

# MAT-SU BOROUGH LAKE MONITORING PROGRAM

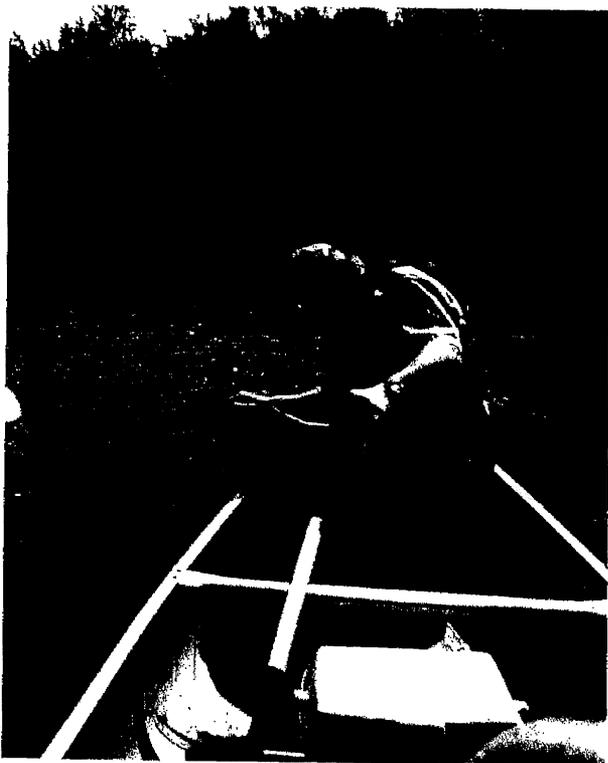
## FY 2003 ANNUAL REPORT

(July 1, 2002 - June 30, 2003)

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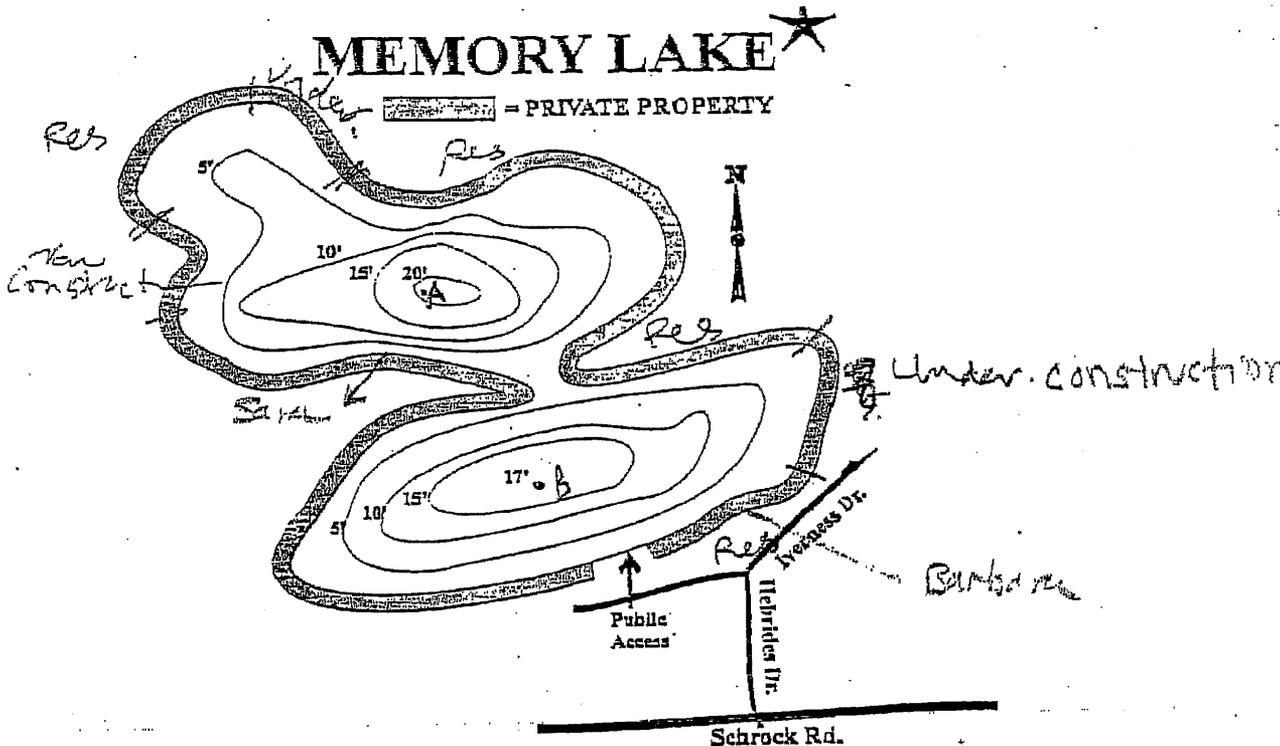
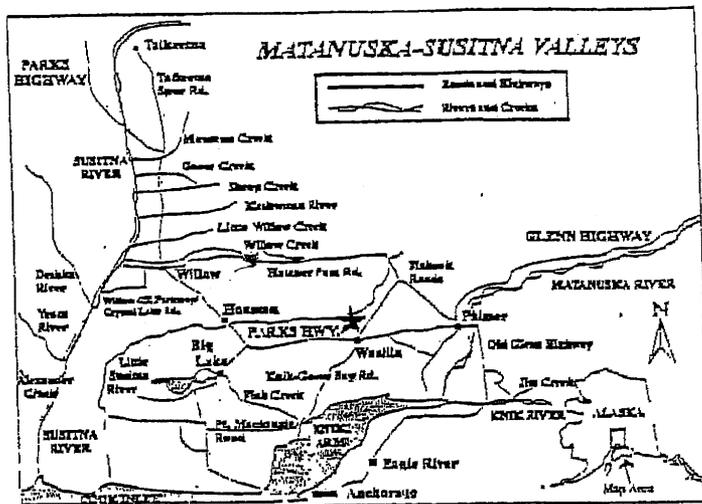
**Recording Secchi Disk readings  
Dandy Lake, June 2003**

