McKenzie Lake near Spooner, WI
Water-Quality Data Summary

This summary primarily covers the period May 1997 to September 1998, which is the period of water-quality monitoring of McKenzie Lake by the U.S Geological Survey (USGS). However, additional data for one of the sampling sites was provided by the Wisconsin Department of Natural Resources. These data covering the period of 1986-97 are included in graphs to illustrate changes or trends.

In reviewing the data, it may be helpful to refer to the methods and explanations of physical and chemical characteristics sections in the USGS annual lake report, "Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1998," and to Shaw and others (1994) " Understanding Lakes Data."

Lake description and sampling locations:

McKenzie Lake is classified as a drainage lake, with one inlet and two outlets. The average depth of the lake is 5.8 meters, the surface area is 1185 acres (1.85 square miles), the lake's topographically defined watershed are is 32.2 square miles. The watershed area contributing overland runoff to the lake is considerably smaller that 32.2 square miles. Much of the overland runoff within the topographically defined watershed is into closed depressions, many of which contain lakes of wetlands. The water-quality sampling site is located at the deepest point in the lake at a depth of about 18 meters. Lake stage was monitored at the outlet, which is located on the north side of the lake. The locations of the monitoring sites are shown in Figure 1.

Hydrologic conditions during water year 1997 and 98:

Annual variability in lake condition often reflects variability in climatic and hydrologic conditions. Air temperature in northwestern Wisconsin was, on average, 0.4° F cooler than normal for the period December 1996 through March 1997; April and May was 3.9° F cooler than normal; the period June through August was 0.5° F cooler than normal (National Oceanic and Atmospheric Administration "Climatological Data – Wisconsin"). Precipitation during water year 1997 was 100 percent of the normal precipitation for northwestern Wisconsin (Pamela Naber-Knox, UW-Extension, Geological and Natural History Survey, written commun., 1997). Watershed runoff in the region of McKenzie Lake was between 120 and 140 percent of long-term average runoff (Holmstrom and others, 1998, "Water Resources Data – Wisconsin")

Air temperature in northwestern Wisconsin was, on average 8.7° F warmer than normal for the period December 1997 through March 1998; April and May was 5.0° F warmer than normal; and the period June through August was 0.4° F warmer than normal (National Oceanic and Atmospheric Administration "Climatological Data – Wisconsin"). Precipitation during water year 1998 was 87 percent of the normal

precipitation for northwestern Wisconsin (Pamela Naber-Knox, UW-Extension, Geological and Natural History Survey, written commun., 1998). Watershed runoff in the region of McKenzie Lake was between 80 and 100 percent of the long-term average runoff (Holmstrom and others, 1998, "Water Resources Data – Wisconsin").

Lake Data for 1998:

The following summarizes some of the highlights of data given in the tables and shown on the figures.

Lake-stage fluctuations:

Lake stages were measured by the USGS on sampling dates. Observed stages ranged from 0.6 feet on June 24, 1997 to 0.83 on August 15, 1998. Due to the infrequency of measurements, actual stage ranges during the monitoring period may have been greater than observed. Stage values are shown in the table on the top half of Figures 2a, 2b, and 2c.

Lake-depth profiles:

Vertical profiles of water temperature, dissolved oxygen, pH and specific conductance were measured at all three sites in the lake, and are listed in Tables 1a, 1b, 1c and shown in Figures 2a, 2b, 2c. The profiles exhibit a pattern that is typical for thermally stratified lakes. During the sampling period, almost complete water column mixing was observed at the deep hole on May 14, 1997 and March 3, 1998. The lake became thermally stratified through the summer. In July of both years the lower 11 meters of the water were anoxic (devoid of oxygen). The anoxic zone is unable to support fish. The pH, which ranged between 6.8 and 8.5 is common for northwestern Wisconsin lakes and poses no problems for aquatic life. Profiles for the north and south auxiliary sampling sites were very similar to those for the deep-hole as far as was penetrated from the water surface. This indicates that they share a common well-mixed epilimnion with the deep-hole site.

Chemical Constituents:

Analysis of water samples collected on May 14,1997 at the deep-hole for the selected chemical constituents for the chemical characterization of the lake are shown in Figure 2a. Samples collected at 0.5 and 20.0-meter depths show similar constituent concentrations, as would be expected under mixed water column conditions. The constituent values for color, chlorophyll a, chloride, calcium, magnesium, pH, alkalinity, total nitrogen, and total phosphorus are within regional value for this area as described by Lillie and Mason in, "Limnological Characteristics of Wisconsin Lakes," 1983, Technical Bulletin No. 138, Department of Natural Resources.

The ratio of dissolved nitrogen to dissolve phosphorus was 12.5:1, based on the surface concentrations on May 14, 1997. This ratio suggests the lake is transitional having algal growth being limited by the amount of available nitrogen or phosphorus. Lakes with ratios less than 10:1 are regarded as "nitrogen limited," and lakes with a ratio greater than 15:1 are regarded as "phosphorus limited."

Three common measures of water quality used as indices are concentrations of near-surface total phosphorus and chlorophyll a and Secchi depth. At the deep-hole sampling site in 1997, total phosphorus concentrations ranged form 0.009 mg/L on March 19 to 0.067 mg/L on May 14, chlorophyll a ranged form 2.7 µg/L on May 14 and 9.1 µg/L on March 19, and Secchi depths ranged form 3.4 m on June 24 to 4.5 m on May 14. At the north site, total phosphorus concentrations ranged form 0.026 mg/L on June 24 and July 21 to 0.042 mg/L on August 19, chlorophyll a ranged form 3.1 µg/L on June 24 and July 21 and 5.2 µg/L on August 19, and Secchi depths ranged form 2.8 m on August 19 to 4.4 m on July 21. At the south site in 1997, total phosphorus concentrations ranged form 0.030 mg/L on June 24 and July 21 to 0.041 mg/L on August 19, chlorophyll a ranged form 3.8 µg/L on June and 6.1 µg/L on August 19, and Secchi depths ranged form 2.3 m on August 19 to 4.0 m on July 21.

In 1998 at the deep-hole, total phosphorus concentrations ranged form 0.017 mg/L on July 10 to 0.020 mg/L on March 3 and August 21, chlorophyll a ranged form 3.36 µg/L on August 21 to 4.98 µg/L on July 10, and Secchi depths ranged form 2.5 m on August 21 to 4.5 m on March 3. At the north site, total phosphorus concentrations ranged form 0.017 mg/L on June 10 to 0.684 mg/L on March 3, chlorophyll a ranged form 2.56 µg/L on July 10to 7.1 µg/L on August 21, and Secchi depths ranged form 2.6 m on August 21 to 5.3 m on July 10. At the south site in 1997, total phosphorus concentrations ranged form 0.016 mg/L on June 10 to 0.032 mg/L on March 3, chlorophyll a ranged form 4.05 µg/L on July 10 and 6.79 µg/L on August 21, and Secchi depths ranged form 2.6 m on August 21 to 4.4 m on July 10. [The deep-hole site was only sampled three times during the 1998 water year as, as the sampling of this site was discontinued by the WDNR.

Surface total phosphorus, chlorophyll a and Secchi depths for the 1986-98 period at the deep-hole site are shown in Figure 3a. From 1991-98 there was little year to year variation in phosphorus concentration except for 1997, where concentrations were 2-3 times greater than normal. Similar, higher-than-normal phosphorus concentrations were observed in Balsam, Hemlock and Red Cedar Lakes (all drainage lakes) in nearby Washburn County during 1997. The increased concentration in 1997 may reflect the 20-40 percent greater-than-normal watershed runoff in northwestern Wisconsin that year. Phosphorus concentrations in 1998 returned to a "normal" range for the lake. Concentrations of chlorophyll a and Secchi depths did not show change in 1997 in response to the increase phosphorus concentration. This suggests that the lake was nitrogen limited as was indicated in the nitrogen:phosphorus ratio discussed earlier.

Since 1986, there appears to be a general decline in chlorophyll a concentration and increase in water clarity as indicated by Secchi depth.

Phosphorus, chlorophyll a and Secchi depths at the north and south auxiliary sites were very similar to those of the deep-hole site (See Figures 3b + 3c). This suggests that the deep-hole site adequately represents water quality for the entire lake.

Total phosphorus concentration .5 meters above the lake bottom at the deep-hole ranged form 0.051 mg/L on March 3, 1998 to 0.390 mg/L on August 21, 1998. These concentrations observed during anoxic periods are indicative of moderate phosphorus release from bottom sediments.

Lake condition:

Water-quality index

Lilllie and Mason (1983) classified all Wisconsin lakes using a random data set collected in the summer (July and August). The index, shown on page 14 of "Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1998," is based on surface-total phosphorus and chlorophyll a concentrations and Secchi depths. According to the index, surface-total phosphorus concentrations in McKenzie Lake generally indicate "good" water quality, while chlorophyll a concentrations and Secchi depths indicate "very good" water quality.

Lillie and Mason (1983) also provided a means of comparing the condition of McKenzie Lake with other lakes in northwestern Wisconsin. The comparison in Table 3 shows the percentage distribution of northwestern Wisconsin lakes within each condition group and the relative position of McKenzie Lake.

Trophic status:

Another means of assessing the nutrient or trophic status of a lake is to Carlson's Trophic State Index (TSI). The 1997 and 1998 TSI data are listed in Tables 2a, 2b, and 2c. The last plot on Figures 3a, 3b and 3c are graphical illustrations of the variation in Trophic State Indices for McKenzie Lake during the two-year study period. The phosphorus index shows the lake to be in the lower eutrophic range, whereas the chlorophyll a and Secchi indices show the lake to be mesotrophic.

Table 1a. Lake-depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1997 water year.

