2010 Assessment of Selected Lakes in Cass County, Minnesota

McKeown Lake (11-0261)
Kid Lake (11-0262)
Kerr Lake (11-0268)
Lost Lake (11-0269)
Mann Lake (11-0282)
Baby Lake (11-0283)

Minnesota Pollution Control Agency

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Editing

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Lake Assessment Program 2010
2010 Lake Assessment of McKeown Lake (11-0261)
Kid Lake (11-0262)
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Cass County, Minnesota

Minnesota Pollution Control Agency
Water Monitoring Section
Lakes and Streams Monitoring Unit

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Executive Summary

The Minnesota Pollution Control Agency (MPCA) conducts and supports lake monitoring for a variety of objectives. Staff within the MPCA's Lakes and Streams Monitoring Unit samples approximately 100 lakes per year, coordinates citizen volunteer monitoring through the Citizen Lake Monitoring Program, and manages Surface Water Assessment Grants given to local groups to monitor lake water quality. All of the data from these activities are used to assess the condition of Minnesota lakes. Water quality data are compared to state water quality standards to determine if a given lake is fully supporting or not supporting standards set for recreational use (e.g., swimming, wading, etc.). Lakes not supporting aquatic recreational use are termed 'impaired' and are placed on a list biennially. This list is formally termed the 303(d) list (referencing the section within the federal Clean Water Act that requires us to assess for condition); it is also commonly called the "Impaired Waters List." A lake placed on the Impaired Waters List is required to be intensively researched through a Total Maximum Daily Load (TMDL) study to determine the source and extent of the pollution problem. The study also requires the development of a restoration plan. The water quality data and the results of the condition assessment are incorporated into a variety of products, including lake assessment reports, status and trend/update reports, and fact sheets. Lastly, it should be noted that a great deal of additional lake monitoring is carried out by various other MPCA staff and local groups who are undertaking TMDL studies or other, special projects.

This report provides a water quality assessment of an assemblage of lakes in central Cass County (Northern Lakes and Forests ecoregion), within the Leech Lake River Hydrological Unit Code 8 (HUC-8) watershed: McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes. This report was also done at the request of the lake association that represents these lakes, which they refer to as the McKeown Creek Watershed. Data collected in 2009, combined with MPCA and volunteer monitoring data from previous sample seasons, provide the basis for this assessment.

A summary of the physical characteristics follows:

- McKeown Lake is a 147-acre lake with a maximum depth of 11 meters (37 feet) and is 87 percent littoral. Access to McKeown Lake can be obtained through a small boat channel from the southern shore of Mann Lake. The total catchment watershed for McKeown Lake is 10,693 hectares (26,469 acres).
- Kid Lake is a 167-acre lake with a maximum depth of 16 meters (52 feet) and is 21 percent littoral. Kid Lake does not have a public access. The total catchment watershed for Kid Lake is 6,891 hectares (17,058 acres).
- Kerr Lake is a 74-acre lake with a maximum depth of 24 meters (79 feet) and 35 percent of the lake is littoral. Kerr Lake does not have a public access. The total catchment watershed for Kerr Lake is 137 hectares (339 acres).
- Lost Lake is a 71-acre lake with a maximum depth of eight meters (26 feet). The percent littoral area has not been determined; however, given the shallowness of the lake a majority of the lake is likely <15 feet and be considered littoral. Lost Lake does not have a public access. The total catchment watershed for Lost Lake is 2,739 hectares (6,780 acres).
- Mann Lake is a 491-acre lake with a maximum depth of 28 meters (93 feet) and is nine percent littoral. Mann Lake does not have a public access. The total catchment watershed for Mann Lake is 10,443 hectares (25,850 acres).
- Baby Lake is a 737-acre lake with a maximum depth of 21 meters (69 feet) and is 34 percent littoral. A public access is located on the southeastern shore. The total catchment watershed for Baby Lake is 8,779 hectares (21,729 acres).

Based on current and historical profile data, McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes are all deep dimictic lakes that turn over in the spring and fall and develop two distinct temperature layers (stratify) during the summer. Based on water quality data presented in this report, all six lakes are considered mesotrophic. The lakes are all clear with the probability of anoxic conditions developing in the hypolimnion during the summer. All six lakes meet the lake eutrophication standards for lakes in the Northern Lakes and Forests (NLF) ecoregion and are considered fully supportive of aquatic recreational uses.

Introduction

This report details the analysis of monitoring on McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes in Cass County during the 2009 season. Data collected in 2009 were combined with data from previous sample seasons for the assessment of each lake. For data-poor lakes, monitoring establishes a baseline data. In the selection of lakes, a focus is typically placed on large lakes with surface areas of 500 acres or more. Data analyzed included all available data in STORET, the national repository for water quality data. Further detail on concepts and terms in this report can be found in the Guide to Lake Protection and Management (http://www.pca.state.mn.us/water/lakeprotection.html).

Background

Lake Morphometric and Catchment Watershed Characteristics

McKeown Lake, Kid Lake, Kerr Lake, Mann Lake, and Baby Lake are all located in central/west central Cass County within the Leech Lake River HUC-8 watershed (Figure 1). These lakes are all to the east of Hackensack, Minnesota. Table 1 illustrates the morphometric and watershed characteristics of each of the lakes within this report. Percent littoral refers to that portion of the lake that is 4.6 meters (15 feet) or less in depth, which often represents the depth at which rooted plants may grow in the lake. Lakes with a high percentage of littoral area often have extensive macrophyte (rooted plant) beds. These plant beds are a natural part of the ecology of these lakes and are important to protect (EPA 2007).

McKeown Lake, Kid Lake, Lost Lake Mann Lake, and Baby Lake are a part of relatively large watersheds resulting in very high watershed: lake area ratios (Table 1). Kerr Lake lies within a smaller watershed and receives significantly less contribution. A majority of the watershed flow enters the chain of lakes from the southern shore of Lost Lake. Additional contribution comes from the north shore of Baby Lake and Mann Lake. All six lakes flow to the same pour point on the southern shore of McKeown Lake. Watershed areas were estimated based on data from Minnesota Department of Natural Resources Waters Division delineations.

Table 1. McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes morphometric and watershed characteristics

Lake Name	Lake ID	Lake Basin	Littoral Area	Total Watershed Area	Watershed: Lake	Max. Depth	Mean Depth
		Hectares (Acres)	%	Hectares (Acres)	Ratio	Meters (Feet)	Meters (Feet)
McKeown	11-0261	59 (147)	87	10,693 (26,469)	180:1	11 (37)	1.5 (5)
Kid	11-0262	67 (167)	21	6,891 (17,058)	102:1	16 (52)	6.4 (21)
Kerr	11-0268	30 (74)	35	137 (339)	5:1	24 (79)	10 (34)
Lost	11-0269	29 (71)	-	2,739 (6,780)	95:1	8 (26)	-
Mann	11-0282	198 (491)	9	10,443 (25,850)	53:1	28 (93)	10.6 (35)
Baby	11-0283	298 (737)	34	8,779 (21,729)	29:1	21 (69)	9.5 (31)

Soils within the Leech Lake River major watershed are defined as medium textured forest soils of North-Central Minnesota from the Nebish-Rockwood series. The area is undulating to hilly and the soils are light colored and well drained. (Arneman 1963). These lakes are ice-block basins that were likely formed in the glacial till (Zumberge, 1952).

Land use characteristics and ecoregion

Since land use affects water quality, it has proven helpful to divide the state into regions where land use and water resources are similar. Land use in the watershed for all six lakes is typical for this ecoregion. Forest is the predominant land use and falls within the expected range for the Northern Lakes and Forest (NLF) ecoregion (Table 2 and Figure 1).

Minnesota is divided into seven regions, referred to as ecoregions, as defined by soils, land surface form, natural vegetation, and current land use. All six lakes lie within the NLF ecoregion (Figure 2). Assessment criteria values for the NLF ecoregion (Table 3) were used for comparing the water quality characteristics of these lakes. NLF ecoregion values were also used for land use comparisons (Table 2). Finally, NLF ecoregional characteristics were used for the Minnesota Lake Eutrophication Analysis Procedure (MINLEAP_ model application.

Table 2. McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes ecoregional land use comparisons

Land Use (%)	McKeown	Kid	Kerr	Lost	Mann	Baby	NLF Ecoregion
Developed	1	1	4	4	1	1	0-7
Cropland	<1	<1	2	2	<1	<1	<1
Rangeland	4	4	1	9	3	4	0-6
Forest	75	76	68	44	76	75	54-81
Water and Wetland	20	18	25	41	20	20	14-31

Figure 1. McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes watershed and land use

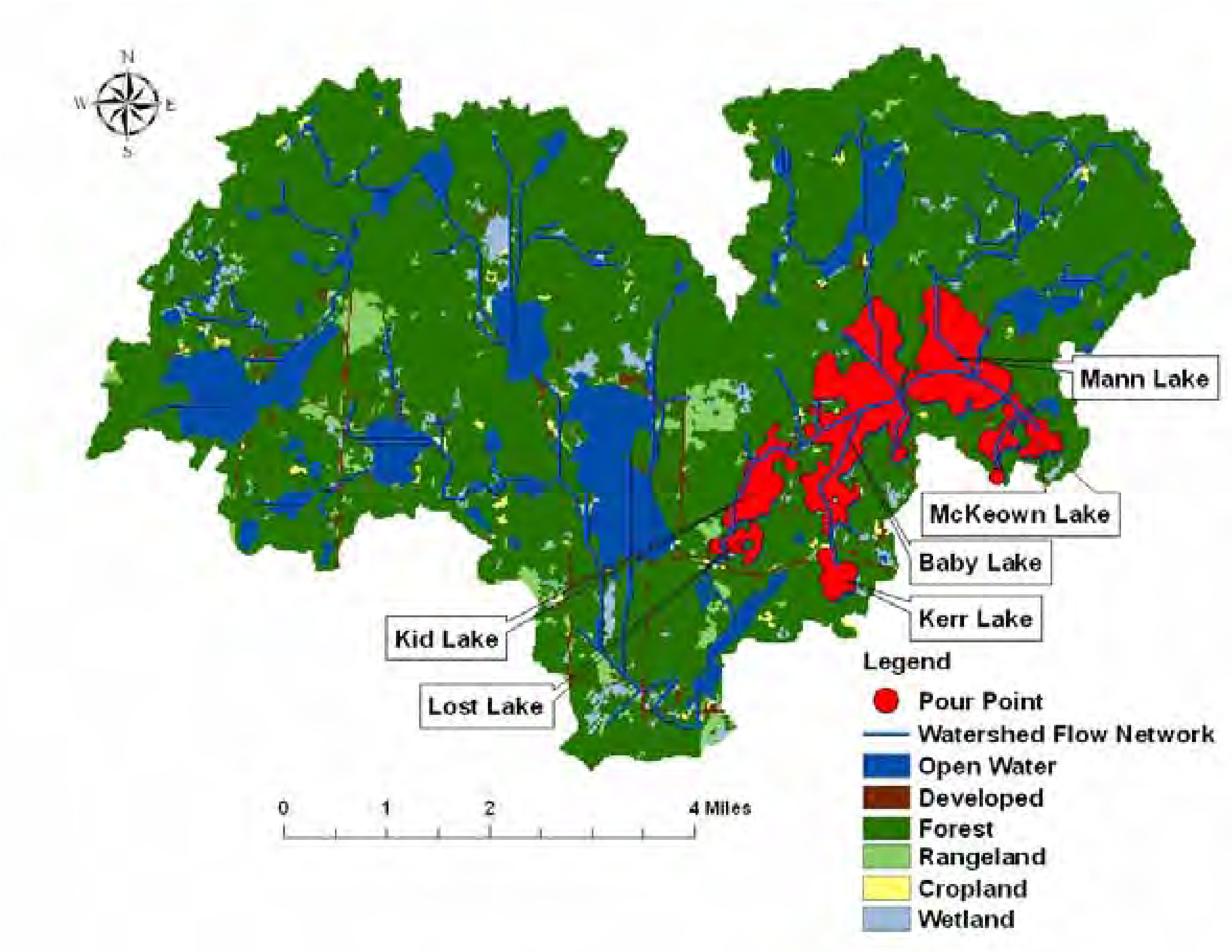
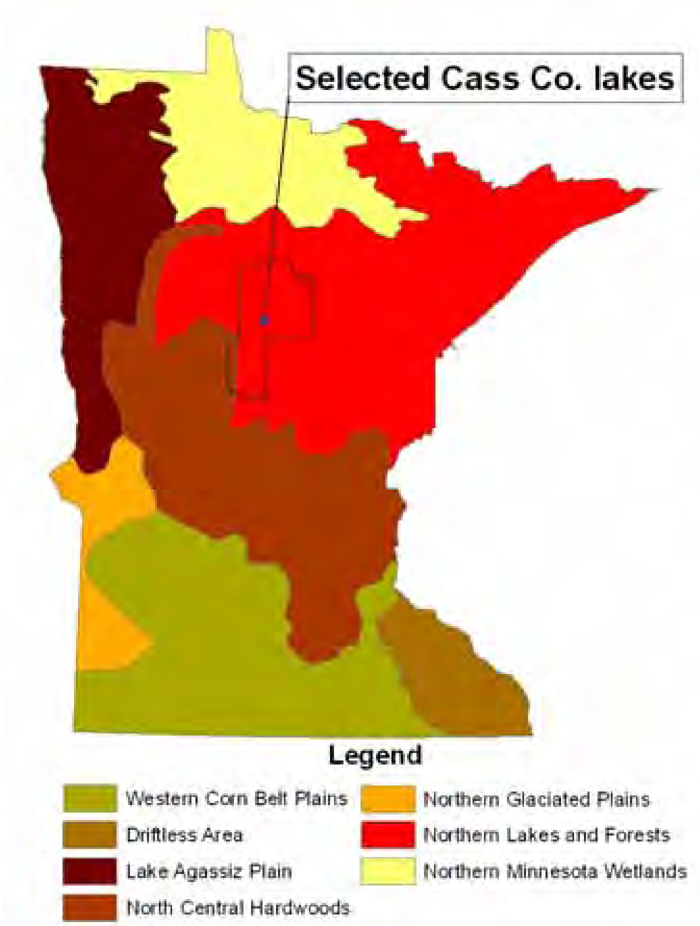


Figure 2. Minnesota's seven ecoregions as mapped by U.S. Environmental Protection Agency (EPA)



Lake mixing

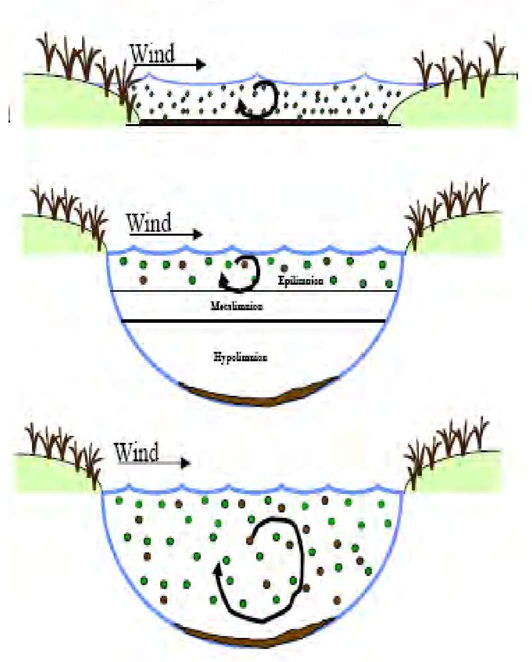
Lake depth has a significant influence on lake processes and water quality. One such process is *thermal stratification* (formation of distinct temperature layers), in which deep lakes (maximum depths of 9.1 – 12.1 meters (30 - 40 feet) or more) often stratify (form layers) during the summer months and are referred to as *dimictic* (Figure 3). These lakes fully mix or turn over twice per year; typically in spring and fall. Shallow lakes (maximum depths of 4.6 meters (15 feet) or less) in contrast, typically do not stratify and are often referred to as *polymictic*. Lakes with moderate depths may stratify intermittently during calm periods, but mix during heavy winds, and during spring and fall. Measurement of temperature throughout the water column (surface to bottom) at selected intervals (e.g. every meter) can be used to determine whether the lake is well mixed or stratified. It can also identify the depth of the thermocline (zone of maximum change in temperature over the depth interval). In general, dimictic lakes have an upper, well-mixed layer (epilimnion) that is warm and has high oxygen concentrations. In contrast, the lower layer (hypolimnion) is much cooler and often has little or no oxygen. This low oxygen environment in the hypolimnion is conducive to the release of phosphorus (P) from the lake sediments. During stratification, dense colder hypolimnetic waters are separated from the warmer algae-rich surface waters in the epilimnion. Mixing events allow for nutrient-rich bottom water to mix with the surface water and become available to algae. Most of the fish in the lake are usually found in the epilimnion or near the thermocline. Based on 2009 and historic profile data, McKeown Lake, Kid Lake, Lost Lake Mann Lake, and Baby Lake were all classified as dimictic.

Figure 3. Lake stratification

Polymictic Lake
Shallow, no layers,
mixes continuously
spring, summer & fall

Dimictic Lake
Deep, form layers,
mixes spring/fall

Intermittently Stratified
Moderately deep,
mixes during high winds
spring, summer, & fall



Lake level trends

The Minnesota Department of Natural Resources (DNR) Division of Waters has consistently measured water levels on McKeown Lake since 1936. During the period of record (1936 – 2009), the lake varied by 1.99 feet, based on 122 readings. The highest and lowest recorded elevations are 1,327.92 feet on October 26, 1994, and 1,325.93 feet on November 12, 1936, respectively. The ordinary high-water mark for McKeown Lake is 1,327.9 feet. Consistent lake level measurements have not been recorded for Kid, Kerr, Lost, Mann, and Baby Lakes.

Precipitation

Rain gauge records from Walker, Minnesota show two one-inch plus rain events during summer 2009 (Figure 4). These rain events will increase runoff into the lakes and may influence in-lake water quality and lake levels; however, despite the higher levels of precipitation occurring in mid- to late-August, nutrient levels showed no distinct trend of measurable increases during this period. Precipitation records for the 2009 water year (October 2008 through September 2009) indicated normal average rainfall for the Walker area but two to four inches below normal for the chain of lakes area (Figure 5).