**Submitted to:** Alaska Department of Environmental Conservation  
Division of Air and Water Quality  
555 Cordova Street  
Anchorage Alaska 99645

**Submitted by:** Matanuska-Susitna Borough  
Department of Planning and Land Use  
Division of Water and Air Quality  
350 East Dahlia  
Palmer, Alaska 99645  
907-746-7441

# MATANUSKA-SUSITNA VALLEYS STOCKED LAKES SERIES

State of Alaska  
 Department of Fish and Game  
 Sport Fish Division  
 1800 Glenn Hwy #4  
 Palmer, AK 99645  
 (907) 746 - 6300



U.S.G.S. Map Ref.	Anch. C-7, T18N, R1W, S22,23,26,27	Geographic Location	61°37'45"N, 149°25'15"W
Elevation	470'	Surface Acres	84
Volume	607 Acre Ft.	Maximum Depth	20'
Mean Depth	7.2'	Shoreline Length	2.2 Miles
Surveyed	1972 ADFG	Year 1st Stocked	1976
Game Fish Present	Rainbow Trout, Landlocked Silver Salmon		

**MEMORY LAKE PUBLIC ACCESS:** Mile 42.3 Parks Hwy. North on Wasilla Fishhook Rd. 3 miles to Schrock Rd. Left on Schrock Rd. 1.1 miles to Hebrides Rd. Right on Hebrides Rd. 0.2 mile to Iverness Drive. Left on Iverness Drive 0.1 mile. Public access is on the right with parking and undeveloped boat launch. **NOTE:** Limited public access. Majority of lake shoreline is privately owned. Please respect private property.

## INTRODUCTION

### BACKGROUND

The Mat-Su Borough Volunteer Lake Monitoring Program completed its third complete sampling season in the fall of 2002. This report includes data from the summer of 2002, and up to June 30, 2003. Prior data is available in previous annual reports, or by contacting the Mat-Su Borough (MSB) or the Alaska Department of Environmental Conservation (ADEC). Since 1998, the Borough has received five consecutive ACWA NPS Water Quality Grants that have funded the development of the lake monitoring protocols and quality assurance documents, the initiation of monitoring, public outreach, and program development. *Appendix A* outlines the management of the monitoring program.

### PROGRAM GOALS

The main goal of the lake monitoring program is to utilize volunteers to collect baseline water quality information on lakes within the Borough. The Borough and other interested agencies obtain data in a cost effective manner on numerous lakes, and the volunteers gain knowledge about the lakes they live on, and management tips to maintain water quality. Another program goal is to provide public outreach about watershed integrity, pollution prevention, and watershed best management practices; we address this via volunteer contact and supplemental school and community programs.

### PROGRAM SUMMARY

For the past several years, volunteers have monitored 15-25 lakes per season. Our current goal is to monitor 25 lakes per season and increase that number gradually over the next few years. Monitoring includes monthly lake profiles for temperature, conductivity, dissolved oxygen and pH, as well as Secchi disk measurements to assess water clarity. The lake profile information is used to determine the physical characteristics of the lake and note its depth, stratification patterns, and unusual lake data that would alert us to pollution problems.

The Secchi clarity, total phosphate and chlorophyll *a* data collectively yield information on the trophic status of the lake. This monthly information constitutes what we now call Level II monitoring. In 2003, we added Level I monitoring. This involves selecting a sample site and obtaining data on Secchi clarity twice a month. Some volunteers are interested in their lakes but cannot commit to the Level II monitoring. Water clarity information from Secchi readings can be valuable as stand alone data, but our hope is that most Level I volunteers will progress to Level II in subsequent seasons. Level I volunteers were trained in May 2003, but no data is presented in this report as the monitors began on-site monitoring after June 30<sup>th</sup>.

## AWCA GRANT WORK TASKS

The FY 2003 ACWA grant work plan outlined ten tasks for the grant year. Prior quarterly reports detailed progress on those tasks. The quarter four report is in *Appendix B*. These comments are brief as this report summarizes much of the same information. All deliverables required for the work tasks for the grant year have been provided in the first three reports or are included in this final report.

## SAMPLE DESIGN AND METHODOLOGIES

### SAMPLE SITES

The volunteers and the Water Quality Coordinator (WQC) select sites. The deepest spot within the lake is determined using the Secchi disk, depth finder, weighted rope, or bathymetric map. Starting in 2003, all established and new sites will be recorded using GPS coordinates. Some lakes have more than one site because of the size or morphometry of the lake. Selecting the deepest spot on the lake provides the most information about all depths of the water column and in many lakes approximates the middle of the lake. Bathymetric maps and/or site maps for most lakes are in *Appendix H*, as well as GPS site coordinates. The same sample site is used each season unless the WQC has a reason to change it.

### SAMPLE FREQUENCY

Our program protocols are for monthly monitoring, and twice a month for Level I monitors. As with any volunteer program, sample frequency objectives are not always met, but we are gradually building a set of lakes that have consistent monthly data. Starting in 2002, we have encouraged volunteers to collect grab samples for total phosphate and chlorophyll *a* whenever they do a lake profile; prior protocols were to collect grab samples in Spring and Fall. We will continue to assess sample frequency for chlorophyll *a* and total phosphate in the upcoming year.

### VOLUNTEER DATA COLLECTION

Volunteers are provided with a field kit for each sampling event. This currently includes:

- Quanta electronic display and transmitter (Hydrolab/Hach Company)
- Secchi Disk
- Thermometer
- GPS unit
- Field forms and field handbook
- Van Dorn sampler (if collecting a water sample)
- Water sampling cooler, with collection bottles (if collecting a water sample)

Once on site, the monitor proceeds with sampling as outlined in "Sample Sequence" in the field handbook (*Appendix C*). Only one lake in 2002 used the *Hydrolab 2* electronic probe, an older probe we have since retired. All other lake profile measurements for 2002 and 2003 were done with the Quanta.

Volunteers complete the field forms on site (see field handbook). In addition to the Secchi clarity and lake profile information, volunteers collect data (quantitative or observational) on weather, light conditions, surface water conditions, and lake use. If water samples are collected, volunteers keep the samples in the coolers until transport to the test lab. Volunteers return the coolers with samples to the test lab within 24 hours of sampling, and sooner if possible. The original data forms are returned to the WQC and the field kits are returned or held onto for the next monitoring event.

