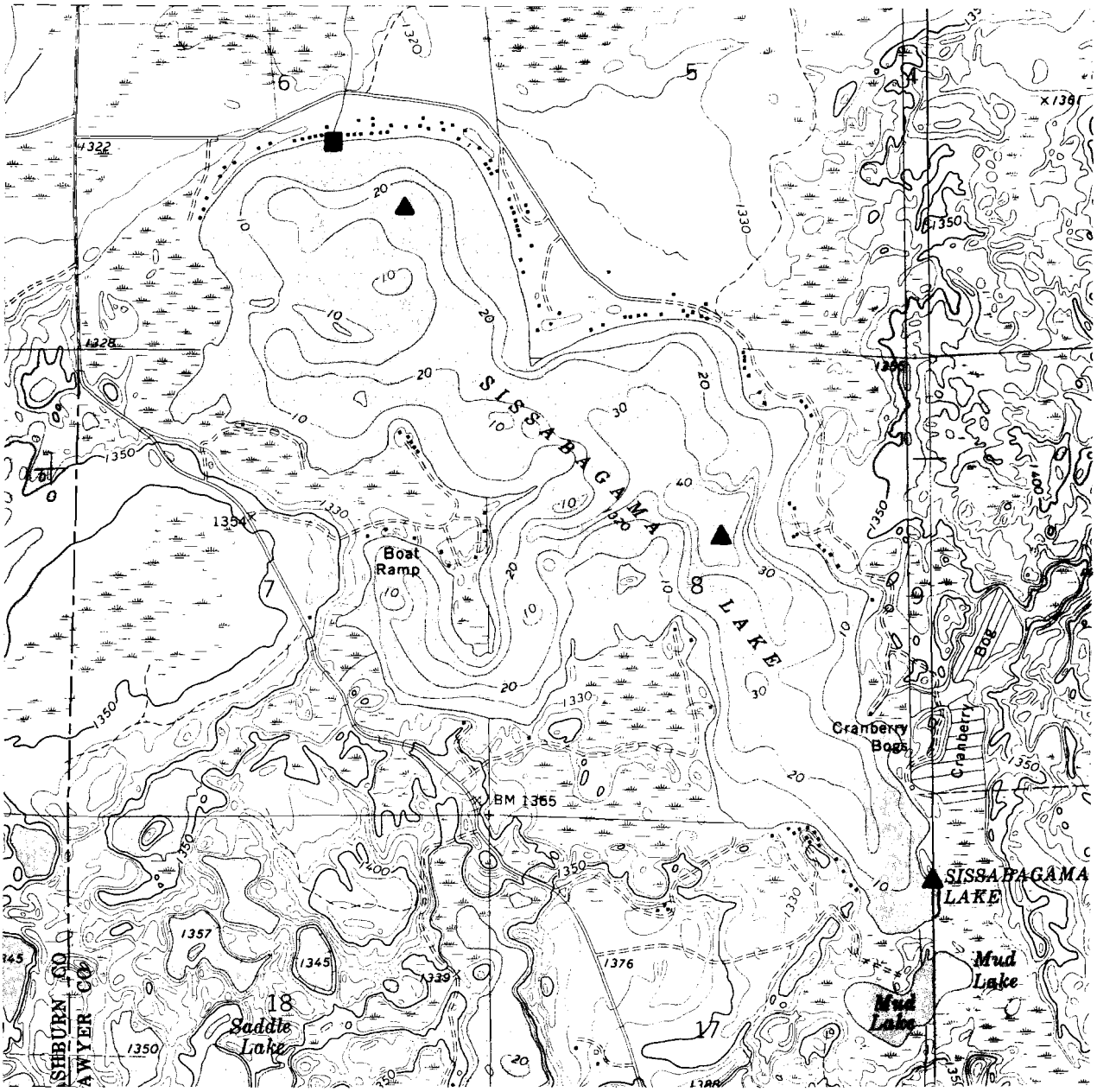
SUMMARY OF DATA COLLECTED AT BIG SISSABAGAMA LAKE DURING 1998 THROUGH 2001

FUNDING PROVIDED BY

Big Sissabagama Lake Association
Wisconsin Department of Natural Resources, Lake Planning Grant LPL-530
United States Geological Survey

CONTENTS



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.

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Invasive Species Prevention Project Summary

For the past two years, Shell Lake, Wisconsin has consistently sustained lake levels in excess of its 100-year flood level. Thanks to Shell Lake's status as the largest landlocked, spring-fed lake in northern Wisconsin, coupled with exceptionally precipitous years, nearly all lakeshore property has been either threatened or damaged by rising waters. In an effort to prevent further damages, the City of Shell Lake initially contracted to construct a four and a half mile pipeline which would pump excess water north to the Yellow River in the summer of 2002. Conditions in the project permit stipulate that if any aquatic species potentially harmful to the ecology of the Yellow River enter Shell Lake, the project must be abandoned to prevent the further spread of said species. Despite complications and delays in the pipeline project which will move the completion date to autumn of 2003, the conditions of the project permit still stand. In order to prevent further flooding and repair existing floodwater damage, the City of Shell Lake took the initiative and installed an Invasive Species Prevention Project early in the summer of 2003.

The project focuses primarily on the prevention of an outbreak of Eurasian water milfoil in the lake. Eurasian milfoil was brought to the Great Lakes in ballast water emptied from ships crossing the Atlantic from Europe and Asia in the early 1900s. Since arriving in the United States, it has spread throughout the midwest and beyond by hitching rides on boats and trailers that travel from lake to lake over relatively short periods of time. Similar to many native milfoil plants, Eurasian water milfoil spreads quickly through shoots and runners sent out beneath the surface of the lakebed. Severed portions of the stem grow adventitious, or temporary, roots which, once rooted, develop into a whole new plant with its own reproductive system of shoots and runners. What makes Eurasian milfoil so dangerous in comparison to its native counterparts is its utter lack of natural predators in the United States. Left to grow unchecked, Eurasian milfoil spreads rampantly, growing up from the lakebottom to eventually spread across the surface of the water. In this way, the exotic severely limits access to sunlight by other plants as it strangles them for nutrients in the soil. This may lead to the depletion of other species which consume the destroyed plants. Not only does Eurasian water milfoil damage the ecology of lake habitats and their food chains, but it also severely affects a lake both recreationally and aesthetically. Swimming and water sports become burdensome and thick matted beds of the plant crawl where clear water once flowed.

In an effort to prevent such an occurence on Shell Lake, the first step of the project involved the closing of all but Shell Lake's major boat landing. In addition to reducing the amount of man-hours actually needed to inspect incoming trailers, the main landing next to the Shell Lake municipal campground is also the least milfoil-prone of all the lake's public landings. The sandy lakebed surrounding the main landing makes it more difficult for the plant to take root and spread. Landings like the closed South Bay landing, however, would have provided near-perfect growing conditions for Eurasian.

After the other landings were closed, the next step of the process required the recruitment of volunteers who would put in time inspecting boats at the main landing. In order to do this, it was necessary to relate the importance and urgency of the project to as many people as possible. A mention was made of it in the area newspaper and presentations were given to various groups. These presentations targeted volunteer-supportive organizations such as the Future Farmers of America, Scout groups, the local Lyons Club, and the area high school's Student Council, as well as the Shell Lake Lake Association and various public events. Although many of the volunteers who signed up to help inspect boats at the main landing came from groups with a history of volunteerism, most of the volunteers were those directly affected by the project: property owners on the lake. Once they realized that the success of the project was crucial to the reduction of flooding on the lake and that they could help to make a difference, many lakeshore residents enthusiastically volunteered.