Figure 4. Summer 2009 rainfall based on records for Walker, Minnesota

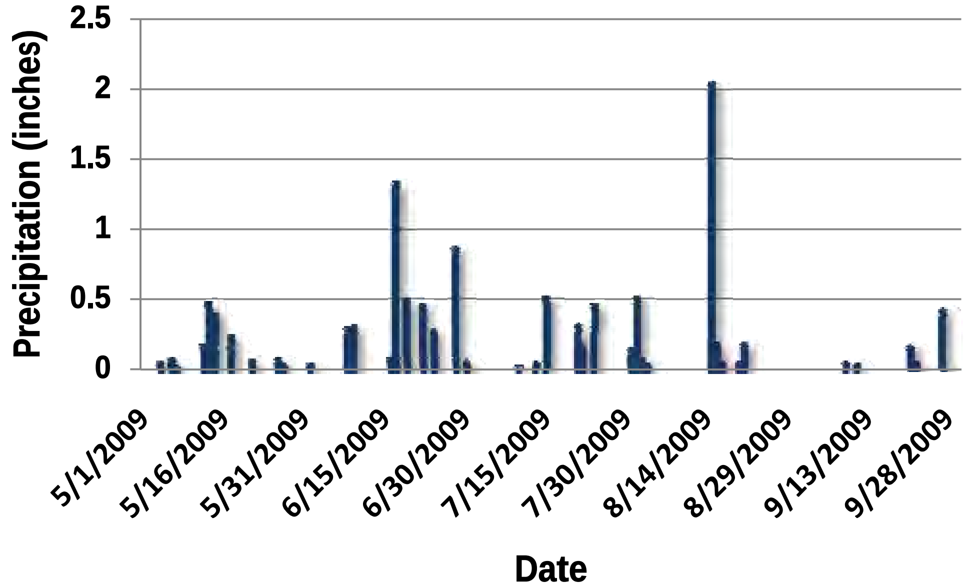
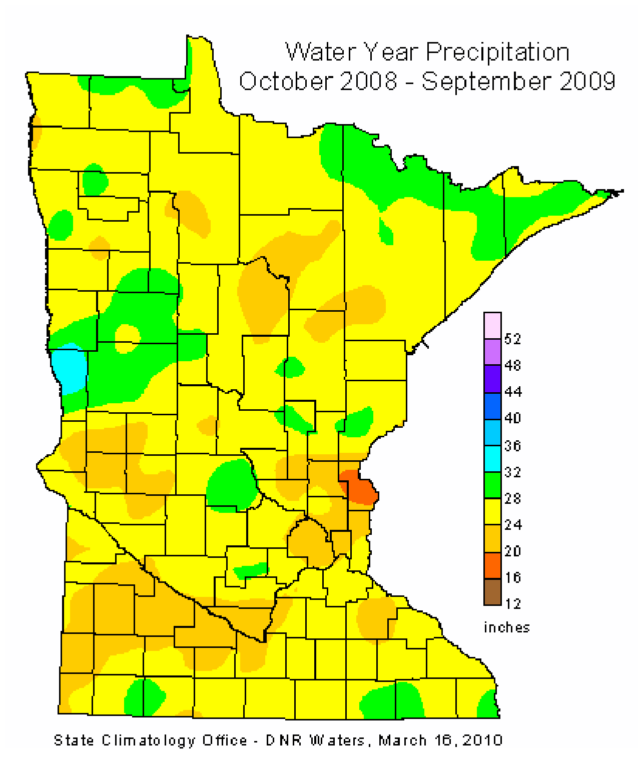
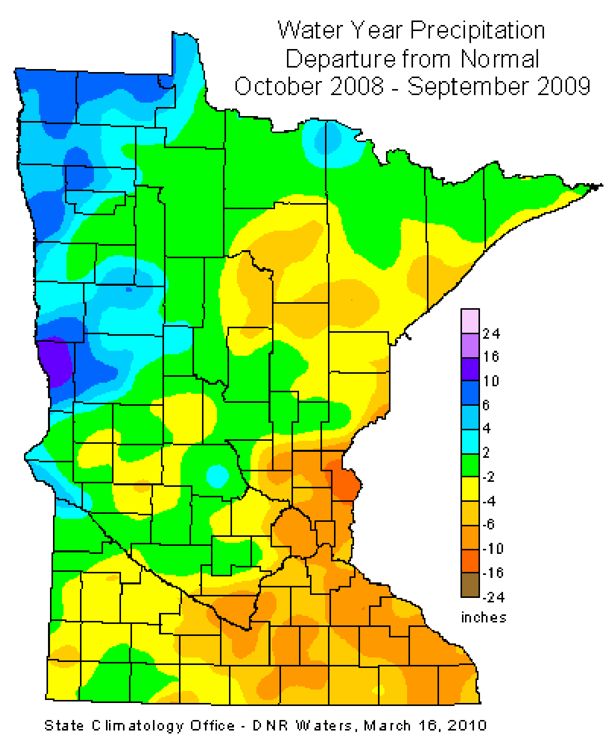


Figure 5. 2009 Minnesota Water Year Precipitation and Departure from Normal

Prepared by State Climatology Office DNR Waters

Values are in inches





Fisheries

DNR fisheries managers utilize netting survey information to assess the well-being of fish communities and measure the efficacy of management programs. Presence, absence, abundance, physical condition of captured fishes, and community relationships among fish species within survey catch information also provide good indicators of current habitat conditions and trophic state of a lake (Schupp and Wilson, 1993). These data are stored in a long-term fisheries survey database, which has proven valuable in qualifying and quantifying changes in environmental and fisheries characteristics over time.

Information on the most recent fish surveys for McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake, and Baby Lake can be found at the DNR lake finder Web site: http://www.dnr.state.mn.us/lakefind/index.html. Additional information on fishery management can be found at: http://www.dnr.state.mn.us/fisheries/management/index.html.

Methods

Water quality data for McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake, and Baby Lake were collected in the 2008 and 2009 monitoring seasons. Lake surface samples were collected with an integrated sampler, a polyvinyl chloride tube two meters (6.6 feet) in length with an inside diameter of 3.2 centimeters (1.24 inches). Depth total phosphorus (TP) samples were collected with a Kemmerer sampler for Baby Lake. Temperature and dissolved oxygen (DO) profiles and Secchi disk transparency measurements were also taken. A summary of data follows in the Appendix.

Sampling procedures were employed as described in the MPCA Lake Water Quality Sampling Standard Operating Procedures (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/lakes/lakes-and-lake-monitoring-in-minnesota.html). RMB Environmental Laboratories, Inc. in Detroit Lakes, Minnesota and the Minnesota Department of Health in St. Paul, Minnesota using EPA-approved methods performed laboratory analysis. Samples were analyzed for nutrients and chlorophyll-*a* (chl-*a*).

The water quality of the lakes will be assessed based on the aquatic recreational use standards (ARUS) for lakes in the NLF ecoregion. The criteria that comprise the water quality standard are as follows: TP <30 µg/L, chlorophyll-a < 9 µg/L and Secchi >2.0 m. All values are measured as summer-means. In a typical assessment that is done annually to assess the condition of Minnesota's waters, we typically use the most recent 10-years of data for the assessment. For the lakes in this report, assessments are based on the two most recent years of data: 2008 and 2009.

Results and Discussion

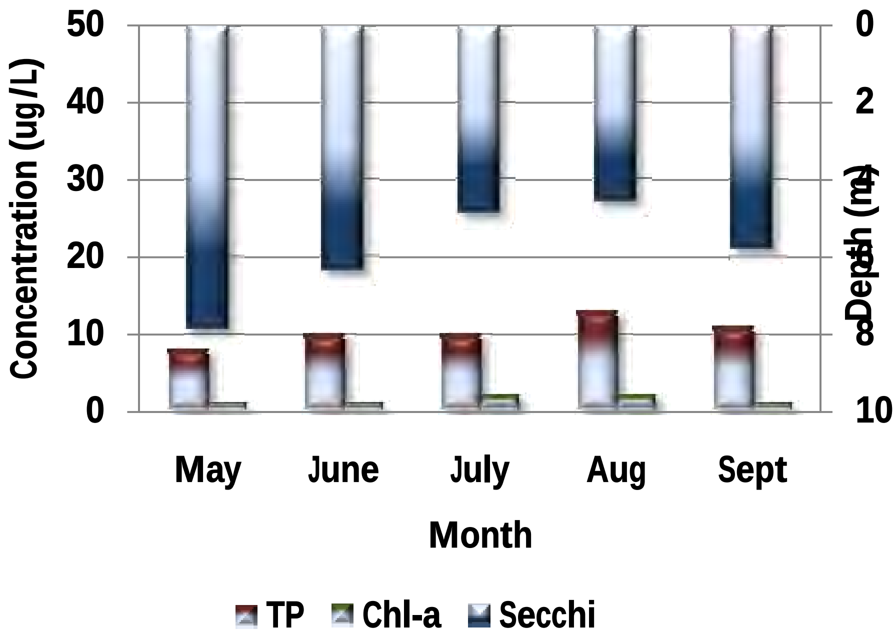
McKeown Lake

Total Phosphorus concentrations, collected in 2008 and 2009, for McKeown Lake averaged 14 micrograms per liter (µg/L) (Table 3). This average met the ARUS. TP concentrations increased slightly from May through August, before declining in September (Figure 6). A majority of the external phosphorous (P) is first processed through other lakes within the watershed likely resulting in low levels of watershed load contribution.

Chlorophyll-*a* concentrations provide an estimate of the amount of algal production in a lake. Chl-*a* concentrations for 2008 and 2009 averaged 3 µg/L (Table 3) and peaked at four µg/L in September of 2008. Based on 2008 and 2009 data, nuisance algal blooms did not occur in McKeown Lake. The summer-mean for McKeown Lake met the ARUS for NLF lakes.

Secchi disk transparency for McKeown Lake averaged 4.8 meters (15.7 feet) for 2008 and 2009 (Table 3). The average Secchi depth met the ARUS for the NLF ecoregion. Additionally, the changes in the transparency for McKeown Lake over the course of the 2009 monitoring season closely mirrored the changes in nutrient availability (TP) and algal production (chl-*a*). The Secchi disk transparency reached a low of 5.5 meters (18 feet) in August and a high of 9.7 meters (31.5 feet) in June (Figure 6 and the appendix).

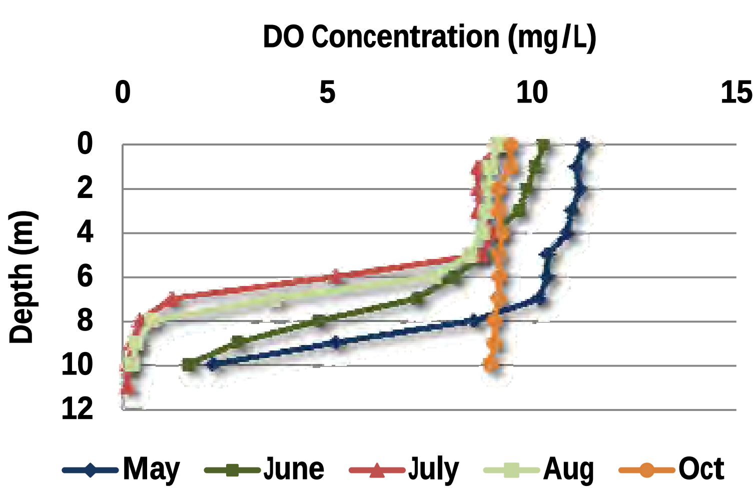
Figure 6. McKeown Lake 2009 TP and Chl-*a* concentrations and Secchi depth

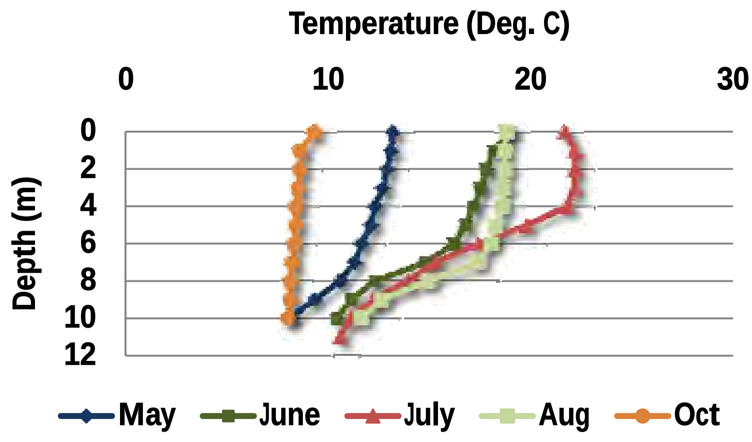


Dissolved Oxygen Profiles were not taken for McKeown Lake during the 2008 or 2009 monitoring seasons. However, historical data collected in 2004 can help understand the lakes mixing characteristics. DO levels remained at or above five milligrams per liter (mg/L) to a depth of nine meters (29.5 feet) in May. DO levels began to drop below five mg/L at a depth of 6 meters (19.7 feet) in July (Figure 7). Oxygen demand from the decomposition of organic materials in the hypolimnetic water and bottom sediments plus a lack of oxygen production was the likely cause of decreasing DO in the hypolimnion.

Temperature Profiles were also taken monthly during the 2004 monitoring season (Figure 7). The lake formed a weak thermocline in May at eight meters (26.2 feet) and was well mixed in October. A more distinct thermocline formed in June at approximately 4 meters (13.1 feet) before descending in July and August to a depth of approximately seven meters (23 feet).

Figure 7. McKeown Lake 2004 dissolved oxygen and temperature profiles





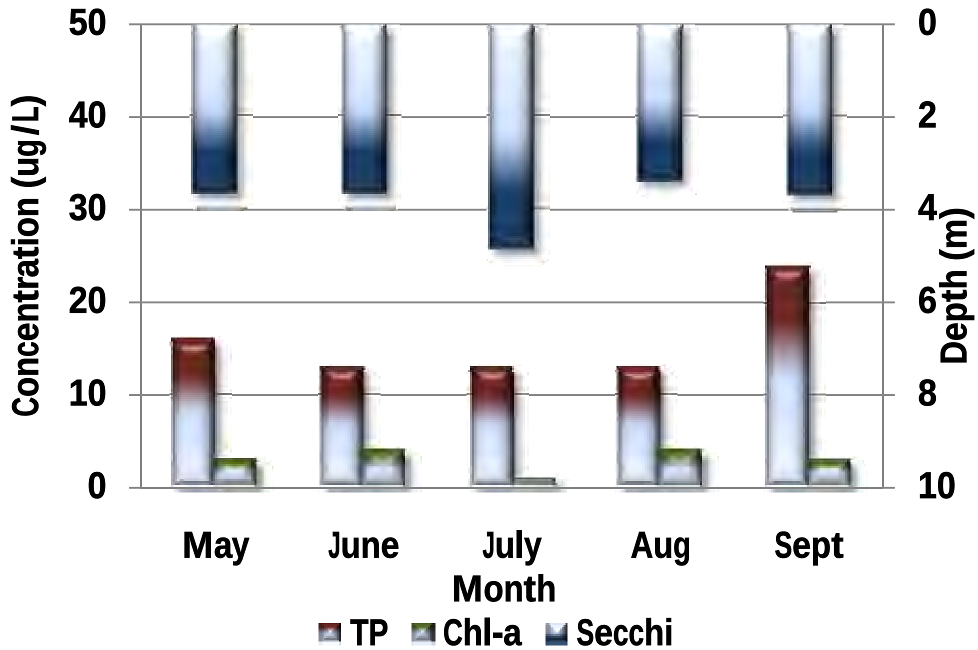
Kid Lake

Total Phosphorus concentrations, collected in 2008 and 2009, for Kid Lake averaged 13 µg/L and met the ARUS (Table 3). TP concentrations were higher in the spring and fall during mixing events as nutrients were released from disturbed lake sediment but were steady throughout the summer months (Figure 8). A majority of the external P is first processed through other lakes within the watershed likely resulting in low levels of watershed load contribution during the summer months.

Chlorophyll-*a* concentrations for 2008 and 2009 averaged 4 µg/L (Table 3) and peaked at 7 µg/L in September of 2008. Based on 2008 and 2009 data, nuisance algal blooms did not occur in Kid Lake. The summer-mean for Kid Lake met the ARUS.

Secchi disk transparency for Kid Lake averaged 4 meters (13.1 feet) for 2008 and 2009 and met the ARUS (Table 3). Additionally, the changes in the transparency for Kid Lake over the course of the 2009 monitoring season closely mirrored the changes in nutrient availability (TP) and algal production (chl-*a*). The Secchi disk transparency reached a low of 3.1 meters (10.2 feet) in August and a high of 5.5 meters (18 feet) in June (Figure 8 and the appendix).

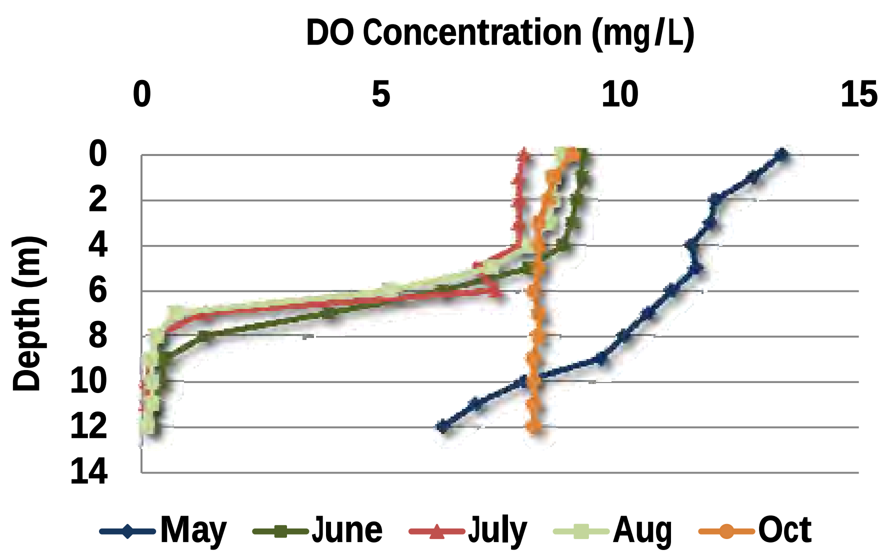
Figure 8. Kid Lake 2009 TP & Chl-*a* concentrations and Secchi depth

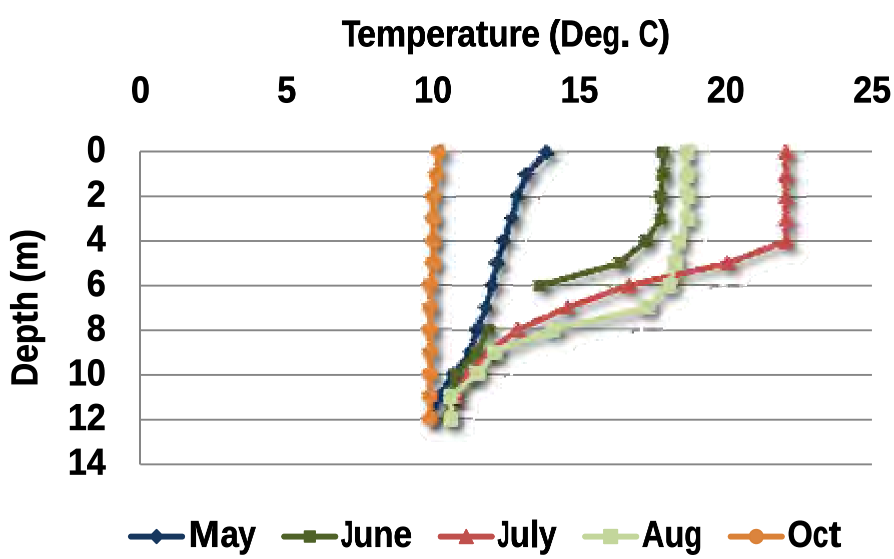


Dissolved Oxygen Profiles were not taken for Kid Lake during the 2008 or 2009 monitoring seasons. However, historical data collected in 2004 can help understand the lakes mixing characteristics. DO levels remained above five mg/L throughout the water column in May and October. DO levels dropped below five mg/L at a depth of six meters (19.7 feet) throughout the summer months (Figure 9). Oxygen demand from the decomposition of organic materials in the hypolimnetic water and bottom sediments plus a lack of oxygen production was the likely cause of decreasing levels of DO.

Temperature Profiles were also taken monthly during the 2004 monitoring season (Figure 9). Kid Lake formed a weak thermocline in May between eight and ten meters (26.2 feet and 32.8 feet) and was well mixed in October. A more distinct thermocline formed in June and July at approximately four meters (13.1 feet) before descending in August to a depth of approximately seven meters (23 feet).

Figure 9. Kid Lake 2004 dissolved oxygen and temperature profiles





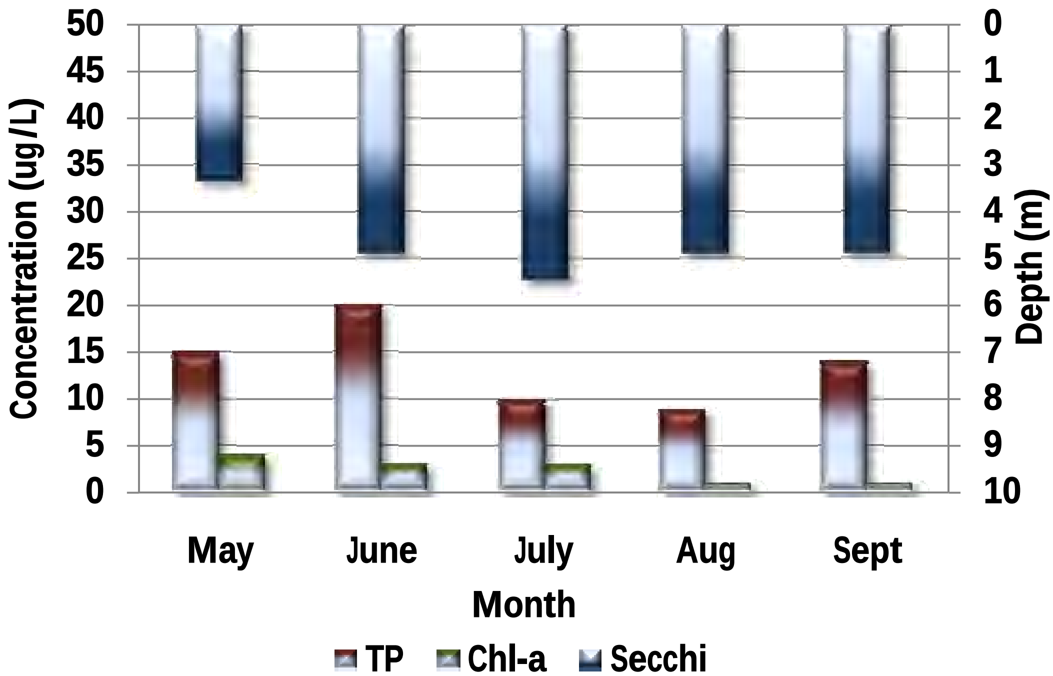
Kerr Lake

Total Phosphorus concentrations, collected in 2008 and 2009, for Kerr Lake averaged 17 µg/L and met the ARUS (Table 3). TP concentrations peaked in June before declining and remaining steady up to September when levels increased again as nutrients were likely released from the disturbed sediment (Figure 10).

