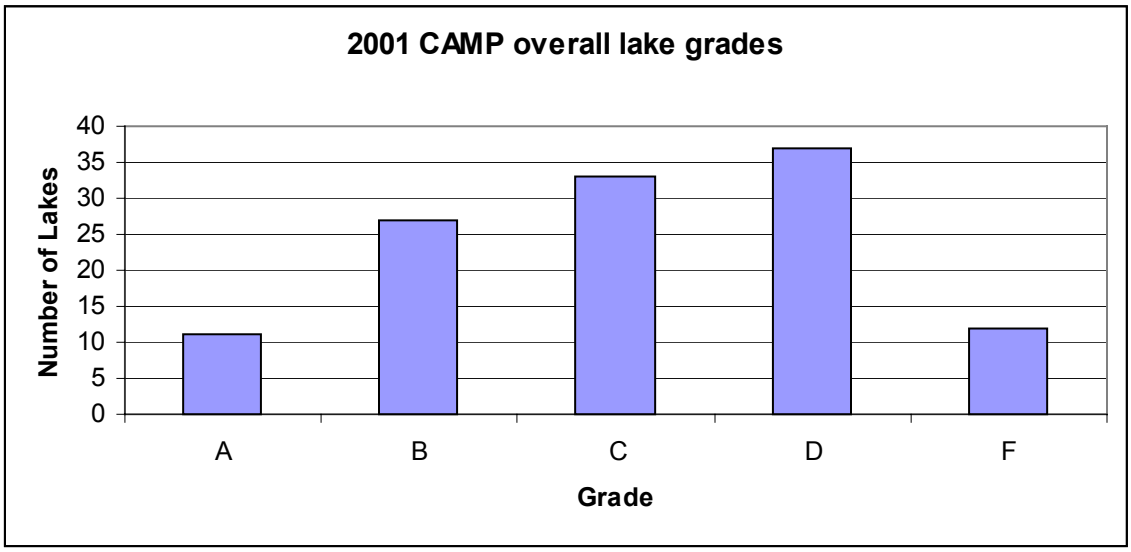
1. Provide lake water quality data to lake and watershed managers.
2. Advise managers of known or suspected threats to lake water quality.
3. Collect water quality data on Lake McCarrons as part of a continued study of the inner workings of the lake and its associated wetland treatment system in partnership with the University of Minnesota.
4. Continue to compile a water quality database on the six area lakes that support a trout fishery.
5. Collect in-lake water quality data on Centerville Lake to determine results of a 1998 whole lake alum treatment meant to lower in-lake phosphorus levels, control algal growth, and improve water clarity.
6. Collect in-lake water quality data on Northwood and Valley lakes to determine the results of an in-lake barley straw treatment on the lake's algal population and resulting water clarity.

The year 2001 marked the ninth 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 nine lakes never before monitored by the Council, and 99 lake sites returning from 2000. The 2001 program included lake data from 22 of the 23 watersheds/municipalities/counties represented in the 2000 program. To date, water quality data from 30 of the region's 46 watersheds (65 percent) have been collected by volunteers through the CAMP program, and lakes in 10 of the remaining 16 watersheds have been monitored by Council staff. In all, a cross-section of lakes in 40 of the 46 area watersheds (87 percent) have been sampled through the Council's lake monitoring program since 1993. Of the remaining six watersheds, lakes were monitored in three through Ramsey County's program, and three watersheds have only one or no lakes (e.g., Lower St. Croix River WMO--no lakes) within their boundaries.

Of the 120 lake sites involved in CAMP in 2001, nine lake sites (Cloverdale, Deeg, Egg, Fireman's, French, Little Johanna, Spring (Anoka County), Tamarack, and Valentine) had never been monitored by the Council prior to 2001. The majority of these lakes have no record of any water quality data at all. Twenty-two of the 120 lake sites (Barker, Bass (Washington Co.), Carol, East Boot, Fish (Washingtom Co.), Jellum's Bay, Little Carnelian, Long (Washington Co.), Loon, Louise, Maple Marsh, Mud, North Twin, Northwood, Silver, South Twin, Staples, Sweeney (Site-1 and Site-2), Turtle (Washington Co.), Virginia, and West Boot) had only one year of Council-collected data prior to 2001. The majority (30.0 percent) of the lakes monitored through CAMP in 2001 received an overall water quality grade of D. The water quality of these lakes is considered below-average. During each of the previous years of CAMP, the majority of the lakes sampled received overall grades of C.

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 below average (40.8 percent to 31.7 percent). The complete 2001 CAMP lake report card grade tally assigned A's to 11 lakes (9.2 percent) and B's to 27 lakes (22.5 percent). Thirty-three lakes acquired C's (37.5 percent), 36 received D's (30.0 percent), and 13 obtained an F (10.8 percent).



Of the 99 repeat CAMP lakes from 2000, 16 had a better overall water quality grade in 2001 (Big Comfort Lake, Crystal Lake (Burnsville), Fish Lake (Scott County), Forest Lake (West Basin), Goose Lake (Waconia), Hydes Lake, Jellum's Bay, Lee Lake, Lily Lake, Long Lake (Washington County), Maria Lake, Mud Lake, Orchard Lake, South Rice Lake, Sunset Lake, and Valley Lake), 17 had worse overall water quality grades in 2001 (Armstrong Lake, Cenaiko Lake, Colby Lake, Gaystock Lake, George Watch Lake, Golden Lake, Highland Lake, Kingsley Lake, Lake Louise, Markgrafs Lake, Oneka Lake, Lake Peltier, Powers Lake, Reitz Lake, South Twin Lake, Westwood lake, and Wilmes Lake), 64 had the same overall water quality grade for both years, and two did not have enough data points in one of the two years to compare their water quality years. By further breaking down the 64 lakes that had identical overall grades in 2000 and 2001, 27 had similar summertime mean conditions in both 2000 and 2001 (mean TP, CLA and Secchi transparency), 24 had better means in 2001, and 13 had worse or somewhat worse means in 2001.

Water quality data from the 99 repeat lakes seem to indicate that the Metro Area lakes experienced similar to slightly better water quality conditions in 2001 as compared to 2000 (both of which were worse water quality years than those of 1993 and 1994, and similar to 1998).

As for the 12 Council-monitored lakes, 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 12 lakes may show a slight degradation in one of the individual parameters (e.g., declining Secchi transparency on Cedar Lake (Scott County) and increasing TP and on Staring Lake), the other parameters either showed no real difference or a slight improvement. Therefore, there was no sign of any statistically significant trends.

Three of the 12 Council-staff monitored lakes monitored in 2001were also monitored in 2000 (two of which were monitored in 1999 as well). Two of the three lakes which were monitored by the Council in 2000 and 2001, received identical overall water quality grades in 2000 and 2001, while one, Lake McCarrons had a better overall grade (due to the lake's best recorded CLA and Secchi transparency means to date).

As was mentioned in the 2000 report, recent (1999-2001) water quality of Lake McCarrons (especially shown in mean TP concentrations and mean Secchi transparencies) is better than those recorded in an in-depth 1994 and 1995 study on the lake, its watershed and associated wetland treatment system. The recent summer means are similar to those recorded prior to the recorded peaks in the mid-1990s. An indepth study on the interaction between the lake's wetland treatment system, in-lake mixing, and varying climatological conditions, is ongoing. Additionally, the Capital Region Watershed District is in the process of developing a Lake McCarrons Lake Management Plan in order to address the lake's many issues and needs.

Two of the lakes enrolled in CAMP 2001, Northwood and Valley, were monitored as part of a special project testing the use of barley straw to inhibit in-lake algal populations (they were also enrolled in CAMP in 2000). Barley straw has been used algae is that enzymes (which inhibit algal growth) are released as the straw rots when placed in water for algal control in the United Kingdom for many years. The principal behind the use of barley straw to control. Each lakes' TP, CLA and Secchi transparency readings were studied and averaged over the summer growing season (May-September), in order to determine if the straw method successfully reduced algal biomass on the lakes in 2001.

While there are no pre-barley straw treatment data available for Northwood Lake, Valley Lake was a part of CAMP in 1995-1997 when barley straw treatments were not used in the lake. This has provided an opportunity to compare the three years where barley straw was used in the lake to the three years where it was not. The Valley Lake data seem to indicate that the barley straw did inhibit algal growth on Valley Lake in 1999, 2000 and 2001. The 2001 summer mean TP, CLA and Secchi transparency were better than those recorded in 2000, which was the the lake's second best water quality year recorded. . The 2001 data for the lake indicate that it was by far the best monitored water quality year to date.

In Northwood's case, the lake's CLA grade was much better than the TP and Secchi grade. This probably indicated that the barley straw did indeed inhibit algal growth over the summer months. The lake's summer mean Secchi transparency, however, was not as good as the lake's mean CLA concentration would suggest it would be. 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 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.

While barley straw seems to inhibit algal growth, 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 in Valley Lake along with monthly samples in a nearby sediment basin where barley straw was not used (control). These additional samples were analyzed for a break down in phenol concentrations (one of the theories behind the barley straw inhibitor). The result of this analysis has yet to be completed. This additional analysis will continue throughout the upcoming 2002 monitoring season.

More data are needed in order to determine possible statistically significant short-term (let alone long-term) trends that the barley straw treatments may have on Northwood and Valley lakes and their algal populations. With this in mind, barley straw will again be placed in both lakes in 2002. To monitor the lakes' quality of the 2002 summer, they will again be enrolled in CAMP. Additionally, similar to 2001, phenol concentrations throughout the summer of 2002 will be determined for Valley Lake and an associated control.

Since 1980, 255 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 [270 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 270 lake sites have been revisited on a rotating schedule throughout the past 21 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 the most economical and efficient method to expand knowledge of our lakes is with the assistance of volunteers and cooperation and financial support of watershed management organizations, counties, and cities. So while the first nine years of CAMP have been very successful, our future goal is to involve as many of the 46 area watershed management organizations as possible in CAMP so they can better understand and manage their resources.

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:

9 years of service
Diane and Bob Coderre - Sunset Lake

8 years of service
City of Columbia Heights- Sullivan lake
Washington Co. SWCD- Multiple

7 years of service
Bill Aamadt- Wilmes Lake
Janet and Harvey Bartz- Seidl Lake
Dan Cederstrom- Powers Lake
Wayne LeBlanc- Lake Peltier
Cindy and Wes Rogers- Marcott Lake
Carver Co. Env. Services- Multiple

6 years of service
City of Circle Pines- Golden lake
J.P Houchins- Marshan Lake
Mahle Family- La Lake
Arlene Peterson- Simley Lake
John Ritter - Lake Alimagnet
Wargo Nature Center- George Watch

5 years of service
City of Blaine-Laddie Lake
Tom Joseph- Earley Lake
City of Prior Lake- Markley Lake
Charles Robin- Fish Lake

5 years of sevice cont.
Don Wechsler- Wood Lake
Anoka Co.- Multiple
PL-SL WD- Multiple

4 years of service
Wally Shaver Lac Lavon Lake
Glen Gramse- Keller Lake
Mona and David Hanson- Pike Lake
City of Cottage Grove- Regional Park Lake
Dale Wahlstrom- Schmidt Lake

3 years of service
Bruce Bernin- Oneka Lake
Joel Buys- Clear Lake
John Engstrom-Pomerleau Lake
Philip Goodrich- Pike Lake
Debra Gutzman- Reshanau Lake
Cindy and Beth Hvass- Colby Lake
John Ryski- Bavaria Lake
Bill Sherry- Farquhar Lake
Westwood Nature Center- Westwood Lake

2 years of service
Steve Bur- Northwood Lake
Dave Hanson-Sweeney Lake
Steve Lane-Cedar Island
Renay Leone-Virginia 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, 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.

CONTENTS

This report is divided into two parts: Part I describes the lake water quality of the 12 lakes monitored by the Metropolitan Council-staff, while Part II details the water quality of the 120 lake sites monitored by volunteers as part of the Citizen-Assisted Monitoring Program.

Executive Summary i
Acknowledgments v

PART I - METROPOLITAN COUNCIL 2001 LAKE MONITORING PROGRAM

Introduction 1
Methods 3
Results/Analysis 4
Lake Quality Report Card 8
- Bush Lake 10
- Cedar Lake [Scott County] 11
- Centerville Lake 12
- Hafften Lake 13
- Little Long Lake 14
- McCarrons Lake 15
- McMahon Lake 16
- Parley Lake 17
- Pierson Lake 18
- Staring Lake 19
- Swede Lake 20
- Whaletail Lake 21

PART II - CITIZEN-ASSISTED LAKE MONITORING PROGRAM

Acknowledgments 23
Introduction 23
Purpose of Volunteer Program 24
CAMP Methods 24
- Obtaining Volunteers 24
- Training Volunteers 25
- Monitoring Methods 25
- Data Handling and Analysis 29
- Program Quality Assurance/Quality Control 29

Results and Analysis 30
- Alimagnet Lake 32
- Armstrong Lake 36
- Barker Lake 38
- Bass Lake [Hennepin County] 40
- Bass Lake [Washington County] 42
- Bavaria Lake 44
- Benton Lake 48
- Big Carnelian Lake 50
- Big Comfort Lake 52
- Big Marine Lake 54
- Bone Lake 56
- Burandt Lake 58
- Carol Lake 60
- Cedar Island Lake 62

Cenaiko Lake....64
Centerville Lake....68
Clear Lake....70
Cloverdale Lake....72
Colby Lake....74
Courthouse Lake....76
Crystal Lake [Burnsville]....78
Crystal Lake [Robbinsdale]....80
Deeg Lake....84
Downs Lake....86
Eagle Lake [Carver County]....88
Earley Lake....90
East Boot Lake....92
Egg Lake....94
Farquhar Lake....96
Fireman's Lake....100
Fish Lake [Scott County]....102
Fish Lake [Washington County]....104
Forest Lake [West Basin]....106
French Lake....108
Gaystock Lake....110
George Watch Lake....112
Goggins Lake....114
Golden Lake....116
Goose Lake [Waconia]....118
Half Breed (Sylvan) Lake....120
Hay Lake....122
Hazeltine Lake....124
Highland Lake....126
Hydes Lake....128
Jellum's Bay....130
Keller Lake [Burnsville]....132
Kingsley Lake....136
Kismet Lake....138
La Lake....140
Lac Lavon Lake....142
Laddie Lake....144
Lee Lake....146
Lily Lake....148
Little Carnelian Lake....150
Little Johanna Lake....152
Long Lake [Carver County]....154
Long Lake [May Township]....156
Long Lake [Stillwater]....158
Long Lake [Washington County]....160
Loon Lake....162
Louise Lake....164
Maple Marsh Lake....166
Marcott Lake [Site 2]....168
Maria Lake....170
Marion Lake....172
Markgrafs Lake....174
Markley Lake....176
Marshan Lake....178

McDonald Lake 180
McKusick Lake 182
Miller Lake 184
Mud Lake 186
North Twin Lake 188
Northwood Lake 190
Oak Lake 194
Oneka Lake 196
Orchard Lake 198
Peltier Lake 200
Pike Lake [Ramsey County] 202
Pike Lake [Scott County] 204
Pine Tree Lake 206
Pomerleau Lake 208
Powers Lake 210
Prior Lake [Lower Basin Site-1 and Site-2] 212
Prior Lake [Upper Basin] 216
Regional Park Lake 218
Reitz Lake 220
Reshanau Lake 222
Rutz Lake 224
Schmidt Lake 226
Schutz Lake 228
Seidl Lake 230
Shields Lake 232
Silver Lake 236
Simley Lake 238
South Rice Lake 240
South Twin Lake 242
Spring Lake [Anoka County] 244
Spring Lake [Scott County] 246
Square Lake 250
Staples Lake 254
Sullivan Lake 256
Sunnybrook Lake 258
Sunset Lake 260
Sunset Pond Lake 262
Sweeney Lake (Site-1 [South] and Site-2 [North]) 264
Tamarack Lake 268
Turtle Lake 270
Twin Lake [Burnsville] 272
Valentine Lake 274
Valley Lake 276
Virginia Lake 278
Waconia Lake 280
West Boot Lake 284
Westwood Lake 286
Wilmes Lake 288
Winkler Lake 290
Wood Lake [Burnsville] 292
Conclusions 294

REFERENCES 299

APPENDICES

A. 2001 CAMP Lake/Watershed Characteristics....305
B. 2001 Volunteer Lake Monitors....311
C. Lakes Sampled by the Metropolitan Council, 1980-2001....314

FIGURES

1. 2001 Metropolitan Council Study Lakes....2
2. 2001 CAMP Study Lakes....26
3. Example of CAMP Sampling Form....28

TABLES

1. Trends in Total Phosphorus Concentration....5
2. Trends in Chlorophyll-a Concentration....6
3. Trends in Secchi Disk....7

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 2001 LAKE MONITORING PROGRAM

INTRODUCTION

The Metropolitan Council-staff sampled 12 lakes in 2001 as part of its continuing effort to manage lakes in the Twin Cities Metropolitan Area (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 (this study)

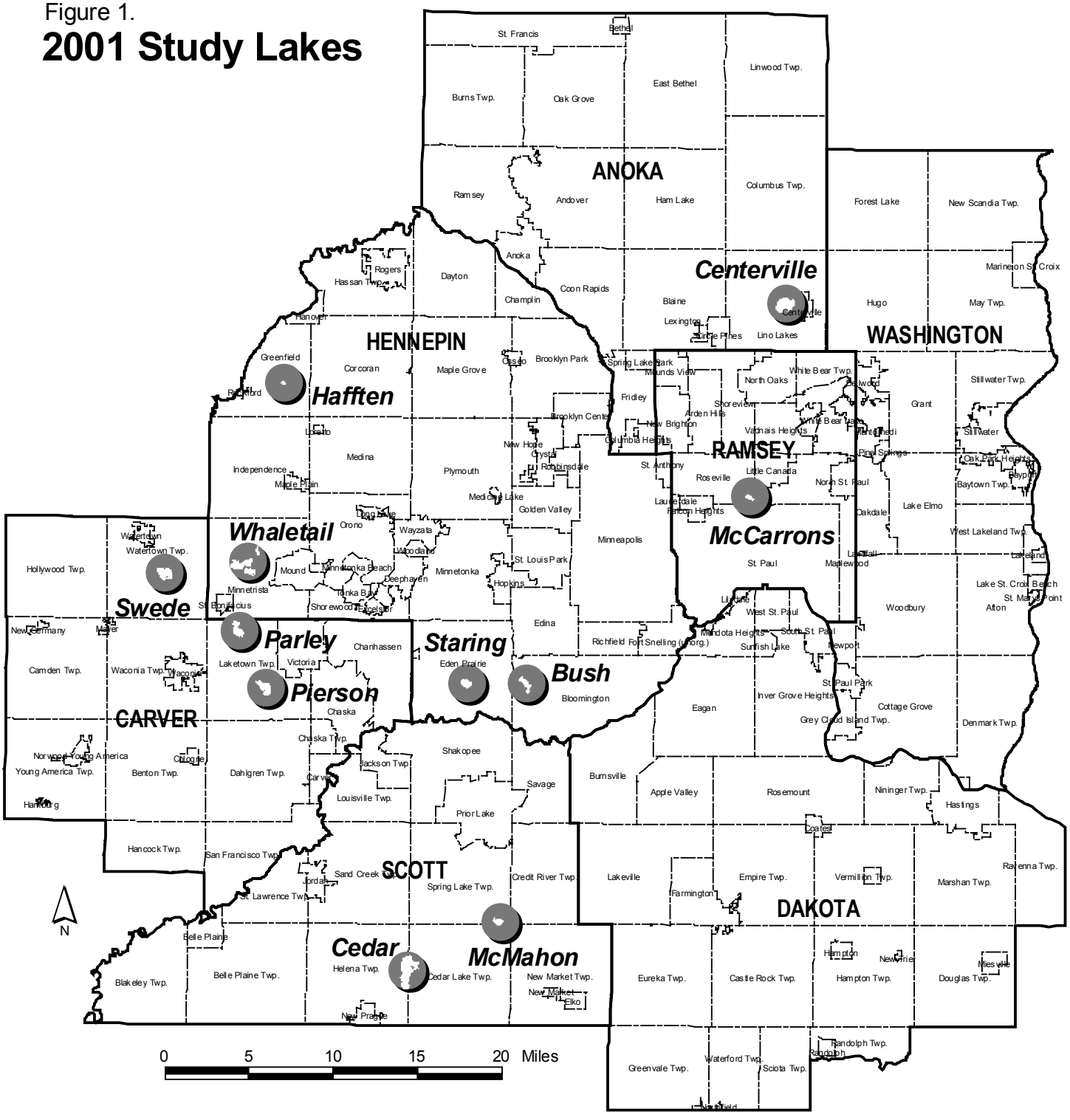
The long-term goal of the Council's lake studies has been to provide a comprehensive database to enable cities, counties and watershed management organizations (WMOs) to better manage area lakes. The Council believes that without such comprehensive lake data, the foundation of lake and watershed management 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), but for the most part the WMOs are not collecting adequate data.

The Council addressed this lack of adequate data collection problem by initiating a citizen-assisted lake monitoring program (CAMP). The citizen-assisted lake monitoring program is funded in part by watershed districts (WDs), WMOs, counties, and cities that are participating in the program and by the Council. 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 Citizen-Assisted Monitoring Program (CAMP) for 2001 are described in Part II of this report.

Figure 1.

2001 Study Lakes



METHODS

Twelve area lakes were sampled by Council-staff at two-week intervals from mid-April through mid-October, 2001. 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 610-DM) 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), and chlorophyll-a (CLA). Subsurface water samples were also drawn using a 2-liter Van Dorn. Subsurface samples were taken for TP analysis on all lakes deeper than 2.5 meters, and for TDP on Lake McCarrons.

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 12 lakes 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. Although the majority of area lake databases are insufficient in size and quality to calculate long-range trends, a few general comments and observations can be made after comparing the 2001 data to pre-2001 data.

After reviewing the summertime TP, CLA and Secchi means and water quality grades of the 12 Council-staff monitored lakes it is apparent that each lakes' water quality in 2001 fell within their normal range of flucuation. While a few of the 12 lakes may show a slight degradation in one of the individual parameters (e.g., declining Secchi transparency on Cedar Lake (Scott County) and increasing TP and on Staring Lake), the other parameters either showed no real difference or a slight improvement. Therefore, there was no sign of any statistically significant trends.

Three of the 12 Council-staff monitored lakes monitored in 2001were also monitored in 2000 (two of which were monitored in 1999 as well). Two of the three lakes which were monitored by the Council in 2000 and 2001, received identical overall water quality grades in 2000 and 2001, while one, Lake McCarrons had a better overall grade (due to the lake's best CLA and Secchi transparency means recorded to date).

As was mentioned in the 2000 report, recent (1999-2001) water quality of Lake McCarrons (especially shown in mean TP concentrations and mean Secchi transparencies) has been better than those recorded in a 1994 and 1995 study on the lake, its watershed and associated wetland treatment system. The recent summer means are similar to those recorded prior to the recorded peaks in the mid-1990s. An indepth study on the interaction between the lake's wetland treatment system, in-lake mixing, and varying climatological conditions, is still ongoing. Additionally, the Capital Region Watershed District is in the process of developing a Lake McCarrons Lake Management Plan in order to address the lake's many issues and needs.

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
Bush	--	--	--	--	21	--	--	--	--	--	--	--	--	22	22	--	--	--	--	25	--	19
Cedar (Scott Co.)	442	341	--	--	168	--	--	--	--	--	--	--	--	197	--	--	--	--	263	--	--	154
Centerville	137	111	--	--	136	--	--	--	133	--	--	106	--	--	--	--	--	--	--	49	50	45
Hafften	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46	46
Little Long	20	--	--	--	23	--	--	--	--	--	--	--	--	--	--	--	--	--	10	--	--	9
McCarrons	--	--	--	--	38	34	28	46	61	34	--	47	--	35	36	69	85	--	--	47	45	33
McMahon	240*	--	--	--	105	--	--	--	--	--	--	--	--	--	--	113	--	--	80	--	--	126
Parley	--	--	--	--	91	--	207	133	--	--	--	104	--	--	--	--	94	--	--	79	--	90
Pierson	25*	24	--	18	--	--	--	--	--	20	--	--	--	--	--	21	--	--	--	--	--	25
Staring	80	--	--	--	--	80	--	--	--	--	--	--	--	--	--	76	--	--	--	--	--	110
Swede	160*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	140	--	--	105	--	167
Whaletail	70	--	--	--	60	--	--	--	--	--	--	--	--	--	--	--	--	--	32	--	--	45

* 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
Bush	--	--	--	--	8	--	--	--	--	--	--	--	--	8	7	--	--	--	--	16	--	10
Cedar (Scott Co.)	266	27	--	--	73	--	--	--	--	--	72	--	--	24	--	--	--	--	56	--	--	107
Centerville	61	43	--	--	48	--	--	--	38	--	--	30	--	--	--	--	--	--	--	10	22	30
Hafften	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	36
Little Long	3	--	--	--	3	--	--	--	--	--	3	--	--	--	--	--	--	--	5	--	--	4
McCarrons	--	--	--	--	20	16	14	26	30	17	18	30	--	15	13	28	16	--	--	19	29	19
McMahon	85*	--	--	--	73	--	--	--	--	--	--	--	--	--	--	50	--	--	64	--	--	69
Parley	--	--	--	--	70	--	86	66	--	--	--	76	--	--	--	--	55	--	--	57	--	78
Pierson	12*	8	--	14	--	--	--	--	--	10	--	--	--	--	--	11	--	--	--	--	--	18
Staring	48	--	--	--	--	50	--	--	--	--	--	--	--	--	--	36	--	--	--	68	--	71
Swede	140*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	87	--	--	--	--	72
Whaletail	65	--	--	--	53	--	--	--	--	--	--	--	--	--	--	--	--	--	27	--	--	31

* 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
Bush	--	--	--	--	3.0	--	--	--	--	--	--	--	--	3.1	2.6	--	--	--	--	2.2	--	3.2
Cedar (Scott Co.)	1.4	2.1	--	--	1.4	--	--	--	--	--	0.9	--	--	1.9	--	--	--	--	1.2	--	--	0.7
Centerville	1.5	1.6	--	--	1.4	--	--	--	0.8	--	--	1.4	--	--	--	--	--	--	--	1.0	1.8	1.3
Hafften	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6	1.3
Little Long	5.3	--	--	--	5.2	--	--	--	--	--	6.0	--	--	--	--	--	--	--	4.8	--	--	4.8
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
McMahon	1.5*	--	--	--	1.0	--	--	--	--	--	--	--	--	--	--	1.8	--	--	1.1	--	--	0.9
Parley	--	--	--	--	0.8	--	1.8	1.1	--	--	--	1.0	--	--	--	--	1.3	--	--	--	1.2	1.4
Pierson	2.4*	3.3	--	2.4	--	--	--	--	--	2.7	--	--	--	--	--	2.2	--	--	--	--	--	2.0
Staring	0.6	--	--	--	--	0.9	--	--	--	--	--	--	--	--	--	0.8	--	--	--	0.5	--	0.7
Swede	0.3*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	0.7
Whaletail	0.7	--	--	--	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--	1.0

* Sampled only twice in 1980

LAKE QUALITY REPORT CARD

The lake quality report card was developed by the Metropolitan Council following its 1989 lake survey (Osgood 1989b). The idea is simply that comparing measured values to those of other Metro Area lakes can rank lake water quality characteristics. 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)	SD(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

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 2001 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 (+) or degradation (-) in the quality of the lake.

2001 LAKE QUALITY REPORT CARD

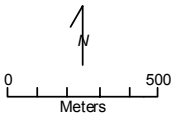
Bush	A	McMahon	D
Cedar	F	Parley	D
Centerville	C	Pierson	B
Hafften	C	Staring	D
Little Long	A	Swede	D
McCarrons	B	Whaletail	C

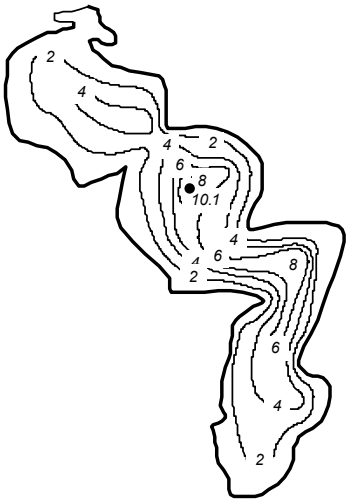
Bush Lake

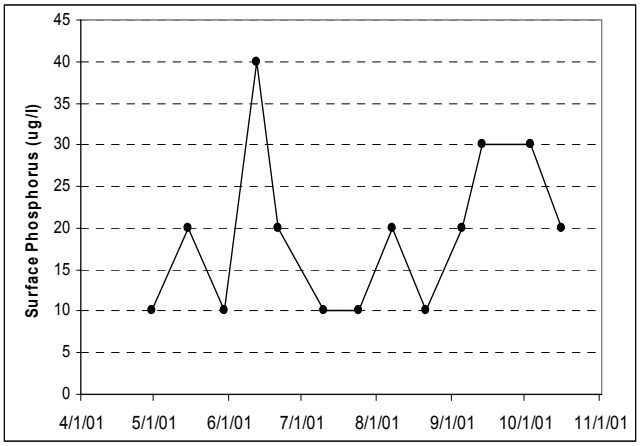
Bloomington, Hennepin Co.

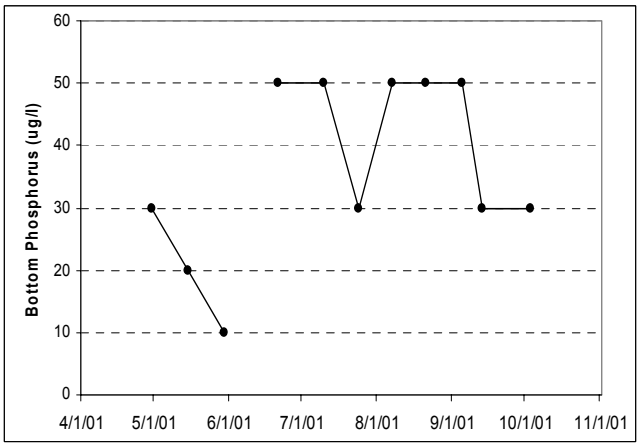
Lake ID: 270047
WD: Nine Mile Creek

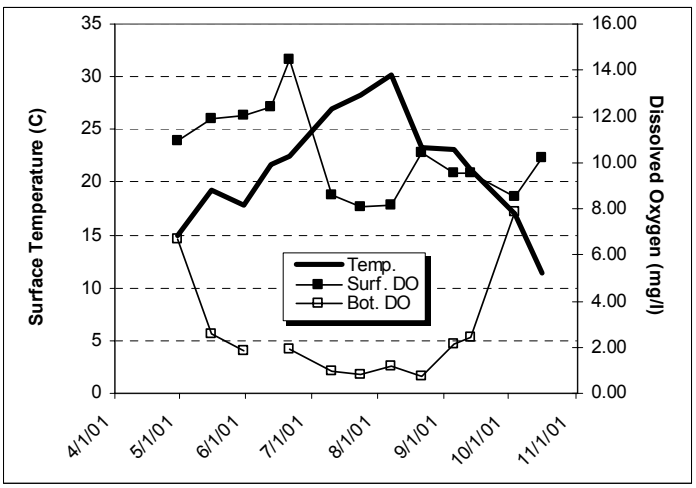
● Sampling site
Contours in meters

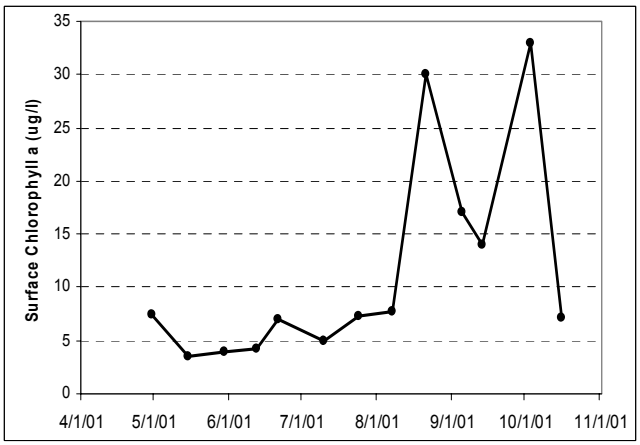


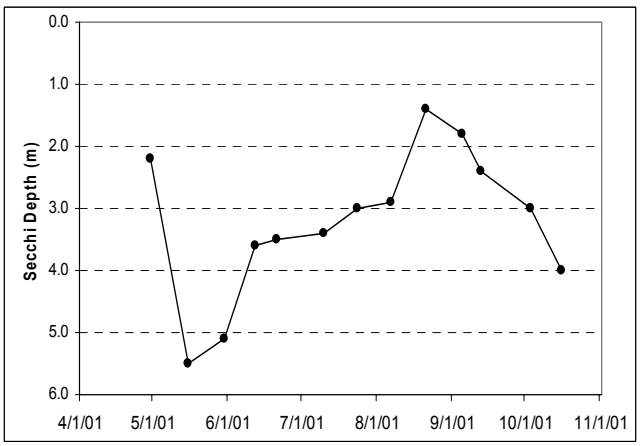












Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			A	A					B		A
Chlorophyll a			A	A					B		B
Secchi Depth			A	B					B		A
Overall			**A**	**A**					**B**		**A**

Source: Metropolitan Council and STORET data

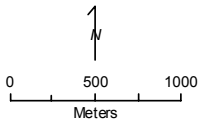
Cedar Lake

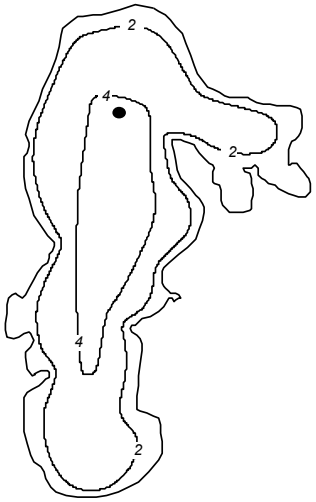
Cedar Lake Twp./Helena Twp., Scott Co.

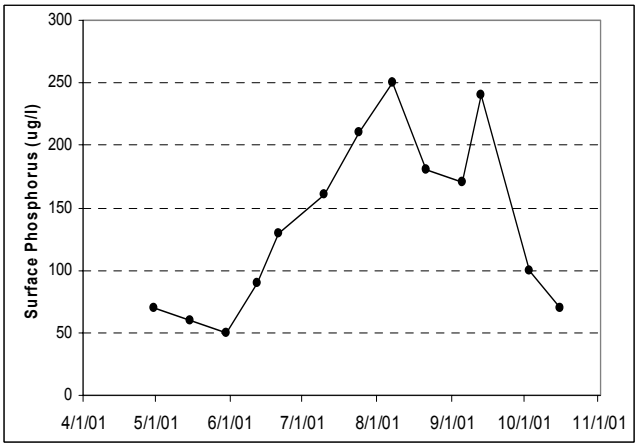
● Sampling site

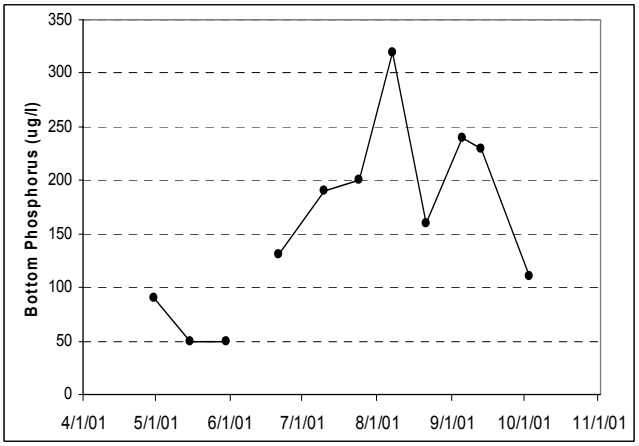
Contours in meters

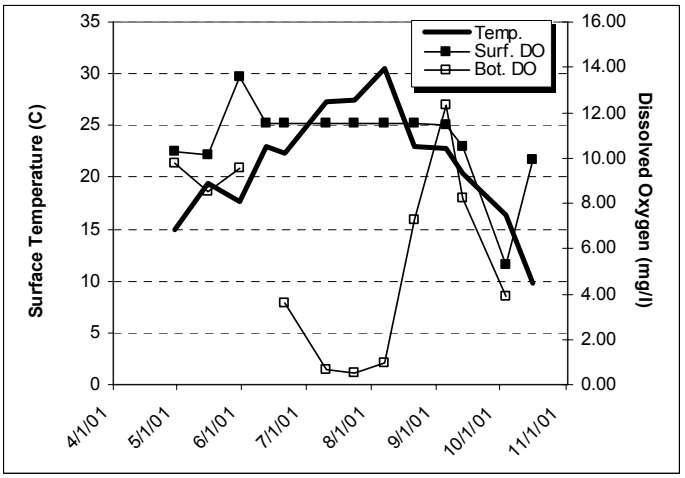
LAKE ID: 700091
WMO: Scott County

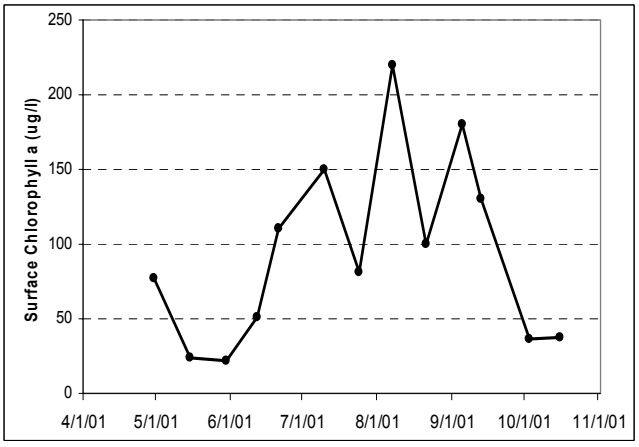


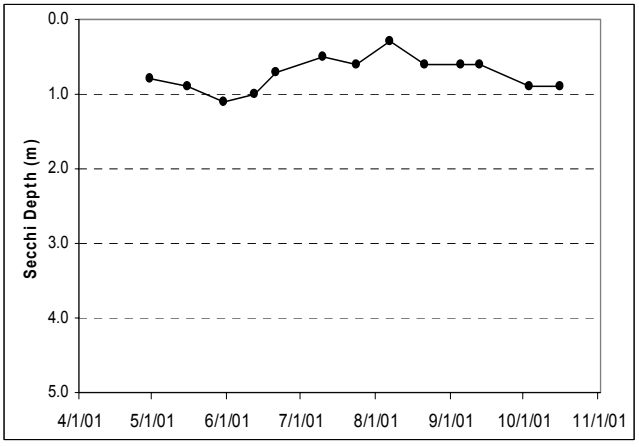












Lake Water Quality Grades Based on Summertime Averages

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

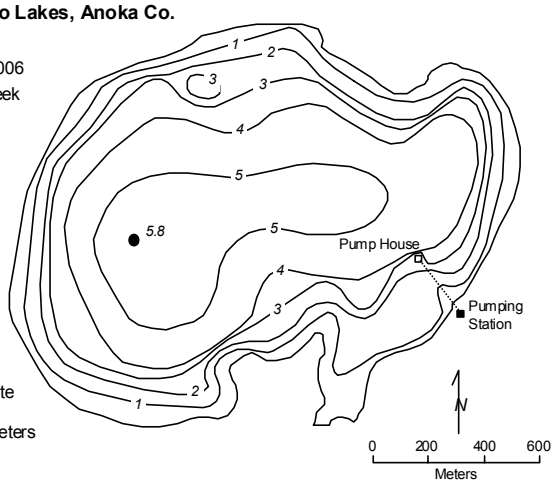
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			F					F			F
Chlorophyll a			C					D			F
Secchi Depth	D	D	C					D			D
Overall			**D**					**D**			**F**

Source: Metropolitan Council and STORET data

Centerville Lake

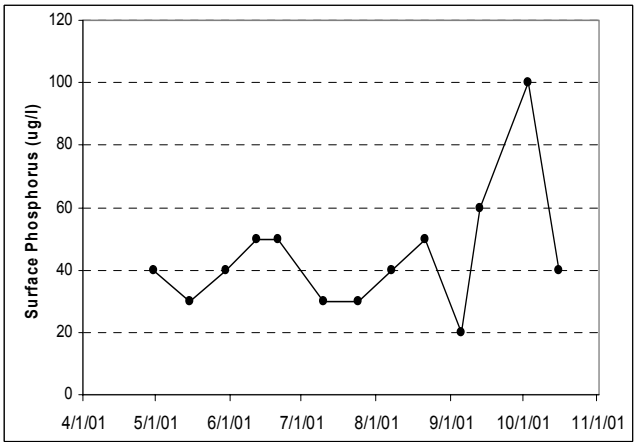
Centerville/Lino Lakes, Anoka Co.

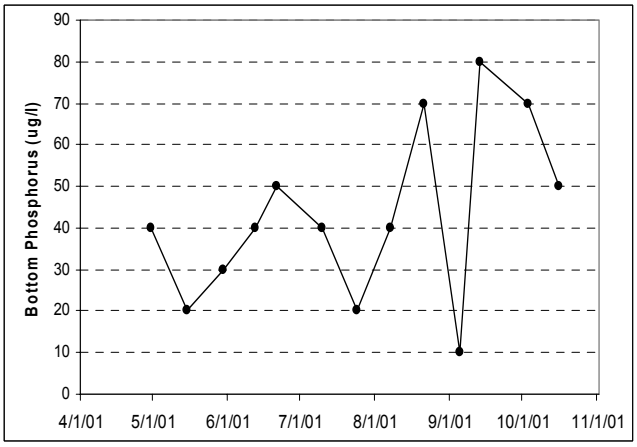
LAKE ID: 20006
WD: Rice Creek

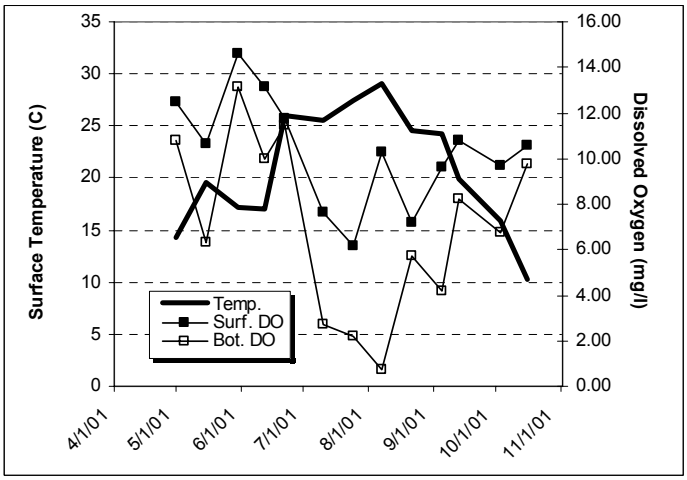


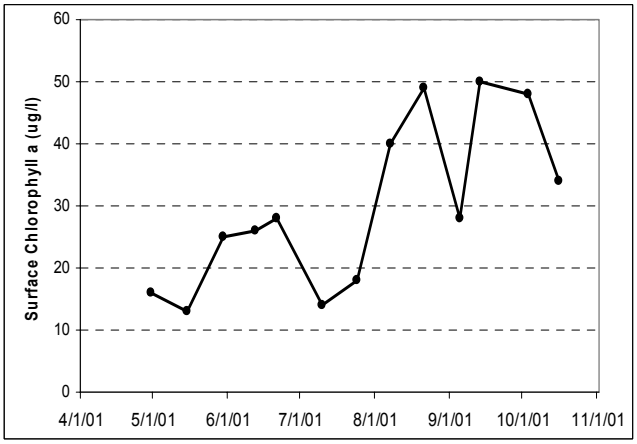
● Sampling site

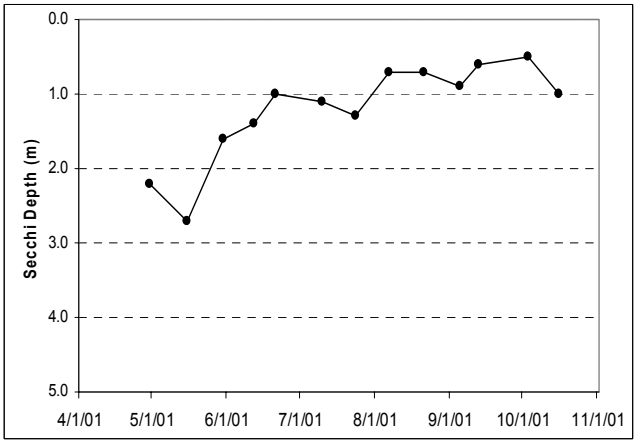
Contours in meters











Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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**		

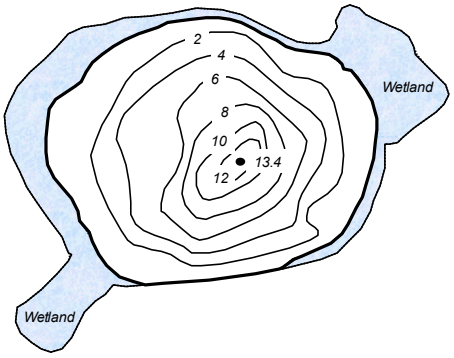
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										C	C
Chlorophyll a										C	C
Secchi Depth		D	D	C						C	C
Overall										**C**	**C**

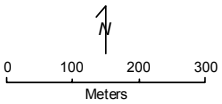
Source: Metropolitan Council and STORET data

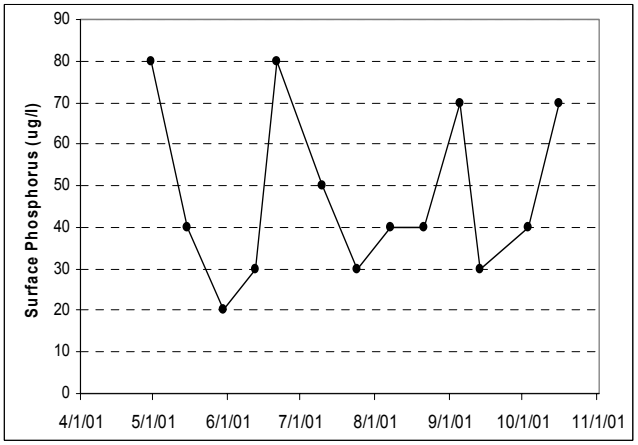
Hafften Lake,
Greenfield, Hennepin Co.

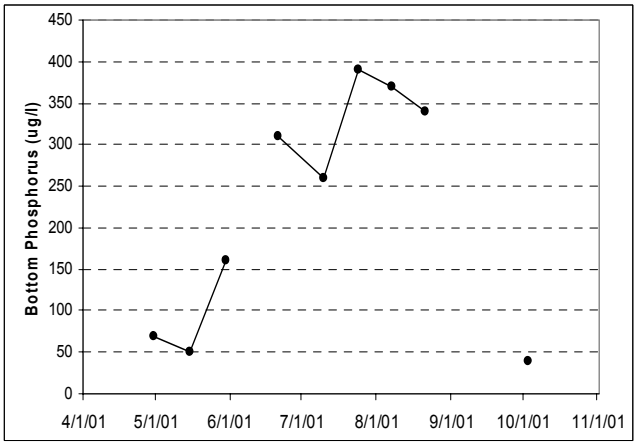
LAKE ID: 270199
WD: Pioneer-Sarah Creek

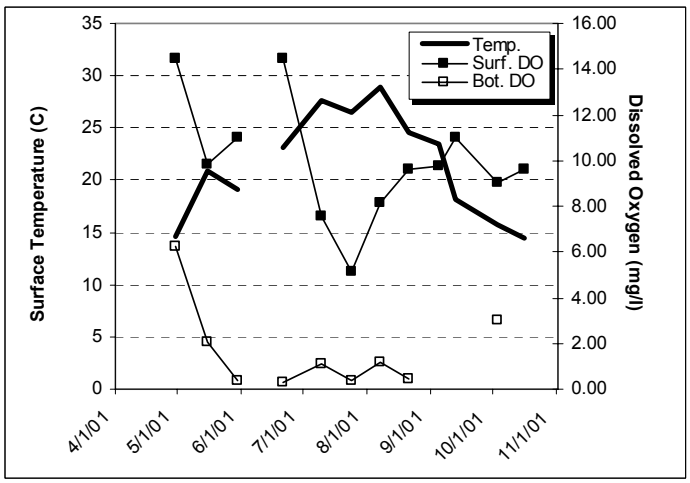
● Sampling site
Contours in meters

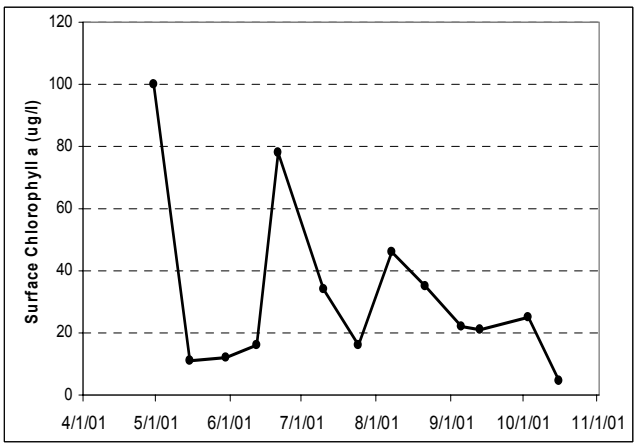


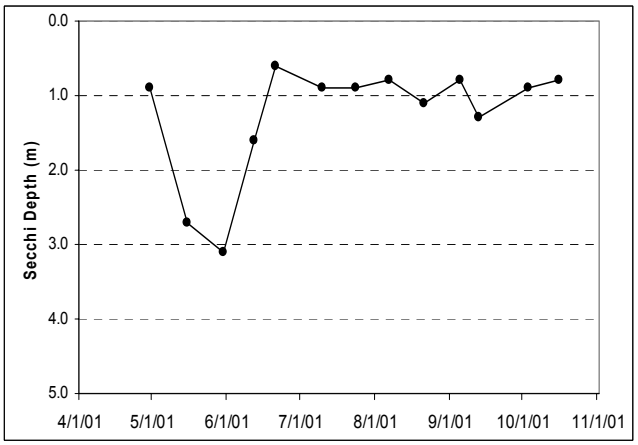












Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										C	C
Chlorophyll a										C	C
Secchi Depth										C	C
Overall										**C**	**C**

Source: Metropolitan Council and STORET data

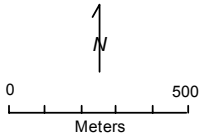
Little Long Lake

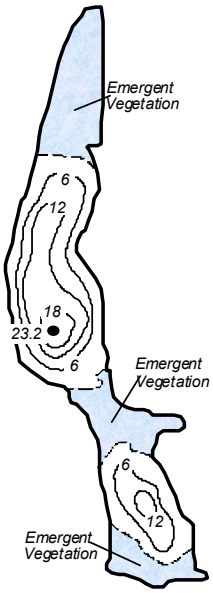
Minnetrista, Hennepin Co.

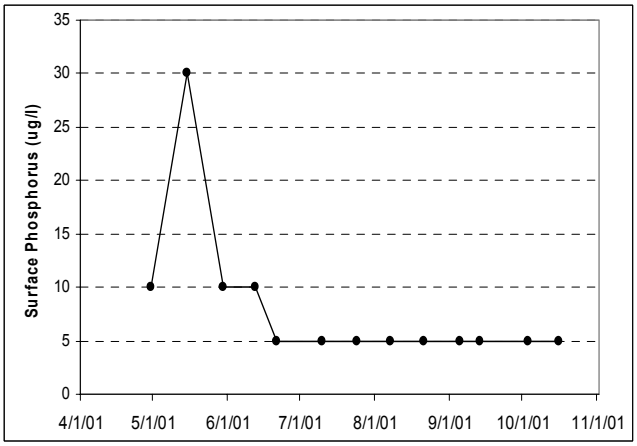
Lake ID: 270179-02
WMO: Pioneer-Sarah Creek

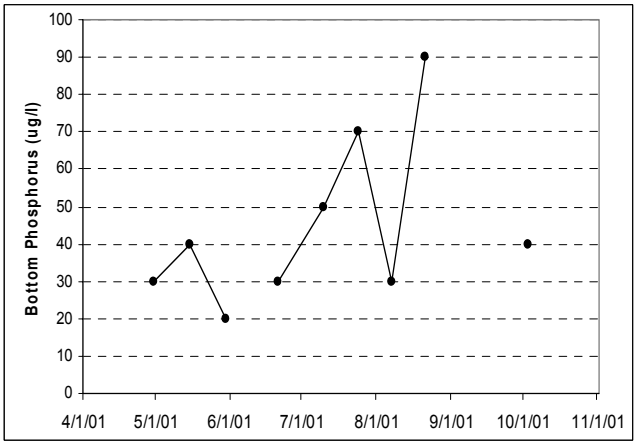
● Sampling site

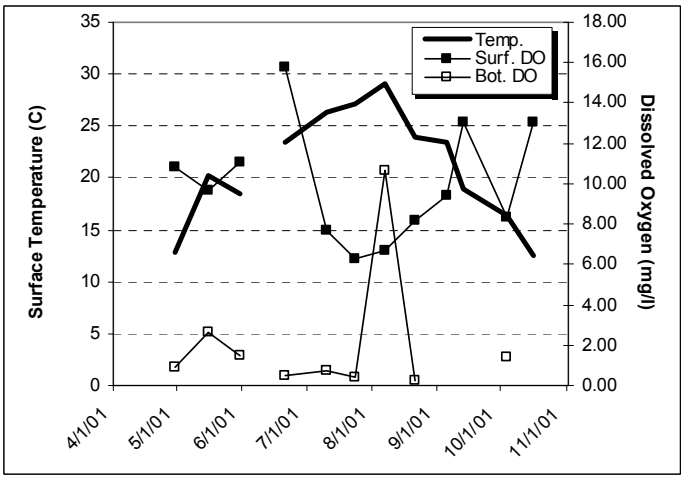
Contours in meters

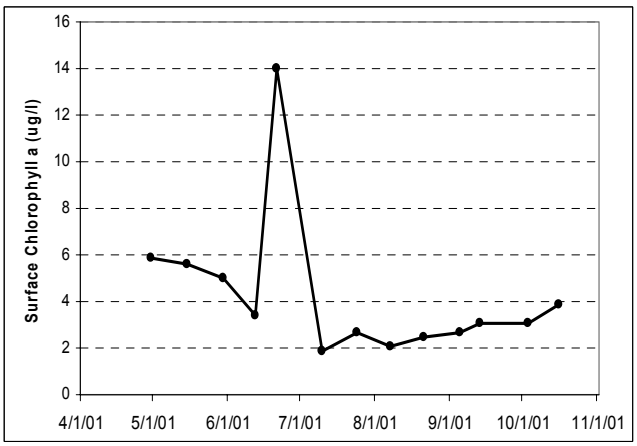


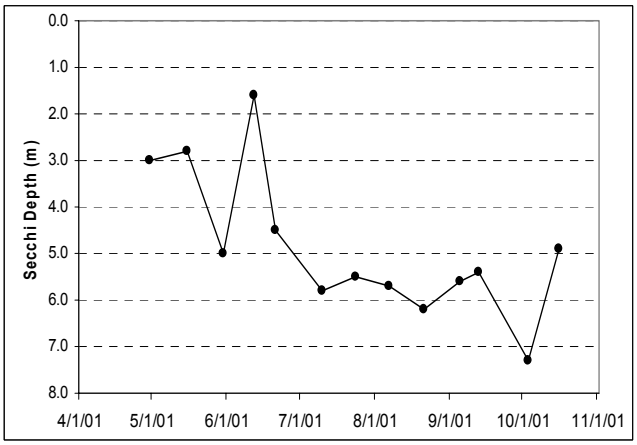












Lake Water Quality Grades Based on Summertime Averages

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

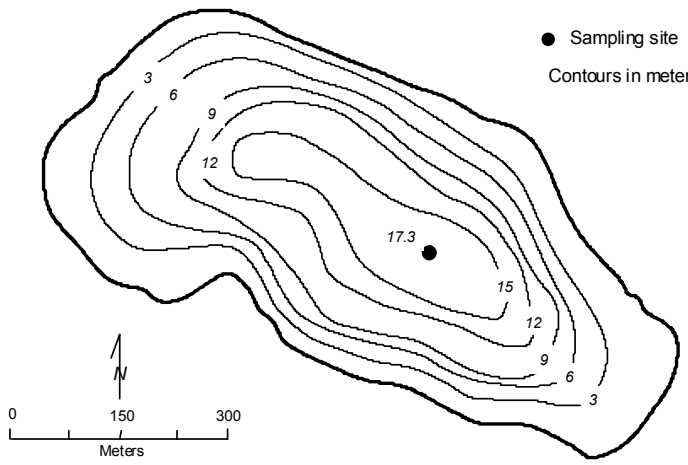
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								A			A
Chlorophyll a								A			A
Secchi Depth								A			A
Overall								**A**			**A**

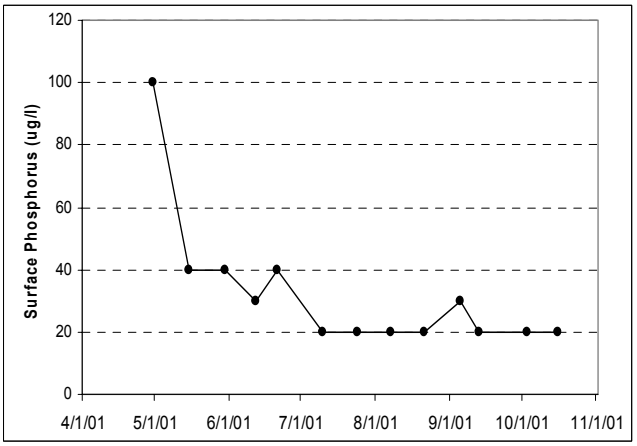
Source: Metropolitan Council and STORET data

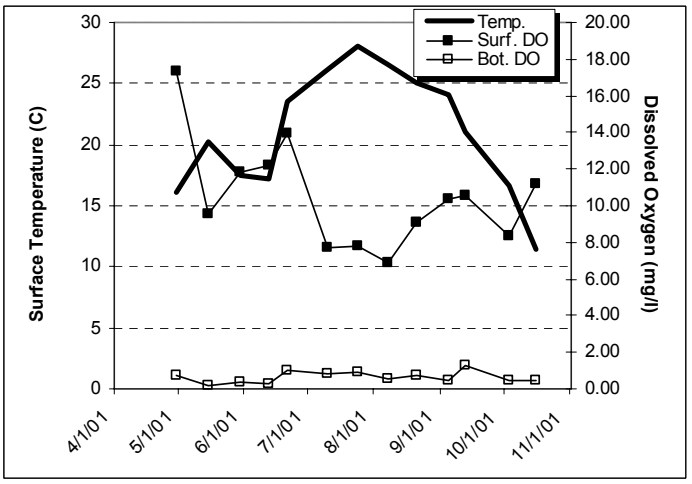
Lake McCarrons

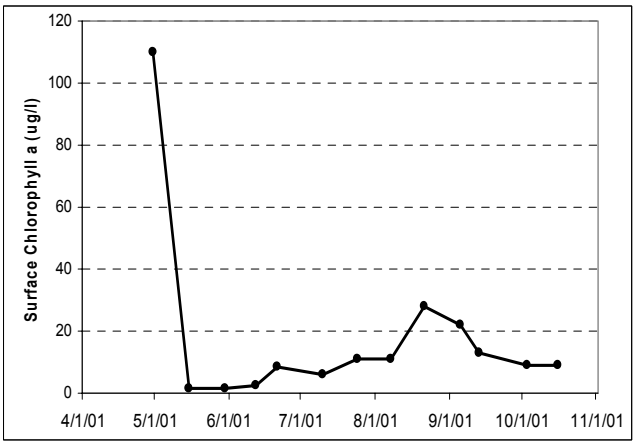
Roseville, Ramsey Co.

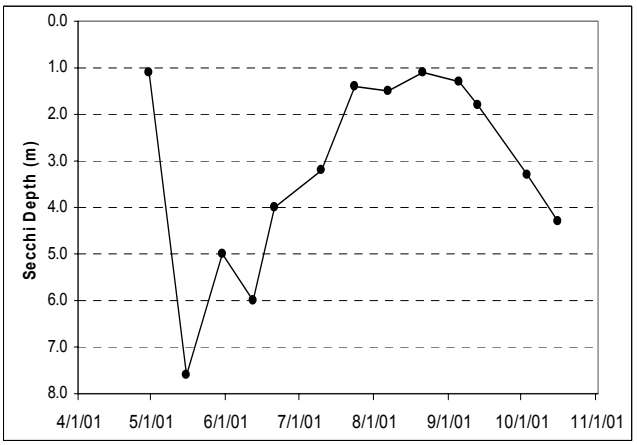
Lake ID: 620054
WD: Capitol Region











Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	C		C	C	D	D			C	C	C
Chlorophyll a	C		B	B	C	B			B	C	B
Secchi Depth	C		C	B	C	C			C	B	A
Overall	**C**		**C**	**B**	**C**	**C**			**C**	**C**	**B**

Source: Metropolitan Council and STORET data

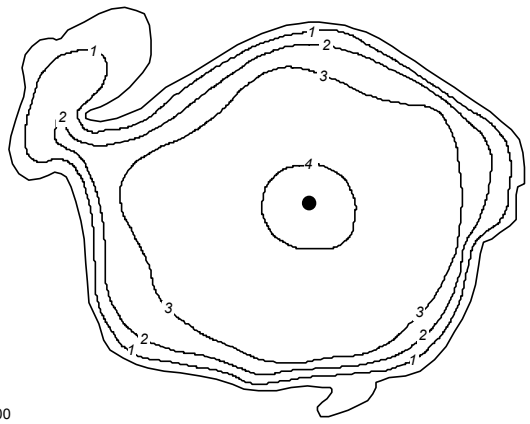
McMahon Lake

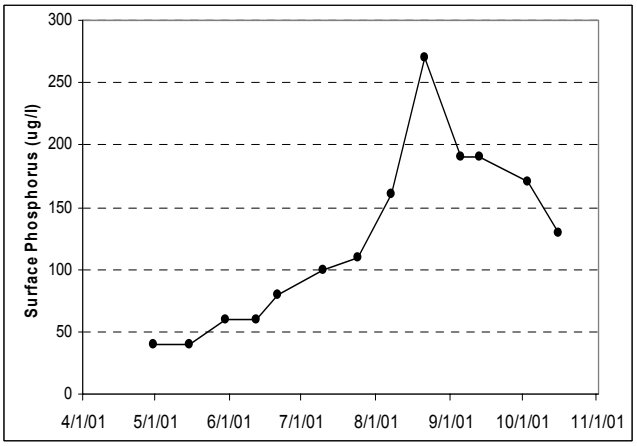
Spring Lake Twp., Scott Co.

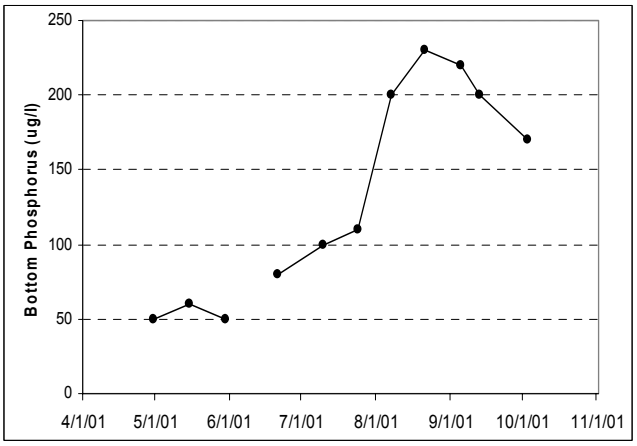
Lake ID: 700050
WMO: Scott County

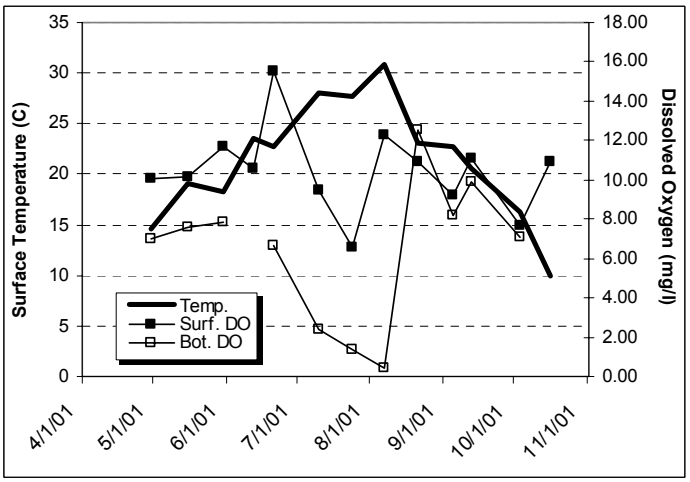
● Sampling site

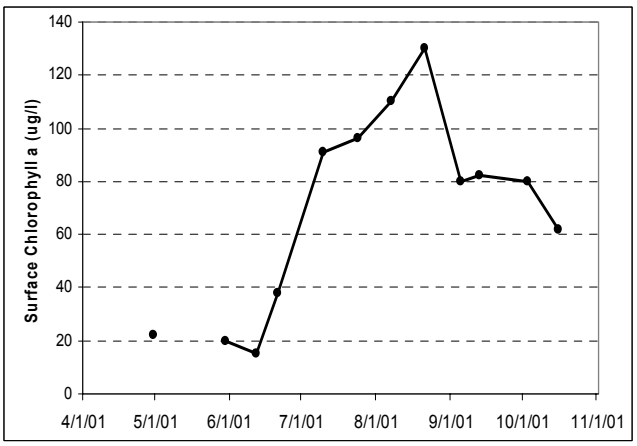
Contours in meters

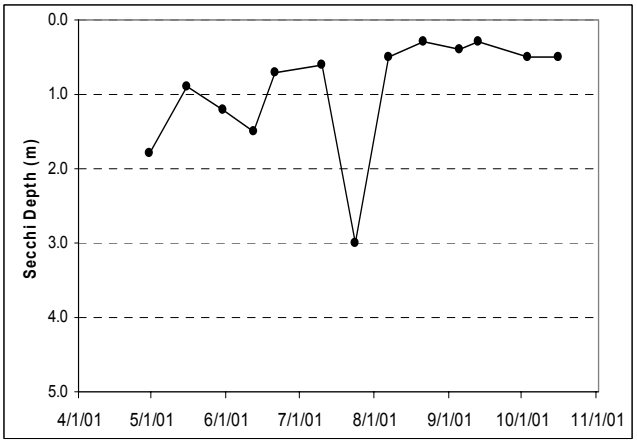










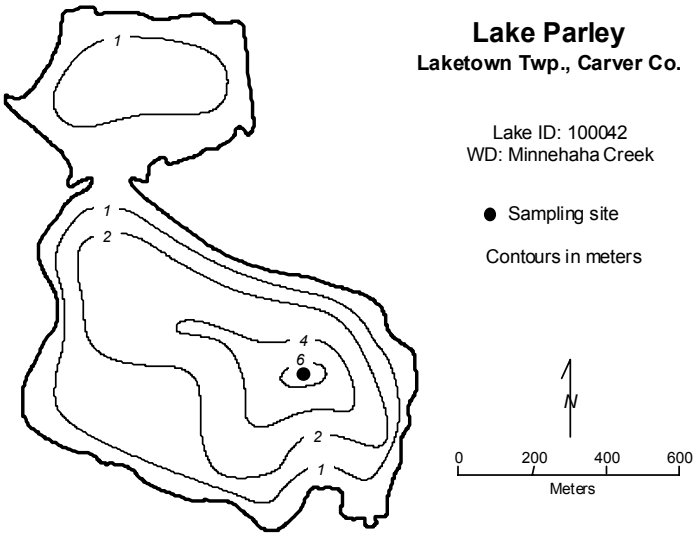


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D			D			D
Chlorophyll a					D			D			D
Secchi Depth					C			D			D
Overall					**D**			**D**			**D**

Source: Metropolitan Council and STORET data



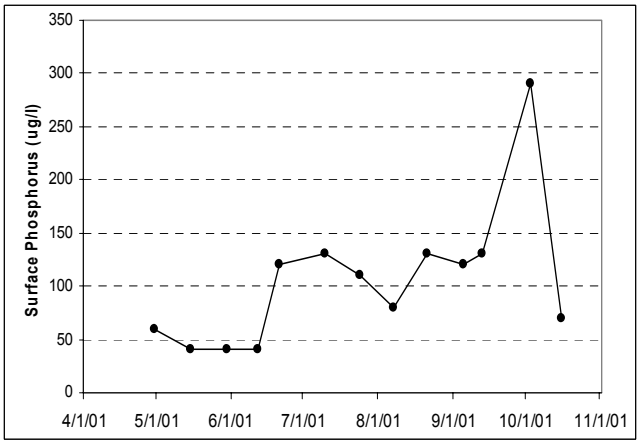
Lake Parley

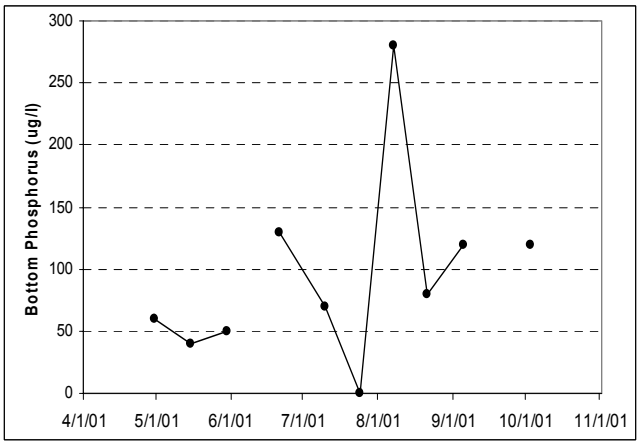
Laketown Twp., Carver Co.

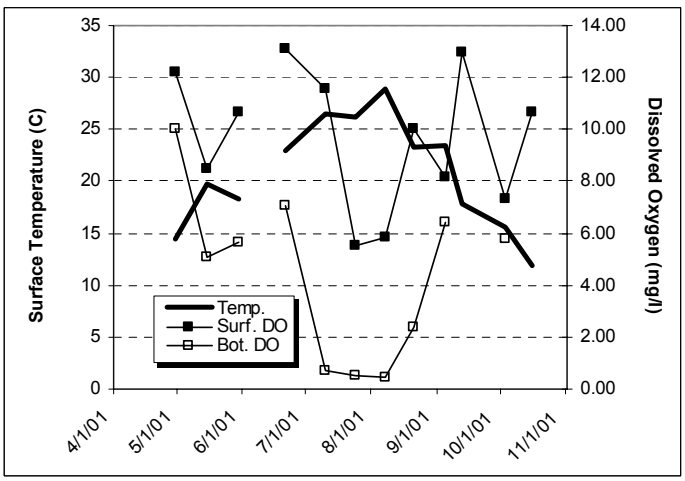
Lake ID: 100042
WD: Minnehaha Creek

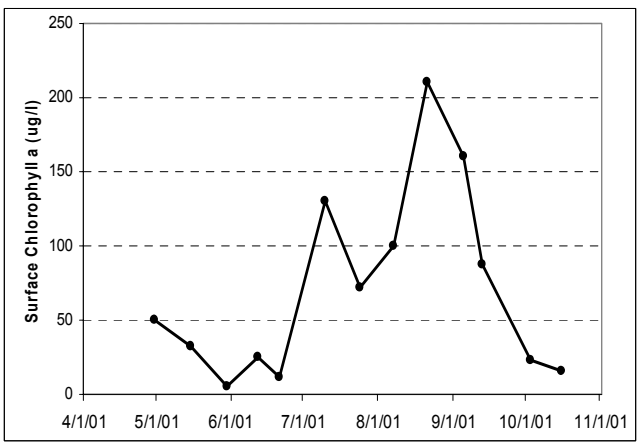
● Sampling site

Contours in meters









Lake Water Quality Grades Based on Summertime Averages

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

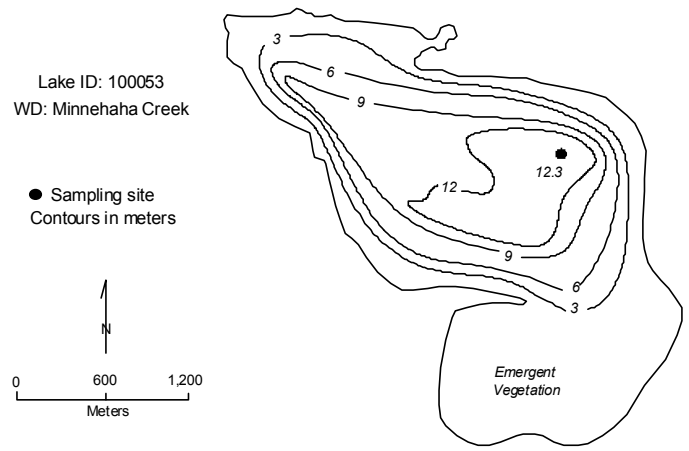
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D					D					D
Chlorophyll a	D					D					F
Secchi Depth	D					C					C
Overall	**D**					**D**					**D**

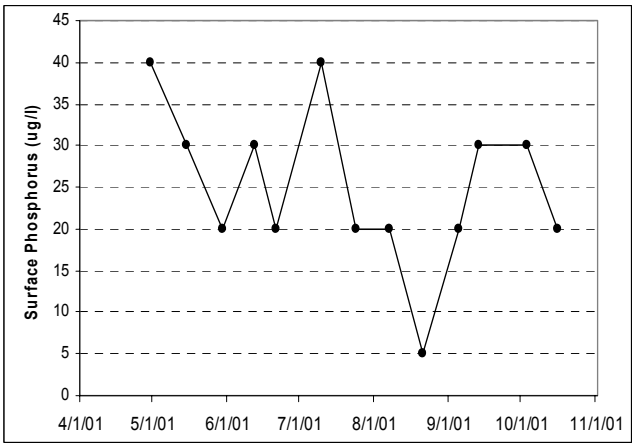
Source: Metropolitan Council and STORET data

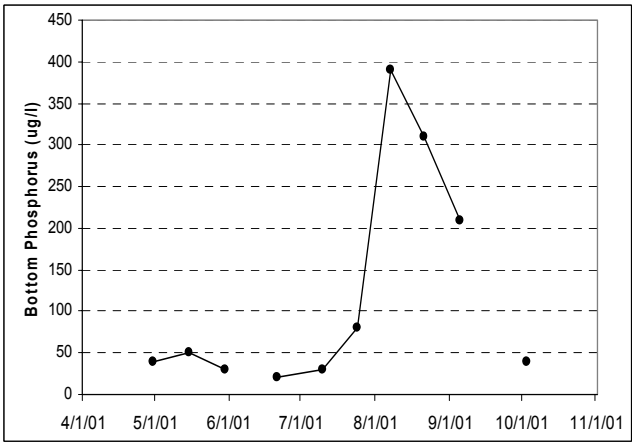
Lake Pierson

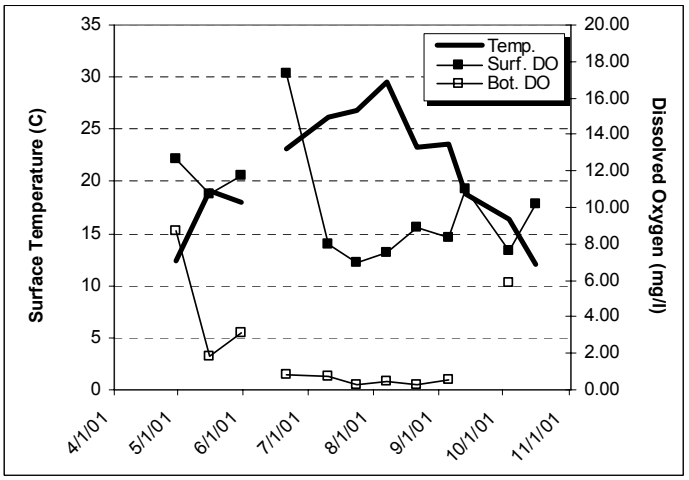
Laketown Twp., Carver Co.

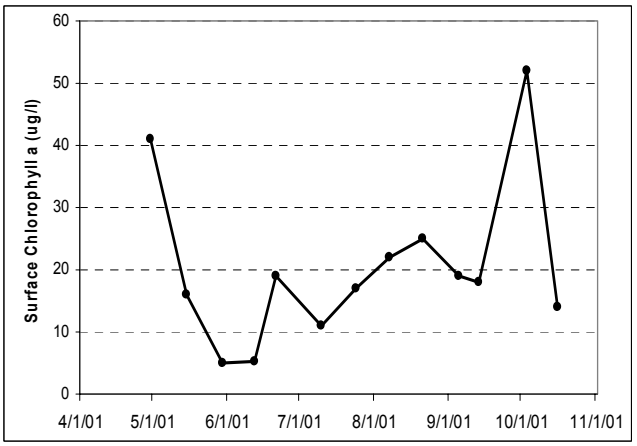
Lake ID: 100053
WD: Minnehaha Creek

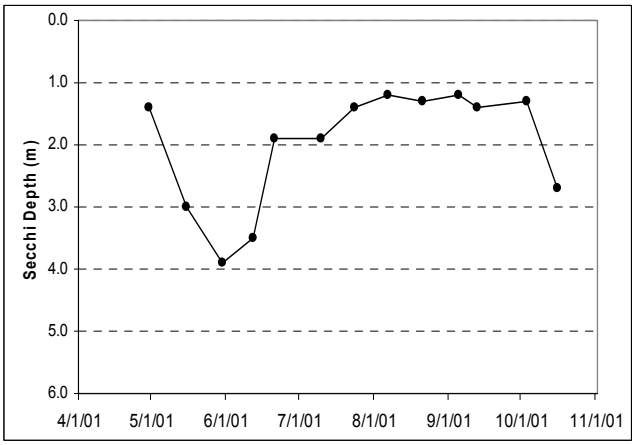












Lake Water Quality Grades Based on Summertime Averages

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

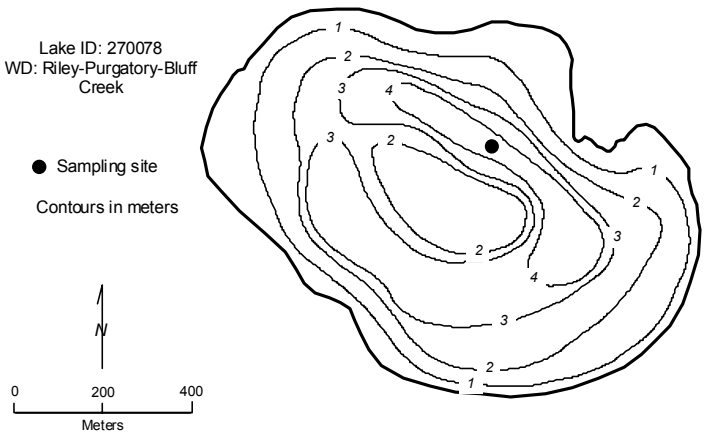
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					A						B
Chlorophyll a					B						B
Secchi Depth					B						C
Overall					**B**						**B**

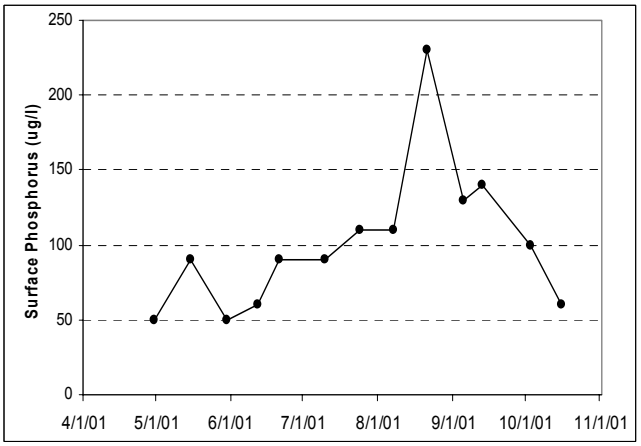
Source: Metropolitan Council and STORET data

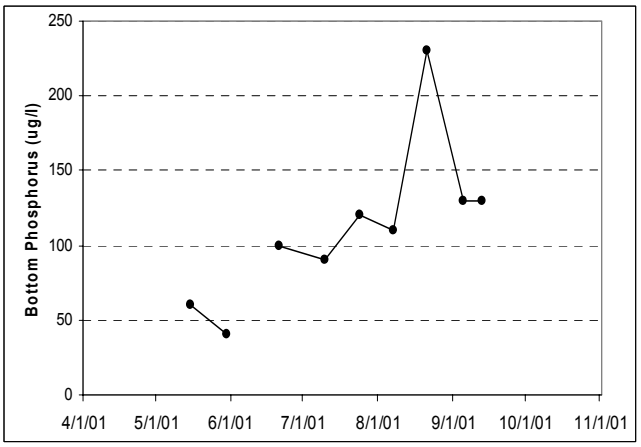
Staring Lake

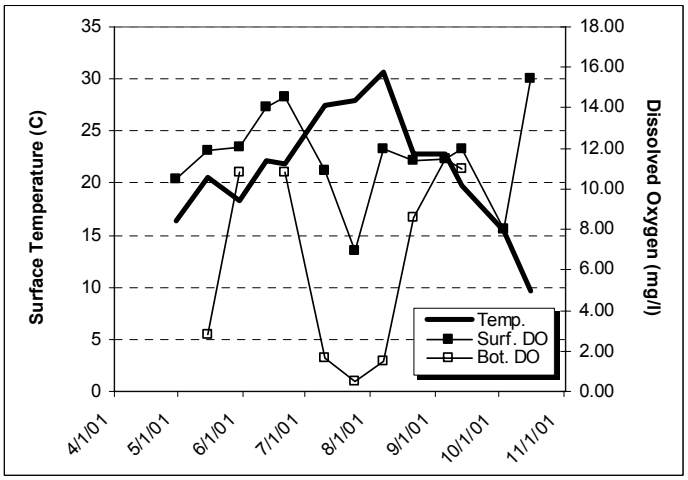
Eden Prairie, Hennepin Co.

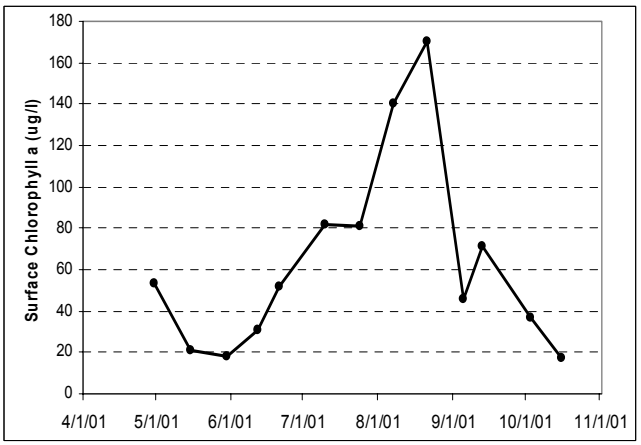
Lake ID: 270078
WD: Riley-Purgatory-Bluff Creek

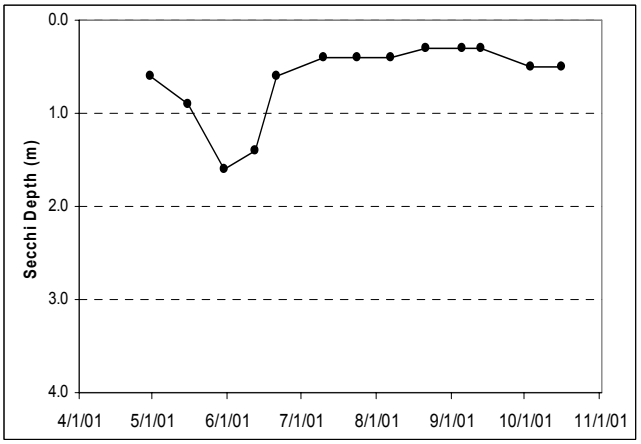












Lake Water Quality Grades Based on Summertime Averages

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

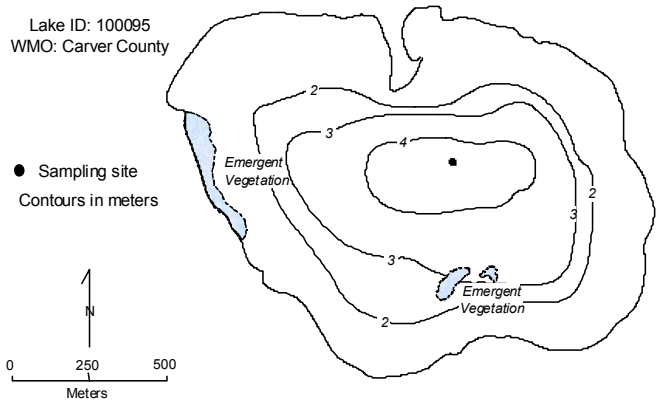
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D				D		D
Chlorophyll a					C				D		D
Secchi Depth					D				F		D
Overall					**D**				**D**		**D**

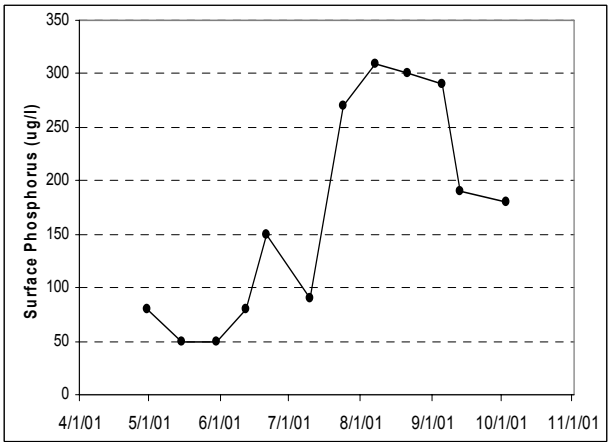
Source: Metropolitan Council and STORET data

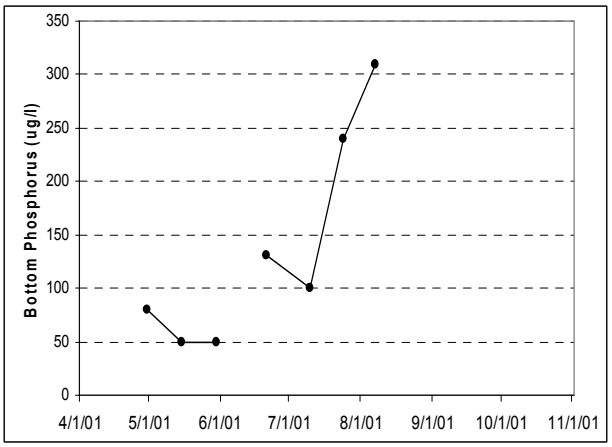
Swede Lake

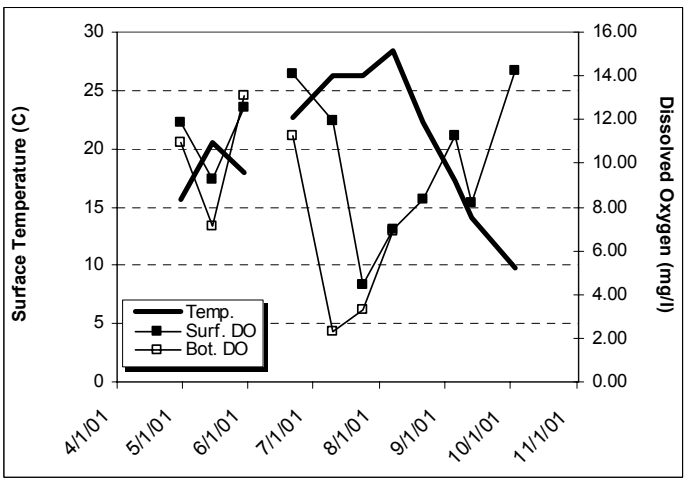
Watertown Twp., Carver Co.

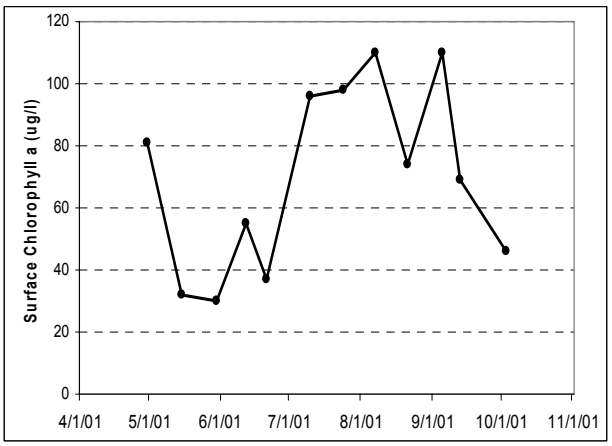
Lake ID: 100095
WMO: Carver County

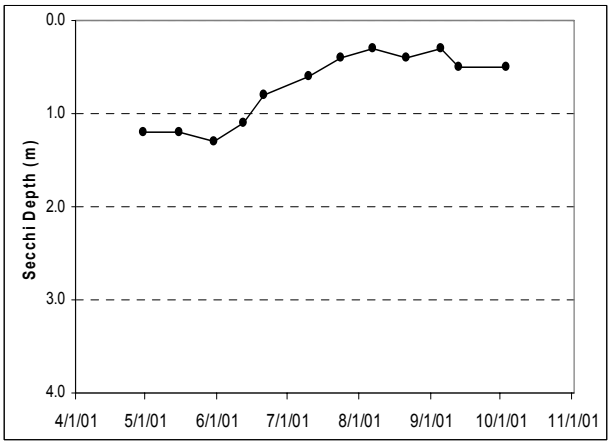












Lake Water Quality Grades Based on Summertime Averages

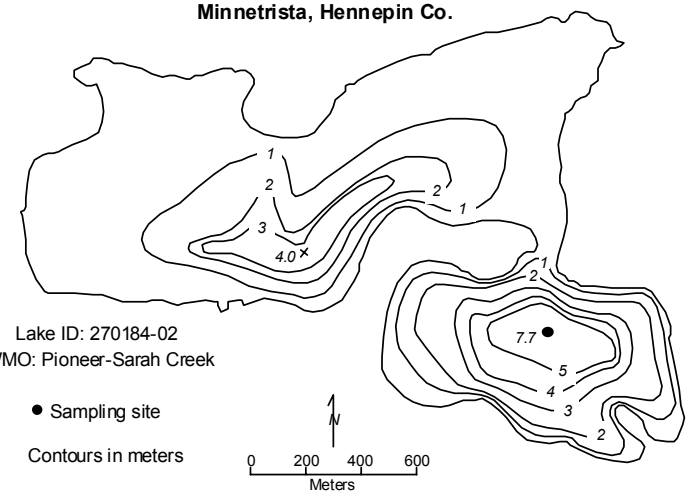
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Total Phosphorus											
Chlorophyll a											
Secchi Depth											
Overall											

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						D					D
Chlorophyll a						F					D
Secchi Depth						F					D
Overall						**F**					**D**

Source: Metropolitan Council and STORET data

Whaletail Lake

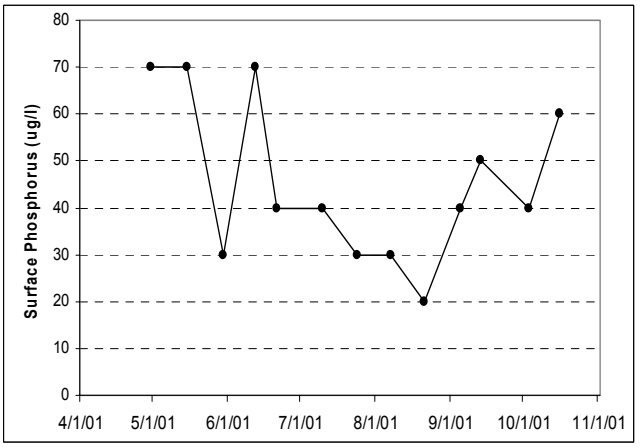
Minnetrista, Hennepin Co.

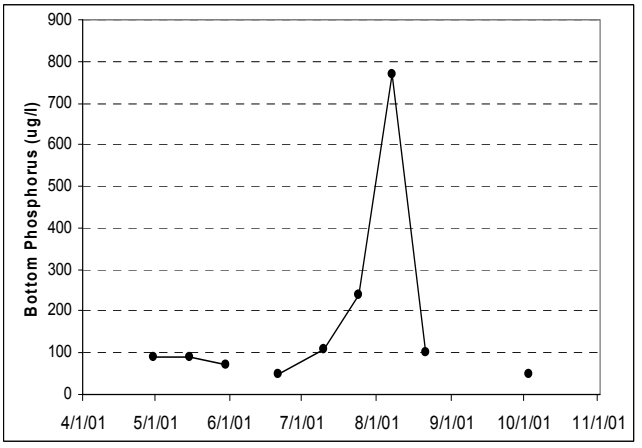


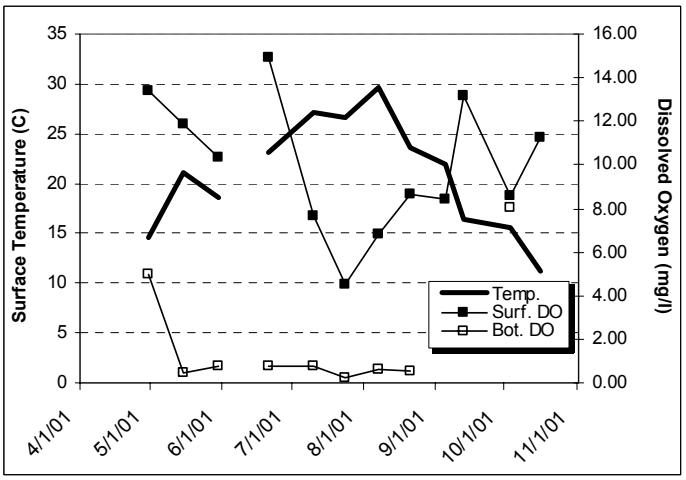
Lake ID: 270184-02
WMO: Pioneer-Sarah Creek

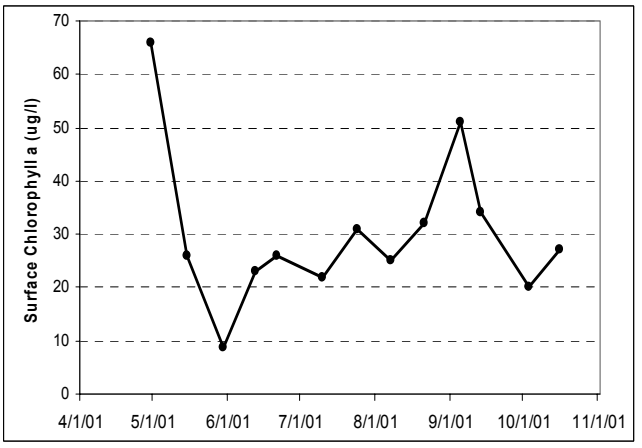
● Sampling site

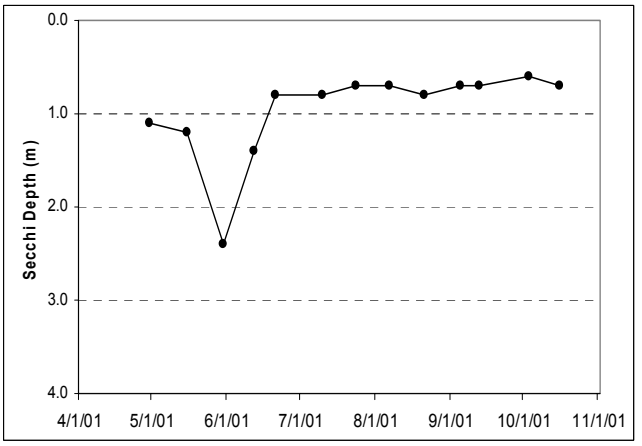
Contours in meters











Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								C			C
Chlorophyll a								C			C
Secchi Depth								D			D
Overall								**C**			**C**

Source: Metropolitan Council and STORET data

PART II - CITIZEN-ASSISTED LAKE MONITORING

ACKNOWLEDGMENTS

The success of the 2001 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), seven cities, and two counties 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 2001 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 - Water Management Technical Services staff 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). In addition, they measured surface water temperature, water transparency, and recorded user perceptions. 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 2001 volunteer monitoring program began in the winter months of 2000. 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 2001 marked the ninth year of the Council's volunteer program. Fourteen watershed management organizations/watershed districts (WMO/WD), seven cities, and two counties participated in CAMP in 2001, enrolling a total of 120 lake sites on 118 lakes. This year's volunteer monitoring program included nine lakes never before monitored by the Council and 99 lake sites returning from 2000. To date, water quality data from 30 of the region's 46 watersheds (65 percent). A map indicating the 2001 CAMP lakes and their affiliated WMO/WD 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 2001. 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
- Dial 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.

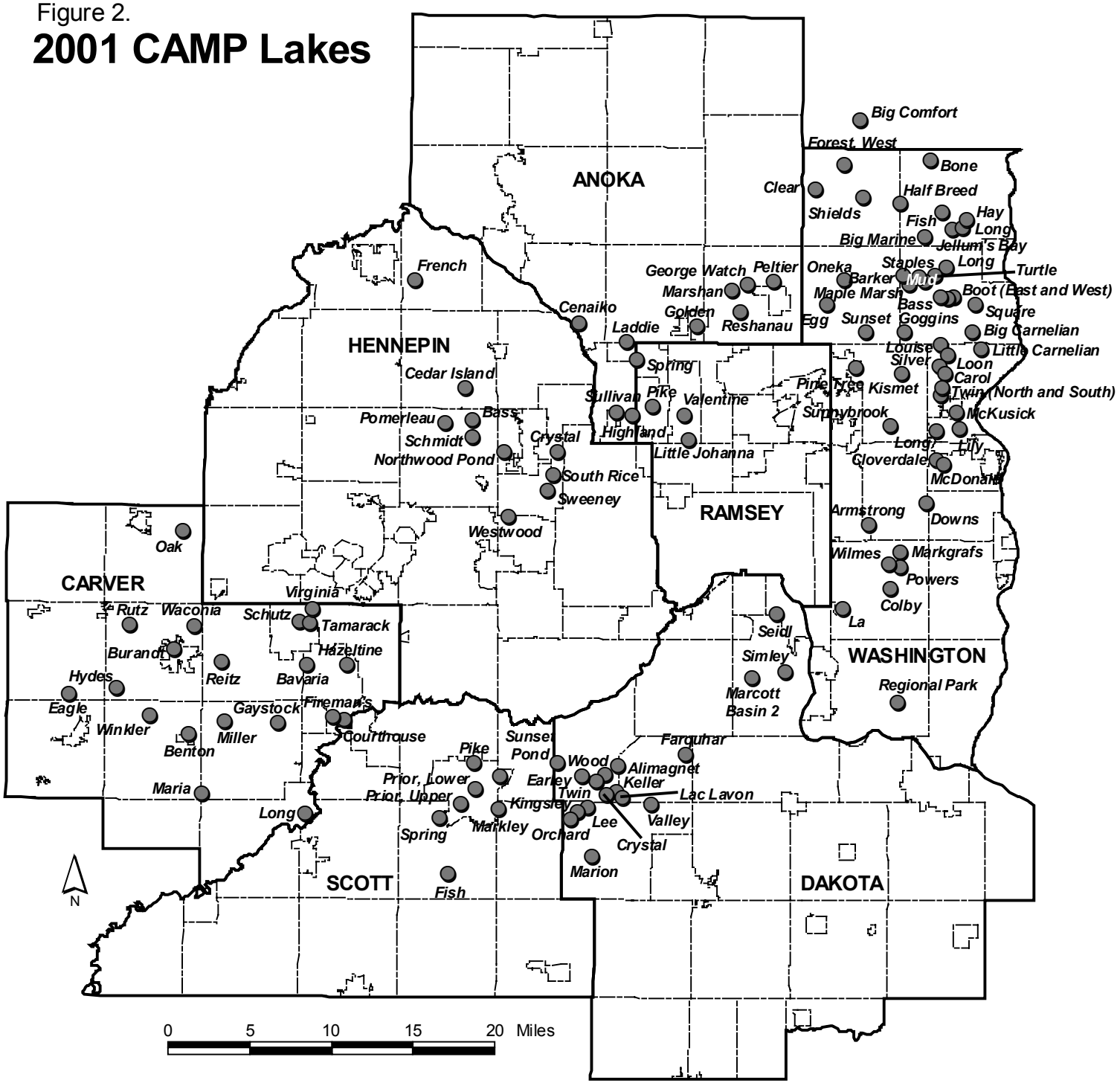
MONITORING METHODS

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.

2001 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 dial thermometer that is readable to 0.5°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 1.0 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, gently folded, put in the sample container and wrapped in aluminum foil. 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), and frozen until pick-up and delivery to the lab.

The frozen samples were picked up within approximately 45-60 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 volunteers record dissolved oxygen (DO) and temperature profiles as well as collect subsurface TP and CLA samples. These 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.

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 2001 CAMP monitoring and a separate lake information sheet. Each information sheet includes current 2001 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).

The lake has an active lake association that has been aggressively attempting to improve the lake's quality by reducing phosphorus throughout the watershed, implementing shoreline buffer planting, reducing the abundance of the lake's curlyleaf pondweed (*Potamogeton crispus*), and other efforts. In early-summer 1996 the Alimagnet Lake association attempted a unique plan to reduce the abundance of curlyleaf pondweed on the lake by using volunteers to manually cut the vegetation and transport it off site, rather than continually treating the problem with chemicals. The volunteers attempted to cut the curlyleaf at the right time: just after the point that the plant would not grow back after the cutting and before it went to seed. The objective of this process was to eliminate the curlyleaf problem over the long-term rather than treat it annually (on the short-term). Because of the success of the program in the late-1990's, the curlyleaf pondweed removal is now done on a smaller scale in order to keep its population in check.

Between early-May and mid-October+ 2001, the lake was sampled eight times. Summertime (May through September) means for the monitored variables were: surface TP= 77.1 µg/l (minimum concentration of 40.0 µg/l and a maximum value of 140.0 µg/l); surface chlorophyll-a= 31.9 µg/l (minimum of 9.3 µg/l and maximum of 88.0 µg/l); Secchi transparency= 0.8 m (minimum of 0.3 m and a maximum of 0.9 m); and TKN= 1.05 mg/l (minimum of 0.52 mg/l and maximum of 1.90 mg/l). Lake quality grades associated with the 2001 means were as follows: TP= D; CLA= C; and Secchi= D. The overall 2001 water quality grade calculated from the TP, CLA, and Secchi grades was D. The 2001 overall grade is similar to that of 1990, 1996, 1999, and 2000. This year's lake quality grade, however, is worse than that recorded in 1995, 1997 and 1998.

While annual Secchi transparency data are recorded from 1980 to 2001, only a limited amount of nutrient and chlorophyll data exist. The only years other than 1995-2001 (as a part of CAMP) for which other nutrient data were found were 1980 and 1981 (surface phosphorus), and 1990 (phosphorus and chlorophyll). For this reason the determination of any long-term trend from this limited database would be unreliable. The lake's overall water quality grades indicate that the lake fluctuates between a C and D. 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, 1999, 2000, and 2001 (overall grade of D). The lake's 2001 summertime TP, CLA, and Secchi means were better than those recorded in 1999 and 2000 and similar to those of 1996.

Similar to past years the data graphs again show a distinct relationship between the lake's TP and CLA concentrations, and Secchi transparency. Generally when fewer nutrients (TP) are available for algal growth (fewer algae = less CLA), Secchi transparencies (lake clarity) will increase, and vice versa.

Graphs showing the lake's physical condition and recreational suitability perceptions as charted by the volunteer(s) are somewhat correlated to the other lake graphs. The better the lake's clarity, which relates to lower TP and CLA concentrations, the better the lake's perceived physical condition and recreational suitability. The summertime mean physical condition was 3.3 on a 1-to-5 scale shown on the lake information sheet (between 3-"definite algal presence" and 4-"high algal color"). The mean suitability for recreation ranking, also on a 1-to-5 scale, was 2.4 (between 2-"minor aesthic problem" and 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.

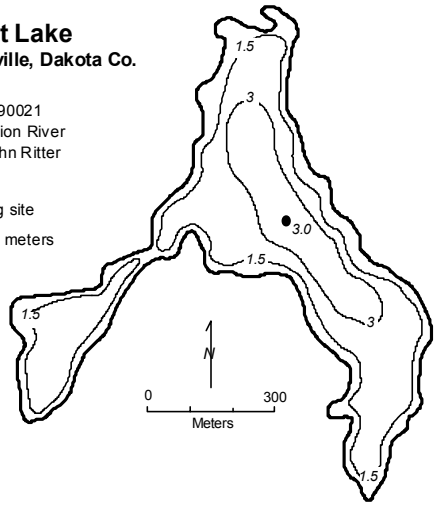
Alimagnet Lake

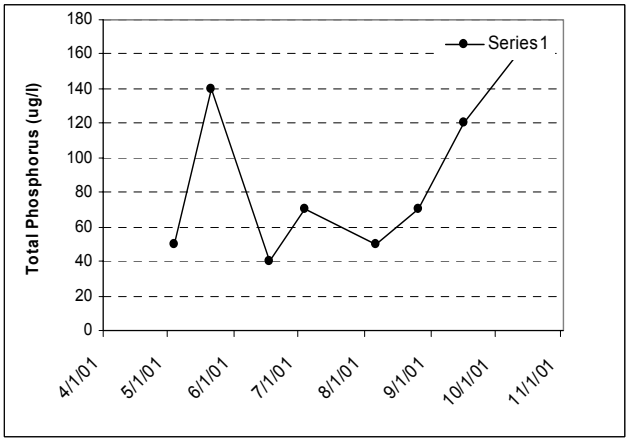
Apple Valley/Burnsville, Dakota Co.

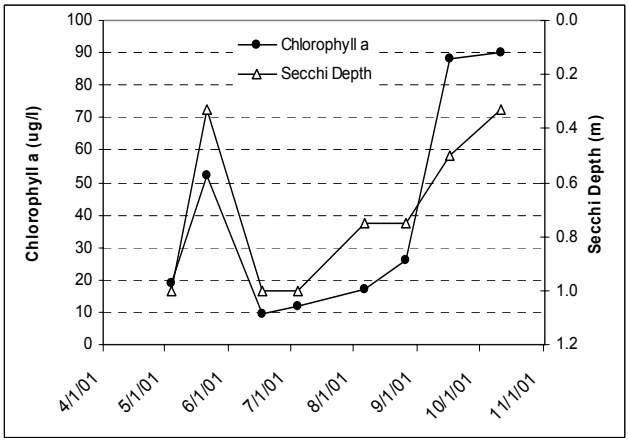
Lake ID: 190021
WMO: Vermillion River
Volunteer: John Ritter

● Sampling site

Contours in meters

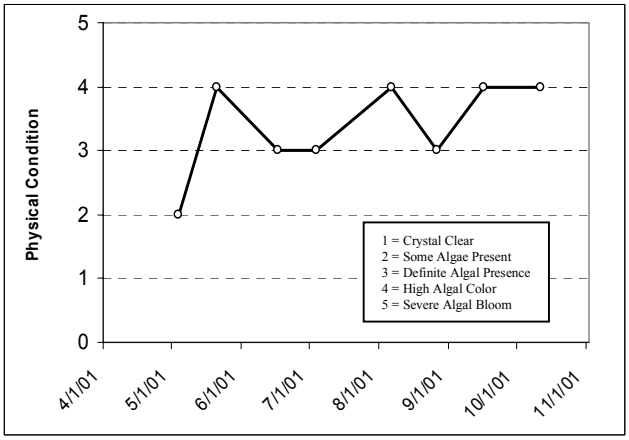






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/4	17				19	50		1.0	2	2
5/21	16				52	140		0.3	4	3
6/17	24.1				9.3	40		1.0	3	3
7/4	25.8				12	70		1.0	3	2
8/6	32.5				17	50		0.8	4	3
8/26	24.8				26	70		0.8	3	2
9/16	19				88	120		0.5	4	2
10/11	11.2				90	160		0.3	4	4

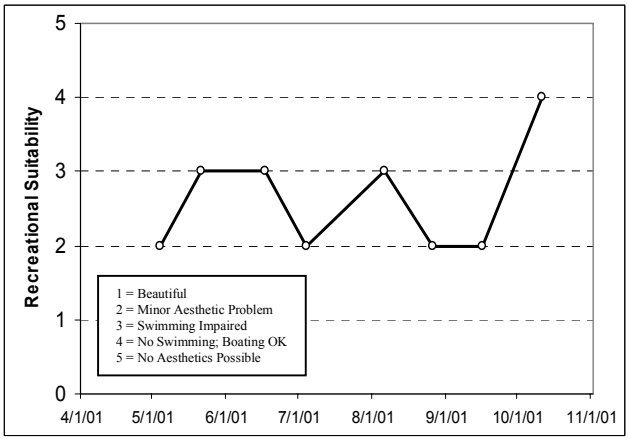


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D	D	C	D	F	D	D
Chlorophyll a					B	C	C	C	D	D	C
Secchi Depth	C	D	C	C	C	D	C	C	D	F	D
Overall					**C**	**D**	**C**	**C**	**D**	**D**	**D**

Source: Metropolitan Council and STORET data



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

This was the fourth year that Armstrong Lake has been monitored through CAMP. 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 early-May and mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page. Armstrong Lake received an overall grade of D for 2001. The overall grade was determined from the individual parameter grades. The summertime May through September) mean TP concentration of 73.1 µg/l (minimum of 40.0 µg/l and maximum of 110.0 µg/l) fell within the lake water quality D grade range. Similarly, the lake's Secchi transparency mean of 0.8 m (minimum of 0.6 m and maximum of 1.2 m) also resulted in a grade of D.

The lake's 2001 CLA mean of 21.1 µg/l (minimum and maximum of 4.6 and 42.0 µg/l) on the otherhand, resulted in a grade of C. The lake's mean TKN concentration was 1.10 mg/l (minimum of 0.20 mg/l and maximum of 1.50 mg/l). The lake's 2001 water quality was worse than that recorded in 2000 and comparable to that recorded in 1998 and 1999.

Because 2001 is only the fourth year of available data for Armstrong Lake, it is not possible to determine long-term trends. To better understand the lake's current water quality condition, and which direction its quality may be heading, additional years of data collection are needed. In the short-tern, however, the lake's quality seems best described by a high D/low C grade.

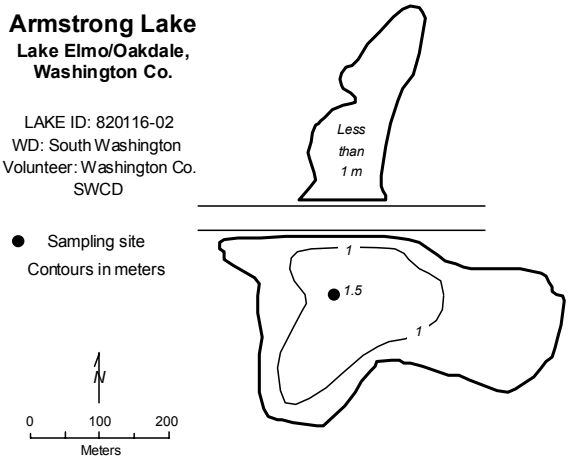
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 3.1 (ranking between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability ranking was 4.4 (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

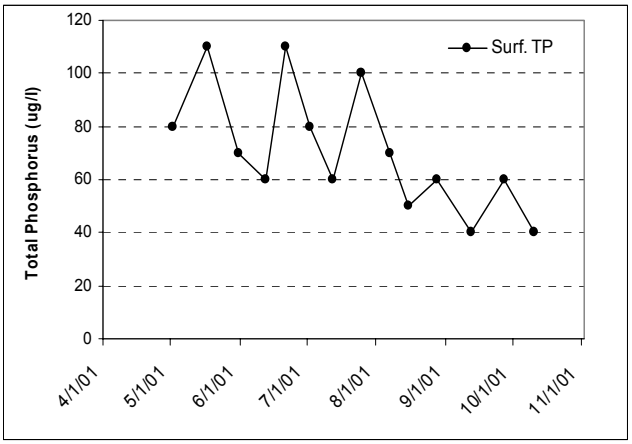
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

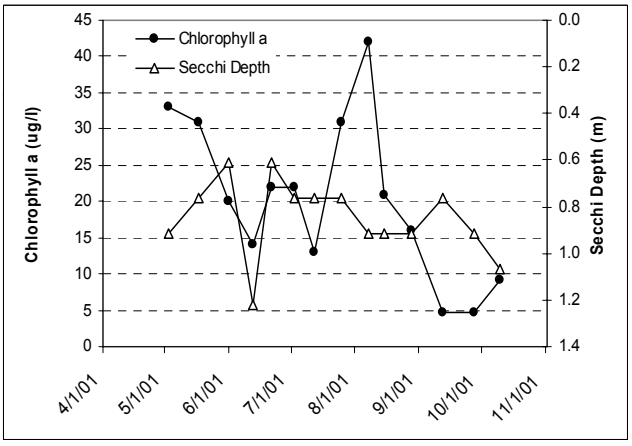
Armstrong Lake

Lake Elmo/Oakdale, Washington Co.

LAKE ID: 820116-02
WD: South Washington
Volunteer: Washington Co. SWCD

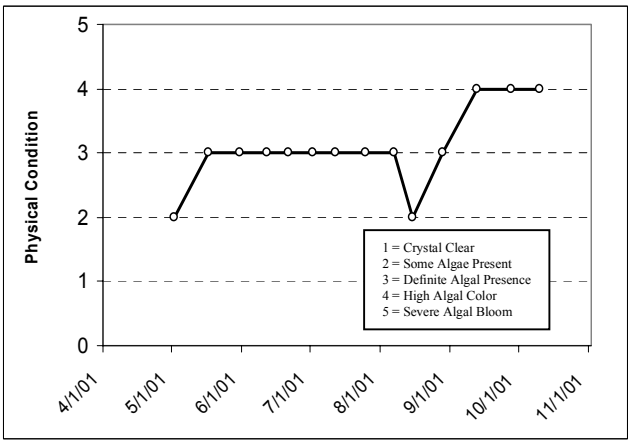






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	18.3				33	80		0.9	2	4
5/17	21.2				31	110		0.8	3	4
5/31					20	70		0.6	3	4
6/12	22.3				14	60		1.2	3	4
6/21	22.3				22	110		0.6	3	4
7/2	20.2				22	80		0.8	3	4
7/12	25.8				13	60		0.8	3	5
7/25					31	100		0.8	3	4
8/7	28.2				42	70		0.9	3	5
8/15	20.7				21	50		0.9	2	5
8/28	27.5				16	60		0.9	3	4
9/12	19.1				4.7	40		0.8	4	5
9/27	13.4				4.6	60		0.9	4	5
10/10	12.7				9.1	40		1.1	4	5

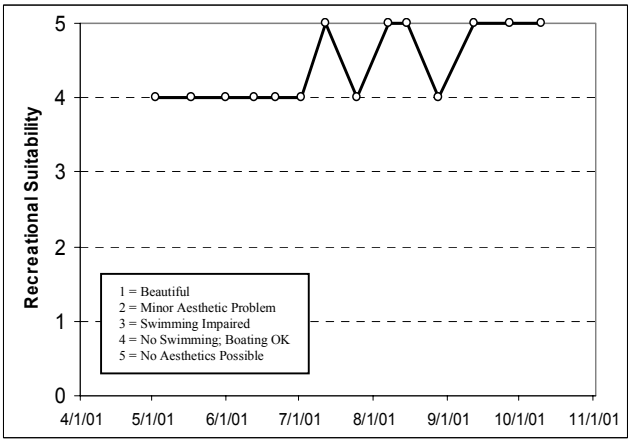


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								D	F	C	D
Chlorophyll a								D	C	C	C
Secchi Depth								D	F	D	D
Overall								**D**	**D**	**C**	**D**

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 one marks the second 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 (1997-2000) collected over the past twenty years.

The lake was monitored five times from mid-May to mid-September 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 80.0 µg/l (minimum concentration of 60.0 µg/l and a maximum value of 100.0 µg/l); surface chlorophyll-a= 30.6 µg/l (minimum of 18.0 µg/l and maximum of 49.0 µg/l); Secchi transparency= 1.8 m (minimum of 0.8 m and a maximum of 2.9 m); and TKN= 1.19 mg/l (minimum of 0.93 mg/l and maximum of 1.40 mg/l). The lake's summer means translate to water quality grades of D for TP, C, for CLA, and C for Secchi transparency. These grades result in an overall water quality grade of C for Barker Lake in 2001. While the overall grade for the lake in 2001 was similar to that recorded in 2000, the lake's overall water quality (determined by looking at each individual parameter mean) was worse.

As mentioned earlier, because there is little water quality data available for Barker Lake, it is impossible 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 2.4 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 2.3 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.

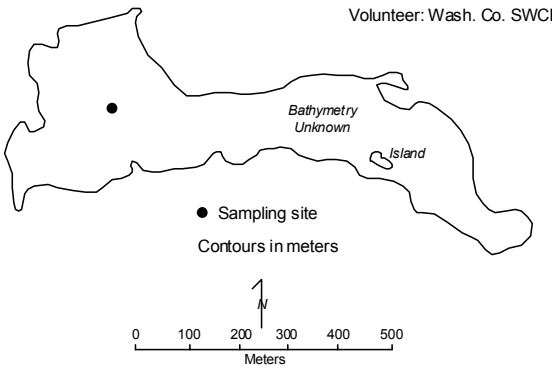
Barker Lake

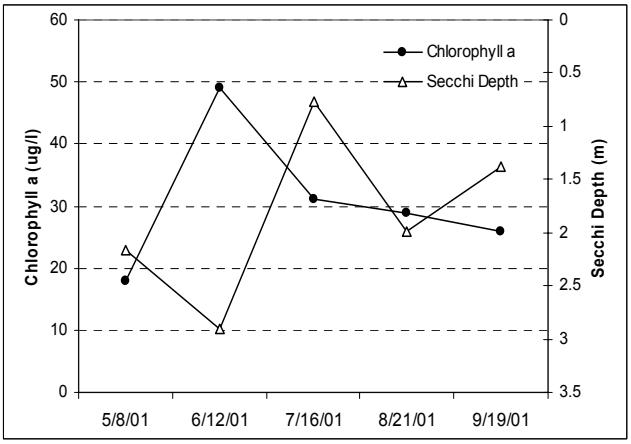
Hugo, May Twp., Washington Co.

