

# **Big Sissabagama Lake near Stone Lake, WI**

## **Water-Quality Data Summary, 1986 through 1996**

This summary covers the period from March 1986 through November 1996, which is the period of water-quality monitoring of Big Sissabagama Lake by the U.S. Geological Survey (USGS). Emphasis in this summary is on data collected during 1996. All data collected during 1996 are included in tables. Data from previous years 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 data report "Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1996" and to Shaw and others (1994) "Understanding Lake Data."

The data that have been collected for Big Sissabagama Lake from 1986-96 are useful for understanding the lake's water quality, and for managing the lake. These data define the present water quality of the lake and provide a basis for assessing trends or changes in water quality in the future.

### **Lake description and sampling locations:**

Big Sissabagama Lake is classified as a seepage lake with an outlet that flows intermittently. The lake may receive runoff through the local drainage area and adjacent marshes. Surface area of Big Sissabagama Lake is 719 acres (1.12 square miles) and the lake's watershed area is 9.47 square miles. The average depth of the lake is 15.6 feet. The primary water quality sampling site is located at the deepest point in the lake, at a depth of about 48 feet. An additional water quality sampling site, Big Sissabagama Tributary, is located on the southeast side of the lake at the cranberry bog outlet. Lake stage was monitored near the lake outlet on the northwest side of the lake. The locations of the monitoring sites are shown in Figure 1.

Normally during the spring turnover sampling both near-surface and a near-bottom samples are collected and analyzed for general chemical characterization of the lake water. During the May 1996 sampling, the sampler broke and precluded collection of the bottom sample. To compensate for this, a fall turnover sample was collected on Nov. 7, 1996.

### **Hydrologic conditions during water year 1996:**

Annual variability in lake condition often reflects variability in climatic and hydrologic conditions. Air temperature in northwestern Wisconsin was, on the average, 4.2 °F warmer than normal for the period December 1995 through March 1996; April and May was 4.4 °F cooler than normal; and June through August was 0.6 °F warmer than normal (National Oceanic and Atmospheric Administration

"Climatological Data--Wisconsin"). Precipitation during water year 1996 was 109 percent of normal precipitation for northwestern Wisconsin (Pamela Naber-Knox, UW-Extension, Geological and Natural History Survey, written commun., 1996). Watershed runoff in the region of Big Sissabagama Lake was between 120 and 140 percent of long-term average runoff (Holmstrom and others, 1997, "Water Resources Data--Wisconsin").

#### **Lake Data:**

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

#### Lake-stage fluctuations:

Lake stages were read by Richard Roehrich and John Eary, and by the USGS on lake sampling dates. Stages ranged from 5.49 feet on several dates to 6.01 feet on Apr. 21-23. This range of fluctuation is slightly less than the range of fluctuation experienced during the previous 10 years of monitoring. Stage values are listed in Table 1. Stage fluctuations for the period of April 1986 through September 1996 range from 4.78 to 6.09 feet. Lake stages and the position of the lake's outflow structure crest are shown in figure 2.

#### Lake-depth profiles:

Vertical profiles of water temperature, dissolved oxygen, pH, and specific conductance are similar to those from 1995; except, the thermocline in July and August was shallower than in 1995. This pattern was also noted in last year's lake-depth profiles. These profiles, which were measured over the deepest point in the lake, are listed in Table 2 shown in Figure 3. Complete water-column mixing was observed on May 15 and Nov. 7 during spring and fall turnover sampling. The lake became thermally stratified through the summer. In June the lower 20 feet of water was anoxic (devoid of oxygen), and by August the lower 34.0 feet of water was anoxic. This anoxic zone is unable to support fish. The pH, which ranged from 6.4 to 8.9, is common for northwestern Wisconsin lakes and poses no problems for aquatic life.

The depth of the epilimnion and thickness of the anoxic zone at the time of the August sampling varied from year-to-year. During the 1986-96 period, depth of the epilimnion ranged from 17-28 feet and the anoxic zone thickness ranged from 20-34 feet.

#### Chemical constituents:

Analyses of water samples collected at the primary site on May 15 and Nov. 7 for selected chemical constituents for chemical characterization of the lake are shown in Table 3. The constituent values for

color, chlorophyll *a*, chloride, calcium, magnesium, pH, alkalinity, total-nitrogen, and total-phosphorus are within regional values 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 dissolved-phosphorus was 48:1, based on the surface concentrations at the primary site on May 15, 1996. This ratio suggests the lake is phosphorus limited, which means algal growth is dependent on the amount of available phosphorus rather than nitrogen. However, a review of the data collected since 1988 shows that the ratio ranged from 1 to 50, with a median ratio of 12. The lake appears to be transitional between being nitrogen and phosphorus limited.

Three common measures of water quality used as indices are near-surface total-phosphorus and chlorophyll *a* concentrations, and Secchi depth. At the primary site, total-phosphorus concentrations ranged from 0.017 mg/L on June 25 and Aug. 20 to 0.027 mg/L on May 15, chlorophyll *a* ranged from 4.0 µg/L on Nov. 7 to 16 µg/L on May 15, and Secchi depths ranged from 1.5 m on May 15 to 2.4 m on Aug. 20.

Surface total-phosphorus and chlorophyll *a* concentrations and Secchi depths for the 1986-96 period, at the primary site are shown in Figure 4. No general year to year trends are apparent from the data. However, in many years there is a seasonal pattern of a high total-phosphorus value in the spring, followed by lower values in June, then increasing values during the remainder of the summer. This pattern is also observed in the chlorophyll *a* concentrations and Secchi depths.

Total-phosphorus concentration 1.5 feet above the lake bottom at the primary site ranged from 0.027 mg/L on May 15 (The sample was taken at the surface, but during turnover the water column is mixed.) to 0.196 mg/L on August 20. These total-phosphorus concentrations observed during anoxic periods are indicative of a moderate phosphorus release from the bottom sediments.