Table 1 shows the data quality specifications for both types of electronic probes. Table 2 shows the methods for the water sampling and water clarity parameters, and the Method Detection Limit (MDL) or Method Reporting Limit (MRL) for the chlorophyll *a* and total phosphate measurements.

**TABLE 1 - HYDROLAB PROBE SPECIFICATIONS <sup>(1)</sup>**

PARAMETER (UNITS)	METHOD	RANGE	ACCURACY	RESOLUTION	CALIBRATION
Temperature (°C)	H2O Probe	-5 to -50°C	± 0.15°C	0.01°C	None required
	Quanta	-5 to -50°C	± 0.2°C	0.01°C	None Required
Specific Conductance (mS/cm)	H2O Probe	0 to 100 mS/cm	± 1% of range	4 digits	At least monthly
	Quanta	0 to 100 mS/cm	± 1% of reading ± 1 count	4 digits	At least monthly
Dissolved Oxygen (mg/L)	H2O Probe	0-20 mg/L	± 0.2mg/L	0.01 mg/L	At least monthly
	Quanta	0-20 mg/L	± 0.2mg/L	0.01 mg/L	At least monthly
pH (Standard Units)	H2O Probe	0 to 14 units	± 0.2 units	(not available)	At least monthly
	Quanta	2 to 12 units	± 0.2 units	0.01 units	At least monthly
Depth (m)	Either probe	Depends on cable length- see specifications on file at MSB for more information.			At least monthly

(1) See H2O and Quanta manuals for more specific information on all columns.

**TABLE 2 - WATER CLARITY, CHLOROPHYLL AND PHOSPHORUS METHODS**

	<b>EQUIPMENT</b>	<b>METHOD</b>	<b>MINIMUM DETECTION LIMIT (MDL) OR METHOD REPORTING LIMIT (MRL)</b>
<b>Water Clarity (m)</b>	<b>Secchi Disk</b>	<b>Visual inspection in water</b>	<b>n/a disk rope marked in tenth meter increments</b>
<b>Chlorophyll <i>a</i> (mg/m<sup>3</sup>)</b>	<b>Van Dorn Sampler and lab bottles</b>	<b>SM 10200H</b>	<b>0.1mg/m<sup>3</sup></b>
<b>Total Phosphate (mg/L)</b>	<b>Van Dorn Sampler and lab bottles</b>	<b>SM 4500-P-E</b>	<b>0.01mg/L(2002) MDL 0.025 mg/L MRL (2003)</b>

#### **DATA ENTRY AND ANALYSIS**

The Water Quality Coordinator or data entry staff compile and file the original data sheets. Data is entered into an Excel spreadsheet. Water sample data is sent to the Borough from the Mat-Su Test Lab, the lab contractor, and entered into an Excel spreadsheet by staff. The Borough is tentatively assigning a trophic status to each lake based on all of the data from 2002 and 2003, but that will require additional work beyond this grant year to complete. In addition, trophic status data for the past two sample seasons will be charted using Excel or another program so volunteers can better visualize the data for their lakes.

#### **TRAINING**

All volunteers receive new or refresher training prior to monitoring for the season. Training includes a classroom session on area lakes and watersheds, program goals, data quality objectives, and reporting methods. The WQC also reviews Quanta use and water testing methodologies. Monitors are certified at end of the training by demonstrating use of the Secchi disk, Quanta electronic probe, Van Dorn sampler and GPS unit. Level I monitors are certified in the use of the GPS and Secchi disk. Two training sessions were held in 2002, and four sessions in 2003, but on site reviews and quality control checks occur as the WQC visits lakes. Training agendas, sign-in sheets, certification records, and volunteer information forms are all on file at MSB.

## QUALITY CONTROL

### SITE SELECTION, DATA COLLECTION AND DATA ENTRY

Establishing and finding the site on the lake is up to the volunteers using a bathymetric map and/or their knowledge of the lake. In 2002, volunteers used landmarks, compass triangulation, and GPS coordinates to locate and relocate sites. In 2003, all Level II volunteers are confirming sites and recording using GPS coordinates. Volunteers record data on write-in-rain field forms, and return the original data to Borough staff. Data is entered by the WQC or other trained staff. Starting with the 2002 season, data is checked at least once for data entry errors during the sample season, and checked during the winter season for errors that may have been missed.

For the chlorophyll *a* and total phosphate tests, volunteers follow the field procedures outlined in the field kit handbook. Each lake profile and water sample is done in replicate. The chlorophyll *a* draws are put into amber bottles and taken to the Mat-Su Test Lab. There they are immediately filtered and shipped to Northern Testing Laboratories in Fairbanks. The phosphorus draws are put into plastic bottles with an acid preservative, and transported to the test lab and to Fairbanks along with the chlorophyll *a* samples. Samples are kept cold during the entire transport process. The chlorophyll *a* measurement is determined using standard method #10200H. Total phosphate is determined with standard method #4500 P.E. Quality assurance documents from the Mat-Su Test Lab and Northern Testing Labs, Inc., are available upon request.

The Water Quality Coordinator conducts on site visits with volunteers to assess sample site selection, equipment use, and other quality control concerns. Fourteen of the 23 lakes monitored during the 02-03 grant year received onsite visits, and the WQC hopes to do a quality control check on all lakes prior to the end of the 2003 sample season.

### INSTRUMENT MAINTENANCE AND CALIBRATION

The electronic probes need to be visually inspected, cleaned and calibrated at regular intervals throughout the sampling season. Hydrolab/Hach Corporation recommends calibrating according to research requirements. The WQC visually inspects each piece of equipment upon its return to the Borough, and calibrates the equipment prior to check out when possible. The dissolved oxygen membrane, circulator and pH electrolyte level are checked with each visual inspection. All of the Quantas are calibrated at least monthly, regardless of the frequency of their use, and usually more often. A complete calibration record for the 2002-03 sample seasons is on file at the Borough.