Volunteers were then trained to handle inspections at Shell Lake's main landing. These

training sessions were usually completed within an hour, and covered identification and inspection procedures. Although, for the purposes of the project, it is not necessary for the volunteers to be able to identify Eurasian water milfoil, it was felt that it would be helpful for volunteers to be equipped with as much knowledge as possible. During each training session, volunteers learned to identify Eurasian milfoil based on its leaflet structure (12-21 leaflet pairs) and they also learned to identify some plants commonly mistaken for Eurasian (Northern water milfoil: 5-12 leaflet pairs; Coontail: branching leaflets). Volunteers were then familiarized with the chart used to gather information from boaters during inspections. The information obtained with the chart is as follows: the name and city of the watercraft user, the type of watercraft (motorboat, sailboat, jetski), the boat license number, the waterbody used previously by the boater, the boater's purpose on the lake (fishing, recreation), whether or not the boat was inspected and cleaned, and whether or not the boater would make use of a hot water pressure wash if it were installed. This information provides a useful overview of activity on the lake. Volunteers at the landing are also equipped with a list of Eurasian-infested lakes in both Wisconsin and Minnesota, a whisk broom for brushing off bunks on trailers, and a diagram of key areas to inspect on boats and trailers. Key areas to inspect include rollers, bunks, motor propellers, hitches, the trailer frame, and any other suspicious looking protrusions on the boat or trailer. Any plant life found on boats and trailers is deposited in a designated collection barrel. In addition to the survey and inspections, volunteers remind boaters of the 1,000 foot no-wake zone on the lake and to empty their livewells and bait buckets before travelling between water bodies. Finally, volunteers are also informed that although they cannot force boaters to submit to inspection, continued refusal entitles them to contact the authorities to handle the situation.

After the training session, volunteers are qualified to inspect boats at the main landing. In order to inspect the most boats possible, volunteers are scheduled to work Friday through Sunday from 5am to 9pm. This is due to the heightened non-local boat traffic experienced throughout the weekends. During weekdays, landing usage is primarily confined to local boaters and out-of-towners that are staying throughout the week at the campgrounds and who have been inspected over the weekend. As the volunteeer pool has increased over the summer, however, inspection times have increasingly spread to cover additional portions of the week.

Before starting a day of inspections, the necessary materials are delivered to the volunteer who will work the earliest shift. Materials are passed from volunteer to volunteer as they relieve each other throughout the day. Each shift usually covers approximately three hours, although there have been instances where volunteers have signed up for as much as seven hours in any given day. At the end of the day, the materials are collected and distributed to the volunteer who will begin the next day's early shift.

The scheduling process usually takes place via telephone early in the week. Often, a message will simply be left inquiring as to whether or not the volunteer can work during the upcoming weekend. In these situations, volunteers have plenty of time to peruse their personal schedules and call back before the weekend arrives. Once the schedule is established, volunteer hours are recorded with a monetary value attributed to them. This contributes to the total amount that must be paid by the City to supplement the money alloted to the project via government grant.

Reactions to the program from the boaters themselves has been, for the most part, as overwhelmingly positive as those of the project volunteers. Despite the rare difficult boater, most are helpful with the inspections and they often express concern over the threat posed by invasive species like Eurasian water milfoil. In these instances, volunteers can usually inform boaters as to how Eurasian infects lakes and of why the project is of such importance to reducing flood levels. Additionally, volunteers are equipped with brochures which can be given to boaters, providing them with information on how to identify the plant. Even during the three significant findings of Eurasian milfoil this summer, the boats' owners were helpful in the inspection and cleaning process. In one instance, boaters even lifted their sailboat to provide access to hard-to-reach places on the trailer.

In addition to inspections of incoming boats at Shell Lake's main landing, periodic inspections of the lake itself were performed at areas around the lake with the highest susceptibility to infestation by Eurasian milfoil. Despite a minor scare from a crafty length of coontail, inspections have turned up no signs of Eurasian milfoil and our lake remains clean and

healthy.

In conclusion, Shell Lake's Invasive Species Prevention Program is off to a promising start. New volunteers have continued to be trained throughout the summer season and coverage at the boat landing has increased. It is anticipated that this trend will continue with the start of the boating season next spring. Boaters themselves have also become more conscientious of the threat posed by Eurasian milfoil and have maintained cleaner boats over the course of the summer. Although boaters may simply consider a clean boat entering Shell Lake to be less time taken during an inspection, it doesn't change the fact that fewer weeds are being pulled off boats now than at the project's inception. Whereas each volunteer would initially have had to clean off three or four boats each day, they are now "lucky" to encounter a weedy boat more than two times in an entire weekend. If projects such as the one implemented in Shell Lake, Wisconsin continue to spread and succeed, we will be able to prevent the further spread of Eurasian water milfoil and keep our lakes safe and clean for generations to come.

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 mi^2.

LAKE-STAGE RECORDS

PERIOD OF RECORD.--1986 to 1996, and October 1997 to September 1998, during open-water periods.

GAGE.--Water surface measured from reference point near lake outlet. Measurements were made by Richard Roehrich and James 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, 5.88 ft, June 27; minimum observed, less than 5.00 ft, Sept. 26-30 (stages below 5.00 ft cannot be measured from reference point).

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.56	5.44	---	---	---	---	---	5.69	5.72	5.79	5.37	5.21
2	5.55	5.45	---	---	---	---	---	5.68	5.71	5.77	5.37	5.17
3	5.53	5.45	---	---	---	---	---	5.67	5.69	5.76	5.37	5.16
4	5.51	5.45	---	---	---	---	---	5.66	5.67	5.73	5.36	5.14
5	5.50	5.45	---	---	---	---	---	5.66	5.66	5.72	5.34	5.14
6	5.57	5.44	---	---	---	---	---	5.66	5.65	5.72	5.31	5.13
7	5.59	5.43	---	---	---	---	---	5.67	5.65	5.74	5.34	5.11
8	5.61	5.42	---	---	---	---	---	5.66	5.64	5.73	5.32	5.10
9	5.64	5.42	---	---	---	---	---	5.64	5.63	5.71	5.29	5.09
10	5.65	5.42	---	---	---	---	---	5.63	5.63	5.71	5.29	5.07
11	5.65	5.41	---	---	---	---	---	5.62	5.62	5.7	5.28	5.04
12	5.65	5.40	---	---	---	---	---	5.61	5.67	5.69	5.26	5.03
13	5.63	5.40	---	---	---	---	---	5.66	5.68	5.67	5.23	5.03
14	5.70	5.37	---	---	---	---	---	5.65	5.69	5.66	5.22	5.02
15	5.70	5.37	---	---	---	---	---	5.71	5.68	5.67	5.21	5.02
16	5.63	5.37	---	---	---	---	---	5.72	5.67	5.65	5.21	5.01
17	5.61	5.36	---	---	---	---	---	5.72	5.67	5.64	5.27	5.01
18	5.61	5.35	---	---	---	---	---	5.73	5.69	5.62	5.28	5.00
19	5.58	5.32	---	---	---	---	---	5.73	5.74	5.59	5.26	5.00
20	5.56	5.26	---	---	---	---	---	5.71	5.77	5.58	5.29	5.00
21	5.54	5.23	---	---	---	---	---	5.69	5.76	5.57	5.27	5.00
22	5.52	---	---	---	---	---	---	5.68	5.74	5.55	5.29	5.00
23	5.51	---	---	---	---	---	---	5.67	5.73	5.5	5.31	5.00
24	5.50	---	---	---	---	---	---	5.65	5.79	5.48	5.31	5.00
25	5.47	---	---	---	---	---	---	5.63	5.88	5.47	5.29	5.00
26	5.45	---	---	---	---	---	---	5.62	5.86	5.47	5.27	<5.00
27	5.44	---	---	---	---	---	---	5.61	5.88	5.47	5.28	<5.00
28	5.43	---	---	---	---	---	---	5.62	5.86	5.45	5.26	<5.00
29	5.42	---	---	---	---	---	---	5.61	5.84	5.45	5.25	<5.00
30	5.41	---	---	---	---	---	---	5.71	5.80	5.41	5.24	<5.00
31	5.43	---	---	---	---	---	---	5.72	---	5.38	5.23	---
MEAN	5.55	---	---	---	---	---	---	5.67	5.72	5.61	5.29	---
MAX	5.70	---	---	---	---	---	---	5.73	5.88	5.79	5.37	---
MIN	5.41	---	---	---	---	---	---	5.61	5.62	5.38	5.21	---

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DRAINAGE AREA.--9.47 mi^2.