**Lake condition:**

Water-quality index:

Lillie and Mason (1983) classified all Wisconsin lakes using a random data set collected in the summer (July and August). The index, shown on page 12 of "Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1996," is based on surface total-phosphorus and chlorophyll *a* concentrations, and Secchi depths. According to the index, surface total-phosphorus concentrations, and Secchi depths in Big Sissabagama Lake at the primary site indicate "good" water quality, and chlorophyll *a* concentrations indicate "fair" water quality

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

	Parameter	Percentage distribution of lakes in northwest Wisconsin within parameter ranges		
	<u>Total-phosphorus (mg/L)</u>			
	<0.010	best condition	12	
Big Sissabagama Lake values	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
	<u>Chlorophyll a (µg/L)</u>			
	0-5	best condition	29	
Big Sissabagama Lake values	5-10	↓	36	
	10-15		14	
	15-30		14	
	>30		worst condition	9
			<u>Secchi depth (feet)</u>	
	9.8-19.7	best condition	22	
Big Sissabagama Lake values	6.6-9.8	↓	29	
	3.3-6.6		30	
	<3.3		worst condition	19

### Trophic status:

Another means of assessing the nutrient, or trophic, status of a lake is to use Carlson's Trophic State Index (TSI). The 1995 TSI data is listed in Table 4. Figure 5 is a graphical illustration of the variation in Trophic State Indices for Big Sissabagama Lake during the 10 year study period. The chlorophyll *a* value for July 1995 is not included in Figure 5. The data show the lake to be meso-eutrophic, or a lake with moderate to high nutrient levels.

### Big Sissabagama Tributary

The tributary site, (location shown in Figure 1), was monitored for total-phosphorus, water temperature, dissolved oxygen, specific conductance, and pH at the mouth of the tributary. Streamflow was also estimated there. The data for 1986-96 are in Table 5 and shown in Figure 6. During the 1994-96 sampling visits, no flow from the cranberry bog was observed, and the tributary total-phosphorus concentrations were similar to the concentrations observed at the lake's primary sampling site. Concentrations for the 1989-96 period were generally lower than those for the 1986-88 period. Observation of flow from the tributary was less frequent during 1989-96 than during 1986-88.

Table 1. Lake stages for Big Sissabagma Lake near Stone Lake, Wisconsin, 1996 water year

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 mi<sup>2</sup>.

LAKE-STAGE RECORDS

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

GAGE.--Staff gage near lake outlet read by Richard Roehrich and John Eary.

EXTREMES FOR PERIOD OF RECORD: Maximum gage height observed, 6.09 ft, May 7 and Sept. 15, 1991; minimum observed, 4.78 ft, Sept. 15, 16, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.04 ft, Apr. 21-23; minimum observed, 5.49 ft, Mar. 13, and Sept 20, 22-23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1995 TO SEPTEMBER 1996

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.79	5.77	5.64	---	---	---	---	5.90	5.78	6.00	5.84	5.65
2	5.77	5.78	5.63	---	---	---	---	5.87	5.87	5.99	5.84	5.62
3	5.78	5.78	5.63	---	---	---	---	5.86	5.88	5.96	5.83	5.65
4	5.76	5.77	5.63	---	---	---	---	5.85	5.87	5.94	5.81	5.66
5	5.73	5.75	5.63	---	---	---	---	5.87	5.86	5.91	5.81	5.66
6	5.80	5.68	5.62	---	---	---	---	5.86	5.87	5.90	5.81	5.64
7	5.80	5.61	5.60	---	---	---	---	5.85	5.86	5.97	5.86	5.63
8	5.78	5.59	5.60	---	---	---	---	5.82	5.86	5.97	5.83	5.63
9	5.82	5.58	5.59	---	---	---	---	5.81	5.85	5.95	5.79	5.62
10	5.84	5.57	---	---	---	---	---	5.60	5.84	5.92	5.79	5.61
11	5.85	5.57	---	---	---	---	---	5.78	5.83	5.90	5.78	5.60
12	5.83	5.58	---	---	---	---	---	5.77	5.82	5.93	5.78	5.60
13	5.82	5.60	---	---	---	---	5.49	5.76	5.82	5.91	5.77	5.57
14	5.81	5.63	---	---	---	---	---	5.77	5.80	5.89	5.75	5.56
15	5.78	5.65	---	---	---	---	---	5.76	5.79	5.89	5.75	5.54
16	5.75	5.65	---	---	---	---	---	5.75	5.79	---	5.74	5.51
17	5.72	5.65	---	---	---	---	---	5.73	5.82	---	5.73	5.51
18	5.72	5.65	---	---	---	---	---	5.87	5.73	5.85	5.91	5.51
19	5.71	5.65	---	---	---	---	---	5.93	5.92	5.85	5.92	5.50
20	5.70	5.65	---	---	---	---	---	5.98	5.99	5.84	5.89	5.49
21	5.71	5.65	---	---	---	---	6.04	5.99	5.86	5.89	5.71	5.51
22	5.71	5.65	---	---	---	---	6.04	5.96	5.84	5.85	5.75	5.49
23	5.73	5.65	---	---	---	---	6.04	5.96	5.85	5.83	5.74	5.49
24	5.79	5.65	---	---	---	---	6.00	5.92	5.85	5.87	5.73	5.51
25	5.80	5.65	---	---	---	---	5.99	5.87	5.84	5.86	5.71	5.51
26	5.79	5.65	---	---	---	---	5.98	5.86	5.99	5.85	5.70	5.52
27	5.80	5.65	---	---	---	---	5.98	5.83	6.03	5.83	5.69	5.53
28	5.79	5.65	---	---	---	---	5.96	5.80	6.02	5.89	5.68	5.53
29	5.79	5.64	---	---	---	---	5.95	5.80	6.02	5.87	5.66	5.53
30	5.78	5.64	---	---	---	---	5.91	5.79	6.01	5.86	5.66	5.53
31	5.77	---	---	---	---	---	---	5.79	---	5.86	5.65	---
MEAN	5.77	5.65	---	---	---	---	---	5.84	5.87	---	5.75	5.56
MAX	5.85	5.78	---	---	---	---	---	5.93	6.03	---	5.86	5.66
MIN	5.70	5.57	---	---	---	---	---	5.73	5.76	---	5.65	5.49