LAKE ID: 820076

WD: Carnelian-Marine

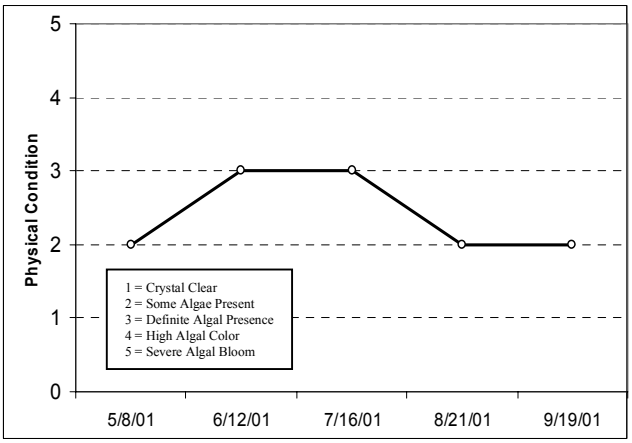
Volunteer: Wash. Co. SWCD





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	15				18	80		2.2	2	1
6/12	23.9				49	60		2.9	3	3
7/16	28.2				31	100		0.8	3	4
8/21	23.6				29	90		2.0	2	2
9/19	19.2				26	70		1.4	2	1

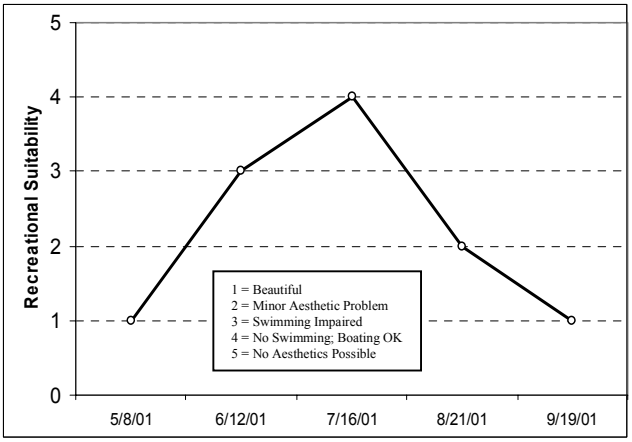


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus							C	D	D	C	D
Chlorophyll a							C	C	D	B	C
Secchi Depth							D	C	C	C	C
Overall							**C**	**C**	**D**	**C**	**C**

Source: Metropolitan Council and STORET data



Bass Lake (27-0098) *Shingle Creek Watershed Management Commission*

Bass Lake is located within the City of Plymouth (Hennepin County). The lake covers an area of 194 acres and has a maximum and mean depth of 9.4 m (roughly 31 feet) and 2.9 m (9.5 feet). About 82 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 1,640 acre-feet (ac-ft) and its approximate residence time (the amount of time required to completely replace the lake's current volume of water with an equal volume of "new" water) is 0.7 years. The lake's watershed of 3,100 acres translates to a rather large watershed-to-lake size ratio of 16:1. The larger the ratio the greater the potential stress put on the lake from surface runoff. 1990 land use estimates indicate that approximately 23.1 % of the watershed is single family residential, 1.2 % is commercial/retail, 0.4 % is industrial/manufacturing, 13.0 % is public waters/wetlands, and 62.3 % is available for potential growth (Montgomery Watson 1994).

Additionally, the lake is considered a "Priority Lake" by the Metropolitan Council, due to its multi-recreational uses. Primary management concerns in the past have revolved around the lake's sizable aquatic macrophyte population and periods of low oxygen levels.

Bass Lake, which was also monitored through CAMP in 1994, 1997, and 1999, was monitored 13 times from early-May to mid-October, 2001. Summertime (May through September) means for the monitored variables were: surface TP= 56.4 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 140.0 µg/l); surface chlorophyll-a= 35.7 µg/l (minimum of 3.1 µg/l and maximum of 110.0 µg/l); Secchi transparency= 1.8 m (minimum of 0.5 m and a maximum of 3.6 m); and TKN= 1.13 mg/l (minimum of 0.64 mg/l and maximum of 2.20 mg/l). The summer means for TP and CLA were the worst recorded to date.

The water quality database for Bass Lake is limited to four years of CAMP data collection (1994, 1997, 1999, and 2001) and a 1980 study by Council staff. Lake quality grades associated with the 2001 summertime means are as follows: TP= C; CLA= C; and Secchi= C. Similarly to past years, the lake's overall water quality grade, calculated from the TP, CLA, and Secchi grades, was C. To date, 1997 was the lake's best water quality year, as determined by individual parameter means and grades.

While the limited nature of the lake's water quality database makes any long-term trend detection impossible, on the short-term the lake seems to consistently have water quality that is representative of a lake grade of C.

The summertime mean physical condition was ranked 3.1 on a 1-to-5 scale shown on the lake information sheet (roughly equal to 3- "definite algal presence"). The mean suitability for recreation ranking, also on a 1-to-5 scale, was 3.8 (between 1- "beautiful" and 2- "minor aesthetic problem"). As expected, due to the lower water quality of the lake in 2001, the lakes mean user perception rankings were lower than past years.

The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) conducted a fisheries survey on the lake in 1991. 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.

Bass Lake

Plymouth, Hennepin Co.

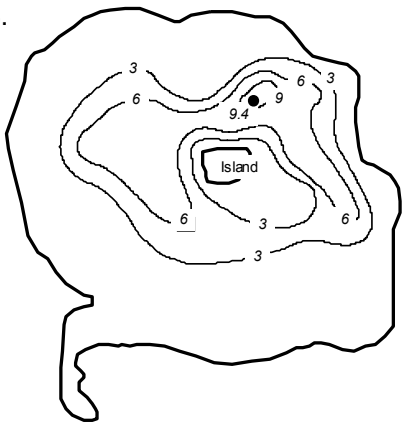
LAKE ID: 270098

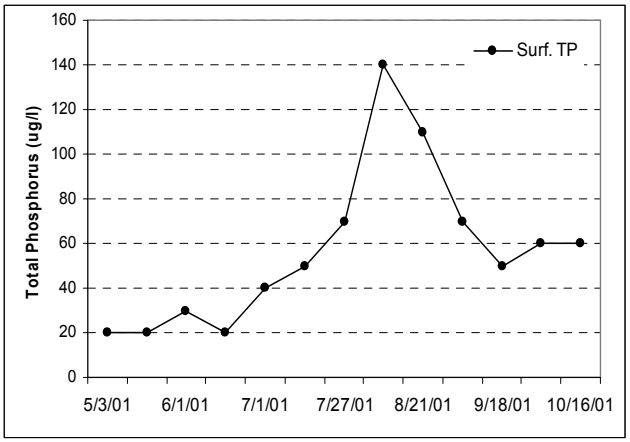
WMO: Shingle Creek

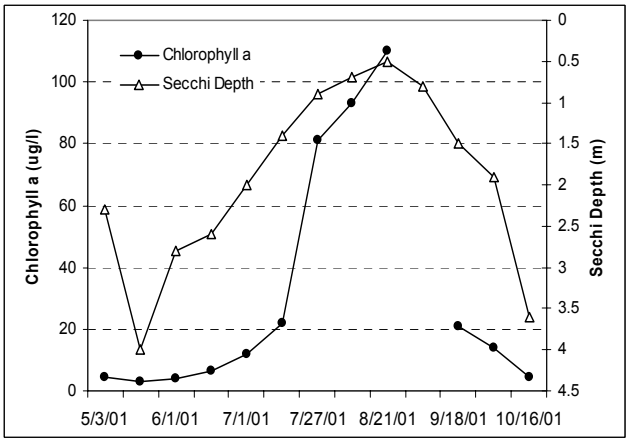
Volunteer: Walt Richards

● Sampling site

Contours in meters

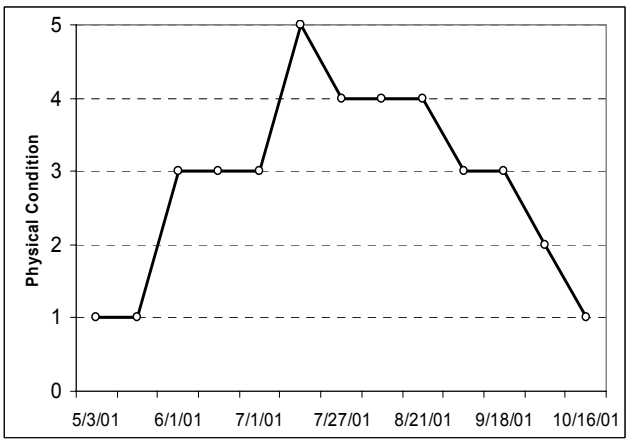






2001 Data

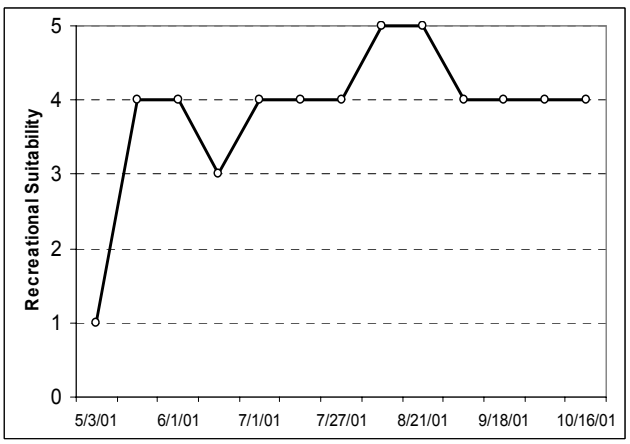
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/3	13				4.5	20		2.3	1	1
5/20	21				3.1	20		4.0	1	4
6/1	19				4	30		2.8	3	4
6/12	23				6.6	20		2.6	3	3
7/1	21				12	40		2.0	3	4
7/9	29				22	50		1.4	5	4
7/27	25				81	70		0.9	4	4
8/12	26				93	140		0.7	4	5
8/21	25				110	110		0.5	4	5
9/6	25					70		0.8	3	4
9/18	20				21	50		1.5	3	4
10/3	24				14	60		1.9	2	4
10/16	11				4.4	60		3.6	1	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C			C		C		C
Chlorophyll a				C			C		C		C
Secchi Depth				C			C	D	C	C	C
Overall				**C**			**C**		**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 second 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 1991-2000 and nutrient and CLA data in 1991-1992 and 1996-2000.

The lake was monitored five times from early-May to mid-September 2001. Summertime (May through September) means for the monitored variables were: surface TP= 44.0 µg/l (minimum concentration of 40.0 µg/l and a maximum value of 50.0 µg/l); surface chlorophyll-a= 18.3 µg/l (minimum of 9.6 µg/l and maximum of 32.0 µg/l); Secchi transparency= 1.9 m (minimum of 1.4 m and a maximum of 2.3 m); and TKN= 0.95 mg/l (minimum of 0.74 mg/l and maximum of 1.10 mg/l).

Similar to that recorded in 2000, the lake quality grades associated with the 2001 summertime means are as follows: TP= C; CLA= B; and Secchi= C. The lake's overall 2001 water quality grade, calculated from the TP, CLA, and Secchi grades, was C.

Because of the limited nature of the lake's water quality database the determination of any long-term trend detection impossible. In the short-term, however, 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.

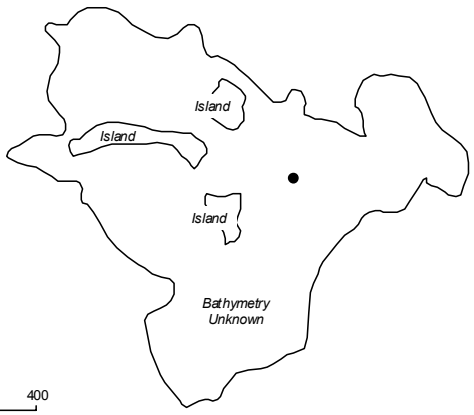
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-5-scale. The user perception rankings are shown on the lake's associated information sheet on the following page. The summertime mean physical condition was ranked 2.3 on a (between 2- "some algae present" and 3- "definite algae present"). The mean suitability for recreation ranking, also on a 1-to-5 scale, was 2.3 (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.

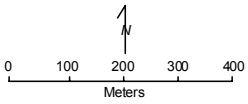
Bass Lake

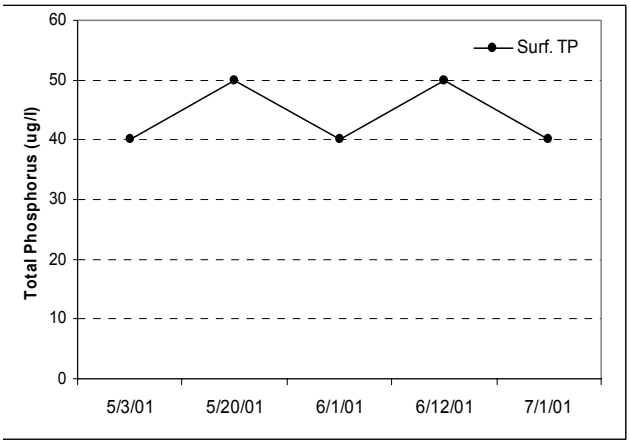
May Twp., Washington Co.

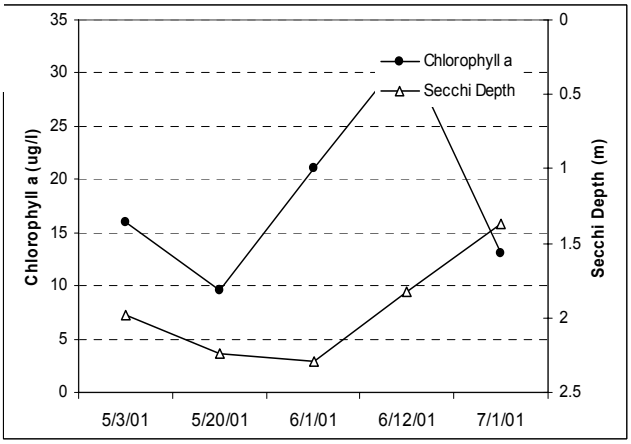
LAKE ID: 820035
WD: Carnelian-Marine
Volunteer:
Wash. Co. SWCD



● Sampling site
Contours in meters

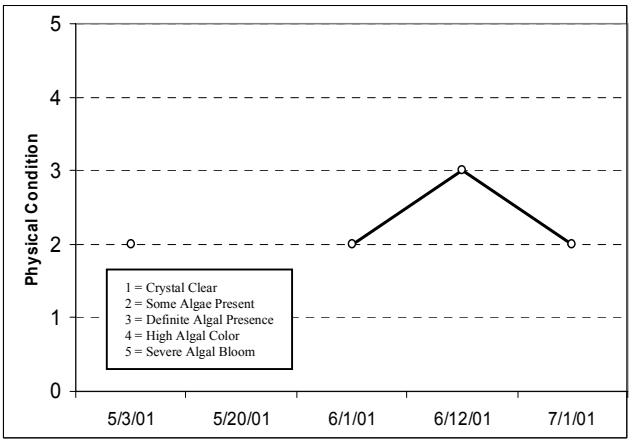






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	16.9				16	40		2.0	2	2
6/12	23.3				9.6	50		2.2		
7/16	26.7				21	40		2.3	2	2
8/22	23.7				32	50		1.8	3	3
9/19	18.6				13	40		1.4	2	2

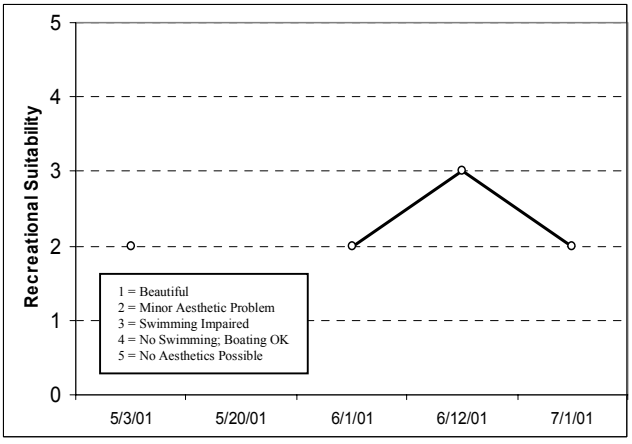


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	C	B				C	C	C	C	C	C
Chlorophyll a	B	B				C	C	B	B	B	B
Secchi Depth	C	C	C	C	C	C	C	C	C	C	C
Overall	**C**	**B**					**C**	**C**	**C**	**C**	**C**

Source: Metropolitan Council and STORET data



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

The year 2001 marked the sixth year that Lake Bavaria has been involved in CAMP (1996-2000). 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 14 times between late-April and mid-October, 2001. The mean summertime (May through September) TP concentration for the lake was 30.0 µg/l (minimum of 10.0 µg/l and maximum of 80.0 µg/l). The summertime mean CLA concentrations was 14.3 µg/l (minimum of 3.3 µg/l and maximum of 36.0 µg/l). The summertime mean Secchi transparency for the lake in 2001 was 2.2 m (minimum of 0.5 m and a maximum of 4.5 m). Additionally, the lake's summertime mean surface TKN concentration was 0.92 mg/l (minimum of 0.62 mg/l and maximum of 1.10 mg/l). The resulting water quality grades for Lake Bavaria in 2001 were: B for TP, B for CLA, and B for Secchi transparency, which translate to a 2001 overall water quality grade of B.

The year 2001 marks the third year in a row, and the only the third year since 1996, that the lake did not received an overall water quality grade of A. The lake received A grades in 1997 and 1998. While the reason for the degradation in the lake's water quality over the past three years is not known at this time, a watchful eye should be kept on future lake water quality data.

While the lake's 2001 CLA and TKN means were very similar to those of 1998-2000, the lake's TP and Secchi means in 2000 and 2001, were worse. The lake's 2001 overall grade of B is similar to 1994, 1996, and 2000 and better than the C grades recorded in 1983, 1986, and 1987.

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 2001 was the sixth 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, will be 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 and improved slightly in the mid-1990s before declining slightly in 1999 and 2000. 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.

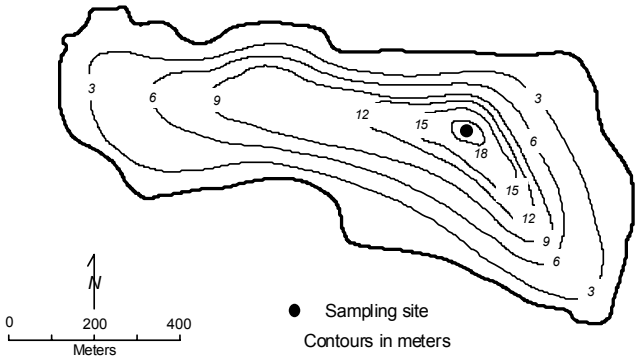
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

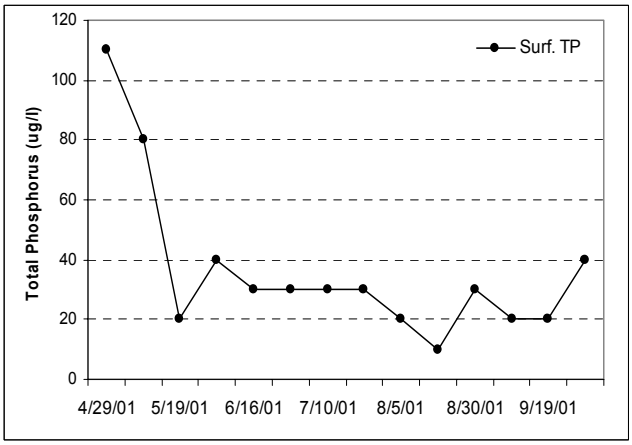
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

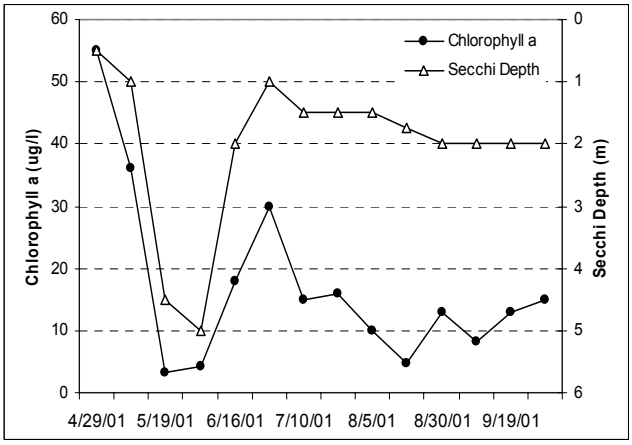
Lake Bavaria

Chaska/Laketown Twp., Carver Co.

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

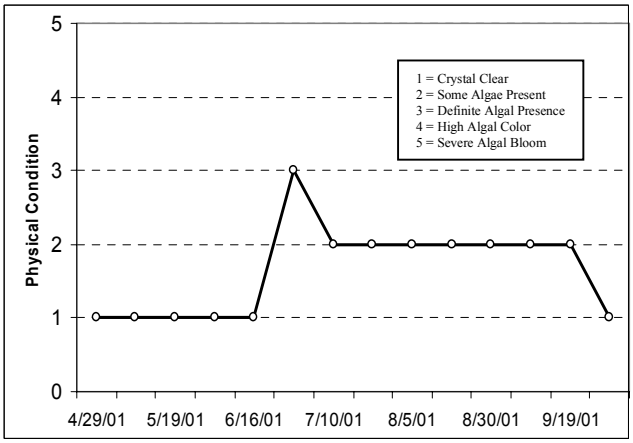






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/29	11				55	110		0.5	1	1
5/7	11				36	80		1.0	1	1
5/19	18				3.3	20		4.5	1	1
6/3	15				4.3	40		5.0	1	1
6/16	19				18	30		2.0	1	1
6/27	25				30	30		1.0	3	2
7/10	25				15	30		1.5	2	2
7/25	25				16	30		1.5	2	1
8/5	27				10	20		1.5	2	1
8/20	21				4.7	10		1.8	2	1
8/30	21				13	30		2.0	2	1
9/5	20				8.2	20		2.0	2	1
9/19	17				13	20		2.0	2	1
10/7	12				15	40		2.0	1	1

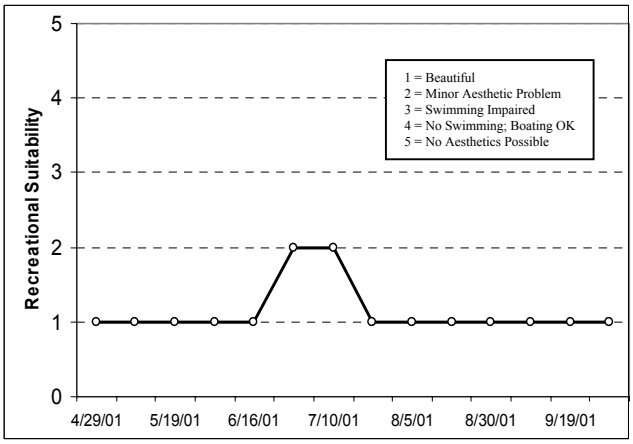


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				B		C	A	B	B	C	B
Chlorophyll a				A		A	A	A	B	B	B
Secchi Depth				B	B	C	A	A	B	B	B
Overall				**B**		**B**	**A**	**A**	**B**	**B**	**B**

Source: Metropolitan Council and STORET data



Benton Lake (10-0069) *Carver County Environmental Services*

Benton Lake is a 115-acre lake located within Benton Township (Carver County). The maximum depth of the lake is 2.0 m (roughly 6.5 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 has a 322-acre immediate watershed, which translates to a watershed-to-lake area ratio of 2.8:1 (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: 19 percent residential, 55 percent agricultural, 16 percent commercial/industrial, and 10 percent open/undeveloped (Carver County Planning 1999).

This was the third year that Benton Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided only one year of prior data (collected through CAMP in 1999 and 2000). The lake was monitored 14 times between mid-April and mid-October, 2001. 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.

The lake's 2001 summertime (May through September) mean TP concentration of 210.0 µg/l (minimum of 90.0 µg/l and maximum of 300.0 µg/l) fell within the lake water quality F grade range. The lake's Secchi transparency mean of 0.5 m (minimum of 0.1 m (worst recorded Secchi reading in CAMP 2001) and maximum of 1.4 m) resulted in a grade of F. The CLA mean of 191.7 µg/l (minimum and maximum of 26.0 and 470.0 µg/l) fell within the F grading percentile range. The lake's mean TKN concentration was 4.26 mg/l (minimum of 2.00 mg/l and maximum of 8.00 mg/l). Similar to that recorded in 1999 and 2000, the resulting overall grade for the lake's 2001 water quality was F.

As mentioned earlier, there are no water quality data available for Benton Lake other than the 1999 and 2000 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 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 average user perception rankings, on a 1-to-5 scale, were 3.6 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 4.2 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

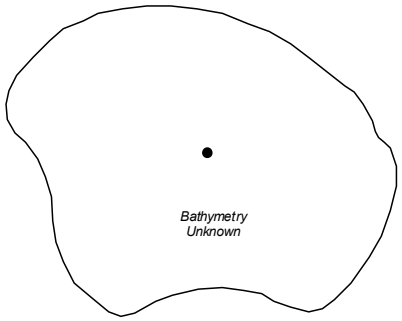
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

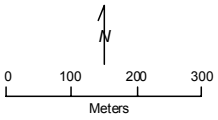
Lake Benton

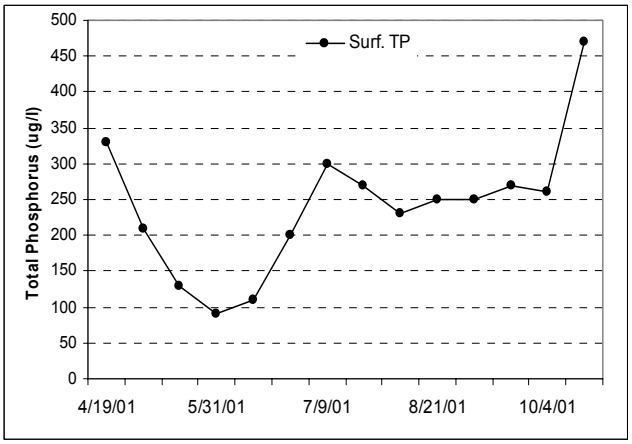
Cologne, Carver Co.

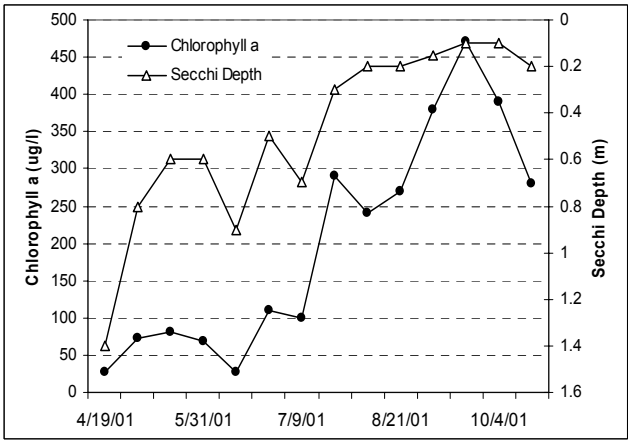
Lake ID: 100069
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling site
Contours in meters



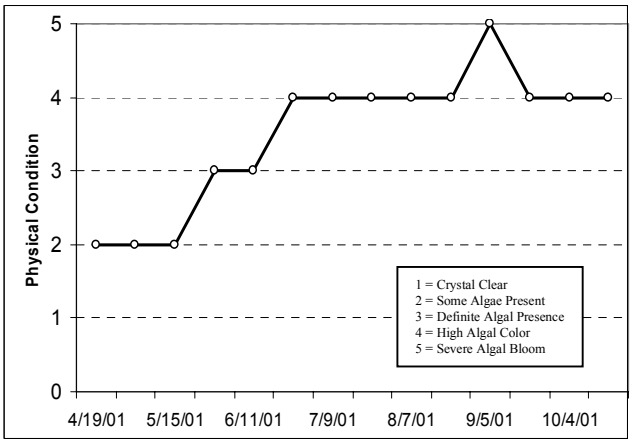






2001 Data

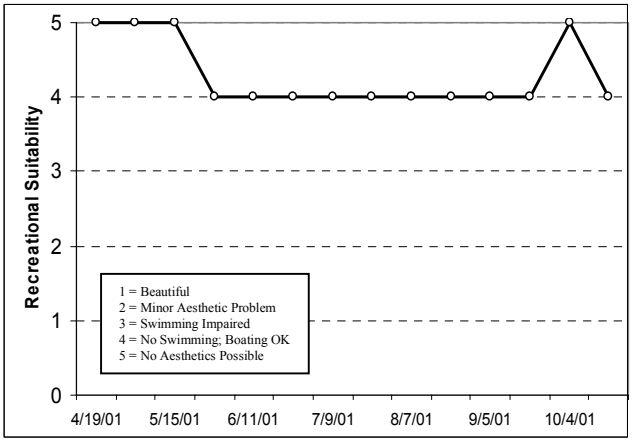
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/19	8		13.85		28	330		1.4	2	5
5/1	18.1		13.65		73	210		0.8	2	5
5/15	21.7		15.11		81	130		0.6	2	5
5/31	19.2		15.75		69	90		0.6	3	4
6/11	23		8.38		26	110		0.9	3	4
6/25	24.8		8.93		110	200		0.5	4	4
7/9	27.5		12.12		100	300		0.7	4	4
7/24	27		11.2		290	270		0.3	4	4
8/7	30.5		6.75		240	230		0.2	4	4
8/21	22.1		9.29		270	250		0.2	4	4
9/5	22.1		10.27		380	250		0.2	5	4
9/24	13.7		11.75		470	270		0.1	4	4
10/4	14.8		11.16		390	260		0.1	4	5
10/17	9		8.42		280	470		0.2	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									F	F	F
Chlorophyll a									F	F	F
Secchi Depth				C					F	F	F
Overall									**F**	**F**	**F**



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 19.5 m (roughly 64 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 seven times between late-April and mid-October, 2001. The data and related graphs are presented on the information sheet on the following page.

The summertime (May - September) mean TP concentration of 18.0 µg/l (minimum of 10.0 µg/l and maximum of 20.0 µg/l) corresponded to a lake water quality grade of A, as did the Secchi transparency mean of 4.1 m (minimum of 2.8 m and maximum of 7.2 m). The lake's mean CLA concentration of 5.7 µg/l (minimum and maximum of 3.3 and 8.7 µg/l) also resulted in a grade of A. The lake's mean TKN concentration was 0.65 mg/l (minimum of 0.50 mg/l and maximum of 1.10 mg/l). The overall lake quality grade for Big Carnelian Lake in 2001, determined from the three individual grades, was A. The lake received overall grades of A in 1980, 1989, 1991, 1994, 1996-1998, 2000, and a grade of B in 1984 and 1999.

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 2.0 ("some algae present"), while the mean recreational suitability ranking was 2.0 ("minor aesthetic problem").

No statistically significant long-term trend can be determined by the lake's database, on the short-term however, the lake's quality seems well represented by an overall grade of A.

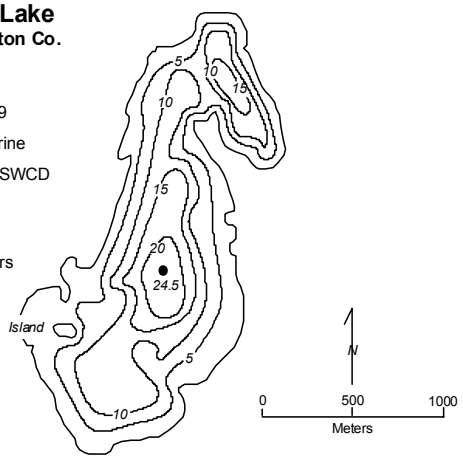
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

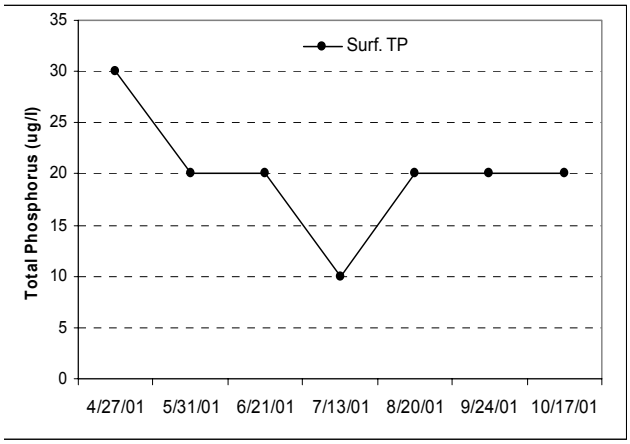
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

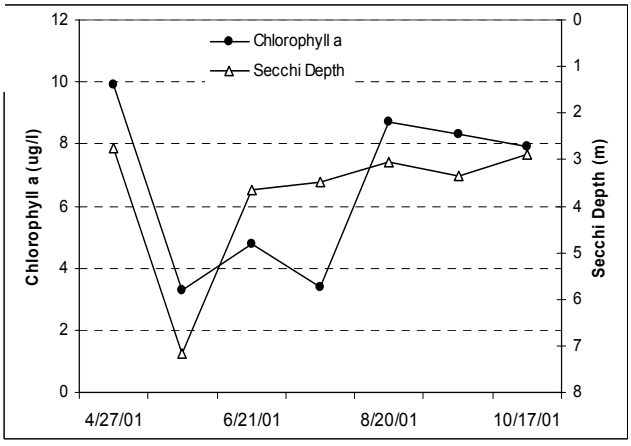
Big Carnelian Lake
May Twp., Washington Co.

LAKE ID: 820049
WD: Carnelian-Marine
Volunteer: Wash. Co. SWCD

● Sampling site
Contours in meters

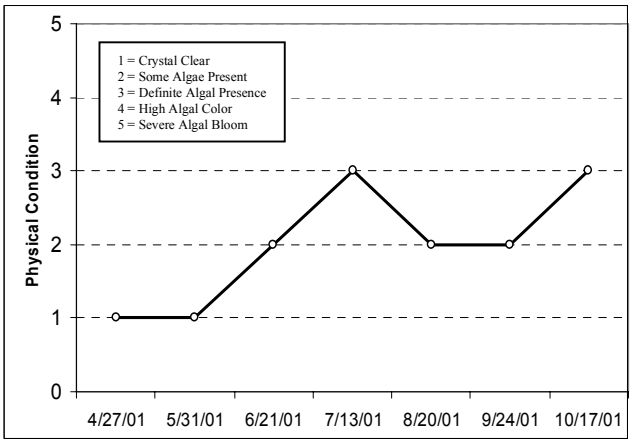






2001 Data

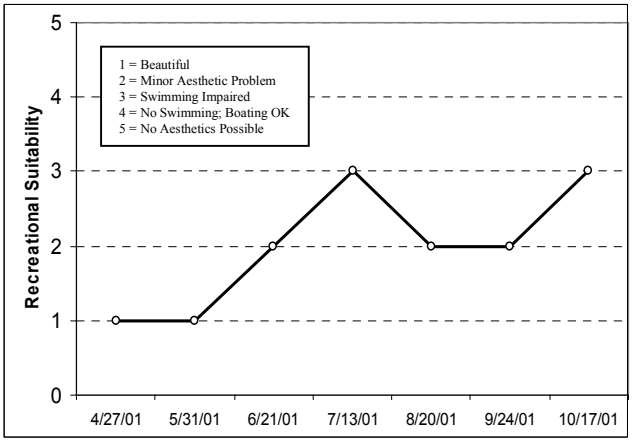
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					9.9	30		2.8	1	1
5/31	17.8		9.7		3.3	20		7.2	1	1
6/21	21.8		7.7		4.8	20		3.7	2	2
7/13	26.2		12.3		3.4	10		3.5	3	3
8/20	23.7		8.8		8.7	20		3.1	2	2
9/24	17.9		8.34		8.3	20		3.4	2	2
10/17	12.3		7.48		7.9	20		2.9	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	A			A		A	A	A	A	A	A
Chlorophyll a	A			A		A	A	A	B	A	A
Secchi Depth	B	B	B	B	B	B	A	A	B	A	A
Overall	**A**			**A**		**A**	**A**	**A**	**B**	**A**	**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 third year that the 219-acre lake has been enrolled in CAMP (1998 being the first [it was only monitored a two times in October however] and 2000 being the second). 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 mid-October, 2001. The data and related graphs are presented on the information sheet on the following page.

The summertime (May - September) mean TP concentration of 30.0 µg/l (minimum of 20.0 µg/l and maximum of 40.0 µg/l) corresponded to a lake water quality grade of B mean as did the CLA mean of 18.4 µg/l (minimum and maximum of 10.0 and 23.0 µg/l). The lake's 2001 Secchi transparency mean of 1.9 m (minimum of 1.4 m and maximum of 2.6 m) falls within the C grading range. The lake's mean TKN concentration was 1.08 mg/l (minimum of 0.86 mg/l and maximum of 1.30 mg/l). The overall lake quality grade for Big Comfort Lake, determined from the three individual grades, was B.

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 2.4 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

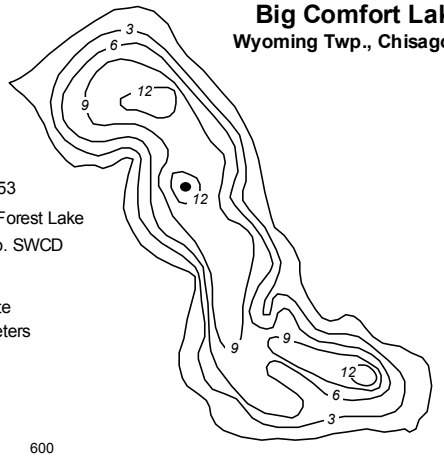
Because of the limited size of the lake's water quality database, no long- or short-term trends can be determined. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed.

The 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.

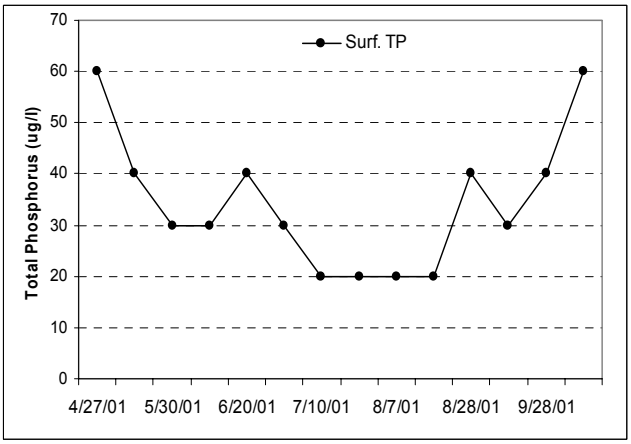


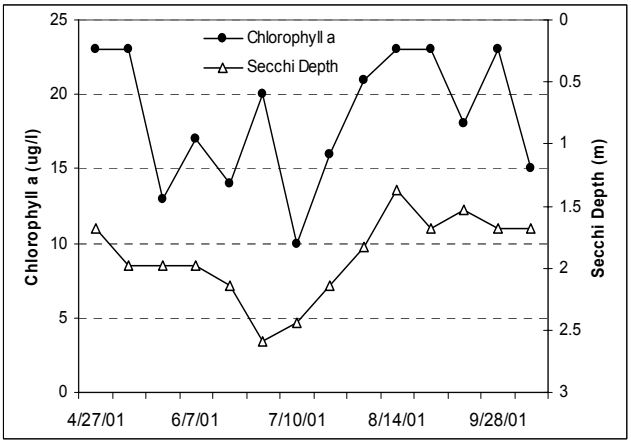
Lake ID: 130053
WMO: Comfort Lake - Forest Lake
Volunteer: Wash. Co. SWCD

● Sampling site
Contours in meters

N

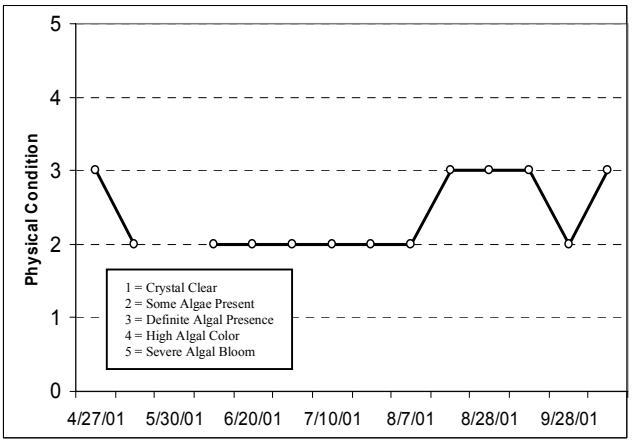
0 200 400 600





2001 Data

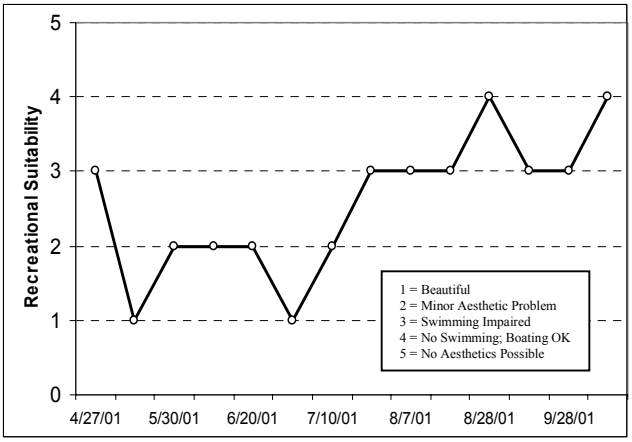
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					23	60		1.7	3	3
5/15	18.8				23	40		2.0	2	1
5/30	18.5				13	30		2.0		2
6/7	17.2				17	30		2.0	2	2
6/20	21.9				14	40		2.1	2	2
6/28	26.9				20	30		2.6	2	1
7/10	25.9				10	20		2.4	2	2
7/25	26.2				16	20		2.1	2	3
8/7	30.3				21	20		1.8	2	3
8/14	25.1				23	20		1.4	3	3
8/28	24.1				23	40		1.7	3	4
9/13	20.3				18	30		1.5	3	3
9/28	16.8				23	40		1.7	2	3
10/11	13.4				15	60		1.7	3	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				D						C	B
Chlorophyll a				B						C	B
Secchi Depth				C	C		C	C		C	C
Overall				**C**						**C**	**B**



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 seven times between late-April and mid-October, 2001. The data and related graphs are presented on the information sheet on the following page.

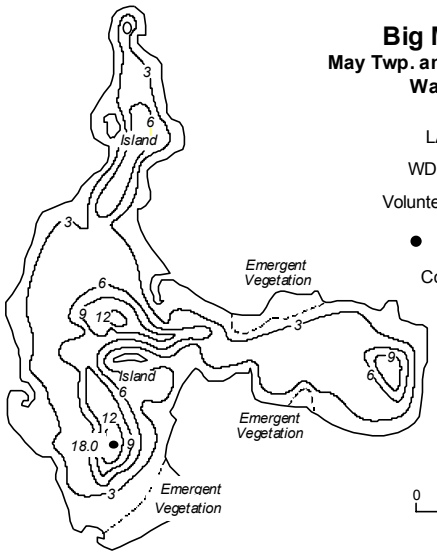
The summertime (May - September) mean TP concentration of 15.0 µg/l (minimum of <10.0 µg/l [in which case 0.5 µg/l was used to calculate the summer mean) and maximum of 20.0 µg/l) corresponded to a lake water quality grade of A, as did the Secchi transparency mean of 3.7 m (minimum of 2.9 m and maximum of 4.6 m). The lake's mean CLA concentration of 7.0 µg/l (minimum and maximum of 3.7 and 14.0 µg/l) also resulted in a grade of A. The lake's mean TKN concentration was 0.61 mg/l (minimum of 0.48 mg/l and maximum of 0.79 mg/l). The overall lake quality grade for Big Marine Lake, determined from the three individual grades, was A. The lake received overall grades of A in 1989, 1994, 1996-1998, and 2000 and a grades of B in 1980, 1981, 1984, 1991, and 1999.

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 2.0 ("some algae present"), while the mean recreational suitability ranking was 2.0 ("minor aesthetic problem").

No statistically significant long-term trend can be determined by the lake's database, on the short-term however, 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.

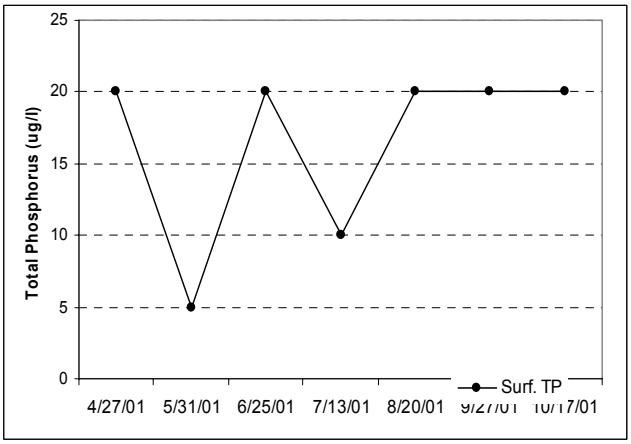
LAKE ID: 820052

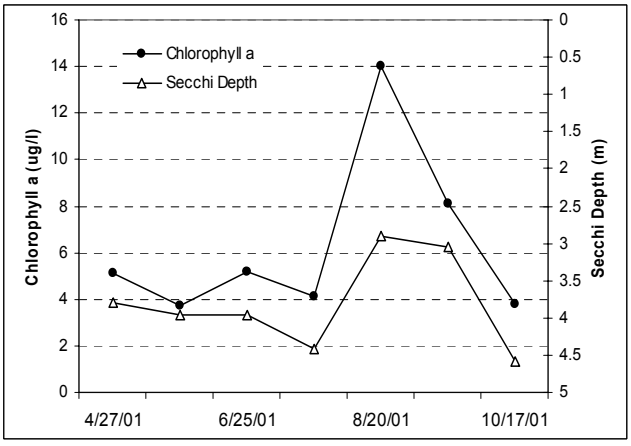
WD: Carnelian-Marine

Volunteer: Wash. Co. SWCD

● Sampling site

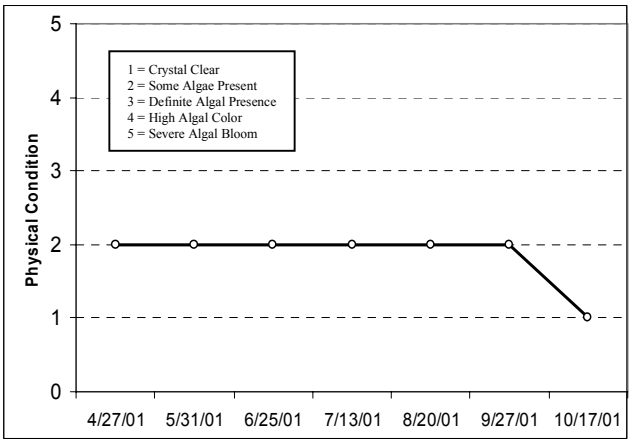
Contours in meters





2001 Data

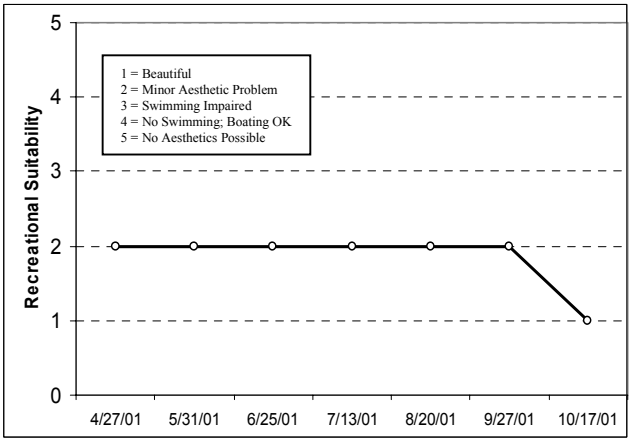
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					5.1	20		3.8	2	2
5/31	17.3		12.4		3.7	5		4.0	2	2
6/25	21.6		6.98		5.2	20		4.0	2	2
7/13	25.9		12.33		4.1	10		4.4	2	2
8/20	23.5		8.3		14	20		2.9	2	2
9/27	16.9		11.59		8.1	20		3.1	2	2
10/17	11.5		8.98		3.8	20		4.6	1	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	B			A		B	A	A	A	A	A
Chlorophyll a	A			A		A	A	A	B	A	A
Secchi Depth	B	A	A	B		A	B	A	B	A	A
Overall	**B**			**A**		**A**	**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, and 1997-1999. In 2001, the lake was monitored 14 times between mid-April and mid-October. The 14 sampling dates included 13 biweekly events by the volunteer(s) and one 'quality check' by Council-staff. 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.

The summertime (May - September) mean TP concentration of 40.0 µg/l (minimum of 30.0 µg/l and maximum of 50.0 µg/l), corresponded to a lake water quality grade of C, as did the CLA mean of 30.9 µg/l (minimum and maximum of 4.7 and 53.0 µg/l). The lake's Secchi transparency mean of 1.5 m (minimum of 0.8 m and maximum of 3.7 m) also resulted in a grade of C. The lake's mean TKN concentration was 1.40 mg/l (minimum of 1.20 mg/l and maximum of 1.80 mg/l).

The overall lake quality grade for Bone Lake in 2001, determined from the three individual grades, was 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 2.9 for physical condition (roughly equal to 3- "definite algae present"), and 2.8 for recreational suitability (between 2- "minor aesthetic problem" and 3- " swimming 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.

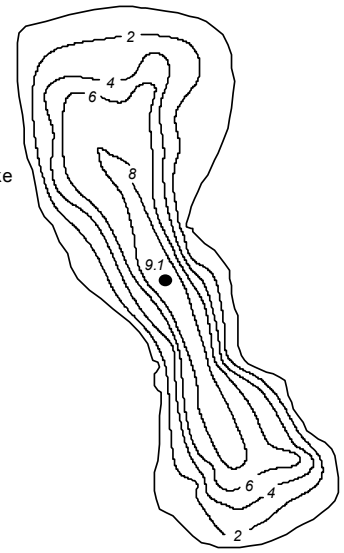
Bone Lake

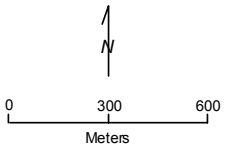
New Scandia Twp,
Washington Co.

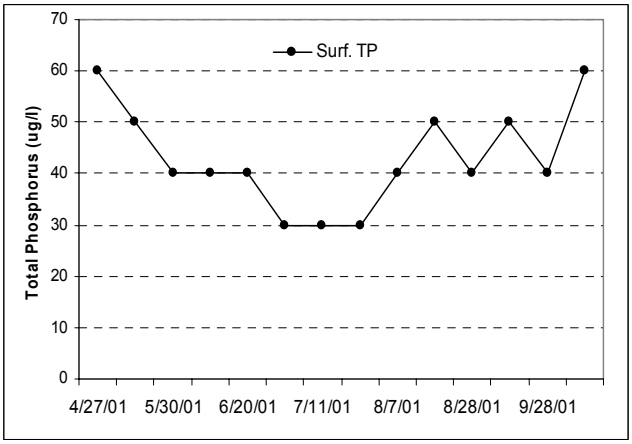
Lake ID: 820054
WMO: Comfort Lake - Forest Lake
Volunteer: Washington Co. SWCD

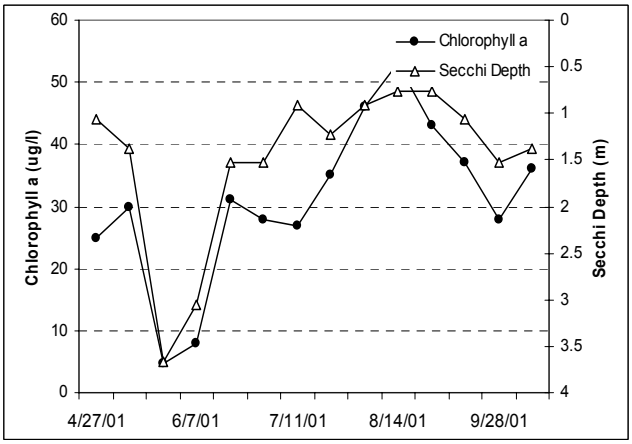
● Sampling site

Contours in meters



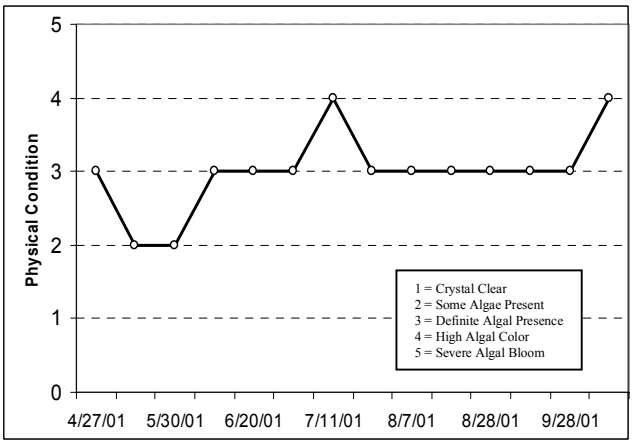






2001 Data

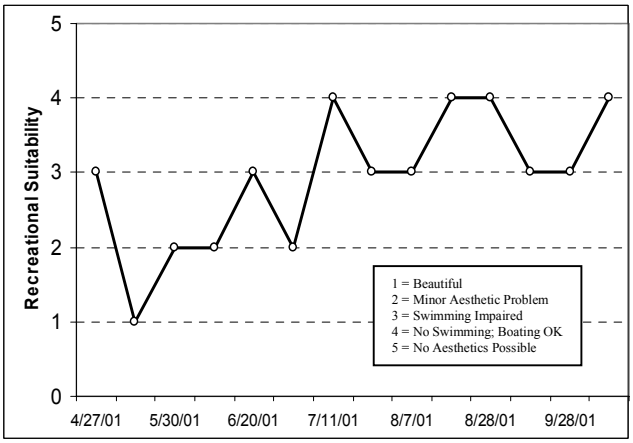
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					25	60		1.1	3	3
5/15	19.4		14.7		30	50		1.4	2	1
5/30	19.2		9.86		4.7	40		3.7	2	2
6/7	17.4		8.94		8	40		3.1	3	2
6/20	23.1		7.07		31	40		1.5	3	3
6/28	27.3		10.8		28	30		1.5	3	2
7/11	26.7		11		27	30		0.9	4	4
7/25	26.5		12.5		35	30		1.2	3	3
8/7	30.8		10.76		46	40		0.9	3	3
8/14	25		9.21		53	50		0.8	3	4
8/28	25.8		10.47		43	40		0.8	3	4
9/13	20.9		9		37	50		1.1	3	3
9/28	17.4				28	40		1.5	3	3
10/17	11		9.18		36	60		1.4	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D		C				C	C	C		C
Chlorophyll a	C		C				B	B	C		C
Secchi Depth	C		C	D	C		C	C	D		C
Overall	**C**		**C**				**C**	**C**	**C**		**C**



Source: Metropolitan Council and STORET data

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

Burandt Lake, a 93-acre lake located within Waconia Township (Carver County) is considered a Metropolitan Area "Priority Lake" because of its multi-recreational uses. The maximum depth of the lake is 7.3 m (roughly 24 feet). Seventy-two percent of the lake's surface area is considered littoral zone (area of aquatic plant dominance).

This was the third year that Burandt Lake has been involved in CAMP (1999 and 2000). The lake was monitored nine times between mid-June and early-October, 2001. 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.

Summertime (May through September) means for the monitored variables were: surface TP= 47.1 µg/l (minimum concentration of 30.0 µg/l and a maximum value of 70.0 µg/l); surface chlorophyll-a= 34.4 µg/l (minimum of 16.0 µg/l and maximum of 74.0 µg/l); Secchi transparency= 0.9 m (minimum of 0.4 m and a maximum of 1.3 m); and TKN= 1.57 mg/l (minimum of 1.20 mg/l and maximum of 1.80 mg/l). Similar to that recorded in 2000, the lake quality grades associated with the 2001 summertime means are as follows: TP= C; CLA= C; and Secchi= D. The lake's resulting overall 2001 water quality grade, calculated from the TP, CLA, and Secchi grades, was C.

To the best of our knowledge, there are no water quality data available for Burandt Lake other than the 1999-2001 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, 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 2.8 for physical condition (between 2- "some algae problem" and 3- "definite algal presence"), and 2.3 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

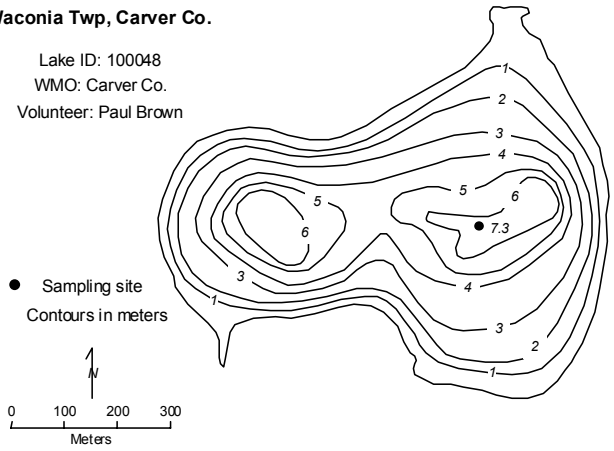
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

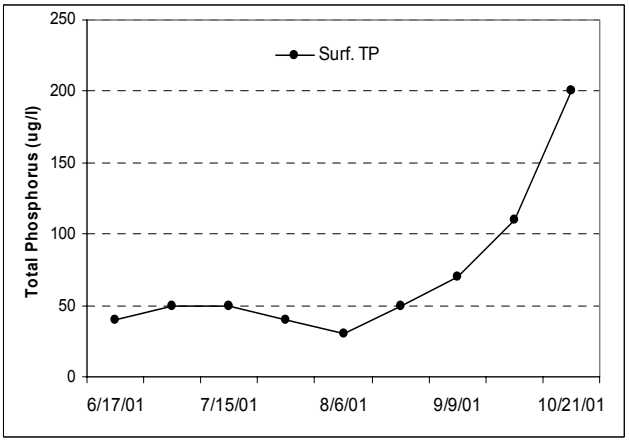
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

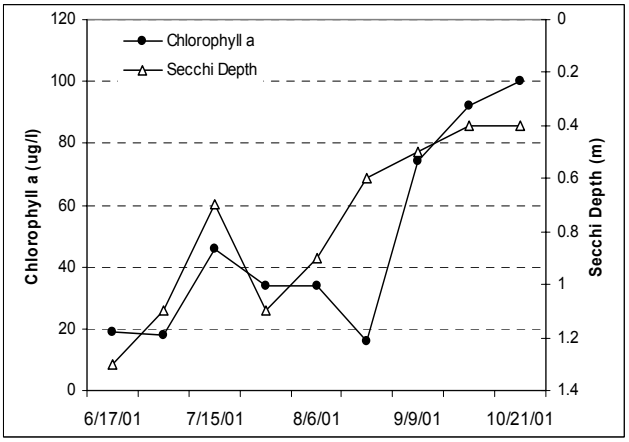
Burandt Lake

Waconia Twp, Carver Co.

Lake ID: 100048
WMO: Carver Co.
Volunteer: Paul Brown







2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/17	21				19	40		1.3	3	2
6/27	25				18	50		1.1	2	2
7/15	26				46	50		0.7	3	2
7/24	28				34	40		1.1	3	3
8/6	30				34	30		0.9	3	
8/22	24				16	50		0.6	3	3
9/9	20				74	70		0.5	3	2
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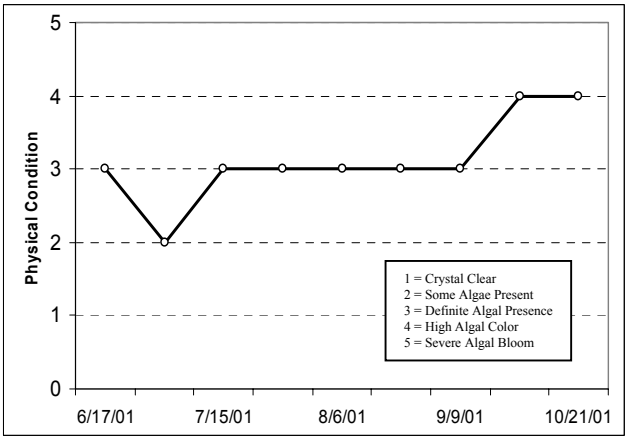
10/21	8				100	200		0.4	4	4

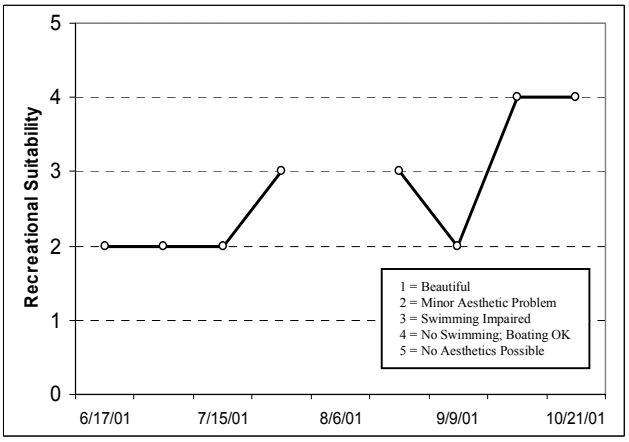


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									D	C	C
Chlorophyll a									C	C	C
Secchi Depth									D	D	D
Overall									**D**	**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.

Carol Lake was monitored five times between mid-May and mid-September, 2001. The data and related graphs are presented on the information sheet on the following page.

This was the second 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 limited amount of data (1996-2000) collected over the past twenty years.

The summertime (May through September) means for the monitored variables were: surface TP= 24.0 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 30.0 µg/l); surface chlorophyll-a= 6.8 µg/l (minimum of 3.3 µg/l and maximum of 16.0 µg/l); Secchi transparency= 1.2 m (minimum of 0.8 m and a maximum of 1.5 m); and TKN= 0.68 mg/l (minimum of 0.52 mg/l and maximum of 0.77 mg/l). The lake's summer means translate to water quality grades of B for TP, A, for CLA, and C for Secchi transparency. Similar to that recorded in 2000 the individual grades result in an overall water quality grade of B for Carol Lake in 2001.

This overall grade is skewed, however, to the shallowness of the lake. When looking at the lake's mean TP and CLA readings, it seems that the lake's Secchi readings were limited by the shallowness of the lake. So, while the lake only received an overall grade of B, the actual water quality my be more representative of an A.

As mentioned earlier, there is a limited amount of water quality data available for Carol Lake other then the 2000 and 2001 CAMP data. Therefore it is impossible 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- "definite algal presence"), and 2.9 for recreational suitability (roughly equal to 3- "swimming slightly impaired") [this may be due to the shallowness of the lake].

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.

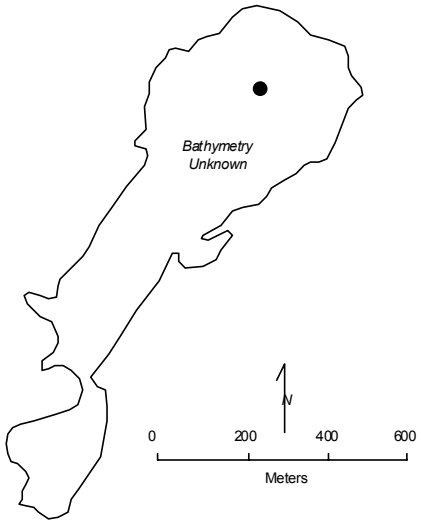
LAKE ID: 820017

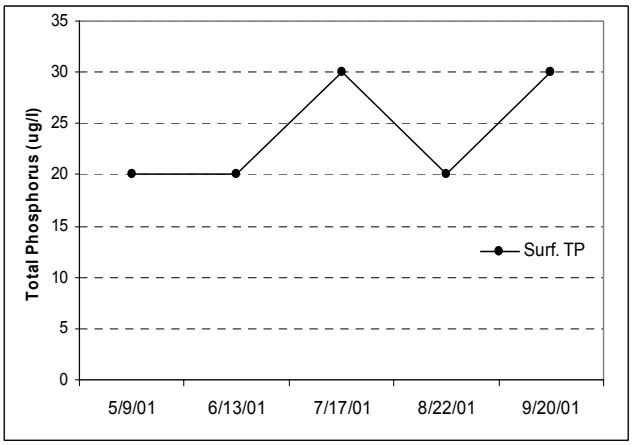
WD: Carnelian-Marine

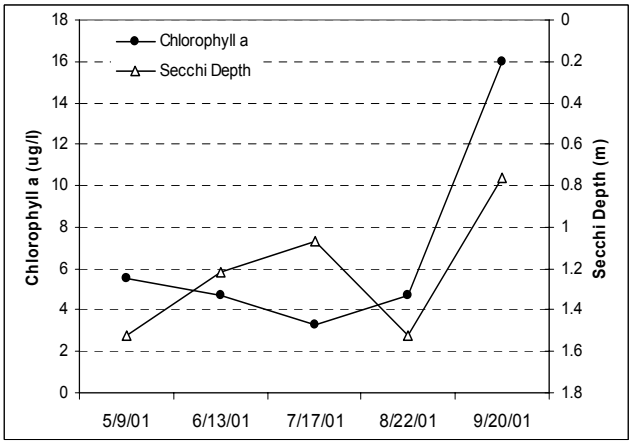
Volunteer: Wash. Co. SWCD

● Sampling site

Contours in meters

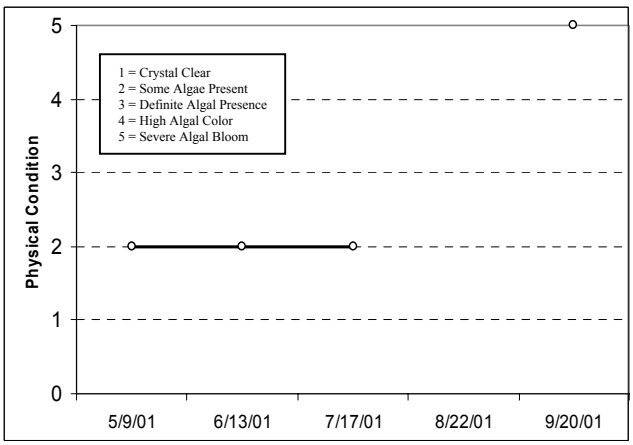






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/9	15.9		11.03		5.5	20		1.5	2	1
6/13	22		5.5		4.7	20		1.2	2	2
7/17	25.3		9.01		3.3	30		1.1	2	2
8/22	23.4		3.33		4.7	20		1.5		4
9/20	20				16	30		0.8	5	5

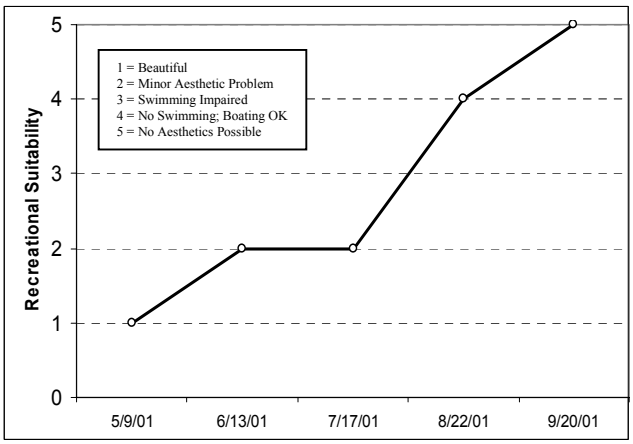


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						B	A	A	A	A	B
Chlorophyll a						B	C	C	C	A	A
Secchi Depth						B	B	B	B	C	C
Overall						**B**	**B**	**B**	**B**	**B**	**B**

Source: Metropolitan Council and STORET data



Cedar Island Lake (27-0119) *Shingle Creek Watershed Management Commission*

This was the second year that Cedar Island Lake has been enrolled in CAMP (the lake was involved in CAMP in 1995). The 80-acre lake is located within the City of Maple Grove (Hennepin County). It has a 800-acre immediate watershed. The lake and watershed areas translate to a watershed-to-lake area ratio of 8:1. The larger the ratio the greater the potential stress put on the lake from surface runoff.

The maximum and mean depths of the lake are 2.1 and 1.4 m (seven and 4.5 feet), respectively. The mean depth and surface translates to an approximate lake volume of 360 ac-ft and it would take approximately 0.5 years to replenish itself. Because of the shallowness of the lake, 100 percent of the lake's area is considered littoral (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).

Cedar Island Lake was monitored 13 times from mid-May to mid-October, 2001. 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.

The 2001 summertime (May through September) mean concentrations in Cedar Island Lake were: TP= 90.0 µg/l (minimum of 30.0 µg/l, maximum of 150.0 µg/l), CLA= 52.3 µg/l (minimum of 13.0 µg/l, maximum of 150.0 µg/l), Secchi transparency= 0.7 m (minimum of 0.4 m, maximum of 1.0 m), and TKN= 2.14 mg/l (minimum and maximum of 0.74 and 3.40 mg/l, respectively). The summertime means resulted in a TP grade of D, CLA grade of D, and Secchi transparency grade of D, culminating in an overall grade of D.

The lake's 2001 overall water quality grade is better than the F recorded in 1995.

A search for water quality data through Council, MPCA, and STORET files resulted in a minimal amount of data. 1984, 1995, and now 2001 are the only years for which nutrient data are available. Using Secchi transparency data collected through the MPCA's Citizen-Lake monitoring Program to supplement the three years of nutrient data it becomes apparent that the lake's water quality through the 1990's has remained fairly constant.

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 2.5 (between 2- "some algae present" and 3- "defini
te algae present"), and 3.0 for recreational suitability ("swimming slightly impaired").

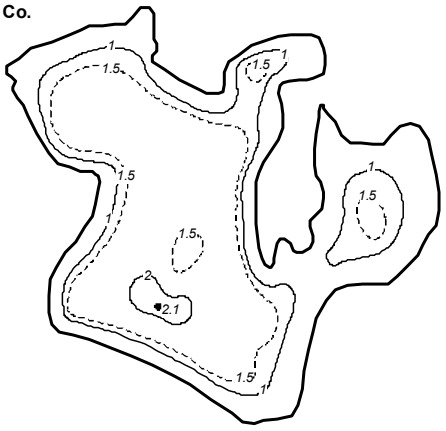
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

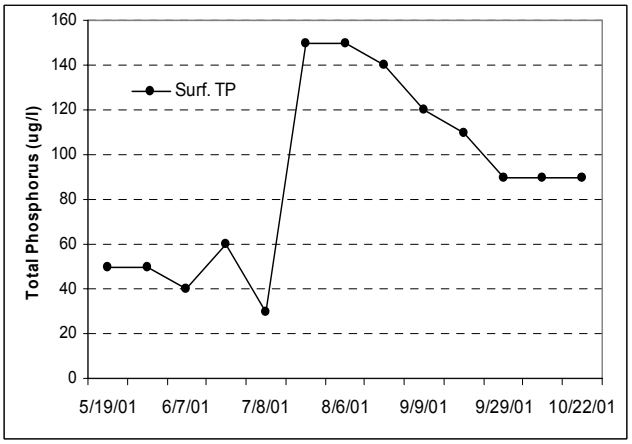
Cedar Island Lake

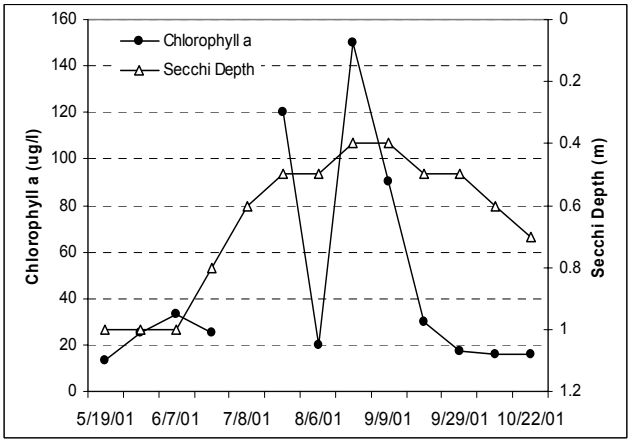
Maple Grove, Hennepin Co.

Lake ID: 270119
WMO: Shingle Creek
Volunteer: Steve Lane

Sampling site
Contours in meters

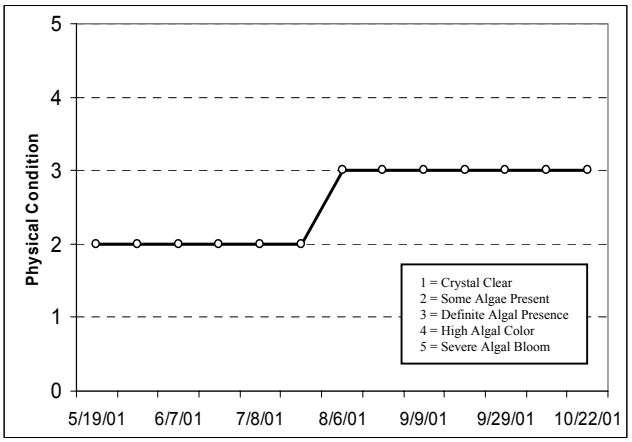






2001 Data

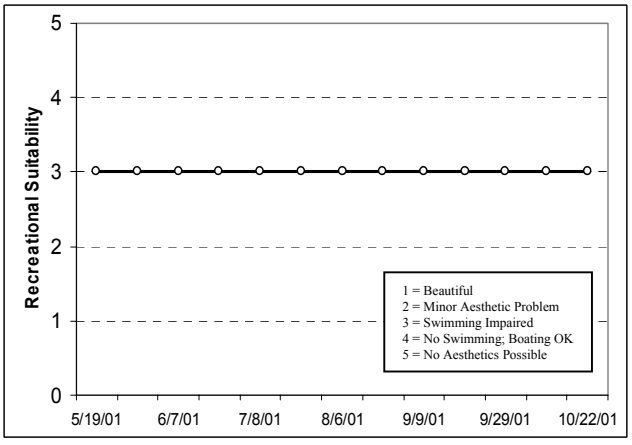
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/19	22				13	50		1.0	2	3
5/27	15				25	50		1.0	2	3
6/7	20				33	40		1.0	2	3
6/18	24				25	60		0.8	2	3
7/8	29					30		0.6	2	3
7/28	26				120	150		0.5	2	3
8/6	34				20	150		0.5	3	3
8/18	22				150	140		0.4	3	3
9/9	21				90	120		0.4	3	3
9/18	19				30	110		0.5	3	3
9/29	15				17	90		0.5	3	3
10/10	12				16	90		0.6	3	3
10/22	10				16	90		0.7	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D						D
Chlorophyll a					F						D
Secchi Depth	F	F	F	F	F	F	F	F	F	F	D
Overall					**F**						**D**



Source: Metropolitan Council and STORET data

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

Prior to the water quality data collected through CAMP in 2000 (the lake was also monitored as a part of CAMP in 1997, 1998 and 1998), there were no known water quality data available for Cenaiko Lake. The lake is located within Coon Rapids Dam Regional Park in the City of Coon Rapids in Anoka County. 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 13 times between mid-April and early-October, 2001. 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.

Cenaiko Lake, which received an overall grade of B in 1997, an A from 1998-2000, fell back to a B in 2001. The overall grade was determined from the individual parameter grades. The 2001 summertime (May through September) mean TP concentration of 21.7 µg/l (minimum of < 10.0 µg/l [in which case 5.0 µg/l was used to calculate a summer mean] and maximum of 40.0 µg/l) fell within the lake water quality A grade range. The lake's 2001 Secchi transparency mean of 1.3 m (minimum of 0.8 m and maximum of 2.5 m) resulted in a grade of C. The CLA mean of 6.6 µg/l (minimum and maximum of 1.2 and 17.0 µg/l) fell within the A grading percentile range. The lake's mean TKN concentration was 0.58 mg/l (minimum of 0.37 mg/l and maximum of 0.98 mg/l).

While the lake's 2001 overall grade is similar to that recorded in 1997, the individual summer means were worse. Therefore, 2001 represents the worst recorded water quality for Cenakio Lake to date.

Because 2001 is only the fifth 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.

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 2.6 (between 2- "some algae present" and 3- "definite algal presence"), and 4.6 for recreational suitability (between 4- no swimming - boating ok" and 5- "no aesthetics possible").

Cenaiko Lake is one of eight lakes in Minnesota and one in Wisconsin where ongoing research supported by the MDNR and conducted by researchers at the University of Minnesota is examining 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.

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/.

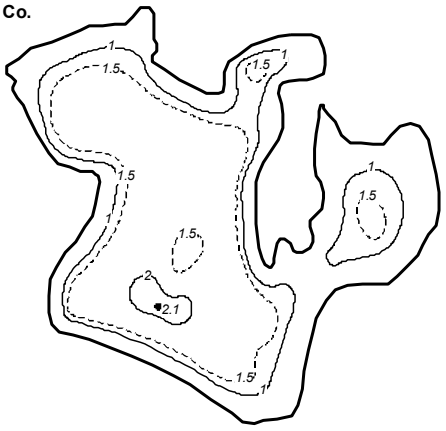
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

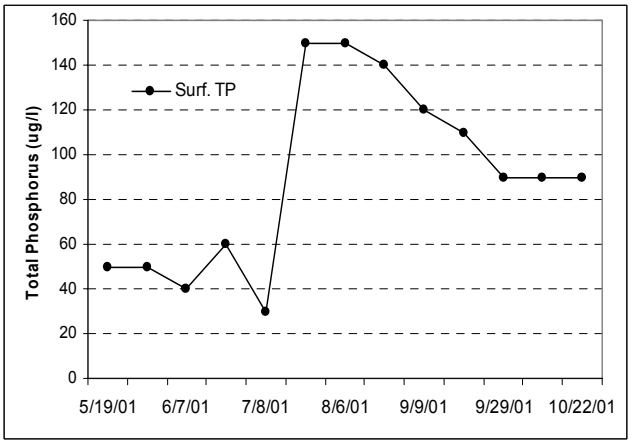
Cedar Island Lake

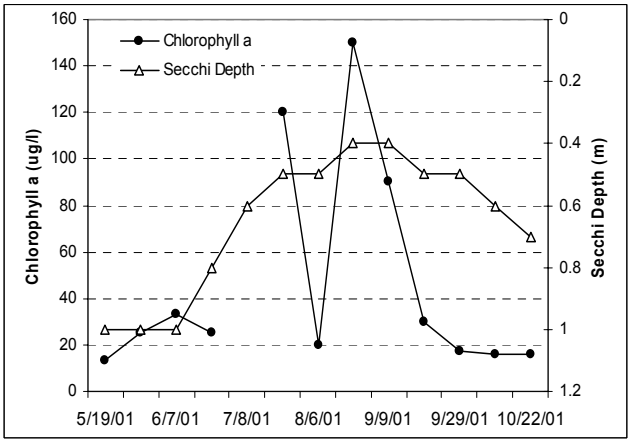
Maple Grove, Hennepin Co.

Lake ID: 270119
WMO: Shingle Creek
Volunteer: Steve Lane

Sampling site
Contours in meters

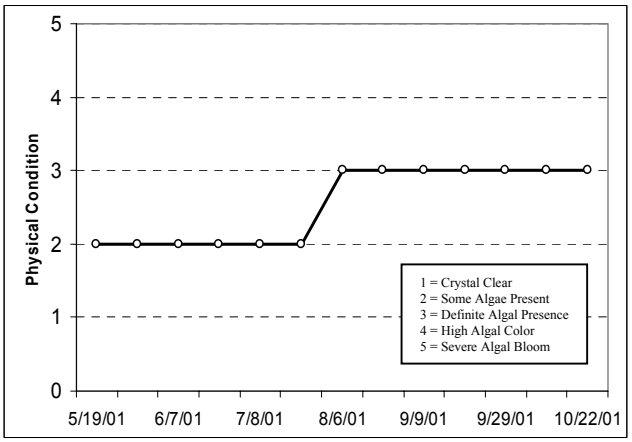






2001 Data

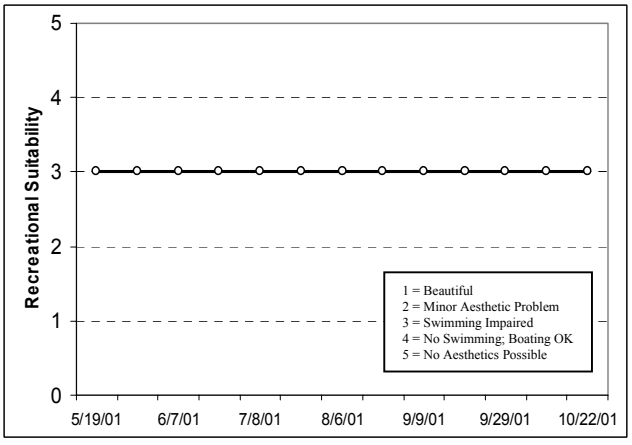
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/19	22				13	50		1.0	2	3
5/27	15				25	50		1.0	2	3
6/7	20				33	40		1.0	2	3
6/18	24				25	60		0.8	2	3
7/8	29					30		0.6	2	3
7/28	26				120	150		0.5	2	3
8/6	34				20	150		0.5	3	3
8/18	22				150	140		0.4	3	3
9/9	21				90	120		0.4	3	3
9/18	19				30	110		0.5	3	3
9/29	15				17	90		0.5	3	3
10/10	12				16	90		0.6	3	3
10/22	10				16	90		0.7	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D						D
Chlorophyll a					F						D
Secchi Depth	F	F	F	F	F	F	F	F	F	F	D
Overall					**F**						**D**



Source: Metropolitan Council and STORET data

Centerville Lake (2-0006) *Rice Creek Watershed District*

While Centerville Lake has previously been monitored by Council staff (including this year), 2001 marks the first year the lake has been monitored through CAMP. Centerville Lake, with a surface area of 455 acres, is located one mile north of the City of Centerville (Anoka County). The maximum and mean depths of the lake are 6.0 and 3.7 m (six and 12 feet), respectively. The approximate volume of the lake is 5,460 ac-ft. Public access is possible on the western end of the lake through the Rice Creek Chain of Lakes Regional Park. The lake is considered a "Priority Lake" due to its multi-recreational uses.

For the purpose of this report the Coucil-staff and volunteer monitoring data for Centerville lake were combined (13 council-staff mionitoring events and four CAMP monitoring events). Summertime (May through September) means were: surface TP= 44.7 µg/l (minimum of 20.0 µg/l, maximum value of 100.0 µg/l); surface CLA= 29.5 µg/l (minimum of 13.0 µg/l, maximum of 50.0 µg/l); Secchi transparency= 1.3 m (minimum of 0.5 m, maximum of 2.7 m); and TKN= 1.18 mg/l (minimum of 0.82 mg/l, maximum of 1.90 mg/l). Lake quality grades for the summertime means were TP= C; CLA= C; and Secchi= C, and an overall grade of C was calculated for 2001. The lake's 2001 overall grade of C is identical to that of 1981, 1983, 1999 and 2000, and better than overall grades of D reported in 1980 and 1988.

Of the seven years of available nurient data, the best water quality on Centerville Lake has been recorded from 1999-2001. This comes after a whole lake alum treatment in 1998 meant to lower in-lake phosphorus levels, control algal growth, and improve water clarity.

The average user perception rankings, on a 1-to-5 scale, was 2.0 for physical condition ("some algae present"), and 1.3 for recreational suitability (between 1- " beautiful" and 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.

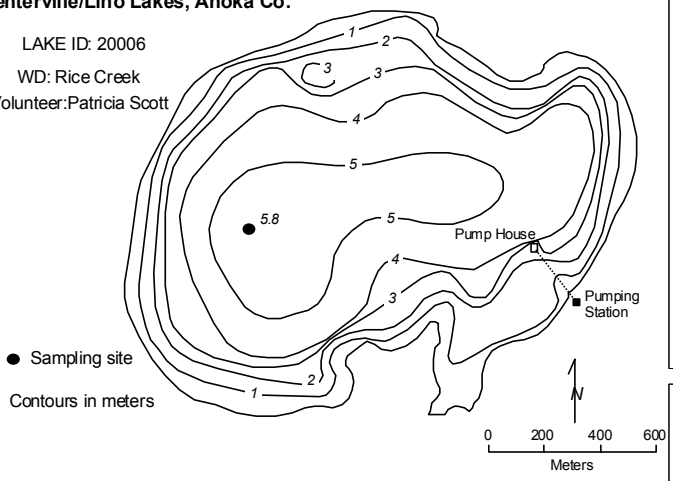
Centerville Lake

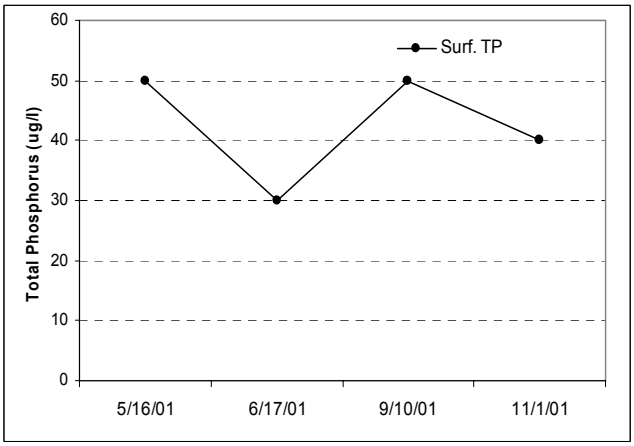
Centerville/Lino Lakes, Anoka Co.

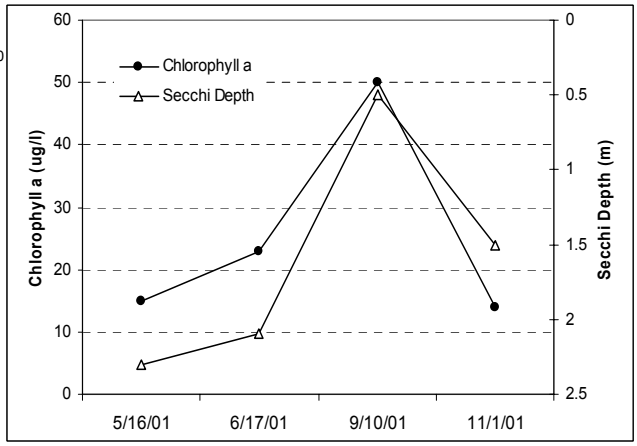
LAKE ID: 20006

WD: Rice Creek

Volunteer:Patricia Scott

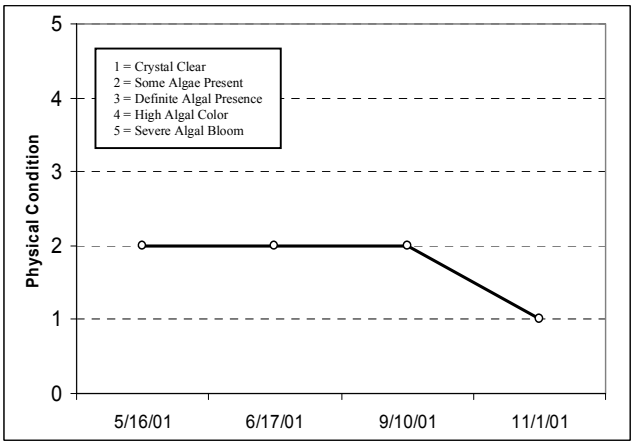






2001 Data

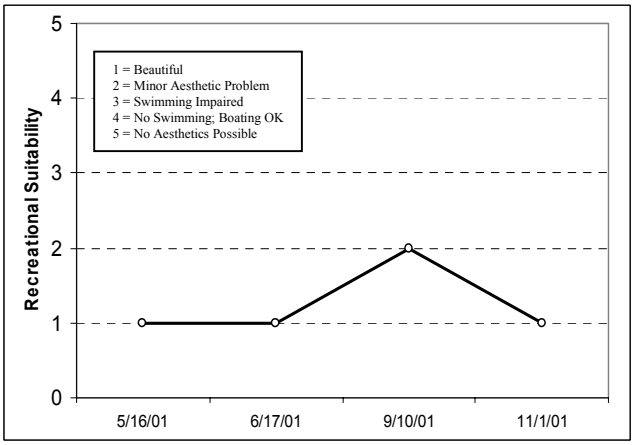
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/16	19.6				15	50		2.3	2	1
6/17	21				23	30		2.1	2	1
9/10	20.7				50	50		0.5	2	2
11/1	7.8				14	40		1.5	1	1



Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										C	C
Chlorophyll a										C	C
Secchi Depth		D	D	C						C	C
Overall										**C**	**C**



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 2001, the lake was monitored 12 times between mid-April and mid-October. 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 summertime (May - September) mean surface TP concentration for the lake was 34.4 µg/l (minimum of 20.0 µg/l, maximum of 60.0 µg/l). The mean CLA and Secchi transparency readings were 14.3 µg/l (minimum of 4.9 µg/l, maximum of 22.0 µg/l), and 1.3 m (minimum of 1.1 m, maximum of 1.5 m), respectively. Additionally, the lake's mean surface TKN concentration was 1.01 mg/l (minimum of 0.73 mg/l and a maximum of 1.20 mg/l). The resulting individual water quality grades for 2001 were C for TP, B for CLA, and C for Secchi transparency, translating to an overall water quality grade of C. The lake's 2000 and 2001 overall grades are worse than those reported from 1994 through 1999 (overall grade of B). Then main reason for the lowering of the overall grade in 2000 was its dramatically high TP mean (68.6 µg/l). While the lake's TP mean fell back to its "normal" range in 2001, it was just out of the B grade range as recorded from 1994-1996, and 1998-1999.

The volunteers' perceived conditions of the lake (both physical and recreational) were ranked on a 1-to-5 scale. The mean physical condition was 2.5 (between 2- "some algae present" and 3- "swimming slightly impaired"), while the mean recreational suitability was 1.9 (roughly equal to 2- "minor aesthetics problem").

Clear Lake has a fairly large database with varying degrees of water quality data available for 17 of the last 21 years. Six of those years contain just Secchi transparency data, but the last nine (1993-2001) contain TP, CLA and transparency data collected through CAMP.

Available data show that Clear Lake's water quality has remained fairly constant through the 1980's and 1990's. 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, 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 1994-2001 Secchi transparency grades of C (with means ranging from 1.2 m to 1.4 m), however, remained consistent with the C or D grades recorded since 1980.

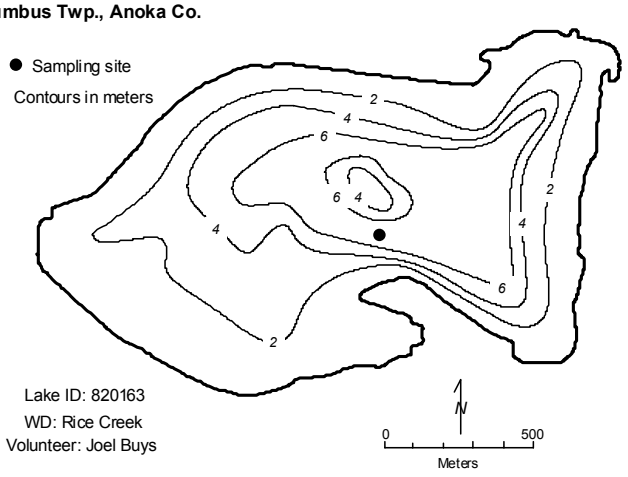
While the lake's water quality improved in 2001 (as compared to that recorded in 2000), the last three years of data (1999-2001) show a decline in general overall water quality from that experienced from 1994-1998.

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/.

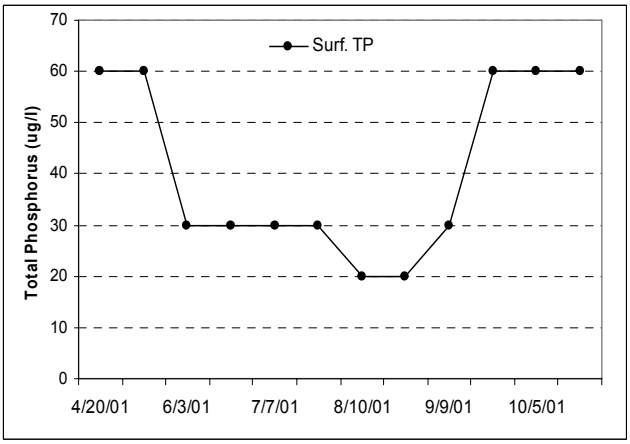
If you know of any errors in the lake's data or physical information, or are aware of additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

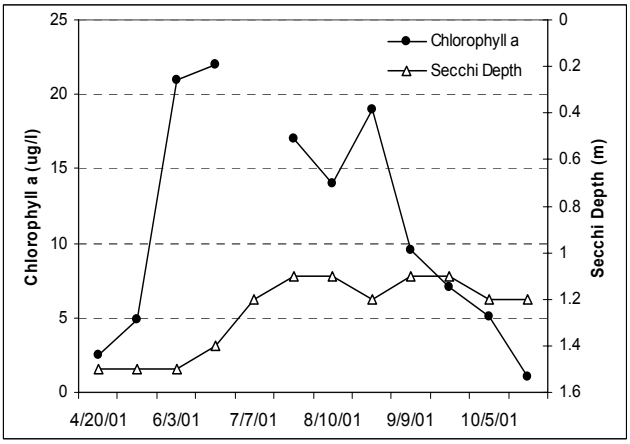
Clear Lake

Columbus Twp., Anoka Co.



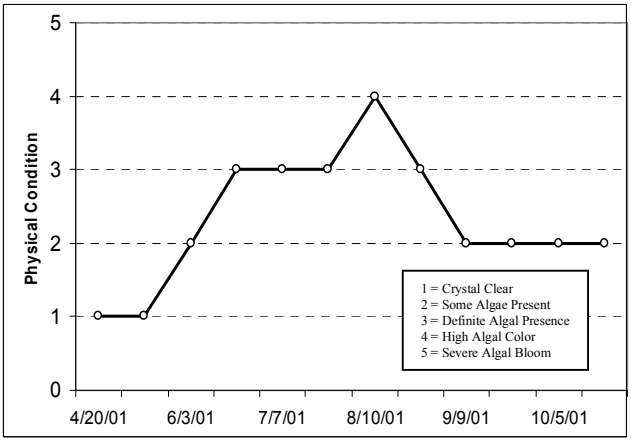
Lake ID: 820163
WD: Rice Creek
Volunteer: Joel Buys





2001 Data

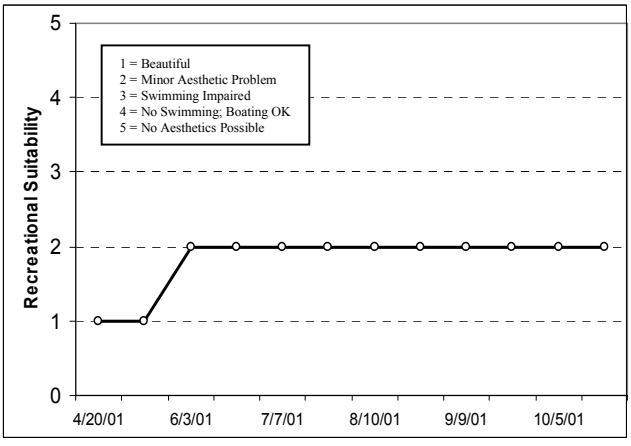
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/20	4				2.5	60		1.5	1	1
5/16	20				4.9	60		1.5	1	1
6/3	61				21	30		1.5	2	2
6/16	70				22	30		1.4	3	2
7/7	25.8					30		1.2	3	2
7/29	28				17	30		1.1	3	2
8/10	23				14	20		1.1	4	2
8/24	20				19	20		1.2	3	2
9/9	18				9.5	30		1.1	2	2
9/22	13				7.1	60		1.1	2	2
10/5	11				5.1	60		1.2	2	2
10/22	9				1	60		1.2	2	2



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			C	B	B	B	A	B	B	D	C
Chlorophyll a			B	A	A	A	A	B	B	B	B
Secchi Depth	D	D	C	C	C	C	C	C	C	C	C
Overall			**C**	**B**	**B**	**B**	**B**	**B**	**B**	**C**	**C**



Source: Metropolitan Council and STORET data

Cloverdale Lake (82-0009) *Lower St. Croix Valley 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 first 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 is 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 10 times between early-May and mid-October, 2001. The resulting data and graphs appear on the next page.

The lake's overall 2001 lake quality grade of C was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 32.2 µg/l (minimum of 20.0 µg/l, maximum of 60.0 µg/l) corresponds to a lake water quality grade of C, as did the mean Secchi transparency of 2.1 m (minimum of 1.1 m, maximum of 4.8 m). The lake's the mean CLA concentration of 10.2 µg/l (minimum of 2.1 µg/l and maximum of 45.0 µg/l) resulted in a grade of B. The mean TKN concentration over the same time period was 0.53 mg/l (minimum of 0.20 mg/l and maximum of 0.89 mg/l).

As mentioned earlier, there is no nutrient data available for Cloverdale Lake other than 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, additional years of data collection are needed.

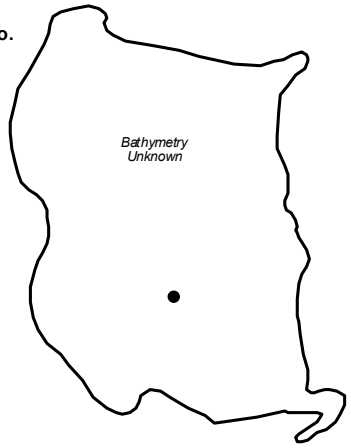
The perceived physical and recreational conditions (ranked on a 1-to-5 scale) are shown on the lake's information sheet on the next page. The average user perception rankings, were 1.8 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 1.7 for recreational suitability (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

Baytown Twp., Washington Co.



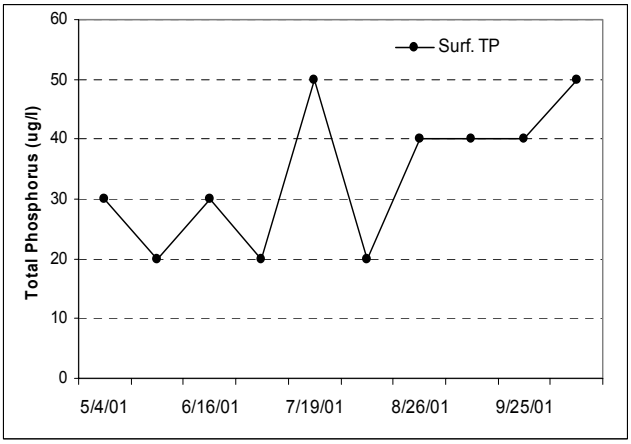
● Sampling site

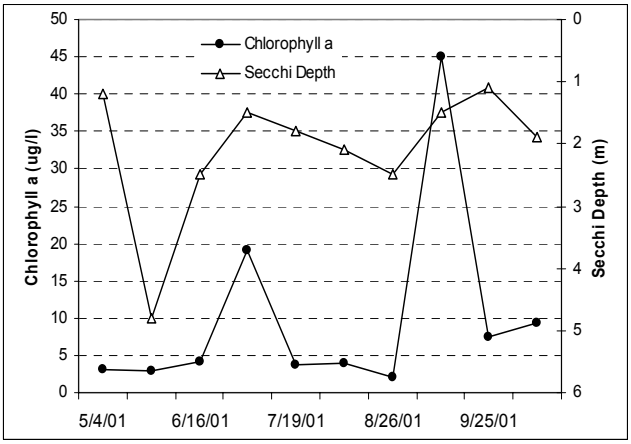
Contours in meters

Lake ID: 820009
WD: Lower St. Croix Valley
Volunteer: Kevin Bjork

N

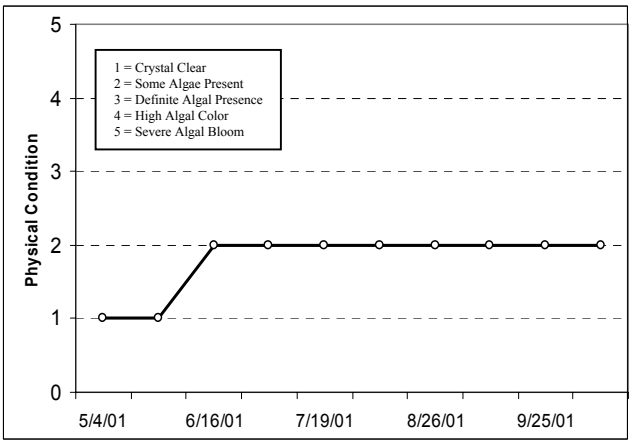
0 100 200
Meters





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/4	14.5				3.1	30		1.2	1	1
5/18	14.5				3	20		4.8	1	1
6/16	21				4.2	30		2.5	2	1
7/1	21.8				19	20		1.5	2	2
7/19	30.2				3.8	50		1.8	2	2
8/11	29.1				3.9	20		2.1	2	2
8/26	25.8				2.1	40		2.5	2	2
9/11	22.4				45	40		1.5	2	2
9/25	16.8				7.5	40		1.1	2	2
10/17	10.1				9.3	50		1.9	2	2

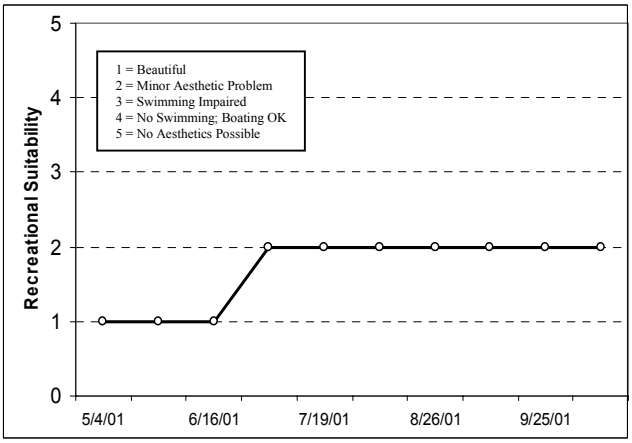


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											C
Chlorophyll a											B
Secchi Depth											C
Overall											**C**

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 eight data years (1994-2001); however, because of the limited size of the database, no long-term trends can be determined. To better understand the lake's quality and what direction it may be heading on the long-term, additional years of data collection are needed. On the short-term however, the lake's water quality seems while 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 2001, the lake was monitored 10 times between early-May 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.

The mean summertime (May through September) surface TP concentration was 220.0 µg/l (minimum of 80.0 µg/l, maximum of 340.0 µg/l). The mean CLA and Secchi transparency readings were 81.1 µg/l (minimum of 4.7 µg/l, maximum of 190.0 µg/l), and 0.8 m (minimum of 0.2 m, maximum of 2.0 m), respectively. The lake's mean surface TKN concentration was 2.31 mg/l (minimum of 1.3 mg/l and a maximum of 3.40 mg/l). The summertime means resulted in a TP grade of F, CLA grade of F, and a Secchi transparency grade of D. The overall grade determined through the calculation of all three parameters was F.

2001 TP variability suggests sediment or algae in the samples (inconsistent sample proceedure) therefore the TP mean (greater than past years) should be used with caution. With this in mind, however, the lakes 2001 CLA mean was also almost double that recorded in 2000.

The lake's 2001 overall grade was similar to that of 1995, 1996 and 1998, and worse than that of 1994, 1997, and 1999-2000. The lake's 2001 mean TP and CLA mean concentrations were the lake's worst recorded to date.

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- "definite algal presence"), while the mean recreational suitability ranking was 4.3 (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.

Colby Lake

Woodbury, Washington Co.

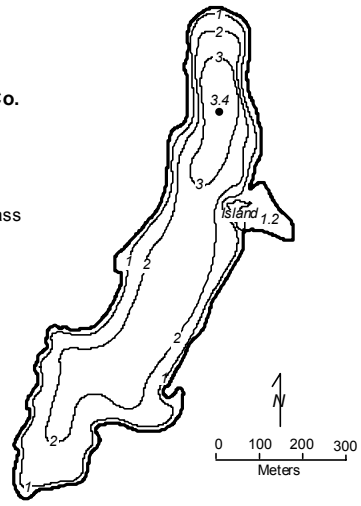
Lake ID: 820094

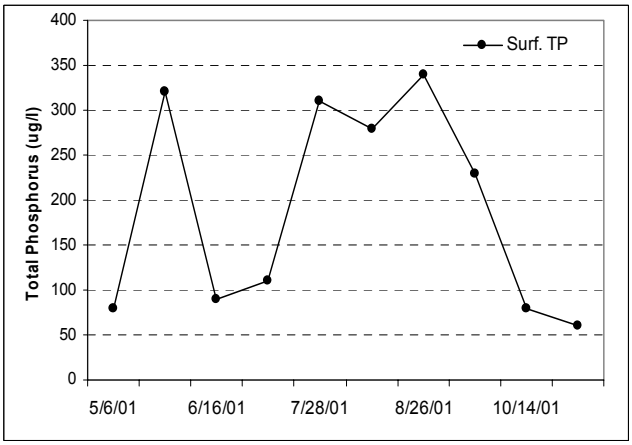
WD: South Washington

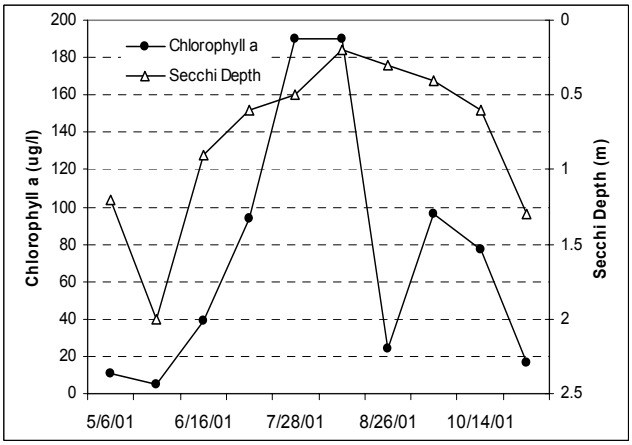
Volunteers: Beth and Claire Hvass

● Sampling site

Contours in meters

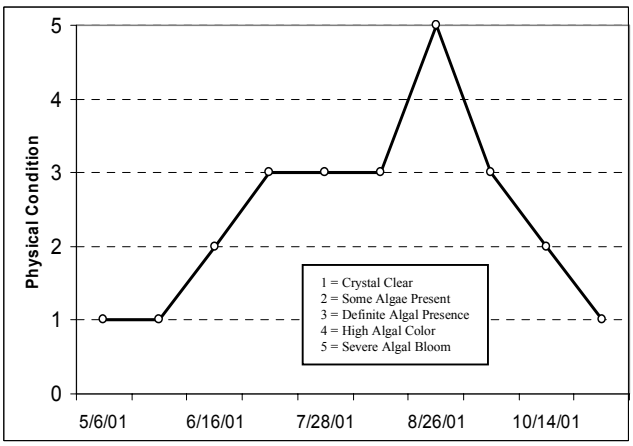






2001 Data

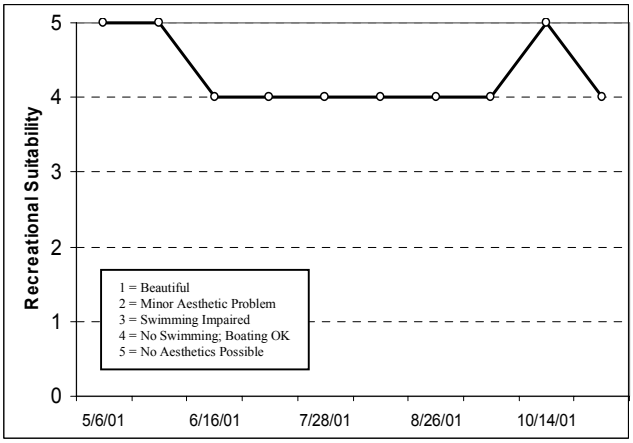
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/6	15.5				11	80		1.2	1	5
5/20	22.5				4.7	320		2.0	1	5
6/16	27				39	90		0.9	2	4
6/30	32				94	110		0.6	3	4
7/28	26.5				190	310		0.5	3	4
8/12	26.5				190	280		0.2	3	4
8/26	26.9				24	340		0.3	5	4
9/24	15.7				96	230		0.4	3	4
10/14	14.6				77	80		0.6	2	5
10/21	11.2				17	60		1.3	1	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				D	D	F	F	F	D	D	F
Chlorophyll a				D	F	F	C	F	F	D	F
Secchi Depth				F	F	F	F	F	D	D	D
Overall				**D**	**F**	**F**	**D**	**F**	**D**	**D**	**F**



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).

Other than CAMP monitoring from 1996-2000, 2001 is the only other year data are available for Courthouse Lake. Courthouse Lake was monitored biweekly from late-April to mid-October 2001, 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.

The 2001 summertime (May through September) mean concentrations were as follows: TP= 21.4 µg/l (minimum of <10.0 µg/l [in which case 0.5 µg/l was used to claculate the summer mean], maximum of 70.0 µg/l); CLA= 7.0 µg/l (minimum of 1.7 µg/l, maximum of 32.0 µg/l); Secchi transparency= 3.4 m (minimum of 0.8 m, maximum of 6.0 m); and TKN= 0.64 mg/l (minimum and maximum of 0.52 and 0.8 mg/l). The summertime means resulted in a TP grade of A, CLA grade of A, and Secchi transparency grade of A. The individual lake water quality grades translate to an overall grade of A for the lake in 2001. Similar to past years, the overall 2001 water quality grade reveals that the water quality in Courthouse Lake rates in the top 10 percent of lakes in the area.

The lake's 2001 water quality was similar to, or slightly better, than that 1996-1997, and 1999-2000. And while the lake's mean Secchi transparency reading declined in 1999, the 2000 and 2001 mean rebounded to pre-1999 means. The lake's best water quality year to date was 1998.

Because 2001 is only the sixth complete year of available data for Courthouse Lake, it is not possible to determine any long-term trends. In the short-term, however, the lake's water quality is well represented by an A/B+ grade. In order to detect any possible long-term trends, additional years of data collection are needed.

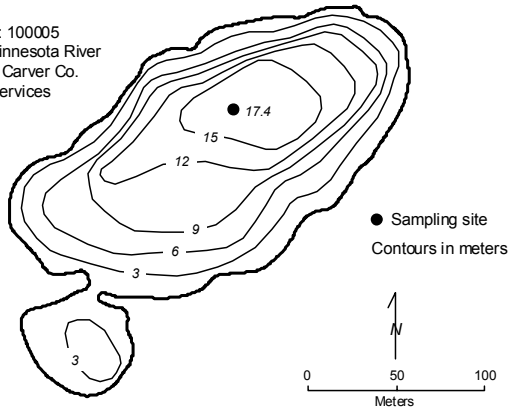
The average user perception rankings, on a 1-to-5 scale, were 1.8 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.1 for recreational suitability (roughly equal to 2- "minor aesthic problem").

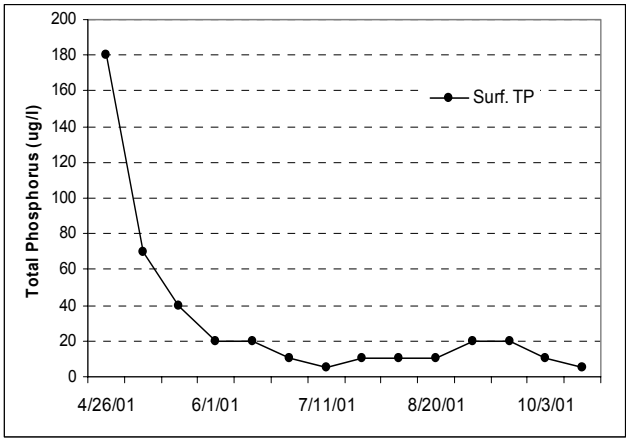
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

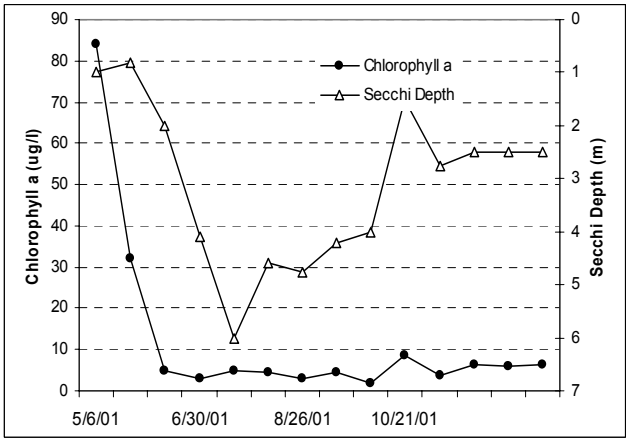
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Courthouse Lake
Chaska, Carver Co.

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

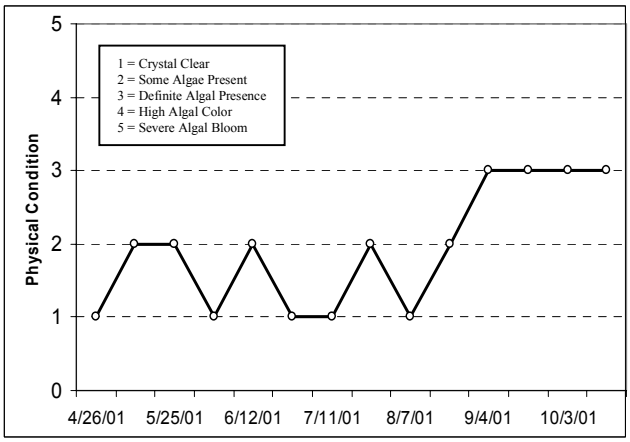


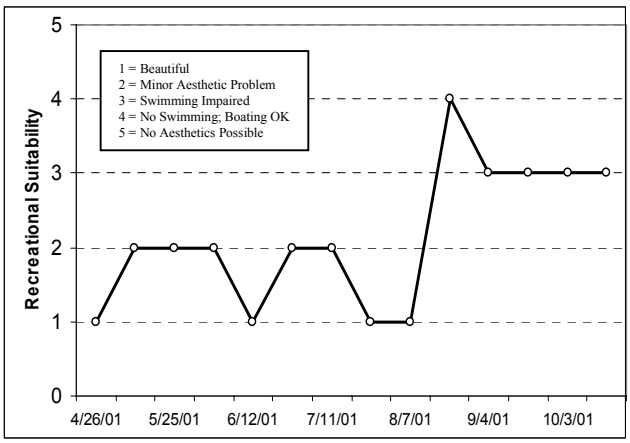




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/26	15.7				84	180		1.0	1	1
5/3	17.6		17.3		32	70		0.8	2	2
5/25	15.7		11.32		5	40		2.0	2	2
6/1	18.3		9.89		3	20		4.1	1	2
6/12	22.2		8.88		4.9	20		6.0	2	1
6/26	25.1		8.97		4.3	10		4.6	1	2
7/11	27.8		5.83		3	5		4.8	1	2
7/25	24.8		9.67		4.3	10		4.2	2	1
8/7	32.2		6.69		1.7	10		4.0	1	1
8/20	25.8		10.42		8.6	10		1.5	2	4
9/4	26.2		8.53		3.9	20		2.8	3	3
9/20	20.4		9.02		6.4	20		2.5	3	3
10/3	17.7		9.14		6.1	10		2.5	3	3
10/17	13.1		8.56		6.3	5		2.5	3	3





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						A	A	A	A	A	A
Chlorophyll a						A	A	A	A	A	A
Secchi Depth						A	C	A	B	A	A
Overall						**A**	**B**	**A**	**A**	**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 third year that Crystal Lake has been involved in CAMP (1999-2001). 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 throughout the 1980's and 1990's with nutrient data available in 1980, 1983, 1989, and 1994-2001. Additionally, Secchi transparency data are available for all years between 1980 and 1999 except 1993.

The lake was monitored 14 times between mid-April and mid-October, 2001. 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.

The mean summertime (May through September) surface TP concentration for the lake was 29.1 µg/l (minimum of 10.0 µg/l, maximum of 60.0 µg/l). The mean CLA and Secchi transparency readings were 18.5 µg/l (minimum of 3.0 µg/l, maximum of 60.0 µg/l) and 2.0 m (minimum of 0.8 m, maximum of 4.1 m), respectively. The lake's mean surface TKN concentration was 0.73 mg/l. The lake quality grades assigned to the 2001 summertime means are TP= B; CLA= B; and Secchi= C, resulting in an overall grade of B.

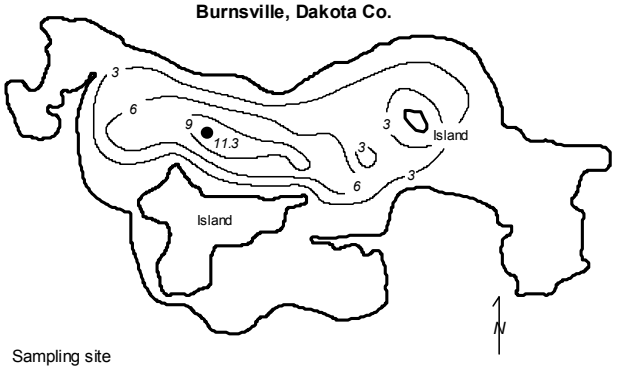
The lake's 2001 overall grade is better than those recorded dring the 1990's and 2000. While the lake's best recorded water quality year was 1989, the 2001 summer means are very similar to those of 1989.

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 1.4 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.

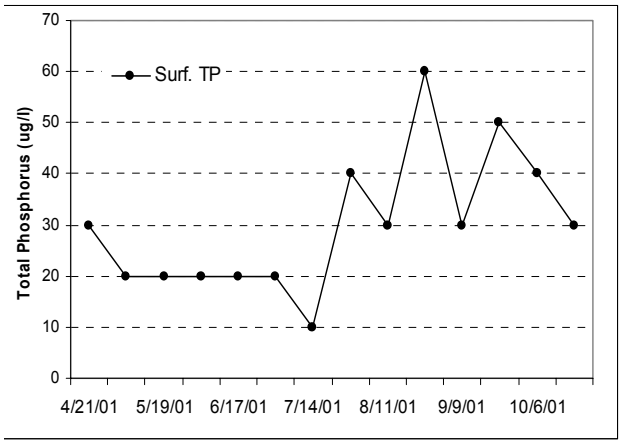
Crystal Lake,
Burnsville, Dakota Co.