WATER QUALITY DATA

DATE	SAMPLING DEPTH (M) (00003)	TEMPERATURE WATER (DEG C) (00010)	PH WATER WHOLE FIELD (STANDARD UNITS) (00095)	OXYGEN, DISSOLVED (MG/L) (00300)
MAR				
19...	0.5	0.0	7.7	11.8
19..	1.0	0.5	--	11.0
19...	2.0	2.0	--	9.6
19...	3.0	3.0	--	7.5
19...	4.0	3.0	--	6.0
19...	5.0	3.5	--	5.3
19..	6.0	3.0	--	5.5
19...	7.0	3.0	5.4	5.4
19...	8.0	3.5	--	5.0
19...	9.0	3.5	--	4.2
19...	10.0	4.0	--	2.0
19..	11.0	4.0	--	2.5
19...	12.0	4.0	--	2.7
19...	13.0	4.0	--	0.6
19...	14.0	4.0	--	0.6
19.	15.0	4.0	--	0.2
19..	16.0	4.0	--	0.2
19...	17.0	4.5	--	0.2
19...	18.0	4.5	--	0.2
19...	19.0	4.5	--	0.2
19...	20.0	4.5	7.4	0.2
19...	20.5	--	--	--
MAY				
14...	0.5	10.5	7.4	9.5
14...	1.0	10.5	--	9.5
14...	2.0	10.5	--	9.5
14...	3.0	10.5	--	9.5
14...	4.0	10.5	--	9.5
14...	5.0	10.5	--	9.5
14...	6.0	10.5	--	9.5
14...	7.0	10.5	--	9.5
14...	8.0	10.5	--	9.6
14...	9.0	10.0	--	9.5
14...	10.0	10.0	--	9.5
14...	11.0	10.0	--	9.4
14...	12.0	10.0	--	9.4
14...	13.0	10.0	--	9.4
14..	14.0	10.0	--	9.4
14...	15.0	10.0	--	9.1
14...	16.0	10.0	--	9.1
14...	17.0	10.0	--	8.8
14...	18.0	10.0	--	8.5
14...	19.0	10.0	--	8.0
14...	20.0	10.0	7.4	7.0
14...	20.4	--	--	--

Table 1a. Lake-depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1997 water year - continued.

WATER QUALITY DATA

DATE	SAMPLING DEPTH (M) (00003)	TEMPERATURE WATER (DEG C) (00010)	PH WATER WHOLE FIELD (STANDARD UNITS) (00095)	OXYGEN, DISSOLVED (MG/L) (00300)
JUN				
24...	0.5	23.0	7.6	9.0
24...	1.0	23.0	--	9.0
24...	2.0	23.0	--	9.1
24...	3.0	23.0	--	9.1
24...	4.0	20.5	--	9.4
24...	5.0	19.0	--	9.0
24...	6.0	18.0	--	8.3
24...	7.0	16.0	--	8.2
24...	8.0	15.0	--	7.7
24...	9.0	14.0	7.5	3.9
24...	10.0	13.0	--	3.1
24...	11.0	13.0	--	2.7
24...	12.0	12.0	--	1.5
24...	13.0	12.0	--	1.1
24...	14.0	11.5	--	0.9
24...	15.0	11.0	--	0.7
24...	16.0	11.0	--	0.7
24...	17.0	11.0	--	0.5
24...	18.0	11.0	--	0.4
24...	19.0	11.0	--	0.4
24...	20.0	11.0	--	0.3
24...	21.0	11.0	7.4	0.3
24...	21.5	--	--	--
JUL				
21...	0.5	24.0	8.1	9.0
21...	1.0	24.0	--	9.0
21...	2.0	24.0	--	9.3
21...	3.0	23.5	--	9.3
21...	4.0	23.0	--	8.8
21...	5.0	22.0	--	8.4
21...	6.0	22.0	--	8.2
21...	7.0	19.0	--	4.2
21...	8.0	18.0	--	1.1
21...	9.0	15.0	--	0.5
21...	10.0	14.0	7.5	0.4
21...	11.0	13.0	--	0.4
21...	12.0	12.5	--	0.4
21...	13.0	12.0	--	0.4
21...	14.0	11.5	--	0.4
21...	15.0	11.5	--	0.4
21...	16.0	11.5	--	0.4
21...	17.0	11.5	--	0.4
21...	18.0	11.5	--	0.4
21...	19.0	11.5	--	0.3
21...	20.0	11.0	7.4	0.3
21...	20.8	--	--	--

Table 1a. Lake-depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1997 water year - continued.

WATER QUALITY DATA

DATE	SAMPLING DEPTH (M) (00003)	TEMPERATURE WATER (DEG C) (00010)	PH WATER WHOLE FIELD (STANDARD UNITS) (00095)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG				
18...	0.5	20.5	7.5	7.7
18...	1.0	20.5	--	7.7
18...	2.0	20.5	--	7.7
18...	3.0	20.5	--	7.7
18...	4.0	20.5	--	7.7
18...	5.0	20.5	--	7.6
18...	6.0	20.0	--	7.6
18...	7.0	20.0	--	7.6
18...	8.0	18.0	--	3.3
18...	9.0	16.0	--	0.3
18...	10.0	15.0	--	0.3
18...	11.0	13.5	7.3	0.3
18...	12.0	13.0	--	0.3
18...	13.0	12.0	--	0.3
18...	14.0	12.0	--	0.3
18...	15.0	12.0	--	0.3
18...	16.0	11.5	--	0.2
18...	17.0	11.5	--	0.2
18...	18.0	11.5	--	0.2
18...	20.0	11.5	--	0.2
18...	19.0	11.5	--	0.2
18...	21.0	11.0	7.3	0.2
18..	21.5	--	--	--

Table 1a. Lake-depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1998 water year

WATER-QUALITY DATA

DATE	SAMPLING DEPTH (M) (00098)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
MAR					
03...	0.5	4.2	140	6.8	11.3
03...	1.0	4.6	160	7.1	11.0
03...	2.0	4.7	160	7.2	10.9
03...	3.0	4.7	162	7.2	10.3
03...	4.0	4.7	162	7.2	9.5
03...	5.0	4.7	162	7.2	9.5
03...	6.0	4.6	165	7.2	9.0
03...	7.0	4.5	165	7.2	8.6
03...	8.0	4.5	162	7.2	8.5
03...	9.0	4.5	167	7.2	7.2
03...	10.0	4.6	170	7.1	7.1
03..	11.0	4.6	170	7.1	6.3
03..	12.0	4.7	174	7.1	5.4
03..	13.0	4.7	175	7.0	4.0
03..	14.0	4.8	180	7.0	2.4
03...	14.8	--	--	--	--
JUL					
10...	0.5	25.4	158	8.2	8.9
10...	1.0	25.3	156	8.2	8.9
10...	2.0	24.7	155	8.2	9.0
10...	3.0	24 1	154	8.3	9.3
10...	4.0	23.9	156	8.3	9.4
10...	5.0	23.5	157	8.2	8.5
10...	6.0	21 2	158	7.4	4.4
10...	7.0	19 9	160	7.1	3.1
10...	8.0	18.8	162	7.0	1.7
10...	9.0	17 9	163	6.9	0.2
10...	10.0	17.3	160	6.8	0.1
10...	11.0	16.8	165	6.8	0.0
10...	12.0	15.9	168	6.9	0.0
10...	13.0	15.0	172	6.9	0.0
10...	14.0	14.0	174	7.0	0.0
10...	15.0	12.8	176	7.1	0.0
10...	16.0	12.0	184	7.1	0.0
10...	17.0	11.5	186	7.1	0.0
10...	18.0	11.3	185	7.2	0.0
10...	19.0	11.1	187	7.2	0.0
10...	19.5	10.9	188	7.2	0.0
10...	20.0	--	--	--	--

Table 1a. Lake-depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1998 water year - continued

WATER-QUALITY DATA

DATE	SAMPLING DEPTH (M) (00098)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG					
21...	0.5	24.0	161	8.5	9.8
21...	1.0	23.8	161	8.6	9.7
21...	2.0	23.6	161	8.6	9.5
21...	3.0	23.2	161	8.5	8.5
21...	4.0	22.9	161	8.4	7.7
21...	5.0	22.9	161	8.4	7.5
21...	6.0	22.7	162	8.3	7.0
21...	7.0	22.4	163	8.2	6.0
21...	8.0	22.0	163	8.0	3.8
21...	9.0	20.9	172	7.8	0.7
21...	10.0	17.8	196	7.6	0.5
21...	11.0	16.7	201	7.6	0.5
21...	12.0	15.6	203	7.6	0.5
21...	13.0	14.6	201	7.6	0.5
21...	14.0	13.7	201	7.6	0.5
21...	15.0	12.8	203	7.5	0.5
21...	16.0	12.4	204	7.5	0.5
21...	17.0	12.1	208	7.5	0.4
21...	18.0	--	--	--	--

Table 1b. Lake-depth profiles do McKenzie Lake (North Site), near Spooner, Wisconsin, 1997 water year.

WATER QUALITY DATA

DATE	SAMPLING DEPTH (M) (00003)	TEMPERATURE WATER (DEG C) (00010)	PH WATER WHOLE FIELD (STANDARD UNITS) (00095)	SPECIFIC CONDUCTANCE (US/CM) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
JUN					
24...	0.5	23.5	8.6	140	10.2
24...	1.0	23.5	8.6	140	9.9
24...	1.5	23.5	8.6	140	9.5
24...	2.0	23.5	8.6	140	9.4
24...	2.5	23.5	8.6	140	9.4
24...	3.0	23.5	8.6	140	9.4
24...	3.5	23.5	8.6	140	9.4
24...	4.0	23.5	8.6	140	9.4
24...	4.5	23.5	8.6	141	9.9
24...	5.0	21.0	8.5	139	9.7
24...	5.5	20.5	8.4	141	9.7
24...	6.0	18.0	8.1	138	9.3
24...	7.0	--	--	--	--
JUL					
21...	0.5	24.0	8.7	151	9.0
21...	1.0	24.0	8.7	151	8.8
21...	1.5	24.0	8.7	151	8.6
21...	2.0	24.0	8.7	151	8.6
21...	2.5	24.0	8.7	151	8.5
21...	3.0	24.0	8.7	151	8.5
21...	3.5	24.0	8.7	151	8.5
21...	4.0	23.5	8.6	151	8.4
21...	4.5	22.0	8.4	153	8.0
21...	5.0	21.5	8.3	153	7.8
21...	5.5	21.0	8.1	154	7.0
21...	6.0	20.5	7.8	155	6.3
21...	6.5	20.0	7.6	156	5.1
21...	7.0	19.5	7.5	156	3.2
21...	7.5	18.5	7.3	157	1.5
21...	8.0	17.0	7.2	162	0.2
21...	8.5	16.5	7.2	164	0.2
21...	9.0	16.0	7.2	169	0.1
21...	9.5	16.0	7.2	173	0.1
21...	10.0	--	--	--	--
AUG					
19...	0.5	21.0	8.4	140	8.1
19...	1.0	21.0	8.4	140	8.0
19...	2.0	21.0	8.5	141	7.9
19...	3.0	21.0	8.4	141	7.9
19...	4.0	21.0	8.4	140	7.7
19...	5.0	21.0	8.3	140	7.1
19...	6.0	20.5	8.3	140	7.1
19...	7.0	20.5	8.1	140	6.4
19...	8.0	20.0	7.8	143	4.1
19...	9.0	17.0	7.3	163	0.3
19...	9.5	--	--	--	--

Table 1b. Lake-depth profiles for McKenzie Lake, North Site, near Spooner, Wisconsin, 1998 water year