LAKE-STAGE RECORDS

PERIOD OF RECORD.--1986 to 1996, and October 1997 to current year, during open-water periods.

GAGE.--Water surface measured from reference point near lake outlet. Measurements were made by Richard Roehrich and James 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, 5.95 ft, June 11; minimum observed, less than 5.07 ft, Oct. 1-16 (stages below 5.07 ft cannot be measured from reference point).

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	<5.07	5.10	---	---	---	---	---	---	5.78	5.75	5.88	---
2	<5.07	5.08	---	---	---	---	---	---	5.75	5.75	5.86	5.76
3	<5.07	5.08	---	---	---	---	---	---	5.74	5.79	5.91	5.75
4	<5.07	5.08	---	---	---	---	---	---	5.74	5.81	5.90	5.74
5	<5.07	5.08	---	---	---	---	---	---	5.75	5.84	5.87	5.82
6	<5.07	5.08	---	---	---	---	---	---	5.84	5.83	5.87	5.92
7	<5.07	5.73	---	---	---	---	---	---	5.91	5.80	5.91	5.90
8	<5.07	---	---	---	---	---	---	---	5.89	5.84	5.88	5.96
9	<5.07	---	---	---	---	---	---	---	5.88	5.88	5.86	5.94
10	<5.07	---	---	---	---	---	---	5.91	5.88	5.84	5.85	5.91
11	<5.07	5.12	---	---	---	---	---	5.93	5.95	5.83	5.85	5.89
12	<5.07	5.15	---	---	---	---	---	5.91	5.93	5.82	5.84	5.95
13	<5.07	5.12	---	---	---	---	---	5.89	5.91	5.87	5.91	5.92
14	<5.07	5.11	---	---	---	---	---	5.88	5.88	5.84	5.90	5.91
15	<5.07	5.12	---	---	---	---	---	5.87	5.86	5.83	5.88	5.89
16	<5.07	5.13	---	---	---	---	---	5.85	5.84	---	5.86	5.88
17	5.10	5.13	---	---	---	---	---	5.88	5.82	---	5.85	5.88
18	5.13	5.12	---	---	---	---	---	5.90	5.80	---	5.85	5.87
19	5.12	5.12	---	---	---	---	---	5.89	5.77	5.78	5.88	5.87
20	5.11	5.13	---	---	---	---	---	5.91	5.75	5.75	5.87	5.86
21	5.11	5.13	---	---	---	---	---	5.91	5.74	5.75	5.87	5.84
22	5.10	5.14	---	---	---	---	---	5.90	5.74	5.74	5.86	5.83
23	5.10	5.14	---	---	---	---	---	5.91	5.80	5.72	5.86	5.82
24	5.09	5.15	---	---	---	---	---	---	5.78	5.70	5.90	5.80
25	5.11	5.15	---	---	---	---	---	---	5.77	5.70	5.93	5.78
26	5.11	5.16	---	---	---	---	---	5.88	5.72	5.95	5.90	5.76
27	5.11	5.16	---	---	---	---	---	5.84	5.70	5.94	5.88	5.75
28	5.11	5.16	---	---	---	---	---	5.83	5.75	5.92	5.86	5.72
29	5.11	5.17	---	---	---	---	---	5.83	5.74	5.90	5.83	5.69
30	5.10	5.18	---	---	---	---	---	5.82	5.73	5.88	5.81	5.66
31	5.10	---	---	---	---	---	---	5.80	---	5.93	5.79	---
MEAN	5.09	---	---	---	---	---	---	---	5.80	---	5.87	---
MAX	5.13	---	---	---	---	---	---	---	5.95	---	5.93	---
MIN	5.07	---	---	---	---	---	---	---	5.70	---	5.79	---

< Actual value is known to be less than the value shown

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 mi^2.

LAKE-STAGE RECORDS

PERIOD OF RECORD.--1986 to 1996, and October 1997 to current year, during open-water periods.

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

EXTREMES FOR PERIOD OF RECORD: Maximum gage height observed, 6.39 ft, July 9, 2000; minimum observed, 4.78 ft, Sept. 15, 16, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.39 ft, July 9; minimum observed, less than 5.55 ft, Oct. 5, 6, and Sept. 30.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1999 TO SEPTEMBER 2000

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.63	5.65	5.67	---	---	---	---	5.89	---	5.82	5.96	5.73
2	5.61	5.64	5.67	---	---	---	---	5.89	5.75	5.83	5.95	5.73
3	5.60	5.62	5.67	---	---	---	---	5.88	5.75	5.82	5.93	5.81
4	5.58	5.64	5.67	---	---	---	---	5.87	5.78	5.81	5.91	5.79
5	5.55	5.59	5.67	---	---	---	---	5.85	5.76	5.80	5.89	5.78
6	5.55	5.60	---	---	---	---	---	5.84	5.75	5.80	5.87	5.77
7	5.58	5.62	---	---	---	---	---	5.81	5.77	5.87	---	5.76
8	5.62	5.60	---	---	---	---	---	5.92	5.76	5.98	5.88	5.75
9	5.65	5.60	---	---	---	---	---	5.90	5.75	6.39	5.84	5.75
10	5.67	5.61	---	---	---	---	---	5.90	5.75	6.37	5.83	5.74
11	5.70	5.62	---	---	---	---	---	5.93	5.74	6.36	5.81	5.74
12	5.70	5.61	---	---	---	---	---	5.91	5.73	6.35	5.84	5.73
13	5.69	5.60	---	---	---	---	---	5.89	5.72	6.30	5.82	5.71
14	5.68	5.60	---	---	---	---	---	5.84	5.78	6.25	5.81	5.70
15	5.68	5.60	---	---	---	---	---	5.83	5.77	6.20	5.92	5.68
16	5.68	5.60	---	---	---	---	---	5.85	5.78	6.16	5.91	5.68
17	5.67	5.60	---	---	---	---	---	5.85	5.77	6.10	5.92	5.67
18	5.67	5.60	---	---	---	---	---	5.85	5.77	6.08	5.90	5.66
19	5.66	5.60	---	---	---	---	---	5.83	5.76	6.05	5.90	5.65
20	5.70	5.60	---	---	---	---	---	5.82	5.91	6.03	5.88	5.64
21	5.67	5.60	---	---	---	---	---	5.81	5.92	6.00	5.85	5.62
22	5.65	5.60	---	---	---	---	---	5.81	5.94	5.98	5.83	5.62
23	5.63	5.63	---	---	---	---	---	5.76	5.92	5.95	5.82	---
24	5.63	5.67	---	---	---	---	---	5.75	5.90	5.94	5.81	---
25	5.61	5.69	---	---	---	---	---	5.75	5.91	5.92	---	5.59
26	5.61	5.70	---	---	---	---	---	5.74	5.91	6.08	5.80	5.59
27	5.59	5.69	---	---	---	---	---	5.74	5.90	---	5.79	5.57
28	5.60	5.67	---	---	---	---	---	5.74	5.89	---	5.77	5.56
29	5.60	5.67	---	---	---	---	---	5.73	5.85	---	5.76	5.56
30	5.63	5.67	---	---	---	---	---	---	5.84	5.99	5.75	5.55
31	5.64	---	---	---	---	---	---	---	---	5.96	5.75	---
MEAN	5.64	5.63	---	---	---	---	---	---	---	---	---	---
MAX	5.70	5.70	---	---	---	---	---	---	---	---	---	---
MIN	5.55	5.59	---	---	---	---	---	---	---	---	---	---

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 mi^2.