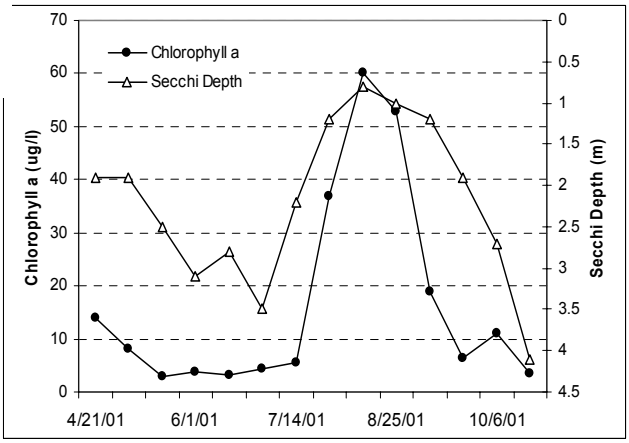


● Sampling site
Contours in meters

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

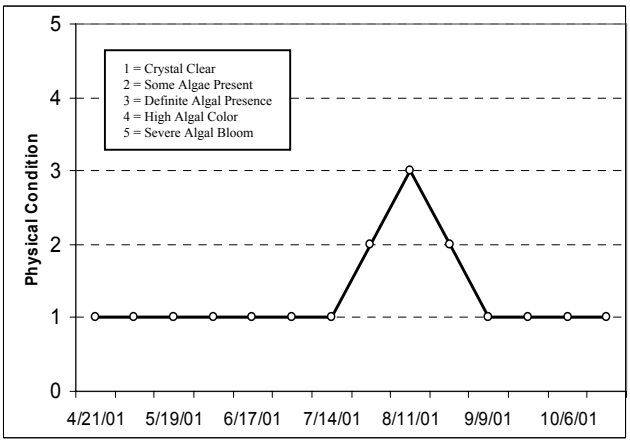
0 300 600
Meters





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/21	11				14	30		1.9	1	1
5/5	15				8	20		1.9	1	1
5/19	21				3	20		2.5	1	1
6/1	18				3.8	20		3.1	1	1
6/17	22.8				3.1	20		2.8	1	
6/30	27.1				4.3	20		3.5	1	1
7/14	27.8				5.4	10		2.2	1	1
7/28	25.3				37	40		1.2	2	2
8/11	27.2				60	30		0.8	3	2
8/25	26.2				53	60		1.0	2	2
9/9	22.3				19	30		1.2	1	1
9/23	18.1				6.5	50		1.9	1	1
10/6	140				11	40		2.7	1	1
10/20	10.9				3.5	30		4.1	1	1

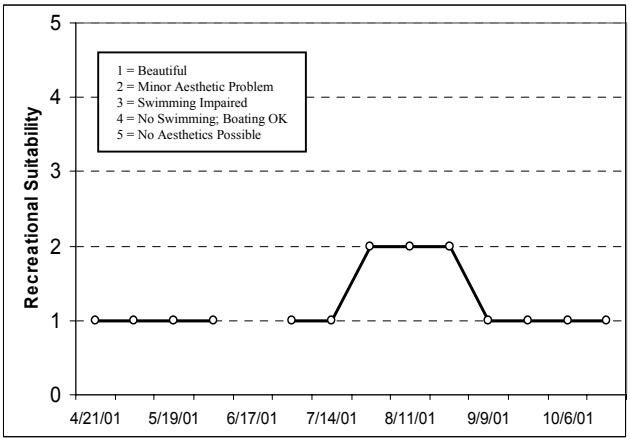


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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
Overall	**C**			**B**						**B**	

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	C	C	C	C	C	C	B
Chlorophyll a				B	C	C	C	C	B	C	B
Secchi Depth	B	B		C	C	C	C	C	C	C	C
Overall				**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**

Source: Metropolitan Council and STORET data



Crystal Lake [Robbinsdale] (27-0034) *Shingle Creek Watershed Management Commission*

Crystal Lake is a 76-acre lake located in the City of Robbinsdale (Hennepin County). The lake was first enrolled in CAMP in 1994. The lake has a maximum and mean depth of 10.4 and 3.7 m (34 and 12 feet), and an approximate volume of 917 ac-ft (Beduhn 1993). Sixty-eight percent of the lake's surface area is considered littoral zone (the 0-15 foot depth area of aquatic vegetation dominance). The lake's fishing pier and earthen public access are located on the southeastern end of the lake.

The lake, managed by the MNDNR as a warm-water gamefish lake, has been stocked with muskellunge and northern pike in the past. Because of the numerous historical winter fishkills, an aeration system was installed in 1973 to maintain the lake's oxygen levels. While the aerator stopped the winterkill problem, it may have created another. The aeration system may actually allow phosphorus in the sediment to circulate throughout the lake's water column by disrupting the thermocline. In fact, recent summerkills have been reported because the lake's high TP concentrations lead to heavy algal blooms which in turn choke the lake's oxygen load.

The lake's watershed is mostly urban/developed with some undeveloped/park areas. The urban areas consist of single family residential homes around portions of the lake, as well as multi-family and commercial/industrial areas within the watershed. The majority of the undeveloped areas are associated with parkland on the shores of the lake. Eighty-nine percent of the land use within the lake's 1,272 acre watershed is urban, while the remaining 11 percent is undeveloped (Beduhn 1993). The resulting watershed-to-lake size ratio is 10.4:1.

Crystal Lake, which was monitored through CAMP in 1994 and 1997, was monitored eight times from early-May to late-September in 2001. On each sampling date the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

Summertime (May through September) means for the monitored variables were: surface TP= 83.3 µg/l (minimum concentration of 70.0 µg/l, maximum value of 100.0 µg/l); surface chlorophyll-a= 27.5 µg/l (minimum of 3.3 µg/l, maximum of 45.0 µg/l); Secchi transparency= 1.0 m (minimum of 0.5 m, maximum of 1.7 m); and TKN= 1.15 mg/l (minimum of 0.79 mg/l, maximum of 1.40 mg/l). Associated lake quality grades for the 2001 summertime means were TP= D, CLA= C, Secchi= D. The lake's overall 2001 quality grade, identical to that of 1994 and 1997, was D as calculated from the TP, CLA, and Secchi grades. Results are presented on graphs and data tables on the following page.

While the lake's 2001 TP and CLA means were quite a bit better than those recorded in 1997, the 2001 Secchi transparency mean was quite a bit worse. This may indicate that the water clarity of the lake in 2001 may have been influenced by something more than just the lake's algal biomass (e.g., genera or species of algae, or amount of suspended sediments).

Graphs showing the volunteer perceptions of the lake's physical condition and recreational suitability seem to be correlated to the other graphs for this lake. Generally, the greater the lake's clarity, the better the lake's perceived physical condition and recreational suitability. The summertime mean recorded physical condition was 2.7 on a 1-to-5 ranking scale (between 2- " some algae present" and 3- "definite algal presence"). The mean suitability for recreation ranking was also 2.7 (between 2- "minor aesthetic problem" and 3- "swimming impaired").

The water quality database for Crystal Lake consists of nutrients and Secchi data in 1986-1988, 1992, 1994, 1997, and 2001. The lake quality grades seem to show that the lake's quality has remained rather similar through the mid-1980's and mid-1990's.

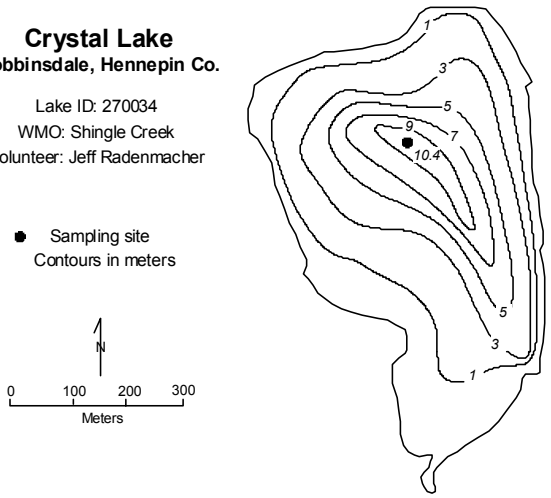
The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) conducted a fisheries survey on the lake in 1993. Information on the survey can be obtained through the MNDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the internet at http://www.dnr.state.mn.us/lakefind/.

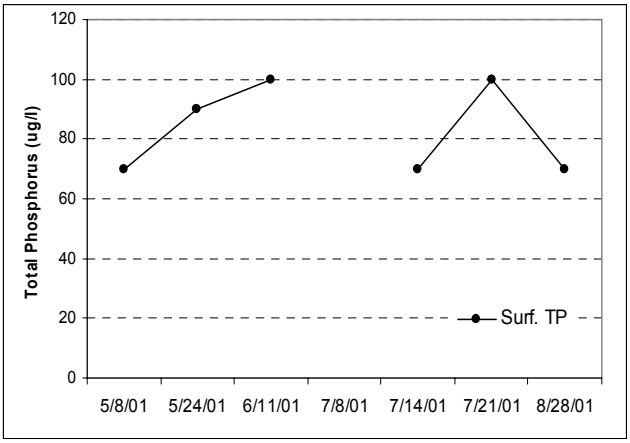
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

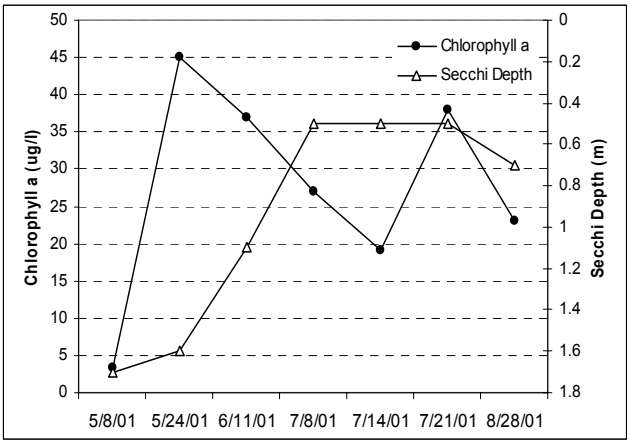
Crystal Lake

Robbinsdale, Hennepin Co.

Lake ID: 270034
WMO: Shingle Creek
Volunteer: Jeff Radenmacher

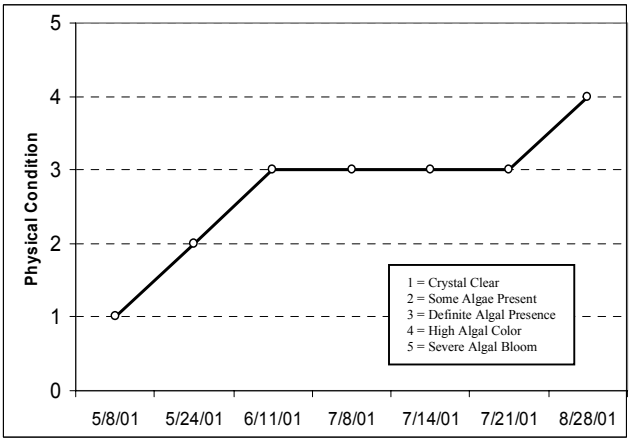






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	20				3.3	70		1.7	1	1
5/24	20				45	90		1.6	2	2
6/11	23				37	100		1.1	3	3
7/8	24.5				27			0.5	3	3
7/14	25.2				19	70		0.5	3	3
7/21	25.2				38	100		0.5	3	3
8/28	27				23	70		0.7	4	4

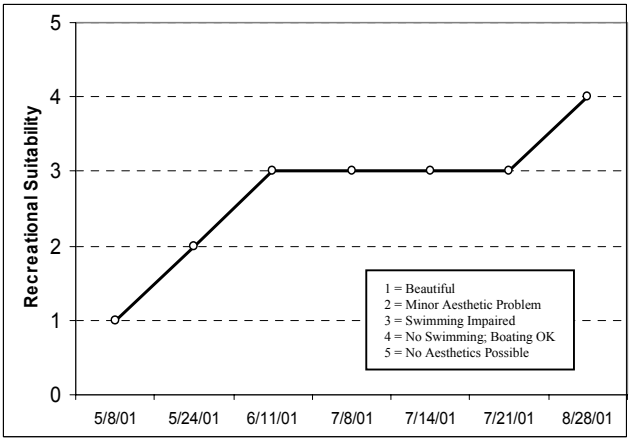


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus		F		F			F				D
Chlorophyll a		D		C			C				C
Secchi Depth		D		D			C				D
Overall		**D**		**D**			**D**				**D**

Source: Metropolitan Council and STORET data



Deeg Lake (19-????) *Black Dog Watershed Management Commission*

Deeg Lake is a small shallow lake located within City of Burnsville (Dakota County). There is very little known morphological data available for the lake.

Two Thousand and one marks the first year in which Deeg Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2001 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 12 times between early-April and early-October, 2001. The resulting data and graphs appear on the next page.

The lake's overall 2001 lake quality grade of D was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 177.3 µg/l (minimum of 30.0 µg/l, maximum of 460.0 µg/l) corresponds to a lake water quality grade of F, as did the mean Secchi transparency of 0.5 m (minimum of 0.3 m, maximum of 0.7 m). The lake's the mean CLA concentration of 49.9 µg/l (minimum of 14.0 µg/l and maximum of 98.0 µg/l) resulted in a grade of B. The mean TKN concentration over the same time period was 2.13 mg/l.

By comparing the lakes 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 2001 findings may be that the majority of the lake's TP comes from either in-lake suspended sediments (re-suspenion), 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 Deeg Lake other than 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, 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 algal presence"), and 4.0 for recreational suitability ("no swimming - boating ok").

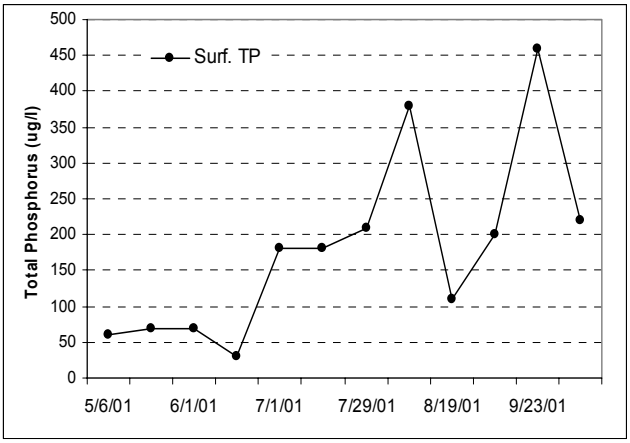
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

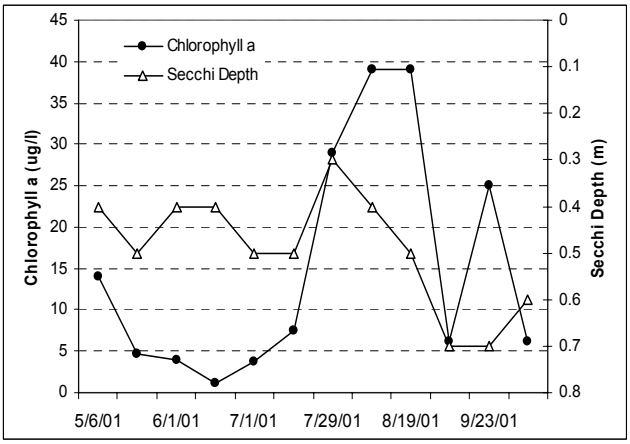
Deeg Lake

Burnsville, Dakota Co.

Lake Map Not Available

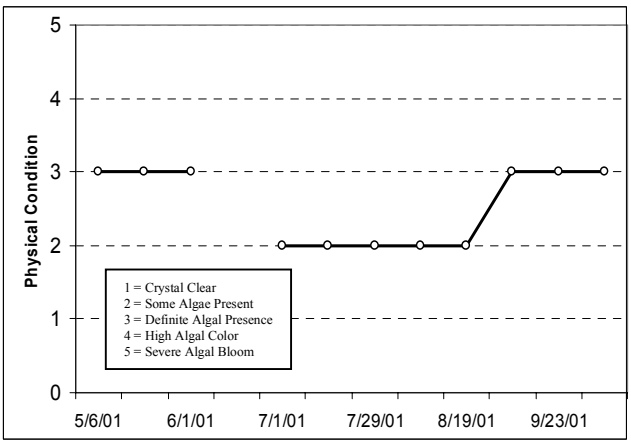
Lake ID: 19xxxx
WMO: Black Dog
Volunteer: Vernon Peterson





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/6	20				14	60		0.4	3	4
5/14	21				4.7	70		0.5	3	4
6/1	21				3.9	70		0.4	3	4
6/17	21				1.2	30		0.4		
7/1	26.9				3.7	180		0.5	2	
7/15	26.9				7.4	180		0.5	2	
7/29	26.3				29	210		0.3	2	4
8/12	26.3				39	380		0.4	2	
8/19	21.3				39	110		0.5	2	4
9/9	20				6.2	200		0.7	3	4
9/23	16				25	460		0.7	3	4
10/7	11				6.2	220		0.6	3	4

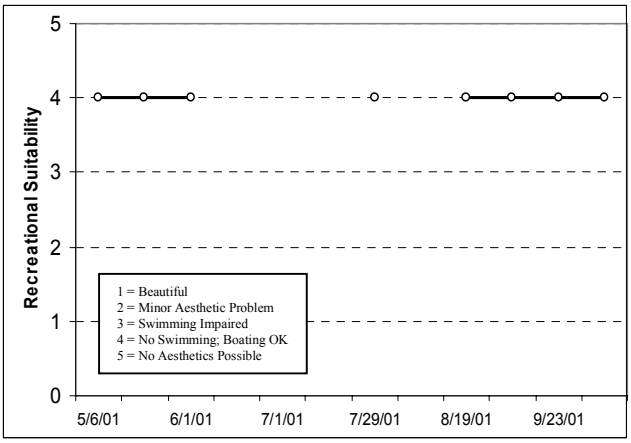


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											F
Chlorophyll a											B
Secchi Depth											F
Overall											**D**

Source: Metropolitan Council and STORET data



Downs Lake (82-0110) *Lower St.C roix ValleyWatershed District*

Downs Lake, located in Lake Elmo (Washington County), was monitored nine times between early-May and mid-October, 2001. 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 second year in which Downs Lake has been involved in CAMP (1999 being the other). 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 are the only years where data are available. 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 perceived physical condition and recreational suitability. The mean summertime (May through September) surface TP concentration for the lake was 143.3 µg/l (minimum of 110.0 µg/l, maximum of 180.0 µg/l). The mean CLA and Secchi transparency readings were 144.3 µg/l (minimum of 57.0 µg/l, maximum of 290.0 µg/l) and 0.4 m (minimum of 0.2 m, maximum of 0.7 m), respectively. The lake's mean surface TKN concentration was 2.83 mg/l (minimum of 1.10 mg/l, maximum of 4.40 mg/l).

The summertime means resulted in a TP grade of D, CLA grade of F, and Secchi transparency grade of F. The overall grade calculated from all three parameters was F. The lake's 2001 water quality was quite a bit worse than that recorded in 1999 (overall grade of D). This is especially noticeable when comparing the 1999 and 2001 CLA and Secchi means. The 2001 CLA mean is roughly double that recorded in 1999 and the 2001 Secchi mean is half that of 1999.

As mentioned earlier, there are no water quality data available for Downs Lake other than the 1999 and 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, 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- "difnite algal presence"), 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 data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

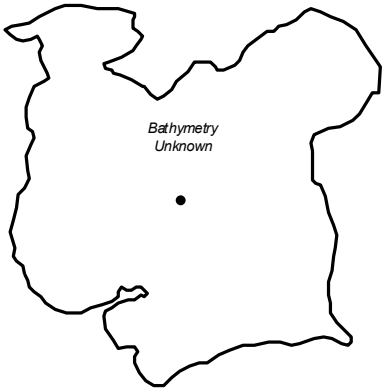
Downs Lake

Lake Elmo, Washington Co.

Lake ID: 820110

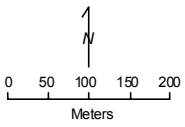
WD: Lower St. Croix Valley

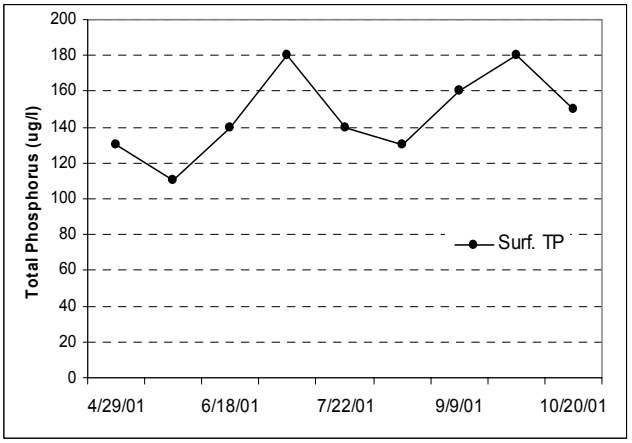
Volunteers: the Wesley Sly Family

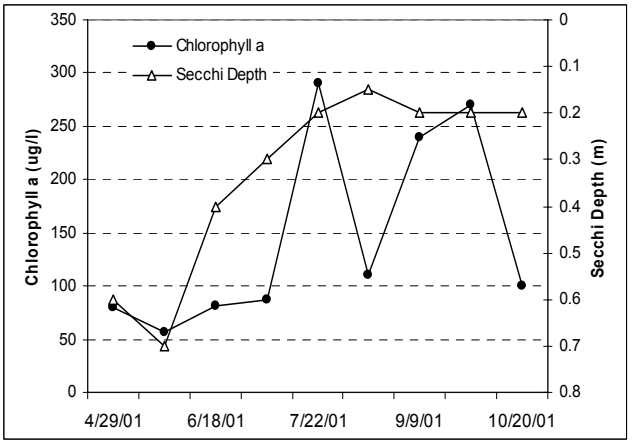


● Sampling site

Contours in meters

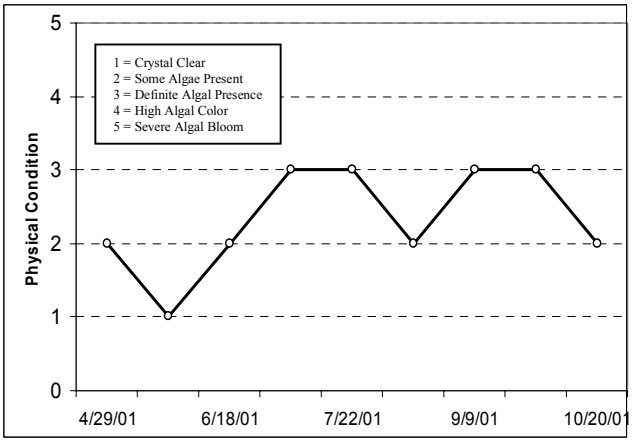






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/29	16				80	130		0.6	2	2
5/27	17				57	110		0.7	1	1
6/18	25				82	140		0.4	2	4
7/1	25				87	180		0.3	3	4
7/22	30				290	140		0.2	3	4
8/9	27.4				110	130		0.2	2	4
9/9	22				240	160		0.2	3	4
10/7	12				270	180		0.2	3	4
10/20	10				100	150		0.2	2	4

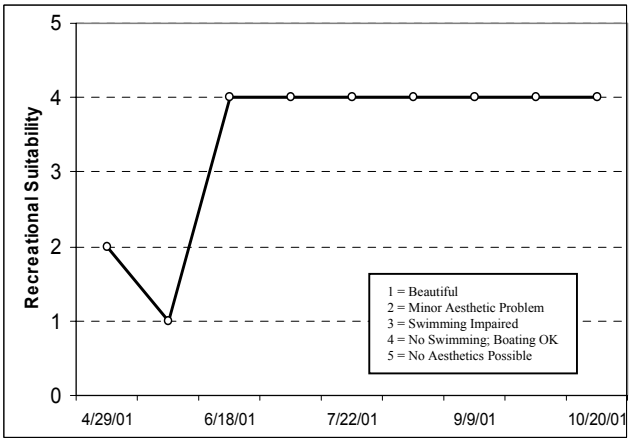


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									D		D
Chlorophyll a									D		F
Secchi Depth									D		F
Overall									**D**		**F**

Source: Metropolitan Council and STORET data



Eagle Lake [Carver County] (10-0121) *Carver County Environmental Services*

Eagle Lake is located in Young America Township in Carver County. The lake has a surface area of 233 acres, and a maximum and mean depth of 7.9 m (26 feet) and 1.2 m (4 feet), respectively. Because of the shallowness of the lake, the entire area is considered littoral, (the shallow [0-15 foot depth] area dominated by aquatic vegetation) and does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column).

The lake has a 1,050-acre immediate watershed, which translates to a watershed-to-lake area ratio of 4.5:1 (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: two percent residential, 63 percent agricultural, and 35 percent open/undeveloped (Carver County Planning 1999).

This was the fourth year that Eagle Lake has been involved in CAMP (enrolled in 1998-2000), although it has been previously monitored by Council staff. The lake was monitored 12 times between mid-April and mid-October, 2001. 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 mean summertime (May through September) surface TP concentration was 279.0 µg/l (minimum of 80.0 µg/l, maximum of 590.0 µg/l). The mean CLA and Secchi transparency readings were 71.3 µg/l (minimum of 3.2 µg/l, maximum of 200.0 µg/l) and 1.1 m (minimum of 0.3 m, maximum of 3.6 m) [the widest range in CAMP 2001], respectively. The lake's mean surface TKN concentration was 2.65 mg/l (minimum of 1.30 mg/l, maximum of 6.90 mg/l). Results are presented on graphs and data tables on the following page.

The lake quality grades determined from each parameter's summertime mean are TP= F, CLA= D, and Secchi transparency= D, resulted in a 2001 overall grade of D. The lake's 2001 overall water quality grade is identical to those recorded in 1980-1981, 1996, 1998-2000. Therefore the lake's overall grade seems to be well represented by D.

While the lake's current overall grade in similar to those recorded previously, the water quality (as shown by its individual summer means and resulting grades) was much worse. In past years the lake has maintained good CLA and water clarity conditions, although TP concentrations were very high. One thought to the reason for this centered on the lake's zooplankton population. It was mentioned in past reports that additional analysis to study the lake's zooplankton population may be of some interest to determine if large zooplankton may be grazing (see Square Lake) on algae thus reducing CLA and increasing water clarity. In 2001, however, the lake's CLA summer mean is approximately double, and the Secchi transparency mean is nearly half, that of past years.

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 3.2 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.6 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

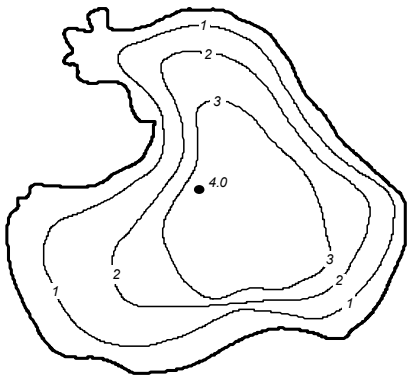
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

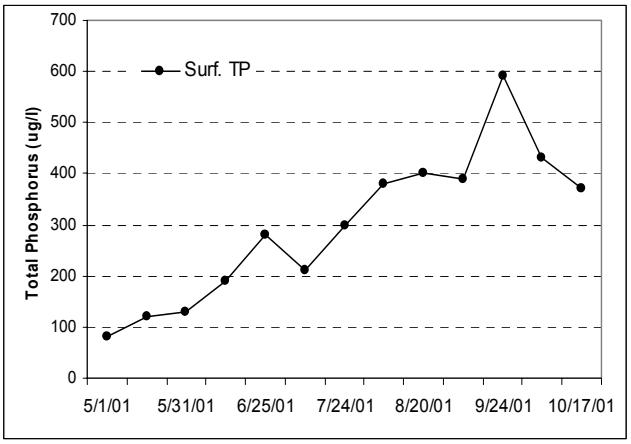
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

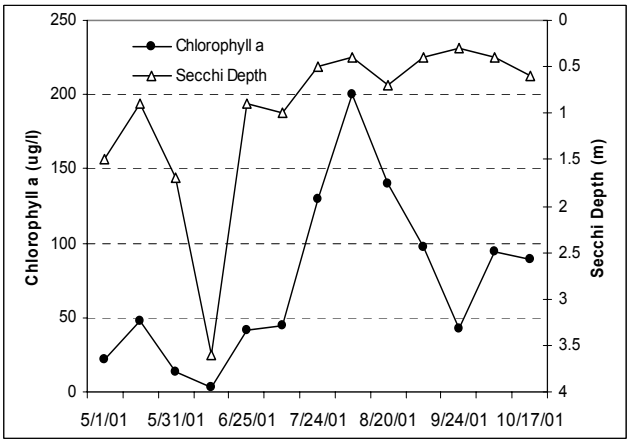
Eagle Lake,
Camden Twp. Carver Co.

Lake ID: 100121
WMO: Carver County
Volunteer: Carver Co.
Env. Services

● Sampling site
Contours in meters

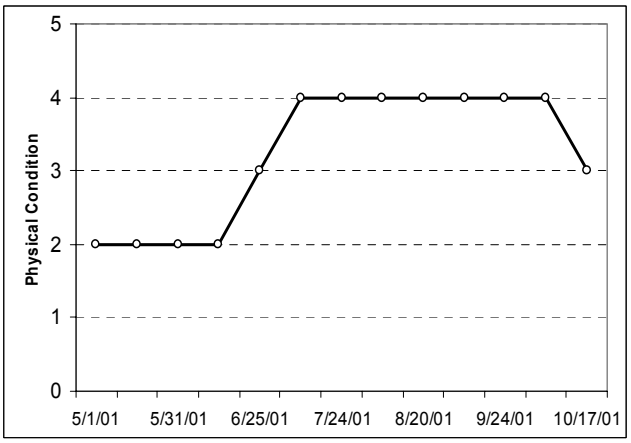






2001 Data

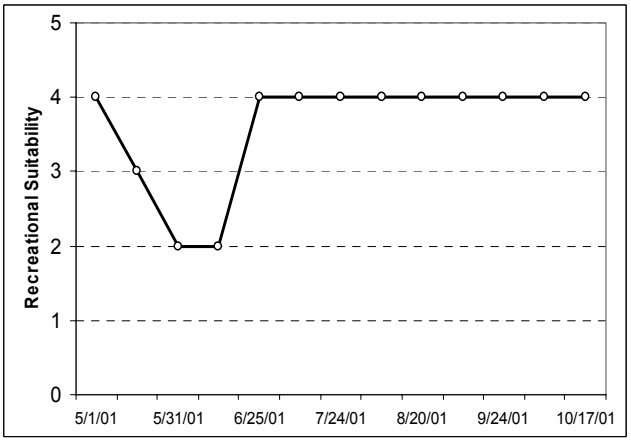
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	15.1		9.63		22	80		1.5	2	4
5/15					48	120		0.9	2	3
5/31	18.2		11.91		14	130		1.7	2	2
6/11	22.2		6.98		3.2	190		3.6	2	2
6/25	23		8.01		41	280		0.9	3	4
7/9	26.9		13.06		45	210		1.0	4	4
7/24	27.2		9.42		130	300		0.5	4	4
8/6	28.9		9.8		200	380		0.4	4	4
8/20	23.8		11.37		140	400		0.7	4	4
9/4	23.2		9.43		98	390		0.4	4	4
9/24	15.8		7.03		43	590		0.3	4	4
10/3	16.1		8.81		94	430		0.4	4	4
10/17	9.2		10.29		89	370		0.6	3	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						F		F	F	F	F
Chlorophyll a						C		C	C	C	D
Secchi Depth						B		C	B	C	D
Overall						**D**		**D**	**D**	**D**	**D**



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 42-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 39:1. 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 mid-May and early-September in 2001. On each sampling date the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as perceived physical condition and recreational suitability.

The mean summertime (May through September) surface TP concentration for the lake was 60.0 µg/l (minimum of 20.0 µg/l, maximum of 130.0 µg/l). The mean CLA and Secchi transparency readings were 17.9 µg/l (minimum of 4.7 µg/l, maximum of 43.0 µg/l), and 1.4 m (minimum of 1.0 m, maximum of 1.9 m), respectively. The lake's mean surface TKN concentration was 1.00 mg/l (minimum of 0.77 mg/l, maximum of 1.30 mg/l). Overall, the mean TP, CLA and Secchi numbers for 2001 were very similar to those of 1995, and 1997-2000, and worse than those recorded for 1994 and 1996. The best TP and CLA means were recorded in 1994, while the best Secchi mean was recorded in 1996.

Associated lake quality grades for the 2001 summertime means were TP= C, CLA= B, and Secchi= C, resulting in an overall quality grade of C. Individual and overall grades for 2001 are identical to those found in 1994-2000. 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 1.2-1.6 m, respectively.

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 3.5 (between 3- "definite algal presence" and 4- "no swimming but boating ok"), while the mean recreational suitability ranking was 2.5 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired).

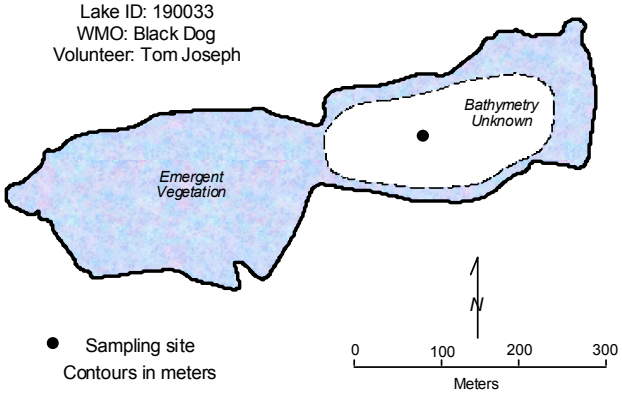
Because 1994-2001 are the only years of available data, no long-trends can be determined. On the short-term, however, the lake seems to be very well represented by an overall water quality grade of C. In order to detect any possible long-term trends, more years of monitoring are needed.

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.

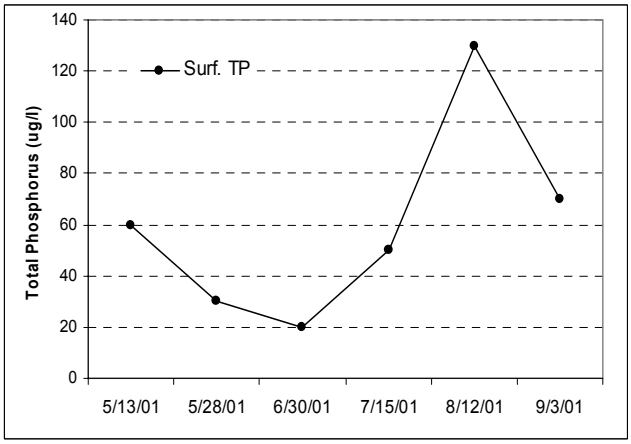
Earley Lake

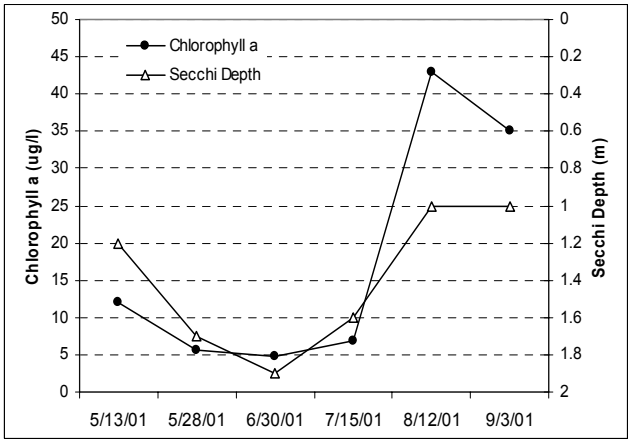
Burnsville, Dakota Co.

Lake ID: 190033
WMO: Black Dog
Volunteer: Tom Joseph



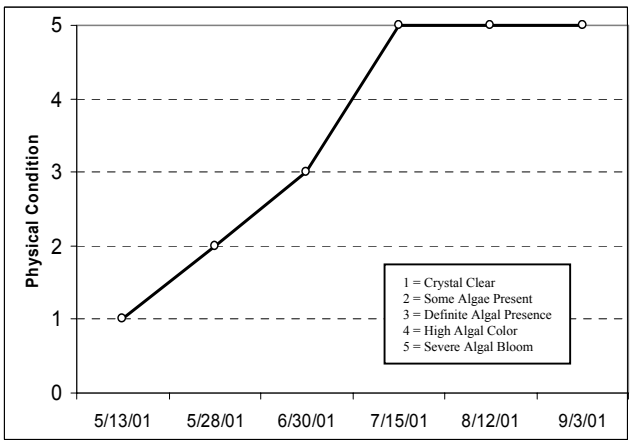
● Sampling site
Contours in meters





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/13	20.5				12	60		1.2	1	1
5/28	20.5				5.6	30		1.7	2	2
6/30	29				4.7	20		1.9	3	2
7/15	29				6.9	50		1.6	5	4
8/12	27				43	130		1.0	5	2
9/3	24				35	70		1.0	5	4

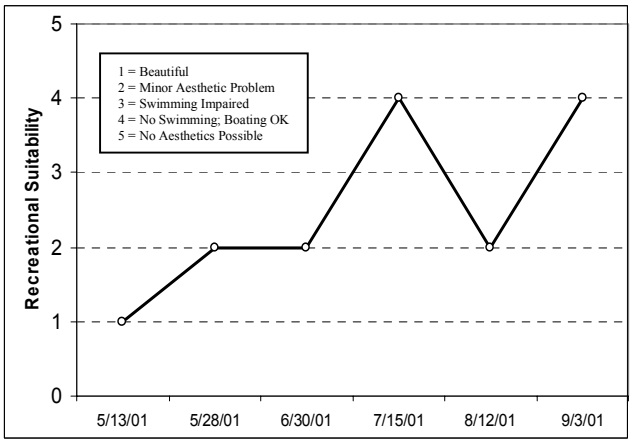


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	C	C	C	C	C	C	C
Chlorophyll a				B	B	B	B	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



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

East Boot Lake, located in May Township (Washington County), was monitored 14 times between early-April and mid-October, 2001. 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 second 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 (1996-2000) collected over the past twenty years.

On each sampling date, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as perceived physical condition and recreational suitability. The 2001 mean summertime (May through September) surface TP concentration for the lake was 34.2 µg/l (minimum of 20.0 µg/l, maximum of 70.0 µg/l). The mean CLA and Secchi transparency readings were 19.6 µg/l (minimum of 4.4 µg/l, maximum of 44.0 µg/l) and 2.2 m (minimum of 0.9 m, maximum of 5.0 m), respectively. The lake's mean surface TKN concentration was 1.15 mg/l (minimum of 0.78 mg/l, maximum of 1.80 mg/l).

The summertime means resulted in a TP grade of C, CLA grade of C, and Secchi transparency grade of C. The overall grade calculated from all three parameters was C. While the lake's individual parameter and overall grades are identical to those recorded in 2000, the 2001 individual means are better.

As mentioned earlier, there little water quality data available for East Boot Lake other than the 2001 CAMP data. A Search for historic data revealed water quality data for 1996-2000. Because of the limitedness of the lake's water quality database, it is not possible to determine any long-term or short-term 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 ("definite algal presence"), 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.

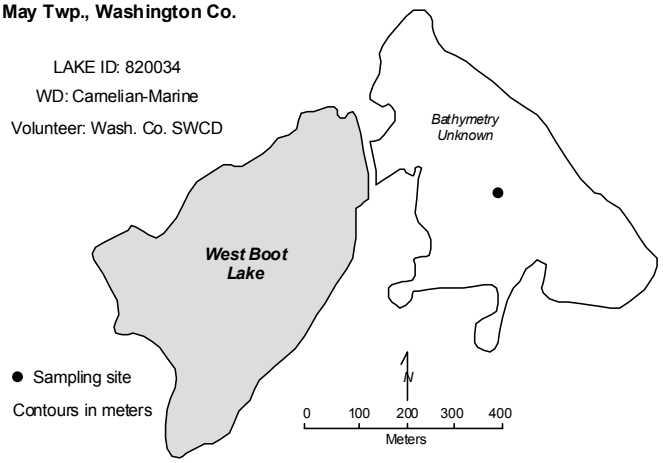
East Boot Lake

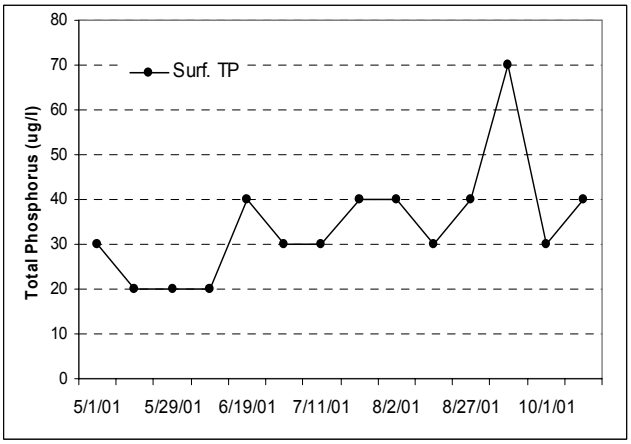
May Twp., Washington Co.

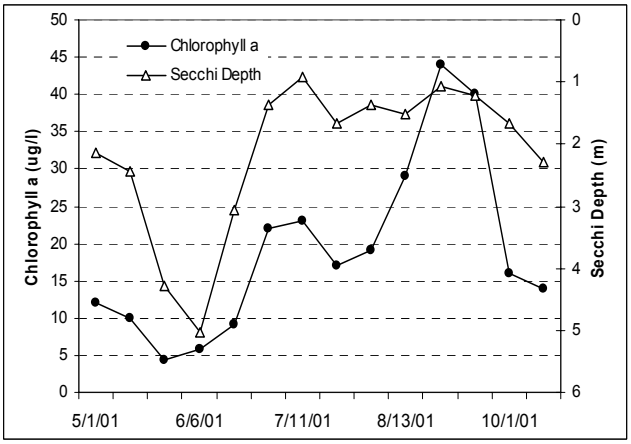
LAKE ID: 820034

WD: Carnelian-Marine

Volunteer: Wash. Co. SWCD

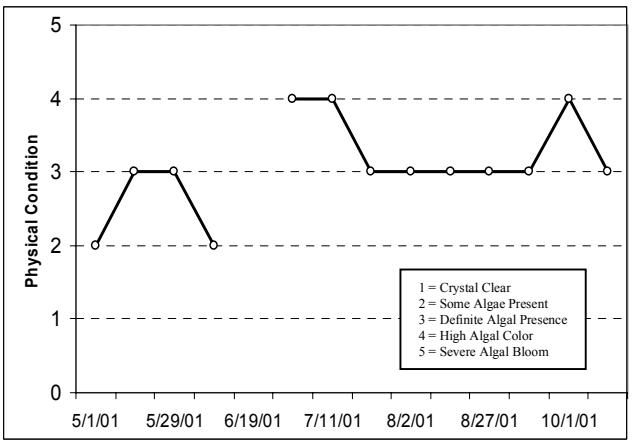






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	15.7		9.1		12	30		2.1	2	1
5/16	21.6		12.86		10	20		2.4	3	3
5/29	17.7		10.5		4.4	20		4.3	3	3
6/6	17.2		10.2		5.8	20		5.0	2	2
6/19	21.6		6.89		9.2	40		3.1		3
6/29	27.6		12.86		22	30		1.4	4	4
7/11	26.4		14.3		23	30		0.9	4	4
7/23	28.1		9.8		17	40		1.7	3	4
8/2	27.1		8.9		19	40		1.4	3	4
8/13	25.5		9.57		29	30		1.5	3	4
8/27	24.6		9.95		44	40		1.1	3	4
9/11	20.5		9.9		40	70		1.2	3	2
10/1	16		10.67		16	30		1.7	4	4
10/16	11.1		6.34		14	40		2.3	3	3

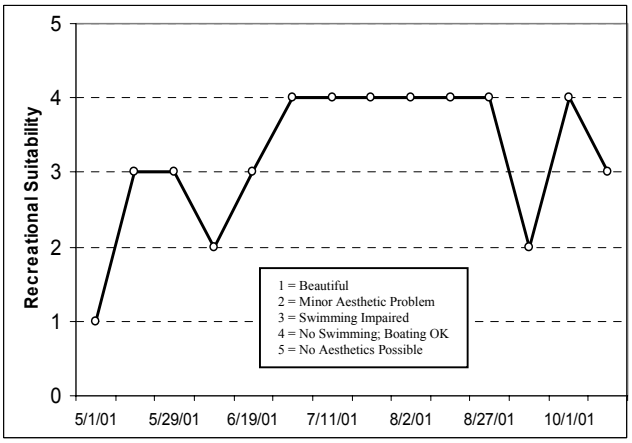


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						B	B	B	C	C	C
Chlorophyll a						B	C	C	C	C	C
Secchi Depth						B	A	B	C	C	C
Overall						**B**	**B**	**B**	**C**	**C**	**C**

Source: Metropolitan Council and STORET data



Egg Lake (82-0147) *Rice Creek Watershed District*

Egg Lake is a 106-acre lake located within the City of Hugo (Washington County). Because the maximum depth of the lake is only 1.2 m (4.7 feet), 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 Egg Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided no data, therefore 2001 is the only year of available water quality data for the lake.

As part of the watershed's involvement in CAMP in 2001, the lake was monitored 3 times between late-June and late-September, 2001. 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 the lake was only monitored three times in 2001, the validity of the lake's summer TP, CLA, and Secchi transparency means are suspect and the limited number of monitoring events used to calculate the means should be taken into consideration when using the means. With that said, the 2001 mean summertime (May through September) surface TP concentration was 46.7 µg/l (minimum of 30.0 µg/l, maximum of 60.0 µg/l). The mean CLA and Secchi transparency readings were 6.0 µg/l (minimum of 2.5 µg/l, maximum of 13.0 µg/l), and 1.2 m (minimum of 1.1 m, maximum of 1.4 m), respectively. The lake's mean surface TKN concentration was 0.94 mg/l (minimum of 0.76 mg/l and a maximum of 1.10 mg/l). The summertime means in 2001 resulted in a TP grade of C, CLA of A, and a Secchi transparency grade of C. The overall grade determined through the calculation of all three parameters was B.

By comparing the lakes 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 2001 findings may be that the majority of the lake's TP comes from either in-lake suspended sediments (re-suspenion), or the intrusion of sediment-laden runoff to the lake, which in turn lessens the clarity of the water and inhibits algal growth.

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 2.3 (between 2- "minor aesthetic problems" and 3- "swimming slightly impaired").

As mentioned earlier, there are no water quality data available for Egg Lake other than the limited 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, 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.

Egg Lake

Hugo, Washington Co.

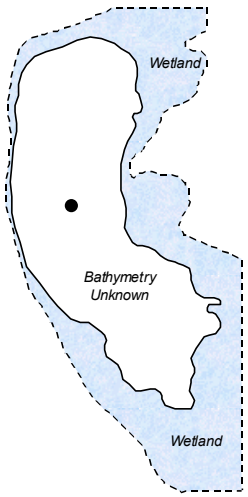
LAKE ID: 820147

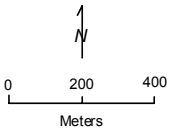
WD: Rice Creek

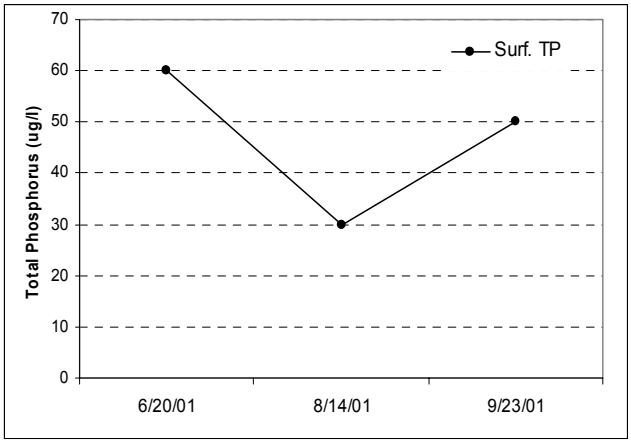
Volunteers: Roger Aiken, Chuck Johnson

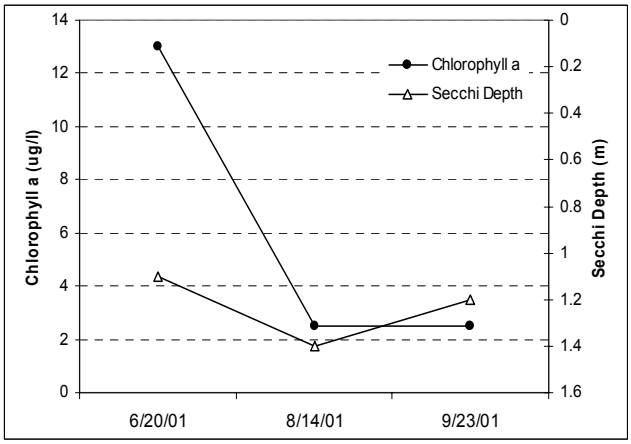
● Sampling site

Contours in meters



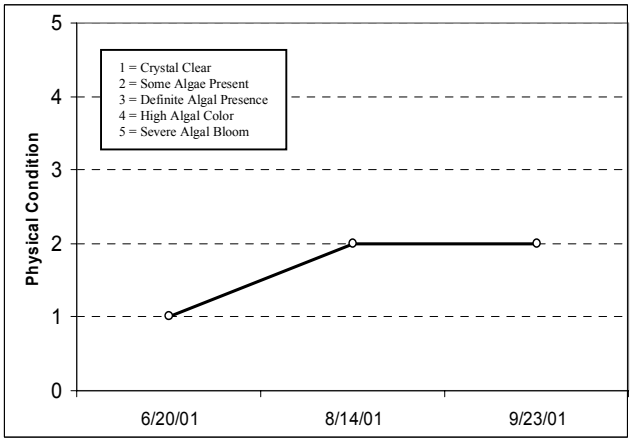






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/20	20				13	60		1.1	1	1
8/14	22				2.5	30		1.4	2	1
9/23	14.6				2.5	50		1.2	2	5

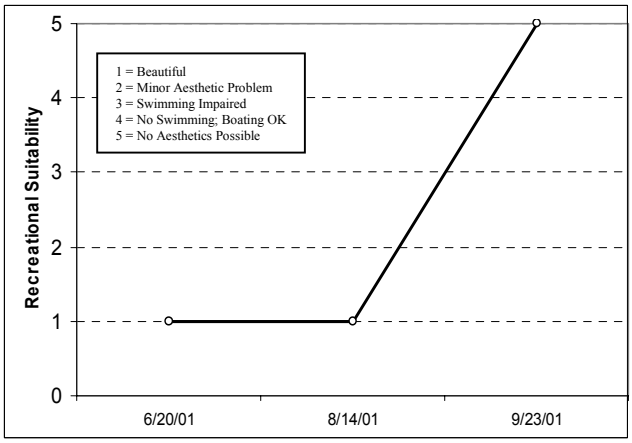


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											C
Chlorophyll a											A
Secchi Depth											C
Overall											**B**

Source: Metropolitan Council and STORET data

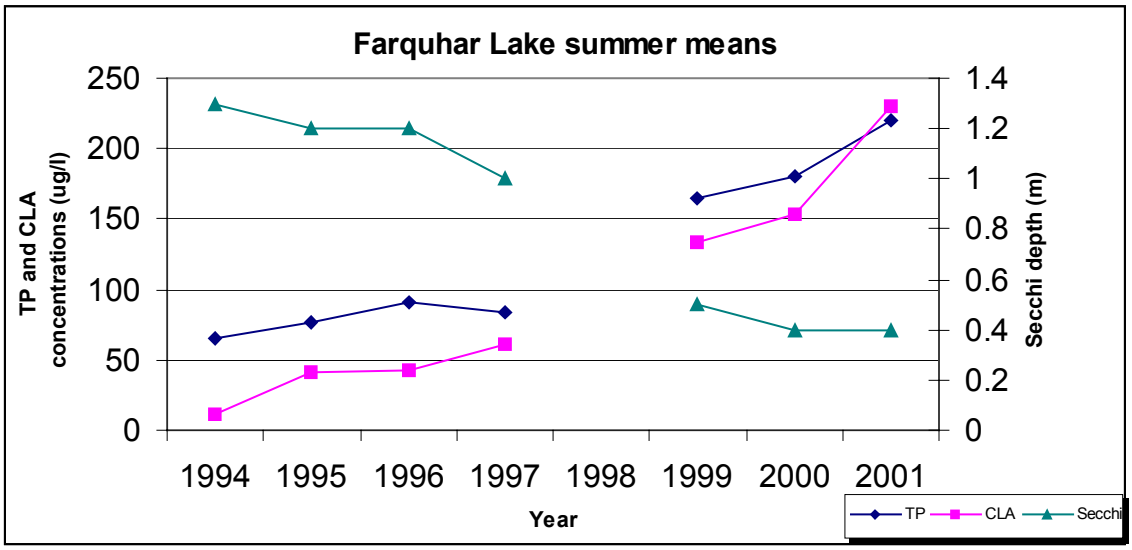


Farquhar Lake (19-0023) *City of Apple Valley*

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 seventh year that Farquhar Lake has been enrolled in CAMP. The lake was monitored 11 times between late-May and early-October, 2001.
The summertime (May through September) mean TP concentration was 220.0 µg/l (minimum of 70.0 µg/l, maximum of 400.0 µg/l), while the CLA mean was 230.0 µg/l (minimum and maximum of 20.0 and 480.0 µg/l). The lake's 2001 mean Secchi transparency was 0.4 m (minimum of 0.1 m [worst recorded readings in CAMP 2001] and maximum of 1.0 m). The mean TKN concentration over the same time period was 3.04 mg/l (minimum of 1.10 mg/l, maximum of 5.10 mg/l). The lake's means in 2001 continued the recent trend of being worse than those recorded for the previous year. This scenerio is shown on the graph below.



The graph clearly depicts the lakes recent (mid-1990s to present) degrading trend. The reason for the degradation in the lake's water quality is not known at this time. 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 lake quality grades determined from each parameter's summertime mean are TP= F, CLA= F and Secchi transparency= F, resulted in a 2001 overall grade of F (as it did in 1999 and 2000). For comparison, the lake had overall grades of D in 1995 and 1997 and C in 1994 and 1996.

Because of continual high water conditions on the lake, a 30-inch culvert from the lake to the pumping station was to be completed in November of 1999. This, along with the reduction of the culvert size from the outlet of Long Lake (inlet to Farquhar), should help in lowering the lake's level.

Throughout the 2001 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 3.4 (falling between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability was 3.4 (between 3- "swimming slightly impaired" and 4- "no swimming but boating ok").

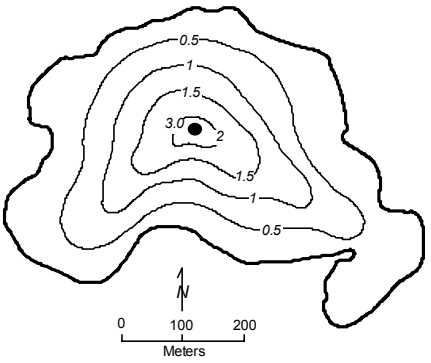
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

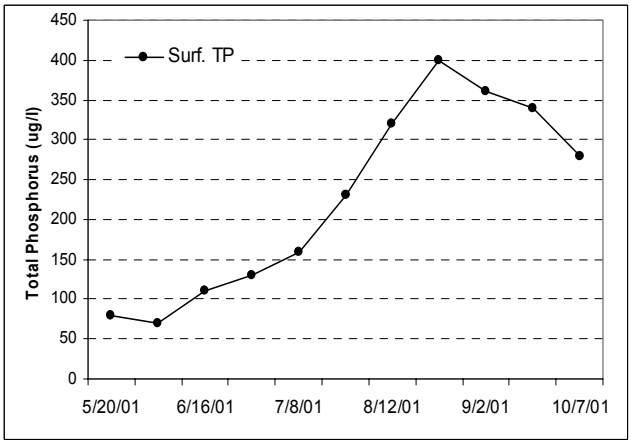
Farquhar Lake

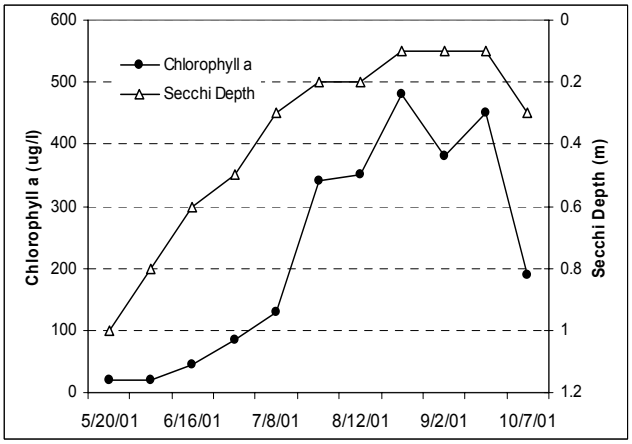
Apple Valley, Dakota Co.

Lake ID: 190023
WD: Vermillion River
Volunteer: Bill Sherry

● Sampling site
Contours in meters

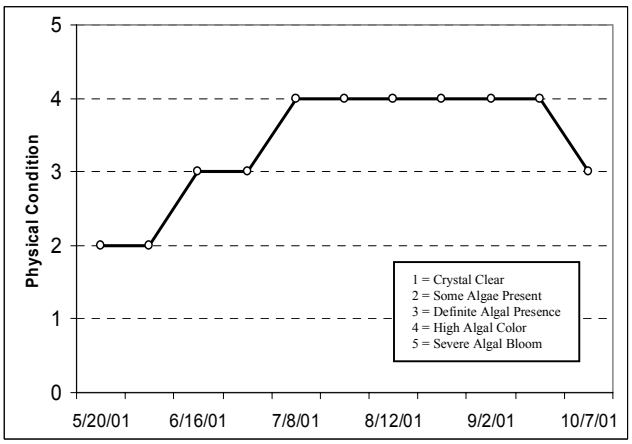






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/20	20				21	80		1.0	2	2
6/10	24				20	70		0.8	2	3
6/16	22				44	110		0.6	3	3
6/26	27				85	130		0.5	3	3
7/8	28				130	160		0.3	4	3
7/22	29				340	230		0.2	4	4
8/12	25				350	320		0.2	4	4
8/19	25				480	400		0.1	4	4
9/2	23				380	360		0.1	4	4
9/16	18				450	340		0.1	4	4
10/7	12				190	280		0.3	3	3

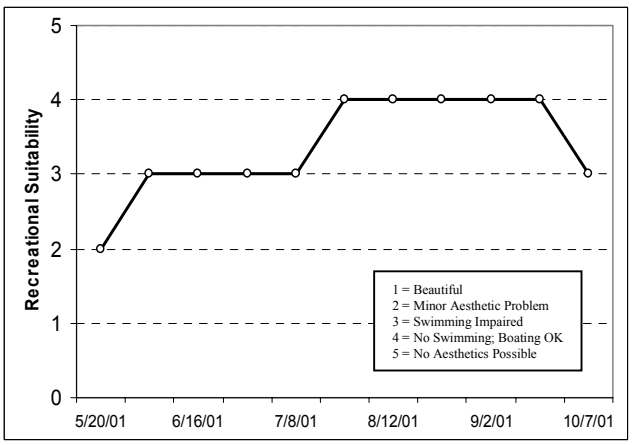


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	D	D	D		F	F	F
Chlorophyll a				B	C	C	D		F	F	F
Secchi Depth				C	D	C	D		F	F	F
Overall				**C**	**D**	**C**	**D**		**F**	**F**	**F**

Source: Metropolitan Council and STORET data



Fireman's Lake (10-0266) *Carver County Environmental Services*

This year was the first year that Fireman's Lake (located within the City of Chaska [Carver County]), has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided no data. Therefore, 2001 is the only year of available water quality data for the lake.

The lake was monitored 12 times from mid-May to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 21.0 µg/l (minimum concentration of 10.0 µg/l and a maximum value of 30.0 µg/l); surface chlorophyll-a= 6.6 µg/l (minimum of 1.7 µg/l and maximum of 22.0 µg/l); Secchi transparency= 2.9 m (minimum of 1.2 m and a maximum of 3.5 m); and TKN= 0.57 mg/l (minimum of 0.38 mg/l and maximum of 0.87 mg/l). The lake's summer means translate to water quality grades of A for TP, A, for CLA, and B for Secchi transparency. These grades result in an overall water quality grade of A for Fireman's Lake in 2001.

As mentioned earlier, there are no water quality data available for Fireman's Lake other than the limited 2001 CAMP data. Therefore it is impossible 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 2.5 for physical condition (between 2- "some algae prersent" and 3- "definite algal presence"), and 2.3 for recreational suitability (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

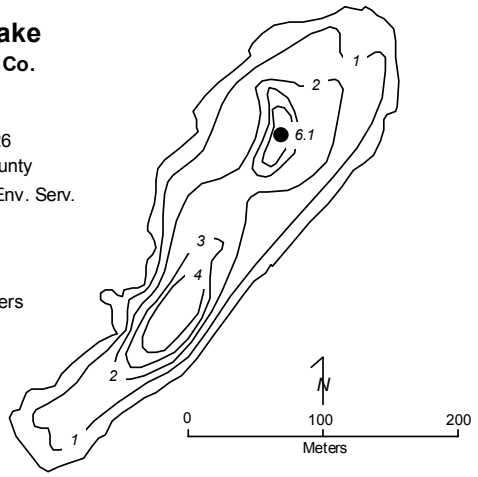
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

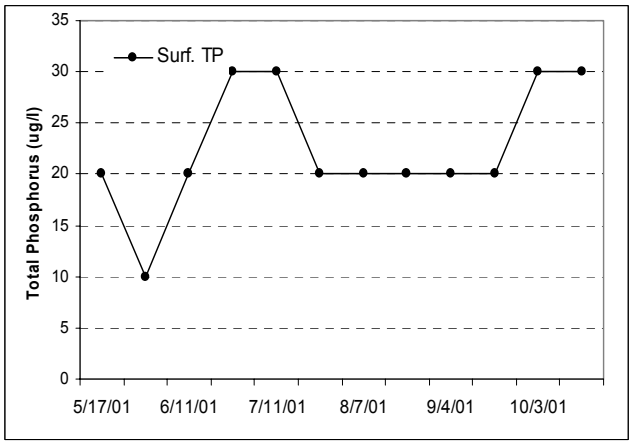
Fireman's Lake

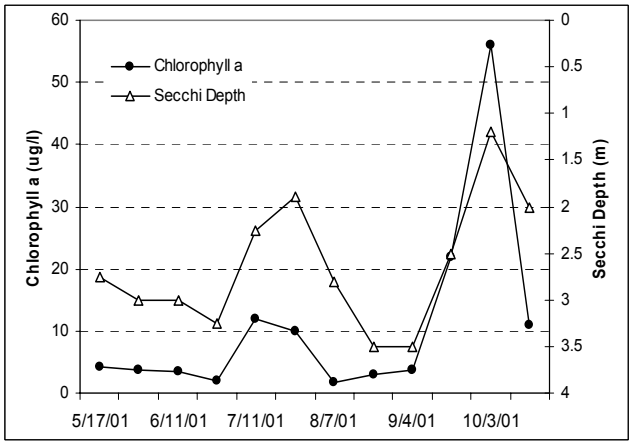
Chaska, Carver Co.

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

● Sampling site
Contours in meters

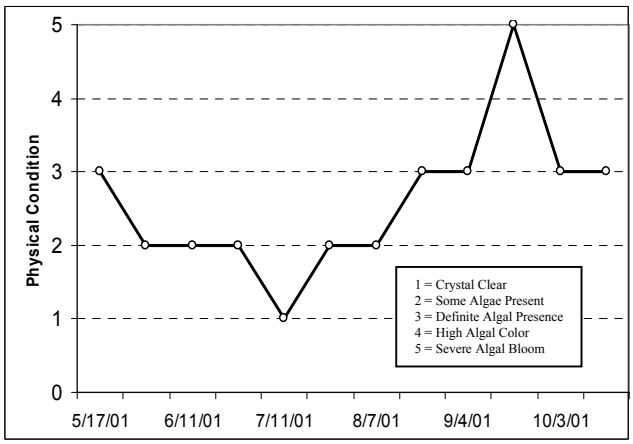






2001 Data

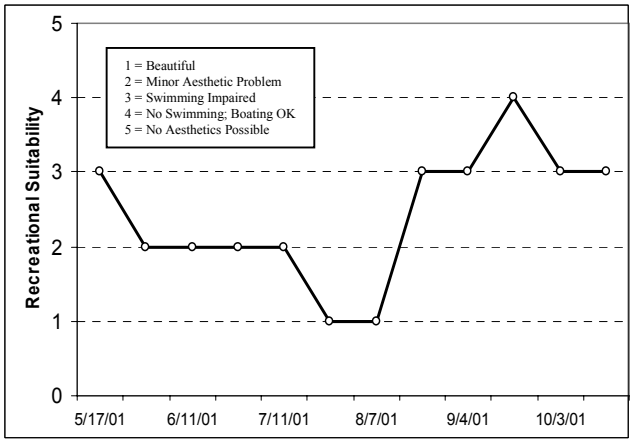
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/17	22.5		11.94		4.3	20		2.8	3	3
6/1	18.4		11.77		3.8	10		3.0	2	2
6/11	24.4		10.35		3.4	20		3.0	2	2
6/25	25.9		8.24		2	30		3.3	2	2
7/11	28.6		7.27		12	30		2.3	1	2
7/25	26.8		10.05		10	20		1.9	2	1
8/7	32.2		9.61		1.7	20		2.8	2	1
8/20	25.4		10.3		3	20		3.5	3	3
9/4	25.3		10.84		3.8	20		3.5	3	3
9/17	19.8		8.25		22	20		2.5	5	4
10/3	16.9		11.99		56	30		1.2	3	3
10/17	12.2		7.55		11	30		2.0	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											A
Chlorophyll a											A
Secchi Depth											B
Overall											**A**



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 fifth 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 nine times between early-June and mid-October, 2001. 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 1998-2000).

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.

The 2001 mean concentrations were as follows; TP= 66.3 µg/l (minimum of 30.0 µg/l and a maximum of 100.0 µg/l), CLA= 18.9 µg/l (minimum of 4.9 µg/l and maximum of 40.0 µg/l), Secchi transparency= 2.8 m (minimum of 1.1 m and maximum of 5.8 m), and TKN= 1.40 mg/l (minimum and maximum of 0.96 and 1.70 mg/l, respectively). The means resulted in grades of C for TP and B for CLA and Secchi transparency. The resulting 2001 overall water quality grade for the lake was B was the best recorded to date

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 2.3 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 2.3 (2- "minor aesthetic problem" and 3- "swimming slightly impaired").

Because there are the only nine years of available data, no long-trends can be determined. On the short-term, however, the lake seems to be very well represented by an overall lake water quality grade of C+. In order to detect any possible long-term trends, more years of monitoring are needed.

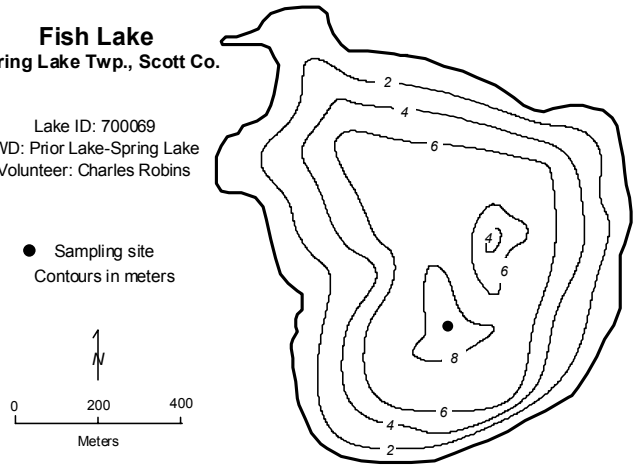
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

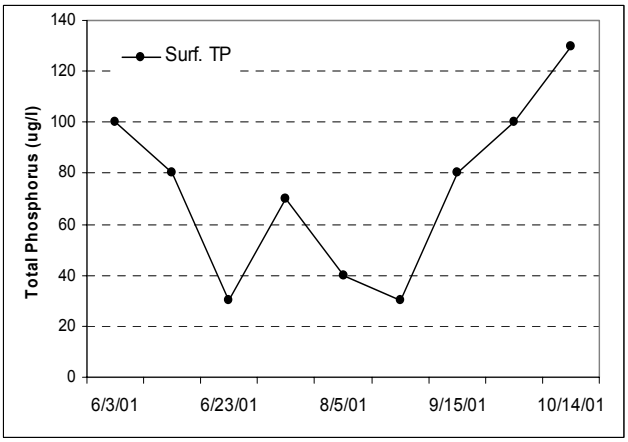
If you know of any erroneous lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Fish Lake

Spring Lake Twp., Scott Co.

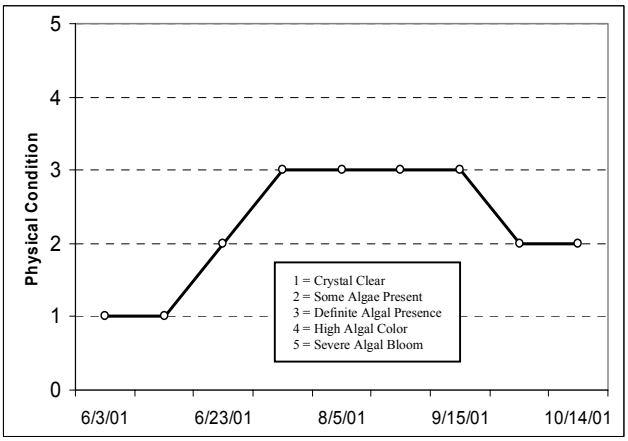
Lake ID: 700069
WD: Prior Lake-Spring Lake
Volunteer: Charles Robins





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/3	15		8.25		7.3	100		5.8	1	1
6/10	16				7	80		5.8	1	1
6/23	24.1				5.3	30		3.0	2	2
7/24	26.9				17	70		1.8	3	3
8/5	28				35	40		1.4	3	3
8/16	26.9				40	30		1.1	3	3
9/15	24.6				4.9	80		1.7	3	3
9/30	22.4				35	100		1.9	2	2
10/14	20.1				71	130		2.0	2	2

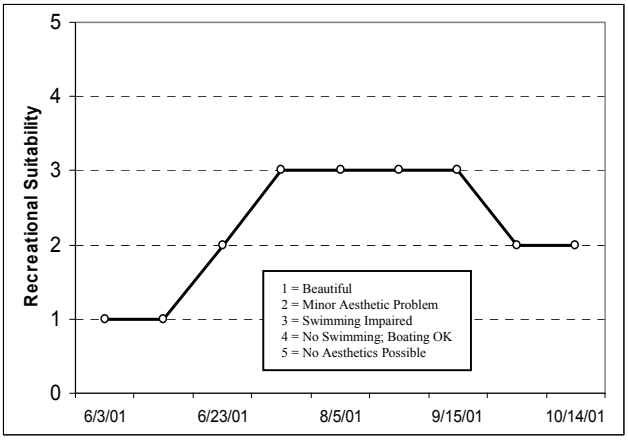


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					C		C	C	C	C	C
Chlorophyll a					C		C	C	C	C	B
Secchi Depth					D		C	C	C	B	B
Overall					**C**		**C**	**C**	**C**	**C**	**B**

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 second 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 (1998-2000) collected over the past twenty years.

The lake was monitored 14 times between early-May and mid-October, 2001. 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 mean summertime (May through September) surface TP concentration was 86.9 µg/l (minimum of 50.0 µg/l, maximum of 130.0 µg/l). The mean CLA and Secchi transparency readings were 91.1 µg/l (minimum of 26.0 µg/l, maximum of 170.0 µg/l) and 0.6 m (minimum of 0.5 m, maximum of 1.1 m), respectively. The lake's mean surface TKN concentration was 3.40 mg/l (minimum of 2.00 mg/l, maximum of 5.20 mg/l).

Similar to that recorded in 2000, the lake's 2001 quality grades determined from each parameter's summertime mean are TP= D, CLA= F, and Secchi transparency= F. The resulting overall grade for 2001 is F (as it was it was in 2000). The lake's 2001 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. 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 2.9 (roughly 3- "definite algae present"), while the mean recreational suitability ranking was 4.1 (roughly 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.

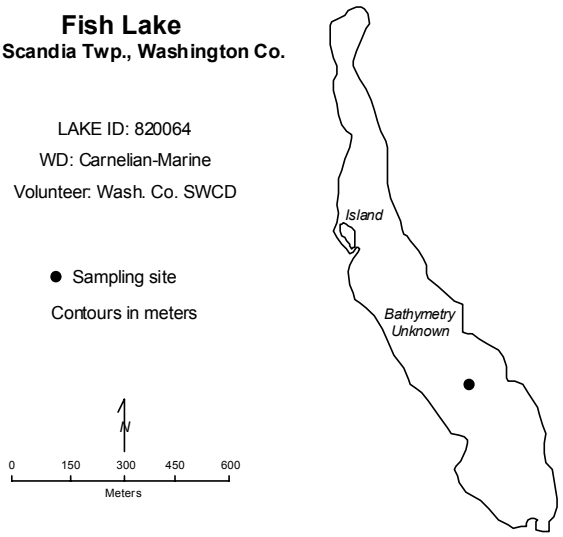
Fish Lake

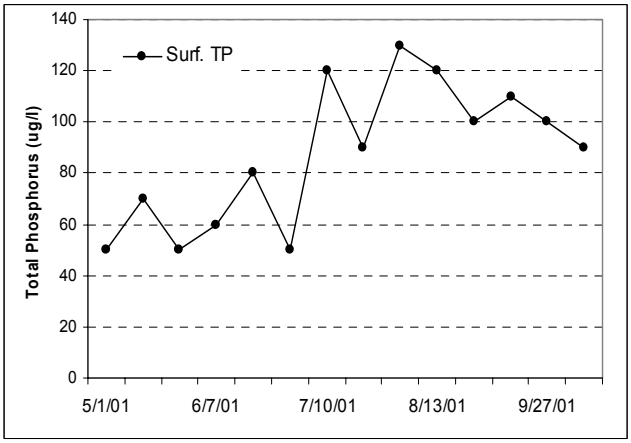
New Scandia Twp., Washington Co.

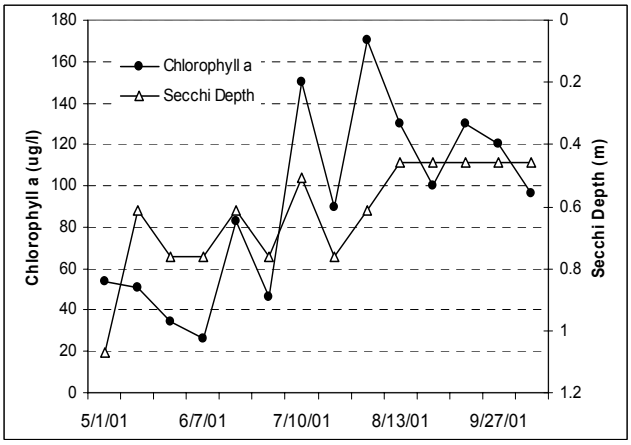
LAKE ID: 820064

WD: Carnelian-Marine

Volunteer: Wash. Co. SWCD

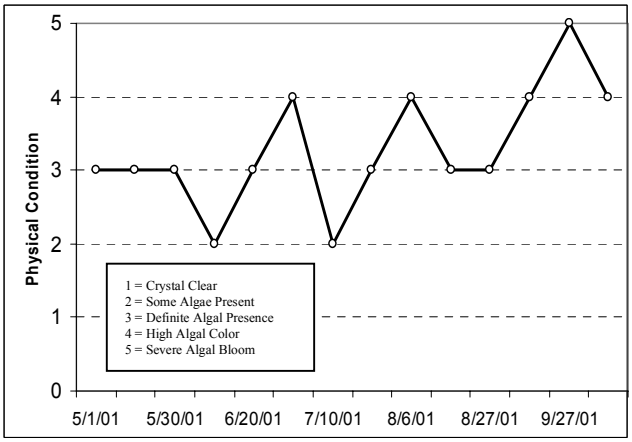






2001 Data

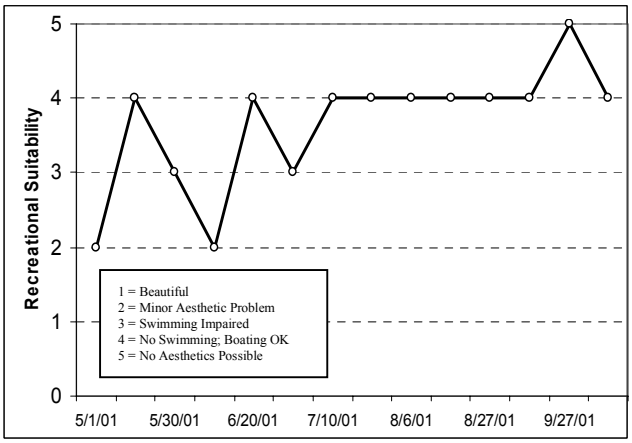
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	16.8		8.9		54	50		1.1	3	2
5/18	22.6		11.9		51	70		0.6	3	4
5/30	20.4		12.2		34	50		0.8	3	3
6/7	17.5		8.8		26	60		0.8	2	2
6/20	23.7		8.22		83	80		0.6	3	4
6/28	28.6		10.58		46	50		0.8	4	3
7/10	27		10.89		150	120		0.5	2	4
7/24	27.6		8.83		90	90		0.8	3	4
8/6	30		8.3		170	130		0.6	4	4
8/13	26.2		9.35		130	120		0.5	3	4
8/27	24.6		9.16		100	100		0.5	3	4
9/11	20.4		10.4		130	110		0.5	4	4
9/27	16.1		14.76		120	100		0.5	5	5
10/10	11.8		9.1		96	90		0.5	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								F	F	D	D
Chlorophyll a								D	D	F	F
Secchi Depth								F	F	F	F
Overall								**F**	**F**	**F**	**F**



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 2001. Because of the lake's multi-recreational uses it is considered a "Priority Lake" in the Metropolitan Area.

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 seveththh year that the west basin of Forest Lake has been involved in CAMP (the previous being 1993, and 1996-2000). In 2001, the west basin of Forest Lake was monitored 14 times between late-April and mid-October. Results are presented on graphs and data tables on the following page.

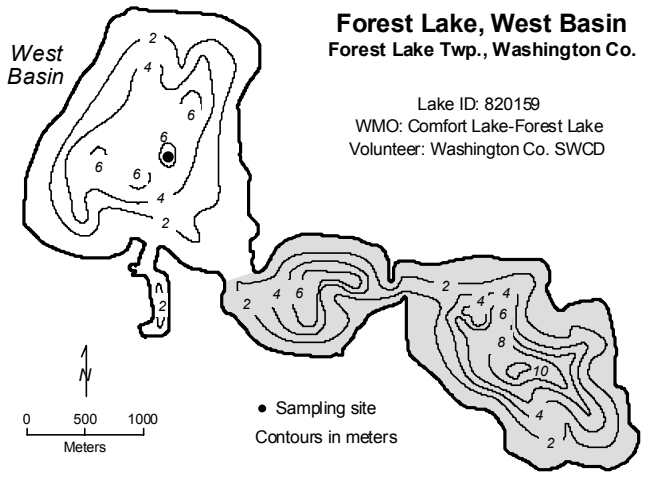
The overall lake quality grade for the west basin of Forest Lake in 2001 was B. This was determined from the individual parameter grades. The lake's 2001 summertime (May through September) mean TP concentration of 26.7 µg/l (minimum of 10.0 µg/l and maximum of 40.0 µg/l) corresponds to a lake water quality grade of B for the basin, as did the CLA mean of 16.7 µg/l (minimum and maximum of 4.7 and 33.0 µg/l). The west basin's mean Secchi transparency of 1.7 m (minimum of 0.9 m and maximum of 3.2 m) assigns a grade of C for water clarity. The mean TKN concentration over the same time period was 0.86 mg/l (minimum of 0.60 mg/l, maximum of 1.10 mg/l).

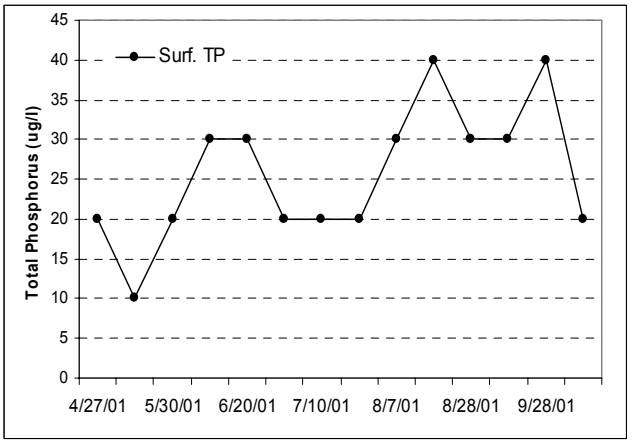
Given the volatility of the lake's annual water quality (the lake received overall water quality grades of C in 1984, 1986, 1988, 1991, 1992, 1999, and 2000, and B in 1989, 1997-1998, and 2001), no definitive long-trends can be determined at this time. The lake's water quality fluctuates beween and B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

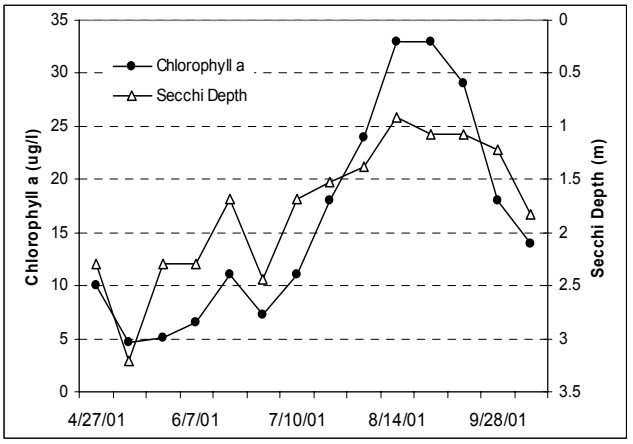
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The mean perceived physical condition of the west basin of Forest Lake was 2.8 (ranking between 2- " some algae present" and 3- "definite algae present"), while the mean recreational suitability was 2.7 (falling between 2- "minor aesthetics 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 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.

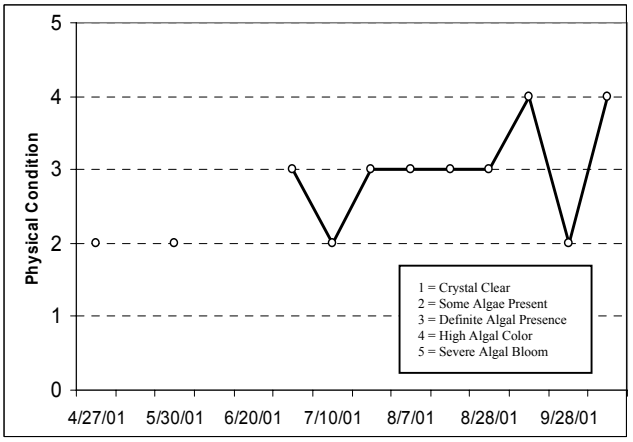


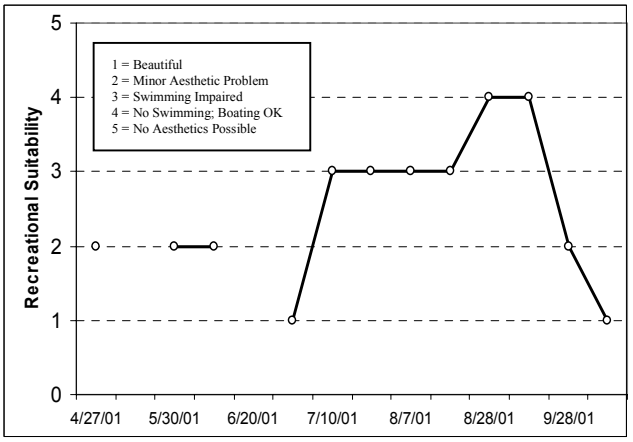




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					10	20		2.3	2	2
5/15	18				4.7	10		3.2		
5/30	17.2		10.4		5.1	20		2.3	2	2
6/7	16.7		9		6.6	30		2.3		2
6/20	21.6		6.09		11	30		1.7		
6/28	26.2		8.79		7.3	20		2.4	3	1
7/10	25.8		9.87		11	20		1.7	2	3
7/25	25.9		8.8		18	20		1.5	3	3
8/7	30.1		9.04		24	30		1.4	3	3
8/14	24.9		7.36		33	40		0.9	3	3
8/28	23.9		10.44		33	30		1.1	3	4
9/13	19.8		10.8		29	30		1.1	4	4
9/28	15.6		12.24		18	40		1.2	2	2
10/11	11.9		7.39		14	20		1.8	4	1





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	C		C			C	B	B	C	C	B
Chlorophyll a	B		B			B	B	B	B	B	B
Secchi Depth	C		C			C	C	C	C	C	C
Overall	**C**		**C**			**C**	**B**	**B**	**C**	**C**	**B**

Source: Metropolitan Council and STORET data

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

This was the first year that French Lake (a 352-acre lake located within the boundaries of Dayton [Hennepin County]), has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake provided limited data (just Secchi data in 1985). Therefore, 2001 is the only year of available nutrient water quality data for the lake.

The lake was monitored 11 times from late-April to mid-September, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 275.5 µg/l (minimum concentration of 50.0 µg/l and a maximum value of 650.0 µg/l); surface chlorophyll-a= 34.5 µg/l (minimum of 4.4 µg/l and maximum of 12.0 µg/l); Secchi transparency= 0.6 m (minimum of 0.3 m and a maximum of 0.9 m); and TKN= 2.41 mg/l (minimum of 1.40 mg/l and maximum of 4.30 mg/l). The lake's summer means translate to water quality grades of F for TP, C, for CLA, and F for Secchi transparency. These grades result in an overall water quality grade of D for French Lake in 2001.

As mentioned earlier, there was little water quality data found for French Lake prior to the 2001 CAMP data. Therefore it is impossible 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 2.9 for physical condition (roughly equal to 3- "definite algal presence"), and 4.1 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aethetics 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.

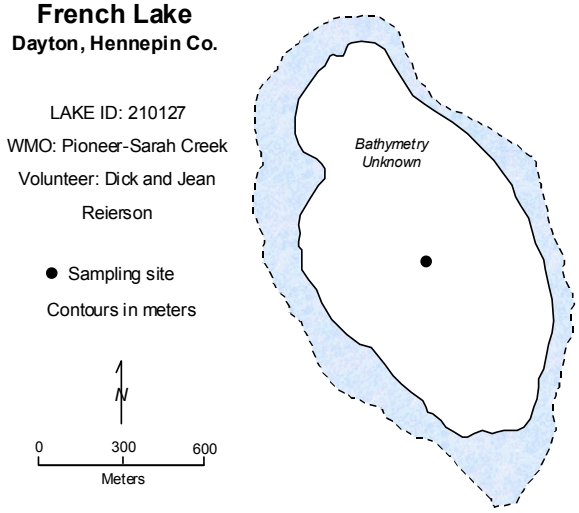
French Lake

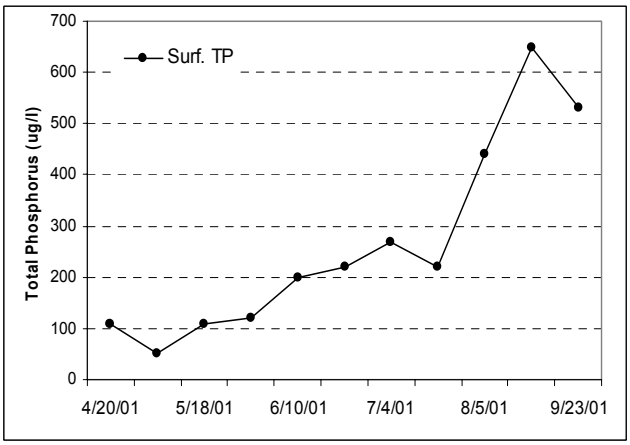
Dayton, Hennepin Co.

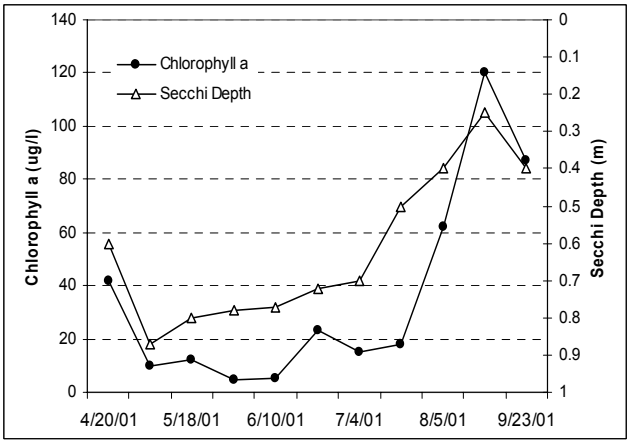
LAKE ID: 210127

WMO: Pioneer-Sarah Creek

Volunteer: Dick and Jean Reierson

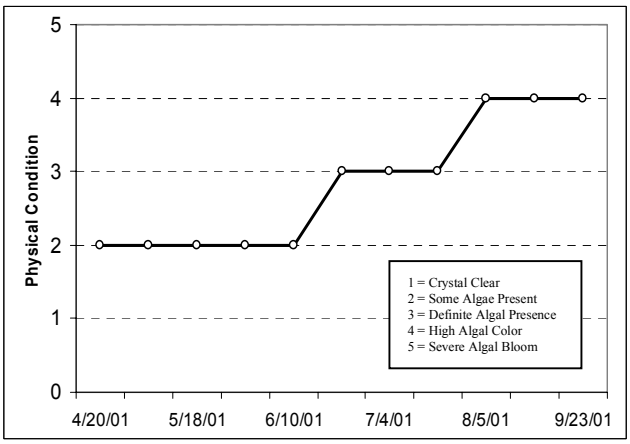






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/20	10				42	110		0.6	2	4
5/4	16				10	50		0.9	2	4
5/18	21				12	110		0.8	2	4
5/27	17				4.4	120		0.8	2	4
6/10	25				5.4	200		0.8	2	4
6/22	23				23	220		0.7	3	4
7/4	24				15	270		0.7	3	4
7/21	31				18	220		0.5	3	4
8/5	28				62	440		0.4	4	4
9/2	21				120	650		0.3	4	5
9/23	15.6				87	530		0.4	4	4

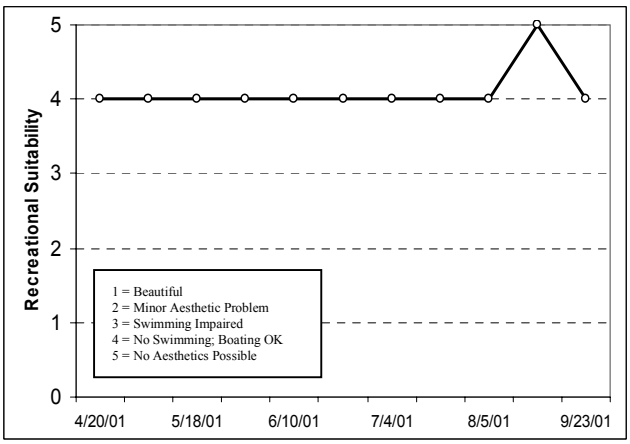


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											F
Chlorophyll a											C
Secchi Depth											F
Overall											**D**

Source: Metropolitan Council and STORET data



Gaystock Lake (10-0031) *Carver County Environmental Services*

This year marks the third year of CAMP monitoring on Gaystock Lake (1999-2000 being the others), which is located in Dahlgren Township (Carver County). Other than the 1999-2000 CAMP data, a search for any historical water quality data came up empty. The 105-acre lake has a maximum depth of 5.0 m (16 feet). Because of the shallowness of the lake, the majority of its are 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.

The lake was monitored 14 times between late-April and mid-October, 2001. 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.

The mean summertime (May through September) surface TP concentration for the lake was 289.0 µg/l (minimum of 90.0 µg/l, maximum of 450.0 µg/l). The mean CLA and Secchi transparency readings were 87.9 µg/l (minimum of 21.0 µg/l, maximum of 310.0 µg/l) and 0.9 m (minimum of 0.2 m, maximum of 1.5 m), respectively. The lake's mean surface TKN concentration was 2.28 mg/l. The lake quality grades assigned to the 2001 summertime means are TP= F; CLA= F; and Secchi= D, resulting in an overall grade of F. While the lake's overall grade in 2001 was identical to that of 2000, the individual parameter means were much better in 2001.

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 3.1 (between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability ranking was 3.8 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

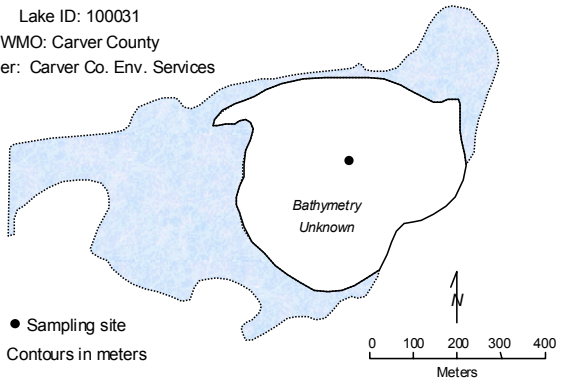
Because 2001 was only the third year of available data, no long- or short-term trends can be determined. To better understand the lake's quality and what direction it may be heading, more years of data collection are needed.

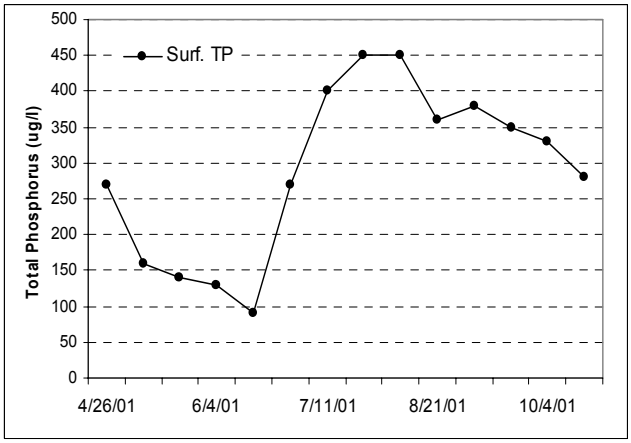
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

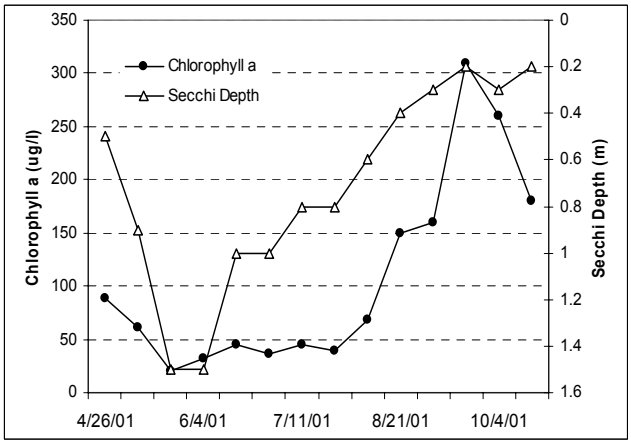
Gaystock Lake

Dahlgren Twp., Carver Co.

Lake ID: 100031
WMO: Carver County
Volunteer: Carver Co. Env. Services

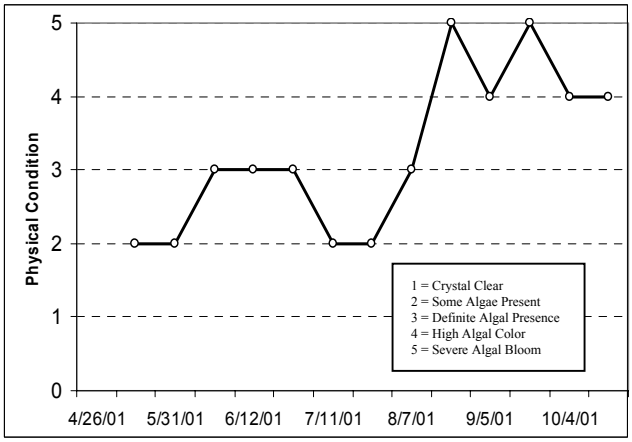






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/26	12.4		17.27		89	270		0.5		
5/3	15.9		9.59		61	160		0.9	2	4
5/31	19.2		10.57		21	140		1.5	2	3
6/4	17.2		10.77		32	130		1.5	3	4
6/12	23.6		16.63		45	90		1.0	3	3
6/26	23.6		7.65		36	270		1.0	3	3
7/11	27.5		4.49		45	400		0.8	2	4
7/23	29.9		8.88		39	450		0.8	2	2
8/7	30.6		7.41		68	450		0.6	3	4
8/21	23.3		16.83		150	360		0.4	5	5
9/5	22.5		7.46		160	380		0.3	4	5
9/17	17.9		8.8		310	350		0.2	5	5
10/4	15.4		7.81		260	330		0.3	4	5
10/17	9.5		9.15		180	280		0.2	4	5

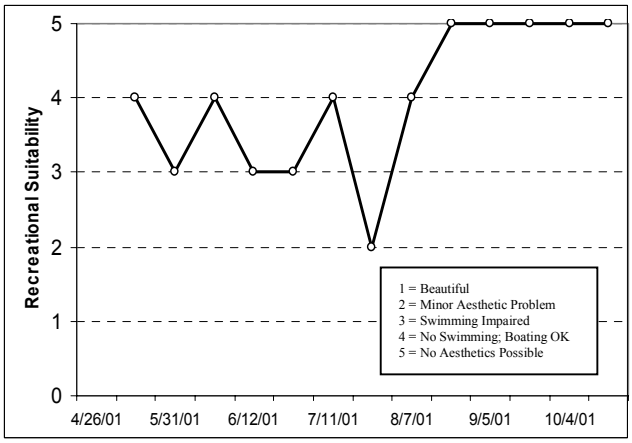


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										C	F
Chlorophyll a										F	F
Secchi Depth										F	D
Overall										**D**	**F**

Source: Metropolitan Council and STORET data



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

This was the sixth year that George Watch Lake, located in the City of Lino Lakes (Anoka County), has been enrolled in CAMP. The lake was monitored seven times from late-April to late-September, 2001. 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.

Summertime (May through September) means for the variables monitored were: surface TP= 327.1 µg/l (minimum concentration of 60.0 µg/l, maximum value of 680.0 µg/l); surface chlorophyll-a= 96.4 µg/l (minimum of 6.9 µg/l, maximum of 280.0 µg/l); Secchi transparency= 0.7 m (minimum of 0.1 m [the worst recorded in CAMP 2001], and maximum of 1.4 m); and TKN= 4.26 mg/l. The associated lake quality grades for the 2001 means (TP= F, CLA= F, and Secchi= D) translated to an overall water quality grade of F for the lake in 2001 .

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

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 1996-2000. 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 3.3 (between 3- "definite algal presence" and 4- "high algal color"). The mean suitability for recreation ranking was 4.0 ("no swimming - boating ok").

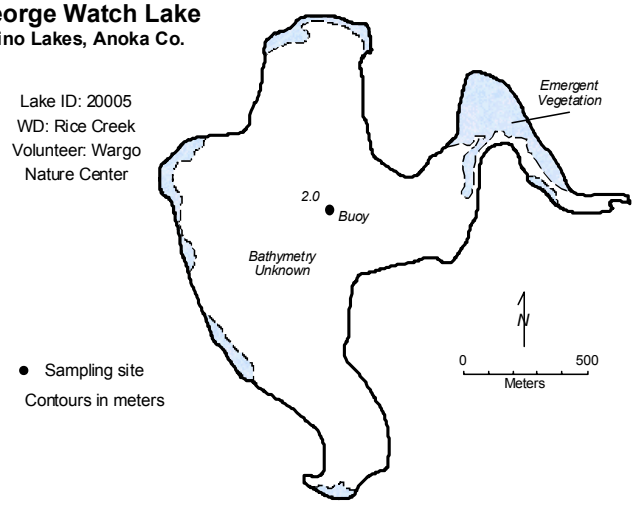
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

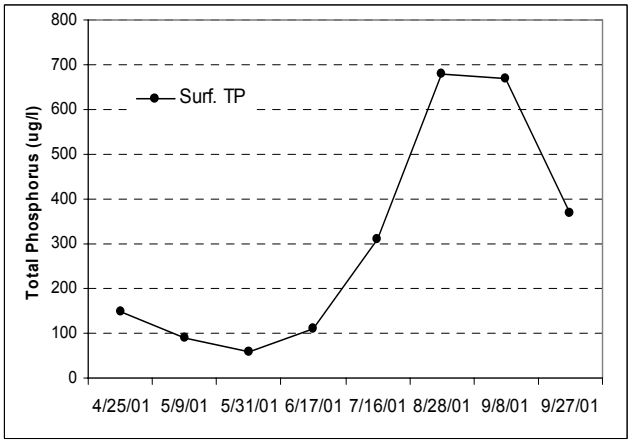
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

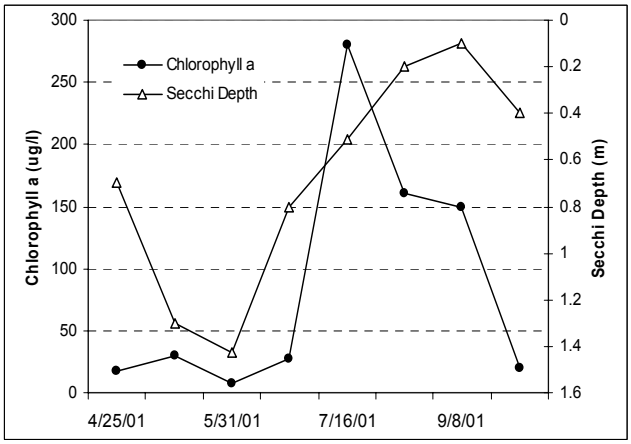
George Watch Lake

Lino Lakes, Anoka Co.

Lake ID: 20005
WD: Rice Creek
Volunteer: Wargo Nature Center

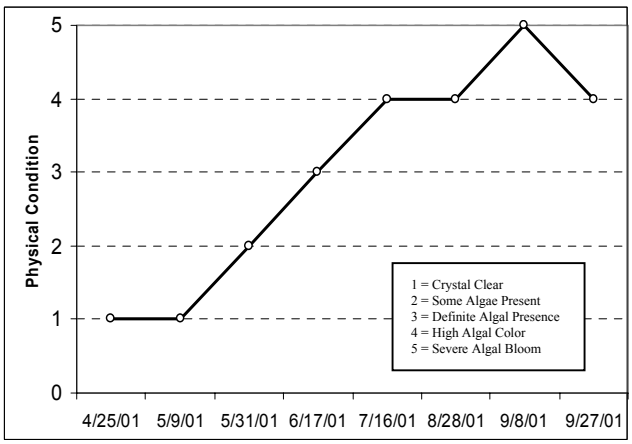






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/25	10				18	150		0.7	1	4
5/9	15				30	90		1.3	1	4
5/31	19				6.9	60		1.4	2	4
6/17	24				28	110		0.8	3	4
7/16	28				280	310		0.5	4	4
8/28	26				160	680		0.2	4	4
9/8	20				150	670		0.1	5	4
9/27	20				20	370		0.4	4	4

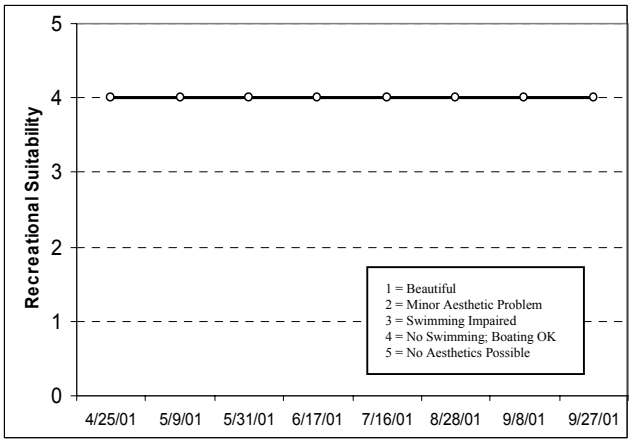


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	F					F	D	F	D	D	F
Chlorophyll a	F					D	C	D	C	C	F
Secchi Depth	F					F	F	F	D	F	D
Overall	**F**					**F**	**D**	**F**	**D**	**D**	**F**

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 third year that Goggins Lake has been involved in CAMP (1999 and 2000 being the other CAMP years). 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 early-May and mid-October, 2001. 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 mean summertime (May through September) surface TP concentration was 95.4 µg/l (minimum of 30.0 µg/l, maximum of 180.0 µg/l). The mean CLA and Secchi transparency readings were 39.7 µg/l (minimum of 14.0 µg/l, maximum of 69.0 µg/l) and 1.0 m (minimum of 0.5 m, maximum of 2.0 m), respectively. The lake's mean surface TKN concentration was 1.50 mg/l (minimum of 0.68 mg/l, maximum of 2.20 mg/l).

The lake quality grades determined from each parameter's summertime mean are TP= D, CLA= C, and Secchi transparency= D, resulted in a 2001 overall grade of D. The 2001 overall grade is identical to that recorded in 2000, but is worse than the overall grade of C recorded in 1999. Results are presented on graphs and data tables on the following page.

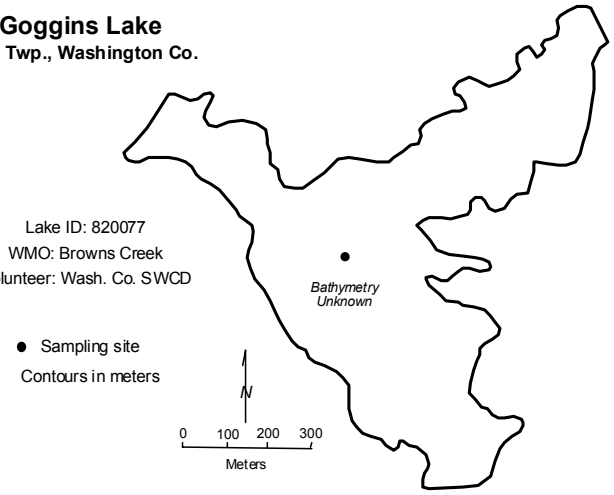
Because 2001 is just the third year that data are available for the lake, long- or short-term trends are not possible to determine. To better understand the lake's water quality and what direction it may be heading, more years of data collection are needed.

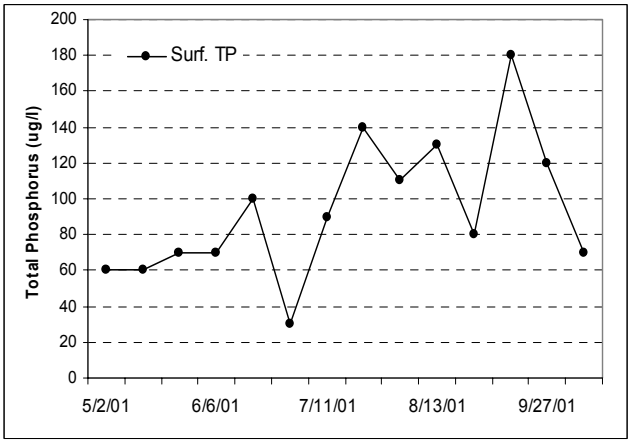
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.1 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 3.6 for recreational suitability (between 3- "swimming slightly impaired" and 4- " no swimming – boating ok).

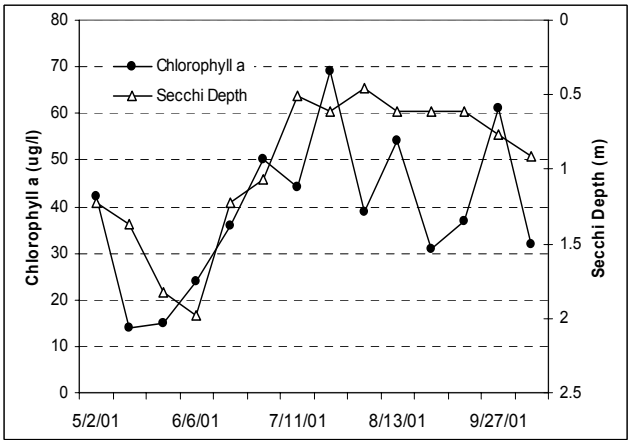
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Goggins Lake

May Twp., Washington Co.

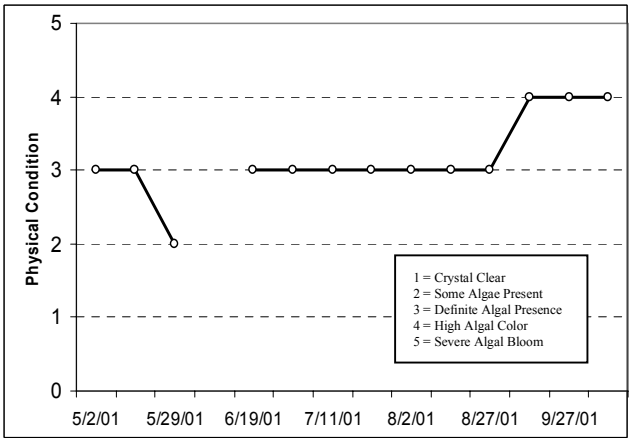






2001 Data

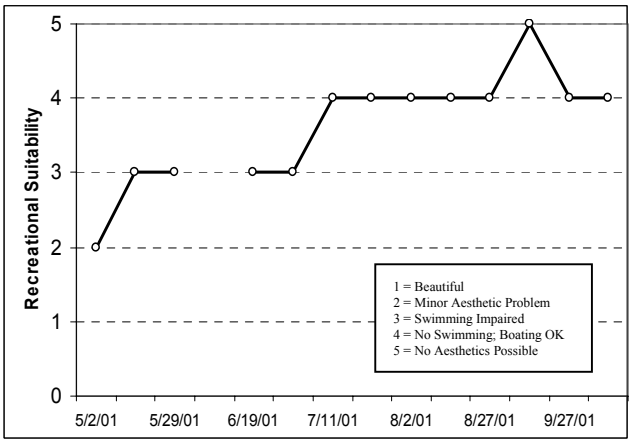
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	16.1		10.7		42	60		1.2	3	2
5/16	21.8		12.06		14	60		1.4	3	3
5/29	18.3		11.5		15	70		1.8	2	3
6/6	16.5		10.4		24	70		2.0		
6/19	21.8		6.3		36	100		1.2	3	3
6/29	27.5				50	30		1.1	3	3
7/11	28.5		18		44	90		0.5	3	4
7/23	29.4		12.9		69	140		0.6	3	4
8/2	28.9		11.78		39	110		0.5	3	4
8/13	26.8		9.03		54	130		0.6	3	4
8/27	25.4		10.53		31	80		0.6	3	4
9/11	22		11.5		37	180		0.6	4	5
9/27	18.3		15.6		61	120		0.8	4	4
10/16	10.5		8.9		32	70		0.9	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									D	D	D
Chlorophyll a									C	C	C
Secchi Depth									C	D	D
Overall									**C**	**D**	**D**



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 14 times between late-April and late-October, 2001. 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. The 2001 mean summertime (May through September) surface TP concentration for the lake was 78.9 µg/l (minimum of 50.0 µg/l, maximum of 120.0 µg/l). The mean CLA and Secchi transparency readings were 62.8 µg/l (minimum of 4.4 µg/l, maximum of 190.0 µg/l), and 1.0 m (minimum of 0.4 m, maximum of 2.3 m), respectively. The lake's mean surface TKN concentration was 3.07 mg/l (minimum of 2.10 mg/l, maximum of 4.70 mg/l). The lake's 2001 summertime means resulted in a TP grade of D, CLA grade of D, and Secchi transparency grade of D. The 2001 overall grade calculated from all three parameters is 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 1.8 (between 1- " crystal clear" and 2- "some algae present"). The mean suitability for recreation ranking, was 1.6 (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 1993-2001. 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, and an F in 1988-1991) throughout these 17 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.

A 1986 report by the Environmental Research Group, Inc., indicated that Golden Lake suffered from three basic problems: input of high levels of nutrients and colors which lead to decreased transparency; hypolimnetic oxygen depletion and subsequent sediment phosphorus release (internal load); and an imbalance in the biology of the lake, that contributes to poor water quality (ERG 1986). An aeration system has since been installed to raise dissolved oxygen levels and reduce internal loads.

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/.

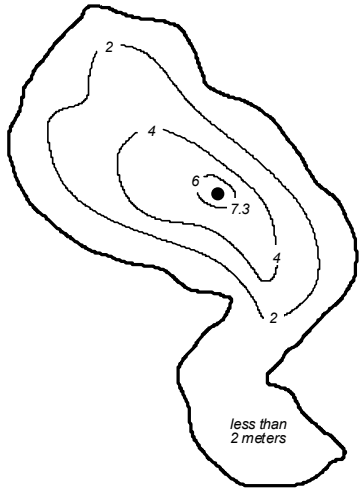
If you recognize any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

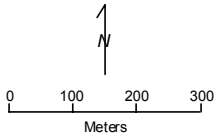
Golden Lake

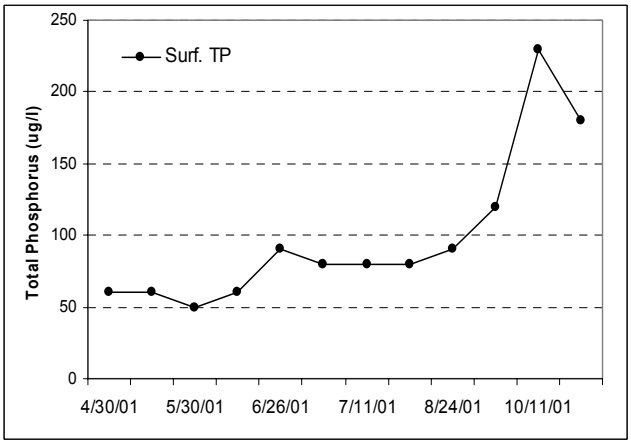
Circle Pines, Anoka Co.

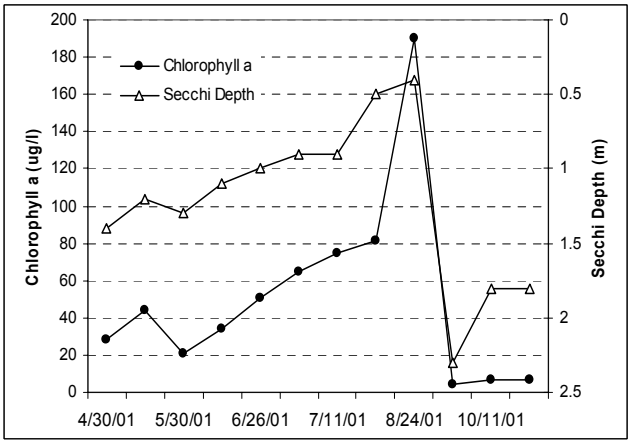
Lake ID: 20045
WD: Rice Creek
Volunteer: City of Circle Pines

● Sampling site
Contours in meters



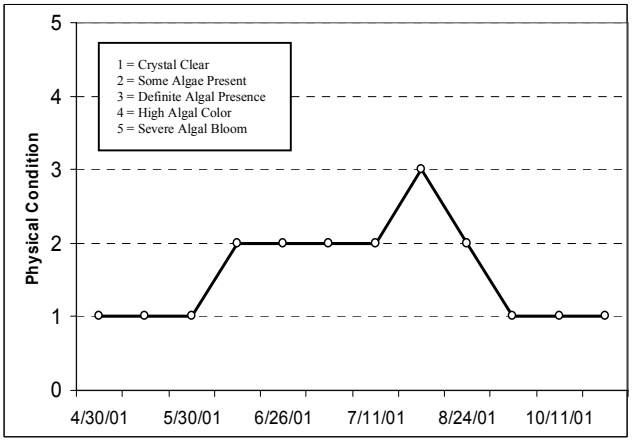


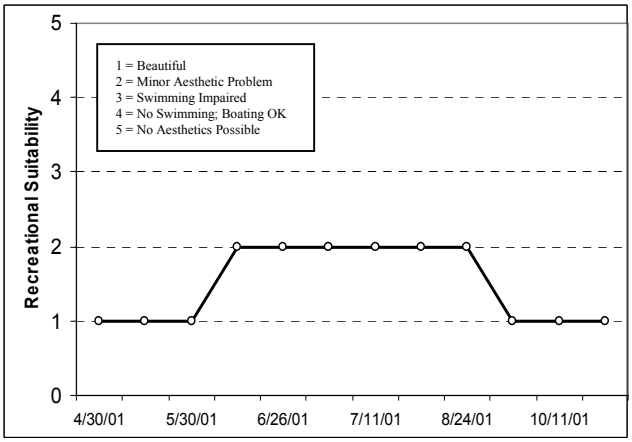




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/30	15.5				28	60		1.4	1	1
5/11	22				44	60		1.2	1	1
5/30	19				21	50		1.3	1	1
6/12	24.6				34	60		1.1	2	2
6/26	24.1				51	90		1.0	2	2
7/5	26.3				65	80		0.9	2	2
7/11	26.3				75	80		0.9	2	2
8/7	29.7				81	80		0.5	3	2
8/24	24.6				190	90		0.4	2	2
9/26	15.7				4.4	120		2.3	1	1
10/11	11.8				6.6	230		1.8	1	1
10/31	7.8				6.3	180		1.8	1	1





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D		D			C	D	C	C	C	D
Chlorophyll a	F		D			C	C	C	C	C	D
Secchi Depth	F		D			D	D	D	D	C	D
Overall	**F**		**D**			**C**	**D**	**C**	**C**	**C**	**D**

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, 2001. The lake has 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. The mean summertime (May through September) surface TP concentration for the lake was 116.4 µg/l (minimum of 70.0 µg/l, maximum of 160.0 µg/l). The mean CLA and Secchi transparency readings were 41.5 µg/l (minimum of 2.2 µg/l, maximum of 87.0 µg/l), and 1.2 m (minimum of 0.5 m, maximum of 2.5 m), respectively. The lake's mean surface TKN concentration was 3.05 mg/l (minimum of 2.10 mg/l, maximum of 3.90 mg/l). The summertime means resulted in a TP grade of D, CLA grade of C, and Secchi transparency grade of D. An overall grade of D was calculated from the grades of all three parameters.

The overall quality of the lake in 2001 was the best that it has been since 1998, which represents a significant improvement over that recorded in 2000

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 3.0 ("definite algal presence"), while the mean recreational suitability ranking was 3.6, (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

Because 2001 was only the seventh year of available data, and because of the variability among the seven years of data (grades ranging from C to F), no long-term trends can be determined. On the short-term however, the lake flucuates greatly, with an overall grade of C in 1996 and 1998, D in 1995, 1999, and 2001, and an overall grade of F in 1997 and 2000. To better understand the lake's current water quality condition, and to help detect any possible long-term trends, more years of data collection are needed.

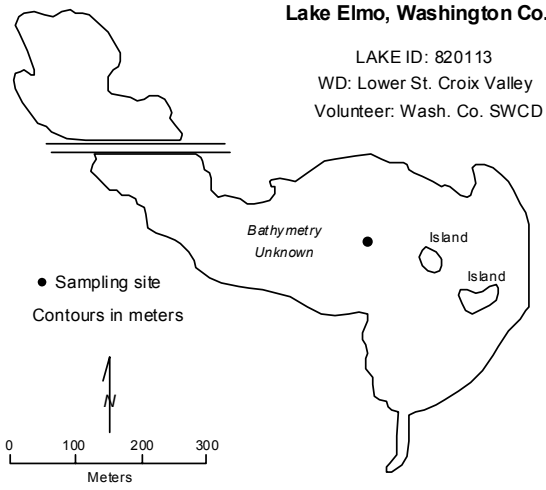
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

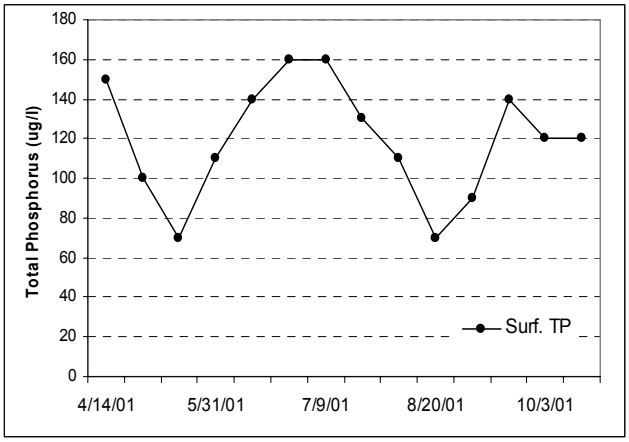
If you know of any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

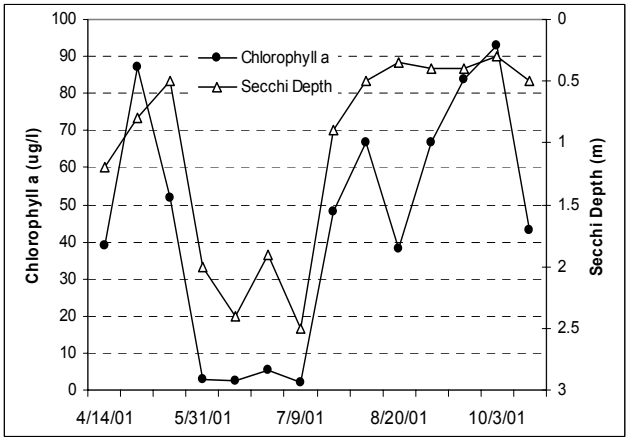
Goose Lake,

Lake Elmo, Washington Co.