WATER-QUALITY DATA

DATE	SAMPLING DEPTH (M) (00098)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
MAR					
03...	0.5	3.7	144	8.0	11.0
03...	1.0	4.2	158	7.9	10.9
03...	1.5	4.4	159	7.9	10.7
03...	2.0	4.5	159	7.8	10.6
03...	2.5	4.5	160	7.8	10.6
03...	3.0	4.6	161	7.8	10.5
03...	3.5	4.6	158	7.8	10.3
03...	4.0	4.5	160	7.8	10.1
03...	4.5	4.6	159	7.7	9.8
03...	5.0	4.6	158	7.7	9.3
03...	5.5	4.6	160	7.7	8.9
03...	6.0	4.6	165	7.6	8.6
03...	6.5	4.6	165	7.6	8.2
03...	7.0	4.6	161	7.6	8.1
03...	7.5	4.7	160	7.5	7.8
03...	8.0	4.7	169	7.5	5.8
03...	8.5	4.8	171	7.4	5.1
03...	9.0	4.9	170	7.4	5.0
03...	9.5	--	--	--	--
APR					
15...	0.5	9.0	146	7.5	12.0
15...	1.0	8.9	146	7.5	11.8
15...	1.5	8.9	146	7.5	11.8
15...	2.0	8.9	146	7.5	11.7
15...	2.5	8.9	146	7.5	11.7
15...	3.0	8.8	146	7.5	11.7
15...	3.5	8.8	145	7.5	11.7
15...	4.0	8.8	145	7.5	11.7
15...	4.5	8.8	145	7.5	11.6
15...	5.0	8.8	145	7.5	11.7
15...	6.0	8.8	144	7.6	11.7
15...	7.0	8.8	144	7.6	11.6
15...	8.0	8.8	144	7.6	11.6
15...	9.0	8.7	145	7.6	11.5
15...	9.5	--	--	--	--

Table 1b. Lake-depth profiles for McKenzie Lake, North Site, near Spooner, Wisconsin, 1998 water year - continued

WATER-QUALITY DATA

DATE	SAMPLING DEPTH (M) (00098)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
JUN					
10...	0.5	17.5	159	8.4	9.6
10...	1.0	17.5	159	8.3	9.6
10...	2.0	17.5	159	8.2	9.6
10...	3.0	17.5	159	8.2	9.5
10...	4.0	17.4	159	8.1	9.3
10...	5.0	17.4	159	8.1	8.9
10...	6.0	17.3	159	8.0	8.6
10...	7.0	17.2	160	7.9	8.1
10...	8.0	17.1	161	7.9	7.3
10...	9.0	17.0	161	7.8	7.2
10...	9.5	--	--	--	--
JUL					
10...	0.5	23.5	156	8.1	9.0
10...	1.0	23.5	153	8.2	9.0
10...	2.0	23.5	154	8.1	8.9
10...	3.0	23.4	153	8.1	8.9
10...	4.0	23.4	155	8.1	8.9
10...	5.0	23.3	152	8.1	8.4
10...	6.0	22.8	158	7.7	7.1
10...	7.0	20.9	160	7.3	3.5
10...	8.0	19.3	158	7.0	1.5
10...	8.5	--	--	--	--
AUG					
21...	0.5	23.5	160	8.4	8.9
21...	1.0	23.5	160	8.4	8.9
21...	2.0	23.3	160	8.5	9.1
21...	3.0	23.3	160	8.5	9.5
21...	4.0	23.0	162	8.4	7.6
21...	4.5	22.9	162	8.3	7.6
21...	5.0	22.9	162	8.3	7.6
21...	5.5	22.9	162	8.2	7.0
21...	6.0	22.8	162	8.2	7.0
21...	6.5	22.7	163	8.1	6.5
21...	7.0	22.5	164	8.0	4.7
21...	7.5	22.2	165	7.9	4.2
21...	8.0	21.9	165	7.8	3.2
21...	8.5	21.5	168	7.7	1.0
21...	9.0	19.9	186	7.6	0.5
21...	9.5	--	--	--	--

Table 1c. Lake-depth profiles do McKenzie Lake (South Site), near Spooner, Wisconsin, 1997 water year.

WATER QUALITY DATA

DATE	SAMPLING DEPTH (M) (00003)	TEMPERATURE WATER (DEG C) (00010)	PH WATER WHOLE FIELD (STANDARD UNITS) (00095)	SPECIFIC CONDUCTANCE (US/CM) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
JUN					
24...	0.5	22.5	8.6	141	10.1
24...	1.0	22.5	8.6	141	10.0
24...	1.5	22.5	8.6	141	9.7
24...	2.0	22.5	8.6	140	9.7
24...	2.5	22.5	8.6	140	9.6
24...	3.0	22.0	8.5	140	9.6
24...	3.5	21.0	8.4	141	9.5
24...	4.0	21.0	8.3	140	9.3
24...	4.5	20.5	8.2	141	8.9
24...	5.0	20.5	8.2	141	9.1
24...	5.5	20.0	8.1	141	8.6
24...	6.0	17.5	7.8	140	7.0
24...	6.5	17.0	7.6	142	6.2
24...	7.0	--	--	--	--
JUL					
21...	0.5	24.0	8.7	150	9.2
21...	1.0	24.0	8.7	150	9.0
21...	1.5	24.0	8.7	151	8.8
21...	2.0	24.0	8.7	150	8.8
21...	2.5	24.0	8.7	150	8.8
21...	3.0	24.0	8.7	150	8.8
21...	3.5	24.0	8.7	151	8.8
21...	4.0	24.0	8.7	151	8.8
21...	4.5	24.0	8.7	150	8.6
21...	5.0	23.5	8.5	152	8.1
21...	5.5	23.0	8.2	153	6.5
21...	6.0	22.0	7.8	155	4.8
21...	6.5	20.5	7.4	161	2.2
21...	7.0	20.5	7.4	162	1.9
21...	7.5	--	--	--	--
AUG					
19...	0.5	21.0	8.5	139	8.2
19...	1.0	21.0	8.5	139	8.1
19...	1.5	21.0	8.5	139	8.1
19...	2.0	21.0	8.5	139	8.0
19...	2.5	21.0	8.5	138	8.0
19...	3.0	21.0	8.5	138	8.0
19...	3.5	21.0	8.5	139	8.0
19...	4.0	21.0	8.5	138	8.0
19...	4.5	21.0	8.5	139	8.0
19...	5.0	21.0	8.5	139	7.9
19...	5.5	21.0	8.5	139	7.8
19...	6.0	21.0	8.4	139	7.2
19...	6.5	21.0	8.3	140	7.1
19...	7.0	20.5	8.3	139	6.7
19...	7.5	20.5	8.1	140	5.5
19...	8.0	--	--	--	--

Table 1c. Lake-depth profiles for McKenzie Lake, South Site, near Spooner, Wisconsin, 1998 water year

WATER-QUALITY DATA

DATE	SAMPLING DEPTH (M) (00098)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
MAR					
03...	0.5	3.3	154	8.8	12.0
03...	1.0	4.2	161	8.4	11.6
03...	1.5	4.3	158	8.3	11.5
03...	2.0	4.4	160	8.2	11.5
03...	2.5	4.4	160	8.2	11.5
03...	3.0	4.4	160	8.1	11.4
03...	3.5	4.4	160	8.1	11.5
03...	4.0	4.4	160	8.1	11.4
03...	4.5	4.4	159	8.1	11.4
03...	5.0	4.4	160	8.1	11.4
03...	5.5	--	--	--	--
APR					
15...	0.5	8.6	144	7.8	13.7
15...	1.0	8.6	144	7.8	12.3
15...	1.5	8.6	144	7.8	12.2
15...	2.0	8.6	144	7.8	12.1
15...	3.0	8.6	145	7.8	12.0
15...	4.0	8.6	145	7.8	12.0
15...	5.0	8.6	144	7.8	12.0
15...	6.0	8.6	144	7.8	12.0
15...	7.0	8.5	143	7.8	11.9
15...	7.5	--	--	--	--
JUN					
10...	0.5	17.3	159	8.1	10.0
10...	1.0	17.3	159	8.1	9.9
10...	1.5	17.3	159	8.2	9.8
10...	2.0	17.3	159	8.2	9.7
10...	2.5	17.3	159	8.2	9.7
10...	3.0	17.3	159	8.2	9.7
10...	3.5	17.3	159	8.2	9.6
10...	4.0	17.3	159	8.2	9.6
10...	4.5	17.2	159	8.1	9.1
10...	5.0	17.1	159	8.1	9.0
10...	5.5	17.1	159	8.1	9.0
10...	6.0	17.0	160	8.1	8.7
10...	6.5	--	--	--	--

Table 1c. Lake-depth profiles for McKenzie Lake, South Site, near Spooner, Wisconsin, 1998 water year - continued

WATER-QUALITY DATA

DATE	SAMPLING DEPTH (M) (00098)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
JUL					
10...	0.5	25.2	156	8.2	8.9
10...	1.0	25.2	155	8.2	9.0
10...	1.5	25.1	156	8.2	8.9
10...	2.0	25.0	154	8.2	8.9
10...	2.5	25.0	156	8.2	8.8
10...	3.0	24.9	154	8.2	8.8
10...	3.5	24.5	155	8.2	8.2
10...	4.0	23.9	156	8.2	8.9
10...	4.5	23.5	154	8.1	8.1
10...	5.0	23.3	157	8.0	7.8
10...	5.5	22.2	160	7.5	4.7
10...	6.0	21.4	159	7.2	3.7
10...	6.5	--	--	--	--
AUG					
21...	0.5	24.1	160	8.4	9.5
21...	1.0	24.1	160	8.5	9.4
21...	1.5	23.7	159	8.6	9.3
21...	2.0	23.6	160	8.6	9.3
21...	2.5	23.6	160	8.6	9.4
21...	3.0	23.5	159	8.7	9.4
21...	3.5	23.4	160	8.6	8.6
21...	4.0	23.1	160	8.6	8.6
21...	4.5	22.9	160	8.5	7.9
21...	5.0	22.7	160	8.4	9.0
21...	5.5	22.6	161	8.3	6.2
21...	6.0	--	--	--	--

Table 2a. – Water clarity and water quality analysis and their associated Trophic State Indices (TSI) for McKenzie Lake (Deep Hole)
1997 water year
[-indicates no applicable; -- indicates no data available