The Secchi disks and Van Dorn samplers are visually inspected prior to each checkout. This equipment is reliable and durable. At the beginning of the season, marked lines are checked to make sure the meter and tenth-meter marks are still accurate, and the Van Dorn samplers are checked for leaks or other problems.

## RESULTS

During the 2002 sample season, volunteers monitored 28 sites on 22 lakes. Fifty-seven monitoring events occurred over the course of the season. As of 6/30/03, 23 sites on 17 lakes were monitored at least once.

Figure 1 shows the lakes monitored over the FY '03 grant year. Rocky, Wolf and HiLine lakes were added in the '03 season after June 30<sup>th</sup>.

**FIGURE 1 MAT-SU BOROUGH LAKE MONITORING PROGRAM  
2002 AND 2003 MONITORED LAKES**

Big Lake	Lynn's Lake
Dandy Lake	Memory Lake Sites A & B
Finger Lake Sites A & B	Ravine Lake
Jim Lake	Scotty Lake
Kalmbach Lake	Seventeen Mile Lake
Lalen Lake	Seymour Lake
Little Question	Susitna Lake Sites A & B
Long Lake (Glenn)	Tyone Lake
Long Lake (Willow)	Weiner Lake
Lake Louise Sites A, B, C, & D	Wolverine Lake
Lake Lucille	Woody Lake
Lower Stephan	(Rocky, HiLine, Wolf)

The lake profile data for all 2002 and 2003 lakes is in *Appendices D* and *E*. Trophic status data (Secchi depth, water sample data) for 2002 and up to June 30, 2003 is in *Appendices F and G*. Table 3 shows the range of trophic status data for the 2002 sample season.

**TABLE 3 2002 VOLUNTEER TROPHIC STATUS DATA**

	<b>Chlorophyll <i>a</i></b> <b>(mg/m<sup>3</sup>)</b>	<b>Total Phosphate</b> <b>(mg/L)</b>	<b>Secchi Depth</b> <b>(m)</b>
Range of values	0.34-26	<MDL-0.08	1.1-8.6

## CONCLUSIONS

The lake profile and trophic status data collected by volunteers seems "in line" with information from limnological studies done over the past thirty years on Borough lakes. The Alaska Department of Fish and Game (ADF&G) has established trophic state boundaries for area lakes, based on a compilation from ADF&G databases.<sup>1</sup> While we are not at the point in our program of making limnological comparisons with other studies, we can provide quality volunteer data on some parameters on numerous Borough lakes. When lake profile and trophic status data is charted for individual lakes over several seasons, we will have in place a good baseline set of data available to the general public and interested agencies. We will also be able to monitor trends and detect degradation, which is particularly important on some lakes that we identify to be prone to eutrophication.

## RECOMMENDATIONS and FUTURE ACTIONS

Trophic status is often determined using a combination of Secchi disk clarity, chlorophyll *a*, and total phosphate values. We will be analyzing our 2002 and 2003 values with an end goal of assigning a trophic status to each lake. We need to increase the sensitivity of our phosphorus testing, and work on determining lake color indicators in order to improve our ability to assign a trophic status to lakes. To make the most of our monitoring funds and volunteer efforts, we will form a technical committee that will work with us on our data quality objectives and specific assessment objectives for individual lakes and their associated sub watersheds.

Since the inception of the program, Borough staff has continued to learn the "how's and why's" of lake monitoring. In the 2002 and 2003 sample seasons, we have focused on quality control from field sampling to data entry. Our next step will be to fully assess our water sampling methodologies, and revise our quality assurance documents to reflect any necessary changes. We also need to review our data objectives overall as we move into the next five years of our program, and consider statistical analyses on current and future data.

## PHOTOGRAPHS

Selected photographs are on the following pages and are provided with the electronic copy of this report.

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<sup>1</sup> An Assessment of Trophic Status of 25 lakes in the Matanuska-Susitna Borough, Alaska by J. A. Edmundson, V. P. Litchfield, and D. M. Cialek



Field Notes  
2002

Temp	Wind	Sky Cover	Precip	Wildlife	Birds	Aquatic Life	Human Presence	Residential	Vacant Disturbed	Vacant Undisturbed
60 ° F	none	cloudy	zero	motoring mallard and common golden eye, broods,	golden eye eagle, loon,	kings, fish jumping, surfacing bugs	human on property running table saw, float plane helicopter overhead	73%	2%	25%
9/17/2002	1:00 PM	Sara Larson and Barbara LaGrone	residential public access some unrestrict areas			Site A-Memard Gazabo woley's, shed 90 ° channel, Site B-reistards, woleys pls 90 ° Esters house	55-45 ° F	0-10 mph	partly cloudy	zero
Weather Now				Wildlife	Birds	Aquatic Life	Human Presence	Surrounding Land Use		
Temp	Wind	Sky Cover	Residential					Vacant Disturbed	Vacant Undisturbed	
53 ° F	5-10 mph	partly cloudy	zero	common golden eyes 30 +	see wildlife	fish being caught	1 fisherman, new boat, 2 fisherman single eng, sm planes, some yards being built	75%	2%	25%

Date	Time	Volunteers	Location	GPS Coordinates		Site	Temp	Weather in Past 24 Hours		
				Longitude (N)	Latitude (W)			Wind	Sky Cover	Precip
10/8/2002	10:30 AM	Sara Larson and Barbara LaGrone	Site A-Memard Gazabo Woleys, Site B-Reistards Worlys Pl, 90 °			Site B	33-48 ° F	0-10 mph	partly cloudy	widely scattered showers
Weather Now				Wildlife	Birds	Aquatic Life	Human Presence	Surrounding Land Use		
Temp	Wind	Sky Cover	Residential					Vacant Disturbed	Vacant Undisturbed	

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Memory Lake

Field Notes  
2002

37 ° F	n/a	ply cldy	zero	mallards, common golden eyes, gulls, magpies, chickadees	see wildlife	jumping fish	private float plane taking off, resident with catpillar	75%	2%	25%
Date	Time	Volunteers	Location	GPS Coordinates		Site	Temp	Weather in Past 24 Hours		
10/8/2002	10:30 AM	Lison	Memory	Longitude (N)	Latitude (W)	Site B	48-33 ° F	Wind	Sky Cover	Precip
Weather Now				A and B				10 mph	ply cldy	showers
Temp	Wind	Sky Cover	Precip	Wildlife	Birds	Aquatic Life	Human Presence	Surrounding Land Use		
37 ° F	n/a	ply cldy	zero	2 mallards commons golden eagles, and chickadees	see wildlife	none	one private float plane, one resident	Residential	73%	2%
								Disturbed		25%
								Undisturbed		

