

Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 2002



U.S. GEOLOGICAL SURVEY
Open-File Report 03-99

*Prepared in cooperation with the
State of Wisconsin and local agencies*



WATER-QUALITY AND LAKE-STAGE DATA FOR WISCONSIN LAKES, WATER YEAR 2002

By Wisconsin District Lake-Studies Team

U.S. GEOLOGICAL SURVEY
Open-File Report 03-99

A report by the Wisconsin District Lake-Studies Team—
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D.L. Olson, and D.M. Robertson



Prepared in cooperation with
THE STATE OF WISCONSIN AND OTHER AGENCIES

Middleton, Wisconsin
2003

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CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATED WATER-QUALITY UNITS

Multiply	By	To Obtain
mile (mi)	1.609	kilometer
pound (lb)	453.6	gram
acre	0.4048	hectare
foot (ft)	0.3048	meter
gallon (gal)	3.785	liter
square mile (mi ²)	2.590	square kilometer

Temperature, in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) by use of the following equation:

$$^{\circ}\text{F} = 1.8(^{\circ}\text{C}) + 32.$$

Sea level: In this report “sea level” refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Abbreviated water-quality units: Chemical concentrations and water temperature are given in metric units. Chemical concentration is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For water with dissolved-solids concentrations less than 7,000 mg/L, the numerical values for concentrations expressed as mg/L and µg/L are the same as for concentrations in parts per million and parts per billion, respectively.

Specific conductance of water is expressed in microsiemens per centimeter at 25 degrees Celsius (µS/cm). This unit is equivalent to micromhos per centimeter at 25 degrees Celsius (µmho/cm), formerly used by the U.S. Geological Survey.

WATER-QUALITY AND LAKE-STAGE DATA FOR WISCONSIN LAKES, WATER YEAR 2002

By Wisconsin District Lake-Studies Team

INTRODUCTION

The U.S. Geological Survey (USGS), in cooperation with local and other agencies, collects data at selected lakes throughout Wisconsin. These data, accumulated over many years, provide a data base for developing an improved understanding of the water quality of lakes. To make these data available to interested parties outside the USGS, the data are published annually in this report series. The locations of water-quality and lake-stage stations in Wisconsin for water year 2002 are shown in figure 1. A water year is the 12-month period from October 1 through September 30. It is designated by the calendar year in which it ends. Thus, the period October 1, 2001 through September 30, 2002 is called "water year 2002."

The purpose of this report is to provide information about the chemical and physical characteristics of Wisconsin lakes. Data that have been collected at specific lakes, and information to aid in the interpretation of those data, are included in this report. Data collected include measurements of in-lake water quality and lake stage. Time series of Secchi depths, surface total phosphorus and chlorophyll *a* concentrations collected during non-frozen periods are included for all lakes. Graphs of vertical profiles of temperature, dissolved oxygen, pH, and specific conductance are included for sites where these parameters were measured. Descriptive information for each lake includes: location of the lake, area of the lake's watershed, period for which data are available, revisions to previously published records, and pertinent remarks. Additional data, such as streamflow and water quality in tributary and outlet streams of some of the lakes, are published in another volume: "Water Resources Data-Wisconsin, 2002."

Water-resources data, including stage and discharge data at most streamflow-gaging stations, are available through the World Wide Web on the Internet. The Wisconsin District's home page is at <http://wi.water.usgs.gov/>. Information on the Wisconsin District's Lakes Program is found at wi.water.usgs.gov/lake/index.html and wi.water.usgs.gov/projects/index.html.



Figure 1. Location of lake water-quality and lake-stage stations in Wisconsin.

The USGS has done cooperative lake monitoring with local and other agencies since 1983. Cooperators in 2002 included:

Big Cedar Lake Protection and Rehabilitation District
Big Muskego Lake District
Booth Lake Management District
City of Muskego
Dane County Department of Public Works
Geneva Lake Environmental Agency
Green Lake Sanitary District
Lac La Belle Management District
Lauderdale Lakes Lake District
Little Green Lake Protection and Rehabilitation District
Little Muskego Lake Protection and Rehabilitation District
Little St. Germain Lake Protection and Rehabilitation District
Middle Genesee Lake District
Okauchee Lake Management District
Potters Lake Protection and Rehabilitation District
Powers Lake District
Rock County Public Works Department
St. Croix Tribe
Spooner Lake District
Town of Cedar Lake (Red Cedar Lake Association)
Town of Delavan (Delavan Lake)
Town of Springfield (Twin Lakes Conservancy)
U.S. Army Corps of Engineers
Village of Oconomowoc Lake
Whitewater Lake Management District
Wind Lake Management District
Wisconsin Department of Natural Resources

Lake data-collection sites are identified by a unique identification number. Lake water-quality sites are identified by a 15-digit number that is a concatenation of the site's latitude, longitude, and a two-digit sequence number. The sequence number is used to distinguish between sites located at the same latitude-longitude designation. The site identification number is permanently assigned to the site; actual latitude and longitude of the site are subject to update and are stored separately. For some lakes, which have historical records of lake stage, an eight-to-ten digit number is assigned according to downstream order. Gaps are left in the numerical series to allow for new stations; hence, the numbers are not consecutive. The first two digits of the complete eight-to-ten digit number, such as 04087000 or 054310157, designate the major river basin. For example, "04" designates the St. Lawrence River Basin and "05" designates the Upper Mississippi River Basin.

The water-quality lake stations that were discontinued prior to water year 2002 are listed in table 1. Discontinued lake-stage stations are not included in this table.

This report is the culmination of a concerted effort by a number of people who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. The authors had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to USGS policy and established guidelines. Technicians in charge of the field offices are: T.J. Popowski (Rice Lake), J.J. Hanig (Merrill), and J. Habale (Middleton). The data were collected and processed by S.M. Berg, C.J. Bloom, G.L. Goddard, J.J. Hanig, D.E. Housner, B.W. Olson, D.L. Olson, and J.G. Schuler. P.A. Stark assembled, edited, and formatted the report. Additional assistance in preparation of the report was provided by M.M. Greenwood.

METHODS OF DATA COLLECTION

Depth profiles of water temperature, dissolved oxygen, pH, and specific conductance were collected using multi-parameter meters. Prior to measurements, the meters were calibrated using standards for pH and conductance, and dissolved oxygen was calibrated using the air calibration method. Generally, field measurements in profiles were made at 0.5-m intervals if the maximum depth of the lake was 5 m or less and at 1.0-m intervals if the maximum depth was greater than 5 m.

Table 1. Discontinued lake stations

Station name	Site identification number	Period of record
Alma Lake near St. Germain	455426089254700	Oct. 1984–Sept. 1990, May 1992–Sept. 1996
Balsam Lake, off Cedar Island, at Balsam Lake	452755092264600	Feb. 1991–Aug. 1994
off Little Narrows, near Balsam Lake	452858092265300	May 1991–Aug. 1994
off Rock Island, near Balsam Lake	452754092234300	May 1991–Aug. 1994
Balsam Lake near Birchwood	453907091345800	Mar. 1993–Aug. 1994, Mar. 1996–Aug. 1997, Mar.–Sept. 201
Bass Lake near Shawano	445215088300300	Feb. 1990–Aug. 1992
Bear Lake at Deep Hole near Haugen	453754091490900	Mar. 1992–Aug. 1993
Beaver Dam Lake, South end, at Beaver Dam	432814088515000	June–Oct. 1991
North end, near Beaver Dam	433122088545700	June–Oct. 1991
Benedict Lake near Powers Lake	423201088180800	May 1998–Aug. 2000
Big Blacksmith Lake near Keshena	445401088334500	Feb. 1990–Aug. 1992
Big Hills (Hills) Lake near Wild Rose	440912089092000	June 1983–Aug. 1984, Feb.–Aug. 1987, Feb.–Aug. 1990, Feb.–Aug. 1993, Feb.–Aug. 1996, Feb.–Aug. 1999
Big Muskego Lake, at North Site, near Muskego	425301088061300	Feb.–Aug. 1988
Research Base, near Muskego	425235088075300	May–June 1994
Big Round Lake near Milltown	453142092180100	Feb.–Sept. 2001
Big St. Germain Lake, near St. Germain	455557089311000	Feb. 1992–Aug. 1996
near Lake Tomahawk	05390750	1991–2001
Big Sand Lake, Deep Hole, near Hertel	454910092134000	Feb.–Sept. 2001
East Site, near Hertel	454921092124300	Feb.–Sept. 2001
Big Sissabagama Lake, North Site, near Stone Lake	454800091312900	1986–1996 Mar. 1998–Sept. 2001
Buffalo Lake, Center Site, at Packwaukee	434558089260600	May 1998–Sept. 2001
East End, at Montello	434720089201600	May 1998–Sept. 2001
West End, near Endeavor	434414089282400	May 1998–Sept. 2001
Denoon Lake at Wind Lake	425044088100300	Feb. 1991–Aug. 1996
Druid Lake near Hartford	431643088243300	Feb. 1991–Sept. 1996
Eagle Lake near Kansasville	05544500	1936–64, 1975–77, 1979, Feb. 1993–Sept. 1996
Eagle Lake, at Deep Hole, near Kansasville	424207088072400	Feb. 1993–Aug. 1996
Eagle Spring Lake at Eagleville	425103088261500	Apr. 1991–Sept. 2001
Elizabeth Lake near Twin Lakes	423051088155300	Feb. 1995–Sept. 1997
Forest Lake near Dundee	433632088100200	Mar. 1994–Aug. 1996
Fowler Lake, Center, at Oconomowoc	430653088294601	Jan.–Dec. 1984, Oct. 1986–Sept. 1996
Fox Lake Deep Hole at Fox Lake	433458088560600	June 1991–Mar. 1993

Table 1. Discontinued lake stations

Station name	Site identification number	Period of record
Geneva Lake		
Geneva Bay, at Lake Geneva	423455088263800	Apr. 1997–Feb. 1999
Williams Bay, at Williams Bay	423420088320500	Apr. 1997–Feb. 1999
Center, near Lake Geneva	423402088301400	Apr. 1997–Mar. 1999
East End, near Lake Geneva	423421088272300	Apr. 1997–May 2000
Hemlock Lake near Mikana	453421091333700	Mar. 1993–Aug. 1994, Mar. 1996–Aug. 1997, Mar.–Sept. 2001
Hooker Lake at Salem	423335088060300	Feb. 1992–Aug. 1993
Kirby Lake near Cumberland	453554092042101	Nov. 1995–Oct. 1996
(Site 1) near Cumberland	453608092035801	Nov. 1995–Nov. 1996
(Site 2) near Cumberland	453601092035301	Nov. 1995–Nov. 1996
(Site 3) near Cumberland	453612092034901	Nov. 1995–Nov. 1996
(Site 4) near Cumberland	453603092035701	Nov. 1995–Nov. 1996
(Site 5) near Cumberland	453608092041201	Nov. 1995–Nov. 1996
(Site 6) near Cumberland	453555092040901	Nov. 1995–Nov. 1996
Lac La Belle, NW, at Oconomowoc	430809088313900	Feb. 1984–Aug. 1985
SE at Oconomowoc	430707088301400	Feb. 1984–Aug. 1985
Lake Blass at Lake Delton	433545089482400	Mar. 1989–Aug. 1990
Lake Keesus, East Bay, near Merton	430957088183400	Apr. 1991–Aug. 1995
North Bay, near Merton	431006088191000	Apr. 1991–Aug. 1995
Lake Morris at Mount Morris	440654089120500	Jun. 1983–Sept. 1989
Lake Nebagamon, Northeast Bay, at Lake Nebagamon	463050091412300	May 1992–Aug. 1995
Southeast Bay, at Lake Nebagamon	462928091413500	Mar. 1992–Sept. 1995
West Bay, at Lake Nebagamon	463034091425300	May 1992–Aug. 1995
Lake Noquebay near Crivitz	451511087550900	Feb. 1987–Aug. 1988, Apr. 1991–Aug. 1994
East End, near Crivitz	451540087525700	Apr. 1991–Aug. 1994
Lamotte Lake near Shawano	445305088361200	Feb. 1990–Aug. 1992
Lauderdale Lakes		
at Lauderdale	424554088332700	Oct. 1993–Oct. 1994
Green, Auxiliary, Number 1, near Lauderdale	424640088341900	June 1999–Sept. 2000
Legend Lake (site 1) near Shawano	445342088312700	Feb. 1990–Feb. 1992
Little Cedar Lake		
North Site, near West Bend	432255088134700	Feb. 1997–Aug. 1999
South Site, near West Bend	432249088134500	Feb. 1997–Aug. 1999
Little Rock Lake near Woodruff	455946089415702	Oct. 1983–Sept. 1996
Little Sand Lake, Site Number 2, near Mole Lake	452826088544101	May 1996–Sept. 2001
Long (Kee Nong Go-Mong) Lake at Wind Lake	424937088103400	Feb. 1988–Aug. 1989, Feb. 1991–Aug. 1996
Loon Lake near Shawano	445009088303700	Feb. 1991–Aug. 1993
Lost Lake near Beaver Dam	432640088580500	June–Oct. 1991

Table 1. Discontinued lake stations

Station name	Site identification number	Period of record
McKenzie Lakes		
McKenzie (Big McKenzie)		
Deep Hole, near Spooner	455507092013500	Feb. 1987–Aug. 1998
Northern Site, near Spooner	455540092022000	June 1997–Aug. 1998
South Site, near Spooner	455437092022300	June 1997–Aug. 1998
Lower McKenzie, near Webb Lake	455902092011900	June 1997–Aug. 1998
Middle McKenzie, near Spooner	455635092021800	June 1997–Aug. 1998
Mary (Marie) Lake at Twin Lakes	423128088151200	Feb. 1995–Aug. 1997
Max Lake near Woodruff	460128089423501	Mar. 1988–Dec. 1996
Mead Lake, East Bay near Willard	444720090445000	Apr. 1991–Aug. 1995
West Bay near Willard	444733090460100	Feb. 1991–Sept. 1995
Montello Lake at Montello	434748089195800	Feb. 1995–Aug. 1998
Moon Lake near St. Germain	455504089260500	Feb. 1992–Aug. 1996
Morgan Lake near Fence	454622088324801	Oct. 1987–Sept. 1998.
Moshawquit Lake near Shawano	445352088295800	Feb. 1990–Aug. 1992
Muskego (Big Muskego)		
Auxiliary Number 1, near Muskego	425329088054000	June 1996–Aug. 2000
Muskellunge Lake, near Lake Outlet near Eagle River	455706089232400	Nov. 2000–Oct. 2001
near Eagle River	455700089224900	June 2000–Aug. 2001
Namekagon Lakes		
Garden, near Cable	461224091033200	Mar. 1998–Aug. 1999
Jackson, near Cable	461457091065900	Mar. 1998–Aug. 1999
Namekagon		
Deep Hole, near Cable	461308091065100	Mar. 1998–Aug. 1999
East Basin, near Cable	461228091044300	Mar. 1998–Aug. 1999
Northeast Basin, near Cable	461410091050700	Mar. 1998–Aug. 1999
Park Lake (site 1) at Pardeeville	433239089175800	Feb. 1986–Aug. 1987, May–Nov. 1993
(site 2) at Pardeeville	433226089175500	May–Nov. 1993
(site 3) at Pardeeville	433245089173000	May–Nov. 1993
(site 4) at Pardeeville	433257089165100	May–Nov. 1993
Pike Lake near Hartford	431835088200600	Dec. 1998–Nov. 2000
Pretty Lake, at Deep Hole, near Dousman	425722088295000	Feb. 1993–Aug. 1997
Red Cedar Lake, at Mikana	453522091360600	Mar. 1993–Aug. 1994, Mar. 1966–Aug. 1997, Oct. 2000–Sept. 2001
Deep Hole, near Mikana	453725091345100	Mar. 1993–Aug. 1994, Mar. 1966–Aug. 1997, Mar. –Sept. 2001
South End, at Mikana	453519091352500	Mar. 1993–Aug. 1994, Mar. 1966–Aug. 1997, Mar. –Sept. 2001
Rice Lake at Deep Hole near Whitewater	424629088415700	Apr.–Nov. 1991
Round Lake near Shawano	445328088335000	Feb. 1990–Aug. 1992

Table 1. Discontinued lake stations

Station name	Site identification number	Period of record
Sand Lake (Deep Hole) near Keshena	445321088323101	June–Aug. 1992
Shell Lake at Shell Lake	05334000	Aug. 1936–Sept. 1999
Silver Lake near Oconomowoc	430436088293300	Apr. 1992–Aug. 1996
Silver Lake near West Bend	432322088125000	Feb. 1996–Aug. 1997
Sinissippi Lake, off Anthony Is., at Hustisford	432113088361100	Feb. 1991–Aug. 1993
off Butternut Is., near Hustisford	432240088363900	Apr. 1991–Aug. 1993
off Sam Point, near Hustisford	432300088374200	Apr. 1991–Aug. 1993
Spirit Lake near Keshena	445400088320100	Apr.–Aug. 1992
Stewart Lake at Mt. Horeb	430117089442701	May 1992–Sept. 1993
Tichigan Lake near Waterford	424854088123300	Mar. 1994–Aug. 1996
Tombeau Lake near Powers Lake	423153088184800	May 1998–Aug. 2000
Upper Nemahbin Lake, Center, near Delafield	430400088254900	June 1993–Aug. 1995
South Site, near Delafield	430339088254800	June 1993–Aug. 1995
Outlet near Delafield	430334088255400	June 1993–Aug. 1995
Vandercook Lake near Woodruff	455909089405602	Nov. 1980–Aug. 1998
Watosah-skice Lake near Keshena	445330088361400	Feb. 1990–Aug. 1992
Waubeesee Lake at Wind Lake	424857088101500	Feb. 1988–Aug. 1989, Feb. 1991–Aug. 1996
Wazee Lake near Black River Falls	441721090431700	Nov. 1999–Aug. 2000
Whitefish Lake, North Basin, near Gordon	461321091520900	Mar. 1998–Sept. 2001
South Basin, near Gordon	461212091523200	Mar. 1998–Sept. 2001
Whitewater Lake, off Heart Prairie, near Whitewater	424533088420100	Apr.–Nov. 1991
near Whitewater	424608088414800	Apr.–Oct. 1991
North Bay, near Whitewater	424625088405500	Apr.–Nov. 1991
South Bay, near Whitewater	424501088422300	Apr.–Nov. 1991
Wind Lake, Northeast Basin, at Wind Lake	424938088080800	Feb. 1997–Aug. 1998
Wolf Lake near Mt. Calvary	435152088123100	Nov. 1983–Sept. 1986, Nov. 1992–Sept. 1997

In most lakes, water samples were collected at two depths - near the surface and near the bottom. Chemical analyses of water samples were performed using standard analytical methods by either the USGS National Water Quality Laboratory (Wershaw and others, 1987; Fishman and Friedman, 1989; Fishman, 1993) or the Wisconsin State Laboratory of Hygiene (Wisconsin State Laboratory of Hygiene, 1993). Analyses for dissolved constituents were performed on samples that were filtered in the field through a 0.45- μm (micrometer) pore-size filter. Total or total recoverable constituents were determined by analyzing unfiltered water samples. Preservation and shipment of samples followed standard protocols established by the laboratories. Water-quality data were archived in the Water Quality Data Base (QWDATA) of the National Water Information System (NWIS). Additional descriptive information about water-quality data is available in the data report: "Water Resources Data – Wisconsin, 2002". NWIS parameter codes and minimum laboratory reporting levels for chemical constituents are given in table 2.

Records of lake stage are considered complete when one or more manual or automatic measurements were obtained per day. Partial records of lake stage result when measurements were less frequent than daily. A complete description of manual or automatic measurements of lake stage is described by Rantz and others (1982).

EXPLANATION OF PHYSICAL AND CHEMICAL CHARACTERISTICS OF LAKES

Following are brief, generalized explanations of some of the common measurements of water quality and some of the physical processes occurring in lakes that influence these measures of water quality. More detailed explanations of water-quality data and lake processes are given by Wetzel (1983), Hem (1985), and Shaw and others (1993).

Water Temperature and Thermal Stratification

Water temperature in lakes is important because of its role in stratification and because of the temperature dependence of many chemical reactions and life processes of aquatic organisms. The extent of thermal stratification in lakes depends on the interaction between the lake's shape, water clarity, solar heating, and wind-driven mixing. Complete mixing of the lake is usually inhibited by thermal stratification in summer and by ice cover in winter. Thermal stratification affects water quality and the distribution of organisms in the lake. Summer thermal stratification can occur in any lake, but in Wisconsin it commonly occurs in lakes deeper than about 6 m (Shaw and others, 1993).

Table 2. Parameter identification numbers and laboratory reporting levels (LRL) for chemical parameters commonly measured in lakes, and analyzed at the National Water Quality Laboratory (NWQL) or the Wisconsin State Laboratory of Hygiene (WSLH)

Parameter Name	Units	CAS Number (1)	Parameter Code (2)	(NWQL)				(WSLH)	
				Standard Analysis		Low-Level Analysis		LRL	Test Code
				LRL	Lab Code	LRL	Lab Code		
Calcium, diss. (Ca)	mg/L	7440-70-2	00915	0.020	659	0.002	1895	0.02	I230IUD
Magnesium, diss. (Mg)	mg/L	7439-95-4	00925	0.004	663	0.001	1897	0.02	I390IUD
Sodium, diss. (Na)	mg/L	7440-23-5	00930	0.09	675	0.025	1898	0.09	I80IUD
Potassium, diss. (K)	mg/L	7440-09-7	00935	0.24	54	0.01	833	0.3	I540IUD
Sulfate, diss. (SO ₄)	mg/L	14808-79-8	00945	0.31	1572	0.01	1263	1.0	I600DLD
Chloride, diss. (Cl)	mg/L	16887-00-6	00940	0.29	1571	0.01	1259	0.1	I240ELD
Fluoride, diss. (F)	mg/L	16984-48-8	00950	0.100	31	0.01	1260	0.03	I330FLD
Iron, diss. (Fe)	µg/L	7439-89-6	01046	10	645	3	1896	10	I370IUD
Manganese, diss. (Mn)	µg/L	7439-96-5	01056	2.2	648	1	1793	0.4	I400IUD
Silica, diss. (SiO ₂)	mg/L	7631-86-9	00955	0.1	56	0.02	1899	0.008	I560LLD
Nitrogen, NO ₂ +NO ₃ , diss.	mg/L		00631	0.05	1975	0.005	1979	0.01	I460MLD
Nitrogen, ammonia, diss.	mg/L	7664-41-7	00608	0.02	1976	0.002	1980	0.013	I440NLD
Nitrogen, organic, total (3)	mg/L								
Nitrogen, amm.+org., total (4)	mg/L	17778-88-0	00625	0.100	1985			0.2	I470BLT
Nitrogen, amm.+org.,diss.	mg/L		00623						I470DLD
Nitrogen, total (5)	mg/L								
Nitrogen, dissolved	mg/L		00602						
Phosphorus, total	mg/L	7723-14-0	00665	0.05	1984	0.004	837	0.005	I520PLT
Phosphorus, ortho, diss.	mg/L	14265-44-2	00671	0.01	1262	0.002	1978	0.002	I530CLD
Chlorophyll a, phytoplankton	µg/L	479-61-8	70953	0.1	586				
Chlorophyll a, phytoplankton	µg/L	479-61-8	32210					0.26	I250UNF

Footnotes:

- 1: CAS (Chemical Abstracting Services) number = unique identification for each constituent
- 2: Parameter Code - unique number for storage of data in database
- 3: Calculated as difference between total ammonia + organic nitrogen and ammonia nitrogen
- 4: Also known as Total Kjeldahl Nitrogen (TKN)
- 5: Calculated as sum of TKN + Nitrogen as (NO₂+NO₃)

The density of water increases with decreasing temperature down to a temperature of 4°C, then decreases with decreasing temperature between 4°C and the freezing point of water (0°C). For a brief period in the spring after the ice is out, water temperature is usually uniform through the entire water column and wind action causes the lake to mix completely. This process is known as “spring turnover.” As the lake absorbs the sun’s energy, the surface water becomes warmer and its density decreases, making it more resistant to complete mixing. The difference in density caused by different water temperatures can prevent warm and cold water from mixing. In most lakes, therefore, a density “barrier” forms between the warmer surface water (epilimnion) and the underlying colder water (hypolimnion). This barrier is often marked by a sharp temperature gradient known as the “thermocline (metalimnion).” During the stratified summer period, these three distinct layers of lake water are often present. As the temperature difference between surface and deep water increases, this “stratified” condition stabilizes and can persist until surface temperatures decrease in the fall, which decreases the stability of the stratification. The mixing of the lake water in the fall is known as “fall turnover.”

Thermal stratification may also occur under ice cover in the winter. In the winter, the coldest water (near 0°C) under the ice at the surface of the lake is less dense than water deeper in the lake with warmer temperatures.

Specific Conductance

Specific conductance is a measure of the ability of water to conduct an electrical current and is an indicator of the concentration of dissolved solids in the water. Because conductance is temperature related, reported values are normalized at 25°C and are termed specific conductance. As the concentration of dissolved minerals increases, specific conductance increases. During winter and summer thermal stratification, concentrations of dissolved constituents near the lake bottom increase due to the decomposition of materials settling from the epilimnion, or release of dissolved materials (such as iron, manganese, and phosphorus) from the bottom sediments during anoxic periods. Therefore, differences in specific conductance with depth indicate differences in concentrations of dissolved solids.

Water Clarity

Water clarity, or transparency, is commonly measured using a Secchi disc. The range of depths within which photosynthetic activity occurs depends largely on depth of light penetration, which is influenced by water clarity. A Secchi disc, most commonly an 20-cm.-diameter disc with alternating black-and-white quadrants, is lowered to a depth at which it is no longer visible. This depth is referred to as the Secchi depth. Clarity can be reduced by algae, zooplankton, water color, and suspended sediment. Algae are often the most dominant influence on clarity in lakes and, therefore, Secchi depth is usually correlated with the algal abundance. Secchi depths are generally the least during summer when algal populations are largest.

pH

The pH is a measure of the acidity of the water. It is defined as the negative logarithm of hydrogen-ion concentration and varies over a 14-unit log scale, with a pH of 7 being neutral. Values less than 7 indicate acidic conditions; the lower the value, the stronger the acidity. Values greater than 7 indicate alkaline conditions. The pH of water is influenced in part by photosynthesis and respiration of planktonic algae and aquatic plants. It is important because it affects the solubility of many chemical constituents, and because aquatic organisms have limited pH tolerances. Planktonic algae and aquatic plants produce oxygen and consume carbon dioxide as they photosynthesize during daytime; they consume oxygen and produce carbon dioxide when they respire at night. Carbon dioxide combines with the water molecule to form carbonic acid; therefore respiration causes a decrease in pH at night and photosynthesis during the day causes an increase in pH. The result is a daily cycle in pH. Because phytoplankton are usually concentrated in the near-surface water, changes in pH in the epilimnion are more extreme than in the hypolimnion, where less photosynthesis usually occurs.

Lakes having good fish populations and productivity generally have a pH between 6.7 and 8.2. Values of pH greater than 8.5 have been shown to cause the release of phosphorus from lake sediments (James and Barko, 1991).

Dissolved Oxygen

Dissolved oxygen is one of the most critical factors affecting a lake ecosystem because it is essential to most aquatic organisms, and it is involved in many chemical reactions. Very low dissolved oxygen concentrations can control some types of chemical reactions. The solubility of oxygen in water is inversely related to temperature—that is, oxygen solubility decreases as water temperature increases. This relation is important because at warmer temperatures the metabolic rate of organisms increases but less oxygen is available for respiration. The primary sources of dissolved oxygen are from the air and from photosynthesis. The minimum dissolved oxygen concentration specified in national water-quality criteria for early life stages of warmwater aquatic life is 5.0 mg/L (U.S. Environmental Protection Agency, 1986).

In early summer, if thermal stratification develops, the metalimnion restricts the surface supply of dissolved oxygen to the hypolimnion. The hypolimnion can become isolated from the atmosphere. Thus, as summer progresses, the dissolved oxygen concentration can decrease in response to decomposition of dead algae that settle from the epilimnion and in response to the biological and chemical oxygen demand of the sediments. The oxygen demand from these processes may completely deplete the oxygen (anoxia) in the water near the lake bottom. The oxygen depletion then progresses upward but usually is confined to the hypolimnion.

Anoxia in the hypolimnion is common in stratified eutrophic (nutrient-rich) lakes in Wisconsin. Complete anoxia, however, is often not detected because of meter constraints. During anoxic conditions, many aquatic organisms cannot survive, but many other species (primarily bacteria) actually function only in such conditions. Therefore, a shift from oxic to anoxic conditions produces a rapid and dramatic change in the biological community and chemical environment. Anoxia also can cause release of phosphorus from the bottom sediments. This phosphorus then mixes throughout the water column during spring and fall turnover.

Phosphorus

Phosphorus is one of the essential nutrients for plant growth. High phosphorus concentrations can cause dense algal populations (blooms) and can therefore be a major cause of eutrophication in lakes. When phosphorus concentrations exceed 0.025 mg/L at the time of spring overturn in lakes and reservoirs, these water bodies may occasionally experience excess or nuisance growth of algae or other aquatic plants (U.S. Environmental Protection Agency, 1986). In many regions of the country, including the upper Midwest, other nutrients, particularly nitrogen, tend to be in abundant supply. Phosphorus is often the nutrient in shortest supply, therefore limiting or controlling plant growth. About 90 percent of the lakes in Wisconsin are limited by phosphorus (Shaw and others, 1993). In water, dissolved orthophosphate is that part of total phosphorus that is most readily available for use by algae.

Internal phosphorus recycling occurs in many lakes. Phosphorus used by algae, aquatic plants, fish, and zooplankton is stored within these organisms. As these organisms die and decompose, this phosphorus is returned to the lake water and sediments. Anoxia in the hypolimnion makes phosphorus more soluble, adding further to the release of phosphorus from the falling particles and the lake sediments. During spring and fall turnover the phosphorus, which was released from the bottom sediments into the hypolimnion during anoxia, is mixed throughout the lake. The phosphorus is then available for algal growth. These phenomena are part of the internal-recycling processes of lakes.

Nitrogen

Nitrogen, like phosphorus, is an essential nutrient for plant and algal growth. Usually in Wisconsin lakes, nitrogen is in abundant supply from the atmosphere and other sources. If phosphorus is abundant relative to algal needs, nitrogen can become the limiting nutrient. In that case, algal blooms are more likely to be triggered by increases in nitrogen than by increases in phosphorus. Some bluegreen algal species can fix nitrogen from the atmosphere (Wetzel, 1983). Therefore, in situations where other types of algae are excluded because of a shortage of nitrogen, the nitrogen-fixing bluegreen algae have a competitive advantage and may be present in abundance.

Lakes with a nitrogen to phosphorus ratio larger than 15 to 1 near the surface may generally be considered phosphorus limited; a ratio from 10 to 1 to 15 to 1 indicates a transition situation; and a ratio smaller than 10 to 1 generally indicates nitrogen limitation. Total nitrogen is the sum of ammonia, organic nitrogen, and nitrate-plus-nitrite nitrogen. The near-surface concentration is commonly used to compute the total nitrogen to phosphorus ratio because most algal species grow near the lake surface.

Chlorophyll *a*

Chlorophyll *a* is a photosynthetic pigment found in algae (Wetzel, 1983) and other green plants. Its concentration, therefore, is commonly used as a measure of the density of the algal population in a lake. Chlorophyll *a* concentrations are generally highest during summer when algal populations are highest. Moderate populations of desirable algae are important in the food chain; however, excessive populations or algal blooms are undesirable. Algal blooms can cause taste and odor problems, and limit light penetration needed to support growth of submerged aquatic plants. Certain species of bluegreen algae can produce toxins (Rapavich and others, 1987).

CLASSIFICATION OF LAKES

Two methods are commonly used to classify and evaluate Wisconsin lakes according to their water quality or trophic state: Lillie and Mason's (1983) water-quality index and a modification of Carlson's (1977) Trophic State Index (TSI) by Lillie and others (1993). Three water-quality measures are used in these classification systems: near-surface concentrations of total phosphorus and chlorophyll *a*, and water clarity as indicated by the Secchi depth.

Lillie and Mason's (1983) water-quality indices for Wisconsin lakes were developed based on random summer measurements of total phosphorus and chlorophyll *a* concentrations, and Secchi depth to classify the lakes' water quality as shown below:

Water-quality index	Total phosphorus range (mg/L)	Chlorophyll <i>a</i> range (µg/L)	Water clarity range (Secchi depth, in meters)
"Excellent"	<0.001	<1.0	>6.0
"Very good"	.001–.009	1.0– 4.9	3.0–6.0
"Good"	.010–.029	5.0– 9.9	2.0–2.9
"Fair"	.030–.049	10.0–14.9	1.5–1.9
"Poor"	.050–.149	15.0–30.0	1.0–1.4
"Very poor"	>.150	>30.0	<1.0

The TSI approach to lake classification assigns numerical ranges to the three trophic conditions generally used to describe the wide range of lake water-quality conditions. Oligotrophic lakes are typically clear, algal populations and phosphorus concentrations are low, and the deepest water is likely to contain oxygen throughout the year. Mesotrophic lakes typically have a moderate supply of nutrients, experience moderate algal blooms, and have occasional oxygen depletions at depth. Eutrophic lakes are nutrient rich with relatively severe water-quality problems, such as frequent seasonal algal blooms, oxygen depletion in lower parts of the lakes, and poor clarity. When eutrophic conditions are very severe, the lake is considered hyper-eutrophic.

The WDNR modified the lakes classification scheme developed by Carlson (1977) to apply specifically to Wisconsin lakes. The WDNR system (Lillie and others, 1993) uses surface total phosphorus and chlorophyll *a* concentrations, and Secchi depth for ice-free periods to calculate values for TSI's. The WDNR has adopted the following TSI ranges to classify Wisconsin lakes: indices of less than 40 define oligotrophic conditions, 40 to 50 define mesotrophic conditions, greater than 50 to define eutrophic conditions, and greater than 70 define hypereutrophic conditions (Wisconsin Department of Natural Resources, 1992). These ranges are used to make relative comparisons in Wisconsin lake trophic-state evaluations by the WDNR and others.

The TSI for a lake can be calculated using the following equations (Lillie and others, 1993):

$$TSI_{\text{Secchi}} = 60.0 - 33.2 \times (\log_{10} \text{ Secchi depth})$$

$$TSI_{\text{chlorophyll } a} = 34.82 + (17.41 \times (\log_{10} \text{ chlorophyll } a \text{ concentration}))$$

$$TSI_{\text{total phosphorus}} = 28.24 + (17.81 \times (\log_{10} \text{ total phosphorus concentration} \times 1,000))$$

where: Secchi depth is in meters,
 chlorophyll *a* is in micrograms per liter, and
 total phosphorus is in milligrams per liter.

The three trophic conditions are defined with the following boundaries for total phosphorus, Secchi disc, and chlorophyll *a*:

Trophic Level	Trophic State Index	Total phosphorus (mg/L)	Secchi depth (m)	Chlorophyll <i>a</i> (µg/L)
Eutrophic	50	0.017	2.0	7.4
Mesotrophic	40	0.005	4.0	2.0
Oligotrophic				

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LAKE DATA

432409088151600 BIG CEDAR LAKE, NORTH SITE, NEAR WEST BEND, WI

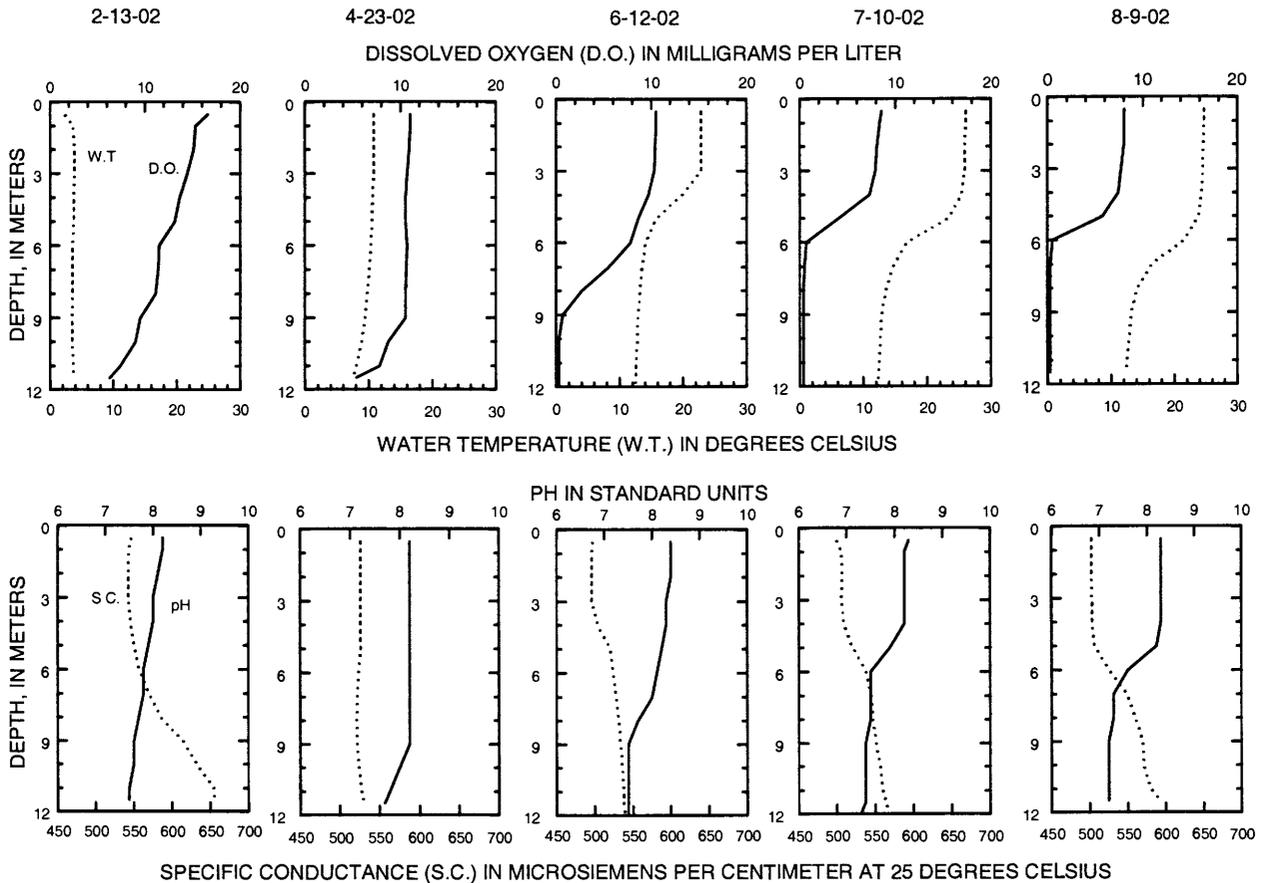
LOCATION.--Lat 43°24'09", long 88°15'16", in NE 1/4 sw 1/4 sec.20, T.11 N., R.19 E., Washington County, Hydrologic Unit 04040003, near West Bend.

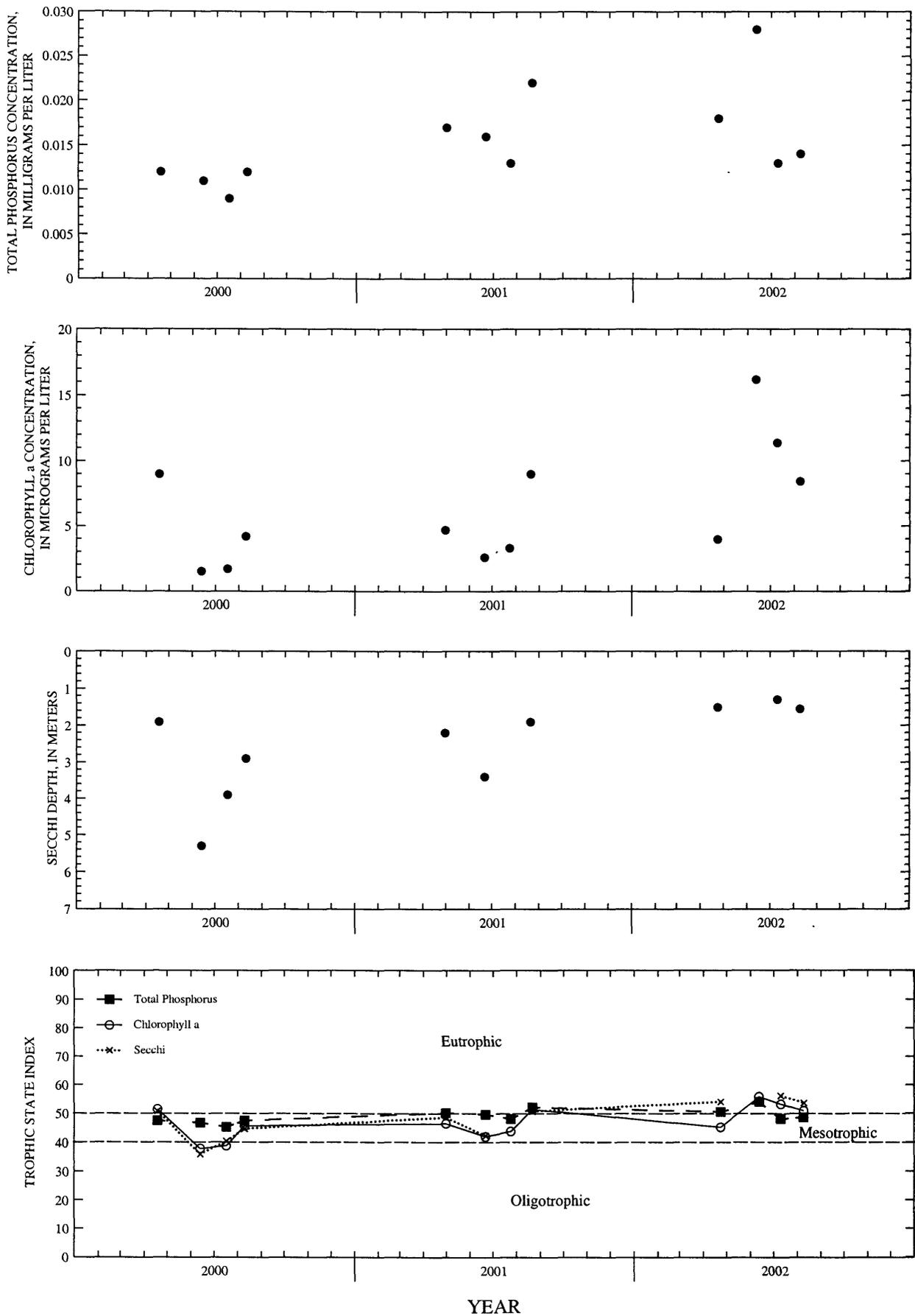
PERIOD OF RECORD.--February 2000 to to current year.

REMARKS.--Lake sampled on north side at a depth of 12 m. Lake ice-covered during February sampling. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 13 TO AUGUST 9, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 13		Apr 23		Jun 12		Jul 10		Aug 9		
Secchi-depth (m)	---		1.5		---		1.30		1.55		
Chlorophyll a, phytoplankton (µg/L)	---		4.00		16.2		11.4		8.45		
Depth of sample (m)	0.5	11.5	0.5	11.5	0.5	12	0.5	12	0.5	6	11.5
Water temperature (°C)	2.3	3.8	10.8	7.6	22.8	12.5	26.1	12.3	24.7	21.5	12.3
Specific conductance (µS/cm)	547	656	526	530	497	540	499	568	502	525	593
pH (units)	8.2	7.5	8.2	7.7	8.4	7.5	8.3	7.3	8.3	7.6	7.2
Dissolved oxygen (mg/L)	16.6	6.3	11.0	5.4	10.5	0.3	8.6	0.4	8.1	0.5	0.3
Phosphorus, total (as P)	0.015	0.017	0.018	0.018	0.028	0.023	0.013	0.035	0.014	0.015	0.032
Phosphorus, ortho, dissolved (as P)	---	---	---	---	---	---	0.003	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	---	---	---	---	<0.010	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	---	---	---	---	<0.013	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	---	---	---	---	0.63	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Big Cedar Lake, North Site, near West Bend, Wisconsin.

432224088154900 BIG CEDAR LAKE, SOUTH SITE, NEAR WEST BEND, WI

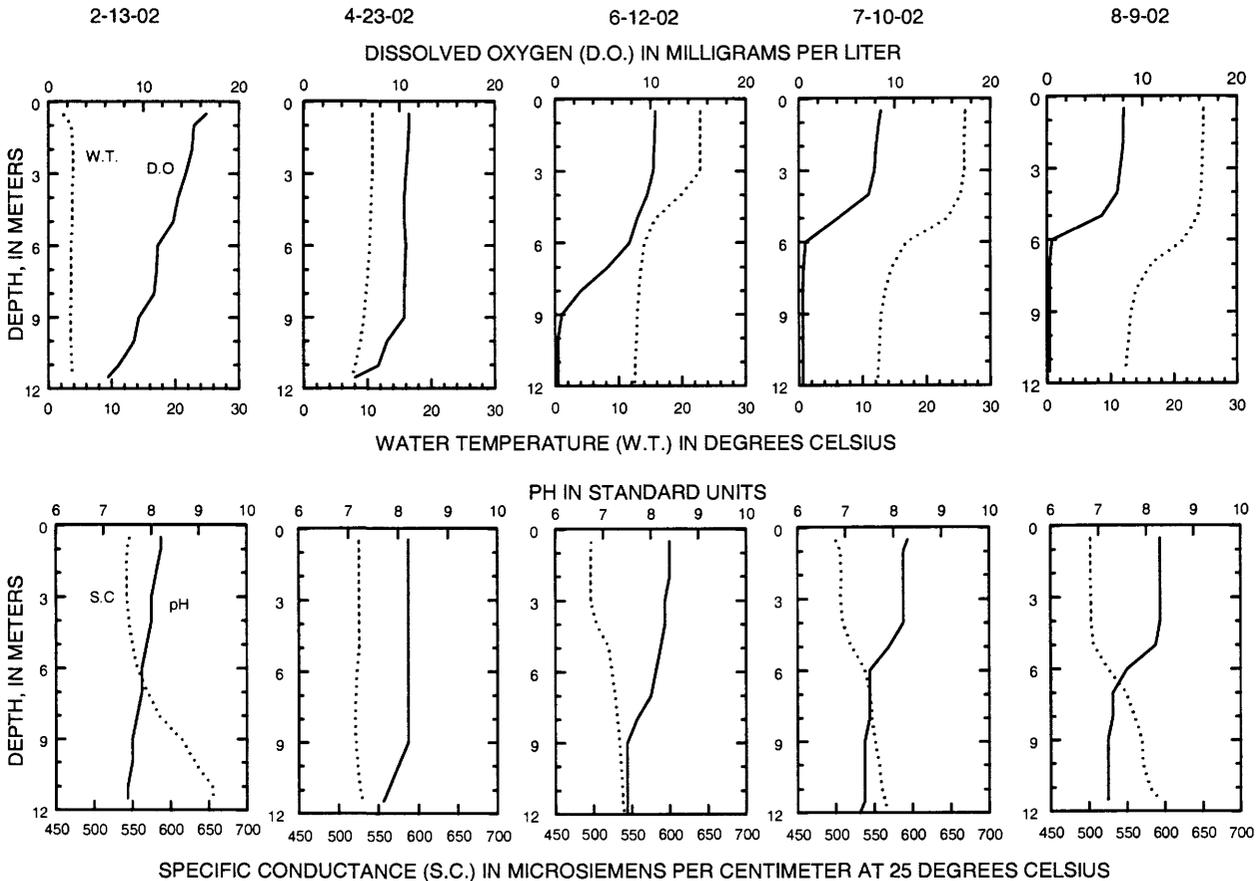
LOCATION.--Lat 43°22'24", long 88°15'49", in NE 1/4 SE 1/4 sec.31, T.11 N., R.19 E., Washington County, Hydrologic Unit 04040003, near West Bend.

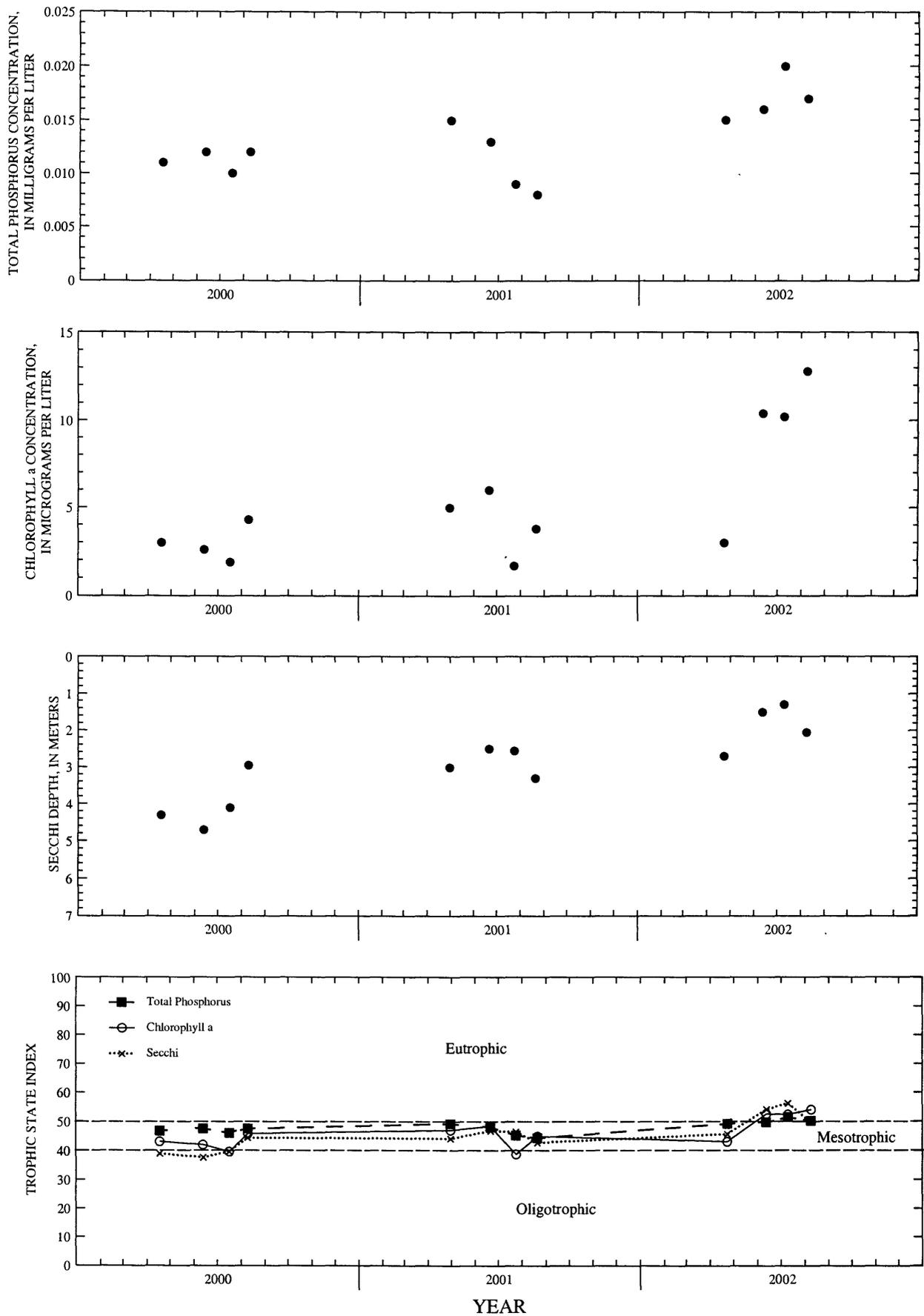
PERIOD OF RECORD.--February 2000 to current year.

REMARKS.--Lake sampled on south side at deep hole. Lake ice-covered during February sampling. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 13 TO AUGUST 9, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 13		Apr 23		Jun 12		Jul 10		Aug 9		
Secchi-depth (m)	---	---	2.7	3.0	1.5	10.4	1.3	10.2	2.1	12.8	
Chlorophyll a, phytoplankton (µg/L)	---	---	3.00	3.00	10.4	10.4	10.2	10.2	12.8	12.8	
Depth of sample (m)	0.5	29.5	0.5	30	0.5	29.5	0.5	30	0.5	19	29.5
Water temperature (°C)	1.6	3.5	8.2	5.3	21.1	6.5	25.8	6.5	24.4	8.2	8.2
Specific conductance (µS/cm)	520	528	507	510	490	520	474	539	480	525	525
pH (units)	8.2	7.6	8.3	8.1	8.3	7.5	8.3	7.4	8.4	7.3	7.3
Dissolved oxygen (mg/L)	13.7	5.8	12.3	10.8	11.7	2.8	9.4	0.5	9.4	0.7	0.7
Phosphorus, total (as P)	0.016	0.016	0.015	0.015	0.016	0.025	0.020	0.058	0.017	0.015	0.101
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---	0.002	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.293	---	---	---	<0.010	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	<0.013	---	---	---	<0.013	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	---	---	---	---	0.66	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.52	---	---	---	---	---	---	---	---
Nitrogen, total (as N)	---	---	0.81	---	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	5	---	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	2.4	---	---	---	---	---	---	---	---
Hardness, as CaCO ₃	---	---	220	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	36.3	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	31.8	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	18.4	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	1.00	---	---	---	---	---	---	---	---
Alkalinity, as CaCO ₃	---	---	190	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	---	---	21.7	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	42.6	---	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	---	---	1.38	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	284	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Big Cedar Lake, South Site, near West Bend, Wisconsin.

454724091303600 BIG SISSABAGAMA LAKE NEAR STONE LAKE, WI

LOCATION.--Lat 45°47'24", long 91°30'36", in NW 1/4 SE 1/4 sec.6, T.38 N., R.9 W., Sawyer County, Hydrologic Unit 07050001, near Stone Lake.

DRAINAGE AREA.--9.47 mi².

PERIOD OF RECORD.--April 1986 to September 1996, and October 1997 to September 2002, during open-water periods (discontinued).

GAGE.--Water surface measured from reference point near lake outlet. Measurements were made by Richard Roehrich and Max Stauffer.

EXTREMES FOR PERIOD OF RECORD: Maximum gage height observed, 6.55 ft, Apr. 16-18, 2002 minimum observed, 4.78 ft, Sept. 15, 16, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.55 ft, Apr. 16-18; minimum observed, less than 5.31 ft, Oct. 11.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.40	5.66	6.05	---	---	---	---	6.18	5.83	6.02	5.92	5.88
2	5.39	5.65	6.01	---	---	---	---	---	5.80	5.99	5.90	6.00
3	5.38	5.64	5.92	---	---	---	---	---	5.82	5.94	5.92	5.86
4	5.37	5.63	5.90	---	---	---	---	---	5.83	5.92	6.01	5.91
5	5.36	5.63	5.97	---	---	---	---	---	5.80	5.90	6.00	5.90
6	5.35	5.63	5.98	---	---	---	---	6.05	5.80	5.88	5.98	---
7	5.34	5.63	5.98	---	---	---	---	6.05	5.81	5.87	5.95	---
8	5.33	5.64	5.99	---	---	---	---	6.26	5.80	6.18	5.94	6.00
9	5.32	5.64	5.99	---	---	---	---	6.37	5.83	6.19	5.91	5.97
10	5.32	5.64	6.00	---	---	---	---	---	5.84	6.20	5.90	5.97
11	5.31	5.64	6.00	---	---	---	---	---	5.84	6.18	5.88	5.92
12	5.33	5.64	5.99	---	---	---	6.26	---	---	6.15	5.89	5.89
13	5.36	5.67	5.98	---	---	---	6.35	6.30	---	6.15	5.88	5.88
14	5.38	5.66	5.97	---	---	---	6.52	6.28	5.85	6.14	5.86	5.88
15	5.55	5.66	5.96	---	---	---	6.37	6.24	5.84	6.13	5.87	5.86
16	5.57	5.66	5.95	---	---	---	6.55	6.22	5.83	6.10	5.85	5.83
17	5.58	5.66	5.94	---	---	---	6.55	6.17	5.84	6.05	5.86	5.80
18	5.58	5.67	5.91	---	---	---	6.55	6.14	5.83	6.05	5.83	5.80
19	5.60	5.67	5.89	---	---	---	6.38	6.10	5.82	6.03	5.82	5.78
20	5.59	5.67	5.87	---	---	---	6.37	6.06	5.84	6.02	5.82	5.78
21	5.59	5.68	5.86	---	---	---	6.32	6.04	5.87	6.00	5.92	5.77
22	5.58	5.68	---	---	---	---	6.31	6.01	6.03	5.95	---	5.75
23	5.58	5.68	---	---	---	---	6.30	5.99	6.07	5.93	---	5.71
24	5.59	5.69	---	---	---	---	6.34	5.95	6.10	5.92	---	5.70
25	5.59	5.69	---	---	---	---	6.30	5.90	6.10	5.90	5.95	---
26	5.60	5.75	---	---	---	---	6.28	5.89	6.09	5.89	5.94	5.75
27	5.60	5.80	---	---	---	---	6.27	5.88	6.08	5.94	5.89	5.73
28	5.60	5.85	---	---	---	---	6.27	5.87	6.07	5.94	5.89	5.73
29	5.60	5.96	---	---	---	---	6.26	5.85	6.05	5.94	5.92	5.71
30	5.63	---	---	---	---	---	6.22	5.84	6.03	5.92	5.92	5.75
31	5.65	---	---	---	---	---	---	5.84	---	5.96	5.90	---
MEAN	5.48	---	---	---	---	---	---	---	---	6.01	---	---
MAX	5.65	---	---	---	---	---	---	---	---	6.20	---	---
MIN	5.31	---	---	---	---	---	---	---	---	5.87	---	---

424800088254800 BOOTH LAKE NEAR EAST TROY, WI

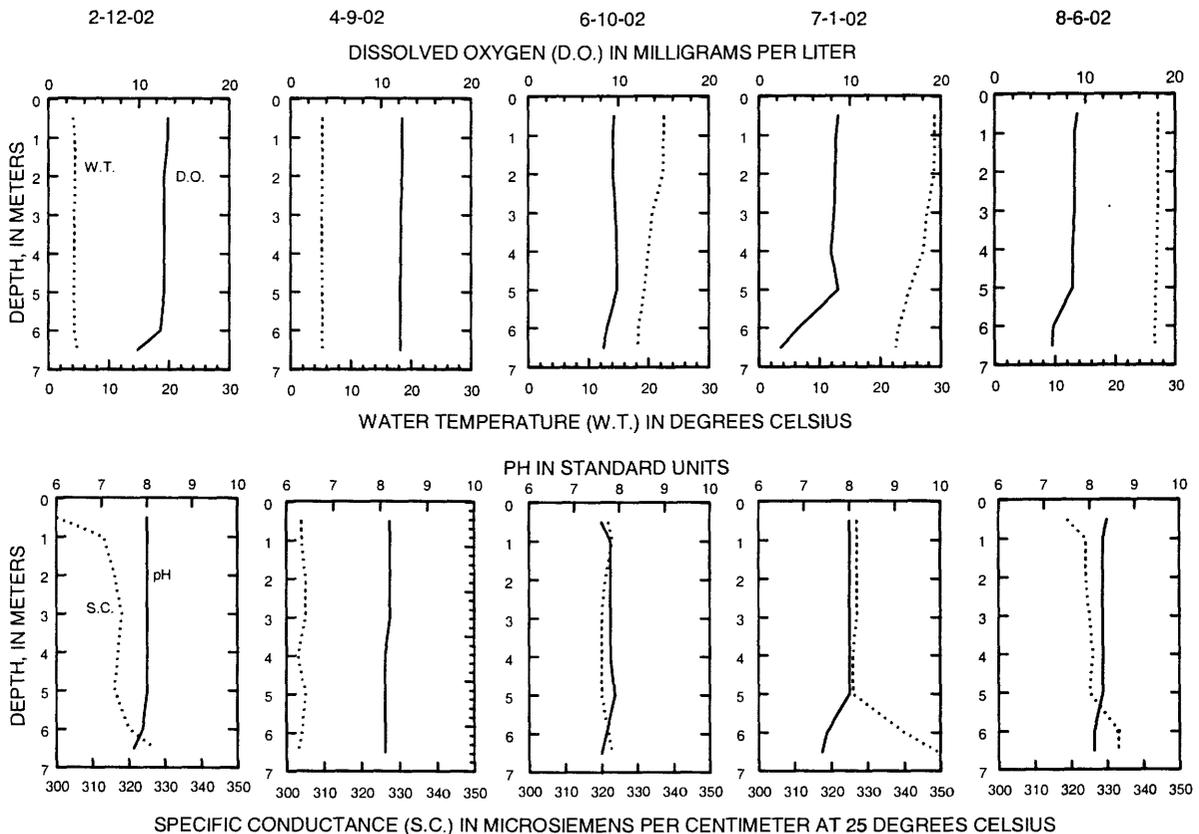
LOCATION.--Lat 42°48'00", long 88°25'48", in SW 1/4 SE 1/4 sec.13, T.4 N., R.17 E., Walworth County, Hydrologic Unit 07120006, 1.6 mi northwest of East Troy.