Date	Secchi Disk			Sampling	Total Phosphorus			Chlorophyll a		Dissolved Ortho-phosphate Phosphorus
	Depth (meters)	Depth (feet)	T.S.I.	Depth (feet)	Conc. (mg/L)	Conc. (µg/L)	T.S.I	Conc. (µg/L)	T.S.I.	Conc. (mg/L)
05/14/97	4.5	14.8	38	0.5	0.067	67	61	2.7	42	<.002
	-	-	-	20	0.075	75	-	-	-	<.003
06/24/97	3.4	11.2	42	0.5	0.031	31	55	4.1	45	--
	-	-	-	21	0.040	40	-	-	-	--
07/21/97	4.1	13.5	40	0.5	0.088	88	63	3.9	45	--
	-	-	-	20	0.054	54	-	-	-	--
08/18/97	3.1	10.2	44	0.5	0.081	81	62	5.1	47	--
	-	-	-	20	0.210	210	-	--	--	--

Table 2a. Water clarity and water-quality analyses and their associated Trophic State Indices (TSI) for McKenzie Lake, South Site, 1998 water year

[- indicates not applicable; -- indicates no data available]

Date	Secchi Disk			Sampling	Total Phosphorus			Chlorophyll a		Dissolved Ortho-phosphate Phosphorus
	Depth (meters)	Depth (feet)	TSI	Depth (meters)	Conc. (mg/L)	Conc. (ug/L)	TSI	Conc. (ug/L)	TSI	Conc. (mg/L)
7/10/98	4.5	14.8	38	0.5	0.017	17	50	4.98	47	--
	-	-	-	-	-	-	-	-	-	--
8/21/98	2.5	8.2	47	0.5	0.218	218	70	3.36	44	--
	-	-	-	-	-	-	-	-	-	--

Table 2b. – Water clarity and water quality analysis and their associated Trophic State Indices (TSI) for McKenzie Lake (North Site)
1997 water year
[-Indicates no applicable; -- indicates no data available

Date	Secchi Disk			Sampling Depth (feet)	Total Phosphorus			Chlorophyll a		Dissolved Ortho-phosphate Phosphorus Conc. (mg/L)
	Depth (meters)	Depth (feet)	T.S.I.		Conc. (mg/L)	Conc. (µg/L)	T.S.I	Conc. (µg/L)	T.S.I.	
06/24/97	3.8	12.5	41	0.5	0.026	26	53	3.12	43	--
	-	-	-	7.5	0.033	33	-	-	-	--
07/21/97	4.4	14.4	39	0.5	0.026	26	53	3.07	43	--
	-	-	-	9.5	0.045	45	-	-	-	--
08/19/97	2.8	9.2	45	0.5	0.042	42	57	5.2	47	--
--	--	--	--	9.0	0.045	45	-	-	-	--
--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--

Table 2b. Water clarity and water-quality analyses and their associated Trophic State Indices (TSI) for McKenzie Lake, North Site, 1998 water year

[- indicates not applicable; -- indicates no data available]

Date	Secchi Disk			Sampling	Total Phosphorus			Chlorophyll a		Dissolved Ortho-phosphate Phosphorus
	Depth (meters)	Depth (feet)	TSI	Depth (meters)	Conc. (mg/L)	Conc. (ug/L)	TSI	Conc. (ug/L)	TSI	Conc. (mg/L)
04/15/98	3	9.8	44	0.5	0.026	26	53	5.96	48	--
	-	-	-	-	-	-	-	-	-	--
06/10/98	3.2	10.5	43	0.5	0.017	17	50	6.52	49	--
	-	-	-	-	-	-	-	-	-	--
07/10/98	5.3	17.4	36	0.5	0.017	17	50	2.56	42	--
	-	-	-	8.0	0.017	17	-	-	-	--
08/21/98	2.6	8.5	46	0.5	0.022	22	52	7.1	50	--
	-	-	-	9.0	0.092	92	-	-	-	--

Table 2c. – Water clarity and water quality analysis and their associated Trophic State Indices (TSI) for McKenzie Lake (South Site)
1997 water year
[-indicates no applicable; -- indicates no data available

Date	Secchi Disk			Sampling	Total Phosphorus			Chlorophyll a		Dissolved Ortho-phosphate Phosphorus
	Depth (meters)	Depth (feet)	T.S.I.	Depth (feet)	Conc. (mg/L)	Conc. (µg/L)	T.S.I	Conc. (µg/L)	T.S.I.	Conc. (mg/L)
06/24/97	3.0	9.8	44	0.5	0.030	30	55	3.79	45	--
	-	-	-	6.5	0.059	59	-	-	-	--
07/21/97	4.0	13.1	40	0.5	0.030	30	55	4.25	46	--
	-	-	-	7	0.039	39	-	-	-	--
08/19/97	2.3	7.5	48	0.5	0.041	41	57	6.07	48	--
--	--	--	--	7.5	0.045	45	-	-	-	--
--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--

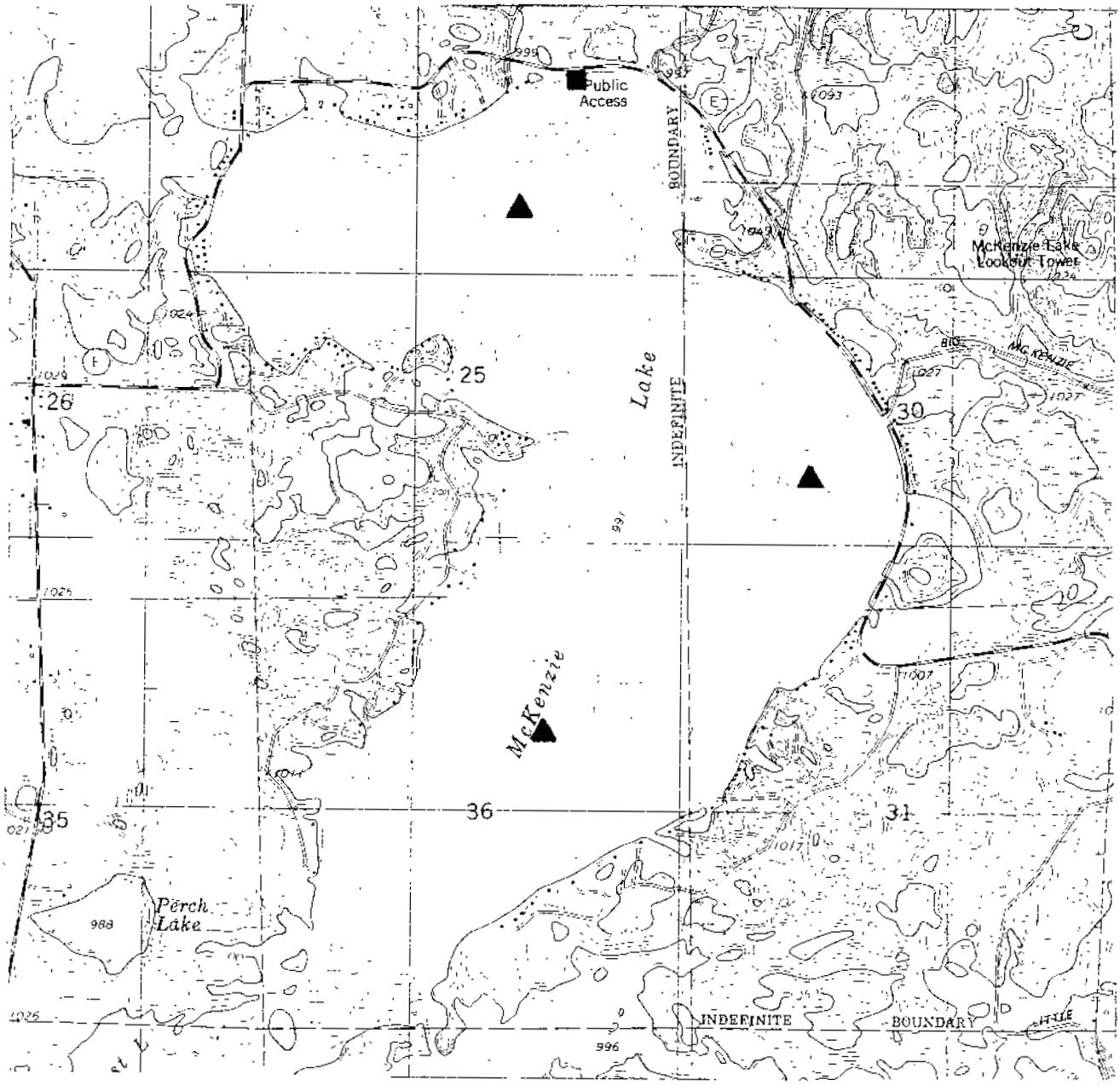
Table 2c. Water clarity and water-quality analyses and their associated Trophic State Indices (TSI) for McKenzie Lake, South Site, 1998 water year

[- indicates not applicable; -- indicates no data available]

Date	Secchi Disk			Sampling	Total Phosphorus			Chlorophyll a		Dissolved Ortho-phosphate Phosphorus
	Depth (meters)	Depth (feet)	TSI	Depth (meters)	Conc. (mg/L)	Conc. (ug/L)	TSI	Conc. (ug/L)	TSI	Conc. (mg/L)
04/15/98	2.8	9.2	45	0.5	0.026	26	53	5.06	47	--
	-	-	-	-	-	-	-	-	-	--
06/10/98	3	9.8	44	0.5	0.016	16	50	5.05	47	--
	-	-	-	-	-	-	-	-	-	--
07/10/98	4.4	14.4	39	0.5	0.018	18	51	4.05	45	--
	-	-	-	6.0	0.021	21	-	-	-	--
08/21/98	2.6	8.5	46	0.5	0.021	21	52	6.79	49	--
	-	-	-	9.0	0.032	32	-	-	-	--

Table 3. Condition of McKenzie Lake relative to other northwestern Wisconsin Lakes

	Parameter	Percentage distribution of lakes in southeast Wisconsin within parameter ranges	
	Total Phosphorus (mg/L)		
	<0.010	best condition	12
McKenzie Lake	0.010-0.020		35
	0.020-0.030		23
	0.030-0.050		18
	0.050-0.100		8
	0.100-0.150		3
	>0.150	worst condition	1
	Chlorophyll a (µg/L)		
McKenzie Lake	0-5	best condition	29
	5-10		36
	10-15		14
	15-30		14
	>30	worst condition	9
	Secchi depth (meters)		
McKenzie Lake	3.0-6.0	best condition	22
	2.0-3.0		29
	1.0-2.0		30
	<1.0	worst condition	19



EXPLANATION

▲ Water-quality monitoring site

■ Lake-stage monitoring site

Figure 1. Locations of water-quality and lake-stage monitoring sites on Big McKenzie Lake near Spooner, Wisconsin.