3 of 3

Memory Lake

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# Lake Profiles

1 of 2

Second Reading Site A 6/4/02					SECOND Reading Site A 6/4/02				
Secchi disk depth 3.5 m					Secchi disk depth 3.5 m				
Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
1 m	14.45	0.073	10.07	8.11	0 m	14.97	0.074	10.40	8.23
2 m	14.98	0.073	10.33	8.18	1 m	14.98	0.074	10.53	8.23
3 m	14.82	0.073	10.35	8.24	2 m	14.83	0.073	10.45	8.26
4 m	12.29	0.077	12.58	7.84	3 m	11.74	0.077	13.00	7.77
5 m	9.1	0.08	11.35	7.47	4 m	8.40	0.08	11.42	7.43
6 m	7.98	0.081	10.49	7.31	5 m	7.91	0.082	10.41	7.27
7 m	7.64	0.083	8.55	7.19	6 m	7.66	0.084	8.64	7.13

FIRST READING Site A 7/2/02					SECOND Reading Site A 7/2/02				
Secchi disk depth 3.3 m					Secchi disk depth 3.5 m				
Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
0 m	19.24	0.071	10.11	7.76	0 m	19.23	0.073	9.82	7.75
1 m	19.30	0.072	10.05	7.77	1 m	19.25	0.072	9.90	7.79
2 m	19.29	0.072	10.07	7.79	2 m	19.29	0.072	9.93	7.79
	19.19	0.073	9.90	7.71	3 m	19.18	0.073	9.83	7.74
	16.99	0.072	10.72	7.51	4 m	17.12	0.073	10.83	7.51
5 m	13.50	0.079	8.60	7.04	5 m	13.47	0.079	9.05	7.11
5.8 m	12.24	0.089	5.15	6.83	6 m	12.51	0.086	4.28	6.83

FIRST READING SITE A 8/6/02					SECOND Reading Site A 8/6/02				
Secchi disk depth 3.4 m					Secchi disk depth 3.4 m				
Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
0 m	20.59	0.075	9.25	7.71	0 m	20.59	0.75	8.63	7.90
1 m	20.62	0.075	9.21	7.70	1 m	20.60	0.75	8.37	7.89
2 m	20.58	0.075	9.02	7.67	2 m	20.60	0.75	8.42	7.85
3 m	19.93	0.075	9.00	7.55	3 m	20.18	0.75	8.22	7.67
4 m	18.98	0.077	6.88	6.49	4 m	18.93	0.77	6.53	7.02
5 m	17.37	0.084	2.98	6.47	5 m	17.45	0.83	2.44	6.49
5.9 m	15.87	0.124	0.28	6.53	6 m	16.47	0.093	0.42	6.25

FIRST READING Site A 108/02					FIRST READING Site A 108/02				
Secchi disk depth 5 m					Secchi Disk Depth 4.7 m				
Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units					
0 m	6.66	0.70	11.20	7.12	1 m	6.86	0.072	10.38	7.00
1 m	6.66	0.70	10.75	6.96	2 m	6.85	0.072	10.00	6.91
2 m	6.62	0.70	10.65	686.00	3 m	6.85	0.072	9.96	6.85
3 m	6.61	0.70	10.53	6.79	4 m	6.82	0.072	10.02	8.80
4 m	6.60	0.70	10.36	6.72	5 m	6.73	0.072	9.90	6.75
5 m	6.57	0.70	10.30	6.67	6 m	6.63	0.072	9.97	6.72
5.9 m	6.55	0.70	10.20	6.64	7 m	6.65	0.071	9.80	6.71

FIRST READING Site B 6/4/02					Second Reading Site B 6/4/02				
Secchi disk depth 3.5 m					Secchi disk depth 3.5 m				
Depth m	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units					
0 m	14.78	0.075	11.43	8.37	1 m	14.32	20.74	10.63	8.36
1 m	14.83	0.075	11.40	8.46	2 m	14.83	20.74	10.68	8.44
					3 m	14.79	0.074	10.73	8.44
					4 m	12.45	0.075	13.49	8.26

Memory Lake

**Lake Profiles**

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2 m	14.81	0.075	11.26	8.46	5 m	9.69	0.075	13.56	8.05
3 m	13.69	0.075	14.20	8.37	6 m	8.76	0.076	11.55	7.56
4 m	9.60	0.075	13.84	7.90	7 m	8.34	0.078	8.66	7.27
5 m	8.87	0.077	12.15	7.51					
5.9 m	8.25	0.077	9.92	7.32					
<b>FIRST READING SITE B 8/6/02</b>					<b>SECOND Reading Site B 8/6/02</b>				
<b>Secchi disk depth 2.8 m</b>					<b>Secchi disk depth 2.9 m</b>				
1 m	20.48	0.075	8.71	7.64	1 m	20.48	0.075	8.25	7.65
2 m	20.49	0.075	8.55	7.65	2 m	20.5	0.075	8.3	7.67
3 m	20.49	0.075	8.56	7.63	3 m	20.49	0.075	8.38	7.62
4 m	20.3	0.076	7.95	7.37	4 m	20.25	0.076	7.4	7.74
5 m	19.18	0.076	7.91	7.18	5 m	19.33	0.075	8.36	7.35
6 m	17.87	0.084	2.79	6.45	6 m	17.89	0.084	2.66	6.36
7 m	16.55	0.164	0.47	6.46	7 m	16.7	0.135	0.44	6.35
<b>Seond Reading Site B 7/2/02 3.9 m</b>					<b>Second Reading Site B 7/2/02 3.7 m</b>				
0 m	19.15	0.072	10.98	8.19	0 m	19.14	0.073	10.81	8.15
1 m	19.19	0.071	10.9	8.25	1 m	19.17	0.072	10.93	8.24
2 m	19.19	0.072	11	8.25	2 m	19.17	0.072	10.98	8.24
3 m	19.19	0.072	11.23	8.23	3 m	19.11	0.072	10.99	8.22
4 m	17.7	0.072	11.66	7.95	4 m	17.92	0.072	11.3	8.06
5 m	14.61	0.076	9.41	7.28	5 m	14.41	0.088	8.75	7.34
5.1 m	13.18	0.082	5.13	6.93	5.1 m	13.85	0.082	5.61	7.02
<b>FIRST READING Site B 10/8/02</b>					<b>SECOND Reading Site B 10/8/02</b>				
<b>Secchi Dick Depth 4.5m</b>					<b>Secchi disk depth 4.9 m</b>				
					<b>Depth m</b>	<b>Temperatu re ° C</b>	<b>Conductivi ty mS/cm</b>	<b>Dissolved Oxygen mg/L</b>	<b>pH standard units</b>
1 m	6.85	0.071	10.51	7.13	0 m	6.65	0.70	10.74	6.98
2 m	6.84	0.072	10.22	6.98	1 m	6.65	0.70	10.4	6.87
3 m	6.84	0.072	10.12	6.91	2 m	6.67	0.70	10.36	6.79
4 m	6.83	0.071	10.01	6.85	3 m	6.62	0.70	10.27	6.34
5 m	6.75	0.071	9.99	6.80	4 m	6.59	0.70	10.26	6.69
6 m	6.65	0.071	9.98	6.76	5 m	6.57	0.70	10.13	6.65
7 m	6.65	0.071	9.76	6.73	6 m	6.54	0.70	10.1	6.62