LAKE ID: 820113
WD: Lower St. Croix Valley
Volunteer: Wash. Co. SWCD

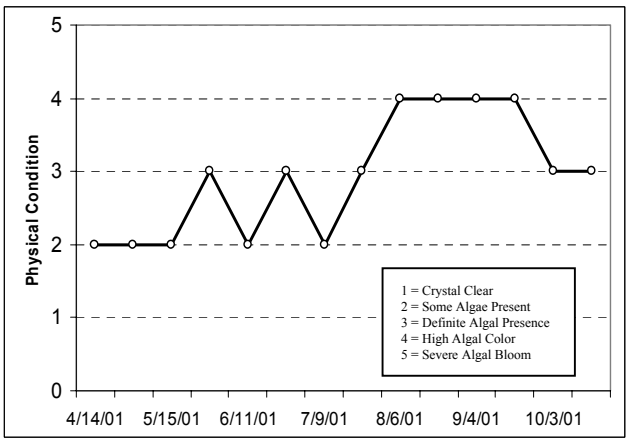


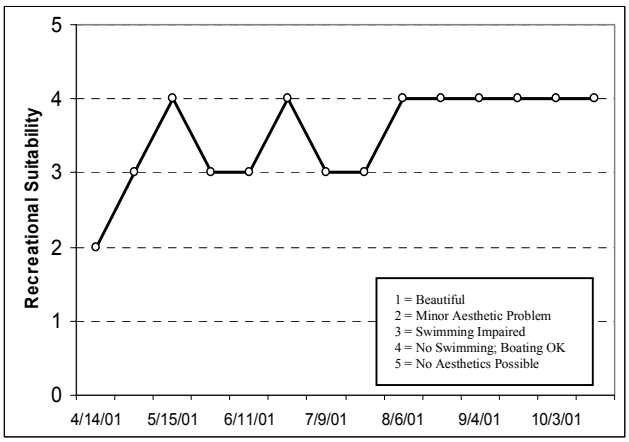




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/14	5.9		13.77		39	150		1.2	2	2
5/1	16.2		13.71		87	100		0.8	2	3
5/15	20.5		10.86		52	70		0.5	2	4
5/31	18.1		3.26		2.9	110		2.0	3	3
6/11	22.9		5.03		2.4	140		2.4	2	3
6/25	23		2.59		5.6	160		1.9	3	4
7/9	27		6.98		2.2	160		2.5	2	3
7/24	28.1		8.59		48	130		0.9	3	3
8/6	30.2		9.66		67	110		0.5	4	4
8/20	23		10.83		38	70		0.4	4	4
9/4	22.7		8.97		67	90		0.4	4	4
9/19	17.5		10.03		84	140		0.4	4	4
10/3	16.1		9.74		93	120		0.3	3	4
10/17	8.4		11.39		43	120		0.5	3	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D	C	F	D	D	F	D
Chlorophyll a					C	C	D	C	D	F	C
Secchi Depth					F	C	F	C	F	F	D
Overall					**D**	**C**	**F**	**C**	**D**	**F**	**D**

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 located in Forest Lake Township (Washington County). The lake, which has been a part of CAMP in six out of the programs nine years, has a surface area of 75 acres. The lake's mean and maximum depth of 1.7 m (5.6 feet) and 10.4 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, 2001. 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 2001. The 2001 summertime (May through September) mean concentrations were as follows; TP= 18.8 µg/l (minimum of < 10.0 µg/l (in which case 5.0 µg/l was used to calculate the summer mean) and a maximum of 30.0 µg/l), CLA= 4.9 µg/l (minimum of 1.7 µg/l and maximum of 11.0 µg/l), Secchi transparency= 4.3 m (minimum of 2.8 m and maximum of 6.4 m), and TKN= 0.63 mg/l (minimum and maximum of 0.47 and 0.79 mg/l, respectively). The summertime means resulted in grades of A for TP, CLA, Secchi transparency. The individual grades translate to an overall water quality grade of A.

The lake's 2001 individual parameter means are similar to those recorded in 2000, which were an improvement over those recorded for 1999 (the worst recorded to date as a part of CAMP). The best CAMP TP and Secchi means were recorded in 1993 while the best CLA mean was in 1996. Historic water quality data and resulting lake quality grades indicate that the lake has maintained its high quality over the past 21 years.

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 1.3 (falling 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 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

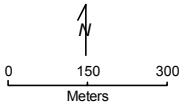
(Sylvan Lake)

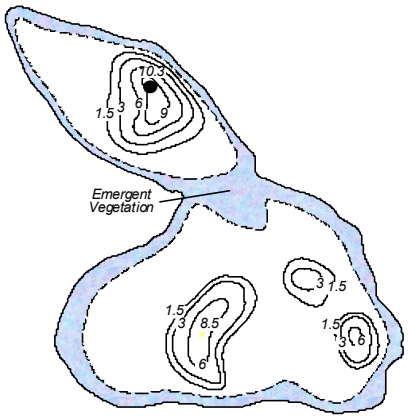
Forest Lake Twp./
New Scandia Twp.,
Washington Co.

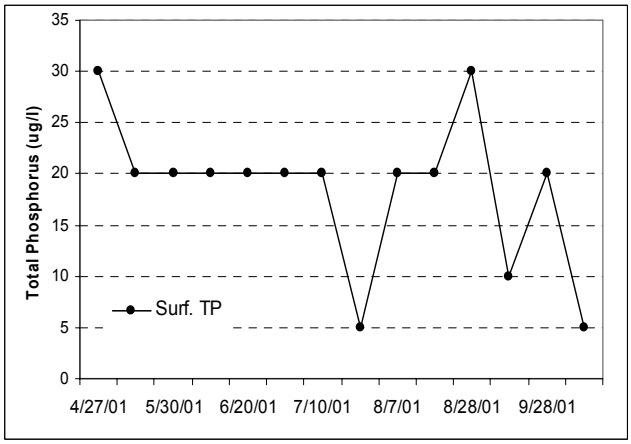
LAKE ID: 820080
WMO: Comfort Lake-Forest Lake
Volunteer: Washington Co. SWCD

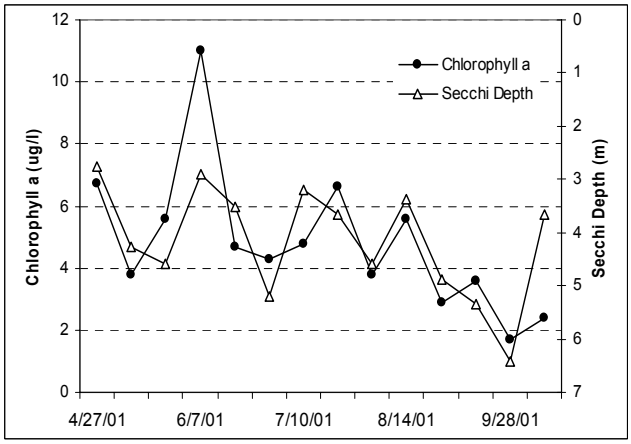
● Sampling station

Contours in meters



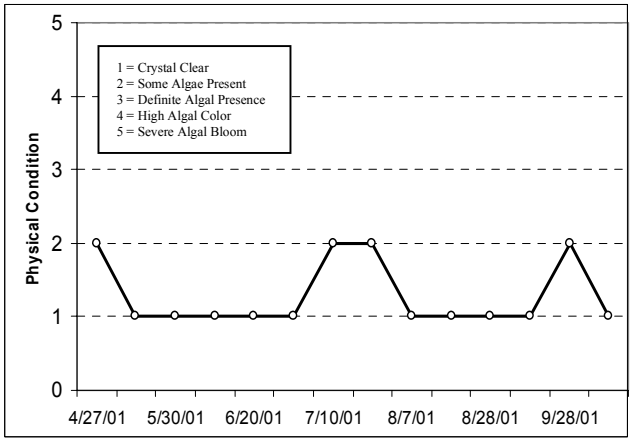


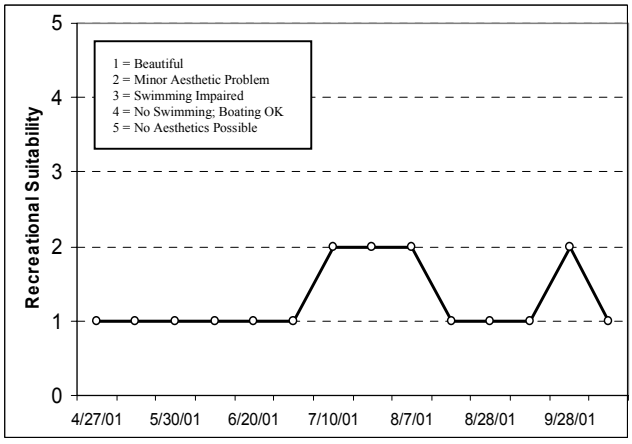




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					6.7	30		2.8	2	1
5/15	21.1		12.8		3.8	20		4.3	1	1
5/30	18.7		11.2		5.6	20		4.6	1	1
6/7	17.8		10.2		11	20		2.9	1	1
6/20	23.1		6.4		4.7	20		3.5	1	1
6/28	27.4		9.49		4.3	20		5.2	1	1
7/10	26.6		12.22		4.8	20		3.2	2	2
7/25	26.9		11.1		6.6	5		3.7	2	2
8/7	30.2		8.88		3.8	20		4.6	1	2
8/14	25.2		8.85		5.6	20		3.4	1	1
8/28	24.9		11.25		2.9	30		4.9	1	1
9/13	20.5		10.9		3.6	10		5.3	1	1
9/28	16		13.09		1.7	20		6.4	2	2
10/11	12		7.87		2.4	5		3.7	1	1





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	A		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
Overall	**A**		**A**			**A**		**A**	**A**	**A**	**A**

Source: Metropolitan Council and STORET data

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

This was the fourth year of CAMP monitoring on Hay Lake, located in New Scandia Township (Washington County). The lake was monitored 14 times between early-May and mid-October, 2001. 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 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.

The lake's overall 2001 lake quality grade of D (determined from the individual parameter grades) was identical to that recorded in 1998-2000. The summertime (May through September) mean TP concentration of 88.5 µg/l (minimum of 20.0 µg/l, maximum of 120.0 µg/l) corresponds to a lake water quality grade of D, as did the mean Secchi transparency of 0.8 m (minimum of 0.6 m, maximum of 1.2 m). The lake's mean CLA concentration of 83.9 µg/l (minimum of 34.0 µg/l and maximum of 160.0 µg/l) resulted in a grade of F. The mean TKN concentration over the same time period was 1.64 mg/l (minimum of 0.61 mg/l and maximum of 2.00 mg/l). The lake's 2001 individual lake means were the best recorded through CAMP to date.

Because 2001 is only the fourth year of available data, no long- or short-term trends can be determined. On the short-term however, the lake seems well represented with an overall water quality grade of D. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed.

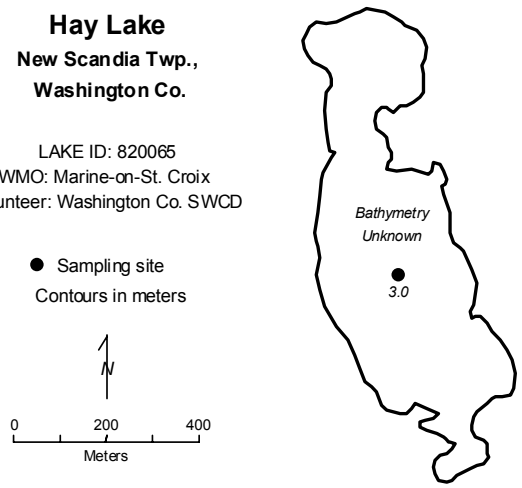
Throughout the monitoring period, the volunteer(s) ranked the perceived physical condition of the lake on a 1-to-5 scale. The mean perceived physical condition of Hay Lake was 2.9 (roughly equal to 3- "definite algal presence"), while the mean recreational suitability was 3.9 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

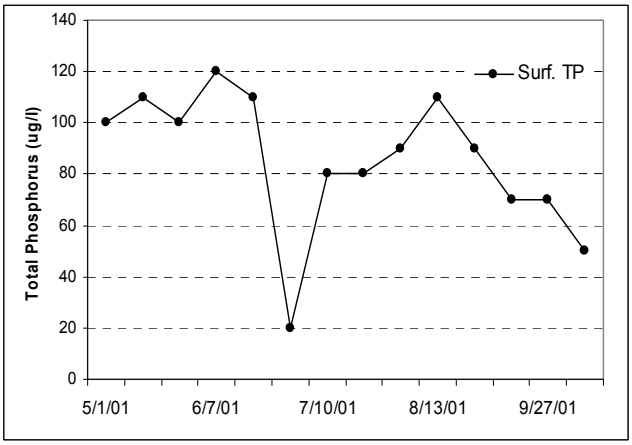
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

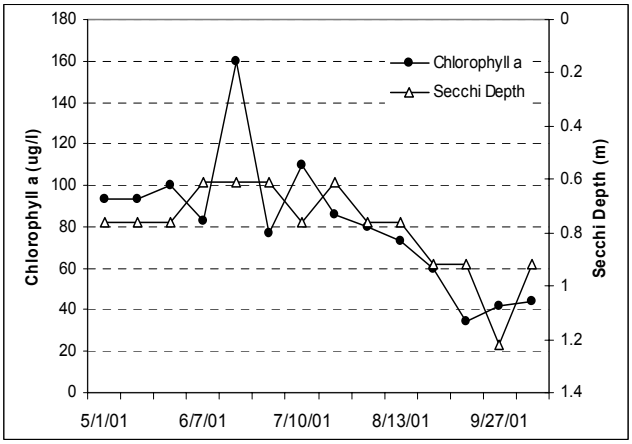
Hay Lake

New Scandia Twp.,
Washington Co.

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

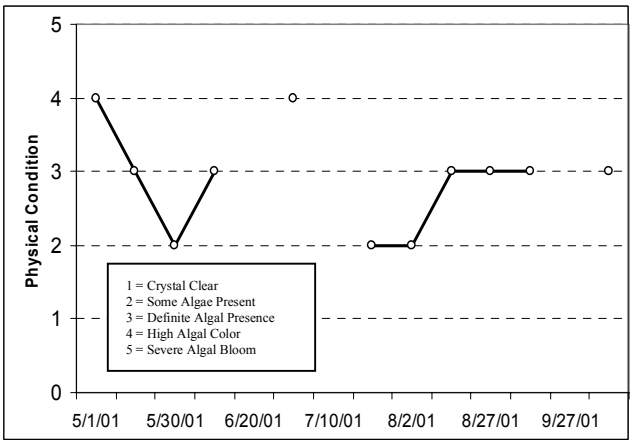






2001 Data

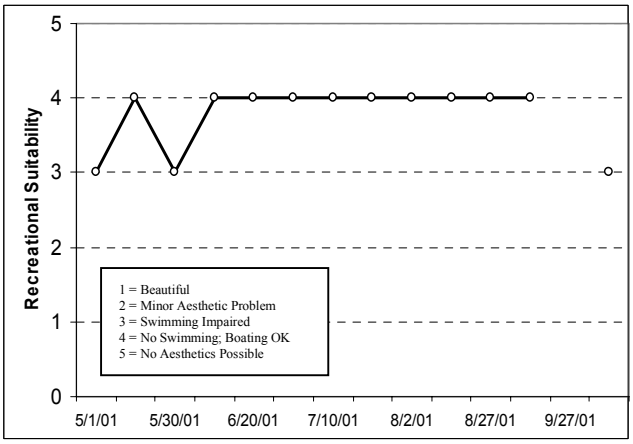
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	17.5		7.99		93	100		0.8	4	3
5/15	22.7		11.8		93	110		0.8	3	4
5/30	21.6		11.6		100	100		0.8	2	3
6/7	17.5		10		83	120		0.6	3	4
6/20	24.6		7.1		160	110		0.6		4
6/28	27.3		9.09		77	20		0.6	4	4
7/10	26.5		11.41		110	80		0.8		4
7/24	26.6		9.1		86	80		0.6	2	4
8/2	26.4				80	90		0.8	2	4
8/13	24.5		5.64		73	110		0.8	3	4
8/27	24.3		6.73		60	90		0.9	3	4
9/11	19.9		6.7		34	70		0.9	3	4
9/27	16.5				42	70		1.2		
10/10			8.11		44	50		0.9	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								D	D	D	D
Chlorophyll a								F	F	F	F
Secchi Depth								D	D	D	D
Overall								**D**	**D**	**D**	**D**



Source: Metropolitan Council and STORET data

Hazeltine Lake (10-0014) *Carver County Environmental Services*

Hazeltine Lake is a 236-acre lake located within the City of Chaska (Carver County). The maximum depth of the lake is 2.0 m (roughly six-and-a-half 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 third year that Hazeltine Lake has been involved in CAMP (1999;[where it was only monitored twice] and 2000 were the others). 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 from late-April to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 187.3 µg/l (minimum concentration of 80.0 µg/l and a maximum value of 280.0 µg/l); surface chlorophyll-a= 121.6 µg/l (minimum of 46.0 µg/l and maximum of 300.0 µg/l); Secchi transparency= 0.4 m (minimum of 0.2 m and a maximum of 0.9 m); and TKN= 3.55 mg/l (minimum of 2.00 mg/l and maximum of 6.90 mg/l). The lake's summer means translate to water quality grades of F for TP, F, for CLA, and F for Secchi transparency. Similar to that recorded in 2000, the individual grades result in an overall water quality grade of F for Hazeltine Lake in 2001.

As mentioned earlier, there is very little water quality data available for Hazeltine Lake. Therefore it is impossible 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.

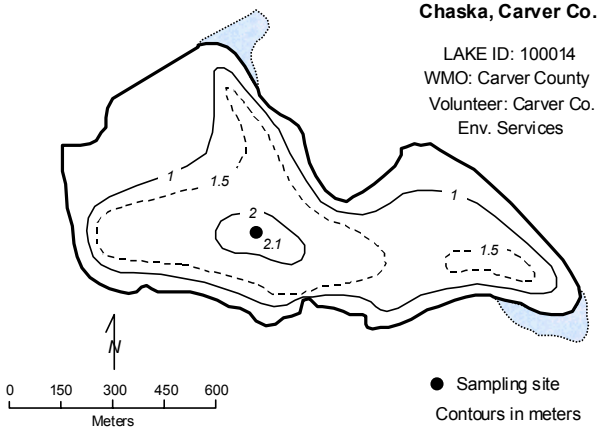
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.9 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 4.1 for recreational suitability (roughly equal to 4- "no swimming - boating ok").

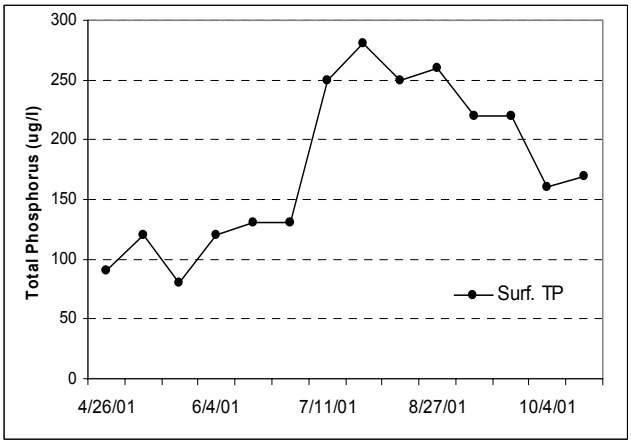
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

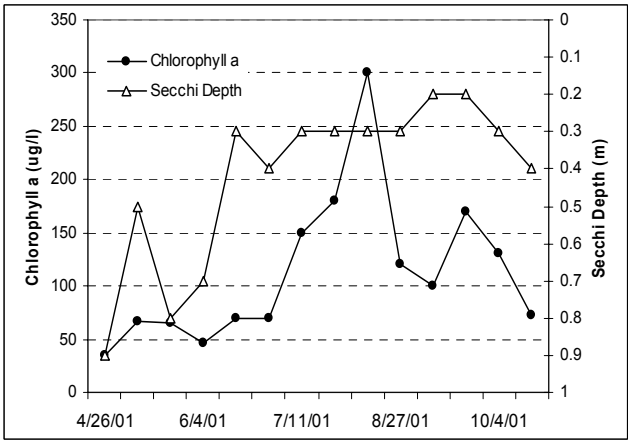
Lake Hazeltine

Chaska, Carver Co.

LAKE ID: 100014
WMO: Carver County
Volunteer: Carver Co. Env. Services

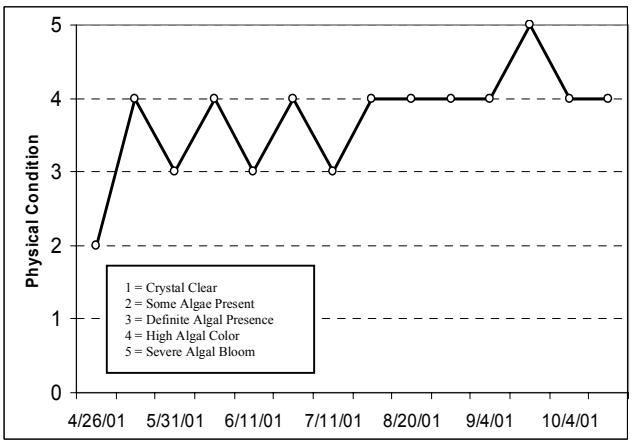






2001 Data

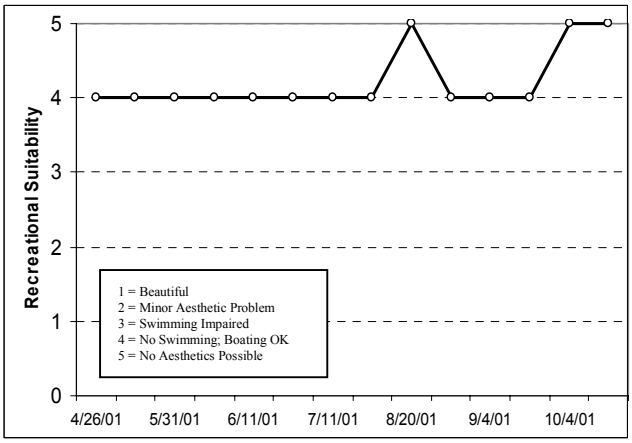
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/26	12.4		14.72		35	90		0.9	2	4
5/3	17.3		10.27		67	120		0.5	4	4
5/31	19.6		10.64		66	80		0.8	3	4
6/4	18.1		8.06		46	120		0.7	4	4
6/11	23.2		9.77		69	130		0.3	3	4
6/25	25		7.44		70	130		0.4	4	4
7/11	28.7		8.89		150	250		0.3	3	4
7/23	29.9		10.86		180	280		0.3	4	4
8/20	24.7		16.52		300	250		0.3	4	5
8/27	34		8.51		120	260		0.3	4	4
9/4	24.3		11.85		100	220		0.2	4	4
9/17	16.8		8.1		170	220		0.2	5	4
10/4	15.1		7.36		130	160		0.3	4	5
10/18	8.4		10.09		73	170		0.4	4	5



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										F	F
Chlorophyll a										F	F
Secchi Depth										F	F
Overall										**F**	**F**



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 third year that Highland Lake has been involved in CAMP (1999 and 2000 being the others). 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 13 times between mid-April and early-October, 2001. 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.

The lake's overall 2001 lake quality grade of D was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 112.7 µg/l (minimum of 80.0 µg/l, maximum of 280.0 µg/l) corresponds to a lake water quality grade of D, as did the mean mean CLA concentration of 51.9 µg/l (minimum of 8.4 µg/l and maximum of 92.0 µg/l). The lake's Secchi transparency of 0.6 m (minimum of 0.4 m, maximum of 1.1 m), on the other hand, resulted in a grade of F. The mean TKN concentration over the same time period was 1.33 mg/l (minimum of 0.72 mg/l and maximum of 2.30 mg/l). The lake's 2001 water quality was worse than that recorded in 1999 or 2000.

As mentioned earlier, there are no water quality data available for Highland Lake other than the 1999-2001 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, additional years of data collection are needed.

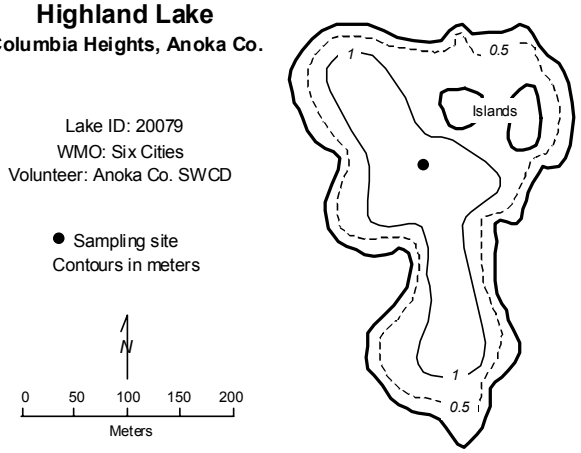
The last two graphs on the information sheet show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.9 for physical condition (roughly equal to 3- "definite algae present"), and 4.6 for recreational suitability (between 4- "no swimming – boating ok" and 5- "no aesthetics possible").

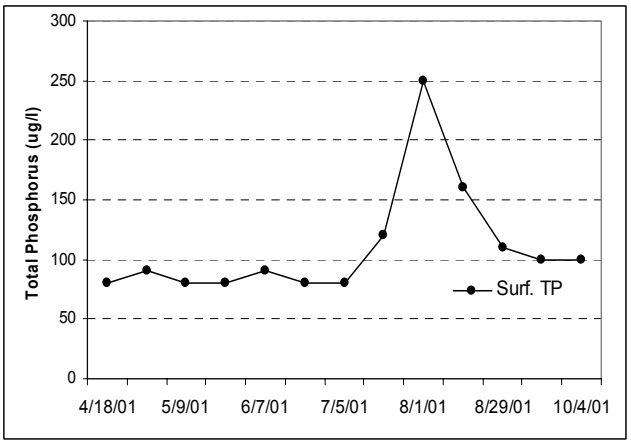
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

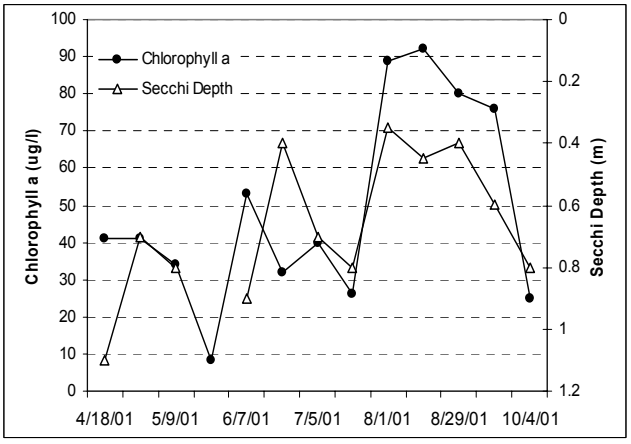
Highland Lake

Columbia Heights, Anoka Co.

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

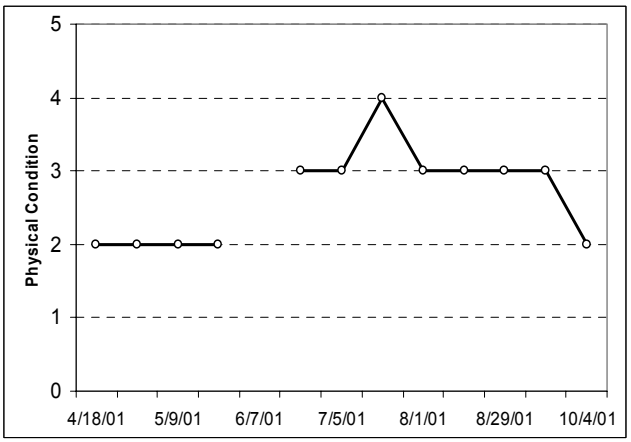






2001 Data

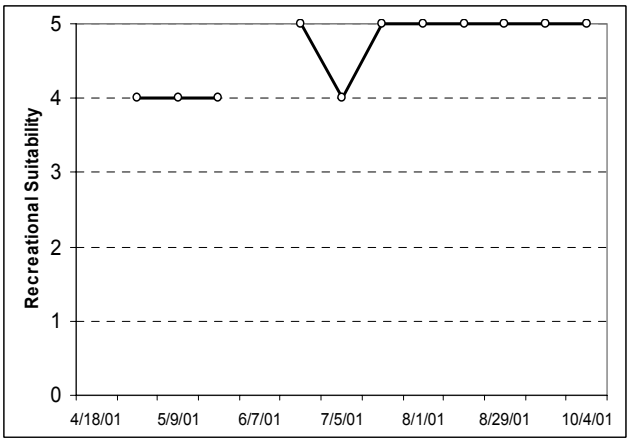
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/18	8				41	80		1.1	2	
5/2	16				41	90		0.7	2	4
5/9	16				34	80		0.8	2	4
5/23	13				8.4	80			2	4
6/7	19				53	90		0.9		
6/20	21				32	80		0.4	3	5
7/5	22				40	80		0.7	3	4
7/17	26				26	120		0.8	4	5
8/1	25				89	250		0.4	3	5
8/15	21				92	160		0.5	3	5
8/29	22				80	110		0.4	3	5
9/19	17.5				76	100		0.6	3	5
10/4	13				25	100		0.8	2	5



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									D	D	D
Chlorophyll a									C	B	D
Secchi Depth									D	D	F
Overall									**D**	**C**	**D**



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 third first year that Hydes Lake has been involved in CAMP (1999 and 2000 being the others). 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 1999-2001.

The lake was monitored nine times between late-June and mid-October, 2001. 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 mean summertime (May through September) surface TP concentration was 147.1 µg/l (minimum of 40.0 µg/l, maximum of 280.0 µg/l). The mean CLA and Secchi transparency readings were 26.7 µg/l (minimum of 9.2 µg/l, maximum of 74.0 µg/l) and 3.1 m (minimum of 1.2 m, maximum of 5.2 m), respectively. The lake's mean surface TKN concentration was 2.70 mg/l (minimum of 1.40 mg/l, maximum of 4.40 mg/l). The lake quality grades determined from each parameter's summertime mean are TP= D, CLA= C, and Secchi transparency= A. This results in an overall grade of C. The lake's 2001 overall grade is its best recorded to date. The reason for the improved grade is due to the lake's reduced mean TP concentration and greatly improved water clarity.

Strangely enough the lake's 2001 Secchi mean actually doubled while the CLA mean remained similar to past years. The reason for this improvement and resulting disparity is not known.

As mentioned earlier, there is a moderate amount of water quality data available for Hydes Lake. It is not, however, extensive enough to determine any long-term trends. On 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 1.5 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 2001 user perception means are half that of previous years, which relate well with the lake's dramatically improved water clarity.

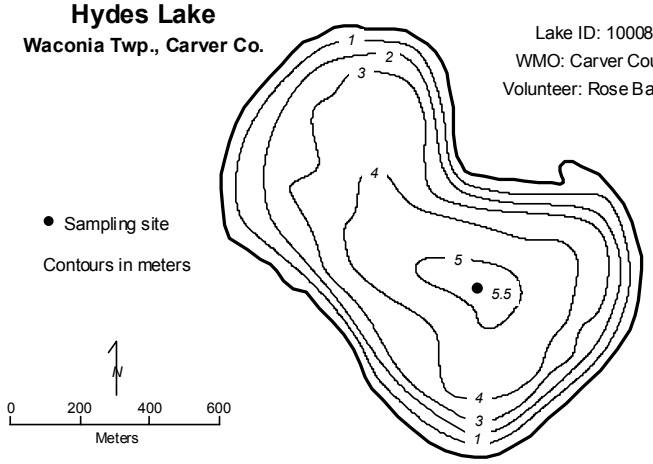
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

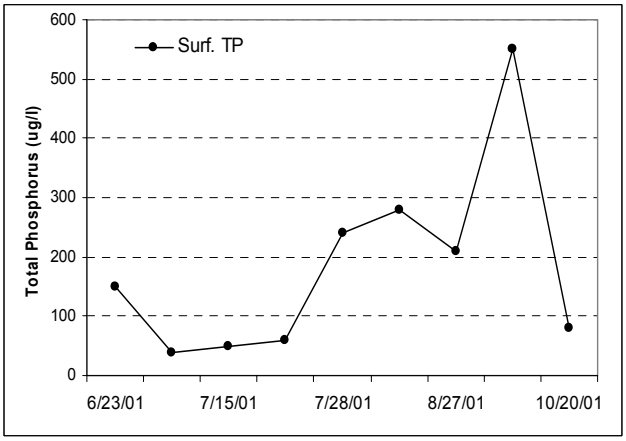
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

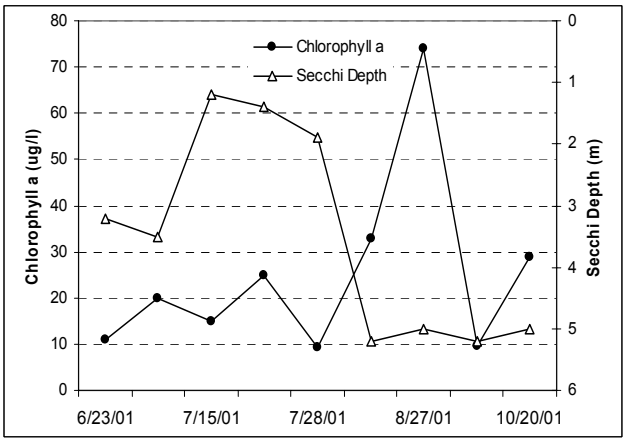
Hydes Lake

Waconia Twp., Carver Co.

Lake ID: 100088
WMO: Carver County
Volunteer: Rose Bastian

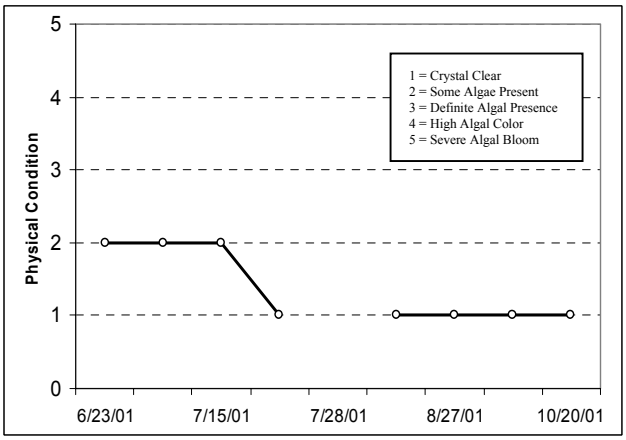






2001 Data

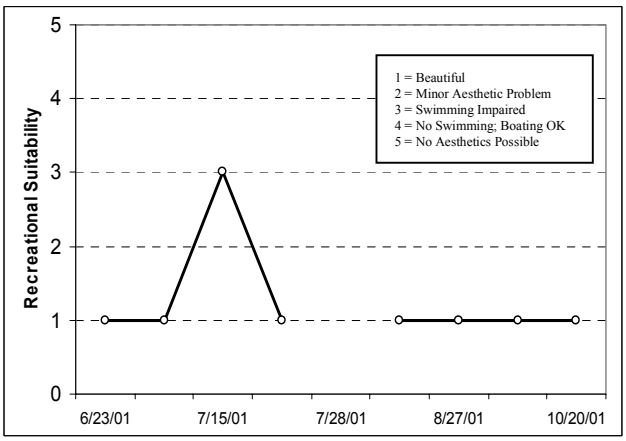
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/23	23				11	150		3.2	2	1
6/28	26				20	40		3.5	2	1
7/15	27.8		6.03		15	50		1.2	2	3
7/17	27.4				25	60		1.4	1	1
7/28	28.6				9.2	240		1.9		
8/8	10.6				33	280		5.2	1	1
8/27	14.5				74	210		5.0	1	1
10/12	10.6				9.7	550		5.2	1	1
10/20	14.5				29	80		5.0	1	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	F		F			F			F	F	D
Chlorophyll a	D		C			C			C	C	C
Secchi Depth	D		C			C			C	C	A
Overall	**D**		**D**			**D**			**D**	**D**	**C**



Source: Metropolitan Council and STORET data

Jellum's Bay (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 1996-2000.

The lake was monitored 14 times from early-May to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 72.1 µg/l (minimum concentration of 60.0 µg/l an d a maximum value of 9.0 µg/l); surface chlorophyll-a= 76.2 µg/l (minimum of 48.0 µg/l and maximum of 130.0 µg/l); Secchi transparency= 0.7 m (minimum of 0.5 m and a maximum of 0.9 m); and TKN= 2.06 mg/l (minimum of 1.50 mg/l and maximum of 2.60 mg/l). The lake's summer means translate to water quality grades of D for TP, D, for CLA, and D for Secchi transparency. These grades result in an overall water quality grade of D for Jellum's Lake in 2001. While the lake's 2001 overall grade is identical to those recorded from 1996-2000, the individual grades reveal that 1997 and 2001 were the best recorded water quality years to date.

As mentioned earlier, there is little historic water quality data available for Jellum's Lake (1996-2001). Because of the limitedness of the lake's database, it is impossible 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 3.2 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 3.8 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.

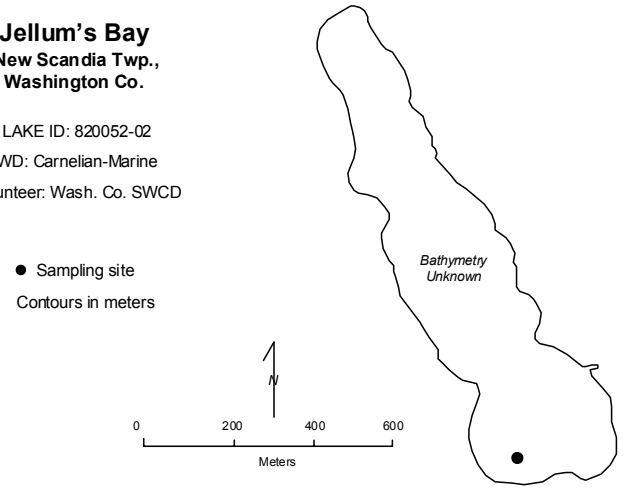
Jellum's Bay

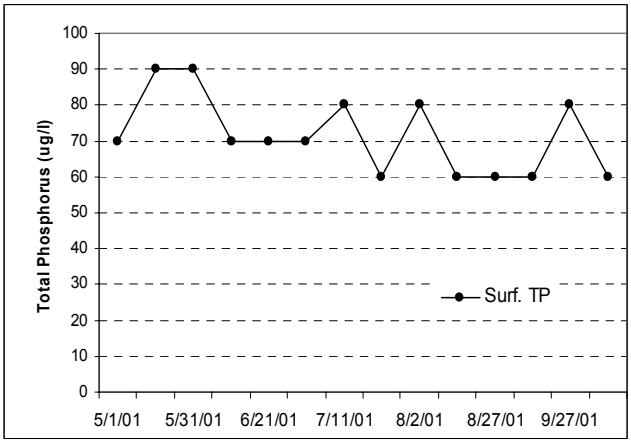
New Scandia Twp., Washington Co.

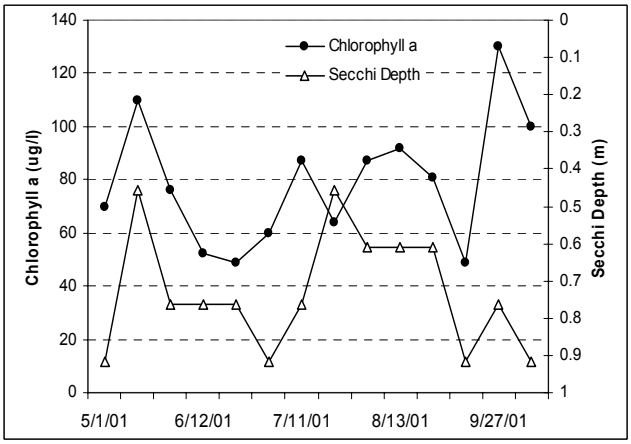
LAKE ID: 820052-02

WD: Carnelian-Marine

Volunteer: Wash. Co. SWCD

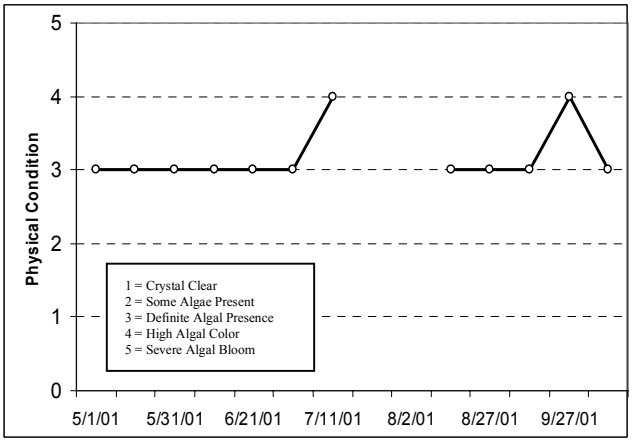






2001 Data

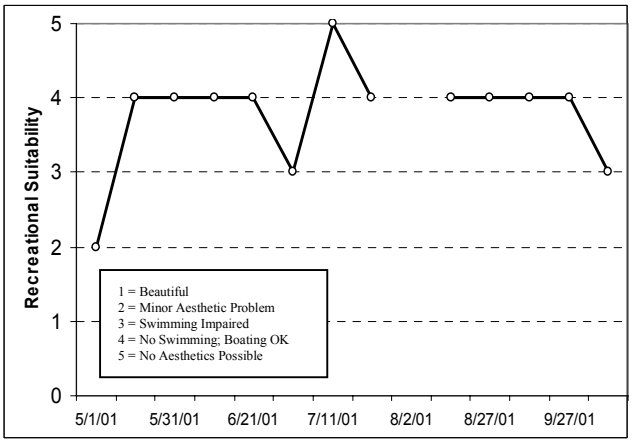
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	15.8		8.8		70	70		0.9	3	2
5/15	23.5		15.2		110	90		0.5	3	4
5/31	19.3		13.2		76	90		0.8	3	4
6/12	22.6		7.2		52	70		0.8	3	4
6/21	23.1		6.17		49	70		0.8	3	4
6/28	29.2		9.89		60	70		0.9	3	3
7/11	26.8		12.11		87	80		0.8	4	5
7/24	27.7		13.5		64	60		0.5		4
8/2	27.6		8.3		87	80		0.6		
8/13	25.1		6.36		92	60		0.6	3	4
8/27	24.4		9.24		81	60		0.6	3	4
9/11	20.3		7.5		49	60		0.9	3	4
9/27	16.6		14.1		130	80		0.8	4	4
10/16	10.5		8.83		100	60		0.9	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						F	D	D	D	D	D
Chlorophyll a						D	D	D	D	F	D
Secchi Depth						D	D	F	F	F	D
Overall						**D**	**D**	**D**	**D**	**F**	**D**



Source: Metropolitan Council and STORET data

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

Keller Lake, located in both the City 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 fourth 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 2001, the lake was monitored 12 times between early-May 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.

The lake's 2001 overall lake quality grade of D was calculated from the individual parameter grades. The summertime (May through September) mean TP concentration of 100.0 µg/l (minimum of 30.0 µg/l, maximum of 240.0 µg/l) corresponds to a grade of D for the basin, as did the mean Secchi transparency of 1.1 m (minimum of 0.4 m and maximum of 2.1 m). The lake's 2001 mean CLA concentration of 25.8 µg/l (minimum and maximum of 3.8 and 73.0 µg/l) resulted in a grade C. The mean TKN concentration over the same time period was 1.18 mg/l (minimum of 0.67 mg/l, maximum of 2.40 mg/l).

The lake's overall grade in 2001 (D) is similar to those recorded in 1996-1997 and 1999-2000, and quite a bit worse than that recorded in 1998. The main reason for the dramatic increase and then decline in the lake's water quality around 1998 is due to the Crystal Lake ferric chloride addition system being turned on in 1998 and then off after the summer of 1998. The reason the system (which pumped ferric chloride treated water from Crystal Lake, into Keller Lake) has not been operating since 1998 is due to odor problems at various locations throughout the system (a strong hydrogen sulfide [rotten egg] smell was reported by residents during the late-summer months). This has provided an opportunity to compare the lake's quality since the system has been turned off to that of previous year when the system had been in operation. It seems apparent that the system had a significant effect on the Keller Lake's water quality. I am unaware, however, of any plans for system to be reactivated.

Because only six years of data are available for Keller Lake (1996-2001), identifying a long-term water quality trend is not possible. As was mentioned in past reports, the best water quality for the lake was found in 1998. Because of the 1998 data, the overall lake grades vary quite a bit: D in 1996-1997 and 1999-2001 and a B in 1998. It seems apparent however, that without the assistance of the Crystal Lake ferric chloride addition system, the lake's water quality is well represented by an overall grade of D.

Throughout the 2001 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 3.1 (between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability was 4.1 (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

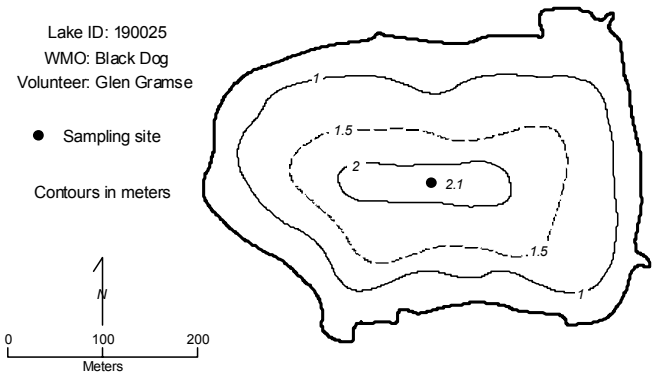
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

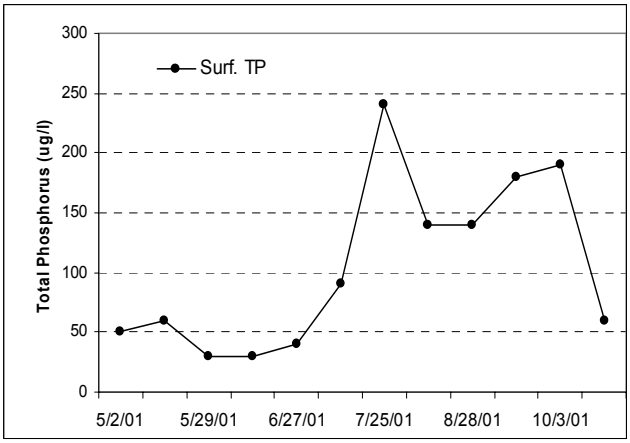
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

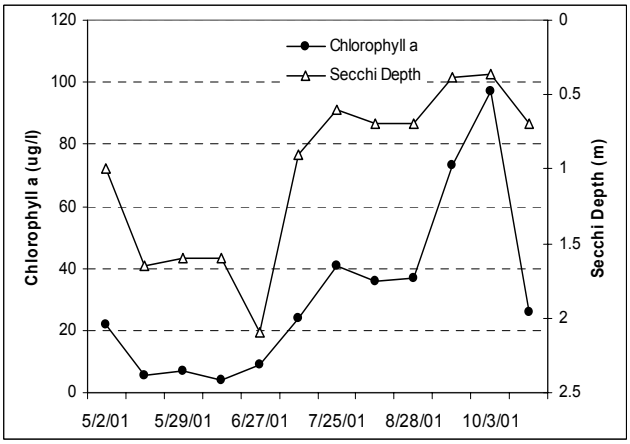
Keller Lake

Burnsville, Dakota Co.

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

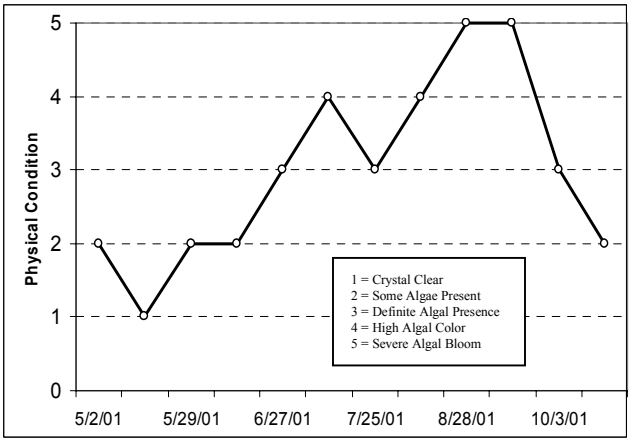






2001 Data

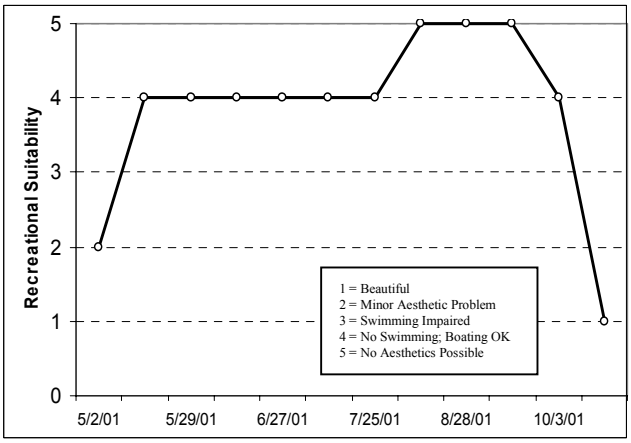
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	16.2				22	50		1.0	2	2
5/16	22.4				5.6	60		1.7	1	4
5/29	17.9				6.9	30		1.6	2	4
6/9	23.5				3.8	30		1.6	2	4
6/27	29.1				9	40		2.1	3	4
7/11	28				24	90		0.9	4	4
7/25	28				41	240		0.6	3	4
8/11	27.8				36	140		0.7	4	5
8/28	28				37	140		0.7	5	5
9/18	19				73	180		0.4	5	5
10/3	16.2				97	190		0.4	3	4
10/19	10.1				26	60		0.7	2	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						D	D	C	D	D	D
Chlorophyll a						F	C	A	C	C	C
Secchi Depth						D	D	C	D	D	D
Overall						**D**	**D**	**B**	**D**	**D**	**D**



Source: Metropolitan Council and STORET data

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

This was the fifth year that Kingsley Lake has been monitored as part of CAMP (1995-1997 and 2000). 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 14 times between mid-April and mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The overall 2001 lake quality grade of B for Kingsley Lake was determined from the grades assigned to the individual parameters. The summertime (May through September) mean TP concentration of 20.5 µg/l (minimum of < 10.0 µg/l (in which case 5.0 µg/l was used to calculate the summer mean), maximum of 60.0 µg/l), fell within the A range, as did the CLA mean of 3.0 µg/l (minimum and maximum of 1.6 and 6.4 µg/l). The lake's 2001 Secchi transparency mean of 2.1 m (minimum of 1.8 m, maximum of 2.8 m) resulted in a grade of C. The lake's mean TKN concentration was 0.48 mg/l (minimum of 0.26 mg/l, maximum of 0.71 mg/l).

Similarly to past years, the Secchi transparency in 2001 would have been greater except on many monitoring events the lake's excessive submergent macrophyte growth got in the way.

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 1.6 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 1.0 ("beautiful").

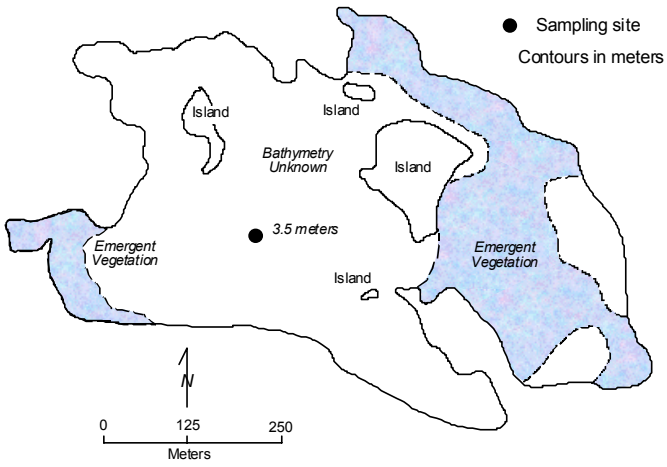
Because of the limitedness of the lake's database, no long-term water quality trends for the lake can be determined. To better understand the quality of the lake and what direction it may be heading, more years of data collection are needed. On the short-term, however, the lake's water quality seems to be represented by a water quality grade of A/high B.

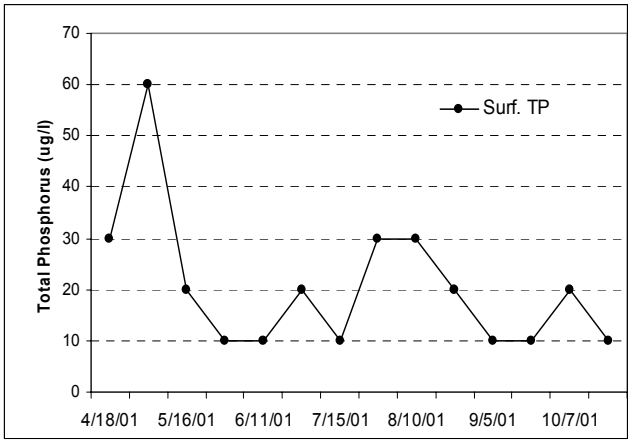
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

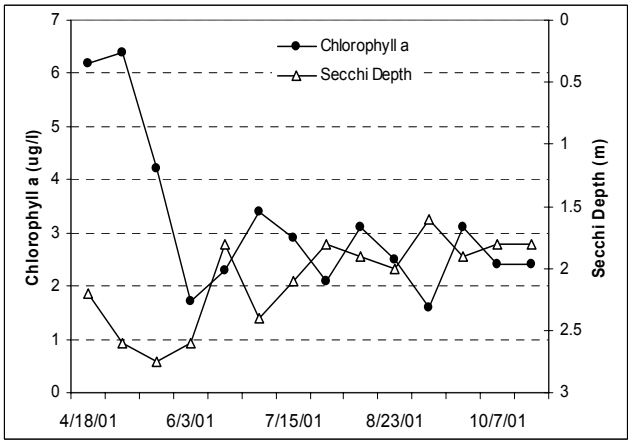
Lake ID: 190030
WMO: Black Dog
Volunteer: The Green Family

Kingsley Lake

Lakeville, Dakota Co.

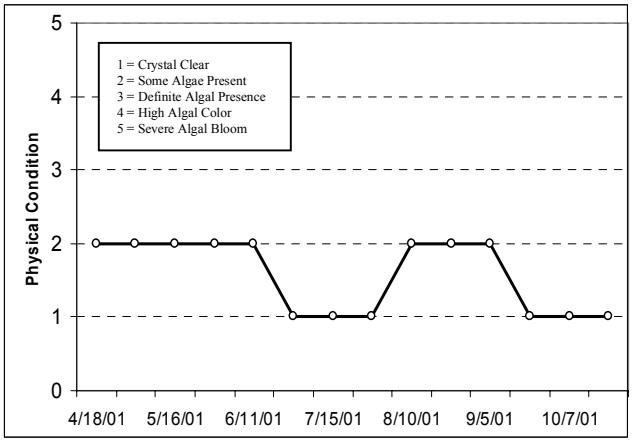






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/18	7.5				6.2	30		2.2	2	1
5/6	14				6.4	60		2.6	2	1
5/16	22				4.2	20		2.8	2	1
6/3	17.5				1.7	10		2.6	2	1
6/11	23				2.3	10		1.8	2	1
6/28	26				3.4	20		2.4	1	1
7/15	27				2.9	10		2.1	1	1
7/29	27				2.1	30		1.8	1	1
8/10	25				3.1	30		1.9	2	1
8/23	24				2.5	20		2.0	2	1
9/5	21				1.6	10		1.6	2	1
9/24	15				3.1	10		1.9	1	1
10/7	12				2.4	20		1.8	1	1
10/17	8				2.4	10		1.8	1	1

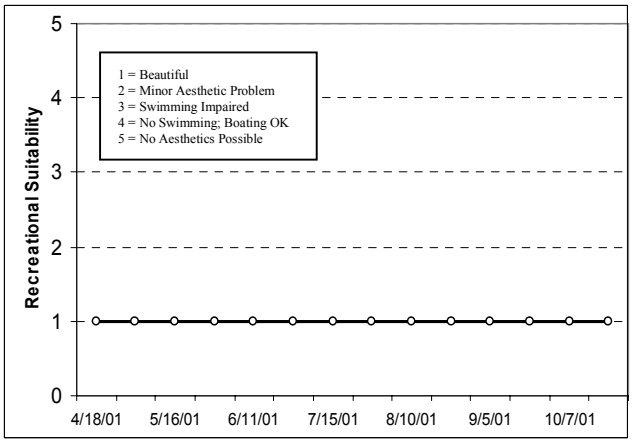


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			B		B	A	A			A	A
Chlorophyll a			A		A	A	A			A	A
Secchi Depth			A		B	B	B			B	C
Overall			**A**		**B**	**A**	**A**			**A**	**B**

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 fourth year that Kismet Lake has been involved in CAMP. The only available lake data found through a search for historical water quality was the 1998-2000 CAMP data. The lake was monitored 14 times between early-May and mid-October, 2001. 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 2001 mean summertime (May through September) surface TP concentration of 43.3 µg/l (minimum of 30.0 µg/l, maximum of 120.0 µg/l). The mean CLA and Secchi transparency readings in 2001 were 18.8 µg/l (minimum of 5.0 µg/l, maximum of 47.0 µg/l) and 1.8 m (minimum of 0.9 m, maximum of 2.6 m), respectively. The lake's mean surface TKN concentration was 1.25 mg/l (minimum of 0.90 mg/l, maximum of 2.40 mg/l).

The lake's CLA mean does not include a point deemed an outlier (410.0 µg/l) on one sampling date (August 6). The point is roughly 10 times greater than the expected value and a reason for the erroneous numbers is not known (in-lab processes and QA/QC runs within the batch where the questionable sample was analyzed, were checked and okayed).

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

The lake quality grades determined from each parameter's summertime mean wer; TP= C, CLA= B, and Secchi transparency= C. The combined individual grades resulted in a 2001 overall grade of C. The 2001 overall grade is better than that recorded in 2000 and similar to those recorded in 1998 and 1999.

Because 2001 is the only the fourth year that data are available for the lake, long- or short-term trends are not possible to determine. 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 2.3 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 3.0 ("swimming slightly impaired").

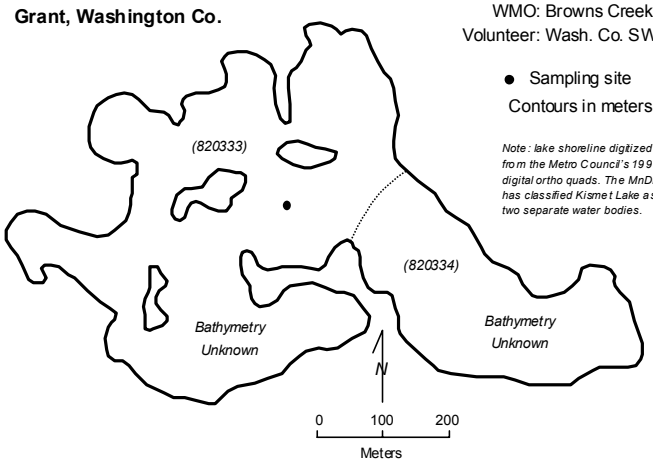
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

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

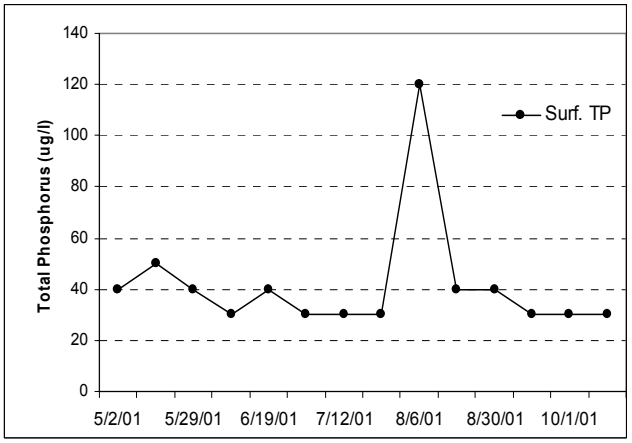
Grant, Washington Co.

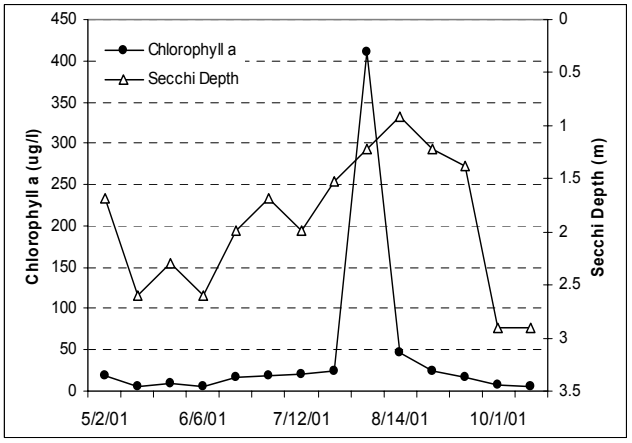
Lake IDs: 820333 and 820334
WMO: Browns Creek
Volunteer: Wash. Co. SWCD



● Sampling site
Contours in meters

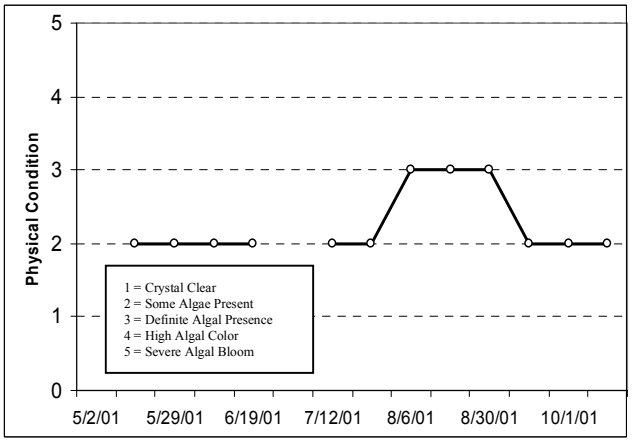
Note: lake shoreline digitized from the Metro Council's 1997 digital ortho quads. The MnDNR has classified Kismet Lake as two separate water bodies.





2001 Data

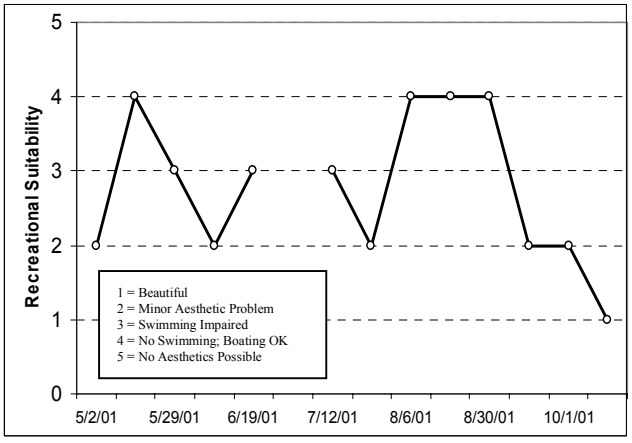
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	18.4		10.15		18	40		1.7		2
5/16	22.7		10.25		6.4	50		2.6	2	4
5/29	19.3		9.83		9.8	40		2.3	2	3
6/6	17.3		8.2		5	30		2.6	2	2
6/19	21.6		5.4		16	40		2.0	2	3
6/29	28.4		8.49		18	30		1.7		
7/12	27.5		9.94		21	30		2.0	2	3
7/25	27.9		10.5		25	30		1.5	2	2
8/6	30.3		7.8		410	120		1.2	3	4
8/14	26		9.67		47	40		0.9	3	4
8/30	23.3		6.4		25	40		1.2	3	4
9/11	23.1		6		16	30		1.4	2	2
10/1	16.9		10.9		6.6	30		2.9	2	2
10/16	10		8.31		5	30		2.9	2	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								C	C	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

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).

Between early-May and mid-October, 2001, the lake was monitored six times. During each sampling event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as perceived physical condition and recreational suitability. The 2001 overall lake quality report card grade for La Lake, a C, was similar to that recorded in 1994, 1996, 1997, 1999, and 2000 and worse than that of 1995 and 1998 (B). The 2001 summertime (May - September) mean CLA concentration of 40.9 µg/l (minimum of 3.6 µg/l, maximum of 100.0 µg/l) and mean Secchi transparency of 1.7 m (minimum of 0.4 m, maximum of 2.4 m), corresponded to a lake water quality grades of C, while the mean TP concentration of 88.0 µg/l (minimum and maximum of 40.0 and 220.0 µg/l) resulted in grade of D. The mean TKN concentration was 1.40 mg/l (minimum of 0.82 mg/l, maximum of 3.20 mg/l.

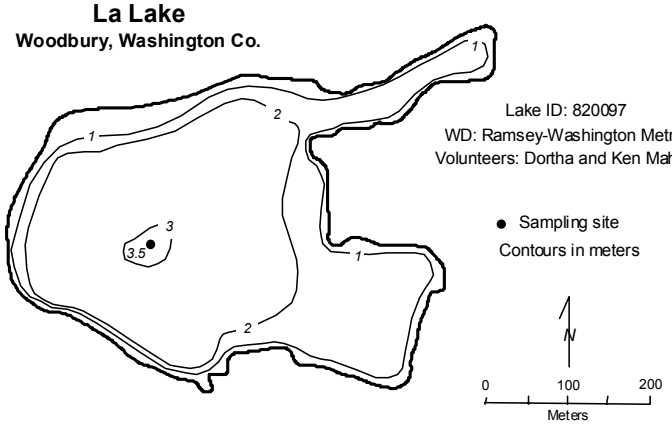
The perceived physical and recreational conditions, ranked on a 1-to-5 scale, were documented during each monitoring event. The mean physical condition ranking in 2001 was 2.6 (between 2- "some algae present" and 3- "definite algae present"), while the mean recreational suitability ranking was 1.6 (between 1- " beautiful" and 2- "minor aesthetic problem").

Because 1994-2001 are the only years of available data, no long-term trends can be determined. In order to detect any possible long-term trends, more years of data collection are needed. On 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.

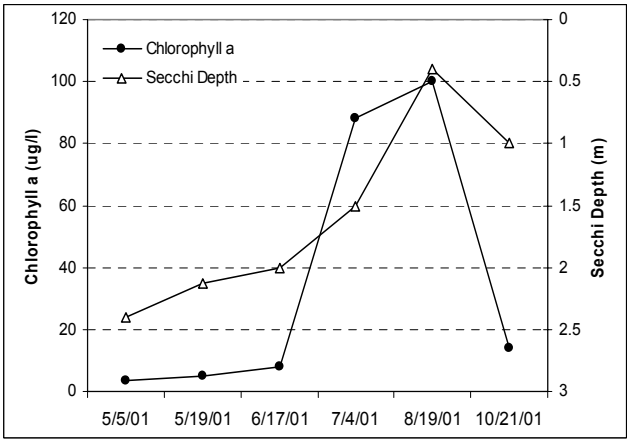
La Lake

Woodbury, Washington Co.



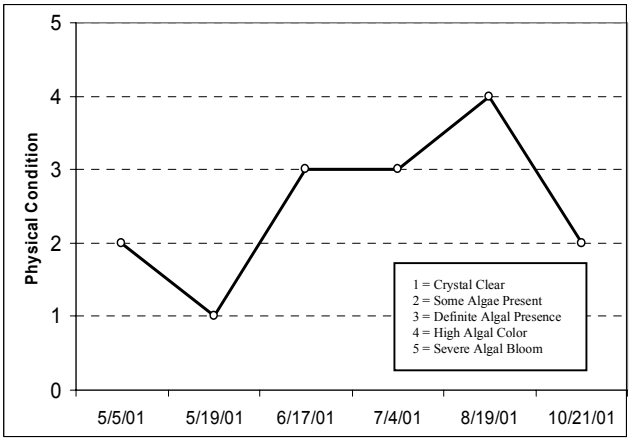
Lake ID: 820097
WD: Ramsey-Washington Metro
Volunteers: Dortha and Ken Mahle

● Sampling site
Contours in meters



2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/5	20				3.6	40		2.4	2	1
5/19	22				4.8	50		2.1	1	1
6/17	23.5				8.1	80		2.0	3	2
7/4	28				88	50		1.5	3	2
8/19	26.9				100	220		0.4	4	2
10/21	12.9				14	80		1.0	2	2

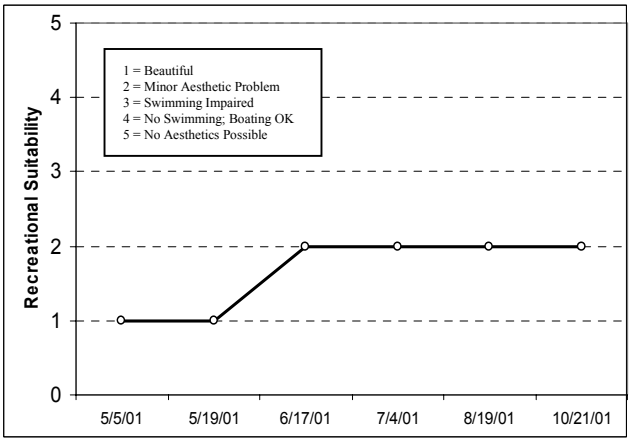


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	C	D	D	C	D	D	D
Chlorophyll a				B	A	B	C	B	C	C	C
Secchi Depth				C	B	C	C	B	C	C	C
Overall				**C**	**B**	**C**	**C**	**B**	**C**	**C**	**C**

Source: Metropolitan Council and STORET data



Lac Lavon Lake (19-0446) *Black Dog Watershed Management Commission*

This was the fifth 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 1997-2001.

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.

Unfortunately, the lake was only monitored twice in 2001 (once in May and once in July). For this reason, little can be determined about the lake's 2001 water quality.

Although there were only two monitoring events for Lac Lavon in 2001, the following are the averages of the two events for each of the parameters tested. The summertime (May - September) mean TP concentration of 25.0 µg/l corresponds to a lake water quality grade of B. The CLA mean of 1.4 µg/l and Secchi mean of 5.3 m, on the other hand, both resulted in grades of A. The overall lake quality grade rom the limited Lac Lavon data in 2001 was A (similar to that recorded in 1997 -2000), which means that the water quality of the lake falls within the top 10 percent in the TCMA.

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 ("crystal clear"), while the mean recreational suitability ranking was 1.0 ("beautiful").

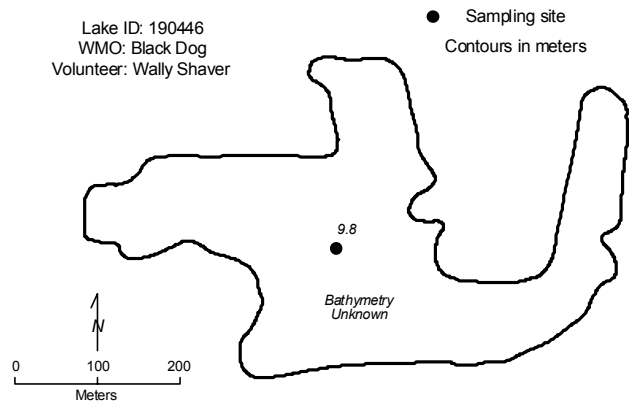
Because 2001 is only the fifth year of available nutrient data (and lacking at that), no long-term trends can be determined. In the short-term however, the lake's water quality seems well represented by an overall grade of A. In order to detect any possible long-term trends, more years of data collection are needed.

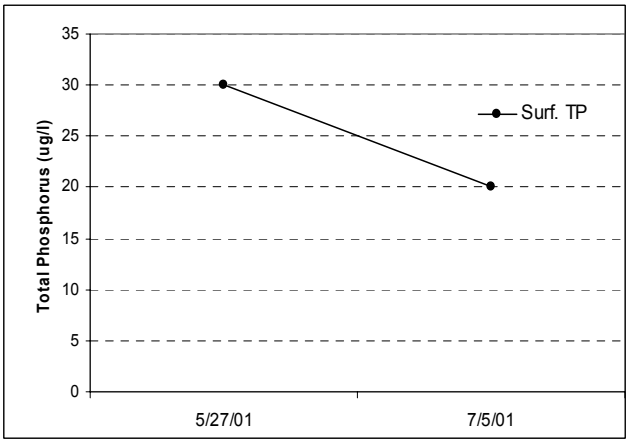
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

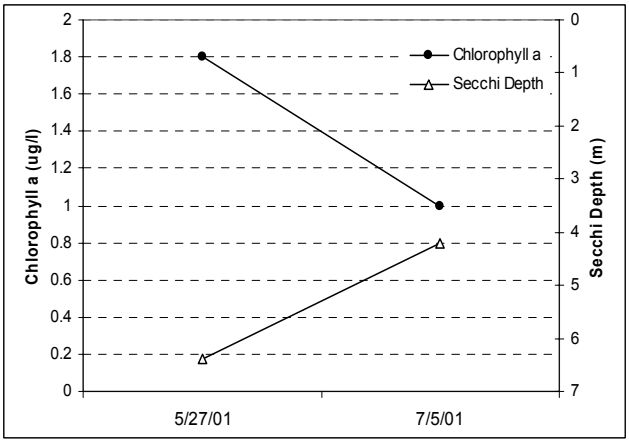
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Lac Lavon

Apple Valley/Burnsville, Dakota Co.

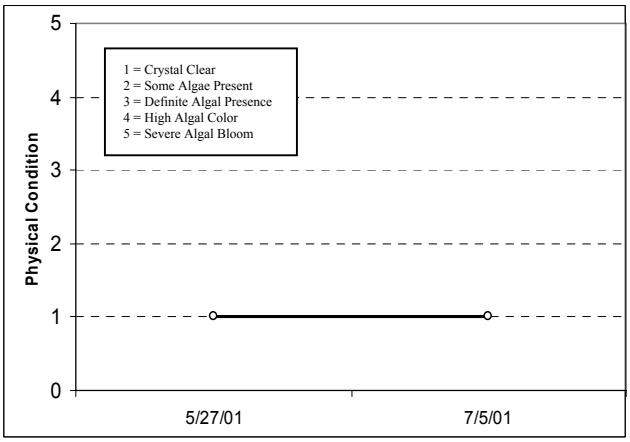






2001 Data

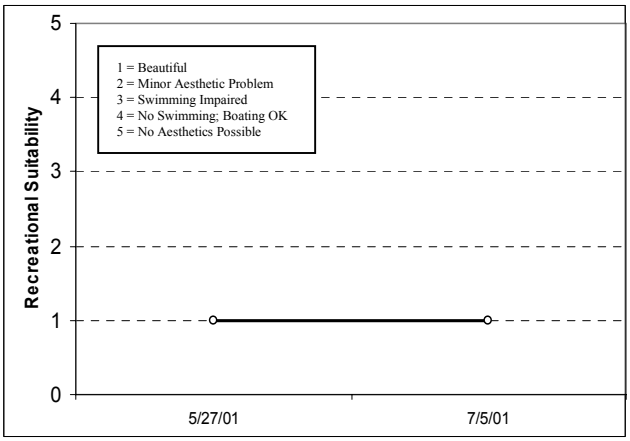
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/27	18				1.8	30		6.4	1	1
7/5	25				1	20		4.2	1	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus							A	A	A	A	B
Chlorophyll a							A	A	A	A	A
Secchi Depth	A						A	A	A	A	A
Overall							**A**	**A**	**A**	**A**	**A**



Source: Metropolitan Council and STORET data

Laddie Lake (2-0072) *Six Cities Watershed District*

Laddie Lake is a shallow lake with maximum and mean depths of 3.0 m and 1.0 m, respectively (10 feet and 3 feet). Located within the Cities of Blaine and Spring Lake Park (Anoka County), its littoral zone (dominated by aquatic vegetation) makes up the majority, if not all, of its 73-acre surface area. With an approximate volume of 219 ac-ft, it outlets to the northwest, eventually flowing into Springbrook Creek.

The major land use within the lake's 542-acre watershed is urban/developed (translating to a watershed-to-lake size ratio of 7.5:1). The City of Blaine has operated an aeration system to help improve lake quality. Laddie Lake, which was involved in CAMP in 1993-1995, was monitored 13 times between early-June and early-October, 2001. 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 mean summertime (May through September) surface TP concentration for the lake was 29.2 µg/l (minimum of 20.0 µg/l, maximum of 40.0 µg/l). The mean CLA and Secchi transparency readings were 3.4 µg/l (minimum of 1.8 µg/l, maximum of 6.3 µg/l) and 1.2 m (minimum of 1.0 m, maximum of 1.3 m), respectively. The lake's mean surface TKN concentration was 1.27 mg/l. The lake quality grades assigned to the 2001 summertime means are TP= B; CLA= A; and Secchi= C, resulting in an overall grade of B. The 2001 overall grade is better than that recorded in 2000 and similar to those in 1993-1995.

Very little water quality data is available for Laddie Lake. The only year other than the CAMP data of 1993-1995 and 2000-2001 is 1980. While the limited historical database makes it impossible to determine any long-term trends, the lake report card grades (see next page) show that lake's quality was better in 1993-1995, and 2001 than in 1980 and 2000. The overall grade in was D in 1980 and C in 2000 compared to overall grades of B in 1993-1995 and 2001. The overall grade in 1993-1995 and 2001 could have been better than B because the mean Secchi depths of 1.2 m, which corresponds to a C grade, was at the bottom of the lake. If the lake was deeper, the Secchi transparencies and corresponding grade might have been better, resulting in a better overall grade.

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 2.3 (falling between 2- "some algae present" and 3- "definite algal presence"), while the mean recreational suitability ranking was 4.0 ("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/.

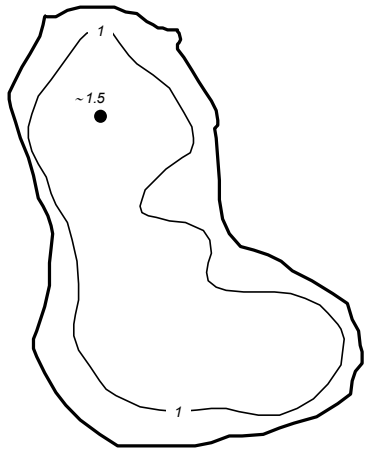
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

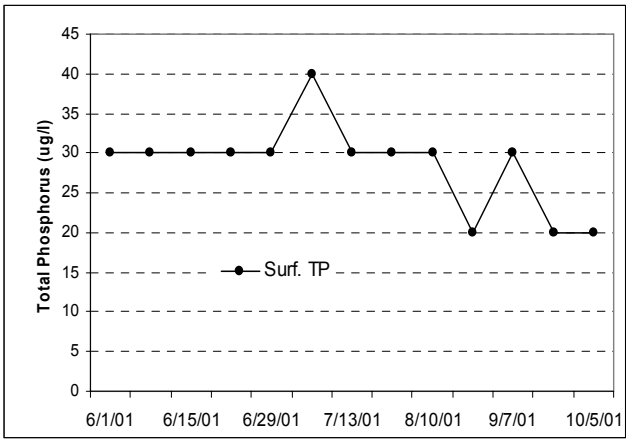
Laddie Lake

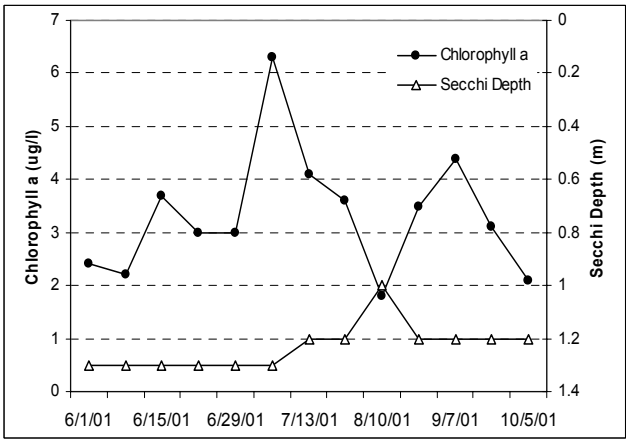
Blaine/Spring Lake Park, Anoka Co.

Lake ID: 20072
WMO: Six Cities
Volunteer: City of Blaine

● Sampling site
Contours in meters

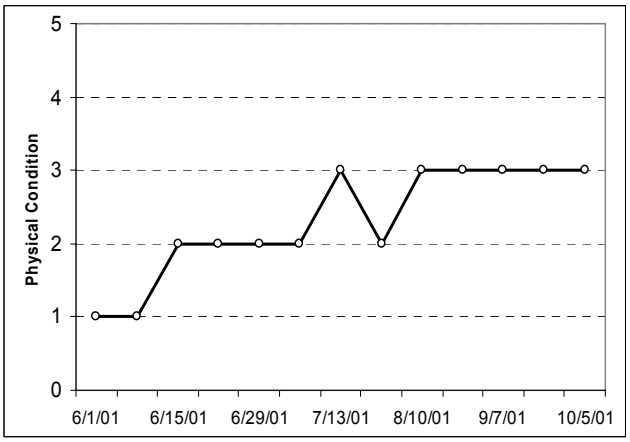






2001 Data

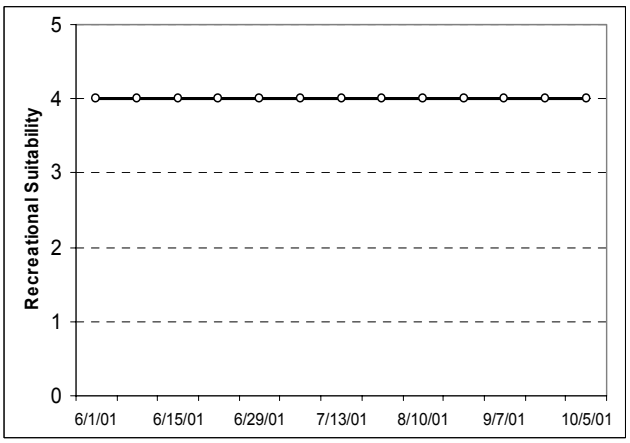
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/1	19				2.4	30		1.3	1	4
6/8	21				2.2	30		1.3	1	4
6/15	21				3.7	30		1.3	2	4
6/22	23				3	30		1.3	2	4
6/29	25				3	30		1.3	2	4
7/6	23				6.3	40		1.3	2	4
7/13	26				4.1	30		1.2	3	4
7/27	24				3.6	30		1.2	2	4
8/10	25				1.8	30		1.0	3	4
8/23	25				3.5	20		1.2	3	4
9/7	22				4.4	30		1.2	3	4
9/21	19				3.1	20		1.2	3	4
10/5	14				2.1	20		1.2	3	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			A	B	B					B	B
Chlorophyll a			A	A	B					A	A
Secchi Depth			C	C	C					D	C
Overall			**B**	**B**	**B**					**B**	**B**



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 (curly-pondleaf) 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, which was enrolled in CAMP in 1994-1997 and 2000, was monitored 13 times between mid-April and mid-October, 2001. The 2001 overall lake quality grade for Lee Lake, a C, was calculated from the individual grades for each water quality parameter. The summertime (May through September) mean TP concentration of 48.0 µg/l (minimum of 30.0 µg/l, maximum of 80.0 µg/l) resulted in a water quality grade of C, as did the Secchi transparency mean of 1.8 m (minimum of 0.9, and a maximum of 3.2 m). The lake's summertime mean CLA of 12.7 µg/l (minimum and maximum of 2.9 and 26.0 µg/l) earned a grade of C. The lake's mean TKN concentration was 0.96 mg/l (minimum of 0.61 mg/l, maximum of 1.2 mg/l).

The lake's 2001 water quality was quite a bit better than that recorded in 2000 (overall grade of D), and similar to that recorded in the previous years of CAMP (where the lake consistently received an overall grade of C). Because 2001 is the only the sixth year that data are available for the lake, long-term trends are not possible to determine. In the short-term however, the lake seems well represented by an overall grade of C with normal flucuations that reach down into the D+ range. 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 3.5 (falling between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability ranking was 4.0 ("no swimming – boating ok").

The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) conducted a fisheries survey on the lake in 1991. 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/.

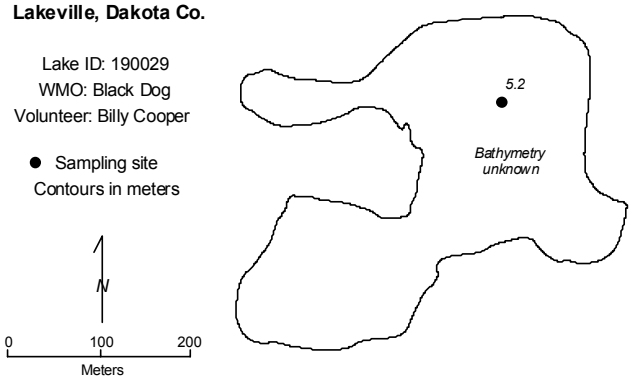
If you know of any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

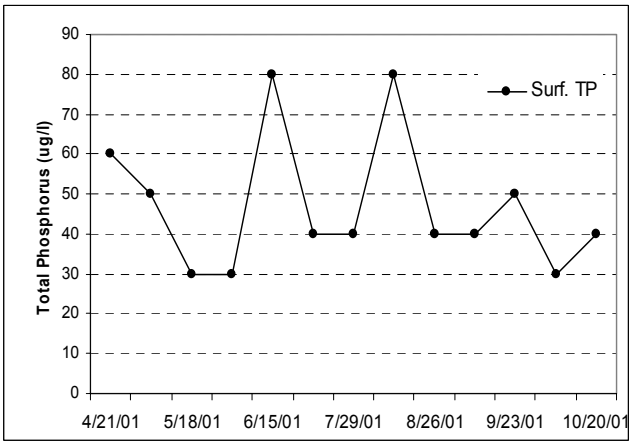
Lee Lake

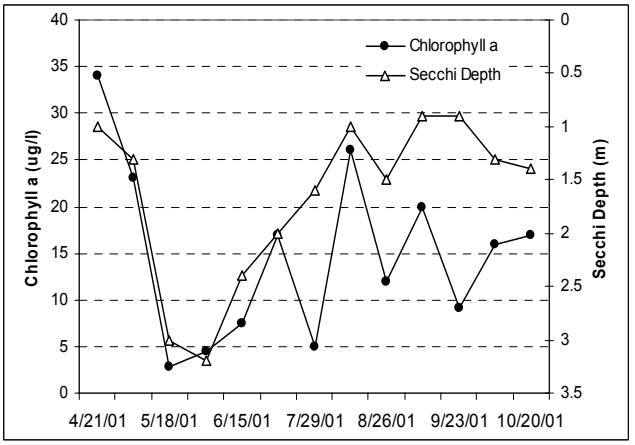
Lakeville, Dakota Co.

Lake ID: 190029
WMO: Black Dog
Volunteer: Billy Cooper

● Sampling site
Contours in meters

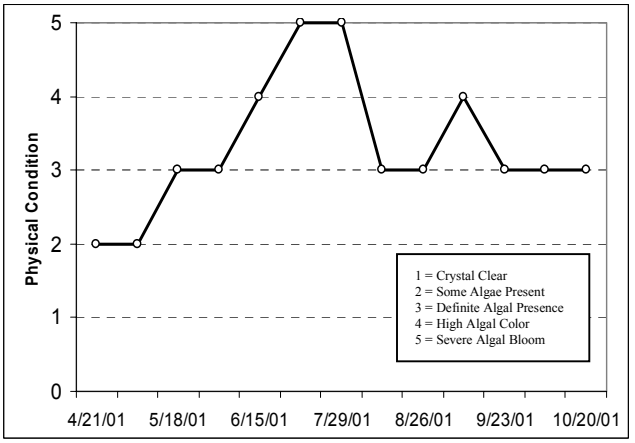






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/21	10				34	60		1.0	2	4
5/6	15				23	50		1.3	2	4
5/18	20				2.9	30		3.0	3	4
6/1	12				4.5	30		3.2	3	4
6/15	22.5				7.5	80		2.4	4	4
7/14	28				17	40		2.0	5	4
7/29	26.9				5	40		1.6	5	5
8/11	25.8				26	80		1.0	3	3
8/26	25.8				12	40		1.5	3	4
9/8	22.4				20	40		0.9	4	4
9/23	15.7				9.1	50		0.9	3	4
10/16	13.4				16	30		1.3	3	4
10/20	10				17	40		1.4	3	4

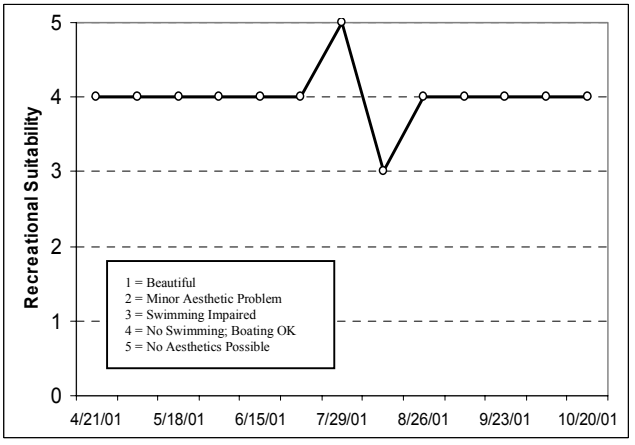


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	C	C	C			D	C
Chlorophyll a				C	B	B	B			C	B
Secchi Depth				C	C	C	C			D	C
Overall				**C**	**C**	**C**	**C**			**D**	**C**

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 14 times between early-May and mid-October, 2001. The l ake 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. The 2001 mean summertime (May through September) surface TP concentration for the lake was 37.5 µg/l (minimum of 20.0 µg/l, maximum of 110.0 µg/l). The mean CLA and Secchi transparency readings were 10.2 µg/l (minimum of 2.5 µg/l, maximum of 62.0 µg/l), and 2.9 m (minimum of 1.6 m and maximum of 6.9 m), respectively. The lake's mean surface TKN concentration was 0.75 mg/l (minimum of 0.48 mg/l, maximum of 1.40 mg/l).

The 2001 summertime means resulted in a TP grade of C, CLA grade of A, and Secchi transparency grade of B. The overall grade determined by averaging all three parameters was a B. The lake's 2001 water quality grades and summer means were much better than that reported in 2000. In fact, the lake's 2001 overall grade in better than those recorded in 1996-2000 and similar to that recorded in 1995. The improved water quality in 2001 comes after concern over a possible decline in the lake's recent water quality (Anhorn 2000).

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 2.1 (between 2- "some algae present" and 3- definite algae present"), while the mean recreational suitability ranking was 2.0, ("minor aesthetic problem").

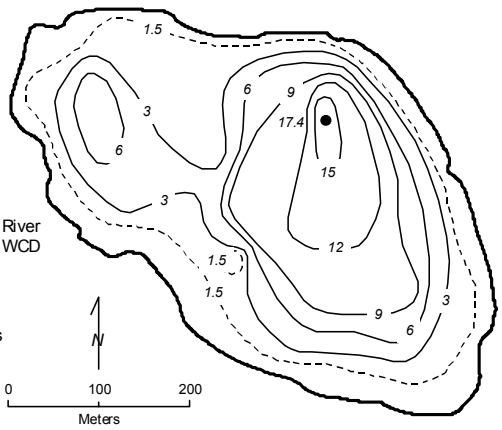
A search for water quality data through Council, MPCA, and STORET files resulted in a moderate amount of data. While 1995-2001are the only years for which nutrient data are available, Secchi transparencies were collected through the MPCA's Citizen Lake Monitoring Program in 1985, and 1987-1992. The data 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 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.

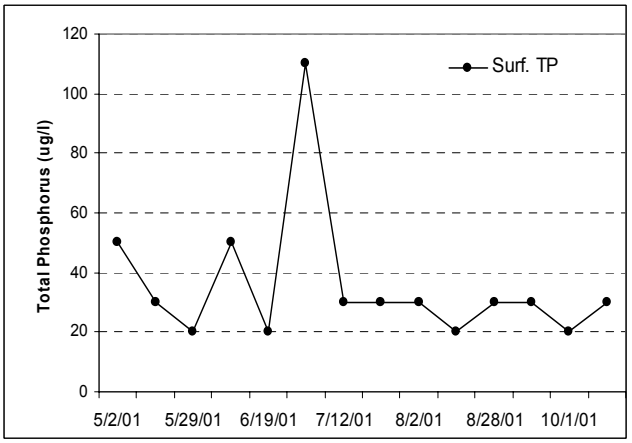
Lily Lake

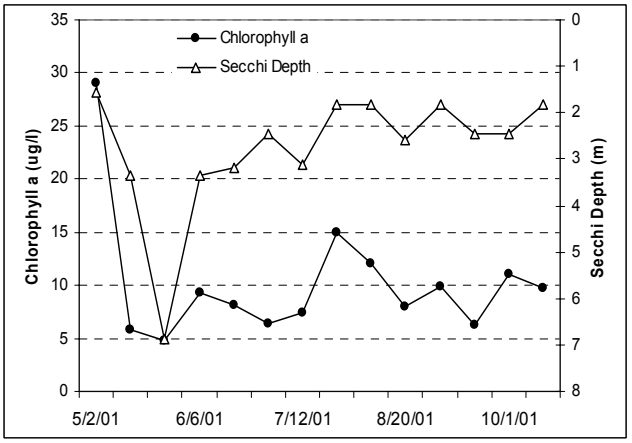
Stillwater, Washington Co.



Lake ID: 820023
WMO: Middle St. Croix River
Volunteer: Wash. Co. SWCD

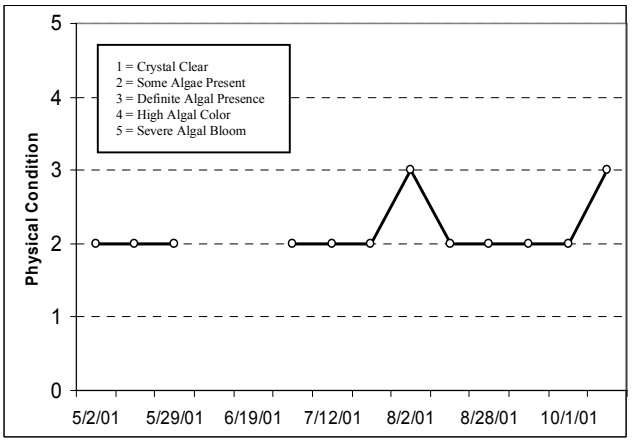
● Sampling site
Contours in meters





2001 Data

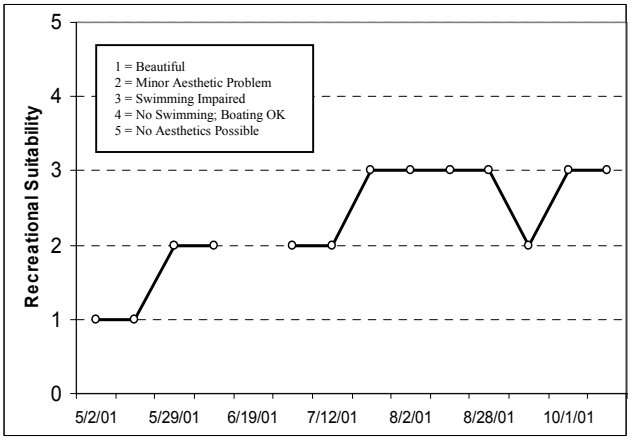
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	16		11.4		29	50		1.6	2	1
5/16	21.5		12.88		5.8	30		3.4	2	1
5/29	19		10		4.8	20		6.9	2	2
6/6	14.4		9.8		9.3	50		3.4		2
6/19	22.9		6.1		8.1	20		3.2		
7/2	24.6		8.39		6.4	110		2.4	2	2
7/12	28.3		10.7		7.4	30		3.1	2	2
7/26	26.4		10.5		15	30		1.8	2	3
8/2	28.3		8.6		12	30		1.8	3	3
8/20	25.1		8.4		8	20		2.6	2	3
8/28	27.1		10.05		9.9	30		1.8	2	3
9/12	21.3		8.86		6.3	30		2.4	2	2
10/1	16.7		13.8		11	20		2.4	2	3
10/17	11.9		9.83		9.8	30		1.8	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					C	C	C	C	C	C	C
Chlorophyll a					B	C	B	C	C	C	A
Secchi Depth	C	B			A	B	C	C	C	C	B
Overall					**B**	**C**	**C**	**C**	**C**	**C**	**B**



Source: Metropolitan Council and STORET data

Little Carnelian (82-0014) *Carnelian-Marine Watershed District*

This was the the second year of CAMP monitoring in Little Carnelian Lake which is located in Stillwater Township (Washington County). 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 seven times between early-May and mid-October, 2001. 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 mean summertime (May through September) surface TP concentration for the lake was 15.8 µg/l (minimum of < 10.0µg/l [in which case 5.0 µg/l was used to calculate the summer mean], maximum of 30.0 µg/l). The mean CLA and Secchi transparency readings were 4.0 µg/l (minimum of 1.9 µg/l, maximum of 7.8 µg/l) and 5.8 m (minimum of 3.2 m, maximum of 8.1 m), respectively. The lake's mean surface TKN concentration was 0.52 mg/l. Similar to that recorded in 2000, the lake quality grades assigned to the 2001 summertime means are TP= A; CLA= A; and Secchi= A. These individual grades result in overall 2001 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 year 2001.

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 1.1 (roughly equal to 1- "beautiful"), while the mean recreational suitability ranking was 1.0 (" crystal clear").

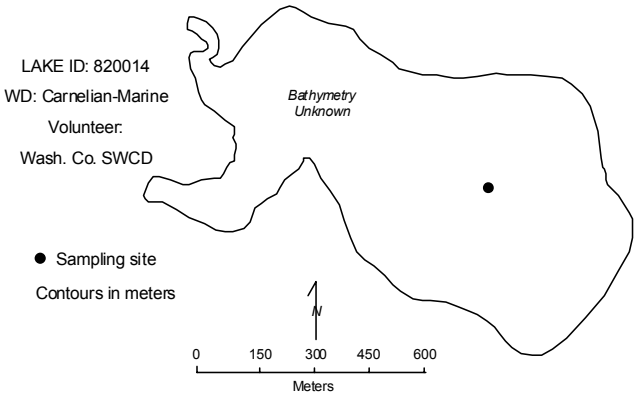
A search of the STORET nationwide water quality database for data on the lake revealed a moderate database throughout the 1990's with nutrient data available in 1991-1996 and 1998-2000. The lake's database indicates that the lake's water quality is well represented by an overall grade of A.

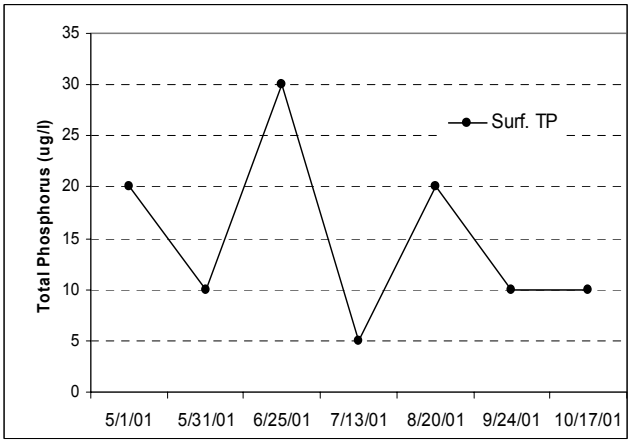
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) conducted a fisheries survey on the lake in 1991. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

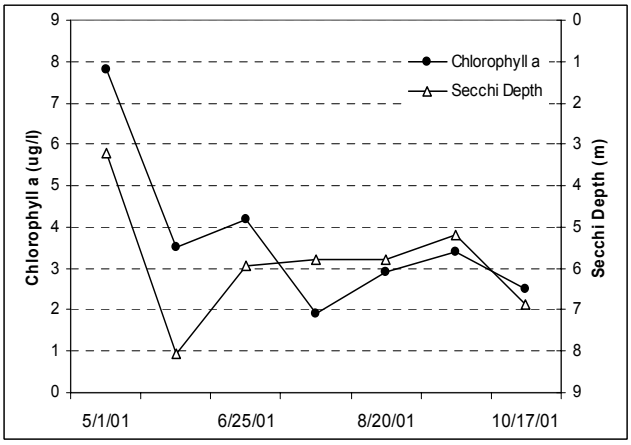
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Little Carnelian Lake

Stillwater Twp., Washington Co.

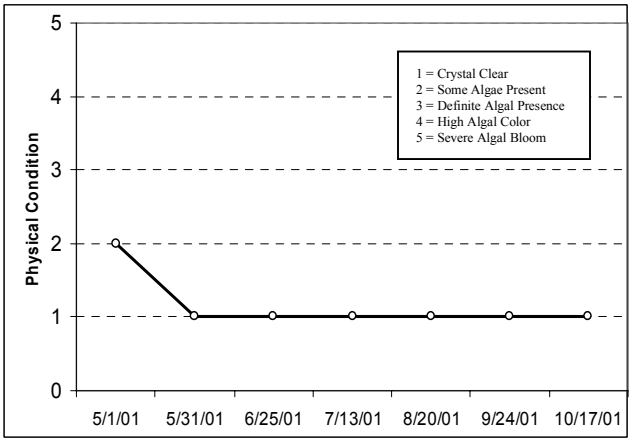






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	12.1				7.8	20		3.2	2	1
5/31	17.9		12.4		3.5	10		8.1	1	1
6/25	22.9		8.18		4.2	30		6.0	1	1
7/13	26.7		10.8		1.9	5		5.8	1	1
8/20	24.9		8.9		2.9	20		5.8	1	1
9/24	18.3		9		3.4	10		5.2	1	1
10/17	12.4		8.21		2.5	10		6.9	1	1

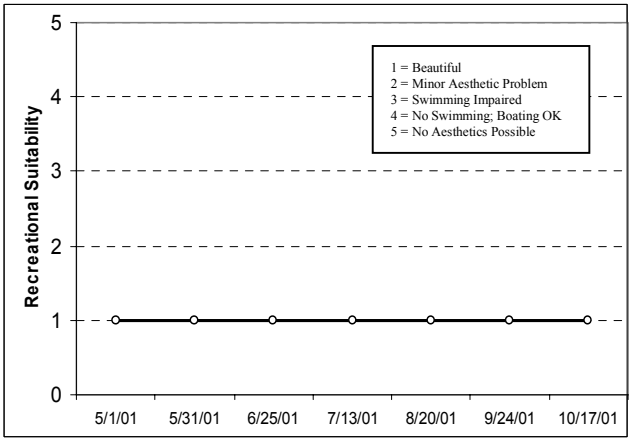


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	A	A				A	A			A	B
Chlorophyll 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**

Source: Metropolitan Council and STORET data



Little Johanna (62-0058) *Rice Creek Watershed District*

This was the first 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 12.2 m (40 feet) (Rice Creek Watershed District 1987). A search through the STORET nationwide water quality database for data on the lake came up empty. Therefore, 2001 is the only year of available water quality data for the lake.

The lake was monitored 12 times from mid-April to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 65.0 µg/l (minimum concentration of 30.0 µg/l and a maximum value of 140.0 µg/l); surface chlorophyll-a= 23.9 µg/l (minimum of 10.0 µg/l and maximum of 57.0 µg/l); Secchi transparency= 1.4 m (minimum of 0.7 m and a maximum of 2.6 m); and TKN= 1.04 mg/l (minimum of 0.69 mg/l and maximum of 1.50 mg/l). The lake's summer means translate to water quality grades of C for TP, C, for CLA, and C for Secchi transparency. These grades result in an overall water quality grade of C for Little Johanna Lake in 2001.

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 2.1 (roughly equal to 2- "some algae present"), while the mean recreational suitability ranking was 3.0 ("swimming slightly impaired").

As mentioned earlier, there are no water quality data available for Little Johanna Lake other than the recent 2001 data. Therefore it is impossible 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.

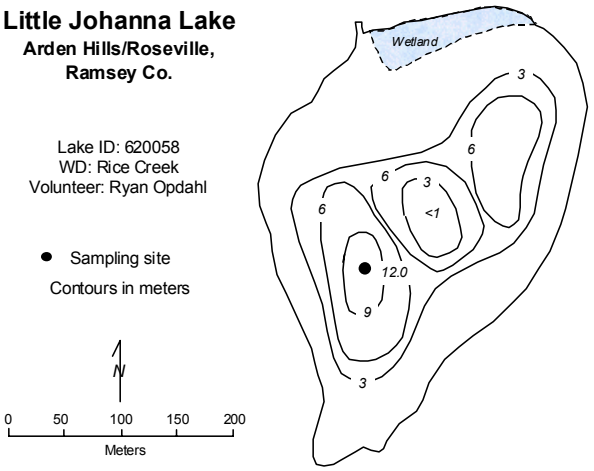
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

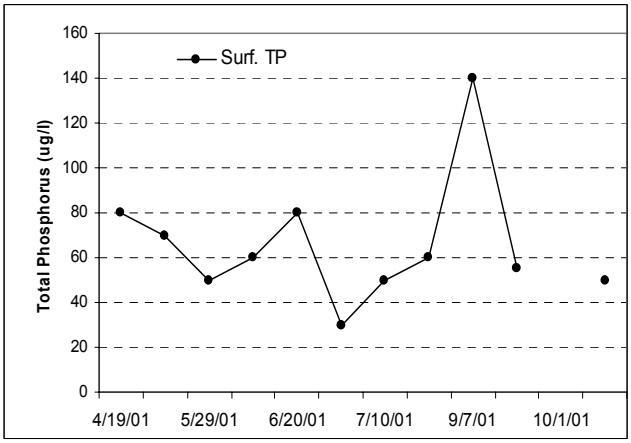
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

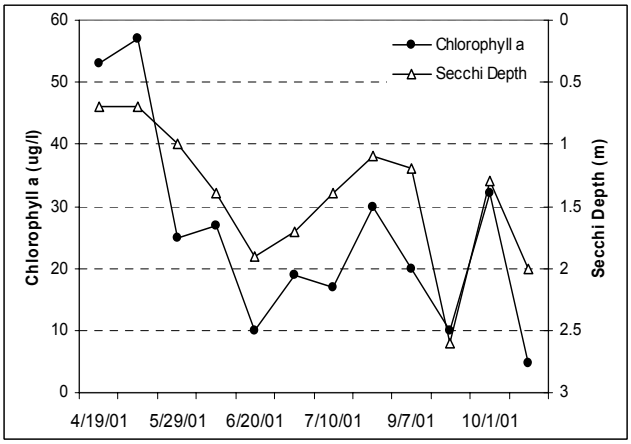
Little Johanna Lake

Arden Hills/Roseville, Ramsey Co.

Lake ID: 620058
WD: Rice Creek
Volunteer: Ryan Opdahl

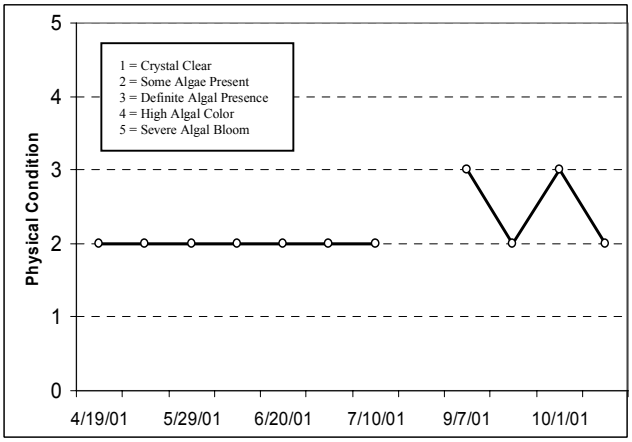






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/19	10				53	80		0.7	2	3
5/8	17				57	70		0.7	2	2
5/29	20.7				25	50		1.0	2	3
6/7	16.8				27	60		1.4	2	2
6/20	22.4				10	80		1.9	2	3
6/27	28.6				19	30		1.7	2	2
7/10	26.3				17	50		1.4	2	3
7/30	26.9				30	60		1.1		3
9/7	23.5				20	140		1.2	3	4
9/17	17.9				10	55		2.6	2	4
10/1	16.8				32			1.3	3	4
10/15	10.6				4.8	50		2.0	2	4

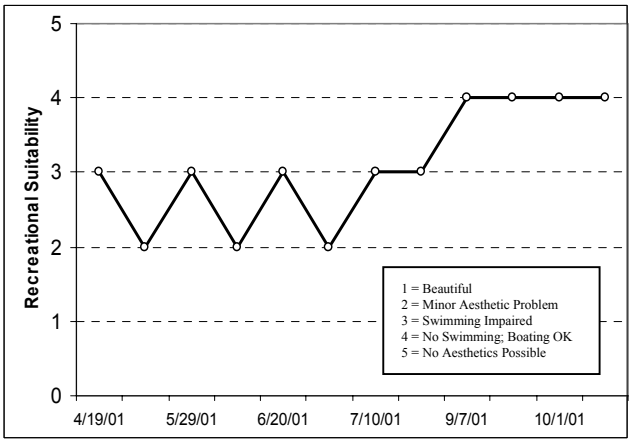


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											C
Chlorophyll a											C
Secchi Depth											C
Overall											**C**

Source: Metropolitan Council and STORET data



Long Lake [Carver County] (10-0016) *Carver County Environmental Services*

This year marks the second year of CAMP monitoring on Long Lake (the other being two sample dates in 1999), which is located in San Franciso Township (Carver County). Other than the 1999 CAMP data, a search for any historical water quality data came up empty. The 56-acre lake has a maximum depth of roughly 2.0 m (just over six feet). Because of the shallowness of the lake, the majority of its are 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.

The lake was monitored 12 times between early-June and early-October, 2001. 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.

The mean summertime (May through September) surface TP concentration for the lake was 305.5 µg/l (minimum of 70.0 µg/l, maximum of 590.0 µg/l). The mean CLA and Secchi transparency readings were 56.7 µg/l (minimum of 9.9 µg/l, maximum of 150.0 µg/l) and 0.5 m (minimum of 0.3 m, maximum of 0.8m), respectively. The lake's mean surface TKN concentration was 2.30 mg/l. The lake quality grades assigned to the 2001 summertime means are TP= F; CLA= D; and Secchi= F, resulting in an overall grade of F.

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 2.6 (between 2- "some algae present" and 3- "definite algal presence"), while the mean recreational suitability ranking was 4.0 ("no swimming – boating ok").

Because 2001 was only the second year of available data, no long- or short-term trends can be determined. To better understand the lake's quality and what direction it may be heading, more 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.

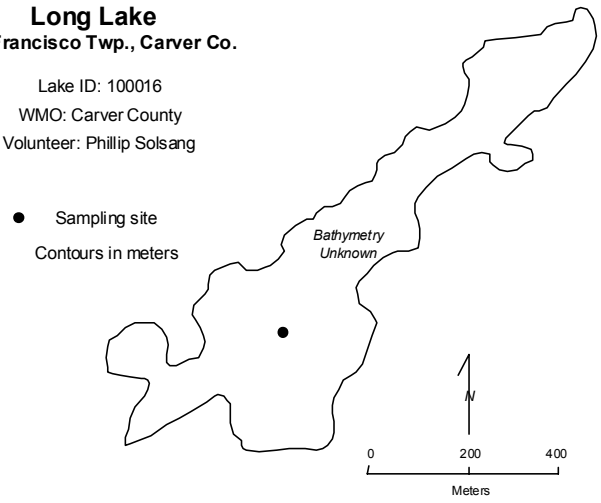
Long Lake

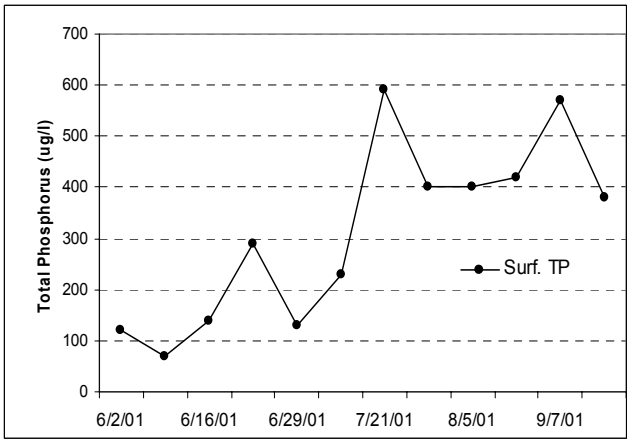
San Francisco Twp., Carver Co.

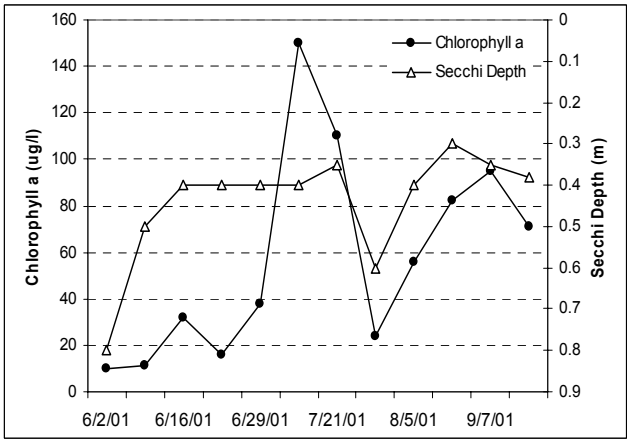
Lake ID: 100016

WMO: Carver County

Volunteer: Phillip Solsang

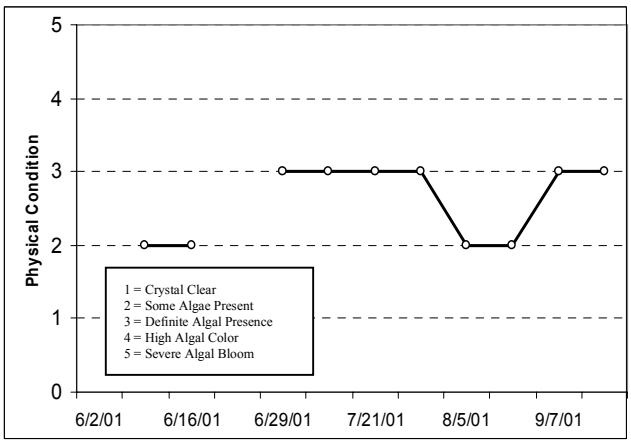


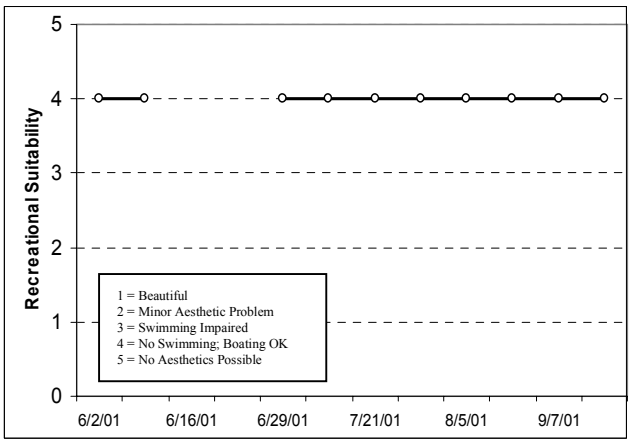




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/2	25				9.9	120		0.8		4
6/9	25				11	70		0.5	2	4
6/16	21				32	140		0.4	2	
6/20					16	290		0.4		
6/29	28				38	130		0.4	3	4
7/11	28				150	230		0.4	3	4
7/21	29				110	590		0.4	3	4
7/30	27				24	400		0.6	3	4
8/5	29				56	400		0.4	2	4
8/19	25				82	420		0.3	2	4
9/7	19				95	570		0.4	3	4
10/6	10				71	380		0.4	3	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											F
Chlorophyll a											D
Secchi Depth											F
Overall											**F**

Source: Metropolitan Council and STORET data

Long Lake [May Township] (82-0030) *Marine on St. Croix WMO*

Long Lake is located in May Township (Washington County). There is very little known 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 1999-2000, was sampled 14 times between early-May and mid-October, 2001.

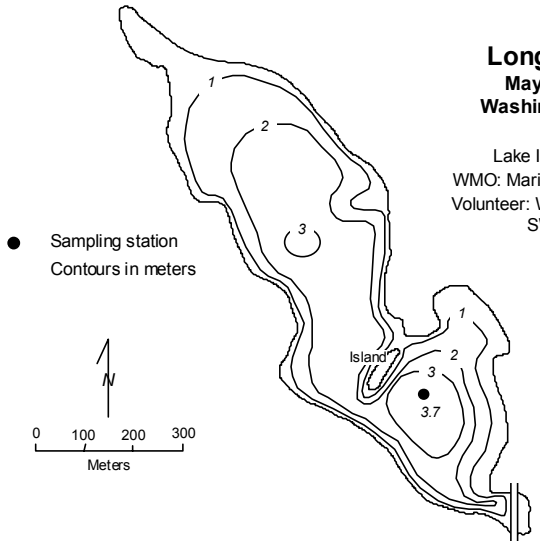
The overall lake quality grade of B was calculated from the individual grades for each parameter. The lake's summertime (May through September) CLA mean of 17.8 µg/l (minimum and maximum of 5.5 and 42.0 µg/l), and the Secchi transparency mean of 2.2 m (minimum of 1.2 m, maximum of 3.7 m) resulted in water quality grades of B. The mean TP concentration of 50.0 µg/l (minimum of 30.0 µg/l, maximum of 70.0 µg/l), on the other hand, resulted in a water quality grade of C. The lake's mean TKN concentration was 0.97 mg/l (minimum of 0.77 mg/l, maximum of 1.20 mg/l).

Because the 88-acre lake lacks a comprehensive historical water quality database, it is not possible to determine any long-term trends. The lake's 2001 overall grade was very similar to that recorded in 2000 and better than those recorded in 1993-1997 and 1999 (C). 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 2.1 (roughly equal to 2- "some algae present"), while the mean recreational suitability ranking was 2.0 ("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/.