Chlorophyll-*a* concentrations for 2008 and 2009 averaged three µg/L (Table 3) and peaked at four µg/L in May of 2009. Based on 2008 and 2009 data, nuisance algal blooms did not occur in Kerr Lake. The summer-mean for Kerr Lake met the ARUS.

Secchi disk transparency for Kerr Lake averaged 4.3 meters (14.1 feet) for 2008 and 2009 (Table 3). The average Secchi depth met the ARUS. Additionally, the changes in the transparency for Kerr Lake over the course of the 2009 monitoring season closely mirrored the changes in nutrient availability (TP) and algal production (chl-*a*). The Secchi disk transparency reached a low of 2.7 meters (8.9 feet) in May and a high of 5.8 meters (19 feet) in July (Figure 10 and the appendix).

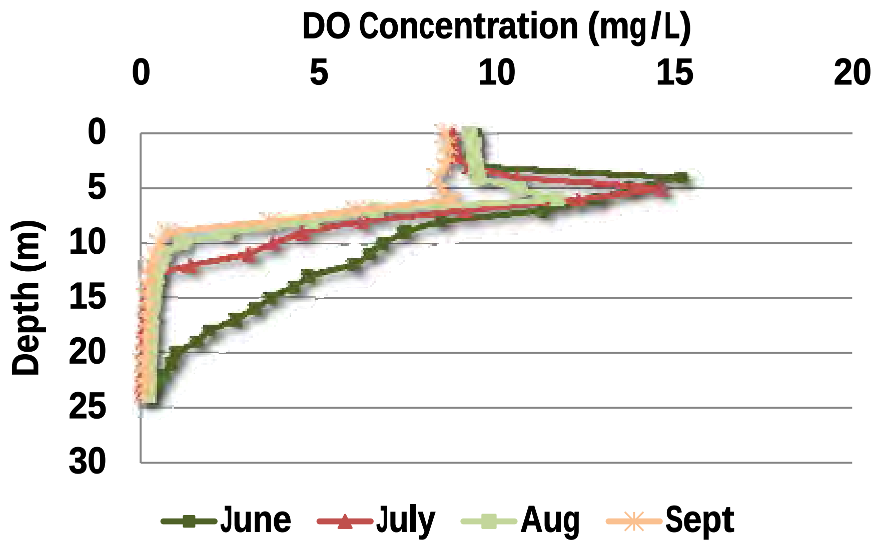
Figure 10. Kerr Lake 2009 TP & Chl-*a* concentrations and Secchi depth

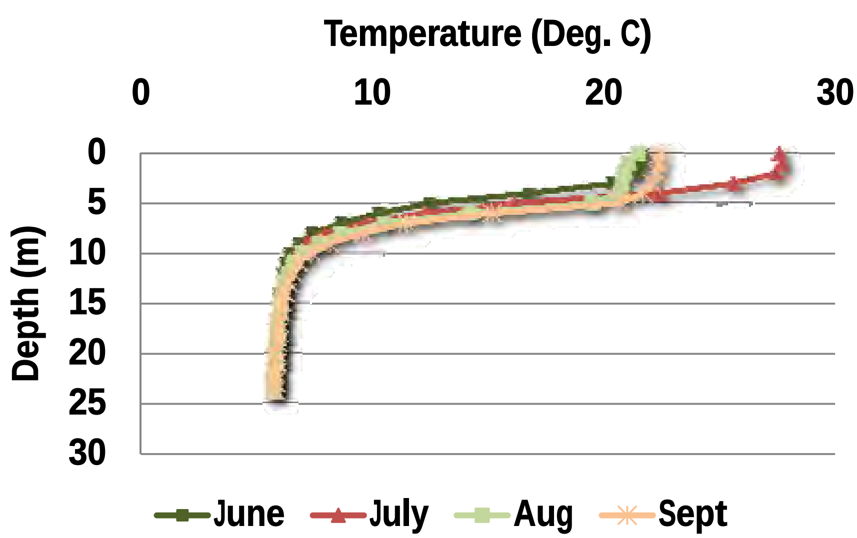


Dissolved Oxygen Profiles were not taken for Kerr Lake during the 2008 or 2009 monitoring seasons. However, historical data collected in 2002 can help understand the lakes mixing characteristics. DO levels remained above five mg/L to a depth of 12 meters (39.4 feet) in June. DO levels dropped below five mg/L at a depth of nine meters (29.5 feet) throughout the remainder of the summer months (Figure 11). Peak DO readings were noted near the top of the thermocline in the metalimnion. This condition, referred to as metalimnetic maxima, is the result of oxygen production by algae in the metalimnion combined with cooler temperatures that allows the water to hold more oxygen. This is a fairly common occurrence in clear mesotrophic lakes.

Temperature Profiles were also taken monthly during the 2002 monitoring season (Figure 11). Kerr Lake formed a shallow thermocline throughout the season at approximately two meters (6.7 feet). This thermocline remained consistent throughout the season.

Figure 11. Kerr Lake 2002 dissolved oxygen and temperature profiles





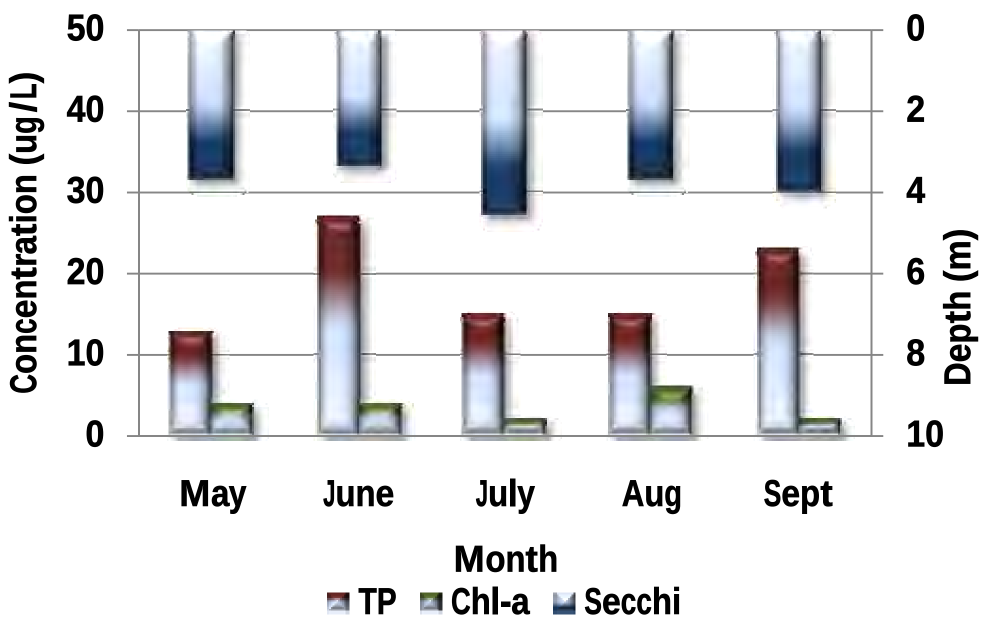
Lost Lake

Total Phosphorus (TP) concentrations, collected in 2008 and 2009, for Lost Lake averaged 19 µg/L and met the ARUS (Table 3). TP concentrations peaked in the June before declining and remaining steady up to September when levels increased again as nutrients were likely released from the disturbed sediment (Figure 12).

Chlorophyll-*a* concentrations for 2008 and 2009 averaged five µg/L (Table 3) and peaked at 11 µg/L in September of 2008. Based on 2008 and 2009 data, nuisance algal blooms did not occur in Lost Lake. The summer-mean for Lost Lake met the ARUS.

Secchi disk transparency for Lost Lake averaged 4.2 meters (13.8 feet) for 2008 and 2009 (Table 3). The average Secchi depth met the ARUS. Additionally, the changes in the transparency for Lost Lake over the course of the 2009 monitoring season closely mirrored the changes in nutrient availability (TP) and algal production (chl-*a*). The Secchi disk transparency reached a low of 3.4 meters (11.2 feet) in May and a high of 5.3 meters (17.4 feet) in June (Figure 12 and the appendix).

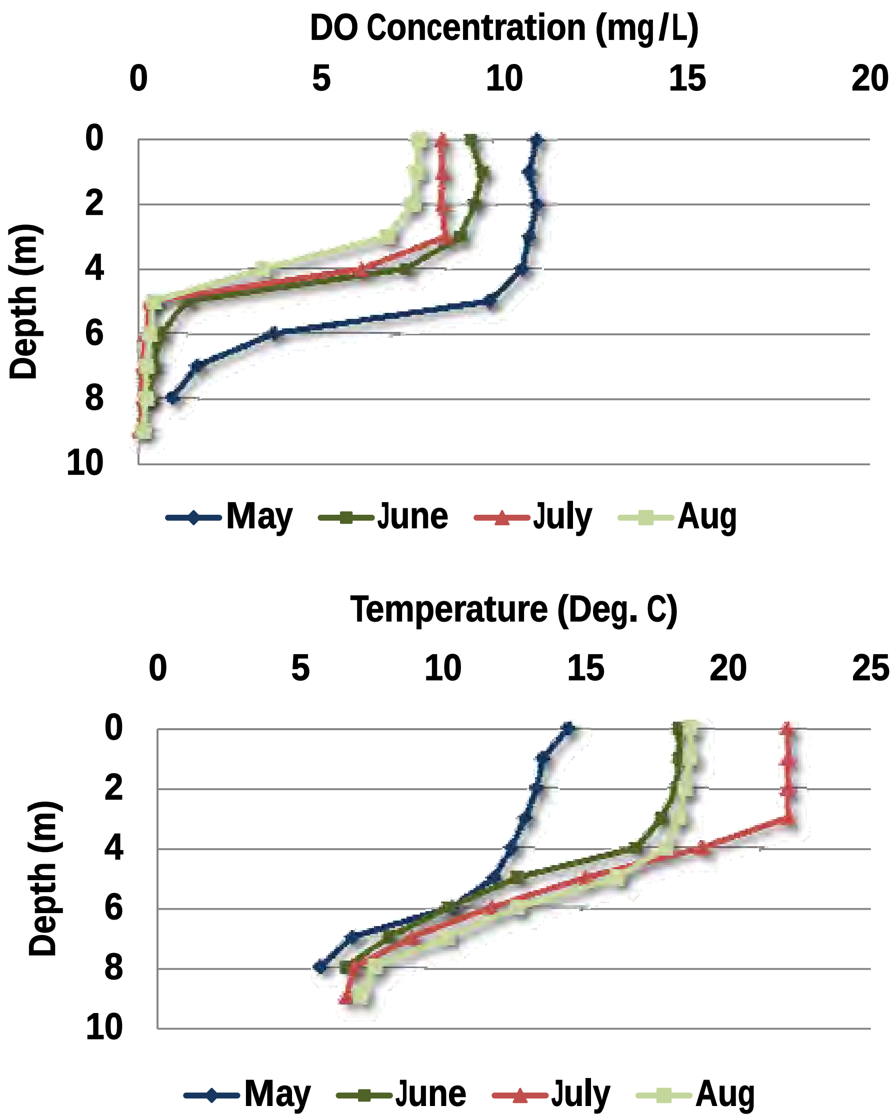
Figure 12. Lost Lake 2009 TP & Chl-*a* concentrations and Secchi depth



Dissolved Oxygen Profiles were not taken for Lost Lake during the 2008 or 2009 monitoring seasons. However, historical data collected in 2004 can help understand the lakes mixing characteristics. DO levels remained above five mg/L to a depth of approximately five meters (16.4 feet) throughout most of the season (Figure 13). Oxygen demand from the decomposition of organic materials in the hypolimnetic water and bottom sediments plus a lack of oxygen production was the likely cause of decreasing levels of DO. Profile data was not collected for the fall.

Temperature Profiles were also taken monthly during the 2004 monitoring season (Figure 13). Lost Lake formed a shallow thermocline throughout the season at approximately four meters (13.1 feet). This thermocline remained relatively consistent throughout the summer months.

Figure 13. Lost Lake 2004 dissolved oxygen and temperature profiles



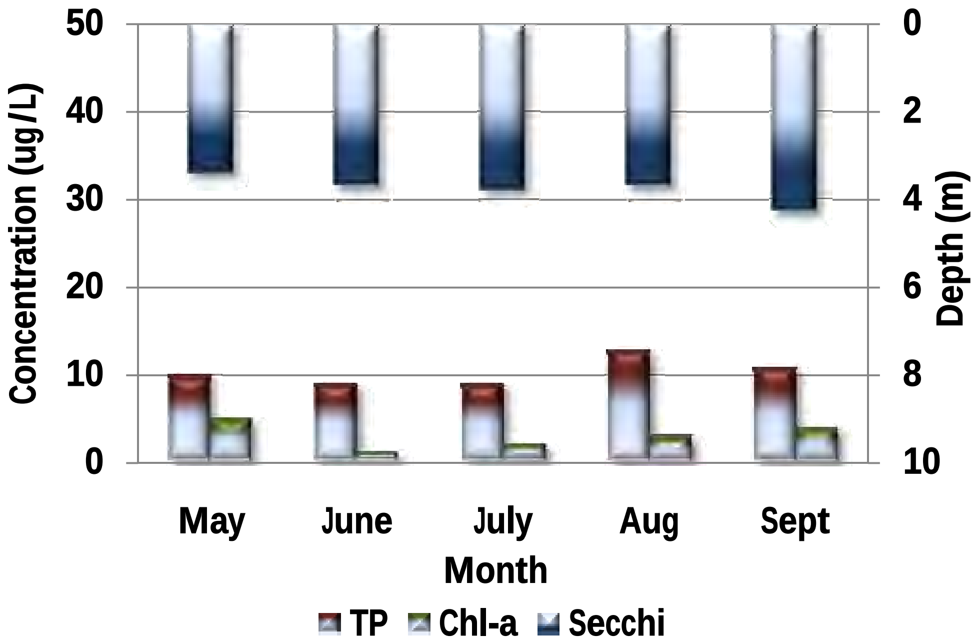
Mann Lake

Total Phosphorus (TP) concentrations, collected in 2008 and 2009, for Mann Lake averaged 12 µg/L and met the ARUS (Table 3). TP concentrations were relatively consistent throughout the 2009 season peaking at 13 µg/L in August (Figure 14).

Chlorophyll-*a* concentrations for 2008 and 2009 averaged three µg/L (Table 3) and peaked at five µg/L in May of 2009. Based on 2008 and 2009 data, nuisance algal blooms did not occur in Mann Lake. The summer-mean for Mann Lake met the ARUS.

Secchi disk transparency for Mann Lake averaged 3.6 meters (11.8 feet) for 2008 and 2009 (Table 3). The average Secchi depth met the ARUS. Additionally, the changes in the transparency for Mann Lake over the course of the 2009 monitoring season were as consistent as nutrient availability (TP) and algal production (chl-*a*). The Secchi disk transparency reached a low of 3.4 meters (11.2 feet) in May and a high of 4.3 meters (14.1 feet) in September (Figure 14 and the appendix).

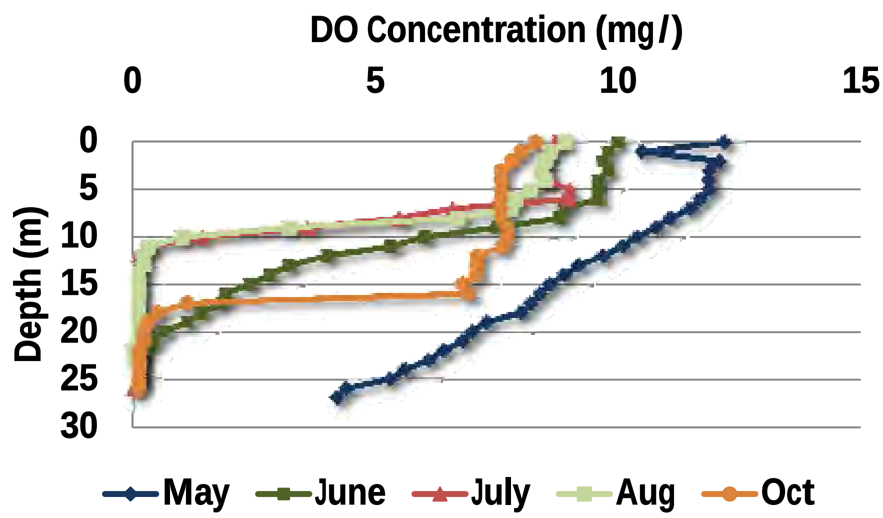
Figure 14. Mann Lake 2009 TP & Chl-*a* concentrations and Secchi depth

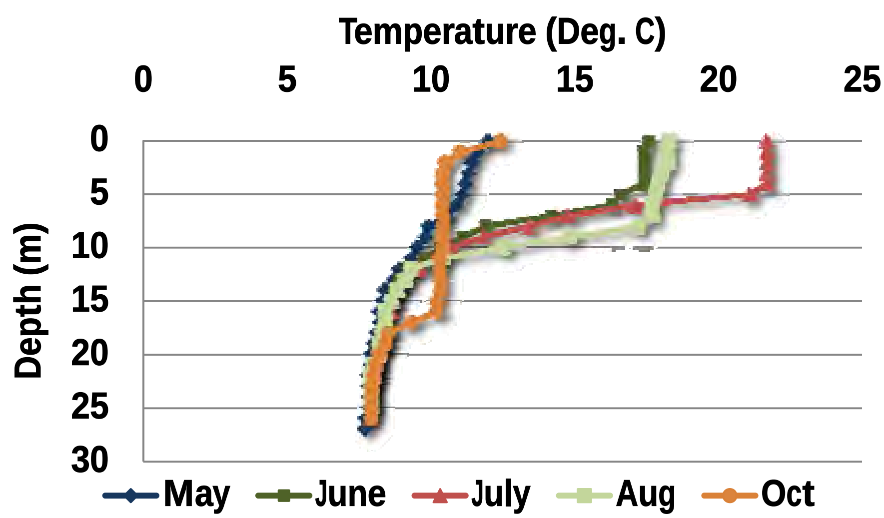


Dissolved Oxygen Profiles were not taken for Mann Lake during the 2008 or 2009 monitoring seasons. However, historical data collected in 2004 can help understand the lakes mixing characteristics. DO levels remained above five mg/L to a depth of 26 meters (85.3 feet) in May. DO levels dropped below five mg/L at a depth of eight meters (26.2 feet) in July and August (Figure 15).

Temperature Profiles were also taken monthly during the 2004 monitoring season (Figure 15). Mann Lake formed a weak thermocline in May. A more distinct thermocline formed in the summer months at approximately five meters (16.4 feet) before descending in August to a depth of approximately eight meters (26.2 feet).