**Table 2. Lake-depth profiles for Big Sissabagama Lake near Stone Lake, Wisconsin, 1996 water year**

DATE	SAM- PLING DEPTH (FEET) (00003)	TEMPER- ATURE WATER (DEG C) (00010)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAR 1996					
13...	3.00	2.0	66	7.1	10.8
13...	7.00	2.5	66	7.1	10.4
13...	11.0	3.0	67	7.0	7.9
13...	15.0	3.5	69	6.9	6.0
13...	19.0	4.0	71	6.8	3.8
13...	23.0	4.5	74	6.8	2.2
13...	27.0	4.5	78	6.7	1.1
13...	31.0	4.5	80	6.7	0.2
13...	35.0	5.0	85	6.7	0
13...	39.0	5.0	108	6.8	0
13...	43.0	5.0	135	7.0	0
13...	46.0	5.5	153	7.0	0
13...	47.5	--	--	--	--
MAY					
15...	1.50	9.5	70	8.9	10.3
15...	3.00	9.5	70	8.8	10.3
15...	7.00	9.5	71	8.7	10.3
15...	11.0	9.5	71	8.7	10.5
15...	15.0	9.5	72	8.6	10.5
15...	19.0	9.5	71	8.5	10.5
15...	23.0	9.5	71	8.5	10.4
15...	27.0	9.0	71	8.5	9.8
15...	31.0	9.0	71	8.4	9.7
15...	35.0	8.5	71	8.4	9.5
15...	39.0	8.0	72	8.3	8.6
15...	40.5	8.0	74	8.3	7.3
15...	42.0	--	--	--	--
JUN					
25...	1.50	21.0	61	7.9	9.2
25...	3.00	21.0	61	7.9	9.2
25...	6.00	21.0	61	7.9	9.2
25...	9.00	20.5	60	7.9	8.9
25...	12.0	19.0	60	7.7	8.3
25...	15.0	17.5	61	6.9	5.5
25...	18.0	15.5	65	6.6	3.1
25...	21.0	15.0	66	6.5	1.9
25...	24.0	13.5	68	6.4	0.6
25...	27.0	12.5	69	6.4	0.1
25...	30.0	11.5	69	6.4	0
25...	33.0	11.0	70	6.4	0
25...	36.0	10.5	74	6.4	0
25...	39.0	10.5	78	6.5	0
25...	42.0	10.0	80	6.6	0
25...	45.5	10.0	82	6.6	0
25...	47.0	--	--	--	--

Table 2. Lake-depth profiles for Big Sissabagama Lake near Stone Lake, Wisconsin, 1996 water year--continued

DATE	SAMPLING DEPTH (FEET) (00003)	TEMPERATURE WATER (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	OXYGEN, DIS-SOLVED (MG/L) (00300)
JUL 1996					
24...	1.50	22.0	74	7.5	8.0
24...	3.00	22.0	73	7.5	8.0
24...	6.00	22.0	73	7.5	8.0
24...	9.00	22.0	73	7.4	7.9
24...	12.0	22.0	73	7.4	7.9
24...	15.0	22.0	74	7.4	7.9
24...	18.0	21.0	76	7.0	4.1
24...	21.0	16.5	92	6.6	0.2
24...	24.0	14.5	98	6.7	0.2
24...	27.0	13.5	102	6.7	0.1
24...	30.0	12.0	107	6.8	0.1
24...	33.0	11.5	107	6.8	0.1
24...	36.0	11.5	109	6.8	0.1
24...	39.0	11.0	114	6.8	0.1
24...	42.0	11.0	114	6.8	0.1
24...	45.0	10.5	116	6.9	0.1
24...	48.5	10.5	119	6.9	0.1
24...	50.0	--	--	--	--
AUG					
20...	1.50	23.0	86	8.1	8.6
20...	3.00	23.0	84	8.1	8.5
20...	6.00	23.0	84	8.0	8.4
20...	9.00	23.0	79	8.0	8.3
20...	12.0	23.0	79	8.0	8.3
20...	15.0	23.0	78	7.8	8.0
20...	18.0	22.5	80	7.2	4.7
20...	21.0	20.0	84	6.8	0.3
20...	24.0	17.0	100	6.8	0.2
20...	27.0	14.5	114	7.0	0.2
20...	30.0	13.5	121	7.1	0.2
20...	33.0	12.5	120	7.1	0.2
20...	36.0	11.5	126	7.2	0.2
20...	39.0	11.5	127	7.2	0.2
20...	42.0	11.5	129	7.2	0.2
20...	45.0	11.0	129	7.2	0.2
20...	48.0	11.0	131	7.2	0.2
20...	51.0	11.0	135	7.2	0.2
20...	53.5	11.0	135	7.2	0.2
20...	55.0	--	--	--	--
NOV					
07...	1.50	5.0	--	7.4	11.4
07...	4.00	5.0	--	7.4	11.4
07...	9.00	5.0	--	7.4	11.4
07...	14.0	5.0	--	7.4	11.4
07...	19.0	5.0	--	7.4	11.4
07...	24.0	5.0	--	7.4	11.4
07...	29.0	5.0	--	7.4	11.3
07...	34.0	5.0	--	7.4	11.3
07...	39.0	5.0	--	7.4	11.3
07...	44.0	5.0	--	7.4	11.3
07...	47.0	--	--	--	--



Table 3. Water-quality data for Big Sissabagama Lake, 1996 water year

WATER-QUALITY RECORDS

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 mi<sup>2</sup>.

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

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

WATER-QUALITY DATA, MARCH 13 TO AUGUST 20, 1996

(Milligrams per liter unless otherwise indicated)