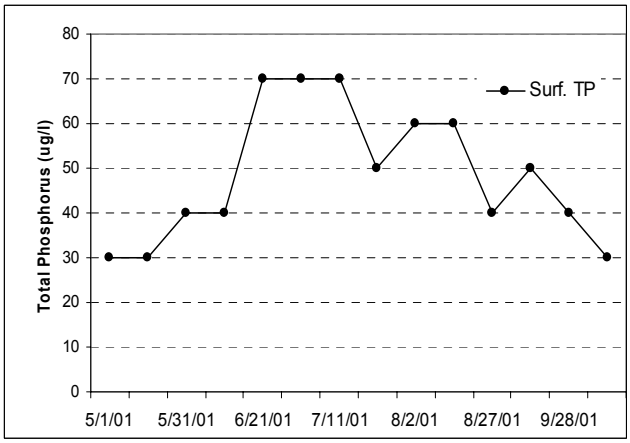
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

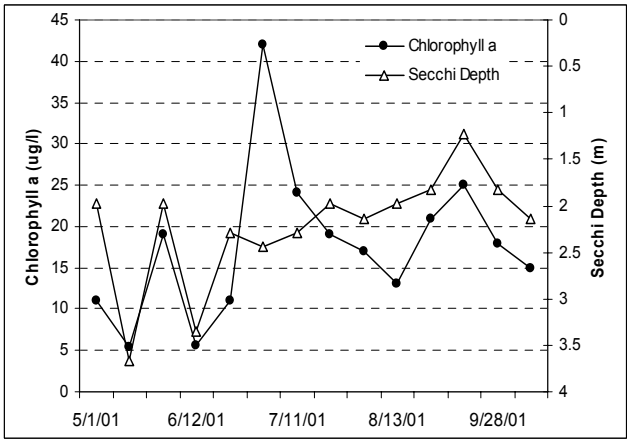


Long Lake,

May Twp., Washington Co.

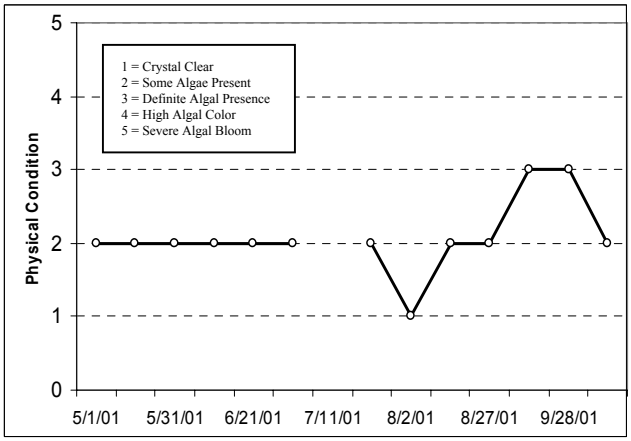
Lake ID: 820030
WMO: Marine-on-St. Croix
Volunteer: Washington Co. SWCD





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	15.8		7.24		11	30		2.0	2	1
5/16	21.7		10.31		5.5	30		3.7	2	1
5/31	18.8		14		19	40		2.0	2	2
6/12	21.6		6.29		5.6	40		3.4	2	2
6/21	23.1		4.8		11	70		2.3	2	3
6/28	28		9.27		42	70		2.4	2	1
7/11	27.1		9.66		24	70		2.3		
7/23	28.4		8.8		19	50		2.0	2	2
8/2	27		7.4		17	60		2.1	1	1
8/13	25.3		6.16		13	60		2.0	2	2
8/27	24.2		7.84		21	40		1.8	2	2
9/11	20.4		8.7		25	50		1.2	3	4
9/28	16.5		11.5		18	40		1.8	3	3
10/16	10.3		8.34		15	30		2.1	2	3

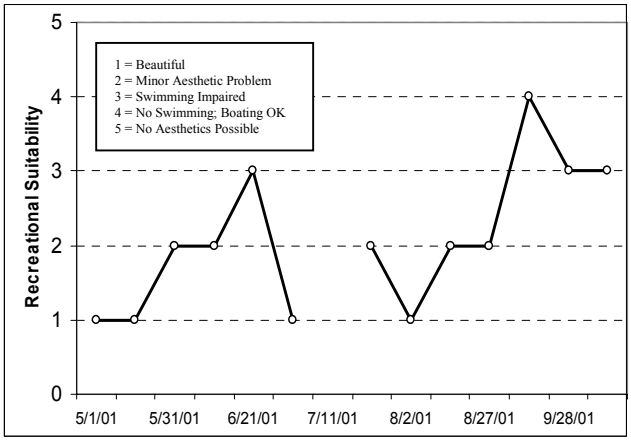


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			C	C	C	C	C		C	C	C
Chlorophyll a			C	C	C	B	C		B	B	B
Secchi Depth			B	C	C	C	C		C	B	B
Overall			**C**	**C**	**C**	**C**	**C**		**C**	**B**	**B**

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 2001volunteer monitoring program, Long Lake was monitored 14 times from early-May to mid-October. This was the sixth year that Long Lake has been involved in CAMP. The lake was also involved in the program in 1995-1996, and 1998-2000. 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.

The 2001 summertime mean concentrations for Long Lake were as follows: TP= 130.0 µg/l (minimum of 80.0 µg/l, maximum of 17.0 µg/l); CLA= 101.8 µg/l (minimum of 26.0 µg/l, maximum of 150.0 µg/l); Secchi transparency= 0.6 m (minimum of 0.3 m, maximum of 0.9 m); and TKN= 1.92 mg/l (minimum and maximum of 1.00 and 2.90 mg/l), respectively. The summertime means resulted in a TP grade of D, CLA grade of F, and Secchi transparency grade of F. The 2001 overall water quality grade for the lake, F, was identical to that recorded in 1998-2000, and worse than the overall D grades the lake received in 1995 and 1996.

A search for water quality data through Council, MPCA, and STORET files resulted in a minimal amount of data. The only years where nutrient data are available for the lake are 1995-1996, and 1998-2001. 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 has seemed fairly constant with grades of F in 1987, 1991-1995, 1998-2001, and a D in 1989 and 1996 (although the 1996 database is limited). Despite the consistent pattern in the lake's clarity, the lake's nutrient concentrations seem to be increasing. To better determine if this indicates a possible trend or is simply a flucuation within the lake's normal range, 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 3.4 (between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability was 4.2 (roughly equal to 4- "no swimming - boating ok"). These numbers are similar to those in past years.

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.

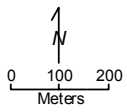
Long Lake,

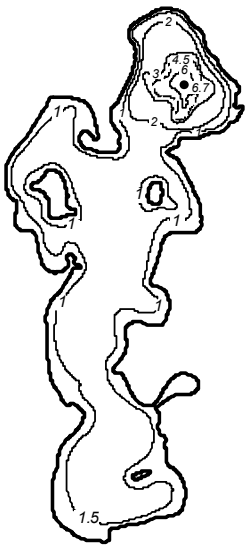
Stillwater, Washington Co.

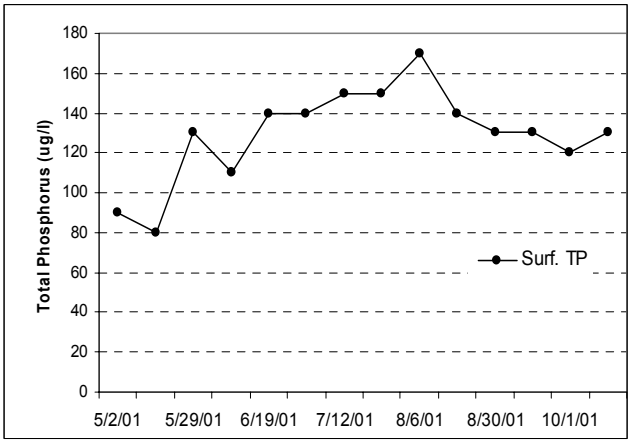
Lake ID: 820021
WMO: Browns Creek
Volunteer: Wash. Co. SWCD

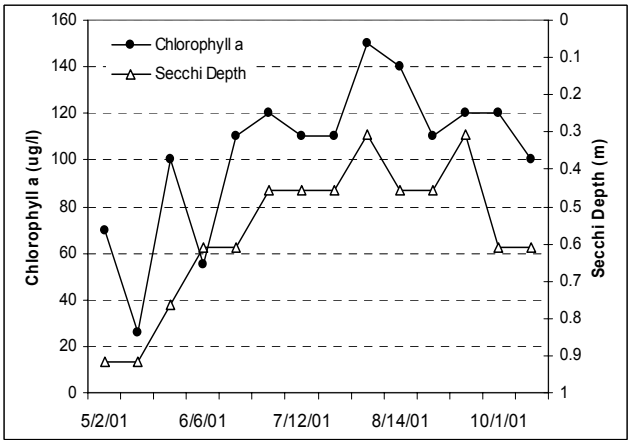
● Sampling site

Contours in meters



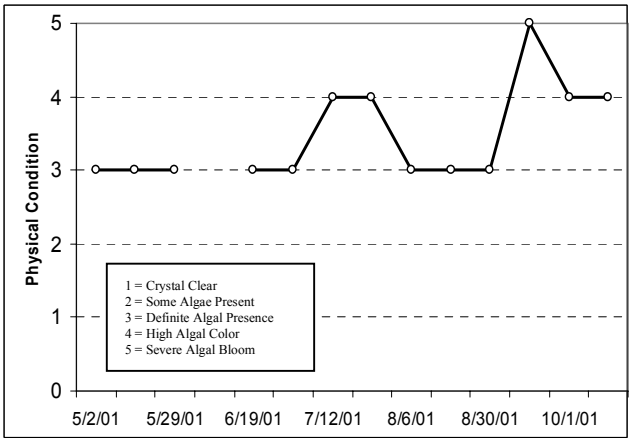






2001 Data

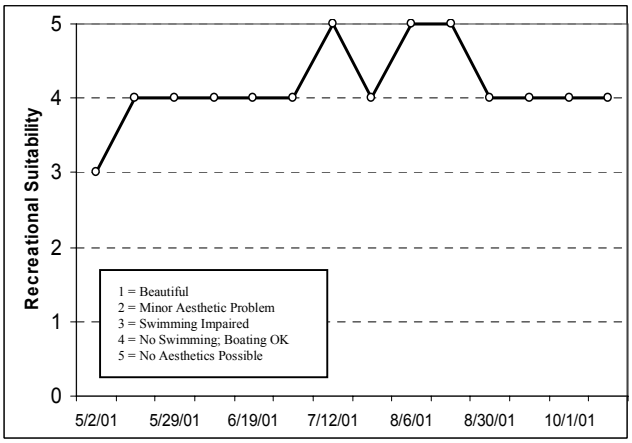
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	17.5		11.9		70	90		0.9	3	3
5/16	24		11.9		26	80		0.9	3	4
5/29	20		13		100	130		0.8	3	4
6/6	17.3		10.7		55	110		0.6		4
6/19	23.2		6.87		110	140		0.6	3	4
6/29	28.8		15.16		120	140		0.5	3	4
7/12	28.1		18.58		110	150		0.5	4	5
7/25	28.5		13.6		110	150		0.5	4	4
8/6	32.1		10.6		150	170		0.3	3	5
8/14	24.6		8.52		140	140		0.5	3	5
8/30	22.7		2.93		110	130		0.5	3	4
9/13	21.9		14.9		120	130		0.3	5	4
10/1	10.7		7.65		120	120		0.6	4	4
10/16	10.7		7.65		100	130		0.6	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D	D		D	D	F	D
Chlorophyll a					D	D		F	F	F	F
Secchi Depth	F	F	F	F	F	D		F	F	F	F
Overall					**D**	**D**		**F**	**F**	**F**	**F**



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 second 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 were available other than the 2000-2001 CAMP data, was 1998-1999. The lake was monitored 14 times between early-May and mid-October, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for Long Lake, calculated from the individual parameter grades, is D. The 2001 summertime (May - September) mean TP concentration of 60.0 µg/l (minimum of 40.0 µg/l, maximum of 80.0 µg/l) corresponded to a lake water quality grade of C, while the CLA mean of 48.9 µg/l (minimum and maximum of 15.0 and 110.0 µg/l) resulted in a grade of D. Long Lake's mean Secchi transparency of 1.1 m (minimum of 0.6 m and maximum of 1.6 m) corresponds to a D for water clarity. The lake's mean TKN concentration was 1.32 mg/l (minimum of 0.98 mg/l, maximum of 2.10 mg/l).

The lake's 2001 water quality was quite a bit better than that recorded in 1998-2000, which had overall grades of F.

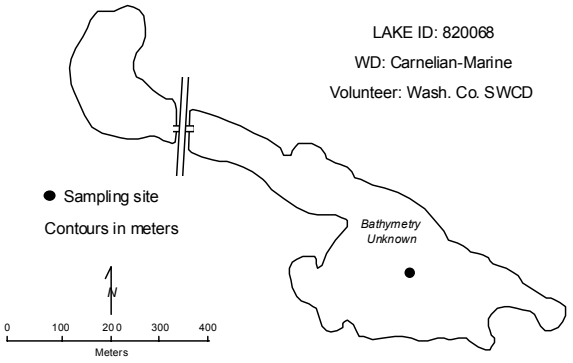
As mentioned earlier, there is very little water quality data available for Long Lake. Therefore it is impossible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, more data are needed.

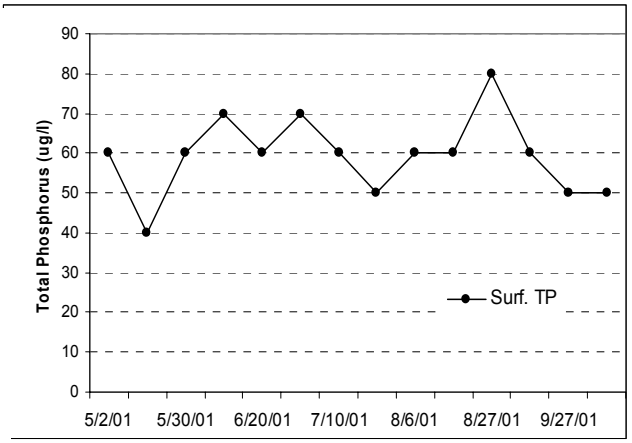
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.0 for physical condition ("definite algal presence"), and 3.7 for recreational suitability (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

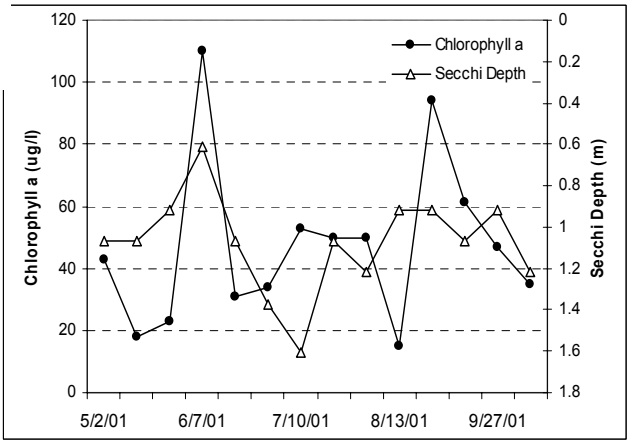
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Long Lake

New Scandia Twp., Washington Co.

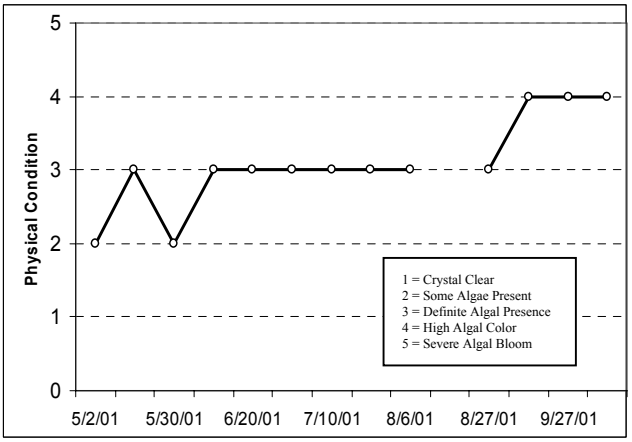






2001 Data

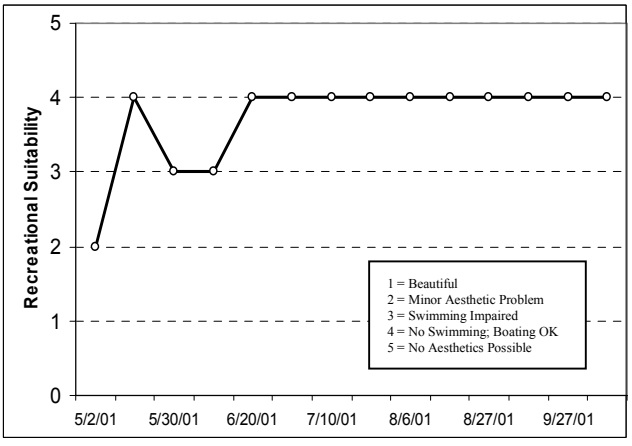
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	17.9		11.23		43	60		1.1	2	2
5/15	26.3		10.4		18	40		1.1	3	4
5/30	22		10.9		23	60		0.9	2	3
6/7	18.1		7.68		110	70		0.6	3	3
6/20	22.9		5.61		31	60		1.1	3	4
6/28	31		7.83		34	70		1.4	3	4
7/10	28.1		12		53	60		1.6	3	4
7/24	27.8		11.4		50	50		1.1	3	4
8/6	30.3		7.1		50	60		1.2	3	4
8/13	25.8		8.3		15	60		0.9		4
8/27	25.1		8.57		94	80		0.9	3	4
9/11	20.2		12		61	60		1.1	4	4
9/27	16.3		14		47	50		0.9	4	4
10/10	12.1		9.36		35	50		1.2	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								D	D	D	C
Chlorophyll a								F	F	F	D
Secchi Depth								F	F	F	D
Overall								**F**	**F**	**F**	**D**



Source: Metropolitan Council and STORET data

Loon Lake (82-0015) *Carnelian-Marine Watershed District*

This was the second 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 14 times between early-May and mid-October, 2001. 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 mean summertime (May through September) surface TP concentration for the lake was 76.7 µg/l (minimum of 50.0 µg/l, maximum of 100.0 µg/l). The mean CLA and Secchi transparency readings were 66.5 µg/l (minimum of 29.0 µg/l, maximum of 130.0 µg/l) and 0.7 m (minimum of 0.4 m, maximum of 1.1 m), respectively. The lake's mean surface TKN concentration was 1.98 mg/l. The lake quality grades assigned to the 2001 summertime means are TP= D; CLA= D; and Secchi= D, resulting in an overall grade of D. While the lake's 2001 overall grade was identical to that recorded in 2000 (both of which were better than 1996-1998), the individual means of 2001 were much improved.

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 3.2 (between 3- "definite algal presence"), while the mean recreational suitability ranking was 3.6 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

Because of the limitedness of the lake's water quality database, 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 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.

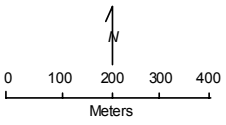
LAKE ID: 820015

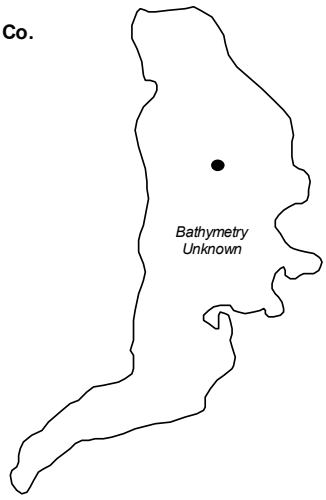
WD: Carnelian-Marine

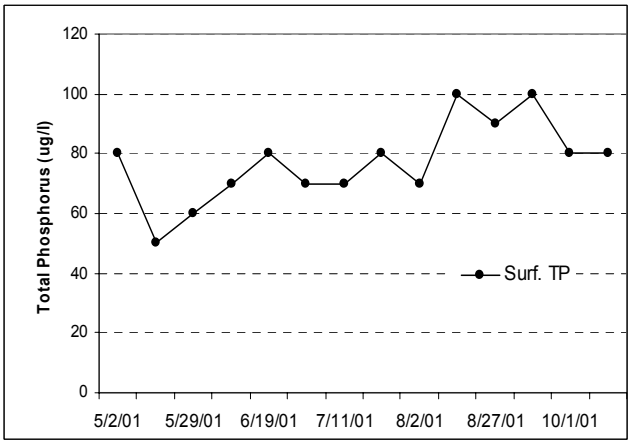
Volunteer: Wash. Co. SWCD

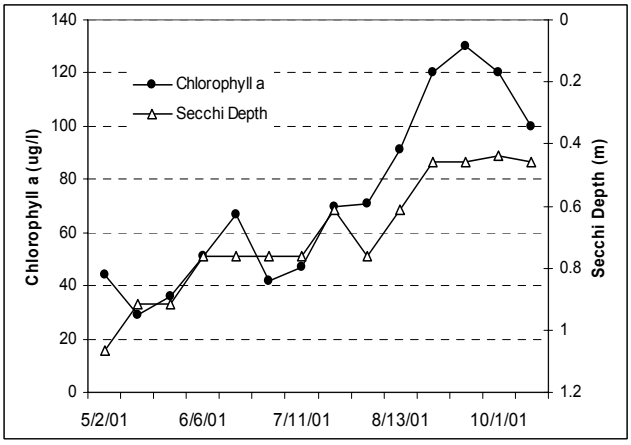
● Sampling site

Contours in meters



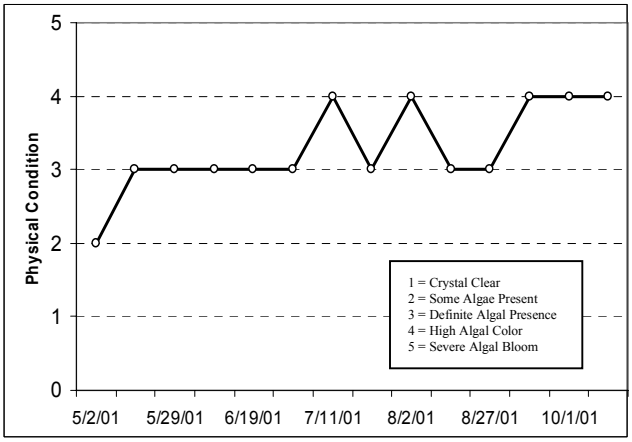






2001 Data

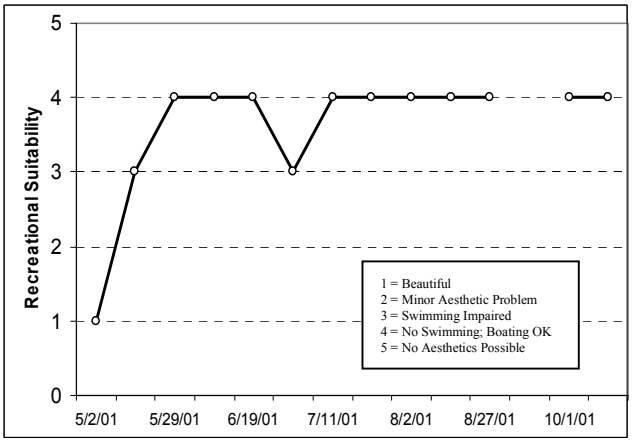
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	17		10.7		44	80		1.1	2	1
5/16	21.4		10.1		29	50		0.9	3	3
5/29	18.7		12.5		36	60		0.9	3	4
6/6	17.2		10.2		51	70		0.8	3	4
6/19	22.3		5.96		67	80		0.8	3	4
6/28	28.7		10.5		42	70		0.8	3	3
7/11	28.3		10.8		47	70		0.8	4	4
7/24	27.9		11		70	80		0.6	3	4
8/2	27.9		8.65		71	70		0.8	4	4
8/13	26.3		10.04		91	100		0.6	3	4
8/27	25.2		11.56		120	90		0.5	3	4
9/11	21.2		11.4		130	100		0.5	4	
10/1	16.5		15.4		120	80		0.4	4	4
10/16	10.3		9.07		100	80		0.5	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						F	F	F	F	D	D
Chlorophyll a						D	D	D	D	D	D
Secchi Depth						F	F	F	F	D	D
Overall						**F**	**F**	**F**	**F**	**D**	**D**



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 second 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 (1996-2000).

The lake was monitored five times between mid-May and mid-September, 2001. The resulting data and graphs appear on the next page. The 2001 overall lake quality grade for Louise Lake, calculated from the individual parameter grades, is D. The 2001 summertime (May - September) mean TP concentration of 102.0 µg/l (minimum of 50.0 µg/l, maximum of 180.0 µg/l) corresponded to a lake water quality grade of D as does the CLA mean of 46.0 µg/l (minimum and maximum of 8.2 and 100.0 µg/l). Louise Lake's mean Secchi transparency of 0.9 m (minimum of 0.5 m and maximum of 2.0 m) acorresponds to a D for water clarity. The lake's mean TKN concentration was 2.00 mg/l (minimum of 1.20 mg/l, maximum of 3.40 mg/l).

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 2.9 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 3.5 for recreational suitability (between 3- "swimming slightly impaired" and 3- "no swimming - boating ok").

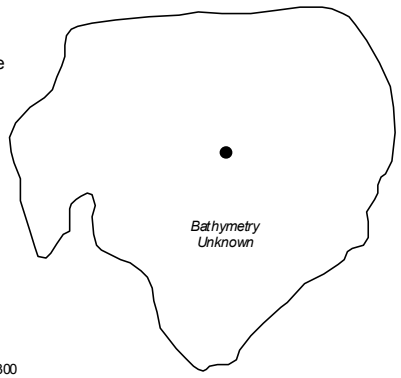
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

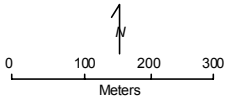
Lake Louise

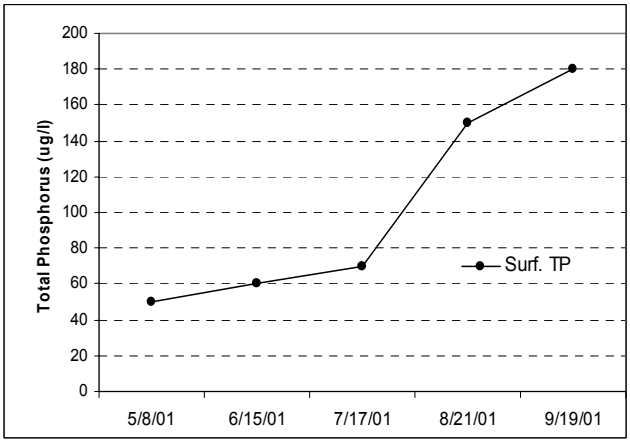
Stillwater Twp., Washington Co.

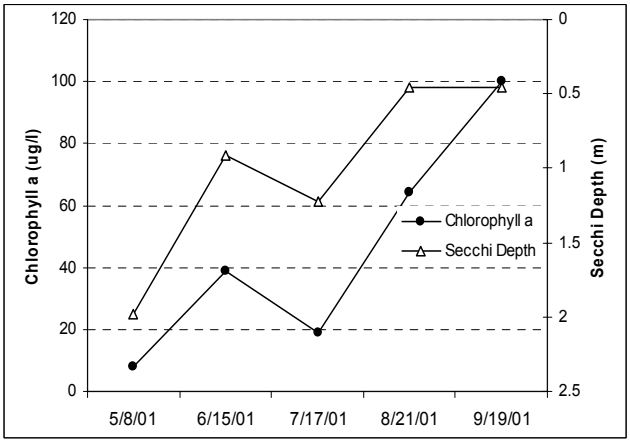
LAKE ID: 820025
WD: Carnelian-Marine
Volunteer:
Wash. Co. SWCD

● Sampling site
Contours in meters



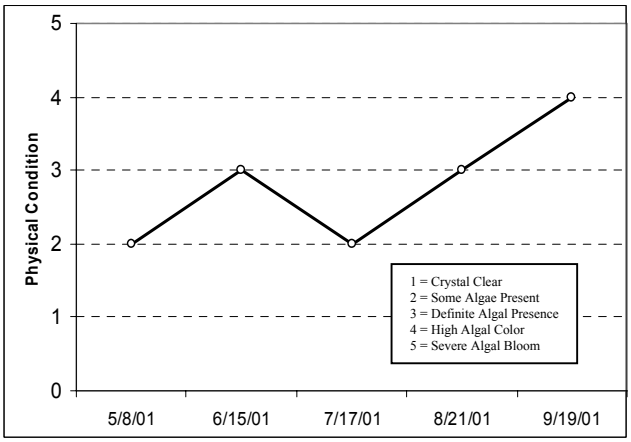






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	15.8		11.2		8.2	50		2.0	2	2
6/15	22.4		7		39	60		0.9	3	3
7/17	26.7		10.8		19	70		1.2	2	4
8/21	23.5		9.57		64	150		0.5	3	4
9/19	18.6		7.12		100	180		0.5	4	4

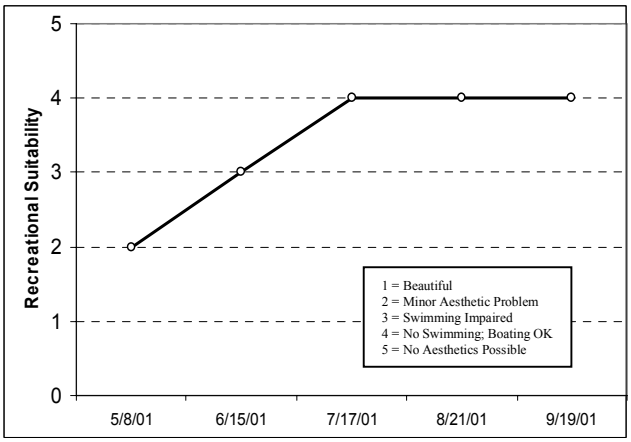


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						D	D	B	C	D	D
Chlorophyll a						D	D	D	F	B	D
Secchi Depth						B	C	C	C	C	D
Overall						**C**	**D**	**C**	**D**	**C**	**D**

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 second 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 (1997-2000).

The lake was monitored 5 times from mid-May to mid-September, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page. The summertime (May through September) means for the monitored variables were: surface TP= 162.0 µg/l (minimum concentration of 90.0 µg/l and a maximum value of 280.0 µg/l); surface chlorophyll-a= 60.1 µg/l (minimum of 5.3 µg/l and maximum of 140.0 µg/l); Secchi transparency= 0.9 m (minimum of 0.5 m and a maximum of 1.8 m); and TKN= 1.88 mg/l (minimum of 1.60 mg/l and maximum of 2.50 mg/l). The lake's summer means translate to water quality grades of F for TP, D for CLA, and D for Secchi transparency. These grades result in an overall water quality grade of D for Maple Marsh Lake in 2001.

As mentioned earlier, there is limited water quality data available for Maple Marsh Lake other then the 2001 CAMP data. Therefore it is impossible 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 3.4 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), 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.

Maple Marsh

May Twp., Washington Co.

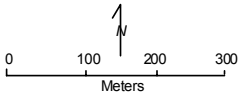
LAKE ID: 820038

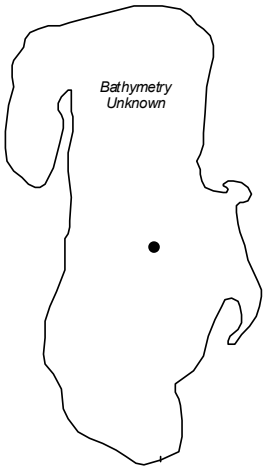
WD: Carnelian-Marine

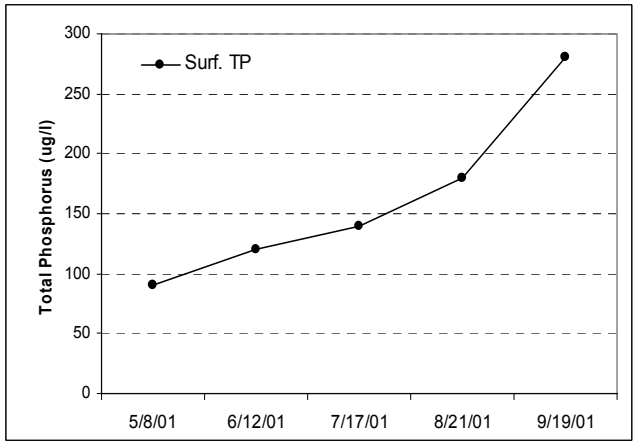
Volunteer: Wash. Co. SWCD

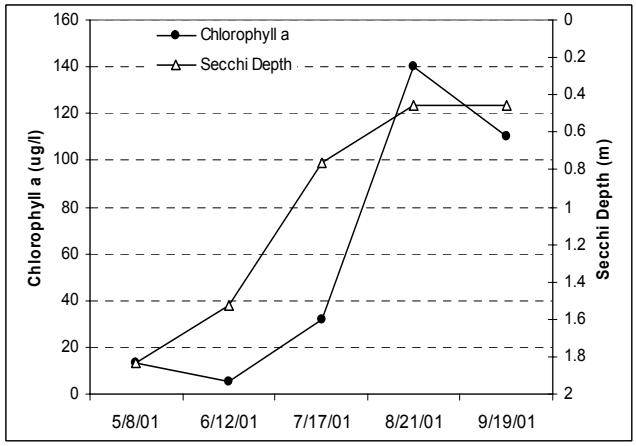
● Sampling site

Contours in meters



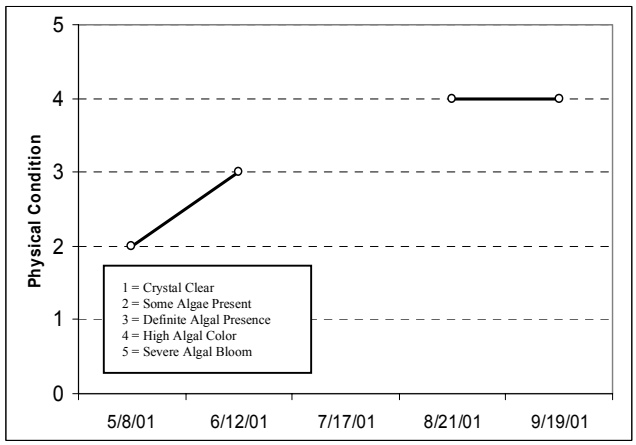






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	14.7		10		13	90		1.8	2	2
6/12	24.2		5.5		5.3	120		1.5	3	4
7/17	25.4		8.2		32	140		0.8		
8/21	22.1		7.86		140	180		0.5	4	4
9/19	17.7		5.98		110	280		0.5	4	4

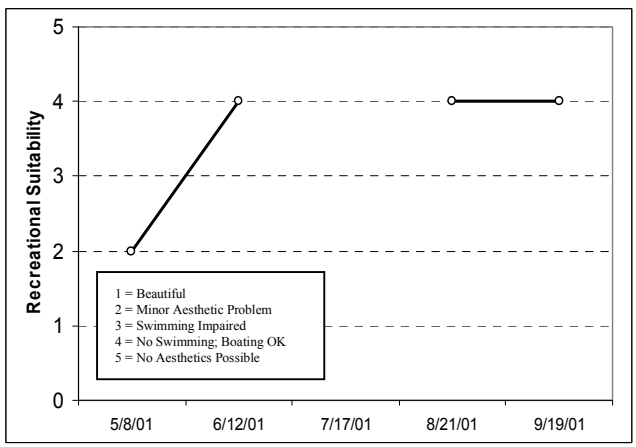


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus							F	F	C	D	F
Chlorophyll a							D	F	F	C	D
Secchi Depth							D	F	D	D	D
Overall							**D**	**F**	**D**	**D**	**D**

Source: Metropolitan Council and STORET data



Marcott Lake [Site 2] (19-0041) *City of Inver Grove Heights*

This was the sixtth year that the south basin of Marcott Lake [Site 2] has been involved in CAMP. The lake was also involved in the program in 1995-1999. Located in the City of Inver Grove Heights, the 39-acre south basin (EP-80) has a maximum depth of 7.9 m (26 feet). The lake was monitored six times from mid-May to late-September, 2001. It is estimated that 90 percent of the lake's area is considered littoral zone (the 0-15 foot depth area that is dominated by aquatic vegetation).

Summertime (May through September) means for the monitored variables were: surface TP= 18.3 µg/l (minimum concentration of 10.0 µg/l, maximum value of 20.0 µg/l), surface chlorophyll-a= 3.5 µg/l (minimum of < 1.0 µg/l, [in which case 0.5 µg/l was used to calculate the summer mean], maximum of 9.8 µg/l), Secchi transparency= 3.4 m (minimum of 2.0 m, maximum of 5.5) and TKN= 0.83 mg/l (minimum of 0.70 mg/l, maximum of 0.95 mg/l). Associated lake quality grades for the 20001 summertime means were TP= A, CLA= A, Secchi= A. The lake's overall 2001 quality grade, calculated from the TP, CLA, and Secchi grades, was A. This overall grade is identical to those recorded during past CAMP monitoring years.

A search for historical water quality for the south basin of Marcott Lake revealed little. Other than the mentioned CAMP data, the only year that data were found for Marcott Lake [Site 2] was 1993 (five sampling events by Barr Engineering). The 1993 summertime means were similar to the means of 1995-2001. The 1993 means of TP= 14.0 µg/l, CLA= 4.7 µg/l, and Secchi= 2.6 m similarly resulted in an overall grade of A. The available water quality data for the south basin of Marcott Lake places it within the top 10 percent of Metro Area lakes for both 1993, and 1995-2001.

Because 1993, and 1995-2001 are the only years of available data, no long- term trends can be determined. On the short-term, however, the lake seems to be suitably represented by an overall grade of A. More years of data collection are needed to help determine any long-term trends.

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. The summertime mean physical condition was 1.5 (between 1- "crystal clear" and 2- "some algae present"). The mean suitability for recreation ranking was 2.0 ("minor aesthetic problem").

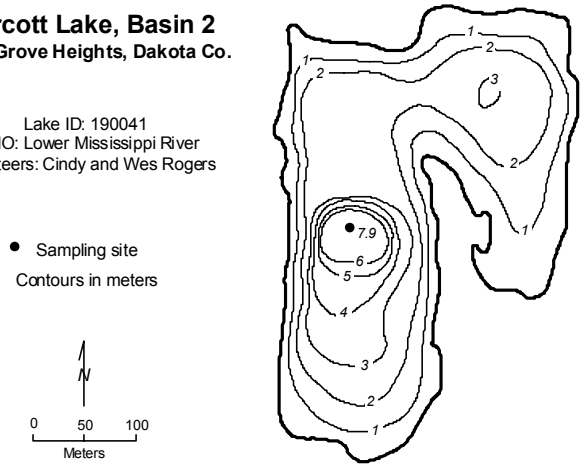
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

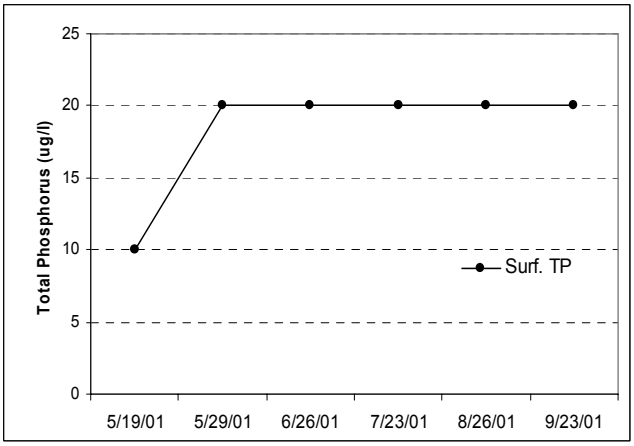
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

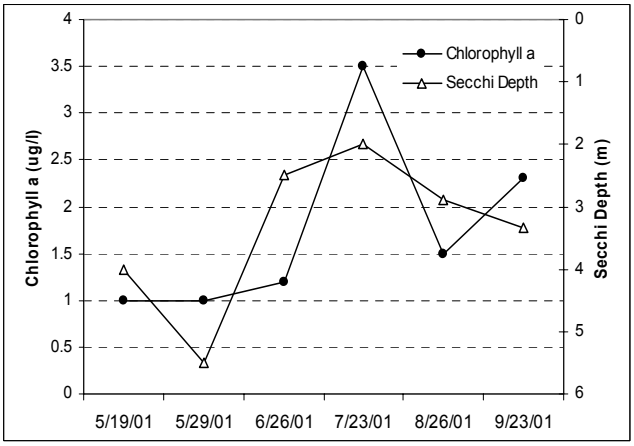
Marcott Lake, Basin 2

Inver Grove Heights, Dakota Co.

Lake ID: 190041
WMO: Lower Mississippi River
Volunteers: Cindy and Wes Rogers

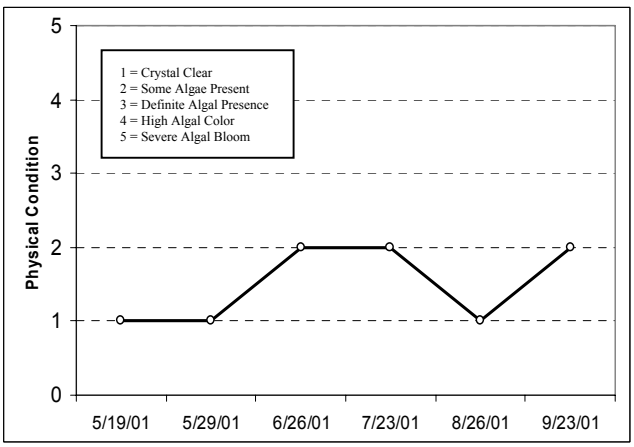






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/19	24				1	10		4.0	1	2
5/29	21				1	20		5.5	1	2
6/26	29				1.2	20		2.5	2	2
7/23	31				3.5	20		2.0	2	2
8/26	27				1.5	20		2.9	1	2
9/23	17				2.3	20		3.3	2	2

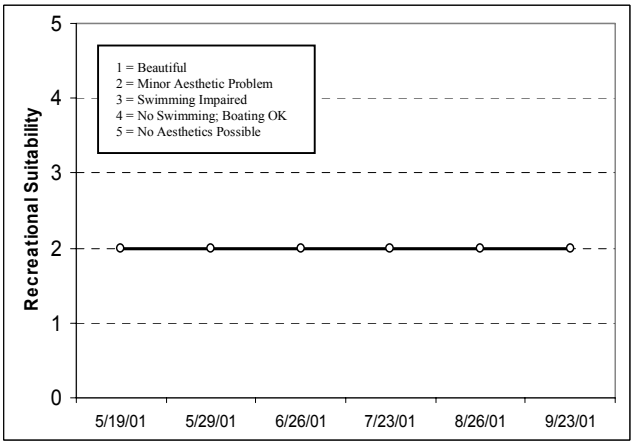


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			A		A	A	A	A	A	A	A
Chlorophyll a			A		A	A	A	A	A	A	A
Secchi Depth			B		A	B	B	B	A	B	A
Overall			**A**		**A**	**A**	**A**	**A**	**A**	**A**	**A**

Source: Metropolitan Council and STORET data



Maria Lake (10-0058) *Carver County Environmental Services*

Maria Lake is a 169-acre lake located within Benton and Dahlgren Townships (Carver County). The maximum depth of the lake is 1.0 m (roughly three 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 third year that Maria Lake has been involved in CAMP. Other than the 1999 CAMP data (only monitored twice) and 2000 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 1999-2001 are the only years of available data.

The lake was monitored 14 times from mid-April to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 155.5 µg/l (minimum concentration of 30.0 µg/l and a maximum value of 290.0 µg/l); surface chlorophyll-a= 36.9 µg/l (minimum of 2.5 µg/l and maximum of 94.0 µg/l); Secchi transparency= 0.8 m (minimum of 0.5 m and a maximum of 1.0 m); and TKN= 2.25 mg/l (minimum of 1.70 mg/l and maximum of 3.30 mg/l). The lake's summer means translate to water quality grades of F for TP, C for CLA, and D for Secchi transparency. These grades result in an overall water quality grade of D for Maria Lake in 2001 (better than that recorded in 2000).

As mentioned earlier, there is no water quality data available for Maria Lake other then the 1999-2001 CAMP data. Therefore it is impossible 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.

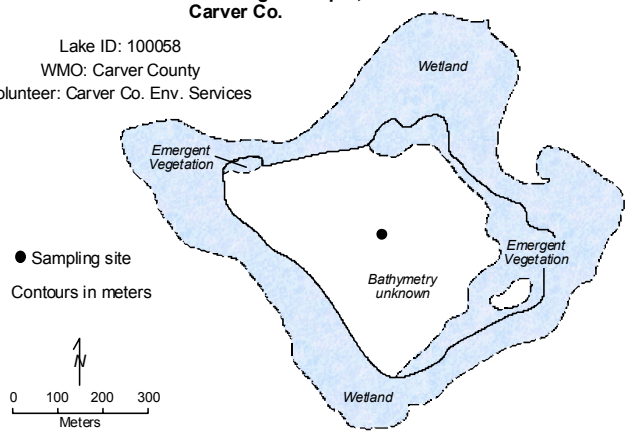
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.5 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 4.4 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aesthetic possible").

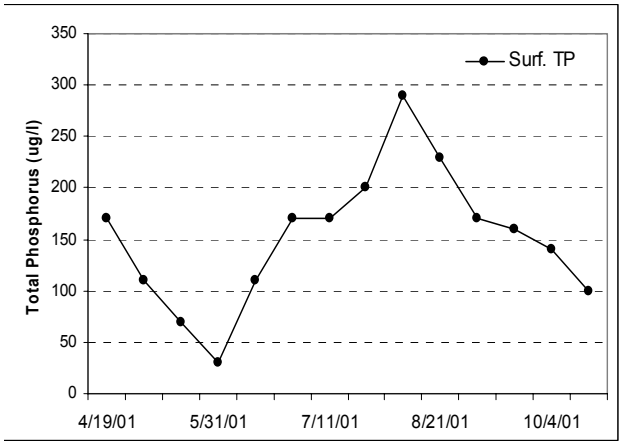
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

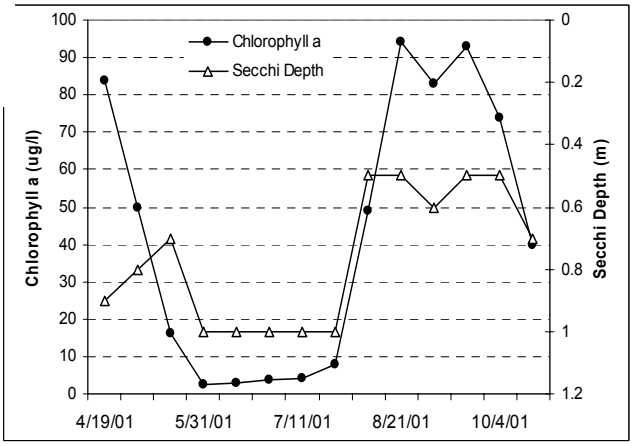
Lake Maria

Benton and Dahlgren Twps., Carver Co.

Lake ID: 100058
WMO: Carver County
Volunteer: Carver Co. Env. Services

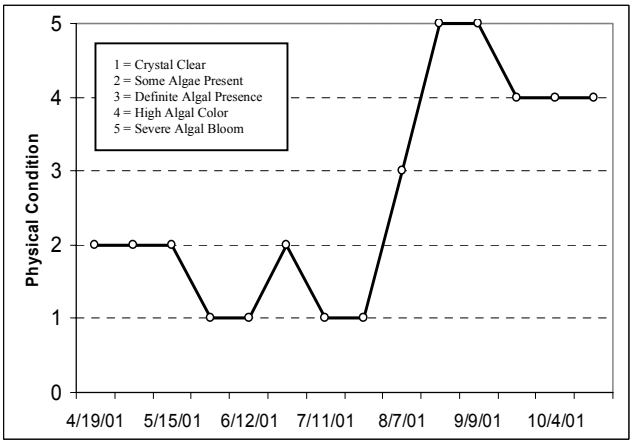






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/19	9.6				84	170		0.9	2	5
5/1	19		12.21		50	110		0.8	2	5
5/15	22		10.33		16	70		0.7	2	4
5/31	19.6		14.4		2.5	30		1.0	1	4
6/12	24.5		9.08		3.1	110		1.0	1	4
6/26	21.4		5.11		3.6	170		1.0	2	4
7/11	25.3		4.85		4	170		1.0	1	4
7/23	28		5.15		7.7	200		1.0	1	4
8/7	31		5.12		49	290		0.5	3	4
8/21	22.5		8.91		94	230		0.5	5	5
9/9	22.4		5.91		83	170		0.6	5	5
9/24	12.2		11.66		93	160		0.5	4	5
10/4	13.8		9.2		74	140		0.5	4	4
10/17	7.7		12.07		40	100		0.7	4	5

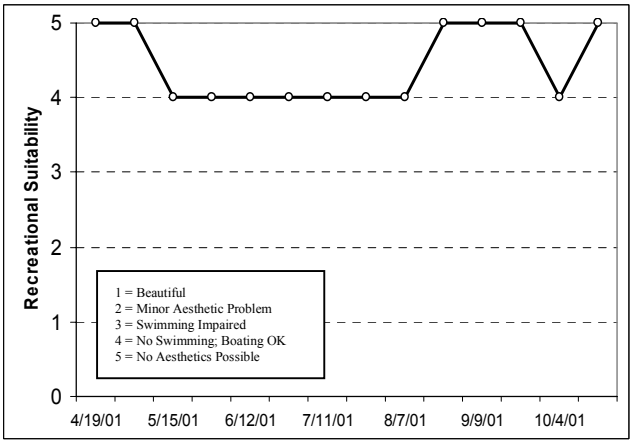


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										F	F
Chlorophyll a										F	C
Secchi Depth										F	D
Overall										**F**	**D**

Source: Metropolitan Council and STORET data



Marion Lake (19-0026) *City of Lakeville*

This was the fourth year that Marion Lake has been a part of CAMP (the others were 1994 and 1999-2000). 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.

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 (during the last three winters aeration was not needed).

As part of the 2001 volunteer monitoring program, Lake Marion was monitored 13 times from late-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).

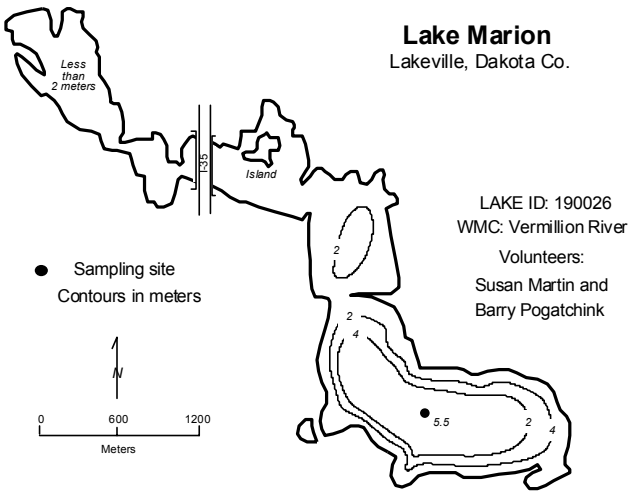
The 2001 summertime (May through September) mean concentrations for Lake Marion were as follows: TP= 25.5 µg/l (minimum of < 10.0 µg/l [in which case 0.5 µg/l was used to calculate the summer mean], and maximum of 50.0 µg/l); CLA= 14.4 µg/l (minimum of 3.2 µg/l and maximum of 62.0 µg/l); Secchi transparency= 2.3 m (minimum of 0.9 m and maximum of 3.1 m); and TKN= 0.66 mg/l (minimum and maximum of 0.33 and 1.30 mg/l), respectively. The summertime means resulted in a TP grade of B, CLA grade of B, and Secchi transparency grade of B. The resulting overall grade in 2001 (B), determined through the calculation of all three parameters, is identical to that of 1994, 1999, and 2000.

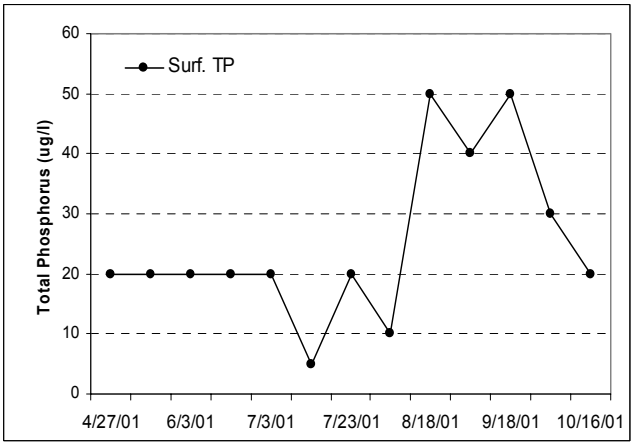
The physical and recreational conditions of the lake, as observed by the volunteer monitors, were ranked on a 1 to 5 ranking scale. The volunteer's user perception rankings are shown on the lake's information sheet. The mean physical condition ranking was 1.3 (between 1- "crystal clear" and 2- "some algae present"), while the lake's mean recreational suitability ranking was 1.3 (between 1- "beautiful" and 2- "minor aesthetic problem").

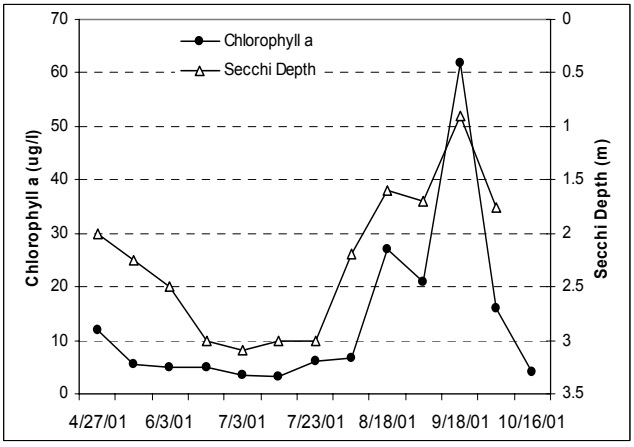
While Lake Marion does have 12 years of data (nine of which contain some nutrient measurements) over the past 22 years, it is difficult to determine what is happening with the lake's water quality. The available data shows a wide range in the lake's quality with the water quality showing an improvement 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, and 1987; and finally received a B in 1994, 1999, 2000, and 2001. With such a wide range of fluctuation, it is difficult to determine any long-term trends let alone if the database contains some bad data or simply outlines the range of the lake's normal water quality variability. A few more years of data should help create a better picture of the lake's condition.

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.

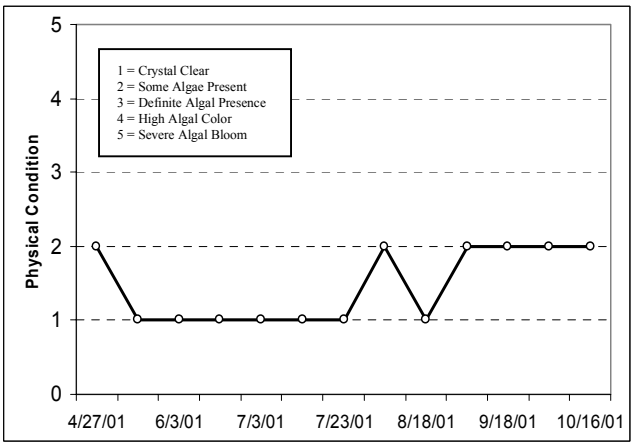






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27	10				12	20		2.0	2	1
5/12	15				5.6	20		2.3	1	1
6/3	16				5	20		2.5	1	3
6/13	22				4.8	20		3.0	1	1
7/3	22				3.4	20		3.1	1	1
7/10	27				3.2	5		3.0	1	1
7/23	27				6.1	20		3.0	1	1
8/8	28				6.8	10		2.2	2	1
8/18	22				27	50		1.6	1	1
9/4	21.3				21	40		1.7	2	
9/18	16.8				62	50		0.9	2	2
10/2	14.6				16	30		1.8	2	2
10/16	6				4	20			2	2

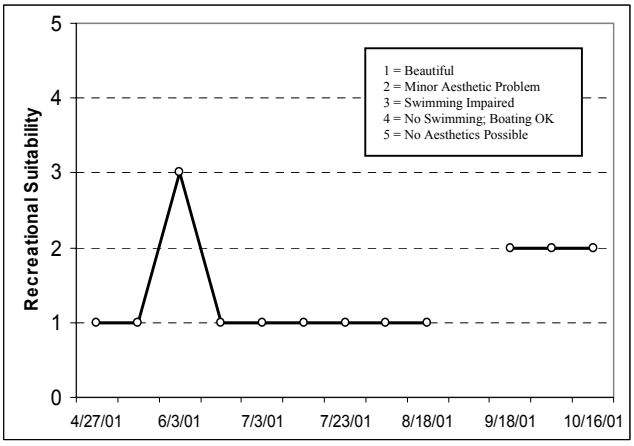


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				B					B	B	B
Chlorophyll a				A					B	A	B
Secchi Depth	C			B					C	B	B
Overall				**B**					**B**	**B**	**B**

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 no outlet. 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 early-May and mid-October 2001, the lake was monitored nine times. During each monitoring event; TP, CLA, TKN, and Secchi transparency were measured, as was the lake's perceived physical condition and recreational suitability. The 2001 overall lake quality report card grade, determined from the lake's mean TP, CLA and Secchi transparency, was D (C in 1995-1996, and 2000, D in 1994, 1997 and 1999, and F in 1998).

The 2001summertime (May - September) mean TP concentration of 197.5 µg/l (minimum of 70.0 µg/l, maximum of 320.0 µg/l), corresponded to a grade of F. The lake's mean Secchi transparency of 1.0 m (minimum of 0.3 m, maximum of 2.2 m) results in a D grade for water clarity, while the CLA mean of 38.1 µg/l (minimum and maximum of 3.5 µg/l and 92.0 µg/l), resulted in a grade of C for algal biomass. The lake's mean TKN concentration was 2.62 mg/l (minimum of 0.68 mg/l, maximum of 4.60 mg/l

A moderate amount historical water quality data is available for Markgrafs Lake. Data found were collected through CAMP in 1994-2001. Because of the size of the lake's water quality database, howver, no long-term trends can be determined. In the short-term, however, it the lake's overall quality generally fluctuates between a low C (1995-1996, and 2000) and a D (1994, 1997, 1999, and 2001). The lake had its worst 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 3.6 (between 3- "definite algae present" and 4- "high algal color") while the mean recreational suitability was 3.0 ("swimming slightly impaired").

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.

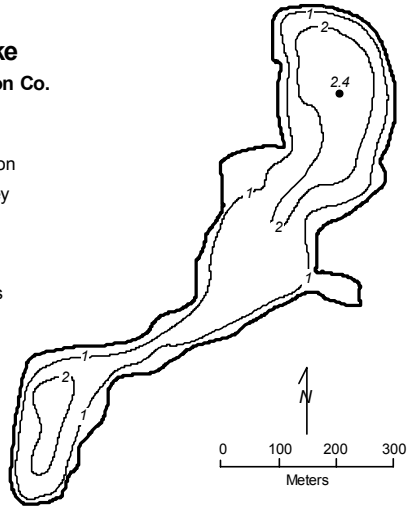
Markgrafs Lake

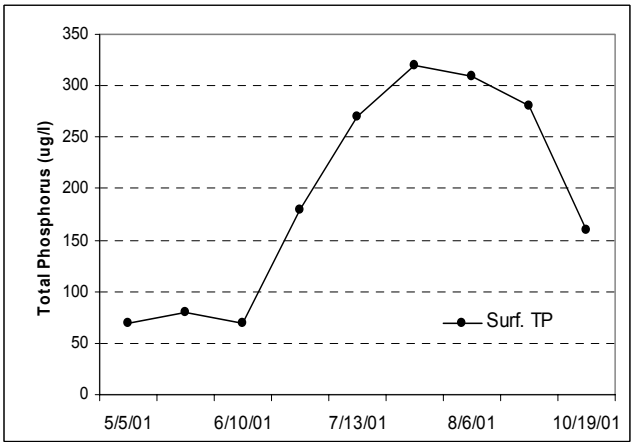
Woodbury, Washington Co.

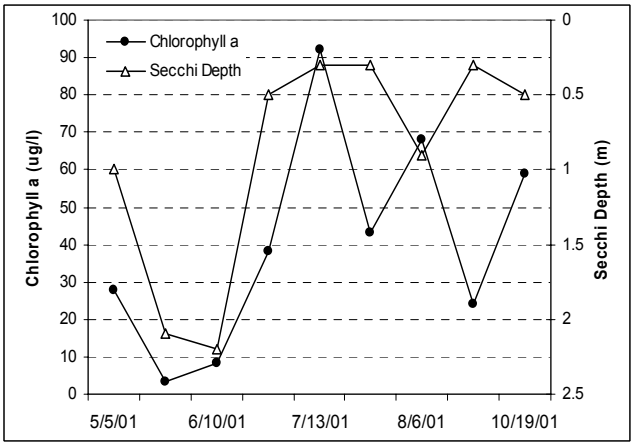
Lake ID: 820089
WD: South Washington
Volunteer: Terry Riley

- Sampling site

Contours in meters

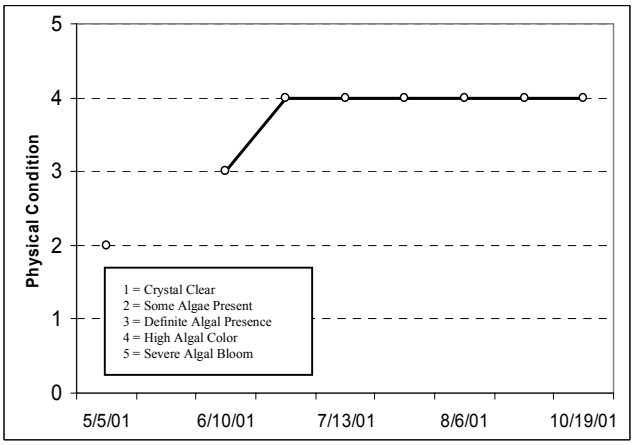






2001 Data

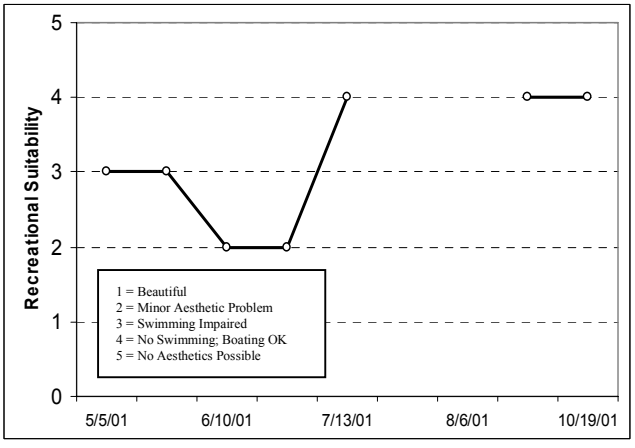
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/5	15				28	70		1.0	2	3
5/29	20				3.5	80		2.1		3
6/10	22.5				8.5	70		2.2	3	2
7/5	26.3				38	180		0.5	4	2
7/13	28				92	270		0.3	4	4
7/25	30.2				43	320		0.3	4	
8/6	31.3				68	310		0.9	4	
8/26	25.8				24	280		0.3	4	4
10/19	9.5				59	160		0.5	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				D	C	D	D	F	D	D	F
Chlorophyll a				C	B	B	C	F	C	C	C
Secchi Depth				D	C	C	D	F	D	C	D
Overall				**D**	**C**	**C**	**D**	**F**	**D**	**C**	**D**



Source: Metropolitan Council and STORET data

Markley Lake (70-0021) *Scott County*

This was the fifth year that Markley Lake has been monitored for lake water quality information. 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 2001 volunteer monitoring program, Markley Lake was monitored 13 times from late-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) are presented on the next page.

The 2001 summertime mean concentrations for Markley Lake were as follows: TP= 34.6 µg/l (minimum of 20.0 µg/l, maximum of 50.0 µg/l), CLA= 15.2 µg/l (minimum of 6.8 µg/l, maximum of 30.0 µg/l), Secchi transparency= 1.4 m (minimum of 0.3 m, maximum of 2.0 m), and TKN= 0.87 mg/l (minimum and maximum of 0.72 and 1.10 mg/l), respectively. The summertime means resulted in a TP grade of C, CLA grade of B, and Secchi transparency grade of C. The individual parameter grades resulted in an overall grade of C (similar to past years). While the lake's 2001 overall water quality grade was similar to past years, its individual parameter means were better than that recorded in 2000 and more in line to those of 1997-1998.

Because 2001 is only the fifth year of available nutrient data, no long-term trends can be determined. 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, more years of data collection are needed.

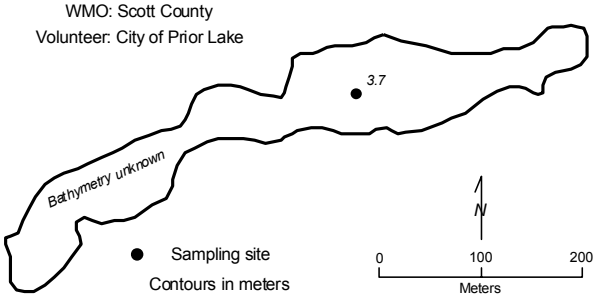
The average user perception rankings of Markley Lake correspond to the overall quality of the lake. On a 1-to-5 ranking scale, the mean physical condition ranking was 2.1 (between 2- "some algae present" and 3- "swimming slightly impaired"), while the mean recreational suitability was 3.4 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

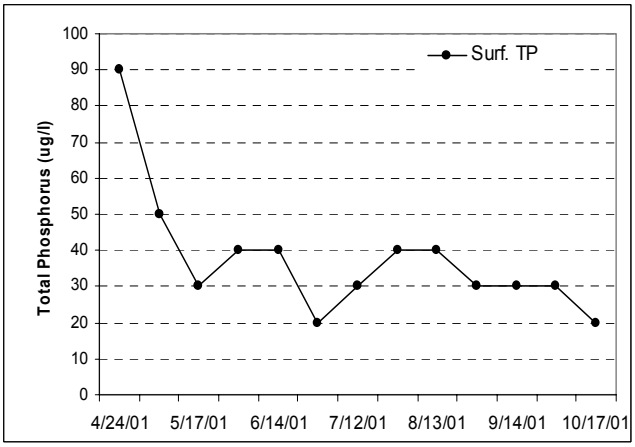
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

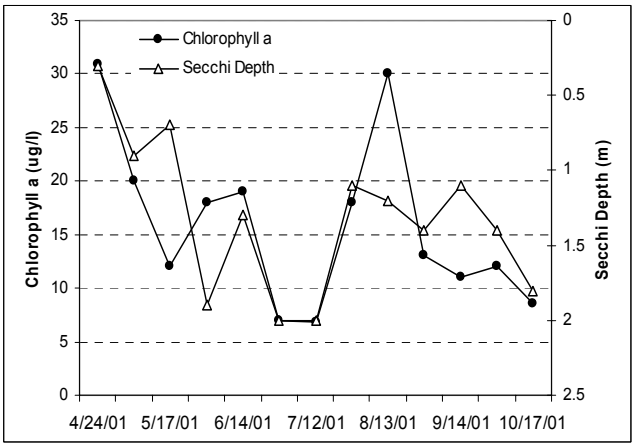
Markley Lake

Credit River Twp./Prior Lake, Scott Co.

Lake ID: 700021
WMO: Scott County
Volunteer: City of Prior Lake

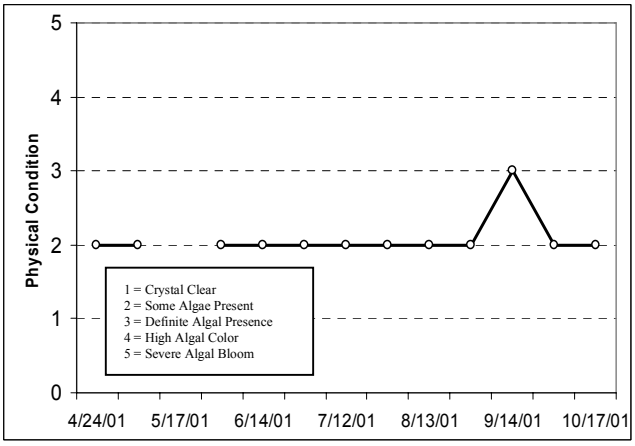






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/24	10				31	90		0.3	2	3
5/4	15		15		20	50		0.9	2	3
5/17	22				12	30		0.7		
6/4	15				18	40		1.9	2	5
6/14	25				19	40		1.3	2	5
6/29	28				7	20		2.0	2	
7/12	29				6.8	30		2.0	2	5
7/30	29				18	40		1.1	2	5
8/13	25				30	40		1.2	2	2
8/30	27				13	30		1.4	2	2
9/14	20				11	30		1.1	3	2
9/28	18				12	30		1.4	2	2
10/17	11				8.5	20		1.8	2	2

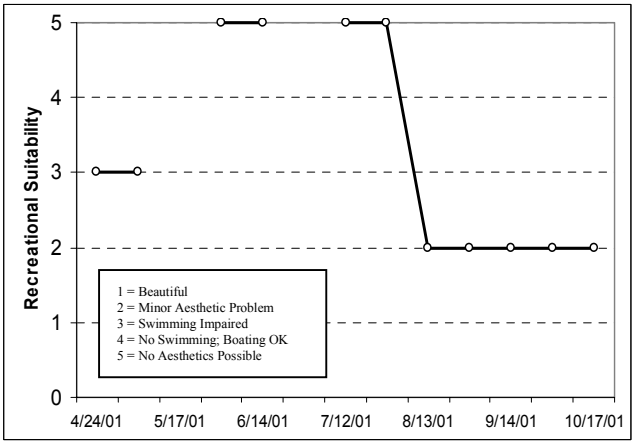


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus							C	C	C	C	C
Chlorophyll a							B	B	B	C	B
Secchi Depth							C	C	C	C	C
Overall							**C**	**C**	**C**	**C**	**C**

Source: Metropolitan Council and STORET data



Marshan Lake (2-0007) *Rice Creek Watershed District*

This was the sixth year that Marshan Lake, which is located in the City of Lino Lakes (Anoka County) was enrolled in CAMP (the lake was also sampled through CAMP in 1996-2000). The 230-acre lake has a maximum depth of 1.4 m (4.6 feet). Because of the shallowness of the lake, it is entirely considered littoral zone (the 0-15 foot depth 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 was monitored seven times between late-April and early-September, 2001. 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.

The mean summertime (May through September) surface TP concentration for the lake in 2001 was 168.3 µg/l (minimum of 50.0 µg/l, maximum of 470.0 µg/l). The mean CLA and Secchi transparency readings were 104.2 µg/l (minimum of 11.0 µg/l, maximum of 240.0 µg/l) and 0.6 m (minimum of 0.2 m, maximum of 1.4 m), respectively. The lake's mean surface TKN concentration was 2.79 mg/l. The lake quality grades assigned to the 2001 summertime means were TP= F; CLA= D; and Secchi= F, resulting in an overall grade of F.

The lake's TP and TKN means do not include points deemed an outlier (1,300.0 µg/l and 12.0 mg/l) on one sampling date (September 10). The dates TP and TKN concentrations are roughly three to five times greater than expected values, and a reason for the erroneous numbers is not known (in-lab processes and QA/QC runs within the batch where the questionable sample was analyzed, were checked and okayed).

The lake's 2001 overall grade was similar to those recorded in 1996, 1997, and 1999-2000 and worse than the D grade recorded in 1998.

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 mean physical condition ranking was 3.7 (between 3-definite algae present" and "high algal color") while the mean recreational suitability ranking was 4.3 (between 4- "no swimming - boating ok" and 5- "no aesthetics possible"). However, since the lake is not really used recreationally (due to its shallowness), it may not be necessary for it to sustain activities such as swimming.

Since 1981 Marshan has been monitored during 14 years: 1981-1983, 1985, 1987-1990, 1996-2001. Analysis of these data reveals that the quality of the lake is consistently low, fluctuating between overall grades of D and F (the lake received a C in 1981). No long-term trend is apparent

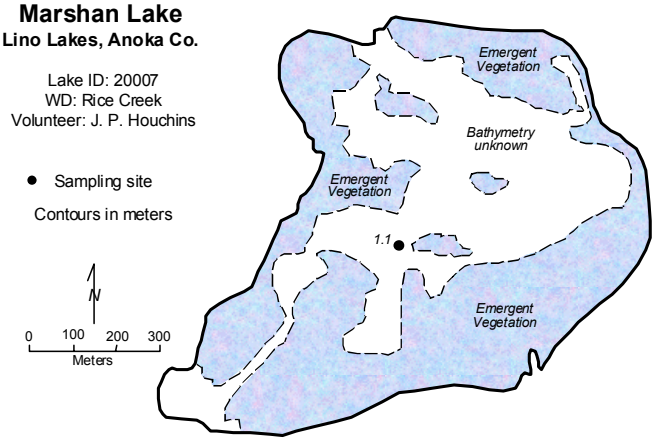
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

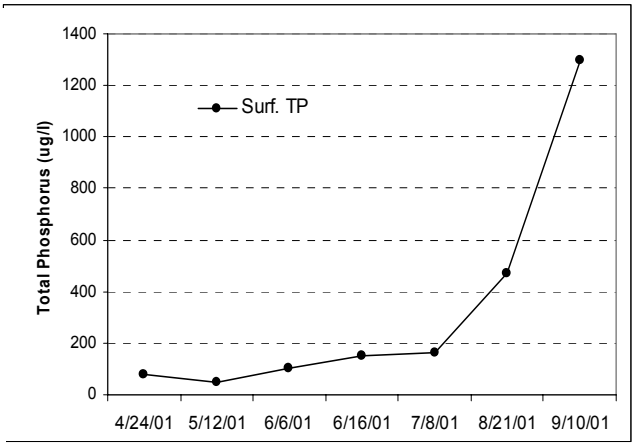
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

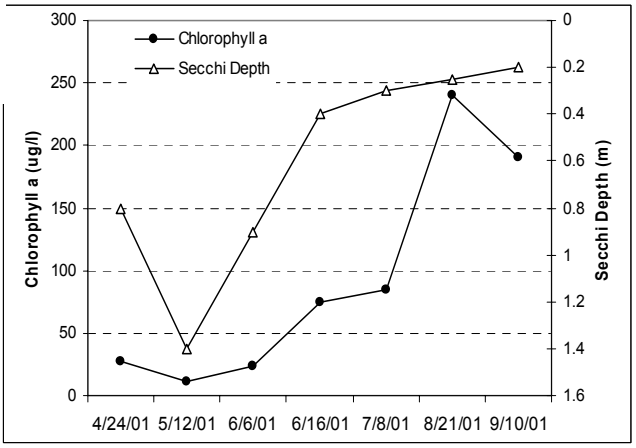
Marshan Lake

Lino Lakes, Anoka Co.

Lake ID: 20007
WD: Rice Creek
Volunteer: J. P. Houchins

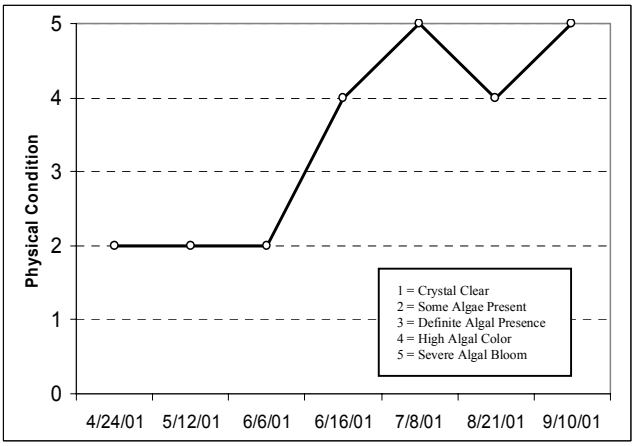






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/24	9				28	80		0.8	2	4
5/12	18				11	50		1.4	2	4
6/6	16				24	100		0.9	2	4
6/16	20				75	150		0.4	4	4
7/8	30				85	160		0.3	5	4
8/21	28				240	470		0.3	4	5
9/10	25				190	1300		0.2	5	5

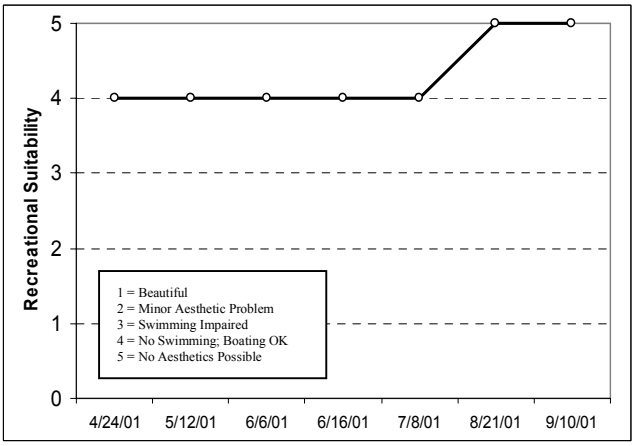


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						F	F	F	F	F	F
Chlorophyll a						D	D	C	F	D	F
Secchi Depth						F	F	F	F	F	F
Overall						**F**	**F**	**D**	**F**	**F**	**F**

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 second year in which McDonald Lake has been involved in CAMP (1999 was the other). Except for Secchi transparency data for 1998 and CAMP data 1999, a search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 1999 and 2001 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 14 times between mid-April and mid-October, 2001. The resulting data and graphs appear on the next page.

The lake's overall 2001 lake quality grade of C was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 47.3 µg/l (minimum of 20.0 µg/l, maximum of 90.0 µg/l) corresponds to a lake water quality grade of C, as did the mean Secchi transparency of 1.6 m (minimum of 0.5 m, maximum of 3.1 m). The lake's the mean CLA concentration of 40.9 µg/l (minimum of 3.4 µg/l and maximum of 130.0 µg/l) also resulted in a grade of C (which is worse thjan the B grade the lake received in 1999). The mean TKN concentration over the same time period was 1.33 mg/l (minimum of 0.71 mg/l and maximum of 2.80 mg/l).

As mentioned earlier, there is no nutrient data available for McDonald Lake other than the 1999 and 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, 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 2.5 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 4.0 for recreational suitability ("no swimming – boating ok").

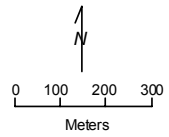
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

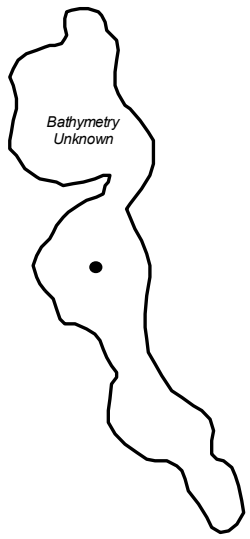
McDonald Lake

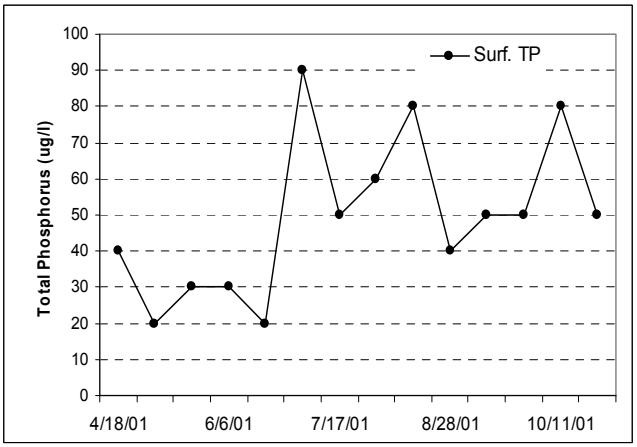
Baytown Twp., Washington Co.

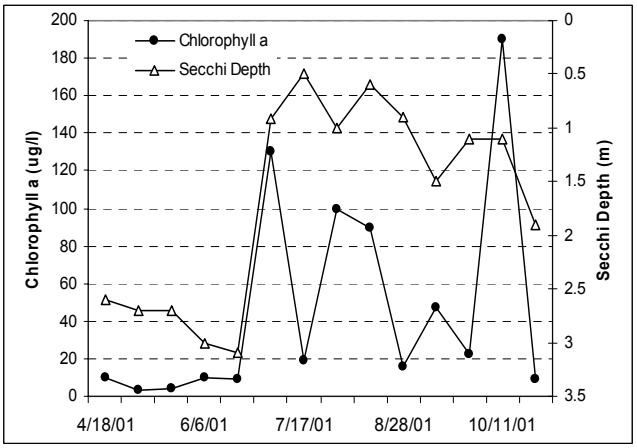
Lake ID: 820010
WD: Lower St. Croix Valley
Volunteer: Paul Bishoff

● Sampling site
Contours in meters



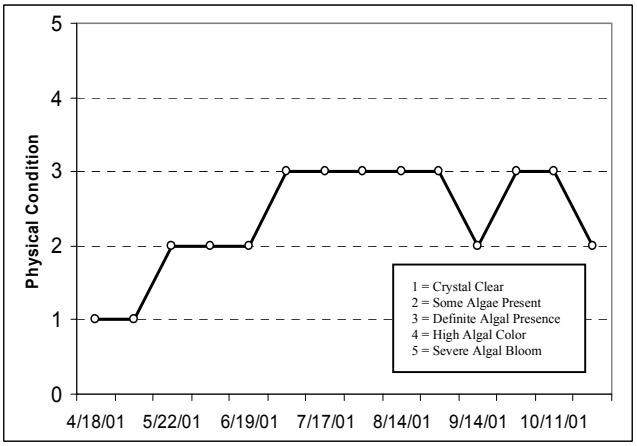






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/18	10.5				9.7	40		2.6	1	4
5/18	15.5				3.4	20		2.7	1	4
5/22	17.4				3.8	30		2.7	2	4
6/6	16.2				10	30		3.0	2	4
6/19	16.2				9	20		3.1	2	4
7/3	26.9				130	90		0.9	3	4
7/17	27				19	50		0.5	3	4
8/1	27				100	60		1.0	3	4
8/14	24				90	80		0.6	3	4
8/28	26.9				16	40		0.9	3	4
9/14	20.7				47	50		1.5	2	4
9/25	15.7				22	50		1.1	3	4
10/11	10.1				190	80		1.1	3	4
10/22	10.1				9.3	50		1.9	2	

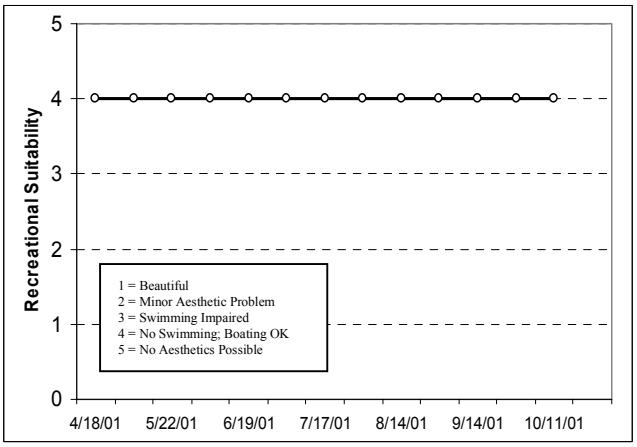


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									C		C
Chlorophyll a									B		C
Secchi Depth								C	C	C	C
Overall									**C**		**C**

Source: Metropolitan Council and STORET data



McKusick Lake (82-0020) *Middle St. Croix Watershed Management Organization*

Lake McKusick is a 46-acre lake located within the City of Stillwater (Washington County). The lake has been involved in CAMP since 1994. In 2001, the lake was monitored 14 times between early-May and mid-October.

The overall lake quality grade for Lake McKusick in 2001 was B as calculated from the individual grades for each parameter. The summertime (May through September) mean TP concentration of 45.5 µg/l (minimum of 40.0 µg/l, maximum of 70.0 µg/l) resulted in a water quality grade of C. The lake's Secchi transparency mean of 2.3 m (minimum of 1.5 m, maximum of 2.9 m), on the other hand, and the lake's CLA mean of 14.0 µg/l (minimum and maximum of 4.9 and 25.0 µg/l) resulted in a grade of B. The lake's mean TKN concentration was 0.87 mg/l (minimum of 0.72 mg/l, maximum of 1.10 mg/l).

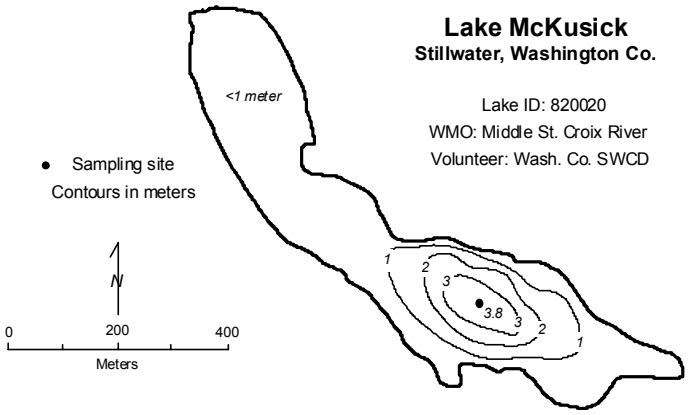
The lake's TP mean does not include a point deemed an outlier (740.0 µg/l) on one sampling date (June 12). The dates TP concentration is roughly 10+ times greater than the expected value, and a reason for the erroneous number is not known (in-lab processes and QA/QC runs within the batch where the questionable sample was analyzed, were checked and okayed).

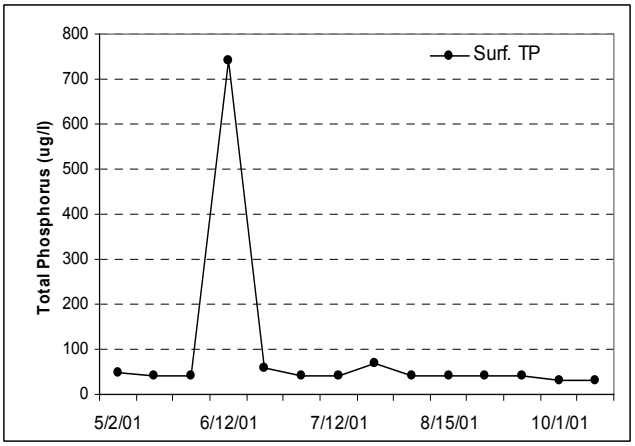
The overall grade of B recorded in 2000 and 2001 is the lake's best recorded overall grades to date. The previous best grade (C) was recorded in 1997 while the lake received D's during the other years where data were collected. Therefore, 2000-2001 marks the lake's best monitored water quality years, while 1994 marks the worst.

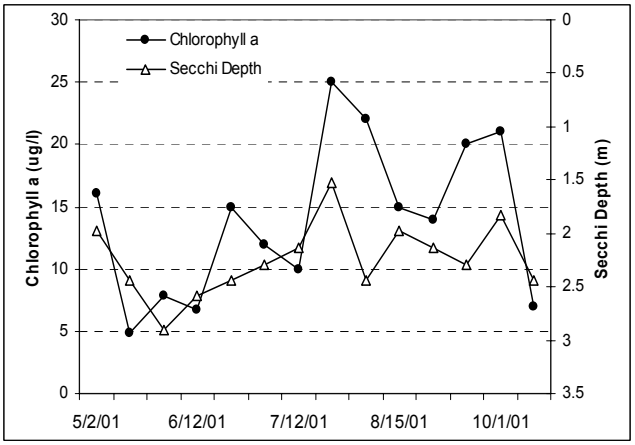
Throughout the monitoring period, the volunteer(s) ranked their opinions of physical and recreational conditions of the lake on a 1-to-5 scale. The resulting user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 2.3 (between 2- "some algae present"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

Because 1994-2001 are the only years where data are available, 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 (2000-2001) when the lake's overall grade has improved to 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.

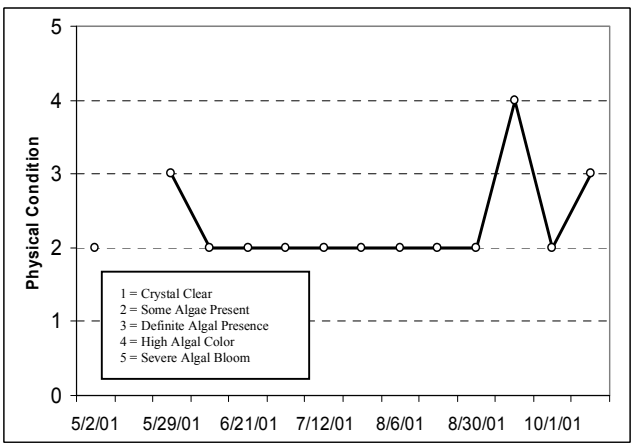






2001 Data

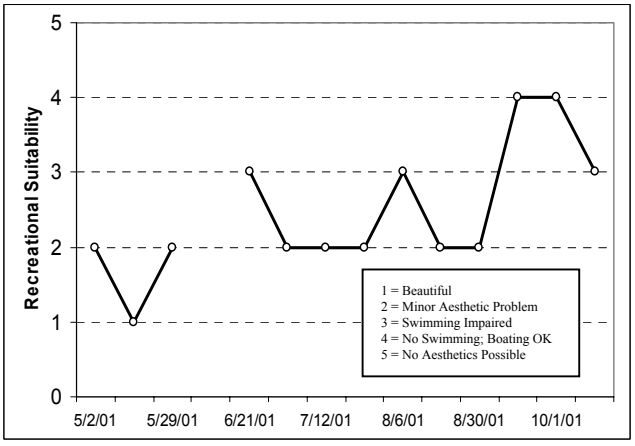
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	17.9		9.26		16	50		2.0	2	2
5/16	22.7		12.72		4.9	40		2.4		1
5/29	19.5		12.4		7.8	40		2.9	3	2
6/12	22		8.1		6.7	740		2.6	2	
6/21	22.8		5.89		15	60		2.4	2	3
6/29	28.5		11.87		12	40		2.3	2	2
7/12	27.8		12.1		10	40		2.1	2	2
7/26	25.2		9.3		25	70		1.5	2	2
8/6	31.2		7.69		22	40		2.4	2	3
8/15	24.1		7.55		15	40		2.0	2	2
8/30	23.8		8.64		14	40		2.1	2	2
9/13	21.6		13.82		20	40		2.3	4	4
10/1	16.2		14.7		21	30		1.8	2	4
10/17	9.6		9.76		7	30		2.4	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				D	D	D	C	D	D	C	C
Chlorophyll a				D	C	C	C	D	D	B	B
Secchi Depth				D	D	D	C	D	D	B	B
Overall				**D**	**D**	**D**	**C**	**D**	**D**	**B**	**B**



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 sixth 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 1999-2000.

The lake was monitored 13 times between late-April and mid-October, 2001. Results are presented on graphs and data tables on the following page.

The lake's overall 2001 lake quality grade of D was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 436.0 µg/l (minimum of 220.0 µg/l, maximum of 700.0 µg/l) corresponds to a lake water quality grade of F. The lake's mean CLA concentration of 44.5 µg/l (minimum and maximum of 3.4 and 110.0 µg/l) corresponds to a lake quality grade of C, as did the Secchi transparency mean of 1.6 m (minimum of 0.4 m, maximum of 3.3 m). The mean TKN concentration over the same time period was 2.15 mg/l (minimum of 1.60 mg/l, maximum of 3.00 mg/l).

Because 2001 is only the sixth year of available data, no long-term trends can be determined. In order to detect any possible long-term water quality trends, more years of data collection are needed. In the short-term however, it seems that the lake is well represented by an overall D/F grade, and the lake's CLA grade has steadly improved from F's in 1995-1996, D's in 1997 and 1999, to C's in 2000-2001.

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 3.3 (between 3- "definite algal presence" and 4- "high algal color"), while the mean recreational suitability was 3.5 (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.

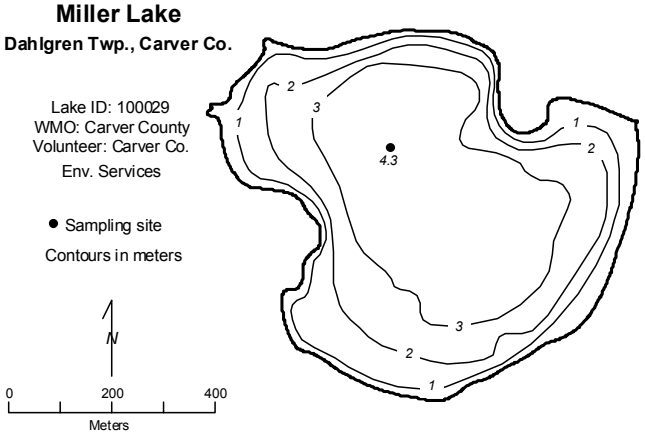
Miller Lake

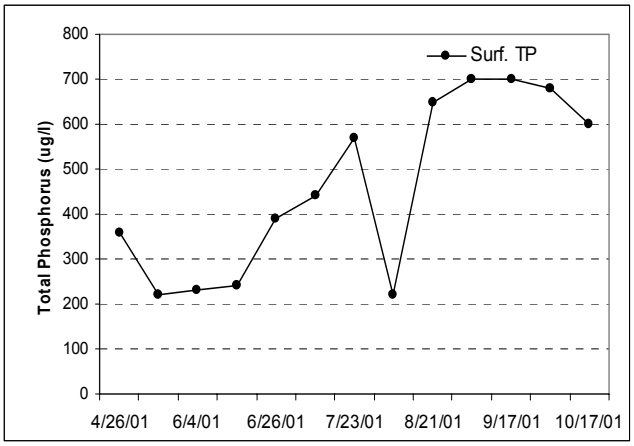
Dahlgren Twp., Carver Co.

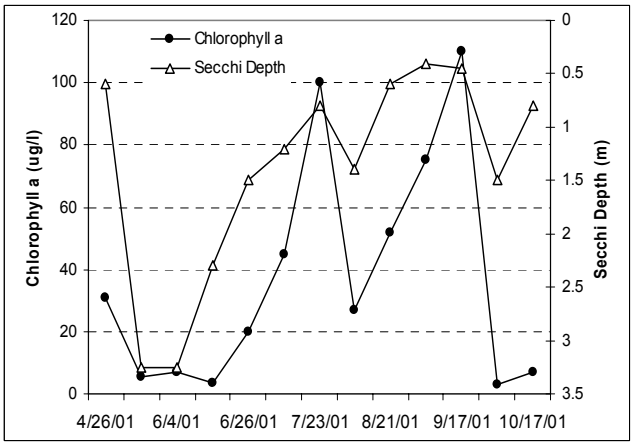
Lake ID: 100029
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling site

Contours in meters

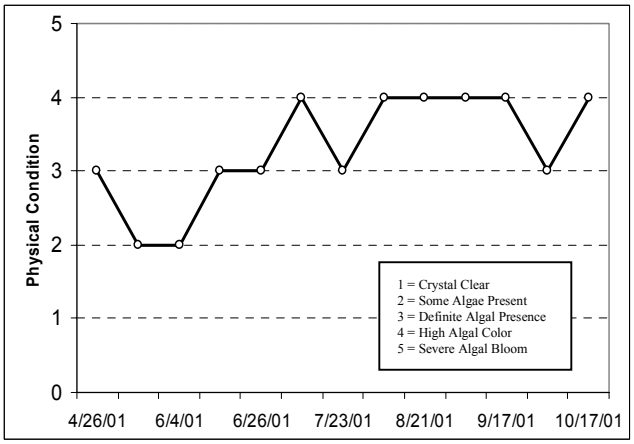






2001 Data

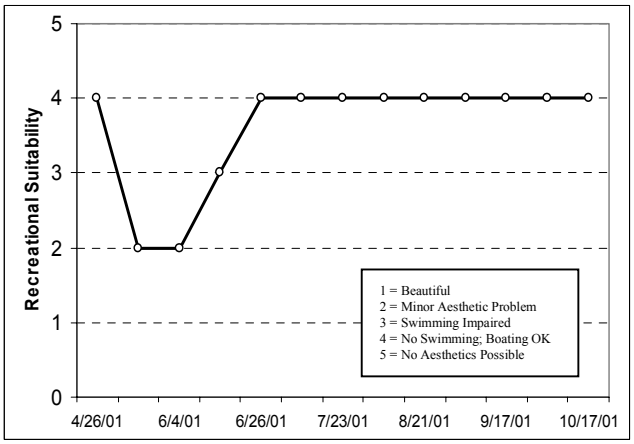
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/26	12.5		10.48		31	360		0.6	3	4
5/31	18.8		6.84		5.5	220		3.3	2	2
6/4	17.3		7.37		7	230		3.3	2	2
6/12	23		7.01		3.4	240		2.3	3	3
6/26	24		7.87		20	390		1.5	3	4
7/11	28.1		6.84		45	440		1.2	4	4
7/23	30.4		14.09		100	570		0.8	3	4
8/7	30.9		12.14		27	220		1.4	4	4
8/21	23.5		11.05		52	650		0.6	4	4
9/9	23.2		10.47		75	700		0.4	4	4
9/17	18.5		12.25		110	700		0.5	4	4
10/4	15.9		4.7		3.2	680		1.5	3	4
10/17	10.1		7.05		7.2	600		0.8	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					F	F	F		F	F	F
Chlorophyll a					F	F	D		D	C	C
Secchi Depth					F	F	D		D	D	C
Overall					**F**	**F**	**D**		**D**	**D**	**D**



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 second year that Mud Lake has been involved in CAMP (2000 being the other). A search through the STORET nationwide water quality database for historical data on Mud Lake provided data for six years (1995-2000).

The lake was monitored five times from early-May to mid-September, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 142.0 µg/l (minimum concentration of 80.0 µg/l and a maximum value of 190.0 µg/l); surface chlorophyll-a= 129.2 µg/l (minimum of 78.0 µg/l and maximum of 200.0 µg/l); Secchi transparency= 0.4 m (minimum of 0.3 m and a maximum of 0.5 m); and TKN= 2.54 mg/l (minimum of 1.40 mg/l and maximum of 3.80 mg/l). The lake's summer means translate to water quality grades of D for TP, F, for CLA, and F for Secchi transparency. Similar to that recorded in 2000, the 2001 individual grades result in an overall water quality grade of F for Mud Lake in 2001.

As mentioned earlier, there are limited amounts of historic water quality data available for Mud Lake (1995-2000). Therefore it is impossible to determine any long-term trends. On 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 3.6 for physical condition (between 3- "definite algal presence" 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.

Mud Lake

May Twp., Washington Co.

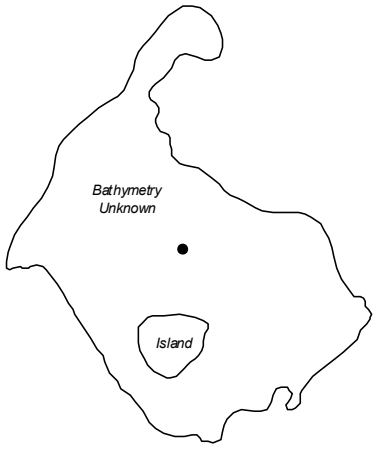
LAKE ID: 820026

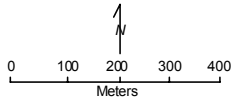
WD: Carnelian-Marine

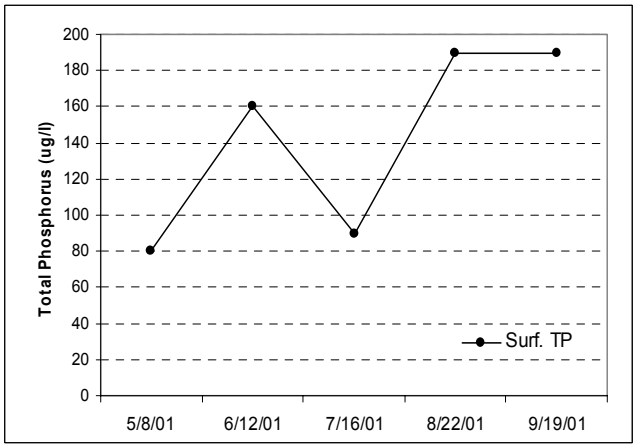
Volunteer: Wash. Co. SWCD

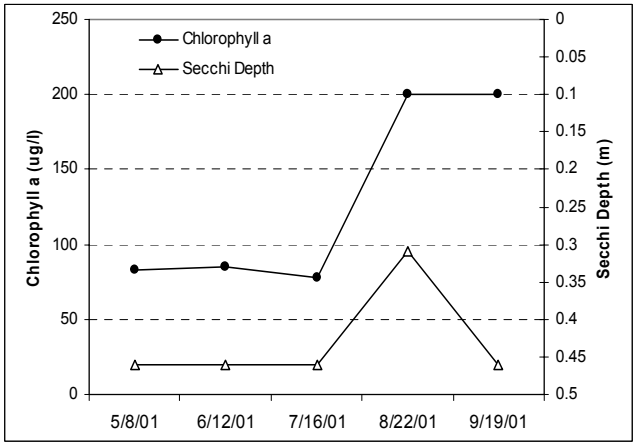
● Sampling site

Contours in meters



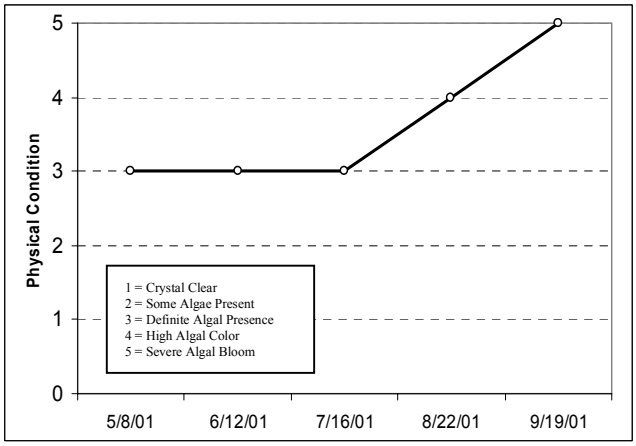


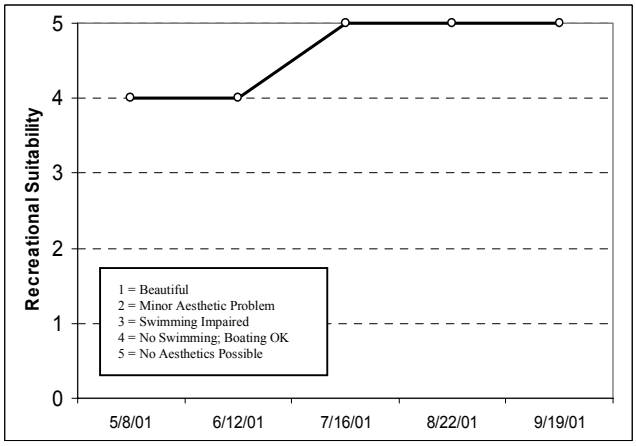




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	15.3		12		83	80		0.5	3	4
6/12	25.3		7.3		85	160		0.5	3	4
7/16	26.4		11.07		78	90		0.5	3	5
8/22	22.9		7.75		200	190		0.3	4	5
9/19	17.7		6.55		200	190		0.5	5	5





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
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
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 second year that North Twin Lake has been involved in CAMP (2000 being the other). A search through the STORET nationwide water quality database for data on the lake provided limited information (1996-2000).

The lake was monitored five times between early-May and mid-September, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for North Twin Lake, calculated from the individual parameter grades, is B. The 2001 summertime (May - September) mean TP concentration of 32.0 µg/l (minimum of 20.0 µg/l, maximum of 40.0 µg/l) corresponded to a lake water quality grade of B, as does the CLA mean of 15.7 µg/l (minimum and maximum of 2.7 and 50.0 µg/l). North Twin Lake's mean Secchi transparency of 1.4 m (minimum of 1.2 m and maximum of 1.5 m), however, corresponds to a C for water clarity. The lake's mean TKN concentration was 0.91 mg/l (minimum of 0.69 mg/l, maximum of 1.20 mg/l).

As mentioned earlier, there is limited amounts of historic water quality data available for North Twin Lake (1996-2001). Therefore it is impossible to determine any long-term trends. In the short-term however, the lake seemd well represented by an overall B/C+ 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 2.3 for physical condition (between 2- "some algae present" and 3- "definite 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.

North Twin Lake

Stillwater Twp., Washington Co.

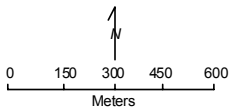
LAKE ID: 820018

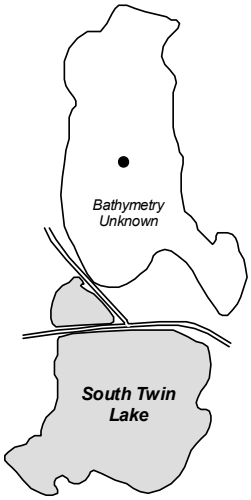
WD: Carnelian-Marine

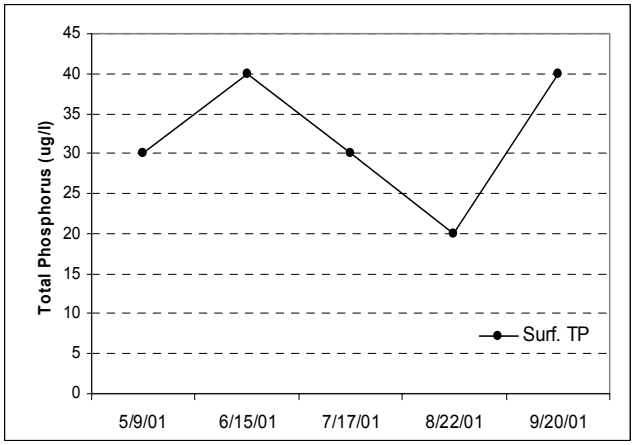
Volunteer: Wash. Co. SWCD

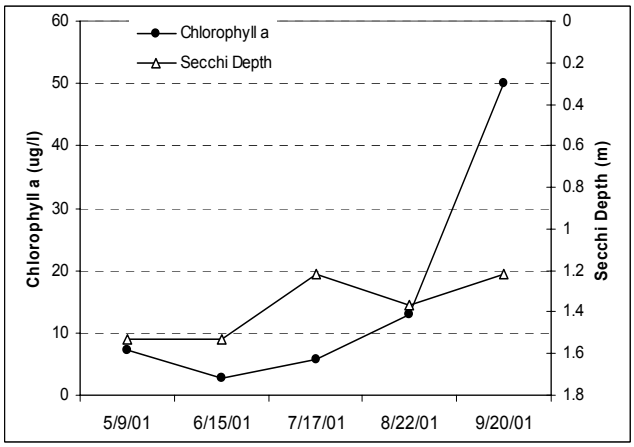
● Sampling site

Contours in meters



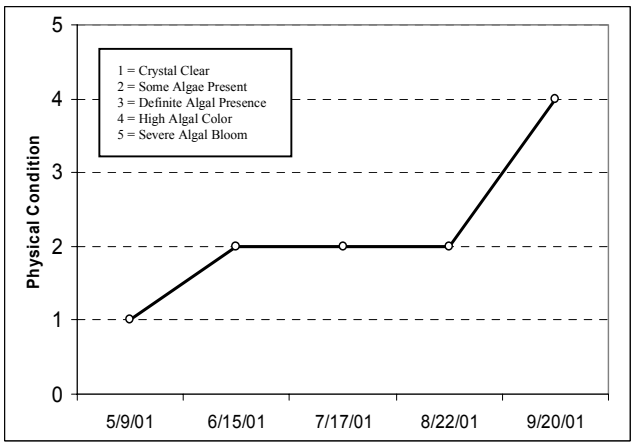






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/9	16.7		11.24		7.2	30		1.5	1	1
6/15	22.4		4.9		2.7	40		1.5	2	2
7/17	26.4		8.3		5.8	30		1.2	2	2
8/22	25.4		10.15		13	20		1.4	2	3
9/20	18.9		10.54		50	40		1.2	4	4

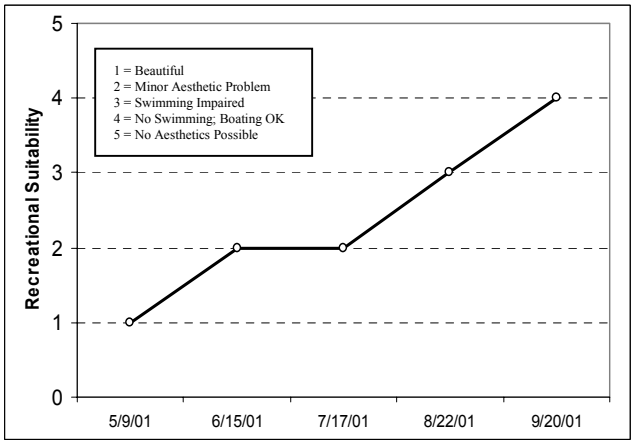


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						C	B	B	A	B	B
Chlorophyll a						D	C	D	B	A	B
Secchi Depth						B	B	B	B	C	C
Overall						**C**	**B**	**C**	**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 second year that Northwood Lake has been involved in CAMP (2000 being the other). Other than the 2000 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 2000-2001 are the only years of available data.

The lake was involved in CAMP in 2000-2001 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 is that enzymes (which inhibit algal growth) are released as the straw rots when placed in water. Therefore, in order to determine if the straw method successfully reduced algal biomass on Northwood Lake in 2001, TP, TKN, CLA and Secchi transparency were tested 10 times between late-May and mid-October. The resulting data and graphs appear on the next page.

The summertime (May through September) means for the monitored variables were: surface TP= 152.5 µg/l (minimum concentration of 70.0 µg/l and a maximum value of 260.0 µg/l); surface chlorophyll-a= 31.1 µg/l (minimum of 5.3 µg/l and maximum of 15.0 µg/l); Secchi transparency= 1.1 m (minimum of 0.7 m and a maximum of 1.3 m); and TKN= 1.08 mg/l (minimum of 0.81 mg/l and maximum of 1.60 mg/l). The lake's summer means translate to water quality grades of F for TP, C, for CLA, and D for Secchi transparency. These grades result in an overall water quality grade of D for Northwood Lake in 2001.

While the 2001 overall grade is identical to that of 2000, the 2001 CLA grade is acvtually worse. This is due to a large algal bloom (CLA of 150.0 µg/l, [TP 260.0 µg/l and Secchi of 0.7 m]). If it were not for the poor water quality on this sampling date the lake grades would have been better.

As can be seen above, the lake's CLA grade was much 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.

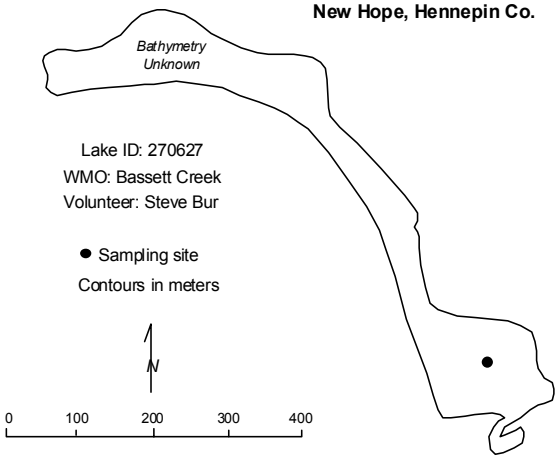
As mentioned earlier, there is no water quality data available for Northwood Lake other then the 2001 CAMP data. Therefore it is impossible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, more data are needed.

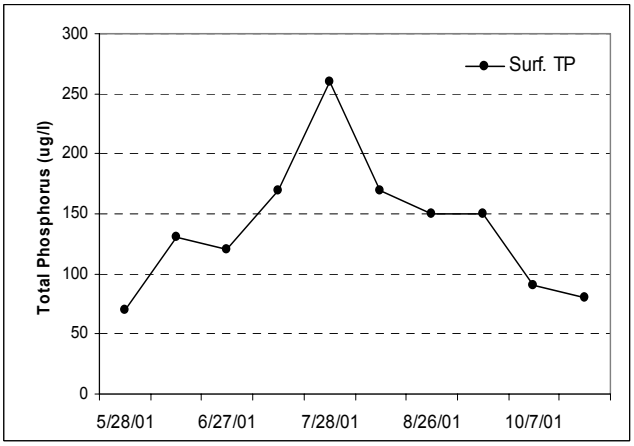
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 4.1 for physical condition (between 4- "high algal color" and 5- "severe bloom"), and 4.8 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

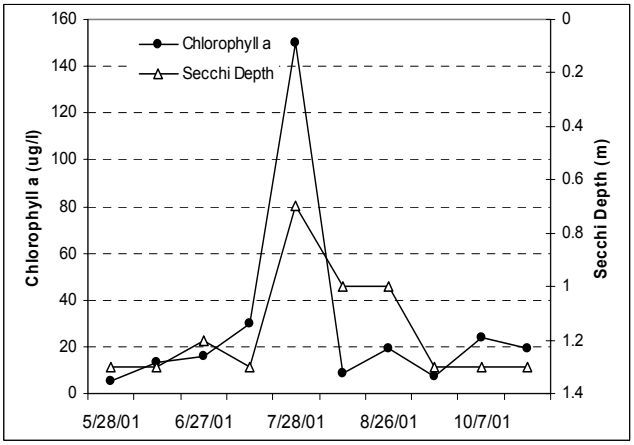
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Northwood Pond

New Hope, Hennepin Co.

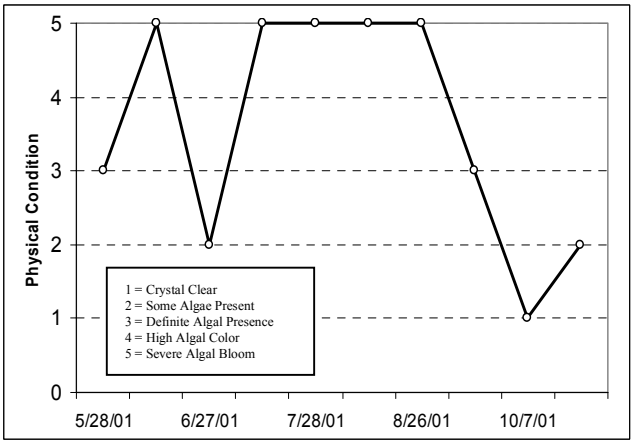


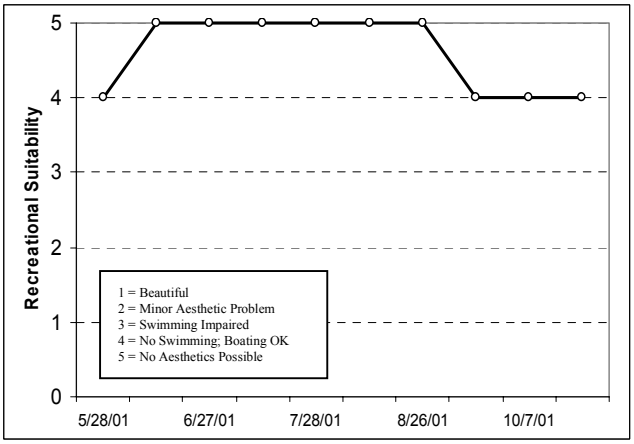




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/28	17				5.3	70		1.3	3	4
6/16	23.5				13	130		1.3	5	5
6/27	28				16	120		1.2	2	5
7/15	28.5				30	170		1.3	5	5
7/28	24				150	260		0.7	5	5
8/13	25.5				8.3	170		1.0	5	5
8/26	25.5				19	150		1.0	5	5
9/9	20.5				7.1	150		1.3	3	4
10/7	10.5				24	90		1.3	1	4
10/21	9.5				19	80		1.3	2	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										F	F
Chlorophyll a										B	C
Secchi Depth										D	D
Overall										**D**	**D**

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 3.7 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).

This was the first year in which Oak Lake has been involved in CAMP. A search through the STORET nationwide water quality database for historic data on the lake was unsuccessful. Thus, 2001 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 14 times between mid-April and mid-October, 2001. The resulting data and graphs appear on the next page.

The lake's overall 2001 lake quality grade of C was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 81.8 µg/l (minimum of 40.0 µg/l, maximum of 140.0 µg/l) corresponds to a lake water quality grade of D. The mean CLA concentration of 26.7 µg/l (minimum of 3.3 µg/l and maximum of 48.0 µg/l) and the mean Secchi transparency of 1.8 m (minimum of 0.5 m, maximum of 3.0 m) both resulted in a grade of C. The mean TKN concentration over the same time period was 1.74 mg/l (minimum of 1.20 mg/l and maximum of 2.60 mg/l).

As mentioned earlier, there are no water quality data available for Oak Lake other than this years 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 ("definite algal presence"), and 3.4 for recreational suitability (between 3- "definite algae present" and 4- "no swimming - boating ok").

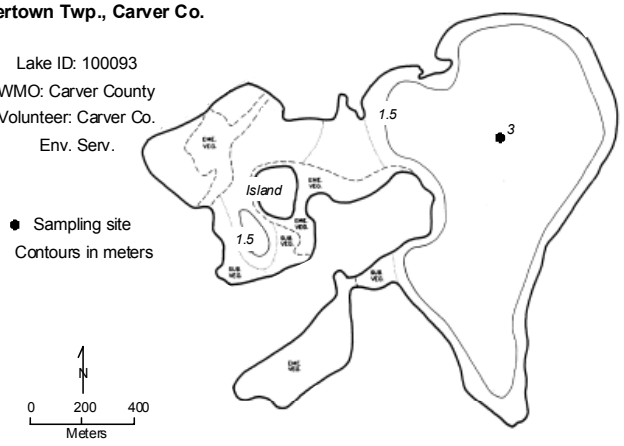
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

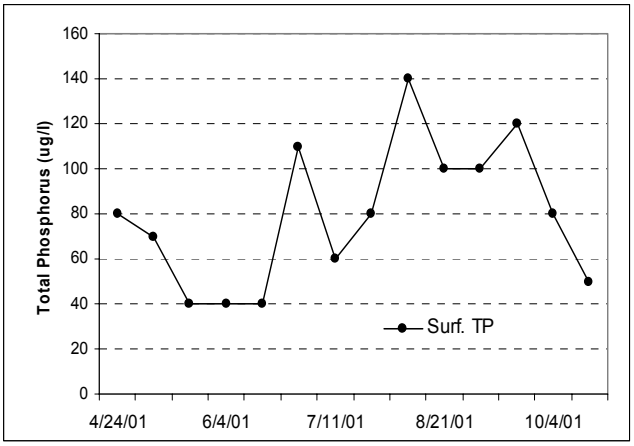
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

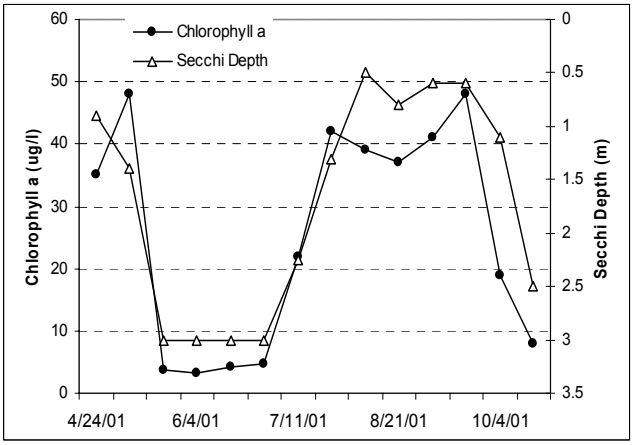
Oak Lake

Watertown Twp., Carver Co.

Lake ID: 100093
WMO: Carver County
Volunteer: Carver Co. Env. Serv.