Test Results

7/7/2002	Lynn Fuller	F306921	SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.4	0.1		7/12/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.01	0.0	J	7/18/2002
			SM 10200H	Chlorophyll A, Corrected	mg/m3	1.6	0.1		8/8/2002
8/4/2002	Lynn Fuller	F307763	SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2	0.1		8/8/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.0	J	8/21/2002
			SM 10200H	Chlorophyll A, Corrected	mg/m3	1.2	0.1		8/8/2002
8/4/2002	Lynn Fuller	F307764	SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.6	0.1		8/8/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	8/21/2002
			SM 10200H	Chlorophyll A, Corrected	mg/m3	2.1	0.1		9/5/2002
9/2/2002	Lynn Fuller	F308524	SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2.3	0.1		9/5/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	9/10/2002
			SM 10200H	Chlorophyll A, Corrected	mg/m3	0.57	0.06		9/5/2002
9/2/2002	Lynn Fuller	F308525	SM 10200H	Chlorophyll A, Uncorrected	mg/m3	0.65	0.06		9/5/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	9/10/2002
			<b>Memory Lake Site B</b>						
6/4/2002	Sara Larson	F306013	SM 10200H	Chlorophyll A, Corrected	mg/m3	2.4	0.1		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2.7	0.1		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	6/11/2002
6/4/2002	Sara Larson	F306014	SM 10200H	Chlorophyll A, Corrected	mg/m3	3.6	0.5		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.7	0.5		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01	U	6/11/2002
7/2/2002	Sara Larson	F306892	SM 10200H	Chlorophyll A, Corrected	mg/m3	1.4	0.1		7/12/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.5	0.1		7/12/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	7/18/2002
7/2/2002	Sara Larson	F306891	SM 10200H	Chlorophyll A, Corrected	mg/m3	2	0.1		7/12/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2.2	0.1		7/12/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.04	0.01		7/18/2002
8/6/2002	Sara Larson	F307825	SM 10200H	Chlorophyll A, Corrected	mg/m3	3.1	0.1		8/5/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.3	0.1		8/5/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	8/21/2002
8/6/2002	Sara Larson	F307826	SM 10200H	Chlorophyll A, Corrected	mg/m3	3.1	0.1		8/5/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.2	0.1		8/5/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	8/21/2002
9/17/2002	Sara Larson	F308794	SM 10200H	Chlorophyll A, Corrected	mg/m3	1.22	0.06		10/3/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.47	0.06		10/3/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	10/2/2002
9/17/2002	Sara Larson	F308795	SM 10200H	Chlorophyll A, Corrected	mg/m3	1.24	0.06		10/3/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.47	0.06		10/3/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	10/2/2002
10/8/2002	Sara Larson	F309178	SM 10200H	Chlorophyll A, Corrected	mg/m3	2.3	0.1		11/1/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2.5	0.1		11/1/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01	U	10/28/2002
10/8/2002	Sara Larson	F309179	SM 10200H	Chlorophyll A, Corrected	mg/m3	2.1	0.1		11/1/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2.4	0.1		11/1/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01		10/28/2002
<b>Ravine Lake</b>									
6/6/2002	Angie Wade, Jennifer McFill, Paul Harrison	F306091	SM 10200H	Chlorophyll A, Corrected	mg/m3	0.45	0.04		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	0.50	0.04		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.01	0.01	J	6/19/2002
6/6/2002	Angie Wade, Jennifer McFill, Paul Harrison	F306090	SM 10200H	Chlorophyll A, Corrected	mg/m3	0.75	0.04		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	0.86	0.04		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.01	0.01	J	6/19/2002
6/6/2002	Angie Wade, Jennifer McFill, Paul Harrison	F306089	SM 10200H	Chlorophyll A, Corrected	mg/m3	2.7	0.2		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.0	0.2		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01	U	6/19/2002
6/6/2002	Angie Wade, Jennifer McFill, Paul Harrison	F306088	SM 10200H	Chlorophyll A, Corrected	mg/m3	3.4	0.1		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.8	0.1		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.02	0.01	J	6/19/2002
<b>Seymour Lake</b>									
5/30/2002	Pat and Marie Sweeney	F305921	SM 10200H	Chlorophyll A, Corrected	mg/m3	3.2	0.1		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.5	0.1		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01	U	6/11/2002
5/30/2002	Pat and Marie Sweeney	F305922	SM 10200H	Chlorophyll A, Corrected	mg/m3	3.6	0.1		6/18/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	3.9	0.1		6/18/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01	U	6/11/2002
9/17/2002	Pat and Marie Sweeney	F308792	SM 10200H	Chlorophyll A, Corrected	mg/m3	0.91	0.04		10/3/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.02	0.04		10/3/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.01	0.01	J	10/2/2002
9/17/2002	Pat and Marie Sweeney	F308793	SM 10200H	Chlorophyll A, Corrected	mg/m3	0.92	0.04		10/3/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	1.04	0.04		10/3/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	0.01	0.01	J	10/2/2002
<b>Stephan Lake</b>									
9/15/2002	Jim Farks, Lynn Fuller	F308756	SM 10200H	Chlorophyll A, Corrected	mg/m3	2.4	0.1		10/3/2002
			SM 10200H	Chlorophyll A, Uncorrected	mg/m3	2.7	0.1		10/3/2002
			SM 4500-P-E	Total Phosphate - P	mg/L	<MDL	0.01	U	10/2/2002
	Jim Farks, Buzz		SM 10200H	Chlorophyll A, Corrected	mg/m3	2.5	0.1		10/3/2002