	Mar. 13		May 15		June 25		July 24		Aug. 20		Nov. 07
Depth of sample (ft)	3.0	43	1.5	39	1.5	46	1.5	49	1.5	54	1.5
Lake stage (ft)	5.49		5.72		5.83		5.86		5.72		---
Specific conductance (µS/cm)	66	135	70	72	61	82	74	119	86	170	---
pH (units)	7.1	7.0	8.9	8.3	7.9	6.6	7.5	6.9	8.1	7.2	7.4
Water temperature (°C)	2.0	5.0	9.5	8.0	21.0	10.0	22.0	10.5	23.0	11.0	5.0
Color (Pt-Co. scale)	---	---	20	---	---	---	---	---	---	---	5
Turbidity (NTU)	---	---	1.6	---	---	---	---	---	---	---	1.4
Secchi-depth (meters)	---	---	1.5	---	2.1	---	1.8	---	2.4	---	---
Dissolved oxygen	10.8	0.0	10.2	8.6	9.2	0.0	8.0	0.1	8.6	0.2	11.4
Hardness, as CaCO <sub>3</sub>	---	---	31	---	---	---	---	---	---	---	29
Calcium, dissolved (Ca)	---	---	8.1	---	---	---	---	---	---	---	7.5
Magnesium, dissolved (Mg)	---	---	2.5	---	---	---	---	---	---	---	2.5
Sodium, dissolved (Na)	---	---	1.5	---	---	---	---	---	---	---	1.6
Potassium, dissolved (K)	---	---	0.8	---	---	---	---	---	---	---	0.7
Alkalinity, as CaCO <sub>3</sub>	---	---	31	---	---	---	---	---	---	---	29
Sulfate, dissolved (SO <sub>4</sub> )	---	---	5.0	---	---	---	---	---	---	---	4.0
Chloride, dissolved (Cl)	---	---	1.0	---	---	---	---	---	---	---	0.7
Fluoride, dissolved (F)	---	---	<0.1	---	---	---	---	---	---	---	<0.1
Silica, dissolved (SiO <sub>2</sub> )	---	---	5.3	---	---	---	---	---	---	---	7.0
Solids, dissolved, at 180°C	---	---	44	---	---	---	---	---	---	---	50
Nitrogen, NO <sub>2</sub> + NO <sub>3</sub> , diss. (as N)	---	---	0.08	---	---	---	---	---	---	---	<0.01
Nitrogen, ammonia, dissolved (as N)	---	---	<0.03	---	---	---	---	---	---	---	---
Nitrogen, organic, total (as N)	---	---	0.60	---	---	---	---	---	---	---	0.02
Nitrogen, amm. + org., total (as N)	---	---	0.60	---	---	---	---	---	---	---	0.50
Nitrogen, total (as N)	---	---	0.68	---	---	---	---	---	---	---	0.50
Phosphorus, total (as P)	---	---	0.027	---	0.017	0.051	0.023	0.119	0.017	0.196	0.028
Phosphorus, ortho, dissolved (as P)	---	---	0.002	---	---	---	---	---	---	---	0.004
Iron, dissolved (Fe) µg/L	---	---	180	---	---	---	---	---	---	---	30
Manganese, dissolved (Mn) µg/L	---	---	8	---	---	---	---	---	---	---	4
Chlorophyll a, phytoplankton (µg/L)	---	---	16	---	7.7	---	11	---	9.2	---	---

Table 4.--Water clarity and water-quality analyses and their associated Trophic State Indices (TSI) for Big Sissabagama Lake, 1996 water year

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

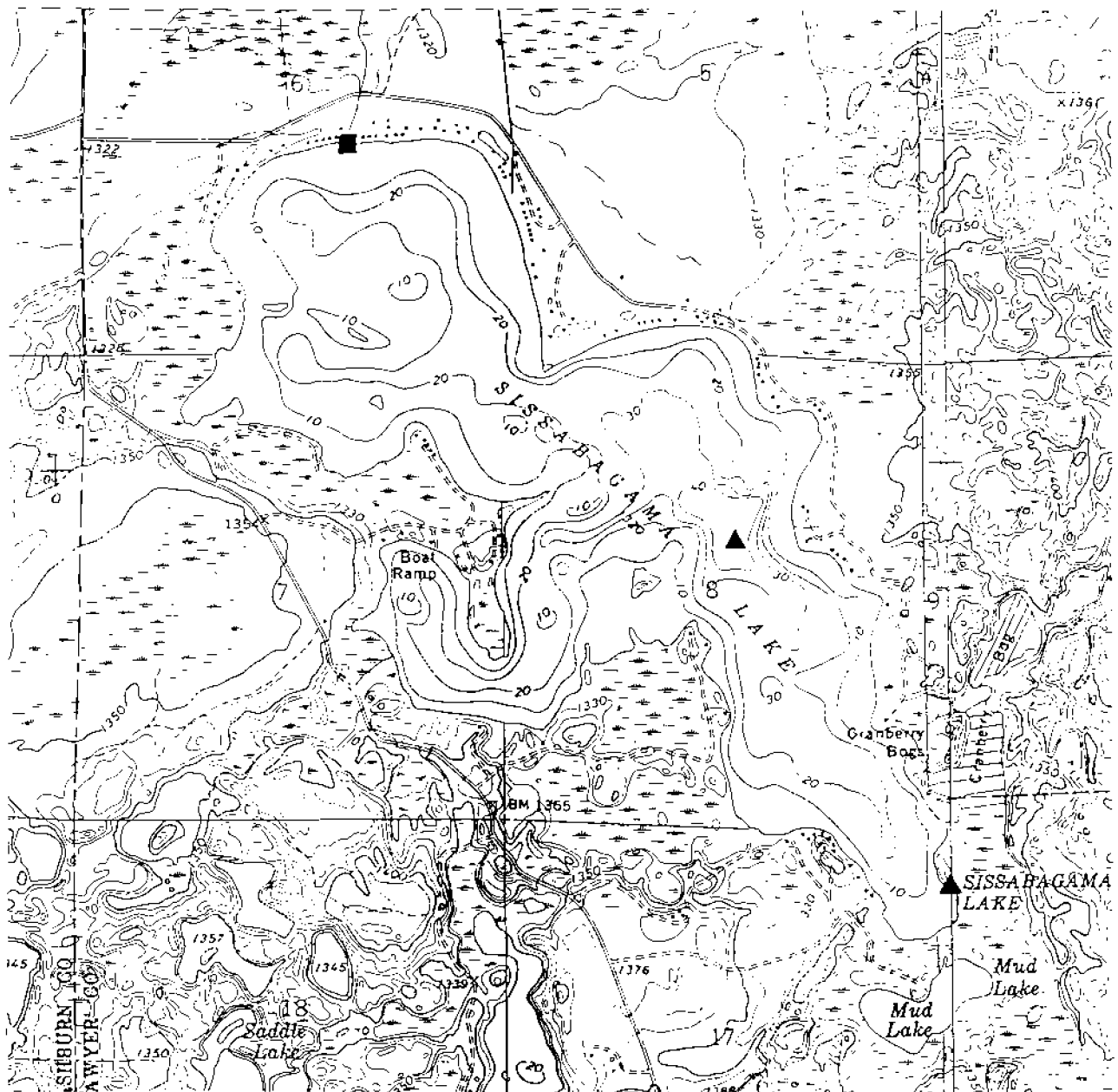
Date	Secchi Disk			Sampling Depth (feet)	Total Phosphorus			Chlorophyll a		Dissolved Ortho- phosphate Phosphorus Conc. (mg/L)
	Depth (meters)	Depth (feet)	T.S.I.		Conc. (mg/L)	Conc. (µg/L)	T.S.I.	Conc. (µg/L)	T.S.I.	
05/15/96	1.5	4.9	54	1.5	0.027	27	54	16	56	0.002
	-	-	-	-	--	-	-	-	-	--
06/25/96	2.1	6.9	49	1.5	0.017	17	50	7.7	50	--
	-	-	-	46	0.051	51	-	-	-	--
07/24/96	1.8	5.9	52	1.5	0.023	23	52	11	53	--
	-	-	-	49	0.119	119	-	-	-	--
08/20/96	2.4	7.9	47	1.5	0.017	17	50	9.2	52	--
	-	-	-	54	0.196	196	-	-	-	--
11/07/96	2.0	6.6	50	1.5	0.028	28	54	4	45	--
	-	-	-	-	--	-	-	-	-	--