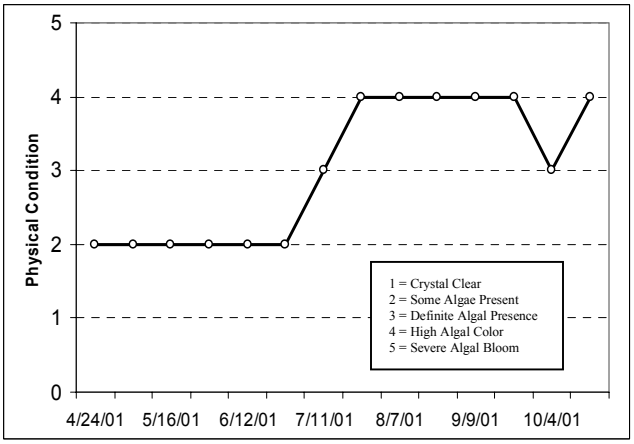


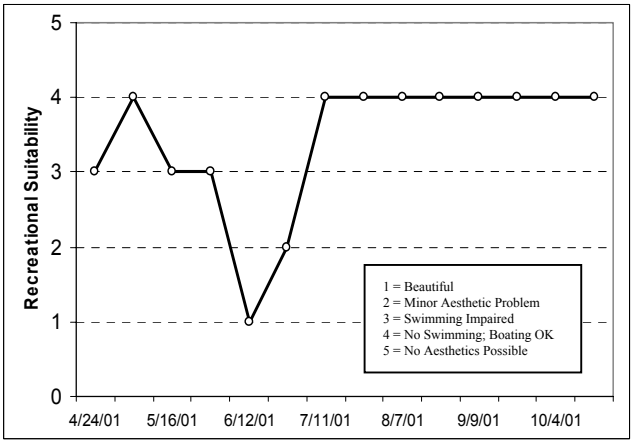




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/24	8.4		12.48		35	80		0.9	2	3
5/1	16.4		10.48		48	70		1.4	2	4
5/16	20.5		8.1		3.8	40		3.0	2	3
6/4	17.4		7.31		3.3	40		3.0	2	3
6/12	21.7		6.71		4.2	40		3.0	2	1
6/26	21.7		5.75		4.8	110		3.0	2	2
7/11	26.5		7.17		22	60		2.3	3	4
7/23	27.9		8.64		42	80		1.3	4	4
8/7	30.2		11.02		39	140		0.5	4	4
8/21	22.8		8.25		37	100		0.8	4	4
9/9	22.5		8.02		41	100		0.6	4	4
9/24	14.8		5.72		48	120		0.6	4	4
10/4	15.77		5.37		19	80		1.1	3	4
10/18	10		6.73		8	50		2.5	4	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											D
Chlorophyll a											C
Secchi Depth											C
Overall											**C**

Source: Metropolitan Council and STORET data

Oneka Lake (82-0140) *Rice Creek Watershed District*

This was the third 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 1999-2000. 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 11 times between mid-April and late-August, 2001. The resulting data and graphs appear on the next page.

The 2001 mean summertime (May through September) TP concentration for the lake was 42.0 µg/l (minimum of 20.0 µg/l and maximum of 50.0 µg/l). The summertime mean CLA concentration was 12.6 µg/l (minimum of 3.9 µg/l and maximum of 40.0 µg/l). The summertime mean Secchi transparency for the lake in 2001 was 1.8 m (minimum of 1.0 m and a maximum of 2.0 m). Additionally, the lake's summertime mean surface TKN concentration was 1.37 mg/l (minimum of 0.96 mg/l and maximum of 1.90 mg/l). The resulting individual water quality grades for Oneka Lake in 2001 were as follows: C for TP, B for CLA, and C for Secchi transparency. The three individual grades translate to a 2001 overall water quality grade of C

The 2001 individual and overall grades were worse than those recorded in 2000 (B). In fact, the overall C grade of 2001 (similar to those recorded in 1983, and 1990-1991), is worse then the overall B grades recorded in 1981, 1985, 1987, 1992, and 1999-2000.

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 1.8 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 2.0 for recreational suitability ("minor aesthetic problem").

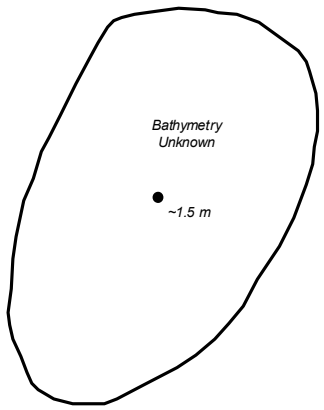
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

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.

Oneka Lake

Hugo, Washington Co.

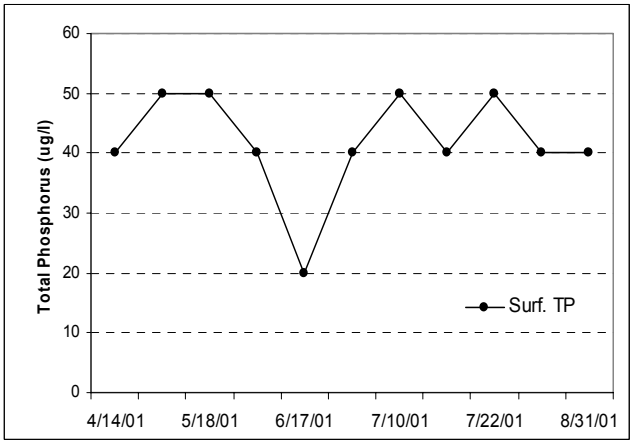
Lake ID: 820140
WD: Valley Branch
Volunteer: Bruce Bernin

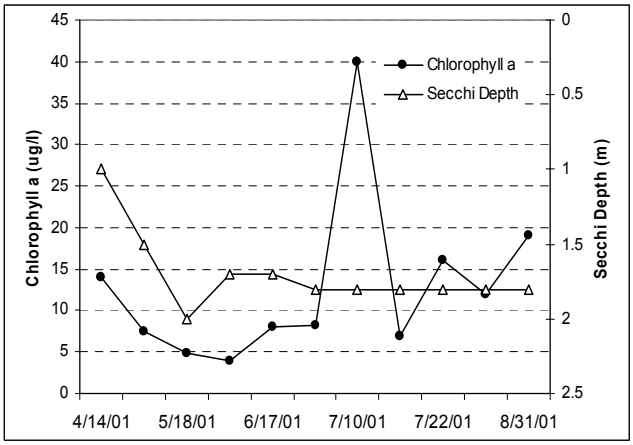


● Sampling site
Contours in meters

N

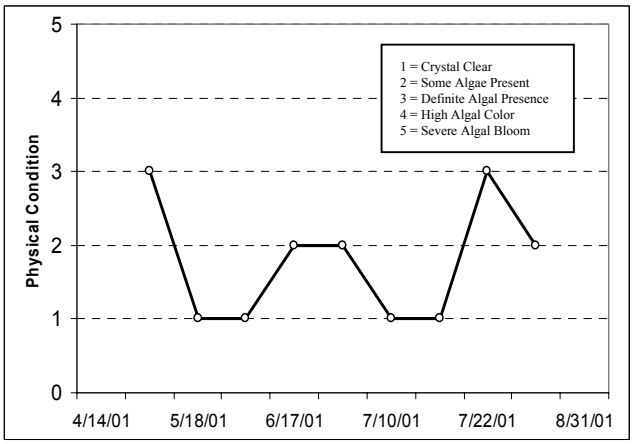
0 200 400 600
Meters





2001 Data

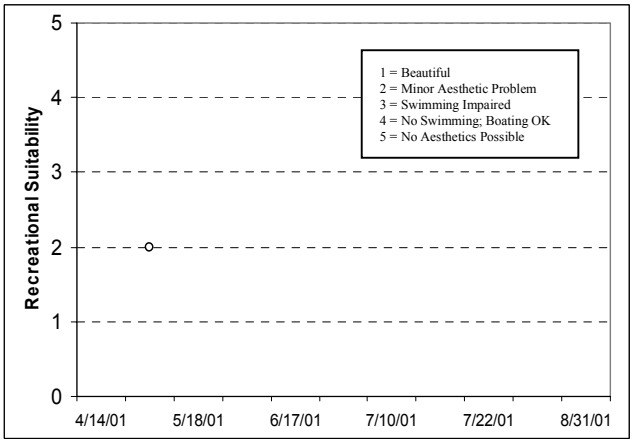
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/14	7.3				14	40		1.0		
5/9	15.5				7.4	50		1.5	3	2
5/18	22				4.8	50		2.0	1	
6/7	16.8				3.9	40		1.7	1	
6/17	23.5				8	20		1.7	2	
7/2	21.3				8.3	40		1.8	2	
7/10	29.1				40	50		1.8	1	
7/14	29				6.9	40		1.8	1	
7/22	29.7				16	50		1.8	3	
7/29	26.3				12	40		1.8	2	
8/31	21.3				19	40		1.8		



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D	C							A	B	C
Chlorophyll a	B	A							A	A	B
Secchi Depth	C	C							C	C	C
Overall	**C**	**B**							**B**	**B**	**C**



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 third year that Orchard Lake has been involved in CAMP (also invovled in 1999 and 2000). 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, and 1998-2000, as well as just Secchi data for 1987-1988.

As part of the city's involvement in CAMP in 2001, the lake was monitored 13 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.

The mean summertime (May through September) surface TP concentration was 25.0 µg/l (minimum of 10.0 µg/l, maximum of 60.0 µg/l). The mean CLA and Secchi transparency readings were 13.4 µg/l (minimum of 5.0 µg/l, maximum of 22.0 µg/l), and 2.3 m (minimum of 1.2 m, maximum of 4.5 m), respectively. The lake's mean surface TKN concentration was 0.79 mg/l (minimum of 0.50 mg/l and a maximum of 1.10 mg/l). The summertime means resulted in a TP grade of B, CLA of B, and a Secchi transparency grade of B. The overall grade determined through the calculation of all three parameters was B. The lake's 2001 water quality was the best recorded since the early-1980's.

The lake's 2001 overall grade was similar to that of 1981, 1983, and 1989, and better than those of 1980, 1993, and 1998-2000. The lake's 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 2.1 (between 2- "some algae present" and 3- "definite algal presence"), while the mean recreational suitability ranking was 1.6 (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.

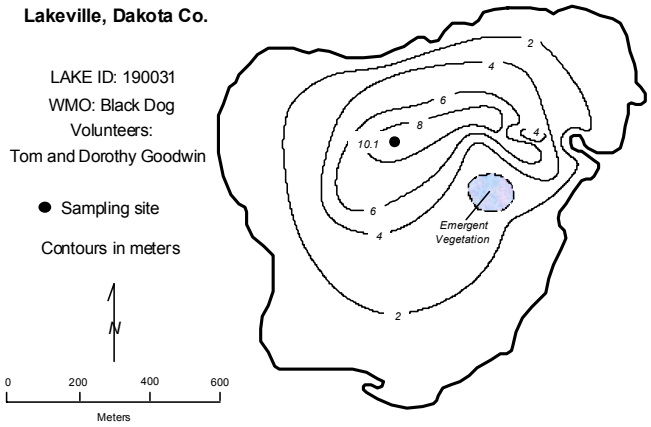
Orchard Lake

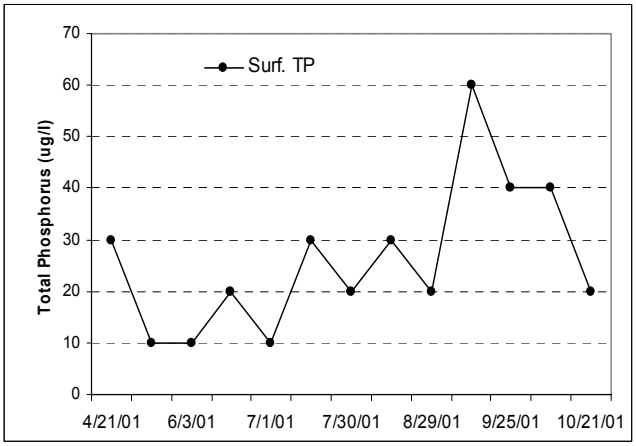
Lakeville, Dakota Co.

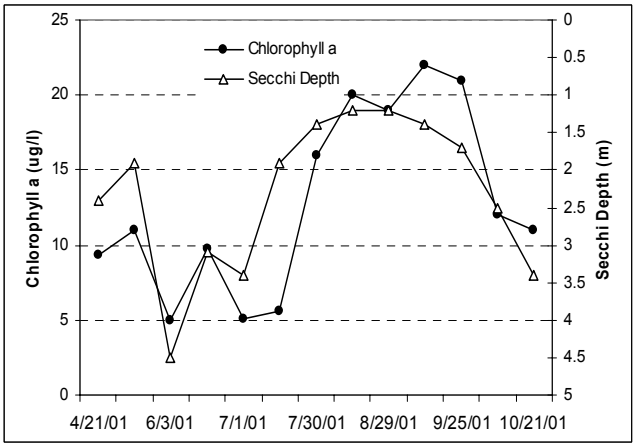
LAKE ID: 190031
WMO: Black Dog
Volunteers:
Tom and Dorothy Goodwin

● Sampling site

Contours in meters

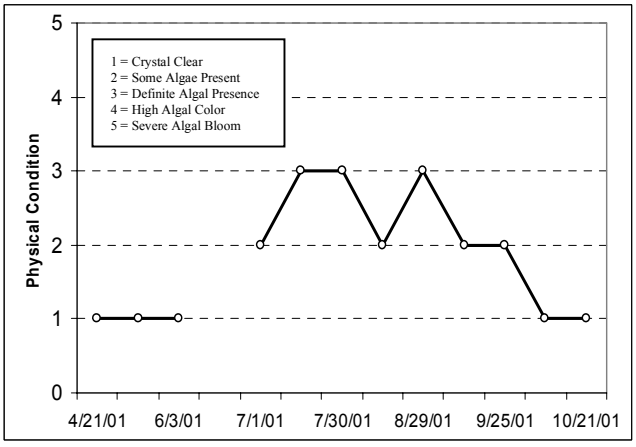






2001 Data

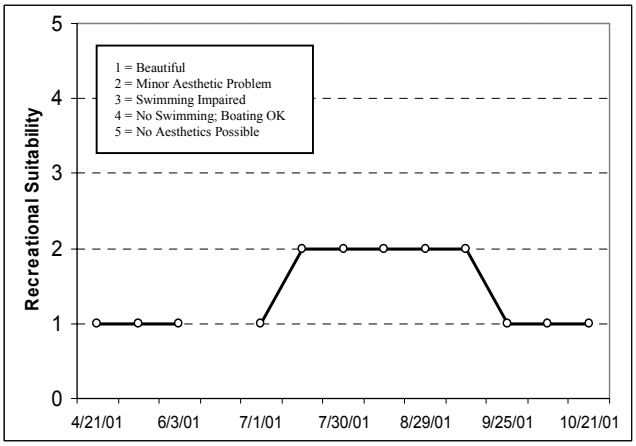
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/21	8				9.3	30		2.4	1	1
5/4	14				11	10		1.9	1	1
6/3	15				5	10		4.5	1	1
6/14	21				9.7	20		3.1		
7/1	25				5.1	10		3.4	2	1
7/16	27				5.6	30		1.9	3	2
7/30	26				16	20		1.4	3	2
8/15	22				20	30		1.2	2	2
8/29	24				19	20		1.2	3	2
9/10	20				22	60		1.4	2	2
9/25	15				21	40		1.7	2	1
10/8	11				12	40		2.5	1	1
10/21	7				11	20		3.4	1	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			C					C	C	C	B
Chlorophyll a			B					C	C	C	B
Secchi Depth	C		C					C	C	C	B
Overall			**C**					**C**	**C**	**C**	**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 13 times from late-April to mid-October, 2001. Results are presented in graphs and data tables on the following page.

Summertime (May through September) means were: surface TP= 261.0 µg/l (minimum of 70.0 µg/l, maximum value of 630.0 µg/l); surface CLA= 121.7 µg/l (minimum of 7.8 µg/l, maximum of 360.0 µg/l); Secchi transparency= 0.6 m (minimum of 0.2 m, maximum of 1.3 m); and TKN= 2.58 mg/l (minimum of 1.10 mg/l, maximum of 5.40 mg/l). Lake quality grades for the summertime means were TP= F; CLA= F; and Secchi= F, resulting in an overall grade of F for 2000.

The lake's 2001 water quality was its worst recorded to date. The 2001 overall grade of F, while similar to that of 1994, was worse than the overall D grades of 1993, 1995-1997, and 1999-2000.

Of the nine years of CAMP data the best water quality was in 1995 (with 1999 being the second best) and the worst was 2001 (1994 was the second worst). Other than the 1993-2001 CAMP data, the only other data found through a search of the STORET database was from 1983. While a limited database restricts the ability to determine any long-term trends, past grades seems to promote the idea that the lake's overall quality has remained fairly constant over the past decade [fluctuating between a D and F] (see report card on next page).

The average user perception rankings, on a 1-to-5 scale, was 3.6 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 3.0 for recreational suitability ("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/.

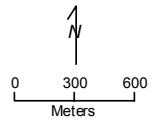
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

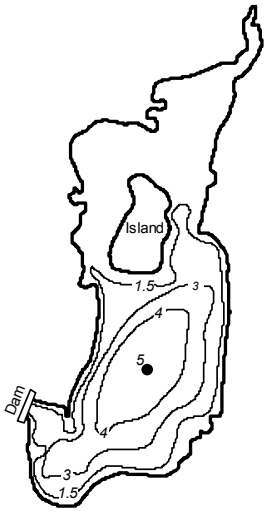
Peltier Lake

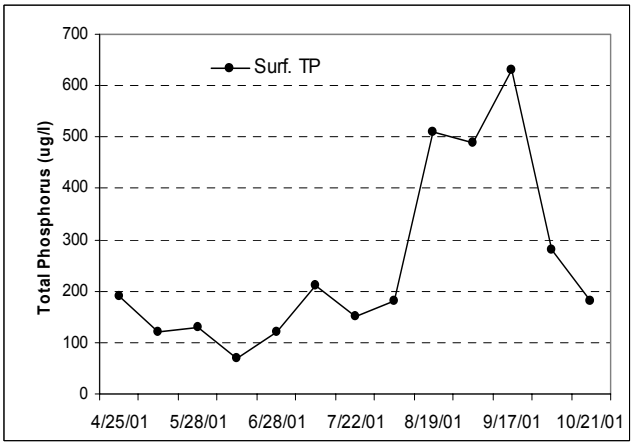
Centerville/Lino Lakes, Anoka Co.

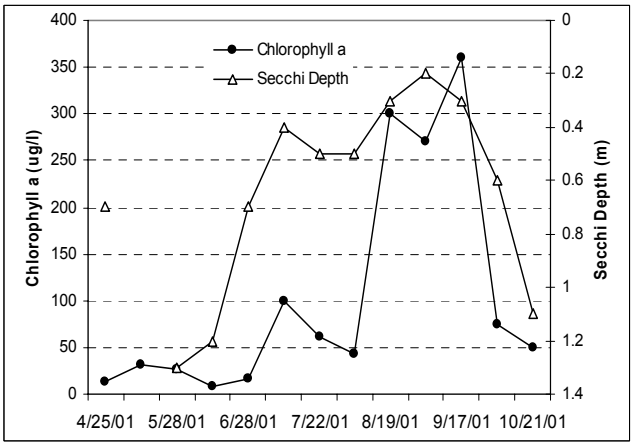
Lake ID: 20004
WD: Rice Creek
Volunteer: Wayne LeBlanc

● Sampling site
Contours in meters



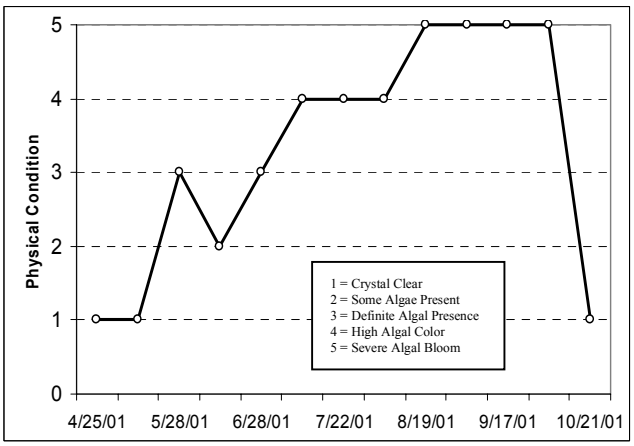


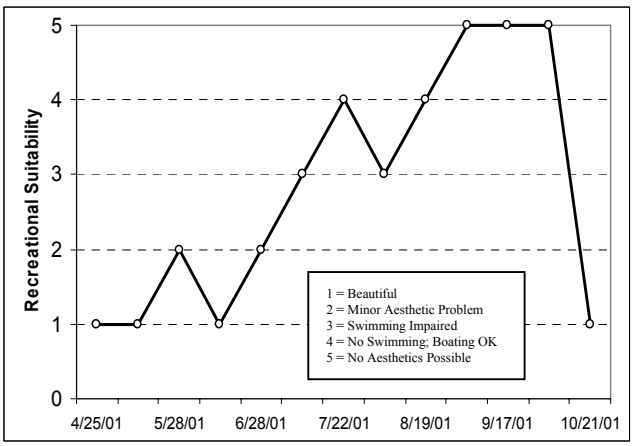




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/25	10				13	190		0.7	1	1
5/14	18				32	120			1	1
5/28	18				26	130		1.3	3	2
6/7	19				7.8	70		1.2	2	1
6/28	28				17	120		0.7	3	2
7/10	27				100	210		0.4	4	3
7/22	31				61	150		0.5	4	4
8/6	33				43	180		0.5	4	3
8/19	25				300	510		0.3	5	4
9/3	21				270	490		0.2	5	5
9/17	20				360	630		0.3	5	5
10/1	19				75	280		0.6	5	5
10/21	12				49	180		1.1	1	1





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			F	F	D	F	D	F	F	F	F
Chlorophyll a			C	D	C	D	C	F	C	D	F
Secchi Depth			D	F	D	D	F	C	C	D	F
Overall			**D**	**F**	**D**	**D**	**D**	**D**	**D**	**D**	**F**

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 third 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 1999-2000, as well as just Secchi data for 1992-1993.

As part of the watershed district's involvement in CAMP in 2001, the lake was monitored 14 times between mid-April and mid-October, 2001. 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.

The mean summertime (May through September) surface TP concentration was 78.2 µg/l (minimum of 30.0 µg/l, maximum of 110.0 µg/l). The mean CLA and Secchi transparency readings were 48.2 µg/l (minimum of 4.1 µg/l, maximum of 92.0 µg/l), and 1.4 m (minimum of 0.5 m, maximum of 3.8 m), respectively. The lake's mean surface TKN concentration was 1.45 mg/l (minimum of 0.82 mg/l and a maximum of 2.40 mg/l). The summertime means in 2001 resulted in a TP grade of D, CLA of D, and a Secchi transparency grade of C. The overall grade determined through the calculation of all three parameters was D. The lake's 2001 overall grade was similar to that of 1981-1982, 1987-1990, and 1999-2000, better than 1991 (F), and slightly 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 many fall with the overall grade range of low-C/high-D.

While the lake's overall grade was identical during each of the CAMP monitoring years, the lake's CLA grade was worse and the Secchi transparency grade better in 2001 than those recorded in 1999 and 2000.

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" and 3- "definite algal presence"), while the mean recreational suitability ranking was 2.3 (between 2- "minor aesthetic problems" and 3- "swimming slightly impaired").

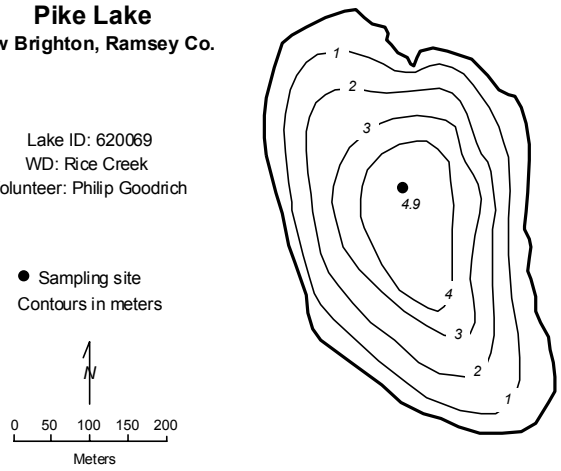
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

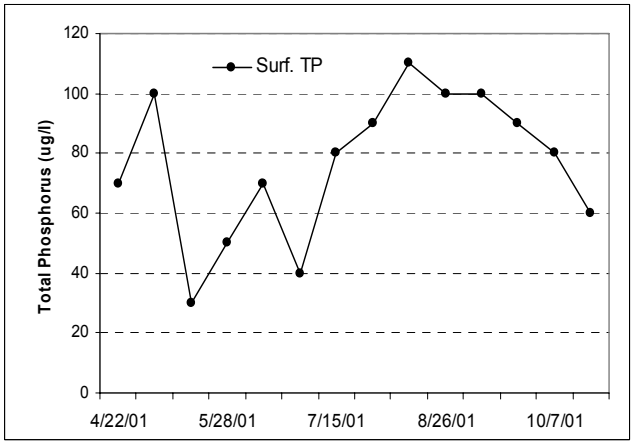
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

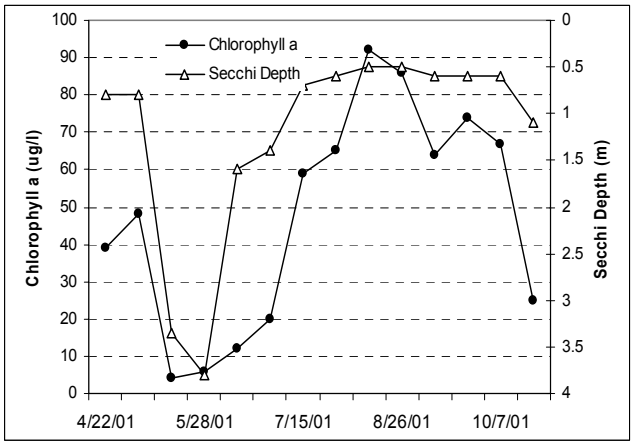
Pike Lake

New Brighton, Ramsey Co.

Lake ID: 620069
WD: Rice Creek
Volunteer: Philip Goodrich

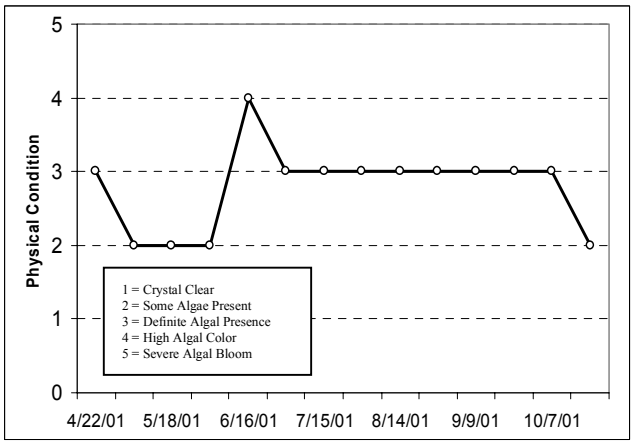






2001 Data

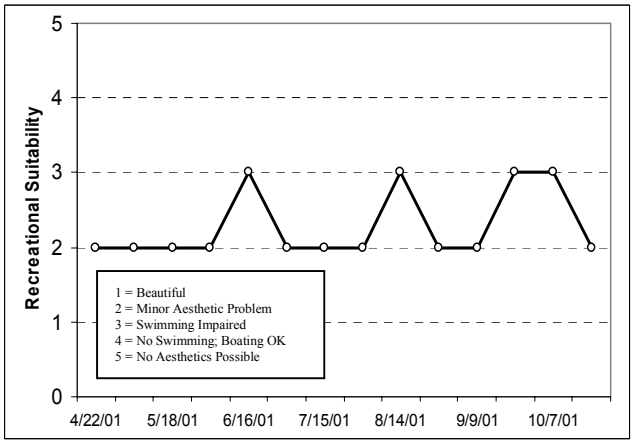
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/22	11				39	70		0.8	3	2
5/7	16.5				48	100		0.8	2	2
5/18	20				4.1	30		3.4	2	2
5/28	20				5.8	50		3.8	2	2
6/16	23				12	70		1.6	4	3
6/30	26				20	40		1.4	3	2
7/15	28				59	80		0.7	3	2
7/25	30				65	90		0.6	3	2
8/14	25				92	110		0.5	3	3
8/26	26				86	100		0.5	3	2
9/9	21				64	100		0.6	3	2
9/22	19				74	90		0.6	3	3
10/7	17				67	80		0.6	3	3
10/21	11				25	60		1.1	2	2



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D								D	D	D
Chlorophyll a	F								C	C	D
Secchi Depth	F	D	D						D	D	C
Overall	**F**								**D**	**D**	**D**



Source: Metropolitan Council and STORET data

Pike Lake [Scott County] (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 fourth year that Pike Lake has been involved in CAMP (the lake was also involved in 1997 and 1999-2000). A search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 1997 and 1999-2001 are the only years of available data. The lake was monitored nine times between late-May and mid-October, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for Pike Lake, calculated from the individual parameter grades, is D. The 2001 summertime (May - September) mean TP concentration of 138.8 µg/l (minimum of 60.0 µg/l, maximum of 220.0 µg/l) corresponded to a lake water quality grade of D, while the CLA mean of 101.6 µg/l (minimum and maximum of 3.7 and 270.0 µg/l) resulted in a grade of F. Pike Lake's mean Secchi transparency of 1.3 m (minimum of 0.2 m and maximum of 3.0 m) corresponds to a C for water clarity. The lake's mean TKN concentration was 2.23 mg/l (minimum of 1.20 mg/l, maximum of 3.80 mg/l). The lake's water quality in 1999-2001 (overall grade of D) was worse than that recorded in 1997 (overall grade of C).

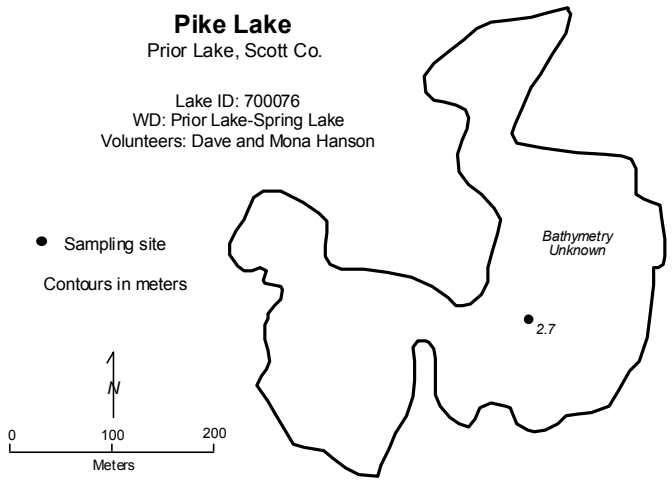
While the lake received an identical overall grade in 2001 to that of 1999 and 2000, the individual CLA and Secchi transparency grades were different. In 1999 and 2000 it was reported that the lake's CLA grade was much better than the TP and Secchi grades. One explanation mentioned for this scenerio was that the majority of the lake's TP comes from in-lake suspended sediments which in turn reduces the clarity of the water and inhibits algal growth. In 2001, however, the lake's CLA grade was much worse than the TP and Secchi grades would indicate. The lake experienced a dramatic increase in CLA concentrations all the while it experienced much improved transparencies. The reason for this is change is unknown at the time. Hopefully the upcoming 2002 data will help determine if that seen in 2001 is an aberration or not.

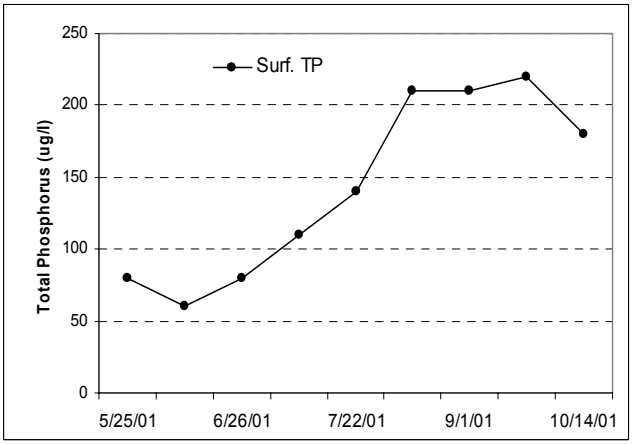
As mentioned earlier, there are no water quality data available for Pike Lake other than the 1997, and 1999-2001 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

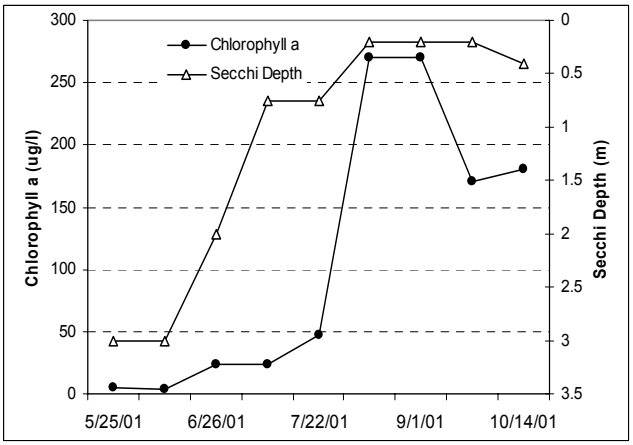
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 3.5 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 3.6 for recreational suitability (between 3- "swimming slighly 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.

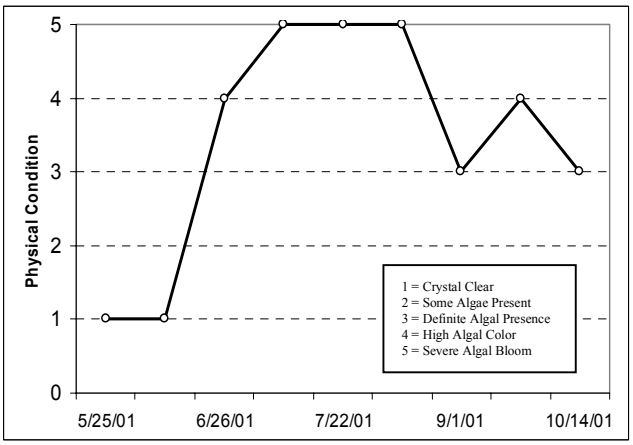


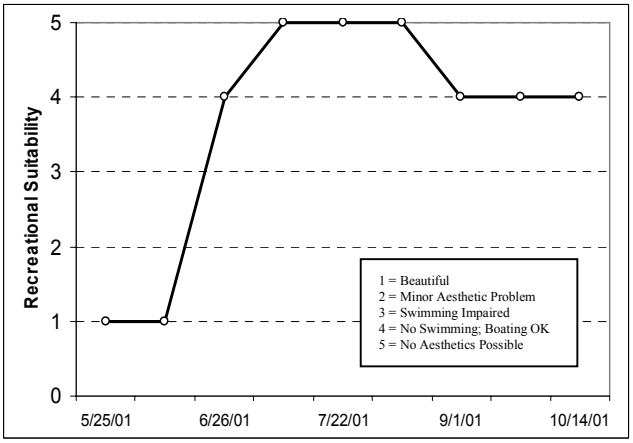




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/25	20				4.4	80		3.0	1	1
6/10	23				3.7	60		3.0	1	1
6/26	27				24	80		2.0	4	4
7/10	28				24	110		0.8	5	5
7/22	30				47	140		0.8	5	5
8/12	25				270	210		0.2	5	5
9/1	25				270	210		0.2	3	4
9/10	21				170	220		0.2	4	4
10/14	13				180	180		0.4	3	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus							D		D	D	D
Chlorophyll a							B		C	C	F
Secchi Depth							D		F	F	C
Overall							**C**		**D**	**D**	**D**

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 2001, the lake was monitored nine times between mid-May and 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. The mean summertime (May through September) surface TP concentration for the lake was 32.9 µg/l (minimum of 20.0 µg/l, maximum of 50.0 µg/l). The mean CLA and Secchi transparency readings were 6.0 µg/l (minimum of 3.3 µg/l, maximum of 11.0 µg/l) and 2.3 m (minimum of 1.1 m, maximum of 4.0 m), respectively. The lake's mean surface TKN concentration was 0.81 mg/l (minimum of 0.50 mg/l, maximum of 1.10 mg/l).

Lake quality grades associated with the 2001 summertime means are as follows: TP= C; CLA= A; and Secchi transparency= B. The resulting overall water quality grade for the lake, calculated from TP, CLA, and Secchi grades, was B.

The lake's overall and individual grades were similar to the wide flucation shown in its historic database. The 2001 Secchi mean, however, did decrease back to a normal measurement than the improved condition reported in 2000.

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 1.6 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 1.5 (between 1- "beautiful" and 2- "minor aesthetic problem").

There is not an extensive water quality database available for Pine Tree Lake. Other than the 1993-2001 CAMP data, the only other year for which data were found was 1985. Because of the size of the database it is not possible to determine any long-term trends. In the short-term, however, it seems that the lake's overall water quality is well represented by a B/C grade. The only way to determine the true baseline quality of the lake, or statistically calculate any water quality trends, is to continue monitoring to expand the lake's water quality database.

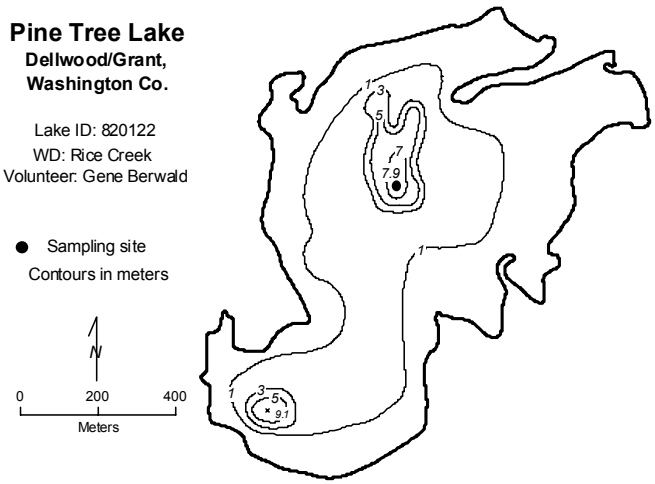
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

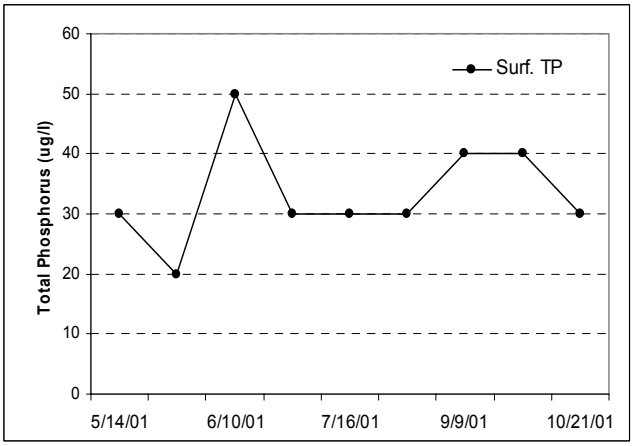
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

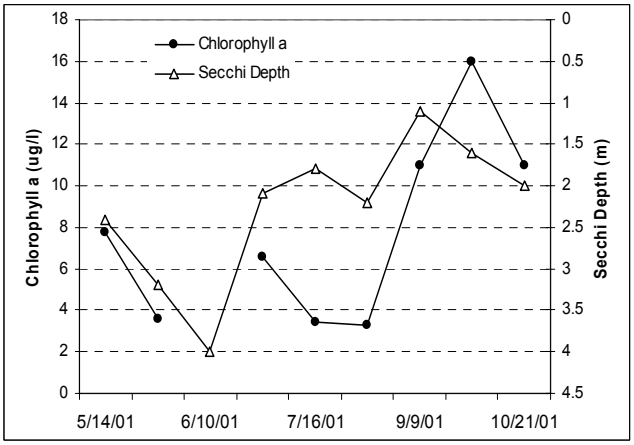
Pine Tree Lake

Dellwood/Grant, Washington Co.

Lake ID: 820122
WD: Rice Creek
Volunteer: Gene Berwald

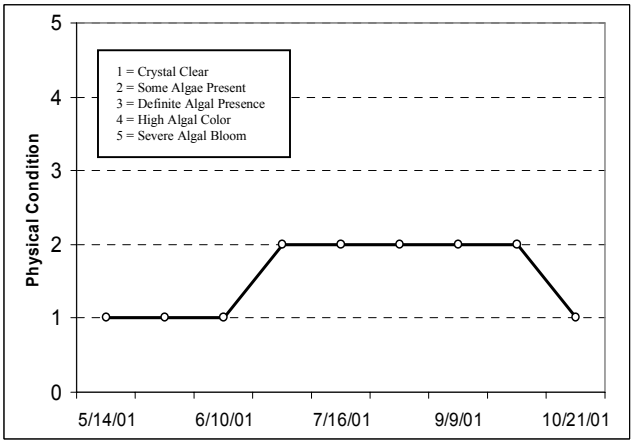






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/14	16				7.8	30		2.4	1	1
5/28	17				3.6	20		3.2	1	1
6/10	21					50		4.0	1	1
6/24	23.5				6.6	30		2.1	2	1
7/16	27.4				3.4	30		1.8	2	1
8/26	26.3				3.3	30		2.2	2	3
9/9	21.8				11	40		1.1	2	2
10/1	16.2				16	40		1.6	2	1
10/21	10				11	30		2.0	1	1

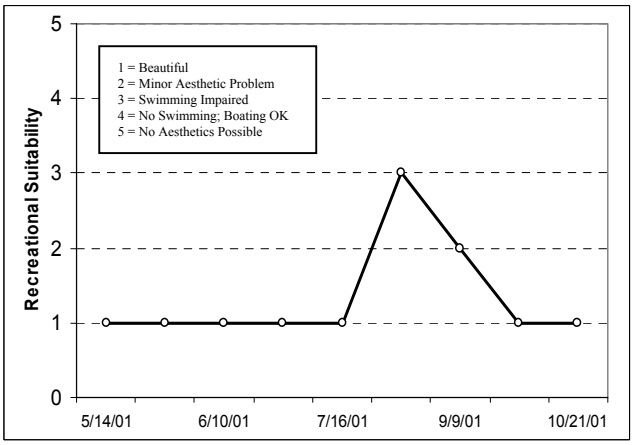


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			B	B	C	C	B	B	B	C	C
Chlorophyll a			A	A	C	B	A	B	B	A	A
Secchi Depth			C	B	C	C	B	C	C	A	B
Overall			**B**	**B**	**C**	**C**	**B**	**B**	**B**	**B**	**B**

Source: Metropolitan Council and STORET data



Pomerleau Lake (27-0100) *Shingle Creek Watershed Management Commission*

Pomerleau Lake is a 35-acre lake located within the City of Plymouth (Hennepin County). The maximum and mean depths of the lake are 7.9 and 2.7 m (26 and 9 feet), and the approximate volume of the lake is 450 ac-ft. Roughly half of the lake is considered littoral zone (the area of aquatic vegetation dominance). The majority of the land within the 1,140-acre watershed is undeveloped, and the watershed-to-lake size ratio is 33:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

This was the third year in which Pomerleau Lake has been involved in CAMP (the lake was also enrolled in CAMP in 1996 and 1999. This CAMP data represents the only known water quality data available for the lake. The lake was monitored six times between mid-May and late-July, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for Pomerleau Lake, calculated from the individual parameter grades, is C (similar to 1996 and 1999). The 2001 summertime (May - September) mean TP concentration of 81.7 µg/l (minimum of 40.0 µg/l, maximum of 120.0 µg/l) corresponded to a lake water quality grade of D, while the CLA mean of 28.9 µg/l (minimum and maximum of < 1.0 µg/l, [in which case 0.5 µg/l was used to calculate the summer mean and 56.0 µg/l) resulted in a grade of C. Pomerleau Lake's mean Secchi transparency of 1.4 m (minimum of 0.6 m and maximum of 2.8 m) corresponds to a C grade for water clarity. The lake's mean TKN concentration was 1.83 mg/l (minimum of 1.20 mg/l, maximum of 2.40 mg/l). While the lake received the same overall grade in 1996, 1999, and 2001, the individual parameter grades and summer means reveal that the lake's 2001 water quality was very similar to that recorded in 1999 and worse than that recorded in 1996.

As mentioned earlier, there are no water quality data available for Pomerleau Lake other than the 1996, 1999, and 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, additional years of data collection are needed.

The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability (no rankings avaiable for 2001). The average user perception rankings, on a 1-to-5 scale, were 2.5 for physical condition (which fell between 2- "some algae present" and 3- "definite algal presence").

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 the reader is aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

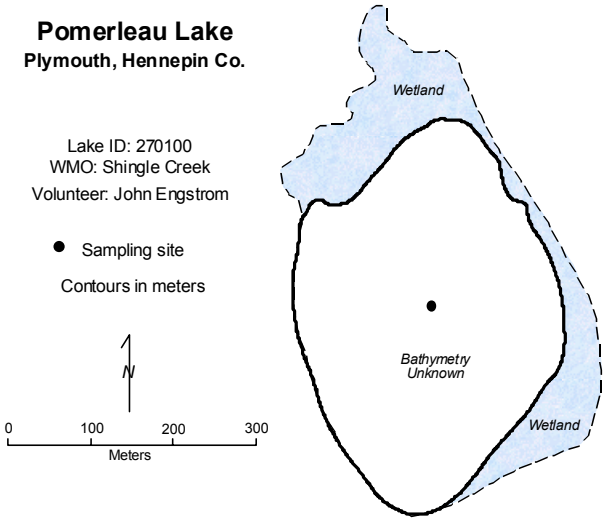
Pomerleau Lake

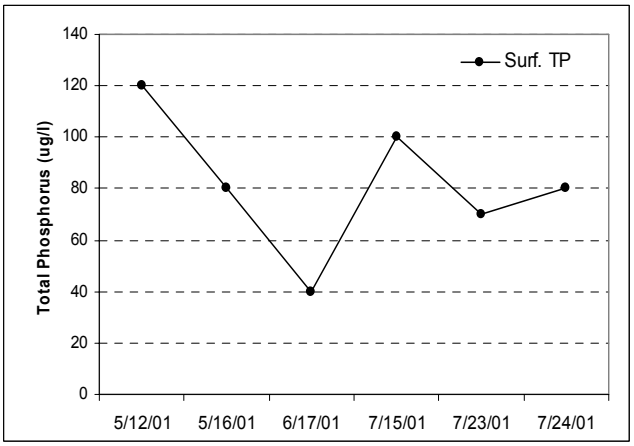
Plymouth, Hennepin Co.

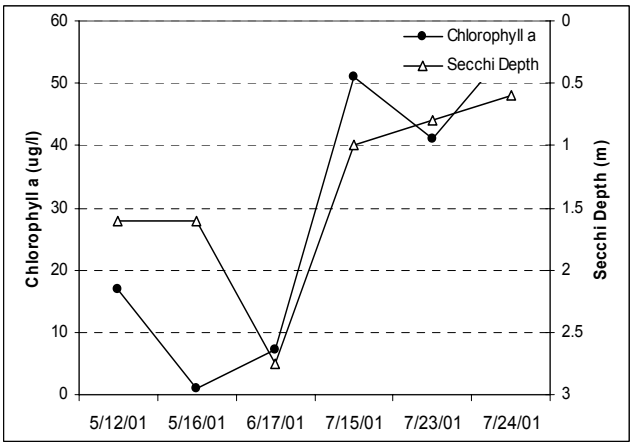
Lake ID: 270100
WMO: Shingle Creek
Volunteer: John Engstrom

● Sampling site

Contours in meters

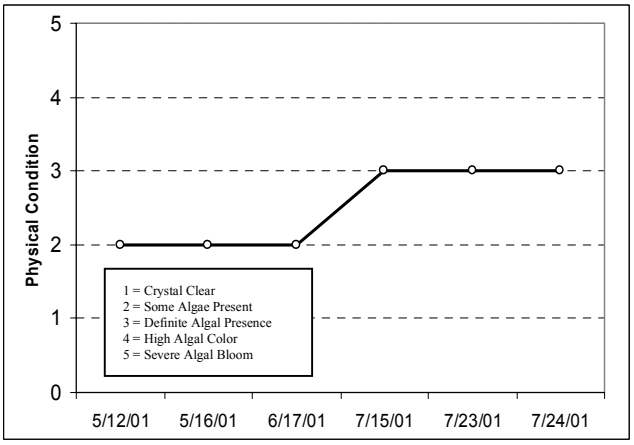






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/12	20				17	120		1.6	2	
5/16	21				1	80		1.6	2	
6/17	24				7.1	40		2.8	2	
7/15	29				51	100		1.0	3	
7/23	31				41	70		0.8	3	
7/24	26				56	80		0.6	3	

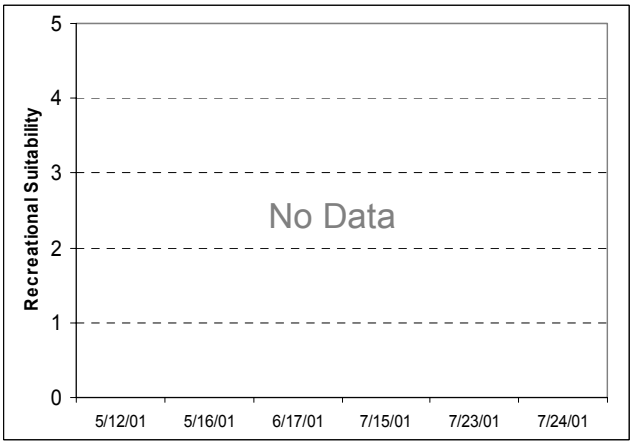


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						C			D		D
Chlorophyll a						B			C		C
Secchi Depth						C			C		C
Overall						**C**			**C**		**C**

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. While the lake has no public access, there is one private access on the northwest end of the lake near one of its two inlets. The lake has no outlet.

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 early-May and mid-October, 2001, the lake was monitored five 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.

The 2001 summertime (May through September) mean concentrations for Powers Lake were as follows: TP= 40.0 µg/l (minimum of 30.0 µg/l, maximum of 50.0 µg/l); CLA= 23.4 µg/l (minimum of 5.5 µg/l, maximum of 54.0 µg/l); Secchi transparency= 2.0 m (minimum of 1.1 m, maximum of 2.5 m); and TKN= 0.84 mg/l (minimum and maximum of 0.65 and 1.10 mg/l), respectively. The summer means resulted in a TP grade of C, CLA grade of C, and Secchi transparency grade of C. The 2001 overall grade determined by averaging the three parameter grades was C.

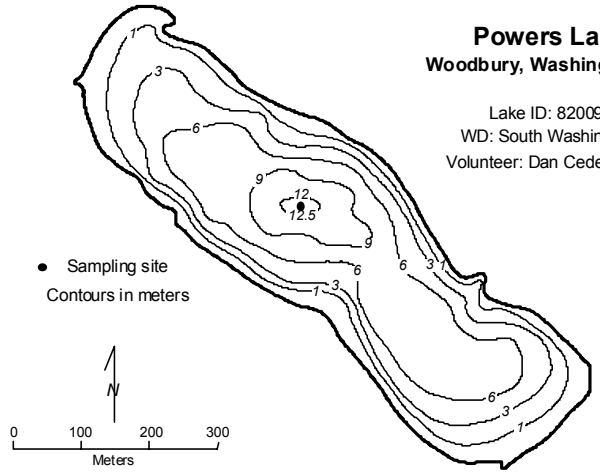
Continuing a disturbing recent trend, this year's water quality was worse than that recorded for the year before (which was worse than than the year before that). The lake has received overall grades of A in 1994, 1996, and 1999, B in 1995, 1997, and 2000, and C in 1998 and now 2001.

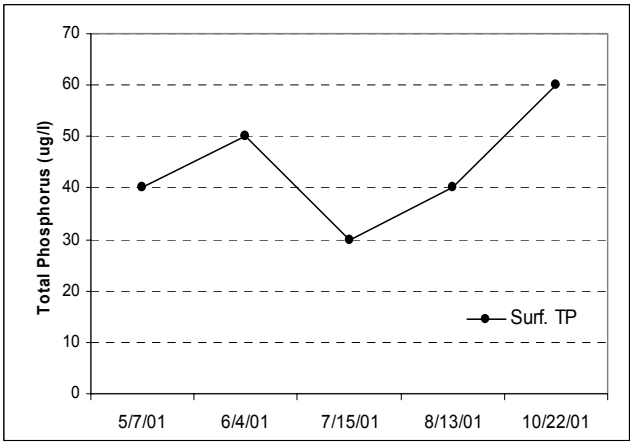
The physical and recreational conditions of the lake, as perceived by the volunteer, were ranked on a 1-to-5 scale and are displayed on the next page. The mean physical condition ranking was 1.5 (between 1-"crystal clear" and 2-"some algae present"), while the mean recreational suitability ranking was 2.0 ("minor aesthetics problem").

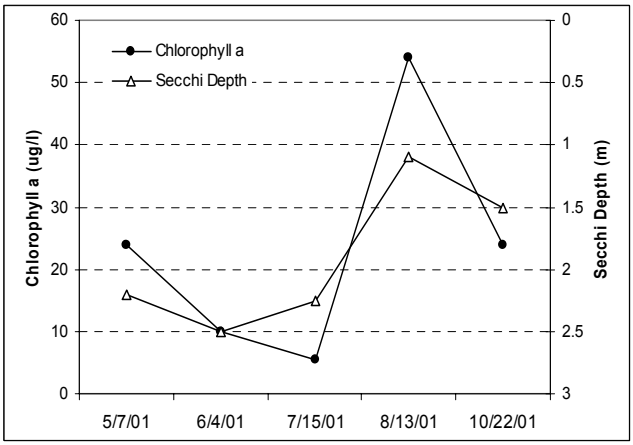
Because only eight years of data are available, and the wide flucuation in the available data, no long-term trends can statistically be determined. In the short-term, however, while the lake recently had water quality generally falling within or near the TCMA top 10-percentile range (overall grade of A/B), its water quality in 2001dramatically fell away from this range. In fact, the lake's water quality over the past three years has shown a continued degradation. 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 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.

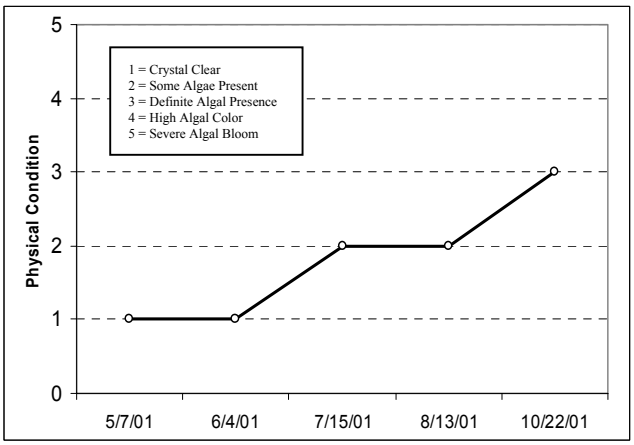


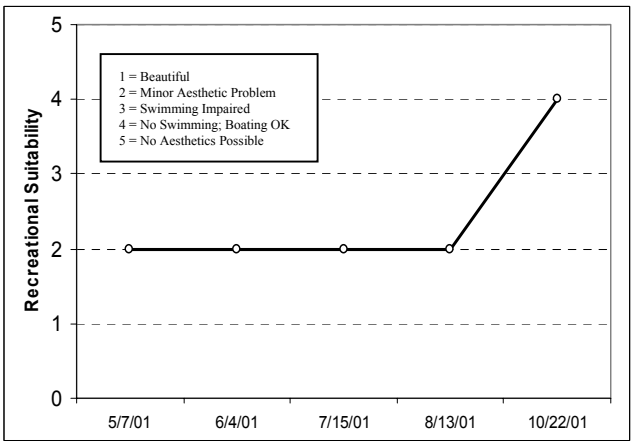




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/7	14				24	40		2.2	1	2
6/4	16				10	50		2.5	1	2
7/15	27				5.5	30		2.3	2	2
8/13	25				54	40		1.1	2	2
10/22	10				24	60		1.5	3	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				B	B	A	A	C	A	B	C
Chlorophyll a				A	B	A	B	C	B	B	C
Secchi Depth				A	B	A	C	C	A	B	C
Overall				**A**	**B**	**A**	**B**	**C**	**A**	**B**	**C**

Source: Metropolitan Council and STORET data

Prior Lake [Lower Basin] (70-0026) *Prior Lake - Spring Lake Watershed District*

Prior Lake is divided into two distinct basins (the results of the 2001 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.

While the Metropolitan Council has monitored the lower and upper basins of Prior Lake in the past, the sites have been a part of CAMP since 1997.

There were two monitoring locations (as shown on map on information page) on the lower basin of Prior Lake in 2001 (as was the case in 1999 and 2000). Site-1 is the same sampling site that has been monitored in past years. As part of this report the water quality of each monitoring location will be discussed separately and then both locations will be combined to determine an overall average.

Both monitoring sites in Lower Prior were monitored 14 times from early-June to mid-October, 2001. Results are presented on graphs and data tables on the following page). Summertime (May through September) means for the monitored variables at **Site-1** were: surface TP= 20.9 µg/l (minimum concentration of 10.0 µg/l and a maximum value of 30.0 µg/l), surface chlorophyll-a= 13.6 µg/l (minimum of 3.5 µg/l and maximum of 24.0 µg/l), Secchi transparency= 2.4 m (minimum of 1.3 m and a maximum of 4.5 m), and TKN= 0.89 mg/l (minimum of 0.71 mg/l and maximum of 1.10 mg/l). Associated lake quality grades for the 2001 summertime means at **Site-1** were TP= A, CLA= B, Secchi= B. The **Site-1** overall 2001 quality grade, calculated from the TP, CLA, and Secchi grades, was B The 2001 overall grade is similar to that recorded in 1996, 1998 and 2000, and worse than the A's recorded in 1997 and 1999.

Summertime (May through September) means for the monitored variables at **Site-2** were: surface TP= 29.0 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 40.0 µg/l), surface chlorophyll-a= 22.3 µg/l (minimum of 4.0 µg/l and maximum of 34.0 µg/l), Secchi transparency= 1.8 m (minimum of 1.0 m and a maximum of 3.4 m), and TKN= 1.02 mg/l (minimum of 0.88 mg/l and maximum of 1.20 mg/l). Associated lake quality grades for the 2001 summertime means at **Site-2** were TP= B, CLA= C, Secchi= C. The **Site-2** overall 2001 quality grade, calculated from the TP, CLA, and Secchi grades, was C, similar to the C'c recorded in 1998 and 1999, but worse than the B recorded in 2000.

When looking at the water quality data, it becomes apparent that the water quality at Site-1 is better than that at Site-2. The reason for this is similar to what is discussed later in the Upper Prior section. Water flows through Prior Lake from Upper Prior to Lower Prior (Site 2 is actually "upstream" of Site-1). Therefore, the "upstream" portions of the lake, first the upper basin, then Site-2 of the lower basin, actually act as a sort of detention basin for Site-1 of the lower basin. That is, the majority of the water entering the lake goes through the upper basin first and then passes through the bay of the lower basin where Site-2 is located, allowing the settlement of sediments and associated nutrients before it enters the portion of the lower basin where Site-1 is located. The result is better quality water at Site-2 than at the upper basin and better water quality at Site-1 than at either monitoring location.

The overall lake quality grade for the combined sites in the lower basin of Prior Lake in 2001 was B (identical to that recorded in 1999 and 2000, and better than the C recorded in 1998). This was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 25.0 µg/l and the CLA mean of 18.0 µg/l corresponds to a lake water quality grade of B for the basin. The lower basin's Secchi transparency mean of 2.1 m also translates to a C for water clarity. The mean TKN concentration over the same time period was 0.96 mg/l.

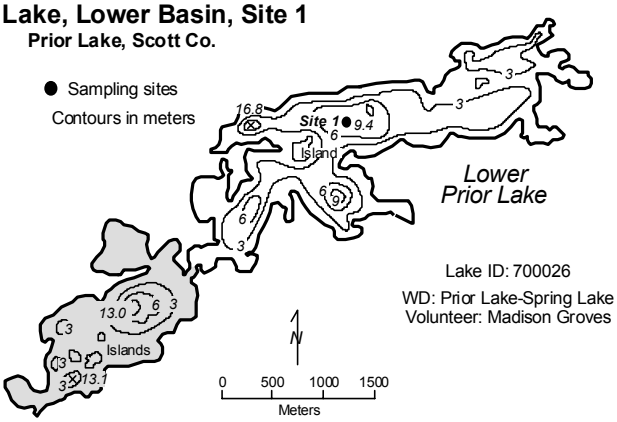
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked at both monitoring sites on a 1-to-5 scale. The mean perceived physical condition of **Site-1** and **Site-2** of lower basin of Prior Lake was 1.9 and 2.0 (ranking between 1- "crystal clear"; 2- "some algae present"), while the mean recreational suitability was 1.1 and 1.1 (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/.

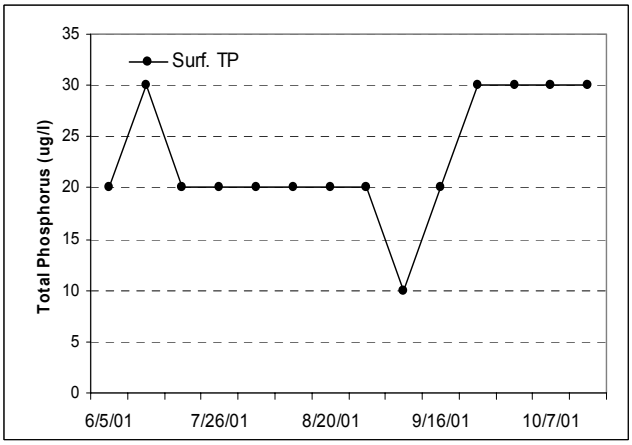
If you detect any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

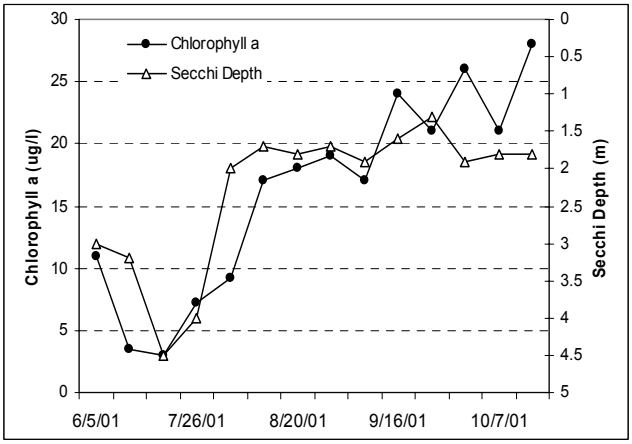
Prior Lake, Lower Basin, Site 1

Prior Lake, Scott Co.



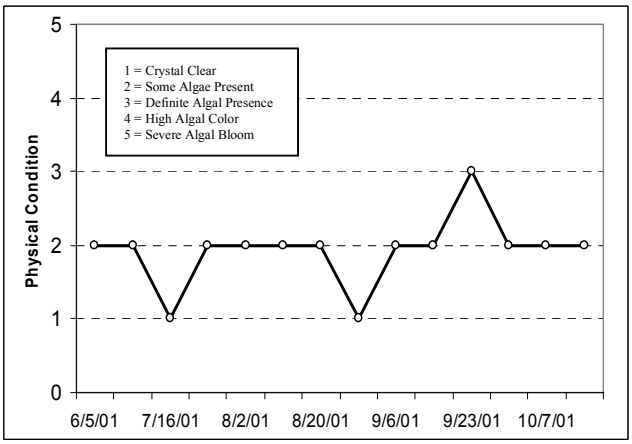
Lake ID: 700026
WD: Prior Lake-Spring Lake
Volunteer: Madison Groves

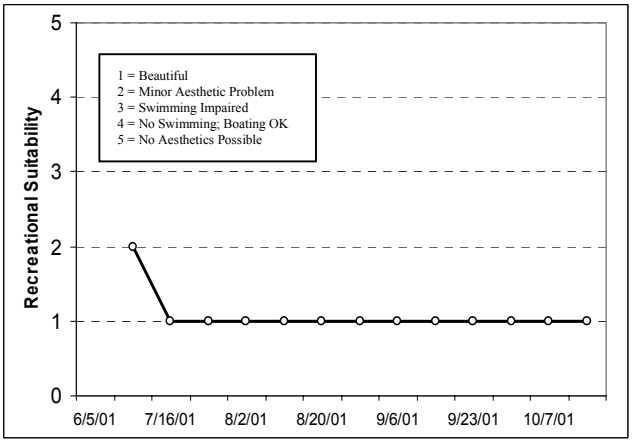




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/5	17				11	20		3.0	2	
7/5	25.5				3.5	30		3.2	2	2
7/16	26				3	20		4.5	1	1
7/26	27				7.2	20		4.0	2	1
8/2	28				9.2	20		2.0	2	1
8/14	24				17	20		1.7	2	1
8/20	24.6				18	20		1.8	2	1
8/26	25				19	20		1.7	1	1
9/6	24				17	10		1.9	2	1
9/16	19.5				24	20		1.6	2	1
9/23	18.5				21	30		1.3	3	1
10/1	18.5				26	30		1.9	2	1
10/7	15				21	30		1.8	2	1
10/13	14.5				28	30		1.8	2	1





Lake Water Quality Grades Based on Summertime Averages

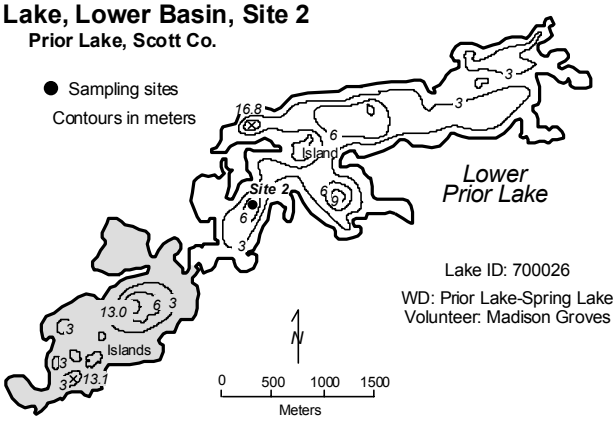
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Phosphorus	C	A			B								C
Chlorophyll a	B				B					A	B		B
Secchi Depth	C	C	B	C	B	C	B	C	C	B	B	C	C
Overall	**C**				**B**								**C**

Year	1993	1994	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
Total Phosphorus				C	A	A	B	A	C	B	B	A	B
Chlorophyll a				A	A	B	C	A	B	B	B	B	C
Secchi Depth	B	B	B	B	B	C	C	B	C	B	C	B	C
Overall				**B**	**A**	**B**	**C**	**A**	**C**	**B**	**B**	**B**	**C**

Source: Metropolitan Council and STORET data

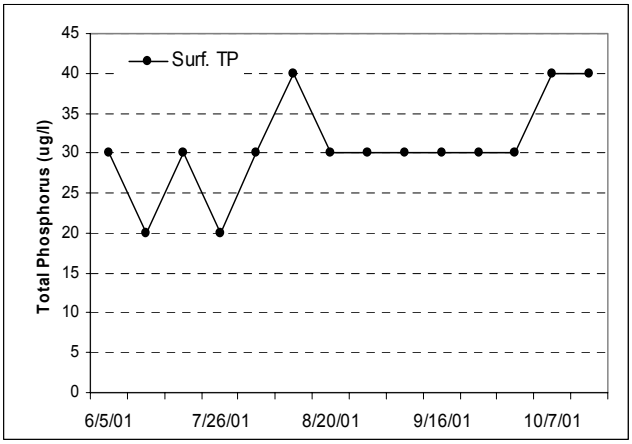
Prior Lake, Lower Basin, Site 2

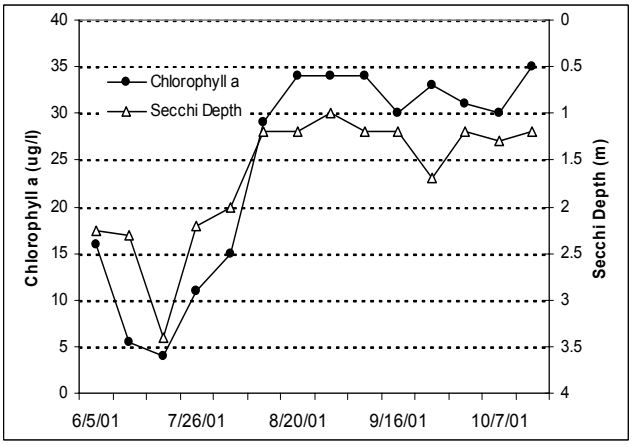
Prior Lake, Scott Co.



Lake ID: 700026

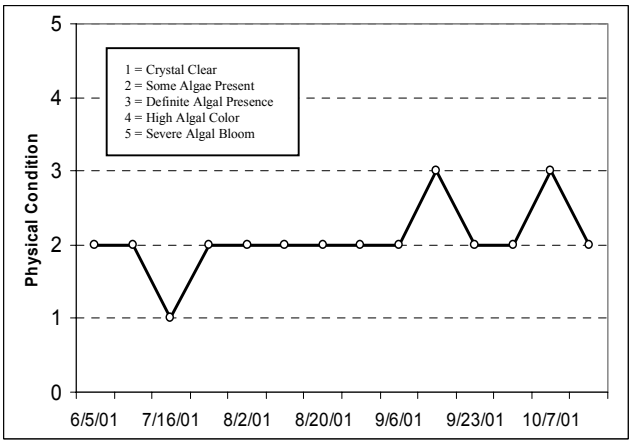
WD: Prior Lake-Spring Lake
Volunteer: Madison Groves

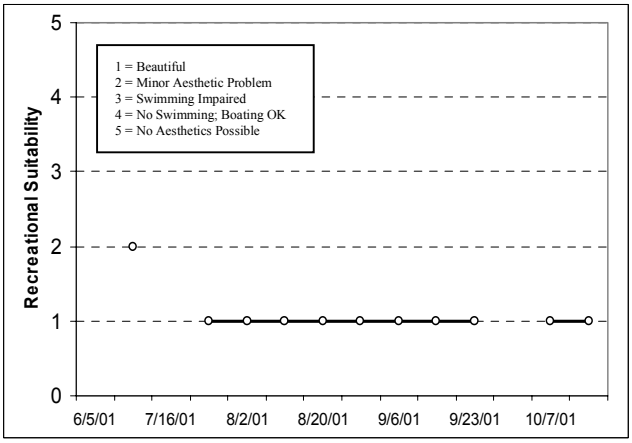




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/5	16.5				16	30		2.3	2	
7/5	25				5.4	20		2.3	2	2
7/16	26				4	30		3.4	1	
7/26	27				11	20		2.2	2	1
8/2	28				15	30		2.0	2	1
8/14	24				29	40		1.2	2	1
8/20	24.6				34	30		1.2	2	1
8/26	25				34	30		1.0	2	1
9/6	24				34	30		1.2	2	1
9/16	19.5				30	30		1.2	3	1
9/23	18.5				33	30		1.7	2	1
10/1	18.5				31	30		1.2	2	
10/7	15				30	40		1.3	3	1
10/13	14.5				35	40		1.2	2	1





Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
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
Overall	**C**				**B**								**C**

Year	1993	1994	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
Total Phosphorus				C	A	A	B	A	C	B	B	A	B
Chlorophyll a				A	A	B	C	A	B	B	B	B	C
Secchi Depth	B	B	B	B	B	C	C	B	C	B	C	B	C
Overall				**B**	**A**	**B**	**C**	**A**	**C**	**B**	**B**	**B**	**C**

Source: Metropolitan Council and STORET data

Prior Lake [Upper Basin] (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.

Upper Prior was monitored 14 times from early-June to early-October, 2001. Summertime (May through September) means for the monitored variables were: surface TP= 90.0 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 380.0 µg/l), surface chlorophyll-a= 79.9 µg/l (minimum of 18.0 µg/l and maximum of 140.0 µg/l), Secchi transparency= 0.9 m (minimum of 0.4 m and a maximum of 2.5 m), and TKN= 1.67 mg/l (minimum of 0.91 mg/l and maximum of 2.20 mg/l).

Associated lake quality grades for the 2001 summertime means were TP= D, CLA= F, Secchi= D. The lake's overall 2001 quality grade, calculated from the TP, CLA, and Secchi grades, was D. The 2001 overall grade was similar to that recorded in the 1980s, and 1998-2000, and worse than that recorded in 1996 and 1997. The lake's best water quality year was 1996, while the worst was 1999-2001.

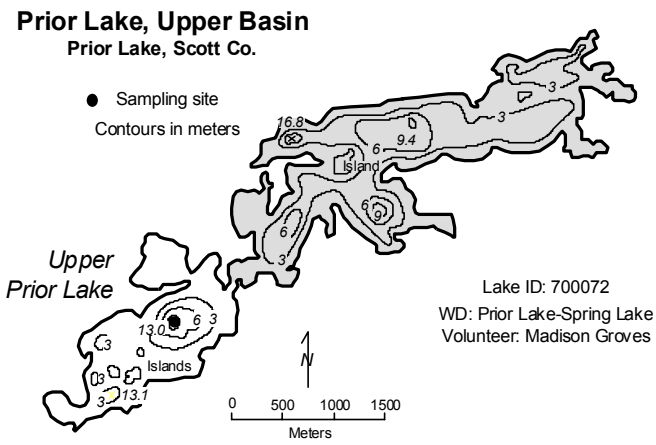
Historical data for the upper basin of Prior Lake indicate that the water quality of the basin has remained fairly constant over the past decade fluctuating between overall grades of C and D. Lake quality grades (see the lake's information sheet on the following page) show that when nutrient data were collected on the upper basin of Prior Lake, overall grades ranged from C in 1981, 1990, and 1996-1997, and a D in 1980, 1984, 1989, and 1998-2001.

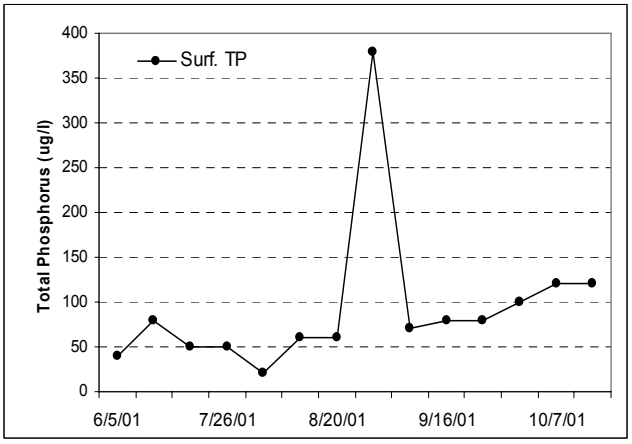
As apparent by the historic lake water quality grades, the lower basin of Prior Lake has better water quality than the upper basin. The reason being that the upper basin actually acts as a sort of detention basin for the lower basin. That is, the majority of the water entering the lakes goes through 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.

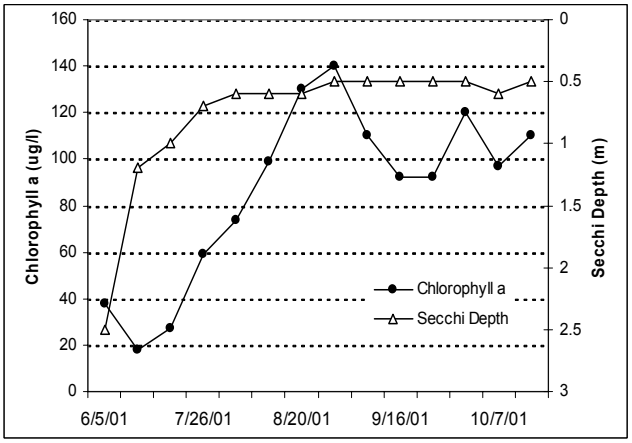
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. The summertime mean recorded physical condition was 2.9 (between 2- "some algae present" and 3- "definite algae problem"). The mean suitability for recreation ranking was 1.7 (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 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.

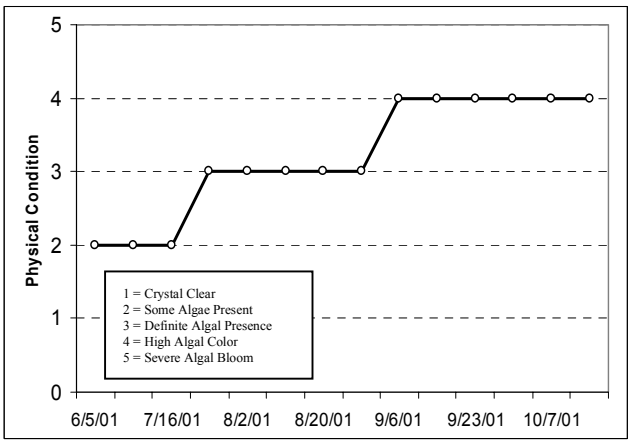


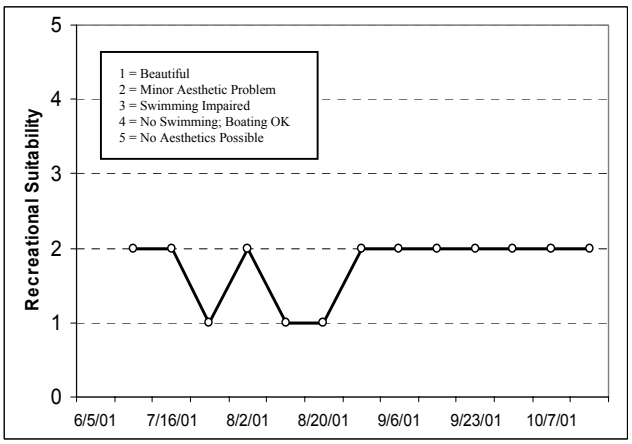




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/5	17.3				38	40		2.5	2	
7/5	26				18	80		1.2	2	2
7/10	26				27	50		1.0	2	2
7/26	27				59	50		0.7	3	1
8/2	29				74	20		0.6	3	2
8/14	24				99	60		0.6	3	1
8/20	24.6				130	60		0.6	3	1
8/26	26				140	380		0.5	3	2
9/6	24				110	70		0.5	4	2
9/16	19.5				92	80		0.5	4	2
9/23	18				92	80		0.5	4	2
10/1	18.5				120	100		0.5	4	2
10/7	15				97	120		0.6	4	2
10/13	14				110	120		0.5	4	2





Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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
Overall	**D**	**D**			**D**					**D**	

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						C	C	C	D	D	D
Chlorophyll a						C	C	D	D	D	F
Secchi Depth	D	D	D	D	C	C	D	D	D	C	D
Overall						**C**	**C**	**D**	**D**	**D**	**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 fourth year that Regional Park Lake has been involved in CAMP. Other than the 1998-2001 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. The lake was monitored 13 times between mid-April and early-October, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for Regional Park Lake, calculated from the individual parameter grades, is D. The 2000 summertime (May - September) mean TP concentration of 103.6 µg/l (minimum of 40.0 µg/l, maximum of 140.0 µg/l) corresponded to a lake water quality grade of D, while the CLA mean of 36.3 µg/l (minimum and maximum of 6.2 and 63.0 µg/l) resulted in a grade of C. Regional Park Lake's mean Secchi transparency of 0.5 m (minimum of 0.2 m and maximum of 1.4 m) corresponds to an F for water clarity. The lake's mean TKN concentration was 1.77 mg/l (minimum of 0.91 mg/l, maximum of 3.30 mg/l). The lake's 2001 overall grade is identical to that recorded in 1998 and 2000 which is worse worse than that for 1999.

As mentioned earlier, there are no water quality data available for Regional Park Lake other than the 1998-2001 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, 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 3.2 for physical condition (between 3- "definite algal presence" and 4- " high algal color"), and 4.0 for recreational suitability ("no swimming - boating ok").

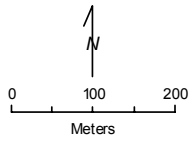
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

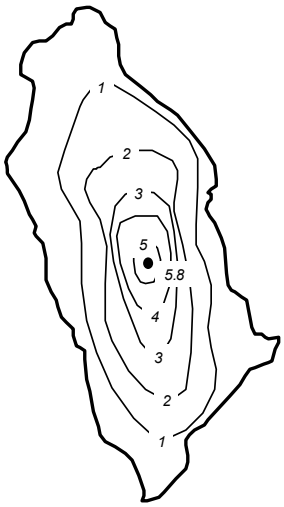
Regional Park Lake

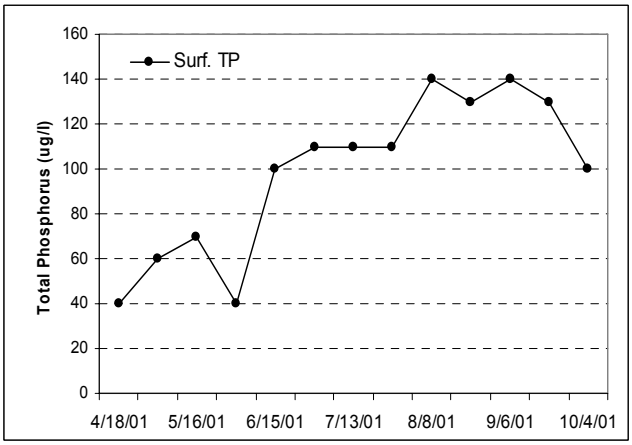
Cottage Grove, Washington Co.

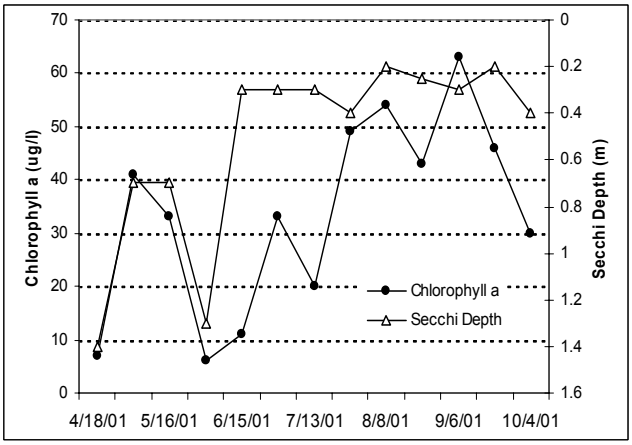
Lake ID: 820086
WD: South Washington
Volunteer: City of Cottage Grove

● Sampling site
Contours in meters



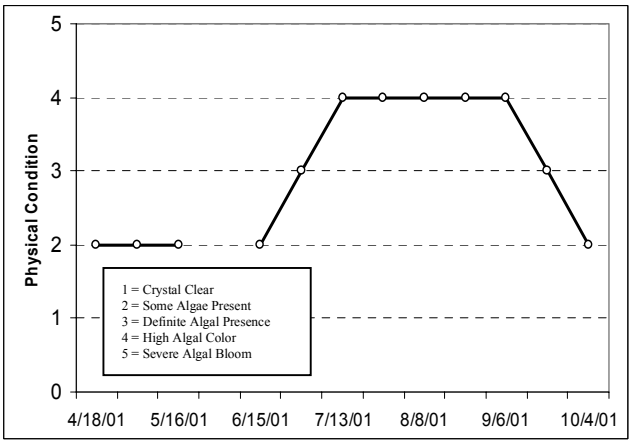


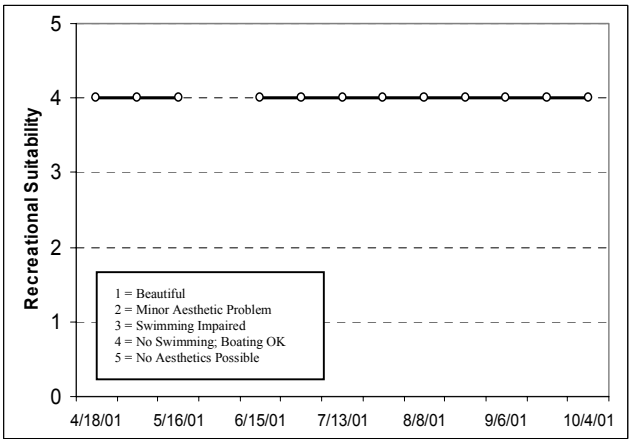




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/18	7				6.9	40		1.4	2	4
5/4	16				41	60		0.7	2	4
5/16	21				33	70		0.7	2	4
5/30	20				6.2	40		1.3		
6/15	21				11	100		0.3	2	4
6/29	21				33	110		0.3	3	4
7/13	25				20	110		0.3	4	4
7/25	25				49	110		0.4	4	4
8/8	30				54	140		0.2	4	4
8/21	21				43	130		0.3	4	4
9/6	22				63	140		0.3	4	4
9/18	18				46	130		0.2	3	4
10/4	15				30	100		0.4	2	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus								F	C	D	D
Chlorophyll a								B	B	C	C
Secchi Depth								F	C	F	F
Overall								**D**	**C**	**D**	**D**

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 third 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 1999-2001 CAMP data.

The lake was monitored seven times between mid-April and mid-September, 2001. 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 mean summertime (May through September) surface TP concentration was 92.9 µg/l (minimum of 50.0 µg/l, maximum of 130.0 µg/l). The mean CLA and Secchi transparency readings were 56.4 µg/l (minimum of 5.7 µg/l, maximum of 160.0 µg/l) and 0.7 m (minimum of 0.6 m, maximum of 1.2 m), respectively. The lake's mean surface TKN concentration was 2.21 mg/l (minimum of 1.60 mg/l, maximum of 2.80 mg/l). The lake quality grades determined from each parameter's summertime mean are TP= D, CLA= D, and Secchi transparency= F, resulted in a 2001 overall grade of D. The overall and individual grades for the lake in 2001, are dramatically worse than those recorded through CAMP in 1999 and 2000, and more similar to thoose of 1985.

As mentioned earlier, there is little water quality data available for Reitz Lake. Therefore it is not possible to determine any long-term trends. On 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, 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 2.8 for physical condition (between 2- "some algae present and 3- "definite algal presence"), and 4.0 for recreational suitability ("no swimming – boating ok").

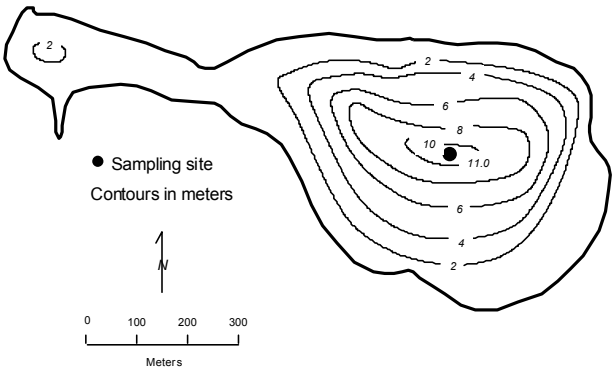
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

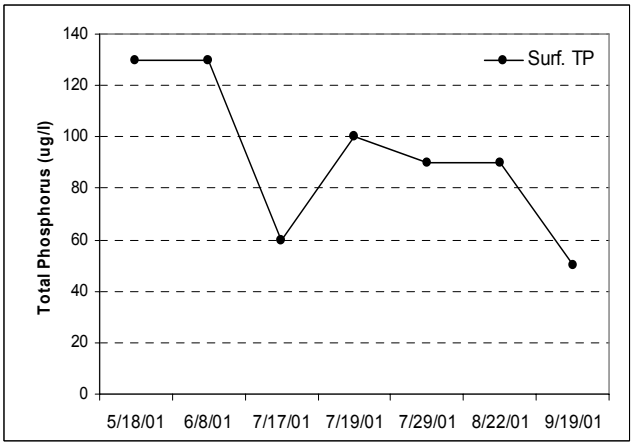
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us

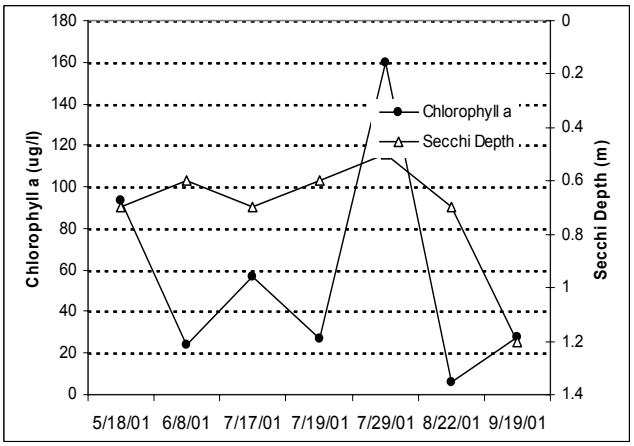
Reitz Lake

Laketown Twp., Carver Co.

Lake ID: 100052
WMO: Carver County
Volunteer: Lil Heiland

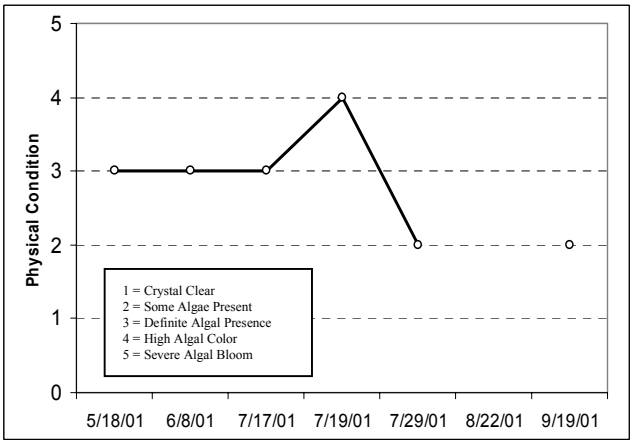






2001 Data

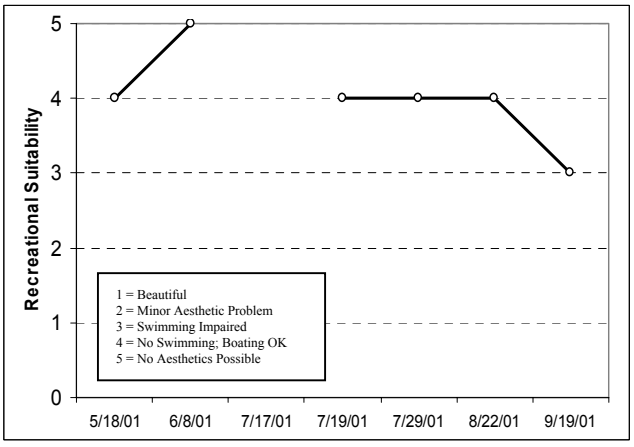
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/18	22				93	130		0.7	3	4
6/8	30				24	130		0.6	3	5
7/17	28		9.11		57	60		0.7	3	
7/19	26.9				27	100		0.6	4	4
7/29	26.9				160	90		0.5	2	4
8/22	24.1				5.7	90		0.7		4
9/19	18.3		8.15		28	50		1.2	2	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D		D						C	C	D
Chlorophyll a	D		C						B	C	D
Secchi Depth	C		D						C	C	F
Overall	**D**		**D**						**C**	**C**	**D**



Source: Metropolitan Council and STORET data

Reshanau Lake (02-0009) *Rice Creek Watershed District*

This was the third year that Reshanau Lake, which is located in the City of Lino Lakes (Anoka County), was monitored as part of CAMP (although it was only monitored once in 2000). As part of the volunteer monitoring program the lake was sampled six times from late-April to mid-October, 2001. The 336-acre lake has a mean and maximum depth of 3.2 m (10.5 feet) and 4.9 m (16 feet). The lake's surface area and mean depth translates to an approximate lake volume of 3,535 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).

Summertime (May - September) means for the monitored variables were: surface TP= 90.0 µg/l (minimum concentration of 40.0 µg/l, maximum value of 130.0 µg/l), surface chlorophyll-a= 35.8 µg/l (minimum of 8.2 µg/l, maximum of 66.0 µg/l), Secchi transparency= 0.5 m (minimum of 0.2 m, maximum of 2.0 m), and TKN= 1.85 mg/l (minimum of 1.40 mg/l, maximum of 2.40 mg/l). Similar to that recorded in 1999, the lake's 2001 water quality grades (determined from the summermenas) were as follows: TP= D; CLA= C; and Secchi= F. These individual grades result in an overall grade of D.

Again, similar to that reported in the 1999 report, the lake's CLA grade was much better than the TP and Secchi grade. An explanation may be that the majority of the lake's TP comes from in-lake suspended sediments which in turn lessens the clarity of the water and inhibits algal growth.

While there is a fair amount of historical data available for the lake (1980-1983, 1985, 1987-1991, 1999, and 2000), each years' data (other than 1999) consists of only one or two monitoring events. Because of the sporadic and limited nature of the database no long-term trends can be determined. In the short-term, however, the lake's water quality over the past 22 years seems well represented by a high-D/low-C grade. In order to detect any possible long-term trends, additional years of data collection are needed.

Throughout the course of the monitoring season the volunteers 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 3.5 (between 3- "definite algae present" and 4- "high algal color"). The mean suitability for recreation ranking was 2.8 (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/.

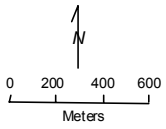
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

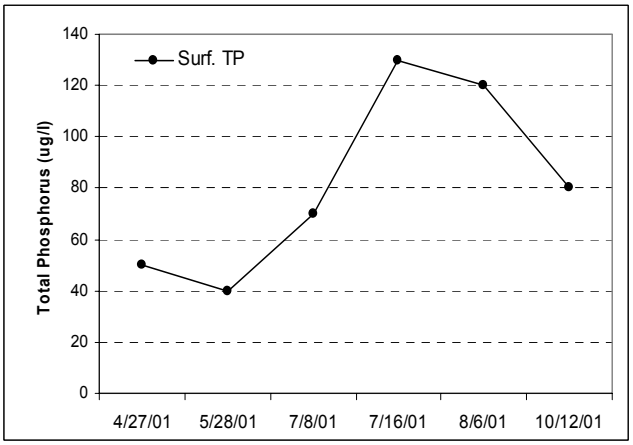
Reshanau Lake

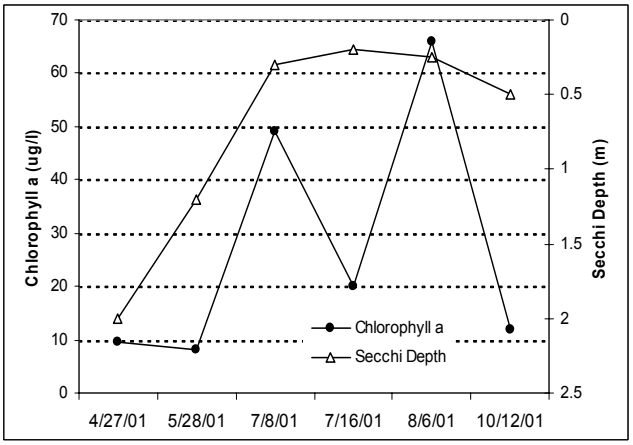
Lino Lakes, Anoka Co.

Lake ID: 20009
WD: Rice Creek
Volunteer: Debra Gutzman

● Sampling site
Contours in meters

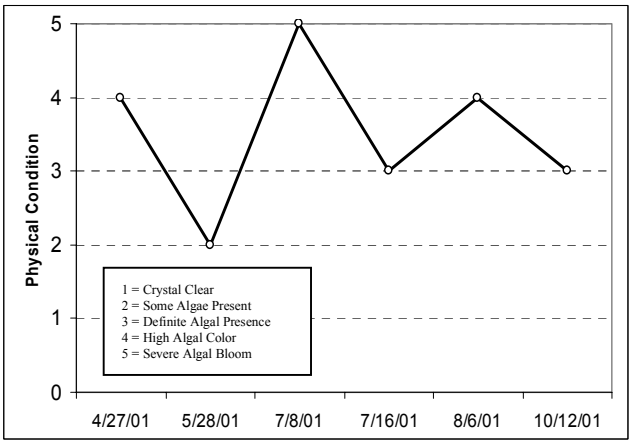






2001 Data

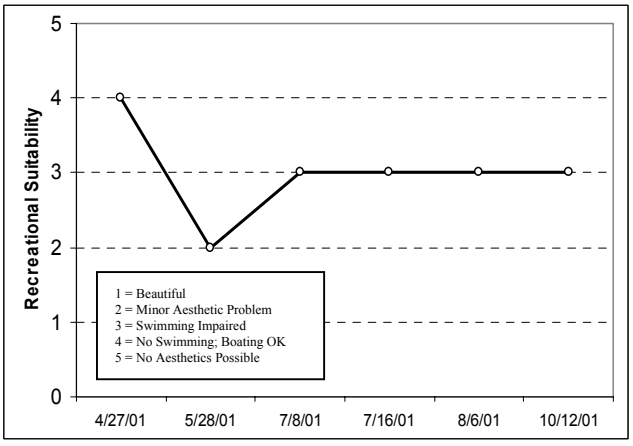
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27	15.5				9.7	50		2.0	4	4
5/28	16.8				8.2	40		1.2	2	2
7/8	28				49	70		0.3	5	3
7/16	28				20	130		0.2	3	3
8/6	25				66	120		0.3	4	3
10/12					12	80		0.5	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D								D		D
Chlorophyll a	D								C		C
Secchi Depth	F							F	F		F
Overall	**D**								**D**		**D**



Source: Metropolitan Council and STORET data

Rutz Lake (10-0080) *Carver County Environmental Services*

Rutz Lake is a 61-acre lake located within Waconia Township (Carver County). The maximum depth of the lake is 4.0 m (roughly 13 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 third year that Rutz Lake has been involved in CAMP (one sampling date in 1999 and 14 in 2000). The 15 CAMP sampling dates were the only data found for the lake in a STORET nationwide water quality database search for historical data. Thus, this is only the second complete year of monitoring on the lake.

The lake was monitored 14 times from late-April to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 268.2 µg/l (minimum concentration of 80.0 µg/l and a maximum value of 400.0 µg/l); surface chlorophyll-a= 33.1 µg/l (minimum of 6.1 µg/l and maximum of 53.0 µg/l); Secchi transparency= 1.4 m (minimum of 0.8 m and a maximum of 2.2 m); and TKN= 1.81 mg/l (minimum of 1.20 mg/l and maximum of 2.80 mg/l). The lake's summer means translate to water quality grades of F for TP, C, for CLA, and C for Secchi transparency. These grades result in an overall water quality grade of D for Rutz Lake in 2001 (identical to that recorded for 2000).

As mentioned earlier, there is no water quality data available for Rutz Lake other then the 1999-2001 CAMP data. Therefore it is impossible 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 2.6 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 3.0 for recreational suitability ("swimming slightly impaired").

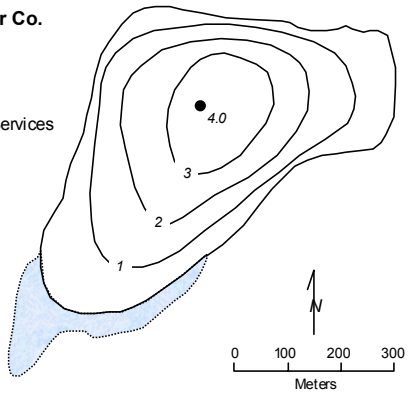
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

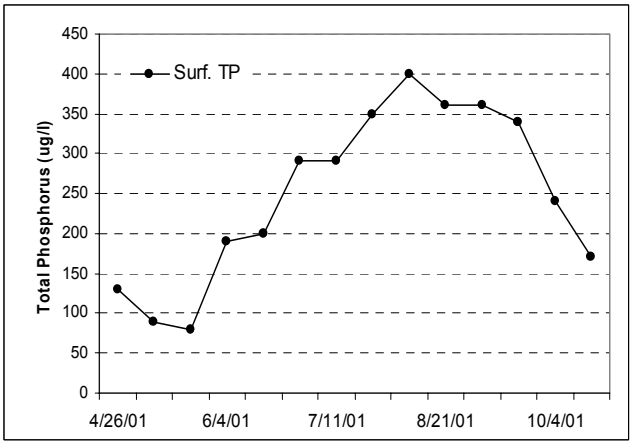
Rutz Lake

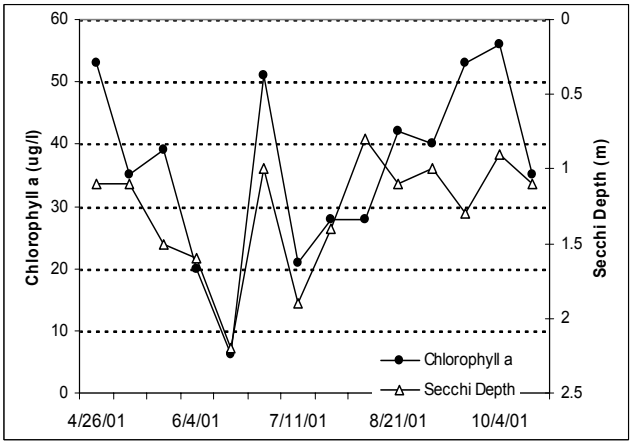
Waconia Twp., Carver Co.

Lake ID: 100080
WMO: Carver County
Volunteer: Carver Co. Env. Services

● Sampling site
Contours in meters

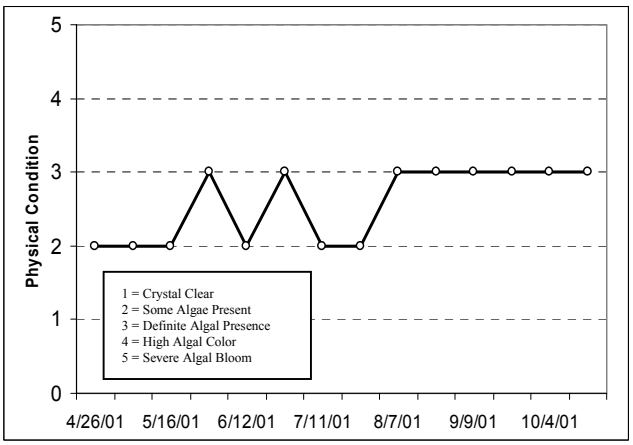






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/26	11.7		14.24		53	130		1.1	2	4
5/3	16.5		8.63		35	90		1.1	2	4
5/16	20.8				39	80		1.5	2	2
6/4	17.3		10.87		20	190		1.6	3	3
6/12	22.6		10.16		6.1	200		2.2	2	2
6/26	23.4		9.15		51	290		1.0	3	3
7/11	26.2		8.5		21	290		1.9	2	3
7/23	28.3		6.25		28	350		1.4	2	2
8/7	29.7		9.64		28	400		0.8	3	3
8/21	22.6		11.66		42	360		1.1	3	3
9/9	22.4		7.39		40	360		1.0	3	4
9/24	14.9		7.11		53	340		1.3	3	4
10/4	15.6		8.25		56	240		0.9	3	4
10/18	9.8		8.44		35	170		1.1	3	4

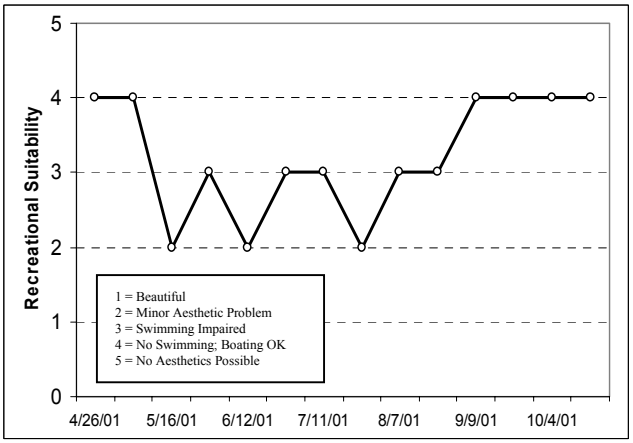


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										F	F
Chlorophyll a										C	C
Secchi Depth										D	C
Overall										**D**	**D**

Source: Metropolitan Council and STORET data



Schmidt Lake (27-0102) *Shingle Creek Watershed Management Commission*

This was the fourth 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 years besides 1995, 1998, and 2000-2001 (CAMP data) for which data are available was 1994 and 1996, 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.

Schmidt Lake was monitored nine times between late-May and late-September, 2001. The data and related graphs are presented on the information sheet on the following page.

The summertime (May - September) mean TP concentration of 53.3 µg/l (minimum of 20.0 µg/l and maximum of 80.0 µg/l) corresponded to a lake water quality grade of C, as did the The CLA mean of 26.6 µg/l (minimum and maximum of 3.6 and 45.0 µg/l). The Secchi transparency mean of 1.2 m (minimum of 0.6m and maximum of 2.0 m).on the other hand, corresponds to a grade of D for water clarity. The lake's mean TKN concentration was 1.00 mg/l (minimum of 0.65 mg/l and maximum of 1.50 mg/l). While the lakes overall grade for 2001, C, was identical to those for 1995, 1998, and 2000, the 2001 CLA and Secchi means were the worst recorded to date.

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 3.2 (between 3- “definite algae present” and 4- “high algal color”), while the mean recreational suitability ranking was 3.1 (between 3- “swimming slightly impaired” and 4- “no swimming – boating ok”).

Because of the limited size of the database (just Secchi data in 1994 and 1996, and CAMP data in 1995, 1998, and 2000-2001), 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/.

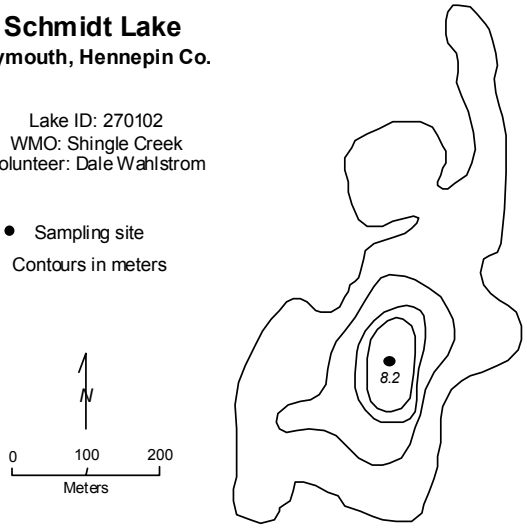
If you notice any errors in the lake’s data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

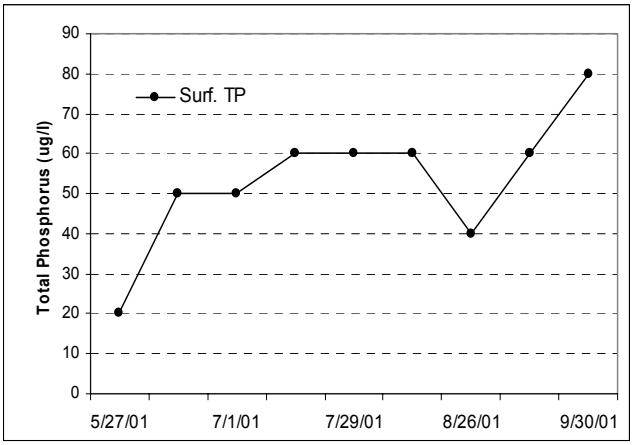
Schmidt Lake

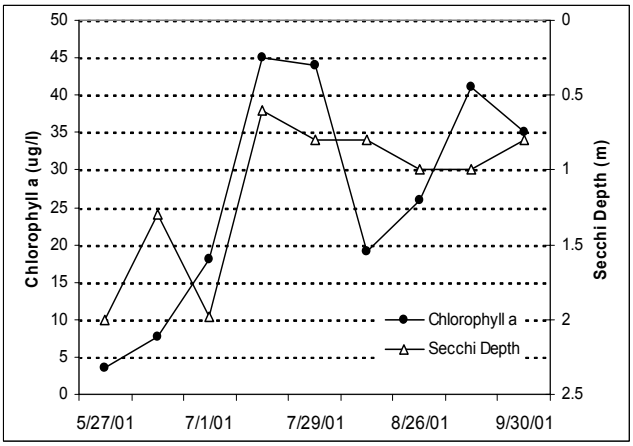
Plymouth, Hennepin Co.

Lake ID: 270102
WMO: Shingle Creek
Volunteer: Dale Wahlstrom

● Sampling site
Contours in meters

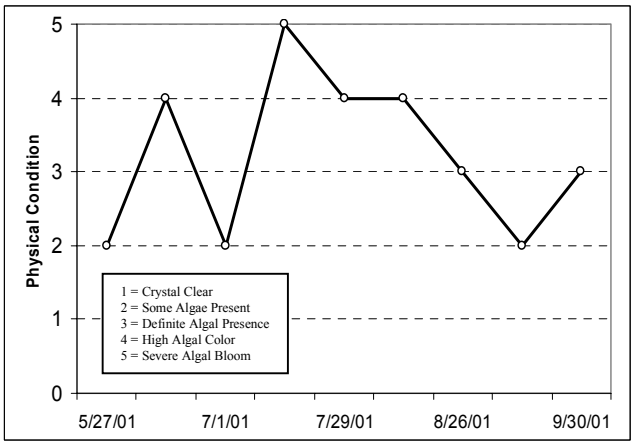






2001 Data

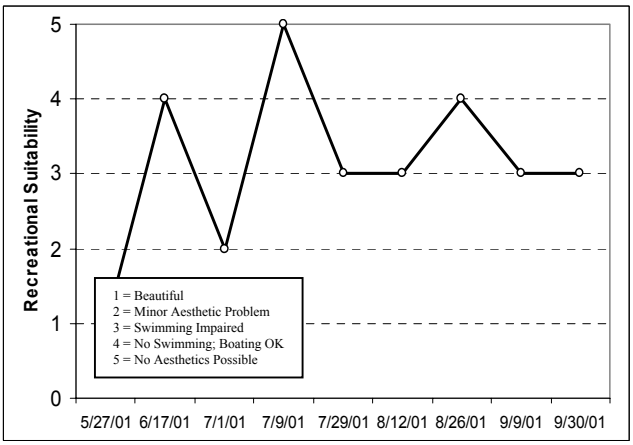
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/27	16				3.6	20		2.0	2	1
6/17	24				7.6	50		1.3	4	4
7/1	24				18	50		2.0	2	2
7/9	29				45	60		0.6	5	5
7/29	26				44	60		0.8	4	3
8/12	26				19	60		0.8	4	3
8/26	25				26	40		1.0	3	4
9/9	21				41	60		1.0	2	3
9/30	16				35	80		0.8	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					C			C		C	C
Chlorophyll a					B			C		C	C
Secchi Depth				C	C			C		C	D
Overall					**C**			**C**		**C**	**C**



Source: Metropolitan Council and STORET data

Schutz Lake (10-0018) *City of Victoria*

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.

This was the second 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 data, a search through the STORET nationwide water quality database solely includes Secchi data (1981-1988 and 1990-1991). Thus, 1984 and 2000-2001 are the only years of available nutrient data.

The lake was monitored 10 times from mid-June to mid-October, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 31.1 µg/l (minimum concentration of 10.0 µg/l and a maximum value of 50.0 µg/l); surface chlorophyll-a= 12.0 µg/l (minimum of 5.4 µg/l and maximum of 26.0 µg/l); Secchi transparency= 1.8 m (minimum of 1.4 m and a maximum of 2.9 m); and TKN= 0.84 mg/l (minimum of 0.76 mg/l and maximum of 1.10 mg/l). The lake's summer means translate to water quality grades of B for TP, B, for CLA, and C for Secchi transparency. These grades result in an overall water quality grade of B for Schutz Lake in 2001 (identical to that recorded in 2000 and better than that recorded in 1984). While the lake's overall grade in 2001 was identical to that of 2000, the 2001 CLA grade is slightly worse.

As mentioned earlier, other then the 1984 and 2000-2001 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 very little TP and CLA data available however, and to better understand the lake's TP and CLA conditions and to determine any possible trends, 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 2.3 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 1.9 for recreational suitability (roughly equal to 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/.

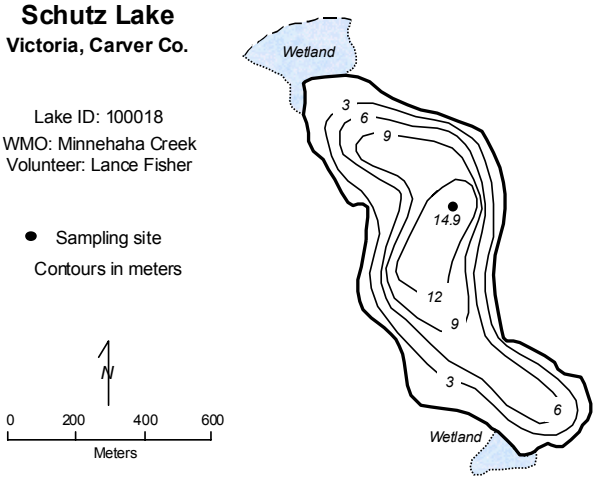
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

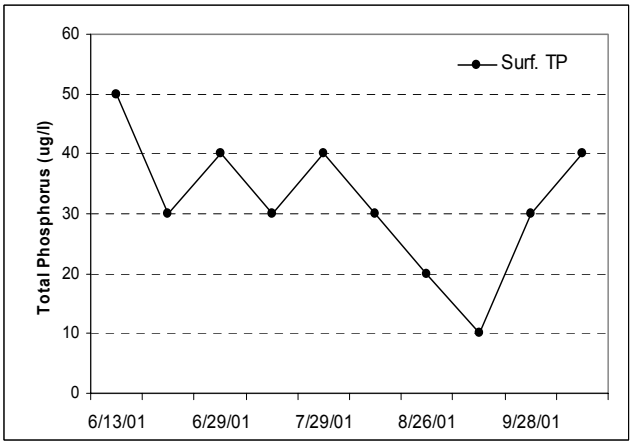
Schutz Lake

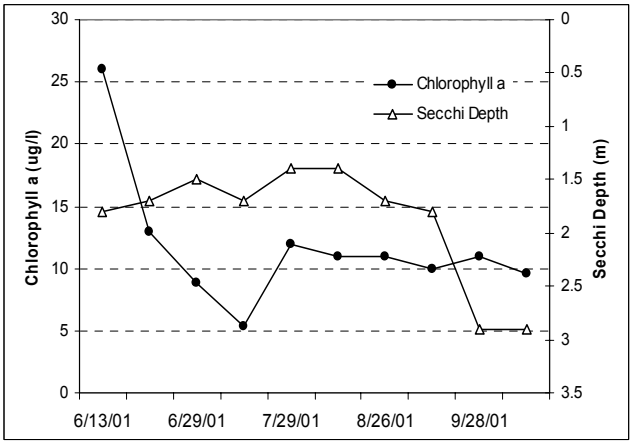
Victoria, Carver Co.

Lake ID: 100018
WMO: Minnehaha Creek
Volunteer: Lance Fisher

● Sampling site
Contours in meters

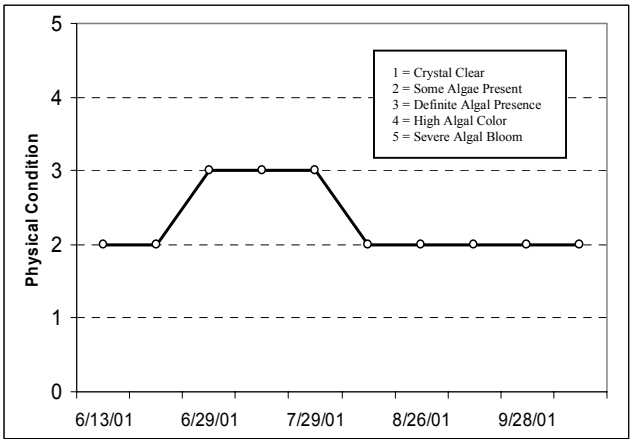






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/13	22.4				26	50		1.8	2	2
6/24	23				13	30		1.7	2	2
6/29	28				8.8	40		1.5	3	2
7/15	28				5.4	30		1.7	3	2
7/29	26				12	40		1.4	3	2
8/12	26				11	30		1.4	2	2
8/26	23				11	20		1.7	2	2
9/9	21.3				10	10		1.8	2	2
9/28	17.4				11	30		2.9	2	1
10/14	16.2				9.6	40		2.9	2	1

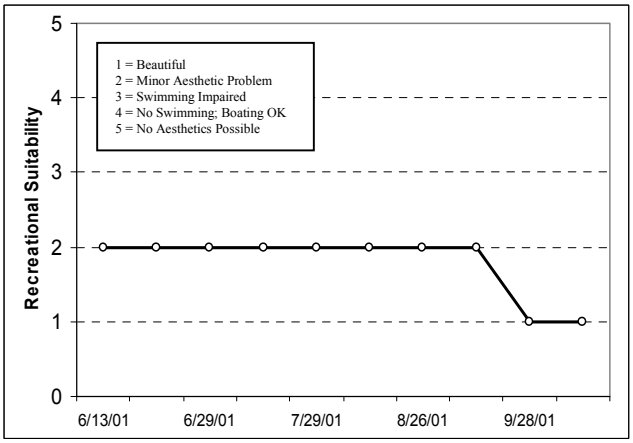


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									A	B	B
Chlorophyll a									A	A	B
Secchi Depth	D								A	C	C
Overall									**A**	**B**	**B**

Source: Metropolitan Council and STORET data



Seidl Lake (19-0095) *City of Inver Grove Heights*

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 2001 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.

Summertime (May through September) means for the monitored variables were: surface TP= 54.6 µg/l (minimum concentration of 40.0 µg/l, maximum value of 70.0 µg/l); surface chlorophyll-a= 20.6 µg/l (minimum of 3.4 µg/l, maximum of 62.0 µg/l); Secchi transparency= 1.4 m (minimum of 0.6 m, maximum of 2.6 m); and TKN= 1.05 mg/l (minimum of 0.73 mg/l, maximum of 1.30 mg/l). Associated lake quality grades for the 2001 summertime means were as follows: TP= C, CLA= C, Secchi= C. The lake's overall 2001 quality grade is C (identical to that recorded in 2000). The 2000 and 2001 overall grades represent an improvement over those recorded in 1998 and 1999 (the worst water quality year), but not as good as 1995 (the best water quality year) and 1996.

The difference between the TP, CLA and Secchi grades in past years (see report grade on the lake's information page), may indicate that in the past, suspended sediments have played 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).

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 3.0 ("definite algal presence"), while the mean suitability for recreation ranking was 3.5 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

The water quality database for Seidl Lake consists of nutrients and Secchi data in 1991, Secchi data in 1993-1994, and CAMP data in 1995-2001. While the lake's database is expanding, it is lacking in pre-1995 data. For this reason, no long-trends can be determined. In the short-term, however, it the lake's quality fluctuated between an overall C and low-B grade in 1991-1998 and 2000-2001, and a low grade of D in 1999. In fact, until the last two years (2000-2001), the lake's quality had progressively worsened from 1995 through 1999. Hopefully this recent improvement in the lake's quality continues to 1995 conditions.