LOCATION.--Lat 45°55'07", long 92°01'35", in NW 1/4 SW 1/4 sec.30, T.40 N., R.13 W., Washburn County, Hydrologic Unit 07030002, 9.4 mi northwest of Spooner.

PERIOD OF RECORD.--February 1987 to current year. (Data collected before 1997 available, but not published in this report series.)

REMARKS.--Lake sampled at deepest point in the lake. Water sampling done by Wisconsin Department of Natural Resources. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 19 TO AUGUST 18, 1997

(Milligrams per liter unless otherwise indicated)

	Mar 19		May 14		June 24			July 21		
Secchi depth (meters)	---		4.5		3.4			4.1		
Chlorophyll a, phytoplankton (µg/L)	9.1		2.7		4.1			3.9		
Depth of sample (m)	0.5	20.0	0.5	20.0	0.5	9.0	21.0	0.5	10.0	20.0
Water temperature (°C)	0.0	4.6	10.3	10.0	23.0	14.0	11.0	23.9	14.2	11.2
pH (units)	7.7	7.4	7.4	7.4	7.6	7.5	7.4	8.1	7.5	7.4
Dissolved oxygen	11.8	0.2	9.5	7.0	9.0	3.9	0.3	9.0	0.4	0.3
Phosphorus, total (as P)	0.009	0.102	0.067	0.075	0.031	0.040	0.088	0.054	0.081	0.21
Phosphorus, ortho, dissolved (as P)	---	---	<0.002	<0.002	---	---	--	---	---	-
Nitrogen, NO2 + NO3, diss. (as N)	---	---	0.012	0.018	---	---	---	--	---	-
Nitrogen, ammonia, dissolved (as N)	---	---	<0.013	<0.013	---	---	---	--	--	---
Nitrogen, amm. + org., total (as N)	---	---	0.3	0.5	---	---	-	---	---	--
Nitrogen, total (as N)	---	---	0.3	0.5	---	---	---	---	---	---
Color (Pt-Co scale)	---	--	5	5	---	---	---	---	---	---
Turbidity (NTU)	-	---	0.6	0.8	---	---	-	---	---	---
Hardness, as CaCO3	---	---	74	73	---	--	---	--	--	---
Calcium, dissolved (Ca)	-	---	20	20	---	---	-	---	---	---
Magnesium, dissolved (Mg)	---	--	5.8	5.8	---	-	---	---	---	---
Sodium, dissolved (Na)	---	--	2.7	2.9	---	---	---	---	---	---
Potassium, dissolved (K)	- -	---	0.7	0.5	---	---	---	---	---	---
Alkalinity, as CaCO3	---	---	72	72	---	- -	---	---	---	---
Sulfate, dissolved (SO4)	---	---	<2	<2	-	---	- -	---	---	--
Chloride, dissolved (Cl)	--	---	3.5	3.1	---	-	---	-	---	---
Silica, dissolved (SiO2)	--	---	---	---	---	---	---	---	-	---
Solids, dissolved, at 180°C	---	--	110	108	- -	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	-	40	80	--	---	---	---	---	
Manganese, dissolved (Mn) µg/L	---	---	21	42	---	---	---	---	---	---

	Aug 18		
Secchi depth (meters)	3.1		
Chlorophyll a, phytoplankton (µg/L)	5.1		
Depth of sample (m)	0.5	11.0	21.0
Water temperature (°C)	20.3	13.5	11.3
pH (units)	7.6	7.3	7.3
Dissolved oxygen	7.7	0.3	0.2
Phosphorus, total (as P)	0.044	0.196	0.345

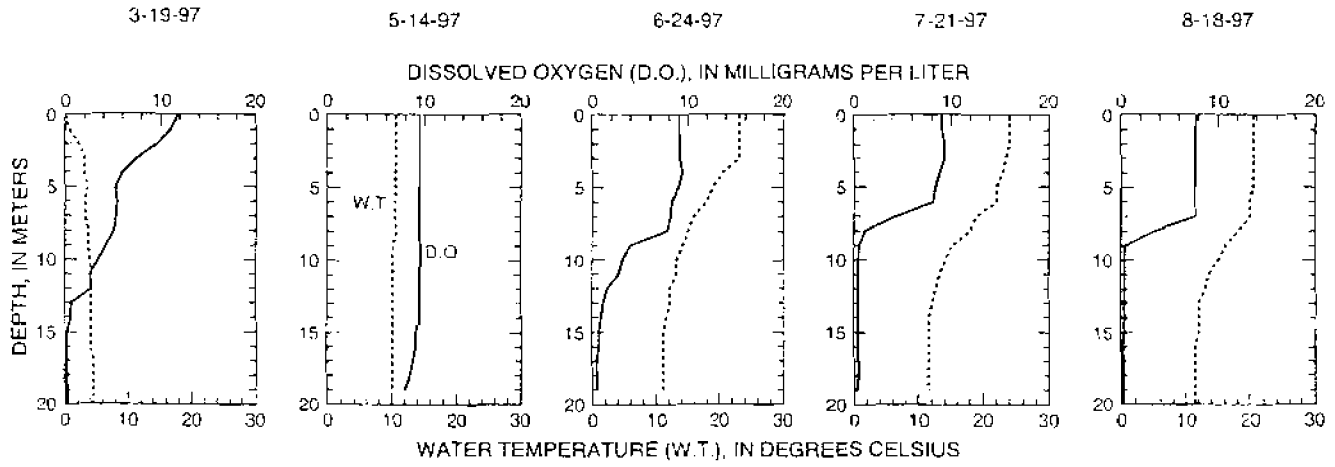


Figure 2a. Water-quality data and depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1997 water year

LOCATION --Lat 45°55'07", long 92°01'35", in NW 1/4 SW 1/4 sec.30, T.40 N., R.13 W., Washburn County, Hydrologic Unit 07030002, 9.4 mi northwest of Spooner.

PERIOD OF RECORD.--February 1987 to current year. (Data collected by Wisconsin Department of Natural Resources before 1997 available, but not published in this report series.)

REMARKS --Lake sampled at deepest point in the lake. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 03 TO AUGUST 21, 1998
(Milligrams per liter unless otherwise indicated)

	Mar 03		July 10		Aug. 21		
Lake stage (ft)	---		0.31		0.17		
Secchi-depth (meters)	-		4.5		2.5		
Chlorophyll a, phytoplankton (µg/L)	---		4.9s		3.3s		
Depth of sample (m)	0.5	14.3	0.5	10.5	0.5	9.0	17.0
Water temperature (°C)	1.2	---	25.4	10.9	24.0	20.0	12.1
Specific conductance (µS/cm)	140	---	158	198	161	172	208
pH (units)	6.8	-	8.2	7.2	8.5	7.8	7.5
Dissolved oxygen	11.3	---	8.9	0.0	9.8	0.7	0.4
Phosphorus, total (as P)	0.020	0.051	0.017	0.218	0.020	0.075	0.390

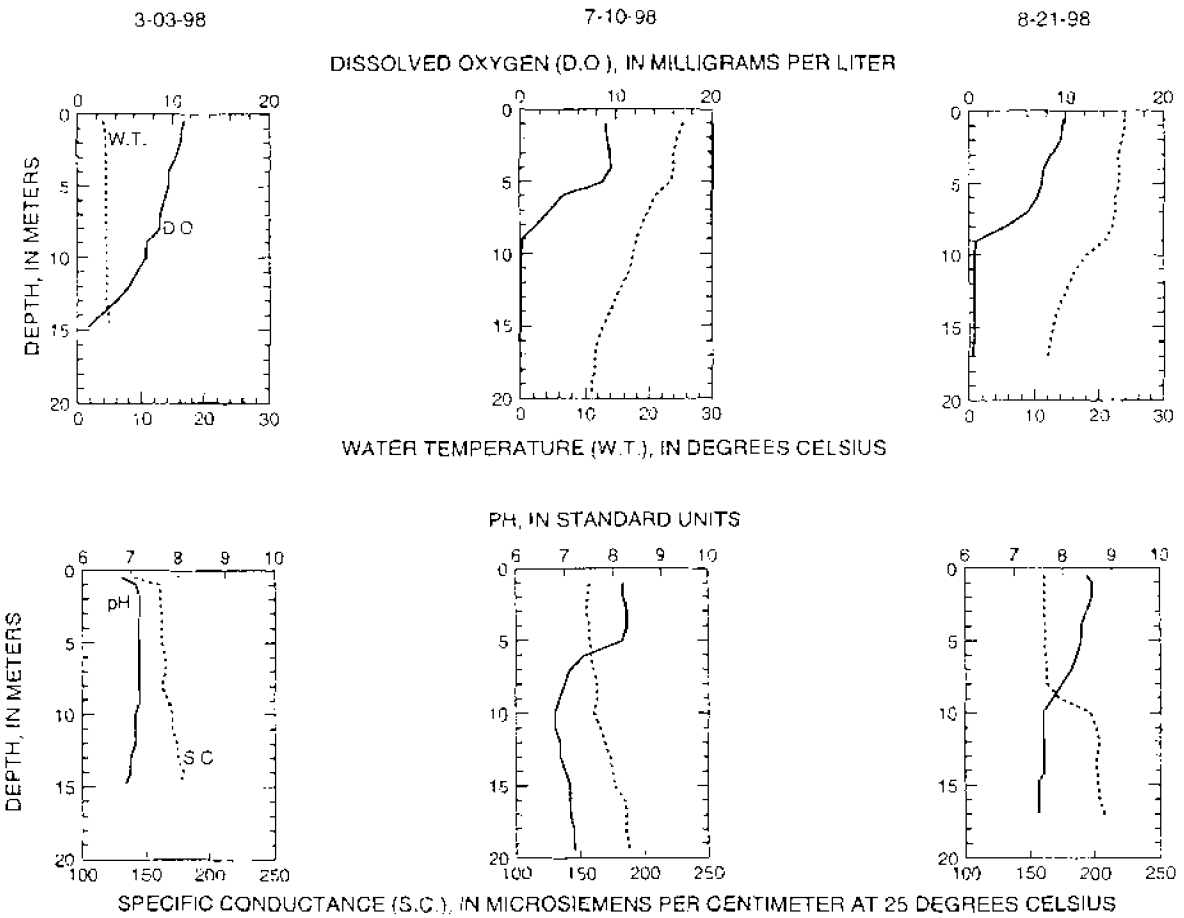


Figure 2a. Water-quality data and depth profiles for McKenzie Lake, Deep Hole, near Spooner, Wisconsin, 1998 water year

LOCATION.--Lat 45°55'40", long 92°02'26", in NW 1/4 NE 1/4 sec.25, T.40 N., R.14 W., Burnett County, Hydrologic Unit 07030002, 10.3 mi northwest of Spooner.