**Table 5. Water-quality data for Big Sissabagama Lake at bog outlet near Stone Lake, Wisconsin, 1986-96**

DATE	TEMPER- ATURE WATER (DEG C)	DIS- CHARGE, INST. CUBIC FEET PER SECOND	SPE- CIFIC CON- DUCT- ANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	PH WATER WHOLE FIELD (STAND- ARD UNITS)	PHOS- PHORUS TOTAL (MG/L AS P)
APR 1986						
24...	10.5	--	60	11.0	7.0	0.140
JUN						
13...	20.5	E5.0	77	7.1	6.9	0.150
JUL						
15...	18.5	E5.0	73	8.6	6.8	0.150
AUG						
14...	19.5	E5.0	71	7.6	7.2	0.100
APR 1987						
24...	10.5	E8.0	50	9.8	6.5	0.150
JUN						
23...	24.5	E8.0	74	7.9	7.5	0.090
JUL						
20...	24.5	E0.0	--	8.7	7.8	0.070
AUG						
20...	19.0	E8.0	59	7.8	8.4	0.160
APR 1988						
21...	10.0	<0.50	--	10	7.9	0.060
JUN						
16...	23.0	0.0	--	8.2	8.0	0.042
JUL						
25...	29.5	0.0	--	7.2	9.2	0.080
AUG						
18...	26.0	0.0	--	7.4	8.6	0.080
APR 1989						
25...	7.0	0.0	72	10.5	7.5	0.030
JUN						
13...	17.5	0.0	73	8.8	7.6	<0.020
JUL						
11...	25.0	0.0	77	8.3	7.4	--
AUG						
22...	19.0	0.0	66	7.9	6.5	0.330
APR 1990						
23...	12.5	0.0	--	12.6	7.3	0.020
JUN						
18...	20.0	0.0	--	9.7	7.2	0.130
JUL						
18...	25.5	0.0	--	7.2	7.0	0.030
AUG						
14...	24.5	0.0	--	10.1	8.6	0.020
APR 1991						
23...	6.0	E3.0	58	8.8	7.4	--

**Table 5. Water-quality data for Big Sissabagama Lake at bog outlet near Stone Lake, Wisconsin, 1986-96--continued**

DATE	TEMPER- ATURE WATER (DEG C)	DIS- CHARGE, INST. CUBIC FEET PER SECOND	SPE- CIFIC CON- DUCT- ANCE (US/CM)	OXYGEN, DIS- SOLVED (MG/L)	PH WATER WHOLE FIELD (STAND- ARD UNITS)	PHOS- PHORUS TOTAL (MG/L AS P)
JUN 10...	23.0	0.0	70	9.3	8.2	<0.020
JUL 15...	25.0	E3.0	64	8.8	8.4	0.020
AUG 20...	23.5	0.0	77	8.6	9.0	0.050
MAY 1992 11...	13.0	0.0	65	10.4	8.1	0.020
JUN 09...	19.5	0.0	25	9.6	7.9	0.078
JUL 23...	20.5	0.0	73	8.6	8.2	0.026
AUG 19...	21.5	E2.0	69	10.8	8.0	0.098
MAY 1993 04...	10.0	E2.0	55	10.1	7.9	0.090
JUN 29...	20.0	0.0	69	8.9	7.6	0.021
JUL 16...	21.5	0.0	74	7.8	8.1	0.019
AUG 12...	24.5	0.0	74	8.7	8.4	0.020
MAY 1994 03...	10.0	0.0	59	11.6	7.7	0.030
JUN 13...	21.0	0.0	82	7.6	7.8	0.016
JUL 15...	22.5	0.0	75	7.8	8.4	0.022
AUG 1994 15...	20.5	0.0	104	8.8	8.5	0.020
MAY 1995 01...	9.5	0.0	80	12.4	8.2	0.020
JUN 19...	28.0	0.0	72	8.8	7.3	<0.008
JUL 18...	22.5	0.0	74	8.6	8.1	0.018
AUG 18...	24.5	0.0	72	8.1	7.8	0.024
AUG 1996 20...	23.0	0.0	86	8.6	8.1	0.031
NOV 07...	5.5	0.0	--	12.6	7.3	--