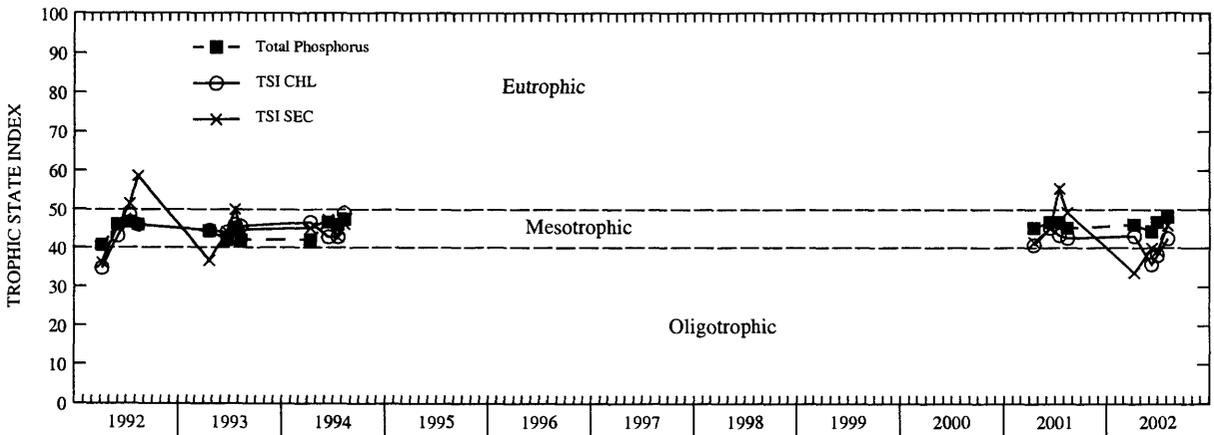
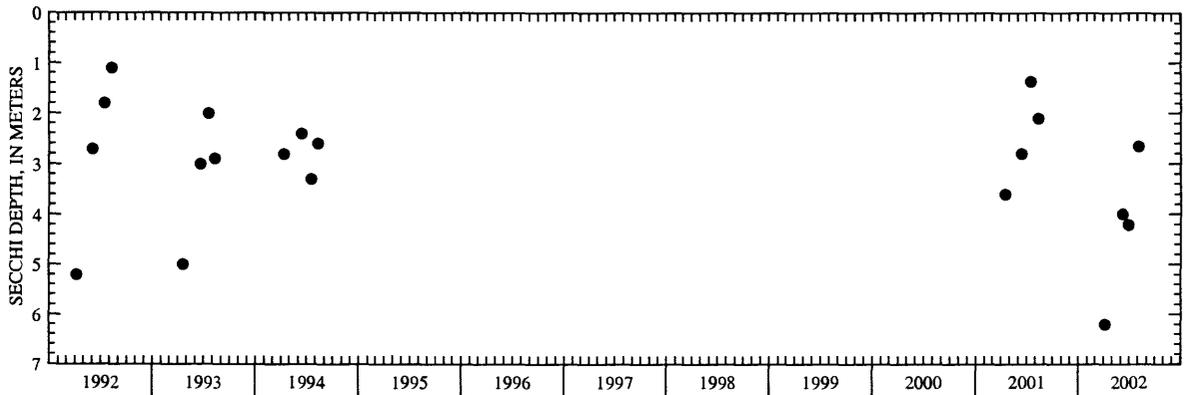
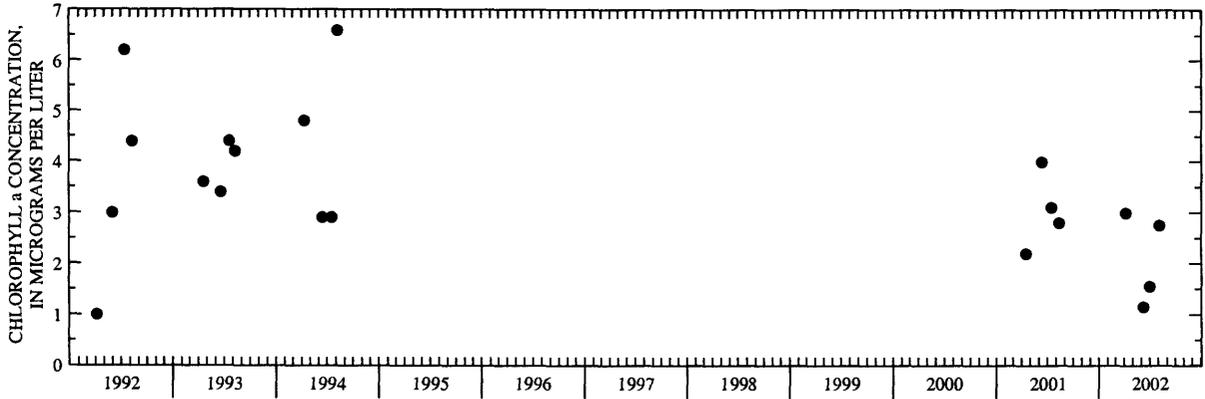
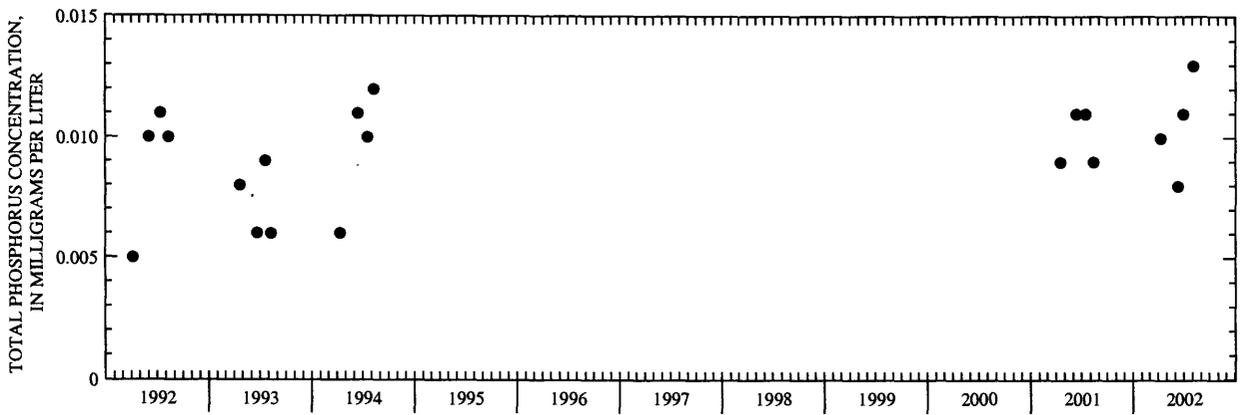
PERIOD OF RECORD.--February 1992 to August 1994, February to August 2001.

REMARKS.--Lake sampled near center of lake at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 12 TO AUGUST 6, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 12		Apr 9		Jun 10		Jul 1		Aug 6	
Lake stage (ft)	---		11.36		11.35		11.27		10.79	
Secchi-depth (m)	---		6.2		4.0		4.2		2.7	
Chlorophyll a, phytoplankton (µg/L)	---		3.00		1.15		1.56		2.76	
Depth of sample (m)	0.5	6.5	0.5	6.5	0.5	6.5	0.5	6.5	0.5	6.5
Water temperature (°C)	4	4.8	5.3	5.2	22.5	18.2	29	22.5	27.1	26.5
Specific conductance (µS/cm)	300	327	304	303	322	323	327	349	319	333
pH (units)	8	7.7	8.2	8.1	7.6	7.6	8	7.4	8.4	8.1
Dissolved oxygen (mg/L)	13.2	9.8	12.3	12.1	9.5	8.3	8.7	2.4	9.1	6.3
Phosphorus, total (as P)	0.014	0.023	0.010	0.009	0.008	0.014	0.011	0.019	0.013	0.017
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---	<0.002	---	---	---
Nitrogen, NO ₂ + NO ₃ , dissolved (as N)	---	---	0.074	---	---	---	0.068	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.145	---	---	---	0.155	---	---	---
Nitrogen, amm. + org., dissolved (as N)	---	---	---	---	---	---	0.85	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.69	---	---	---	---	---	---	---
Nitrogen, total (as N)	---	---	0.76	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	<5	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	1.2	---	---	---	---	---	---	---
Hardness, as CaCO ₃	---	---	140	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	29.5	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	17.2	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	6.7	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	1.00	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	---	---	124	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	---	---	12.8	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	13.4	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	---	---	0.041	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	172	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Booth Lake, near East Troy, Wisconsin.

423706088363400 DELAVAN LAKE NEAR DELAVAN, WI

LOCATION.--Lat 42°36'27", long 88°36'19", in SW 1/4 NE 1/4 sec.28, T.2 N., R.16 E., Walworth County, Hydrologic Unit 07090001, at Delavan Lake Sanitary District Lift Station No. 2 at Delavan Lake Yacht Club, 1.0 mi southeast of outlet, and 2.7 mi southeast of Delavan.

DRAINAGE AREA.--41.4 mi², of which 2.3 mi² is non-contributing. Area of Delavan Lake, 2,072 acres.

PERIOD OF RECORD.--October 1983 to current year. October 1983 to September 1985 data published in Water Resources Investigation series report "Water Quality and Hydrology of Delavan Lake in Southeastern Wisconsin" by S. J. Field and M. D. Duerk (1988).

GAGE.--Water-stage recorder. Datum of gage is 922.92 ft above sea level. Prior to Sept. 5, 1989, staff gage at bridge on North Shore Drive at same datum.

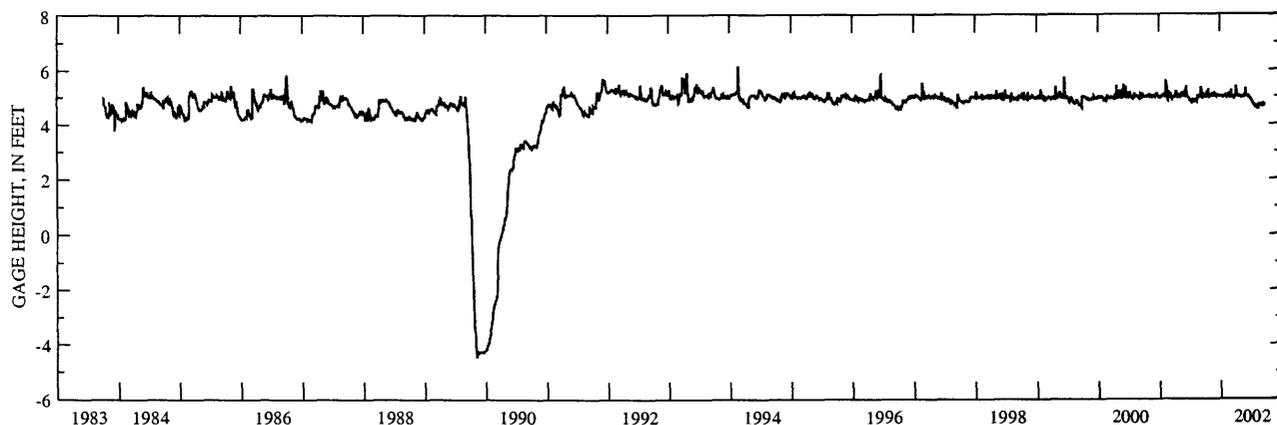
REMARKS.--Lake was ice covered from Dec. 13 to Apr. 7. Lake levels controlled by Delavan Lake Sanitary District. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 6.19 ft, Feb. 21, 1994; minimum daily, -4.44 ft, Nov. 6, 1989 (lake drawn down for lake rehabilitation program).

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 5.43 ft, Apr. 9; minimum, 4.51 ft, Aug. 21.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.00	4.98	5.01	5.00	5.05	4.99	5.00	4.99	5.07	4.97	4.68	4.66
2	5.00	4.99	5.01	5.00	5.04	5.03	5.03	5.02	5.05	4.95	4.67	4.72
3	4.99	5.00	5.00	5.01	5.03	5.06	5.04	5.01	5.07	4.94	4.65	4.75
4	4.99	5.01	5.00	5.01	5.02	5.04	5.04	4.99	5.23	4.93	4.66	4.74
5	5.00	5.01	5.00	5.02	5.01	5.02	5.04	4.99	5.32	4.91	4.66	4.74
6	4.99	5.01	5.01	5.02	4.99	5.00	5.03	4.99	5.21	4.89	4.64	4.73
7	4.98	5.01	5.01	5.03	4.98	4.98	5.06	5.00	5.10	4.89	4.62	4.72
8	4.98	5.02	5.01	5.02	4.97	5.01	5.18	4.98	5.07	4.88	4.61	4.71
9	4.97	5.01	5.00	5.02	4.96	5.16	5.40	4.99	5.05	4.90	4.60	4.71
10	5.00	5.01	4.99	5.01	5.00	5.24	5.37	4.97	5.03	4.89	4.59	4.71
11	5.03	5.01	5.00	5.01	5.03	5.22	5.26	4.98	5.03	4.86	4.57	4.69
12	5.05	5.01	5.00	5.00	5.01	5.16	5.14	5.02	5.01	4.85	4.56	4.68
13	5.07	5.05	5.05	4.99	5.01	5.09	5.03	5.02	5.01	4.83	4.59	4.66
14	5.12	5.13	5.06	5.00	5.01	5.04	4.99	5.02	5.05	4.83	4.60	4.65
15	5.13	5.14	5.05	5.01	5.01	5.02	5.01	5.01	5.04	4.82	4.59	4.64
16	5.12	5.12	5.06	5.02	5.01	5.00	5.02	5.02	5.02	4.81	4.58	4.63
17	5.09	5.09	5.06	5.03	5.01	4.98	5.04	5.03	5.00	4.80	4.57	4.61
18	5.05	5.06	5.04	5.03	5.01	4.97	5.03	5.01	5.00	4.79	4.56	4.61
19	5.03	5.03	5.03	5.02	5.04	4.96	5.06	5.00	4.99	4.78	4.56	4.68
20	5.01	5.00	5.01	5.02	5.10	4.96	5.04	4.99	4.99	4.77	4.54	4.76
21	5.00	5.00	4.99	5.01	5.13	4.96	5.03	4.97	4.99	4.76	4.54	4.76
22	5.00	5.00	5.00	5.01	5.10	4.94	5.04	4.96	4.99	4.75	4.69	4.75
23	5.15	5.01	5.00	5.00	5.06	4.93	5.03	4.96	4.99	4.73	4.71	4.73
24	5.25	5.06	5.00	5.00	5.05	4.93	5.02	4.98	4.99	4.71	4.72	4.71
25	5.25	5.11	4.99	5.01	5.04	4.92	5.02	5.02	4.98	4.69	4.72	4.69
26	5.16	5.12	4.99	5.00	5.03	4.92	5.00	5.05	5.01	4.68	4.72	4.69
27	5.04	5.10	5.00	5.01	5.01	4.93	5.00	5.07	5.01	4.69	4.71	4.68
28	4.93	5.07	5.00	5.01	4.99	4.93	5.01	5.07	5.00	4.69	4.70	4.67
29	4.94	5.04	5.00	5.01	---	4.95	5.01	5.07	4.99	4.70	4.68	4.73
30	4.96	5.02	5.00	5.01	---	4.97	5.00	5.07	4.98	4.70	4.67	4.76
31	4.97	---	5.00	5.04	---	4.98	---	5.07	---	4.69	4.66	---
MEAN	5.04	5.04	5.01	5.01	5.03	5.01	5.07	5.01	5.04	4.81	4.63	4.70
MAX	5.25	5.14	5.06	5.04	5.13	5.24	5.40	5.07	5.32	4.97	4.72	4.76
MIN	4.93	4.98	4.99	4.99	4.96	4.92	4.99	4.96	4.98	4.68	4.54	4.61



423556088365001 DELAVAN LAKE AT CENTER NEAR DELAVAN LAKE, WI

LOCATION.--Lat 42°35'56", long 88°36'50", in SE 1/4 SW 1/4 sec.28, T.2 N., R.16 E., Walworth County, Hydrologic Unit 07090001, 2.6 mi southeast of Delavan.

DRAINAGE AREA.--41.4 mi², of which 2.3 mi² is non-contributing. Area of Delavan Lake, 2,072 acres.

PERIOD OF RECORD.--October 1983 to current year.

REMARKS.--Lake ice-covered during February measurements. Water-quality analyses done by the U.S. Geological Survey National Water Quality Laboratory. Samples for determination of chlorophyll-a concentration are collected from the top 1.5 ft of the lake.

WATER-QUALITY DATA, NOVEMBER 14, 2001 TO MAY 14, 2002
(Milligrams per liter unless otherwise indicated)

	Nov 14		Feb 22		Apr 17		May 14	
Lake stage (ft)	5.13		5.10		5.04		5.02	
Secchi-depth (m)	6.4		2.4		2.0		6.5	
Chlorophyll a, phytoplankton (µg/L)	0.6		3.4		E7.6		0.3	
Depth of sample (m)	0.5	16.0	0.5	16.0	0.5	16.0	0.5	16.0
Water temperature (°C)	9.1	9.0	2.8	4.0	9.1	8.4	11.9	11.7
Specific conductance (µS/cm)	552	553	568	749	578	580	584	585
pH (units)	8.0	8.0	8.6	7.4	---	---	8.2	8.2
Dissolved oxygen (mg/L)	9.4	9.3	19.1	6.7	14.9	14.1	9.3	9.1
Phosphorus, total (as P)	0.105	0.102	0.049	0.147	0.039	0.037	0.043	0.044
Phosphorus, ortho, dissolved (as P)	0.076	0.065	0.018	0.107	<0.007	<0.007	0.018	0.021
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	0.229	---	0.186	---	0.21	0.214	0.192	---
Nitrogen, ammonia, dissolved (as N)	0.102	---	<0.015	---	0.018	0.019	0.098	---
Nitrogen, amm. + org., total (as N)	0.76	---	0.5	---	0.73	0.70	0.61	---
Nitrogen, total (as N)	0.99	---	0.69	---	0.94	0.92	0.81	---
Color (Pt-Co. scale)	---	---	---	---	18	15	---	---
Turbidity (NTU)	---	---	---	---	3.1	2.2	---	---
Hardness, as CaCO ₃	---	---	---	---	240	240	---	---
Calcium, dissolved (Ca)	---	---	---	---	43.3	43.5	---	---
Magnesium, dissolved (Mg)	---	---	---	---	32.1	32.1	---	---
Sodium, dissolved (Na)	---	---	---	---	25.8	25.4	---	---
Potassium, dissolved (K)	---	---	---	---	2.56	2.54	---	---
Alkalinity as CaCO ₃	---	---	---	---	193	193	---	---
Sulfate, dissolved (SO ₄)	---	---	---	---	25.9	25.7	---	---
Chloride, dissolved (Cl)	---	---	---	---	55.1	54.8	---	---
Silica, dissolved (SiO ₂)	---	---	---	---	<0.2	<0.2	---	---
Solids, dissolved, at 180°C	---	---	---	---	334	325	---	---
Iron, dissolved (Fe) µg/L	---	---	---	---	<10	<10	---	---
Manganese, dissolved (Mn) µg/L	---	---	---	---	E1.0	<2.0	---	---

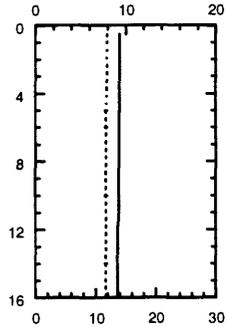
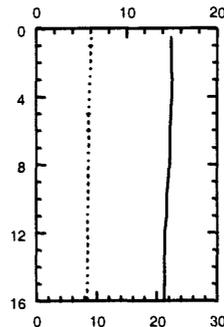
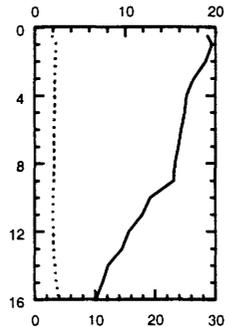
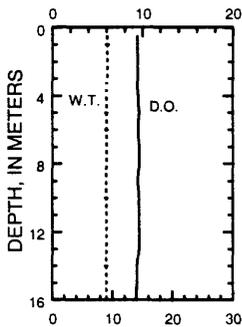
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2-22-02

4-17-02

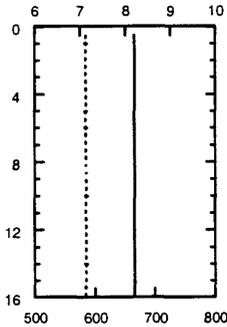
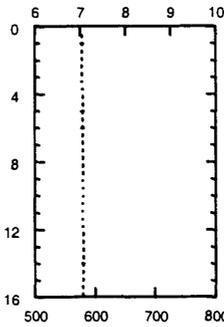
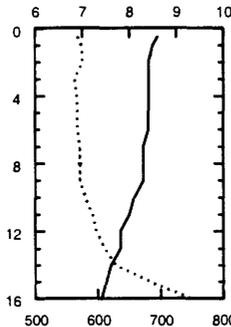
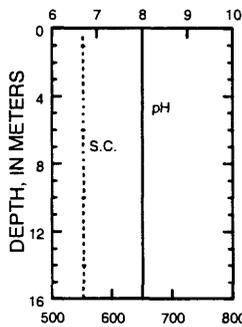
5-14-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

pH IN STANDARD UNITS



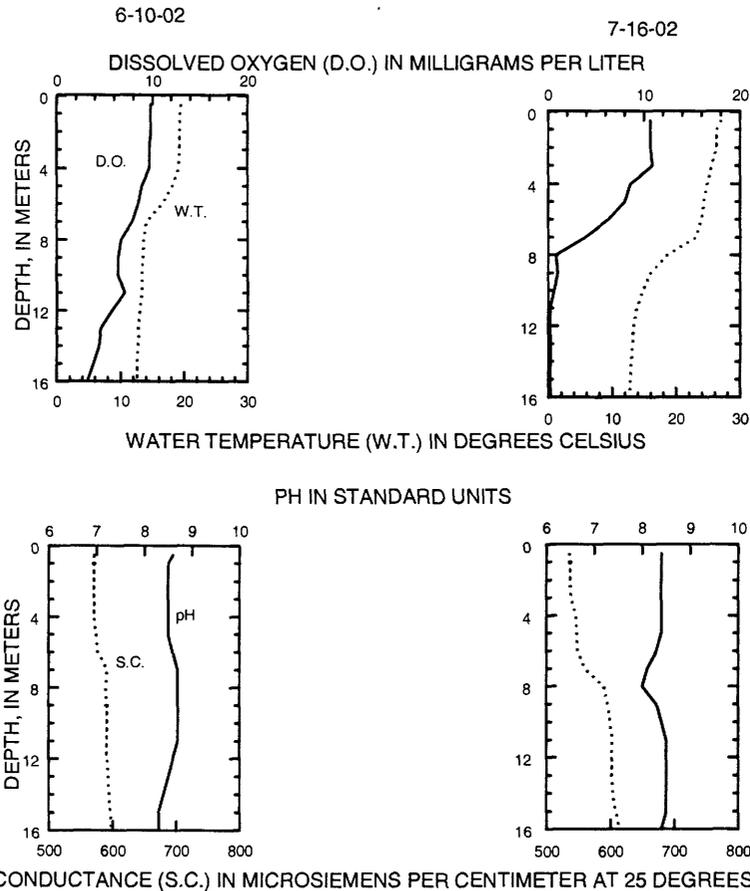
SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

423556088365001 DELAVAN LAKE AT CENTER NEAR DELAVAN LAKE, WI--CONTINUED

WATER-QUALITY DATA, JUNE 10 TO JULY 16, 2002

(Milligrams per liter unless otherwise indicated)

	Jun 10				Jul 16			
Lake stage (ft)	5.03				4.81			
Secchi-depth (m)	4.3				2.0			
Chlorophyll a, phytoplankton (µg/L)	2.2				9.7			
Depth of sample (m)	0.5	4.0	12.0	16.0	0.5	2.0	12.0	16.0
Water temperature (°C)	19.5	19.2	13.0	12.6	27.0	26.3	13.4	12.7
Specific conductance (µS/cm)	571	571	591	598	536	537	602	614
pH (units)	8.6	8.5	8.6	8.3	8.4	8.4	8.5	8.4
Dissolved oxygen (mg/L)	9.8	9.7	5.8	3.2	10.7	10.7	0.2	0.2
Phosphorus, total (as P)	0.037	0.041	0.071	0.124	0.026	0.031	0.248	0.552
Phosphorus, ortho, dissolved (as P)	<0.007	E0.004	0.040	0.084	<0.007	<0.007	0.202	0.474
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	0.085	---	---	---	E0.011	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.032	---	---	---	0.053	---	---	---
Nitrogen, amm. + org., total (as N)	0.89	---	---	---	0.75	---	---	---
Nitrogen, total (as N)	0.97	---	---	---	---	---	---	---

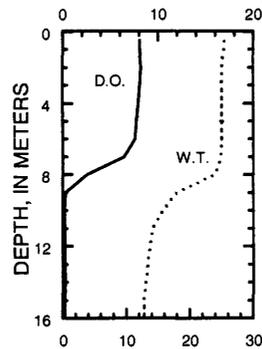


WATER-QUALITY DATA, AUGUST 14, 2002
(Milligrams per liter unless otherwise indicated)

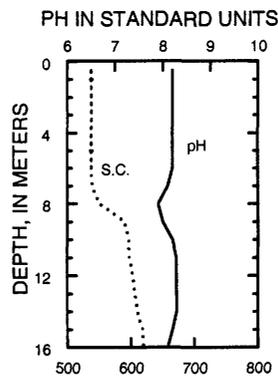
	Aug 14							
Lake stage (ft)	4.60							
Secchi-depth (m)	2.3							
Chlorophyll a, phytoplankton (µg/L)	E9.3							
Depth of sample (m)	0.5	4.0	7.0	9.0	11.0	13.0	14.0	16.0
Water temperature (°C)	25.4	25.0	24.9	17.9	14.1	13.3	13	12.8
Specific conductance (µS/cm)	538	538	539	590	598	606	610	620
pH (units)	8.2	8.2	8.1	8.0	8.3	8.3	8.3	8.1
Dissolved oxygen (mg/L)	8.1	7.9	6.4	0.3	0.2	0.2	0.2	0.2
Phosphorus, total (as P)	0.029	0.038	0.029	0.11	0.273	0.397	0.504	0.605
Phosphorus, ortho, dissolved (as P)	<0.007	---	<0.007	---	---	---	0.417	0.517
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.013	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.039	---	---	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.65	---	---	---	---	---	---	---

8-14-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



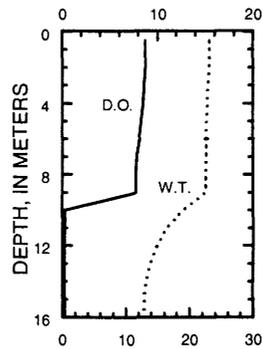
SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

WATER-QUALITY DATA, SEPTEMBER 16, 2002
(Milligrams per liter unless otherwise indicated)

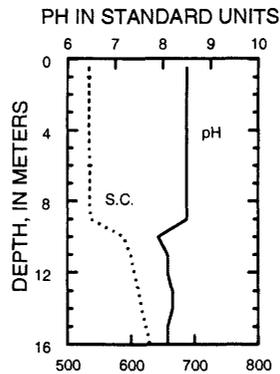
	<u>Sep 16</u>				
Lake stage (ft)	4.63				
Secchi-depth (m)	2.9				
Chlorophyll a, phytoplankton (µg/L)	5.1				
Depth of sample (m)	0.5	9.0	10.0	14.0	16.0
Water temperature (°C)	23.2	22.5	19.0	13.2	12.8
Specific conductance (µS/cm)	534	536	588	616	630
pH (units)	8.5	8.5	7.9	8.2	8.1
Dissolved oxygen (mg/L)	8.7	7.7	0.3	0.2	0.2
Phosphorus, total (as P)"	0.021	0.03	0.191	0.632	0.729
Phosphorus, ortho, dissolved (as P)	<0.007	<0.007	0.140	0.530	0.604
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	E.010	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.03	---	---	---	---
Nitrogen, amm. + org., total (as N)	1.9	---	---	---	---

9-16-02.

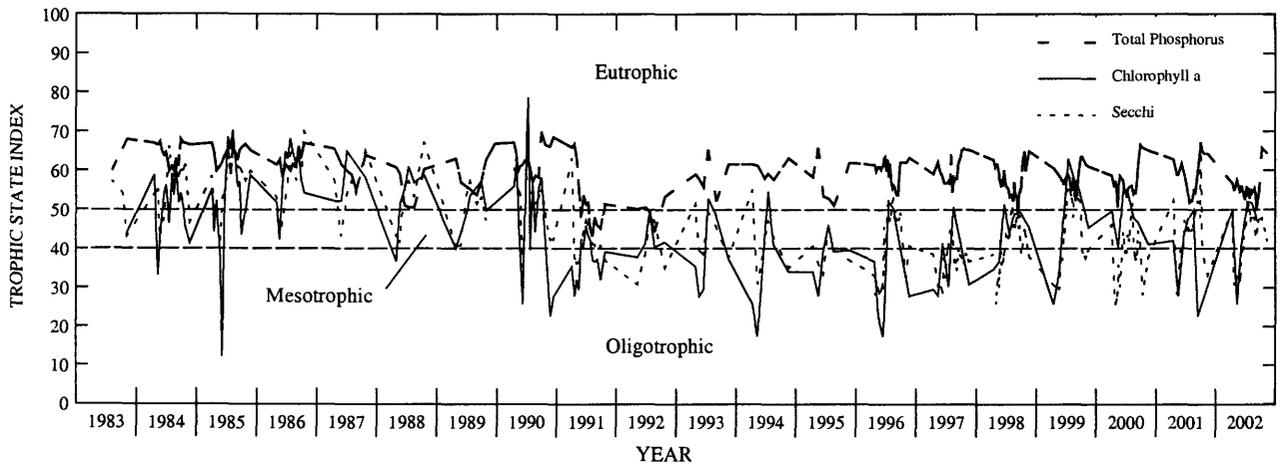
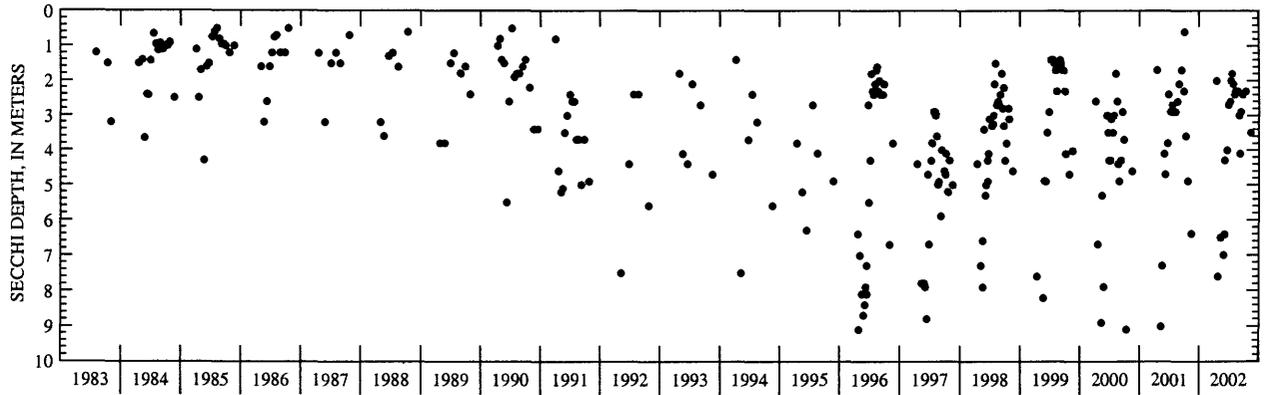
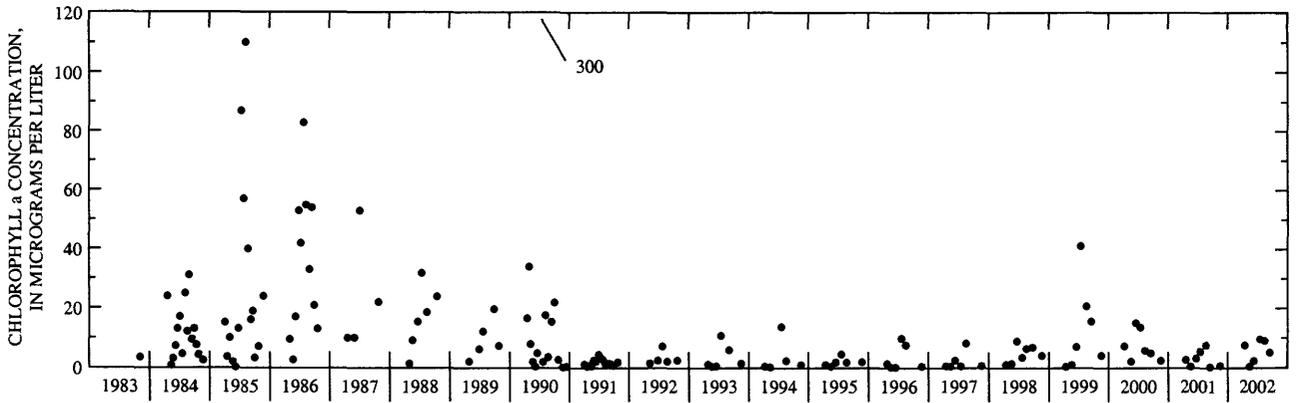
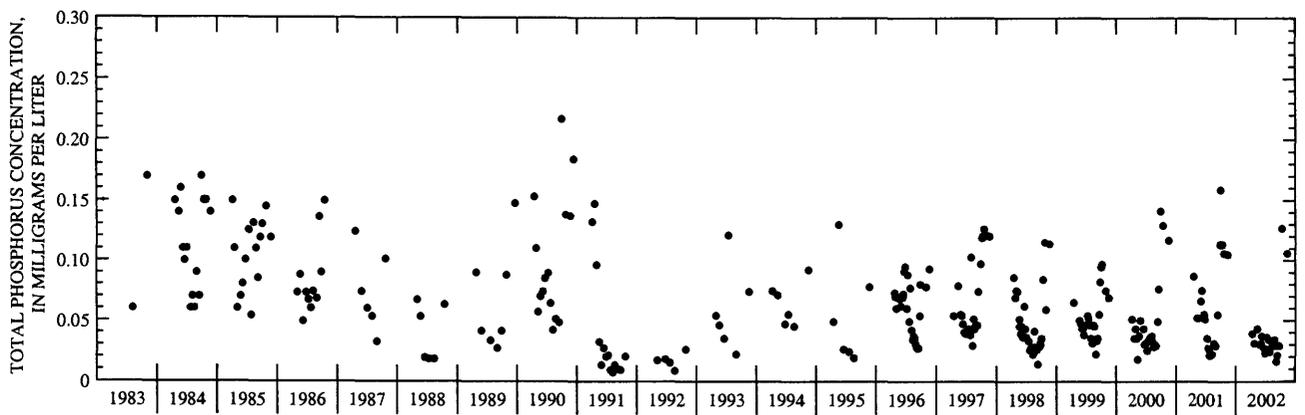
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS



Surface total phosphorus, chlorophyll a concentrations, Secchi depths,
and TSI data for Delavan Lake at Center near Delavan, Wisconsin.

423556088365001 DELAVAN LAKE AT CENTER NEAR DELAVAN LAKE, WI--CONTINUED

ADDITIONAL WATER-QUALITY DATA, OCTOBER 2, 2001 TO SEPTEMBER 26, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Oct. 2</u>	<u>Oct. 11</u>	<u>Oct. 23</u>	<u>Apr. 26</u>	<u>May 31</u>
Lake stage (ft)	5.00	5.03	5.15	5.00	5.07
Secchi-depth (meters)	0.6	3.6	4.9	7.6	7.0
Depth of sample (meters)	0.5	0.5	0.5	0.5	0.5
Water temperature (°C)	15.0	13.0	11.0	10.5	17.2
Phosphorus, total (as P)	0.159	0.114	0.106	0.031	0.030

	<u>June 6</u>	<u>June 24</u>	<u>July 2</u>	<u>July 12</u>	<u>July 24</u>
Lake stage (ft)	5.21	4.99	4.95	4.85	4.71
Secchi-depth (meters)	6.4	4.0	2.7	2.6	1.8
Depth of sample (meters)	0.5	0.5	0.5	0.5	0.5
Water temperature (°C)	---	23.9	25.0	24.0	25.0
Phosphorus, total (as P)	0.031	0.027	0.023	0.036	0.034

	<u>July 31</u>	<u>Aug. 8</u>	<u>Aug. 29</u>	<u>Sept. 5</u>	<u>Sept. 11</u>
Lake stage (ft)	4.69	4.61	4.68	4.74	4.69
Secchi-depth (meters)	2.1	2.4	2.3	3.0	4.1
Depth of sample (meters)	0.5	0.5	0.5	0.5	0.5
Water temperature (°C)	26.0	26.1	24.4	23.5	24.5
Phosphorus, total (as P)	0.024	0.033	0.034	0.028	0.016

	<u>Sept. 26</u>
Lake stage (ft)	4.69
Secchi-depth (meters)	2.4
Depth of sample (meters)	0.5
Water temperature (°C)	21
Phosphorus, total (as P)	0.029

* Measurements and samples collected by the Delavan Lake Sanitary District.

423659088354401 DELAVAN LAKE, AT NORTH END, NEAR LAKE LAWN, WI

LOCATION.--Lat 42°36'59", long 88°35'44", in NW 1/4 SW 1/4, sec.22, T.2 N., R.16 E., Walworth County, Hydrologic Unit 07090001, 2.6 mi southeast of Delavan.

DRAINAGE AREA.--41.4 mi², of which 2.3 mi² is non-contributing.

PERIOD OF RECORD.--October 1983 to current year.

WATER-QUALITY DATA, APRIL 17 TO AUGUST 14, 2002

	Apr. 17 -----	May 14 -----	June 10 -----	July 16 -----	Aug. 14 -----
Secchi-depth (meters)	2.9	5.8	2.7	1.7	1.5

423526088380101 DELAVAN LAKE, AT SW END, NEAR DELAVAN LAKE, WI

LOCATION.--Lat 42°35'26", long 88°38'01", in SE 1/4 NW 1/4, sec.32, T.2 N., R.16 E., Walworth County, Hydrologic Unit 07090001, 2.6 mi southeast of Delavan.

DRAINAGE AREA.--41.4 mi², of which 2.3 mi² is non-contributing.

PERIOD OF RECORD.--October 1983 to current year.

WATER-QUALITY DATA, APRIL 17 TO AUGUST 14, 2002

	Apr. 17 -----	May 14 -----	June 10 -----	July 16 -----	Aug. 14 -----
Secchi-depth (meters)	2.0	7.3	4.9	2.3	2.2

05404500 DEVILS LAKE NEAR BARABOO, WI

LOCATION.--Lat 43°25'18", long 89°43'38", in SW 1/4 SE 1/4 sec.13, T.11 N., R.6 E., Sauk County, Hydrologic Unit 07070004, in Devils Lake State Park, 3.5 mi south of Baraboo.

DRAINAGE AREA.--4.79 mi². Area of Devils Lake, 361 acres.

PERIOD OF RECORD.--June 1922 to August 1930, June to August 1932, June 1934 to September 1981, October 1984 to June 1991 (fragmentary), July 1991 to current year. Unpublished daily stage records from October 1981 to September 1984 in District files.

REVISED RECORDS.--WDR WI-78-1: Drainage area.

GAGE.--Water-stage recorder installed July 17, 1991. Datum of gage is 955.00 ft, above sea level.

REMARKS.--Lake has no surface outlet. Water removed from lake by pumping or siphon June 12 to Aug. 12, Aug. 22-25, and Aug. 29 to Sept. 30.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 14.13 ft, July 18, 1993; minimum observed, 1.49 ft, Feb. 8, 1965.

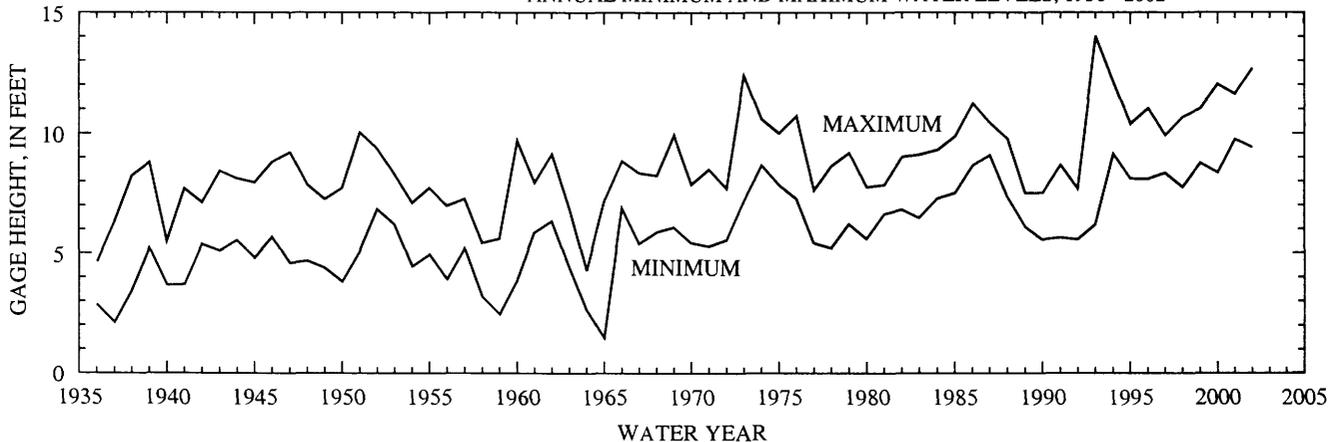
EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 12.69 ft, May 15; minimum recorded, 9.43 ft, Sept. 30.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10.89	10.45	10.34	10.33	10.23	10.60	10.93	12.19	12.50	12.14	11.12	10.69
2	10.89	10.44	10.34	10.32	10.22	10.65	10.95	12.25	12.48	12.09	11.07	10.70
3	10.86	10.43	10.33	10.31	10.22	10.67	10.95	12.26	12.54	12.05	11.04	10.65
4	10.85	10.42	10.33	10.31	10.21	10.67	10.95	12.26	12.62	12.01	11.06	10.60
5	10.82	10.41	10.38	10.30	10.20	10.67	10.94	12.25	12.65	11.96	11.03	10.56
6	10.79	10.39	10.41	10.29	10.20	10.67	10.94	12.27	12.64	11.92	10.99	10.51
7	10.77	10.38	10.40	10.29	10.19	10.66	10.95	12.30	12.63	11.88	10.95	10.45
8	10.75	10.36	10.40	10.28	10.19	10.68	11.02	12.30	12.61	11.85	10.92	10.41
9	10.72	10.35	10.40	10.27	10.18	10.73	11.08	12.51	12.60	11.81	10.88	10.36
10	10.73	10.33	10.38	10.27	10.22	10.76	11.10	12.57	12.59	11.77	10.84	10.32
11	10.72	10.32	10.38	10.27	10.22	10.77	11.12	12.61	12.63	11.72	10.81	10.27
12	10.71	10.30	10.37	10.26	10.20	10.78	11.17	12.66	12.62	11.67	10.79	10.22
13	10.70	10.31	10.42	10.26	10.20	10.79	11.19	12.67	12.61	11.63	10.79	10.17
14	10.70	10.31	10.42	10.26	10.19	10.81	11.21	12.67	12.62	11.59	10.77	10.12
15	10.68	10.30	10.42	10.26	10.18	10.81	11.22	12.67	12.60	11.55	10.74	10.07
16	10.66	10.30	10.42	10.26	10.18	10.82	11.24	12.66	12.58	11.52	10.71	10.02
17	10.64	10.29	10.42	10.27	10.17	10.82	11.25	12.65	12.56	11.48	10.71	9.97
18	10.62	10.29	10.42	10.26	10.17	10.83	11.33	12.63	12.52	11.44	10.69	9.92
19	10.60	10.30	10.41	10.26	10.22	10.85	11.56	12.61	12.49	11.41	10.67	9.93
20	10.59	10.29	10.40	10.25	10.34	10.90	11.60	12.60	12.45	11.39	10.64	9.92
21	10.57	10.27	10.40	10.25	10.48	10.91	11.65	12.58	12.43	11.37	10.66	9.88
22	10.57	10.26	10.40	10.24	10.51	10.92	11.70	12.56	12.40	11.40	10.90	9.83
23	10.59	10.25	10.40	10.23	10.53	10.92	11.72	12.54	12.37	11.36	10.97	9.77
24	10.59	10.31	10.39	10.23	10.55	10.92	11.77	12.52	12.33	11.32	10.95	9.71
25	10.57	10.34	10.38	10.22	10.57	10.92	11.85	12.54	12.29	11.28	10.92	9.65
26	10.54	10.33	10.38	10.21	10.58	10.92	11.87	12.56	12.31	11.30	10.90	9.60
27	10.52	10.34	10.37	10.20	10.59	10.92	11.91	12.54	12.28	11.28	10.88	9.56
28	10.50	10.34	10.36	10.20	10.60	10.93	12.08	12.53	12.25	11.25	10.86	9.51
29	10.48	10.33	10.35	10.19	---	10.93	12.14	12.55	12.21	11.22	10.83	9.49
30	10.47	10.34	10.34	10.19	---	10.93	12.17	12.54	12.17	11.19	10.79	9.46
31	10.47	---	10.33	10.20	---	10.92	---	12.52	---	11.16	10.74	---
MEAN	10.66	10.34	10.38	10.26	10.30	10.81	11.39	12.50	12.49	11.58	10.86	10.08
MAX	10.89	10.45	10.42	10.33	10.60	10.93	12.17	12.67	12.65	12.14	11.12	10.70
MIN	10.47	10.25	10.33	10.19	10.17	10.60	10.93	12.19	12.17	11.16	10.64	9.46

ANNUAL MINIMUM AND MAXIMUM WATER LEVELS, 1936 - 2002



05406050 FISH LAKE NEAR SAUK CITY, WI

LOCATION.--Lat 43°17'27", long 89°39'09" in NE 1/4 SW 1/4 sec.3, T.9 N., R.7 E., Dane County, Hydrologic Unit 07070005, on north side of lake, 0.4 mi southwest of Crystal Lake, and 3.1 mi east of Sauk City.

DRAINAGE AREA.--2.23 mi². Area of Fish Lake, 252 acres.

PERIOD OF RECORD.--November 1966 to September 1981, April 1985 to May 1987, May 1988, April 1989 to October 1990 (fragmentary); continuous record from October 1990 to November 1996; nonrecording gage November 1996 to current year.

REVISED RECORDS.--WDR WI-92-1: Drainage area. WDR WI-87-1: All published values for the 1987 water year are invalid. Two valid values for water years 1987 and 1988 are available: May 7, 1987, water surface 10.52 ft, and May 16, 1988, water surface 10.83 ft.

GAGE.--Nonrecording gage. Datum of gage is 848.07 ft above sea level. Local observer, Richard Lillie, reads staff gage when lake is ice-free.

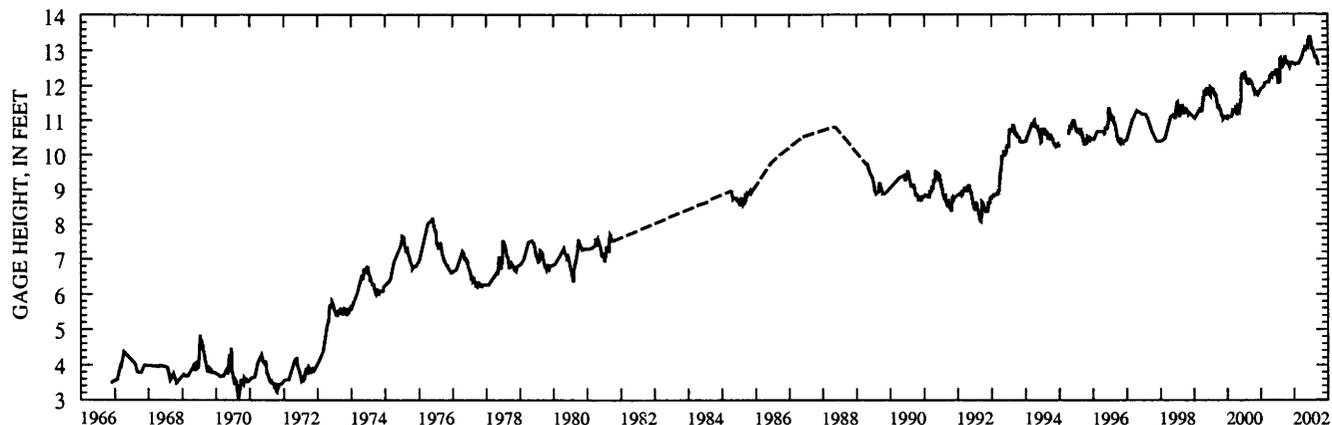
REMARKS.--Lake has no surface outlet.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 13.39 ft, June 14 and 26, 2002; minimum observed, 3.02 ft, Aug. 29, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 13.39 ft, June 14 and 26; minimum observed, 12.52 ft, Nov. 13.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	12.84	---	---	---	12.97	12.75
2	---	---	12.61	---	---	---	---	13.04	---	13.29	12.95	12.8
3	12.71	---	12.62	---	---	---	---	13.05	13.24	13.28	---	12.79
4	12.70	---	---	---	---	---	---	---	13.31	---	12.98	---
5	12.69	---	12.65	---	---	---	---	---	13.31	---	---	12.77
6	---	---	12.68	12.61	---	---	---	13.03	13.3	13.21	---	---
7	12.65	12.56	---	---	---	---	---	---	13.28	13.2	12.93	12.75
8	12.63	---	12.68	12.62	---	---	---	---	13.28	13.19	12.9	12.74
9	---	---	12.67	---	---	---	---	---	---	13.18	---	---
10	---	---	---	---	---	---	---	---	13.27	---	12.87	12.72
11	12.68	---	12.66	---	---	---	---	---	13.38	13.15	12.86	12.71
12	12.68	---	---	---	---	---	12.96	---	13.37	13.09	12.85	12.69
13	---	12.52	---	---	---	---	12.96	---	13.36	---	12.87	12.68
14	12.70	---	---	---	---	---	---	---	13.39	13.06	---	12.67
15	---	---	---	---	---	---	---	---	13.37	13.05	12.84	12.65
16	12.66	12.55	---	---	---	---	---	13.14	---	13.04	12.8	---
17	12.65	12.55	---	---	12.62	---	12.98	---	13.34	---	12.82	12.63
18	12.63	---	---	---	---	---	13.00	13.10	13.32	---	12.8	12.6
19	12.62	---	---	---	---	---	---	---	13.33	13.00	12.79	12.63
20	---	---	---	---	---	---	---	13.08	13.32	12.99	---	12.64
21	12.62	12.56	---	---	---	---	13.01	---	13.32	---	12.76	12.63
22	---	12.55	---	---	---	---	13.01	---	13.3	13.1	12.86	12.6
23	12.67	---	---	---	---	---	13.00	13.05	13.3	13.07	12.86	12.58
24	12.69	12.62	---	---	---	---	---	---	13.28	---	12.85	12.56
25	---	---	---	---	---	---	---	13.10	13.28	13.02	---	---
26	---	---	---	---	---	---	---	---	13.39	---	12.84	---
27	12.64	---	---	---	---	---	13.04	13.09	---	13.02	12.82	---
28	---	---	---	---	---	---	---	13.08	---	---	12.8	---
29	---	---	---	---	---	---	---	13.09	13.34	13.01	12.78	---
30	12.6	12.63	---	---	---	---	13.01	---	13.33	12.99	12.77	---
31	12.58	---	---	---	---	---	---	13.08	---	12.98	---	---



423525088260400 GENEVA LAKE AT LAKE GENEVA, WI

LOCATION.--Lat 42°35'25", long 88°26'04" in SE 1/4 NW 1/4 sec.36, T.2 N., R.17 E., Walworth County, Hydrologic Unit 07120006, at Geneva Lake dam at Center Street at Lake Geneva.

DRAINAGE AREA.--28.7 mi². Area of Geneva Lake, 5,262 acres.

PERIOD OF RECORD.--October 1997 to August 2002 (temporarily discontinued for repairs to dam).

GAGE.--Water-stage recorder. Datum of gage is 862.08 ft above sea level. Intermittent staff-gage readings in August and September.

REMARKS.--Recording rain gage and gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.29 ft, June 13, 2000; minimum gage height, 1.66 ft, Apr. 9, 2001.

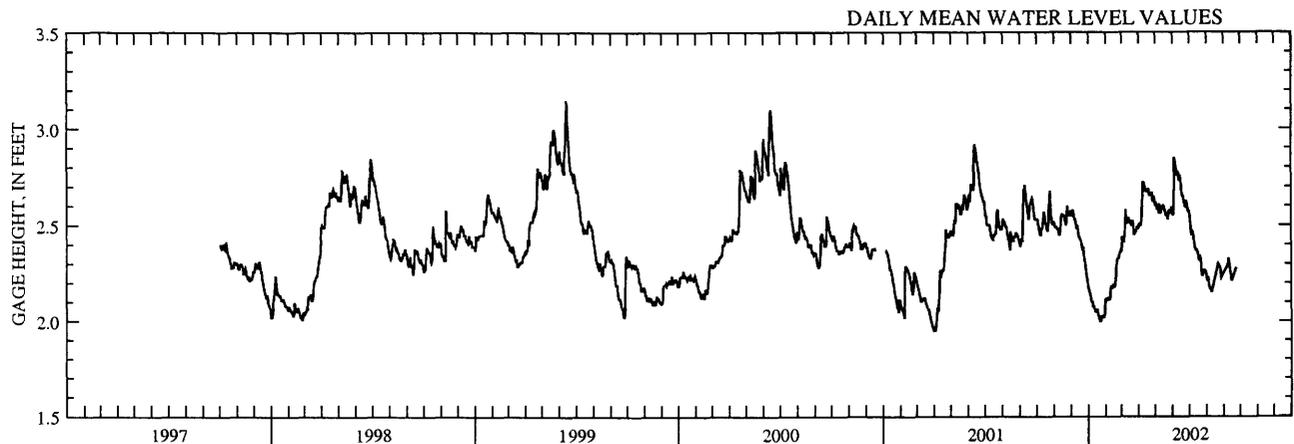
EXTREMES FOR CURRENT YEAR.--Maximum gage height, 2.97 ft, June 4; minimum gage height, 1.84 ft, Jan. 29.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.53	2.51	2.57	2.18	2.11	2.36	2.48	2.61	2.58	2.57	2.25	---
2	2.53	2.51	2.55	2.17	2.12	2.40	2.50	2.62	2.55	2.55	2.22	---
3	2.53	2.49	2.55	2.16	2.11	2.44	2.51	2.60	2.56	2.53	2.21	---
4	2.51	2.49	2.55	2.15	2.11	e2.43	2.50	2.59	2.78	2.50	2.22	---
5	2.50	2.49	2.58	2.14	2.12	e2.42	2.50	2.58	2.85	2.46	2.23	---
6	2.48	2.49	2.56	2.12	2.12	e2.41	2.50	2.59	2.83	2.45	2.19	---
7	2.46	2.48	2.54	2.11	2.12	e2.43	2.53	2.58	2.81	2.45	2.18	---
8	2.45	2.48	2.53	2.10	2.12	2.46	2.61	2.56	2.79	2.46	2.17	---
9	2.45	2.48	2.53	2.10	2.11	2.58	2.72	2.61	2.76	2.45	2.17	2.30
10	2.48	2.46	2.52	2.08	2.15	2.54	2.72	2.57	2.76	2.41	2.16	2.33
11	2.48	2.45	2.50	2.08	2.18	2.53	2.71	2.56	2.78	2.39	2.15	---
12	2.49	2.45	2.48	2.07	2.18	2.52	2.70	2.59	2.75	2.38	e2.16	---
13	2.52	2.48	2.50	2.05	2.17	2.53	2.68	2.59	2.73	2.37	---	---
14	2.57	2.54	2.47	2.05	2.19	2.51	2.68	2.58	2.76	2.37	---	---
15	2.56	2.56	2.46	2.06	2.19	2.54	2.67	2.60	2.74	2.37	---	---
16	2.53	2.55	2.44	2.06	2.18	2.52	2.68	2.60	2.71	2.36	---	2.21
17	2.51	2.55	2.44	2.06	2.18	2.51	2.68	2.59	2.69	2.35	---	---
18	2.51	2.55	2.43	2.04	2.19	2.52	2.68	2.58	2.66	2.34	---	---
19	2.49	2.55	2.42	2.03	2.22	2.51	2.69	2.57	2.65	2.32	---	---
20	2.48	2.54	2.40	2.02	2.27	2.52	2.66	2.56	2.65	2.32	---	---
21	2.47	2.53	2.38	2.01	2.31	2.52	2.65	2.55	2.63	2.33	---	---
22	2.48	2.51	2.37	2.00	2.32	2.52	2.67	2.55	2.62	2.32	2.30	---
23	2.57	2.50	2.39	2.00	2.33	2.50	2.66	2.55	2.61	2.28	---	---
24	2.63	2.54	2.35	2.01	2.33	2.47	2.66	2.53	2.60	2.25	---	2.28
25	2.68	2.60	2.32	2.03	2.34	2.45	2.67	2.56	2.59	2.24	---	---
26	2.57	2.55	2.31	2.02	2.36	2.46	2.63	2.58	2.63	2.24	2.28	---
27	2.54	2.57	2.29	2.03	2.36	2.46	2.62	2.57	2.61	2.26	---	---
28	2.54	2.55	2.27	2.02	2.37	2.47	2.65	2.56	2.59	2.26	2.23	---
29	2.51	2.55	2.25	2.02	---	2.48	2.64	2.57	2.58	2.27	---	---
30	2.50	2.57	2.23	2.03	---	2.49	2.62	2.59	2.57	2.26	---	---
31	2.52	---	2.21	2.06	---	2.49	---	2.59	---	2.26	---	---
MEAN	2.52	2.52	2.43	2.07	2.21	2.48	2.63	2.58	2.68	2.37	---	---
MAX	2.68	2.60	2.58	2.18	2.37	2.58	2.72	2.62	2.85	2.57	---	---
MIN	2.45	2.45	2.21	2.00	2.11	2.36	2.48	2.53	2.55	2.24	---	---

e Estimated



423329088323300 GENEVA LAKE AT WEST END NEAR WILLIAMS BAY, WI

LOCATION.--Lat 42°33'29", long 88°32'33", in NE 1/4 SE 1/4, sec.12, T.1 N., R.16 E., Walworth County, Hydrologic Unit 07120006, 1.3 mi south of Williams Bay.