Date	Time	Volunteers Present	Monitoring Location	GPS Coordinates		Site Description	Weather in Past 24 Hours		Other		
				Longitude (N)	Latitude (W)		Temperature	Wind		Sky Cover	Precipitation
6/24/2003	1:10 PM	S. Larson	Site B	61° 37.56	149° 25.22	Site B	38.53 ° F	calm to lt	cl to pty cldy	zero	Commercial
Weather Now											
Temperature	Wind	Sky Cover	Precipitation	Wildlife Observed	Birds Observed	Aquatic Life Observed	Human Use Observed	Residential	Vacant Disturbed	Vacant Undisturbed	Commercial
12.31 ° C	1-7 mph	2%	zero	Grabes, Duck, Common Loon, Raven, Robin, Gulls	see wildlife	n/a	fishers, canoe	n/a	n/a	n/a	n/a
Weather in Past 24 Hours											
Date	Time	Volunteers Present	Monitoring Location	GPS Coordinates		Site Description	Temperature	Wind	Sky Cover	Precipitation	Other
6/24/2003	12:30 PM	S. Larson	Site A	n/a	n/a	Site A	65 ° F	n/a	cl to pty cldy	zero	n/a
Weather Now											
Temperature	Wind	Sky Cover	Precipitation	Wildlife Observed	Birds Observed	Aquatic Life Observed	Human Use Observed	Residential	Vacant Disturbed	Vacant Undisturbed	Commercial
18 ° C	8 mph	clty	zero	grebes, common golden eyes, mallards, male broad	see wildlife	lilly pads, grasses and bottom plants veg particles	one on shore	n/a	n/a	n/a	n/a
Weather in Past 24 Hours											
Date	Time	Volunteers Present	Monitoring Location	GPS Coordinates		Site Description	Temperature	Wind	Sky Cover	Precipitation	Other
5/20/2003	11:45 AM	S. Larson	Site A	61° 37.741'	149° 25.432'	Site A	38.53 ° F	calm	clear	zero	n/a
Weather Now											
Temperature	Wind	Sky Cover	Precipitation	Wildlife Observed	Birds Observed	Aquatic Life Observed	Human Use Observed	Residential	Vacant Disturbed	Vacant Undisturbed	Commercial
12.31 ° C	1-7 mph	2%	zero	grebes, gulls, golden eyes, common loon raven nest on shore	see wildlife	fish jumping	2 fishermen	n/a	n/a	n/a	n/a

\* Field Notes 2003

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Date	Time	Volunteers Present	Monitoring Location	GPS Coordinates		Site Description	Weather in Past 24 Hours			Other	
				Longitude (N)	Latitude (W)		Temperature	Wind	Sky Cover		Precipitation
5/20/2003	12:45 PM	S. Larson	Site A	n/a	n/a	Site B	65 ° F	n/a	cldy	zero	n/a
Weather Now											
Temperature	Wind	Sky Cover	Precipitation	Wildlife Observed	Birds Observed	Aquatic Life Observed	Human Use Observed	Residential	Vacant Disturbed	Vacant Undisturbed	Commercial
18 ° C	8 mph	cldy	zero	grebes, common golden eye, mallards,	see wildlife	n/a	fisherman	n/a	n/a	n/a	n/a

Lake Profiles  
2003

First Reading 5/20/03 Site A					Second Reading 5/20/03 Site A				
Secchi disk depth 5.9 m					Secchi disk depth 5.9 m				
Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
0 m	12.56	0.069	12.13	7.59	0 m	12.74	0.069	12.12	7.92
1 m	12.13	0.07	12.32	7.70	1 m	12.13	0.07	12.10	7.91
2 m	11.87	0.07	12.33	7.76	2 m	11.89	0.07	12.33	7.94
3 m	11.44	0.07	12.28	7.73	3 m	11.45	0.07	12.18	7.85
4 m	11.15	0.07	12.22	7.71	4 m	11.15	0.07	12.19	7.75
5 m	10.72	0.071	10.65	7.17	5 m	10.72	0.071	10.78	7.13
5.5 m	10.66	0.071	9.85	7.02	5.5 m	10.66	0.071	9.85	6.94
					5.8 m	10.07	0.071	9.87	6.89
First Reading 6/24/03 Site A					Second Reading 6/24/03 Site A				
Secchi disk depth 3.6 m					Secchi disk depth 3.5 m				
Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
0 m	18.17	0.069	9.98	8.94	0 m	18.15	0.069	9.68	9.01
1 m	18.17	0.069	9.93	8.98	1 m	18.17	0.069	9.72	9.00
2 m	18.16	0.069	9.88	8.99	2 m	18.16	0.069	9.75	8.99
3 m	18.15	0.069	9.78	8.98+	3 m	18.13	0.069	9.79	8.99
4 m	18.07	0.069	9.81	8.98	4 m	18.02	0.069	9.69	8.99
5 m	17.25	0.069	7.74	7.64	5 m	17.39	0.069	8.09	7.78
6 m	16.18	0.071	3.99	7.10	6 m	16.28	0.071	4.05	7.15
First Reading 5/20/03 Site B					Second Reading 5/20/03 Site B				
Secchi disk depth 5.8 m					Secchi disk depth 5.8 m				
Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
0 m	12.88	0.071	11.78	7.38	0 m	12.96	0.071	11.89	7.68
1 m	12.04	0.071	12.04	7.65	1 m	12.08	0.071	12.08	7.72
2 m	11.89	0.071	12.08	7.66	2 m	11.86	0.072	12.16	7.77
3 m	11.71	0.072	11.99	7.58	3 m	11.67	0.072	12.00	7.60
4 m	11.33	0.072	12.03	7.54	4 m	11.34	0.072	12.00	7.57
5 m	11.21	0.072	11.71	7.31	5 m	11.22	0.072	11.65	7.38
6 m	11.21	0.072	11.63	7.24	5.5 m	11.22	0.072	11.51	7.26
First Reading 6/24/03 Site B					Second Reading 6/24/03 Site B				
Secchi disk depth 3.4 m					Secchi disk depth 3.25 m				
Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units	Depth M	Temperature °C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH standard units
0 m	18.09	0.070	9.47	8.88	0 m	18.10	0.070	9.31	8.89
1 m	18.1	0.070	9.57	8.86	1 m	18.11	0.070	9.28	8.88
2 m	18.1	0.070	9.55	8.85	2 m	18.11	0.070	9.30	8.86
3 m	18.1	0.070	9.54	8.84	3 m	18.10	0.070	9.33	8.85
4 m	18.05	0.070	9.28	8.79	4 m	18.07	0.070	9.18	8.78
5 m	17.62	0.071	7.97	7.87	5 m	17.57	0.071	7.94	7.81
6 m	17.36	0.072	6.74	7.45	6 m	17.41	0.071	6.40	7.48