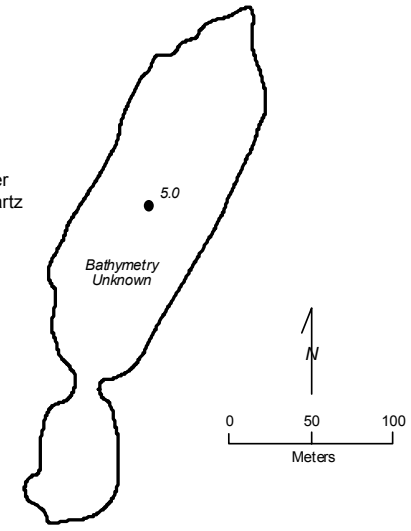
In order to tackle these possible degradation concerns, the lake homeowners with assistance from South St. Paul High School (which has actively collected data on and around the lake), have been working on addressing lake management issues for the lake. They are currently working on garnering city involvement and funding to further initiate the planning/improvement process.

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

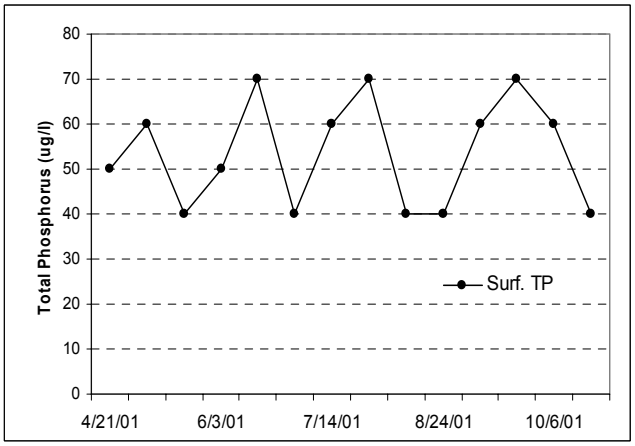
Inver Grove Heights,
Dakota Co.

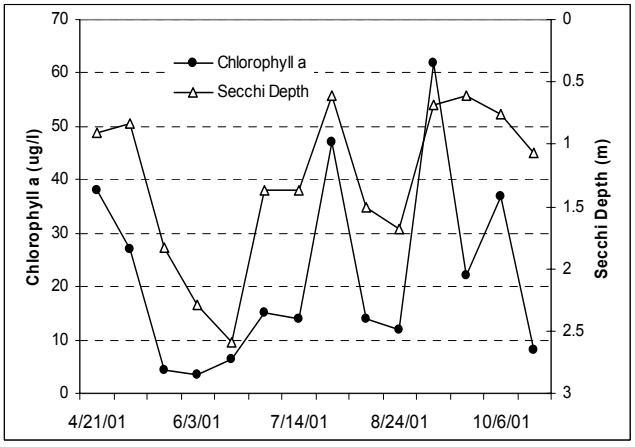
Lake ID: 190095
WMO: Lower Mississippi River
Volunteers: Harvey and Judy Bartz



● Sampling site

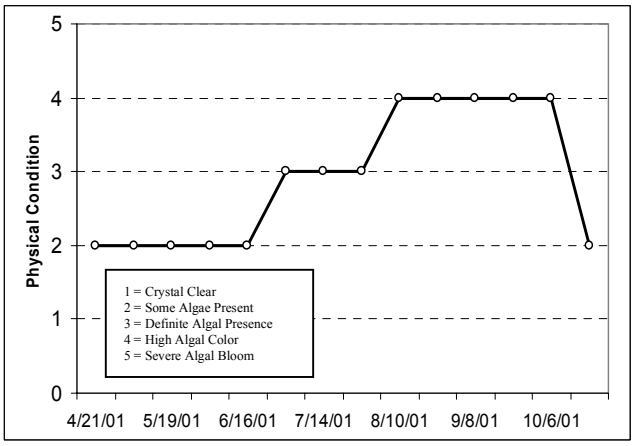
Contours in meters





2001 Data

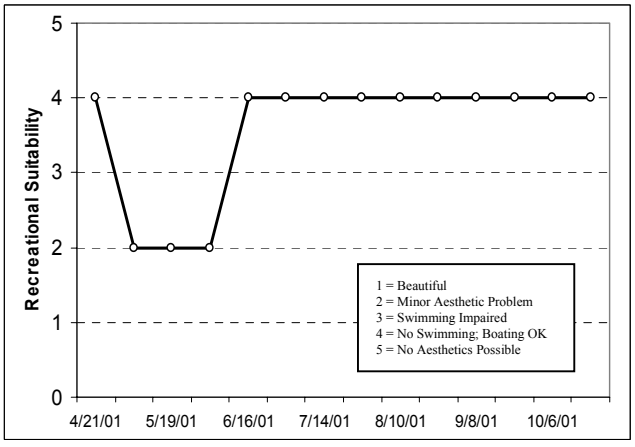
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/21	13				38	50		0.9	2	4
5/5	15				27	60		0.8	2	2
5/19	20				4.3	40		1.8	2	2
6/3	17				3.4	50		2.3	2	2
6/16	21				6.4	70		2.6	2	4
7/10	27				15	40		1.4	3	4
7/14	27				14	60		1.4	3	4
7/27	25				47	70		0.6	3	4
8/10	27				14	40		1.5	4	4
8/24	25				12	40		1.7	4	4
9/8	22				62	60		0.7	4	4
9/22	18				22	70		0.6	4	4
10/6	14				37	60		0.8	4	4
10/20	10				8	40		1.1	2	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	C				C	C	C	C	D	C	C
Chlorophyll a	C				A	B	B	C	C	C	C
Secchi Depth	D		D	D	B	B	C	D	D	C	C
Overall	**C**				**B**	**B**	**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 mid-October, 2001. 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 mean summertime (May through September) surface TP concentration of 215.0 µg/l (minimum of 60.0 µg/l, maximum of 370.0 µg/l). The mean CLA and Secchi transparency readings were 21.8 µg/l (minimum of 4.3 µg/l, maximum of 50.0 µg/l) and 2.1 m (minimum of 1.2 m, maximum of 4.6 m), respectively. The lake's mean surface TKN concentration was 1.55 mg/l (minimum of 0.99 mg/l, maximum of 2.60 mg/l).

The lake quality grades determined from each parameter's summertime mean are: TP= F, CLA= C, and Secchi transparency= C, resulted in a 2001 overall grade of D. While the lake's 2001 individual grades were identical to those recorded in 1998-2000, the 2001 CLA and Secchi means have continued to improve since bottoming out in 1998 and 1999.

The lake's worst water quality was recorded in 1999, 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 is a 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.

While the water quality database for Shields Lake is not extensive, it is growing. Nine years (1991, 1994-2001) 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 1998-2001. 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 have shown improvement again since 2000. However, because of the absence of historic data, accurate long-trend analysis is difficult. To better understand the quality of the lake and what direction it may be heading, more years of data are needed.

While the lake's CLA concentrations (corresponding to algal abundance) and Secchi transparencies have recently improved, concern about their degradation in 1998 and 1999 has been raised in past reports. It

was mentioned in the 1998 and 1999 lake report 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 3 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 late-September. It was thought that the 1998 storms no doubt started the degradation of the lake's water quality by increasing runoff from the surrounding watershed, and riling up the lake's sediments. This would potentially result 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). Future data will indicate if the recent CLA and Secchi improvements continue or if the degradation seen in 1998 and 1999 prevail.

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 2.9 (roughly equal to 3- "definite algal presence"), while the mean recreational suitability ranking was 3.1 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

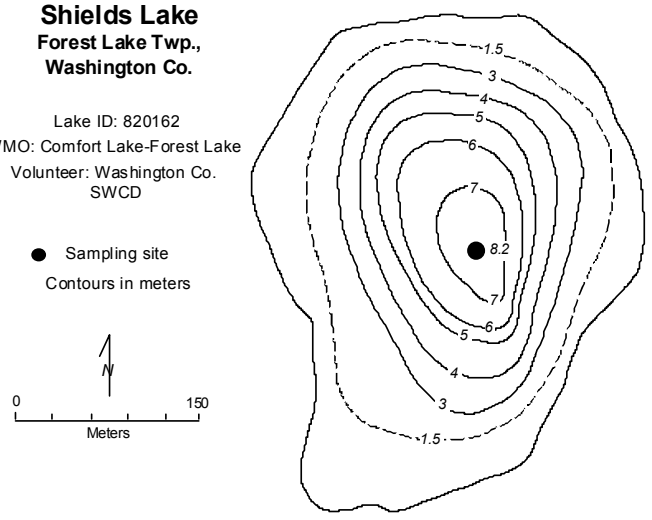
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

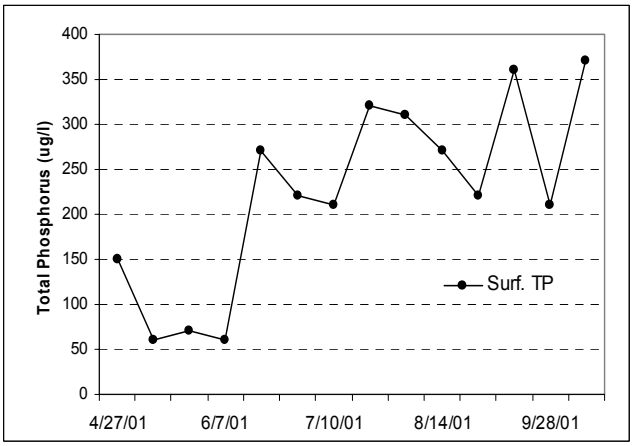
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

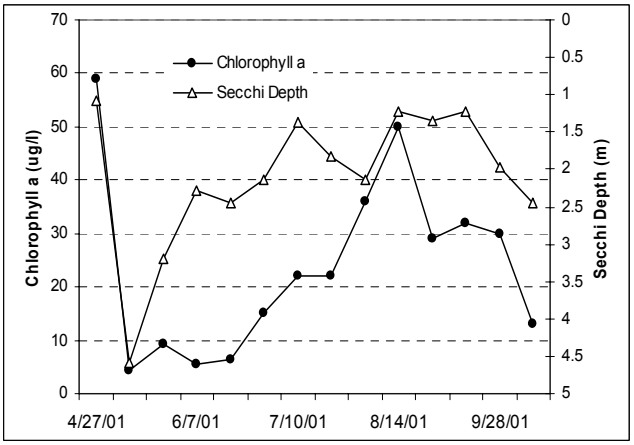
Shields Lake

Forest Lake Twp., Washington Co.

Lake ID: 820162
WMO: Comfort Lake-Forest Lake
Volunteer: Washington Co. SWCD

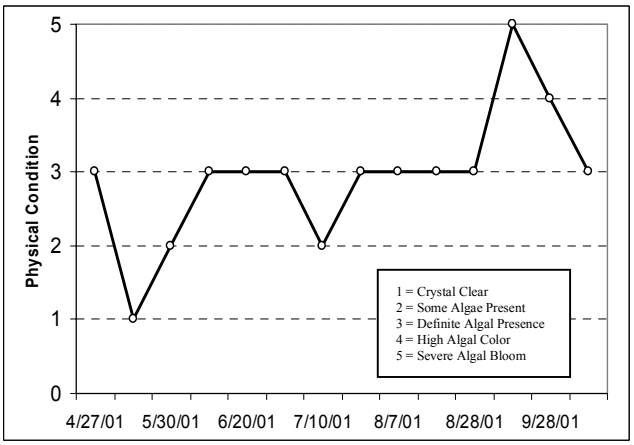






2001 Data

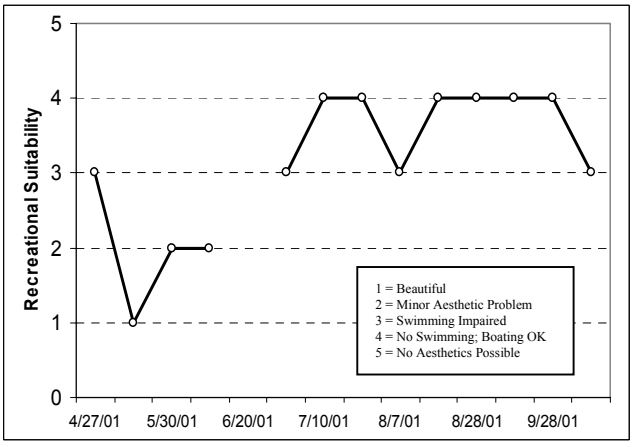
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27					59	150		1.1	3	3
5/15	21.3				4.3	60		4.6	1	1
5/30	19.1		13.6		9.2	70		3.2	2	2
6/7	17.6		9.6		5.5	60		2.3	3	2
6/20	22.7		5.57		6.4	270		2.4	3	
6/28	27.4		11.58		15	220		2.1	3	3
7/10	26.9		15.5		22	210		1.4	2	4
7/25	25.9		8.3		22	320		1.8	3	4
8/7	30.9		6.48		36	310		2.1	3	3
8/14	26.3		7.87		50	270		1.2	3	4
8/28	24.7		8.92		29	220		1.3	3	4
9/13	20		9.8		32	360		1.2	5	4
9/28	16.3		16.7		30	210		2.0	4	4
10/17	10.3		7.76		13	370		2.4	3	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	D		F	D	F	F	F	F	F	F	F
Chlorophyll a	C		C	C	C	B	A	C	C	C	C
Secchi Depth	C		C	C	B	B	B	C	C	C	C
Overall	**C**		**D**	**C**	**C**	**C**	**C**	**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 second year that Silver 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 were found, other than the 2000 and 2001 CAMP data, was 1997-1999. The lake was monitored five times between early-May and late-September, 2001. The resulting data and graphs appear on the next page.

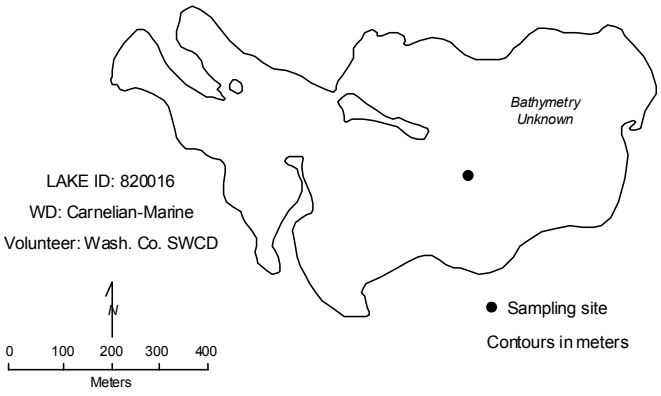
The summertime (May through September) means for the monitored variables were: surface TP= 36.0 µg/l (minimum concentration of 30.0 µg/l and a maximum value of 40.0 µg/l); surface chlorophyll-a= 14.3 µg/l (minimum of 7.3 µg/l and maximum of 29.0 µg/l); Secchi transparency= 2.1 m (minimum of 1.4 m and a maximum of 2.9 m); and TKN= 1.06 mg/l (minimum of 0.91 mg/l and maximum of 1.20 mg/l). Indentical to that recorded in 2000, the lake's 2001 summer means translate to water quality grades of C for TP, B, for CLA, and C for Secchi transparency. These grades result in an overall water quality grade of C for Silver Lake in 2001.

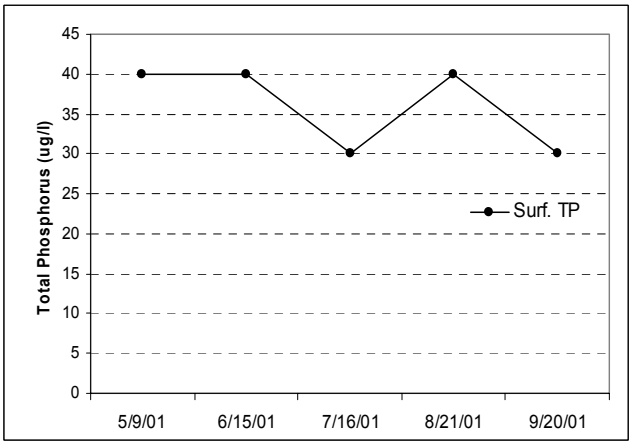
As mentioned earlier, there is a limited amount of water quality data available for Silver Lake. Therefore it is impossible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, more data are needed.

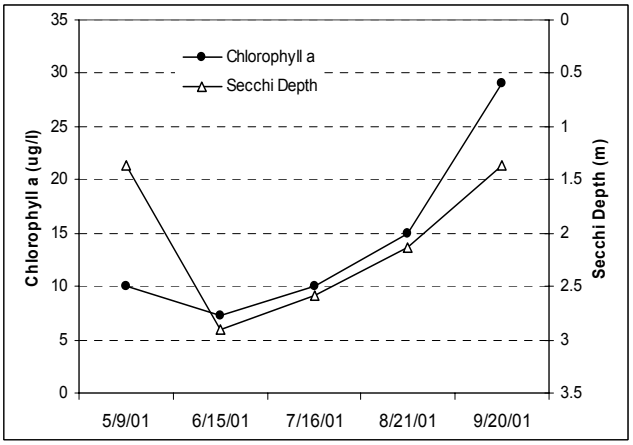
The last two graphs show seasonal variation in the lake's perceived physical condition and recreational suitability. The average user perception rankings, on a 1-to-5 scale, were 2.4 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 2.3 for recreational suitability (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.

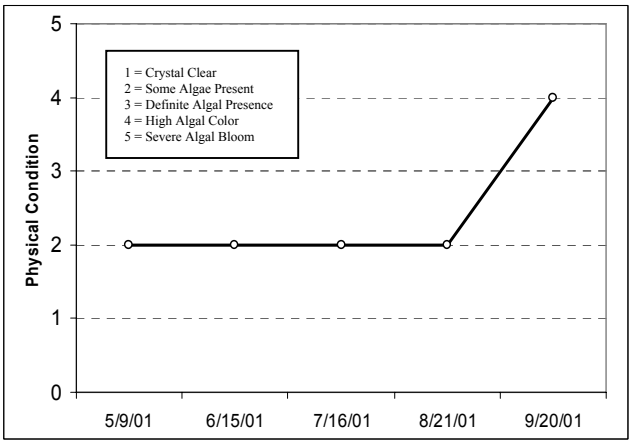






2001 Data

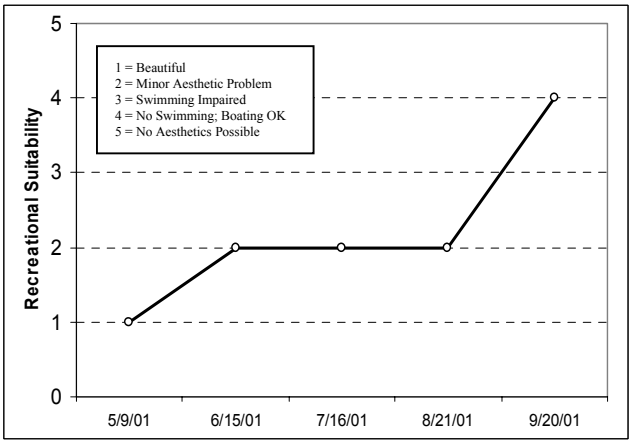
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/9	16.5		11.2		10	40		1.4	2	1
6/15	22.2		6.8		7.3	40		2.9	2	2
7/16	26.9		11.3		10	30		2.6	2	2
8/21	23.5		8.9		15	40		2.1	2	2
9/20	18.6		8.96		29	30		1.4	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						C	C	C	D	C	C
Chlorophyll a						C	C	C	D	B	B
Secchi Depth						C	D	D	D	C	C
Overall						**C**	**C**	**C**	**D**	**C**	**C**



Source: Metropolitan Council and STORET data

Simley Lake (19-0037) *City of Inver Grove Heights*

This was the seventh year that Simley Lake has been involved in CAMP (the lake has been monitored through CAMP since 1995). The 15-acre lake, located within the City of Inver Grove Heights (Dakota County), has a 472-acre immediate watershed. The lake and watershed areas translate to a watershed-to-lake-area ratio of 31:1. The larger the ratio, the greater the potential stress on the lake's quality from surface runoff.

The maximum and mean depths of the lake are 5.0 and 2.4 m (16 and eight feet), respectively. The approximate volume of the lake is 170 acre-feet (ac-ft). Land use estimates for the lake's watershed are; approximately 80 percent low-density residential (single-family), 10 percent high-density residential (multi-family), and 10 percent commercial (City of Inver Grove Heights 1993). While the lake has no public access, it is managed as a children's fishing lake.

Simley Lake was monitored 12 times from early-April to mid-October, 2001. 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 following page.

The 2001 summertime (May through September) mean concentrations were as follows: TP= 45.6 µg/l (minimum of 30.0 µg/l and a maximum of 80.0 µg/l), CLA= 24.3 µg/l (minimum of 2.3 µg/l and maximum of 56.0 µg/l), Secchi transparency= 1.5 m (minimum of 0.5 m and maximum of 2.6 m), and TKN= 0.93 mg/l (minimum and maximum of 0.53 and 1.60 mg/l, respectively). The summertime means resulted in grades of C for TP, C for CLA, and C for Secchi transparency. Therefore, the overall water quality grade for the lake in 2001 is C. While the lake's overall grade in 2001 was similar to that recorded in 1993, 1995, and 1999-2000, the individual parameter grades have flucuated over the years. The lake's worst recorded water quality year was 1999 (TP= 46.4 µg/ CLA = 27.3 µg/ and Secchi transparency= 0.8 m), while the best was 1996 (TP= 30.0 µg/ CLA = 8.3 µg/ and Secchi transparency= 1.7 m), where the lake received an overall grade of B.

Throughout the course of the study, the volunteer ranked their perceptions of the lake's physical and recreational condition on a 1-to-5 scale. The mean physical condition ranking was 1.2 (between 1- "crystal clear" and 2- "some algae present"), while the mean recreational suitability ranking was 2.1 (betrween 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

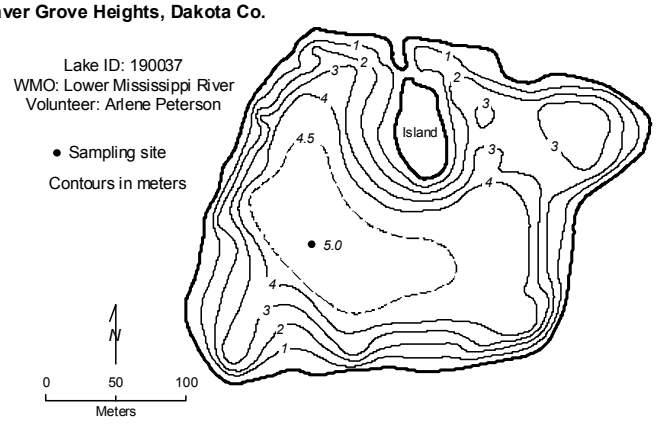
Because of the limited size of the database (1993 and 1995-2001), no long-term trends can be determined. On the short-term, the lake quality report card shows that the lake's overall grade increased from C in 1993 and 1995, to B in 1996-1998, before falling back to a C in 1999-2001. To better understand the lake's water quality and what direction it may be heading, more years of data are needed.

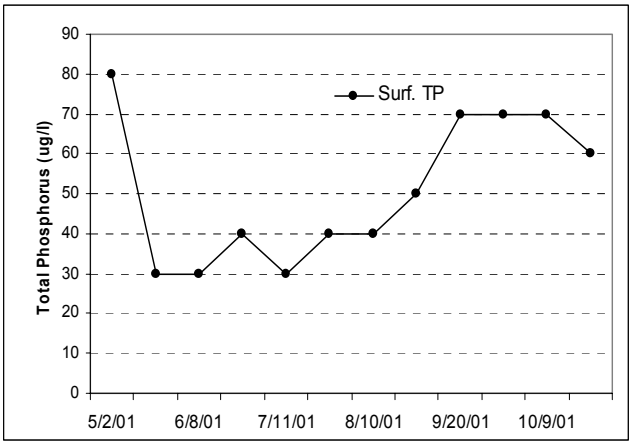
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

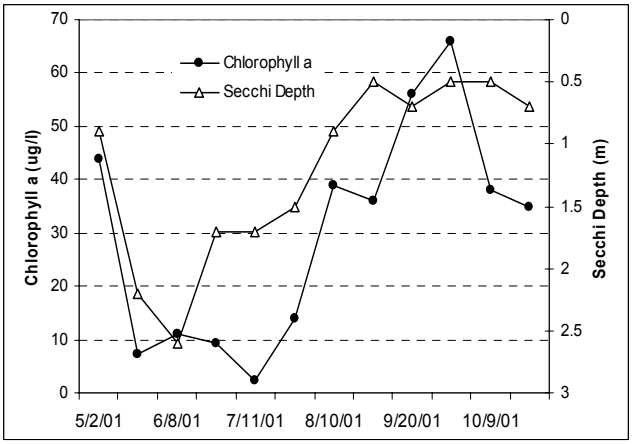
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Simley Lake

Inver Grove Heights, Dakota Co.

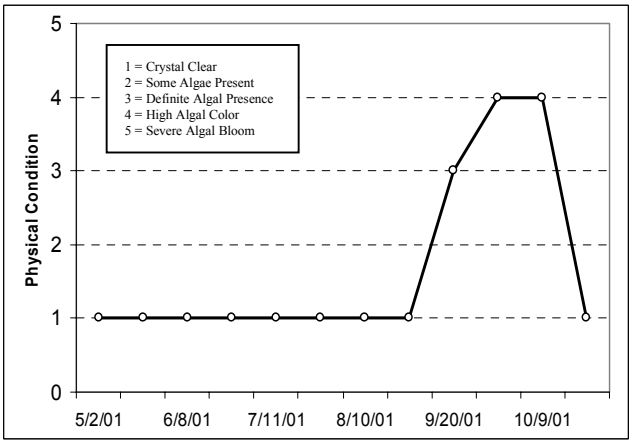






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/2	17				44	80		0.9	1	2
5/29	19				7.4	30		2.2	1	2
6/8	18				11	30		2.6	1	2
6/22	24				9.2	40		1.7	1	2
7/11	26				2.3	30		1.7	1	2
7/25	25				14	40		1.5	1	2
8/10	26				39	40		0.9	1	2
8/28	24				36	50		0.5	1	2
9/20	18				56	70		0.7	3	3
10/1	17				66	70		0.5	4	4
10/9	12				38	70		0.5	4	4
10/19	11				35	60		0.7	1	2

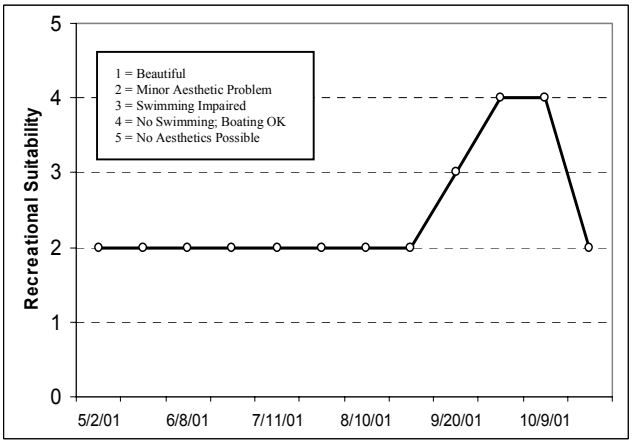


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			C		C	C	C	C	C	C	C
Chlorophyll a			C		B	A	A	A	C	B	C
Secchi Depth			C		C	C	C	C	D	D	C
Overall			**C**		**C**	**B**	**B**	**B**	**C**	**C**	**C**

Source: Metropolitan Council and STORET data



South Rice Lake (27-????) *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 1.5 m (roughly 5 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 second year that South Rice Lake has been involved in CAMP (it was also involved in 2000). Other than the 2000 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 late-April and mid-October, 2001. The resulting data and graphs appear on the next page.

The summertime (May through September) means for the monitored variables were: surface TP= 185.5 µg/l (minimum concentration of 60.0 µg/l and a maximum value of 440.0 µg/l); surface chlorophyll-a= 19.0 µg/l (minimum of 2.8 µg/l and maximum of 54.0 µg/l); Secchi transparency= 0.6 m (minimum of 0.3 m and a maximum of 0.9 m). The lake's summer means translate to water quality grades of F for TP, B, for CLA, and F for Secchi transparency. These grades result in an overall water quality grade of D for South Rice Lake in 2001.

The lake's 2001 overall grade is better than the F the lake received in 2000. While the lake did have a dramatically improved mean TP concentration, it was its CLA grade improvement from an F in 2000 to a B in 2001 that translated to the improved overall grade. The variability of the lake's 2000 and 2001 data definitely requires more monitoring to help determine which year's monitoring represents the lake's actual condition. Given the limited database it is simply impossible to determine if either 2000, 2001, or both truly represent the lake's true water quality. 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 3.7 for physical condition (between 3- "definite agal presence" and 4- "high algal color"), and 4.6 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

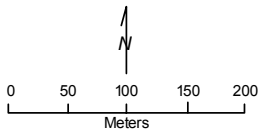
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

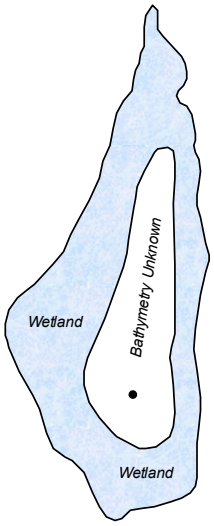
South Rice Pond

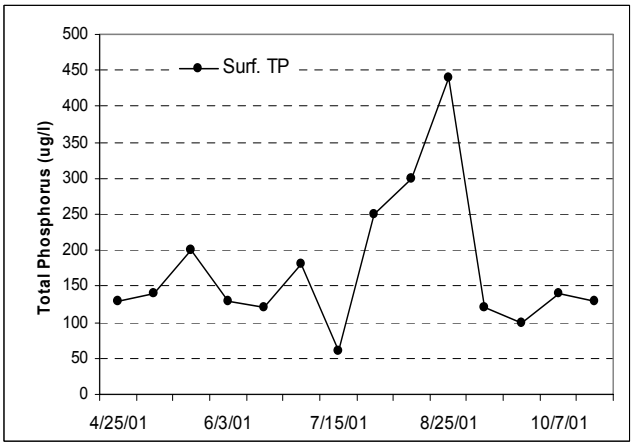
Golden Valley, Robbinsdale, Hennepin Co.

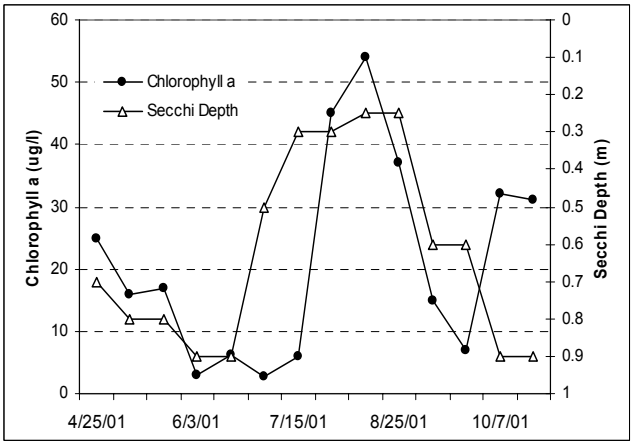
Lake ID: 27xxxx
WMO: Bassett Creek
Volunteers: The Streff Family

• Sampling site
Contours in meters



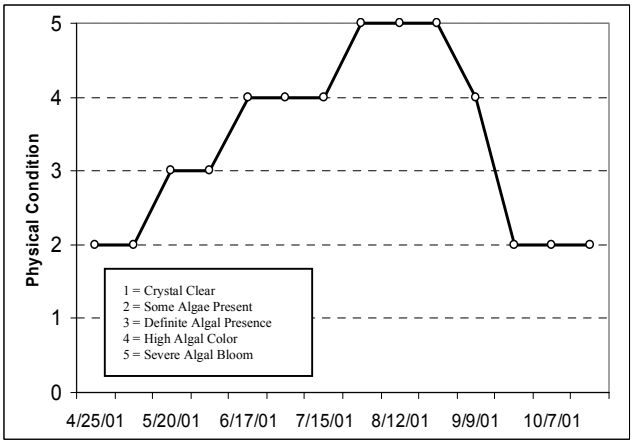


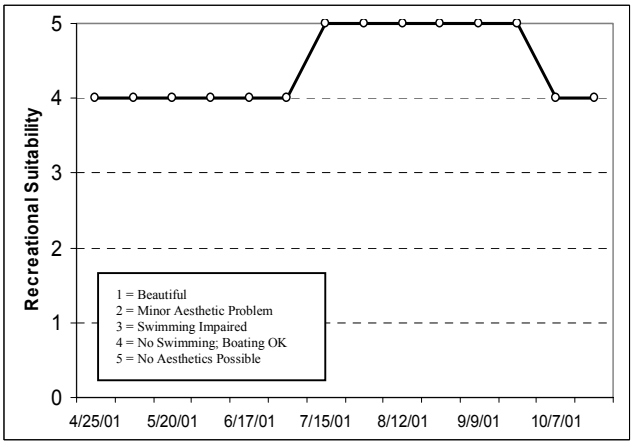




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/25	17				25	130		0.7	2	4
5/6	21				16	140		0.8	2	4
5/20	20				17	200		0.8	3	4
6/3	22				3.1	130		0.9	3	4
6/17	23.5				6.1	120		0.9	4	4
7/1	24.6				2.8	180		0.5	4	4
7/15	26.3				6	60		0.3	4	5
7/30	25.2				45	250		0.3	5	5
8/12	21.8				54	300		0.3	5	5
8/25	21.3				37	440		0.3	5	5
9/9	19				15	120		0.6	4	5
9/23	12.3				7	100		0.6	2	5
10/7	10.1				32	140		0.9	2	4
10/20	10.1				31	130		0.9	2	4





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										F	F
Chlorophyll a										F	B
Secchi Depth										F	F
Overall										**F**	**D**

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 second year that South Twin Lake has been involved in CAMP (it was also involved in CAMP in 2000). A search through the STORET nationwide water quality database for data on the lake was very limited. The only years in which data were found, other than the 2000 and 2001 CAMP data, was 1996-1999. The lake was monitored five times between early-May and mid-September, 2001. The resulting data and graphs appear on the next page.

The summertime (May through September) means for the monitored variables were: surface TP= 70.0 µg/l (minimum concentration of 60.0 µg/l and a maximum value of 80.0 µg/l); surface chlorophyll-a= 64.4 µg/l (minimum of 31.0 µg/l and maximum of 110.0 µg/l); Secchi transparency= 0.6 m (minimum of 0.5 m and a maximum of 0.8 m); and TKN= 1.31 mg/l (minimum of 0.48 mg/l and maximum of 3.00 mg/l). The lake's summer means translate to water quality grades of D for TP, D, for CLA, and F for Secchi transparency. These grades result in an overall water quality grade of D for South Twin Lake in 2001. The 2001 overall grade is a full grade worse than that recorded in 2000, but more in line to the grades associated with the 1996-1999 data.

As mentioned earlier, there is little historic data available for South Twin Lake other then the 2001 CAMP data. Therefore it is impossible to determine any long-term. In the short-term, however, the lake seems well represented by an overall grade of D with some "normal" variability in the low C and F range. 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 3.2 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 3.8 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.

South Twin Lake

Stillwater Twp., Washington Co.

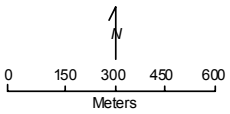
LAKE ID: 820019

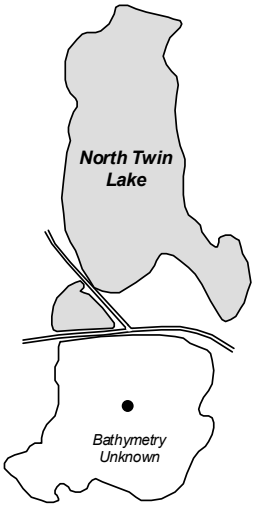
WD: Camelian-Marine

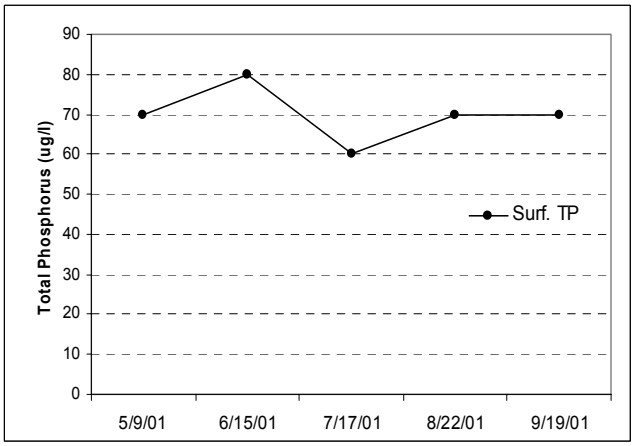
Washington Co. SWCD

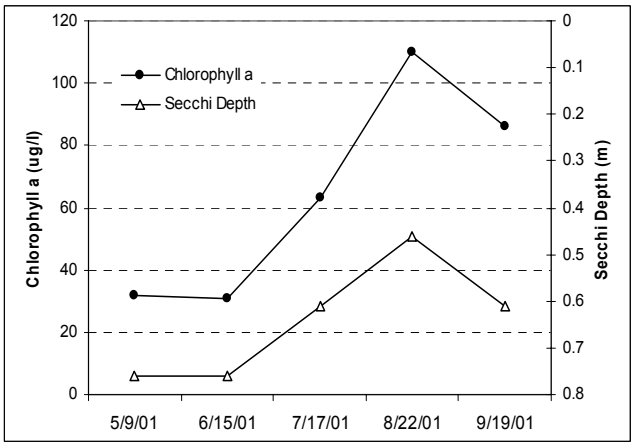
● Sampling site

Contours in meters



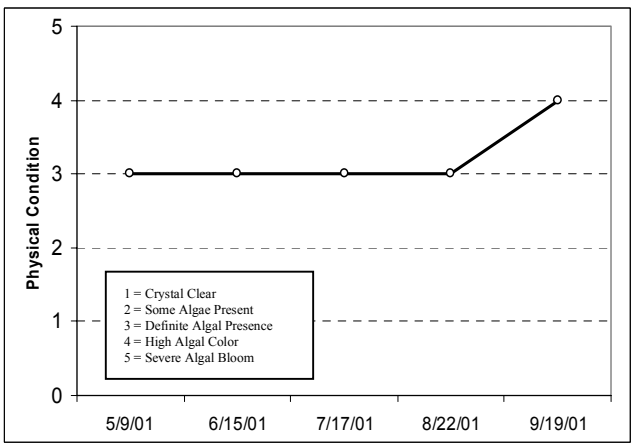






2001 Data

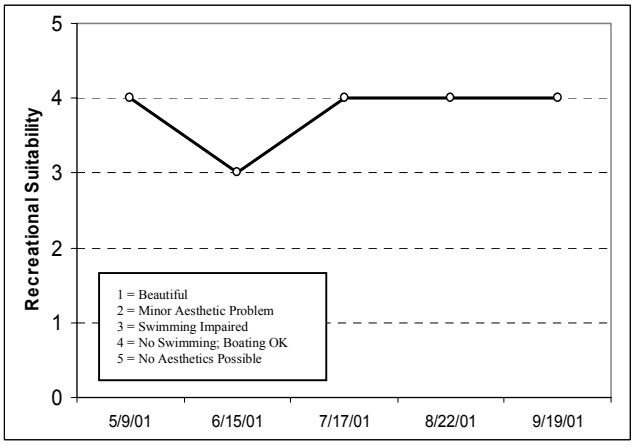
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/9	16		11.7		32	70		0.8	3	4
6/15	21.8		5.8		31	80		0.8	3	3
7/17	26.5		14.1		63	60		0.6	3	4
8/22	24.8		10.7		110	70		0.5	3	4
9/19	18.8		8.9		86	70		0.6	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						C	C	D	D	C	D
Chlorophyll a						D	D	D	F	C	D
Secchi Depth						D	D	F	F	D	F
Overall						**D**	**D**	**D**	**F**	**C**	**D**



Source: Metropolitan Council and STORET data

Spring Lake (Anoka County) (2-0071) *Shingle Creek Watershed Management Commission*

Spring Lake is a 60-acre lake located within City of Spring Lake Park (Anoka County). Other than the fact that the maximum depth of the lake is approximately 5.5 m (18 feet) and that roughly 97 percent of the lake's area is considered littoral (the shallow [0-15 foot depth] area dominated by aquatic vegetation), there is very little known morphological data available.

The year 2001 marks the first year that Spring Lake has been involved in CAMP. The only water quality data found for the lake (through search of the STORET water quality database) were Secchi transparency data for 1998, 1992, and 1993. 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, 2001. The resulting data and graphs appear on the next page.

The summertime (May through September) means for the monitored variables in 2001 were: surface TP= 31.3 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 50.0 µg/l); surface chlorophyll-a= 6.2 µg/l (minimum of 3.1 µg/l and maximum of 17.0 µg/l); Secchi transparency= 2.6 m (minimum of 1.6 m and a maximum of 4.3 m); and TKN= 0.88 mg/l (minimum of 0.70 mg/l and maximum of 1.10 mg/l). The lake's 2001 summer means translate to water quality grades of B for TP, A, for CLA, and B for Secchi transparency. These grades result in an overall water quality grade of B for Spring Lake in 2001.

As mentioned earlier, there is a limited amount of water quality data available for Spring Lake. Therefore it is impossible 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.

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 3.8 for physical condition (between 3- "definite algal presence" and 4- "high algal color"), and 3.9 for recreational suitability (roughly equal to "no swimming - boating ok").

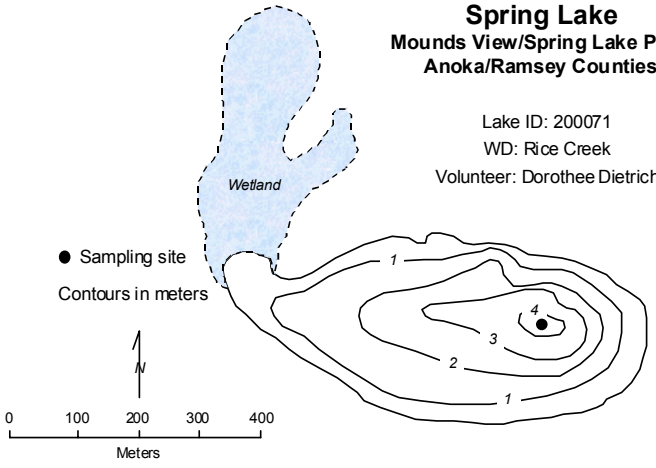
The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MNDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the internet at http://www.dnr.state.mn.us/lakefind/.

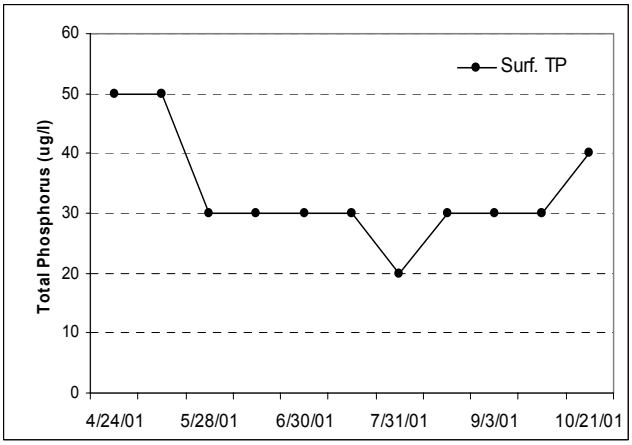
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

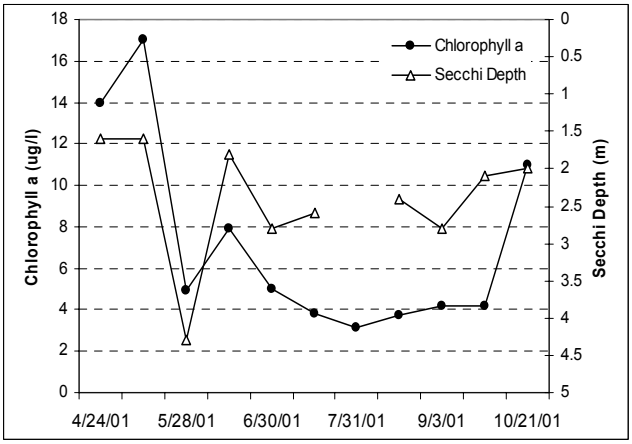
Spring Lake

Mounds View/Spring Lake Park, Anoka/Ramsey Counties

Lake ID: 200071
WD: Rice Creek
Volunteer: Dorothee Dietrich

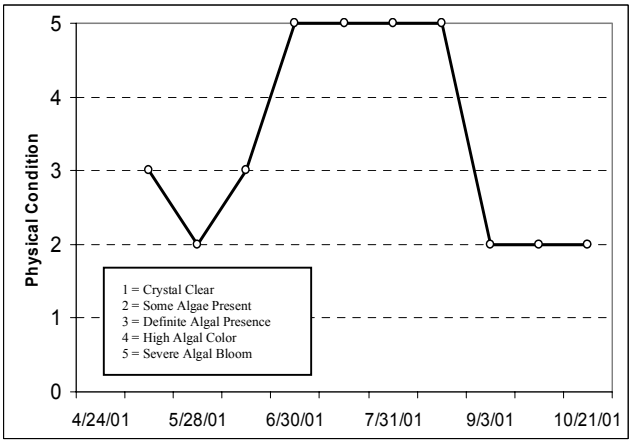






2001 Data

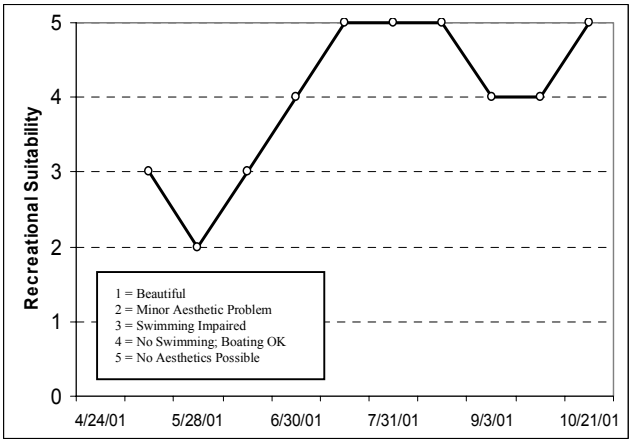
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/24	11				14	50		1.6		
5/7	15				17	50		1.6	3	3
5/28	20.1				4.9	30		4.3	2	2
6/14	24.6				7.9	30		1.8	3	3
6/30	27.8				5	30		2.8	5	4
7/15	28.5				3.8	30		2.6	5	5
7/31	28.6				3.1	20			5	5
8/14	25.8				3.7	30		2.4	5	5
9/3	24.1				4.2	30		2.8	2	4
9/30	16.8				4.2	30		2.1	2	4
10/21	11.2				11	40		2.0	2	5



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											B
Chlorophyll a											A
Secchi Depth		B	C								B
Overall											**B**



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 11 times between mid-April and lmid-October, 2001. 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.

A 1983 Metropolitan Council diagnostic /feasibility study (Osgood 1983) on the lake determined that the lake's dominant algae over the Council's monitoring period, Aphanizomenon, grows in flake form under the conditions found in Spring Lake. These flakes are unsightly, but also profoundly influences the lake's internal nutrient dynamics. Certain life-history characteristics of this alga act to transport phosphorus (and other nutrients) from their deposition site (lake sediments) back to the water. These algae will resist efforts at nutrient reduction in the lake; in fact, it appears theoretically possible that algae could increase in abundance with nutrient reductions. Improving the water quality of Spring Lake requires both that the character of the algal community be changed and that phosphorus in the lake be substantially reduced (Osgood 1983).

The annual phosphorus load to the lake in the mid-80's was estimated to be 4,000 kg (2,650 kg [56 percent] from external sources such as snowmelt and spring runoff, and 1300 kg [33 percent] from internal sources such as release from the bottom sediments) (Osgood 1983). While external phosphorus is generally considered controllable (Oberts 1982), in-lake improvements (reduced algal blooms resulting in lower chlorophyll) may not be possible. The maximum possible reduction of phosphorus input from surface runoff in this type of watershed is 47 percent (Oberts 1982).

In-lake restoration measures for Spring Lake are also not very feasible. Normal phosphorus control would be difficult or expensive in this large shallow lake. Also, in-lake measures are ineffective without prior substantial reduction in external nutrients (Osgood 1983).

Council studies concluded that improvements in water quality may occur if phosphorus from all sources is reduced by greater than 38 percent (Osgood 1983). It was projected that a reduction of at least 1,500 kg/yr phosphorus would be required before significant changes in in-lake chlorophyll and transparency could be achieved. This minimum reduction is judged to be extremely difficult to attain, thus water quality improvement in Spring Lake would be extremely difficult to attain.

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 has continued to monitor the effectiveness of the system

While Spring Lake has been monitored by the Metropolitan Council in the past, 2001 was the third year it has been involved in CAMP (the others being 1997 and 2000). 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. The mean 2001 summertime surface TP concentration for the lake was 93.3 µg/l (minimum of 50.0 µg/l, maximum of 190.0 µg/l). The mean CLA and Secchi transparency readings were 58.3 µg/l (minimum of 4.4 µg/l, maximum of 120.0 µg/l), and 1.1 m (minimum of 0.3 m, maximum of 4.5 m), respectively. The lake's mean surface TKN concentration was 1.89 mg/l (minimum of 1.30 mg/l and maximum of 2.70 mg/l).

The 2001 summertime means resulted in a TP grade of D, CLA grade of D, and Secchi transparency grade of D. The resulting 2001 overall grade calculated from all three parameters was D. While the 2001 overall grade is similar to that recorded in 1996, 1997 and 2000, there is quite a wide range of variability between each year's individual parameter means and grades.

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 3.2 (between 3- "definite algal presence" and 4- "high algal color"). The mean suitability for recreation ranking was 2.2 (between 2- "minor aesthetic problem" and 3- "swimming slightly impaired").

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. 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 and 1982, and a D in 1980, 1984, 1996-1997, and 2000-2001. 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. To better understand all aspects of the lake's water quality and what direction it may be heading, more years of data collection are needed.

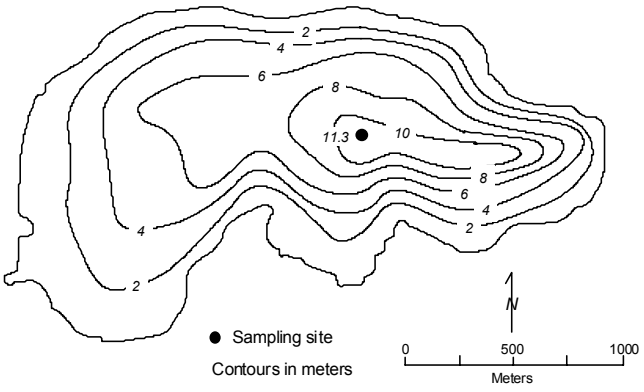
The Fisheries Section of the Minnesota Department of Natural Resources (MNDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MNDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the internet at http://www.dnr.state.mn.us/lakefind/.

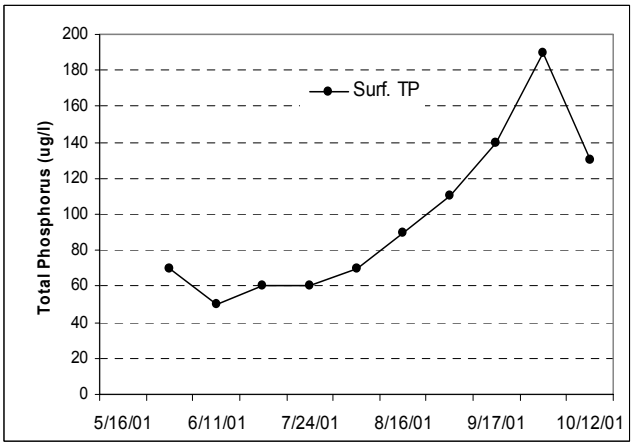
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

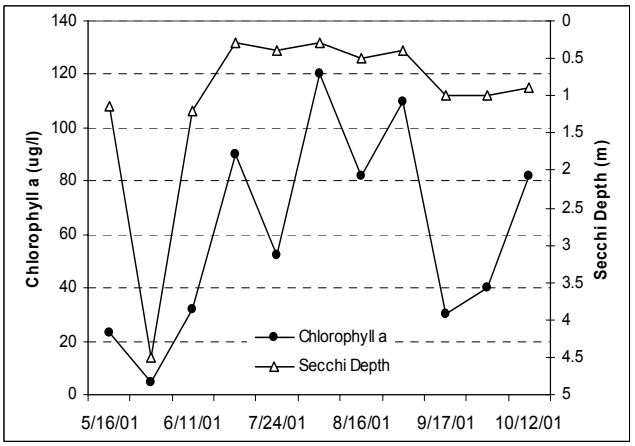
Spring Lake

Prior Lake/Spring Lake Twp., Scott Co.

Lake ID: 700054
WD: Prior Lake-Spring Lake
Volunteer: Bob Palmby

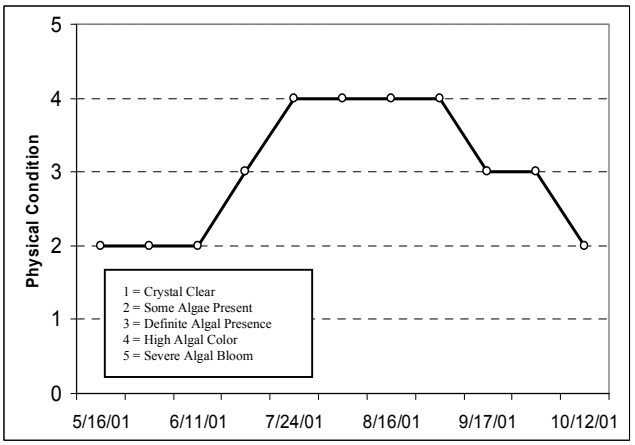






2001 Data

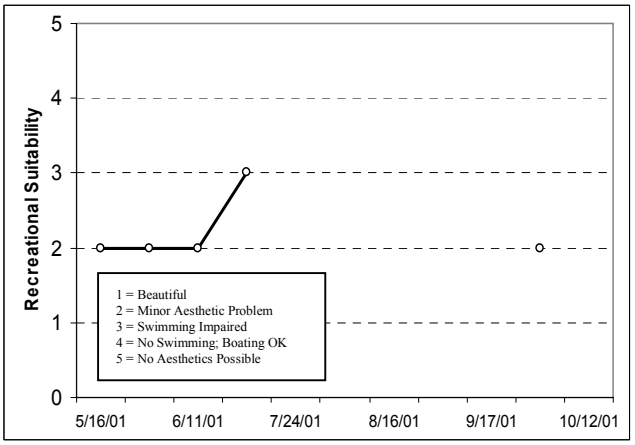
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/16	19				23			1.2	2	2
5/29	16				4.4	70		4.5	2	2
6/11	22.5				32	50		1.2	2	2
7/13	30				90	60		0.3	3	3
7/24	26.9				52	60		0.4	4	
8/5	28				120	70		0.3	4	
8/16	22.4				82	90		0.5	4	
9/4	23.5				110	110		0.4	4	
9/17	19.6				30	140		1.0	3	
9/25	18				40	190		1.0	3	2
10/12	12				82	130		0.9	2	



Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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
Overall	**D**	**C**	**C**		**D**						

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						D	D			F	D
Chlorophyll a						C	C			D	D
Secchi Depth	D	C	C	C	C	D	D			C	D
Overall						**D**	**D**			**D**	**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). Access is 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 1999-2001. The lake was monitored 15 times from early-May to mid-October, 2001. Summertime (May through September) means for the monitored variables were: surface TP= 10.4 μg/l (minimum concentration of < 10.0 μg/l [in which case 5.0 μg/l was used to calculate mean], maximum of 20.0 μg/l); surface chlorophyll-a= 3.2 μg/l (minimum of 1.7 μg/l, maximum of 8.7 μg/l); Secchi transparency= 6.3 m (minimum of 4.9 m, maximum of 9.2 m); and TKN= 0.36 mg/l (minimum of 0.29 mg/l, maximum of 0.66 mg/l). Associated lake quality grades for the 2001 summertime means were as follows: TP= A; CLA= A; and Secchi= A. The lake's overall 2001 quality grade calculated from the TP, CLA, and Secchi grades was A (identical to CAMP 1993-1997, and 1999-2000).

The water quality graphs show seasonal trends in TP and CLA concentrations, and Secchi transparency for 2001, 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 Parnetship 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 lake projects designed to address issues affecting the lake's quality.

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 1.0 ("crystal clear"). The mean suitability for recreation ranking was 1.0 ("beautiful").

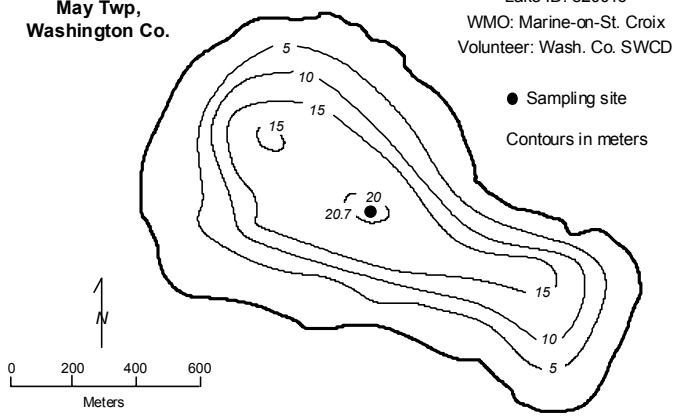
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

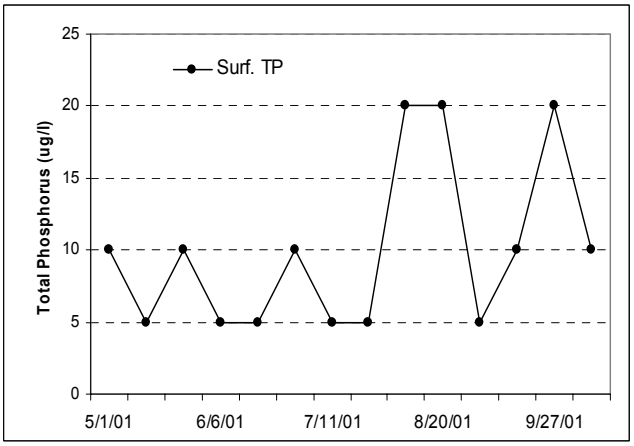
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

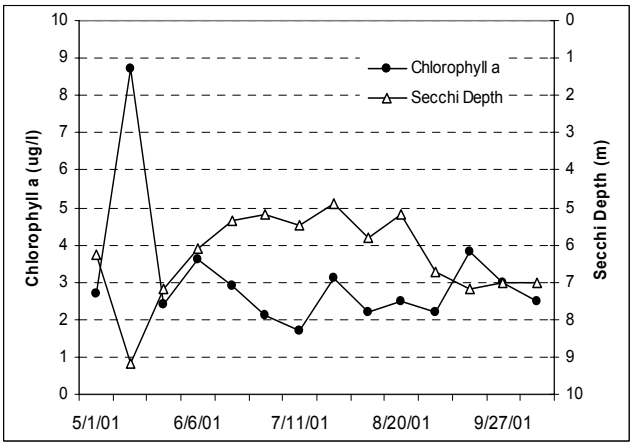
Square Lake

May Twp,
Washington Co.

Lake ID: 820046
WMO: Marine-on-St. Croix
Volunteer: Wash. Co. SWCD

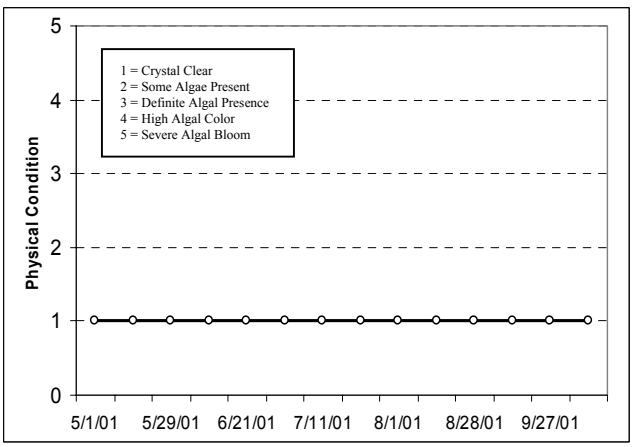






2001 Data

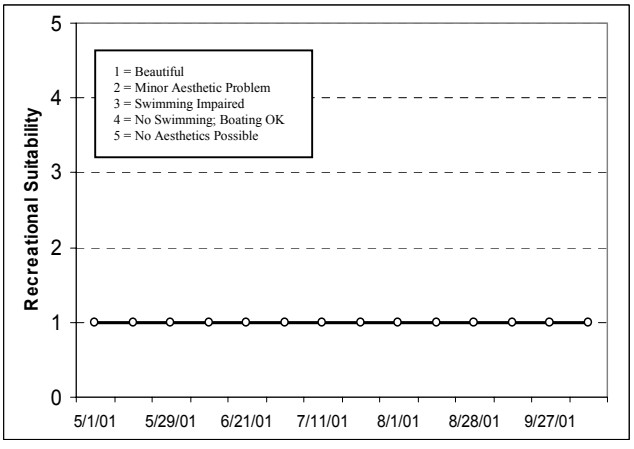
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	12.6		8.21		2.7	10		6.3	1	1
5/16	18.5		11.69		8.7	5		9.2	1	1
5/29	16.6		11		2.4	10		7.2	1	1
6/6	16.7		10.2		3.6	5		6.1	1	1
6/21	22		6.6		2.9	5		5.3	1	1
6/29	26.3		10.5		2.1	10		5.2	1	1
7/11	25.5		10.6		1.7	5		5.5	1	1
7/26	26.3		10.3		3.1	5		4.9	1	1
8/1	27.2		7.86		2.2	20		5.8	1	1
8/20	24.5		8.2		2.5	20		5.2	1	1
8/28	26.2		10.29		2.2	5		6.7	1	1
9/13	21.7		12.2		3.8	10		7.2	1	1
9/27	18.2		10.89		3	20		7.0	1	1
10/11	13.5		7.36		2.5	10		7.0	1	1



Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
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
Overall			**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 second year that Staples 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 were found, other than the 2000 and 2001 CAMP data, was 1997-1999. The lake was monitored five times between early-May and late-September, 2001. The resulting data and graphs appear on the next page.

The lake's overall 2001 lake quality grade of B was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 32.0 µg/l (minimum of 10.0 µg/l, maximum of 50.0 µg/l) resulted in a lake water quality grade of B. The lake's mean CLA concentration of 16.4 µg/l (minimum and maximum of 5.6 and 43.0 µg/l) corresponds to a grade of B, as did the mean Secchi transparency of 2.6 m (minimum of 1.7 m, maximum of 3.2 m). The mean TKN concentration over the same time period was 0.79 mg/l (minimum of 0.70 mg/l and maximum of 0.83 mg/l).

As mentioned earlier, there is a limited amount of historic data available for Staple Lake other then the 2000-2001 CAMP data. Therefore it is impossible to determine any long-term. In the short-term, however, the lake seems well represented by an overall grade of B. To better understand the lake's water quality and where it may be heading, more data are needed.

Throughout the monitoring period, the volunteers ranked the perceived physical condition of the lake on a 1-to-5 scale. The mean perceived physical condition for Staples Lake was 2.0 ("some algae present"), while the mean recreational suitability was 2.4 (between 2- "minor aesthetics problem" and 3- "swimming slightly impaired").

If the reader is 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.

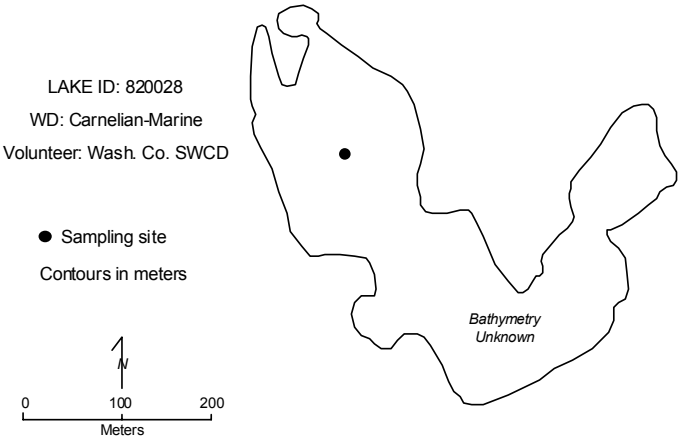
Staples Lake

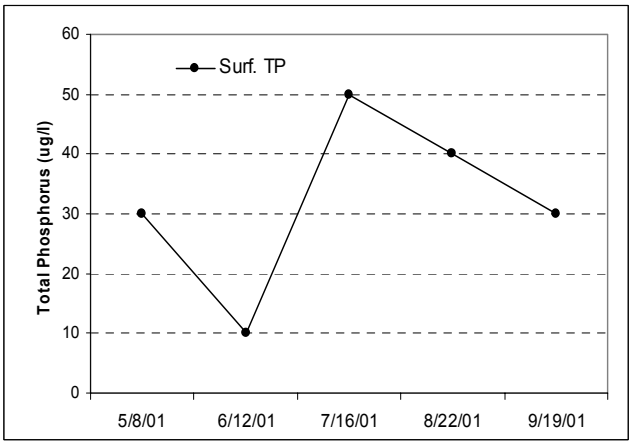
May Twp., Washington Co.

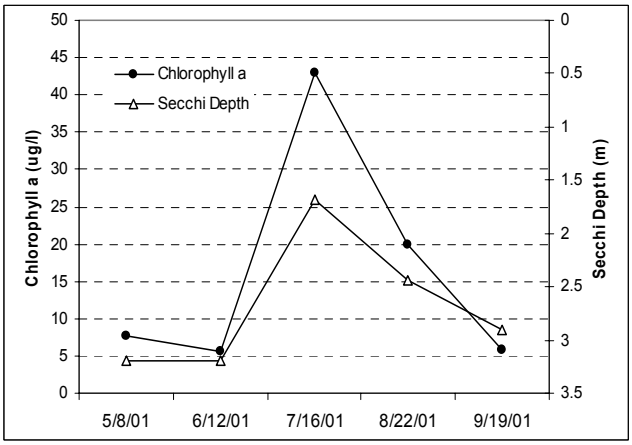
LAKE ID: 820028

WD: Carnelian-Marine

Volunteer: Wash. Co. SWCD

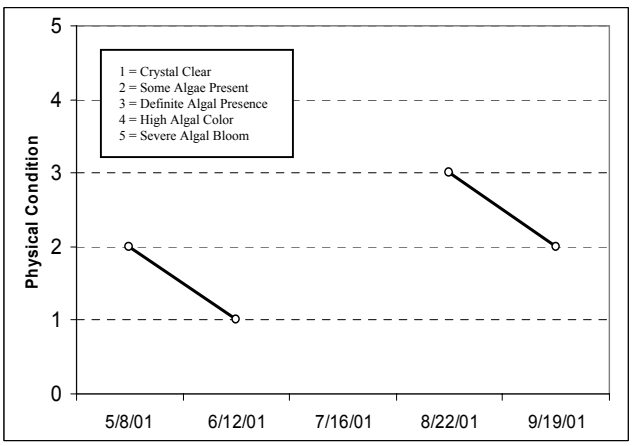






2001 Data

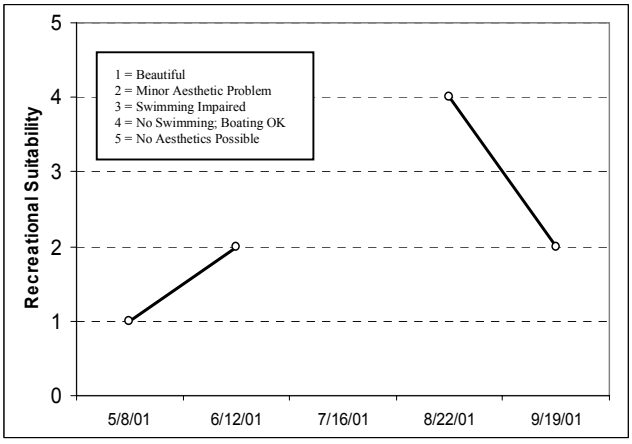
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	16.1		10.9		7.6	30		3.2	2	1
6/12	22.6		7.2		5.6	10		3.2	1	2
7/16	26.4		11.8		43	50		1.7		
8/22	23.5		7.91		20	40		2.4	3	4
9/19	18				5.8	30		2.9	2	2



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus							B	A	A	C	B
Chlorophyll a							C	B	B	B	B
Secchi Depth							B	B	B	B	B
Overall							**B**	**B**	**B**	**B**	**B**



Source: Metropolitan Council and STORET data

Sullivan Lake (2-0080) *Six Cities Watershed District*

Sullivan Lake is a 19-acre lake located within the City of Columbia Heights (Anoka County) which receives inflow from two inlets. The maximum and mean depths of the lake are 2.1 and 1.0 m (seven and three feet), respectively, and the approximate volume of the lake is 57 ac-ft. Because the maximum depth is only 2.1 m, the entire lake 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).

The majority of the land within the 480-acre watershed is urban/developed. The lake and watershed areas translate to a large watershed-to-lake area ratio of 25:1. The larger the ratio, the greater the potential stress on the lake's quality from surface runoff.

Sullivan Lake, which was involved in CAMP from 1993-1995, and 1997-2000, was monitored 11 times between late-April and late-September, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for Sullivan Lake, calculated from the individual parameter grades, is D, the same as in 1993-1995 and 1997-2000. The 2001 summertime (May - September) mean TP concentration of 91.0 µg/l (minimum of 50.0 µg/l, maximum of 150.0 µg/l) corresponded to a lake water quality grade of D, as did the Secchi transparency mean of 0.7 m (minimum of 0.4 m and maximum of 1.5 m). Sullivan Lake's 2001 CLA mean of 63.2 µg/l (minimum and maximum of 14.0 and 150.0 µg/l) corresponds to a grade of D. The lake's mean TKN concentration was 1.49 mg/l (minimum of 0.77 mg/l, maximum of 2.30 mg/l).

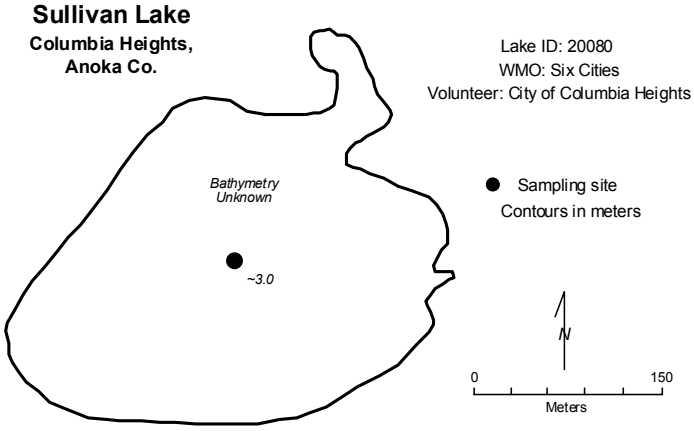
Very little historical water quality data is available for Sullivan Lake. The only other years for which data were found was 1993-1995 and 1997-2001. Because of the relatively short timeframe of the database, it is not possible to determine any long-term trends. On the short-term, however, the lake seems to be well represented by an over water quality grade of D. While the lake received identical overall water quality grades in all eight years of data, the data reveal that individually, the lake's water quality in 2001 was similar to that of 1998 and 2000 (which is the year in which the lake experienced its worst monitored water quality). The lake's best monitored water quality was probably that monitored in 1994 and 1997. To better understand the lake's long-term water quality and what direction it may be heading, more 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. These user perception rankings are shown on the lake information sheet. The average user perception rankings were: 3.7 for physical condition (3- "definite algal presence" and 4- "high algal color"), and 4.1 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.

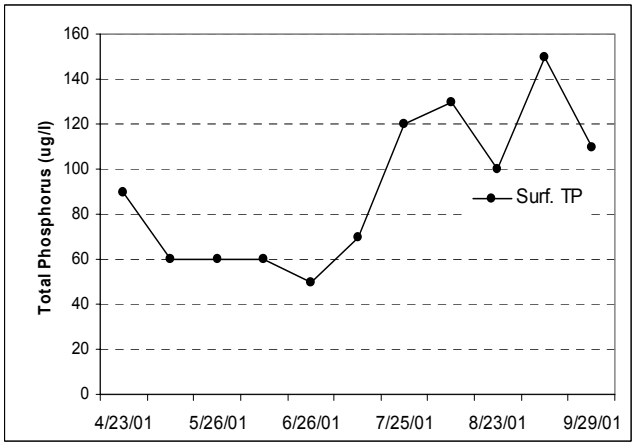
Sullivan Lake

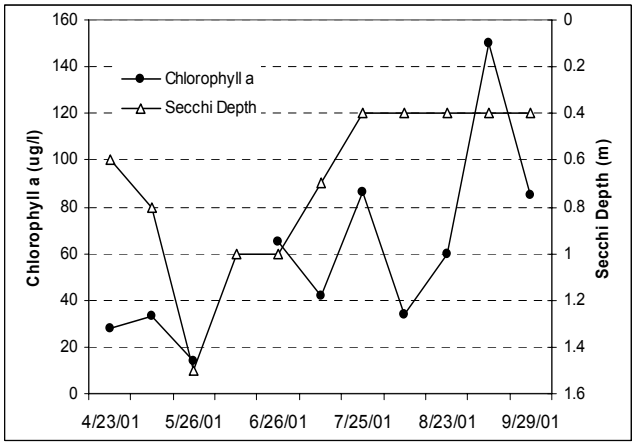
Columbia Heights, Anoka Co.



Lake ID: 20080
WMO: Six Cities
Volunteer: City of Columbia Heights

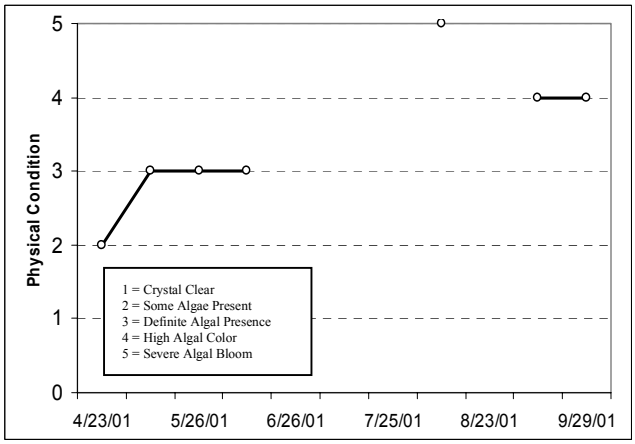
Sampling site
Contours in meters





2001 Data

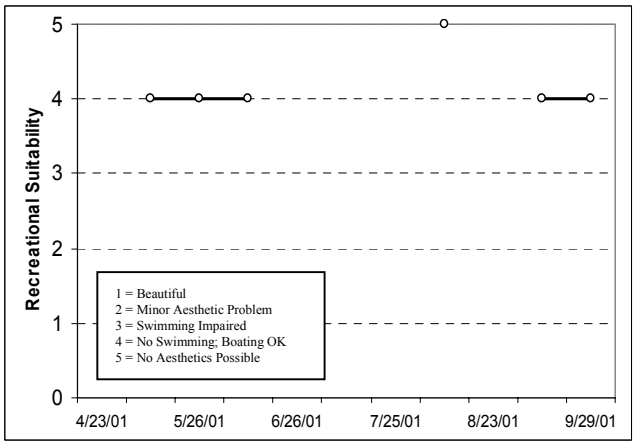
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/23	7				28	90		0.6	2	
5/2	20				33	60		0.8	3	4
5/26	12				14	60		1.5	3	4
6/11	24.5					60		1.0	3	4
6/26	23				65	50		1.0		
7/9	24				42	70		0.7		
7/25	25				86	120		0.4		
8/15	26				34	130		0.4	5	5
8/23	25.8				60	100		0.4		
9/18	17				150	150		0.4	4	4
9/29	16.8				85	110		0.4	4	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			D	D	D		D	D	D	D	D
Chlorophyll a			C	C	C		C	D	C	D	D
Secchi Depth			D	F	D		D	F	D	D	D
Overall			**D**	**D**	**D**		**D**	**D**	**D**	**D**	**D**



Source: Metropolitan Council and STORET data

Sunnybrook Lake (82-0133) *Lower St. Croix Valley 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 second year in which Sunnybrook Lake has been involved in CAMP (1999 being the other). The lake was monitored 13 times between late-April and mid-October, 2001. Other than for the 1999 CAMP data, a search through the STORET nationwide water quality database for data on the lake came up empty. Thus, 1999 and 2001 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.

The lake's overall 2001 lake quality grade of B was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 24.0 µg/l (minimum of 20.0 µg/l, maximum of 40.0 µg/l) corresponds to a lake water quality grade of B, as did the mean Secchi transparency of 2.2 m (minimum of 1.0 m, maximum of 3.0 m). The lake's mean CLA concentration of 5.4 µg/l (minimum of 1.0 µg/l [in which case 0.5 µg/l was used to calculate the summer mean] and maximum of 19.0 µg/l) resulted in a grade of A. The mean TKN concentration over the same time period was 0.77 mg/l (minimum of 0.70 mg/l and maximum of 0.84 mg/l).

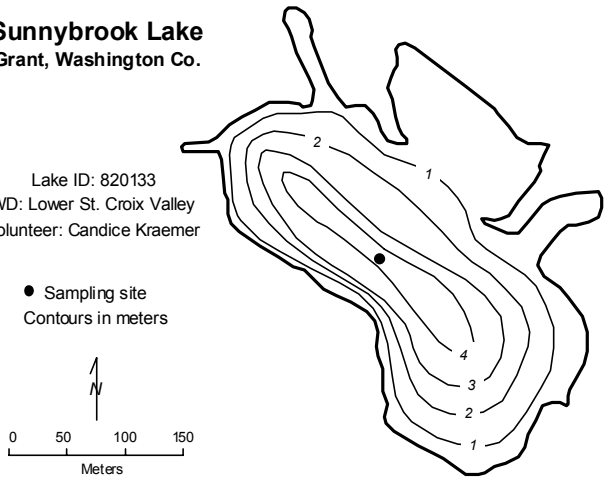
As mentioned earlier, there are no water quality data available for Sunnybrook Lake other than the 1999 and 2001 CAMP data. Therefore it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

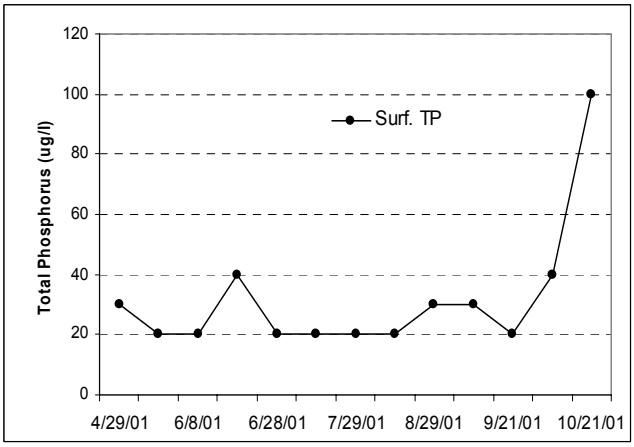
The average user perception rankings, on a 1-to-5 scale, were 2.1 for physical condition (between 2- "some algae present" and 3- "definite algal presence"), and 1.7 for recreational suitability (between 1- "beautiful" and 2- "minor aesthetic problem").

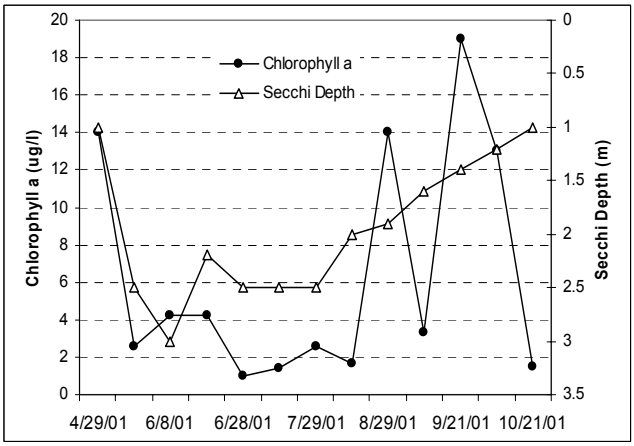
If you notice any errors in the lake data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-1267 or randy.anhorn@metc.state.mn.us.

Sunnybrook Lake
Grant, Washington Co.

Lake ID: 820133
WD: Lower St. Croix Valley
Volunteer: Candice Kraemer

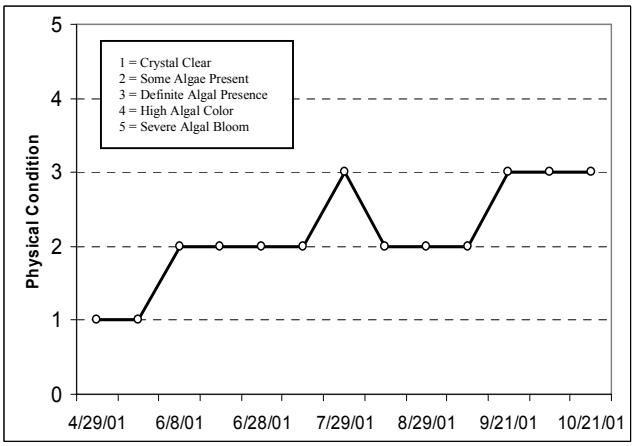






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/29	16.8				14	30		1.0	1	1
5/15	23				2.6	20		2.5	1	1
6/8	20				4.2	20		3.0	2	1
6/17	25.7				4.2	40		2.2	2	2
6/28	29.1				1	20		2.5	2	1
7/15	28				1.4	20		2.5	2	1
7/29	28				2.6	20		2.5	3	2
8/16	23				1.7	20		2.0	2	2
8/29	23				14	30		1.9	2	2
9/9	22.4				3.3	30		1.6	2	2
9/21	21.3				19	20		1.4	3	3
10/7	15.1				13	40		1.2	3	4
10/21	12.3				1.5	100		1.0	3	4

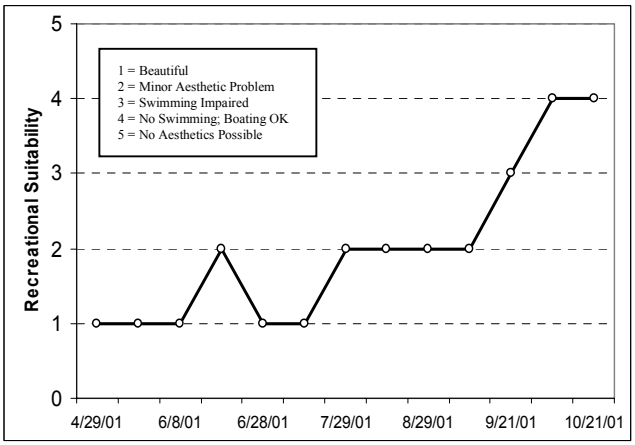


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											B
Chlorophyll a											A
Secchi Depth											B
Overall											**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. Its deepest point is approximately 5.2 m (17 feet).

Sunset Lake has been involved in CAMP since 1993. The lake was monitored 13 times from late-May to early-Setember, 2001. 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.

The 2001 summertime (May through September) mean concentrations for Sunset Lake were as follows: TP= 20.1 µg/l (minimum of 20.0 µg/l, maximum of 30.0 µg/l); CLA= 4.8 µg/l (minimum of 2.5 µg/l, maximum of 8.7 µg/l); Secchi transparency= 3.4 m (minimum of 2.0 m, maximum of 4.3 m); and TKN= 0.67 mg/l (minimum and maximum of 0.57 and 0.77 mg/l), respectively. The 2001 summertime means resulted in a TP grade of A, CLA grade of A, and Secchi transparency grade of A. The lake's overall water quality grade for 2001 was A (falling within the top 10 percent of lakes in the area).

When comparing the 2001 overall grade to those of previously monitored years it becomes apparent that the lake's 2001 water quality was the best monitored to date (compared to B's in 1994 and 2000, and C's in 1993 and 1995-1999). This after it was reported last year that the 2000 individual parameter means were the best recorded to that point.

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 is difficult to determine let alone any trend. With this in mind, however, a primitive interpretation of the data seems to show that the lake maintained a C+ grade average (with normal fluctuations) without a noticeable change in the trend. Recently, however, the lake's quality has shown improvement. A few more years of data would be helpful to determine a more accurate "normal" condition for the lake.

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 1.9 (which fell between 1- "crystal clear" and 2- "some algae present"), and the mean recreational suitability ranking was 1.6 (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/.

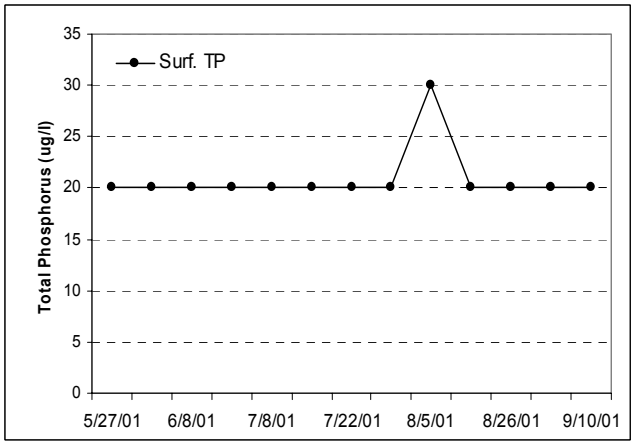
If you know of errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

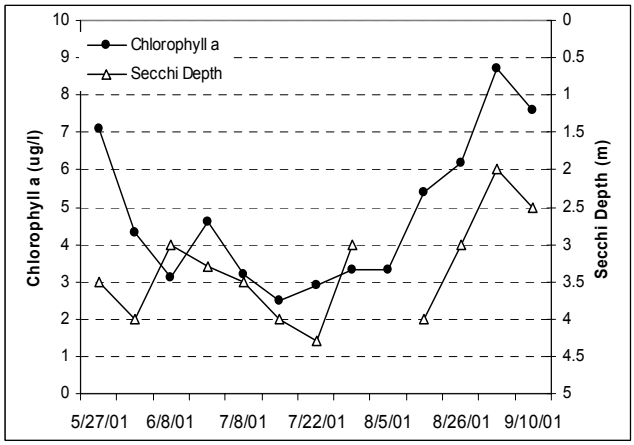
Sunset Lake

Hugo, Washington Co.

Lake ID: 820153
WD: Rice Creek
Volunteers: Diane and Bob Coderre

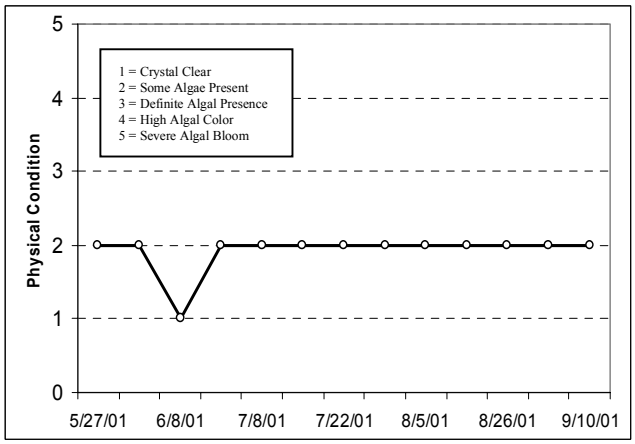
● Sampling site
Contours in meters





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/27	17				7.1	20		3.5	2	1
6/3	23				4.3	20		4.0	2	1
6/8	15				3.1	20		3.0	1	1
7/3	25				4.6	20		3.3	2	1
7/8	26				3.2	20		3.5	2	2
7/14	27				2.5	20		4.0	2	2
7/22	30				2.9	20		4.3	2	2
7/30	27				3.3	20		3.0	2	2
8/5					3.3	30			2	2
8/12	26				5.4	20		4.0	2	2
8/26	25				6.2	20		3.0	2	2
9/2	25				8.7	20		2.0	2	2
9/10	22				7.6	20		2.5	2	1

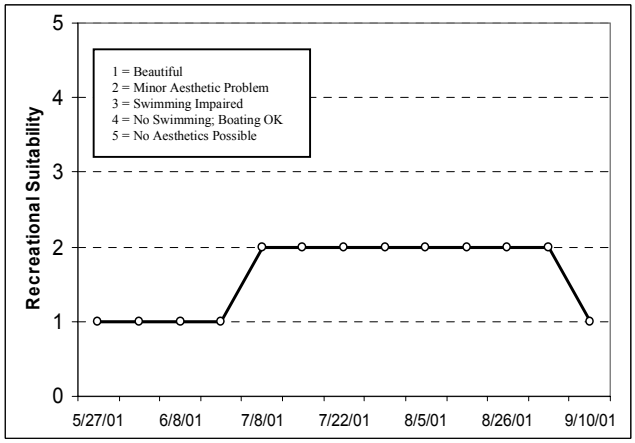


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			C	B	C	C	C	C	C	B	A
Chlorophyll a			B	B	B	C	C	B	B	A	A
Secchi Depth			C	B	C	B	C	C	C	B	A
Overall			**C**	**B**	**C**	**C**	**C**	**C**	**C**	**B**	**A**

Source: Metropolitan Council and STORET data



Sunset Pond Lake (19-0364) *Black Dog Watershed Management Commission*

Sunset Pond, a 60-acre 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 2001, the lake was monitored 11 times between mid-April and mid-October. Because of the shallow depth of the lake (maximum depth of 2.1 m [about 7 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).

During each sampling event, the lake was monitored for TP, CLA, TKN, Secchi transparency, as well as perceived physical condition and recreational suitability. The mean summertime (May through September) surface TP concentration for the lake was 35.6 µg/l (minimum of 20.0 µg/l, maximum of 70.0 µg/l). The mean CLA and Secchi transparency readings were 8.1 µg/l (minimum of 3.6 µg/l, maximum of 18.0 µg/l) and 2.2 m (minimum of 1.3 m, maximum of 4.0 m), respectively. The lake's mean surface TKN concentration was 0.76 mg/l (minimum of 0.40 mg/l and maximum of 1.00 mg/l). The lake quality grades associated with the 2001 summertime means are: TP= C; CLA= A; and Secchi= B. The 2001 overall water quality grade for the lake was B.

While the lake's 2001 overall lake grade is identical to those of 1994, 1998, and 2000 (and better than those of 1995-1997), the individual parameter means reveal the 2001 was the best monitored water quality year to date.

Because 1994-1998, and 2000-2001 are the only years of available data, no long-term trends can be determined. On 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.

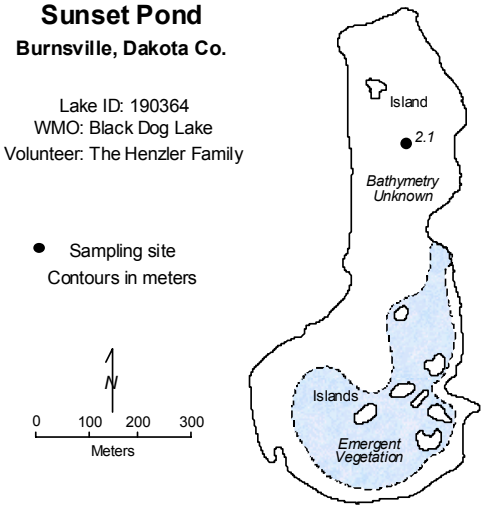
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The mean physical condition ranking was 2.1 (which fell between 2- "some algae present" and 3- "definite algal presence"), and the mean recreational suitability ranking was 4.0 ("no swimming – boating ok").

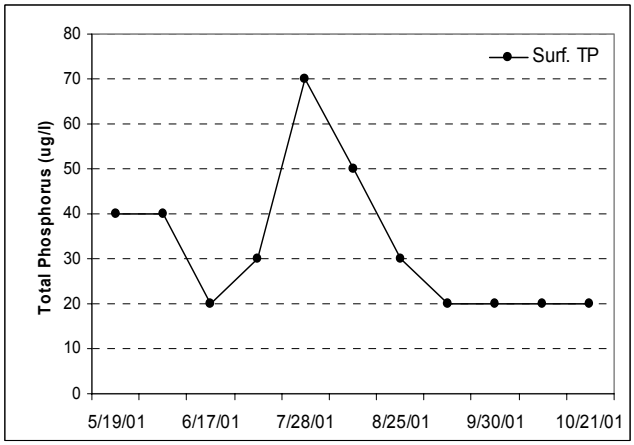
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

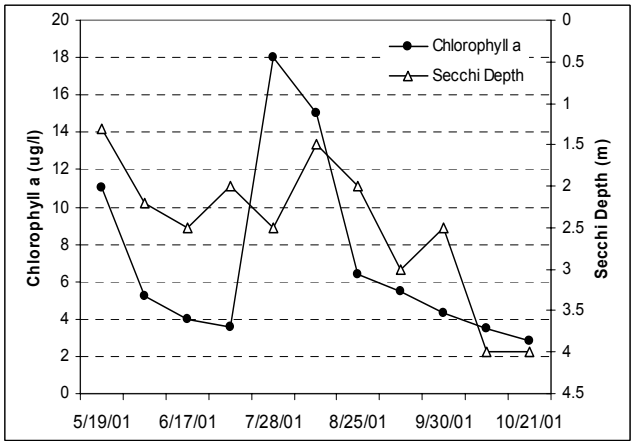
Sunset Pond

Burnsville, Dakota Co.

Lake ID: 190364
WMO: Black Dog Lake
Volunteer: The Henzler Family

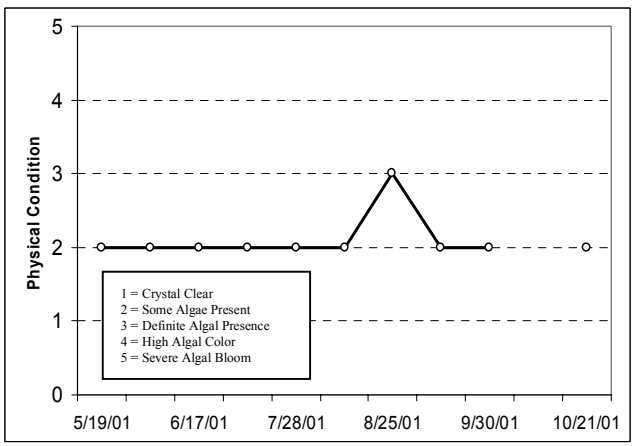






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/19	22.5				11	40		1.3	2	4
6/3	18				5.2	40		2.2	2	4
6/17	23.5				4	20		2.5	2	
7/14	28				3.6	30		2.0	2	
7/28	24.6				18	70		2.5	2	
8/12	24.6				15	50		1.5	2	
8/25	24.1				6.4	30		2.0	3	
9/9	22.4				5.5	20		3.0	2	
9/30	17.9				4.3	20		2.5	2	
10/12	13.4				3.5	20		4.0		
10/21	10.6				2.8	20		4.0	2	

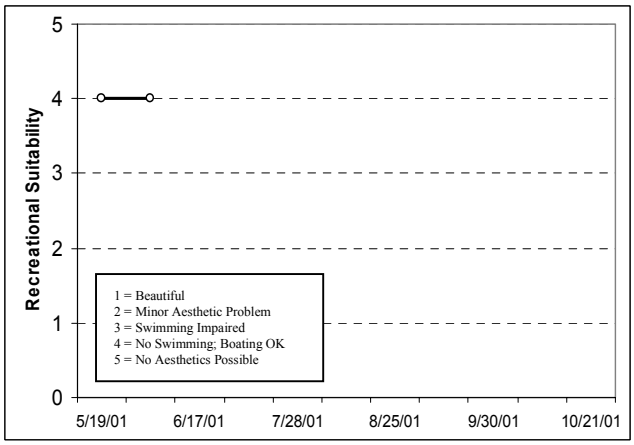


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	C	C	C	C		C	C
Chlorophyll a				A	B	B	B	A		A	A
Secchi Depth				C	C	C	C	C		C	B
Overall				**B**	**C**	**C**	**C**	**B**		**B**	**B**

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 second year of CAMP monitoring in Sweeney Lake, which is located in the City of Golden Valley (Henepin County). Sweeny Lake has a surface area of about 62 acres. 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 previous sampling over both depressions indicated a sufficient homogenity of results to justify the use of a single sampling location at the lake's north end. The lake was again monitored in both the south (**Site-1**) and north (**Site-2**) basins. Both lake sites were monitored nine times between early-May and late-September, 2001. 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.

Summertime (May through September) means for the monitored variables at **Site-1** were: surface TP= 35.0 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 50.0 µg/l), surface chlorophyll-a= 19.6 µg/l (minimum of 4.3 µg/l and maximum of 49.0 µg/l), Secchi transparency= 1.3 m (minimum of 0.7 m and a maximum of 2.1 m), and TKN= 0.90 mg/l (minimum of 0.62 mg/l and maximum of 1.10 mg/l). Associated lake quality grades for the 2001 summertime means at **Site-1** were TP= C, CLA= C, Secchi= C. While the **Site-1** overall 2001 quality grade of C (calculated from the TP, CLA, and Secchi grades), was identical to that of 2000, the individual parameter means (and CLA and Secchi grades) were better.

Summertime (May through September) means for the monitored variables at **Site-2** were: surface TP= 35.0 µg/l (minimum concentration of 20.0 µg/l and a maximum value of 60.0 µg/l), surface chlorophyll-a= 26.1 µg/l (minimum of 5.6 µg/l and maximum of 51.0 µg/l), Secchi transparency= 1.4 m (minimum of 0.8 m and a maximum of 2.8 m), and TKN= 0.97 mg/l (minimum of 0.62 mg/l and maximum of 1.20 mg/l). Associated lake quality grades for the 2001 summertime means at **Site-2** were TP= C, CLA= C, Secchi= D. The **Site-2** overall 2001 quality grade, calculated from the TP, CLA, and Secchi grades, was C (identical to that recorded in 2000).

When looking at the water quality data, it becomes apparent that the water quality at Site-1 and Site-2 remains homogeneous. The overall lake quality grade for the combined sites in Sweeny Lake in 2001 was C. This was determined from the individual parameter grades. The summer mean TP concentration of 35.6 µg/l, CLA mean of 22.8 µg/l and Secchi transparency mean of 1.4 m for the lake as a whole, each corresponds to a lake water quality grades of C.

Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked at both monitoring sites on a 1-to-5 scale. The mean perceived physical condition of **Site-1** and **Site-2** of SweeneyLake was 1.4 and 1.4 (ranking between 1- "crystal clear"; 2- "some algae present"), while the mean recreational suitability was 1.1 and 1.0 (falling between 1- "beautiful" and 2- "minor aesthetics problem").

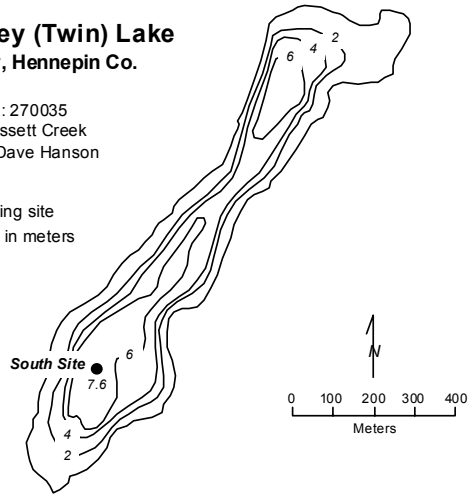
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

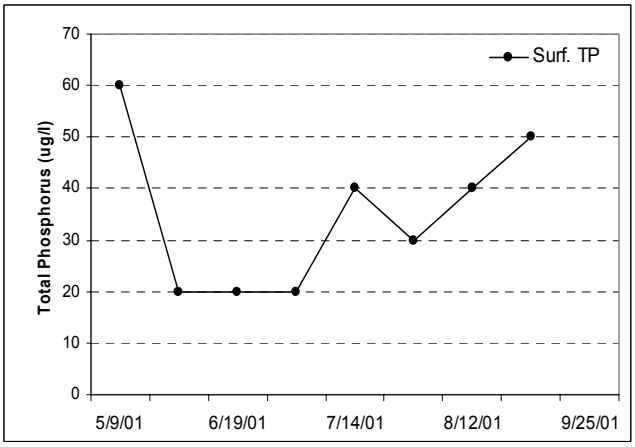
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

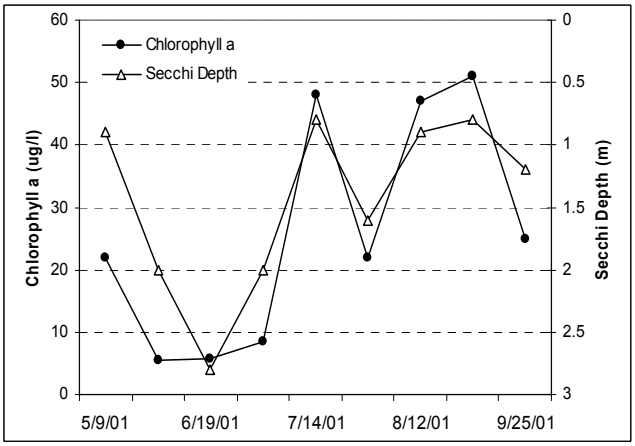
South Sweeney (Twin) Lake

Golden Valley, Hennepin Co.

Lake ID: 270035
WMO: Bassett Creek
Volunteer: Dave Hanson

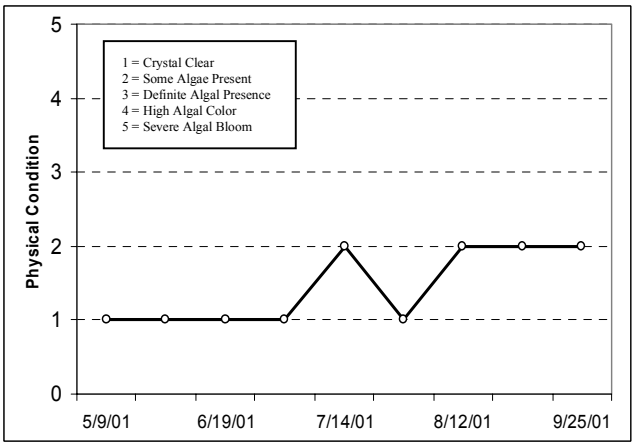


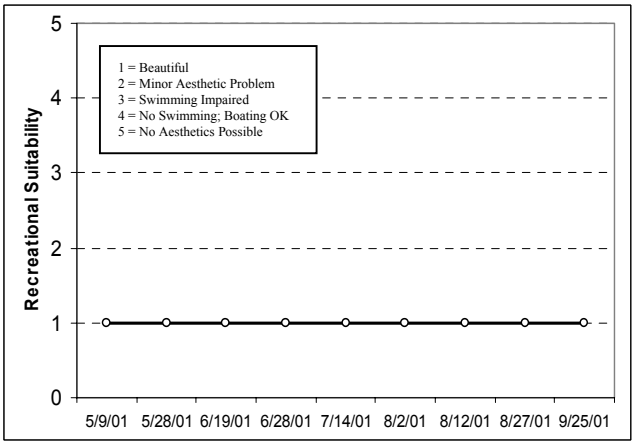




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/9	14.5				22	60		0.9	1	1
5/28	18				5.6	20		2.0	1	1
6/19	22				5.8	20		2.8	1	1
6/28	28				8.5	20		2.0	1	1
7/14	29				48	40		0.8	2	1
8/2	28				22	30		1.6	1	1
8/12	28				47	40		0.9	2	1
8/27	26				51	50		0.8	2	1
9/25	18				25			1.2	2	1





Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Phosphorus													
Chlorophyll a													
Secchi Depth													
Overall													

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

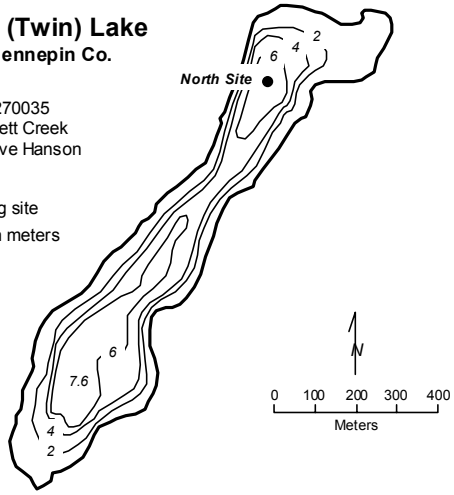
Source: Metropolitan Council and STORET data

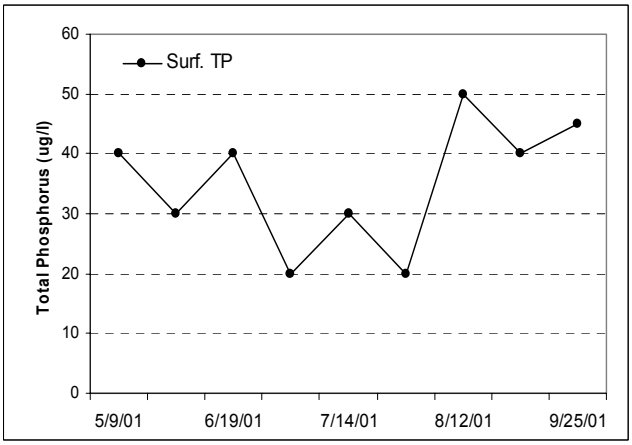
North Sweeney (Twin) Lake

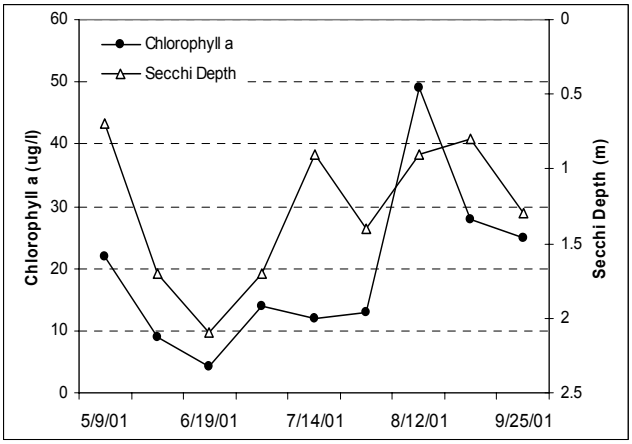
Golden Valley, Hennepin Co.

Lake ID: 270035
WMO: Bassett Creek
Volunteer: Dave Hanson

● Sampling site
Contours in meters

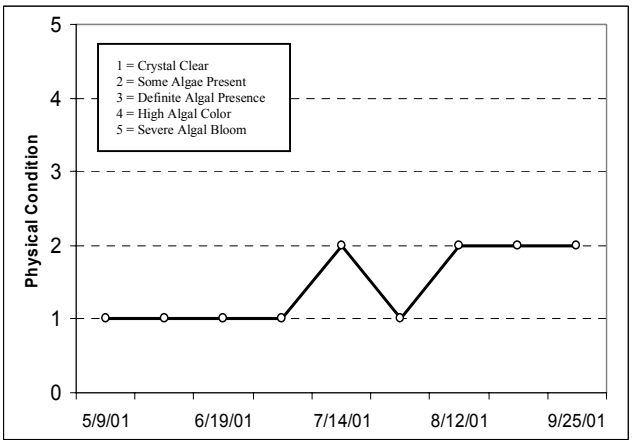






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/9	15				22	40		0.7	1	2
5/28	20				8.9	30		1.7	1	1
6/19	22				4.3	40		2.1	1	1
6/28	26				14	20		1.7	1	1
7/14	29				12	30		0.9	2	1
8/2	28				13	20		1.4	1	1
8/12	28				49	50		0.9	2	1
8/27	26				28	40		0.8	2	1
9/25	18				25	45		1.3	2	1

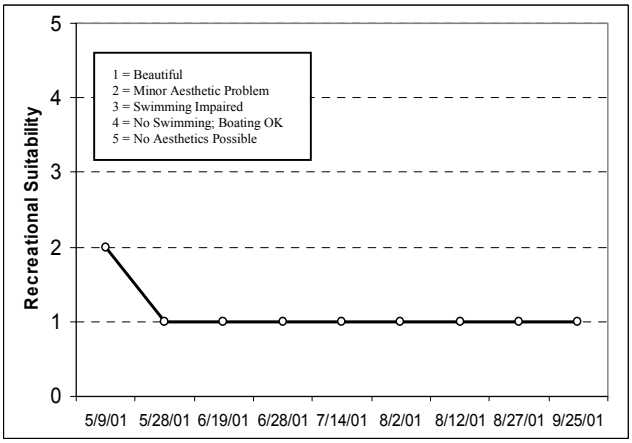


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Phosphorus													
Chlorophyll a													
Secchi Depth													
Overall													

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

Source: Metropolitan Council and STORET data



Tamarack Lake (10-0010) *City of Victoria*

This was the first year that Tamarack Lake has been involved in CAMP. While the 24-acre lake has an unexpected maximum depth of 25.0 m (82.0 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).

The lake was monitored 10 times from late-May to late-September, 2001. Results are presented in both graphs and data tables on the lake's information sheet on the following page.

The summertime (May through September) means for the monitored variables were: surface TP= 29.0 µg/l (minimum concentration of 10.0 µg/l and a maximum value of 50.0 µg/l); surface chlorophyll-a= 8.8 µg/l (minimum of 2.4 µg/l and maximum of 34.0 µg/l); Secchi transparency= 2.8 m (minimum of 1.7 m and a maximum of 4.7 m); and TKN= 1.18 mg/l (minimum of 0.73 mg/l and maximum of 1.50 mg/l). The lake's summer means translate to water quality grades of B for TP, A, for CLA, and B for Secchi transparency. These grades result in an overall water quality grade of B for Tamarack Lake in 2001 (better than the overall grade of C corresponding to the 2000 data).

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 1.5 for physical condition (between 1- "crystal clear" and 2- "some algae present"), and 1.0 for recreational suitability ("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/.

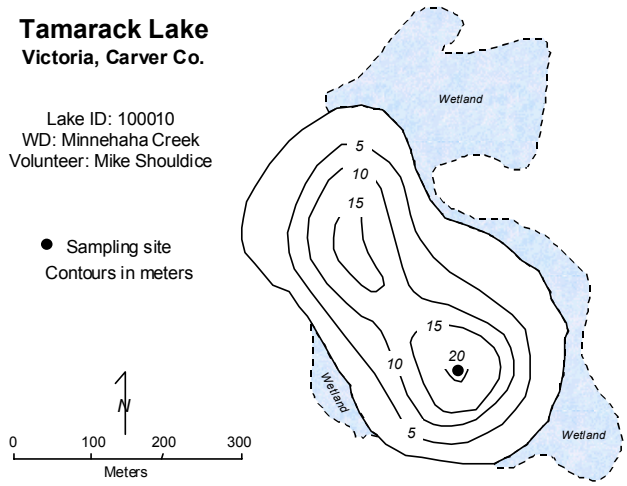
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

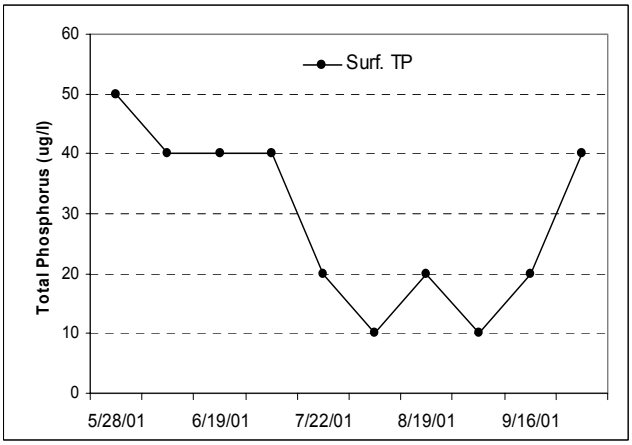
Tamarack Lake

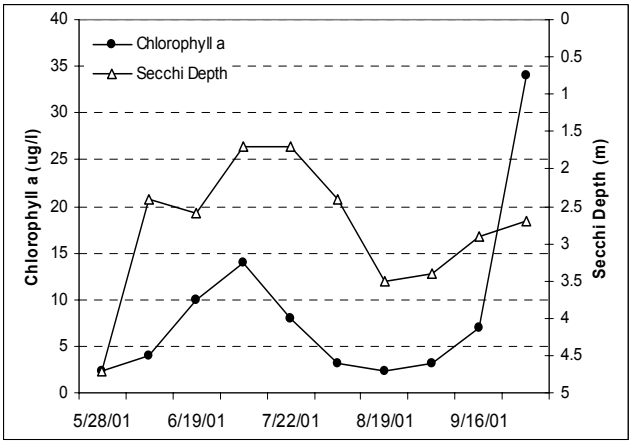
Victoria, Carver Co.

Lake ID: 100010
WD: Minnehaha Creek
Volunteer: Mike Shouldice

● Sampling site
Contours in meters

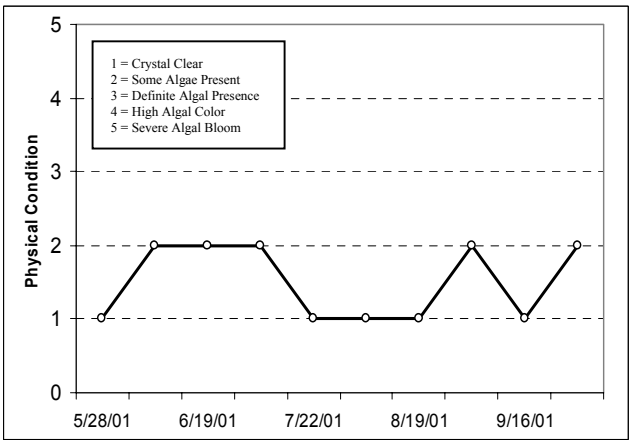






2001 Data

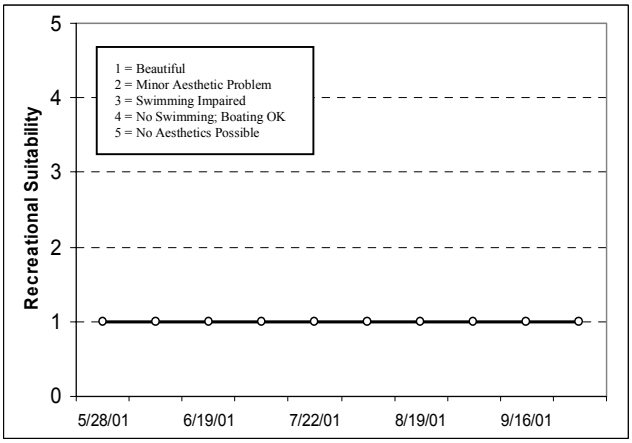
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/28	15.7				2.4	50		4.7	1	1
6/10	22.4				4	40		2.4	2	1
6/19	21				10	40		2.6	2	1
7/7	24.1				14	40		1.7	2	1
7/22	30				7.9	20		1.7	1	1
8/5	28				3.2	10		2.4	1	1
8/19	23.5				2.4	20		3.5	1	1
9/2	24.1				3.1	10		3.4	2	1
9/16	16.8				6.9	20		2.9	1	1
9/30	16.2				34	40		2.7	2	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										C	B
Chlorophyll a										C	A
Secchi Depth						A				C	B
Overall										**C**	**B**



Source: Metropolitan Council and STORET data

Turtle Lake (82-0036) *Carnelian-Marine Watershed District*

This was the second 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. The only years in which data were found, other than the 2000 and 2001 CAMP data, were Secchi data from 1991-1999 and nutrient data from 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 was monitored five times from late-May and late-September, 2001. 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 mean summertime (May through September) surface TP concentration for the lake in 2001 was 56.0 µg/l (minimum of 40.0 µg/l, maximum of 70.0 µg/l). The mean CLA and Secchi transparency readings were 12.7 µg/l (minimum of 9.5 µg/l, maximum of 17.0 µg/l) and 1.6 m (minimum of 1.5 m, maximum of 1.8 m), respectively. The lake's mean surface TKN concentration was 0.97 mg/l. The lake quality grades assigned to the 2001 summertime means are TP= C; CLA= B; and Secchi= C, resulting in an overall grade of C.

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.

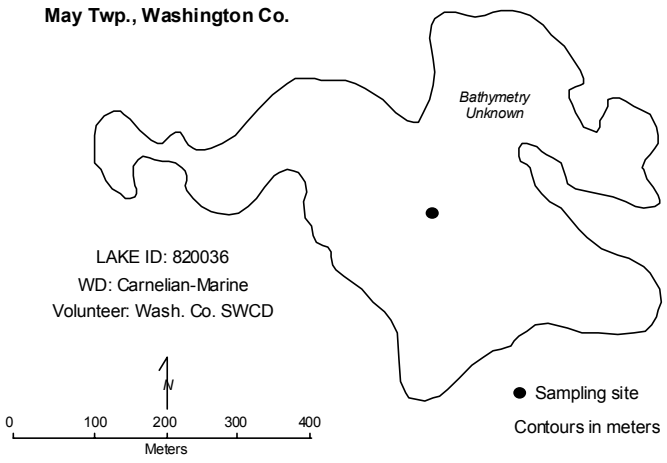
Throughout the summer, the volunteer ranked the lake's perceived physical condition on a 1-to-5 scale (see lake information sheet). The mean physical condition ranking was 2.4 (between 2- "some algae present" and 3- "definite algal presence"), while the mean recreational suitability ranking was 3.8 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

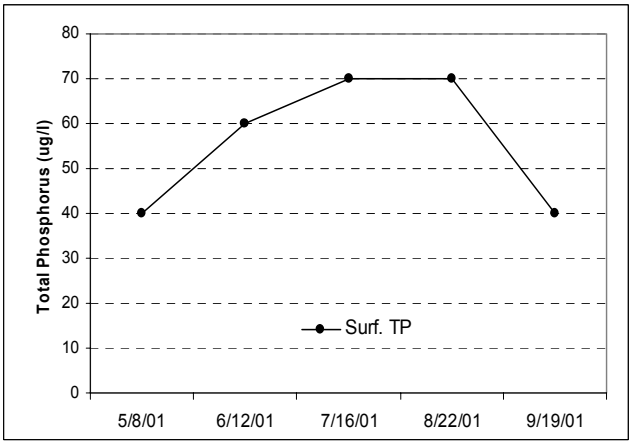
As mentioned earlier, there is a limited amount of historic data available for Turtle Lake recent data collected in the 1990s. Therefore it is impossible to determine any long-term. In the short-term, however, the lake seems well represented by an overall grade of C. To better understand the lake's water quality and where it may be heading, more data are needed.

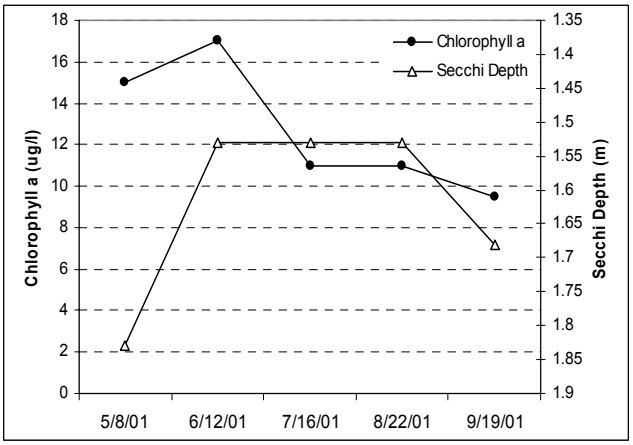
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

Turtle Lake

May Twp., Washington Co.