Figure 15. Mann Lake 2004 dissolved oxygen and temperature profiles





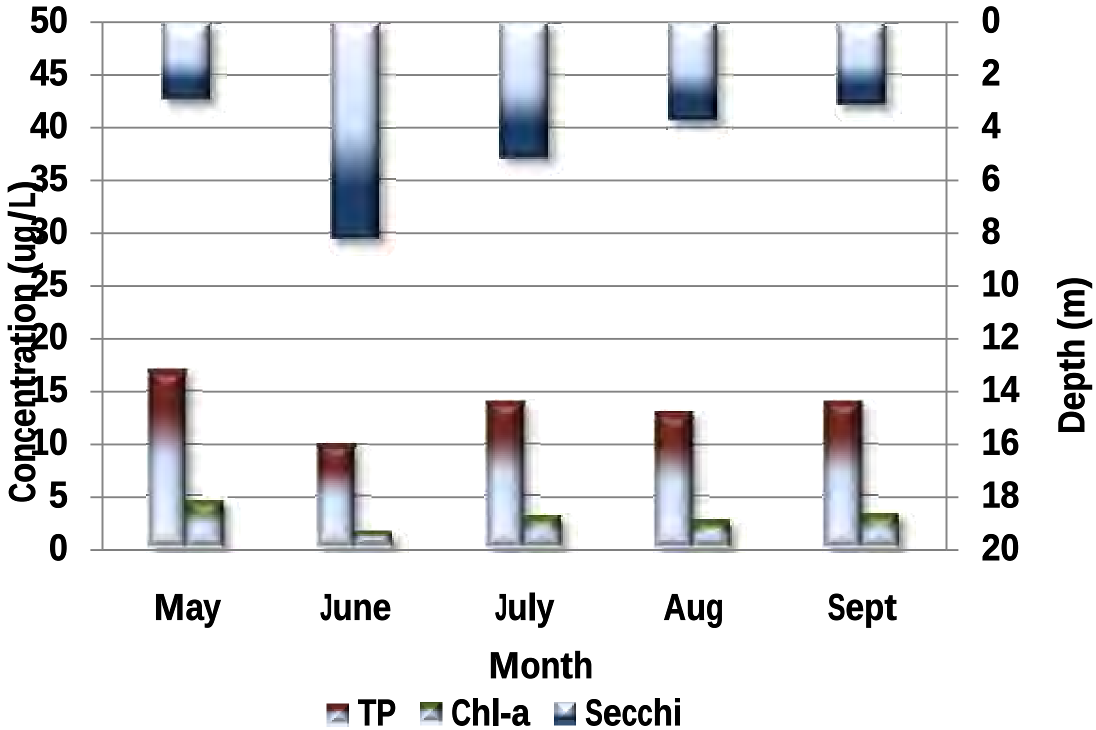
Baby Lake

Total Phosphorus (TP) concentrations, collected in 2008 and 2009, for Baby Lake averaged 16 µg/L and met the ARUS (Table 3). TP concentrations were relatively consistent throughout the 2009 season peaking at 17 µg/L in May (Figure 16).

Chlorophyll-*a* concentrations for 2008 and 2009 averaged four µg/L (Table 3) and peaked at five µg/L in May of 2009. Based on 2008 and 2009 data, nuisance algal blooms did not occur in Baby Lake. The summer-mean for Baby Lake met the ARUS for NLF lakes.

Secchi disk transparency for Baby Lake averaged 4.1 meters (13.4 feet) for 2008 and 2009 (Table 3). The average Secchi depth met the ARUS for the NLF ecoregion. Additionally, the changes in the transparency for Baby Lake over the course of the 2009 monitoring season were as consistent as nutrient availability (TP) and algal production (chl-*a*). The Secchi disk transparency reached a low of three meters (9.8 feet) in May and a high of 8.3 meters (27.2 feet) in June (Figure 16 and the appendix).

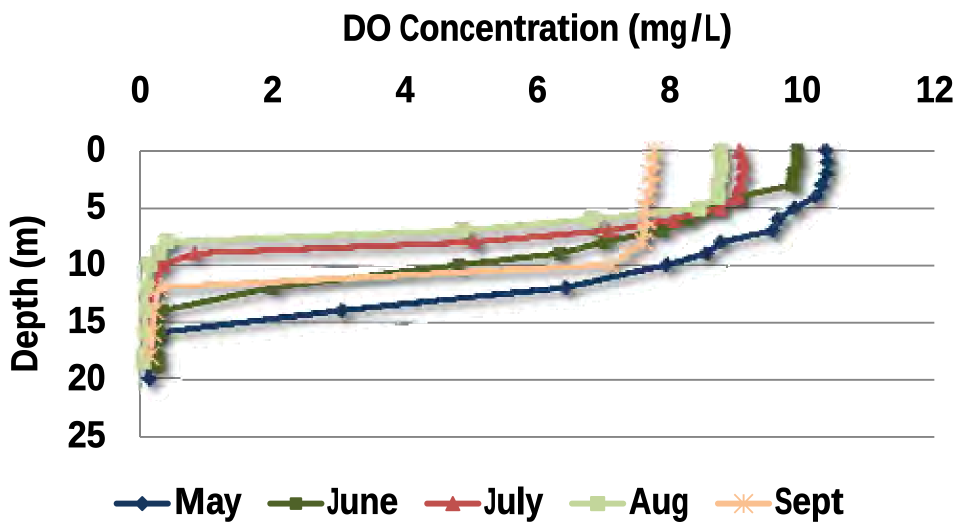
Figure 16. Baby Lake 2009 TP & Chl-*a* concentrations and Secchi depth



Dissolved Oxygen Profiles for Baby Lake collected during the 2009 monitoring seasons can help understand the lakes mixing characteristics. DO levels remained above five mg/L to a depth of 12 meters (39.4 feet) in May. By August DO levels had dropped below five mg/L at a depth of seven meters (23 feet) (Figure 17).

Temperature Profiles were also taken monthly during the 2009 monitoring season (Figure 17). Baby Lake formed a thermocline between seven and nine meters (23 and 29.5 feet) in May. Baby Lake's thermocline formed at approximately five meters (16.4 feet) during the summer months before descending in September to a depth of approximately 10 meters (32.8 feet).

Figure 17. Baby Lake 2009 dissolved oxygen and temperature profiles



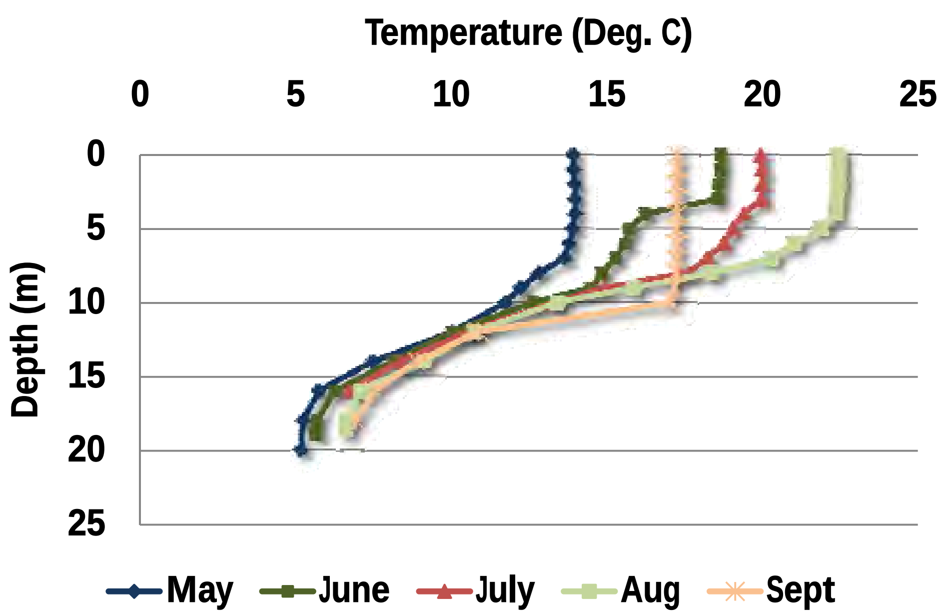


Table 3. McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes
2008 & 2009 seasonal averages as compared to NLF aquatic recreational use standards

Ecoregion	**TP**	**Chl-*a***	**Secchi**
	ug/L	**ug/L**	**meters**
NLF – Lake Trout (Class 2A)	< 12	< 3	> 4.8
NLF – Aquatic Rec. Use (Class 2B)	< 30	< 9	> 2.0
McKeown Lake Averages	14	3	4.8
Kid Lake Averages	13	4	4.0
Kerr Lake Averages	17	3	4.3
Lost Lake Averages	19	5	4.2
Mann Lake Averages	12	3	3.6
Baby Lake Averages	16	4	4.1

Trophic State Index (TSI)

One way to evaluate the trophic status of a lake and to interpret the relationship between TP, chl-*a*, and Secchi disk transparency is Carlson's Trophic State Index (Carlson 1977). TSI values are calculated as follows:

TP TSI (TSIP) = 14.42 ln (TP) + 4.15

Chl-*a* TSI (TSIC) = 9.81 ln (Chl-a) + 30.6

Secchi disk TSI (TSIS) = 60 – 14.41 ln (SD)

TP and chl-*a* are in µg/L and Secchi disk is in meters. TSI values range from 0 (ultra-oligotrophic) to 100 (hypereutrophic). In this index, each increase of ten units represents a doubling of algal biomass. Comparisons of the individual TSI measures provides a bases for assessing the relationship among TP, chl-*a*, and Secchi (Figure 18). In general, the TSI values are in fairly close correspondence with each other. The TSI values also correspond with observations for the 2008 and 2009 averages. Based on the values presented in Table 3 all six lakes were classified as mesotrophic.

FIGURE 18. Carlson's Trophic State Index for McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes
R.E. Carlson

TSI < 30 Classical Oligotrophy: Clear water, oxygen throughout the year in the Hypolimnion, salmonid fisheries in deep lakes.

TSI 30 – 40 Deeper lakes still exhibit classical oligotrophy, but some shallower lakes will become anoxic in the hypolimnion during the summer.

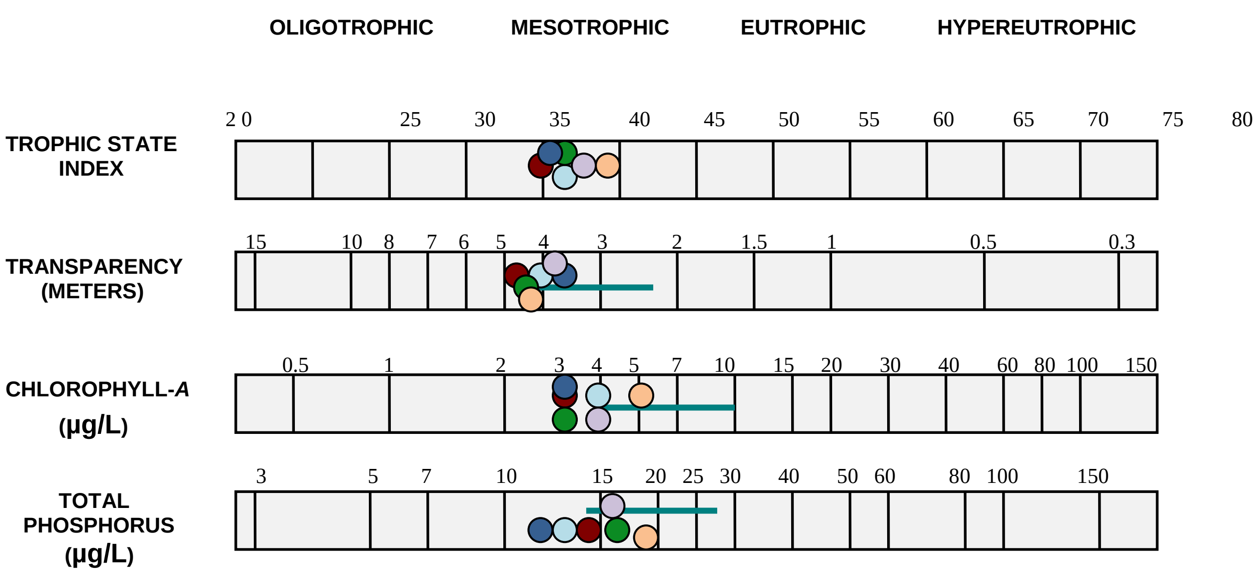
TSI 40 – 50 Water moderately clear, but increasing probability of anoxia in hypolimnion during summer.

TSI 50 – 60 Lower boundary of classical eutrophy: Decreased transparency, anoxic hypolimnia during the summer, macrophyte problems evident, warm-water fisheries only.

TSI 60 – 70 Dominance of blue-green algae, algal scum probable, extensive Macrophyte problems.

TSI 70 – 80 Heavy algal blooms possible throughout the summer, dense macrophyte beds, but extent limited by light penetration. Often would be classified as hypereutrophic.

TSI > 80 Algal scum, summer fish kills, few macrophytes, dominance of rough fish.



After Moore, I. and K. Thornton, [Ed.]1988. Lake and Reservoir Restoration Guidance Manual. USEPA>EPA 440/5-88-002.

NLF Ecoregion Range: McKeown: Kid: Kerr: Lost: Mann: Baby:

Trophic Status Trends

One aspect of lake monitoring is to assess trends where possible based on available STORET data. A review of these data reveals a large amount of historical Secchi data for McKeown Lake, Kerr Lake, Mann Lake, and Baby Lake (Figures 19, 21, 23, and 24) and a fair amount of Secchi data for Kid Lake and Lost Lake (Figures 20 through 22). Dashed lines within the figures indicate long-term means for each lake.

Based on historical Secchi data, the long-term mean Secchi transparency for the six lakes is 4.2 meters (13.8 feet). McKeown Lake has the greatest transparency with an average Secchi depth of 4.9 meters (16.1 feet) while Mann Lake has the shallowest transparency at 3.7 meters (12.1 feet). The long-term Secchi transparency means and all individual summer means (figures 19-24) for all six lakes are better than the ARUS for lakes within the NLF ecoregion (Table 4).

Each lake exhibits year-to-year variability in transparency, which is common in lakes. For some of the lakes, Kid and Lost, the records are very short and minimal variability is evident. Kerr and Mann have slightly longer records and most years measures vary within 0.5 m of the long-term mean with no evident trend. McKeown and Baby have somewhat longer records which indicate increasing transparency over time, with subtle increases noted from 2003-2009 in both cases. For all lakes, continued monitoring will allow for better characterization of year-to-year variability and understanding the factors that may contribute to the variation. As records increase statistical assessment of trends will become possible.

Figure 19. McKeown Lake historical Secchi transparency trends

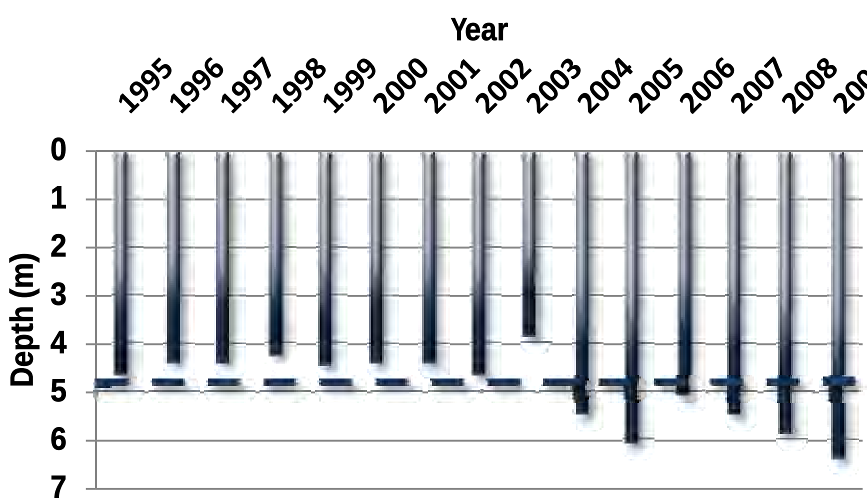


Figure 20. Kid Lake historical Secchi transparency trend

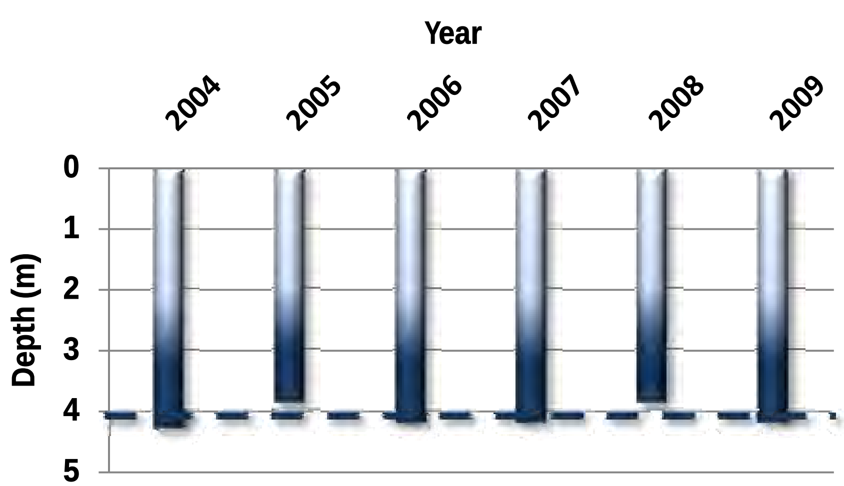


Figure 21. Kerr Lake historical Secchi transparency trend

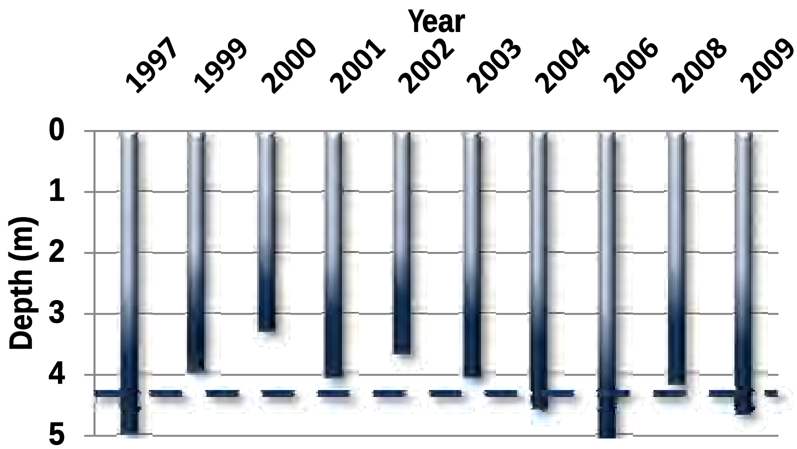


Figure 22. Lost Lake historical Secchi transparency trend

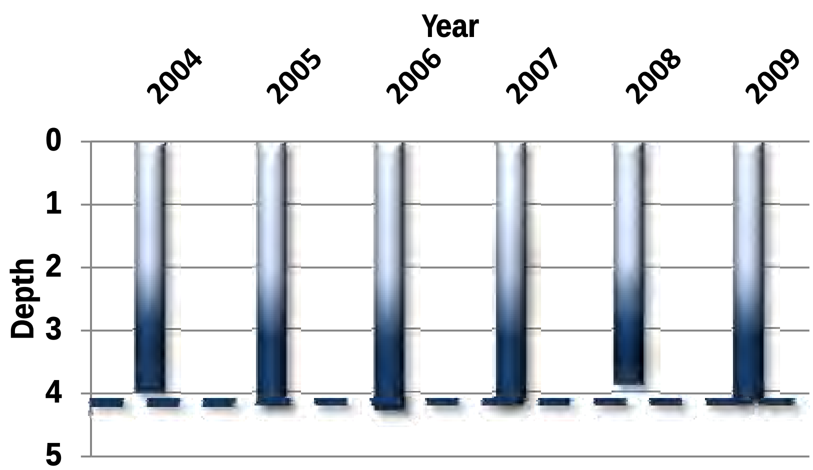


Figure 23. Mann Lake historical Secchi transparency trend

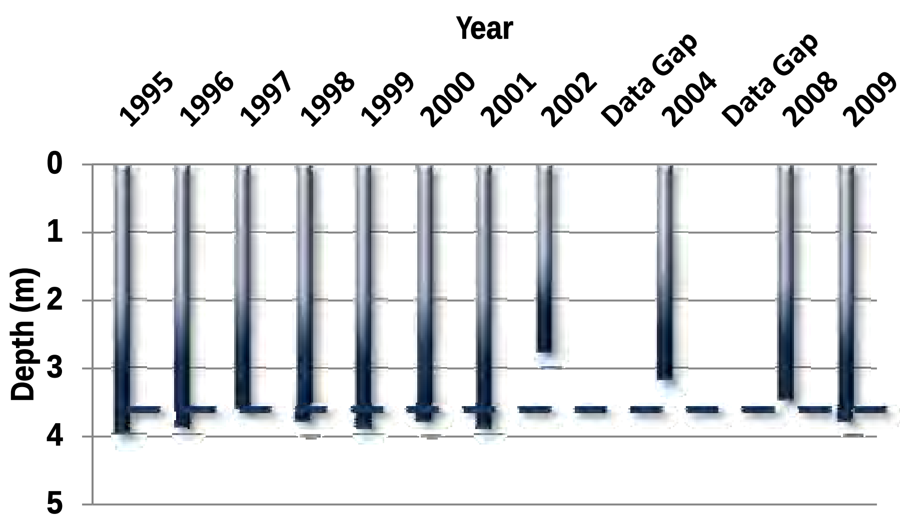


Figure 24. Baby Lake historical Secchi transparency trend

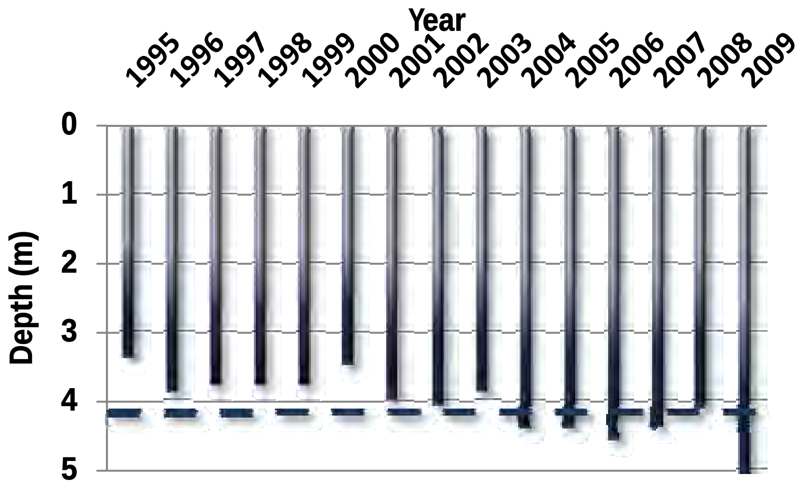


Table 4. McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes long term Secchi transparency means