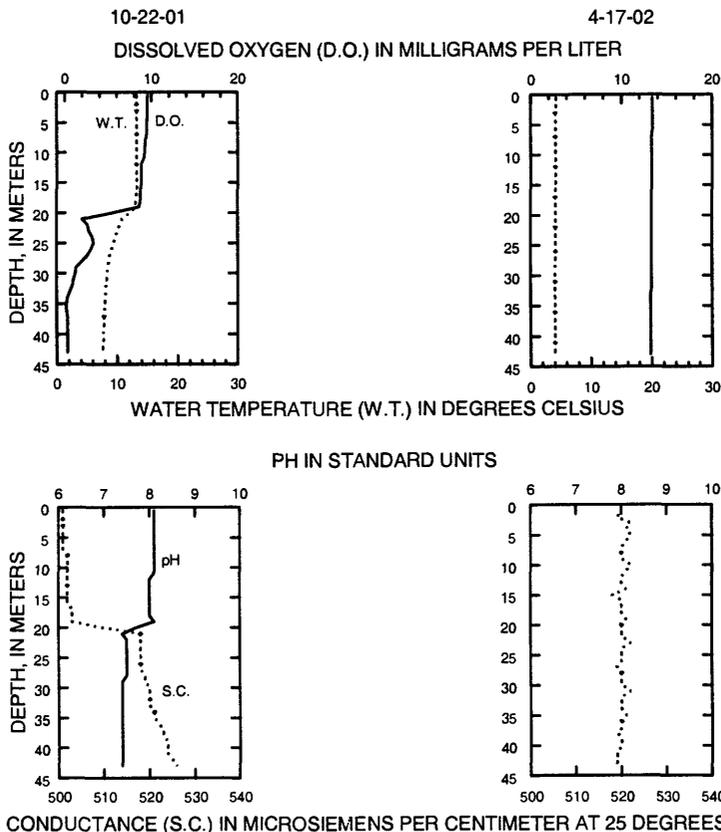
DRAINAGE AREA.--28.7 mi².

PERIOD OF RECORD.--April 1997 to current year.

REMARKS.--Lake sampled at deep hole at a depth of about 43 m. Water-quality analyses done by Wisconsin State Laboratory of Hygiene. Samples for determination of chlorophyll-a concentration are collected from the top 1.5 ft of the lake.

WATER-QUALITY DATA, OCTOBER 22, 2001 TO APRIL 17, 2002
(Milligrams per liter unless otherwise indicated)

	Oct 22				Apr 17	
Lake stage (ft)	2.48				2.68	
Secchi-depth (m)	5.5				5.8	
Chlorophyll a, phytoplankton (µg/L)	2.10				1.00	
Depth of sample (m)	0.5	19	29	42.5	0.5	43
Water temperature (°C)	13.2	13.1	8.5	7.6	4.2	4.0
Specific conductance (µS/cm)	501	503	519	526	520	519
pH (units)	8.1	8.1	7.4	7.4	8.4	8.4
Dissolved oxygen (mg/L)	9.6	8.6	1.3	0.3	13.4	13.2
Phosphorus, total (as P)	0.013	0.011	0.011	0.052	0.008	0.009
Phosphorus, ortho, dissolved (as P)	<.002	---	---	---	<0.002	<0.002
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	0.023	---	---	---	0.094	0.098
Nitrogen, ammonia, dissolved (as N)	0.022	---	---	---	0.023	0.021
Nitrogen, amm. + org., total (as N)	0.49	---	---	---	0.52	0.44
Nitrogen, total (as N)	0.51	---	---	---	0.61	0.54
Color (Pt-Co. scale)	---	---	---	---	5	<5
Turbidity (NTU)	---	---	---	---	1.2	1.7
Hardness, as CaCO ₃	---	---	---	---	220	220
Calcium, dissolved (Ca)	---	---	---	---	34.1	34.1
Magnesium, dissolved (Mg)	---	---	---	---	33.6	33.6
Sodium, dissolved (Na)	---	---	---	---	17.4	17.3
Potassium, dissolved (K)	---	---	---	---	2.00	2.00
Alkalinity as CaCO ₃	---	---	---	---	180	179
Sulfate, dissolved (SO ₄)	---	---	---	---	31.6	32.0
Chloride, dissolved (Cl)	---	---	---	---	36.6	36.9
Silica, dissolved (SiO ₂)	---	---	---	---	1.40	1.42
Solids, dissolved, at 180°C	---	---	---	---	272	260
Iron, dissolved (Fe) µg/L	---	---	---	---	<100	<100
Manganese, dissolved (Mn) µg/L	---	---	---	---	<1	<1

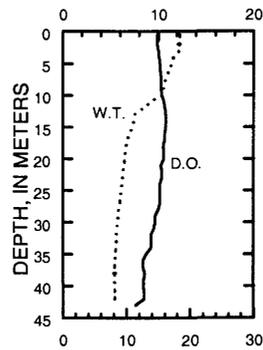


WATER-QUALITY DATA, JUNE 12, 2002
(Milligrams per liter unless otherwise indicated)

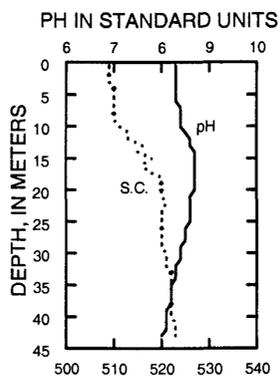
	<u>Jun 12</u>					
Lake stage (ft)	2.75					
Secchi-depth (m)	5.5					
Chlorophyll a, phytoplankton (µg/L)	<.260					
Depth of sample (m)	0.5	3.0	20	33	38	42
Water temperature (°C)	18.4	18.3	9.7	8.4	8.2	8.1
Specific conductance (µS/cm)	509	509	520	522	522	523
pH (units)	8.3	8.3	8.7	8.3	8.2	8.1
Dissolved oxygen (mg/L)	9.9	10.0	10.6	9.2	8.6	8.5
Phosphorus, total (as P)	0.007	0.007	<0.005	0.008	0.008	0.012
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	0.038	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.026	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.43	---	---	---	---	---
Nitrogen, total (as N)	0.47	---	---	---	---	---

6-12-02.

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



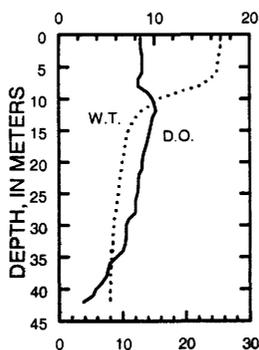
SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

WATER-QUALITY DATA, JULY 17, 2002
(Milligrams per liter unless otherwise indicated)

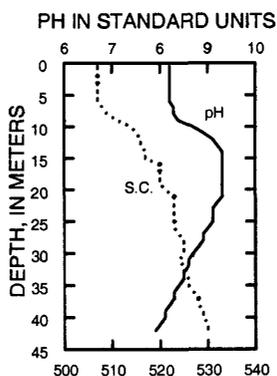
	Jul 17					
Lake stage (ft)	2.35					
Secchi-depth (m)	5.9					
Chlorophyll a, phytoplankton (µg/L)	0.74					
Depth of sample (m)	0.5	6	17	33	38	42
Water temperature (°C)	25.4	24.8	10.4	8.4	8.1	8.0
Specific conductance (µS/cm)	507	507	520	525	528	530
pH (units)	8.2	8.2	9.3	8.5	8.2	7.9
Dissolved oxygen (mg/L)	8.6	8.7	9.2	6.9	5.0	2.5
Phosphorus, total (as P)	0.008	0.010	0.009	0.007	0.011	0.038
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.010	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.016	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.44	---	---	---	---	---

7-17-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

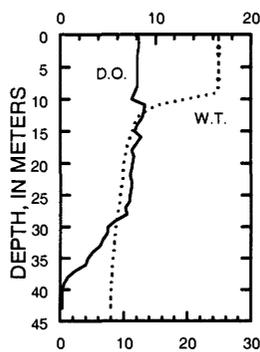


SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

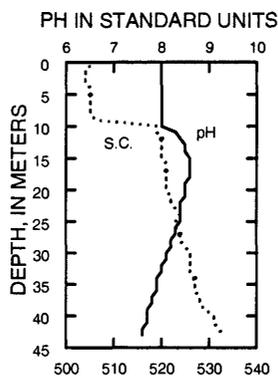
WATER-QUALITY DATA, AUGUST 14, 2002
(Milligrams per liter unless otherwise indicated)

	Aug 14					
Lake stage (ft)	---					
Secchi-depth (m)	4.1					
Chlorophyll a, phytoplankton (µg/L)	2.87					
Depth of sample (m)	0.5	9	20	33	38	43
Water temperature (°C)	24.9	24.6	10	8.5	8.1	7.9
Specific conductance (µS/cm)	505	506	521	526	528	533
pH (units)	8.0	8.0	8.5	8.0	7.8	7.6
Dissolved oxygen (mg/L)	8.2	7.8	7.6	4.2	0.8	0.2
Phosphorus, total (as P)	0.010	0.011	0.008	0.010	0.027	0.069
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.010	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.019	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.41	---	---	---	---	---

8-14-02
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

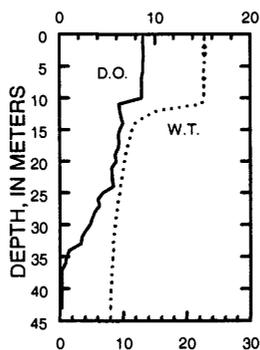


SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

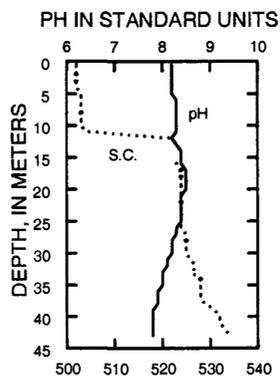
WATER-QUALITY DATA, SEPTEMBER 16, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Sep 16</u>					
Lake stage (ft)	2.21					
Secchi-depth (m)	3.80					
Chlorophyll a, phytoplankton (µg/L)	2.96					
Depth of sample (m)	0.5	11	16	33	38	42
Water temperature (°C)	22.8	22.3	11.1	8.4	8.1	7.9
Specific conductance (µS/cm)	502	504	523	526	529	533
pH (units)	8.2	8.3	8.4	8.0	7.9	7.8
Dissolved oxygen (mg/L)	8.8	6.2	6.1	2.2	0.2	0.2
Phosphorus, total (as P)	0.009	0.011	0.007	0.008	0.032	0.068
Phosphorus, ortho, dissolved (as P)	<0.002	<0.002	<0.002	0.003	0.023	0.053
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.022	<0.022	0.045	0.316	0.132	<0.022
Nitrogen, ammonia, dissolved (as N)	<0.013	<0.013	<0.013	<0.013	0.124	0.335
Nitrogen, amm. + org., total (as N)	0.44	0.40	0.29	0.38	0.69	0.97
Nitrogen, total (as N)	---	---	0.33	0.7	0.82	---

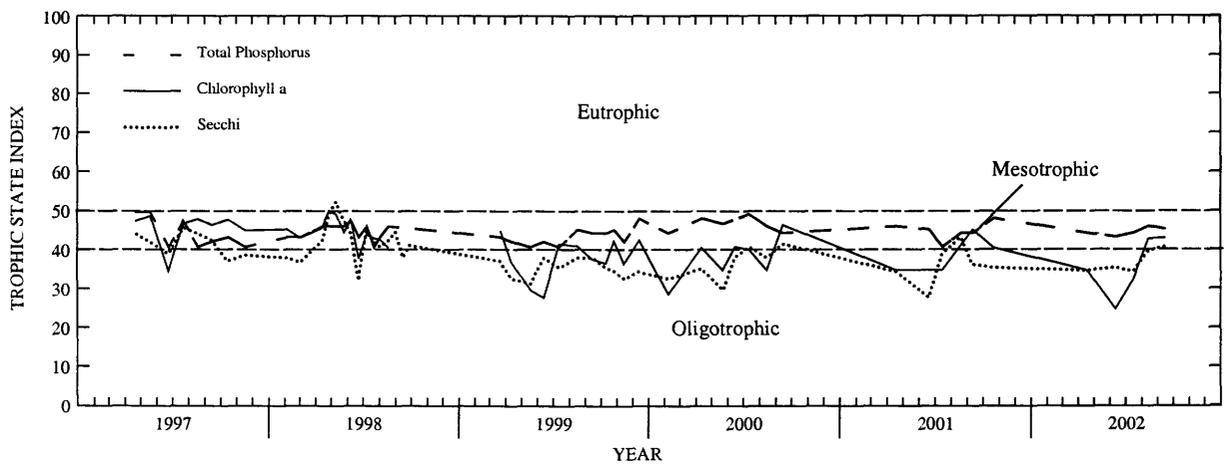
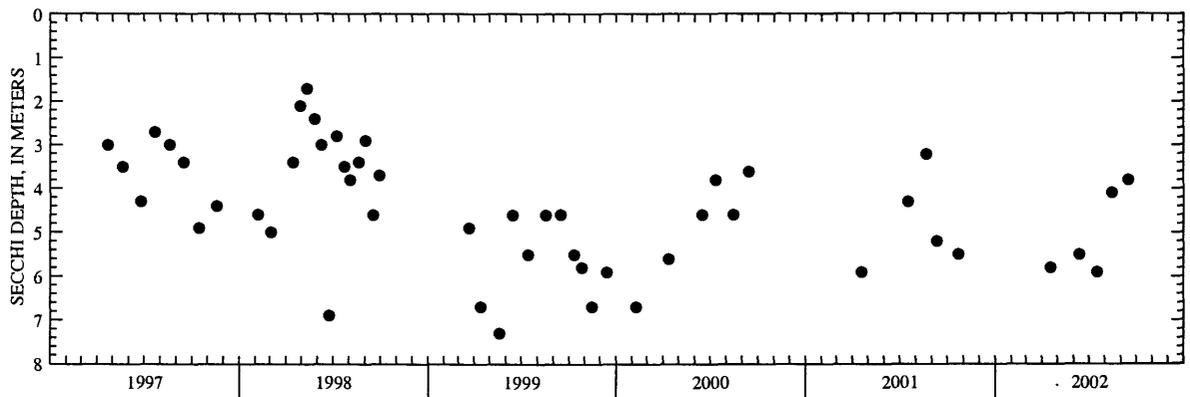
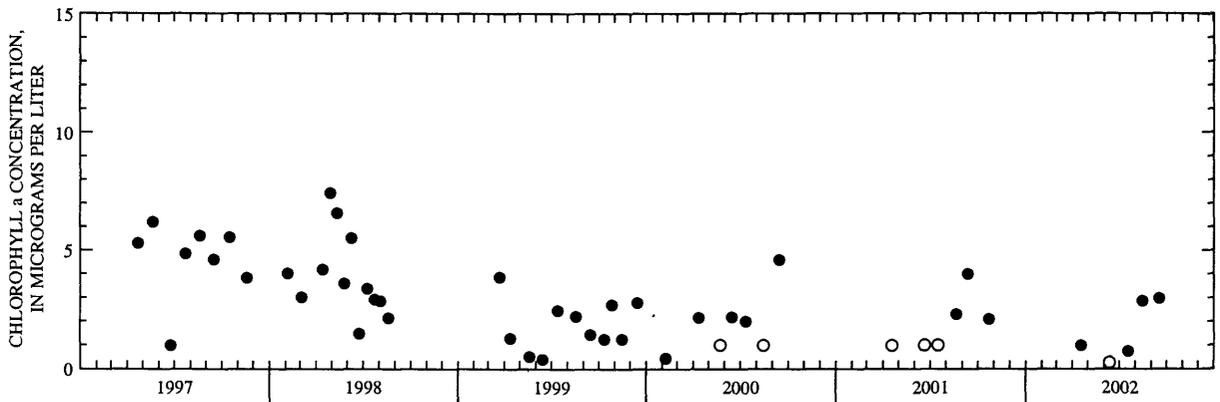
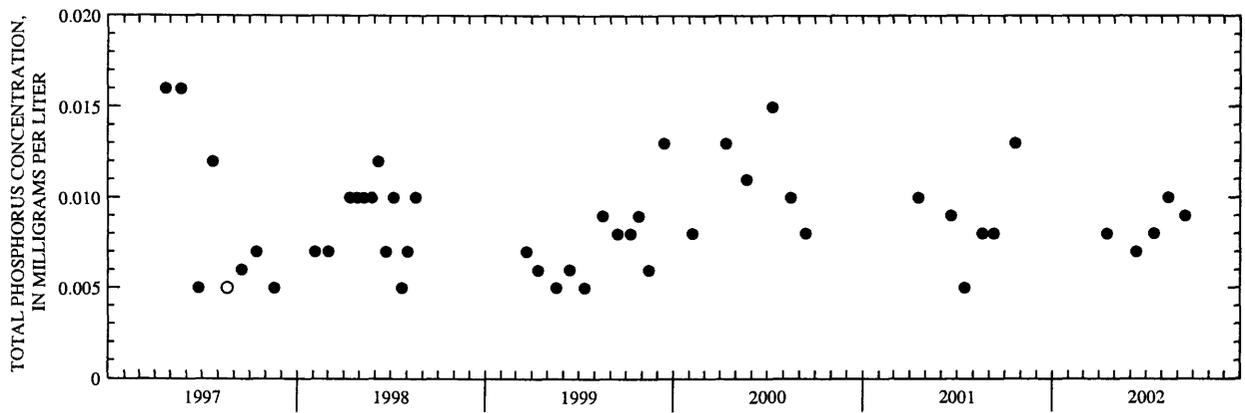
9-16-02
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS



Surface total phosphorus, chlorophyll a concentrations, Secchi depths,
and TSI data for Lake Geneva, West End, near Williams Bay, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses.
Actual concentrations for these particular analyses are less than the plotted circles.)

434928088553601 GREEN LAKE AT COUNTY TRUNK HIGHWAY A NEAR GREEN LAKE, WI

LOCATION.--Lat 43°49'28", long 88°55'36" in NE 1/4 SE 1/4 SE 1/4 sec.27, T.16 N., R.13 E., Green Lake County, Hydrologic Unit 04030201, on left bank at downstream side of County Trunk Highway A, 2.3 mi southeast of Green Lake.

DRAINAGE AREA.--103 mi².

PERIOD OF RECORD.--October 1993 to current year.

GAGE.--Water-stage recorder. Datum of gage is 790.00 ft above sea level.

REMARKS.--Lake level regulated by dam at outlet at Green Lake. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum recorded gage height, 7.05 ft, Apr. 12, 2001; minimum recorded, 5.41 ft, Jan. 17, 1995.

EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 6.76 ft, May 9; minimum recorded, 5.93 ft, Aug. 20 and 21.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.38	6.25	6.39	6.21	6.16	6.32	6.53	6.67	6.48	6.66	6.22	6.00
2	6.38	6.26	6.37	6.21	6.16	6.35	6.54	6.71	6.44	6.65	6.18	6.04
3	6.38	6.24	6.37	6.20	6.15	6.39	6.56	6.68	6.50	6.62	e6.16	6.10
4	6.35	6.24	6.38	6.19	6.14	6.36	6.55	6.67	6.56	6.57	e6.15	6.07
5	6.34	6.24	6.43	6.18	6.13	6.35	6.54	6.65	6.58	6.52	e6.14	6.06
6	6.32	6.24	6.44	6.17	6.13	6.35	6.53	6.64	6.58	6.50	e6.13	6.06
7	6.29	6.23	6.42	6.17	6.12	6.34	6.54	6.62	6.57	6.49	e6.12	6.05
8	6.27	6.24	6.42	6.16	6.12	6.37	6.57	6.60	6.56	6.49	e6.12	6.05
9	6.27	6.24	6.41	6.16	6.11	6.45	6.59	6.67	6.55	6.50	6.10	6.05
10	6.28	6.23	6.39	6.16	6.13	6.46	6.60	6.62	6.55	6.48	6.10	6.05
11	6.28	6.22	6.37	6.16	6.14	6.45	6.60	6.57	6.60	6.46	6.08	6.03
12	6.27	6.22	6.37	6.16	6.15	6.45	6.61	6.59	6.58	6.46	6.06	6.02
13	6.27	6.22	6.41	6.14	6.12	6.46	6.60	6.58	6.57	6.45	6.05	6.00
14	6.31	6.23	6.39	6.16	6.12	6.47	6.59	6.57	6.57	6.44	6.04	5.98
15	6.29	6.24	6.38	6.18	6.12	6.49	6.60	6.56	6.55	6.43	6.02	5.97
16	6.28	6.24	6.38	6.19	6.12	6.49	6.60	6.54	6.53	6.43	5.99	5.97
17	6.27	6.24	6.38	6.20	6.11	6.49	6.60	6.51	6.50	6.41	6.02	5.95
18	6.27	6.24	6.37	6.18	6.11	6.51	6.59	6.48	6.47	6.38	5.99	5.94
19	6.26	6.28	6.38	6.17	6.17	6.52	6.63	6.47	6.46	6.35	5.96	6.11
20	6.25	6.28	6.35	6.16	6.24	6.57	6.61	6.45	6.47	6.33	5.95	6.18
21	6.25	6.27	6.33	6.16	6.29	6.59	6.60	6.44	6.49	6.33	5.96	6.19
22	6.25	6.27	6.33	6.15	6.30	6.59	6.62	6.42	6.57	6.35	6.03	6.18
23	6.26	6.27	6.35	6.15	6.31	6.58	6.60	6.41	6.65	6.29	6.03	6.14
24	6.28	6.27	6.33	6.15	6.31	6.57	6.63	6.39	6.67	6.28	6.06	6.10
25	6.37	6.31	6.31	6.15	6.32	6.55	6.68	6.41	6.68	6.26	6.06	6.08
26	6.29	6.29	6.30	6.14	6.33	6.55	6.64	6.45	6.72	6.25	6.05	6.07
27	6.25	6.32	6.29	6.13	6.34	6.54	6.62	6.45	6.72	6.24	6.04	6.06
28	6.25	6.33	6.27	6.13	6.34	6.54	6.68	6.44	6.71	6.24	6.03	6.05
29	6.23	6.33	6.26	6.13	---	6.55	6.69	6.45	6.69	6.25	6.03	6.07
30	6.23	6.35	6.25	6.12	---	6.56	6.68	6.47	6.68	6.24	6.02	6.09
31	6.25	---	6.23	6.12	---	6.55	---	6.48	---	6.22	6.01	---
MEAN	6.29	6.26	6.36	6.16	6.19	6.48	6.60	6.54	6.58	6.41	6.06	6.06
MAX	6.38	6.35	6.44	6.21	6.34	6.59	6.69	6.71	6.72	6.66	6.22	6.19
MIN	6.23	6.22	6.23	6.12	6.11	6.32	6.53	6.39	6.44	6.22	5.95	5.94

e Estimated

05427235 LAKE KOSHKONONG NEAR NEWVILLE, WI

LOCATION.--Lat 42°51'27", long 88°56'27", in NW 1/4 NE 1/4 sec.34, T.5 N., R.13 E., Jefferson County, Hydrologic Unit 07090001, 80 ft east of Pottawatomi Trail Bridge at Bingham Point Estates, and 4.5 mi northeast of Newville.

DRAINAGE AREA.--2,560 mi², at lake outlet. Area of Lake Koshkonong, 16.3 mi².

PERIOD OF RECORD.--July 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 770.00 ft above sea level.

REMARKS.--Lake level regulated by dam at Indianford. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum recorded gage height, 12.23 ft, Apr. 25, 1993; minimum recorded, 5.10 ft, Dec. 28, 29, 1999.

EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 8.28 ft, Apr. 18; minimum recorded, 5.46 ft, Feb. 9 and 10.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.20	7.58	6.60	6.11	5.76	7.37	7.65	7.62	6.53	6.42	6.31	6.22
2	7.12	7.60	6.60	6.04	5.72	7.34	7.63	7.64	6.43	6.36	6.30	6.24
3	7.04	7.57	6.62	5.97	5.68	7.29	7.58	7.59	6.38	6.29	6.27	6.30
4	6.93	7.52	6.62	5.90	5.62	7.24	7.52	7.55	6.52	6.25	6.28	6.29
5	6.84	7.45	6.63	5.82	5.56	7.21	7.45	7.52	6.74	6.20	6.28	6.29
6	6.75	7.36	6.66	5.74	5.53	7.16	7.36	7.50	6.93	6.17	6.24	6.29
7	6.63	7.28	6.67	5.67	5.50	7.12	7.30	7.49	7.13	6.15	6.22	6.30
8	6.53	7.23	6.68	5.62	5.48	7.11	7.36	7.43	7.32	6.12	6.21	6.30
9	6.45	7.10	6.65	5.58	5.46	7.29	7.53	7.48	7.46	6.14	6.20	6.30
10	6.42	7.03	6.64	5.59	5.51	7.47	7.69	7.41	7.55	6.12	6.19	6.31
11	6.43	6.93	6.63	5.61	5.56	7.63	7.89	7.36	7.65	6.11	6.19	6.28
12	6.40	6.85	6.61	5.63	5.64	7.82	8.06	7.42	7.72	6.13	6.20	6.26
13	6.39	6.80	6.65	5.66	5.70	7.96	8.16	7.42	7.76	6.16	6.34	6.25
14	6.43	6.79	6.65	5.69	5.76	8.05	8.21	7.42	7.82	6.18	6.37	6.25
15	6.43	6.76	6.64	5.71	5.79	8.12	8.24	7.40	7.82	6.20	6.29	6.24
16	6.50	6.68	6.68	5.72	5.80	8.14	8.22	7.42	7.80	6.21	6.25	6.21
17	6.50	6.61	6.73	5.73	5.80	8.15	8.23	7.40	7.75	6.21	6.27	6.20
18	6.51	6.54	6.75	5.71	5.80	8.14	8.18	7.37	7.70	6.21	6.28	6.19
19	6.53	6.54	6.82	5.70	5.85	8.12	8.18	7.33	7.62	6.20	6.29	6.28
20	6.54	6.45	6.81	5.68	5.99	8.12	8.11	7.28	7.57	6.20	6.26	6.34
21	6.55	6.41	6.77	5.67	6.23	8.15	8.03	7.21	7.51	6.22	6.25	6.39
22	6.56	6.36	6.70	5.66	6.48	8.08	8.00	7.13	7.44	6.26	6.39	6.40
23	6.69	6.34	6.71	5.64	6.70	8.04	7.93	7.06	7.34	6.24	6.36	6.38
24	6.85	6.35	6.65	5.64	6.90	8.02	7.90	7.00	7.21	6.20	6.31	6.37
25	7.12	6.44	6.57	5.65	7.07	7.95	7.88	6.97	7.07	6.19	6.25	6.36
26	7.28	6.45	6.50	5.66	7.21	7.90	7.80	6.92	6.95	6.22	6.22	6.37
27	7.38	6.50	6.45	5.67	7.30	7.85	7.72	6.87	6.84	6.24	6.22	6.37
28	7.46	6.54	6.39	5.70	7.35	7.80	7.74	6.81	6.71	6.28	6.20	6.35
29	7.55	6.56	6.33	5.73	---	7.78	7.68	6.76	6.61	6.31	6.21	6.42
30	7.58	6.58	6.26	5.74	---	7.75	7.66	6.69	6.51	6.31	6.21	6.45
31	7.57	---	6.18	5.75	---	7.70	---	6.61	---	6.31	6.22	---
MEAN	6.81	6.84	6.61	5.72	6.03	7.74	7.83	7.26	7.21	6.22	6.26	6.31
MAX	7.58	7.60	6.82	6.11	7.35	8.15	8.24	7.64	7.82	6.42	6.39	6.45
MIN	6.39	6.34	6.18	5.58	5.46	7.11	7.30	6.61	6.38	6.11	6.19	6.19

430733088305900 LAC LA BELLE AT OCONOMOWOC, WI

LOCATION.--Lat 43°07'33", long 88°30'59", in NW 1/4 SW 1/4 sec.29, T.8 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Oconomowoc.

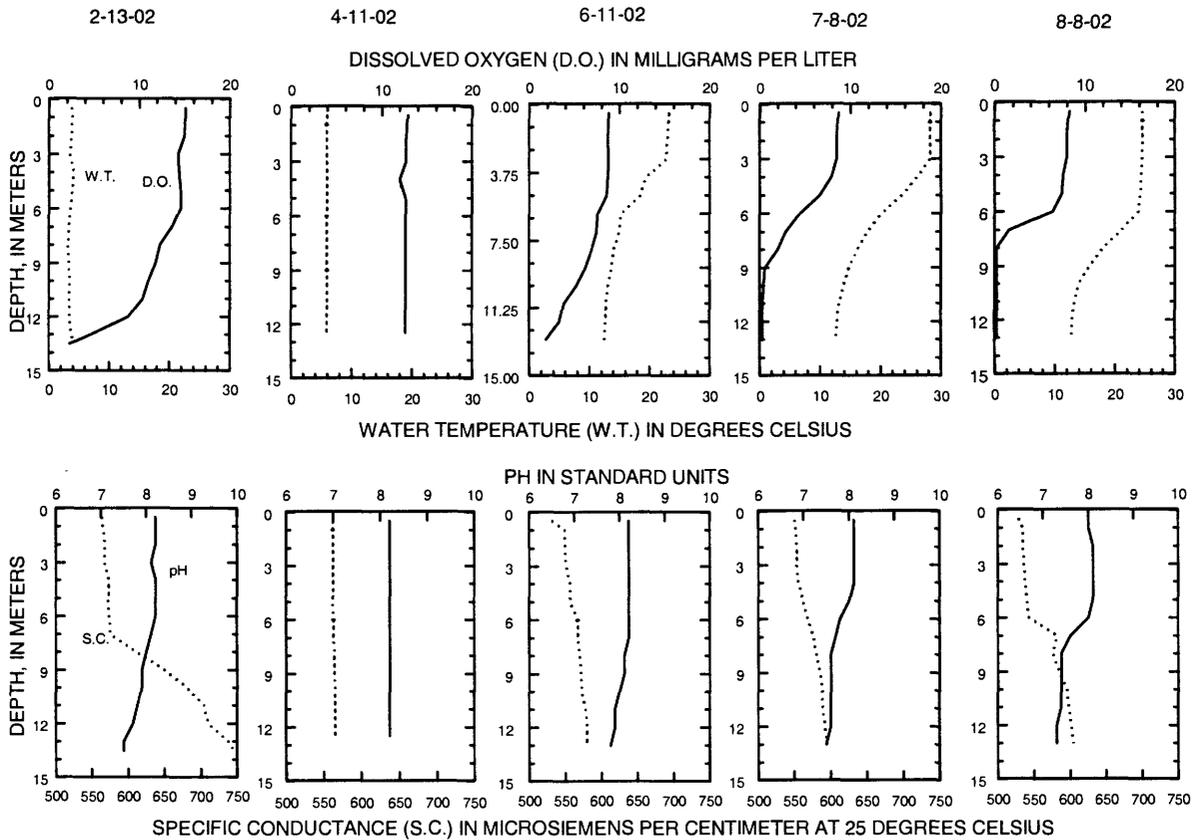
DRAINAGE AREA.--99.6 mi².

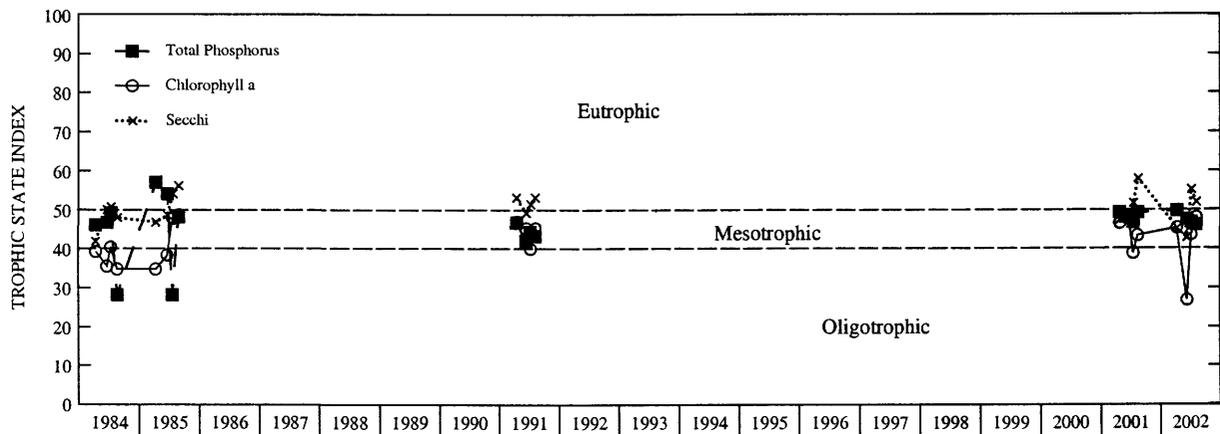
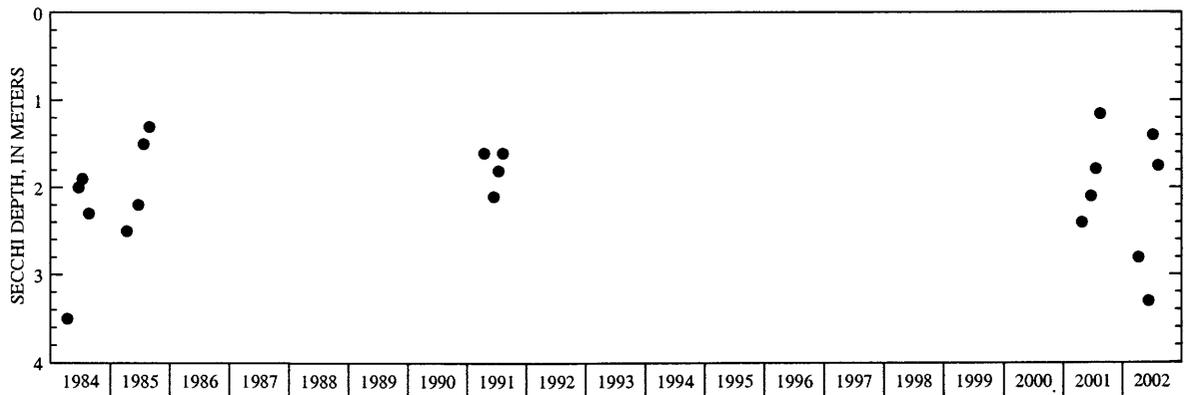
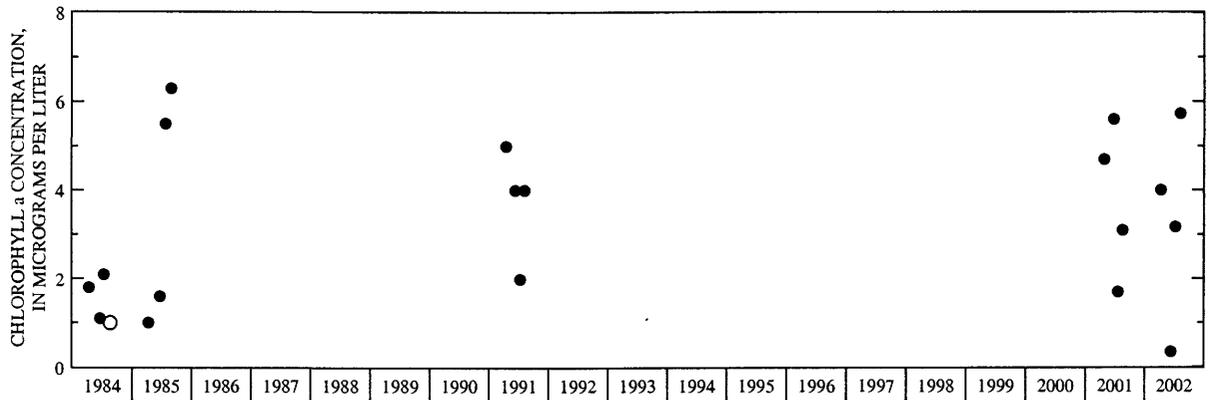
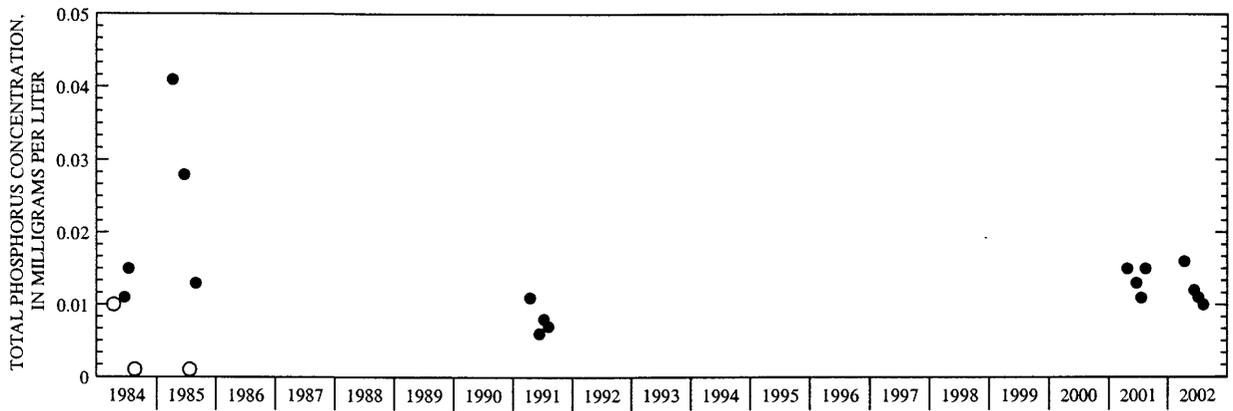
PERIOD OF RECORD.--February 1984 to August 1985, April to August 1991, and February 2001 to current year.

REMARKS.--Lake sampled near center of lake at a depth of 13 m. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 13 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 13		Apr 11		Jun 11		Jul 8		Aug 8	
Secchi-depth (m)	---		2.8		3.3		1.4		1.75	
Chlorophyll a, phytoplankton (µg/L)	---		4.00		0.35		3.18		5.73	
Depth of sample (m)	0.5	13.5	0.5	12.5	0.5	13	0.5	13	0.5	13
Water temperature (°C)	3.7	4	5.9	5.9	23.2	12.5	28.2	12.6	24.5	18
Specific conductance (µS/cm)	564	745	562	565	531	580	551	595	529	576
pH (units)	8.2	7.5	8.2	8.2	8.2	7.8	8.1	7.5	8	7.4
Dissolved oxygen (mg/L)	15.1	2.3	12.9	12.6	8.8	1.9	8.7	0.3	8.3	0.2
Phosphorus, total (as P)	0.011	0.019	0.016	0.020	0.012	0.014	0.011	0.023	0.010	0.014
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---	<0.002	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.675	---	---	---	0.294	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.048	---	---	---	<0.013	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	---	---	---	---	0.65	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.63	---	---	---	---	---	---	---
Nitrogen, total (as N)	---	---	1.3	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	5	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	2.5	---	---	---	---	---	---	---
Hardness, as CaCO ₃	---	---	260	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	49.1	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	33.2	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	20.5	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	2.00	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	---	---	208	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	---	---	24.7	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	45.5	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	---	---	4.53	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	340	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Lac La Belle, at Oconomowoc, Wisconsin.

Circles on the first three plots indicate laboratory detection limit for selected analysis. Actual concentrations for these particular analyses are less than the plotted circles.

424652088341500 GREEN LAKE NEAR LAUDERDALE, WI

LOCATION.--Lat 42°46'52", long 88°34'15", in SW 1/4 NE 1/4 sec.26, T.4 N., R.16 E., Walworth County, Hydrologic Unit 07120006, 1.2 mi north-west of Lauderdale.

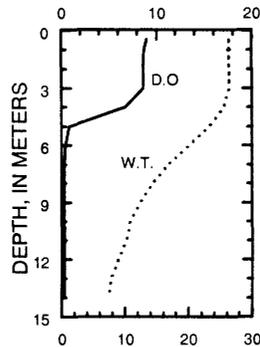
PERIOD OF RECORD.--November 1993 to November 1994, and August 2002.

REMARKS.--Lake sampled near center of lake at a depth of about 57 ft. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

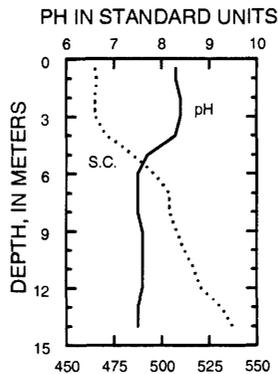
WATER-QUALITY DATA, AUGUST 06, 2002
(Milligrams per liter unless otherwise indicated)

		<u>Aug 6</u>	
Secchi-depth (m)		1.3	
Chlorophyll a, phytoplankton (µg/L)		8.40	
Depth of sample (m)	0.5	6	14
Water temperature (°C)	26.4	20.1	7.4
Specific conductance (µS/cm)	465	496	537
pH (units)	8.3	7.5	7.5
Dissolved oxygen (mg/L)	9.0	0.4	0.3
Phosphorus, total (as P)	0.019	0.017	0.042

8-6-02
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

424621088335500 MIDDLE LAKE AT LAUDERDALE, WI

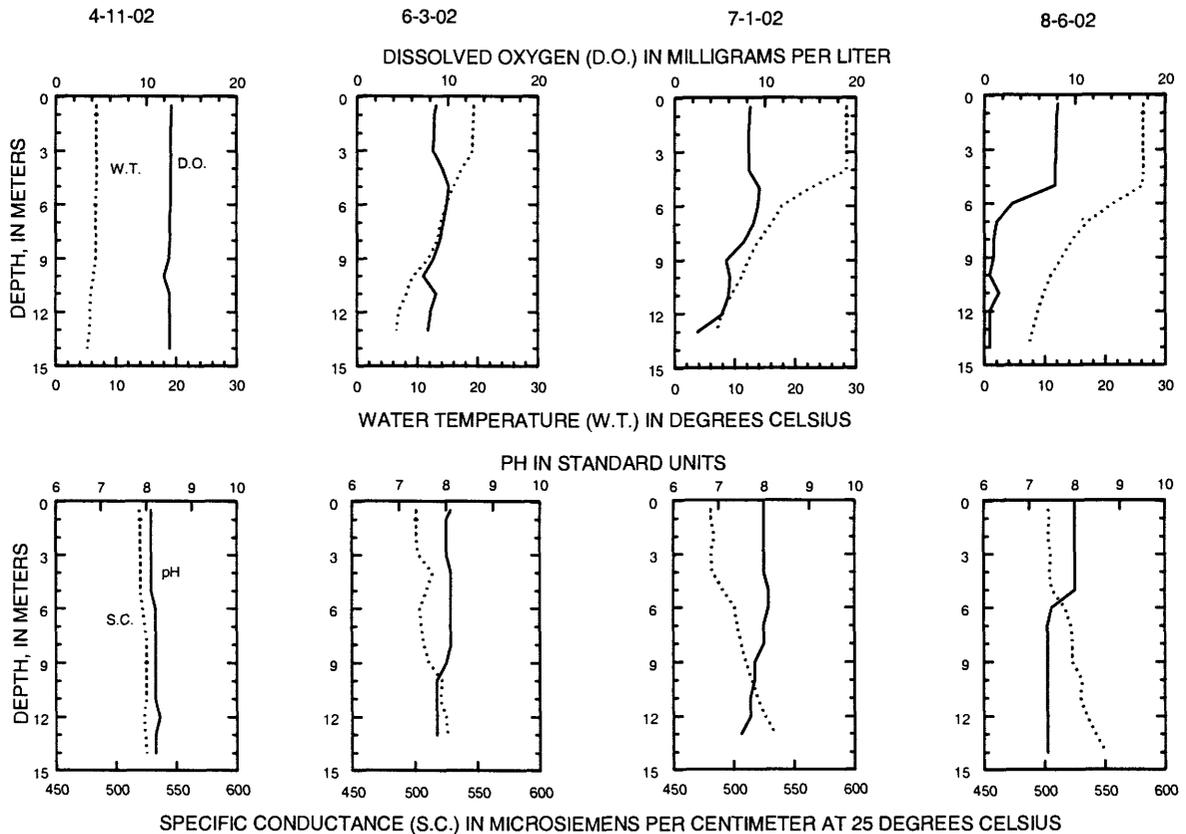
LOCATION.--Lat 42°46'21", long 88°33'55", in SE 1/4 SE 1/4 sec.26, T.4 N., R.16 E., Walworth County, Hydrologic Unit 07120006, at Lauderdale.

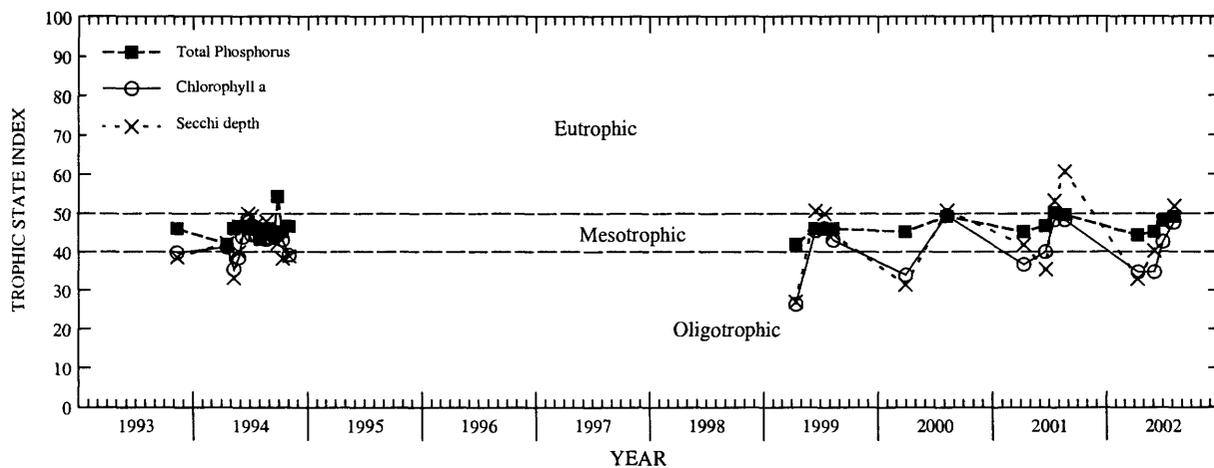
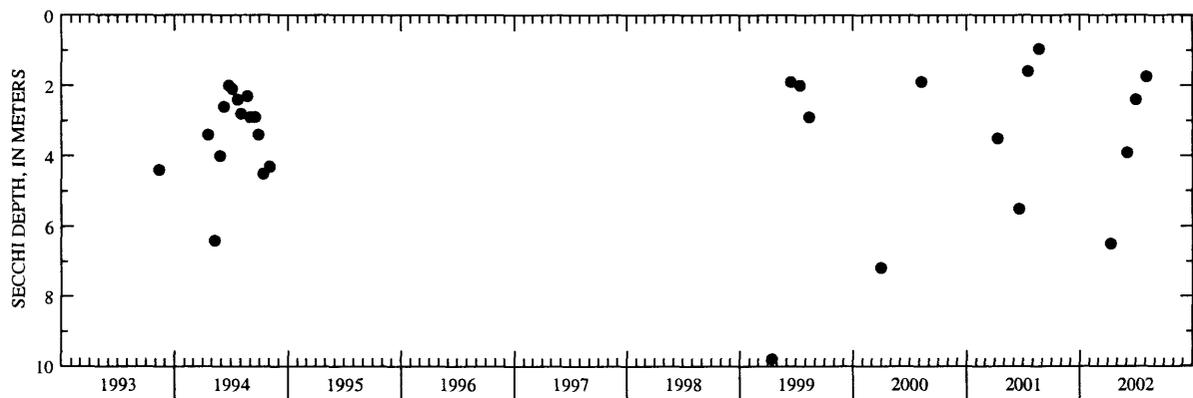
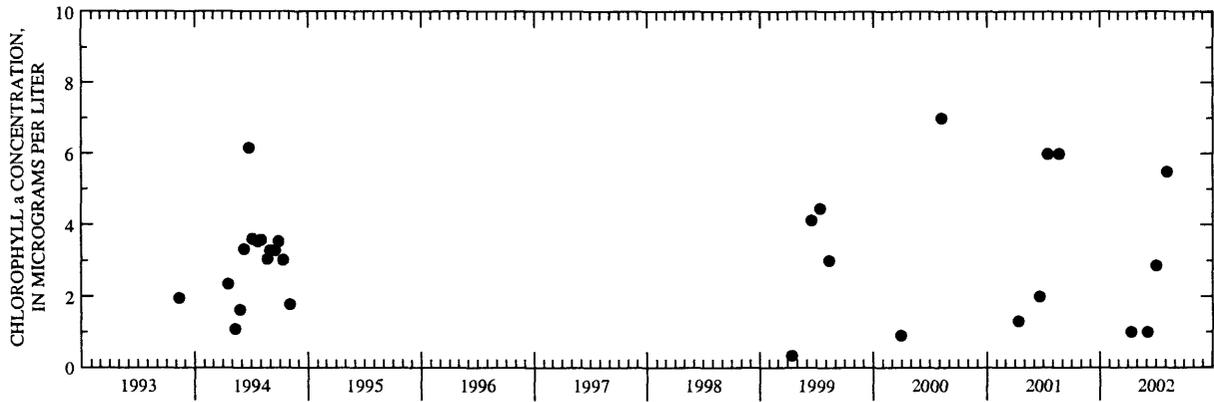
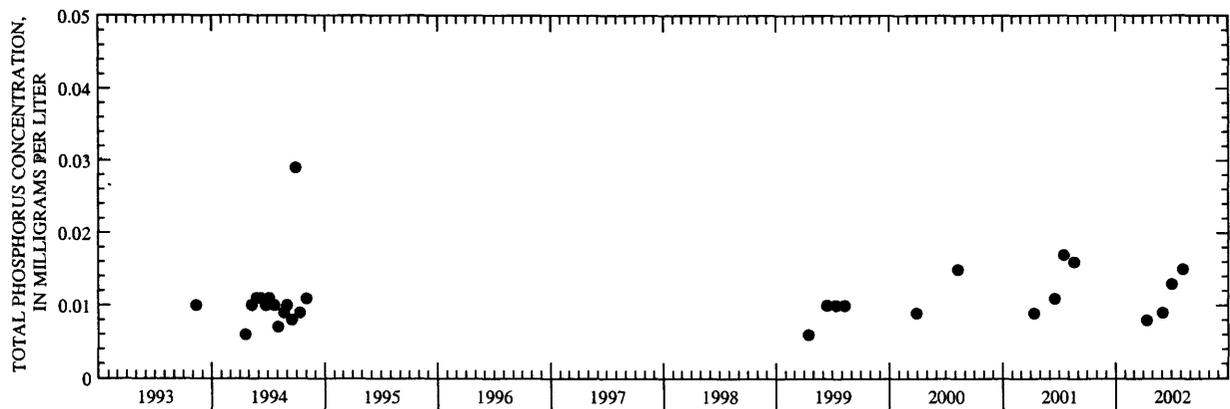
PERIOD OF RECORD.--November 1993 to November 1994, February 1999 to August 2002.

REMARKS.--Lake sampled near east end of lake at a depth of about 52 ft. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 11 TO AUGUST 06, 2002
(Milligrams per liter unless otherwise indicated)

	Apr 11		Jun 3		Jul 1		Aug 6		
Secchi-depth (m)	6.50		3.90		2.40		1.75		
Chlorophyll a, phytoplankton (µg/L)	<1.00		1.00		2.85		5.49		
Depth of sample (m)	0.5	14	0.5	13.5	0.5	13	0.5	12	14
Water temperature (°C)	6.7	5.3	19.3	6.3	28.5	6.9	26.3	8.8	7.3
Specific conductance (µS/cm)	519	525	501	526	481	534	503	535	550
pH (units)	8.1	8.2	8.1	7.7	8	7.5	8	7.4	7.4
Dissolved oxygen (mg/L)	12.8	12.6	8.7	7.7	8.4	2.2	8.1	0.6	0.6
Phosphorus, total (as P)	0.008	0.009	0.009	0.016	0.013	0.016	0.015	0.016	0.037
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	<0.002	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , dissolved (as N)	1.47	---	---	---	0.49	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.146	---	---	---	0.112	---	---	---	---
Nitrogen, amm. + org., dissolved (as N)	---	---	---	---	0.95	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.61	---	---	---	---	---	---	---	---
Nitrogen, total (as N)"	2.1	---	---	---	---	---	---	---	---
Color (Pt-Co. scale)	5	---	---	---	---	---	---	---	---
Turbidity (NTU)	2.9	---	---	---	---	---	---	---	---
Hardness, as CaCO ₃	270	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	49.7	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	34.8	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	8.5	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	2.00	---	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	209	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	34.2	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	23.5	---	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	3.99	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	334	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	<100	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	<1	---	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Lauderdale Lake (Middle) near Lauderdale, Wisconsin.

424621088335500 MILL LAKE AT LAUDERDALE, WI

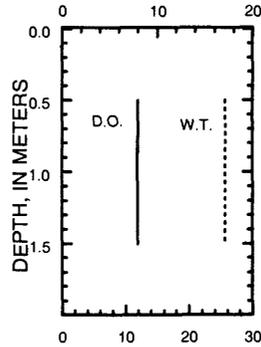
LOCATION.--Lat 42°45'55", long 88°33'57", in SE 1/4 NE 1/4 sec.35, T.4 N., R.16 E., Walworth County, Hydrologic Unit 07120006, at Lauderdale.
 PERIOD OF RECORD.--November 1993 to November 1994, and August 2002.
 REMARKS.--Lake sampled near center of lake at a depth of about 52 ft. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, AUGUST 06, 2002
 (Milligrams per liter unless otherwise indicated)

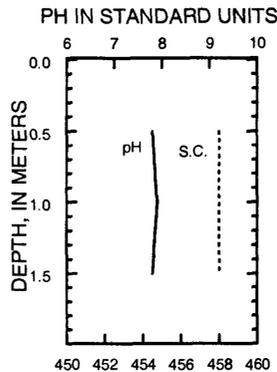
	<u>Aug 6</u>
Secchi-depth (m)	>2
Chlorophyll a, phytoplankton (µg/L)	4.75
Depth of sample (m)	0.5
Water temperature (°C)	25.7
Specific conductance (µS/cm)	458
pH (units)	7.8
Dissolved oxygen (mg/L)	8.0
Phosphorus, total (as P)	0.013

8-6-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

455446089370300 LITTLE ARBOR VITAE LAKE NEAR WOODRUFF, WI

LOCATION.--Lat 45°54'46" long 89°37'03", in SW 1/4 SE 1/4 sec.28, T.40 N., R.7 E., Vilas County, Hydrologic Unit 07070001, 4 mi north-east of Woodruff.

PERIOD OF RECORD.--February 1991 to current year.

GAGE.--Staff gage read by Glyn A. Roberts.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 8.76 ft, July 13, 2000; minimum observed, 7.63 ft, Aug. 23, 2001.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 8.00 ft, Apr. 22; minimum observed, 7.74 ft, Sept. 7.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	7.78	---	---	---	---	---	7.80	---
2	---	---	7.82	---	---	7.78	---	7.88	---	---	---	7.75
3	---	---	---	---	---	---	---	---	---	---	---	---
4	---	7.78	---	---	---	---	---	---	---	7.76	---	---
5	---	---	---	---	---	---	---	---	---	---	---	---
6	7.79	---	---	---	---	---	7.80	---	7.82	---	---	---
7	---	---	---	---	7.76	---	---	---	---	---	---	7.74
8	---	---	7.80	---	---	7.82	---	7.88	---	---	7.78	---
9	---	7.78	---	7.80	7.77	7.85	---	---	7.80	7.78	---	---
10	7.78	---	---	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---	---	---	---
12	---	7.77	---	---	---	---	7.96	---	---	---	---	---
13	---	---	---	7.77	---	---	---	---	7.80	---	7.78	7.78
14	---	---	7.80	---	7.76	---	---	7.86	---	7.80	---	---
15	---	---	---	---	---	---	---	---	---	---	---	---
16	7.80	---	---	---	---	7.86	---	---	---	---	---	---
17	---	7.77	---	---	---	---	7.98	---	---	---	7.80	---
18	---	---	7.78	---	7.76	---	---	---	7.78	---	---	---
19	---	---	---	---	---	---	---	---	---	---	---	7.80
20	---	---	---	7.78	---	---	---	7.83	---	---	---	---
21	---	7.78	---	---	---	---	---	---	---	7.78	---	---
22	---	---	7.78	---	7.82	---	8.00	---	7.77	---	---	---
23	7.80	---	---	---	---	7.82	---	---	---	---	7.78	7.82
24	---	7.80	---	7.78	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---	---	---	---
26	---	---	7.80	---	---	---	---	---	---	---	7.75	---
27	---	---	---	7.76	---	---	---	7.84	7.80	---	---	7.82
28	7.80	---	---	---	7.80	---	7.90	---	---	7.80	---	7.80
29	---	---	---	---	---	---	---	---	---	---	---	---
30	---	7.82	7.80	---	---	7.80	7.90	---	7.80	---	---	7.80
31	7.80	---	---	---	---	---	---	7.85	---	---	7.75	---

434412088590700 LITTLE GREEN LAKE, AT CENTER, NEAR MARKESAN, WI

LOCATION--Lat 43°44'12", long 88°59'07", in SW 1/4 SW 1/4 sec.29, T.15 N., R.13 E., Green Lake County, Hydrologic Unit 04030201, 2 mi north of Markesan.

PERIOD OF RECORD.--February 1991 to current year.