LAKE-STAGE RECORDS

PERIOD OF RECORD.--April 1986 to September 1996, and October 1997 to current year, during open-water periods.

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

EXTREMES FOR PERIOD OF RECORD: Maximum gage height observed, 6.39 ft, July 9, 2000; minimum observed, 4.78 ft, Sept. 15, 16, 1988.

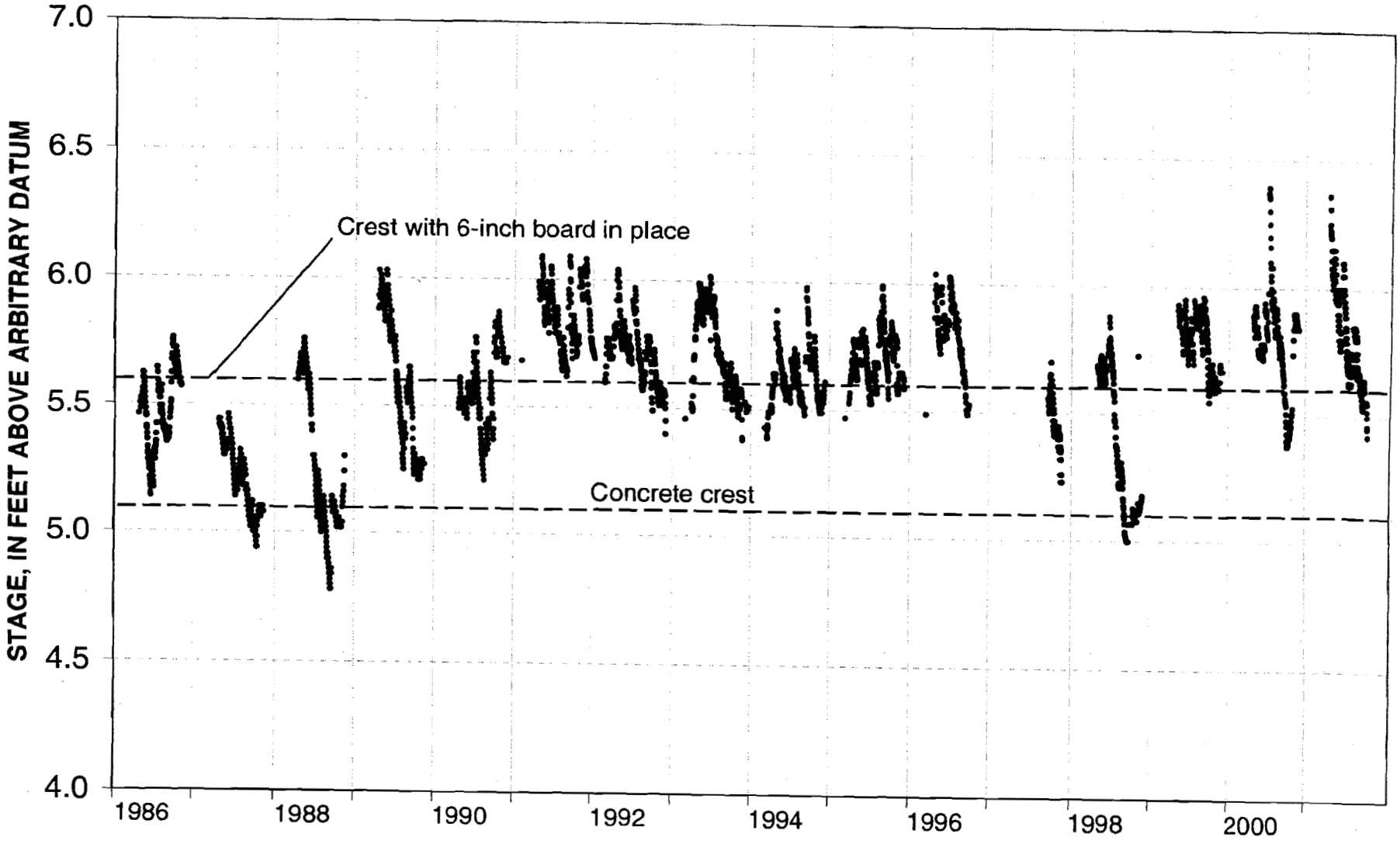
EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 6.36 ft, Apr. 25; minimum observed, less than 5.38 ft, Oct. 8-12.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 2000 TO SEPTEMBER 2001

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.55	5.53	---	---	---	---	---	6.20	5.86	5.84	5.85	5.57
2	5.54	5.74	---	---	---	---	---	6.15	5.84	5.81	5.84	5.55
3	5.51	5.80	---	---	---	---	---	6.11	5.80	5.79	5.84	5.54
4	5.48	5.80	---	---	---	---	---	6.08	5.80	5.76	5.82	5.54
5	5.46	5.80	---	---	---	---	---	6.06	5.78	5.74	5.82	5.53
6	5.43	5.84	---	---	---	---	---	6.05	5.76	5.73	5.81	5.53
7	5.40	5.90	---	---	---	---	---	6.04	5.80	5.71	5.80	5.60
8	5.38	5.89	---	---	---	---	---	6.02	5.76	5.70	5.73	5.63
9	5.38	5.88	---	---	---	---	---	6.00	5.78	5.70	5.75	5.64
10	5.38	5.85	---	---	---	---	---	6.08	5.83	5.69	5.70	5.62
11	5.38	5.84	---	---	---	---	---	6.05	---	5.68	5.69	5.62
12	5.38	5.86	---	---	---	---	---	6.04	---	5.67	5.68	5.61
13	5.39	5.89	---	---	---	---	---	6.03	5.98	---	5.66	5.60
14	5.40	5.90	---	---	---	---	---	6.15	6.00	---	5.65	5.55
15	5.41	5.90	---	---	---	---	---	6.12	5.98	5.63	5.66	5.55
16	5.41	5.90	---	---	---	---	---	6.10	5.99	5.62	5.67	5.55
17	5.41	5.89	---	---	---	---	---	6.06	5.97	5.63	5.66	5.55
18	5.41	5.88	---	---	---	---	---	---	6.05	5.68	5.67	5.55
19	5.41	5.87	---	---	---	---	---	6.00	6.10	5.66	5.66	5.55
20	5.42	5.87	---	---	---	---	---	5.96	6.10	---	5.65	5.55
21	5.42	5.87	---	---	---	---	---	5.98	6.08	---	5.65	5.55
22	5.42	5.86	---	---	---	---	---	6.00	6.05	5.75	5.64	5.56
23	5.43	5.86	---	---	---	---	---	5.98	---	5.75	5.63	5.56
24	5.44	5.85	---	---	---	---	---	5.95	6.00	5.73	5.61	5.55
25	5.45	5.84	---	---	---	---	6.36	6.00	5.98	5.70	5.60	5.52
26	5.46	5.84	---	---	---	---	6.31	5.98	5.95	5.69	5.60	5.55
27	5.48	5.84	---	---	---	---	6.25	5.96	5.93	5.67	5.60	5.50
28	5.46	5.84	---	---	---	---	6.23	5.95	5.91	5.70	5.59	5.46
29	5.48	5.84	---	---	---	---	6.22	5.94	5.89	5.69	5.59	5.45
30	5.50	5.84	---	---	---	---	6.21	5.90	5.85	5.69	5.60	5.42
31	5.51	---	---	---	---	---	---	5.88	---	5.69	5.59	---
MEAN	5.44	5.84	---	---	---	---	---	---	---	---	5.69	5.55
MAX	5.55	5.90	---	---	---	---	---	---	---	---	5.85	5.64
MIN	5.38	5.53	---	---	---	---	---	---	---	---	5.59	5.42