Lake Name	Long Term Secchi Mean
McKeown	4.9
Kid	4.1
Kerr	4.3
Lost	4.1
Mann	3.7
Baby	4.1

Modeling

Numerous complex mathematical models are available for estimating nutrient and water budgets for lakes. These models can be used to relate the flow of water and nutrients from a lake's watershed to observed conditions in the lake. Alternatively, they may be used for estimating changes in the quality of the lake as a result of altering nutrient inputs to the lake (e.g., changing land uses in the watershed) or altering the flow or amount of water that enters the lake. To analyze the 2009 water quality of McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake, and Baby Lake, the Minnesota Lake Eutrophication Analysis Procedures (MINLEAP) model (Wilson and Walker, 1989) was used. A comparison of MINLEAP predicted vs. observed values is presented in Table 5.

MINLEAP was developed by MPCA staff based on an analysis of data collected from the ecoregion reference lakes. It is intended to be used as a screening tool for estimating lake conditions with minimal input data and is described in greater detail in Wilson and Walker (1989). The model predicts in-lake TP from these inputs and subsequently predicts chl-*a* based on a regression equation of TP and Secchi based on a regression equation based on chl-*a*. To assist with the analysis of McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake, and Baby Lake MINLEAP was applied as a basis for comparing the observed (2009) TP, chl-*a*, and Secchi values with those predicted by the model based on the lake depth and size as well as the size of the catchment watershed.

All six lakes are located in the NLF ecoregion and the model was run using NLF ecoregion-based inputs. It should be noted that the model predicts in-lake TP from these inputs and subsequently predicts chl-*a* based on a regression equation of TP and Secchi based on a regression equation based on chl-*a*.

Table 5. MINLEAP model results for McKeown, Kid, Kerr, Lost, Mann, and Baby Lakes

Parameter	2009 McKeown Lake Observed	McKeown Lake MINLEAP Predicted	2009 Kid Lake Observed	Kid Lake MINLEAP Predicted	2009 Kerr Lake Observed	Kerr Lake MINLEAP Predicted
TP (µg/L)	14	18	13	16	17	14
Chl-*a* (µg /L	3	5	4	4	3	3
Secchi (m)	4.8	3.1	4	3.6	4.3	4.1
P loading rate (kg/yr)	-	501	-	327	-	21
P retention (%)	-	10	-	24	-	77
P inflow Avg. (µg/L)	-	20	-	21	-	59
Areal Water Load (m/yr)	-	41.8	-	23.8	-	1.2
Outflow volume (hm^3/yr)	-	24.7	-	15.9	-	0.4
Residence time (yrs)	-	0	-	0.3	-	8.5

Parameter	2009 Lost Lake Observed	Lost Lake MINLEAP Predicted	2009 Mann Lake Observed	Mann Lake MINLEAP Predicted	2009 Baby Lake Observed	Baby Lake MINLEAP Predicted
TP (µg/L)	19	16	12	13	16	12
Chl-*a* (µg /L	5	4	3	3	4	2.5
Secchi (m)	4.2	3.6	3.6	4.2	4.1	4.5
P loading rate (kg/yr)	-	130	-	510	-	449
P retention (%)	-	23	-	38	-	44
P inflow Avg. (µg/L)	-	21	-	21	-	22
Areal Water Load (m/yr)	-	21.9	-	12.3	-	6.9
Outflow volume (hm^3/yr)	-	6.3	-	24.3	-	20.6
Residence time (yrs)	-	0.2	-	0.9	-	1.4

303 (d) Assessment and Goal Setting

The federal Clean Water Act requires states to adopt water quality standards to protect waters from pollution. These standards define how much of a pollutant can be in the water and still allow it to meet designated uses, such as drinking water, fishing and swimming. The standards are set on a wide range of pollutants, including bacteria, nutrients, turbidity and mercury. A water body is "impaired" if it fails to meet one or more water quality standards.

Under Section 303(d) of the Clean Water Act, the state is required to asses all waters of the state to determine if they meet water quality standards. Waters that do not meet standards (i.e., impaired waters) are added to the 303(d) list and updated every even-numbered year. In order for a lake to be considered impaired for aquatic recreation use, the average TP concentration must exceed the water quality standard for its ecoregion. In addition, either the chl-*a* concentration for the lake must exceed the standard or the Secchi data for the lake must be below the standard. A minimum of eight samples collected over two or more years are needed to conduct the assessment. There are numerous other water quality standards for which we assess Minnesota's water resources. An example is mercury found in fish tissue. If a water body is listed, an investigative TMDL study must be conducted to determine the sources and extent of pollution, and to establish pollutant reduction goals needed to restore the resource to meet the determined water quality standards for its ecoregion. The MPCA is responsible for performing assessment activities, listing impaired waters, and conducting TMDL studies in Minnesota.

According to Table 6, the TP and chl-*a* standards for the support of aquatic recreation in class 2B lakes within the NLF ecoregion are less than 30 µg/L and 9 µg/L respectively. For TP levels at or below 30 µg/L, "nuisance algal blooms" (chl-*a* > 20 µg/L) should occur less than 10 percent of the summer and transparency should remain at or above 3 meters (9.8 feet) over 85 percent of the summer. Summer averages for TP, chl-*a*, and Secchi transparency for McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake, and Baby Lake all met the ARUS and most measures were well below the standards. Chl-*a* concentrations greater than 20 µg/L will typically be perceived as a nuisance, while concentrations greater than 30 µg/L are perceived as a severe nuisance algal bloom (Heiskary and Walker, 1988). Based on 2008 and 2009 data, nuisance algal blooms did not occur within any of these lakes.

Maintaining low levels of TP will be required in order to prevent the occurrence of algal blooms for all three lakes. Alternatively, should in-lake TP concentrations increase, the potential for nuisance algal blooms will also increase. It is important to minimize external (watershed) phosphorus loading to the lakes wherever possible to maintain current concentrations. By minimizing external loading this should reduce the likelihood that internal recycling of P (from the sediments) remains at a low level. Based on the data used in the 2010 assessment cycle, McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake, and Baby Lake fully support aquatic recreational uses (do not exceed the eutrophication standards) and will not be placed on the 303(d) impaired waters list.

Table 6. Eutrophication standard by ecoregion and lake type
(Heiskary and Wilson, 2005)

Ecoregion	TP µg/L	Chl-*a* µg/L	Secchi meters
NLF – Lake trout (Class 2A)	< 12	< 3	> 4.8
NLF – Stream trout (Class 2A)	< 20	< 6	> 2.5
NLF – Aquatic Rec. Use (Class 2B)	< 30	< 9	> 2.0
NCHF – Stream trout (Class 2a)	< 20	< 6	> 2.5
NCHF – Aquatic Rec. Use (Class 2b)	< 40	< 14	> 1.4
NCHF – Aquatic Rec. Use (Class 2b) Shallow lakes	< 60	< 20	> 1.0
WCBP & NGP – Aquatic Rec. Use (Class 2B)	< 65	< 22	> 0.9
WCBP & NGP – Aquatic Rec. Use (Class 2b) Shallow lakes	< 90	< 30	> 0.7

References

Arneman, H.F. 1963. Soils of Minnesota. University of Minnesota, Agricultural Extension Service and U.S. Department of Agriculture.

Carlson, R.E. 1977. A Trophic State Index for Lakes. Limnology and Oceanography 22:361-369.

'Closest Station' Climate Data Retrieval, October 2008 – September 2009. State Climatology Office, Minnesota Department of Natural Resources. 2010.

Heiskary, S.A. and W.W. Walker Jr. 1988. Developing Phosphorus Criteria for Minnesota Lakes. Lake and Reservoir Management 4(1): 1-9.

Heiskary, S.A. and C. B. Wilson. 1989 (updated 2004). Minnesota Lake Water Quality Assessment Report. MPCA, Water Quality Division St. Paul, MN.

Heiskary, S.A. and C.B.Wilson. 1990. "Minnesota Lake Water Quality Assessment Report. 2nd Ed." MPCA. St. Paul MN 95 pp.

Heiskary, S.A. and C.B. Wilson. 2005. "Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria." 3rd Ed." MPCA. St. Paul MN 150 pp.

"Macrophytes as Indicators." **Biological Indicators of Watershed Health**. Online. EPA.GOV. 2007.

Schupp, D. and B. Wilson. 1993. Developing lake goals for water quality and fisheries. *Lakeline* 13: 18-21.

Water Year Precipitation Departure from Normal, October 2008 – September 2009. Map. State Climatology Office, Minnesota Department of Natural Resources. 2010.

Wilson, C.B. and W.W. Walker 1989. Development of lake assessment methods based upon the aquatic ecoregion concept. Lake and Reserv. Manage. 5(2):11-22.

Zumberge, J.H. 1952. The Lakes of Minnesota. Their origin and classification. Minnesota Geological Survey. University of Minnesota Press. Minneapolis, Minnesota.

Appendix

McKeown Lake, Kid Lake, Kerr Lake, Lost Lake, Mann Lake and Baby Lake Surface Water Results

Lake Name	Lake ID	Sample Date	Site ID	Secchi	TP	Chl-*a*
				Meters	ug/L	ug/L
McKeown	11-0261	5/3/1995	201	4.42		
McKeown	11-0261	5/9/1995	201	3.81		
McKeown	11-0261	5/17/1995	201	4.11		
McKeown	11-0261	5/25/1995	201	4.11		
McKeown	11-0261	5/30/1995	201	5.03		
McKeown	11-0261	6/6/1995	201	6.55		
McKeown	11-0261	6/19/1995	201	5.79		
McKeown	11-0261	6/26/1995	201	5.64		
McKeown	11-0261	7/3/1995	201	5.64		
McKeown	11-0261	7/10/1995	201	5.49		
McKeown	11-0261	7/17/1995	201	4.27		
McKeown	11-0261	7/22/1995	201	4.57		
McKeown	11-0261	7/29/1995	201	4.42		
McKeown	11-0261	8/4/1995	201	4.27		
McKeown	11-0261	8/11/1995	201	4.11		
McKeown	11-0261	8/18/1995	201	3.66		
McKeown	11-0261	9/2/1995	201	4.42		
McKeown	11-0261	9/9/1995	201	3.96		
McKeown	11-0261	10/9/1995	201	4.88		
McKeown	11-0261	5/8/1996	201	4.88		
McKeown	11-0261	5/15/1996	201	4.27		
McKeown	11-0261	5/22/1996	201	3.35		
McKeown	11-0261	5/25/1996	201	3.81		
McKeown	11-0261	6/4/1996	201	5.03		
McKeown	11-0261	6/8/1996	201	4.57		
McKeown	11-0261	6/16/1996	201	4.72		
McKeown	11-0261	6/22/1996	201	5.03		
McKeown	11-0261	6/29/1996	201	4.42		
McKeown	11-0261	7/7/1996	201	4.88		
McKeown	11-0261	7/13/1996	201	4.57		
McKeown	11-0261	7/21/1996	201	3.81		
McKeown	11-0261	7/30/1996	201	4.11		
McKeown	11-0261	8/8/1996	201	4.11		
McKeown	11-0261	8/15/1996	201	4.27		
McKeown	11-0261	8/24/1996	201	3.96		
McKeown	11-0261	8/31/1996	201	3.96		
McKeown	11-0261	9/8/1996	201	4.42		

McKeown	11-0261	9/16/1996	201	4.57		
McKeown	11-0261	9/29/1996	201	4.57		
McKeown	11-0261	10/10/1996	201	4.11		
McKeown	11-0261	5/15/1997	201	3.66		
McKeown	11-0261	5/25/1997	201	4.11		
McKeown	11-0261	6/6/1997	201	5.03		
McKeown	11-0261	6/16/1997	201	4.88		
McKeown	11-0261	6/24/1997	201	4.72		
McKeown	11-0261	7/1/1997	201	4.57		
McKeown	11-0261	7/9/1997	201	4.88		
McKeown	11-0261	7/16/1997	201	4.11		
McKeown	11-0261	7/25/1997	201	3.81		
McKeown	11-0261	8/4/1997	201	3.81		
McKeown	11-0261	8/13/1997	201	3.81		
McKeown	11-0261	8/20/1997	201	4.11		
McKeown	11-0261	8/27/1997	201	4.72		
McKeown	11-0261	9/3/1997	201	4.27		
McKeown	11-0261	9/10/1997	201	4.42		
McKeown	11-0261	9/23/1997	201	4.88		
McKeown	11-0261	10/2/1997	201	4.72		
McKeown	11-0261	4/16/1998	201	3.96		
McKeown	11-0261	4/22/1998	201	3.81		
McKeown	11-0261	4/29/1998	201	4.27		
McKeown	11-0261	5/6/1998	201	4.27		
McKeown	11-0261	5/17/1998	201	4.27		
McKeown	11-0261	5/21/1998	201	4.57		
McKeown	11-0261	5/29/1998	201	4.57		
McKeown	11-0261	6/13/1998	201	4.27		
McKeown	11-0261	6/17/1998	201	4.42		
McKeown	11-0261	6/24/1998	201	4.42		
McKeown	11-0261	7/1/1998	201	4.27		
McKeown	11-0261	7/9/1998	201	5.03		
McKeown	11-0261	7/15/1998	201	3.66		
McKeown	11-0261	7/22/1998	201	4.42		
McKeown	11-0261	7/30/1998	201	4.57		
McKeown	11-0261	8/6/1998	201	3.96		
McKeown	11-0261	8/15/1998	201	4.11		
McKeown	11-0261	8/21/1998	201	4.11		
McKeown	11-0261	8/30/1998	201	4.42		
McKeown	11-0261	9/6/1998	201	3.96		
McKeown	11-0261	9/15/1998	201	4.11		
McKeown	11-0261	5/26/1999	201	5.18		

McKeown	11-0261	6/8/1999	201	5.18		
McKeown	11-0261	6/16/1999	201	4.57		
McKeown	11-0261	6/24/1999	201	5.18		
McKeown	11-0261	6/30/1999	201	4.57		
McKeown	11-0261	7/13/1999	201	4.57		
McKeown	11-0261	7/22/1999	201	4.27		
McKeown	11-0261	7/28/1999	201	4.27		
McKeown	11-0261	8/4/1999	201	4.27		
McKeown	11-0261	8/14/1999	201	4.27		
McKeown	11-0261	8/22/1999	201	3.96		
McKeown	11-0261	9/15/1999	201	3.96		
McKeown	11-0261	9/22/1999	201	4.57		
McKeown	11-0261	5/13/2000	201	3.35		
McKeown	11-0261	5/19/2000	201	4.27		
McKeown	11-0261	5/26/2000	201	4.57		
McKeown	11-0261	6/3/2000	201	3.66		
McKeown	11-0261	6/22/2000	201	3.66		
McKeown	11-0261	6/28/2000	201	3.81		
McKeown	11-0261	7/5/2000	201	3.66		
McKeown	11-0261	7/13/2000	201	4.11		
McKeown	11-0261	7/22/2000	201	5.94		
McKeown	11-0261	7/27/2000	201	5.64		
McKeown	11-0261	8/3/2000	201	4.72		
McKeown	11-0261	8/10/2000	201	3.96		
McKeown	11-0261	8/21/2000	201	4.27		
McKeown	11-0261	8/26/2000	201	4.72		
McKeown	11-0261	9/5/2000	201	4.57		
McKeown	11-0261	9/11/2000	201	4.57		
McKeown	11-0261	9/26/2000	201	4.57		
McKeown	11-0261	5/3/2001	201	3.51		
McKeown	11-0261	5/12/2001	201	3.81		
McKeown	11-0261	5/18/2001	201	3.81		
McKeown	11-0261	5/28/2001	201	3.96		
McKeown	11-0261	6/3/2001	201	4.72		
McKeown	11-0261	6/8/2001	201	4.88		
McKeown	11-0261	6/12/2001	201	4.88		
McKeown	11-0261	6/15/2001	201	4.88		
McKeown	11-0261	6/23/2001	201	4.27		
McKeown	11-0261	7/1/2001	201	4.27		
McKeown	11-0261	7/12/2001	201	4.88		
McKeown	11-0261	7/20/2001	201	4.27		
McKeown	11-0261	8/2/2001	201	4.88		

McKeown	11-0261	8/2/2001	201	4.88		
McKeown	11-0261	8/13/2001	201	4.27		
McKeown	11-0261	8/22/2001	201	4.42		
McKeown	11-0261	9/3/2001	201	4.57		
McKeown	11-0261	9/20/2001	201	4.57		
McKeown	11-0261	9/26/2001	201	4.79		
McKeown	11-0261	5/14/2002	201	3.96		
McKeown	11-0261	5/19/2002	201	4.27		
McKeown	11-0261	5/26/2002	201	7.01		
McKeown	11-0261	6/4/2002	201	7.32		
McKeown	11-0261	6/11/2002	201	6.4		
McKeown	11-0261	6/17/2002	201	5.18		
McKeown	11-0261	7/2/2002	201	3.96		
McKeown	11-0261	7/11/2002	201	4.72		
McKeown	11-0261	7/17/2002	201	4.72		
McKeown	11-0261	7/29/2002	201	3.35		
McKeown	11-0261	8/19/2002	201	3.35		
McKeown	11-0261	8/26/2002	201	3.66		
McKeown	11-0261	9/4/2002	201	3.66		
McKeown	11-0261	9/12/2002	201	4.27		
McKeown	11-0261	9/24/2002	201	4.11		
McKeown	11-0261	10/13/2002	201	3.66		
McKeown	11-0261	5/13/2003	201	3.35		
McKeown	11-0261	5/20/2003	201	3.51		
McKeown	11-0261	5/28/2003	201	3.35		
McKeown	11-0261	6/2/2003	201	3.35		
McKeown	11-0261	6/9/2003	201	3.35		
McKeown	11-0261	6/19/2003	201	4.27		
McKeown	11-0261	6/27/2003	201	3.96		
McKeown	11-0261	7/3/2003	201	4.57		
McKeown	11-0261	7/11/2003	201	4.27		
McKeown	11-0261	7/18/2003	201	4.27		
McKeown	11-0261	7/26/2003	201	3.96		
McKeown	11-0261	8/2/2003	201	3.35		
McKeown	11-0261	8/14/2003	201	3.66		
McKeown	11-0261	8/25/2003	201	3.51		
McKeown	11-0261	9/4/2003	201	4.57		
McKeown	11-0261	9/12/2003	201	4.57		
McKeown	11-0261	9/23/2003	201	4.27		
McKeown	11-0261	10/5/2003	201	3.35		
McKeown	11-0261	5/6/2004	201	3.66		
McKeown	11-0261	5/18/2004	201	4.57		
McKeown	11-0261	5/26/2004	201	6.4		