2002 FIELD SEASON TROPHIC STATUS DATA

NOTE: Minimum detection limit for phosphate is 0.01 mg/L. Results "Less than MDL" are recorded here as 0.00.

LAKE	DATE	HOURS	GRAB SAMPLE	Chlorophyll a #1 (mg/m3)	Chlorophyll a #2 (mg/m3)	Total phosphate #1 (mg/L)	Total phosphate #2 (mg/L)	Secchi Depth (m)	COMMENTS	LAKE
LOWER STEPHAN	6/21/02	1.00	NO	2.40			0.01	2.65		LOWER STEPHAN
	9/15/02	2.00	YES		2.50	0.00	0.01	3.45	Clear to bottom	
	6/5/03	0.50	NO						Clear to bottom	
LYNN'S	7/7/02	0.50	YES 1m	1.70	1.20	0.03	0.01	1.40	Clear to bottom	LYNN'S
	8/4/02	0.50	YES	1.60	1.20	0.02	0.02		Clear to bottom	
	9/2/02	0.50	YES	2.10	0.57	0.02	0.02	1.50	Clear to bottom	
	9/22/02	0.50	NO						Clear to bottom	
	10/13/03	0.50	NO							
MEMORY SITE A	6/4/02	1.00	NO					3.50		MEMORY SITE A
	7/2/02	2.00	NO					3.40		
	8/6/02	1.25	NO (PUMP PROBLEMS)					3.40		
	9/17/02	1.50	NO (PUMP PROBLEMS)					4.70		
MEMORY SITE B	10/8/03	1.50	NO					4.95		MEMORY SITE B
	6/4/02	1.00	YES SITE B ONLY	2.40	3.60	0.02	0.00	3.50		
	7/2/02	2.00	YES SITE B	2.00	1.40	0.04	0.02	3.80		
	8/6/02	1.25	YES SITE B	3.10	3.10	0.02	0.02	2.85		
	9/17/02	1.50	YES sample only	1.22	1.24	0.02	0.02	4.20		
	10/8/03	1.50	YES SITE B	2.30	2.10	0.00	0.00	4.60		
RAYNE	6/6/02	4.00	YES	0.75	0.45	0.01	0.01	3.75		RAYNE
SCOTTY	7/28/02	2.00	YES	3.50	4.10	0.02	0.02	2.60	Secchi on bottom	SCOTTY
SEVENTEEN MILE	6/6/02	4.00	YES	3.40	2.70	0.02	0.02	2.75		SEVENTEEN MILE
	6/29/02		YES (5/50)	3.20	3.60	0.00	0.00	2.40	Secchi on bottom	
SEYMOUR	6/29/02		NO					5.10		SEYMOUR
	8/9/02	1.00	NO					4.35		
SUSITNA ENTRANCE	9/17/02	1.00	YES	0.91	0.92	0.01	0.01	5.20	Secchi on bottom	SUSITNA ENTRANCE
	6/30/02	1.50	YES	1.17	1.13	0.00	0.00	7.75		
	9/29/03	1.50	YES	1.50	1.54	0.00	0.00	5.45		
SUSITNA WEST SIDE	6/30/03	1.50	YES	0.83	0.80	0.00	0.00	8.60		SUSITNA WEST SIDE
	9/29/03	1.50	YES	1.40	1.30	0.00	0.00	5.90	Secchi on bottom	
TYONE	6/30/02	1.50	YES	1.00	0.82	0.01	0.01	1.50	Secchi on bottom	TYONE
	9/29/03	1.50	YES	2.00	2.00	0.01	0.01	1.50	Secchi on bottom	
WEINER	6/6/02	4.00	YES	0.34	0.37	0.02	0.02	4.60	Circulator not on	WEINER
WOLVERINE	6/9/02	1.50	YES 0.5M	22.00	26.00	0.05	0.05	1.10	Secchi on bottom	WOLVERINE
	7/15/03	1.00	YES DEPTH?	2.30	2.50	0.04	0.01		Check depth (7 feet)	
	9/2/02	1.00	YES DEPTH?	2.10	0.70	0.02	0.02		Secchi not recorded	
WOODY	6/17/02	1.00	YES 1M	1.12	1.16	-0.04	0.01	2.45	Secchi on bottom	WOODY
	7/15/02	0.75	YES 2M	1.70	2.00	0.08	0.00	2.10	Secchi on bottom?	
	8/27/02	1.00	YES 1M	1.90	1.60	0.01	0.00	2.30	Secchi on bottom?	