PERIOD OF RECORD.--June to August 1997.

REMARKS.--Lake sampled at about 8-meter depth in northern region of lake. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, JUNE 24 TO AUGUST 19, 1997
(Milligrams per liter unless otherwise indicated)

	June 24		July 21		Aug. 19	
Lake stage (ft)	0.06		0.12		0.12	
Secchi-depth (meters)	3.8		4.4		2.8	
Chlorophyll a, phytoplankton (µg/L)	3.1		3.1		5.2	
Depth of sample (m)	0.5	7.5	0.5	9.5	0.5	9.0
Water temperature (°C)	23.5	15.5	24.0	16.0	21.0	17.0
Specific conductance (µS/cm)	140	139	151	173	140	163
pH (units)	8.6	7.6	8.7	7.2	8.4	7.3
Dissolved oxygen	10.2	7.2	9.0	0.1	8.1	0.3
Phosphorus, total (as P)	0.026	0.033	0.026	0.045	0.042	0.045

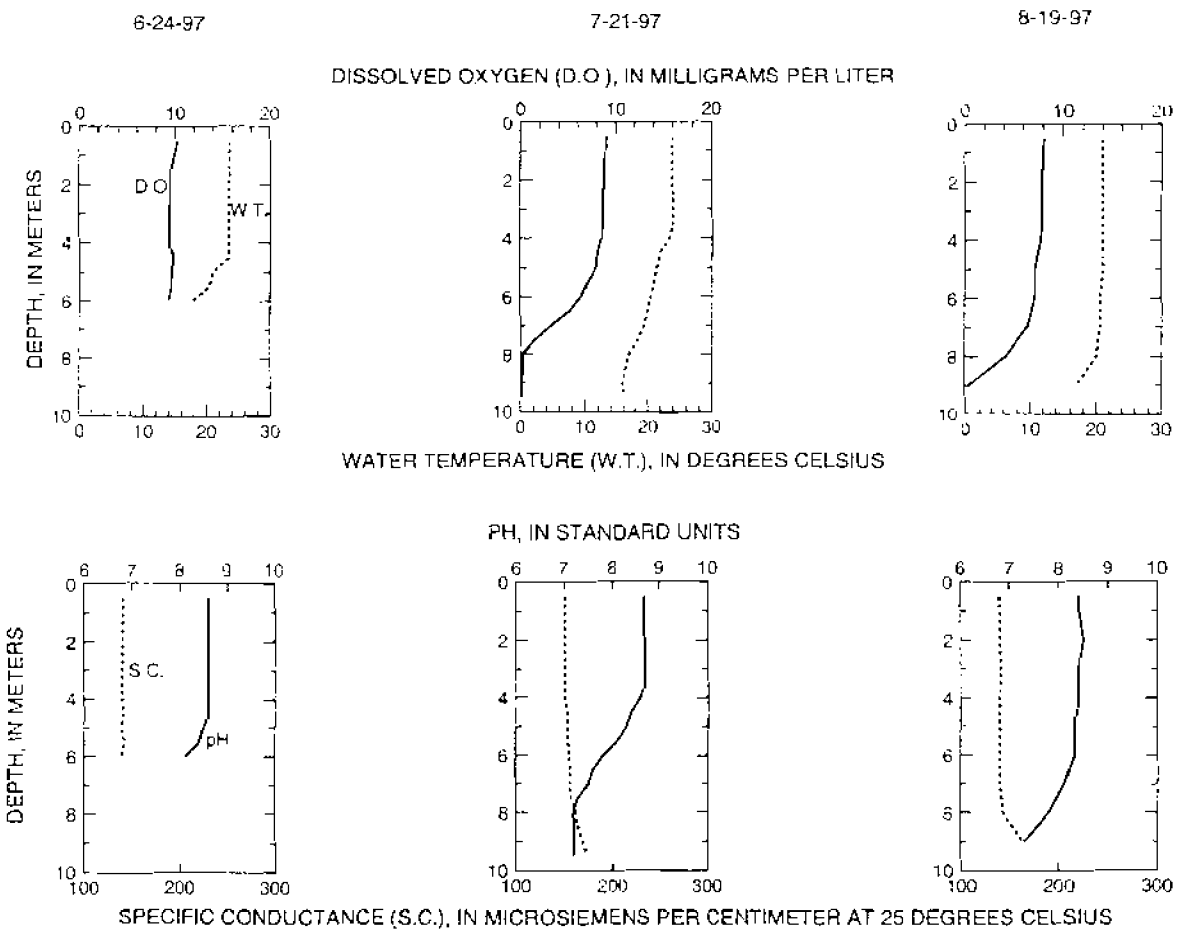


Figure 2b. Water-quality data and depth profiles for McKenzie Lake, North Site, near Spooner, Wisconsin, 1997 water year

LOCATION.--Lat 45°55'40", long 92°02'26", in NW 1/4 NE 1/4 sec.25, T.40 N., R.14 W., Burnett County, Hydrologic Unit 07030002, 10.3 mi northwest of Spooner.

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

REMARKS.--Lake sampled at about 8-meter depth in northern region of lake. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 03 TO AUGUST 21, 1998
(Milligrams per liter unless otherwise indicated)

	Mar. 03	Apr. 15	June 10	July 10		Aug. 21	
Lake stage (ft)	---	0.83	0.17	0.31		0.17	
Secchi-depth (meters)	--	3.0	3.2	3.3		2.6	
Chlorophyll a, phytoplankton (µg/L)	---	5.96	6.52	2.56		7.1	
Depth of sample (m)	0.5	0.5	0.5	0.5	8.0	0.5	9.0
Water temperature (°C)	3.7	9.0	17.5	23.5	19.3	23.5	19.9
Specific conductance (µS/cm)	144	146	159	156	158	160	186
pH (units)	8.0	7.5	8.4	7.1	7.0	8.4	7.6
Dissolved oxygen	11.0	12.0	9.6	9.0	1.5	8.7	0.5
Phosphorus, total (as P)	0.684	0.026	0.017	0.017	0.017	0.022	0.090

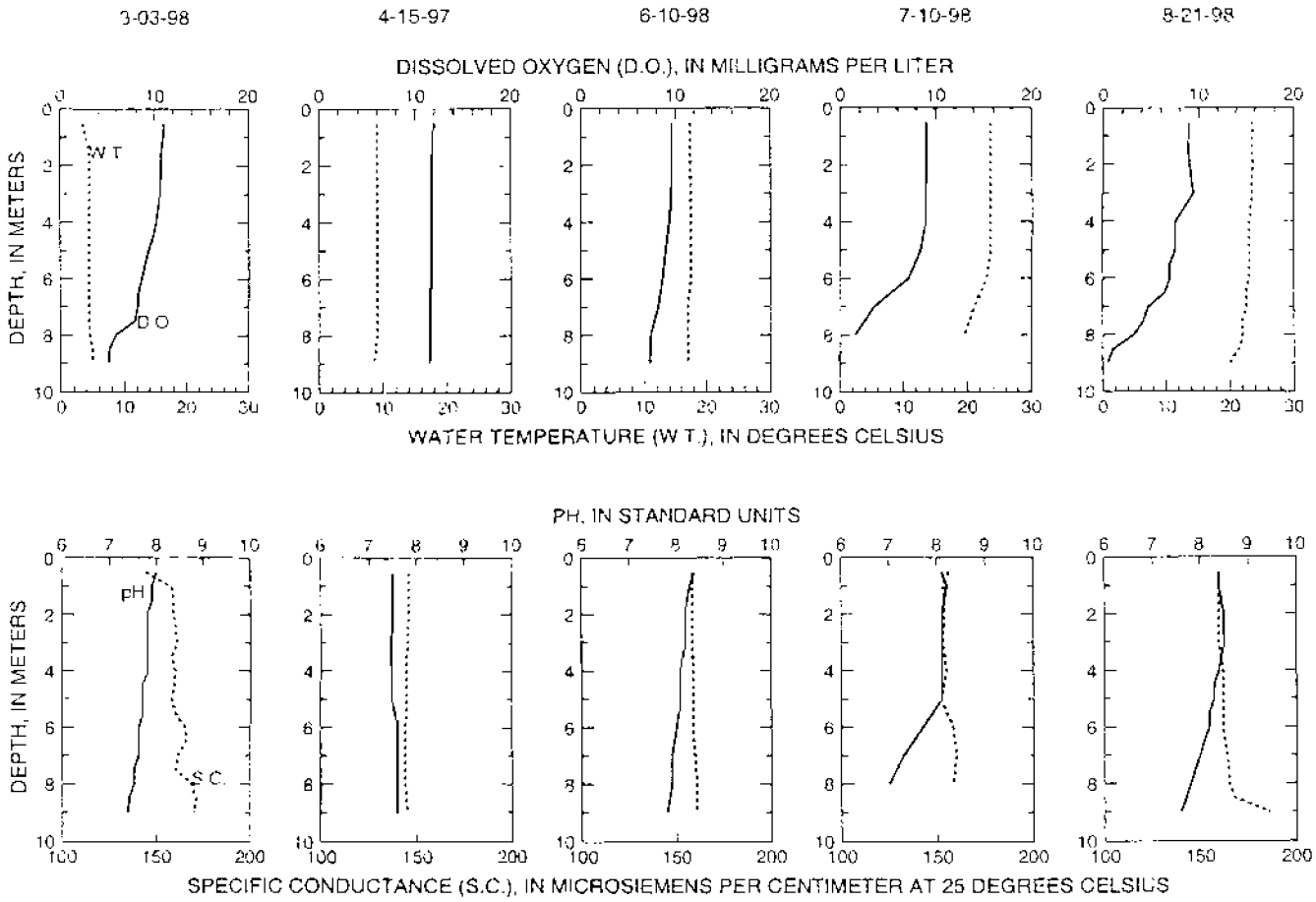


Figure 2b. Water-quality data and depth profiles for McKenzie Lake, North Site, near Spooner, Wisconsin, 1998 water year

LOCATION.--Lat 45°54'37", long 92°02'23", in SW 1/4 NE 1/4 sec.36, T.40 N., R.14 W., Burnett County, Hydrologic Unit 07030002, 9.2 mi northwest of Spooner.