McKeown	11-0261	5/28/2004	202	6.1		
McKeown	11-0261	6/1/2004	201	6.71		
McKeown	11-0261	6/9/2004	201	9.45		
McKeown	11-0261	6/22/2004	201	7.62		
McKeown	11-0261	6/28/2004	202	8.2		
McKeown	11-0261	6/29/2004	201	6.1		
McKeown	11-0261	7/8/2004	201	4.88		
McKeown	11-0261	7/14/2004	201	4.27		
McKeown	11-0261	7/24/2004	201	3.96		
McKeown	11-0261	7/30/2004	202	4.1		
McKeown	11-0261	8/1/2004	201	4.27		
McKeown	11-0261	8/16/2004	201	4.88		
McKeown	11-0261	8/25/2004	201	5.03		
McKeown	11-0261	8/31/2004	202	4.8		
McKeown	11-0261	9/11/2004	201	5.49		
McKeown	11-0261	9/28/2004	201	4.88		
McKeown	11-0261	10/20/2004	202	5.9		
McKeown	11-0261	5/15/2005	201	7.92		
McKeown	11-0261	5/27/2005	201	8.23		
McKeown	11-0261	5/29/2005	201	9.45		
McKeown	11-0261	6/6/2005	201	7.62		
McKeown	11-0261	6/15/2005	201	6.4		
McKeown	11-0261	6/17/2005	201	7.62		
McKeown	11-0261	6/28/2005	201	5.79		
McKeown	11-0261	7/7/2005	201	5.18		
McKeown	11-0261	7/15/2005	201	4.27		
McKeown	11-0261	7/22/2005	201	4.27		
McKeown	11-0261	8/1/2005	201	5.49		
McKeown	11-0261	8/22/2005	201	4.27		
McKeown	11-0261	8/29/2005	201	4.27		
McKeown	11-0261	9/14/2005	201	4.57		
McKeown	11-0261	10/1/2005	201	5.18		
McKeown	11-0261	4/27/2006	201	7.92		
McKeown	11-0261	5/5/2006	201	8.69		
McKeown	11-0261	5/15/2006	201	8.69		
McKeown	11-0261	5/22/2006	201	9.45		
McKeown	11-0261	5/30/2006	201	5.49		
McKeown	11-0261	6/6/2006	201	3.66		
McKeown	11-0261	6/18/2006	201	4.27		
McKeown	11-0261	6/28/2006	201	3.96		
McKeown	11-0261	7/5/2006	201	3.96		
McKeown	11-0261	7/14/2006	201	3.96		

McKeown	11-0261	7/21/2006	201	4.27		
McKeown	11-0261	8/7/2006	201	3.66		
McKeown	11-0261	8/21/2006	201	3.96		
McKeown	11-0261	8/27/2006	201	4.27		
McKeown	11-0261	9/4/2006	201	4.57		
McKeown	11-0261	9/12/2006	201	4.27		
McKeown	11-0261	9/20/2006	201	4.57		
McKeown	11-0261	5/1/2007	201	6.1		
McKeown	11-0261	5/14/2007	201	8.23		
McKeown	11-0261	5/25/2007	201	7.32		
McKeown	11-0261	6/10/2007	201	6.71		
McKeown	11-0261	6/20/2007	201	4.88		
McKeown	11-0261	6/30/2007	201	5.18		
McKeown	11-0261	7/3/2007	201	5.49		
McKeown	11-0261	7/14/2007	201	3.96		
McKeown	11-0261	7/27/2007	201	4.57		
McKeown	11-0261	8/7/2007	201	4.27		
McKeown	11-0261	9/2/2007	201	3.66		
McKeown	11-0261	5/7/2008	201	4.57		
McKeown	11-0261	5/17/2008	201	4.27		
McKeown	11-0261	5/23/2008	201	6.25		
McKeown	11-0261	5/28/2008	201	8.69		
McKeown	11-0261	6/4/2008	201	8.84		
McKeown	11-0261	6/8/2008	202	8.84	28	3
McKeown	11-0261	6/20/2008	201	8.53		
McKeown	11-0261	6/29/2008	201	6.1		
McKeown	11-0261	6/29/2008	202	6.1	9	1
McKeown	11-0261	7/15/2008	201	5.18		
McKeown	11-0261	7/27/2008	201	4.72		
McKeown	11-0261	7/27/2008	202	4.72	10	3
McKeown	11-0261	8/15/2008	201	4.27		
McKeown	11-0261	8/24/2008	201	4.11		
McKeown	11-0261	9/9/2008	201	4.88		
McKeown	11-0261	9/9/2008	202	4.88	9	4
McKeown	11-0261	9/18/2008	201	5.18		
McKeown	11-0261	5/17/2009	201	7.01		
McKeown	11-0261	5/21/2009	201	8.84		
McKeown	11-0261	5/31/2009	201	7.92		
McKeown	11-0261	5/31/2009	202	7.9	8	1
McKeown	11-0261	6/3/2009	201	9.75		

McKeown	11-0261	6/14/2009	201	8.84		
McKeown	11-0261	6/21/2009	201	6.4		
McKeown	11-0261	6/21/2009	202	6.4	10	1
McKeown	11-0261	7/1/2009	201	5.49		
McKeown	11-0261	7/12/2009	201	4.88		
McKeown	11-0261	7/12/2009	202	4.9	10	2
McKeown	11-0261	7/21/2009	201	4.57		
McKeown	11-0261	8/9/2009	201	4.57		
McKeown	11-0261	8/9/2009	202	4.6	13	2
McKeown	11-0261	8/30/2009	201	5.49		
McKeown	11-0261	9/13/2009	201	5.79		
McKeown	11-0261	9/13/2009	202	5.8	11	1

Lake Name	Lake ID	Sample Date	Site ID	Sample Depth	Dissolved Oxygen	Water Temperature
					mg/L	Deg. C
McKeown	11-0261	5/28/2004	202	0	11.3	13.2
				1	11.1	13.1
				2	11.2	12.9
				3	11	12.7
				4	10.9	12.3
				5	10.4	12.1
				6	10.4	11.6
				7	10.2	11.3
				8	8.6	10.6
				9	5.2	9.3
				10	2.2	8.1
McKeown	11-0261	6/28/2004	202	0	10.3	18.9
				1	10.1	18.2
				2	9.9	17.8
				3	9.7	17.5
				4	9.1	17.2
				5	8.8	16.8
				6	8.1	16.2
				7	7.2	14.8
				8	4.8	12.3
				9	2.8	11.1
				10	1.6	10.4

McKeown	11-0261	7/30/2004	202	0	9.3	21.7
				1	8.7	22.2
				2	8.7	22.2
				3	8.7	22.2
				4	9.1	21.8
				5	8.8	19.8
				6	5.2	17.4
				7	1.2	15.3
				8	0.4	13.9
				9	0.2	12.2
				10	0.1	11.1
				11	0.1	10.6
McKeown	11-0261	8/31/2004	202	0	9.2	18.8
				1	9	18.7
				2	9	18.7
				3	8.9	18.6
				4	8.8	18.6
				5	8.5	18.3
McKeown	11-0261	8/31/2004 (Cont.)	202	6	7.6	18
				7	3.7	17.4
				8	0.7	14.9
				9	0.3	12.6
				10	0.2	11.6
McKeown	11-0261	10/20/2004	202	0	9.5	9.3
				1	9.5	8.6
				2	9.2	8.6
				3	9.2	8.5
				4	9.3	8.4
				5	9.2	8.4
				6	9.2	8.3
				7	9.2	8.2
				8	9.1	8.1
				9	9.1	8.1
				10	9	8
				11	0.4	8.8

Lake Name	Lake ID	Sample Date	Site ID	Secchi	TP	Chl-*a*
				Meters	ug/L	ug/l
Kid	11-0262	9/26/2001	201	3.41		
Kid	11-0262	7/17/2002	201	4.18		
Kid	11-0262	8/19/2002	201	3.26		
Kid	11-0262	9/4/2002	201	3.72		
Kid	11-0262	5/7/2004	201	3.96		
Kid	11-0262	5/14/2004	201	5.18		
Kid	11-0262	5/21/2004	201	4.72		
Kid	11-0262	5/28/2004	201	4.11		
Kid	11-0262	6/5/2004	201	4.11		
Kid	11-0262	6/10/2004	201	4.27		
Kid	11-0262	6/16/2004	201	4.42		
Kid	11-0262	6/24/2004	201	4.27		
Kid	11-0262	6/28/2004	201	5.3		
Kid	11-0262	6/30/2004	201	4.72		
Kid	11-0262	7/10/2004	201	5.03		
Kid	11-0262	7/19/2004	201	5.33		
Kid	11-0262	7/28/2004	201	5.49		
Kid	11-0262	7/30/2004	201	3.5		
Kid	11-0262	8/11/2004	201	4.72		
Kid	11-0262	8/17/2004	201	3.66		
Kid	11-0262	8/29/2004	201	3.2		
Kid	11-0262	8/31/2004	201	3.3		
Kid	11-0262	9/6/2004	201	3.66		
Kid	11-0262	9/14/2004	201	3.66		
Kid	11-0262	9/25/2004	201	3.96		
Kid	11-0262	10/7/2004	201	3.2		
Kid	11-0262	10/18/2004	201	3.2		
Kid	11-0262	10/20/2004	201	2.7		
Kid	11-0262	11/11/2004	201	3.2		
Kid	11-0262	5/30/2005	201	4.11		
Kid	11-0262	6/7/2005	201	4.57		
Kid	11-0262	6/15/2005	201	5.03		
Kid	11-0262	6/29/2005	201	4.42		
Kid	11-0262	7/6/2005	201	5.03		
Kid	11-0262	7/13/2005	201	4.27		
Kid	11-0262	7/20/2005	201	4.11		
Kid	11-0262	7/27/2005	201	3.2		
Kid	11-0262	8/3/2005	201	3.05		
Kid	11-0262	8/10/2005	201	3.05		

Kid	11-0262	8/17/2005	201	3.05		
Kid	11-0262	8/24/2005	201	3.2		
Kid	11-0262	8/30/2005	201	3.51		
Kid	11-0262	9/15/2005	201	3.66		
Kid	11-0262	9/28/2005	201	3.66		
Kid	11-0262	10/8/2005	201	3.35		
Kid	11-0262	5/7/2006	201	3.66		
Kid	11-0262	5/19/2006	201	5.03		
Kid	11-0262	5/28/2006	201	4.57		
Kid	11-0262	6/6/2006	201	4.57		
Kid	11-0262	6/14/2006	201	4.57		
Kid	11-0262	6/20/2006	201	4.57		
Kid	11-0262	6/29/2006	201	5.03		
Kid	11-0262	7/8/2006	201	5.03		
Kid	11-0262	7/14/2006	201	4.42		
Kid	11-0262	7/21/2006	201	3.96		
Kid	11-0262	7/29/2006	201	3.51		
Kid	11-0262	8/4/2006	201	3.66		
Kid	11-0262	8/15/2006	201	3.35		
Kid	11-0262	8/28/2006	201	3.35		
Kid	11-0262	9/10/2006	201	3.35		
Kid	11-0262	5/24/2007	201	4.57		
Kid	11-0262	5/31/2007	201	4.88		
Kid	11-0262	6/8/2007	201	5.18		
Kid	11-0262	6/14/2007	201	5.18		
Kid	11-0262	6/27/2007	201	4.57		
Kid	11-0262	7/6/2007	201	4.57		
Kid	11-0262	7/16/2007	201	3.96		
Kid	11-0262	7/23/2007	201	3.81		
Kid	11-0262	7/31/2007	201	3.2		
Kid	11-0262	8/8/2007	201	3.2		
Kid	11-0262	8/13/2007	201	3.81		
Kid	11-0262	8/27/2007	201	4.27		
Kid	11-0262	9/7/2007	201	4.27		
Kid	11-0262	9/14/2007	201	3.96		
Kid	11-0262	6/4/2008	201	3.51		
Kid	11-0262	6/8/2008	201	3.66	17	2
Kid	11-0262	6/14/2008	201	3.51		
Kid	11-0262	6/21/2008	201	4.72		
Kid	11-0262	6/28/2008	201	4.88		
Kid	11-0262	6/29/2008	201	3.81	10	4

Kid	11-0262	7/8/2008	201	4.72		
Kid	11-0262	7/14/2008	201	4.57		
Kid	11-0262	7/20/2008	201	4.57		
Kid	11-0262	7/27/2008	201	3.35	9	1
Kid	11-0262	7/28/2008	201	3.81		
Kid	11-0262	8/5/2008	201	3.81		
Kid	11-0262	8/12/2008	201	4.27		
Kid	11-0262	8/19/2008	201	3.96		
Kid	11-0262	8/25/2008	201	3.05		
Kid	11-0262	9/9/2008	201	2.59	15	7
Kid	11-0262	5/27/2009	201	3.35		
Kid	11-0262	6/1/2009	201	3.7	16	3
Kid	11-0262	6/10/2009	201	5.49		
Kid	11-0262	6/15/2009	201	5.49		
Kid	11-0262	6/21/2009	201	3.7	13	4
Kid	11-0262	6/22/2009	201	4.11		
Kid	11-0262	6/30/2009	201	4.27		
Kid	11-0262	7/7/2009	201	4.88		
Kid	11-0262	7/11/2009	201	4.9	13	1
Kid	11-0262	7/13/2009	201	5.33		
Kid	11-0262	7/21/2009	201	4.27		
Kid	11-0262	7/30/2009	201	4.27		
Kid	11-0262	8/6/2009	201	4.27		
Kid	11-0262	8/9/2009	201	3.4	13	4
Kid	11-0262	8/12/2009	201	3.66		
Kid	11-0262	8/21/2009	201	3.05		
Kid	11-0262	9/13/2009	201	3.7	24	3

Lake Name	Lake ID	Sample Date	Site ID	Sample Depth	Dissolved Oxygen	Temperature
					mg/L	Deg. C
Kid	11-0262	5/28/2004	201	0	13.4	13.9
				1	12.8	13.2
				2	12	12.9
				3	11.9	12.7
				4	11.5	12.4
				5	11.6	12.2
				6	11.1	12
				7	10.6	11.8
				8	10.1	11.5
				9	9.6	11.3
				10	8	10.7
				11	7	10.2
				12	6.3	9.9
Kid	11-0262	6/28/2004	201	0	9.2	17.9
				1	9.2	17.9
				2	9.1	17.8
				3	9	17.8
				4	8.8	17.3
				5	8.1	16.4
				6	6.3	13.7
				7	3.9	
				8	1.3	11.9
				9	0.5	11.5
				10	0.4	10.8
				11	0.2	10.6
				12	0.2	10.5
Kid	11-0262	7/30/2004	201	0	8	22.1
				1	7.9	22.1
				2	7.9	22.1
				3	7.9	22.1
				4	7.9	22.1
				5	7	20.1
				6	7.4	16.7
				7	1.3	14.6
				8	0.3	12.9
				9	0.2	11.9
				10	0.1	11.2
				11	0.1	10.8
Kid	11-0262	8/31/2004	201	0	8.8	18.7
				1	8.6	18.7

Kid	11-0262	8/31/2004 (Cont.)	201	2	8.6	18.7
				3	8.5	18.7
				4	8.1	18.4
				5	7.3	18.3
				6	5.2	18.1
				7	0.7	17.3
				8	0.3	14.1
				9	0.2	12.1
				10	0.2	11.5
				11	0.2	10.6
				12	0.1	10.6
Kid	11-0262	10/20/2004	201	0	9	10.2
				1	8.6	10.1
				2	8.5	10
				3	8.3	10
				4	8.3	10
				5	8.3	10
				6	8.2	9.9
				7	8.3	9.9
				8	8.3	9.9
				9	8.2	9.9
				10	8.2	9.9
				11	8.2	9.9
				12	8.2	9.9

Lake Name	Lake ID	Sample Date	Site ID	Secchi	TP	Chl-*a*
				Meters	ug/L	ug/l
Kerr	11-0268	6/3/1997	201	3.2		
Kerr	11-0268	6/14/1997	201	5.49		
Kerr	11-0268	6/21/1997	201	5.49		
Kerr	11-0268	6/26/1997	201	5.64		
Kerr	11-0268	7/4/1997	201	5.03		
Kerr	11-0268	7/9/1997	201	5.79		
Kerr	11-0268	7/18/1997	201	4.57		
Kerr	11-0268	7/22/1997	201	4.57		
Kerr	11-0268	7/29/1997	201	5.18		
Kerr	11-0268	8/9/1997	201	4.42		
Kerr	11-0268	8/14/1997	201	4.72		
Kerr	11-0268	8/22/1997	201	5.33		
Kerr	11-0268	10/2/1997	201	5.03		
Kerr	11-0268	10/10/1997	201	5.03		
Kerr	11-0268	4/21/1998	201	2.59		
Kerr	11-0268	5/22/1998	201	3.81		
Kerr	11-0268	5/25/1998	201	3.81		
Kerr	11-0268	6/6/1998	201	5.18		
Kerr	11-0268	6/13/1998	201	6.55		
Kerr	11-0268	6/19/1998	201	5.79		
Kerr	11-0268	6/27/1998	201	5.79		
Kerr	11-0268	10/23/1998	201	2.9		
Kerr	11-0268	10/26/1998	201	2.59		
Kerr	11-0268	11/8/1998	201	1.98		
Kerr	11-0268	5/26/1999	201	3.51		
Kerr	11-0268	6/2/1999	201	3.51		
Kerr	11-0268	6/16/1999	201	4.57		
Kerr	11-0268	6/22/1999	201	3.81		
Kerr	11-0268	7/1/1999	201	4.42		
Kerr	11-0268	7/7/1999	201	4.27		
Kerr	11-0268	7/14/1999	201	4.11		
Kerr	11-0268	7/21/1999	201	4.57		
Kerr	11-0268	7/28/1999	201	4.42		
Kerr	11-0268	8/4/1999	201	3.96		
Kerr	11-0268	8/11/1999	201	3.96		
Kerr	11-0268	8/17/1999	201	3.96		
Kerr	11-0268	8/23/1999	201	4.27		
Kerr	11-0268	9/2/1999	201	3.96		
Kerr	11-0268	9/11/1999	201	3.96		

Kerr	11-0268	9/15/1999	201	3.51		
Kerr	11-0268	9/27/1999	201	3.81		
Kerr	11-0268	10/6/1999	201	3.96		
Kerr	11-0268	10/13/1999	201	3.96		
Kerr	11-0268	10/21/1999	201	3.05		
Kerr	11-0268	5/4/2000	201	2.13		
Kerr	11-0268	5/12/2000	201	2.13		
Kerr	11-0268	5/15/2000	201	2.29		
Kerr	11-0268	5/22/2000	201	2.9		
Kerr	11-0268	5/29/2000	201	2.9		
Kerr	11-0268	6/2/2000	201	2.9		
Kerr	11-0268	6/8/2000	201	4.27		
Kerr	11-0268	6/17/2000	201	4.72		
Kerr	11-0268	6/22/2000	201	3.05		
Kerr	11-0268	6/28/2000	201	3.05		
Kerr	11-0268	7/5/2000	201	3.81		
Kerr	11-0268	7/10/2000	201	3.96		
Kerr	11-0268	9/13/2000	201	4.27		
Kerr	11-0268	10/12/2000	201	3.96		
Kerr	11-0268	5/29/2001	201	3.66		
Kerr	11-0268	6/3/2001	201	4.11		
Kerr	11-0268	6/9/2001	201	5.94		
Kerr	11-0268	6/17/2001	201	4.11		
Kerr	11-0268	6/26/2001	201	4.27		
Kerr	11-0268	6/27/2001	3901	4.18		
Kerr	11-0268	7/1/2001	201	3.66		
Kerr	11-0268	7/8/2001	201	3.96		
Kerr	11-0268	7/15/2001	201	3.96		
Kerr	11-0268	7/25/2001	201	4.27		
Kerr	11-0268	8/2/2001	201	4.42		
Kerr	11-0268	8/10/2001	201	3.81		
Kerr	11-0268	8/13/2001	201	3.66		
Kerr	11-0268	8/15/2001	3901	4.02		
Kerr	11-0268	8/19/2001	201	3.81		
Kerr	11-0268	8/30/2001	201	2.13		
Kerr	11-0268	9/4/2001	201	3.96		
Kerr	11-0268	9/24/2001	201	4.72		
Kerr	11-0268	9/26/2001	3901	4.79		
Kerr	11-0268	9/29/2001	201	5.03		
Kerr	11-0268	5/10/2002	201	2.9		
Kerr	11-0268	5/19/2002	201	2.74		