Stage of Big Sissabagama Lake, Oct. 1986 - Sep. 2000



454724091303600 BIG SISSABAGAMA LAKE NEAR STONE LAKE, WI

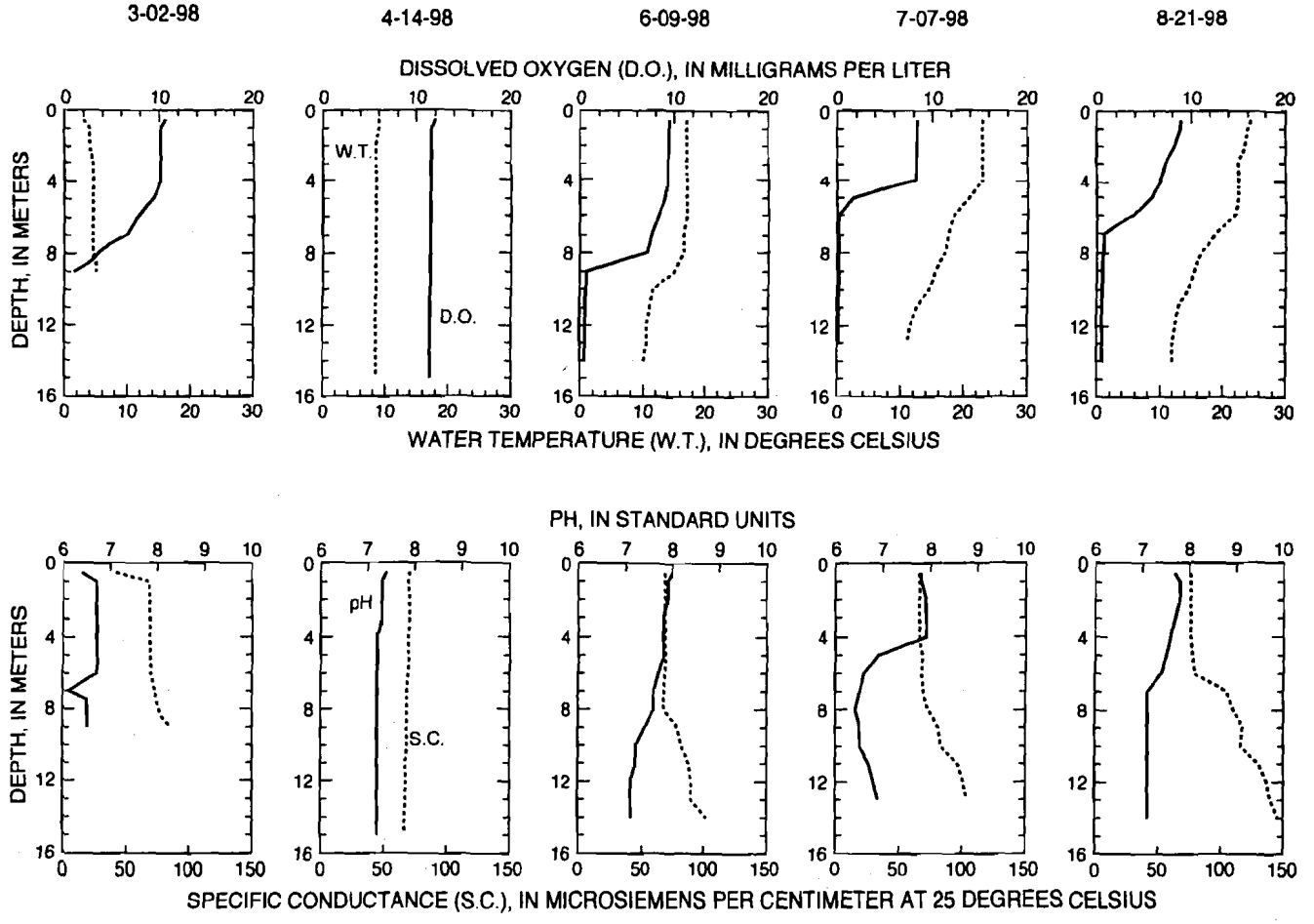
WATER-QUALITY RECORDS

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

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 02 TO AUGUST 21, 1998
(Milligrams per liter unless otherwise indicated)

	Mar. 02		Apr. 14		June 09		July 07		Aug. 21		
Lake stage (ft)	---		5.88		5.65		5.71		5.29		
Secchi-depth (meters)	---		1.8		2.1		2.2		1.8		
Chlorophyll a, phytoplankton (µg/L)	---		18.0		14.7		7.75		3.71		
Depth of sample (m)	0.5	9.0	0.5	15.0	0.5	14.0	0.5	13.0	0.5	8.0	14.0
Water temperature (°C)	3.0	5.0	8.8	8.5	16.9	10.1	22.8	11.2	24.4	16.5	12.1
Specific conductance (µS/cm)	42	85	71	67	69	102	66	104	76	110	140
pH (units)	6.4	6.5	7.4	7.2	8.0	7.1	7.8	6.9	7.7	7.1	7.1
Dissolved oxygen	10.7	1.0	12.0	11.4	9.5	0.4	8.4	0.1	8.9	0.5	0.6
Phosphorus, total (as P)	0.486	0.655	0.042	0.039	0.022	0.188	0.019	0.095	0.022	0.147	0.234
Phosphorus, ortho, dissolved (as P)	---	---	0.005	---	---	---	<0.002	---	---	---	---
Nitrogen, NO2 + NO3, diss. (as N)	---	---	0.043	---	---	---	<0.010	0.020	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	<0.013	---	---	---	<0.013	0.705	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.40	---	---	---	0.56	1.4	---	---	---
Nitrogen, total (as N)	---	---	0.44	---	---	---	---	1.4	---	---	---
Color (Pt-Co. scale)	---	---	35	---	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	3.3	---	---	---	---	---	---	---	---
Hardness, as CaCO3	---	---	31	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	8.0	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	2.6	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	1.5	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	0.8	---	---	---	---	---	---	---	---
Alkalinity, as CaCO3	---	---	31	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO4)	---	---	<1.5	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	0.8	---	---	---	---	---	---	---	---
Silica, dissolved (SiO2)	---	---	7.2	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	50	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	230	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	73	---	---	---	---	---	---	---	---