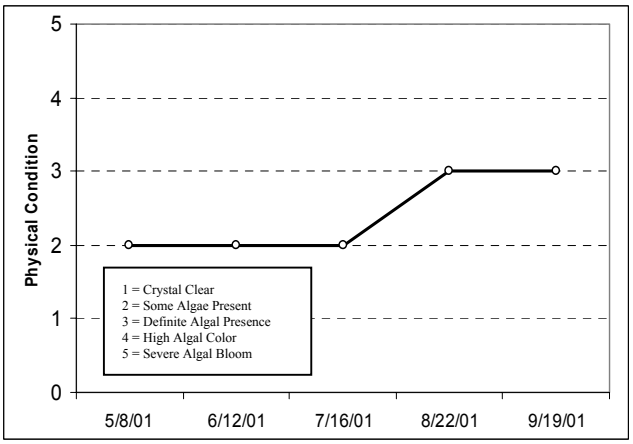






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/8	15.3		11.3		15	40		1.8	2	4
6/12	24.1		5.3		17	60		1.5	2	2
7/16	26.5		13.01		11	70		1.5	2	4
8/22	23		9.07		11	70		1.5	3	4
9/19	17.2		6.87		9.5	40		1.7	3	5

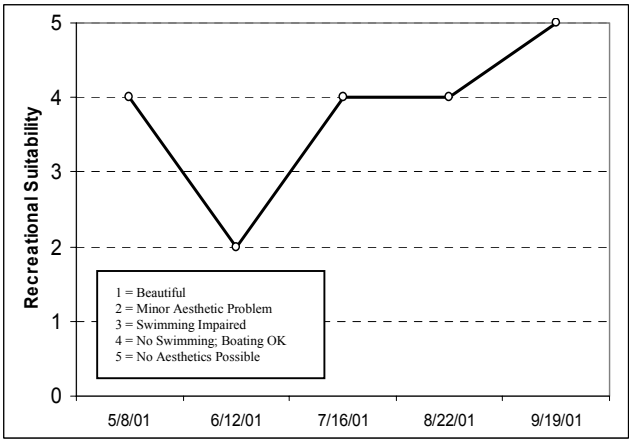


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus	F	F				C	C	C	B	D	C
Chlorophyll a	F	F				D	D	D	C	B	B
Secchi Depth	F	F	D	C	D	D	D	D	C	C	C
Overall	**F**	**F**				**D**	**D**	**D**	**C**	**C**	**C**

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.

This was the second year in which Twin Lake has been involved in CAMP (1999 being the other). The lake was monitored 13 times between late-April and mid-October, 2001. Other than for the 1999 CAMP data, a search through the STORET nationwide water quality database for data on the lake 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.

The lake's overall 2001 lake quality grade of B was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 35.5 µg/l (minimum of 20.0 µg/l, maximum of 60.0 µg/l) corresponds to a lake water quality grade of C, as did the mean Secchi transparency of 1.9 m (minimum of 1.2 m, maximum of 2.8 m). The lake's mean CLA concentration of 7.9 µg/l (minimum of 2.8 µg/l and maximum of 19.0 µg/l) resulted in a grade of A. The mean TKN concentration over the same time period was 0.63 mg/l (minimum of 0.47 mg/l and maximum of 0.79 mg/l).

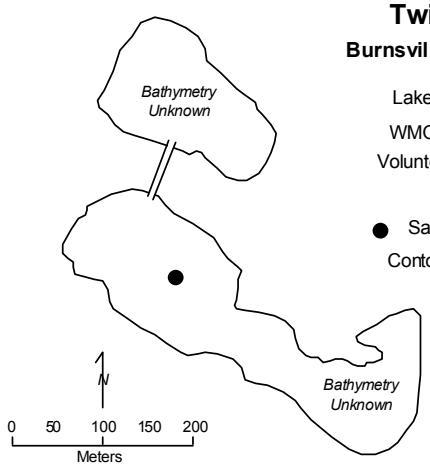
The lake's 2001 overall water quality is better than that recorded in 1999 (C).

The lake's mean Secchi transparency and TP concentration are worse than what the lake's mean CLA concentration would suggest. An explanation for this scenario may be that the majority of the lake's TP comes from in-lake suspended sediments which recorded clarity of the water and inhibits algal growth.

As mentioned earlier, there are no water quality data available for Twin Lake other than the 1999 and 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, additional years of data collection are needed.

The average user perception rankings, on a 1-to-5 scale, were 2.0 for physical condition ("some algae present") and 3.0 for recreational suitability ("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) 602-1267 or randy.anhorn@metc.state.mn.us.



Twin Lake

Burnsville, Dakota Co.

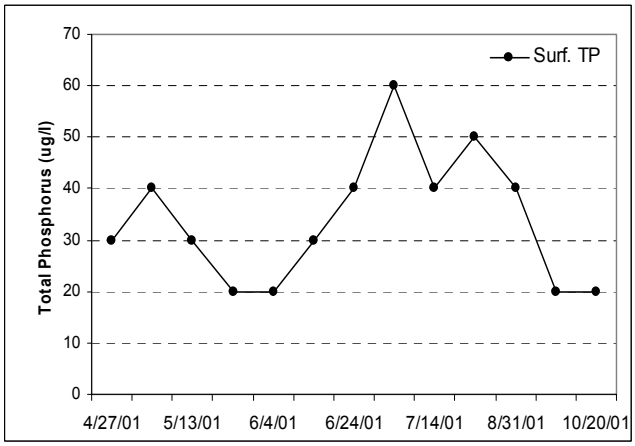
Lake ID: 190028

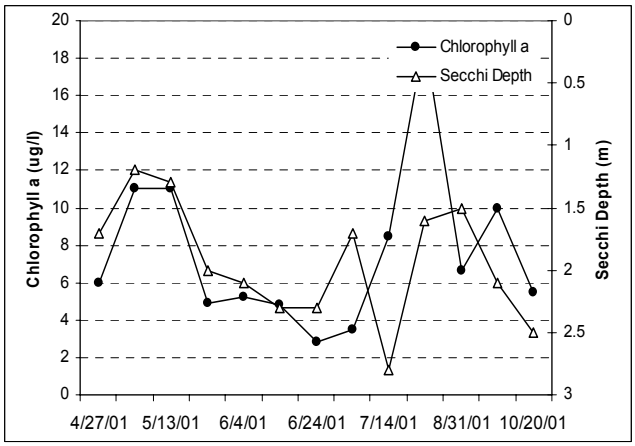
WMO: Black Dog

Volunteer: Paul Pirkl

● Sampling site

Contours in meters





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/27	17				6	30		1.7	1	2
5/4	17				11	40		1.2	2	2
5/13	19				11	30		1.3	2	2
5/27	16				4.9	20		2.0	2	2
6/4	18				5.2	20		2.1	3	2
6/15	24				4.8	30		2.3	1	2
6/24	27				2.8	40		2.3	3	4
7/1	28				3.5	60		1.7	2	2
7/14	30				8.5	40		2.8	2	4
8/11	29				19	50		1.6	3	5
8/31	25				6.6	40		1.5	1	4
9/30	19				10	20		2.1	1	4
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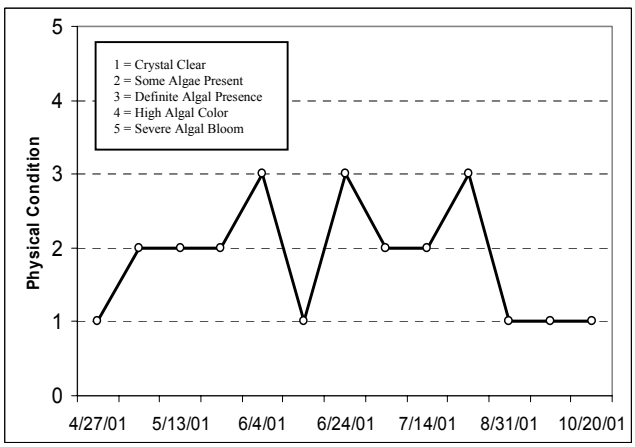
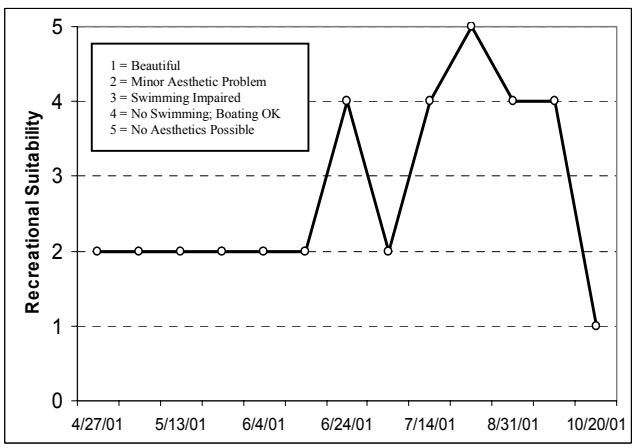




Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus									D		C
Chlorophyll a									B		A
Secchi Depth									D		C
Overall									**C**		**B**

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.

This was the first year that Valentine Lake has been involved in CAMP. A search through the STORET nationwide water quality database for data on the lake came up empty. Therefore 2001 represents the only water quality data readily available for the lake.

The lake was monitored 14 times between mid-April and late-October, 2001. 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 mean summertime (May through September) surface TP concentration was 47.3 µg/l (minimum of 20.0 µg/l, maximum of 70.0 µg/l). The mean CLA and Secchi transparency readings were 19.0 µg/l (minimum of 3.9 µg/l, maximum of 61.0 µg/l) and 1.8 m (minimum of 0.7 m, maximum of 3.7 m), respectively. The lake's mean surface TKN concentration was 1.03 mg/l (minimum of 0.66 mg/l, maximum of 1.70 mg/l).

The lake's 2001 quality grades determined from each parameter's summertime mean are TP= C, CLA= B, and Secchi transparency= C. The resulting overall grade for 2001 is C. The lake's 2001 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. To better understand the lake's water quality and what direction it may be heading, more years of data collection are needed.

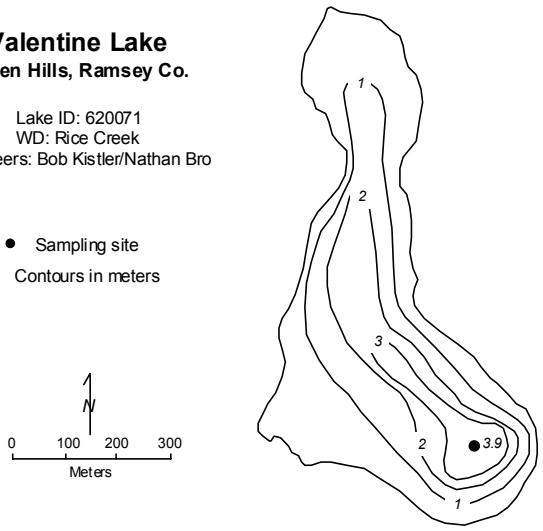
The perceived physical and recreational conditions of the lake, recorded by the volunteers, were ranked on a 1-to-5 scale. The rankings are shown in both tabular and graphical form on the lake's associated information sheet. The mean physical condition ranking was 3.6 (between 3- "definite algae present" and 4- "high algal color"), while the mean recreational suitability ranking was 3.5 (between 3- "swimming slightly impaired" and 4- "no swimming - boating ok").

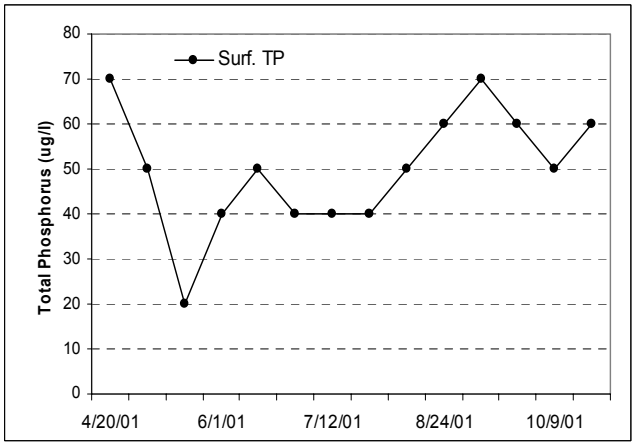
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

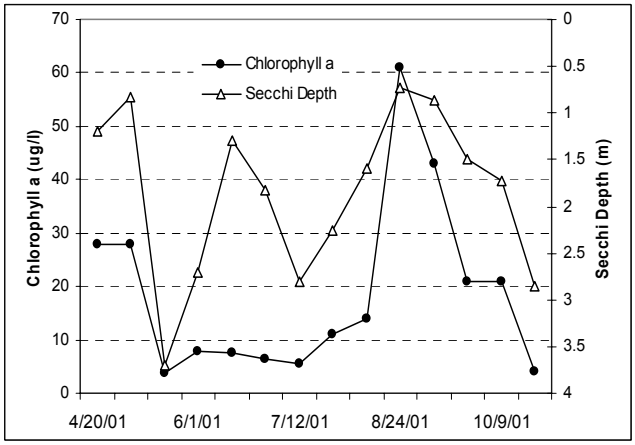
Valentine Lake

Arden Hills, Ramsey Co.

Lake ID: 620071
WD: Rice Creek
Volunteers: Bob Kistler/Nathan Bro

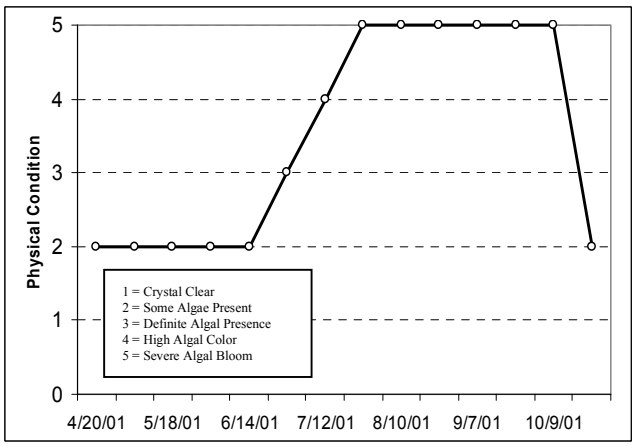






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/20	11.8		12.4		28	70		1.2	2	2
5/3	15.7		11.3		28	50		0.8	2	2
5/18	23.3		8.8		3.9	20		3.7	2	2
6/1	18.2		9		7.9	40		2.7	2	2
6/14	22.9		6.4		7.5	50		1.3	2	4
6/28	28.3		6.3		6.3	40		1.8	3	4
7/12	28.2		5.3		5.6	40		2.8	4	4
7/28	30.2		4.6		11	40		2.3	5	4
8/10	27.1		4		14	50		1.6	5	4
8/24	25.8		4.7		61	60		0.7	5	4
9/7	22.4		3.4		43	70		0.9	5	4
9/26	15.7		8.2		21	60		1.5	5	4
10/9	12		9		21	50		1.7	5	3
10/27	6.2		10.9		4.2	60		2.9	2	2

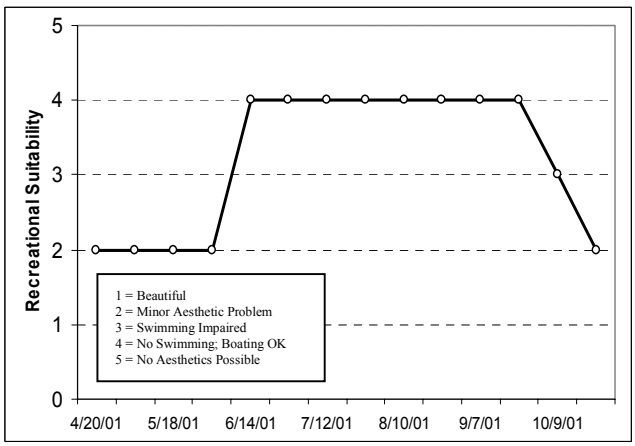


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus											C
Chlorophyll a											B
Secchi Depth											C
Overall											**C**

Source: Metropolitan Council and STORET data



Valley Lake (19-0348) *City of Lakeville*

This was the sixth 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 1999-2000. 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, which has a maximum depth of 3.2 m (10 feet), was monitored 14 times from mid-April to mid-October, 2001. Because of the shallowness of the lake, the entire lake is considered littoral (the area of dominated by aquatic vegetation).

The lake was involved in CAMP in 1999-2001 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 is that enzymes (which inhibit algal growth) are released as the straw rots when placed in water. Therefore, in order to determine if the straw method successfully reduced algal biomass on Valley Lake in 2001, TP, TKN, CLA and Secchi transparency were tested 14 times between mid-April and mid-October. The resulting data and graphs appear on the next page.

The mean summertime (May through September) surface TP concentration for the lake was 36.4 µg/l (minimum of 20.0 µg/l, maximum of 60.0 µg/l). The mean CLA and Secchi transparency readings were 6.6 µg/l (minimum of 2.6 µg/l, maximum of 21.0 µg/l) and 2.2 m (minimum of 1.7 m, maximum of 3.5 m), respectively. The lake's mean surface TKN concentration was 0.65 mg/l. The lake quality grades assigned to the 2001summertime means are TP= C; CLA= A; and Secchi= C, resulting in an overall grade of B. The lake's water quality grades (and associated parameter means), were the best recorded to date. Thus, the year 2001 was the lake's best monitored water quality year (this after it was reported in the 2000 lakes report that 2000 was the lake's best water).

More data are needed, however to determine any statistically significant short-term (let alone long-term) trend the barley straw may have on the lake and its algal population. With this in mind the lake will continue to be a part of CAMP in 2002. The lake has, however shown an improvement in water quality during each of the years the barley straw was used.

While barley straw seems to inhibit algal growth, 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 in Valley Lake along with monthly samples in a nearby sediment basin where barley straw was not used (control). These additional samples were analyzed for a break down in phenol concentrations (one of the theories behind the barley straw inhibitor). The result of this analysis has yet to be completed. This additional analysis will continue throughout the upcoming 2002 monitoring season.

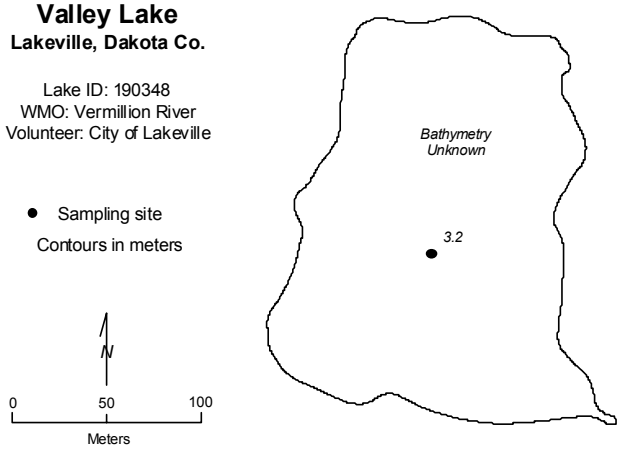
In addition to the collection of TP, TKN, CLA and Secchi information during each monitoring event in 2001, the volunteer(s) ranked their perception of the lake's physical and recreational conditions on a 1-to-5 scale as shown on the attached information sheet. The summertime mean recorded physical condition was 2.4 (between 2- "some algae present"). The mean suitability for recreation ranking was 3.3 (between 3- "swimming slightly impaired" and 4- "no swimming – boating ok").

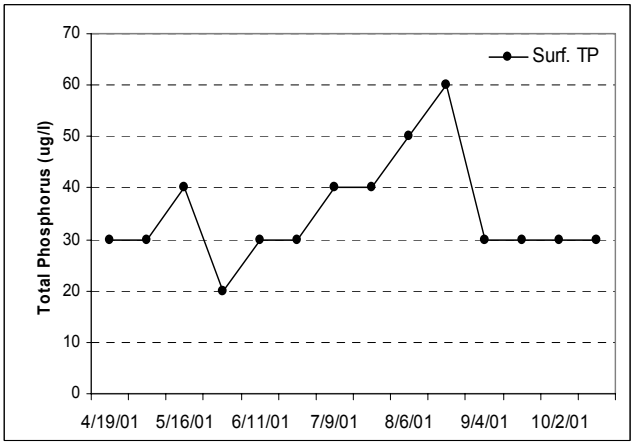
If you know of any errors in the lake's data, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

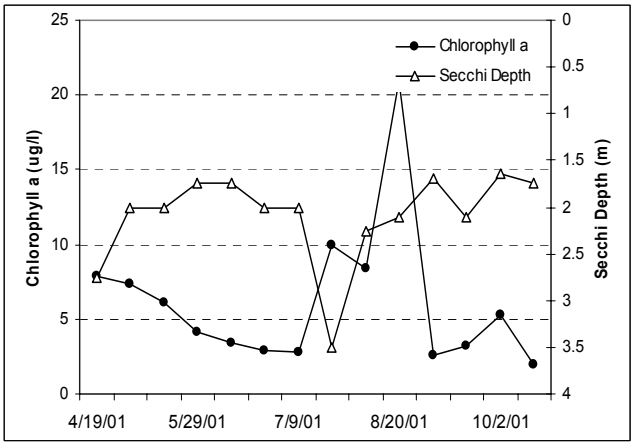
Valley Lake

Lakeville, Dakota Co.

Lake ID: 190348
WMO: Vermillion River
Volunteer: City of Lakeville

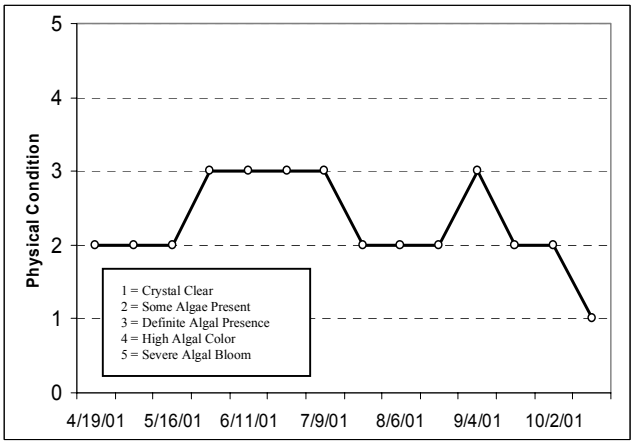






2001 Data

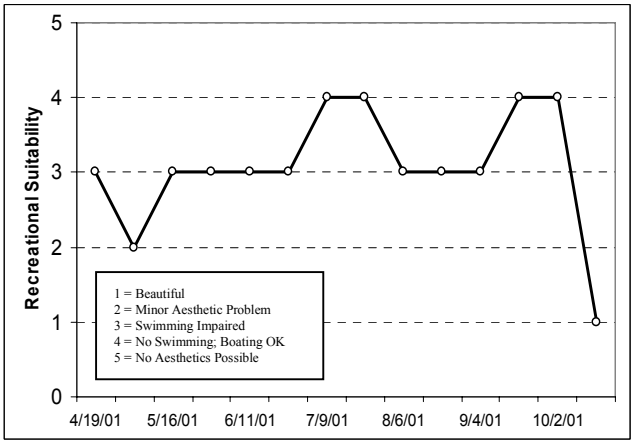
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/19	8				7.9	30		2.8	2	3
5/9	10.5				7.4	30		2.0	2	2
5/16	18				6.1	40		2.0	2	3
5/29	23				4.2	20		1.8	3	3
6/11	23				3.4	30		1.8	3	3
6/26	25.8				2.9	30		2.0	3	3
7/9	29				2.8	40		2.0	3	4
7/25	28				10	40		3.5	2	4
8/6	32				8.4	50		2.3	2	3
8/20	26.3				21	60		2.1	2	3
9/4	26.9				2.6	30		1.7	3	3
9/18	21.3				3.2	30		2.1	2	4
10/2	16.8				5.3	30		1.7	2	4
10/16	10				2	30		1.8	1	1



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					D	D	C			C	C
Chlorophyll a					C	C	C		C	B	A
Secchi Depth					D	D	D		D	C	C
Overall					**D**	**D**	**C**			**C**	**B**



Source: Metropolitan Council and STORET data

Virginia Lake (10-0015) *City of Victoria*

This was the first 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 (1988-1991and 2000). 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 11 times between early-May and early-October, 2001. 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.

The mean summertime (May through September) surface TP concentration for the lake was 43.0 µg/l (minimum of 20.0 µg/l, maximum of 80.0 µg/l). The mean CLA and Secchi transparency readings were 22.5 µg/l (minimum of 1.7 µg/l, maximum of 62.0 µg/l) and 1.6 m (minimum of 0.8 m, maximum of 2.9 m), respectively. The lake's mean surface TKN concentration was 1.16 mg/l. Identical to that recorded in 2000, the lake quality grades assigned to the 2001 summertime means are TP= C; CLA= C; and Secchi= C, resulting in an overall grade of C.

The lake's TP mean does not include a point deemed an outlier (440.0 µg/l) on one sampling date (May 6). The point is roughly 5-10 times greater than the expected value and a reason for the erroneous numbers is not known (in-lab processes and QA/QC runs within the batch where the questionable sample was analyzed, were checked and okayed).

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 algal presence"), while the mean recreational suitability ranking was 2.4 (between 2- "minor aesthetic problems" and 3- "swimming slightly impaired").

As mentioned earlier, there is a limited amount of historic data available for Virginia Lake other then the late 1980s and 2000-2001 CAMP data. Therefore it is impossible to determine any short-term or long-term trends. 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/.

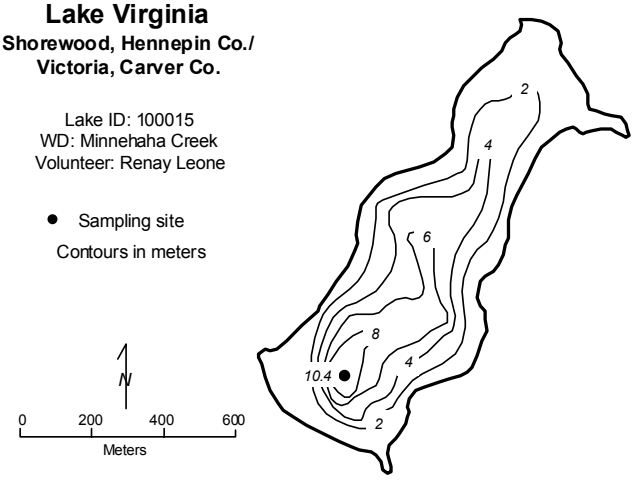
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

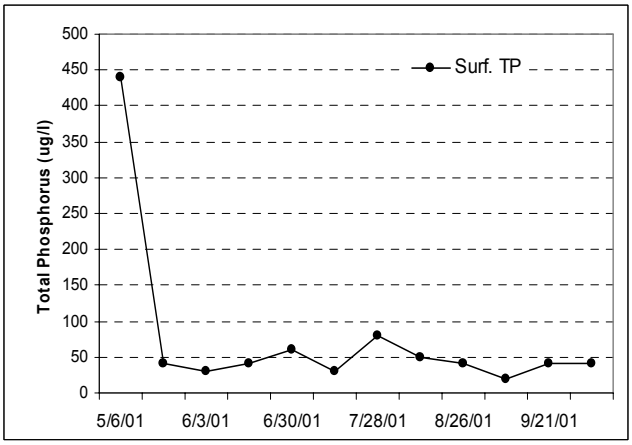
Lake Virginia

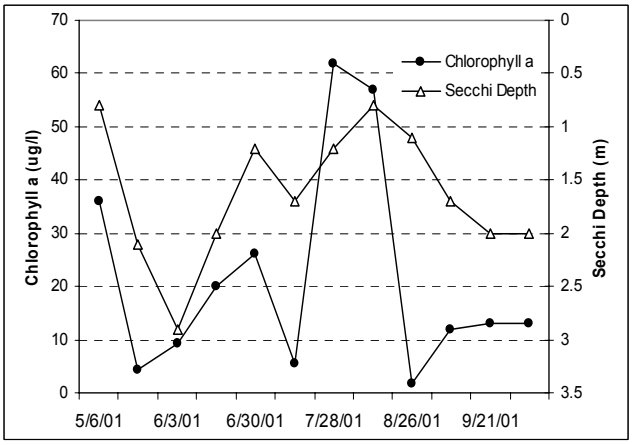
Shorewood, Hennepin Co./
Victoria, Carver Co.

Lake ID: 100015
WD: Minnehaha Creek
Volunteer: Renay Leone

● Sampling site
Contours in meters

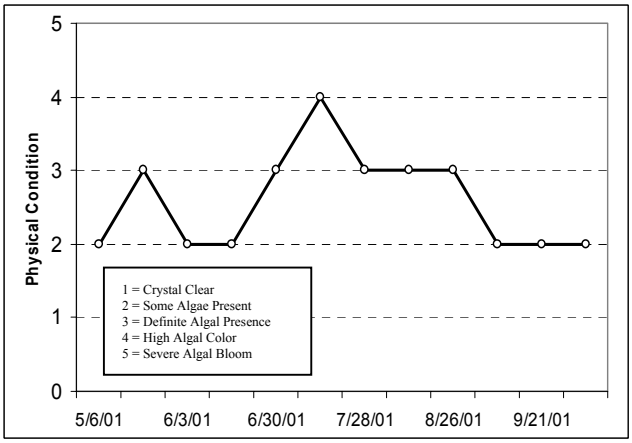






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/6	13.5				36	440		0.8	2	2
5/17	21				4.4	40		2.1	3	3
6/3	17				9.2	30		2.9	2	2
6/18	21				20	40		2.0	2	2
6/30	26.9				26	60		1.2	3	3
7/13	28				5.6	30		1.7	4	3
7/28	24.6				62	80		1.2	3	2
8/12	25.8				57	50		0.8	3	3
8/26	23.5				1.7	40		1.1	3	2
9/8	21				12	20		1.7	2	2
9/21	17.9				13	40		2.0	2	2
10/6	12.3				13	40		2.0	2	2

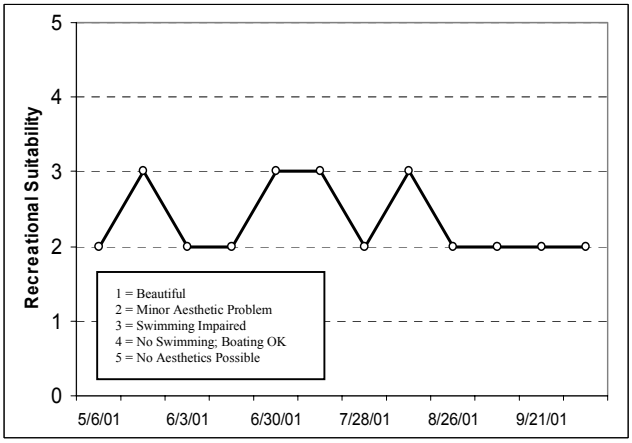


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus										C	C
Chlorophyll a										C	C
Secchi Depth										C	C
Overall										**C**	**C**

Source: Metropolitan Council and STORET data



Waconia Lake (10-0059) *Carver County Environmental Services*

Lake Waconia, located next to the City of Waconia in Carver County, is considered a Metropolitan Area "Priority Lake" because of its multi-recreational uses. Lake Waconia is one of the largest bodies of water in the region. It has a surface area of approximately 3,000 acres (6.8 miles in circumference), and mean and maximum depths of 4.0 and 11.3 m (13.1 and 47.1 feet), respectively. The lake has an approximate volume of 38,632 ac-ft (resulting in a retention time of about 10 years) and an approximate watershed-to-lake size ratio of 4:1. The greater the ratio, the greater the potential stress on the lake from surface runoff.

There are a couple of public accesses on the lake to support its high-volume recreational use. One access is a city-owned access on the southern end of the lake while the other is a state-owned access on the northeastern shore. In the future, the recreational use on and around the lake may increase if a proposed regional park on the lake's southeastern shores becomes a reality. 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.

A variety of land uses around Lake Waconia may contribute to the lake's nutrient load. There are residential areas along the lake's shoreline (25.9 homes/shoreline mile), wetlands, commercial/ industrial areas, and rural/agricultural uses. The predominant uses associated with rural/agricultural areas are livestock and crop farming (51 percent), while those affiliated with the City of Waconia include: single and multi-family residential, commercial/industrial, and paved areas such as parking lots and city streets. All the land uses around the lake pose a potential runoff and pollution problem to the lake. Shoreline homes provide the possibility of lawn runoff of herbicides and fertilizers. Rural/agricultural uses, if not properly managed, can result in herbicides, fertilizers, and eroded soils ending up in the lake. City uses, where a majority of the area is paved, can result in large amounts of nutrient rich debris entering the lake after a rainstorm. These non-point pollution problems can hasten the lake's natural eutrophication process, resulting in a lake that cannot support all of its recreational uses.

Lake Waconia has been involved in CAMP since 1994. In 2001, the lake was monitored 14 times between late-April and mid-October. 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. The mean summertime (May-September) surface TP concentration for the lake was 32.3 µg/l (minimum of < 10.0 µg/l (in which case 5.0 µg/l was used to calculate the summer mean), and maximum of 60.0 µg/l). The mean CLA and Secchi transparency readings were 10.1 µg/l (minimum of 3.9 µg/l and maximum of 21.0 µg/l) and 2.1 m (minimum of 1.5 m and maximum of 4.3 m), respectively. The lake's mean surface TKN concentration was 1.01 mg/l (minimum of 0.87 mg/l and maximum of 1.20 mg/l). Summertime means resulted in a TP grade of C, CLA grade of B, and a Secchi transparency grade of B. Waconia Lake's overall grade for 2001, determined through the calculation of all three parameter grades, was B. The 2001 overall grade (identical to those recorded in 1995-1997) is better than that recorded in 1998-2000. The lake's best water quality year recorded through CAMP was 1994 (TP= 21.0 µg/l, CLA= 6.3 µg/l, and Secchi= 3.1 m resulting in an overall grade of A), while the worst was 1998 (TP= 39.1 µg/l, CLA= 18.2 µg/l, and Secchi= 2.0 m resulting in an overall grade of C).

A search of Council, MPCA, and STORET databases revealed nutrient water quality data for 1980, 1981, 1985, 1990, 1994-2001 (all as a part of the Council's lake monitoring programs). Additionally, Secchi transparencies have been collected through the MPCA's Citizen Lake Monitoring Program since 1974. The lake received C's in 1980, and B's and C's in 1981, 1985 and 1990, an A in 1994 a strong B in 1995,

moderate B in 1996-1997 and 2001, and a C in 1998-2000. Supplemental Secchi data from 1980-1993 has resulted in annual grades of C or D. Because of the variability of the data, no long-term trends can be determined. On the short-term, however, the lake seems to be well represent by an overall grade of C+ (or high-C frequently fluctuating to B). To better understand the quality of the lake and what direction it may be heading, more years of sampling data 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 mean physical condition ranking was 2.5 (between 2- "some algae present" and 3- "definite algal presence"), while the mean recreational suitability ranking was 2.4 (between 2- "minor aesthetics problem" and 3- "swimming slightly impaired").

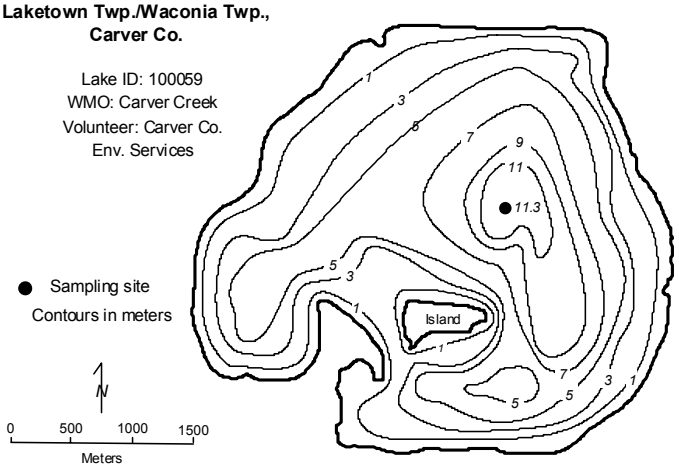
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

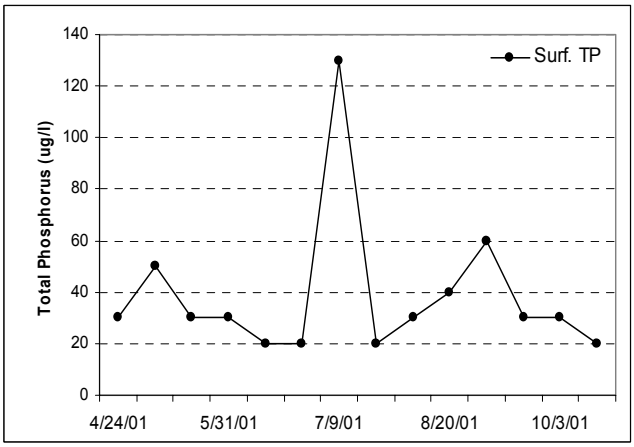
If you know of any errors in the lake's data or physical information, or are aware of any additional information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

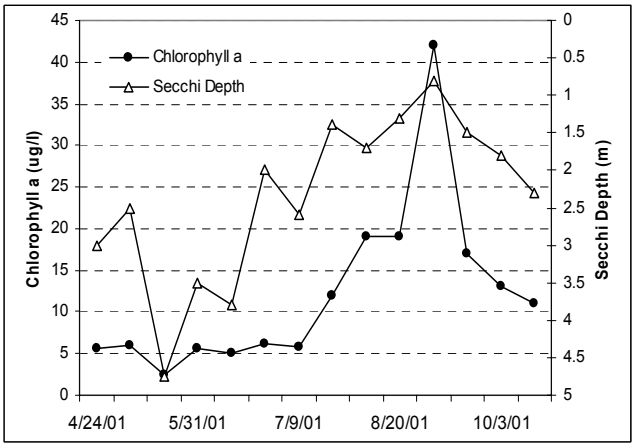
Lake Waconia

Laketown Twp./Waconia Twp., Carver Co.

Lake ID: 100059
WMO: Carver Creek
Volunteer: Carver Co. Env. Services

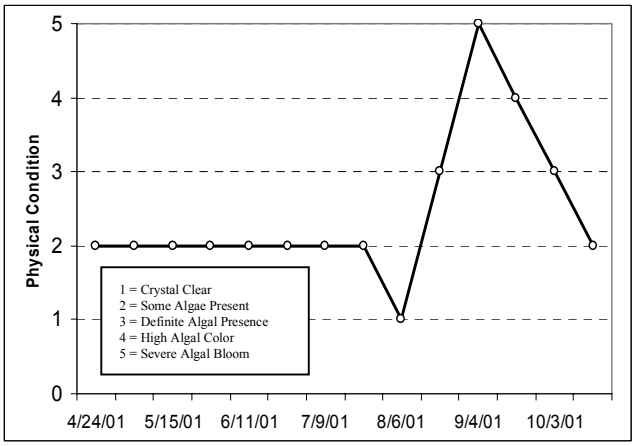






2001 Data

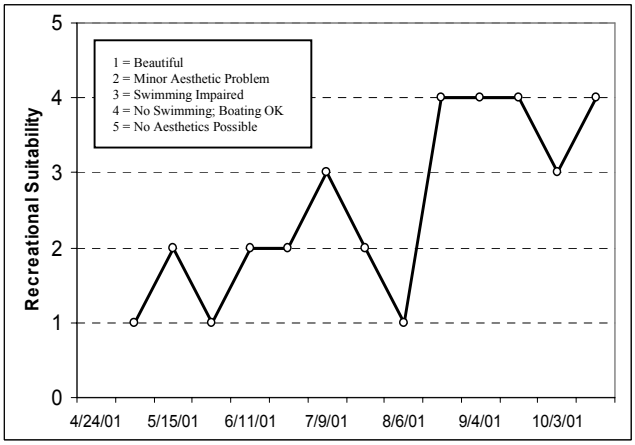
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/24	6.5		10.7		5.6	30		3.0	2	
5/1	12.3		10.8		6	50		2.5	2	1
5/15	17.6		10		2.4	30		4.8	2	2
5/31	16.8		11		5.6	30		3.5	2	1
6/11	18.3		11.8		5.1	20		3.8	2	2
6/26	23.9		10.1		6.1	20		2.0	2	2
7/9	24		10.4		5.8	130		2.6	2	3
7/24	26.8		9.3		12	20		1.4	2	2
8/6	29.3		9.1		19	30		1.7	1	1
8/20	22.9		8.4		19	40		1.3	3	4
9/4	22.3		7.9		42	60		0.8	5	4
9/17	18.8		7.56		17	30		1.5	4	4
10/3	16.5		8.79		13	30		1.8	3	3
10/17	11		10.11		11	20		2.3	2	4



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				A	A	B	B	C	C	C	C
Chlorophyll a				A	B	B	B	B	B	B	B
Secchi Depth	C	C	C	A	B	C	C	C	C	C	B
Overall				**A**	**B**	**B**	**B**	**C**	**C**	**C**	**B**



Source: Metropolitan Council and STORET data

West Boot Lake (82-0044) *Carnelian-Marine Watershed District*

This was the second 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 limited amount of historic data on the lake (1991 and 1996-1999 and the CAMP 2000 data). The 49-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 946 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 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 14 times between early-May and early-October, 2001. 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 mean summertime (May through September) surface TP concentration for the lake was 19.6 µg/l (minimum of < 10.0 µg/l [in which case 5.0 µg/l was used to calculate the summer mean], maximum of 30.0 µg/l). The mean CLA and Secchi transparency readings were 7.0 µg/l (minimum of 2.6 µg/l, maximum of 13.0 µg/l) and 3.8 m (minimum of 1.8 m, maximum of 6.4 m), respectively. The lake's mean surface TKN concentration was 0.68 mg/l. The lake quality grades assigned to the 2001 summertime means were TP= A; CLA= A; and Secchi= A, resulting in an overall grade of A. While the 2001 lake grades are identical to those of 2000, the lake's 2001 water clarity was actually quite a bit better.

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 1.3 (between 1- "beautiful" and 2- "minor aesthetic problem").

Since there is a limited amount of historic data available for West Boot Lake, it is impossible to determine any long-term trends. 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 1999-2001). 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.

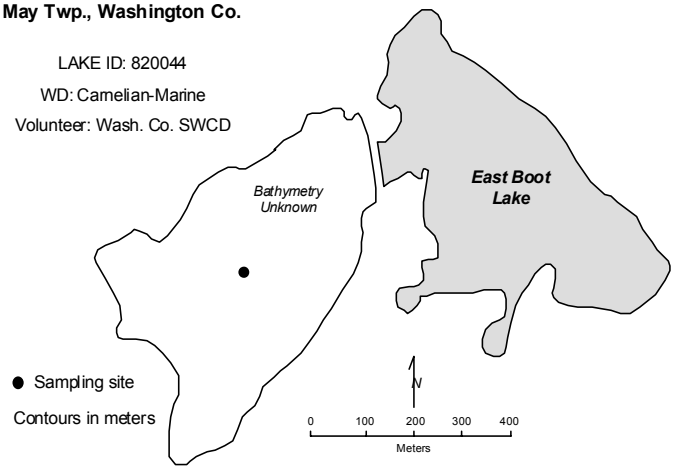
West Boot Lake

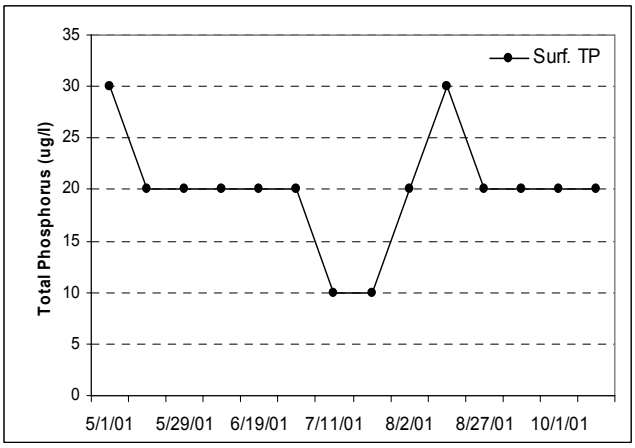
May Twp., Washington Co.

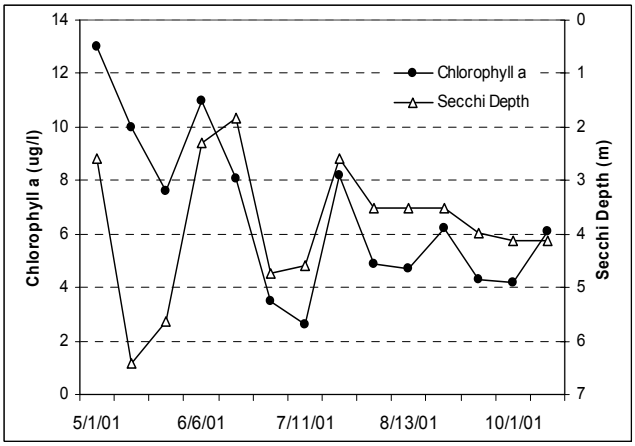
LAKE ID: 820044

WD: Camelian-Marine

Volunteer: Wash. Co. SWCD

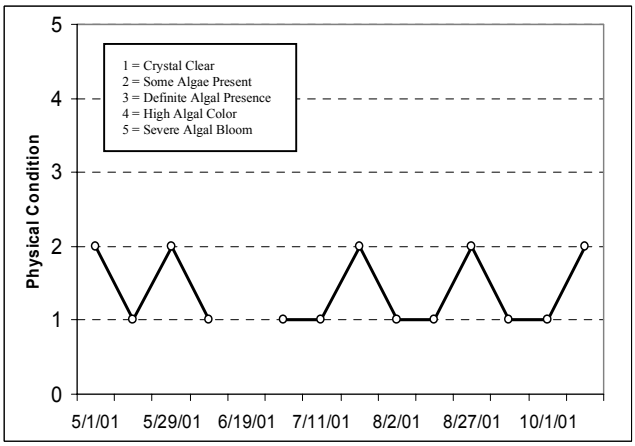






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/1	15.5		8.4		13	30		2.6	2	1
5/16	21.6		11.3		10	20		6.4	1	1
5/29	18		11		7.6	20		5.6	2	2
6/6	17.2		11		11	20		2.3	1	1
6/19	22.1		6.34		8.1	20		1.8		
6/29	27.1		8.23		3.5	20		4.7	1	1
7/11	26.5		9.8		2.6	10		4.6	1	1
7/23	28.1		8.9		8.2	10		2.6	2	2
8/2	26.9		7.7		4.9	20		3.5	1	1
8/13	25.9		6.52		4.7	30		3.5	1	1
8/27	24.6		7.03		6.2	20		3.5	2	2
9/11	21		8		4.3	20		4.0	1	1
10/1	15.8		12		4.2	20		4.1	1	1
10/16	11.2		7.6		6.1	20		4.1	2	2

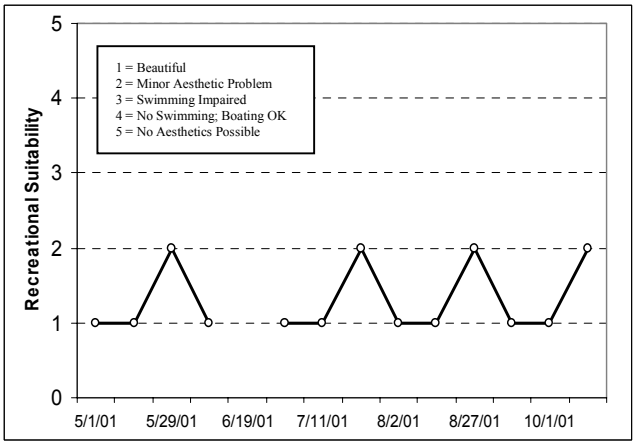


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						B	C	A	A	A	A
Chlorophyll a						A	B	C	A	A	A
Secchi Depth	C					B	C	B	A	A	A
Overall						**B**	**C**	**B**	**A**	**A**	**A**

Source: Metropolitan Council and STORET data



Westwood Lake (27-0711) *Bassett Creek Watershed Management Organization*

This was the third year of CAMP monitoring in Westwood Lake (1993 and 2000 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 11 times between early-May and late-September, 2001. Results from the monitoring are presented on the information sheet on the next page.

The overall lake quality grade for 2001 Westwood Lake was C as determined from the individual parameter grades (B for TP, C for CLA and C for Secchi transparency). The summertime (May through September) mean TP concentration was 24.6 µg/l (minimum of 20.0 µg/l and maximum of 30.0µg/l), while the mean CLA concentration was 25.3 µg/l (minimum and maximum of 3.5 µg/l and 75.0µg/l). Westwood Lake's mean Secchi transparency was 1.5 m (minimum of 1.2 m and maximum of 1.8 m). The lake's mean TKN concentration was 1.09 mg/l (minimum of 0.88 mg/l and maximum of 1.30 mg/l).

Since there is a limited amount of historic data available for Westwood Lake, it is impossible 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, and B in 2000). To better understand the lake's water quality and where it may be heading, more data are needed.

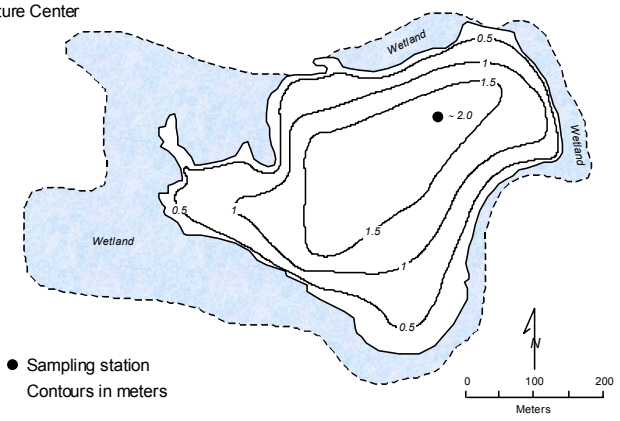
Throughout the monitoring period, the volunteers' opinion of the lake's physical and recreational conditions were ranked on a 1-to-5 scale. These user perception rankings are shown on the lake information sheet. The average user perception rankings, on a 1-to-5 scale, were 1.9 for physical condition (roughly equal to 2- "some algae present"), and 3.4 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.

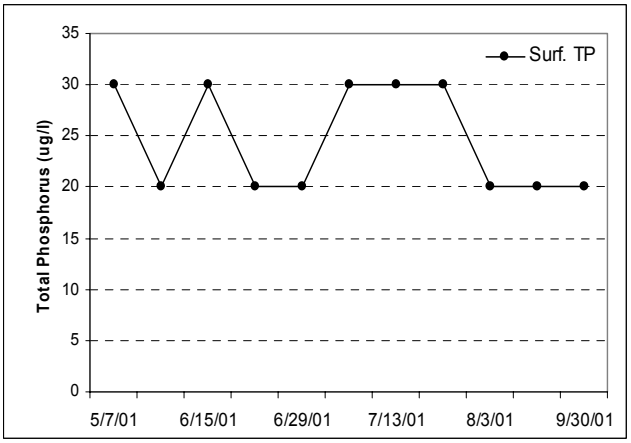
Lake ID: 270711
WMO: Bassett Creek
Volunteer:Westwood Hills
Nature Center

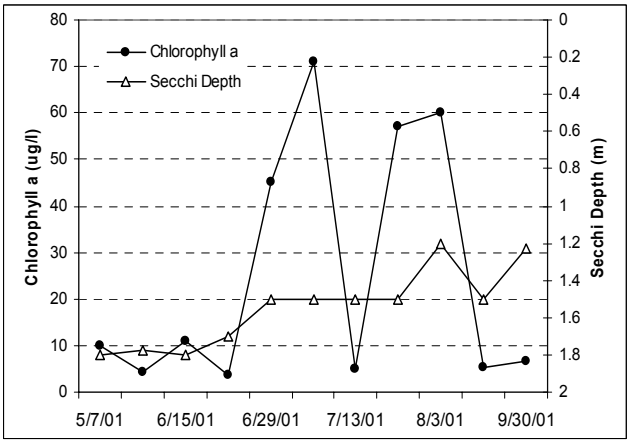
Westwood Lake,

St. Louis Park, Hennepin Co.



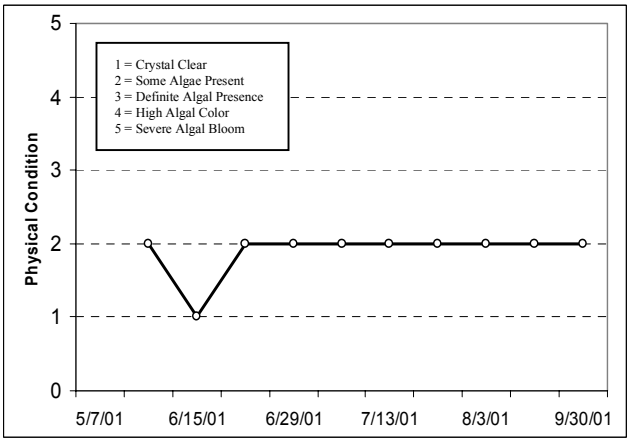
● Sampling station
Contours in meters





2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
5/7	16				10	30		1.8		
6/8	19				4.2	20		1.8	2	4
6/15	15				11	30		1.8	1	1
6/22	22				3.5	20		1.7	2	4
6/29	26				45	20		1.5	2	4
7/6	22				71	30		1.5	2	4
7/13	25				4.9	30		1.5	2	4
7/20	30				57	30		1.5	2	4
8/3	25				60	20		1.2	2	4
8/25	27				5.3	20		1.5	2	2
9/30	13				6.8	20		1.2	2	

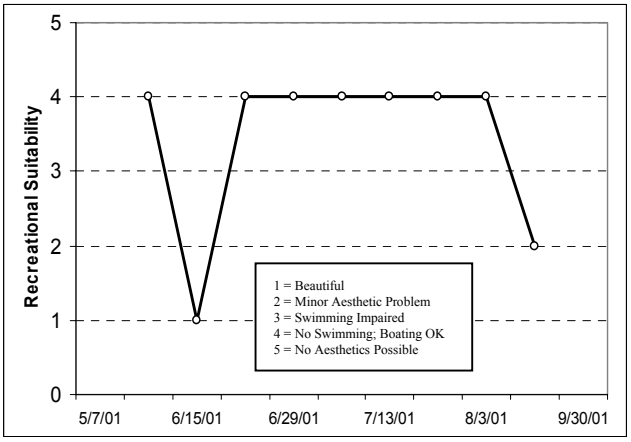


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus			C							B	B
Chlorophyll a			C							B	C
Secchi Depth			C							C	C
Overall			**C**							**B**	**C**

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 2001, the lake was monitored 13 times between mid-April and mid-October. Results are presented on the next page. The overall lake quality grade for Wilmes Lake in 2001 was D (similar to 1997-1998, and worse than 1994 (B), 1995-1996 and 1999-2000 (C)). The summertime (May through September) mean TP concentration of 76.0 µg/l (minimum of 50.0 µg/l, maximum of 100.0 µg/l) corresponded to a grade of D, as does the mean Secchi transparency of 1.2 m (minimum of 0.6 m and maximum of 2.4 m). The mean CLA concentration was 41.7 µg/l (minimum of 11.0 µg/l, maximum of 100.0 µg/l) equates to a C. The lake's mean TKN concentration was 1.43 mg/l (minimum of 0.98 mg/l, maximum of 2.10 mg/l). Although the lake's overall water quality grade is worse than that recorded recently (1999-2000), the summer means are very similar.

While the lake was monitored through CAMP in 1994 and 1995, past data comparisons to the 1996-2001 data cannot really be made because in 1994-1995 the lake was monitored in the northern basin and in 1996-2001 the southern basin has been monitored. 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. Because 1994-2001 are the only years for which data is available, (and the data are divided between the two basins) long- or short-term trends can not be determined. Data will have to be collected over several years to assess trends.

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 3.3 (between 3-"definite algae present" and 4- "definite algal presence"). The mean recreational suitability ranking was 2.7 (between 2- " minor aesthetic problem" and 3- "swimming slightly impaired").

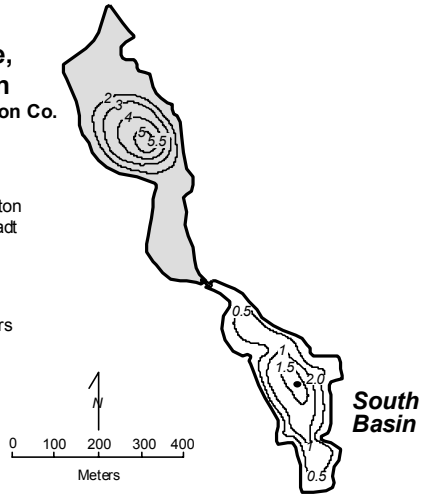
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

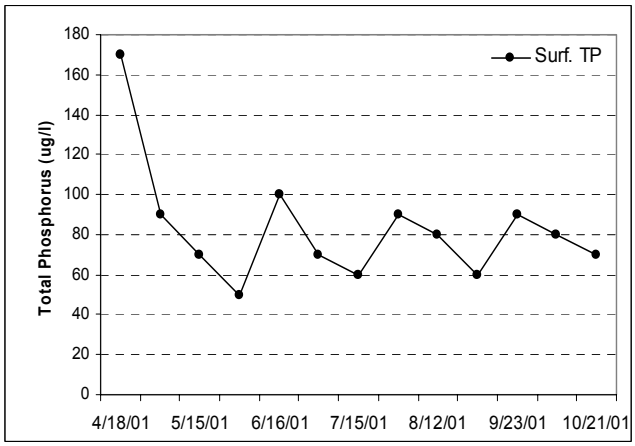
Wilmes Lake, South Basin

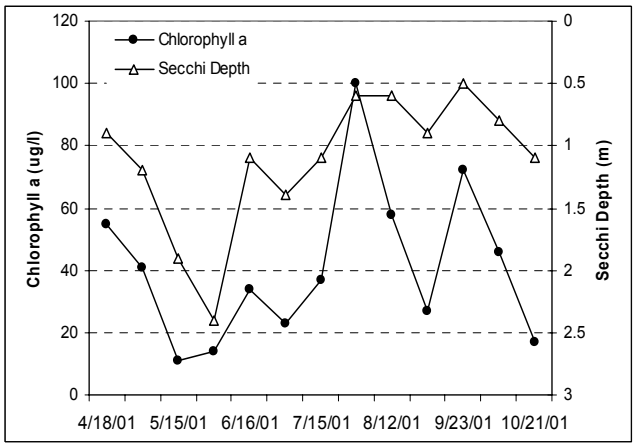
Woodbury, Washington Co.

Lake ID: 820090
WD: South Washington
Volunteer: Bill Aamadt

● Sampling site
Contours in meters

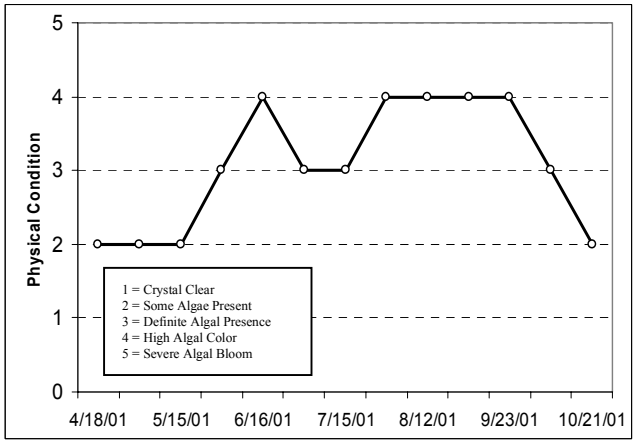






2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/18	5				55	170		0.9	2	2
5/5	15				41	90		1.2	2	2
5/15	19				11	70		1.9	2	2
5/28	17				14	50		2.4	3	2
6/16	21.5				34	100		1.1	4	3
7/1	24.5				23	70		1.4	3	3
7/15	26.5				37	60		1.1	3	3
7/29	26				100	90		0.6	4	3
8/12	25				58	80		0.6	4	3
9/3	22				27	60		0.9	4	3
9/23	15.5				72	90		0.5	4	3
10/2	15				46	80		0.8	3	3
10/21	9.5				17	70		1.1	2	2

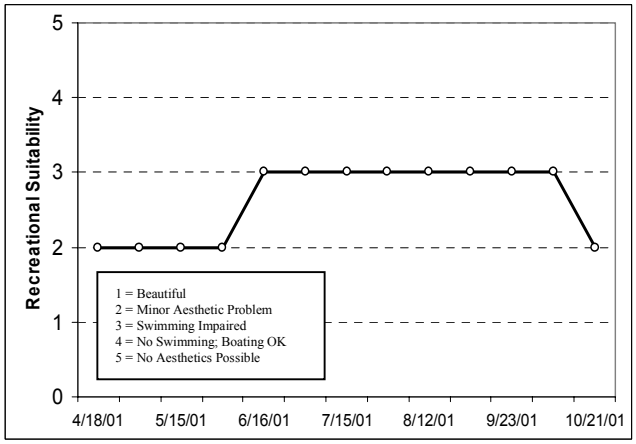


Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus				C	D	D	D	D	D	D	D
Chlorophyll a				B	B	C	C	C	C	C	C
Secchi Depth				B	C	C	D	D	C	C	D
Overall				**B**	**C**	**C**	**D**	**D**	**C**	**C**	**D**

Source: Metropolitan Council and STORET data



Winkler Lake (10-0066) *Carver County Environmental Services*

Winkler Lake is a 129-acre lake located within Benton Township (Carver County). The lake has a 2,758-acre immediate watershed, which translates to a watershed-to-lake area ratio of 21:1 (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: three percent residential, 77 percent agricultural, two percent commercial/industrial, and 18 percent open/undeveloped (Carver County Planning 1999). The lake is the receiving waterbody for the Bongard's wastewater treatment plant.

This was the third year that Winkler Lake has been involved in CAMP (the others being 1999 and 2000). The lake was monitored six times between late-June and mid-October, 2001. A search through the STORET nationwide water quality database provided only one additional year of data other than the 1999-2001 CAMP data (1995).

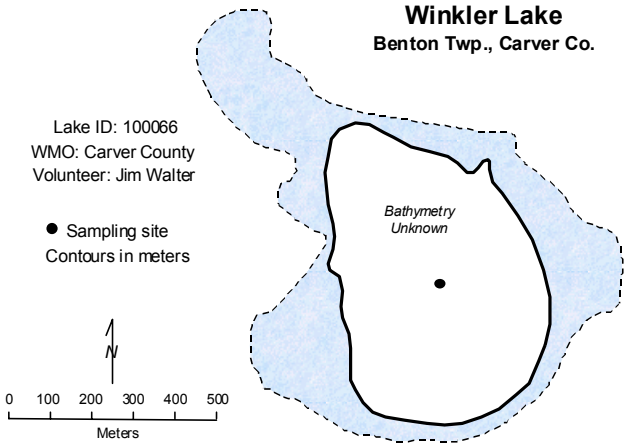
During each monitoring event, the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. Results are presented on graphs and data tables on the following page.

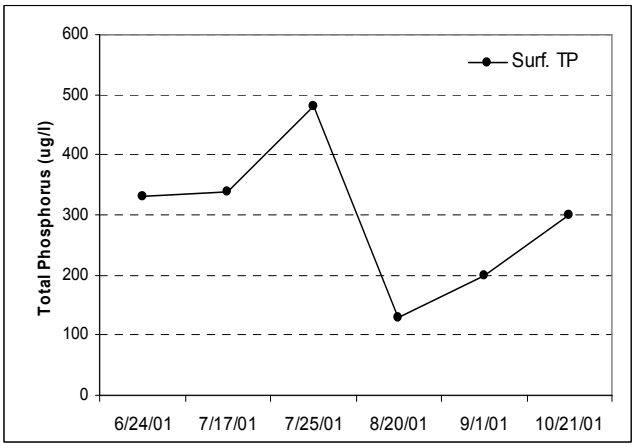
The lake's overall 2001 lake quality grade of F was determined from the individual parameter grades. The summertime (May through September) mean TP concentration of 296.0 µg/l (minimum of 130.0 µg/l, maximum of 480.0 µg/l) corresponds to a lake water quality grade of F, as did the mean Secchi transparency of 0.6 m (minimum of 0.3 m, maximum of 0.7 m). Oddly enough the lake's mean CLA concentration of 41.5 µg/l (minimum of 5.5 µg/l and maximum of 140.0 µg/l) corresponds to an grade of C (quite a bit better than expected especilly when comparing to the physical condition user perception ranking discussed below). The mean TKN concentration over the same time period was 2.04 mg/l (minimum of 1.60 mg/l and maximum of 2.80 mg/l). While the lake's 2001 overall grade is identical to those recorded in 1999 and 2000, the 2001 individual means are dramatically better than those of 2000 and more in line to those of 1999. In fact the 2001 TP mean is only 20 percent of the 2000 recorded mean.

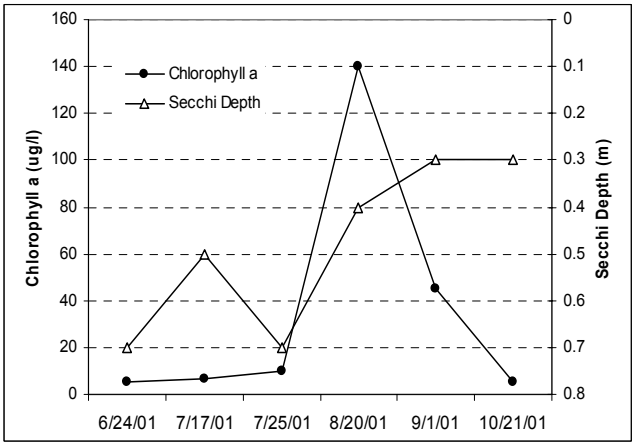
The average user perception rankings, on a 1-to-5 scale, were 4.4 for physical condition (between 4- "high algal color" and 5- "severe bloom") and 4.4 for recreational suitability ranking (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

As mentioned earlier, there is very little water quality data available for Winkler 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.

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.

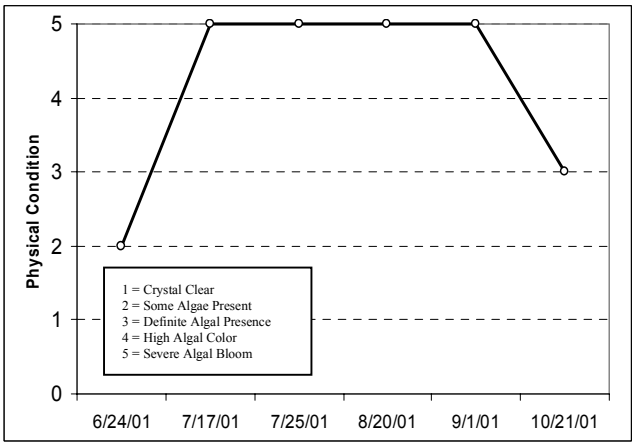


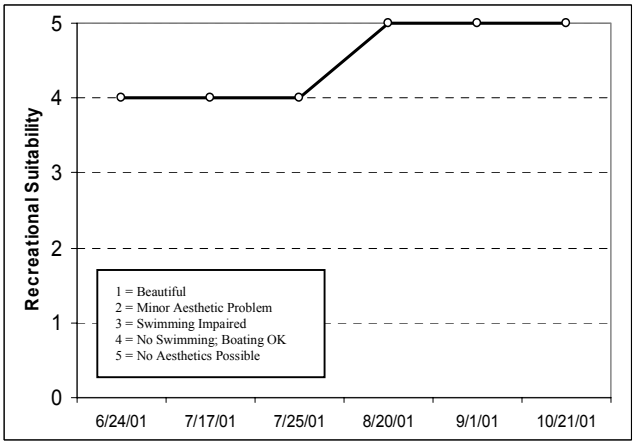




2001 Data

Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
6/24	22.4				5.5	330		0.7	2	4
7/17	27				6.9	340		0.5	5	4
7/25	27				10	480		0.7	5	4
8/20	21				140	130		0.4	5	5
9/1	22.4				45	200		0.3	5	5
10/21	11.8				5.5	300		0.3	3	5





Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus					F				F	F	F
Chlorophyll a					A				D	F	C
Secchi Depth					C				F	F	F
Overall					**C**				**F**	**F**	**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 sixth year that Wood Lake has been involved in CAMP. The lake (which has been enrolled in CAMP since 1996) was monitored 13 times between mid-April and mid-October, 2001. The resulting data and graphs appear on the next page.

The 2001 overall lake quality grade for Wood Lake, calculated from the individual parameter grades, is C (similar to 1996, 1997, and 1999-2000, but worse than the B of 1998). The 2001 summertime (May - September) mean TP concentration of 37.0 µg/l (minimum of 20.0 µg/l, maximum of 80.0 µg/l) corresponded to a lake water quality grade of C, as does the mean Secchi transparency of 1.7 m (minimum of 1.0 m and maximum of 3.7 m). The 2001 CLA mean of 22.4 µg/l (minimum and maximum of 1.6 and 65.0 µg/l) also resulted in a grade of C. The lake's mean TKN concentration was 1.14 mg/l (minimum of 0.80 mg/l, maximum of 1.90 mg/l).

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 simliar to the pre-alum tratment water quality of 1996 and 1997 than that of 1998. For this reason it seems that the alum treatment has not been wholly successful. Additional years of monitoring are needed to truly determine the effectiveness and long-term efficiency of the alum treatment.

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 1996-2001. Because of the limited nature of the lake's water quality database, it is not possible to determine any short- or long-term trends. 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 2.6 for physical condition (which falls between 2- "some algae present" and 3- "definite algal presence"), and 3.6 for recreational suitability (between 3-"swimming slightly impaired " and 4- "no swimming: boating ok").

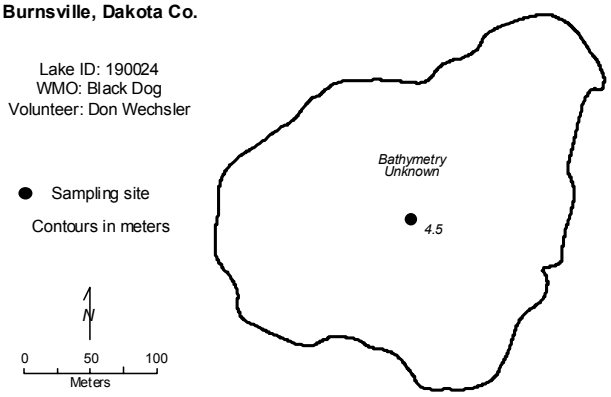
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 297-4916 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

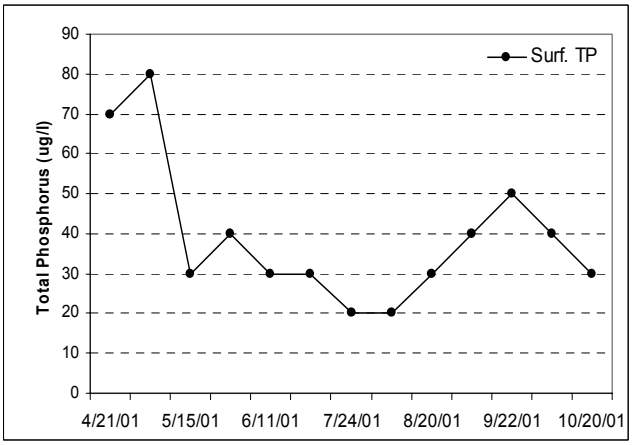
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at (651) 602-8743 or randy.anhorn@metc.state.mn.us.

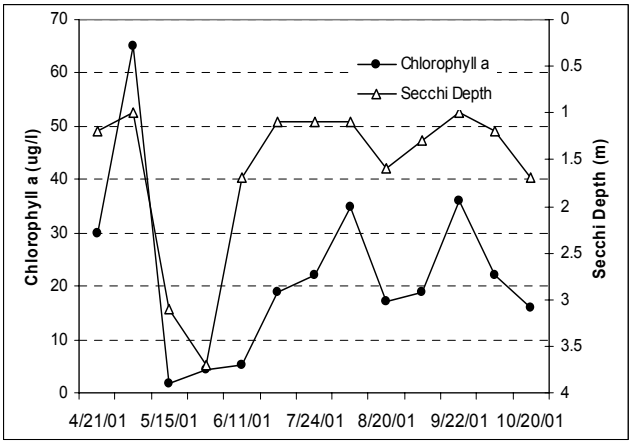
Wood Lake

Burnsville, Dakota Co.

Lake ID: 190024
WMO: Black Dog
Volunteer: Don Wechsler

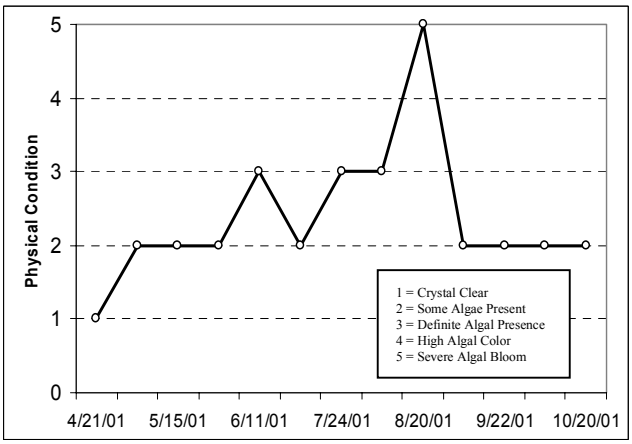






2001 Data

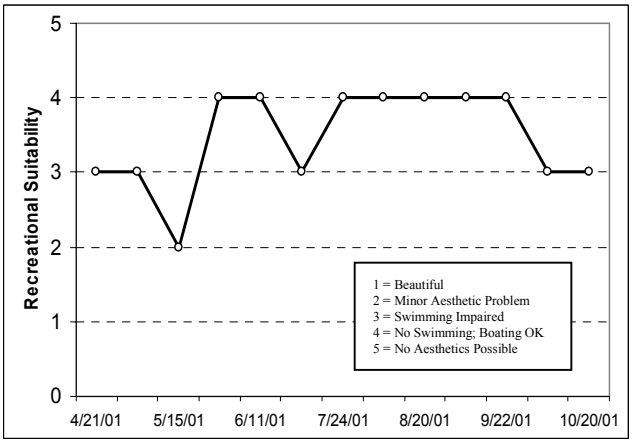
Date	Surf. Temp	Bot. Temp	Surf. DO	Bot. DO	CLA	Surf. TP	Bot. TP	Secchi	PC	RC
	C	C	mg/l	mg/l	ug/l	ug/l	ug/l	M	1 thru 5	1 thru 5
4/21	10				30	70		1.2	1	3
5/1	15				65	80		1.0	2	3
5/15	20				1.6	30		3.1	2	2
5/28	16				4.4	40		3.7	2	4
6/11	23				5.3	30		1.7	3	4
6/26	24				19	30		1.1	2	3
7/24	28				22	20		1.1	3	4
8/7	30				35	20		1.1	3	4
8/20	23				17	30		1.6	5	4
9/6	23				19	40		1.3	2	4
9/22	17				36	50		1.0	2	4
10/1	16				22	40		1.2	2	3
10/20	10				16	30		1.7	2	3



Lake Water Quality Grades Based on Summertime Averages

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

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Phosphorus						C	C	B	C	C	C
Chlorophyll a						B	B	B	B	B	C
Secchi Depth						C	C	C	C	C	C
Overall						**C**	**C**	**B**	**C**	**C**	**C**



Source: Metropolitan Council and STORET data

CONCLUSIONS

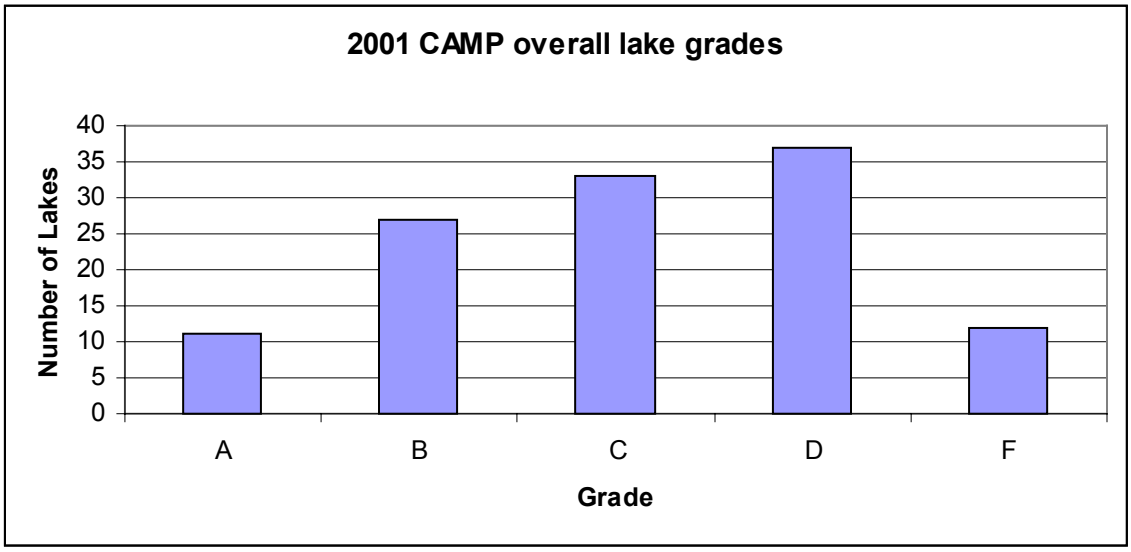
The year 2001 marked the ninth year of the Citizen-Assisted Monitoring Program (CAMP). Evidenced by the increase in the program enrollment and the quality of data collected, CAMP has proven to be a successful and economical tool to determine and/or track the quality of lake resources. Volunteers collected water quality data, including CLA, TKN, and TP concentrations, Secchi transparencies, and user perceptions at 120 lake sites on 118 lakes in the Twin Cities Metropolitan Area. Thirty-one lakes were enrolled in 1993, 38 lakes in 1994, 45 lakes in 1995, 51 in 1996, 59 in 1997, 57 in 1998, 99 in 1999, and 110 in 2000.

This year's volunteer monitoring program included nine lakes never before monitored by the Council, and 99 lake sites returning from 2000. The 2001 program included lake data from 22 of the 23 watersheds/municipalities/Counties represented in the 2000 program. To date, water quality data from 30 of the region's 46 watersheds (65 percent) have been collected by volunteers through the CAMP program, and lakes in 10 of the remaining 16 watersheds have been monitored by Council staff. In all, a cross-section of lakes in 40 of the 46 area watersheds (87 percent) have been sampled through the Council's lake monitoring program since 1993. Of the remaining six watersheds, lakes were monitored in three through Ramsey County's program, and three watersheds have only one or no lakes (e.g., Lower St. Croix River WMO--no lakes) within their boundaries.

Of the 120 lake sites involved in CAMP in 2001, nine lake sites (Cloverdale, Deeg, Egg, Fireman's, French, Little Johanna, Spring (Anoka County), Tamarack, and Valentine) had never been monitored by the Council prior to 2001. The majority of these lakes have no record of any water quality data at all. Twenty-two of the 120 lake sites (Barker, Bass (Washington Co.), Carol, East Boot, Fish (Washingtom Co.), Jellum's Bay, Little Carnelian, Long (Washington Co.), Loon, Louise, Maple Marsh, Mud, North Twin, Northwood, Silver, South Twin, Staples, Sweeney (Site-1 and Site-2), Turtle (Washington Co.), Virginia, and West Boot) had only one year of Council-collected data prior to 2001. The majority (30.0 percent) of the lakes in monitored through CAMP in 2001 received an overall water quality grade of D. The water quality of these lakes is considered below-average. During each of the previous years of CAMP, the majority of the lakes sampled received overall grades of C.

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 below average (40.8 percent to 31.7 percent). The complete 2001 CAMP lake report card grade tally assigned A's to 11 lakes (9.2 percent) and B's to 27 lakes (22.5 percent). Thirty-three lakes acquired C's (37.5 percent), 36 received D's (30.0 percent), and 13 obtained an F (10.8 percent).

The 11 lakes that received A grades, within the top 10-percentile range for Metro Area lakes include: Big Carnelian Lake, Big Marine Lake, Courthouse Lake, Fireman's Lake, Half Breed (Sylvan) Lake, Lac Lavon Lake, Little Carnelian Lake, Marcott Lake (Site 2), Square Lake, Sunset Lake, and West Boot Lake. Cenaiko Lake and Kingsley Lake, which both received an A overall water quality grade in 2000, fell to a B overall grade in 2001. The reason for the lakes' decreased water quality grade was due to lower Secchi transparencies. Sunset Lake, on the other hand, which received a B overall water quality grade in 2000, increased to an A in 2001



The lakes receiving the lowest water quality grade (F) include: Benton Lake, Colby Lake, Downs Lake, Farquhar Lake, Fish Lake (Washington County), Gaystock Lake, George Watch Lake, Long lake (Carver County), Long Lake (Stillwater), Marshan Lake, Mud Lake, Peltier Lake, and Winkler Lake. Five lakes (Hazeltine Lake, Jellum's Bay, Long Lake (Washington County), Lake Maria, and South Rice Lake, which had received overall grades of F in 2000 and improved to a D in 2001.

In 2001, roughly 40 percent of the lakes monitored through CAMP received either a D grade (36 lakes) or F grade (13 lakes) (similar to 2000). This is up from roughly 27 percent of the CAMP lakes receiving a D or F grade in 1997 and 33 percent in 1998, and down from the 42 percent in 1999. This probably is more a function of the type of lakes monitored than an indicator of declining water quality in area lakes. Two lakes which received a D grade previously (Hydes Lake and Lee Lake) improved to a C grade, while eight other lakes (Armstrong lake, Golden Lake, Highland Lake, Louise Lake, Markgrafs Lake, Reitz lake, South Twin Lake, and Wilmes Lake) degraded from a C grade in to a D.

Miller Lake (Carver County) recorded the worst summertime TP mean (**436.0** µg/l) in 2001 (dramatically better than the maxuimum mean of 1,456.7 µg/l recorded on Winkler Lake in 2000). The worst CLA mean was recorded on Farquhar Lake with a mean concentration of **230.0** µg/l (again, much better than the 869.0 µg/l recorded on South Rice Lake (Hennepin County) in 2000). And finally, the lowest Secchi transparency mean of **0.3** m was recorded on Downs Lake.

Similar to past years, no distinct all encompassing pattern emerged 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--they 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: first, deeper lakes have a greater ability to incorporate nutrients and trap them in the sediments where they are not available for plant growth (macrophyte and/or algae); second, shallow lakes tend not to stratify during the summer months, allowing the potential release of phosphorus from bottom sediments to rise through the water column and become available for plant growth; and third, the small surface area of the lakes generally relate to larger watershed-to-lake ratios, which means the lake has to handle a greater potential runoff load for its size than 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 five 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, it is difficult to determine any long-term water quality trends for the majority of this year's CAMP lakes (Farquhar and Bavaria lakes have shown a recent, or short-term, decline in water quality, however). The reason simply being, that the majority of lakes in the Metropolitan Area have limited and/or fluctuating databases. Accurate conclusions are difficult because within a lake's database, one year's data may represent only one monitoring date or parameter or water quality may fluctuate greatly from year to year, and/or the lake may only be monitored every ten years. To fully determine if a lake's water quality has truly changed, either additional years of data collection are needed in the future to compare with the present condition of the lake, and/or a complete historical baseline database is needed. Without a complete and accurate historical database, which is rare, it is difficult to determine if a lake's quality has changed because its former quality is not known. Constructing such a database through continued monitoring is essential so that future lake quality trends can be determined.

Of the 99 repeat CAMP lakes from 2000, 16 had a better overall water quality grade in 2001 (Big Comfort Lake, Crystal Lake (Burnsville), Fish Lake (Scott County), Forest Lake (West Basin), Goose Lake (Waconia), Hydes Lake, Jellum's Bay, Lee Lake, Lily Lake, Long Lake (Washington County), Maria Lake, Mud Lake, Orchard Lake, South Rice Lake, Sunset Lake, and Valley Lake), 17 had worse overall water quality grades in 2001 (Armstrong Lake, Cenaiko Lake, Colby Lake, Gaystock Lake, George Watch Lake, Golden Lake, Highland Lake, Kingsley Lake, Lake Louise, Markgrafs Lake, Oneka Lake, Lake Peltier, Powers Lake, Reitz Lake, South Twin Lake, Westwood lake, and Wilmes Lake), 64 had the same overall water quality grade for both years, and two did not have enough data points in one of the two years to compare their water quality years. By further breaking down the 64 lakes that had identical overall grades in 2000 and 2001, 27 had similar summertime mean conditions in both 2000 and 2001 (mean TP, CLA and Secchi transparency), 24 had better means in 2001, and 13 had worse or somewhat worse means in 2001.

Of the 17 lakes with worse water quality in 2001 than in 2000 six were in Anoka County, six were located in Washington County, three were in Dakota County, and two were in Carver County. The 16 lakes with better water quality in 2001 were located in Washington County (seven), Dakota County (four), Carver County (three), and Anoka, Hennepin Counties (one each).

Water quality data from the 99 repeat lakes seem to indicate that the Metro Area lakes experienced similar to slightly better water quality conditions in 2001 as compared to 2000 (both of which were worse water quality years than those of 1993 and 1994, and similar to 1998).

Two of the lakes enrolled in CAMP 2001, Northwood and Valley, were monitored as part of a special project testing the use of barley straw to inhibit in-lake algal populations (they were also enrolled in CAMP in 2000). 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 is that enzymes (which inhibit algal growth) are released as the straw rots when placed in water. Each lakes' TP, CLA and Secchi transparency readings were studied and averaged over the summer growing season (May-September), in order to determine if the straw method successfully reduced algal biomass on the lakes in 2001.

While there are no pre-barley straw treatment data available for Northwood Lake, Valley Lake was a part of CAMP in 1995-1997 when barley straw treatments were not used in the lake. This has provided an opportunity to compare the three years where barley straw was used in the lake to the three years where it was not. The Valley Lake data seem to indicate that the barley straw did inhibit algal growth on Valley Lake in 1999, 2000 and 2001. The 2001 summer mean TP, CLA and Secchi transparency were better than those recorded in 2000, which was the the lake's second best water quality year recorded. The 2001 data for the lake indicate that it was by far the best monitored water quality year to date.

In Northwood's case, the lake's CLA grade was much better than the TP and Secchi grade. This probably indicated that the barley straw did indeed inhibit algal growth over the summer months. The lake's summer mean Secchi transparency, however, was not as good as the lake's mean CLA concentration would suggest it would be. 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 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.

While barley straw seems to inhibit algal growth, 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 in Valley Lake along with monthly samples in a nearby sediment basin where barley straw was not used (control). These additional samples were analyzed for a break down in phenol concentrations (one of the theories behind the barley straw inhibitor). The result of this analysis has yet to be completed. This additional analysis will continue throughout the upcoming 2002 monitoring season.

More data are needed in order to determine possible statistically significant short-term (let alone long-term) trends that the barley straw treatments may have on Northwood and Valley lakes and their algal populations. With this in mind, barley straw will again be placed in both lakes in 2002. To monitor the lakes' quality of the 2002 summer, they will again be enrolled in CAMP. Additionally, similar to 2001, phenol concentrations throughout the summer of 2002 will be determined for Valley Lake and an associated control.

Since 1980, 255 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 [270 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 270 lake sites have been revisited on a rotating schedule throughout the past 21 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 the most economical and efficient method to expand knowledge of our lakes is with the assistance of volunteers and cooperation and financial support of watershed management organizations, counties, and cities. So while the first nine years of CAMP have been very successful, our future goal is to involve as many of the 46 area watershed management organizations as possible in CAMP so they can better understand and manage their resources.

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.

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APPENDIX A
2001 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 (Henn) 27-98	194	3,100	16:1	9.4	3.1	1,979	82		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	19.5	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		
Burandt 10-84	93			7.3			72		Y	N		
Carol 82-17	63	375	6:1	1.8	0.9	186	100		N	N		
Cedar Island27-119	80	800	10:1	2.1	1.4	368	100		N	N		
Cenaiko 2-654	29			9.1			40		Y	N	0.6	Stocked w/Trout - Fishing Pier
Centerville 2-6	455			6.0	3.7	5,460	61		N	Y		
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		
Colby 82-94	71	8,088	114:1	3.4			100		N	N		
Courthouse 10-5	10			17.4			30		Y	N	0.6	Stocked w/Trout
Crystal(Bnsv)19-27	292	2,001	7:1	11.3	3.1	2,920	72		Y	Y		Panfish - Fishing Pier

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
Crystal(rob) 27-34	76	1,272	17:1	10.4	3.7	917	68		Y	Y		Centrachid - Fishing Pier
Deeg 19-												
Downs 82-110	35	2,400	69:1	2.1	1.5	175	100		N	N		
Eagle(Crv)10-121	233	1,050	4.5:1	4.0	1.2	920	100		N	Y		Natural Environment
Earley 19-33	42	1,629	39:1							N		
East Boot 82-34	47	93	2:1	8.2	0.9	282	84		Y	Y		
Egg 82-147	106			1.2					N	N		
Farquhar 19-23	63	353	6:1	3.0	1.4	290	100		N	N		
Fireman's 10-226												
Fish(Scott) 70-69	171	660	4:1	8.5	4.4	2,468	43		Y	Y		Centrachid
Fish (Wash) 82-64	72	683	9.5:1	3.0	1.5	360	100		N	N		
Forest 82-159	2,249	4,285	2:1	11.5	3.4	24,986	68	14	Y	Y		
French 27-127	352											
Gaystock 10-31	105			5.0			100		N	N		
George Watch 2-5	528			2.0	1.5	2,587	100		N	Y		
Goggins 82-77	11						100			N		
Golden 2-45	57	7,680	135:1	7.3	2.5	463	90	1	Y	Y	1.5	
Goose(Wac)10-89	407	1,100	27:1	3.0	1.5	2,035	100		N	C		Natural Environment
Half Breed 82-80	75	303	4:1	10.4	1.7	420	67	0	Y	N		
Hay 82-65	33			6.1						N		
Hazeltine 10-14	236			2.0			100		N	N		
Highland 2-79	22			1.0			100		N	N		

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
Hydes 10-88	215	430	2:1	5.5	3.0	2,150	88		Y	Y		
Jellum's 82-0052-02	72	333	4.6:1	4.9	2.4	569	100		N	N		
Keller (Brn)19-25	60			2.5	1.5	300	100		N	N		
Kingsley 19-30	44	193	4:1	4.0			100		N	N	1.7	
La 82-97	35			3.5			100		N	N	1.3	
Lac Lavon19-446	69	306	4:1	9.8			26		Y	N	2.3	Stocked w/Trout - Fishing Pier
Laddie 2-72	73	542	7.5:1	1.5	1.0	228	100		N	N		
Lee 19-29	25	324	13:1	5.2			100		N	N	1.0	
Lily 82-23	52			17.4			73		Y	Y		Centrachid - Fishing Pier
Little Carnelian 82-14	162	565	3.5:1	21.3	10.7	5,686			Y	N	1.7	
Little Johanna 62-58	18			6.7			67		N	N		
Long(Carv) 10-16	56			2.0								
Long (May)82-30	88			3.7			100		N	Y		
Long(Still) 82-21	71			6.7			96		N	N		
Long (Wash) 82-68	35	381	11:1	2.1	1.1	126	100		N	N		
Loon 82-15	64	407	6.4:1	4.9	2.4	206	100		N	N		
Louise 82-25	48	616	13:1	3.7	1.8	283	100		N	N		
Maple Marsh 82-38	38	148	4:1	3.4	1.7	212	100		N	N		
Marcott(2) 19-41	30			7.9			90		Y	N		Rearing
Maria 10-58	169			1.0			100		Y	N		
Marion 19-26	560			6.4			81		Y	Y		
Markgrafs 82-89	46	413	10:1	2.4			100		N	N	2.6	Rearing

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
Markley 70-21	27			3.7			100		N	N		
Marshan 2-7	230			1.4			100		N	C		
McDonald 82-10	36	424	12:1	3.7			100		N	N		
McKusick 82-20	46			4.7			100		N	N	1.6	
Miller 10-29	145	16,701	115:1	4.3	3.1	1,479	100		N	N		
Mud 82-26	62	899	15:1	2.1	1.1	224	100		N	N		
North Twin 82-18	69	187	3:1	1.8	0.9	207	100		N	N		
Northwood 27-627	15	1,341	89:1	1.5	0.8	41	100		N	N		
Oak 10-93	339			3.4			100		N	N		
Oneka 82-140	381			2.1	1.2	1,524	100		N	N		Wildlife
Orchard 19-31	250	2,012	8:1	10.0	3.0	2,500	75		Y	Y		Centrachid
Parkers 27-107	97	950	10:1	11.3	3.7	1,164	70		Y	Y		
Peltier 2-4	174	68,082	391:1	4.9	2.1	3,255	100		N	Y		Gamefish
Pike(ramsy)62-69	35			4.9	2.1	252	100		N	N		Gamefish
Pike (scott) 70-76	57	1,991	35:1	2.7			100		N	N		
Pine Tree 82-122	174			7.9	3.0	1,740	91		Y	N		Centrachid
Pomerleau 27-100	35	1,140	33:1	7.9	2.7	450	50		Y	N		
Powers 82-92	57	1,238	22:1	12.5			57	2	Y	N	1.8	Centrachid
Prior(lower)70-26	827	19,560	24:1	18.3	4.1	11,120	46	1	Y	Y		Centrachid
Prior(upper)70-72	340	16,460	48:1	15.2	3.1	3,460	93	2	Y	Y		Centrachid
Region Prk 82-86	16	600	38:1	5.8			100		N	N		
Reitz 10-52	79	3,711	47:1	11.0	4.0	1,027	58		Y	Y		

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
Reshanau 2-9	336			4.9	3.2	3,535	100		N	Y		
Rutz 10-80	61			4.0			100		N	N		
Schmidt 27-102	47	190	4:1	9.1			92		Y	N		
Schutz 10-18	105	943	9:1	15.0	6.0	2,100	27	3	Y	N		Centrarchid/Lm Bass
Seidl 19-95	14	415	30:1	5.0			100	5	N	N		Rearing
Shields 82-162	27			8.2			85		Y	N	0.8	
Silver 82-16	98	455	4.6:1	3.4	1.7	549	100		N	N		
Simley 19-37	15	472	31:1	5.0	2.4	170	100		N	N		Children Fishing
South Rice 27-	3.2	63	20:1	1.5	0.5	5.4	100		N	N		
South Twin 82-19	54	63	1.2:1	4.0	2.0	356	100		N	N		
SpringAnoka Co.) 2-71	60			5.5			97		N	N		
Spring (Scott)70-54	630	13,500	21:1	11.3	5.6	11,500	50	2	Y	Y	5.0	
Square 82-46	193	782	4:1	20.7	9.0	5,694	65	5	Y	Y	2.2	Stocked w/Trout
Staples 82-28	24	127	5.3:1	4.3	2.1	165	100		N	N		
Success 27-??									N	N		
Sullivan 2-80	19	480	25:1	2.1	1.0	57	100	2	N	N		
Sunnybrook 82-133	16	666	42:1	6.1	2.0	104			Y	N		
Sunset 82-153	124			5.2			100		N	N	2.3	Gamefish
Sunset Pnd19-364	60			2.1			100		N	N	1.9	
Sweeney 27-35	66	2,400	36:1	5.2	3.6	790	52		Y	N		Panfish
Tamarack 10-10	24			25.0			82					
Turtle 82-36	44	699	16:1	2.4	1.2	172	100		N	N		

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
Twin(Bnsv)19-28	11											
Valentine 62-71	60			4.0	1.5	300	100		N			
Valley 19-348	15			3.2			100		N	N		
Virginia 10-18	110	772	7:1	10.4	3.3	1,210	88	4	Y	Y		Centrarchid/Lm Bass
Waconia 10-59	3,000	7,880	4:1	11.3	4.0	38,632	53		Y	Y	6.8	Centrachid
West Boot 82-44	49	209	4:1	11.9	5.9	946	56		Y	Y		
Westwood 27-711	41			2.0			100		N	N		
Wilmes 82-90	41	2,247	55:1	5.5						Y	1.3	
Winkler 10-66	129	2,758	21:1									
Wood(Brns)19-24	9	157	17:1	4.5			100	1	N	N		Panfish

APPENDIX B
2001 Volunteer Lake Monitors

WMO/WD/City	Lake	DNR #	Volunteer
Anoka Co. SWCD	Cenaiko	2-654	Anoka Co. SWCD
	Highland	2-79	Anoka Co. SWCD
Apple Valley	Alimagnet	19-21	John Ritter
	Farquhar	19-23	Bill Sherry
Bassett Creek	Northwood	27-627	Steve Bur
	Parkers	27-107	Bob Videen
	South Rice	27-	Streff Family
	Sweeney (North)	27-35	Dave Hanson
	Sweeney (South)	27-35	Dave Hanson
	Westwood	27-711	Westwood Hills Nature Center
Black Dog	Crystal	19-27	Arnett Family
	Deeg	19-	Vernon Peterson
	Earley	19-33	Tom Joseph
	Keller	19-25	Glen Gramse
	Kingsley	19-30	Green Family
	Lac Lavon	19-449	Wally Shaver
	Lee	19-29	Billy Cooper
	Orchard	19-31	Tom/Dorthy Goodwin
	Sunset Pond	19-	Henzler Family
	Twin (Burnsv)	19-28	Paul Pirkl
	Wood	19-24	Don Wechsler
Browns Creek	Goggins	82-77	Washington Co. SWCD
	Kismet	82-333	Washington Co. SWCD
	Long (Stillwater)	82-21	Washington Co. SWCD
Carnelian-Marine	Barker	82-76	Washington Co. SWCD
	Bass	82-35	Washington Co. SWCD
	Big Carnelian	82-49	Washington Co. SWCD
	Big Marine	82-52	Washington Co. SWCD
	Carol	82-17	Washington Co. SWCD
	East Boot	82-34	Washington Co. SWCD
	Fish	82-64	Washington Co. SWCD
	Jellum's	82-0052-02	Washington Co. SWCD
	Little Carnelian	82-14	Washington Co. SWCD
	Long	82-68	Washington Co. SWCD
	Loon	82-15	Washington Co. SWCD
	Louise	82-25	Washington Co. SWCD
	Maple Marsh	82-38	Washington Co. SWCD
	Mud	82-26	Washington Co. SWCD
	North Twin	82-18	Washington Co. SWCD
	Silver	82-16	Washington Co. SWCD
	South Twin	82-19	Washington Co. SWCD
	Staples	82-28	Washington Co. SWCD
	Turtle	82-36	Washington Co. SWCD
	West Boot	82-44	Washington Co. SWCD

WMO/WD/City	Lake	DNR #	Volunteer
Carver Co.	Bavaria	10-19	John Ryski
Cont.	Benton	10-69	Carver Co. Env. Services
	Burandt	10-84	Paul Brown
	Courthouse	10-5	Carver Co. Env. Services
	Eagle	10-121	Carver Co. Env. Services
	Fireman's	10-226	Carver Co. Env. Services
	Gaystock	10-31	Carver Co. Env. Services
	Goose (Waconia)	10-89	Larry Johnson
	Hazeltine	10-14	Carver Co. Env. Services
	Hydes	10-88	Rose Bastian
	Long (Carver)	10-16	Phillip Solseng
	Maria	10-58	Carver Co. Env. Services
	Miller	10-29	Carver Co. Env. Services
	Oak	10-93	Carver Co. Env. Services
	Reitz	10-52	Lil Heiland
	Rutz	10-80	Carver Co. Env. Services
	Waconia	10-59	Carver Co. Env. Services
	Winkler	10-66	Jim Walter
Comfort Lk-Forest Lk	Big Comfort	13-53	Washington Co. SWCD
	Halfbreed (Sylvan)	82-80	Washington Co. SWCD
	Forest-West	82-159	Washington Co. SWCD
	Shields	82-162	Washington Co. SWCD
Elm Creek	French	27-127	Dick and Jean Reierson
Inver Grove Hts	Marcott Site-2	19-41	Cindy/Wes Rogers
	Seidl	19-95	Harvey/Judy Bartz
	Simley	19-37	Arlene Peterson
Lakeville	Marion	19-26	Susan Martin and Barry Pogatchink
	Valley	19-348	City of Lakevile
Lower St. Croix Valley	Cloverdale	82-9	Kevin Bjork
(formerly Valley Branch)	Downs	82-110	Wesley Sly Family
	McDonald	82-10	Paul Bishoff
	Sunnybrook	82-133	Candice Kraemer
Marine/St.Crx	Hay	82-65	Washington Co. SWCD
	Long (May)	82-30	Washington Co. SWCD
	Square	82-46	Washington Co. SWCD
Middle St. Croix	McKusick	82-20	Washington Co. SWCD
Prior Lake	Markley	70-21	City of Prior Lake
Prior Lake-Spring Lake	Fish	70-69	Charles Robins
	Pike	70-76	Dave/Mona Hanson
	Prior (Lower s-1)	70-26-01	Madison Groves
	Prior (Lower s-2)	70-26-02	Madison Groves
	Prior (Upper)	70-72	Madison Groves
	Spring	70-54	Bob Palmby

WMO/WD/City	Lake	DNR #	Volunteer
Rice Creek	Centerville	2-6	Patricia Scott
	Clear	82-163	Joel Buys
	Egg	82-147	Roger Aiken/Chuck Johnson
	George Watch	2-5	Wargo Nature Center
	Golden	2-45	City of Circle Pines
	Little Johanna	62-58	Ryan Opdahl
	Marshan	2-7	J.P.Houchins
	Oneka	82-140	Bruce Bernin
	Peltier	2-4	Wayne LeBlanc
	Pike	62-69	Philip Goodrich
	Pine Tree	82-122	Gene Berwald
	Reshanau	2-9	Debra Gutzman
	Spring	2-71	Dorothee Dietrich
	Sunset	82-153	Diane/Bob Coderre
	Valentine	62-71	Bob Kistler/Nathan Bro
Shingle Creek	Bass	27-98	Walt Richards
	Cedar Island	27-119	Steve Lane
	Crystal	27-34	Jeff Radenmacher
	Pomerleau	27-100	John Engstrom
	Schmidt	27-102	Dale Wahlstrom
Six Cities	Laddie	2-72	City of Blaine
	Sullivan	2-80	City of Columbia Hts.
South Washington	Armstrong	82-116	Washington Co. SWCD
	Regional Park	82-86	City of Cottage Grove
Stillwater	Lily	82-23	Washington Co. SWCD
Victoria	Schutz	10-18	Lance Fisher
	Tamarak	10-10	Mike Shouldice
	Virginia	10-15	Renay Leone
Woodbury	Colby	82-94	Beth and Claire Hvass
	La	82-97	Dortha/Ken Mahle
	Marksgraf	82-89	Terry Riley
	Powers	82-92	Dan Cederstrom
	Wilmes	82-90	Bill Aamadt

APPENDIX C

LAKES SAMPLED BY THE METROPOLITAN COUNCIL, 1980-2001

APPENDIX C

Lakes Sampled either by Metropolitan Council or Volunteer Programs, 1980 - 2001

(Numbers indicate sampling visits per year, while ^{v} denotes volunteer monitoring)

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Alimagnet	19-21																^{v}12	^{v}10	^{v}10	^{v}10	^{v}10	^{v}10	^{v}8	^{v}8
Ann	10-12						5				13													
Armstrong	82-116 -02																			^{v}15	^{v}10	^{v}13	^{v}14	^{v}14
Assumption	10-63																				^{v}1			
Auburn-East	10-44				10																			
Auburn-West	10-44				10			17	18				12			13								
Aue	10-28																				^{v}1			
Bald Eagle	62-2	4	5		5																			
Barnes	10-109																				^{v}1			
Barker	82-96																					^{v}5	^{v}5	^{v}5
Bass	27-98	4														^{v}16			^{v}15		^{v}15		^{v}13	^{v}13
Bass (Washington Co.)	82-35																					^{v}14	^{v}5	^{v}5
Battle Creek	82-91														^{v}14	^{v}13	^{v}11	^{v}13						
Bavaria	10-19				5			17	18							13		^{v}11	^{v}12	^{v}15	^{v}12	^{v}14	^{v}14	^{v}14
Benton	10-69																				^{v}13	^{v}14	^{v}14	^{v}14
Benz	82-120																			^{v}8				
Berliner	10-103																				^{v}1			
Big Carnelian	82-49					5					13					13			13			^{v}14	^{v}7	^{v}7
Big Comfort	13-53																			^{v}3		^{v}14	^{v}14	^{v}14
Big Marine	82-52	4	5			5					13					13			13			^{v}14	^{v}7	^{v}7

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Birch	62-24	2																						
Bluebill Bay	19-449																		v8					
Bone	82-54					5					13				v7		v14		v14	v14	v14		v14	v14
Brand	10-110																				v1			
Braunworth	10-107																				v1			
Bryant	27-67	2	5	16		5					13	13	12											
Burandt	10-84																				v7	v13	v9	v9
Bush	27-47					5									13	13					13		13	13
Byllesby	19-6														v14	v14	v13							
Calhoun	27-31		5			5																		
Campbell	10-127																				v2	v14		
Carol	82-17																					v5	v5	v5
Carver	82-166									20					v15	v15	v16	v9						
Cedar (Minneapolis)	27-39					5																		
Cedar (Helena TWP)	70-91	4	5			5						13			14					13			13	13
Cedar Island	27-119																v13						v13	v13
Cenaiko	2-654																		v12	v11	v13	v11	v13	v13
Centerville	2-6	4	5		5																	13	13/v4	13/v4
Charley	62-62						5																	
Christmas	27-137	4	5				5												13	13	13			
Chub	19-20	2													v14	v14	v11							
Clear (Forest Lake)	82-163	4				5						13			v11	v12	v12	v11	v10	v11	v10	v9	v12	v12

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Cleary	70-22					5																		
Cloverdale	82-9																						v10	v10
Colby	82-94															v13	v14	v13	v13	v12	v12	v9	v10	v10
Comfort	13-53																		v3					
Coon	2-42	4				5										13			13					
Courthouse (Chaska)	10-5																	v2	v14	v13	v13	v14	v14	v14
Cowley	27-169																	v12						
Crane	27-734														v9									
Crooked	2-84				5						13				v15	v15	v14	v14	v12	v14	v14			
Crystal (Burnsville)	19-27	2			5						13					13	13	13	13	13	v12	v10	v14	v14
Crystal (Robbinsdale)	27-34							17	19	19						v15			v11				v8	v8
Crystal (Spring Lake)	70-61																		v12		v11			
Cynthia	70-52	2																						
Dan Patch	70-16																		v15					
Deeg	19-																						v12	v12
Deep	62-18						5																	
DeMontreville	82-101	4				5							12		v15		14					13		
Diamond (Dayton)	27-125	2														v13								
Downs	82-110																				v14		v9	v9
Dutch	27-181					5																		
Eagle (Maple Grove)	27-111-01	4			5			17	18				11		v15			v14	v14	v14		v6		
Eagle (Young America)	10-121	4	5				5											12		v15	v14	v14	v12	v12

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Eagle Point	82-109			2											v14									
Earley	19-33															v10	v11	v9	v10	v10	v9	v8	v6	v6
East Boot	82-34																					v14	v14	v14
East Twin	2-133	2	5		5						13						13			13				
Egg	82-147																						v3	v3
Elmo	82-106	4	5	16		5				19			12			v11								
Farquhar	19-23	4														v15	v16	v14	v15		v15	v13	v11	v11
Fireman's	10-226																						v12	v12
Fish (Eagan)	19-57										13													
Fish (Maple Grove)	27-118	4	5	16			5					13												
Fish (Scott County)	70-69	4				5						13					13		v2	v13	v8	v12	v9	v9
Fish (Washington Co.)	82-64																					v5	v14	v14
Forest - East (3)	82-159	4				5						13			v7			v12						
Forest - Middle (2)	82-159					5						13			v7			v12						
Forest - West (1)	82-159					5						13			v7			v12	v14	v15	v14	v14	v14	v14
French	21-127																						v11	v11
Gables	82-82																			v8	v5			
Gaystock	10-31																				v2	v14	v14	v14
George	2-91	4	5	16		5					13					13				13				
George Watch	2-5																	v14	v12	v11	v11	v6	v7	v7
Gervais	62-7						5																	
Goggins	82-77																				v13	v14	v14	v14

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Golden	2-45	2											12		14			v13	v11	v15	v13	v13	v12	v12
Goose (Lakev.)	19-360																v13	v13						
Goose (New Scandia)	82-59															v15	v15	v13	v13	v15				
Goose (Waconia)	10-89																v9	v7	v15	v15	v14	v11	v14	v14
Grass	27-681																		v12					
Hafften	27-0199																					13	13	13
Half Breed (Sylvan)	82-80														v7			v14		v15	v14	v14	v14	v14
Ham	2-53					5									v15	v13		v13	v9	v14				
Harriet	27-16					5																		
Hay	82-65																			v14	v13	v14	v14	v14
Hazeltine	10-14																				v1	v14	v14	v14
Henry	27-175																v10							
Highland	2-79																				v13	v11	v13	v13
Holland	19-65				10	16	15			20					13						13			
Horseshoe (Wash. Co.)	82-74																				v1			
Horseshoe (Dakota Co.)	19-32																v11	v10						
Hydes	10-88						5						12		13			12			v11	v4	v9	v9
Independence	27-176	4	5		5							13			v14	v15								
Isabelle	19-4															v14								
Island (Linwood)	2-22				7																			
Jane	82-104					5		17	18				12			v12						13		
Jellum's	82-0052-02																					v14	v14	v14

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Johanna	62-78		5				5				13													
Josephine	62-57						5				13													
Jubert	27-165																					v11		
Keller (Burnsville)	19-25																	13	13	v13	v15	v14	v12	v12
Keller (Maplewood)	62-10						5																	
Kingsley	19-30														5		v11	v10	v9			v14	v14	v14
Kismet	82-333																			v14	v13	v14	v14	v14
Kohlman	62-6						5																	
La	82-97															v13	v11	v13	v11	v10	v10	v8	v6	v6
Lac Lavon	19-446																		v11	v10	v10	v9	v2	v2
Laddie	2-72	4													v13	v14	v12					v13	v13	v13
Lake of the Isles	27-40					5																		
Langdon	27-182					5																		
Lee	19-29															v14	v15	v14	v13			v12	v13	v13
Lily	82-23																v15	v14	v14	v15	v13	v14	v14	v14
Linwood	2-26	4	5		7						13					13			13					
Lippert	10-104																				v1			
Little Carnelian	82-14																					v14	v7	v7
Little Johanna	62-58																						v12	v12
Little Long	27-179-02	4				5						13								13			13	13
Long (Apple Valley)	19-22																		v16					
Long (Carver Co.)	10-16																				v2		v13	v13

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Long (May Twnsp)	82-30														v14	v14	v14	v13	v14		v14	v14	v14	v14
Long N (New Brighton)	62-67						5																	
Long S (New Brighton)	62-67						5																	
Long (Orono)	27-160				5																			
Long (Pine Springs)	82-118														v14									
Long (Stillwater)	82-21																v14	v7		v14	v13	v14	v14	v14
Long (Washington Co.)	82-68																					v5	v14	v14
Loon	82-15																					v14	v14	v14
Lost	27-103														v13									
Lotus	10-6						5					13									13	13		
Louise	82-25																					v5	v5	v5
Lucy	10-7						5																	
Magda	27-65																				v14	v13	v13	v13
Maple Marsh	82-38																					v5	v5	v5
Marcott (site 1)	19-263																v15							
Marcott (site 2)	19-41																v15	v13	v10	v10	v12	v10	v6	v6
Maria	10-58																				v2	v14	v14	v14
Marion (Lakeville)	19-26	2	5		5						13					v15					v15	v14	v13	v13
Markgrafs	82-89															v15	v11	v12	v10	v15	v10	v10	v9	v9
Markley	70-21																		v11	v13	v12	v14	v13	v13
Marsh	10-54																				v1			
Marshan	2-7																	v10	v13	v10	v9	v8	v7	v7

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Martin	2-34				7															13				
McCarrons	62-54					12	20	17	18	19	13	13	12		14	13	16	13			18	13	13	13
McDonald	82-10																				v11		v14	v14
McDonough	19-76-						5														13			
McKusick	82-20															v14	v14	v14	v14	v14	v13	v14	v14	v14
McMahon (Carls)	70-50	2				5											13			13			13	13
Meadow	27-57																	v12			v12			
Medicine	27-104	4	5		10							13	12											
Mergen's	82-482																					v10		
Meuwissen	10-70																				v1			
Miller	10-29																	v6	v13		v12	v14	v13	v13
Minnetonka (Lower)	27-133	4	5																					
Minnetonka (Upper)	27-133	2	5																					
Minnewashta	10-9					5						13			13				13	13	13			
Mitchell	27-70																13				13	13		
Mooney	27-134														v14	v10								
Moore	2-75																				v14			
Mud	82-26																					v5	v5	v5
Myers	10-68																				v1			
Nokomis	27-19	4				5																		
North Twin	82-18																					v5	v5	v5
Northwood	27-627																					v12	v10	v10

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Oak	10-93																				v2		v14	v14
O'Dowd	70-95					5										13			13			13		
Olson	82-103												12		v15		14					13		
Oneka	82-140																				v13	v11	v11	v11
Orchard	19-31	4	5		5						13				13					13	v15	v13	v13	v13
Otter	2-3	2			5																			
Owasso	62-56	4			5																			
Parkers	27-107	4										13					13				13	v12		
Parley	10-42					5		17	18				12					12			13		13	13
Patterson	10-86																				v2			
Peltier	2-4				5										v14	v16	v15	v14	v14	v13	v13	v14	v13	v13
Phalen	62-13	4	5				5																	
Pickerel	2-103	2															13							
Pierson	10-53	2	5		5						13						13						13	13
Pike (Maple Grove)	27-111-02																	v14	v15	v13		v13		
Pike (Ramsey Co.)	62-69																				v14	v10	v14	v14
Pike (Scott Co.)	70-76																		v9		v10	v9	v9	v9
Pine Tree	82-122						5								v14	v14	v16	v14	v15	v15	v13	v14	v9	v9
Pleasant (New Prague)	70-98														13									
Pleasant (North Oaks)	62-46						5																	
Pomerleau	27-100																	v9			v10		v6	v6
Powers	82-92															v12	v13	v13	v12	v9	v10	v8	v5	v5

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Prior (Lower) [Site-1]	70-26-1					5						13						13	v15	v14	v13	v9	v14	v14
Prior (Lower) [Site-2]	70-26-2																			v14	v13	v9	v14	v14
Prior (Upper)	70-72	4	5			5						13						13	v15	v14	v13	v9	v14	v14
Raven	19-369																v13	v6	v8					
Rebecca	27-192				10	12	12																	
Red Rock	27-76																				12	13		
Regional Park	82-86																			v12	v14	v12	v13	v13
Reitz	10-52						5						12		13						v15	v13	v7	v7
Reshanau	2-9	2																			v7	v1	v6	v6
Rice	10-78	2																			v1			
Riley	10-2	2	5	16			5	17	18			13	12		13				13			13		
Rutz	10-89																				v1	v14	v14	v14
Ryan	27-58																	v14		v5		v9		
Sand (New Scandia)	82-67														v7	v14	v14	v13						
Sarah	27-191	4			5																			
Scheuble	10-85																				v1			
Schmidt (Smith)	27-102																v14			v12		v12	v9	v9
Schultz	19-75					5	5														13			
Schutz	10-18					5																v6	v10	v10
Seidl	19-95																v15	v14	v14	v15	v16	v14	v14	v14
Shields	82-162														v6	v14	v14	v13	v13	v14	v14	v14	v14	v14
Silver	82-16																					v14	v5	v5

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Simley	19-37																v10	v16	v14	v15	v16	v14	v12	v12
Snail	62-73	4					5																	
South Rice	27-???																					v9	v14	v14
South School Section	82-151																v14	v7		v14				
South Twin	82-19																					v5	v5	v5
Spring (Anoka Co.)	2-71																						v11	v11
Spring (Prior Lake)	70-54	4	5	16		5						13						13	v12			v6	v11	v11
Square	82-46	4	5	16	6	7	7				13				v11	v14	v14	v13	v14	19	v14	v14	v15	v15
Staring	27-78	4					5										13				13		13	13
Staples	82-28																					v14	v5	v5
Steiger	10-45					12					13						13							
Success	27-																	v10						
Sucker	62-28						5																	
Sullivan	2-80														v14	v14	v15		v15	v14	v13	v11	v11	v11
Sunfish	82-107																					v10		
Sunnybrook	82-133																				v14		v13	v13
Sunset	82-153					5									v14	v14	v12	v13	v16	v12	v10	v13	v13	v13
Sunset Pond	19-???															v14	v14	v14	v12	v10		v13	v11	v11
Swan	10-82																				v1			
Swede	10-95	2																13					13	13
Sweeney (North) [Site-2]	27-35																					v11	v9	v9
Sweeney (South) [Site-1]	27-35																					v11	v9	v9

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Tamarack	10-10																						v10	v10
Tanners	82-115	2								20					v14	v13	v12	v14						
Thole	70-120					5										13			13			13		
Thomas	19-67	2																						
Tiger	10-108																				v1			
Turtle	62-61	4	5		5																			
Turtle (Washington Co.)	82-36																					v5	v5	v5
Twin (Burnsville)	19-28																				v6		v13	v13
Twin-Lower (Robbinsd.)	27-42-01												12		v14			13		v5		13		
Twin-Middle (Crystal)	27-42-02						5						12					13	v11		v13	13		
Twin-Upper (Br. Center)	27-42-03												12		v14			11		v15		v11		
Twin-South (May Twnsp)	82-48																		v13	v13				
Vadnais	62-38						5																	
Valentine	62-71																						v14	v14
Valley	19-348																v15	v14	v11		v8	v14	v14	v14
Virginia	10-15																					v11	v12	v12
Wabasso	62-82	4	5		5						12													
Waconia	10-59	4	5				5					13				v16	v13	v15	v17	v15	v14	v14	v14	v14
Wasserman	10-48				5			17	18							13			13	13	13			
Weaver	27-117				5			17	18															
West Boot	82-44																					v14	v14	v14
West Lakeland	82-488																					v2		

LAKE	ID #	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02
Westwood	27-711														v13							v15	v14	v14
Whaletail	27-184-02	4				5														13			13	13
White Bear	82-167	4	5			5																		
Wilmes	82-90															v14	v15	v14	v15	v15	v14	v13	v13	v13
Winkler	10-66																				v8	v6	v6	v6
Wolsfeld	27-157	4																						
Wood (Burnsville)	19-24																	v10	v14	v15	v15	v14	v13	v13
Young America	10-105																				v1			
Zumbra	10-41					5						13												

Metropolitan Council Lake Report Questionnaire

1. The Council publishes a lake water quality report annually.

   - Are you familiar with the report? yes no
   - Have you used any of the data? yes no
   - Describe how you have used report findings.

2. These questions pertain to the content of the Lake Report.

   - What types of information from the report do you find most useful?

   - What portions of the report should be reduced, removed or are not useful?

   - What types of new data should be included in the report? Why?

   - Is the information in the report explained fully? Is it easy to understand?

   - Are the charts and graphs easy to understand?

   - Does the format add to understanding the information?

   - Other suggestions pertaining to writing, format design and graphics:

3. How often should the report be published? less frequently more frequently annually

4. Demographics of report users

   - Please circle occupation/employer

   City County State

   Government Official Government Staff Other (please specify)

Thank you for your help. Please return to:

Metropolitan Council
c/o Randy Anhorn
2400 Childs Road
St. Paul, MN 55106