PERIOD OF RECORD.--June to August 1997

REMARKS --Lake sampled at about 8-meter depth in southern region of lake Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, JUNE 24 TO AUGUST 19, 1997
(Milligrams per liter unless otherwise indicated)

	June 24		July 21		Aug. 19	
Lake stage (ft)	0.06		0.12		0.12	
Secchi-depth (meters)	3.0		4.0		2.3	
Chlorophyll a, phytoplankton (µg/L)	3.8		4.2		6.1	
Depth of sample (m)	0.5	6.5	0.5	7.0	0.5	7.5
Water temperature (°C)	22.5	17.0	24.0	20.5	21.0	20.5
Specific conductance (µS/cm)	141	142	150	162	138	140
pH (units)	8.5	7.6	8.7	7.4	8.5	8.1
Dissolved oxygen	10.1	6.2	9.2	1.9	8.2	5.5
Phosphorus, total (as P)	0.030	0.059	0.030	0.039	0.041	0.045

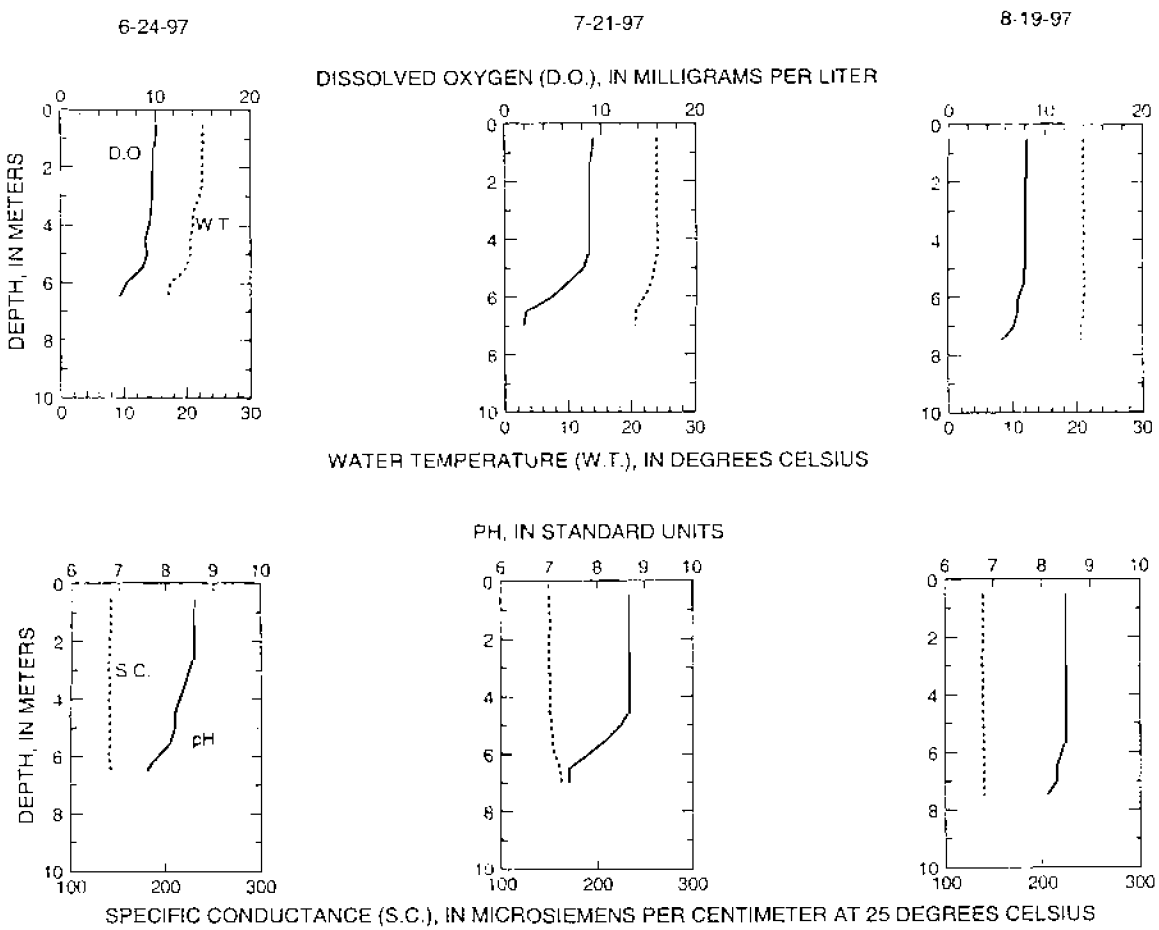


Figure 2c. Water-quality data and depth profiles for McKenzie Lake, South Site, near Spooner, Wisconsin, 1997 water year

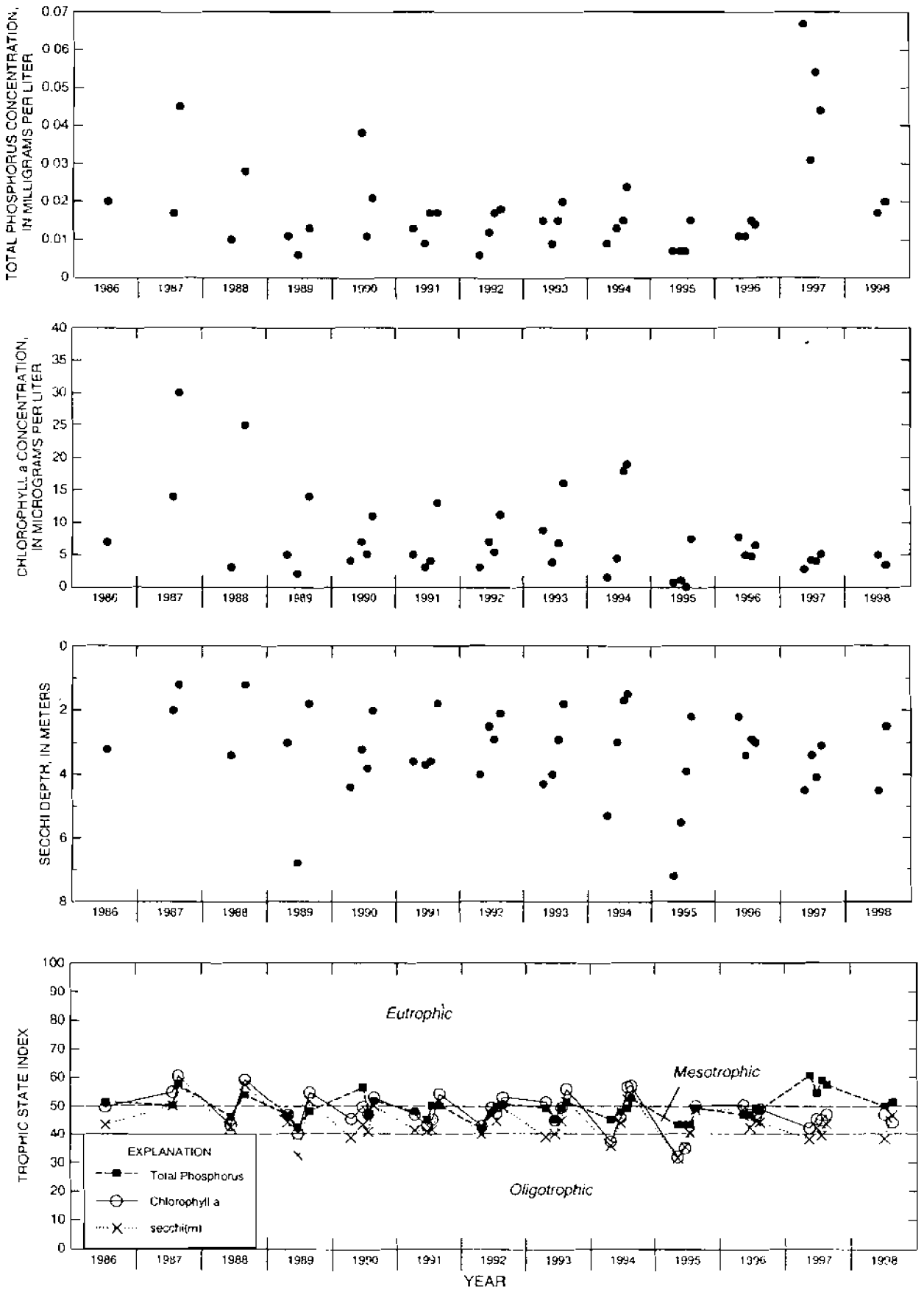


Figure 3a. Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for Big McKenzie Lake at Deep Hole near Spooner, Wisconsin.

LOCATION.--Lat 45°54'37", long 92°02'23", in SW 1/4 NE 1/4 sec.36, T.40 N., R.14 W., Burnett County, Hydrologic Unit 07030002, 9.2 mi northwest of Spooner.

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

REMARKS.--Lake sampled at about 8-meter depth in southern region of lake. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 03 TO AUGUST 21, 1998
(Milligrams per liter unless otherwise indicated)

	Mar. 03	Apr. 15	June 10	July 10		Aug 21	
Lake stage (ft)	---	0.43	0.17	0.31		0.17	
Secchi-depth (meters)	---	3.8	3.0	4.6		2.6	
Chlorophyll a, phytoplankton (µg/L)	---	5.06	5.05	4.05		6.79	
Depth of sample (m)	0.5	0.5	0.5	0.5	6.0	0.5	5.5
Water temperature (°C)	3.3	8.6	17.3	25.2	21.4	24.1	22.6
Specific conductance (µS/cm)	154	144	159	156	159	160	161
pH (units)	8.8	7.8	8.1	8.2	7.2	8.4	8.3
Dissolved oxygen	12.0	12.7	10.0	8.9	3.7	8.5	6.2
Phosphorus, total (as P)	0.032	0.026	0.016	0.018	0.021	0.021	0.032