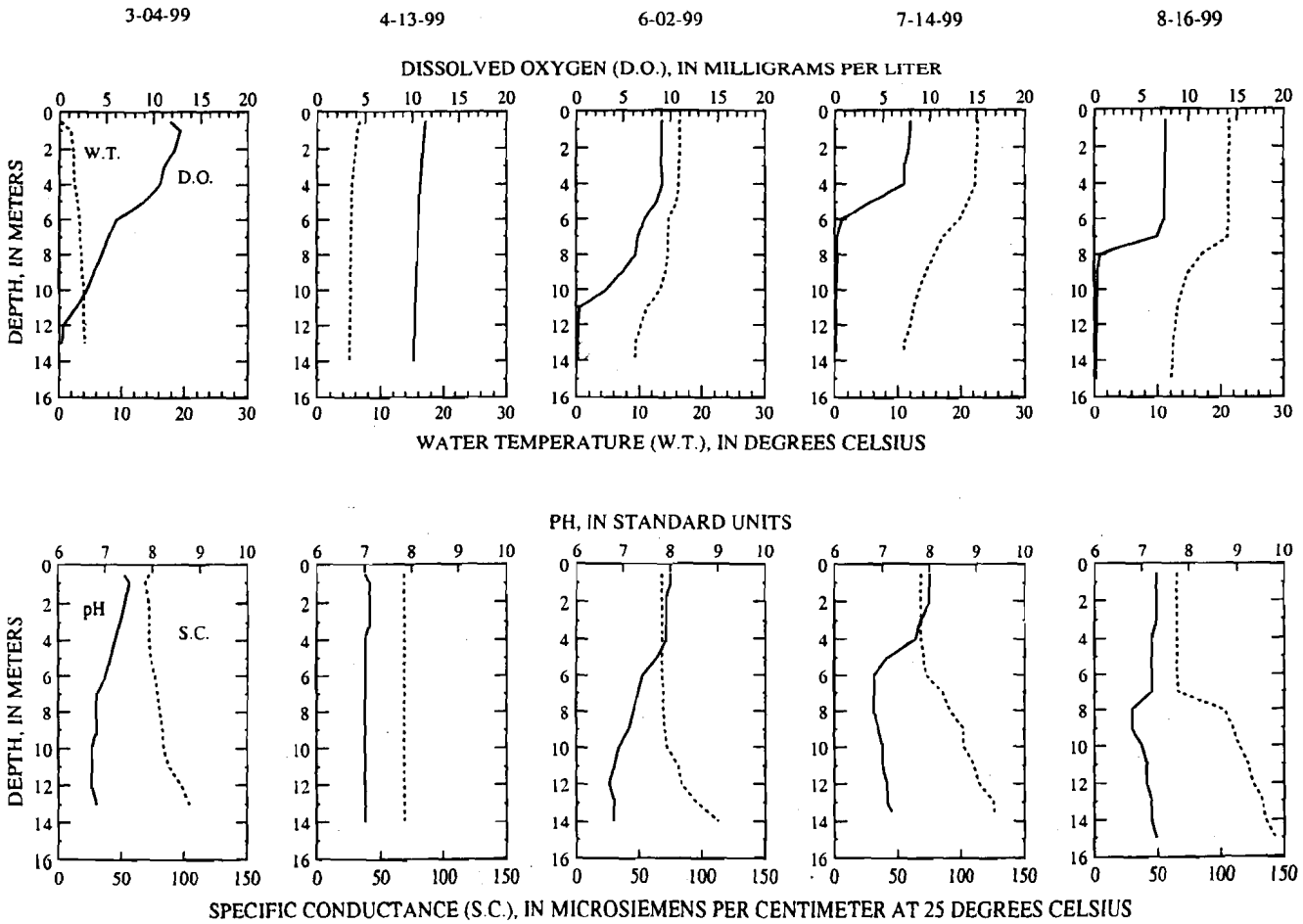
WATER-QUALITY RECORDS

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

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

WATER-QUALITY DATA, MARCH 04 TO AUGUST 16, 1999
(Milligrams per liter unless otherwise indicated)

	Mar-4		Apr-13		Jun-2		Jul-14		Aug-16		
Lake stage (ft)	---		5.92		5.75		5.84		5.76		
Secchi-depth (m)	---		2.4		1.9		2.6		1.6		
Chlorophyll a, phytoplankton (µg/L)	---		---		9.43		7.55		13.0		
Depth of sample (m)	0.5	13.0	0.5	14.0	0.5	14.0	0.5	13.0	0.5	8.0	15.0
Water temperature (°C)	0.1	4.1	6.6	5.0	16.5	9.3	22.7	11.0	21.3	17.0	12.1
Specific conductance (µS/cm)	72	104	69	69	68	113	68	127	65	102	144
pH (units)	7.4	6.8	7.0	7.0	8.0	6.8	8.0	7.2	7.3	6.8	7.3
Dissolved oxygen (mg/L)	11.8	0.3	11.4	10.2	9.1	0.1	8.0	0.1	7.5	0.5	0.1
Phosphorus, total (as P)	0.008	0.071	0.019	0.020	0.023	0.159	0.021	0.185	0.024	0.079	0.311
Phosphorus, ortho, dissolved (as P)	---	---	0.003	---	---	---	0.003	---	---	---	---
Nitrogen, NO2 + NO3, diss. (as N)	---	---	0.056	---	---	---	<0.010	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.063	---	---	---	0.004	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.47	---	---	---	0.51	---	---	---	---
Nitrogen, total (as N)	---	---	0.53	---	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	10	---	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	1.4	---	---	---	---	---	---	---	---
Hardness, (as $CaCO_3$)	---	---	33	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	8.5	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	2.8	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	1.6	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	0.8	---	---	---	---	---	---	---	---
Alkalinity, (as $CaCO_3$)	---	---	34	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO_4)	---	---	3	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	0.9	---	---	---	---	---	---	---	---
Silica, dissolved (SiO_2)	---	---	7.1	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	56	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	220	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	140	---	---	---	---	---	---	---	---