Kerr	11-0268	5/27/2002	201	2.74		
Kerr	11-0268	6/1/2002	201	3.96		
Kerr	11-0268	6/7/2002	201	2.44		
Kerr	11-0268	6/14/2002	201	3.66		
Kerr	11-0268	6/17/2002	3901	4.48		
Kerr	11-0268	6/21/2002	201	3.81		
Kerr	11-0268	6/26/2002	201	3.81		
Kerr	11-0268	7/2/2002	201	3.81		
Kerr	11-0268	7/12/2002	201	3.96		
Kerr	11-0268	7/17/2002	3901	4.18		
Kerr	11-0268	7/19/2002	201	3.96		
Kerr	11-0268	7/29/2002	201	3.66		
Kerr	11-0268	8/16/2002	201	3.35		
Kerr	11-0268	8/19/2002	3901	3.26		
Kerr	11-0268	8/26/2002	201	4.42		
Kerr	11-0268	9/3/2002	201	4.27		
Kerr	11-0268	9/4/2002	3901	3.87		
Kerr	11-0268	9/10/2002	201	4.42		
Kerr	11-0268	9/18/2002	201	3.96		
Kerr	11-0268	9/27/2002	201	3.96		
Kerr	11-0268	10/2/2002	201	3.96		
Kerr	11-0268	10/9/2002	201	3.51		
Kerr	11-0268	4/22/2003	201	2.9		
Kerr	11-0268	4/30/2003	201	2.29		
Kerr	11-0268	5/8/2003	201	2.59		
Kerr	11-0268	5/16/2003	201	2.74		
Kerr	11-0268	5/27/2003	201	2.59		
Kerr	11-0268	6/5/2003	201	3.05		
Kerr	11-0268	6/24/2003	201	4.11		
Kerr	11-0268	6/28/2003	201	4.27		
Kerr	11-0268	7/8/2003	201	3.81		
Kerr	11-0268	7/18/2003	201	4.11		
Kerr	11-0268	8/2/2003	201	3.96		
Kerr	11-0268	8/6/2003	201	4.27		
Kerr	11-0268	8/10/2003	201	5.03		
Kerr	11-0268	8/16/2003	201	5.18		
Kerr	11-0268	8/22/2003	201	5.18		
Kerr	11-0268	8/28/2003	201	4.72		
Kerr	11-0268	9/1/2003	201	5.64		
Kerr	11-0268	5/23/2004	201	1.83		
Kerr	11-0268	5/28/2004	3901	1.2		

Kerr	11-0268	5/30/2004	201	1.37		
Kerr	11-0268	6/26/2004	201	4.42		
Kerr	11-0268	6/28/2004	201	5.03		
Kerr	11-0268	6/28/2004	3901	5		
Kerr	11-0268	7/7/2004	201	4.72		
Kerr	11-0268	7/14/2004	201	4.72		
Kerr	11-0268	7/19/2004	201	4.88		
Kerr	11-0268	8/4/2004	3901	5.8		
Kerr	11-0268	8/23/2004	201	5.64		
Kerr	11-0268	8/31/2004	3901	5.7		
Kerr	11-0268	9/1/2004	201	5.79		
Kerr	11-0268	9/10/2004	201	6.25		
Kerr	11-0268	9/18/2004	201	6.86		
Kerr	11-0268	5/27/2006	201	4.88		
Kerr	11-0268	6/17/2006	201	5.64		
Kerr	11-0268	7/8/2006	201	5.94		
Kerr	11-0268	8/13/2006	201	6.25		
Kerr	11-0268	9/15/2006	201	5.64		
Kerr	11-0268	10/7/2006	201	5.03		
Kerr	11-0268	10/20/2006	201	4.88		
Kerr	11-0268	7/30/2007	201	5.18		
Kerr	11-0268	8/15/2007	201	5.94		
Kerr	11-0268	8/18/2007	201	5.79		
Kerr	11-0268	5/27/2008	201	2.59		
Kerr	11-0268	6/6/2008	201	3.2		
Kerr	11-0268	6/8/2008	3901		26	3
Kerr	11-0268	6/28/2008	201	3.81		
Kerr	11-0268	6/29/2008	3901		26	4
Kerr	11-0268	7/7/2008	201	4.57		
Kerr	11-0268	7/13/2008	201	5.18		
Kerr	11-0268	7/18/2008	201	5.64		
Kerr	11-0268	7/27/2008	3901		8	2
Kerr	11-0268	9/9/2008	3901		8	2
Kerr	11-0268	9/17/2008	201	3.96		
Kerr	11-0268	9/20/2008	201	4.57		
Kerr	11-0268	9/25/2008	201	4.27		
Kerr	11-0268	9/28/2008	201	4.57		
Kerr	11-0268	10/2/2008	201	4.57		
Kerr	11-0268	10/2/2008	202	4.57		
Kerr	11-0268	5/24/2009	201	2.74		
Kerr	11-0268	5/27/2009	201	3.05		

Kerr	11-0268	5/31/2009	3901		15	4
Kerr	11-0268	6/1/2009	201	3.35		
Kerr	11-0268	6/8/2009	201	4.57		
Kerr	11-0268	6/10/2009	201	4.88		
Kerr	11-0268	6/21/2009	3901		20	3
Kerr	11-0268	6/30/2009	201	5.18		
Kerr	11-0268	7/3/2009	201	5.79		
Kerr	11-0268	7/5/2009	201	6.1		
Kerr	11-0268	8/9/2009	3901		10	3
Kerr	11-0268	8/12/2009	201	5.49		
Kerr	11-0268	8/21/2009	201	4.88		
Kerr	11-0268	9/6/2009	201	4.88		
Kerr	11-0268	9/12/2009	201	5.18		
Kerr	11-0268	9/13/2009	3901		9	1
Kerr	11-0268	9/21/2009	201	4.88		
Kerr	11-0268	9/23/2009	201	4.88		
Kerr	11-0268	9/27/2009	3901		14	1

Lake Name	Lake ID	Sample Date	Site ID	Sample Depth	Dissolved Oxygen	Temperature
					mg/L	Deg. C
Kerr	11-0268	6/17/2002	3901	0	9.41	21.67
				1	9.34	21.67
				2	9.28	21.44
				3	9.4	20.39
				4	15.2	16.78
				5	13.72	12.5
				6	12.84	10.28
				7	11.3	8.67
				8	8.43	7.39
				9	7.39	6.83
				10	6.8	6.44
				11	6.43	6.28
				12	5.99	6.17
				13	4.7	6.11
				14	4.32	6
				15	3.63	6
				16	3.21	5.94
				17	2.67	5.89
				18	1.94	5.89
				19	1.58	5.89
				20	0.96	5.83
				21	0.85	5.83
				22	0.65	5.83
				23	0.45	5.83
				23.7	0.29	5.78
Kerr	11-0268	7/17/2002	3901	0	8.77	27.61
				1	8.79	27.72
				2	8.87	27.44
				3	9.24	25.61
				4	10.59	22.44
				5	14.62	16.17
				6	12.28	12.28
				7	9.1	9.72
				8	6.23	7.94
				9	4.53	7.17
				10	3.7	6.72
				11	3.02	6.44
				12	1.37	6.22
				13	0.33	6.17
				14	0.21	6.11

Kerr	11-0268	7/17/2002 (Cont.)	3901	15	0.16	6.06
				16	0.13	5.94
				17	0.11	5.94
				18	0.09	5.89
				19	0.08	5.89
				20	0.07	5.83
				21	0.07	5.83
				22	0.05	5.78
				23	0.04	5.78
				23.7	0.08	5.72
Kerr	11-0268	8/19/2002	3901	0	9.24	21.5
				1	9.35	21.06
				2	9.35	20.89
				3	9.4	20.78
				4	9.51	20.67
				5	10.59	19.5
				6	11.7	14.17
				7	6.61	10.5
				8	4.83	8.61
				9	2.37	7.67
				10	1.15	6.94
				11	0.64	6.56
				12	0.52	6.33
				13	0.44	6.17
				14	0.39	6.11
				15	0.34	6.06
				16	0.33	6
				17	0.3	5.89
				18	0.29	5.89
				19	0.28	5.83
				20	0.26	5.78
				21	0.24	5.78
				22	0.24	5.72
				23	0.23	5.72
				23.9	0.22	5.72
Kerr	11-0268	9/4/2002	3901	0	8.55	22.44
				1	8.63	22.39
				2	8.63	22.33
				3	8.55	22.06
				4	8.34	21.72
				5	8.44	20.72
				6	8.82	15.17
				7	6.03	11.44

Kerr	11-0268	9/4/2002 (Cont.)	3901	8	3.63	9.61
				9	0.73	8.11
				10	0.54	7.33
				11	0.4	6.78
				12	0.27	6.56
				13	0.27	6.33
				14	0.21	6.22
				15	0.17	6.06
				16	0.18	6
				17	0.16	5.94
				18	0.17	5.89
				19	0.13	5.89
				20	0.12	5.83
				21	0.08	5.83
				22	0.12	5.78
				23	0.1	5.78
				23.8	0.09	5.78

Lake Name	Lake ID	Sample Date	Site ID	Secchi	TP	Chl-*a*
				Meters	ug/L	ug/l
Lost	11-0269	5/7/2004	201	2.44		
Lost	11-0269	5/14/2004	201	3.96		
Lost	11-0269	5/21/2004	201	3.51		
Lost	11-0269	5/28/2004	201	3.73		
Lost	11-0269	6/5/2004	201	3.66		
Lost	11-0269	6/10/2004	201	4.11		
Lost	11-0269	6/16/2004	201	4.57		
Lost	11-0269	6/24/2004	201	4.27		
Lost	11-0269	6/28/2004	201	4.6		
Lost	11-0269	6/30/2004	201	4.42		
Lost	11-0269	7/10/2004	201	4.27		
Lost	11-0269	7/19/2004	201	5.18		
Lost	11-0269	7/28/2004	201	4.57		
Lost	11-0269	7/30/2004	201	5		
Lost	11-0269	8/11/2004	201	3.81		
Lost	11-0269	8/17/2004	201	3.66		
Lost	11-0269	8/29/2004	201	3.66		
Lost	11-0269	8/31/2004	201	4		
Lost	11-0269	9/6/2004	201	3.66		
Lost	11-0269	9/14/2004	201	3.51		
Lost	11-0269	9/25/2004	201	3.66		
Lost	11-0269	10/7/2004	201	2.29		
Lost	11-0269	10/18/2004	201	2.44		
Lost	11-0269	10/20/2004	201	1.3		
Lost	11-0269	11/11/2004	201	2.59		
Lost	11-0269	5/30/2005	201	3.51		
Lost	11-0269	6/7/2005	201	3.66		
Lost	11-0269	6/15/2005	201	3.51		
Lost	11-0269	6/29/2005	201	3.66		
Lost	11-0269	7/6/2005	201	4.72		
Lost	11-0269	7/13/2005	201	5.18		
Lost	11-0269	7/20/2005	201	5.18		
Lost	11-0269	7/27/2005	201	4.57		
Lost	11-0269	8/3/2005	201	4.27		
Lost	11-0269	8/10/2005	201	4.27		
Lost	11-0269	8/17/2005	201	4.27		
Lost	11-0269	8/24/2005	201	4.27		
Lost	11-0269	8/30/2005	201	4.57		
Lost	11-0269	9/15/2005	201	3.96		

Lost	11-0269	9/28/2005	201	3.35		
Lost	11-0269	10/8/2005	201	2.74		
Lost	11-0269	5/7/2006	201	3.35		
Lost	11-0269	5/19/2006	201	3.05		
Lost	11-0269	5/28/2006	201	4.11		
Lost	11-0269	6/6/2006	201	4.42		
Lost	11-0269	6/14/2006	201	4.57		
Lost	11-0269	6/20/2006	201	4.72		
Lost	11-0269	6/29/2006	201	4.57		
Lost	11-0269	7/8/2006	201	5.33		
Lost	11-0269	7/14/2006	201	4.88		
Lost	11-0269	7/21/2006	201	4.88		
Lost	11-0269	7/29/2006	201	4.57		
Lost	11-0269	8/4/2006	201	4.88		
Lost	11-0269	8/15/2006	201	3.2		
Lost	11-0269	8/28/2006	201	4.27		
Lost	11-0269	9/10/2006	201	3.51		
Lost	11-0269	5/24/2007	201	3.81		
Lost	11-0269	5/31/2007	201	3.96		
Lost	11-0269	6/7/2007	201	3.81		
Lost	11-0269	6/14/2007	201	3.66		
Lost	11-0269	6/27/2007	201	4.27		
Lost	11-0269	7/6/2007	201	4.42		
Lost	11-0269	7/13/2007	201	4.88		
Lost	11-0269	7/30/2007	201	5.18		
Lost	11-0269	8/8/2007	201	4.88		
Lost	11-0269	8/13/2007	201	4.11		
Lost	11-0269	8/24/2007	201	4.57		
Lost	11-0269	8/27/2007	201	3.96		
Lost	11-0269	9/7/2007	201	3.96		
Lost	11-0269	9/14/2007	201	3.81		
Lost	11-0269	6/4/2008	201	3.66		
Lost	11-0269	6/8/2008	201	3.66	28	5
Lost	11-0269	6/14/2008	201	3.81		
Lost	11-0269	6/21/2008	201	3.96		
Lost	11-0269	6/28/2008	201	4.11		
Lost	11-0269	6/29/2008	201	3.51	13	4
Lost	11-0269	7/8/2008	201	3.81		
Lost	11-0269	7/14/2008	201	3.66		
Lost	11-0269	7/20/2008	201	4.27		
Lost	11-0269	7/27/2008	201	4.27	10	1

Lost	11-0269	7/28/2008	201	4.42		
Lost	11-0269	8/5/2008	201	4.27		
Lost	11-0269	8/12/2008	201	4.27		
Lost	11-0269	8/19/2008	201	4.11		
Lost	11-0269	8/25/2008	201	3.66		
Lost	11-0269	9/9/2008	201	2.74	24	11
Lost	11-0269	5/27/2009	201	3.35		
Lost	11-0269	6/1/2009	201	3.7	13	4
Lost	11-0269	6/10/2009	201	4.88		
Lost	11-0269	6/15/2009	201	5.33		
Lost	11-0269	6/21/2009	201	3.4	27	4
Lost	11-0269	6/22/2009	201	4.11		
Lost	11-0269	6/30/2009	201	4.27		
Lost	11-0269	7/7/2009	201	4.27		
Lost	11-0269	7/11/2009	201	4.6	15	2
Lost	11-0269	7/13/2009	201	4.57		
Lost	11-0269	7/21/2009	201	4.27		
Lost	11-0269	7/30/2009	201	4.27		
Lost	11-0269	8/6/2009	201	4.72		
Lost	11-0269	8/9/2009	201	3.7	15	6
Lost	11-0269	8/12/2009	201	4.27		
Lost	11-0269	8/21/2009	201	4.42		
Lost	11-0269	9/13/2009	201	4	23	2

Lake Name	Lake ID	Sample Date	Site ID	Sample Depth	Dissolved Oxygen	Temperature
					mg/l	Deg. C
Lost	11-0269	5/28/2004	201	0	10.9	14.4
				1	10.7	13.5
				2	10.9	13.3
				3	10.7	12.9
				4	10.5	12.4
				5	9.6	11.8
				6	3.7	10.3
				7	1.6	6.8
				8	0.9	5.7
Lost	11-0269	6/28/2004	201	0	9.1	18.3
				1	9.4	18.3
				2	9.2	18.2
				3	8.8	17.7
				4	7.3	16.8
				5	1.3	12.6
				6	0.6	10.2
				7	0.4	8.1
				8	0.3	6.6
Lost	11-0269	7/30/2004	201	0	8.3	22.1
				1	8.3	22.1
				2	8.3	22.1
				3	8.4	22.1
				4	6.1	19.1
				5	0.3	15
				6	0.2	11.7
				7	0.1	8.9
				8	0.1	6.9
				9	0	6.6
Lost	11-0269	8/31/2004	201	0	7.7	18.7
				1	7.6	18.7
				2	7.5	18.5
				3	6.8	18.3
				4	3.4	17.8
				5	0.4	16.1
				6	0.3	12.6
				7	0.2	10.1
				8	0.2	7.6
				9	0.1	7.1

Lake Name	Lake ID	Sample Date	Site ID	Secchi	TP	Chl-*a*
				Meters	mg/l	ug/l
Mann	11-0282	5/3/1995	201	3.81		
Mann	11-0282	5/9/1995	201	3.35		
Mann	11-0282	5/17/1995	201	3.81		
Mann	11-0282	5/25/1995	201	3.2		
Mann	11-0282	5/30/1995	201	4.27		
Mann	11-0282	6/6/1995	201	4.57		
Mann	11-0282	6/19/1995	201	4.27		
Mann	11-0282	6/26/1995	201	3.81		
Mann	11-0282	7/3/1995	201	4.72		
Mann	11-0282	7/10/1995	201	5.18		
Mann	11-0282	7/17/1995	201	4.11		
Mann	11-0282	7/22/1995	201	4.42		
Mann	11-0282	7/29/1995	201	4.11		
Mann	11-0282	8/4/1995	201	3.66		
Mann	11-0282	8/11/1995	201	3.35		
Mann	11-0282	8/18/1995	201	3.05		
Mann	11-0282	9/2/1995	201	4.27		
Mann	11-0282	9/9/1995	201	3.81		
Mann	11-0282	5/8/1996	201	4.27		
Mann	11-0282	5/15/1996	201	3.96		
Mann	11-0282	5/22/1996	201	3.81		
Mann	11-0282	6/4/1996	201	4.57		
Mann	11-0282	6/8/1996	201	4.27		
Mann	11-0282	6/16/1996	201	4.27		
Mann	11-0282	6/22/1996	201	3.96		
Mann	11-0282	6/29/1996	201	3.05		
Mann	11-0282	7/7/1996	201	3.66		
Mann	11-0282	7/13/1996	201	3.66		
Mann	11-0282	7/21/1996	201	3.81		
Mann	11-0282	7/30/1996	201	3.96		
Mann	11-0282	8/8/1996	201	3.66		
Mann	11-0282	8/15/1996	201	3.81		
Mann	11-0282	8/24/1996	201	3.51		
Mann	11-0282	8/31/1996	201	3.51		
Mann	11-0282	9/8/1996	201	3.66		
Mann	11-0282	9/16/1996	201	4.11		
Mann	11-0282	9/29/1996	201	3.66		
Mann	11-0282	10/10/1996	201	3.81		
Mann	11-0282	6/13/1997	201	3.96		