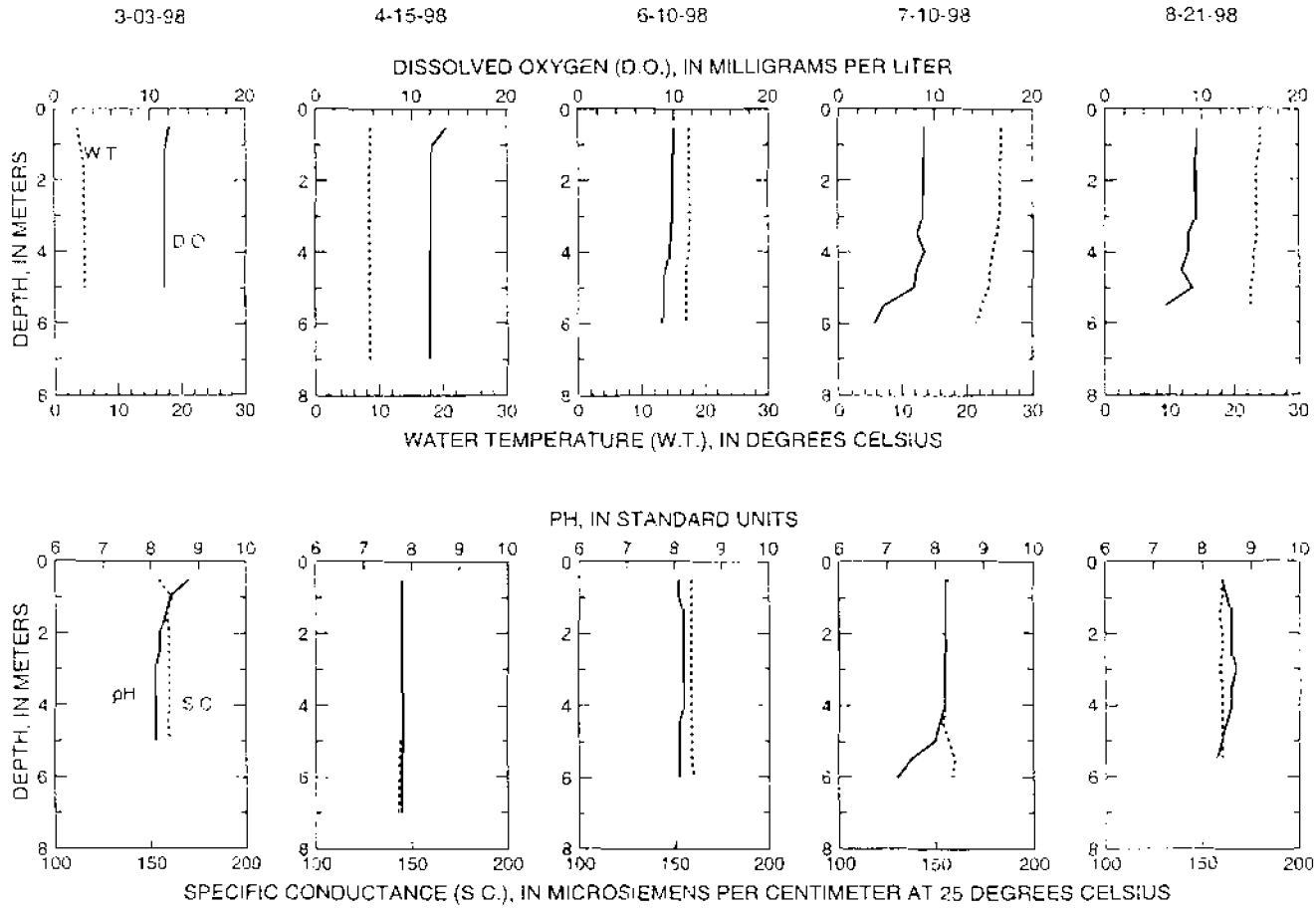


Figure 2c. Water-quality data and depth profiles for McKenzie Lake, South Site, near Spooner, Wisconsin, 1998 water year

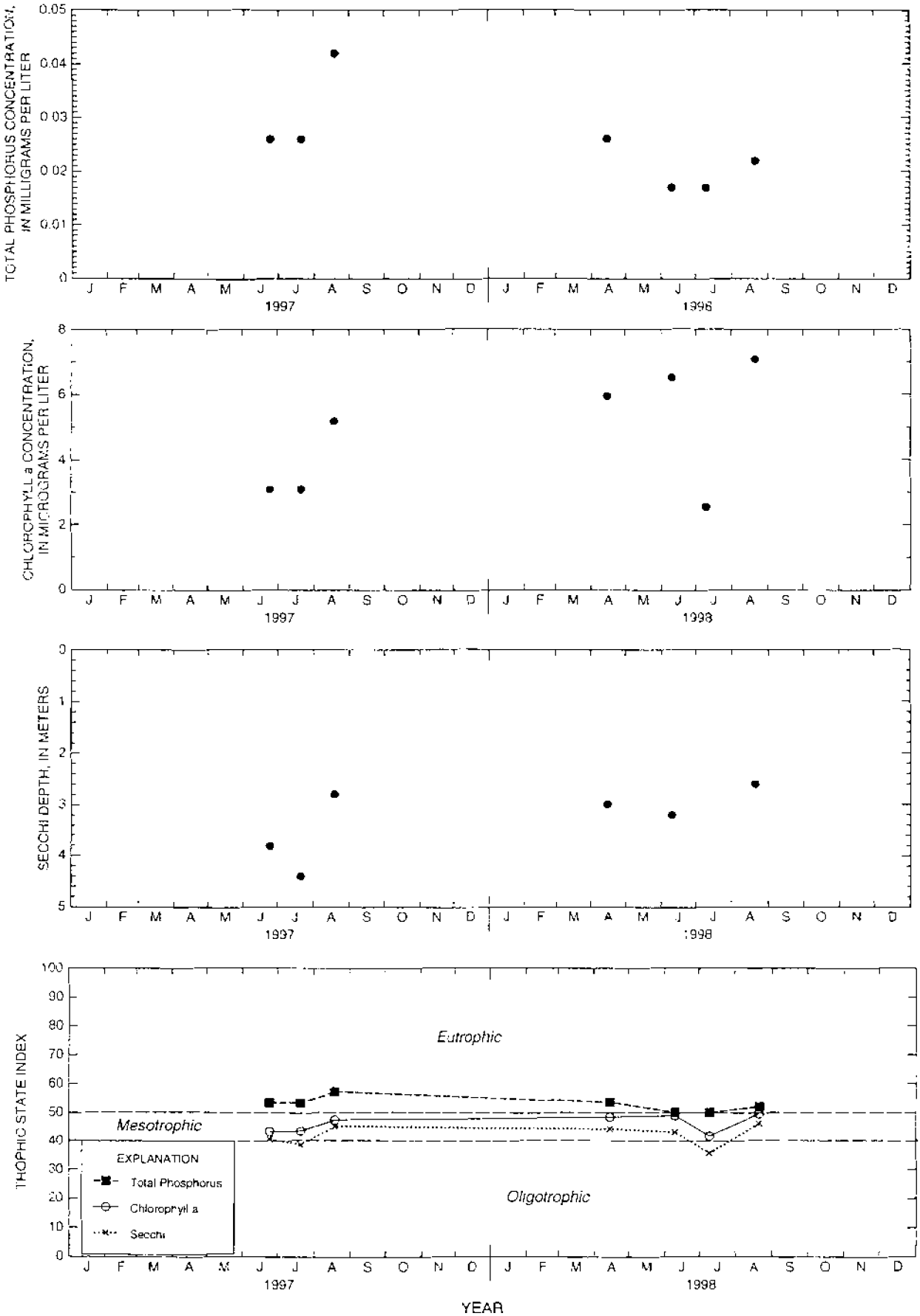


Figure 3b. Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for McKenzie Lake, North Site, near Spooner, Wisconsin.

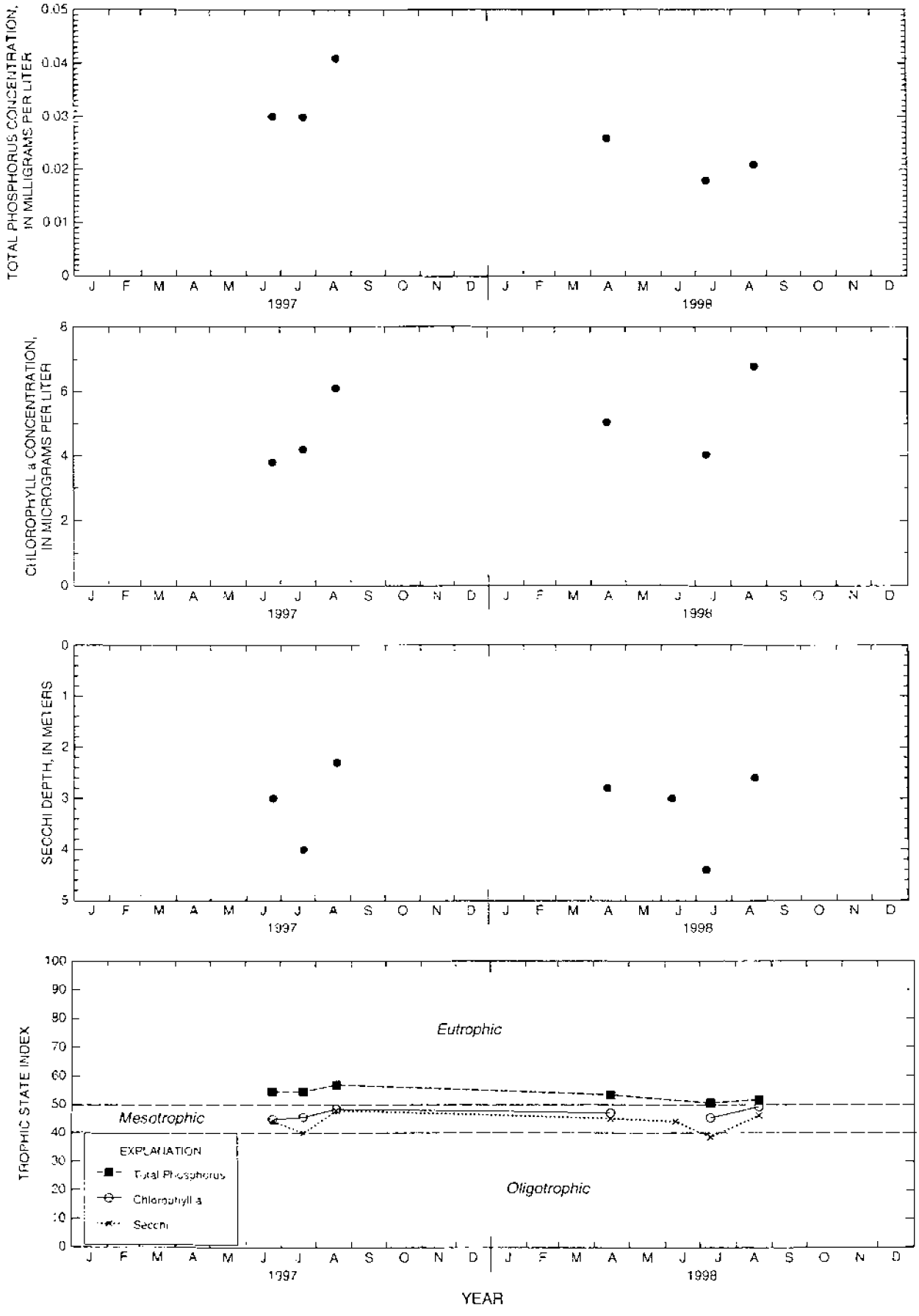


Figure 3c. Surface total phosphorus, chlorophyll a concentrations, Secchi depths, and TSI data for McKenzie Lake, South Site, near Spooner, Wisconsin.