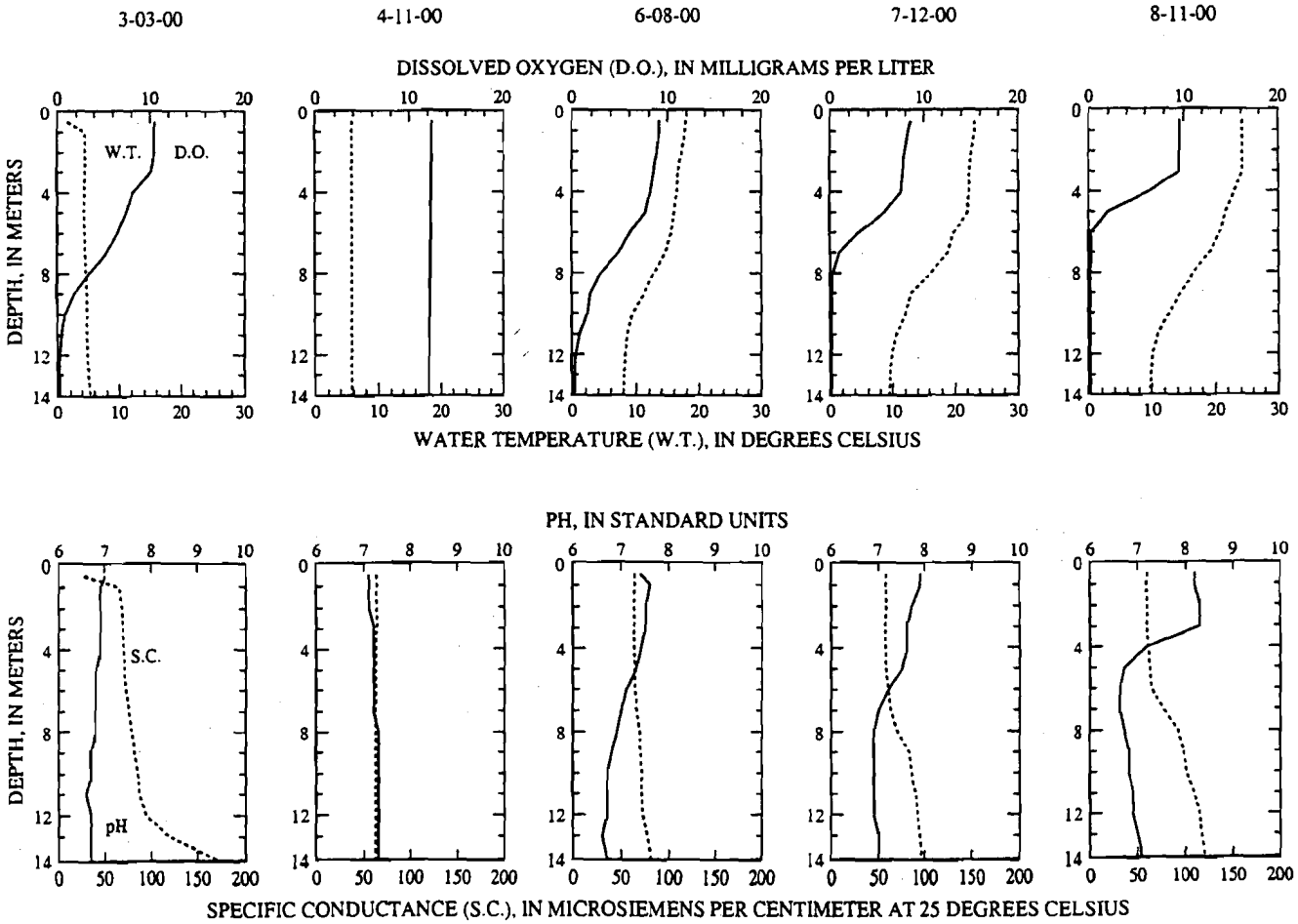
WATER-QUALITY RECORDS

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

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

WATER-QUALITY DATA, MARCH 03 TO AUGUST 11, 2000
(Milligrams per liter unless otherwise indicated)

	Mar-3		Apr-11		Jun-8		Jul-12		Aug-11		
Lake stage (ft)	---		5.96		5.77		6.32		5.82		
Secchi-depth (m)	---		2.5		3.3		2.4		2.3		
Chlorophyll a, phytoplankton (µg/L)	---		6		3.4		2.3		8		
Depth of sample (m)	0.5	14.0	0.5	14.0	0.5	14.0	0.5	14.0	0.5	8.0	13.0
Water temperature (°C)	1.5	5.3	5.8	5.8	17.9	8.0	23.2	9.5	24.2	16.5	9.8
Specific conductance (µS/cm)	28	171	63	62	64	81	58	95	60	92	117
pH (units)	7.0	6.7	7.1	7.3	7.1	6.7	7.9	7.0	8.2	6.7	7.0
Dissolved oxygen (mg/L)	10.5	0.2	12.4	12.0	9.1	0.2	8.3	0.1	9.6	0.1	0.1
Phosphorus, total (as P)	0.013	0.343	0.029	0.030	0.013	0.102	---	0.078	0.024	0.080	0.167
Phosphorus, ortho, dissolved (as P)	---	---	0.004	---	---	---	0.003	---	---	---	---
Nitrogen, NO2 + NO3, diss. (as N)	---	---	0.062	---	---	---	0.025	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	<0.013	---	---	---	0.038	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.57	---	---	---	---	---	---	---	---
Nitrogen, amm. + org., diss. (as N)	---	---	---	---	---	---	0.66	---	---	---	---
Nitrogen, total (as N)	---	---	0.63	---	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	30	---	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	2.0	---	---	---	---	---	---	---	---
Hardness, (as $CaCO_3$)	---	---	54	---	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	17	---	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	2.8	---	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	1.7	---	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	0.7	---	---	---	---	---	---	---	---
Alkalinity, (as $CaCO_3$)	---	---	37	---	---	---	---	---	---	---	---
Sulfate, dissolved (SO_4)	---	---	<4.5	---	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	1.2	---	---	---	---	---	---	---	---
Silica, dissolved (SiO_2)	---	---	7.5	---	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	46	---	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	240	---	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	27	---	---	---	---	---	---	---	---