REMARKS.--Lake sampled near center at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 14 TO JUNE 12, 2002
(Milligrams per liter unless otherwise indicated)

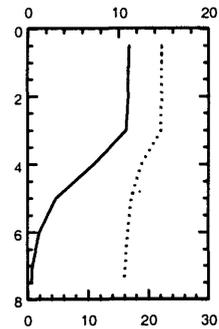
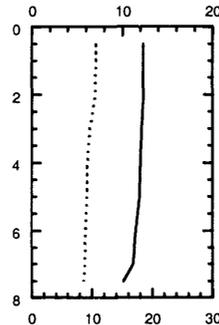
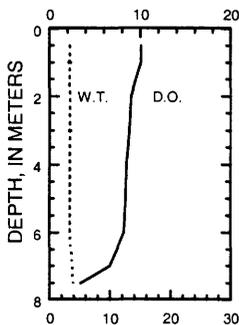
	Feb 14		Apr 15		Jun 12	
Lake stage (ft)	96.63		96.66		---	
Secchi-depth (m)	---		2.4		1.5	
Chlorophyll a, phytoplankton (µg/L)	---		1.00		4.92	
Depth of sample (m)	0.5	7.5	0.5	7.5	0.5	7.5
Water temperature (°C)	3.4	3.9	10.6	8.6	22.2	15.9
Specific conductance (µS/cm)	396	411	353	358	320	349
pH (units)	7.6	7.5	8.3	8	8.5	7.3
Dissolved oxygen (mg/L)	10.1	3.4	12.3	10.1	11.2	0.4
Phosphorus, total (as P)	0.048	0.057	0.028	0.042	0.038	0.11
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.075	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.022	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.86	---	---	---
Nitrogen, total (as N)	---	---	0.93	---	---	---
Color (Pt-Co. scale)	---	---	5	---	---	---
Turbidity (NTU)	---	---	3.7	---	---	---
Hardness, as CaCO ₃	---	---	170	---	---	---
Calcium, dissolved (Ca)	---	---	32.2	---	---	---
Magnesium, dissolved (Mg)	---	---	21.6	---	---	---
Sodium, dissolved (Na)	---	---	7.9	---	---	---
Potassium, dissolved (K)	---	---	3.00	---	---	---
Alkalinity as CaCO ₃	---	---	155	---	---	---
Sulfate, dissolved (SO ₄)	---	---	7.2	---	---	---
Chloride, dissolved (Cl)	---	---	18.5	---	---	---
Silica, dissolved (SiO ₂)	---	---	0.50	---	---	---
Solids, dissolved, at 180°C	---	---	226	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---

2-14-02

4-15-02

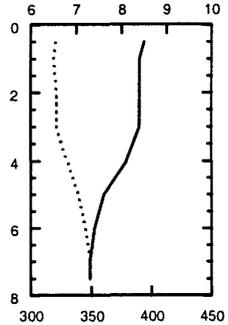
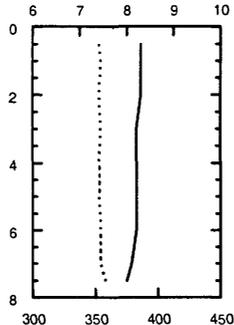
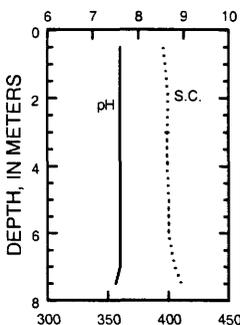
6-12-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

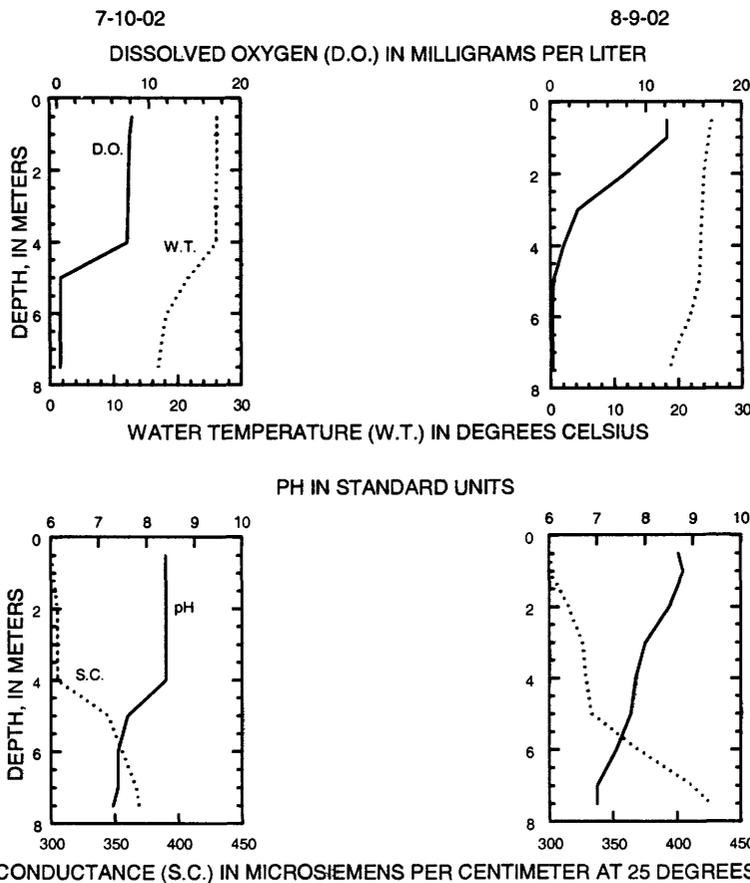
PH IN STANDARD UNITS

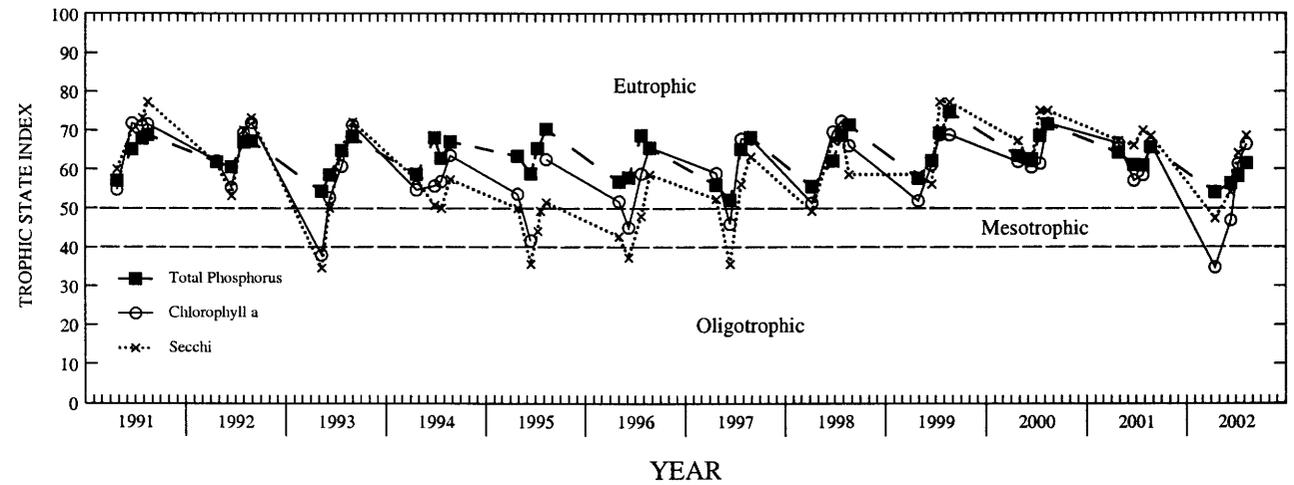
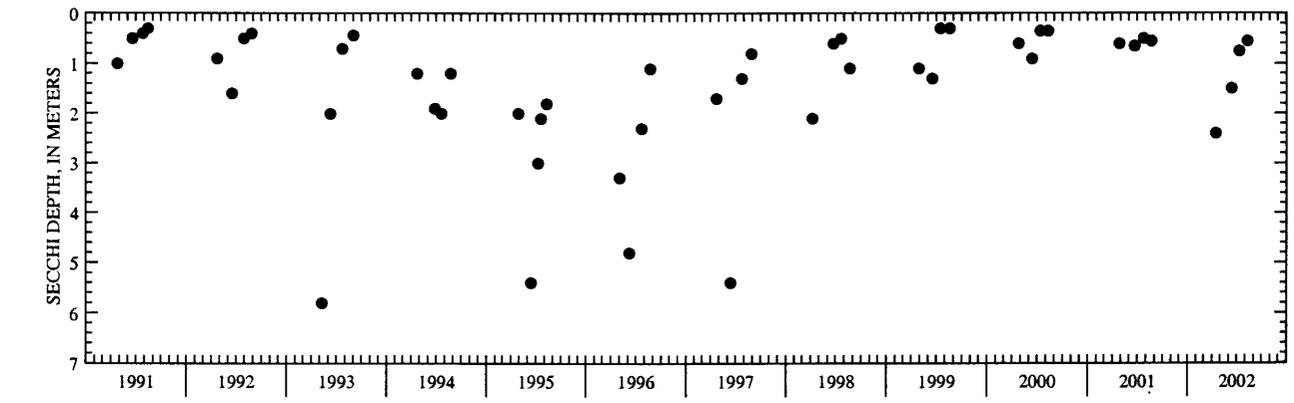
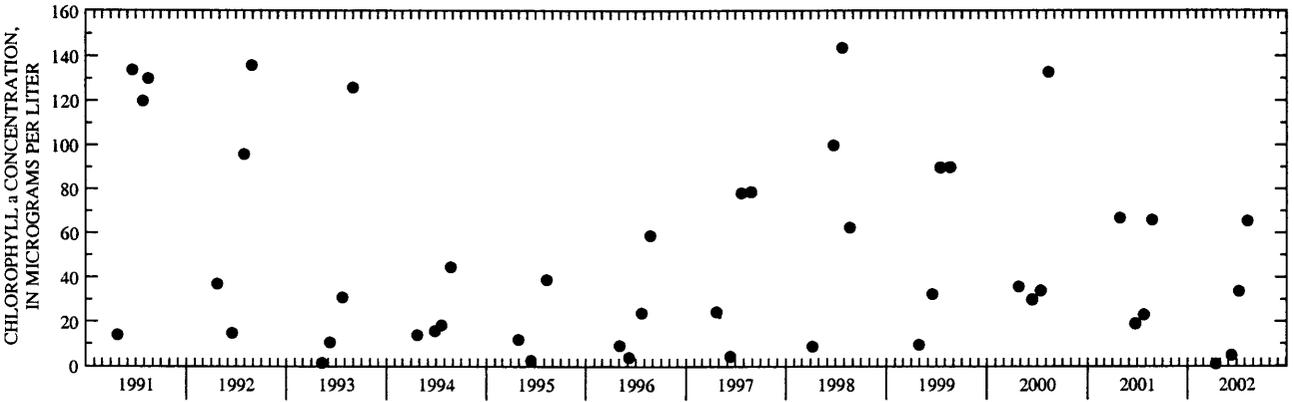
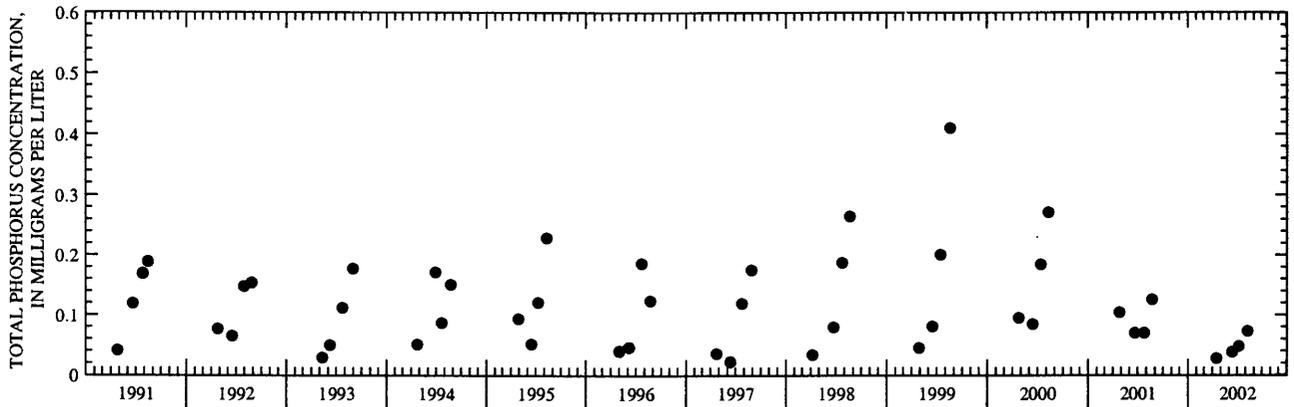


SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

WATER-QUALITY DATA, JULY 10 TO AUGUST 9, 2002
(Milligrams per liter unless otherwise indicated)

	Jul 10				Aug 9			
Lake stage (ft)	96.34				95.95			
Secchi-depth (m)	0.8				0.55			
Chlorophyll a, phytoplankton (µg/L)	33.6				65.5			
Depth of sample (m)	0.5	4	6	7.5	0.5	3	5	7.5
Water temperature (°C)	26.2	26.1	18.3	17	25.3	23.8	23.3	18.6
Specific conductance (µS/cm)	301	305	356	369	303	326	333	426
pH (units)	8.4	8.4	7.4	7.3	8.7	8	7.7	7.0
Dissolved oxygen (mg/L)	8.2	7.6	0.4	0.3	12.2	2.9	0.3	0.2
Phosphorus, total (as P)	0.048	0.052	0.361	0.585	0.073	0.092	0.086	1.47
Phosphorus, ortho, dissolved (as P)	0.002	---	---	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.010	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.01	---	---	---	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	1.0	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Little Green Lake, near Markensan, Wisconsin.

425425088083500 LITTLE MUSKEGO LAKE AT MUSKEGO, WI

LOCATION.--Lat 42°54'25", long 88°08'35", in SE 1/4 NW 1/4 sec.9, T.5 N., R.20 E., Waukesha County, Hydrologic Unit 07120006, at Muskego.

DRAINAGE AREA.--11.6 mi².

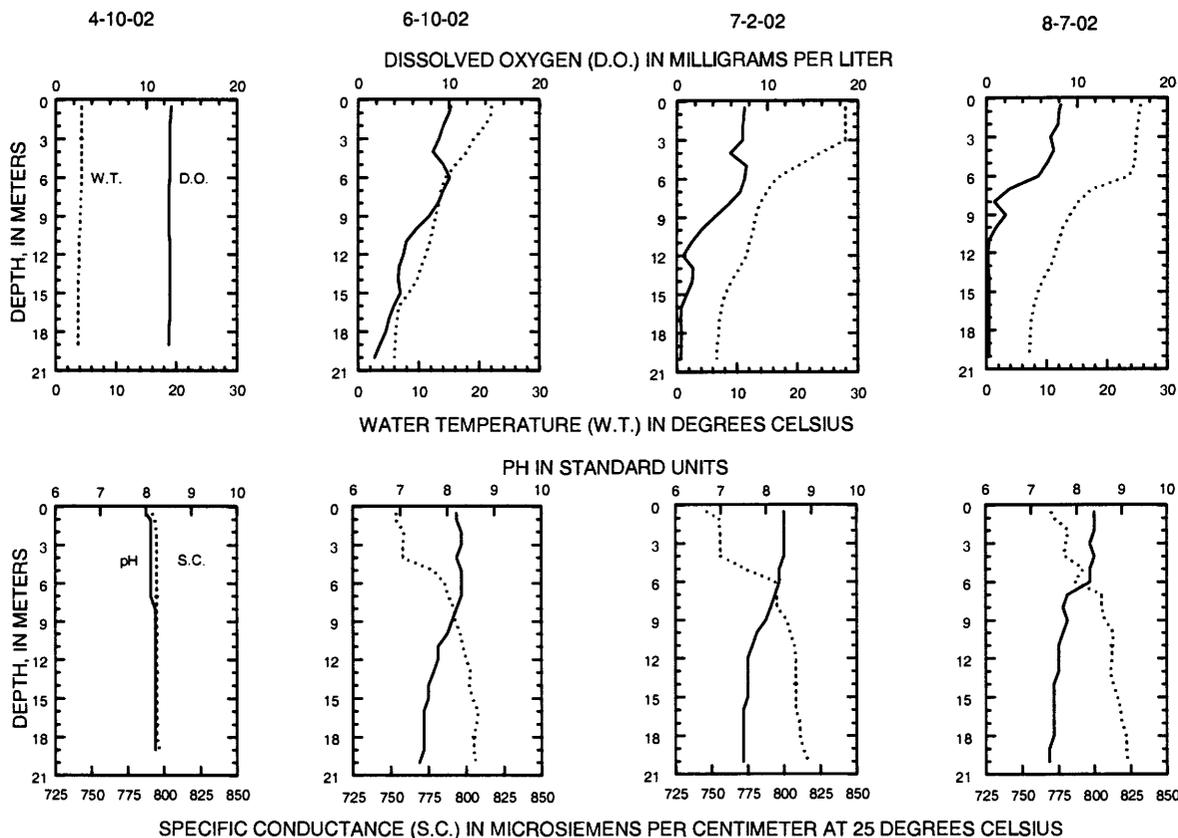
PERIOD OF RECORD.--October 1986 to current year.

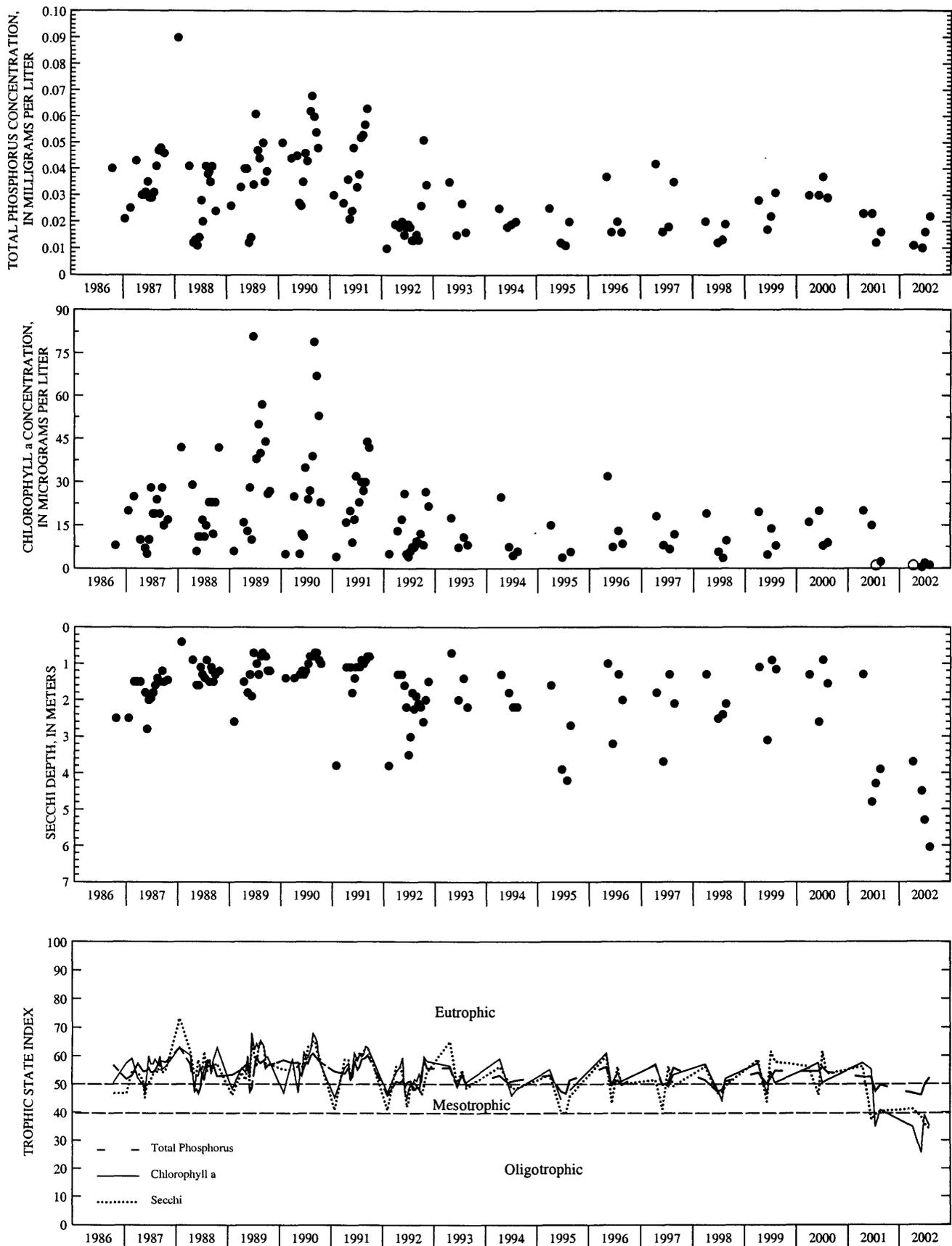
LAKE-STAGE GAGE.--Datum of gage is 693.40 ft above sea level.

REMARKS.--Lake sampled at the deep hole about 1,000 ft north-northwest of dam at outlet. An aeration system was operated from April to November for the years 1987-91. Water-quality analyses done by Wisconsin State Laboratory of Hygiene. Prior to October 1987, published under station number 425450088083500.

WATER-QUALITY DATA, APRIL 10 TO AUGUST 07, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Apr 10</u>		<u>Jun 10</u>		<u>Jul 2</u>		<u>Aug 7</u>				
Lake stage (ft)	98.82		98.85		98.73		98.51				
Secchi-depth (m)	3.70		4.5		5.3		6.1				
Chlorophyll a, phytoplankton (µg/L)	<1.00		0.29		1.34		1.03				
Depth of sample (m)	0.5	19.5	0.5	20	0.5	20	0.5	9	11	19	20
Water temperature (°C)	4.3	3.8	22.1	6	27.9	6.6	25.5	13.8	12	7.2	7.1
Specific conductance (µS/cm)	792	798	754	806	746	817	770	807	812	822	823
pH (units)	8	8.2	8.2	7.4	8.4	7.5	8.4	7.8	7.6	7.4	7.4
Dissolved oxygen (mg/L)	12.8	12.3	10.2	1.8	7.5	0.4	8.2	2.1	0.3	0.3	0.3
Phosphorus, total (as P)	0.011	0.014	0.010	0.121	0.017	0.183	0.022	0.024	0.133	0.248	0.270
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	---	---	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	0.13	---	---	---	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.027	---	---	---	---	---	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.46	---	---	---	---	---	---	---	---	---	---
Nitrogen, total (as N)	0.59	---	---	---	---	---	---	---	---	---	---
Color (Pt-Co. scale)	10	---	---	---	---	---	---	---	---	---	---
Turbidity (NTU)	3.2	---	---	---	---	---	---	---	---	---	---
Hardness, as CaCO ₃	250	---	---	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	44.7	---	---	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	32.6	---	---	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	59.6	---	---	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	2.00	---	---	---	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	183	---	---	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	39	---	---	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	126	---	---	---	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	0.237	---	---	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	456	---	---	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	<100	---	---	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	<1	---	---	---	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Little Muskego Lake, at Muskego, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

05390700 LITTLE ST. GERMAIN LAKE NEAR EAGLE RIVER, WI

LOCATION--Lat 45°53'55", long 89°27'10", in SW 1/4 SE 1/4 sec.35, T.40 N., R.8 E., Vilas County, Hydrologic Unit 07070001, 9.6 mi west of Eagle River.

DRAINAGE AREA.--19.0 mi².

PERIOD OF RECORD.--October 1990 to current year.

GAGE.--Staff gage mounted on the dam wall at lake outlet. Datum of gage is 1,600 ft, above sea level.

REMARKS.--Lake level regulated by dam at outlet.

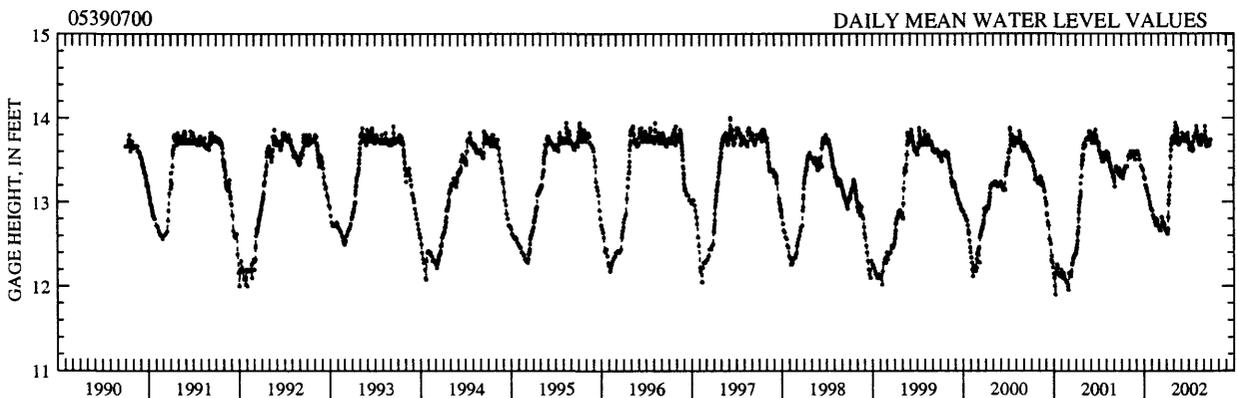
COOPERATION.--Gage readings furnished by Wisconsin Valley Improvement Company.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 14.00 ft, June 6, 1997; minimum observed, 12.00 ft, Jan. 3 and Feb. 3, 1992.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 13.94, May 9; minimum observed, 12.62 ft, Apr. 7 and 8.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUE

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	13.56	---	13.30	12.92	12.72	12.66	13.76	13.76	13.70	13.82	13.72
2	13.30	---	---	---	---	---	12.66	13.76	13.76	13.70	13.90	13.78
3	---	---	13.56	---	12.90	12.70	---	13.74	13.76	13.70	13.84	13.78
4	13.32	---	---	13.28	---	---	---	13.70	13.74	13.68	13.86	13.78
5	13.32	13.52	---	---	12.90	12.68	12.64	13.74	13.82	13.64	13.84	13.78
6	13.32	13.53	13.60	13.28	---	---	---	13.80	13.76	13.62	13.80	13.90
7	13.30	---	---	13.20	---	---	12.62	13.84	13.76	13.62	13.78	13.84
8	13.30	13.60	---	13.20	12.84	12.66	12.62	13.86	13.78	13.66	13.74	13.78
9	13.28	---	---	13.20	---	---	12.66	13.94	13.76	13.70	13.74	13.74
10	13.34	---	13.56	13.19	12.82	12.66	12.68	13.90	13.74	13.70	13.72	13.76
11	13.36	---	---	13.16	---	---	12.82	13.88	13.76	13.68	13.72	13.68
12	13.36	13.56	---	---	12.80	12.70	12.98	13.90	13.76	13.66	13.70	13.68
13	13.36	---	13.50	13.16	---	12.72	13.02	13.90	13.72	13.66	13.70	13.66
14	13.40	---	---	---	---	---	13.08	13.88	13.78	13.64	13.70	13.66
15	13.40	13.56	---	13.12	12.76	12.82	13.18	13.86	13.78	13.64	13.68	13.68
16	13.40	---	---	---	---	---	13.22	13.86	13.78	13.62	13.68	13.68
17	13.42	---	---	---	12.74	12.80	13.30	13.82	13.80	13.60	13.72	13.66
18	13.40	---	---	13.08	---	---	13.40	13.78	13.78	13.64	13.70	13.66
19	13.42	13.60	---	---	12.72	12.76	13.54	13.74	13.74	13.62	13.70	13.66
20	13.42	---	13.42	13.08	---	---	13.68	13.72	13.74	13.62	13.68	13.66
21	13.42	13.54	---	---	---	---	13.62	13.72	13.74	13.72	13.76	13.70
22	---	---	---	13.04	12.80	12.76	13.68	13.68	13.72	13.78	13.80	13.70
23	---	---	---	---	---	---	13.70	13.70	13.72	13.78	13.78	13.68
24	13.42	---	13.40	---	12.78	12.74	13.74	13.72	13.72	13.76	13.78	13.68
25	13.42	---	---	13.00	---	---	13.76	13.70	13.74	13.76	13.78	13.68
26	---	13.50	---	---	12.78	12.72	13.72	13.70	13.80	13.78	13.78	13.72
27	---	---	13.38	12.96	---	---	13.74	13.72	13.80	13.78	13.76	13.74
28	---	---	---	---	---	---	13.78	13.72	13.82	13.80	13.74	13.74
29	13.54	13.60	---	12.92	---	12.68	13.74	13.72	13.76	13.82	13.74	13.74
30	---	---	---	---	---	---	13.76	13.76	13.74	13.82	13.74	13.74
31	---	---	---	---	---	12.66	---	13.76	---	13.80	13.72	---
MEAN	---	---	---	---	---	---	---	13.78	13.76	13.70	13.75	13.72
MAX	---	---	---	---	---	---	---	13.94	13.82	13.82	13.90	13.90
MIN	---	---	---	---	---	---	---	13.68	13.72	13.60	13.68	13.66



455532089253900 LITTLE ST. GERMAIN LAKE, UPPER EAST BAY, AT ST. GERMAIN, WI

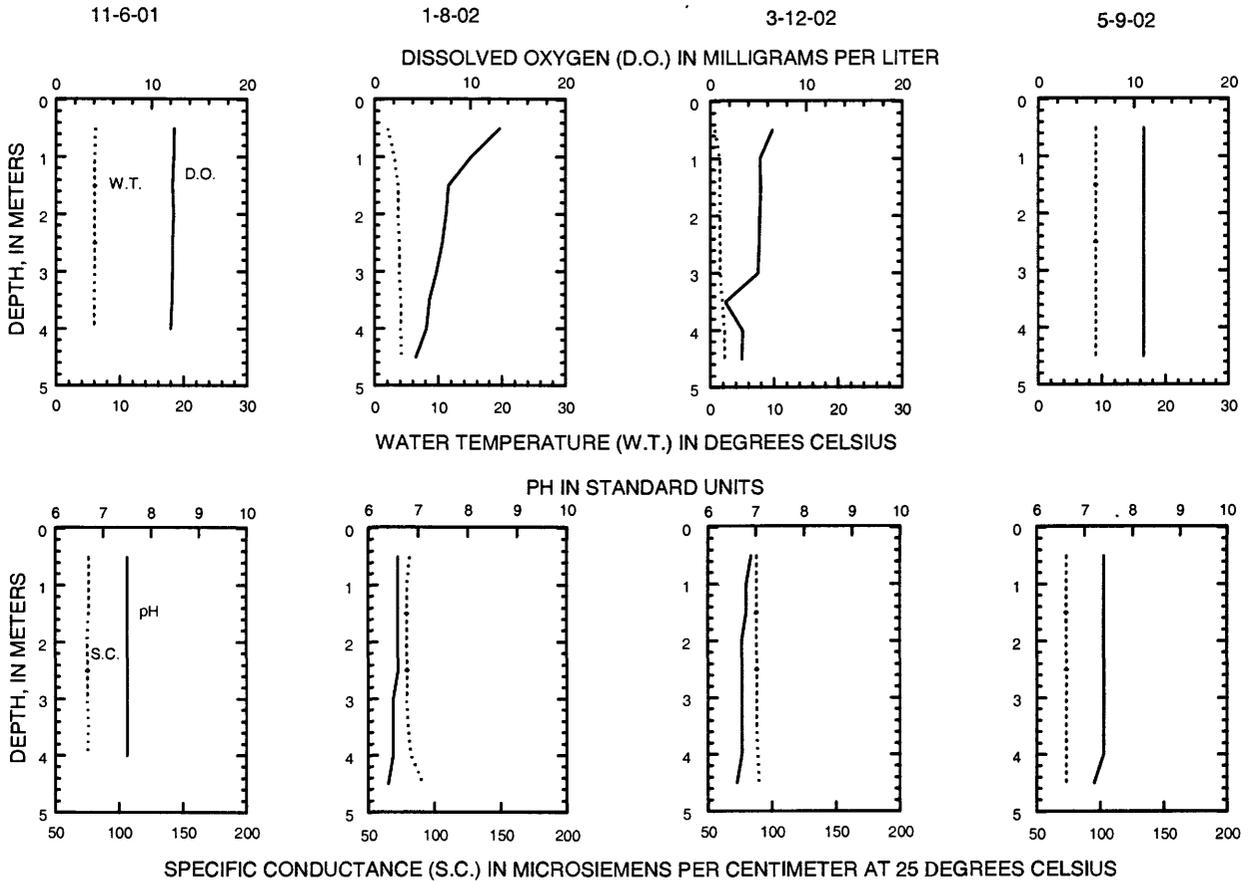
LOCATION.--Lat 45°55'32", long 89°25'39", in NE 1/4 NW 1/4 sec.25, T.40 N., R.8 E., Vilas County, Hydrologic Unit 07070001, near St. Germain.

PERIOD OF RECORD.--December 1996, January-March 1997, March 1999, and March 2000 to current year.

REMARKS.--Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, NOVEMBER 6, 2001 TO MAY 9, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Nov 6</u>		<u>Jan 8</u>		<u>Mar 12</u>		<u>May 9</u>	
Lake stage (ft)	13.53		13.20		12.70		13.94	
Secchi-depth (m)	1.5		---		---		1.30	
Chlorophyll a, phytoplankton (µg/L)	27		---		---		17.00	
Depth of sample (m)	0.5	4.0	0.5	0.5	3.5	0.5		
Water temperature (°C)	6.2	6.0	2.1	0.7	1.9	9.0		
Specific conductance (µS/cm)	76	75	81	88	88	73		
pH (units)	7.5	7.5	6.6	6.9	6.7	7.4		
Dissolved oxygen (mg/L)	12.4	12.0	13.1	6.5	4.6	11.0		
Phosphorus, total (as P)	0.051	0.043	0.033	0.049	0.036	0.045		



WATER-QUALITY DATA, JUNE 18 TO AUGUST 27, 2002
(Milligrams per liter unless otherwise indicated)

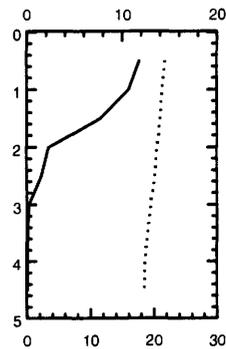
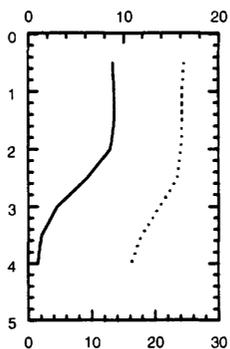
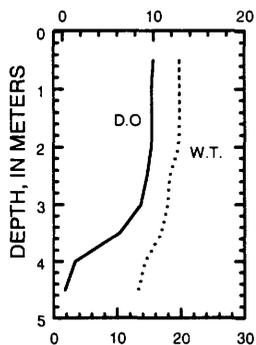
	<u>Jun 18</u>	<u>Jul 23</u>		<u>Aug 27</u>	
Lake stage (ft)	13.78	13.78		13.76	
Secchi-depth (m)	1.8	0.7		0.6	
Chlorophyll a, phytoplankton (µg/L)	6.21	62.2		80.8	
Depth of sample (m)	0.5	0.5	4.0	0.5	4.2
Water temperature (°C)	19.8	24.6	16.2	21.8	18.5
Specific conductance (µS/cm)	68	82	155	83	131
pH (units)	8.3	9.1	9.1	9.1	7.2
Dissolved oxygen (mg/L)	10.0	8.9	1.0	11.8	0.1
Phosphorus, total (as P)	0.033	0.060	0.150	0.095	0.094
Phosphorus, ortho, dissolved (as P)	---	0.003	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	0.015	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	0.019	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	0.52	---	---	---
Nitrogen, dissolved (as N)	---	0.54	---	---	---

6-18-02

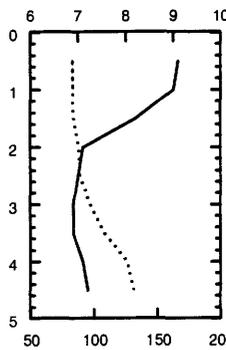
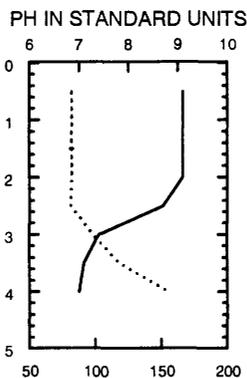
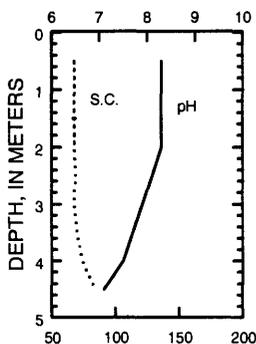
7-23-02

8-27-02

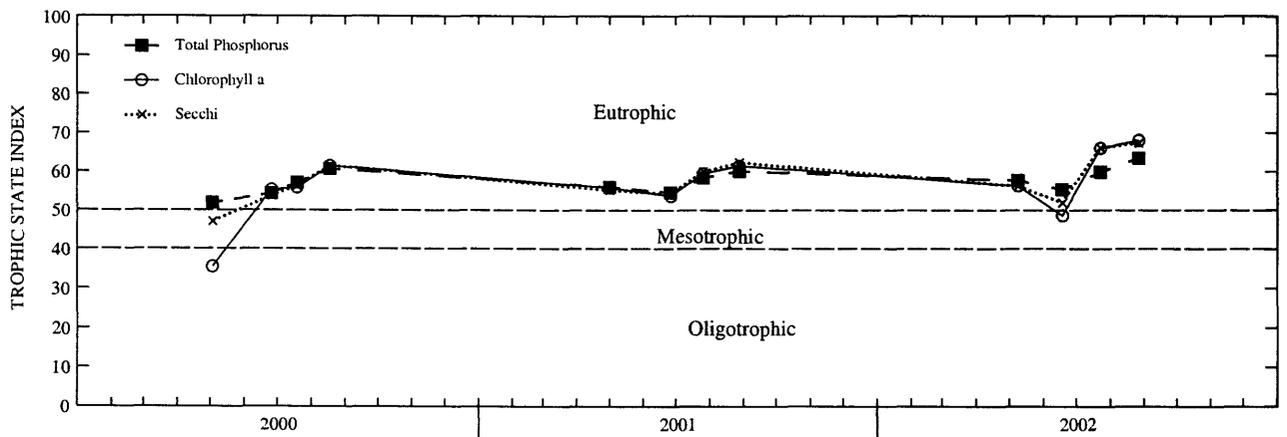
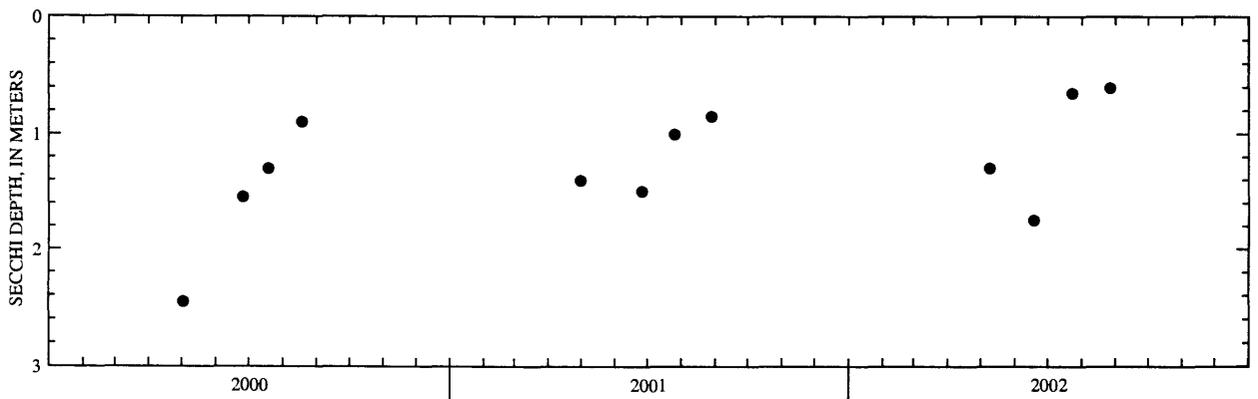
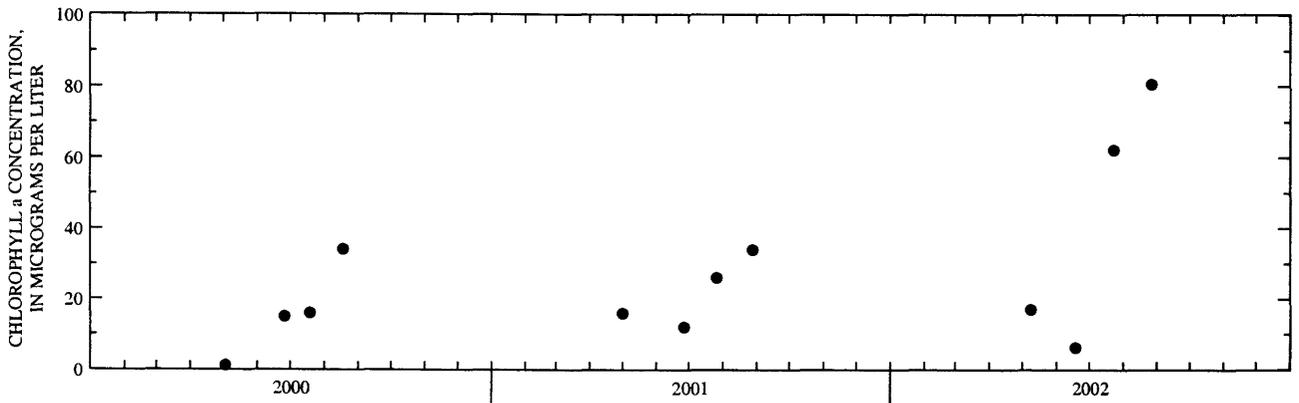
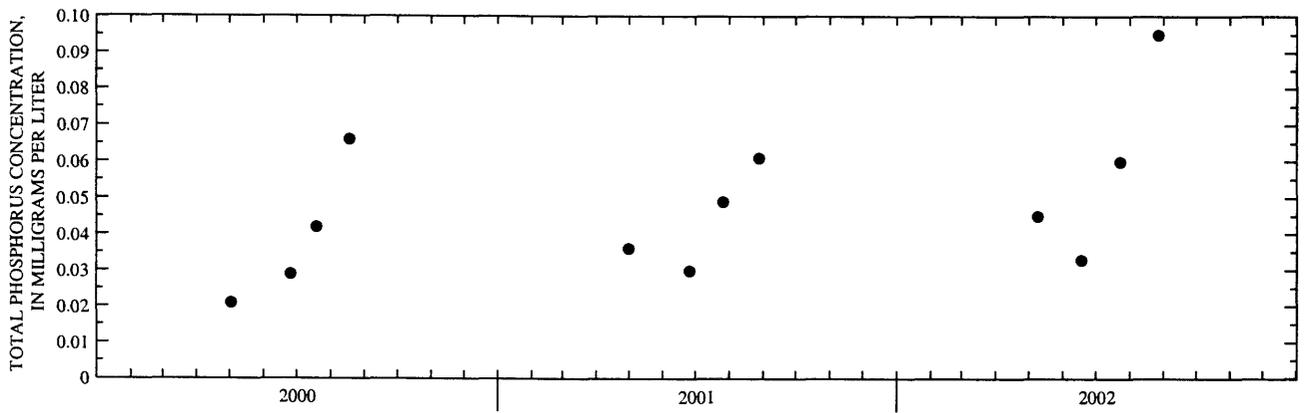
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Little St. Germain Lake, Upper East Bay, at St. Germain, Wisconsin.

455545089262500 LITTLE ST. GERMAIN LAKE, NORTHEAST BAY, NEAR ST. GERMAIN, WI

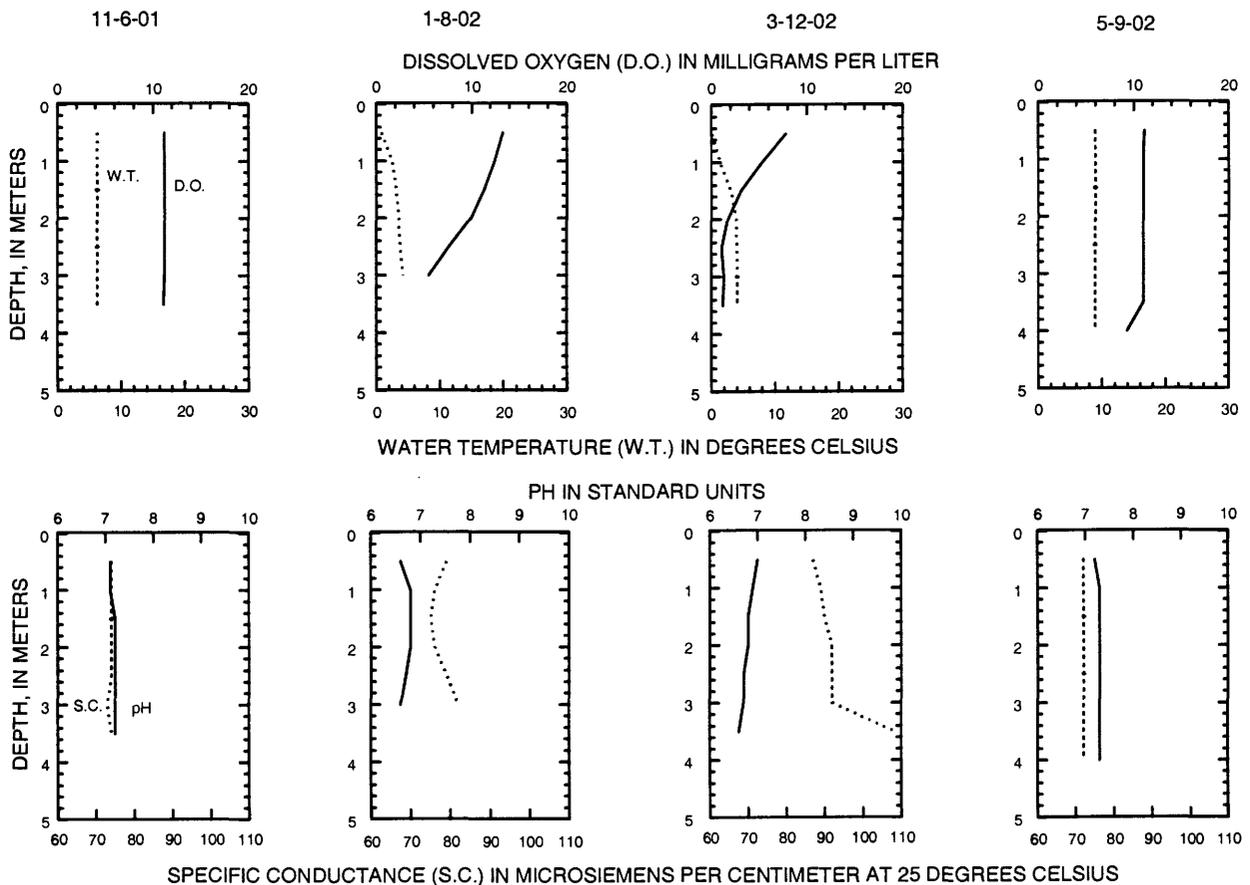
LOCATION.--Lat 45°55'45", long 89°26'25", in SW 1/4 SE 1/4 sec.24, T.40 N., R.8 E., Vilas County, Hydrologic Unit 07070001, near St. Germain.

PERIOD OF RECORD.--April 1991 to August 1994, August 1996 to August 1997, March 1999 to current year.

REMARKS.--Lake sampled in northeast bay at a lake depth of about 4 m. Lake ice-covered during January and March sampling. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, NOVEMBER 6, 2001 TO MAY 9, 2002
(Milligrams per liter unless otherwise indicated)

	Nov 6		Jan 8	Mar 12		May 9
Lake stage (ft)	13.53		13.20	12.70		13.94
Secchi-depth (m)	1.9		---	---		1.20
Chlorophyll a, phytoplankton (µg/L)	10.0		---	---		5.00
Depth of sample (m)	0.5	3.5	0.5	0.5	3.0	0.5
Water temperature (°C)	6.3	6.2	0.8	0.1	4.1	8.9
Specific conductance (µS/cm)	74	74	79	87	92	72
pH (units)	7.1	7.2	6.6	7.0	6.7	7.2
Dissolved oxygen (mg/L)	11.2	11.1	13.3	7.8	1.3	11.1
Phosphorus, total (as P)	0.035	0.035	0.029	0.044	0.034	0.046



WATER-QUALITY DATA, JUNE 18 TO AUGUST 27, 2002
(Milligrams per liter unless otherwise indicated)

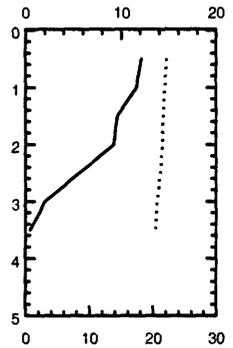
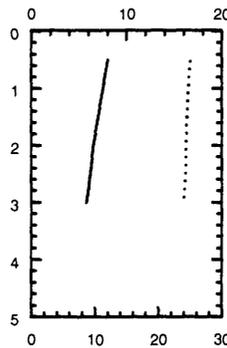
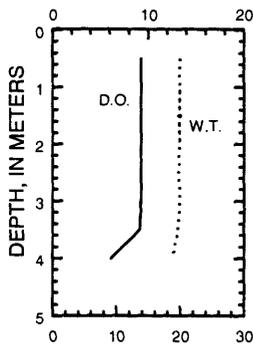
	<u>Jun 18</u>	<u>Jul 23</u>	<u>Aug 27</u>
Lake stage (ft)	13.78	13.78	13.76
Secchi-depth (m)	1.6	0.6	0.6
Chlorophyll a, phytoplankton (µg/L)	4.93	76	94.5
Depth of sample (m)	0.5	0.5 3.0	0.5 3.3
Water temperature (°C)	20.0	25.0 24.0	22.1 20.4
Specific conductance (µS/cm)	69	83 85	83 92
pH (units)	8.1	8.9 8.3	9.2 6.9
Dissolved oxygen (mg/L)	9.2	8.0 5.8	12.1 0.5
Phosphorus, total (as P)	0.036	0.073 0.080	0.116 0.113
Phosphorus, ortho, dissolved (as P)	---	0.004 ---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	0.015 ---	---
Nitrogen, ammonia, dissolved (as N)	---	0.074 ---	---
Nitrogen, amm. + org., diss. (as N)	---	0.53 ---	---
Nitrogen, dissolved (as N)	---	0.55 ---	---

6-18-02

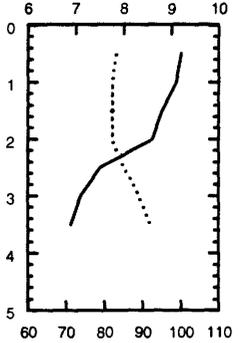
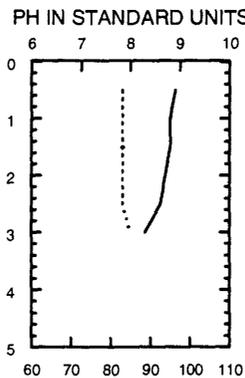
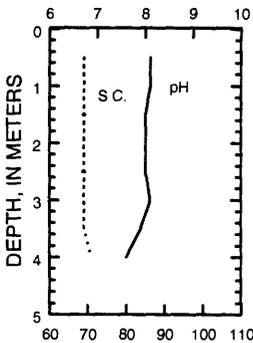
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8-27-02

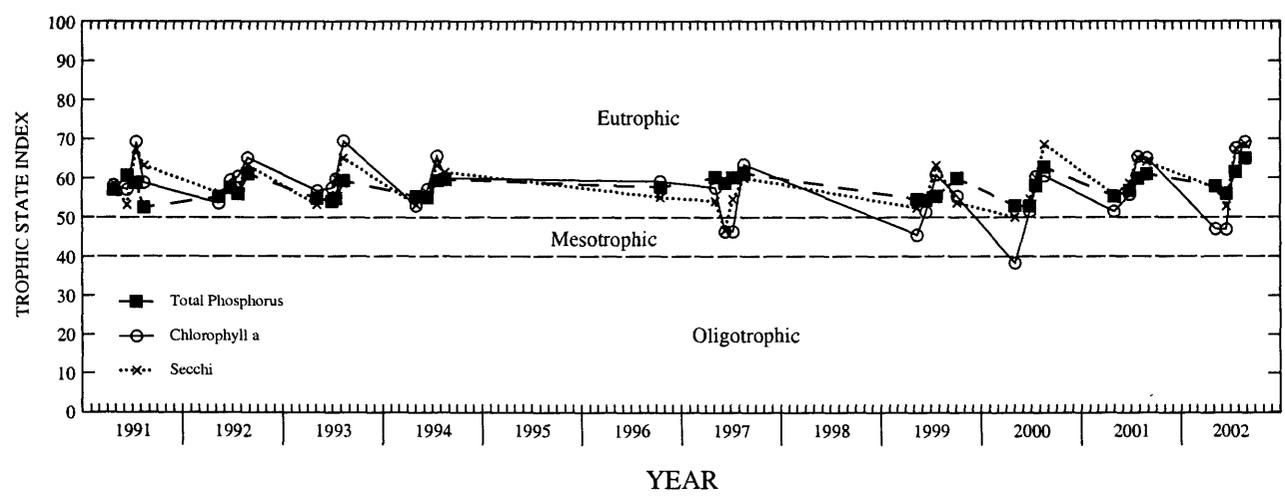
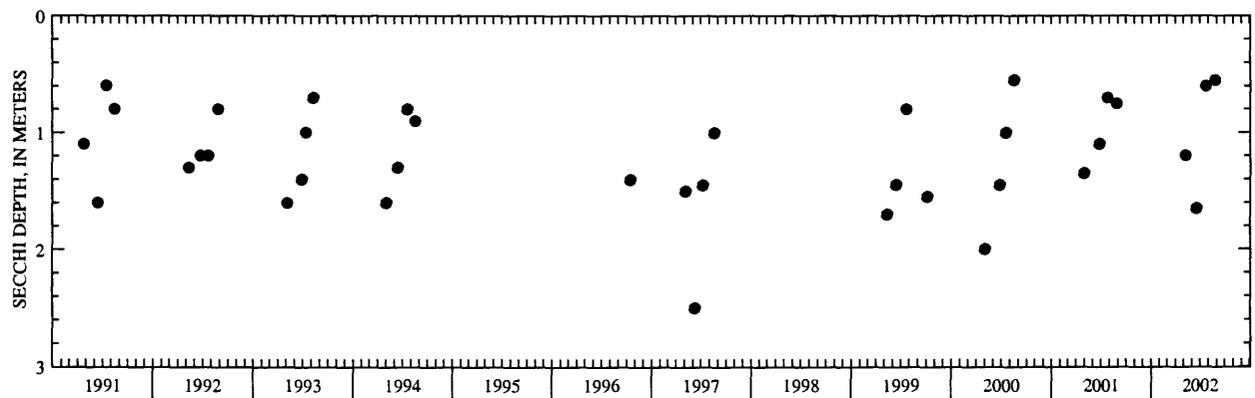
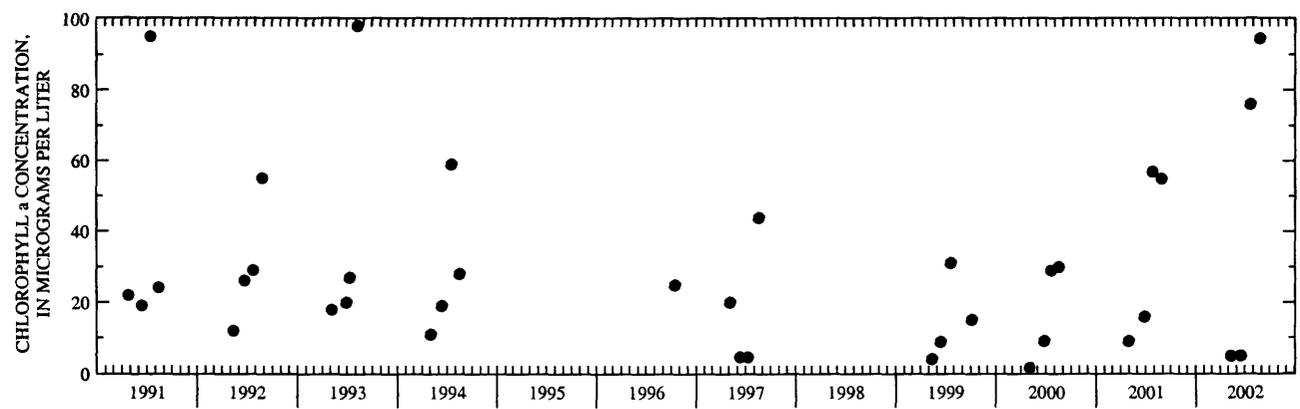
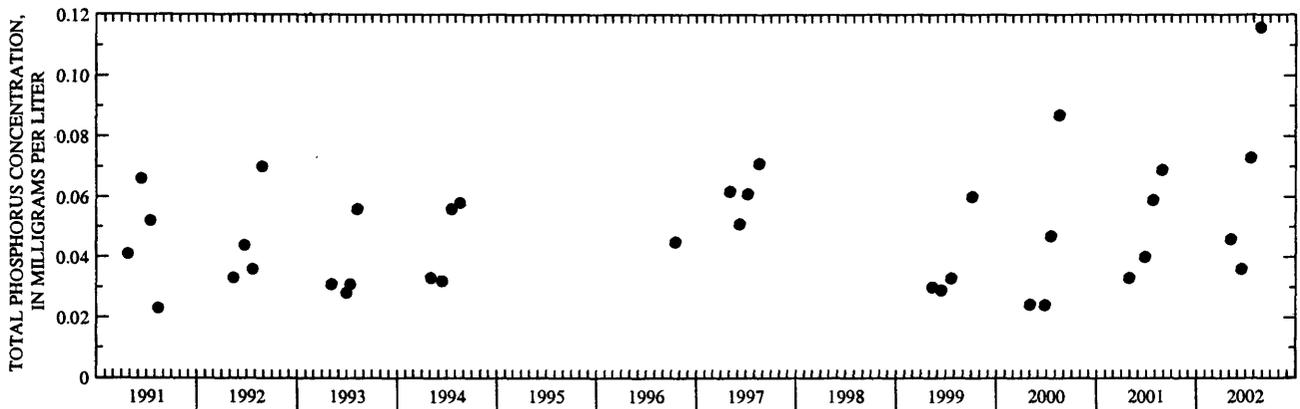
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Little St. Germain Lake, Northeast Bay, at St. Germain, Wisconsin.

455437089270800 LITTLE ST. GERMAIN LAKE, SOUTH BAY, NEAR ST. GERMAIN, WI

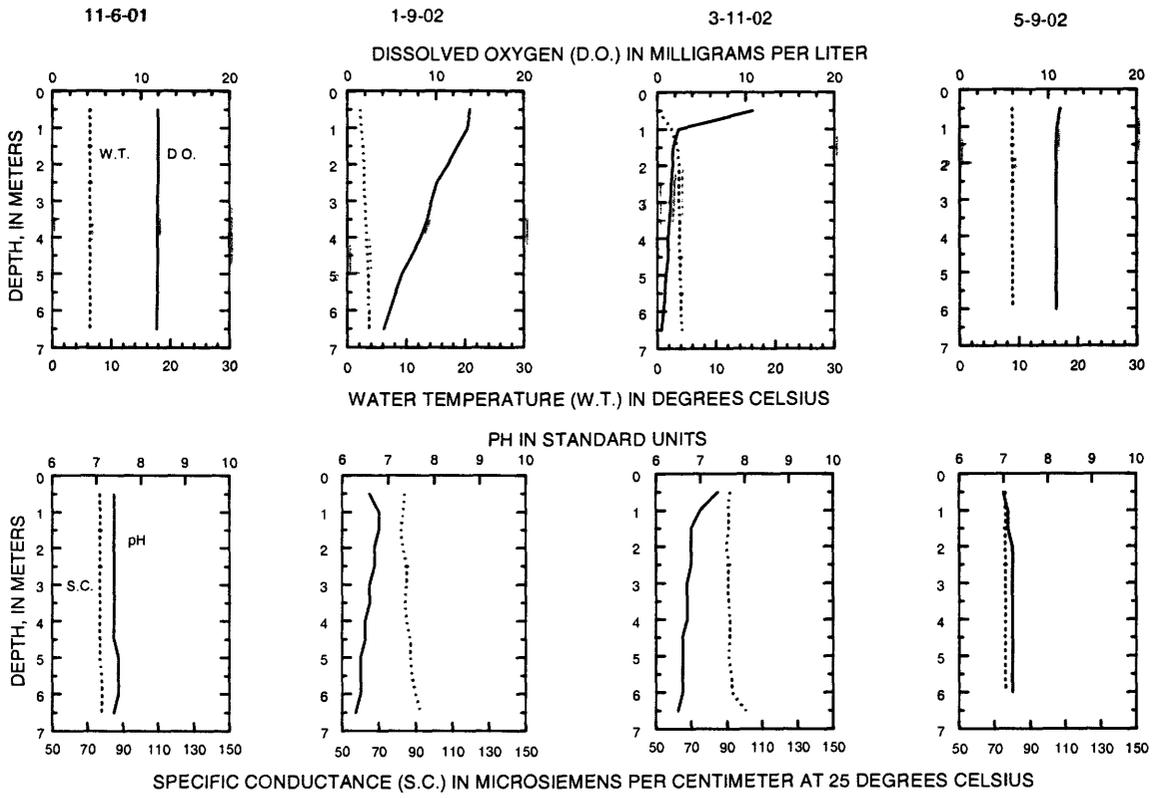
LOCATION.--Lat 45°54'37", long 89°27'08", in NW 1/4 NE 1/4 sec.35, T.40 N., R.8 E., Vilas County, Hydrologic Unit 07070001, 1.7 mi east of St. Germain.

PERIOD OF RECORD.--April 1991 to August 1994, August 1996 to August 1997, March 1999 to current year.