Mann	11-0282	6/20/1997	201	3.81		
Mann	11-0282	6/27/1997	201	3.66		
Mann	11-0282	7/4/1997	201	3.51		
Mann	11-0282	7/13/1997	201	3.81		
Mann	11-0282	7/20/1997	201	3.51		
Mann	11-0282	7/28/1997	201	3.2		
Mann	11-0282	8/3/1997	201	2.74		
Mann	11-0282	8/11/1997	201	3.05		
Mann	11-0282	8/18/1997	201	3.35		
Mann	11-0282	8/27/1997	201	3.35		
Mann	11-0282	9/2/1997	201	3.35		
Mann	11-0282	9/10/1997	201	3.96		
Mann	11-0282	9/17/1997	201	3.96		
Mann	11-0282	9/25/1997	201	4.27		
Mann	11-0282	5/22/1998	201	3.81		
Mann	11-0282	5/29/1998	201	3.66		
Mann	11-0282	6/5/1998	201	3.96		
Mann	11-0282	6/12/1998	201	4.11		
Mann	11-0282	6/21/1998	201	3.96		
Mann	11-0282	6/29/1998	201	3.81		
Mann	11-0282	7/6/1998	201	3.96		
Mann	11-0282	7/13/1998	201	3.96		
Mann	11-0282	7/20/1998	201	3.96		
Mann	11-0282	7/27/1998	201	3.81		
Mann	11-0282	8/3/1998	201	3.51		
Mann	11-0282	8/12/1998	201	3.35		
Mann	11-0282	8/18/1998	201	3.35		
Mann	11-0282	8/27/1998	201	3.51		
Mann	11-0282	9/5/1998	201	3.81		
Mann	11-0282	9/11/1998	201	3.66		
Mann	11-0282	9/17/1998	201	3.81		
Mann	11-0282	9/27/1998	201	4.11		
Mann	11-0282	6/16/1999	201	3.2		
Mann	11-0282	6/23/1999	201	3.96		
Mann	11-0282	6/30/1999	201	3.96		
Mann	11-0282	7/7/1999	201	4.11		
Mann	11-0282	7/14/1999	201	4.11		
Mann	11-0282	7/20/1999	201	4.11		
Mann	11-0282	7/28/1999	201	3.96		
Mann	11-0282	8/4/1999	201	3.81		
Mann	11-0282	8/19/1999	201	3.81		

Mann	11-0282	8/26/1999	201	3.66		
Mann	11-0282	9/8/1999	201	3.66		
Mann	11-0282	9/15/1999	201	3.81		
Mann	11-0282	9/20/1999	201	3.96		
Mann	11-0282	9/27/1999	201	3.96		
Mann	11-0282	6/4/2000	201	3.81		
Mann	11-0282	6/11/2000	201	3.96		
Mann	11-0282	6/13/2000	201	3.81		
Mann	11-0282	6/20/2000	201	3.66		
Mann	11-0282	6/27/2000	201	3.66		
Mann	11-0282	7/12/2000	201	3.81		
Mann	11-0282	7/19/2000	201	3.66		
Mann	11-0282	7/26/2000	201	3.81		
Mann	11-0282	8/2/2000	201	3.66		
Mann	11-0282	8/9/2000	201	3.96		
Mann	11-0282	8/23/2000	201	3.96		
Mann	11-0282	8/30/2000	201	3.81		
Mann	11-0282	9/12/2000	201	3.66		
Mann	11-0282	9/19/2000	201	3.81		
Mann	11-0282	6/6/2001	201	3.81		
Mann	11-0282	6/13/2001	201	3.66		
Mann	11-0282	6/20/2001	201	3.66		
Mann	11-0282	6/27/2001	201	3.81		
Mann	11-0282	7/11/2001	201	3.81		
Mann	11-0282	7/18/2001	201	3.96		
Mann	11-0282	7/25/2001	201	4.57		
Mann	11-0282	8/2/2001	201	4.11		
Mann	11-0282	8/15/2001	201	3.81		
Mann	11-0282	8/22/2001	201	3.66		
Mann	11-0282	8/28/2001	201	3.66		
Mann	11-0282	9/5/2001	201	3.81		
Mann	11-0282	9/11/2001	201	3.96		
Mann	11-0282	9/25/2001	201	3.66		
Mann	11-0282	9/26/2001	3901	4.02		
Mann	11-0282	6/17/2002	3901	2.65		
Mann	11-0282	7/17/2002	3901	3.11		
Mann	11-0282	8/19/2002	3901	2.96		
Mann	11-0282	9/4/2002	3901	2.65		
Mann	11-0282	5/28/2004	3901	2.7		
Mann	11-0282	6/3/2004	202	2.9		
Mann	11-0282	6/10/2004	202	2.9		

Mann	11-0282	6/18/2004	202	3.05		
Mann	11-0282	6/28/2004	3901	3.8		
Mann	11-0282	7/2/2004	202	2.9		
Mann	11-0282	7/9/2004	202	2.74		
Mann	11-0282	7/16/2004	202	2.9		
Mann	11-0282	7/30/2004	3901	3.4		
Mann	11-0282	8/5/2004	202	3.05		
Mann	11-0282	8/13/2004	202	3.05		
Mann	11-0282	8/22/2004	202	3.05		
Mann	11-0282	8/31/2004	3901	4.4		
Mann	11-0282	9/10/2004	202	3.96		
Mann	11-0282	10/20/2004	3901	3.1		
Mann	11-0282	6/9/2008	3901	3.2	17	3
Mann	11-0282	6/29/2008	3901	3.35	16	3
Mann	11-0282	7/28/2008	3901	3.35	8	1
Mann	11-0282	9/9/2008	3901	4.12	8	3
Mann	11-0282	5/31/2009	3901	3.4	10	5
Mann	11-0282	6/21/2009	3901	3.7	9	1
Mann	11-0282	7/12/2009	3901	3.8	9	2
Mann	11-0282	8/9/2009	3901	3.7	13	3
Mann	11-0282	9/13/2009	3901	4.3	11	4

Lake Name	Lake ID	Sample Date	Site ID	Sample Depth	Dissolved Oxygen	Temperature
					mg/L	Deg. C
Mann	11-0282	5/28/2004	3901	0	12.2	12
				1	10.5	11.6
				2	12.1	11.4
				3	11.9	11.3
				4	11.9	11.2
				5	11.9	11.1
				6	11.7	10.9
				7	11.5	10.5
				8	11.1	9.9
				9	10.8	9.8
				10	10.4	9.5
				11	10.1	9.3
				12	9.7	8.9
				13	9.2	8.7
				14	8.9	8.4
				15	8.6	8.3
				16	8.4	8.2
				17	8.2	8.2
				18	8	8.1
				19	7.3	8
				20	7	7.9
				21	6.8	7.9
				22	6.4	7.8
				23	6.1	7.8
				24	5.6	7.8
				25	5.3	7.8
				26	4.4	7.7
				27	4.2	7.7
Mann	11-0282	6/28/2004	3901	0	10	17.6
				1	9.8	17.4
				2	9.7	17.4
				3	9.8	17.4
				4	9.6	17.4
				5	9.6	16.6
				6	9.6	16.3
				7	8.9	14.2
				8	8.8	11.9
				9	7.5	11.1
				10	6	10.3
				11	5.3	9.8

Mann	11-0282	6/28/2004 (Cont.)	3901	12	4	9.2
				13	3.2	8.9
				14	2.8	8.7
				15	2.4	8.6
				16	1.9	8.4
				17	1.8	8.4
				18	1.4	8.3
				19	1.1	8.3
				20	0.6	8.1
				21	0.4	8.1
				22	0.2	8
				23	0.1	7.9
Mann	11-0282	7/30/2004	3901	0	8.7	21.7
				1	8.5	21.7
				2	8.5	21.7
				3	8.5	21.7
				4	8.5	21.7
				5	9	21.1
				6	9	17.1
				7	6.6	14.8
				8	5.5	13.4
				9	3.6	11.8
				10	1.4	10.7
				11	0.3	10.1
				12	0.1	9.6
				13	0.1	9.1
				14	0.1	8.8
				15	0.1	8.7
				16	0.1	8.6
				17	0.1	8.4
				18	0.1	8.4
				19	0.1	8.2
				20	0.1	8.1
				21	0.1	8.1
				22	0.1	8
				23	0.1	7.9
				24	0.1	7.9
				25	0.1	7.9
				26	0	7.9
Mann	11-0282	8/31/2004	3901	0	8.9	18.3
				1	8.6	18.2
				2	8.5	18.2
				3	8.4	18

Mann	11-0282	8/31/2004 (Cont.)	3901	4	8.5	17.9
				5	8.2	17.8
				6	7.9	17.7
				7	7.8	17.7
				8	6.7	17.2
				9	3.2	14.8
				10	1	12.5
				11	0.3	10.4
				12	0.2	9.3
				13	0.2	9.1
				14	0.1	8.8
				15	0.1	8.6
				16	0.1	8.4
				17	0.1	8.4
				18	0.1	8.3
				19	0.1	8.2
				20	0.1	8.2
				21	0.1	8
				22	0	7.9
				23	0	7.9
				24	0.1	7.9
				25	0.1	7.9
Mann	11-0282	10/20/2004	3901	0	8.3	12.4
				1	8	11
				2	7.8	10.5
				3	7.6	10.4
				4	7.6	10.4
				5	7.6	10.4
				6	7.6	10.4
				7	7.6	10.4
				8	7.6	10.4
				9	7.7	10.4
				10	7.7	10.4
				11	7.6	10.3
				12	7.1	10.3
				13	7.1	10.3
				14	7.1	10.3
				15	6.8	10.2
				16	6.9	10.2
				17	1.1	9.3
				18	0.5	8.5
				19	0.3	8.4
				20	0.2	8.2

Mann	11-0282	10/20/2004 (Cont.)	3901	21	0.2	8.1
				22	0.1	8
				23	0.1	7.9
				24	0.1	7.9
				25	0.1	7.9
				26	0.1	7.9

Lake Name	Lake ID	Sample Date	Site ID	Secchi	TP	Chl-*a*
				m	ug/l	ug/l
Baby	11-0283	6/21/1995	201	3.05		
Baby	11-0283	7/5/1995	201	3.51		
Baby	11-0283	7/13/1995	201	3.66		
Baby	11-0283	7/19/1995	201	3.51		
Baby	11-0283	7/26/1995	201	3.35		
Baby	11-0283	8/2/1995	201	3.35		
Baby	11-0283	8/10/1995	201	3.05		
Baby	11-0283	8/21/1995	201	3.66		
Baby	11-0283	8/31/1995	201	3.66		
Baby	11-0283	9/17/1995	201	3.05		
Baby	11-0283	10/4/1995	201	3.81		
Baby	11-0283	5/7/1996	201	3.81		
Baby	11-0283	5/17/1996	201	2.74		
Baby	11-0283	6/4/1996	201	3.66		
Baby	11-0283	6/10/1996	201	3.51		
Baby	11-0283	6/20/1996	201	4.57		
Baby	11-0283	7/3/1996	201	4.27		
Baby	11-0283	7/15/1996	201	3.05		
Baby	11-0283	8/1/1996	201	3.66		
Baby	11-0283	8/16/1996	201	5.18		
Baby	11-0283	9/9/1996	201	3.96		
Baby	11-0283	9/29/1996	201	4.57		
Baby	11-0283	10/7/1996	201	3.96		
Baby	11-0283	5/1/1997	201	2.59		
Baby	11-0283	5/17/1997	201	2.74		
Baby	11-0283	5/30/1997	201	3.51		
Baby	11-0283	6/11/1997	201	3.51		
Baby	11-0283	6/29/1997	201	3.81		
Baby	11-0283	7/18/1997	201	3.66		
Baby	11-0283	7/24/1997	201	3.66		
Baby	11-0283	8/14/1997	201	4.42		
Baby	11-0283	8/20/1997	201	4.42		
Baby	11-0283	9/8/1997	201	4.72		
Baby	11-0283	9/14/1997	201	4.72		

Baby	11-0283	9/22/1997	201	3.66		
Baby	11-0283	10/2/1997	201	4.11		
Baby	11-0283	10/26/1997	201	2.44		
Baby	11-0283	4/30/1998	201	3.2		
Baby	11-0283	5/7/1998	201	3.2		
Baby	11-0283	5/13/1998	201	3.35		
Baby	11-0283	6/7/1998	201	3.05		
Baby	11-0283	6/14/1998	201	4.57		
Baby	11-0283	6/25/1998	201	3.35		
Baby	11-0283	7/2/1998	201	3.96		
Baby	11-0283	7/11/1998	201	4.27		
Baby	11-0283	7/17/1998	201	4.11		
Baby	11-0283	8/6/1998	201	4.11		
Baby	11-0283	8/10/1998	201	4.42		
Baby	11-0283	8/21/1998	201	3.66		
Baby	11-0283	9/15/1998	201	3.81		
Baby	11-0283	9/30/1998	201	4.27		
Baby	11-0283	10/20/1998	201	2.9		
Baby	11-0283	5/26/1999	201	2.9		
Baby	11-0283	6/16/1999	201	3.2		
Baby	11-0283	7/21/1999	201	3.66		
Baby	11-0283	8/27/1999	201	4.88		
Baby	11-0283	9/4/1999	201	4.11		
Baby	11-0283	5/22/2000	201	2.59		
Baby	11-0283	6/14/2000	201	2.74		
Baby	11-0283	7/1/2000	201	3.05		
Baby	11-0283	7/12/2000	201	3.35		
Baby	11-0283	7/25/2000	201	4.11		
Baby	11-0283	8/9/2000	201	4.11		
Baby	11-0283	8/16/2000	201	3.81		
Baby	11-0283	8/29/2000	201	4.27		
Baby	11-0283	9/16/2000	201	3.51		
Baby	11-0283	9/29/2000	201	3.66		
Baby	11-0283	6/18/2001	201	4.42		
Baby	11-0283	6/27/2001	3901	3.26		
Baby	11-0283	6/28/2001	201	3.51		
Baby	11-0283	7/7/2001	201	3.96		
Baby	11-0283	7/18/2001	201	4.11		
Baby	11-0283	8/15/2001	3901	3.57		
Baby	11-0283	8/23/2001	201	5.03		
Baby	11-0283	9/16/2001	201	3.96		
Baby	11-0283	9/26/2001	3901	4.48		
Baby	11-0283	10/18/2001	201	4.11		

Baby	11-0283	6/17/2002	3901	5.09		
Baby	11-0283	6/23/2002	201	4.11		
Baby	11-0283	7/17/2002	3901	4.18		
Baby	11-0283	7/25/2002	201	3.81		
Baby	11-0283	8/13/2002	201	4.42		
Baby	11-0283	8/19/2002	3901	3.87		
Baby	11-0283	8/24/2002	201	4.11		
Baby	11-0283	9/4/2002	3901	3.26		
Baby	11-0283	9/16/2002	201	4.42		
Baby	11-0283	6/15/2003	201	3.51		
Baby	11-0283	7/18/2003	201	3.35		
Baby	11-0283	8/4/2003	201	3.81		
Baby	11-0283	8/18/2003	201	4.42		
Baby	11-0283	9/19/2003	201	4.57		
Baby	11-0283	5/7/2004	201	3.05		
Baby	11-0283	5/20/2004	201	3.05		
Baby	11-0283	5/28/2004	3901	3.1		
Baby	11-0283	6/4/2004	201	4.88		
Baby	11-0283	6/21/2004	201	6.4		
Baby	11-0283	6/28/2004	3901	6.4		
Baby	11-0283	7/10/2004	201	4.42		
Baby	11-0283	7/30/2004	3901	4.4		
Baby	11-0283	8/6/2004	201	3.81		
Baby	11-0283	8/27/2004	201	4.11		
Baby	11-0283	8/31/2004	3901	4.6		
Baby	11-0283	9/12/2004	201	4.27		
Baby	11-0283	10/20/2004	3901	2.8		
Baby	11-0283	6/1/2005	201	2.74		
Baby	11-0283	6/15/2005	201	5.64		
Baby	11-0283	7/10/2005	201	5.18		
Baby	11-0283	8/1/2005	201	4.27		
Baby	11-0283	9/2/2005	201	4.57		
Baby	11-0283	9/20/2005	201	3.96		
Baby	11-0283	6/3/2006	201	5.79		
Baby	11-0283	6/20/2006	201	5.18		
Baby	11-0283	7/8/2006	201	5.03		
Baby	11-0283	7/27/2006	201	4.88		
Baby	11-0283	8/15/2006	201	4.27		
Baby	11-0283	8/31/2006	201	3.96		
Baby	11-0283	9/15/2006	201	3.81		
Baby	11-0283	9/30/2006	201	3.66		
Baby	11-0283	6/12/2007	201	5.49		
Baby	11-0283	6/23/2007	201	4.72		
Baby	11-0283	7/5/2007	201	4.57		

Baby	11-0283	7/20/2007	201	4.42		
Baby	11-0283	8/3/2007	201	4.27		
Baby	11-0283	8/28/2007	201	3.96		
Baby	11-0283	9/10/2007	201	3.66		
Baby	11-0283	9/29/2007	201	3.81		
Baby	11-0283	5/20/2008	3901	3.5	16	8
Baby	11-0283	6/3/2008	3901	3.2	16	5
Baby	11-0283	6/10/2008	201	3.51		
Baby	11-0283	6/25/2008	201	4.42		
Baby	11-0283	7/4/2008	201	5.49		
Baby	11-0283	7/8/2008	3901	4.6	14	2
Baby	11-0283	7/20/2008	201	4.72		
Baby	11-0283	8/5/2008	3901	3.5	19	3
Baby	11-0283	8/16/2008	201	4.27		
Baby	11-0283	9/11/2008	3901	4.3	15	4
Baby	11-0283	9/20/2008	201	4.11		
Baby	11-0283	5/28/2009	3901	3	17	5
Baby	11-0283	6/9/2009	201	7.16		
Baby	11-0283	6/18/2009	3901	8.3	10	2
Baby	11-0283	6/25/2009	201	6.55		
Baby	11-0283	7/22/2009	3901	5.2	14	3
Baby	11-0283	7/23/2009	201	5.94		
Baby	11-0283	8/8/2009	201	4.27		
Baby	11-0283	8/18/2009	3901	3.8	13	3
Baby	11-0283	9/1/2009	201	4.42		
Baby	11-0283	9/28/2009	201	4.27		
Baby	11-0283	9/30/2009	3901	3.2	14	3

Lake Name	Lake ID	Sample Date	Site ID	Sample Depth	Dissolved Oxygen	Tempurature
				Meters	mg/L	Deg. C
Baby	11-0283	5/28/2009	3901	0	10.38	13.94
				1	10.4	13.94
				2	10.39	13.98
				3	10.32	13.98
				4	10.23	13.99
				5	9.91	13.91
				6	9.66	13.8
				7	9.57	13.66
				8	8.8	12.82
				9	8.57	12.25
				10	7.96	11.75
				12	6.43	10.06
				14	3.05	7.47
				16	0.19	5.73
				18	0.15	5.23
				20	0.13	5.14
Baby	11-0283	6/18/2009	3901	0	9.95	18.69
				1	9.95	18.67
				2	9.89	18.62
				3	9.87	18.6
				4	9.06	16.25
				5	8.68	15.75
				6	8.3	15.62
				7	7.9	15.3
				8	7.01	14.85
				9	6.34	14.5
				10	4.81	12.64
				12	2	10.03
				14	0.34	8.13
				16	0.28	6.25
				18	0.27	5.66
				18.9	0.27	5.63
Baby	11-0283	7/22/2009	3901	0	9.08	19.98
				1	9.11	20.01
				2	9.11	20
				3	9.07	20
				4	9.04	19.43
				5	8.78	19.09
				6	8.08	18.79
				7	7.09	18.25

Baby	11-0283	7/22/2009 (Cont.)	3901	8	5.04	17.65
				9	0.82	14.92
				10	0.33	13.33
				12	0.19	10.55
				14	0.14	8.34
				16	0.13	6.7
Baby	11-0283	8/18/2009	3901	0	8.79	22.47
				1	8.8	22.49
				2	8.79	22.47
				3	8.75	22.43
				4	8.76	22.38
				5	8.46	21.93
				6	6.83	21.07
				7	4.86	20.32
				8	0.4	18.37
				9	0.27	15.86
				10	0.13	13.42
				12	0.09	10.74
				14	0.08	9.1
				16	0.07	7.06
				18	0.06	6.62
				18.6	0.06	6.6
Baby	11-0283	9/30/2009	3901	0	7.78	17.27
				1	7.77	17.28
				2	7.73	17.27
				3	7.74	17.28
				4	7.68	17.28
				5	7.65	17.28
				6	7.65	17.28
				7	7.63	17.27
				8	7.61	17.26
				9	7.36	17.17
				10	7.1	17.07
				12	0.28	10.89
				14	0.21	8.88
				16	0.17	7.5
				18	0.15	6.89