EXPLANATION

- ▲ Water-quality monitoring site
- Lake-stage monitoring site

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

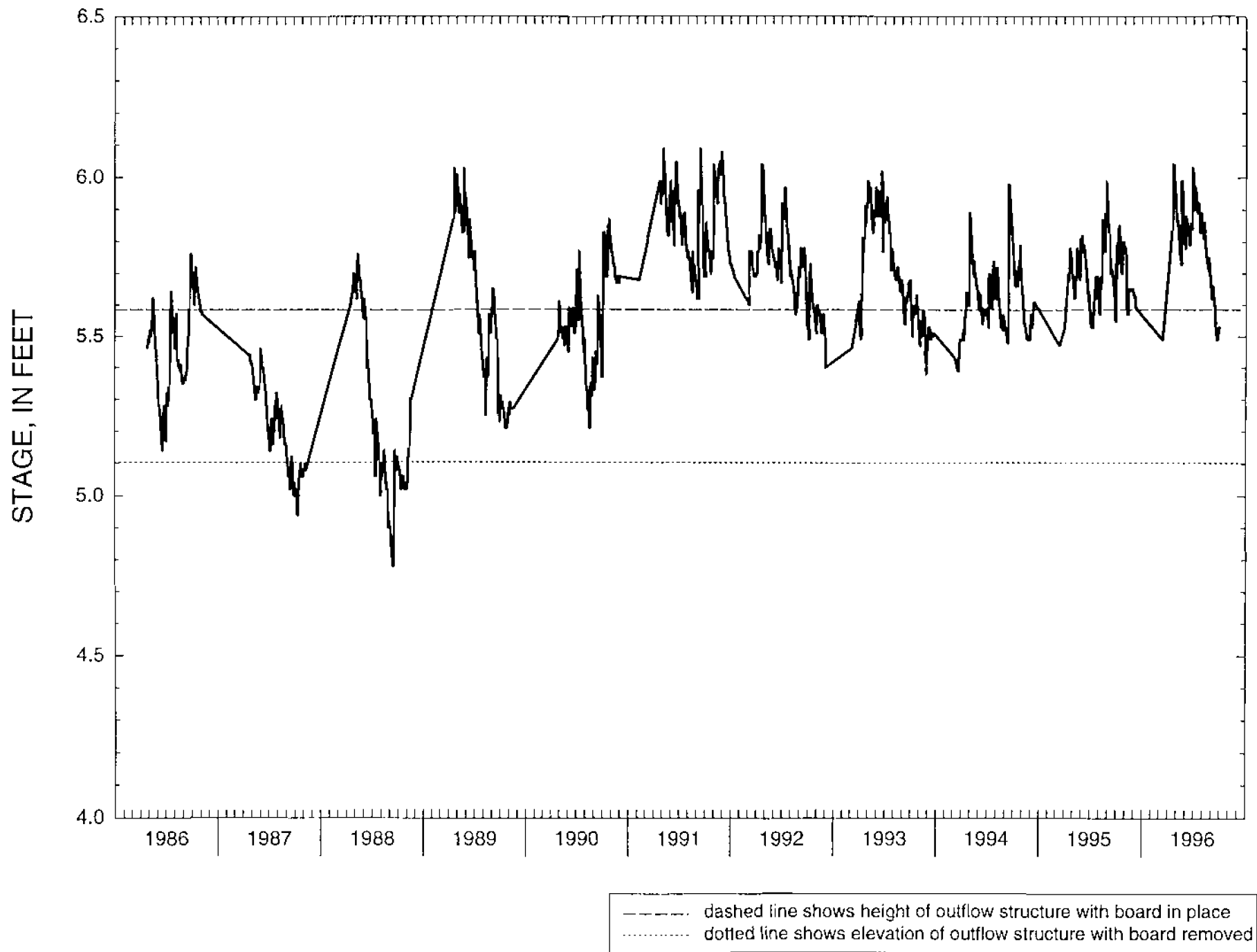


Figure 2. Lake Stage Data for Big Sissabagama Lake 1986-1996

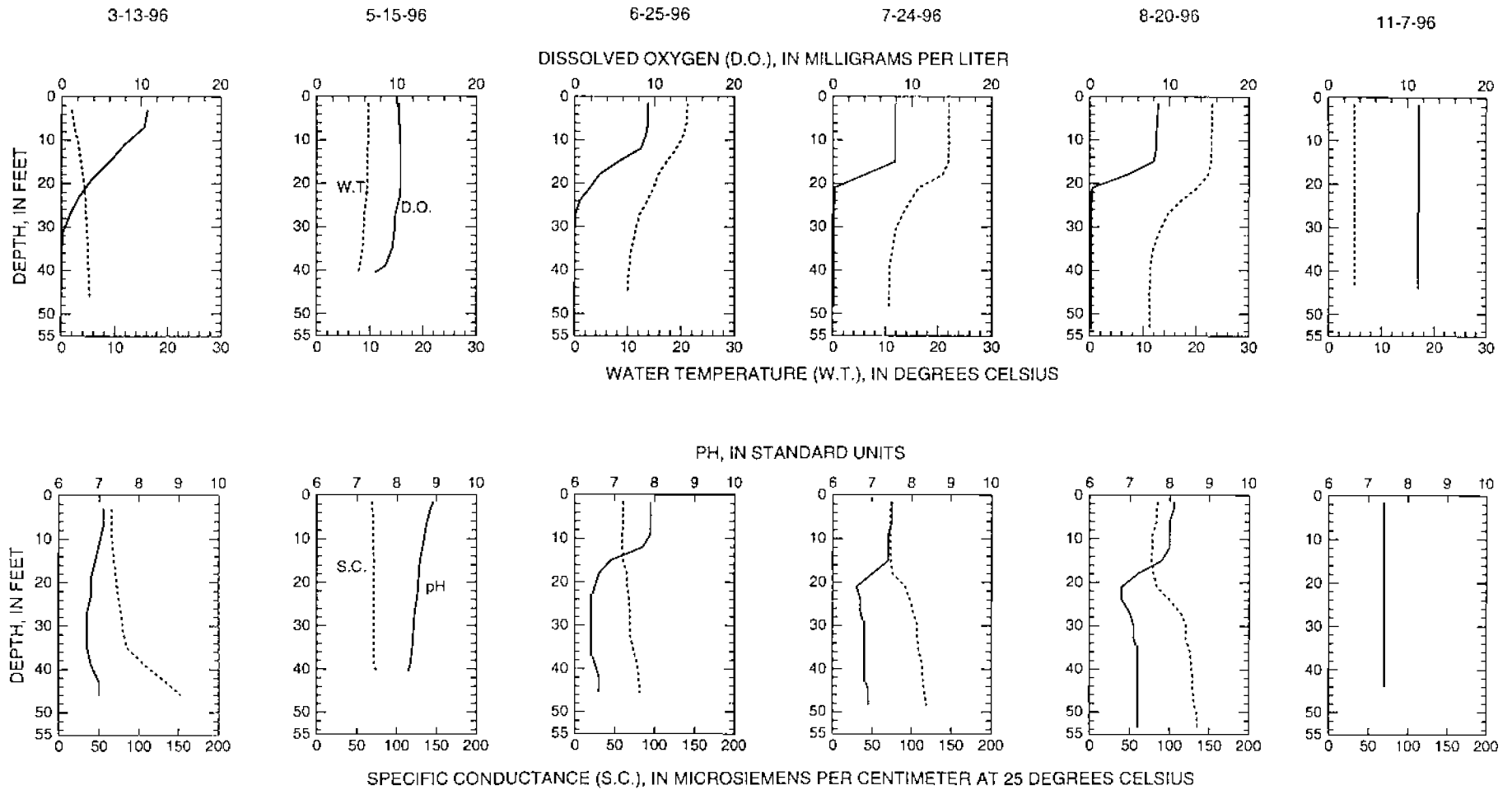