REMARKS.--Lake sampled in south bay at a lake depth of about 7 m. Lake ice-covered during January and March sampling. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, NOVEMBER 6, 2001 TO MAY 9, 2002
(Milligrams per liter unless otherwise indicated)

	Nov 6		Jan 9	Mar 11		May 9	
Lake stage (ft)	13.53		13.20	12.70		13.94	
Secchi-depth (m)	2.5		---	---		1.7	
Chlorophyll a, phytoplankton (µg/L)	5.10		---	---		2.00	
Depth of sample (m)	0.5	6.5	0.5	0.5	6.0	0.5	6.0
Water temperature (°C)	6.4	6.4	2.2	0.2	4.0	8.9	8.9
Specific conductance (µS/cm)	77	78	84	92	93	76	76
pH (units)	7.4	7.4	6.6	7.4	6.6	7.0	7.2
Dissolved oxygen (mg/L)	12.0	11.8	13.9	10.8	0.7	11.4	10.9
Phosphorus, total (as P)	0.029	0.026	0.025	0.094	0.209	0.040	0.035
Phosphorus, ortho, dissolved (as P)	---	---	---	---	---	0.049	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	---	---	---	0.014	---
Nitrogen, ammonia, dissolved (as N)	---	---	---	---	---	0.022	---
Nitrogen, amm. + org., total (as N)	---	---	---	---	---	0.43	---
Nitrogen, total (as N)	---	---	---	---	---	0.44	---
Color (Pt-Co. scale)	---	---	---	---	---	15	---
Turbidity (NTU)	---	---	---	---	---	3.8	---
Hardness, (as CaCO ₃)	---	---	---	---	---	34	---
Calcium, dissolved (Ca)	---	---	---	---	---	9	---
Magnesium, dissolved (Mg)	---	---	---	---	---	2.8	---
Sodium, dissolved (Na)	---	---	---	---	---	1.9	---
Potassium, dissolved (K)	---	---	---	---	---	<1	---
Alkalinity, (as CaCO ₃)	---	---	---	---	---	33	---
Sulfate, dissolved (SO ₄)	---	---	---	---	---	<4.5	---
Chloride, dissolved (Cl)	---	---	---	---	---	3.8	---
Silica, dissolved (SiO ₂)	---	---	---	---	---	10	---
Solids, dissolved, at 180°C	---	---	---	---	---	66	---
Iron, dissolved (Fe) µg/L	---	---	---	---	---	200	---
Manganese, dissolved (Mn) µg/L	---	---	---	---	---	---	---



WATER-QUALITY DATA, JUNE 18 TO AUGUST 27, 2002
(Milligrams per liter unless otherwise indicated)

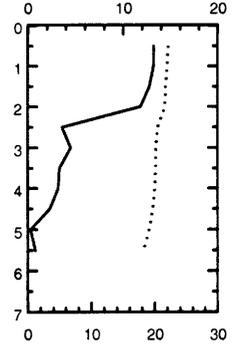
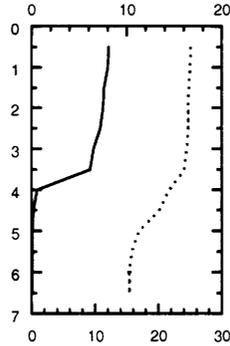
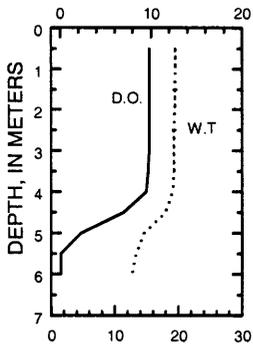
	<u>Jun 18</u>	<u>Jul 23</u>		<u>Aug 27</u>		
Lake stage (ft)	13.78	13.78		13.76		
Secchi-depth (m)	2.2	1.0		0.5		
Chlorophyll a, phytoplankton (µg/L)	4.84	28.8		83.8		
Depth of sample (m)	0.5	0.5	5.8	0.5	2.5	5.5
Water temperature (°C)	19.5	25.1	15.4	22.1	20.4	18.2
Specific conductance (µS/cm)	69	80	129	85	84	133
pH (units)	8.3	8.4	7.0	9.5	7.1	7.2
Dissolved oxygen (mg/L)	9.8	8.1	0.1	13.2	3.6	0.8
Phosphorus, total (as P)	0.045	0.044	0.096	0.054	0.046	0.065
Phosphorus, ortho, dissolved (as P)	---	<.002	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	<.010	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	0.016	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	0.45	---	---	---	---

6-18-02

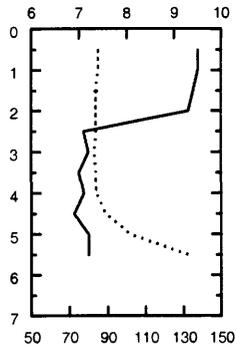
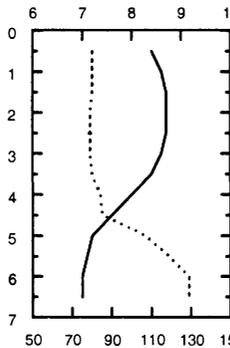
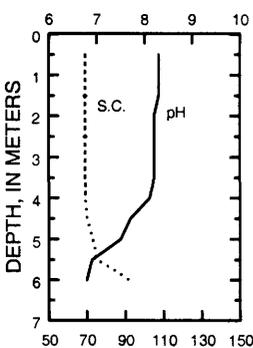
7-23-02

8-27-02

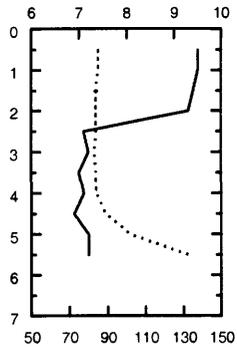
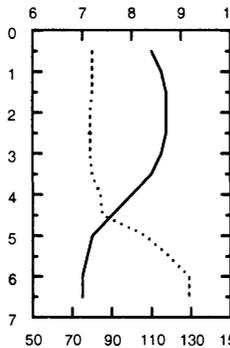
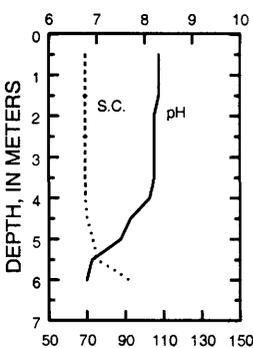
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



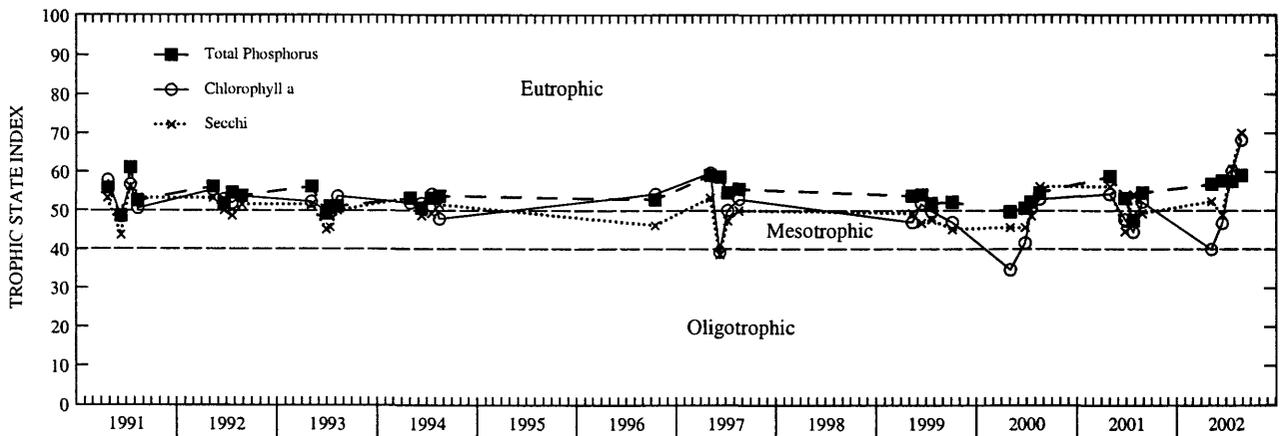
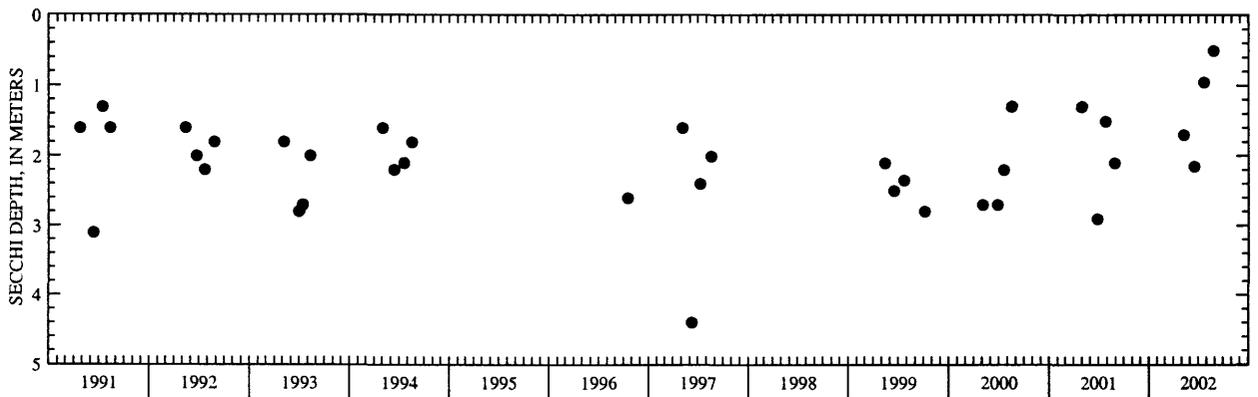
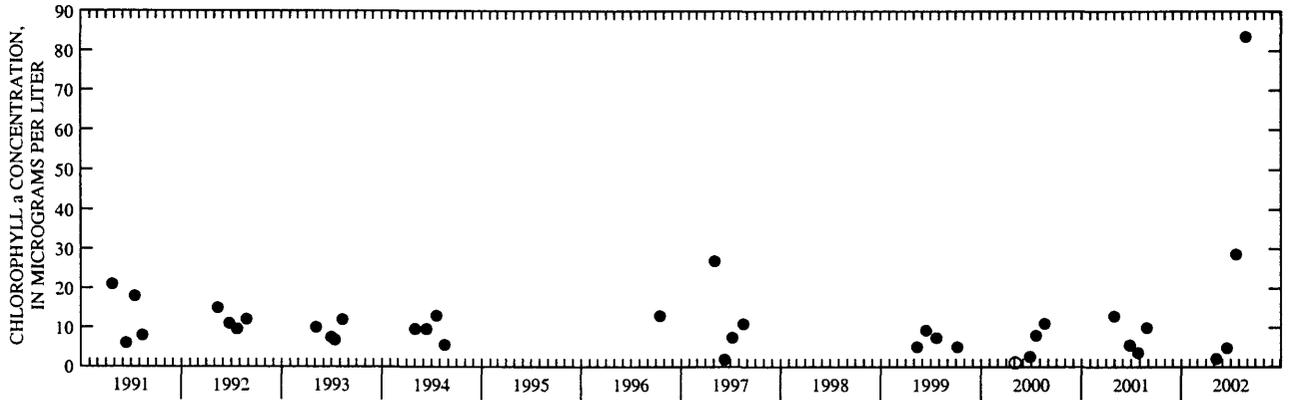
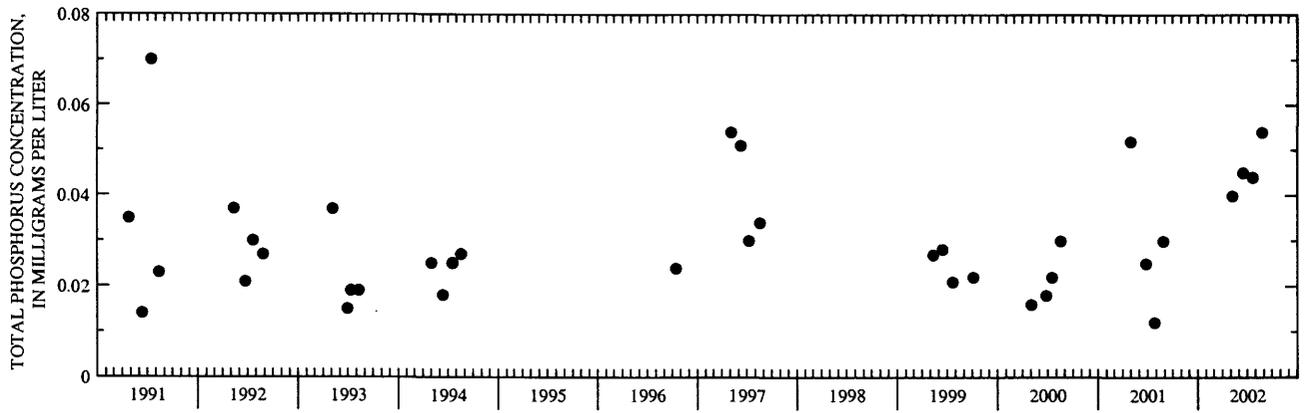
WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



PH IN STANDARD UNITS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Little St. Germain Lake, South Bay, at St. Germain, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

455428089282400 LITTLE ST. GERMAIN LAKE, WEST BAY, AT ST. GERMAIN, WI

LOCATION.--Lat 45°54'28", long 89°28'24", in SW 1/4 NE 1/4 sec.34, T.40 N., R.8 E., Vilas County, Hydrologic Unit 07070001, at St. Germain.

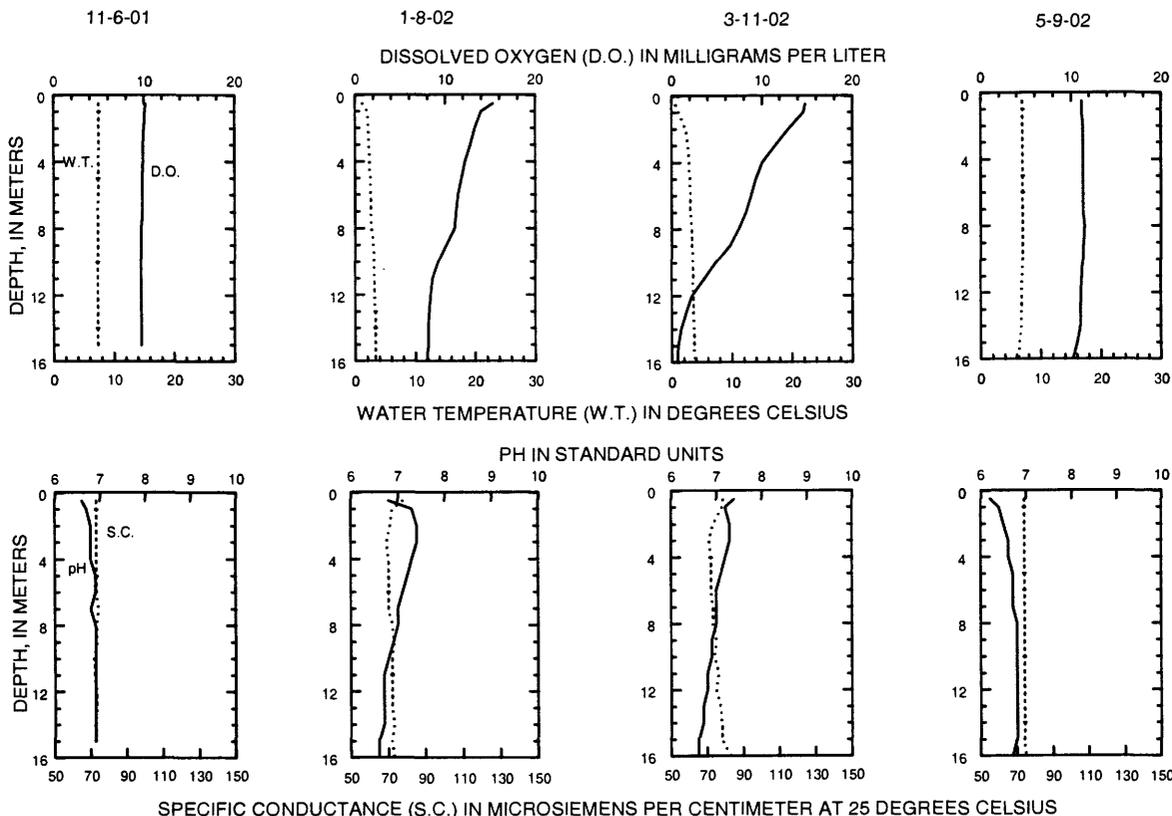
PERIOD OF RECORD.--April 1991 to August 1994, August 1996 to August 1997, March 1999 to current year.

REMARKS.--Lake sampled in west bay at a lake depth of about 18 m. Lake ice-covered during January and March sampling. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, NOVEMBER 6, 2001 TO MAY 9, 2002

(Milligrams per liter unless otherwise indicated)

	Nov 6		Jan 8		Mar 11		May 9	
Lake stage (ft)	13.53		13.20		12.70		13.94	
Secchi-depth (m)	4.2		---		---		2.7	
Chlorophyll a, phytoplankton (µg/L)	4.80		---		---		<1.00	
Depth of sample (m)	0.5	14	0.5	0.5	15	0.5	16	
Water temperature (°C)	7.5	7.3	1.1	0.6	3.7	7	6.3	
Specific conductance (µS/cm)	73	73	78	79	78	74	75	
pH (units)	6.6	6.9	6.8	7.4	6.6	6.2	6.7	
Dissolved oxygen (mg/L)	10.2	9.7	15.3	14.8	0.7	11.2	10.2	
Phosphorus, total (as P)	0.022	0.018	0.012	0.014	0.026	0.019	0.018	
Phosphorus, ortho, dissolved (as P)	---	---	---	---	---	0.003	---	
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	---	---	---	0.126	---	
Nitrogen, ammonia, dissolved (as N)	---	---	---	---	---	0.02	---	
Nitrogen, amm. + org., total (as N)	---	---	---	---	---	0.43	---	
Nitrogen, total (as N)	---	---	---	---	---	0.56	---	
Color (Pt-Co. scale)	---	---	---	---	---	5	---	
Turbidity (NTU)	---	---	---	---	---	1.7	---	
Hardness, as CaCO ₃	---	---	---	---	---	37	---	
Calcium, dissolved (Ca)	---	---	---	---	---	8.30	---	
Magnesium, dissolved (Mg)	---	---	---	---	---	4.00	---	
Sodium, dissolved (Na)	---	---	---	---	---	2.00	---	
Potassium, dissolved (K)	---	---	---	---	---	<1.00	---	
Alkalinity as CaCO ₃	---	---	---	---	---	31	---	
Sulfate, dissolved (SO ₄)	---	---	---	---	---	<4.5	---	
Chloride, dissolved (Cl)	---	---	---	---	---	3.4	---	
Silica, dissolved (SiO ₂)	---	---	---	---	---	7.62	---	
Solids, dissolved, at 180°C	---	---	---	---	---	56	---	
Iron, dissolved (Fe) µg/L	---	---	---	---	---	<100	---	
Manganese, dissolved (Mn) µg/L	---	---	---	---	---	10	---	



WATER-QUALITY DATA, JUNE 18 TO AUGUST 27, 2002
(Milligrams per liter unless otherwise indicated)

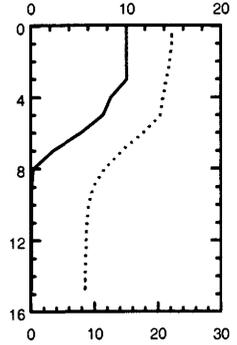
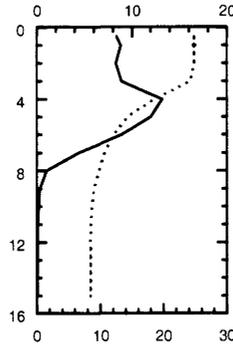
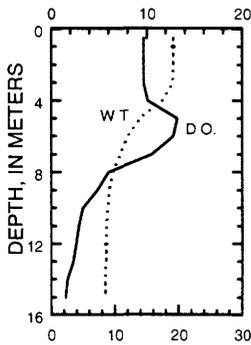
	<u>Jun 18</u>		<u>Jul 23</u>		<u>Aug 27</u>		
Lake stage (ft)	13.78		13.78		13.76		
Secchi-depth (m)	3.4		2.9		1.6		
Chlorophyll a, phytoplankton (µg/L)	2.45		5.45		16.0		
Depth of sample (m)	0.5	15	0.5	15.5	0.5	10	15
Water temperature (°C)	19.2	8.5	24.8	8.3	22.2	9.1	8.5
Specific conductance (µS/cm)	66	70	76	107	77	99	116
pH (units)	7.8	7	7.8	6.9	9.0	6.9	7.0
Dissolved oxygen (mg/L)	9.7	1.5	8.4	0.1	10	0.1	0
Phosphorus, total (as P)	0.015	0.016	0.013	0.191	0.020	0.100	0.263
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	<0.010	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.018	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	0.36	---	---	---	---

6-18-02

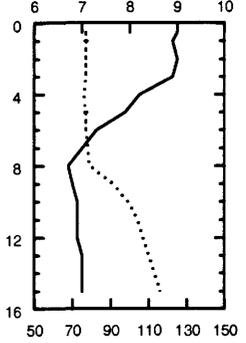
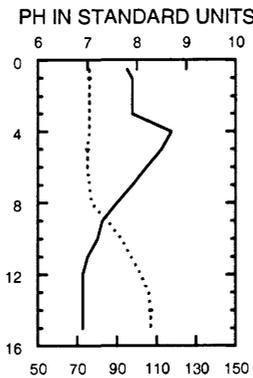
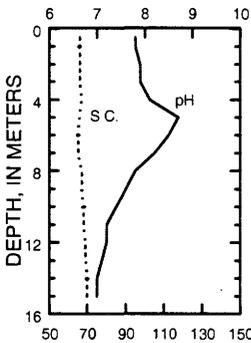
7-23-02

8-27-02

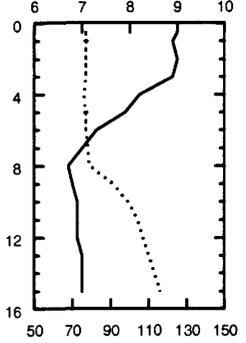
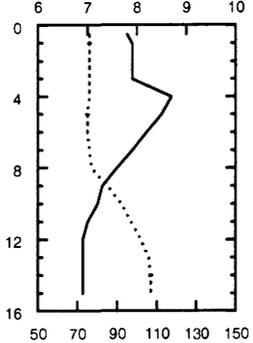
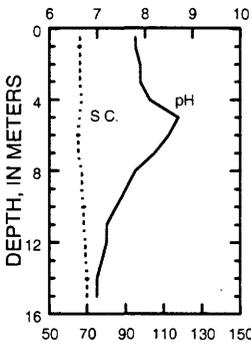
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



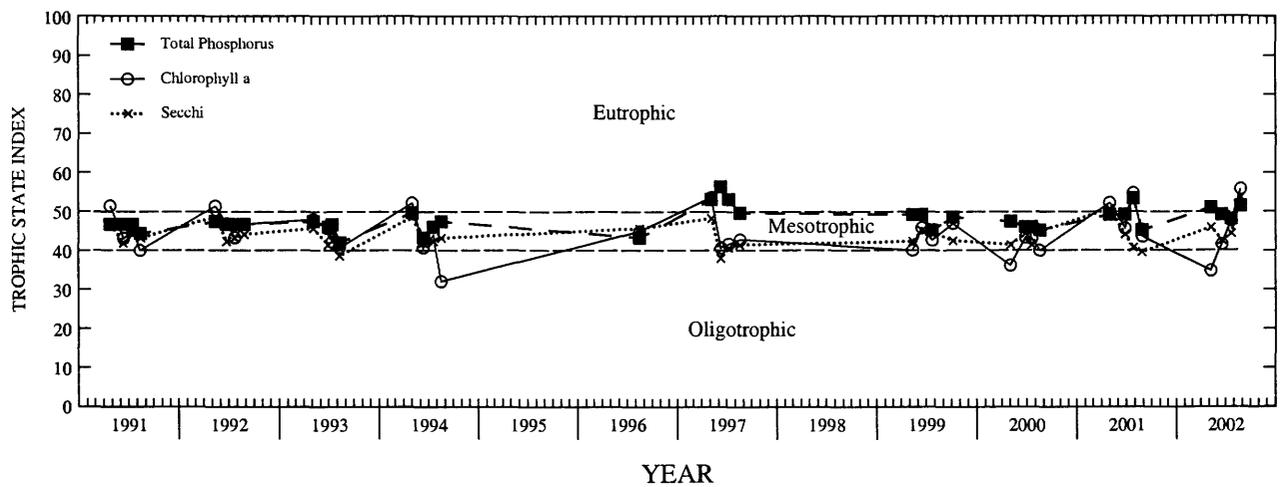
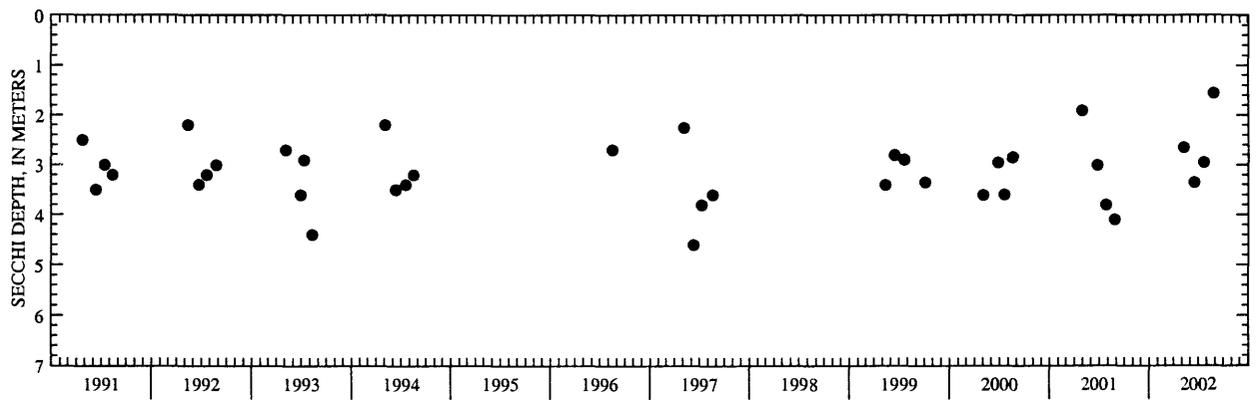
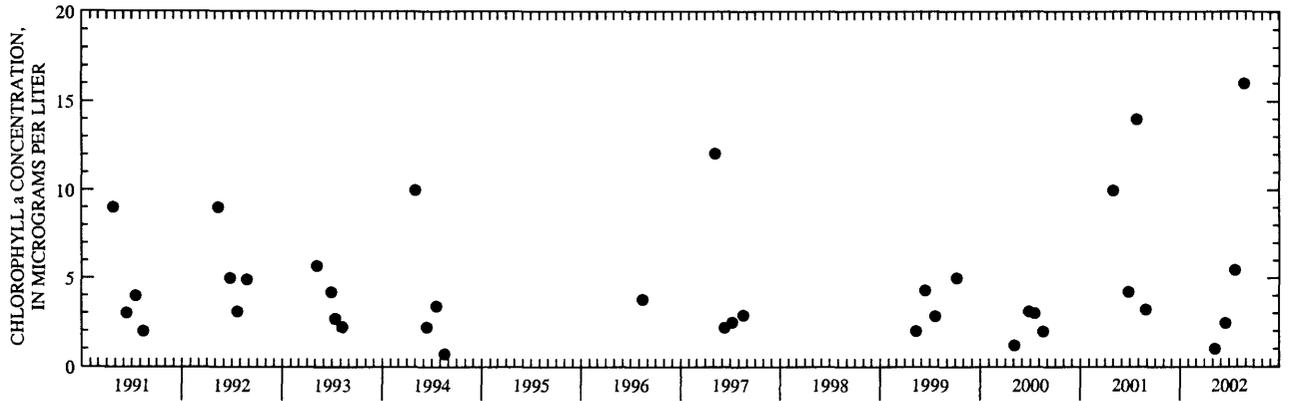
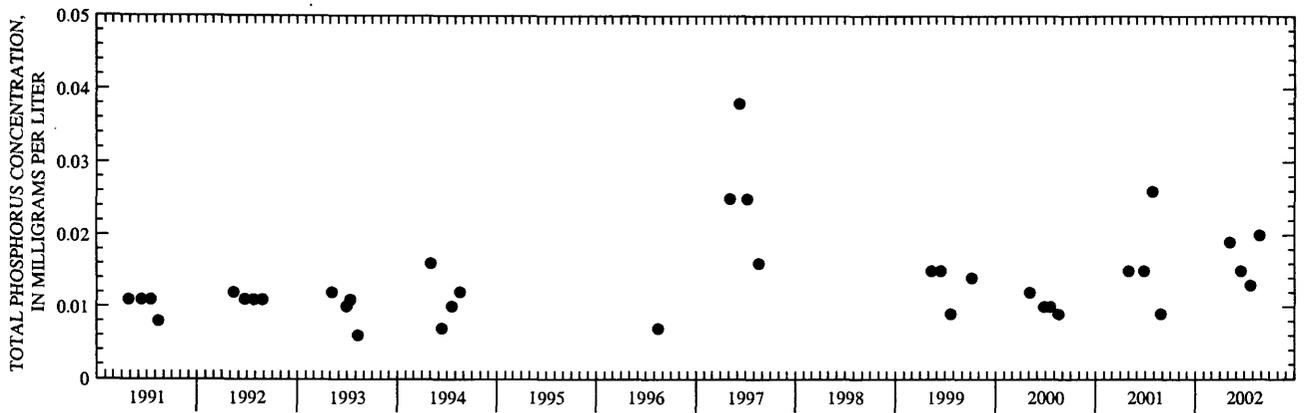
WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



PH IN STANDARD UNITS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Little St. Germain Lake, West Bay, at St. Germain, Wisconsin.

452826088544101 LITTLE SAND LAKE--SITE NUMBER 2--NEAR MOLE LAKE, WI

LOCATION.--Lat 45°28'26" long 88°54'41", in SW 1/4 NE 1/4 sec.31, T.35 N., R.13 E., Forest County, Hydrologic Unit 04030202, on left bank 1 mi upstream of outlet, 3 mi southeast of Mole Lake.

PERIOD OF RECORD.--May 1996 to current year. Prior to October 2000 published as "Little Sand Lake near Mole Lake, WI" under station number 04074651.

GAGE.--Water-stage recorder. Datum of gage is 1,587.32 ft above sea level.

REMARKS.--Recorder removed during winter period, Nov. 5, 2001 to May 17, 2002.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 5.97 ft, May 25, 1997; minimum observed, 3.78 ft, Nov. 7-9, 1999.

EXTREMES FOR CURRENT YEAR.-- Maximum gage height observed, 5.40 ft, May 17; minimum observed, 3.81 ft, Oct. 8-9.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.89	3.91	4.03	---	---	---	---	---	4.98	4.70	4.50	4.32
2	3.88	3.90	4.03	---	---	---	---	---	4.94	4.68	4.49	4.36
3	3.89	3.89	4.03	---	---	---	---	---	4.93	4.66	4.48	4.35
4	3.88	3.88	4.03	---	---	---	---	---	4.93	4.64	4.48	4.32
5	3.86	3.87	---	---	---	---	---	---	4.92	4.61	4.47	4.33
6	3.85	3.87	---	---	---	---	---	---	4.89	4.57	4.45	4.34
7	3.83	3.87	---	---	---	---	---	---	4.85	4.55	4.43	4.33
8	3.81	3.90	---	---	---	---	---	---	4.83	4.62	4.41	4.31
9	3.81	3.89	---	---	---	---	---	---	4.83	4.64	4.38	4.29
10	3.89	3.88	---	---	---	---	---	---	4.81	4.63	4.36	4.30
11	3.89	3.88	---	---	---	---	---	---	4.88	4.60	4.33	4.29
12	3.88	3.87	---	---	---	---	---	---	4.88	4.57	4.36	4.27
13	3.89	3.87	---	---	---	---	---	---	4.86	4.55	4.37	4.25
14	3.91	3.87	---	---	---	---	---	---	4.88	4.53	4.36	4.26
15	3.90	3.88	---	---	---	---	---	---	4.87	4.51	4.33	4.26
16	3.90	3.87	---	---	---	---	---	---	4.84	4.49	4.31	4.24
17	3.89	3.87	---	---	---	---	---	5.40	4.82	4.46	4.35	4.23
18	3.87	3.87	---	---	---	---	---	5.36	4.80	4.43	4.31	4.23
19	3.86	3.91	---	---	---	---	---	5.32	4.77	4.42	4.30	4.23
20	3.85	3.90	---	---	---	---	---	5.29	4.82	4.40	4.29	4.28
21	3.84	3.89	---	---	---	---	---	5.26	4.82	4.51	4.34	4.32
22	3.84	3.89	---	---	---	---	---	5.22	4.82	4.57	4.42	4.30
23	3.84	3.88	---	---	---	---	---	5.19	4.81	4.55	4.42	4.29
24	3.86	3.91	---	---	---	---	---	5.14	4.84	4.53	4.42	4.30
25	3.90	3.96	---	---	---	---	---	5.12	4.83	4.52	4.42	4.28
26	3.91	3.96	---	---	---	---	---	5.12	4.83	4.53	4.41	4.30
27	3.91	3.97	---	---	---	---	---	5.11	4.80	4.52	4.40	4.30
28	3.89	3.98	---	---	---	---	---	5.08	4.79	4.51	4.39	4.30
29	3.87	3.98	---	---	---	---	---	5.04	4.76	4.51	4.38	4.30
30	3.88	3.99	---	---	---	---	---	5.04	4.72	4.50	4.37	4.33
31	3.91	---	---	---	---	---	---	5.02	---	4.50	4.34	---
MEAN	3.87	3.90	---	---	---	---	---	---	4.84	4.55	4.39	4.29
MAX	3.91	3.99	---	---	---	---	---	---	4.98	4.70	4.50	4.36
MIN	3.81	3.87	---	---	---	---	---	---	4.72	4.40	4.29	4.23

05428000 LAKE MENDOTA AT MADISON, WI

LOCATION.--Lat 43°05'42", long 89°22'12", in SE 1/4 sec.12, T.7 N., R.9 E., Dane County, Hydrologic Unit 07090001, in county boat house at dam at outlet, in Madison.

DRAINAGE AREA.--233 mi². Area of Lake Mendota, 15.2 mi².

PERIOD OF RECORD.--January 1916 to current year (incomplete).

REVISED RECORDS.--WDR WI-73-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 840.00 ft above sea level, or 5.60 ft below City of Madison datum. Prior to Oct. 1, 1979, at datum 7.82 ft higher; prior to Nov. 15, 1971, nonrecording gage at same site.

REMARKS.--Lake level regulated by concrete dam with two 12-foot gates and 20-foot lock at outlet. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 12.75 ft, June 5, 2000; minimum observed, 8.02 ft, Feb. 24 to Mar. 10, 1920, current datum.

EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 11.24 ft, Oct. 1; minimum recorded, 8.79 ft, Feb.7.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.22	10.47	9.70	9.17	8.88	9.24	9.40	9.95	10.03	10.09	9.81	9.93
2	11.19	10.43	9.70	9.14	8.86	9.29	9.42	10.00	10.00	10.08	9.80	9.98
3	11.14	10.36	9.73	9.11	8.86	9.30	9.42	9.98	10.09	10.06	9.78	10.02
4	11.10	10.31	9.74	9.08	8.85	9.28	9.42	9.97	10.28	10.04	9.81	10.00
5	11.05	10.23	9.77	9.07	8.84	9.28	9.42	9.97	10.38	10.00	9.82	10.00
6	10.99	10.16	9.78	9.05	8.83	9.28	9.41	9.97	10.40	9.98	9.80	9.99
7	10.92	10.10	9.79	9.03	8.83	9.28	9.44	9.98	10.39	9.98	9.79	9.99
8	10.85	10.04	9.79	9.01	8.83	9.30	9.55	9.95	10.38	9.97	9.78	9.99
9	10.81	9.95	9.78	8.99	8.83	9.35	9.65	10.04	10.36	9.96	9.77	9.99
10	10.79	9.88	9.77	8.98	8.88	9.38	9.68	10.01	10.35	9.92	9.77	10.00
11	10.77	9.82	9.77	8.97	8.89	9.40	9.70	10.02	10.39	9.88	9.77	9.97
12	10.71	9.74	9.77	8.95	8.89	9.41	9.74	10.09	10.36	9.86	9.79	9.96
13	10.66	9.68	9.83	8.94	8.88	9.42	9.75	10.12	10.33	9.85	9.85	9.94
14	10.64	9.65	9.81	8.93	8.87	9.44	9.77	10.12	10.34	9.84	9.86	9.93
15	10.57	9.61	9.80	8.92	8.87	9.43	9.78	10.11	10.30	9.83	9.84	9.91
16	10.51	9.55	9.81	8.91	8.87	9.43	9.80	10.12	10.26	9.81	9.84	9.89
17	10.42	9.50	9.81	8.90	8.87	9.43	9.82	10.10	10.22	9.79	9.87	9.88
18	10.33	9.44	9.78	8.89	8.86	9.43	9.82	10.08	10.20	9.78	9.86	9.87
19	10.29	9.43	9.77	8.88	8.92	9.44	9.87	10.06	10.17	9.75	9.86	9.91
20	10.28	9.40	9.70	8.88	9.05	9.46	9.88	10.04	10.16	9.75	9.84	9.96
21	10.29	9.40	9.65	8.87	9.16	9.48	9.87	10.02	10.15	9.79	9.84	9.96
22	10.32	9.41	9.60	8.87	9.19	9.46	9.89	9.98	10.14	9.84	9.94	9.94
23	10.52	9.42	9.60	8.87	9.20	9.44	9.88	9.96	10.13	9.83	9.96	9.90
24	10.59	9.50	9.57	8.86	9.21	9.44	9.90	9.96	10.11	9.80	9.98	9.87
25	10.63	9.57	9.51	8.85	9.24	9.43	9.91	9.98	10.09	9.78	9.98	9.85
26	10.59	9.58	9.44	8.85	9.26	9.42	9.89	9.98	10.12	9.79	9.98	9.85
27	10.55	9.61	9.42	8.85	9.26	9.41	9.87	9.98	10.12	e9.80	9.97	9.84
28	10.52	9.63	9.38	8.86	9.25	9.40	9.95	9.98	10.11	e9.81	9.96	9.83
29	10.54	9.64	e9.24	8.85	---	9.41	9.94	10.04	10.09	9.82	9.96	9.87
30	10.53	9.68	e9.18	8.85	---	9.41	9.95	10.05	10.09	9.82	9.95	9.89
31	10.51	---	9.19	8.86	---	9.40	---	10.04	---	9.81	9.94	---
MEAN	10.67	9.77	9.65	8.94	8.97	9.39	9.73	10.02	10.22	9.87	9.86	9.93
MAX	11.22	10.47	9.83	9.17	9.26	9.48	9.95	10.12	10.40	10.09	9.98	10.02
MIN	10.28	9.40	9.18	8.85	8.83	9.24	9.40	9.95	10.00	9.75	9.77	9.83

e Estimated

430309088284800 MIDDLE GENESEE LAKE NEAR OCONOMOWOC, WI

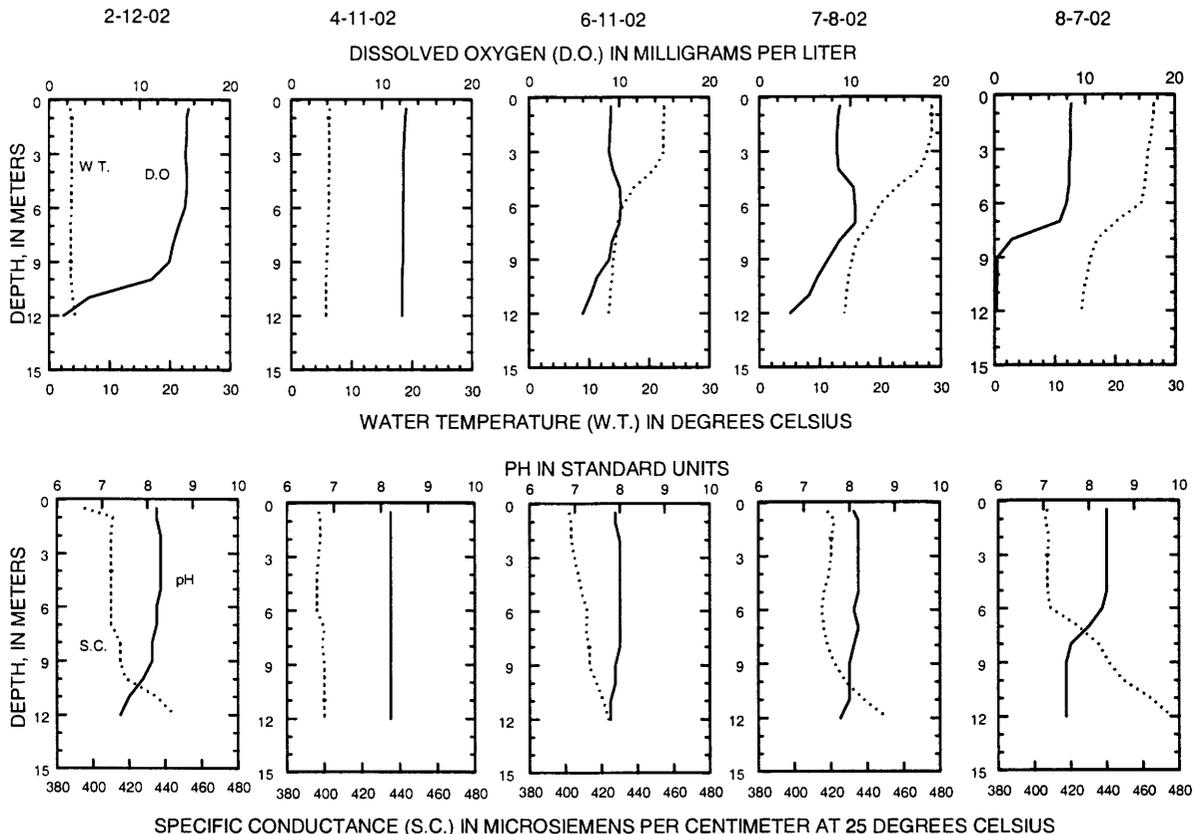
LOCATION.--Lat 43°03'09", long 88°28'48", in NW 1/4 SW 1/4 sec.22, T.7 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, 1.8 mi south of Oconomowoc.

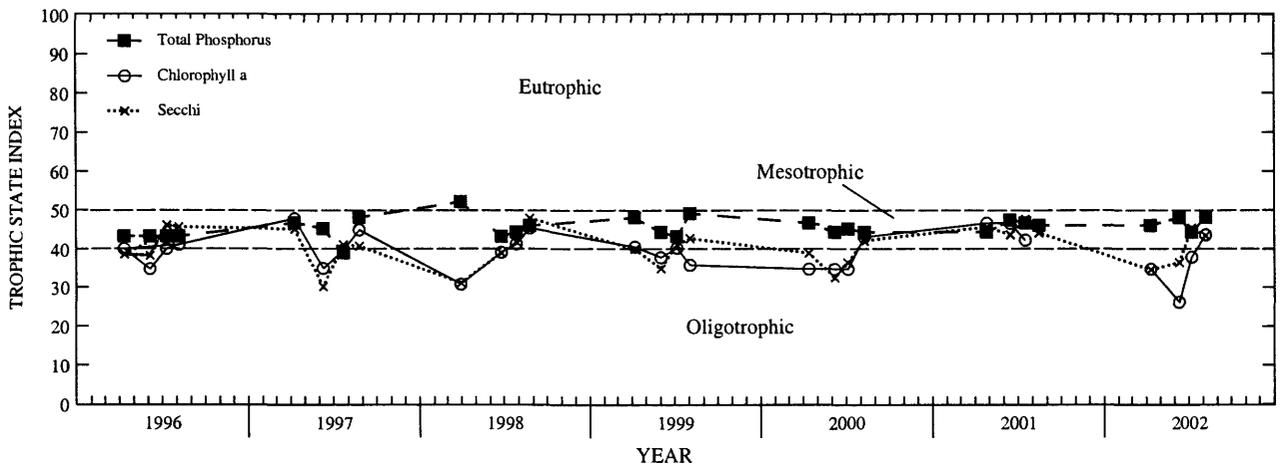
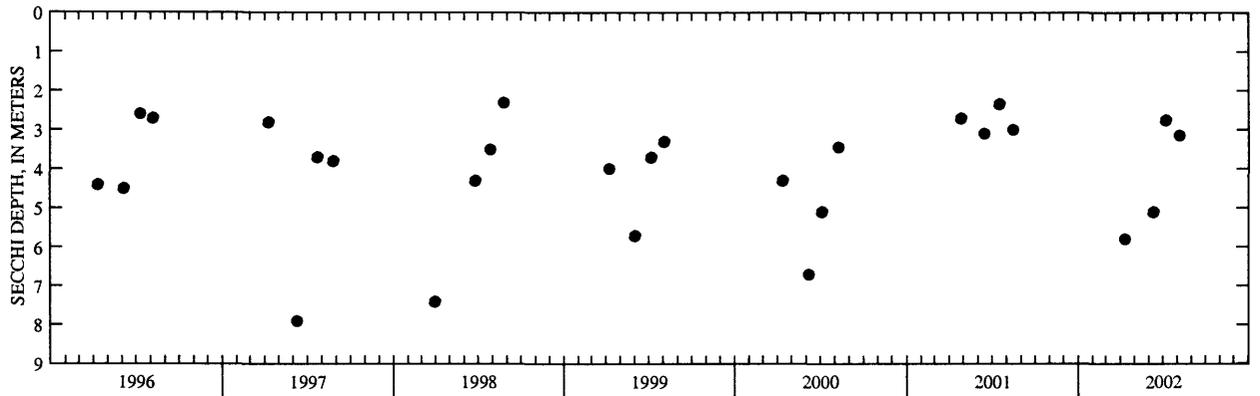
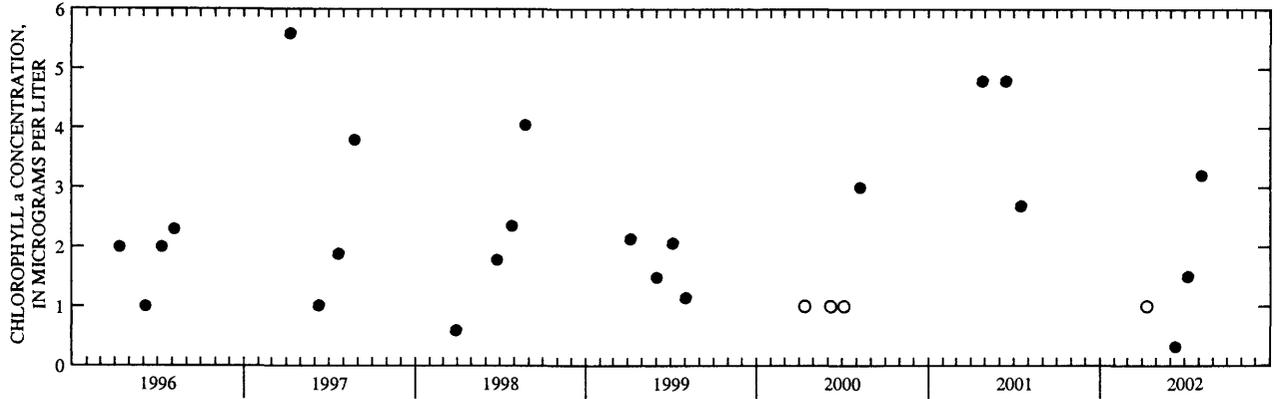
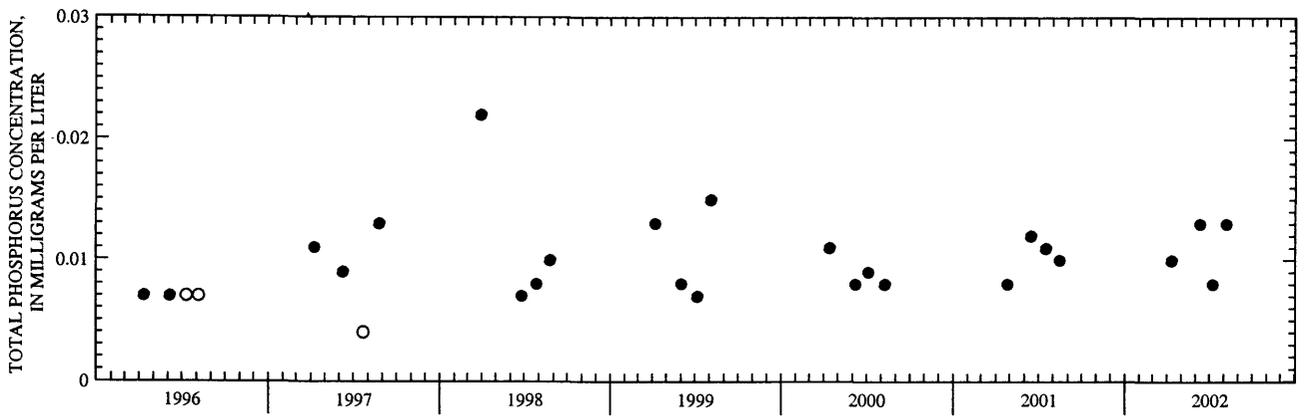
PERIOD OF RECORD.--February 1996 to current year.

REMARKS.--Lake sampled near center at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 12 TO AUGUST 07, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 12		Apr 11		Jun 11		Jul 8		Aug 7	
Lake stage (ft)	865.88		865.97		866.81		866.42		865.82	
Secchi-depth (m)	---		5.8		5.1		2.8		3.15	
Chlorophyll a, phytoplankton (µg/L)	---		<1.0		0.32		1.51		3.21	
Depth of sample (m)	0.5	11.5	0.5	12	0.5	12	0.5	12	0.5	11.5
Water temperature (°C)	3.5	4.3	6.4	5.8	22.5	13.3	28.5	14.1	26.4	14.4
Specific conductance (µS/cm)	395	445	397	400	402	424	418	451	407	476
pH (units)	8.2	7.4	8.2	8.2	7.9	7.8	8.1	7.8	8.4	7.5
Dissolved oxygen (mg/L)	15.4	1.6	12.7	12.2	9.1	5.9	8.9	3.4	8.5	0.2
Phosphorus, total (as P)	0.013	0.015	0.010	0.009	0.013	0.019	0.008	0.024	0.013	0.042
Phosphorus, ortho, dissolved (as P)	---	---	<.002	---	---	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.068	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.129	---	---	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.83	---	---	---	---	---	---	---
Nitrogen, total (as N)	---	---	0.9	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	5	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	1.6	---	---	---	---	---	---	---
Hardness, as CaCO ₃	---	---	190	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	30.7	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	27.4	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	12.0	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	1.00	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	---	---	156	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	---	---	14.2	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	28.2	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	---	---	0.827	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	226	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Middle Genesee Lake, near Oconomowoc, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

05429000 LAKE MONONA AT MADISON, WI

LOCATION.--Lat 43°03'48", long 89°23'49', in SW 1/4 sec.23, T.7 N., R.9 E., Dane County, Hydrologic Unit 07090001, in Brittingham Park, in Madison.

DRAINAGE AREA.--279 mi². Area of Lake Monona, 5.3 mi².

PERIOD OF RECORD.--September 1915 to current year (fragmentary) in reports of the Geological Survey. For 1856 to March 1917 in reports of Wisconsin Railroad Commission, volume 19.

REVISED RECORDS.--WSP 1338: Lake area. WDR WI-73-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 840.00 ft above sea level, or 5.60 ft below City of Madison datum. Prior to Oct. 1, 1979, datum 3.61 ft higher; prior to Nov. 15, 1971, nonrecording gage at same site at the higher datum.

REMARKS.--Lake level regulated by concrete dam with four 12-foot stop-log sections and 12-foot lock at outlet of Lake Waubesa. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 7.48 ft, June 14, 15, 2000; minimum observed, 3.22 ft, Jan. 20, 1965, current datum.

EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 6.15 ft, Oct. 2; minimum recorded, 4.19, Feb. 17 and 18.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.14	5.16	4.63	4.89	4.29	4.35	4.70	5.14	5.17	5.22	5.06	4.94
2	6.14	5.19	4.58	4.90	4.28	4.38	4.74	5.15	5.19	5.18	5.03	5.01
3	6.13	5.25	4.53	4.91	4.27	4.38	4.75	5.15	5.33	5.15	5.01	5.01
4	6.12	5.30	4.51	4.88	4.25	4.39	4.76	5.15	5.54	5.13	5.03	4.99
5	6.10	5.34	4.50	4.84	4.24	4.40	4.78	5.14	5.63	5.11	5.04	4.98
6	6.05	5.39	4.52	4.81	4.23	4.40	4.80	5.14	5.63	5.08	5.02	4.97
7	6.03	5.44	4.49	4.78	4.22	4.39	4.88	5.14	5.62	5.06	4.98	4.96
8	6.01	5.46	4.45	4.76	4.21	4.42	5.00	5.13	5.61	5.04	4.96	4.95
9	5.98	5.48	4.41	4.73	4.21	4.49	5.16	5.08	5.60	5.06	4.94	4.93
10	5.99	5.49	4.39	4.71	4.26	4.52	5.21	5.03	5.59	5.04	4.92	4.93
11	6.00	5.51	4.37	4.69	4.27	4.53	5.22	5.06	5.63	5.02	4.91	4.92
12	6.01	5.53	4.38	4.67	4.25	4.53	5.22	5.11	5.63	4.99	4.91	4.91
13	6.03	5.55	4.43	4.65	4.24	4.52	5.20	5.10	5.63	4.98	5.00	4.90
14	6.04	5.59	4.43	4.65	4.24	4.51	5.19	5.09	5.64	4.97	4.99	4.90
15	6.02	5.61	4.44	4.63	4.23	4.49	5.18	5.09	5.62	4.96	4.97	4.89
16	6.00	5.62	4.44	4.63	4.21	4.47	5.17	5.09	5.61	4.95	4.96	4.87
17	6.00	5.63	4.44	4.62	4.19	4.46	5.16	5.08	5.61	4.95	4.96	4.87
18	6.00	5.63	4.50	4.57	4.20	4.44	5.17	5.04	5.59	4.96	4.95	4.88
19	5.96	5.60	4.51	4.54	4.27	4.45	5.23	5.01	5.56	4.96	4.92	4.96
20	5.81	5.44	4.55	4.51	4.36	4.49	5.22	4.99	5.54	4.98	4.91	5.01
21	5.67	5.30	4.61	4.47	4.45	4.47	5.21	4.96	5.52	5.04	4.91	5.01
22	5.60	5.19	4.67	4.45	4.46	4.47	5.19	4.99	5.50	5.11	5.00	4.98
23	5.72	5.09	4.72	4.42	4.46	4.51	5.18	5.00	5.48	5.13	5.03	4.97
24	5.66	5.07	4.74	4.40	4.46	4.55	5.17	5.00	5.46	5.10	5.03	4.95
25	5.52	5.02	4.77	4.37	4.44	4.56	5.12	5.04	5.44	5.09	5.02	4.95
26	5.42	4.96	4.77	4.35	4.41	4.56	5.11	5.07	5.40	5.08	5.02	4.95
27	5.34	4.88	4.81	4.34	4.38	4.58	5.15	5.09	5.36	5.08	5.01	4.94
28	5.27	4.81	4.83	4.32	4.36	4.62	5.17	5.11	5.32	5.10	4.99	4.93
29	5.21	4.74	4.84	4.30	---	4.64	5.15	5.16	5.29	5.11	4.97	5.00
30	5.14	4.69	4.85	4.28	---	4.64	5.14	5.16	5.25	5.09	4.96	5.02
31	5.10	---	4.87	4.28	---	4.66	---	5.17	---	5.08	4.95	---
MEAN	5.81	5.30	4.58	4.59	4.30	4.49	5.08	5.09	5.50	5.06	4.98	4.95
MAX	6.14	5.63	4.87	4.91	4.46	4.66	5.23	5.17	5.64	5.22	5.06	5.02
MIN	5.10	4.69	4.37	4.28	4.19	4.35	4.70	4.96	5.17	4.95	4.91	4.87

25344088070100 MUSKEGO (BIG MUSKEGO) LAKE, BASS BAY, NEAR MUSKEGO, WI

LOCATION.--Lat 42°53'44", long 88°07'01", in SW 1/4 NE 1/4 sec.15, T.5 N., R.20 E., Waukesha County, Hydrologic Unit 07120006, 1.3 mi southeast of Muskego.

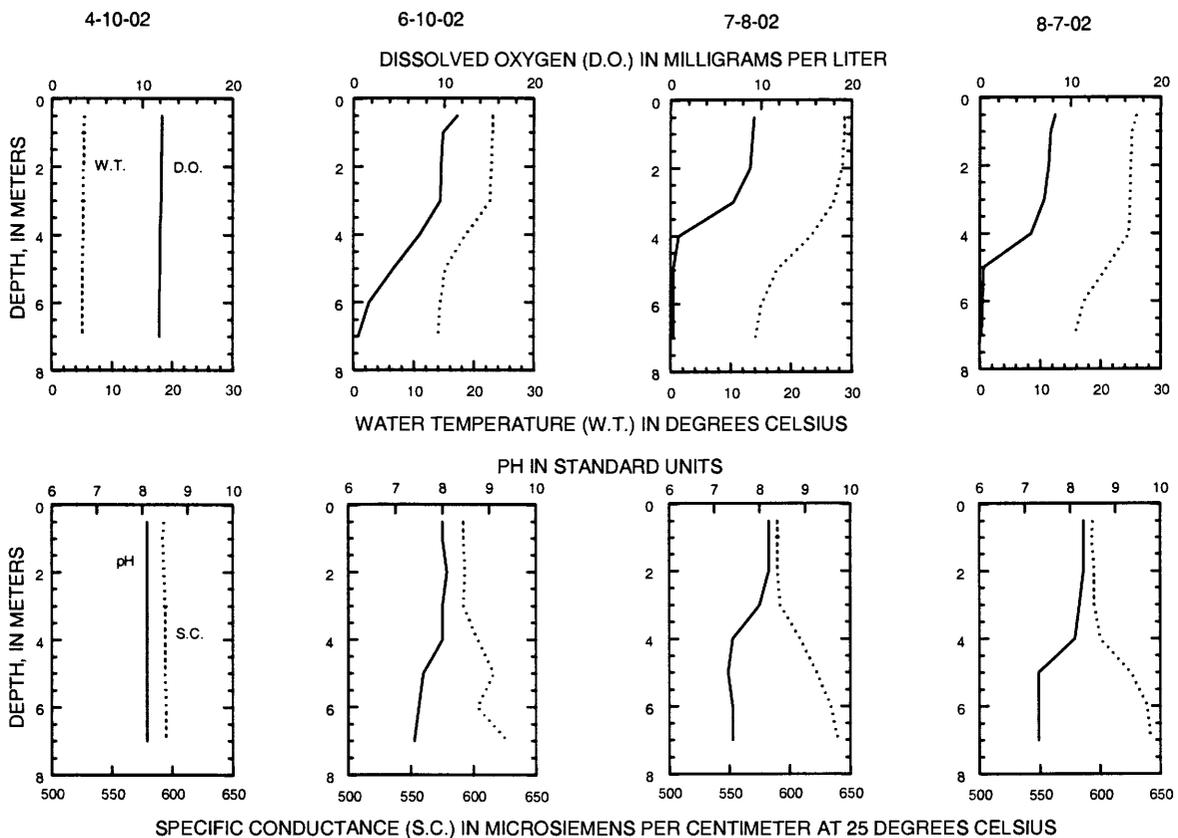
PERIOD OF RECORD.--February 1988 to current year. Prior to October 2000, published as "Big Muskego Lake".