Figure 3. Depth profiles of water temperature, dissolved oxygen, pH, and specific conductance for Big Sissabagama Lake near Stone Lake, Wisconsin, 1996.

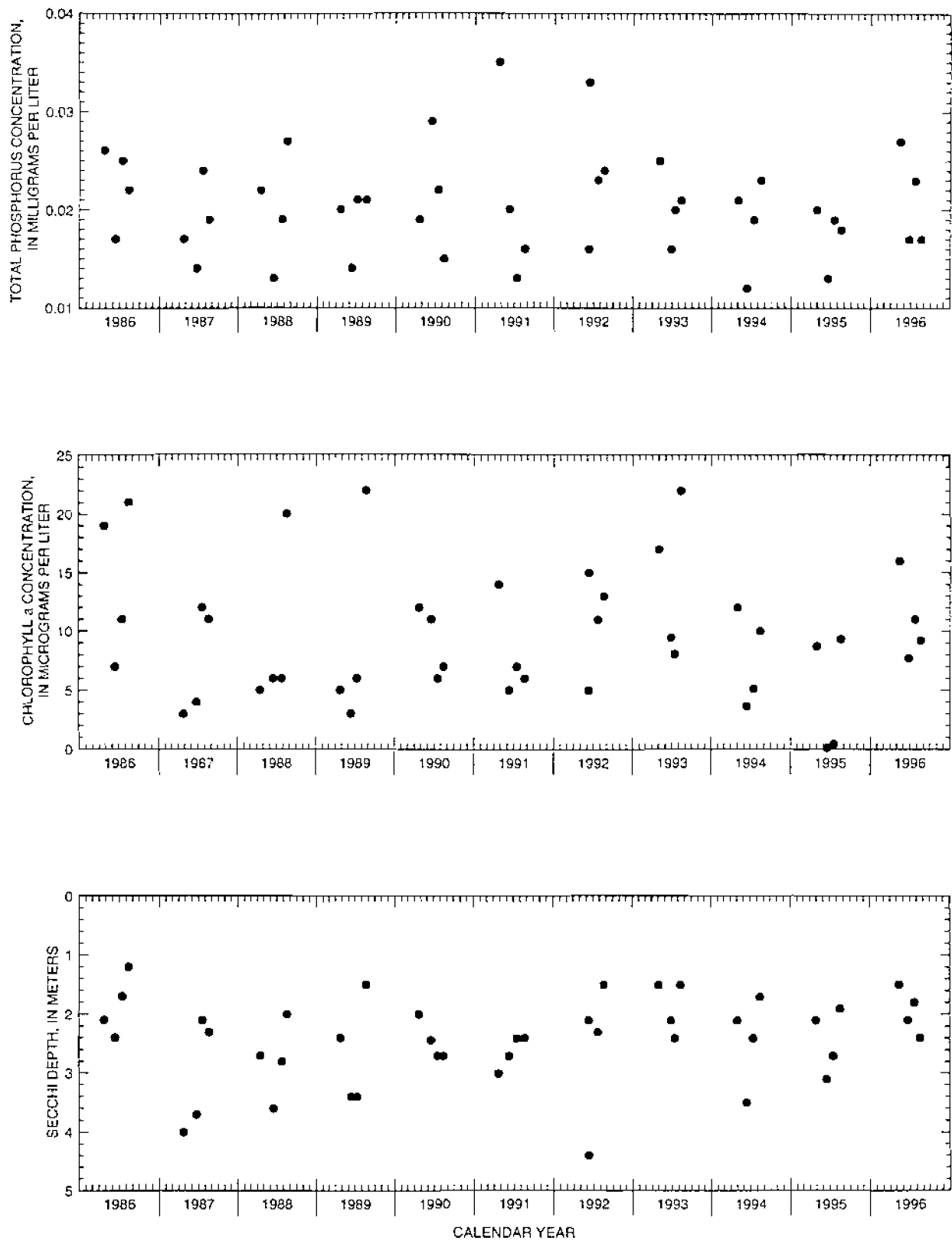


Figure 4. Surface total-phosphorus and chlorophyll a concentrations, and Secchi depths for Big Sissabagama Lake near Stone Lake, Wisconsin



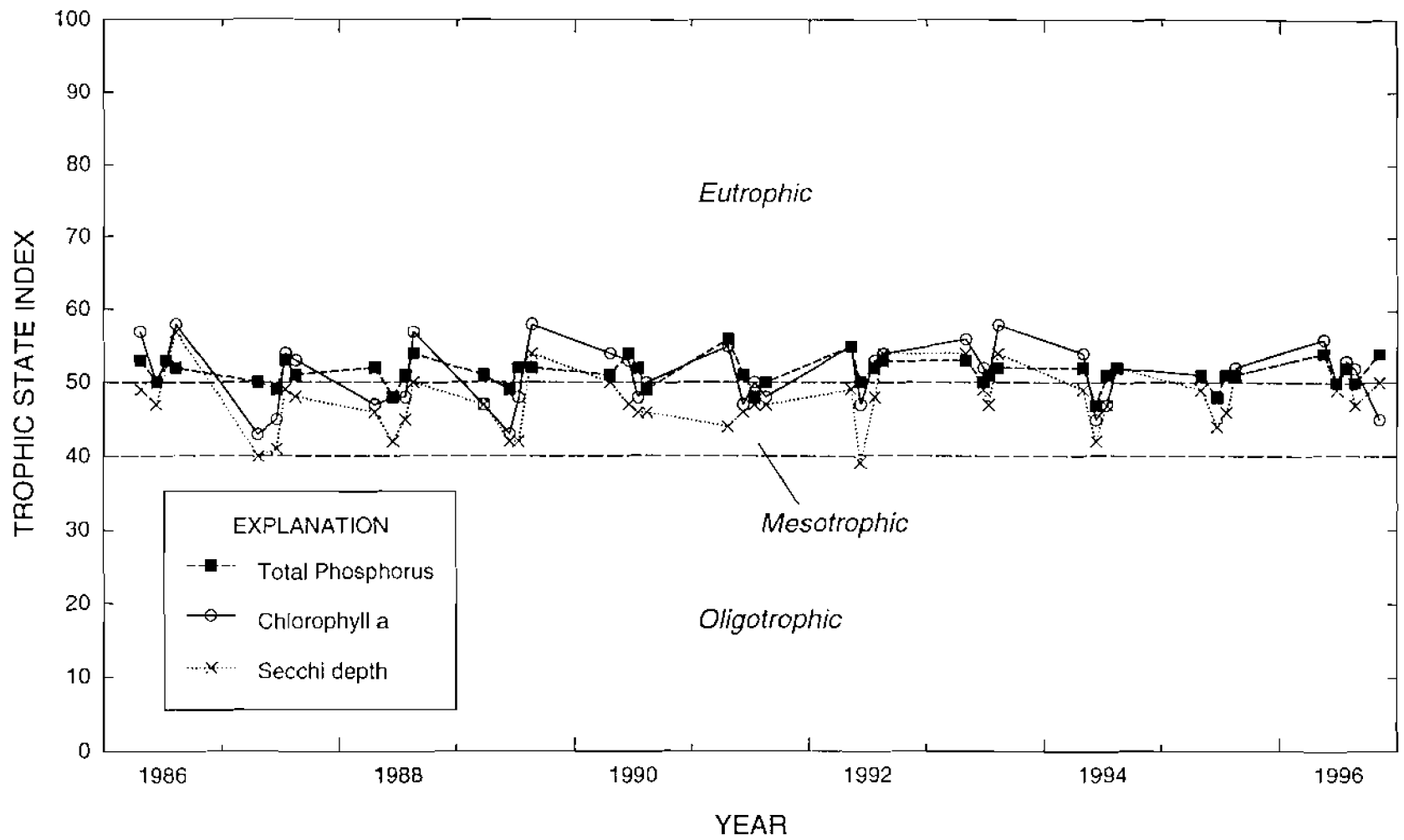
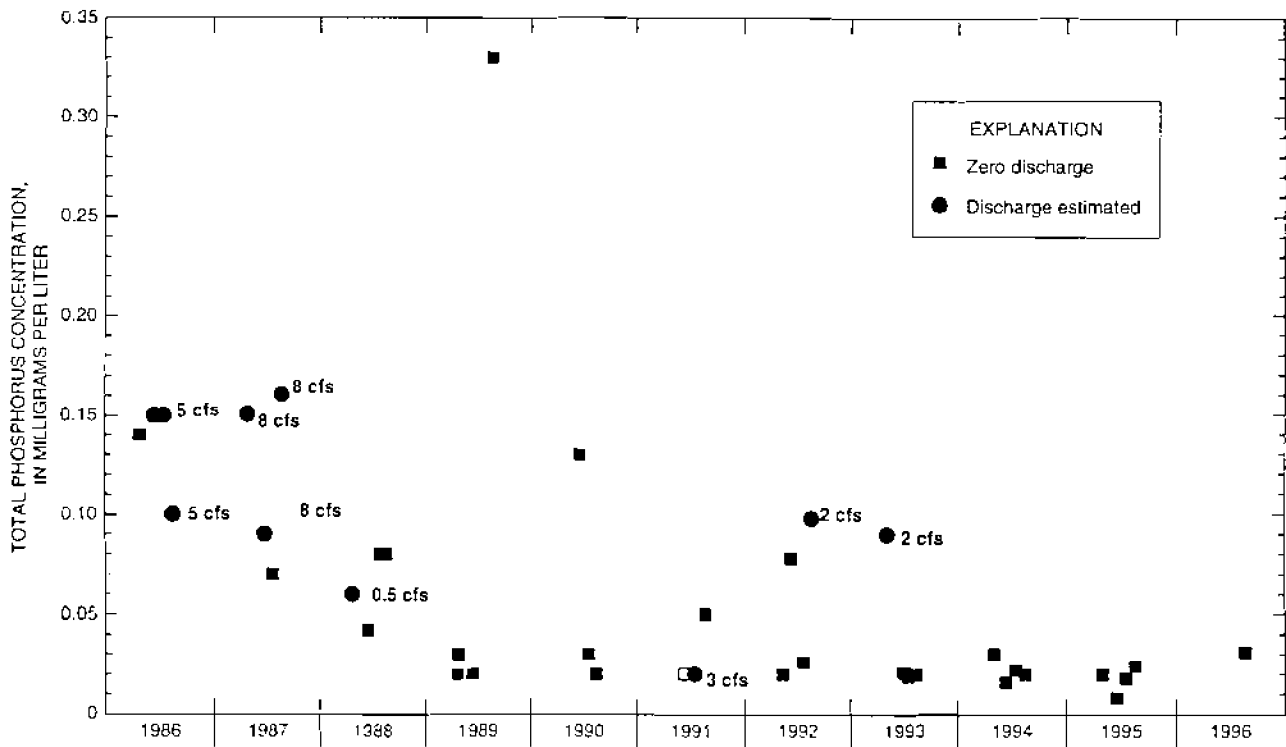


Figure 5. Trophic state indices for Big Sissabagama Lake near Stone Lake, Wisconsin



(Open symbols indicate laboratory detection limit for selected analyses. Actual concentrations for these particular analyses are less than the plotted symbols.)

Figure 6. Total-phosphorus concentrations in Big Sissabagama Lake at mouth of Big Sissabagama Tributary bog outlet, 1986-96