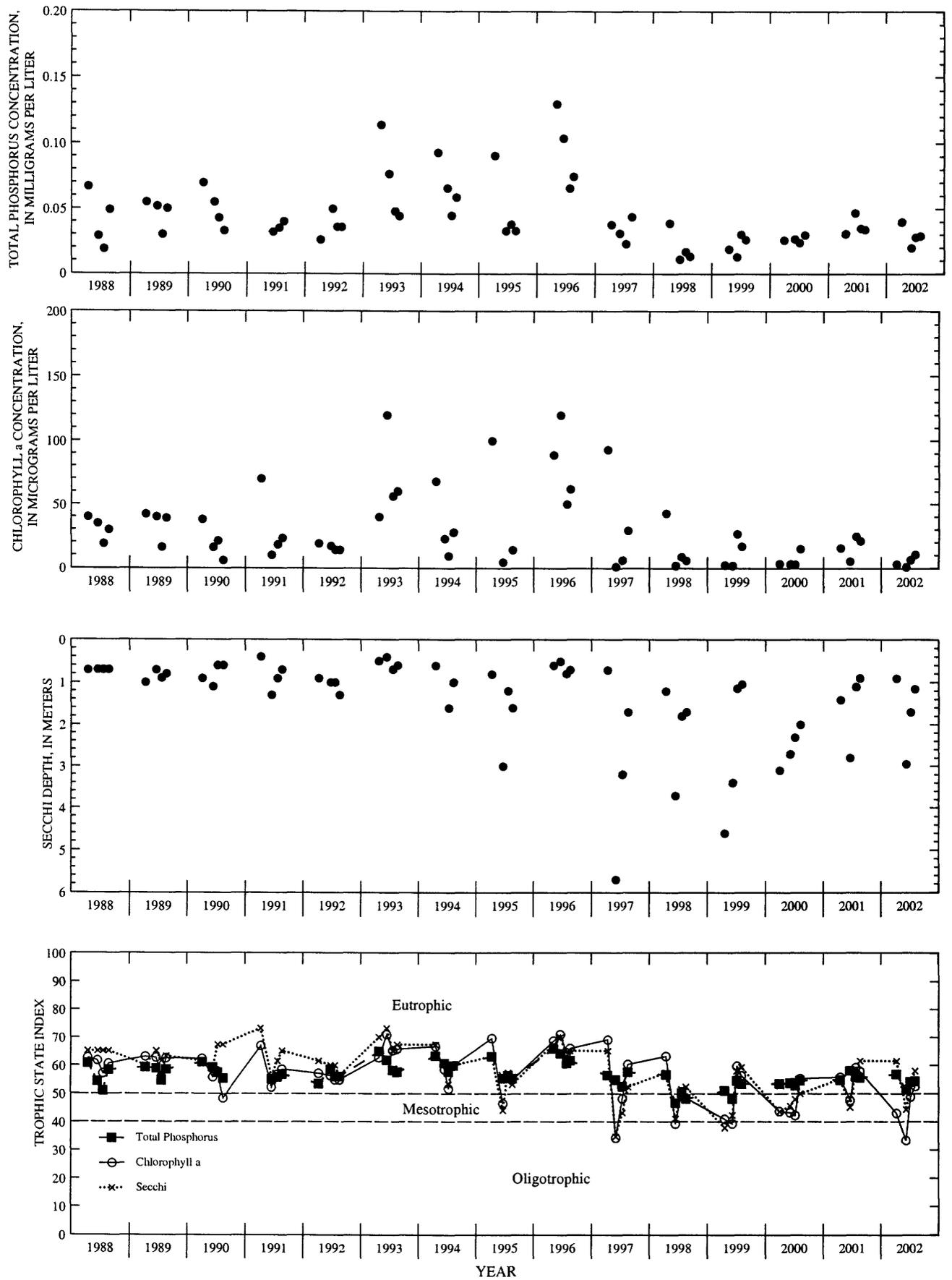
REMARKS.--Lake sampled near center at the deep hole. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 10 TO AUGUST 7, 2002

(Milligrams per liter unless otherwise indicated)

	Apr 10		Jun 10		Jul 8		Aug 7				
Lake stage (ft)	12.00		11.70		11.11		10.75				
Secchi-depth (m)	0.9		2.9		1.7		1.2				
Chlorophyll a, phytoplankton (µg/L)	3.00		0.83		6.32		10.5				
Depth of sample (m)	0.5	7.5	0.5	7	0.5	7	0.5	4	5	6	6.5
Water temperature (°C)	5.4	5.1	23.1	14	28.8	14.1	25.9	24.7	21	17.2	15.7
Specific conductance (µS/cm)	593	597	592	627	590	640	594	600	625	639	642
pH (units)	8.1	8.1	8	7.4	8.2	7.4	8.3	8.1	7.3	7.3	7.3
Dissolved oxygen (mg/L)	12.2	11.8	11.5	0.5	9.2	0.3	8.3	5.6	0.4	0.3	0.2
Phosphorus, total (as P)	0.040	0.039	0.020	0.082	0.028	0.35	0.029	0.051	0.088	0.124	0.160
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	---	---	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , dissolved (as N)	0.49	---	---	---	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.016	---	---	---	---	---	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	0.8	---	---	---	---	---	---	---	---	---	---
Nitrogen, total (as N)	1.3	---	---	---	---	---	---	---	---	---	---
Color (Pt-Co. scale)	25	---	---	---	---	---	---	---	---	---	---
Turbidity (NTU)	12	---	---	---	---	---	---	---	---	---	---
Hardness, as CaCO ₃	240	---	---	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	48.6	---	---	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	28.9	---	---	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	29.1	---	---	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	2.00	---	---	---	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	171	---	---	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	41.1	---	---	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	62.8	---	---	---	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	0.614	---	---	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	360	---	---	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	<100	---	---	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	<1	---	---	---	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Big Muskego Lake, Bass Bay, near Muskego, Wisconsin.

425109088075000 MUSKEGO (BIG MUSKEGO) LAKE NEAR WIND LAKE, WI

LOCATION.--Lat 42°51'09", long 88°07'50", in SE 1/4 NE 1/4 sec.33, T.5 N., R.20 E., Waukesha County, Hydrologic Unit 07120006, on left bank 8 ft upstream of dam outlet of Muskego Lake, 700 ft north of Muskego Dam Drive, 2 mi northeast of Wind Lake.

DRAINAGE AREA.--33.9 mi² (revised).

PERIOD OF RECORD.--October 1987 to September 1989, January 1991 to current year. Prior to October 1993, published as Muskego Lake Outlet near Wind Lake, WI. October 1993 to September 2000, published as "Big Muskego Lake".

GAGE.--Water-stage recorder. Datum of gage is 760.00 ft above sea level. October to December 1987 and January 1991 to September 1995, nonrecording gage at the same datum. December 1987 through September 1989, data collected using water-stage recorder at the same datum.

REMARKS.--Lake levels regulated by concrete dam with one 5-ft lift gate.

EXTREMES FOR PERIOD OF RECORD.--Maximum observed gage height, 12.60 ft, Oct. 7, 1991 and Aug. 8, 1994; minimum instantaneous, less than 8.72 ft, July 12, 1996 to Feb. 18, 1997, due to drawdown of lake.

EXTREMES FOR CURRENT YEAR.--Maximum observed gage-height, 12.05 ft, Mar. 14 and Apr. 9; minimum observed, 10.48 ft, Aug. 12.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.53	11.65	11.65	11.73	11.73	11.82	11.71	11.67	11.60	11.29	10.75	11.19
2	11.52	11.68	11.67	11.72	11.73	11.84	11.75	11.68	11.64	11.26	10.83	11.18
3	11.47	11.66	11.69	11.71	11.73	11.85	11.73	11.69	11.70	11.25	10.78	11.24
4	11.52	11.64	11.69	11.71	11.72	11.84	11.72	11.66	11.75	11.31	10.78	11.25
5	11.53	11.59	11.59	11.71	11.72	11.82	11.72	11.70	11.85	11.27	10.85	11.26
6	11.51	11.55	11.69	11.71	11.71	11.81	11.70	11.64	11.87	11.21	10.86	11.24
7	11.51	11.57	11.73	11.70	11.71	11.80	11.69	11.76	11.82	11.17	10.75	11.24
8	11.48	11.56	11.73	11.70	11.71	11.81	11.86	11.66	11.79	11.11	10.73	11.23
9	11.45	11.47	11.71	11.70	11.71	11.85	12.02	11.55	11.77	11.22	10.71	11.22
10	11.44	11.51	11.69	11.70	11.75	11.92	12.00	11.62	11.70	11.20	10.66	11.24
11	11.53	11.48	11.72	11.70	11.76	11.94	11.97	11.68	11.68	11.14	10.64	11.22
12	11.61	11.45	11.72	11.69	11.77	11.95	11.98	11.74	11.70	11.10	10.58	11.18
13	11.60	11.45	11.74	11.69	11.76	11.94	11.95	11.72	11.65	11.07	10.77	11.17
14	11.63	11.51	11.75	11.70	11.75	12.00	11.88	11.70	11.62	11.05	10.99	11.16
15	11.64	11.52	11.73	11.70	11.76	11.90	11.84	11.60	11.58	11.03	10.96	11.21
16	11.70	11.57	11.74	11.71	11.76	11.94	11.73	11.70	11.54	10.99	11.06	11.13
17	11.68	11.55	11.77	11.72	11.76	11.91	11.75	11.75	11.50	10.96	11.00	11.13
18	11.64	11.55	11.75	11.72	11.74	11.87	11.70	11.68	11.53	10.98	11.07	11.16
19	11.68	11.58	11.77	11.72	11.79	11.86	11.79	11.67	11.49	10.97	11.11	11.16
20	11.70	11.53	11.75	11.72	11.83	11.85	11.82	11.68	11.47	10.91	11.08	11.19
21	11.72	11.53	11.76	11.72	11.88	11.85	11.72	11.61	11.52	10.83	11.04	11.23
22	11.74	11.54	11.76	11.70	11.86	11.78	11.62	11.53	11.48	10.86	11.20	11.23
23	11.82	11.56	11.69	11.70	11.85	11.76	11.58	11.51	11.46	10.96	11.26	11.17
24	11.86	11.57	11.75	11.70	11.84	11.88	11.53	11.69	11.45	10.84	11.26	11.19
25	11.66	11.54	11.75	11.70	11.89	11.83	11.51	11.64	11.42	10.78	11.27	11.17
26	11.90	11.64	11.75	11.69	11.87	11.72	11.57	11.56	11.40	10.88	11.27	11.20
27	11.90	11.61	11.75	11.69	11.84	11.69	11.60	11.62	11.43	10.86	11.30	11.24
28	11.79	11.65	11.74	11.70	11.82	11.67	11.66	11.63	11.39	10.85	11.27	11.18
29	11.87	11.70	11.74	11.69	---	11.70	11.60	11.62	11.37	10.85	11.25	11.21
30	11.82	11.69	11.74	11.69	---	11.67	11.63	11.59	11.34	10.84	11.23	11.19
31	11.70	---	11.74	11.72	---	11.68	---	11.60	---	10.82	11.22	---
MEAN	11.65	11.57	11.72	11.71	11.78	11.83	11.74	11.65	11.58	11.03	10.98	11.20
MAX	11.90	11.70	11.77	11.73	11.89	12.00	12.02	11.76	11.87	11.31	11.30	11.26
MIN	11.44	11.45	11.59	11.69	11.71	11.67	11.51	11.51	11.34	10.78	10.58	11.13

425212088072800 MUSKEGO (BIG MUSKEGO) LAKE, SOUTH SITE, NEAR MUSKEGO, WI

LOCATION.--Lat 42°52'12", long 88°07'28", in NW 1/4 NW 1/4 sec.27, T.5 N., R.20 E., Waukesha County, Hydrologic Unit 07120006, near Muskego.

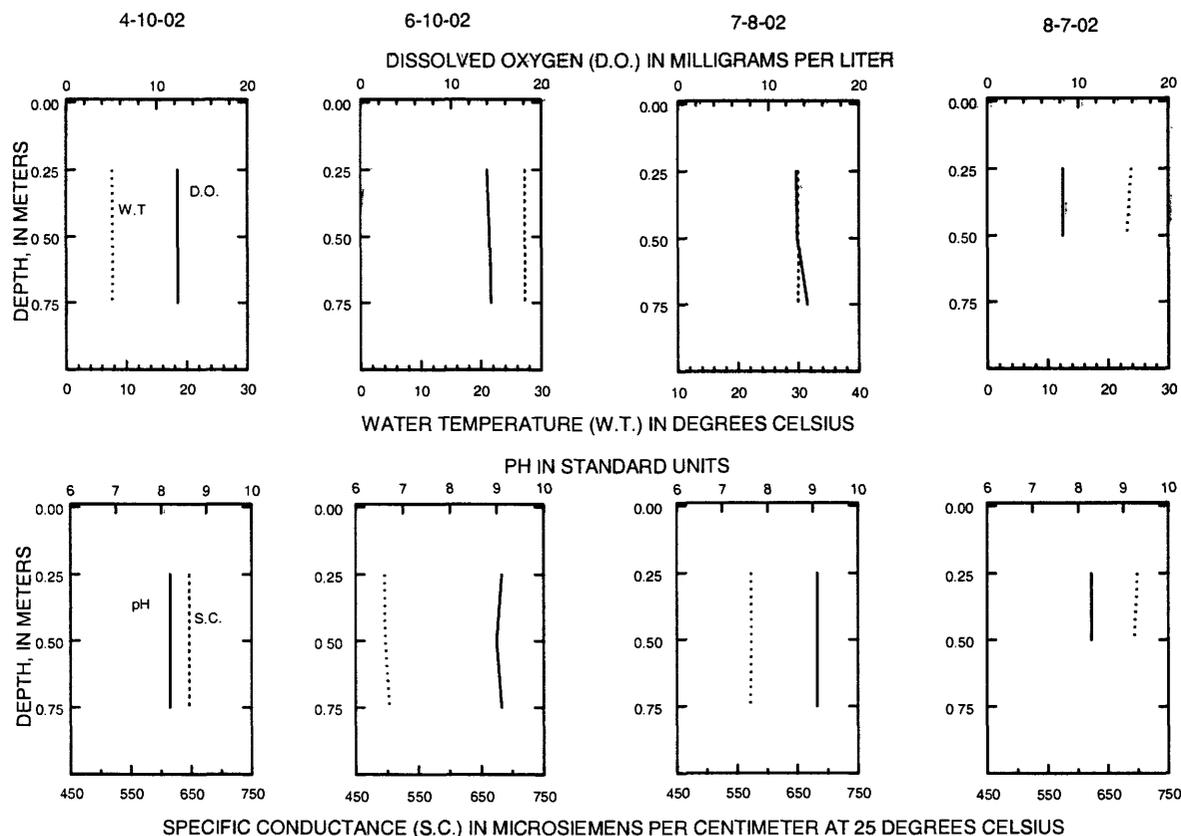
DRAINAGE AREA.--33.9 mi².

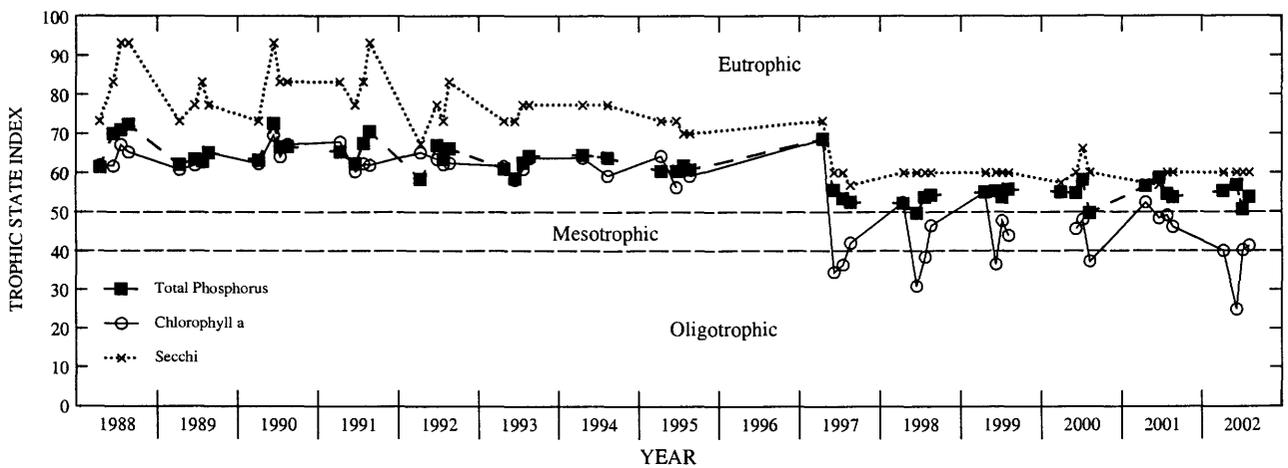
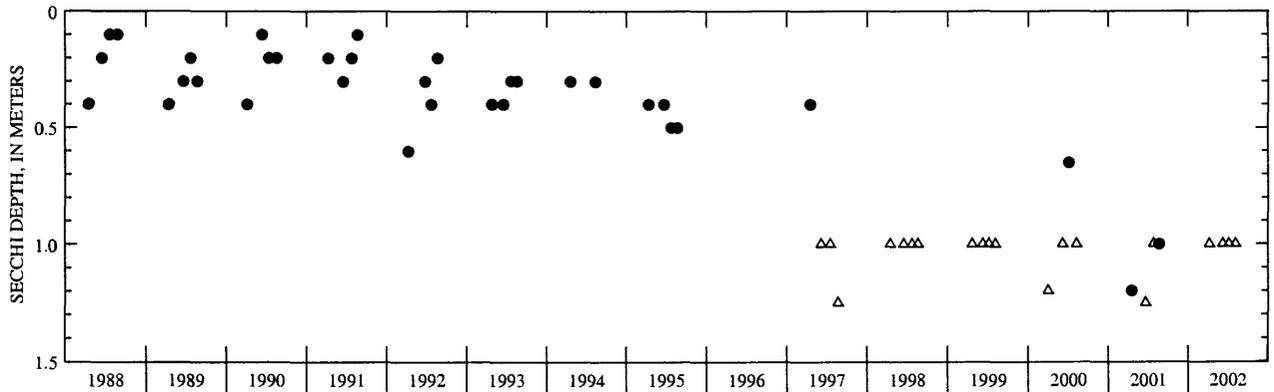
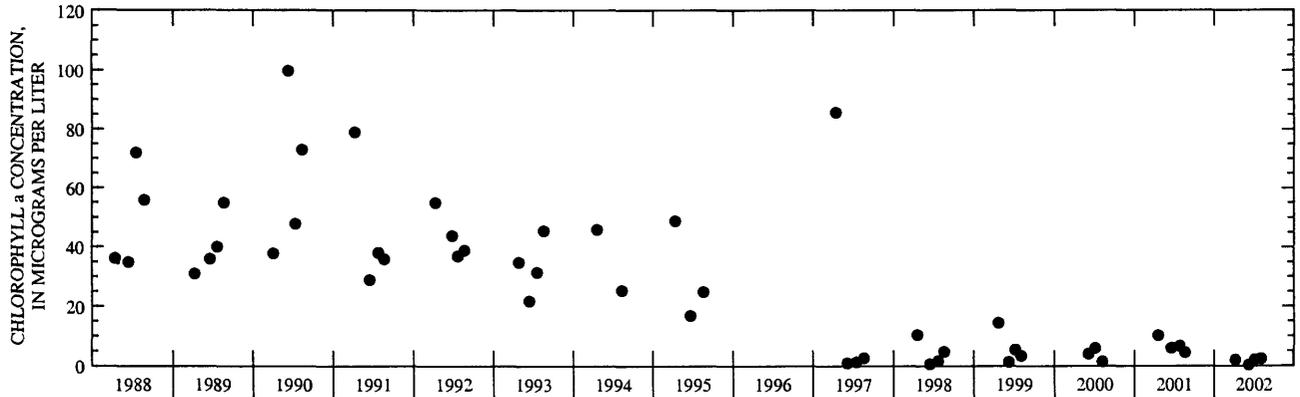
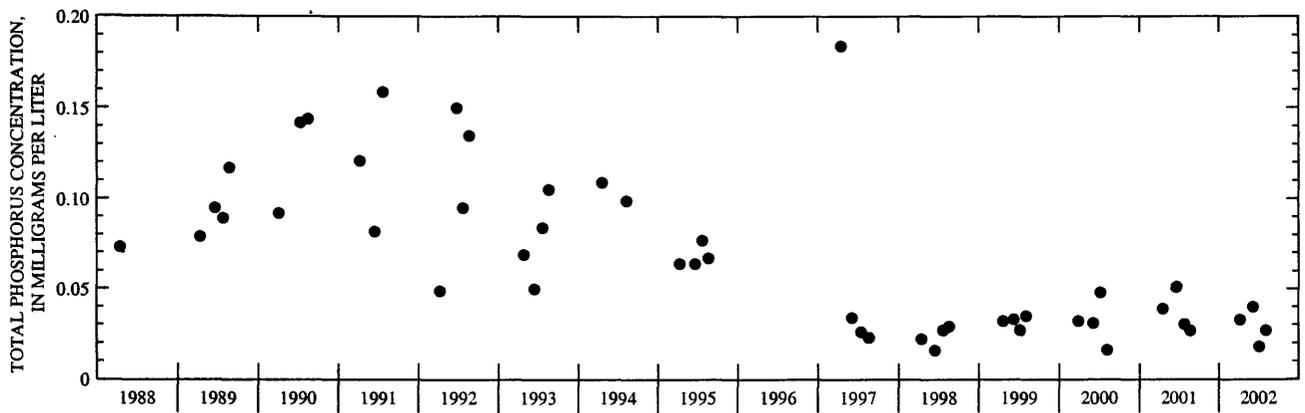
PERIOD OF RECORD.--February 1988 to current year. Prior to October 2000, published as "Big Muskego Lake".

REMARKS.--Lake sampled at south end of lake at a depth of about 1 m. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 10 TO AUGUST 7, 2002
(Milligrams per liter unless otherwise indicated)

	Apr 10	Jun 10	Jul 8	Aug 7
Lake stage (ft)	12.00	11.70	11.11	10.75
Secchi-depth (m)	>1.0	>1.0	>1.0	>1.0
Chlorophyll a, phytoplankton (µg/L)	2.00	0.27	2.05	2.38
Depth of sample (m)	0.5	0.5	0.5	0.5
Water temperature (°C)	7.6	27.2	29.9	23.8
Specific conductance (µS/cm)	647	495	573	699
pH (units)	8.2	9.1	9.1	8.3
Dissolved oxygen (mg/L)	12.3	14	13.1	8.3
Phosphorus, total (as P)	0.033	0.040	0.018	0.027
Phosphorus, ortho, dissolved (as P)	<0.002	---	<0.002	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.010	---	0.011	---
Nitrogen, ammonia, dissolved (as N)	0.016	---	0.015	---
Nitrogen, amm. + org., diss. (as N)	---	---	1.4	---
Nitrogen, amm. + org., total (as N)	0.95	---	---	---
Color (Pt-Co. scale)	20	---	---	---
Turbidity (NTU)	5.2	---	---	---
Hardness, as CaCO ₃	230	---	---	---
Calcium, dissolved (Ca)	45.8	---	---	---
Magnesium, dissolved (Mg)	28	---	---	---
Sodium, dissolved (Na)	39.5	---	---	---
Potassium, dissolved (K)	2.00	---	---	---
Alkalinity as CaCO ₃	177	---	---	---
Sulfate, dissolved (SO ₄)	35.9	---	---	---
Chloride, dissolved (Cl)	80.8	---	---	---
Silica, dissolved (SiO ₂)	0.293	---	---	---
Solids, dissolved, at 180°C	390	---	---	---
Iron, dissolved (Fe) µg/L	<100	---	---	---
Manganese, dissolved (Mn) µg/L	20	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Big Muskego Lake, South Site, near Muskego, Wisconsin.
 (Triangles indicate maximum depth at sampling site. Actual Secchi depth on these days was greater than plotted triangles.)

430551088273500 OCONOMOWOC LAKE NO. 1 (CENTER) AT OCONOMOWOC, WI

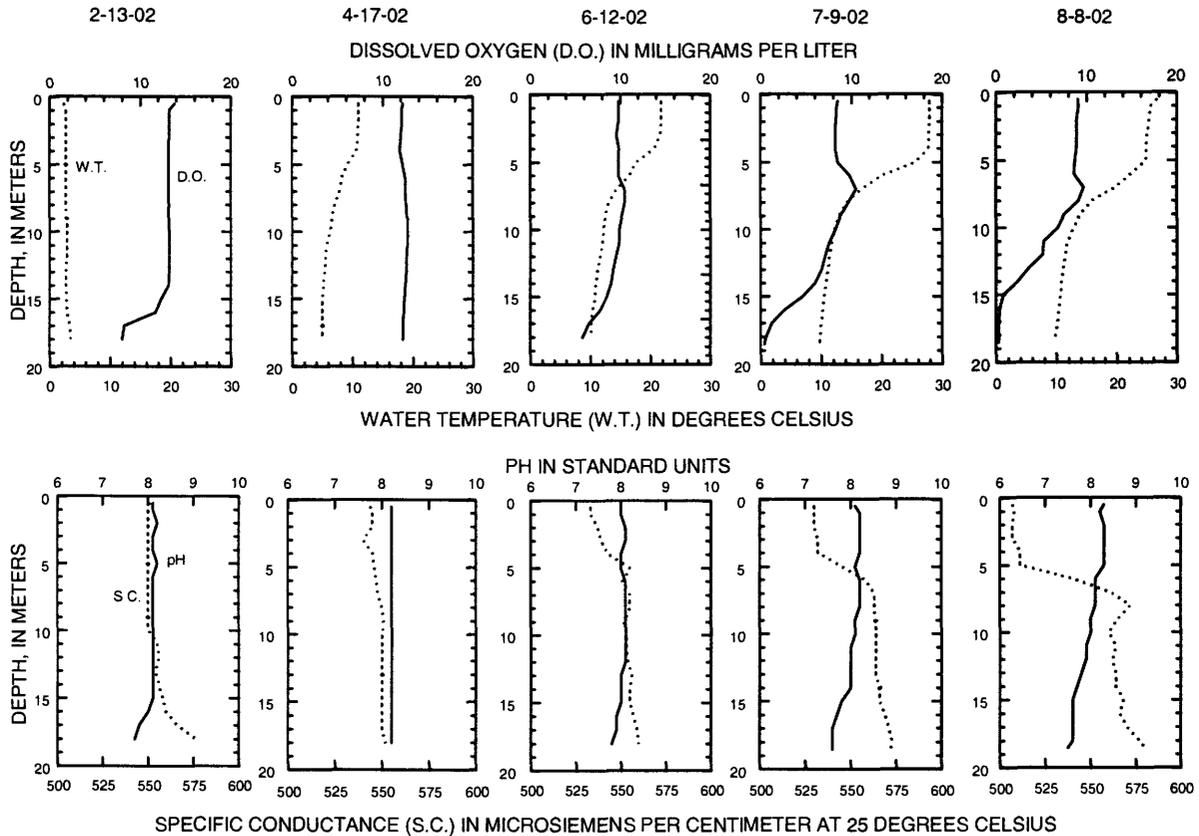
LOCATION.--Lat 43°05'51", long 88°27'35", in NW 1/4 SE 1/4 sec.2, T.7 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Oconomowoc.

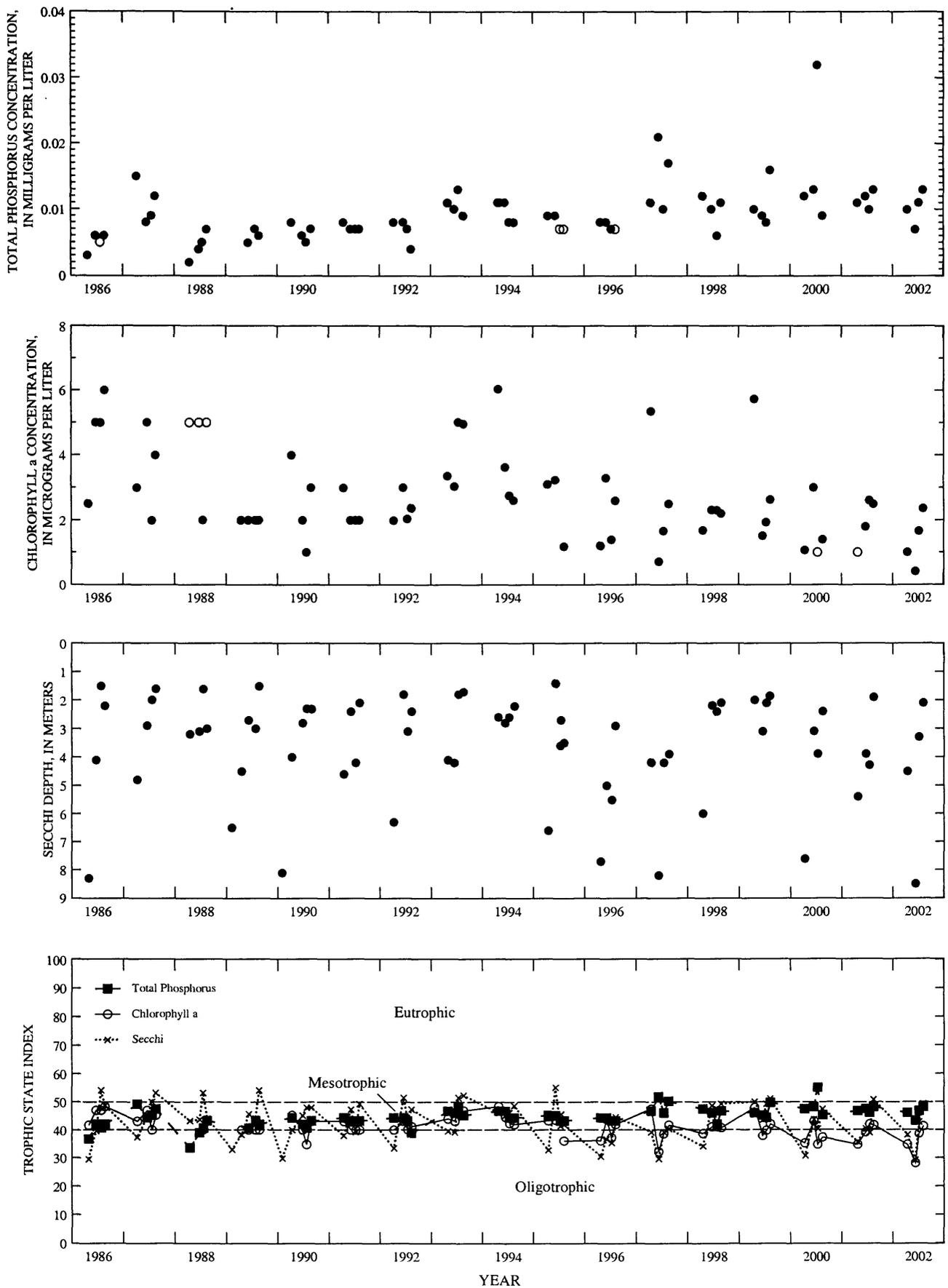
PERIOD OF RECORD.--March 1986 to current year.

REMARKS.--Lake sampled near center at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 13 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 13		Apr 17		Jun 12		Jul 9		Aug 8	
Lake stage (ft)	6.21		6.9		---		8.01		7.87	
Secchi-depth (m)	---		4.5		8.5		3.3		2.10	
Chlorophyll a, phytoplankton (µg/L)	---		1.00		0.41		1.67		2.35	
Depth of sample (m)	0.5	17.5	0.5	18	0.5	18	0.5	18.5	0.5	18.5
Water temperature (°C)	2.3	3.5	11	5	21.8	10.1	27.9	9.8	26.7	9.6
Specific conductance (µS/cm)	551	576	544	552	533	560	530	572	507	580
pH (units)	8.1	7.7	8.2	8.2	8	7.8	8.1	7.6	8.3	7.5
Dissolved oxygen (mg/L)	13.8	8.0	12.2	12.2	9.8	5.8	8.5	0.4	9	0.3
Phosphorus, total (as P)	0.013	0.012	0.010	0.008	0.007	0.021	0.011	0.047	0.013	0.023
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.287	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.018	---	---	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.49	---	---	---	---	---	---	---
Nitrogen, total (as N)	---	---	0.78	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	5	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	<1.0	---	---	---	---	---	---	---
Hardness, as CaCO ₃	---	---	260	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	48.3	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	33.1	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	16.7	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	2.00	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	---	---	213	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	---	---	25.6	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	39.7	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	---	---	5.55	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	320	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Oconomowoc Lake, Center Site, at Oconomowoc, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

430609088262200 OCONOMOWOC LAKE NO. 2 (OFF HEWITT POINT) AT OCONOMOWOC, WI

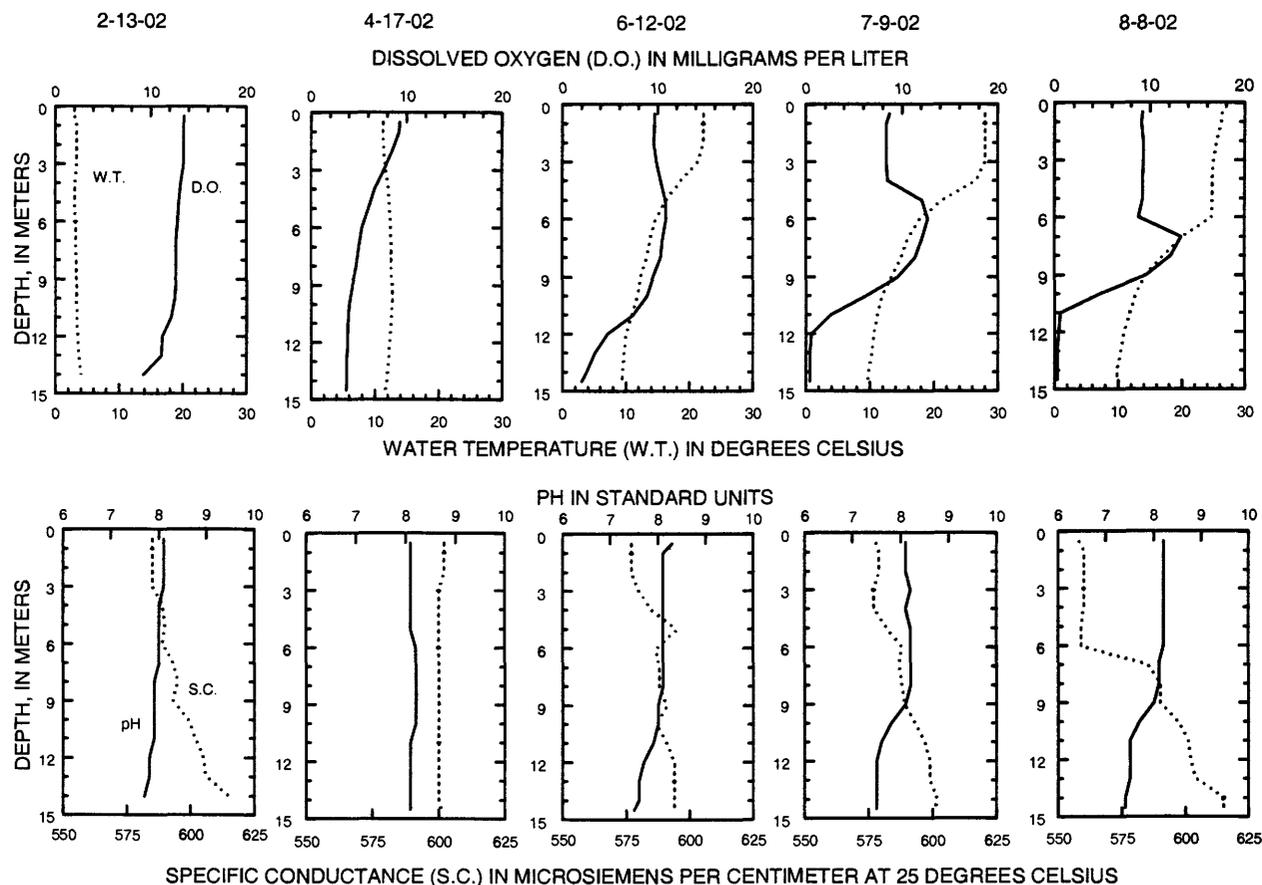
LOCATION.--Lat 43°06'09", long 88°26'22", in NW 1/4 NW 1/4 sec.1, T.7 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Oconomowoc.

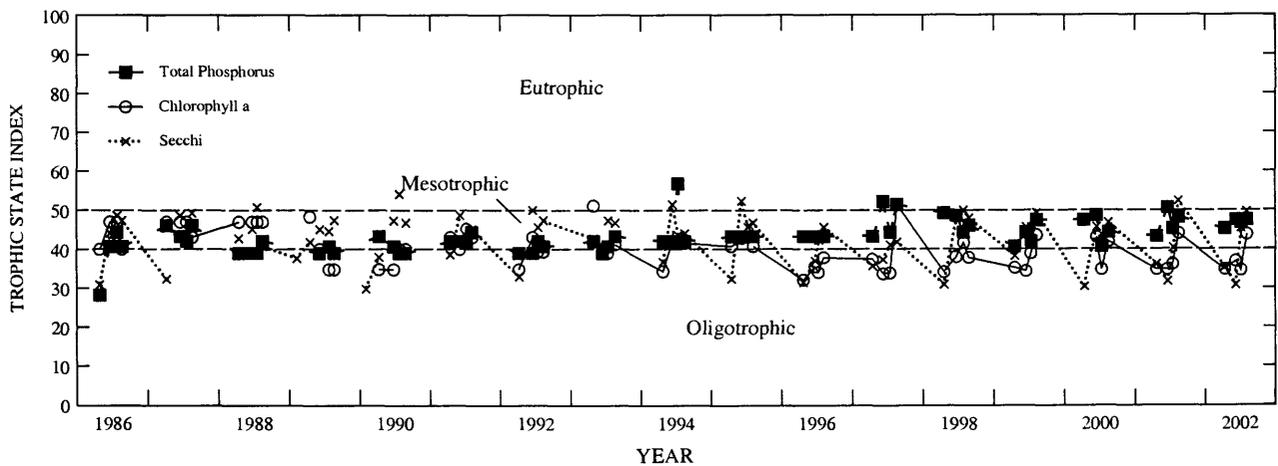
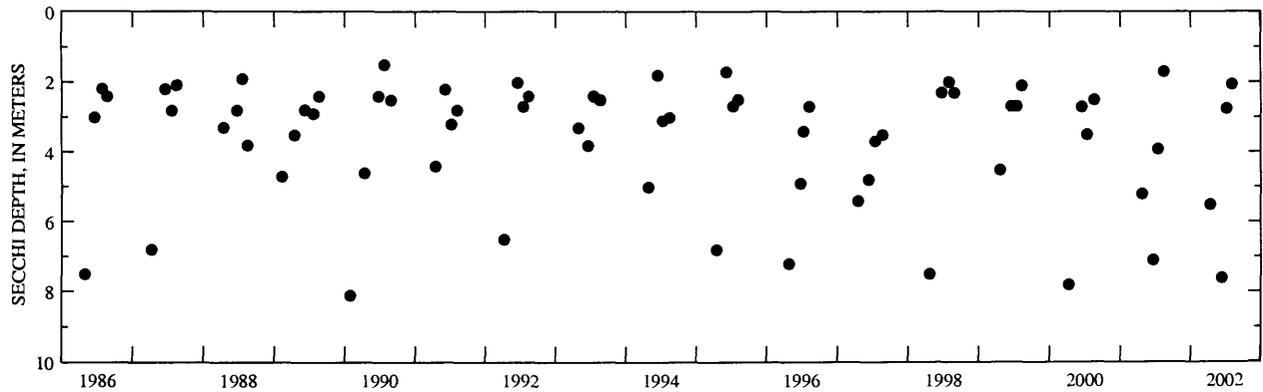
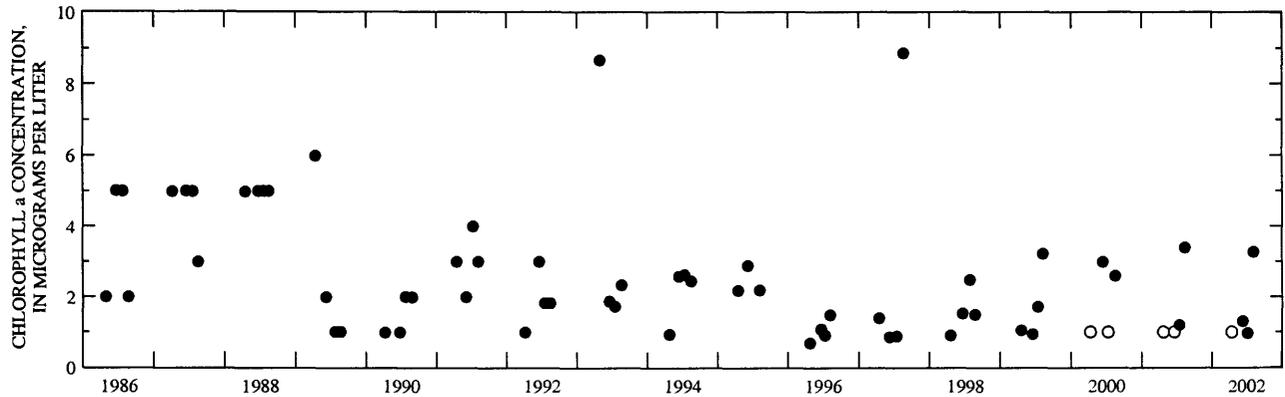
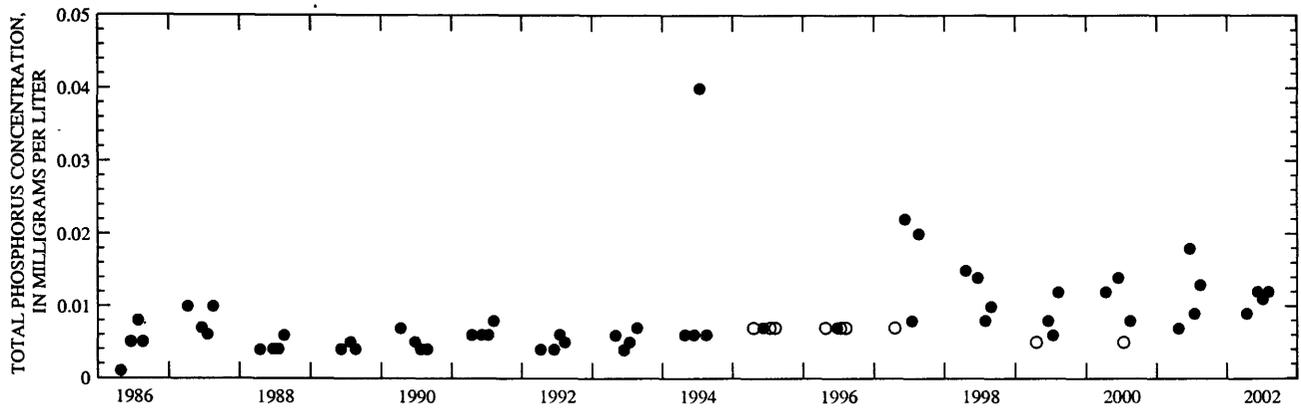
PERIOD OF RECORD.--March 1986 to current year.

REMARKS.--Lake sampled at the deepest point in northeast bay near Hewitt Point. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 13 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Feb 13</u>		<u>Apr 17</u>		<u>Jun 12</u>		<u>Jul 9</u>		<u>Aug 8</u>	
Lake stage (ft)	6.21		6.90		---		8.01		7.87	
Secchi-depth (m)	---		5.5		7.6		2.8		2.1	
Chlorophyll a, phytoplankton (µg/L)	---		<1.00		1.32		0.97		3.27	
Depth of sample (m)	0.5	14	0.5	14.5	0.5	14	0.5	14.5	0.5	14.5
Water temperature (°C)	3.1	4.0	13.9	5.5	22.2	9.4	28	9.7	26.4	9.8
Specific conductance (µS/cm)	585	615	602	601	577	594	578	601	558	615
pH (units)	8.1	7.7	8.1	8.1	8.1	7.6	8.1	7.5	8.2	7.4
Dissolved oxygen (mg/L)	13.5	9.2	11.3	11.6	9.7	2.5	8.7	0.4	9.2	0.3
Phosphorus, total (as P)	0.012	0.012	0.009	0.009	0.012	0.018	0.011	0.028	0.012	0.037





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Oconomowoc Lake, Hewitt Point, at Oconomowoc, Wisconsin.

(Circles of the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

430633088271400 UPPER OCONOMOWOC LAKE NEAR OCONOMOWOC, WI

LOCATION.--Lat 43°06'33", long 88°27'14", in SE 1/4 SW 1/4 sec.35, T.8 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, near Oconomowoc.

PERIOD OF RECORD.--April to September 2002.

REMARKS.--Lake sampled at deepest hole. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 17 TO JUNE 11, 2002
(Milligrams per liter unless otherwise indicated)

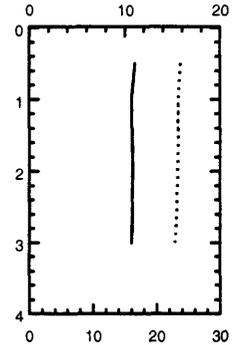
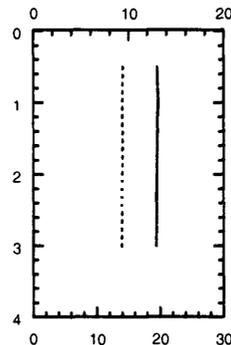
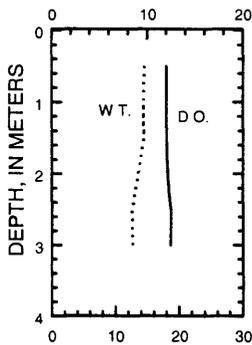
	<u>Apr 17</u>		<u>May 23</u>		<u>Jun 11</u>	
Lake stage (ft)	4.77		4.67		4.91	
Secchi-depth (m)	---		6.2		2.0	
Chlorophyll a, phytoplankton (µg/L)	---		---		1.65	
Depth of sample (m)	0.5	3	0.5	3	0.5	3
Water temperature (°C)	14.5	12.7	14	13.9	23.7	22.9
Specific conductance (µS/cm)	557	560	532	557	530	532
pH (units)	8.3	8.2	8.3	8.3	8.3	8.3
Dissolved oxygen (mg/L)	12.0	12.4	13.0	12.9	11.0	10.7
Phosphorus, total (as P)	0.013	0.014	0.013	0.017	0.014	0.012

4-17-02

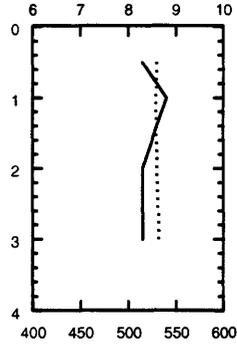
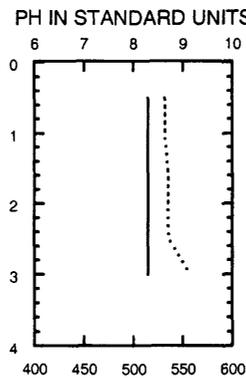
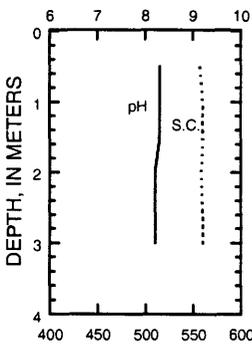
5-23-02

6-11-02

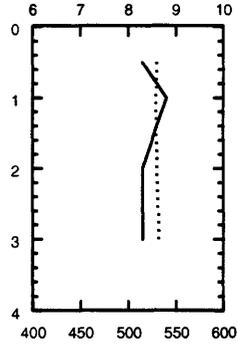
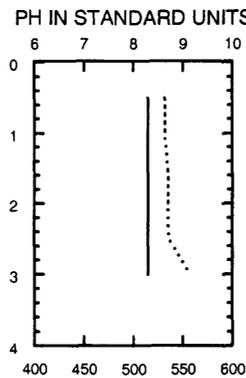
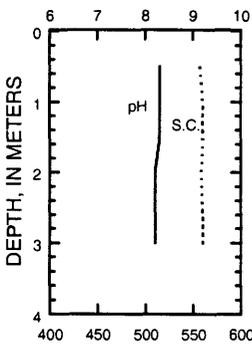
DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



PH IN STANDARD UNITS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

430723088252100 OKAUCHEE LAKE AT OKAUCHEE, WI

LOCATION.--Lat 43°07'23", long 88°25'21", in SE 1/4 SE 1/4, sec.25, T.8 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Okauchee.
DRAINAGE AREA.--80.7 mi².

PERIOD OF RECORD.--February 1984 to current year.

LAKE-STAGE GAGE.--Datum of gage is 869.00 ft above sea level.

REMARKS.--Lake sampled near center at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 12 TO JUNE 11, 2002
(Milligrams per liter unless otherwise indicated)

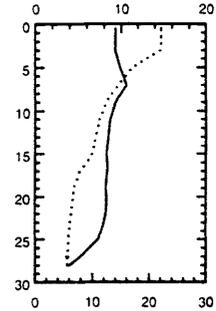
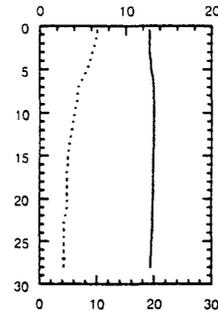
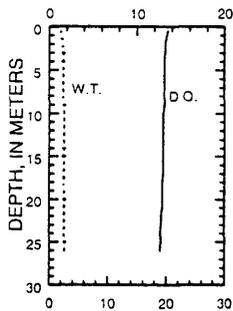
	Feb 13		Apr 17		Jun 11	
Lake stage (ft)	4.05		4.77		4.91	
Secchi-depth (m)	---		3.5		2.1	
Chlorophyll a, phytoplankton (µg/L)	---		3.00		0.74	
Depth of sample (m)	0.5	26	0.5	27.5	0.5	28
Water temperature (°C)	2	2.6	10	4.2	22.1	5.6
Specific conductance (µS/cm)	555	561	567	569	549	569
pH (units)	8.2	8.1	8.3	8.3	8.3	7.8
Dissolved oxygen (mg/L)	13.5	12.6	12.8	12.9	9.3	4
Phosphorus, total (as P)	0.014	0.018	0.017	0.014	0.011	0.046
Phosphorus, ortho, dissolved (as P)	---	---	<.002	---	---	---
Nitrogen, NO ₂ + NO ₃ , dissolved (as N)	---	---	0.495	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	<.013	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.53	---	---	---
Nitrogen, total (as N)	---	---	1.0	---	---	---
Color (Pt-Co. scale)	---	---	15	---	---	---
Turbidity (NTU)	---	---	1.2	---	---	---
Hardness, as CaCO ₃	---	---	270	---	---	---
Calcium, dissolved (Ca)	---	---	53.8	---	---	---
Magnesium, dissolved (Mg)	---	---	32.7	---	---	---
Sodium, dissolved (Na)	---	---	13.6	---	---	---
Potassium, dissolved (K)	---	---	2.0	---	---	---
Alkalinity as CaCO ₃	---	---	231	---	---	---
Sulfate, dissolved (SO ₄)	---	---	26	---	---	---
Chloride, dissolved (Cl)	---	---	34.7	---	---	---
Silica, dissolved (SiO ₂)	---	---	4.34	---	---	---
Solids, dissolved, at 180°C	---	---	322	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---

2-13-02

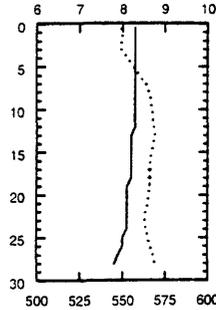
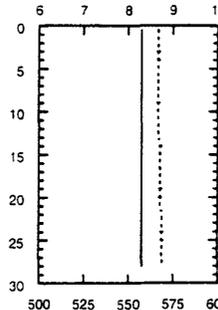
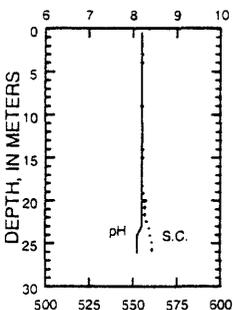
4-17-02

6-11-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



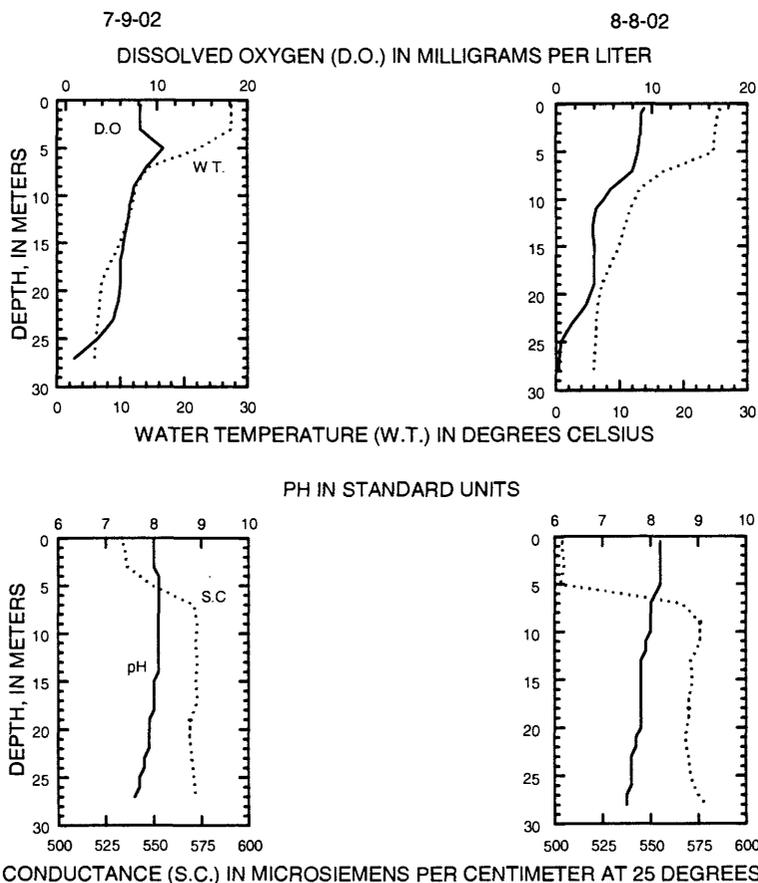
WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

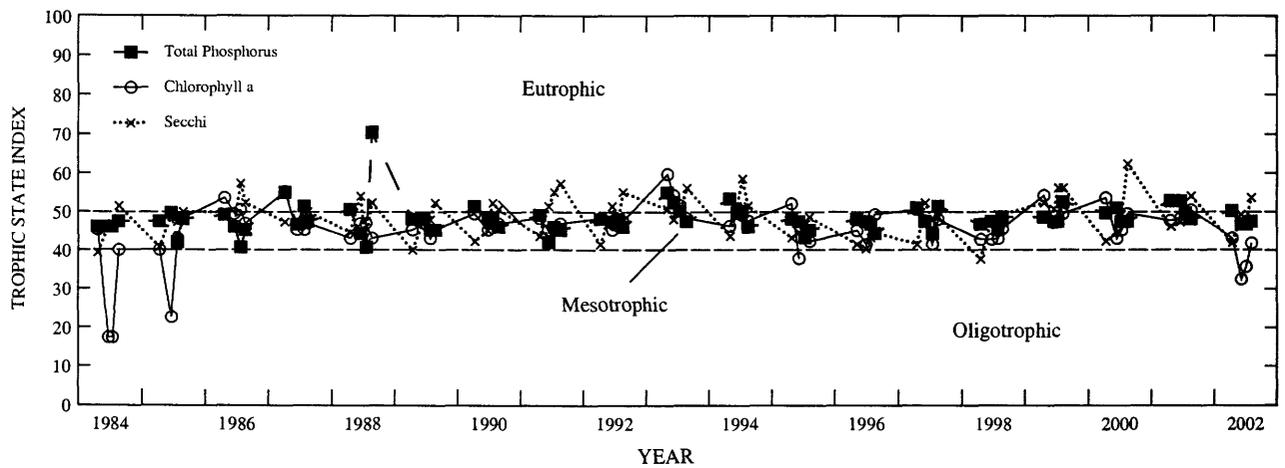
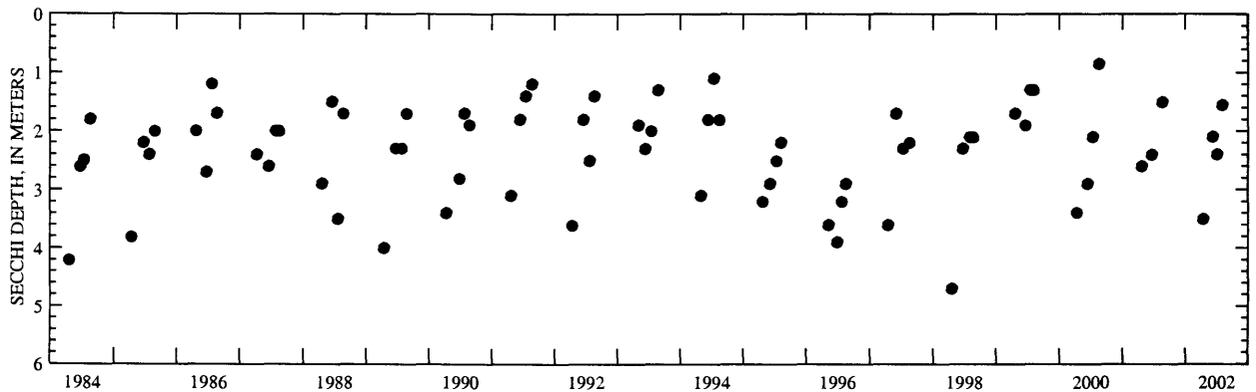
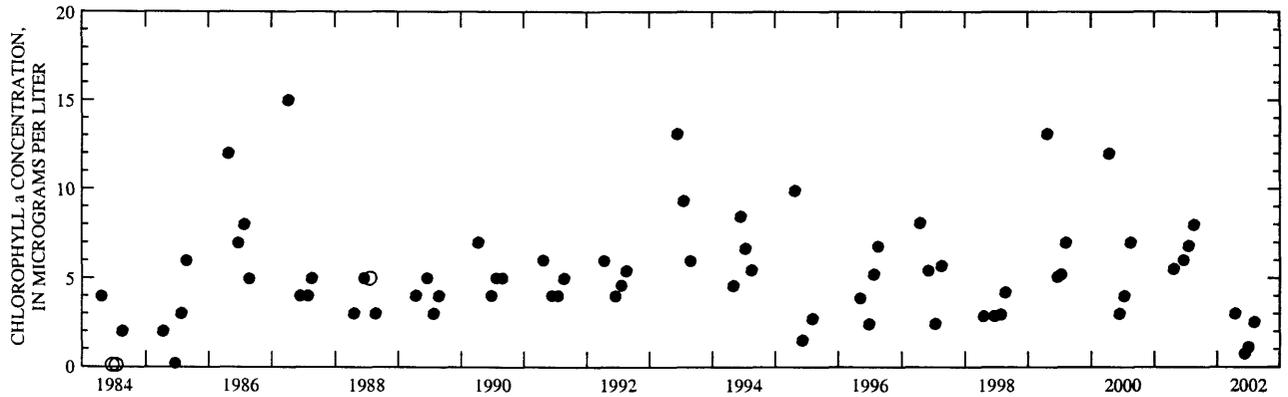
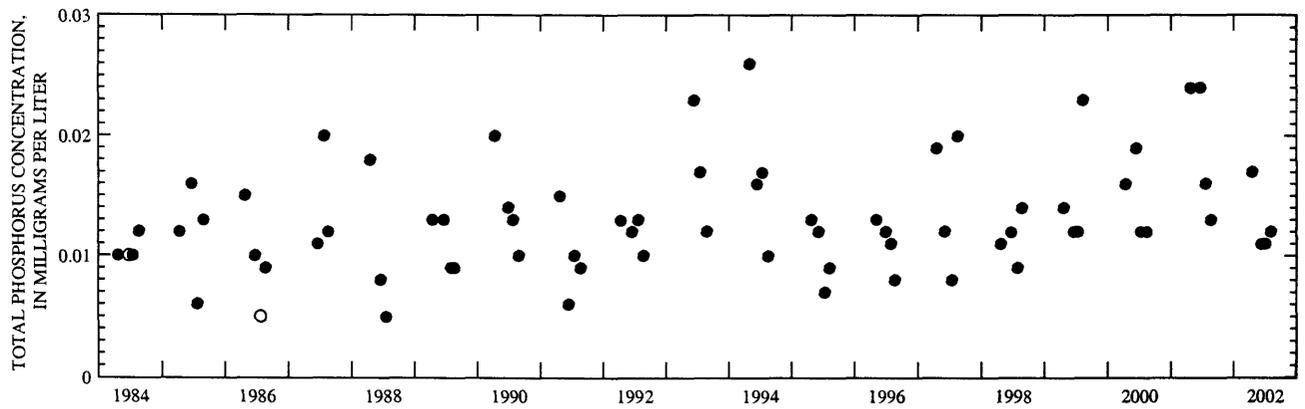


SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

WATER-QUALITY DATA, JULY 9 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	Jul 9		Aug 8		
Lake stage (ft)	4.72		4.71		
Secchi-depth (m)	2.4		1.6		
Chlorophyll a, phytoplankton (µg/L)	1.13		2.52		
Depth of sample (m)	0.5	27	0.5	25	27.5
Water temperature (°C)	27.4	5.9	25.7	6.2	5.9
Specific conductance (µS/cm)	534	572	504	571	579
pH (units)	8.0	7.6	8.2	7.6	7.5
Dissolved oxygen (mg/L)	8.2	0.9	9.2	0.5	0.3
Phosphorus, total (as P)	0.011	0.034	0.012	0.021	0.031
Phosphorus, ortho, dissolved (as P)	<.002	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , dissolved (as N)	0.314	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	0.012	---	---	---	---
Nitrogen, amm. + org., dissolved (as N)	0.60	---	---	---	---
Nitrogen, dissolved (as N)	0.91	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Okauchee Lake, near Okauchee, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

430759088244200 OKAUCHEE LAKE, NO. 1, NEAR OKAUCHEE, WI

LOCATION.--Lat 43°07'59", long 88°24'42", in NE 1/4 NW 1/4 sec.30, T.8 N., R.18 E., Waukesha County, Hydrologic Unit 07090001, near Okauchee.

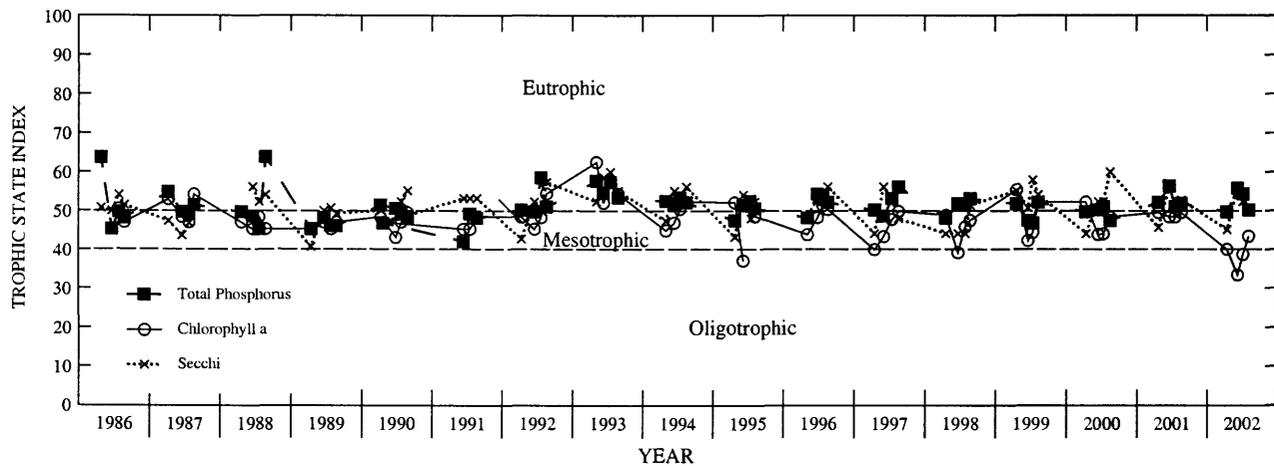
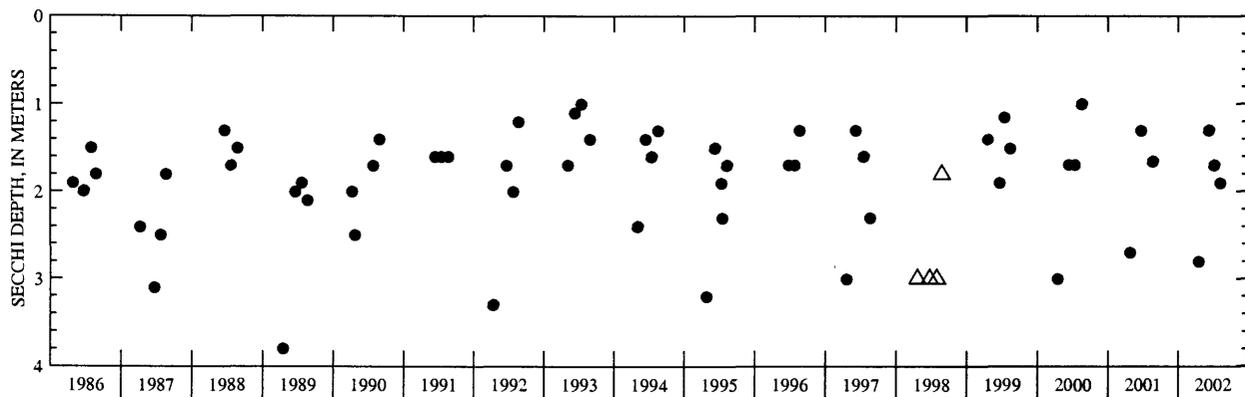
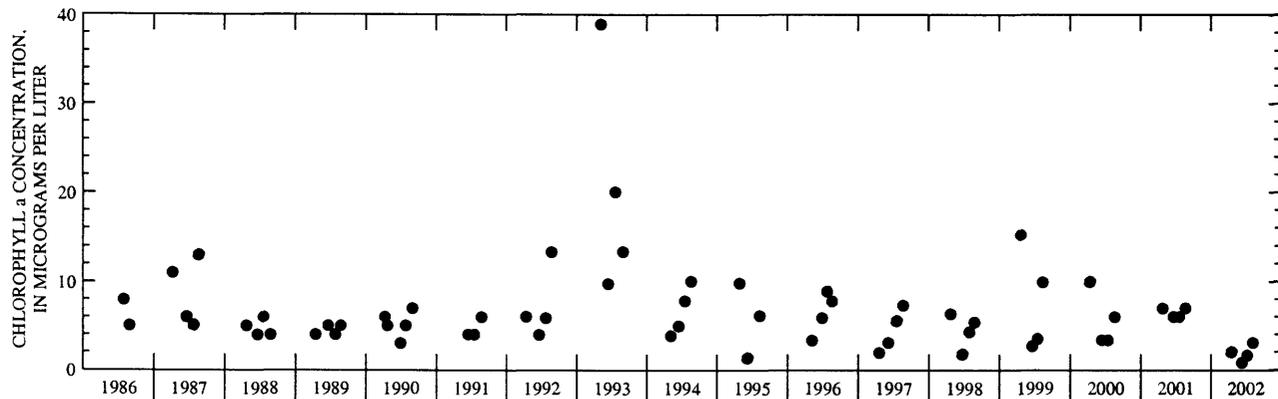
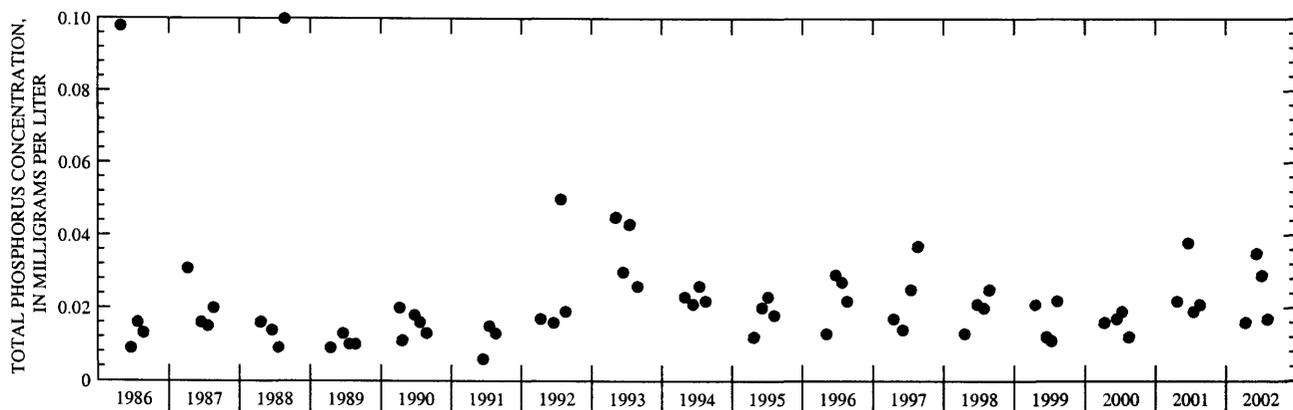
PERIOD OF RECORD.--April 1986 to current year.

LAKE-STAGE GAGE.--Datum of gage is 869.00 ft above sea level.

REMARKS.--Lake sampled in Crane's Nest Bay, in the northeast part of the lake, at an approximate depth of 2 m. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 17 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Apr 17</u>	<u>Jun 11</u>	<u>Jul 9</u>	<u>Aug 8</u>
Lake stage (ft)	4.77	4.91	4.72	4.71
Secchi-depth (m)	2.8	1.3	1.7	1.9
Chlorophyll a, phytoplankton (µg/L)	2.00	0.84	1.68	3.13
Depth of sample (m)	0.5	0.5	0.5	0.5
Water temperature (°C)	11.3	23.7	28.6	25.6
Specific conductance (µS/cm)	575	598	577	511
pH (units)	8.3	8.1	8	8.2
Dissolved oxygen (mg/L)	12.6	7.5	8.5	8.9
Phosphorus, total (as P)	0.016	0.035	0.029	0.017



Surface total phosphorus, chlorophyll a concentrations, Secchi depths,
and TSI data for Okauchee Lake, No. 1, near Okauchee, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses.
Actual concentrations for these particular analyses are less than the plotted circles.)

430645088264500 OKAUCHEE LAKE, NO. 2, AT OKAUCHEE, WI

LOCATION.--Lat 43°06'45", long 88°26'45", in SE 1/4 NE 1/4 sec.35, T.8 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Okauchee.

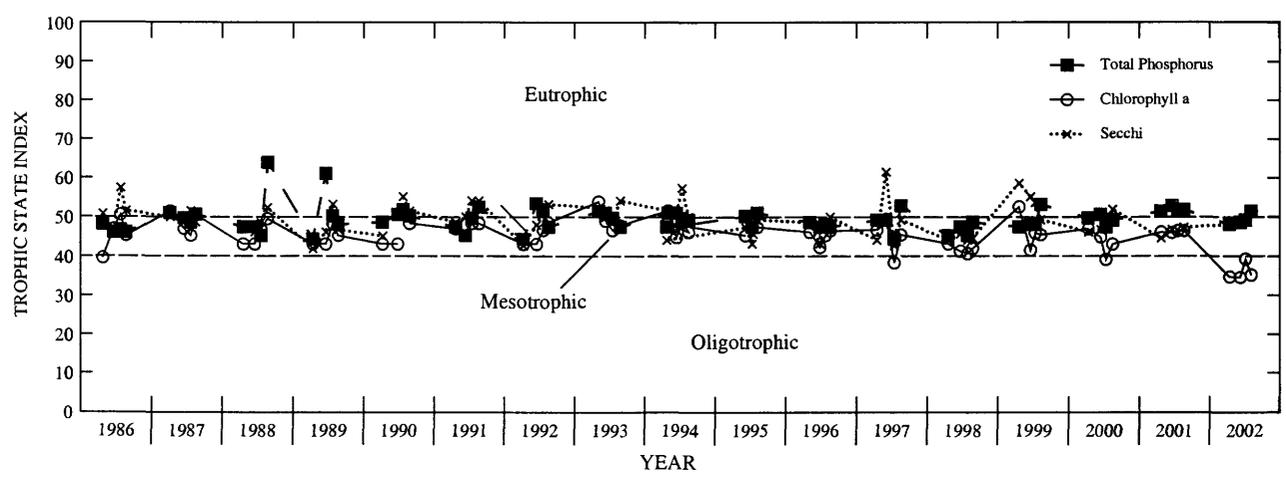
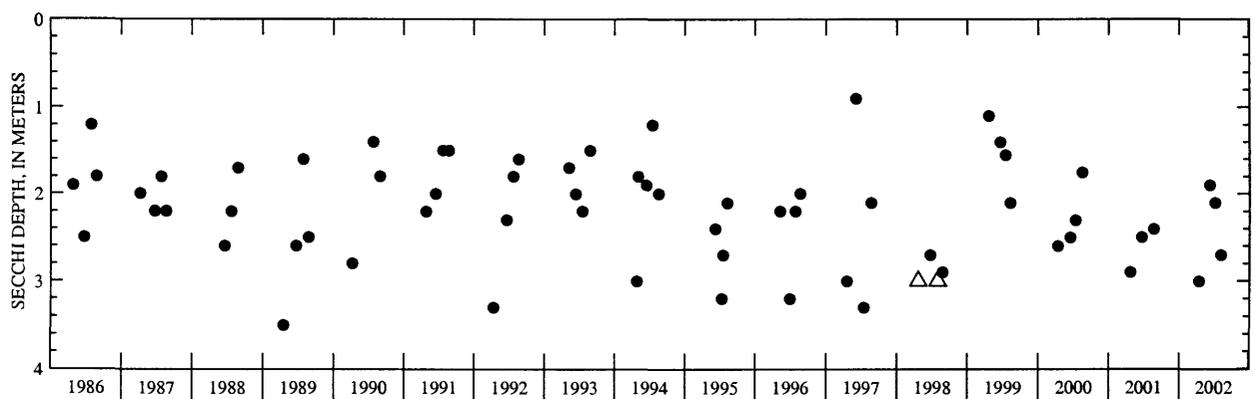
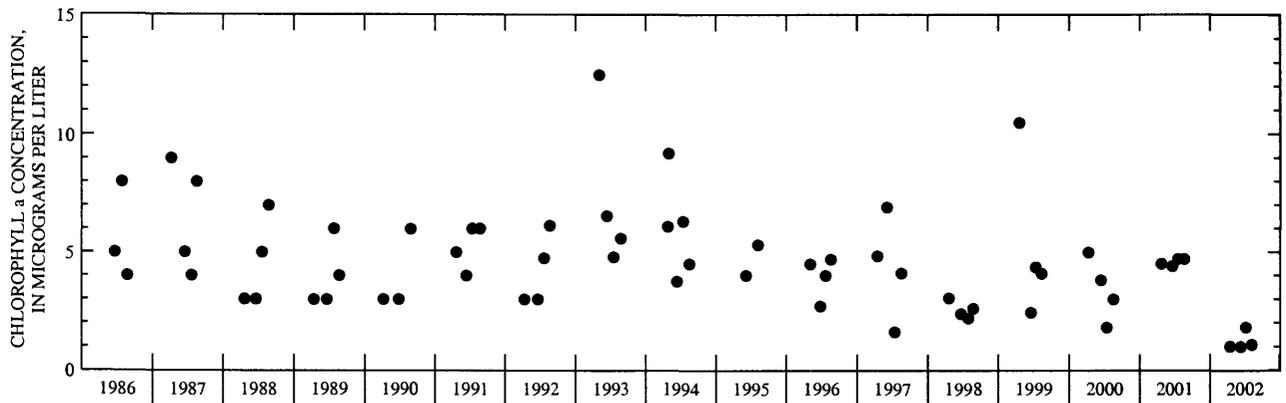
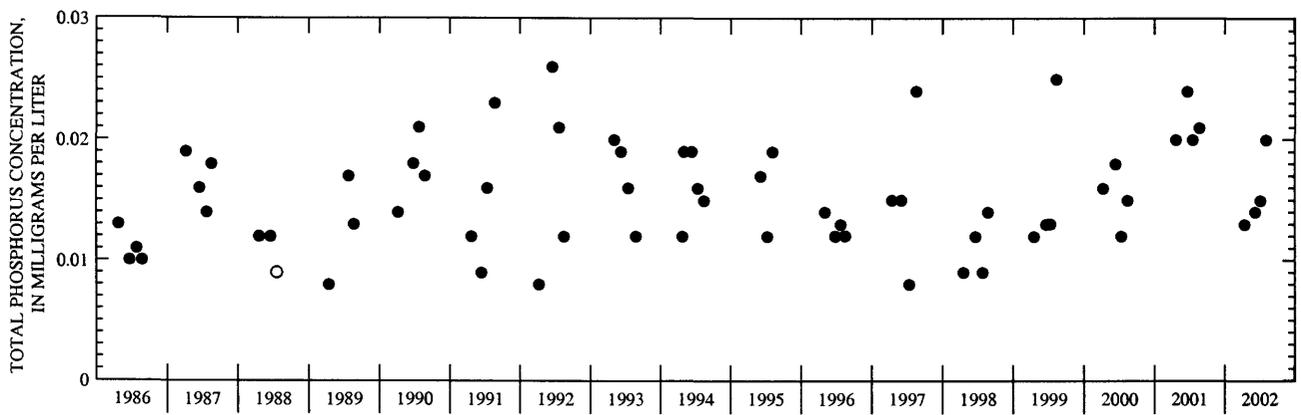
PERIOD OF RECORD.--April 1986 to current year.

LAKE-STAGE GAGE.--Datum of gage is 869.00 ft above sea level.

REMARKS.--Lake sampled in Lower Okauchee Lake, at an approximate depth of 5 m. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 17 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Apr 17</u>	<u>Jun 11</u>	<u>Jul 9</u>	<u>Aug 8</u>
Lake stage (ft)	4.77	4.91	4.72	4.71
Secchi-depth (m)	3.0	1.9	2.1	2.7
Chlorophyll a, phytoplankton (µg/L)	1.00	0.98	1.82	1.07
Depth of sample (m)	0.5	0.5	0.5	0.5
Water temperature (°C)	13	22.8	29.1	25.7
Specific conductance (µS/cm)	560	526	501	464
pH (units)	8.4	8.2	8.1	8.4
Dissolved oxygen (mg/L)	12.2	10.3	8.8	8.8
Phosphorus, total (as P)	0.013	0.014	0.015	0.020



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Okauchee Lake, No. 2, near Okauchee, Wisconsin.
 (Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles. Triangles indicate maximum depth at sampling site. Actual secchi depth on these days was greater than plotted triangles.)

430642088252400 OKAUCHEE LAKE, NO. 3, AT OKAUCHEE, WI

LOCATION.--Lat 43°06'42", long 88°25'24", in NE 1/4 SE 1/4 sec.36, T.8 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Okauchee.

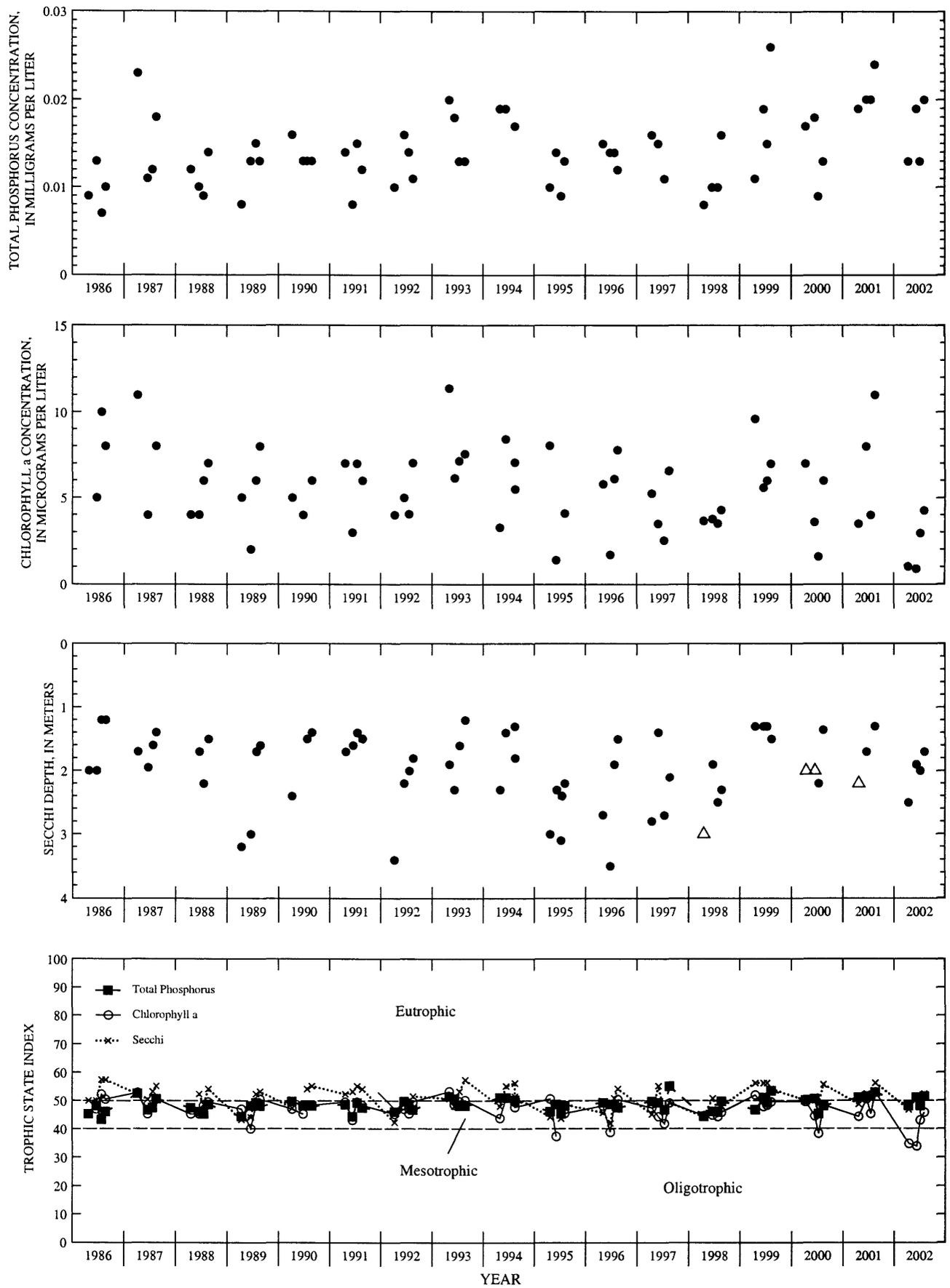
PERIOD OF RECORD.--April 1986 to current year.

LAKE-STAGE GAGE.--Datum of gage is 869.00 ft above sea level.

REMARKS.--Lake sampled in Ice House Bay, in the southern part of the lake, at an approximate depth of 4 m. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 17 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Apr 17</u>	<u>Jun 11</u>	<u>Jul 9</u>	<u>Aug 8</u>
Lake stage (ft)	4.77	4.91	4.72	4.71
Secchi-depth (m)	2.5	1.9	2.0	1.7
Chlorophyll a, phytoplankton (µg/L)	1.00	0.89	2.95	4.26
Depth of sample (m)	0.5	0.5	0.5	0.5
Water temperature (°C)	9.9	21.8	28.5	26.1
Specific conductance (µS/cm)	557	536	491	464
pH (units)	8.4	8.2	8.2	8.3
Dissolved oxygen (mg/L)	12.8	9.9	9.2	9.3
Phosphorus, total (as P)	0.013	0.019	0.013	0.02



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Okauchee Lake, No. 3, near Okauchee, Wisconsin.
 (Triangles indicate maximum depth at sampling site. Actual Secchi depth on these days was greater than the plotted triangles.)

430757088261700 OKAUCHEE LAKE, NO. 4, AT OKAUCHEE, WI

LOCATION.--Lat 43°07'57", long 88°26'17", in NW 1/4 NW 1/4 sec.25, T.8 N., R.17 E., Waukesha County, Hydrologic Unit 07090001, at Okauchee.

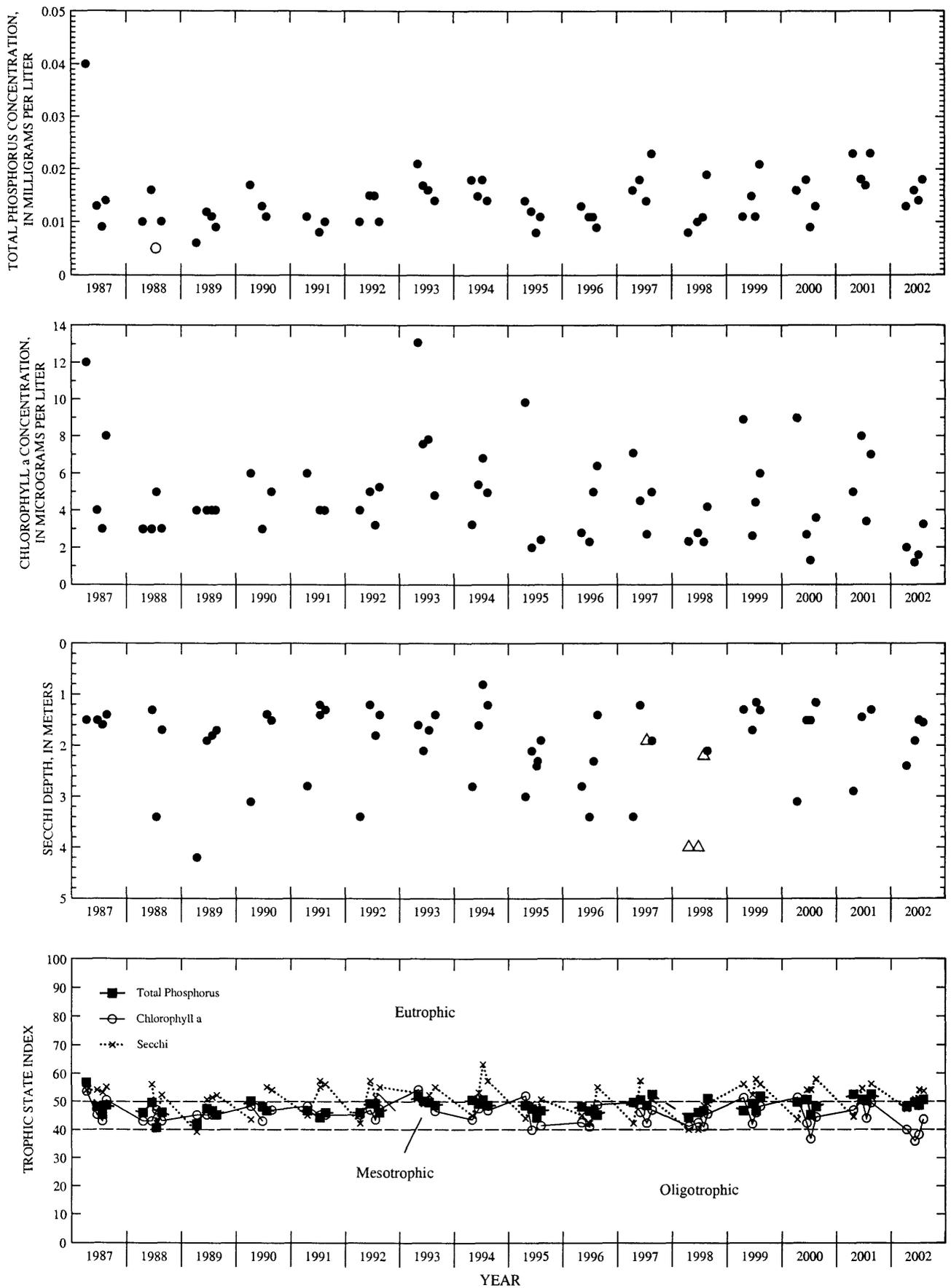
PERIOD OF RECORD.--June 1986 to current year.

LAKE-STAGE GAGE.--Datum of gage is 869.00 ft above sea level.

REMARKS.--Lake sampled near McDowell (Crazyman's) Island, in the northwest bay of the lake, at an approximate depth of 2 m. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 17 TO AUGUST 8, 2002
(Milligrams per liter unless otherwise indicated)

	<u>Apr 17</u>	<u>Jun 11</u>	<u>Jul 9</u>	<u>Aug 8</u>
Lake stage (ft)	4.77	4.91	4.72	4.71
Secchi-depth (m)	2.4	1.9	1.5	1.6
Chlorophyll a, phytoplankton (µg/L)	2.00	1.17	1.58	3.24
Depth of sample (m)	0.5	0.5	0.5	0.5
Water temperature (°C)	10.7	22.9	27.9	25.8
Specific conductance (µS/cm)	573	517	518	493
pH (units)	8.4	8.2	8.1	8.2
Dissolved oxygen (mg/L)	12.9	9.7	8.9	8.9
Phosphorus, total (as P)	0.013	0.016	0.014	0.018



Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Okauchee Lake, No. 4, near Okauchee, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles. Triangles indicate maximum depth at sampling site. Actual Secchi depth on these days was greater than the plotted triangles.)

424905088204000 POTTER LAKE NEAR MUKWONAGO, WI

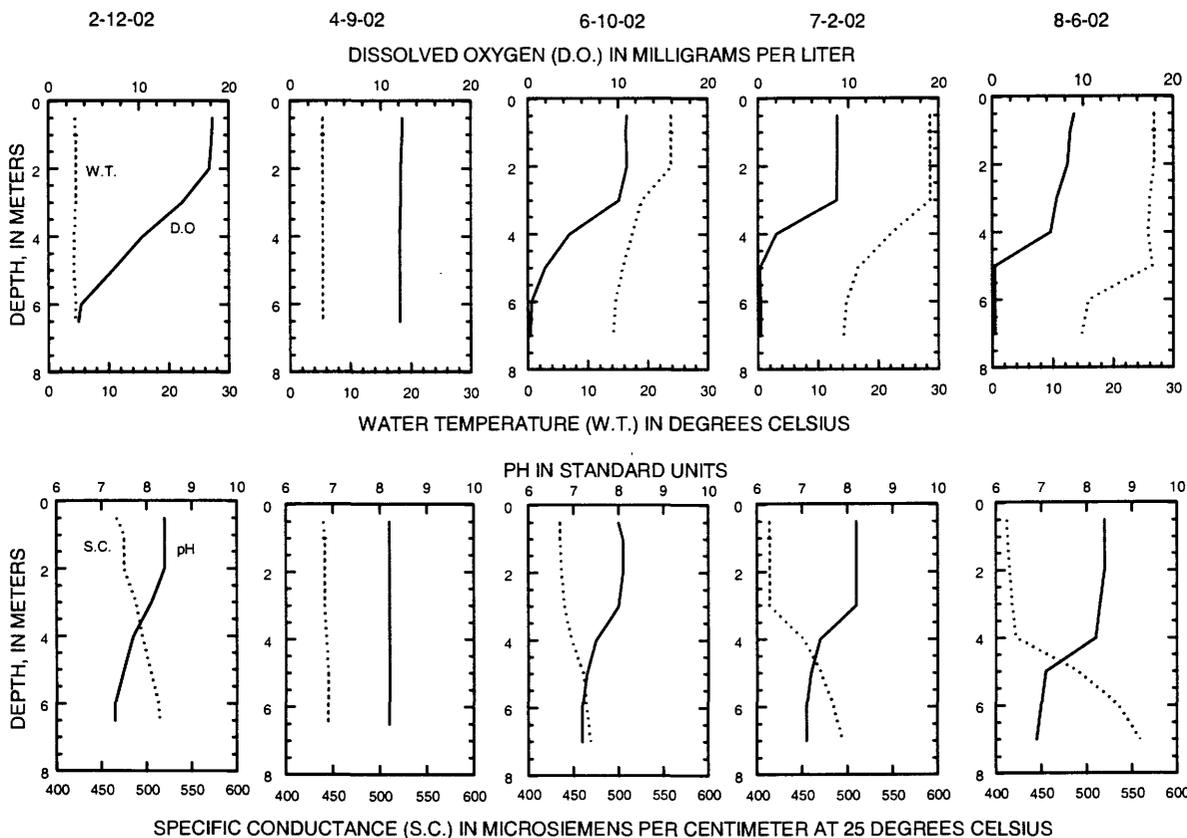
LOCATION.--Lat 42°49'05", long 88°20'40", in NW 1/4 SW 1/4 sec.11, T.4 N., R.18 E., Walworth County, Hydrologic Unit 07120006, 3.3 mi south of Mukwonago.

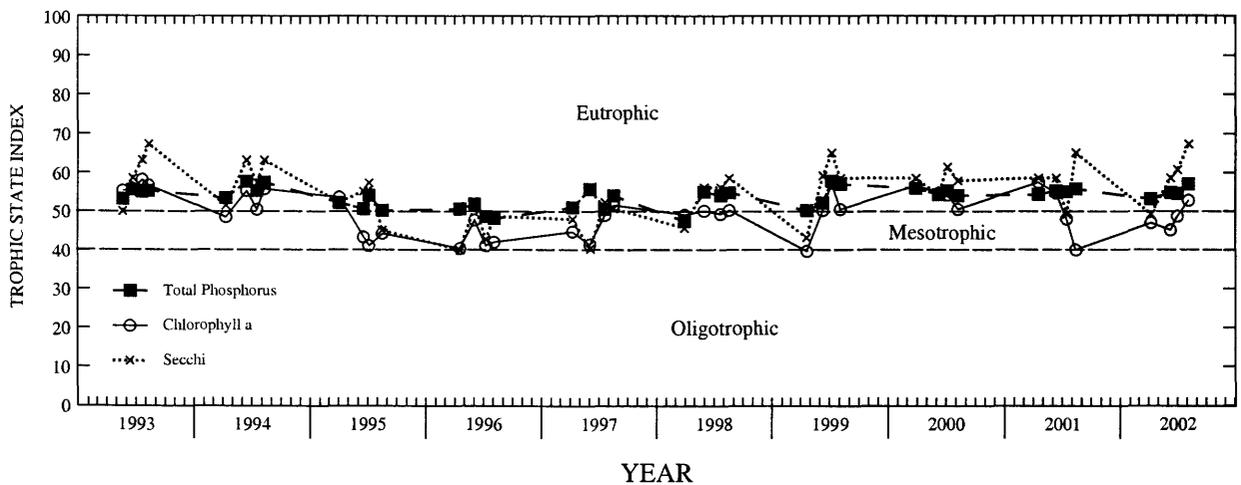
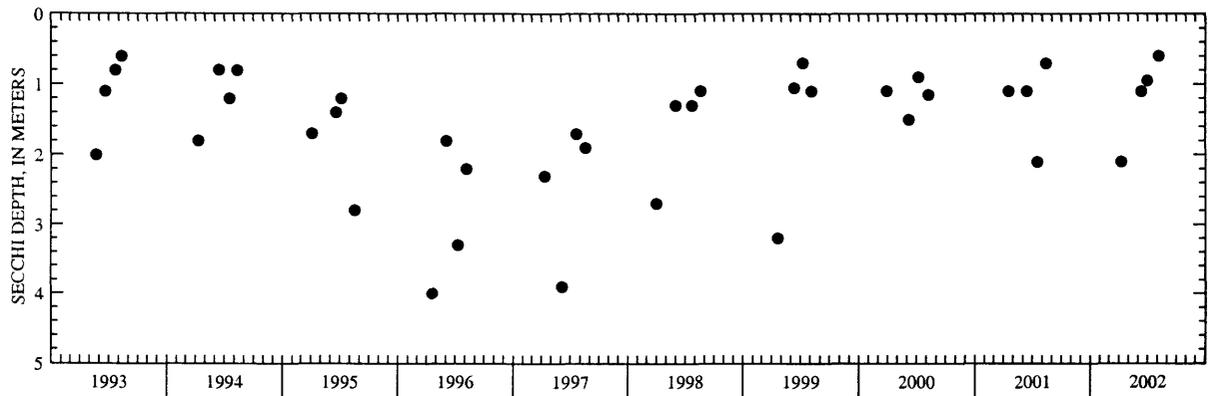
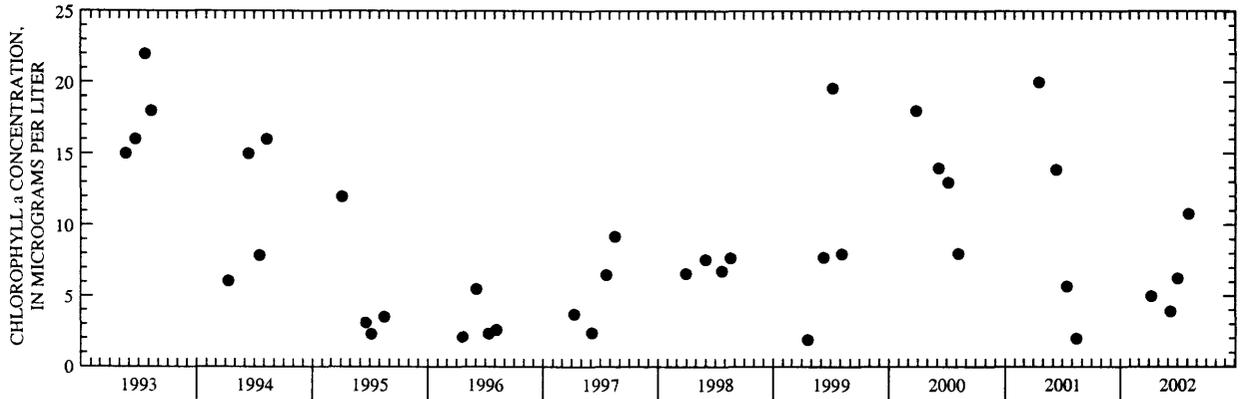
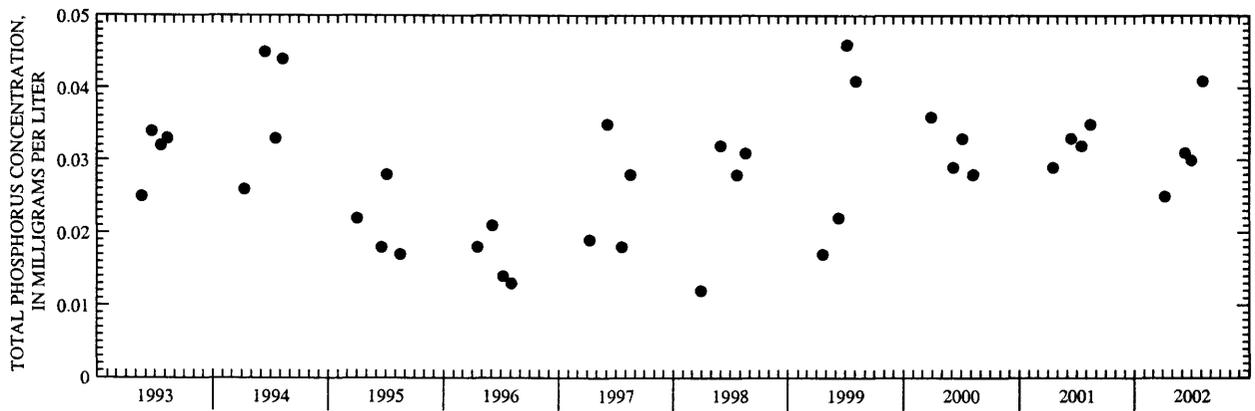
PERIOD OF RECORD.--February 1993 to current year.

REMARKS.--Lake sampled at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 12 TO AUGUST 6, 2002
(Milligrams per liter unless otherwise indicated)

	Feb 12		Apr 9		Jun 10		Jul 2		Aug 6	
Lake stage (ft)	---		8.36		8.27		8.06		7.53	
Secchi-depth (m)	---		2.1		1.1		0.9		0.6	
Chlorophyll a, phytoplankton (µg/L)	---		5		3.92		6.27		10.8	
Depth of sample (m)	0.5	6.5	0.5	6.5	0.5	7	0.5	7	0.5	7
Water temperature (°C)	4.4	4.4	5.4	5.4	23.9	14.2	28.6	14.2	26.8	20.5
Specific conductance (µS/cm)	466	515	440	445	435	469	414	495	412	490
pH (units)	8.4	7.3	8.2	8.2	8	7.2	8.2	7.1	8.4	7.1
Dissolved oxygen (mg/L)	18.2	3.3	12.4	12.1	11	0.3	8.8	0.3	9	0.3
Phosphorus, total (as P)	0.021	0.031	0.025	0.027	0.031	0.052	0.030	0.057	0.041	0.075
Phosphorus, ortho, dissolved (as P)	---	---	0.007	---	---	---	0.007	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.12	---	---	---	0.01	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.145	---	---	---	0.027	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	1.2	---	---	---	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	---	---	---	---	1.0	---	---	---
Nitrogen, total (as N)	---	---	1.3	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	10	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	4.9	---	---	---	---	---	---	---
Hardness, as CaCO ₃	---	---	180	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	37.2	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	21.7	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	22.2	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	2.00	---	---	---	---	---	---	---
Alkalinity as CaCO ₃	---	---	150	---	---	---	---	---	---	---
Sulfate, dissolved (SO ₄)	---	---	<4.5	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	47.8	---	---	---	---	---	---	---
Silica, dissolved (SiO ₂)	---	---	0.368	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	256	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Potter Lake near Mukwonago, Wisconsin.

423246088175800 POWERS LAKE AT POWERS LAKE, WI

LOCATION.--Lat 42°32'46", long 88°17'58", in NW 1/4 SE 1/4 sec.13, T.1 N., R.18 E., Walworth County, Hydrologic Unit 07120006, at Powers Lake.

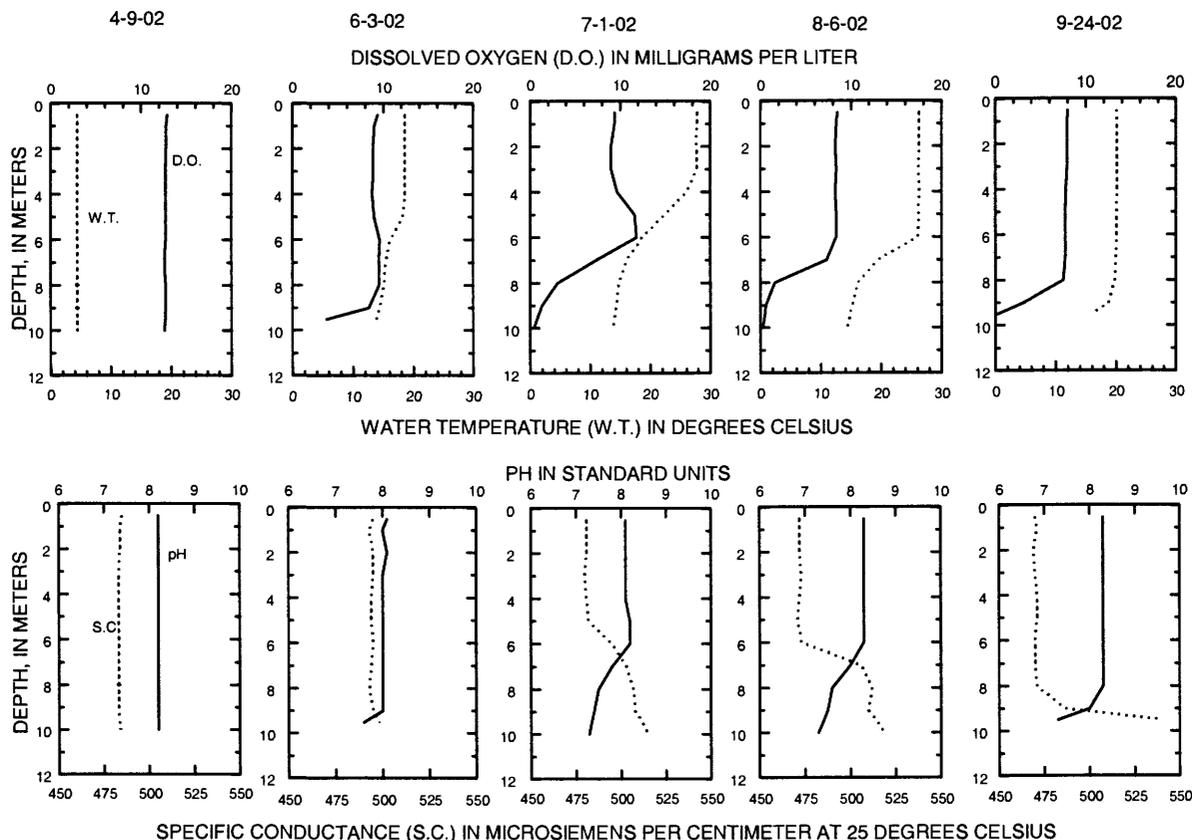
DRAINAGE AREA.--3.42 mi².

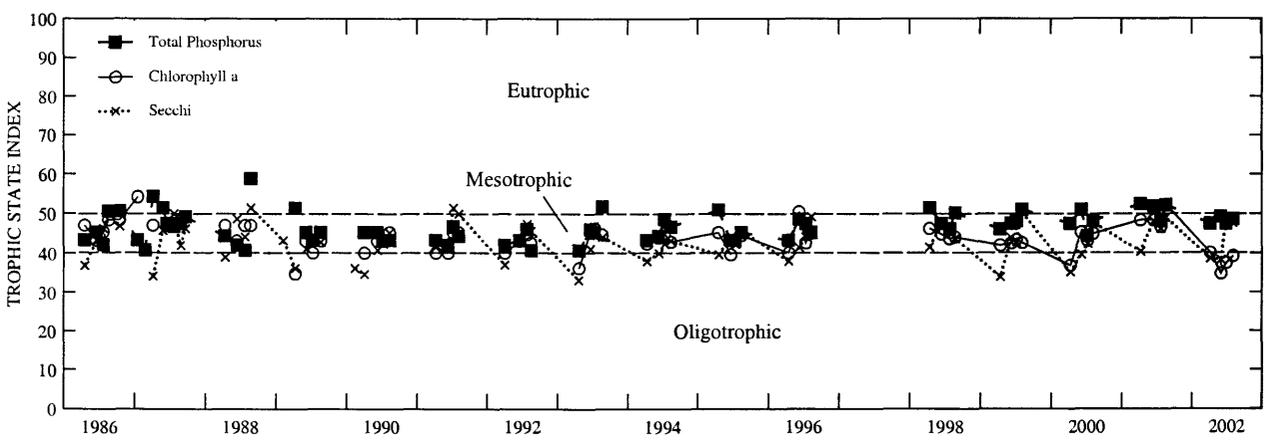
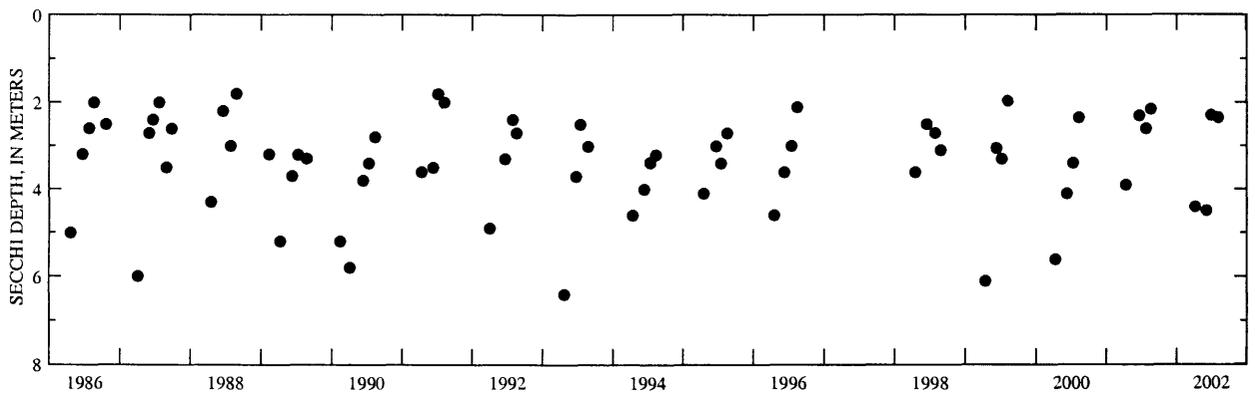
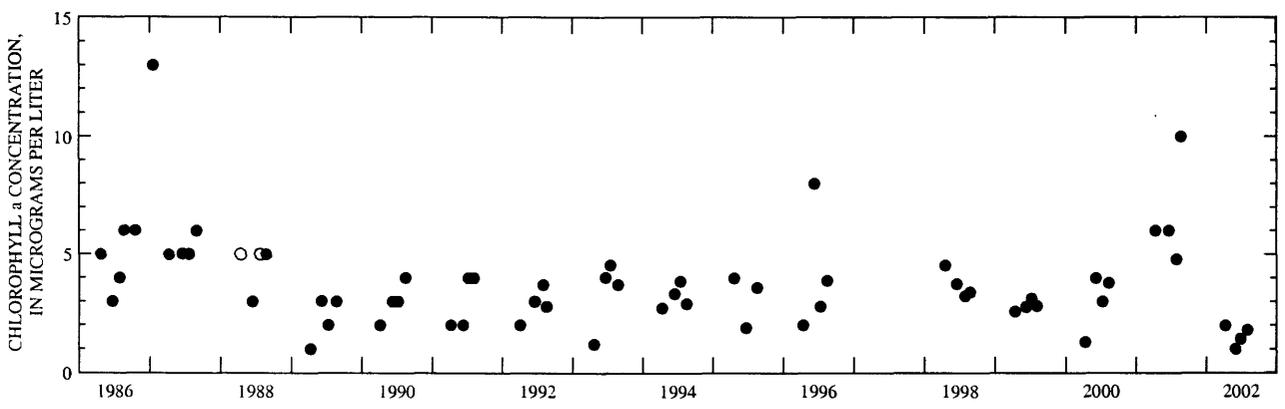
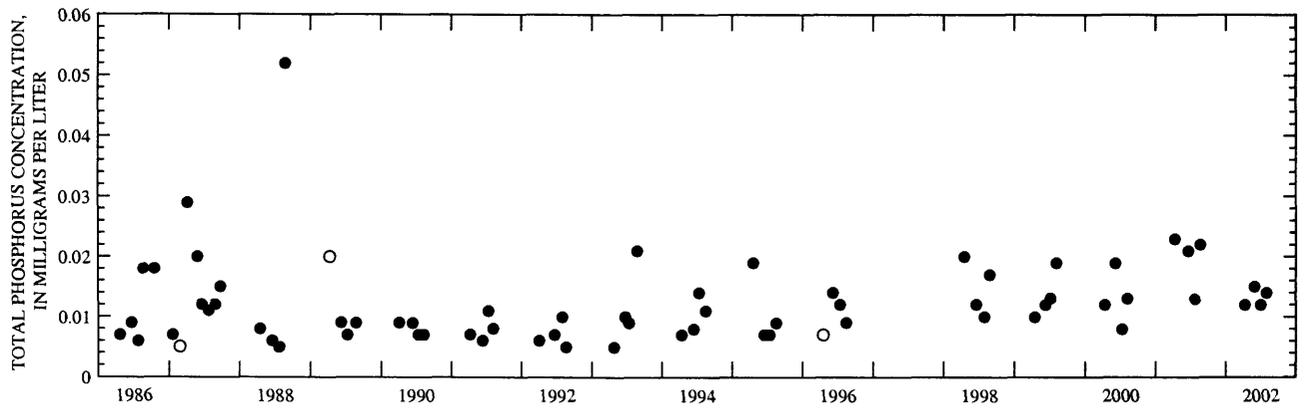
PERIOD OF RECORD.--March 1986 to August 1996, and April 1998 to current year.

REMARKS.--Lake sampled near center at the deep hole. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, APRIL 9 TO SEPTEMBER 24, 2002
(Milligrams per liter unless otherwise indicated)

	Apr 9		Jun 3		Jul 1		Aug 6		Sep 24		
Lake stage (ft)	10.16		10.02		9.94		9.53		9.60		
Secchi-depth (m)	4.4		4.5		2.3		2.3		3.50		
Chlorophyll a, phytoplankton (µg/L)	2.00		1.00		1.42		1.80		4.67		
Depth of sample (m)	0.5	10	0.5	9.5	0.5	10	0.5	9	10	0.5	9.5
Water temperature (°C)	4.4	4.4	18.6	13.8	27.8	13.8	26.3	15.2	14.3	20.1	15.9
Specific conductance (µS/cm)	485	484	495	498	481	515	472	510	519	470	540
pH (units)	8.2	8.2	8.1	7.6	8.1	7.3	8.3	7.5	7.3	8.3	7.3
Dissolved oxygen (mg/L)	12.9	12.6	9.4	3.7	9.4	0.4	8.5	0.6	0.3	8	0.2
Phosphorus, total (as P)	0.012	0.017	0.015	0.011	0.012	0.018	0.014	0.022	0.035	0.017	0.053
Phosphorus, ortho, dissolved (as P)	<0.002				<0.002						
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	0.04				0.011						
Nitrogen, ammonia, dissolved (as N)	0.015				<0.013						
Nitrogen, amm. + org., diss. (as N)					0.79						
Nitrogen, amm. + org., total (as N)	0.5										
Nitrogen, total (as N)	0.54										
Color (Pt-Co. scale)	5										
Turbidity (NTU)	1.2										
Hardness, as CaCO ₃	210										
Calcium, dissolved (Ca)	37.2										
Magnesium, dissolved (Mg)	29.1										
Sodium, dissolved (Na)	16.2										
Potassium, dissolved (K)	2.00										
Alkalinity as CaCO ₃	175										
Sulfate, dissolved (SO ₄)	30										
Chloride, dissolved (Cl)	37.6										
Silica, dissolved (SiO ₂)	7.64										
Solids, dissolved, at 180°C	278										
Iron, dissolved (Fe) µg/L	<100										
Manganese, dissolved (Mn) µg/L	<1										





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Powers Lake, at Powers Lake, Wisconsin.

(Circles on the first three plots indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted circles.)

455034091493300 SPOONER LAKE, AT DEEP HOLE, NEAR SPOONER, WI

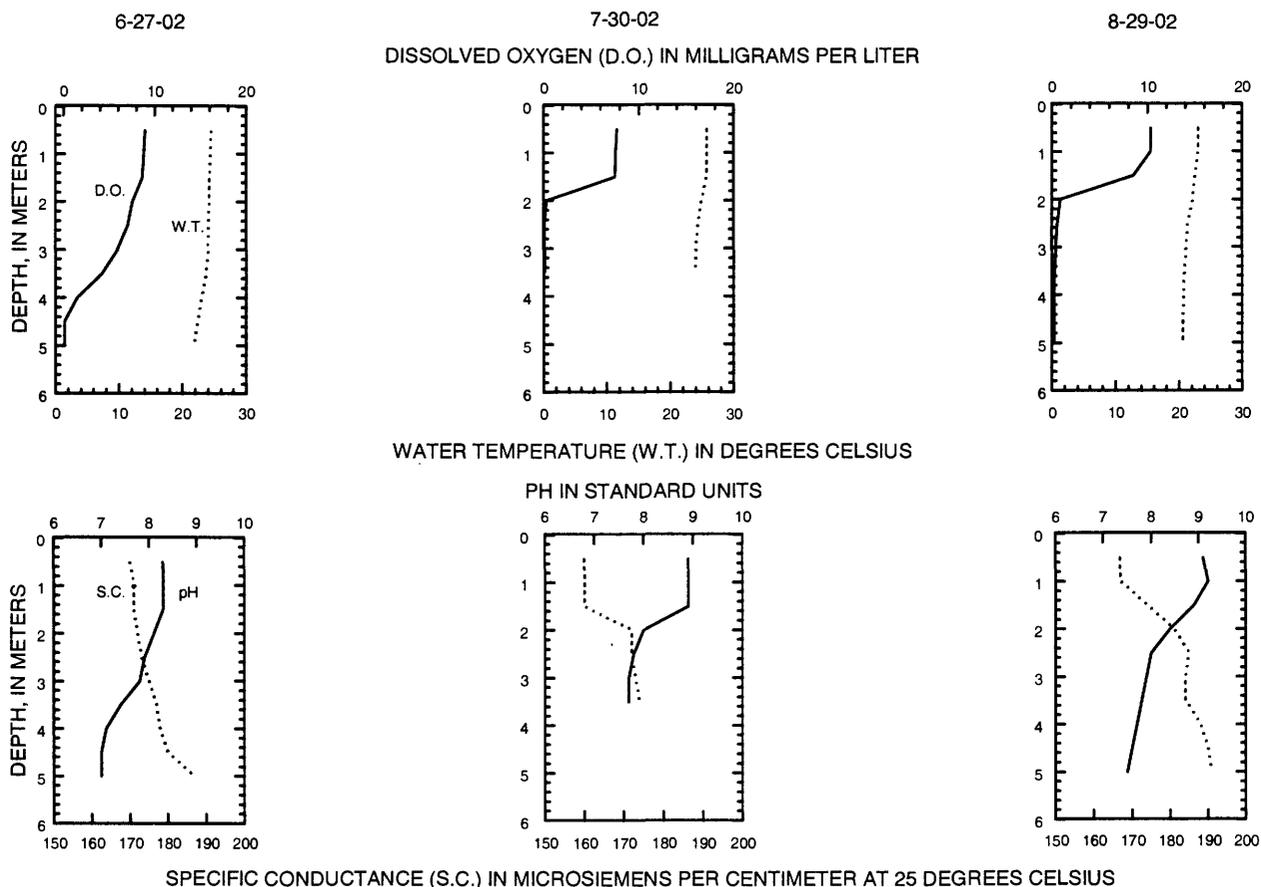
LOCATION.--Lat 45°50'34", long 91°49'33", in NE 1/4 NE 1/4 sec.27, T.39 N., R.12 W., Washburn County, Hydrologic Unit 07030001, near Spooner.

PERIOD OF RECORD.--June to September 2002.

REMARKS.--Lake sampled at deepest hole. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, JUNE 27 TO AUGUST 29, 2002
(Milligrams per liter unless otherwise indicated)

	Jun 27		Jul 30		Aug 29		
Lake stage (ft)	7.05		6.97		6.92		
Secchi-depth (m)	1.4		0.7		0.8		
Chlorophyll a, phytoplankton (µg/L)	15.3		49.3		48.4		
Depth of sample (m)	0.5	4.5	0.5	3.5	0.5	2	4.5
Water temperature (°C)	24.5	22.4	25.7	23.9	23.0	22.1	20.6
Specific conductance (µS/cm)	170	180	160	174	167	181	190
pH (units)	8.3	7.0	8.9	7.7	9.1	8.4	7.6
Dissolved oxygen (mg/L)	8.9	0.1	7.7	0.1	10.3	0.9	0.2
Phosphorus, total (as P)	0.028	0.039	0.070	0.058	0.078	0.093	0.066
Phosphorus, ortho, dissolved (as P)	---	---	0.004	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , dissolved (as N)	---	---	0.012	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.033	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	1.4	---	---	---	---
Nitrogen, dissolved (as N)	---	---	1.4	---	---	---	---



454945091483900 SPOONER LAKE, SOUTHEAST SITE, NEAR SPOONER, WI

LOCATION.--Lat 45°49'45", long 91°48'39", in SW 1/4 SE 1/4 sec.26, T.39 N., R.12 W., Washburn County, Hydrologic Unit 07030001, near Spooner.

PERIOD OF RECORD.--June to August 2002.

REMARKS.--Lake sampled at deepest hole. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, JUNE 27 TO AUGUST 29, 2002
(Milligrams per liter unless otherwise indicated)

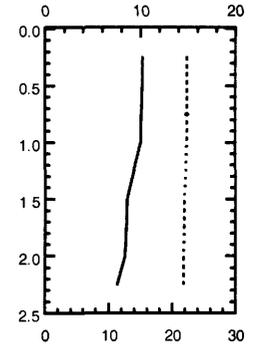
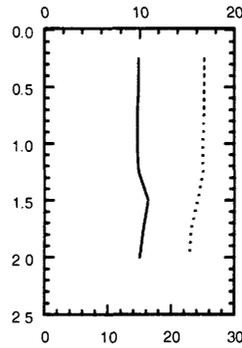
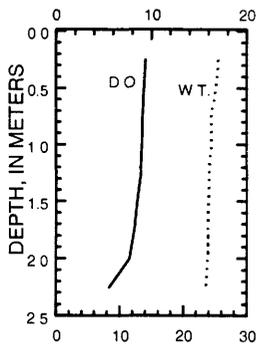
	<u>Jun 27</u>	<u>Jul 30</u>	<u>Aug 29</u>
Lake stage (ft)	7.05	6.97	6.92
Secchi-depth (m)	2.0	1.8	1.7
Chlorophyll a, phytoplankton (µg/L)	8.57	9.84	19.6
Depth of sample (m)	0.25	0.25	0.5
Water temperature (°C)	25.5	25.2	22.3
Specific conductance (µS/cm)	183	190	188
pH (units)	8.2	8.7	8.8
Dissolved oxygen (mg/L)	9.2	9.9	10.2
Phosphorus, total (as P)	0.068	0.046	0.034

6-27-02

7-30-02

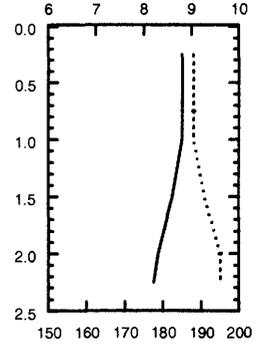
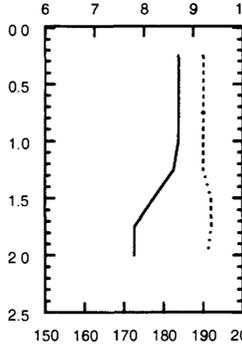
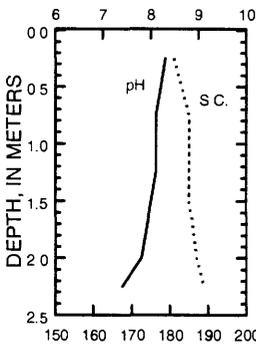
8-29-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

PH IN STANDARD UNITS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

435430089350700 TWIN LAKES, EAST TWIN LAKE, NEAR WESTFIELD, WI

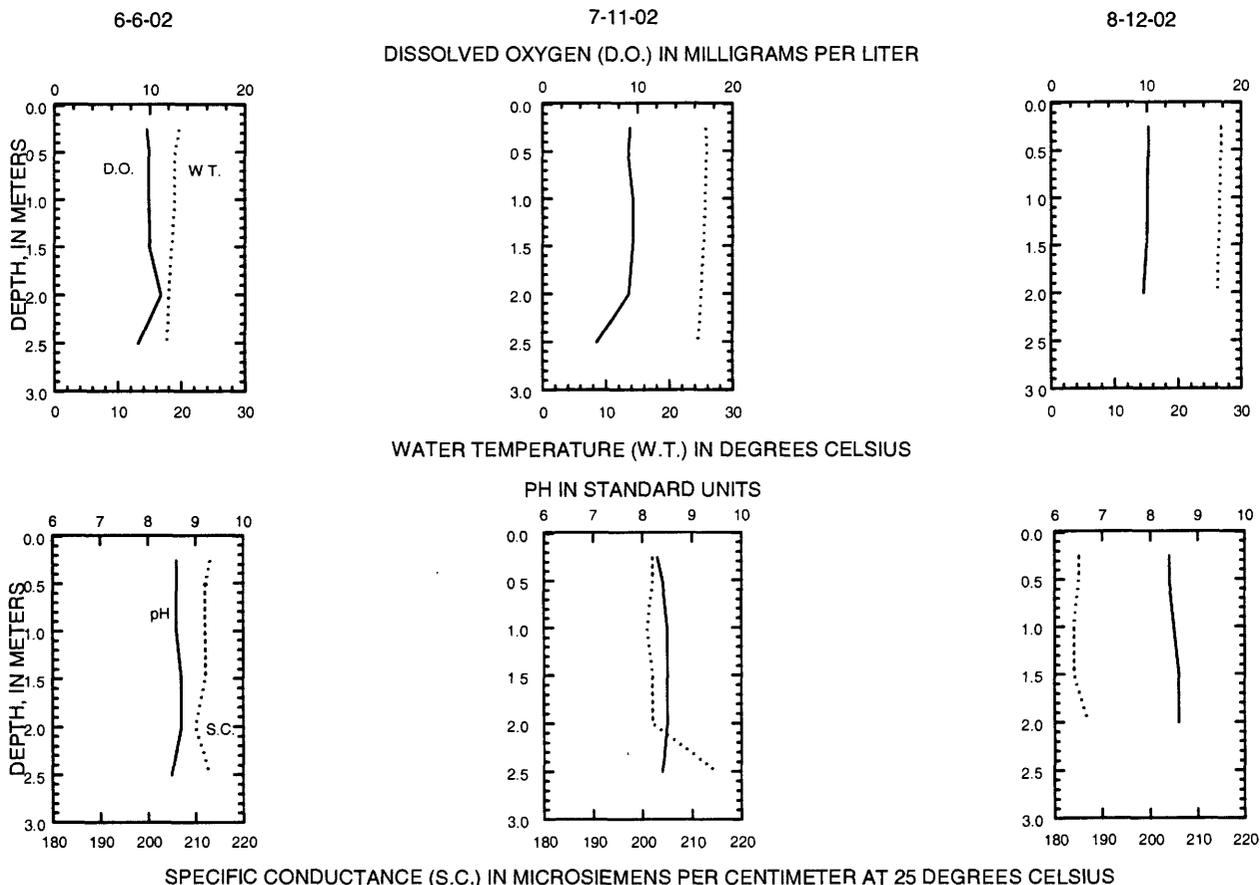
LOCATION.--Lat 43°54'30", long 89°35'07", in NE 1/4 NE 1/4 sec.3, T.17 N., R.8 E., Marquette County, Hydrologic Unit 04030201, near Westfield.

PERIOD OF RECORD.--June to September 2002.

REMARKS.--Lake sampled at deepest hole. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, JUNE 6 TO AUGUST 12, 2002
(Milligrams per liter unless otherwise indicated)

	Jun 6	Jul 11	Aug 12
Lake stage (ft)	10.95	10.73	10.54
Secchi-depth (m)	0.9	0.6	0.5
Chlorophyll a, phytoplankton (µg/L)	7.00	15.5	7.13
Depth of sample (m)	0.5	0.5	0.5
Water temperature (°C)	19.6	25.8	26.8
Specific conductance (µS/cm)	213	202	185
pH (units)	8.6	8.3	8.4
Dissolved oxygen (mg/L)	9.7	9.2	10.2
Phosphorus, total (as P)	0.035	0.032	0.026



435438089352300 TWIN LAKES, WEST TWIN LAKE, NEAR WESTFIELD, WI

LOCATION.--Lat 43°54'38", long 89°35'23", in SW 1/4 SE 1/4 sec.30, T.17 N., R.8 E., Marquette County, Hydrologic Unit 04030201, near Westfield.

PERIOD OF RECORD.--June to September 2002.

REMARKS.--Lake sampled at deepest hole. Water-quality analyses by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, JUNE 6 TO AUGUST 12, 2002
(Milligrams per liter unless otherwise indicated)

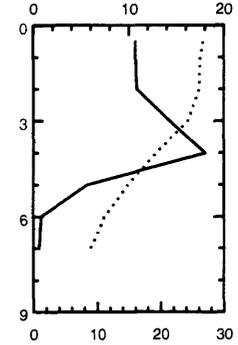
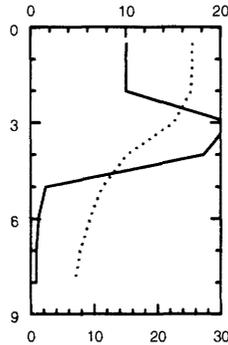
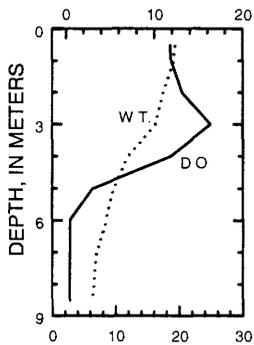
	<u>Jun 6</u>		<u>Jul 11</u>		<u>Aug 12</u>	
Lake stage (ft)	10.95		10.73		10.54	
Secchi-depth (m)	0.8		1.6		1.1	
Chlorophyll a, phytoplankton (µg/L)	2.00		4.63		4.50	
Depth of sample (m)	0.5	8.5	0.5	8	0.5	7
Water temperature (°C)	19.4	6.3	25.6	7.0	26.7	8.9
Specific conductance (µS/cm)	230	439	231	480	225	481
pH (units)	8.6	7.1	8.4	7.1	8.6	7.0
Dissolved oxygen (mg/L)	11.8	0.4	10.1	0.6	10.7	0.6
Phosphorus, total (as P)	0.025	0.113	0.017	0.100	0.015	0.096

6-6-02

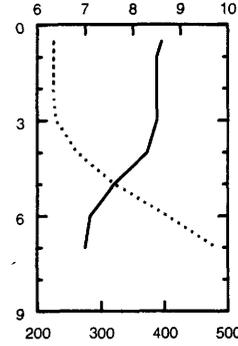
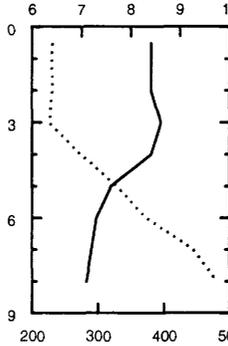
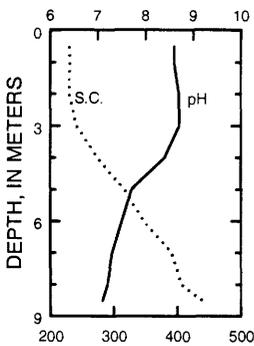
7-11-02

8-12-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS



SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

441730090432900 WAZEE LAKE AT DEEP HOLE NEAR BLACK RIVER FALLS, WI

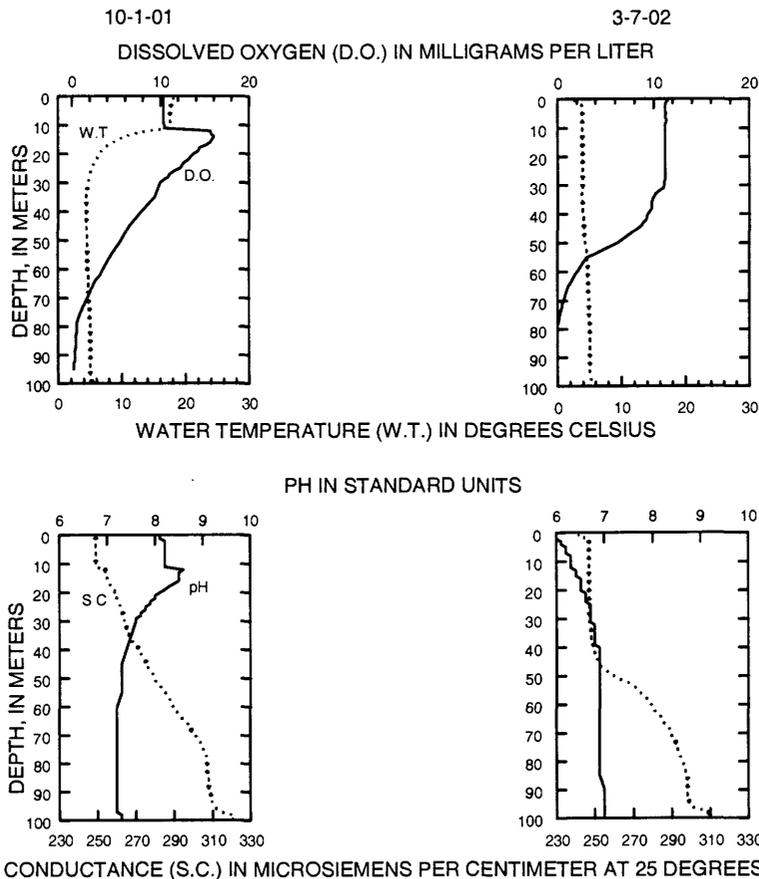
LOCATION.--Lat 44°17'30", long 90°43'29", in SE 1/4 SE 1/4 sec.15, T.21 N., R.3 W., Jackson County, Hydrologic Unit 07040007, 7.0 mi east of Black River Falls.

PERIOD OF RECORD.--October 2001 to March 2002.

REMARKS.--Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, OCTOBER 1, 2001 TO MARCH 7, 2002
(Milligrams per liter unless otherwise indicated)

			<u>Mar 7</u>	
Lake stage (ft)			4.59	
Secchi-depth (m)			7.3	
Depth of sample (m)	0.5	35	45	80
Water temperature (oC)	2.6	3.9	4.1	5
Specific conductance (mS/cm)	242	248	252	295
pH (units)	7.3	6.8	6.9	6.9
Dissolved oxygen (mg/L)	11.5	9.9	8.3	0.1
Phosphorus, total (as P)	0.005	0.005	<.005	0.01
Phosphorus, ortho, dissolved (as P)	<.002	<.002	<.002	0.006
Nitrogen, NO ₂ + NO ₃ , diss., (as N)	0.34	0.32	0.32	0.134
Nitrogen, ammonia, dissolved (as N)	0.006	<.013	<.013	<.013
Nitrogen, amm. + org., total (as N)	0.04	0.1	0.16	<.14
Nitrogen, total (as N)	0.38	0.42	0.48	---



424608088414800 WHITEWATER LAKE NEAR WHITEWATER, WI

LOCATION.--Lat 42°46'08", long 88°41'48", in NW 1/4 NW 1/4 sec.35, T.4 N., R.15 E., Walworth County, Hydrologic Unit 07090001, at outlet, 5.0 mi southeast of Whitewater and 10.0 mi north of Delavan.

DRAINAGE AREA.--10.9 mi², of which 8.5 mi² is non-contributing.

PERIOD OF RECORD.--November 1990 to September 2002 (discontinued).

GAGE.--Water-stage recorder. Datum of gage is 861.00 ft above sea level (Wisconsin Department of Natural Resources).

REMARKS.--Point of zero flow of dam crest is 10.97 ft. Rainfall data published in 1991 under this station number are now stored under station number 424559088420300.

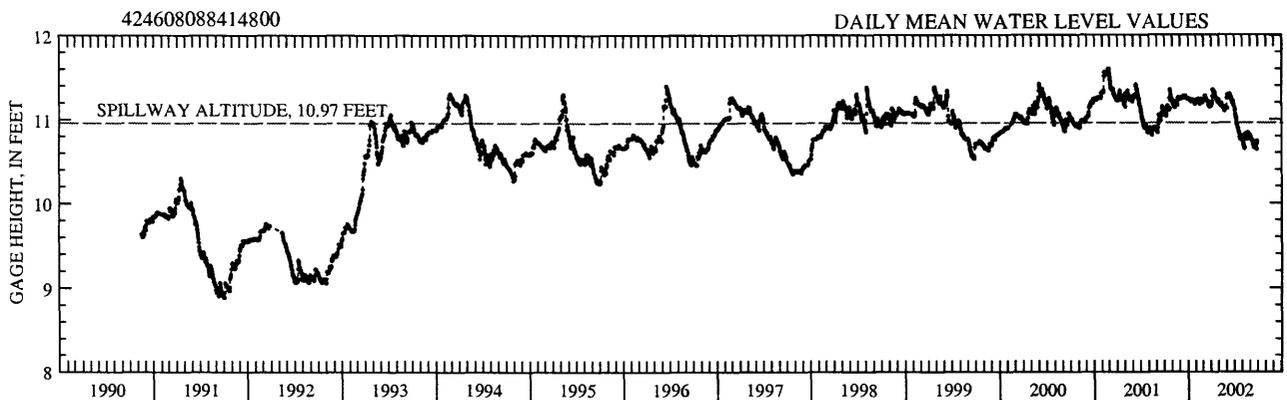
EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 11.61 ft, Feb. 25, 2001; minimum daily gage height, 8.89 ft, Oct. 2, 3, 1991.

EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 11.35 ft, Oct. 24, 25, and Apr. 8-11; minimum recorded, 10.63 ft, Aug. 12.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.09	11.24	11.24	11.24	11.23	11.20	11.16	11.20	11.14	11.15	10.77	10.77
2	11.09	11.23	11.24	11.24	11.23	11.22	11.19	11.23	11.13	11.14	10.75	10.81
3	11.08	11.22	11.24	11.24	11.23	11.24	11.19	11.21	11.13	11.12	10.74	10.80
4	11.08	11.21	11.24	11.24	11.23	11.24	11.19	11.20	11.25	11.10	10.74	10.79
5	11.07	11.19	11.25	11.24	11.23	11.24	11.19	11.19	11.29	11.06	10.74	10.78
6	11.06	11.18	11.26	11.24	11.23	11.24	11.18	11.19	11.29	11.04	10.73	10.77
7	11.04	11.17	11.26	11.24	11.22	11.24	11.21	11.18	11.28	11.03	10.71	10.76
8	11.04	11.16	11.26	11.24	11.22	11.24	11.27	11.17	11.27	11.03	10.70	10.75
9	11.04	11.15	11.26	11.24	11.21	11.28	11.35	11.18	11.27	11.01	10.68	10.75
10	11.08	11.14	11.25	11.24	11.23	11.28	11.35	11.16	11.26	10.98	10.67	10.75
11	11.13	11.14	11.25	11.22	11.24	11.28	11.34	11.17	11.28	10.95	10.65	10.74
12	11.14	11.15	11.25	11.22	11.23	11.26	11.34	11.19	11.27	10.94	10.66	10.73
13	11.15	11.16	11.27	11.22	11.23	11.25	11.33	11.19	11.27	10.93	10.78	10.71
14	11.16	11.19	11.27	11.21	11.22	11.24	11.33	11.18	11.30	10.91	10.82	10.70
15	11.16	11.21	11.27	11.22	11.22	11.24	11.32	11.17	11.29	10.91	10.83	10.69
16	11.14	11.21	11.27	11.22	11.21	11.23	11.32	11.16	11.27	10.90	10.81	10.68
17	11.14	11.21	11.27	11.23	11.20	11.22	11.30	11.15	11.26	10.89	10.80	10.66
18	11.14	11.21	11.28	11.23	11.18	11.22	11.29	11.14	11.27	10.87	10.79	10.66
19	11.13	11.21	11.28	11.23	11.20	11.22	11.30	11.14	11.25	10.86	10.77	10.67
20	11.12	11.20	11.28	11.23	11.22	11.22	11.26	11.13	11.24	10.85	10.76	10.72
21	11.11	11.17	11.27	11.23	11.24	11.22	11.25	11.13	11.23	10.84	10.76	10.73
22	11.13	11.17	11.28	11.23	11.24	11.21	11.25	11.13	11.23	10.83	10.83	10.71
23	11.25	11.17	11.27	11.23	11.23	11.20	11.24	11.11	11.23	10.82	10.84	10.70
24	11.35	11.23	11.26	11.22	11.23	11.19	11.24	11.10	11.21	10.79	10.84	10.68
25	11.33	11.26	11.25	11.22	11.23	11.16	11.24	11.13	11.19	10.77	10.83	10.67
26	11.29	11.25	11.25	11.21	11.23	11.15	11.22	11.14	11.22	10.76	10.83	10.66
27	11.27	11.25	11.25	11.21	11.22	11.15	11.22	11.14	11.22	10.76	10.83	10.65
28	11.27	11.25	11.25	11.21	11.22	11.16	11.23	11.14	11.20	10.78	10.82	10.64
29	11.25	11.25	11.25	11.20	---	11.16	11.22	11.14	11.18	10.80	10.81	10.71
30	11.24	11.24	11.25	11.18	---	11.16	11.20	11.15	11.16	10.80	10.79	10.74
31	11.24	---	11.25	11.21	---	11.16	---	11.14	---	10.79	10.78	---
MEAN	11.16	11.20	11.26	11.23	11.22	11.22	11.26	11.16	11.24	10.92	10.77	10.72
MAX	11.35	11.26	11.28	11.24	11.24	11.28	11.35	11.23	11.30	11.15	10.84	10.81
MIN	11.04	11.14	11.24	11.18	11.18	11.15	11.16	11.10	11.13	10.76	10.65	10.64



424848088083100 WIND LAKE AT OUTLET AT WIND LAKE, WI

LOCATION.--Lat 42°48'48" long 88°08'31", in NE 1/4 NW 1/4 sec.16, T.4 N., R.20 E., Racine County, Hydrologic Unit 07120006, at Wind Lake.

DRAINAGE AREA.--39.6 mi².

PERIOD OF RECORD.--March 1985 to current year. Prior to October 2000, published as "Wind Lake Outlet".

REVISED RECORDS.--WDR WI-91-1: 1988(m).

GAGE.--Water-stage recorder and concrete dam. Datum of gage is 760.30 ft above sea level. Prior to Oct. 2, 1987, nonrecording gage at same site and datum.

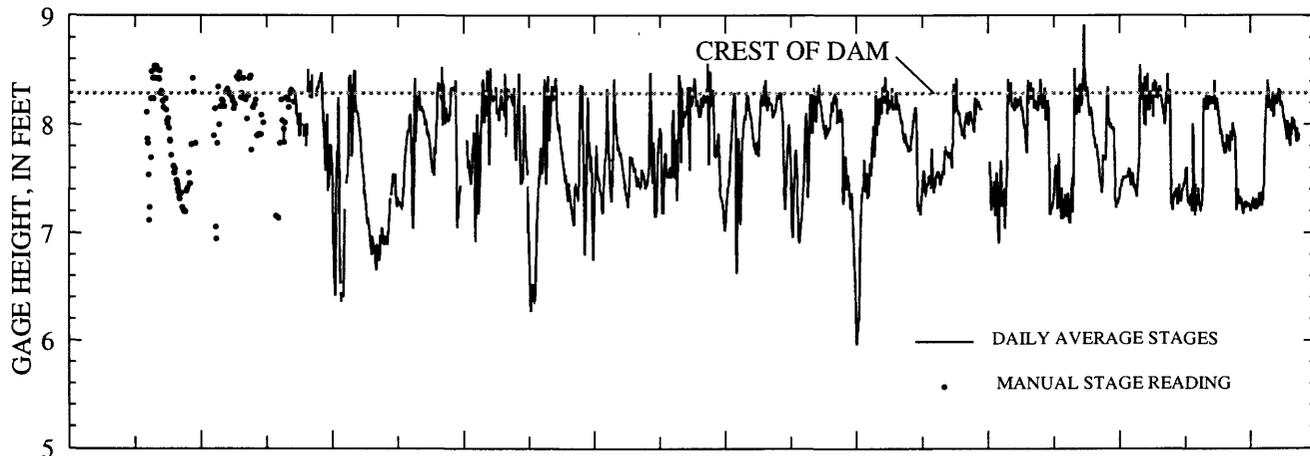
REMARKS.--Lake level regulated by dam with two 10-foot gates at outlet. Lake ice-covered Jan. 1 to Feb. 27, and Mar. 4-16. Prior to October 1987, published as Wind Lake at Wind Lake, Wis. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 8.93 ft, June 15, 1999; minimum recorded, 5.95 ft, Jan. 2, 1996.

EXTREMES FOR CURRENT YEAR.--Maximum recorded gage height, 8.44 ft, Apr. 9; minimum recorded, 7.17 ft, Nov. 20, 22, and 23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.93	7.27	7.27	7.22	7.32	7.29	8.21	8.12	8.20	8.16	7.97	7.96
2	7.92	7.32	7.27	7.21	7.31	7.33	8.26	8.19	8.19	8.14	7.96	8.02
3	7.91	7.33	7.28	7.20	7.30	7.36	8.26	8.21	8.25	8.13	7.94	8.05
4	7.90	7.34	7.29	7.21	7.28	7.35	8.25	8.23	8.28	8.12	7.94	8.03
5	7.90	7.31	7.29	7.22	7.26	7.34	8.23	8.25	8.23	8.09	7.95	8.02
6	7.89	7.27	7.27	7.23	7.24	7.31	8.22	8.27	8.22	8.07	7.91	8.01
7	7.86	7.29	7.27	7.24	7.23	7.27	8.23	8.30	8.28	8.07	7.88	7.99
8	7.79	7.31	7.26	7.25	7.23	7.25	8.32	8.29	8.32	8.06	7.87	7.98
9	7.72	7.31	7.24	7.26	7.23	7.30	8.41	8.22	8.32	8.08	7.85	7.97
10	7.69	7.32	7.24	7.26	7.28	7.36	8.31	8.12	8.30	8.06	7.83	7.97
11	7.62	7.32	7.25	7.27	7.29	7.38	8.18	8.07	8.28	8.04	7.81	7.94
12	7.52	7.31	7.26	7.27	7.30	7.35	8.15	8.12	8.26	8.03	7.80	7.92
13	7.40	7.31	7.29	7.28	7.29	7.33	8.24	8.12	8.27	8.02	7.91	7.91
14	7.31	7.30	7.26	7.29	7.26	7.33	8.32	8.11	8.31	8.00	8.01	7.89
15	7.21	7.28	7.26	7.30	7.26	7.30	8.34	8.08	8.32	8.00	7.99	7.88
16	7.25	7.25	7.26	7.31	7.25	7.32	8.23	8.11	8.30	7.99	7.98	7.86
17	7.27	7.21	7.27	7.31	7.25	7.42	8.19	8.16	8.28	7.97	7.96	7.84
18	7.30	7.21	7.26	7.30	7.25	7.51	8.19	8.19	8.23	7.97	7.94	7.86
19	7.32	7.23	7.28	7.29	7.28	7.60	8.22	8.20	8.18	7.96	7.93	7.90
20	7.30	7.19	7.27	7.28	7.33	7.69	8.22	8.22	8.18	7.94	7.91	7.96
21	7.29	7.19	7.27	7.28	7.37	7.77	8.22	8.23	8.22	7.93	7.90	7.96
22	7.30	7.18	7.27	7.27	7.36	7.81	8.23	8.22	8.21	7.92	8.05	7.94
23	7.37	7.18	7.27	7.26	7.34	7.85	8.22	8.22	8.21	7.91	8.06	7.92
24	7.41	7.21	7.27	7.24	7.31	7.92	8.20	8.25	8.21	7.88	8.07	7.90
25	7.39	7.23	7.26	7.23	7.31	7.99	8.18	8.28	8.20	7.86	8.06	7.88
26	7.36	7.23	7.26	7.23	7.31	8.03	8.14	8.26	8.19	8.03	8.06	7.87
27	7.31	7.24	7.25	7.23	7.31	8.06	8.14	8.23	8.19	8.03	8.05	7.87
28	7.27	7.24	7.25	7.24	7.29	8.09	8.17	8.20	8.18	8.03	8.03	7.85
29	7.30	7.25	7.25	7.24	---	8.13	8.14	8.19	8.17	8.03	8.00	7.91
30	7.32	7.27	7.24	7.25	---	8.16	8.12	8.20	8.16	8.01	7.99	7.92
31	7.29	---	7.23	7.30	---	8.18	---	8.20	---	8.00	7.98	---
MEAN	7.50	7.26	7.26	7.26	7.29	7.59	8.22	8.20	8.24	8.02	7.95	7.93
MAX	7.93	7.34	7.29	7.31	7.37	8.18	8.41	8.30	8.32	8.16	8.07	8.05
MIN	7.21	7.18	7.23	7.20	7.23	7.25	8.12	8.07	8.16	7.86	7.80	7.84



424915088083900 WIND LAKE AT WIND LAKE, WI

LOCATION.--Lat 42°49'15", long 88°08'39", in NW 1/4 SW 1/4 sec.9, T.4 N., R.20 E., Racine County, Hydrologic Unit 07120006, at Wind Lake.

PERIOD OF RECORD.--February 1985 to current year.

REMARKS.--Lake sampled near center at the deep hole. Lake ice-covered during February sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, FEBRUARY 12 TO JUNE 10, 2002
(Milligrams per liter unless otherwise indicated)

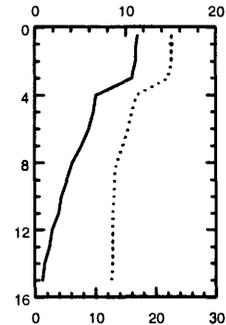
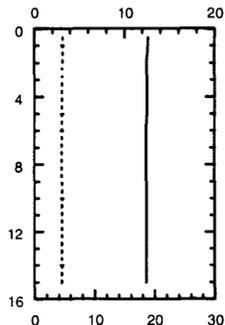
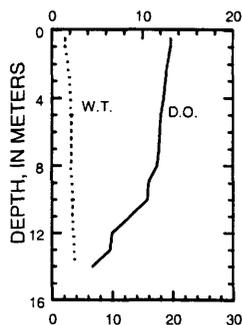
	Feb 12		Apr 10		Jun 10	
Lake stage (ft)	7.30		8.31		8.30	
Secchi-depth (m)	---		1.5		1.2	
Chlorophyll a, phytoplankton (µg/L)	---		10.0		15.2	
Depth of sample (m)	0.5	14	0.5	15	0.5	15
Water temperature (°C)	2.2	3.8	4.7	4.6	22.6	12.7
Specific conductance (µS/cm)	626	713	624	635	610	660
pH (units)	7.8	7.2	8.2	8.2	8.3	7.4
Dissolved oxygen (mg/L)	13.1	4.5	12.6	12.4	11.3	0.9
Phosphorus, total (as P)"	0.037	0.050	0.029	0.028	0.025	0.099
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	---	---	0.17	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.08	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	1.2	---	---	---
Nitrogen, total (as N)	---	---	1.3	---	---	---
Color (Pt-Co. scale)	---	---	25	---	---	---
Turbidity (NTU)	---	---	2.9	---	---	---
Hardness, as CaCO ₃	---	---	230	---	---	---
Calcium, dissolved (Ca)	---	---	47.4	---	---	---
Magnesium, dissolved (Mg)	---	---	27.2	---	---	---
Sodium, dissolved (Na)	---	---	37.8	---	---	---
Potassium, dissolved (K)	---	---	3.00	---	---	---
Alkalinity as CaCO ₃	---	---	177	---	---	---
Sulfate, dissolved (SO ₄)	---	---	34.5	---	---	---
Chloride, dissolved (Cl)	---	---	77.6	---	---	---
Silica, dissolved (SiO ₂)	---	---	<0.020	---	---	---
Solids, dissolved, at 180°C	---	---	380	---	---	---
Iron, dissolved (Fe) µg/L	---	---	<100	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	<1	---	---	---

2-12-02

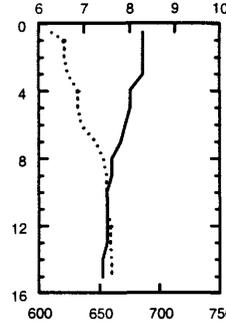
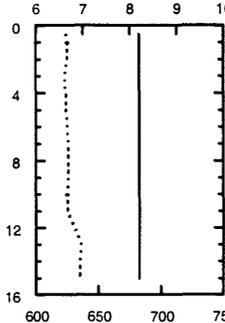
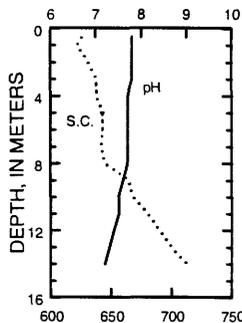
4-10-02

6-10-02

DISSOLVED OXYGEN (D.O.) IN MILLIGRAMS PER LITER



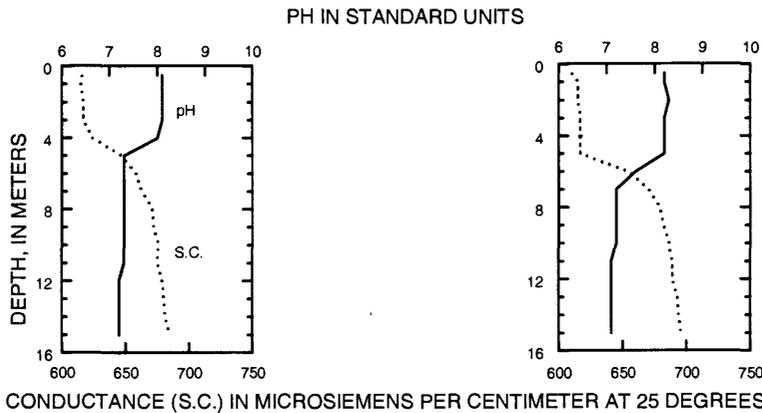
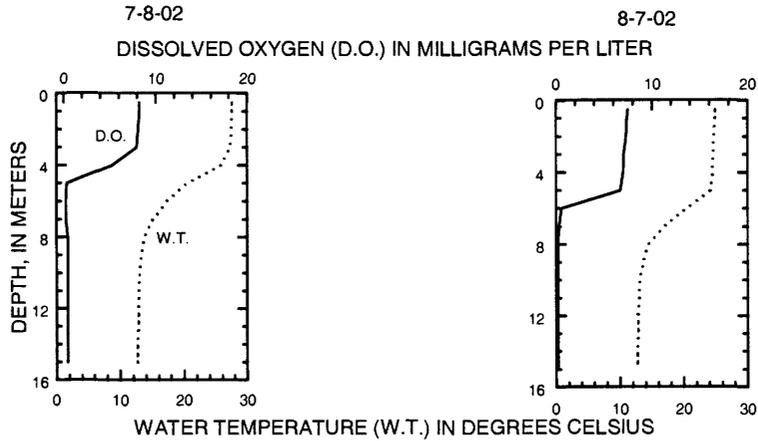
WATER TEMPERATURE (W.T.) IN DEGREES CELSIUS

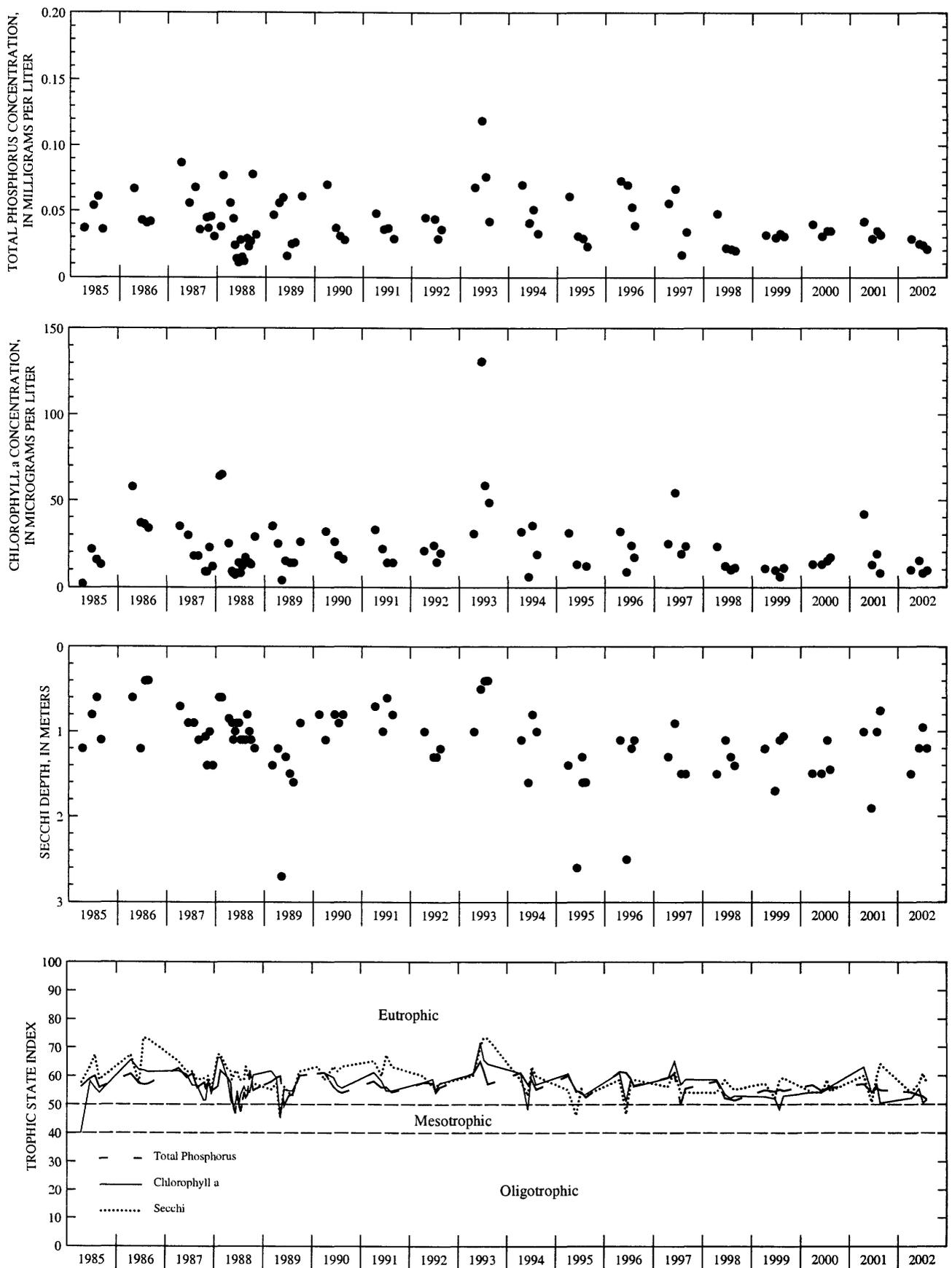


SPECIFIC CONDUCTANCE (S.C.) IN MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS

WATER-QUALITY DATA, JULY 8 TO AUGUST 7, 2002
(Milligrams per liter unless otherwise indicated)

	Jul 8					Aug 7				
Lake stage (ft)	8.06					7.88				
Secchi-depth (m)	0.9					1.2				
Chlorophyll a, phytoplankton (µg/L)	8.10					9.29				
Depth of sample (m)	0.5	4	6	10	15	0.5	5	7	11	15
Water temperature (°C)	27.6	25.8	17.2	13	12.7	24.9	24.2	16.9	13	12.7
Specific conductance (µS/cm)	616	624	658	676	685	610	617	670	689	696
pH (units)	8.1	8.0	7.3	7.3	7.2	8.2	8.2	7.2	7.1	7.1
Dissolved oxygen (mg/L)	8.2	5.2	0.2	0.4	0.4	7.5	6.7	0.3	0.2	0.2
Phosphorus, total (as P)	0.024	0.071	0.029	0.045	0.089	0.021	0.022	0.033	0.038	0.052
Phosphorus, ortho, dissolved (as P)	<0.002	---	---	---	---	---	---	---	---	---
Nitrogen, NO ₂ + NO ₃ , diss. (as N)	<0.010	---	---	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	<0.013	---	---	---	---	---	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	1.0	---	---	---	---	---	---	---	---	---





Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Wind Lake, Deep Hole, at Wind Lake, Wisconsin.

04082500 LAKE WINNEBAGO AT OSHKOSH, WI

LOCATION.--Lat 44°00'35", long 88°31'38", in NE 1/4 NE 1/4 sec.25, T.18 N., R.16 E., Winnebago County, Hydrologic Unit 04030203, at 905 Bay Shore Drive, 800 ft east of mouth of the upper Fox River.

DRAINAGE AREA.--5,880 mi², at lake outlet at Menasha Dam. Area of Lake Winnebago, 215 mi².

PERIOD OF RECORD.--October 1938 to current year in reports of Geological Survey. Records from July 1882 to September 1938 in files of Geological Survey and U.S. Army Corps of Engineers. A report on Fox River by U.S. Army Corps of Engineers, published as House Document No. 146, 67th Congress, 2nd session, contains semi-monthly records of inflow of Lake Winnebago for the period 1896-1917.

REVISED RECORD.--WDR WI-83-1: Drainage area.

GAGE.--Water-stage recorder. Nonrecording gage read once daily October 1938 to October 1978. Datum of gage is 745.05 ft above mean tide at New York City (levels by U.S. Army Corps of Engineers). Datum of Deuchman gage is 745.00 ft above mean tide at New York City.

REMARKS.--Lake elevations controlled by dams at Menasha and Neenah, which are operated in the interest of navigation. Crests of both dams are at elevation 746.73 ft. Present limits of regulation are from 21 1/4 in. above the crest of Menasha dam to crest during navigation season, plus additional 18 in. below crest during winter. Oshkosh staff gage gives true level of lake, while Deuchman gage readings are affected by loss of head in the channel between lake and dam. Data-collection platform and gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height observed, 5.33 ft (Deuchman gage) Nov. 8, 1881; minimum observed, -2.00 ft (Deuchman gage) Nov. 28, 1891.

EXTREMES FOR CURRENT YEAR.--Maximum daily mean gage height, 3.18 ft, June 22, 23; minimum recorded, 1.61 ft, Feb. 10.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.95	2.70	2.32	1.99	1.69	1.94	2.17	3.04	3.11	2.98	2.86	2.91
2	2.94	2.69	2.36	1.97	1.69	1.95	2.18	2.97	3.10	2.95	2.89	2.90
3	2.91	2.71	2.36	1.95	1.67	1.96	2.15	3.04	3.15	2.96	2.88	2.98
4	2.91	2.69	2.36	1.93	1.67	1.95	2.17	2.96	3.14	3.01	2.90	2.98
5	2.89	2.68	2.35	1.92	1.66	1.93	2.16	2.94	3.14	2.97	2.95	2.96
6	2.86	2.65	2.39	1.90	1.66	1.91	2.19	2.89	3.13	2.94	2.93	2.96
7	2.84	2.65	2.40	1.88	1.65	1.89	2.14	2.94	3.09	2.94	2.90	2.95
8	2.80	2.60	2.35	1.86	1.65	1.89	2.21	2.92	3.08	2.95	2.88	2.96
9	2.77	2.59	2.34	1.85	1.64	1.88	2.29	2.68	3.09	3.02	2.86	2.97
10	2.77	2.59	2.30	1.83	1.65	1.90	2.33	2.81	3.07	3.01	2.83	2.96
11	2.80	2.56	2.31	1.82	1.66	1.90	2.37	2.91	3.10	2.95	2.84	2.96
12	2.82	2.53	2.28	1.80	1.66	1.87	2.42	2.82	3.16	2.92	2.82	2.94
13	2.80	2.49	2.28	1.79	1.65	1.86	2.49	2.80	3.14	2.92	2.83	2.93
14	2.78	2.49	2.30	1.79	1.65	1.89	2.52	2.84	3.17	2.92	2.82	2.91
15	2.79	2.46	2.26	1.80	1.63	1.87	2.59	2.83	3.16	2.92	2.77	2.93
16	2.79	2.45	2.24	1.79	1.65	1.91	2.64	2.86	3.15	2.91	2.79	2.89
17	2.79	2.42	2.23	1.78	1.66	1.93	2.67	2.87	3.16	2.90	2.73	2.90
18	2.73	2.40	2.23	1.77	1.65	1.93	2.72	2.84	3.11	2.92	2.78	2.88
19	2.75	2.39	2.16	1.75	1.69	1.96	2.83	2.85	3.04	2.90	2.78	2.91
20	2.74	2.39	2.19	1.74	1.74	2.01	2.87	2.82	3.01	2.86	2.78	2.95
21	2.75	2.36	2.19	1.72	1.82	1.99	2.89	2.80	3.06	2.85	2.76	2.98
22	2.76	2.34	2.18	1.70	1.84	2.04	2.81	2.81	3.18	2.87	2.86	2.96
23	2.75	2.32	2.10	1.68	1.86	2.06	2.85	2.81	3.18	2.91	2.87	2.90
24	2.74	2.33	2.05	1.68	1.87	2.14	2.78	2.92	3.17	2.85	2.90	2.94
25	2.59	2.27	2.12	1.68	1.89	2.12	2.81	2.95	3.15	2.81	2.91	2.92
26	2.79	2.38	2.11	1.66	1.92	2.11	2.94	2.97	3.12	2.84	2.91	2.94
27	2.78	2.31	2.09	1.66	1.94	2.13	2.98	3.04	3.13	2.86	2.94	2.94
28	2.70	2.32	2.07	1.65	1.94	2.13	2.94	3.06	3.10	2.86	2.92	2.94
29	2.74	2.34	2.05	1.65	---	2.14	2.94	3.08	3.07	2.89	2.92	2.95
30	2.74	2.35	2.03	1.65	---	2.13	2.98	3.10	3.02	2.89	2.93	2.95
31	2.72	---	2.01	1.66	---	2.13	---	3.12	---	2.90	2.92	---
MEAN	2.79	2.48	2.23	1.78	1.73	1.98	2.57	2.91	3.12	2.92	2.86	2.94
MAX	2.95	2.71	2.40	1.99	1.94	2.14	2.98	3.12	3.18	3.02	2.95	2.98
MIN	2.59	2.27	2.01	1.65	1.63	1.86	2.14	2.68	3.01	2.81	2.73	2.88

04084255 LAKE WINNEBAGO NEAR STOCKBRIDGE, WI

LOCATION.--Lat 44°04'17", long 88°19'52", Stockbridge Indian Reservation, Calumet County, Hydrologic Unit 04030203, on east shore of Lake Winnebago, 300 ft south of County Highway E and 1.6 mi west of Stockbridge.

DRAINAGE AREA.--5,880 mi², at lake outlet at Menasha Dam. Area of Lake Winnebago, 215 mi².

PERIOD OF RECORD.--November 1982 to current year.

GAGE.--Water-stage recorder. Datum of gage is 745.05 ft above mean tide of New York City (levels by U. S. Army Corps of Engineers).

REMARKS.--Lake elevations controlled by dams at Menasha and Neenah, which are operated in the interest of navigation. Crests of both dams are at elevation 746.73 ft. Present limits of regulation are from 21 1/4 in. above the crest of Menasha dam to crest during navigation season, plus additional 18 in. below crest during winter. Data-collection platform and gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily mean gage height, 3.85 ft, July 9, 11, 1993; minimum observed, 0.30 ft, Mar. 1, 1986.

EXTREMES FOR CURRENT YEAR.--Maximum daily mean gage height, 3.15 ft, June 23; minimum recorded, 1.56 ft, Feb. 11 and 18.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2001 TO SEPTEMBER 2002

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.92	2.71	2.40	1.96	1.67	1.90	2.12	2.94	3.08	2.97	2.90	2.86
2	2.91	2.73	2.34	1.94	1.64	1.92	2.09	3.05	2.99	2.98	2.85	2.95
3	2.93	2.67	2.32	1.91	1.64	1.95	2.14	2.99	3.00	2.97	2.82	3.01
4	2.92	2.66	2.33	1.89	1.64	1.91	2.14	2.92	3.06	2.92	2.86	2.93
5	2.90	2.64	2.43	1.88	1.63	1.88	2.14	2.85	3.08	2.86	2.84	2.90
6	2.93	2.64	2.41	1.86	1.62	1.87	2.12	2.82	3.07	2.88	2.78	2.89
7	2.83	2.59	2.34	1.84	1.62	1.84	2.13	2.80	3.06	2.90	2.80	2.90
8	2.75	2.63	2.35	1.82	1.61	1.84	2.15	2.76	3.03	2.93	2.81	2.91
9	2.77	2.63	2.38	1.80	1.61	1.89	2.23	2.95	3.02	2.90	2.81	2.92
10	2.80	2.54	2.34	1.80	1.62	1.91	2.27	2.97	3.02	2.84	2.82	2.93
11	2.79	2.51	2.27	1.78	1.62	1.84	2.31	2.75	3.09	2.84	2.80	2.91
12	2.73	2.49	2.25	1.77	1.64	1.82	2.38	2.67	3.09	2.86	2.80	2.93
13	2.75	2.49	2.31	1.75	1.61	1.81	2.43	2.74	3.08	2.88	2.80	2.89
14	2.85	2.45	2.26	1.76	1.60	1.78	2.47	2.79	3.11	2.88	2.81	2.87
15	2.87	2.44	2.23	1.77	1.61	1.82	2.53	2.80	3.13	2.87	2.81	2.82
16	2.77	2.40	2.20	1.76	1.62	1.85	2.59	2.77	3.14	2.88	2.77	2.86
17	2.78	2.38	2.22	1.75	1.61	1.85	2.65	2.75	3.10	2.89	2.81	2.84
18	2.77	2.38	2.21	1.74	1.59	1.89	2.69	2.75	3.02	2.83	2.78	2.82
19	2.75	2.43	2.23	1.71	1.64	1.91	2.77	2.74	2.99	2.81	2.72	2.87
20	2.75	2.44	2.22	1.69	1.71	1.97	2.72	2.74	2.99	2.83	2.71	2.95
21	2.71	2.36	2.14	1.68	1.79	2.01	2.64	2.77	3.01	2.84	2.70	3.00
22	2.70	2.31	2.14	1.65	1.80	2.07	2.75	2.80	3.12	2.88	2.76	3.00
23	2.71	2.28	2.24	1.65	1.80	2.05	2.80	2.83	3.15	2.77	2.79	2.98
24	2.79	2.25	2.20	1.65	1.82	2.02	2.84	2.80	3.13	2.76	2.85	2.91
25	3.13	2.35	2.13	1.63	1.86	2.02	2.97	2.85	3.12	2.76	2.85	2.88
26	2.95	2.25	2.09	1.63	1.89	2.07	2.90	2.99	3.14	2.80	2.86	2.85
27	2.78	2.20	2.07	1.62	1.91	2.08	2.76	2.97	3.09	2.82	2.82	2.84
28	2.75	2.26	2.04	1.63	1.90	2.09	2.73	2.98	3.07	2.83	2.85	2.86
29	2.65	2.29	2.03	1.63	---	2.10	2.93	3.03	3.03	2.88	2.86	2.88
30	2.64	2.29	2.01	1.62	---	2.13	2.96	3.08	2.99	2.89	2.86	2.91
31	2.69	---	1.98	1.63	---	2.13	---	3.10	---	2.87	2.85	---
MEAN	2.81	2.46	2.23	1.75	1.69	1.94	2.51	2.86	3.07	2.87	2.81	2.90
MAX	3.13	2.73	2.43	1.96	1.91	2.13	2.97	3.10	3.15	2.98	2.90	3.01
MIN	2.64	2.20	1.98	1.62	1.59	1.78	2.09	2.67	2.99	2.76	2.70	2.82

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APPENDIX

Wisconsin Lakes Team Quality-Assurance Plan

Most lake studies and monitoring programs that are conducted by the USGS Wisconsin District entail water sampling and analysis to determine water quality and biological productivity. Because all sampling and analysis is subject to error and random variability, a certain proportion of the sampling effort should include quality-assurance samples. These samples are collected and/or prepared solely for the purpose of assessing the magnitude of error and random variability so that the accuracy and precision of all data can be evaluated. The plan for this quality-assurance sampling is described below.

Three types of QA/QC samples are collected:

blanks

provide information about accuracy and errors due to treatment or reagents

replicates

provide information about precision (variability)

standard additions (spikes)

provide information about accuracy and matrix interferences

Blank Sampling

B1. A **preservation blank** is prepared for each month of lake sampling. This consists of deionized water or norganic blank water, to which is added any reagents or preservatives that are normally added to natural water samples. The blank is not taken to the field, but is shipped to the laboratory for analysis along with the natural water samples.

This blank sample is analyzed for the Nutrient Group¹ and chlorophyll-a.

B2. At one randomly-chosen lake each month, a **field blank** is prepared. This consists of deionized water or inorganic blank water treated exactly the same as regular samples. During winter, the field blank is analyzed for total phosphorus (TP) only; during summer, it is analyzed for TP and chlorophyll-a, and in the spring, it is analyzed for the Nutrient Group and chlorophyll-a.

¹ Nutrient Group = all phosphorus and nitrogen species that are commonly determined in lakes (total phosphorus, nitrate + nitrite, ammonia, total Kjeldahl nitrogen, total nitrogen)

Replicate Sampling

R1. At all lakes in program, **triplicate samples** are taken near water surface in summer for analysis of total phosphorus and chlorophyll-a. At two of these lakes, a set of triplicate samples is also taken from near-bottom water, for analysis of total phosphorus.

R2. At three selected lakes in the spring (different lakes each year), **triplicate samples** are taken near water surface for analysis of Nutrient Group.

R3. At one lake each year, **5 replicate samples** are taken near water surface for analysis of total phosphorus and chlorophyll-a.

Standard Addition Testing

S1. At Delavan Lake and one other lake (to be determined each year), **5 replicate samples** are taken in August for a **standard addition (spike) test**. The spike consists of addition of a prepared phosphorus solution (standard) of known volume and concentration, such that the expected result of analysis is the natural water TP concentration plus the known addition. One sample from each set will receive a low-concentration spike, one will receive a high-concentration spike, and three will receive no spike (the mean of these gives the natural water TP concentration).

Data and results of replicate sampling and field blank testing in water year 2000 are shown in Table A1.

Table A1. Analyses of replicate samples from Wisconsin lakes in water years 2001-2002.

See text for procedures used. All data except chlorophyll in milligrams per liter. Symbol "<" indicates less than given detection limit (DL); mean and standard deviation not calculated for datasets containing values less than DL. All samples collected near surface (approximately 0.5 m depth) unless otherwise indicated.

Parameter	Lake	Date	Replicate Data			Mean	Standard Deviation	Percent Standard Deviation		
Total Phosphorus	Buffalo	7/23/01	0.276	0.275	0.277	0.276	0.001	0.4		
	Delavan	7/15/01	0.027	0.027	0.031	0.028	0.002	8.2		
	Delavan	8/19/01	0.031	0.027	0.035	0.031	0.004	12.9		
	Geneva	7/15/01	0.005	<0.005	<0.005					
	Little Green	7/23/01	0.069	0.074	0.072	0.072	0.003	3.5		
	Middle	6/17/01	0.012	0.012	0.017	0.016	0.003	18.5		
	Muskego	4/18/01	0.039	0.044	0.047	0.043	0.004	9.3		
	Muskego	7/25/01	0.030	0.031	0.031	0.031	0.001	1.9		
	Oconomowoc	7/17/01	0.010	0.011	0.010	0.010	0.001	5.6		
	Oconomowoc	8/23/01	0.011	0.010	0.009	0.010	0.001	10.0		
	Okauchee	8/20/01	0.013	0.015	0.015	0.014	0.001	8.1		
	Red Cedar	7/9/01	0.021	0.022		0.022	0.001	3.3		
	Delavan	7/15/02	0.026	0.026	0.027	0.031	0.002	8.7		
	Geneva	7/16/02	0.008	0.008	0.008	0.008	0.000	0.0		
	Little Muskego	7/1/02	0.016	0.016	0.017	0.016	0.001	3.5		
Potter	8/5/02	0.041	0.036	0.042	0.043	0.041	0.003	6.7		
Little St. Germain	7/22/02	0.061	0.060	0.059		0.060	0.001	1.7		
Total Phosphorus, near bottom	Geneva	7/15/01	0.017	0.020	0.021	0.019	0.002	10.8		
	Red Cedar	7/9/01	0.187	0.228	0.262	0.226	0.038	16.6		
	Wind	7/8/02	0.084	0.089	0.092	0.088	0.004	4.6		
Dissolved Phosphorus	Delavan	7/15/01	0.010	<0.002	<0.007					
	Geneva	4/17/01	<0.002	<0.002						
	Oconomowoc	8/23/01	0.002	<0.002	<0.002					
Dissolved Ammonia	Delavan	7/15/01	0.026	0.013	0.021	0.020	0.007	32.8		
	Geneva	4/17/01	0.014	0.022		0.018	0.006	31.4		
	Muskego	4/18/01	0.086	0.083	0.084	0.084	0.002	1.8		
	Oconomowoc	8/23/01	0.027	0.028	0.022	0.026	0.003	12.5		
Total Kjeldahl Nitrogen	Delavan	7/15/01	0.560	0.580	0.560	0.567	0.012	2.0		
	Geneva	4/17/01	0.390	0.390		0.390	0.000	0.0		
	Muskego	4/18/01	1.200	1.100	1.200	1.167	0.058	4.9		
	Oconomowoc	8/23/01	0.490	0.500	0.520	0.503	0.015	3.0		
Dissolved Nitrate plus Nitrite	Delavan	7/15/01	0.014	0.008	0.007	0.010	0.004	39.2		
	Geneva	4/17/01	0.113	0.115		0.114	0.001	1.2		
	Muskego	4/18/01	0.102	0.103	0.104	0.103	0.001	1.0		
	Oconomowoc	8/23/01	0.370	0.371	0.369	0.370	0.001	0.3		
Chlorophyll-a (micrograms per liter)	Buffalo	7/23/01	14.0	16.0	17.0	15.7	1.5	9.8		
	Delavan	7/15/01	4.9	4.0	4.8	4.6	0.5	10.8		
	Geneva	7/15/01	<1.0	<1.0	1.1					
	Little Green	7/23/01	23.0	24.0	24.0	23.7	0.6	2.4		
	Middle	6/17/01	1.6	4.7		3.2	2.2	69.6		
	Muskego	7/25/01	6.6	3.2	3.2	4.3	2.0	45.3		
	Oconomowoc	7/17/01	2.6	2.8	2.3	2.6	0.3	9.8		
	Okauchee	8/20/01	8.0	8.0	8.0	8.0	0.0	0.0		
	Powers	7/25/01	4.8	5.0	5.5	5.1	0.4	7.1		
	Red Cedar	7/9/01	5.2	3.7		4.5	1.1	23.8		
	Delavan	7/15/02	9.7	6.9	8.0	8.1	1.2	14.1		
	Geneva	7/16/02	0.74	1.00	0.96	0.9	0.1	15.6		
	Little Muskego	7/1/02	1.74	1.50	1.34	1.5	0.2	13.2		
	Potter	8/5/02	10.8	10.3	11.9	9.77	11.0	10.8	0.8	7.4
	Little St. Germain	7/22/02	63.8	62.2	69.7		65.2	4.0	6.1	

Table A2. Data from tests of blanks, 2001-2002.

All data in milligrams per liter, unless otherwise indicated; < = less than given detection limit; E = estimated value.

Delavan Lake. Analyses at USGS National Water Quality Laboratory, Lakewood, CO

<u>Parameter</u>	<u>2/19/01</u>	<u>4/17/01</u>	<u>7/15/01</u>	<u>2/21/02</u>	<u>4/17/02</u>	<u>7/14/02</u>	
Total P	E 0.003	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.006
Dissolved orthophosphate			< 0.007			< 0.007	< 0.007
Chlorophyll a	< 0.1	< 0.1		< 0.1		< 0.1	< 0.1
Chlorophyll b	< 0.1			< 0.1		< 0.1	< 0.1
Total Kjeldahl Nitrogen (as N)			< 0.08		< 0.10	E 0.05	E 0.05
Ammonia (as N)			< 0.02			0.037	0.034
Nitrate + Nitrite (as N)			< 0.05			E 0.011	0.008

Big Cedar Lake, south site, near West Bend, WI. Analyses at Wisconsin State Laboratory of Hygiene, Madison, WI

<u>Parameter</u>	<u>4/22/02</u>	<u>8/8/02</u>
Total P	< 0.005	< 0.005
Dissolved orthophosphate	< 0.002	
Chlorophyll a	< 1.00	< 0.26
Total Kjeldahl Nitrogen (as N)	< 0.14	
Ammonia (as N)	< 0.013	
Nitrate + Nitrite (as N)	< 0.010	
Calcium, dissolved	< 0.20	
Magnesium, dissolved	< 0.20	
Potassium, dissolved	< 1.0	
Sodium, dissolved	< 0.10	
Iron, dissolved (micrograms per liter)	< 100	
Manganese, dissolved (micrograms per liter)	< 1	