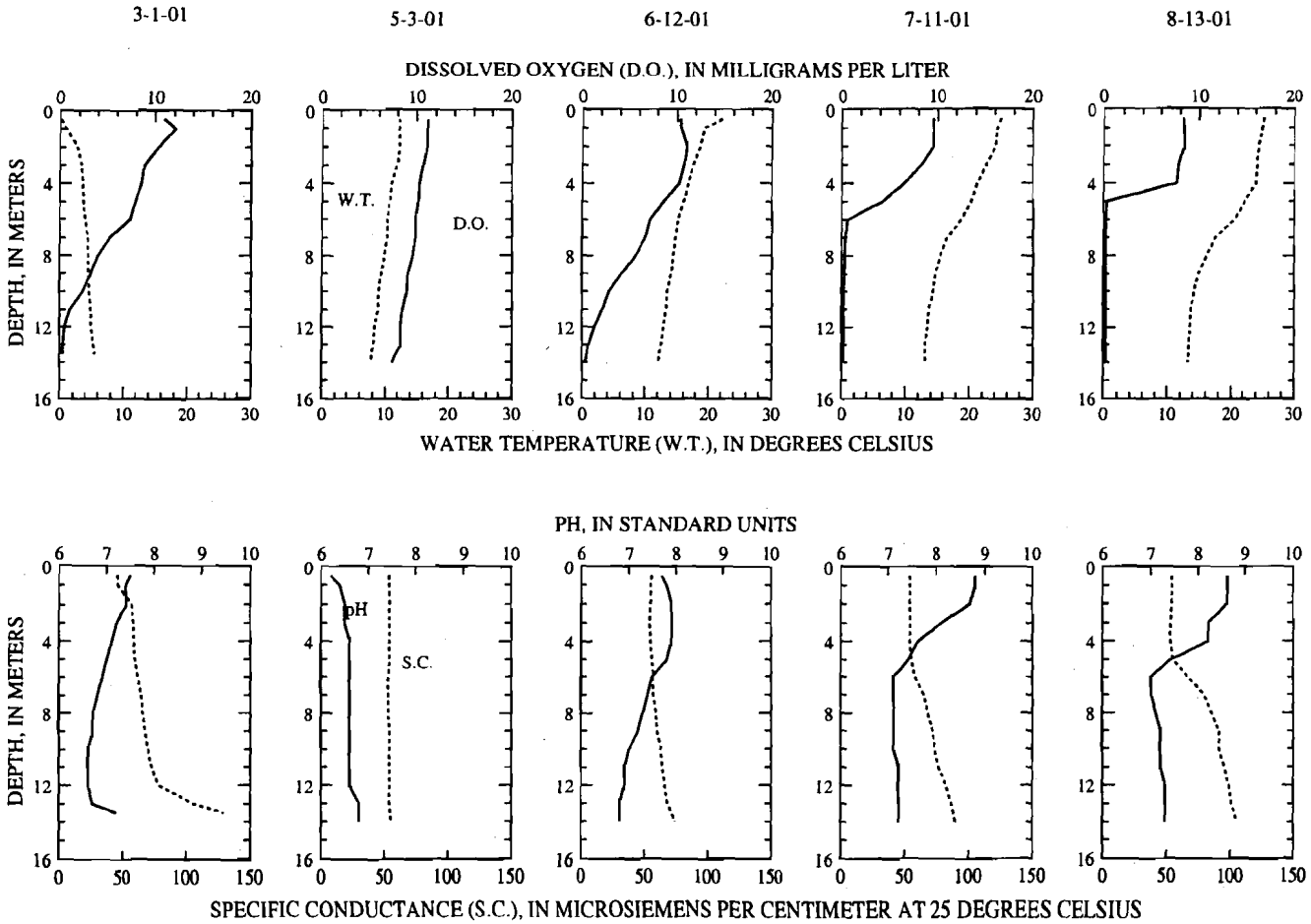
WATER-QUALITY RECORDS

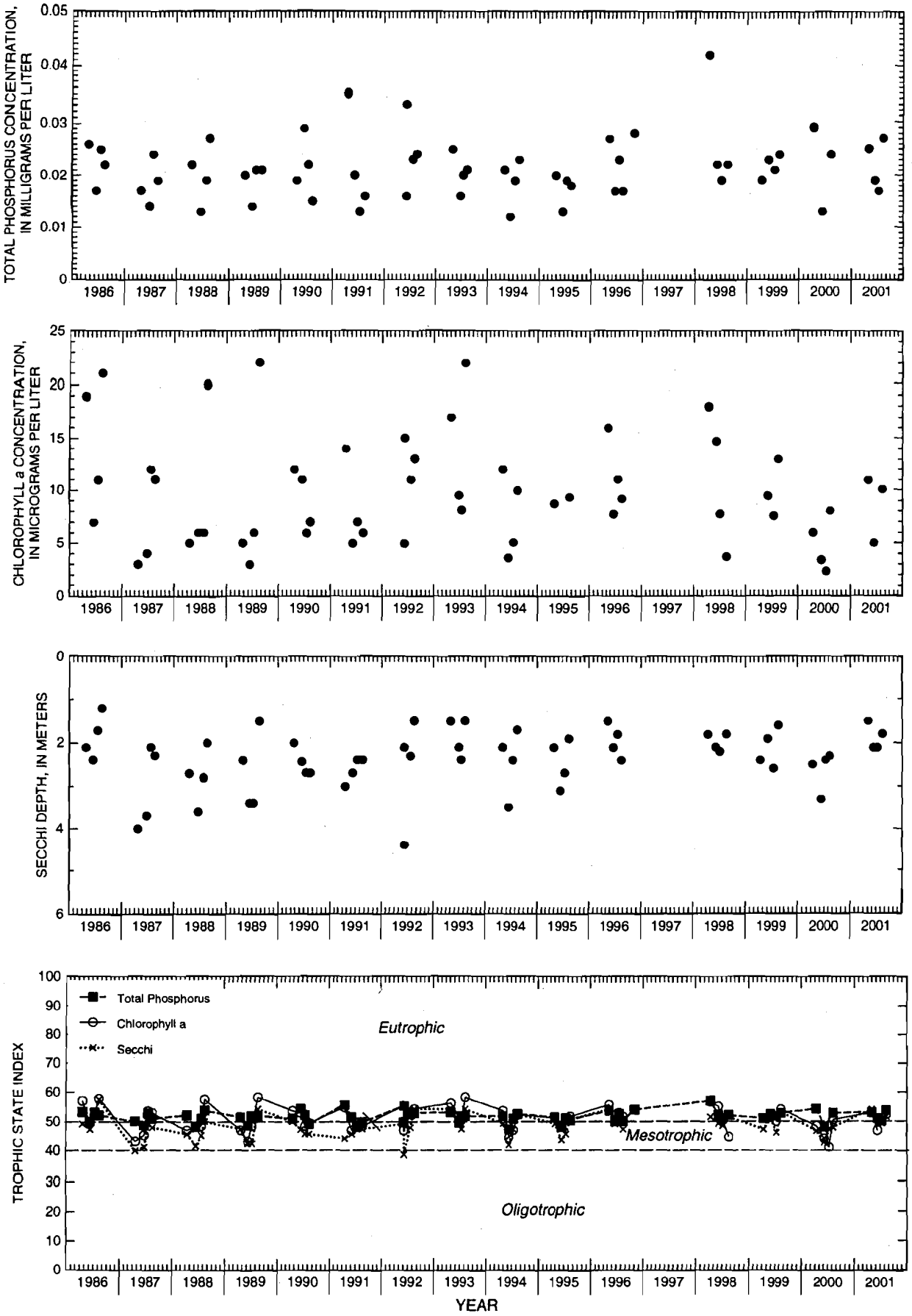
PERIOD OF RECORD.--1986 to 1996, and March 1998 to current year.

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

WATER-QUALITY DATA, MARCH 01 TO AUGUST 13, 2001
(Milligrams per liter unless otherwise indicated)

	Mar-1		May-3	Jun-12		Jul-11		Aug-13		
Lake stage (ft)	---		6.11	5.88		5.68		5.66		
Secchi-depth (m)	---		1.5	2.4		2.3		1.8		
Chlorophyll a, phytoplankton (µg/L)	---		11	5		---		10		
Depth of sample (m)	0.5	13.0	0.5	0.5	14.0	0.5	14.0	0.5	6.0	14.0
Water temperature (°C)	0.1	5.2	12.3	22.1	12.5	20.3	13.1	25.3	20.5	13.2
Specific conductance (µS/cm)	46	106	54	56	68	55	90	54	67	106
pH (units)	7.5	6.7	6.2	7.7	6.8	8.0	7.2	8.6	7.0	7.3
Dissolved oxygen (mg/L)	10.9	0.3	11.2	10.3	0.7	10.5	0.2	8.3	0.2	0.2
Phosphorus, total (as P)	0.011	0.155	0.025	0.019	0.096	---	0.099	0.027	0.032	0.255
Phosphorus, ortho, dissolved (as P)	---	---	0.003	---	---	---	---	---	---	---
Nitrogen, NO2 + NO3, diss. (as N)	---	---	0.059	---	---	---	---	---	---	---
Nitrogen, ammonia, dissolved (as N)	---	---	0.015	---	---	---	---	---	---	---
Nitrogen, amm. + org., total (as N)	---	---	0.61	---	---	---	---	---	---	---
Nitrogen, total (as N)	---	---	0.669	---	---	---	---	---	---	---
Color (Pt-Co. scale)	---	---	40	---	---	---	---	---	---	---
Turbidity (NTU)	---	---	3.9	---	---	---	---	---	---	---
Hardness, (as $CaCO_3$)	---	---	27.9	---	---	---	---	---	---	---
Calcium, dissolved (Ca)	---	---	6.9	---	---	---	---	---	---	---
Magnesium, dissolved (Mg)	---	---	2.6	---	---	---	---	---	---	---
Sodium, dissolved (Na)	---	---	1.6	---	---	---	---	---	---	---
Potassium, dissolved (K)	---	---	0.8	---	---	---	---	---	---	---
Alkalinity, (as $CaCO_3$)	---	---	25	---	---	---	---	---	---	---
Sulfate, dissolved (SO_4)	---	---	<4.5	---	---	---	---	---	---	---
Chloride, dissolved (Cl)	---	---	1.1	---	---	---	---	---	---	---
Silica, dissolved (SiO_2)	---	---	5.5	---	---	---	---	---	---	---
Solids, dissolved, at 180°C	---	---	48	---	---	---	---	---	---	---
Iron, dissolved (Fe) µg/L	---	---	130	---	---	---	---	---	---	---
Manganese, dissolved (Mn) µg/L	---	---	0.9	---	---	---	---	---	---	---





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

454800091312900 BIG SISSABAGAMA LAKE, NORTH SITE, NEAR STONE LAKE, WI

LOCATION.--Lat 42°48'00", long 91°31'29", in NE 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^2.

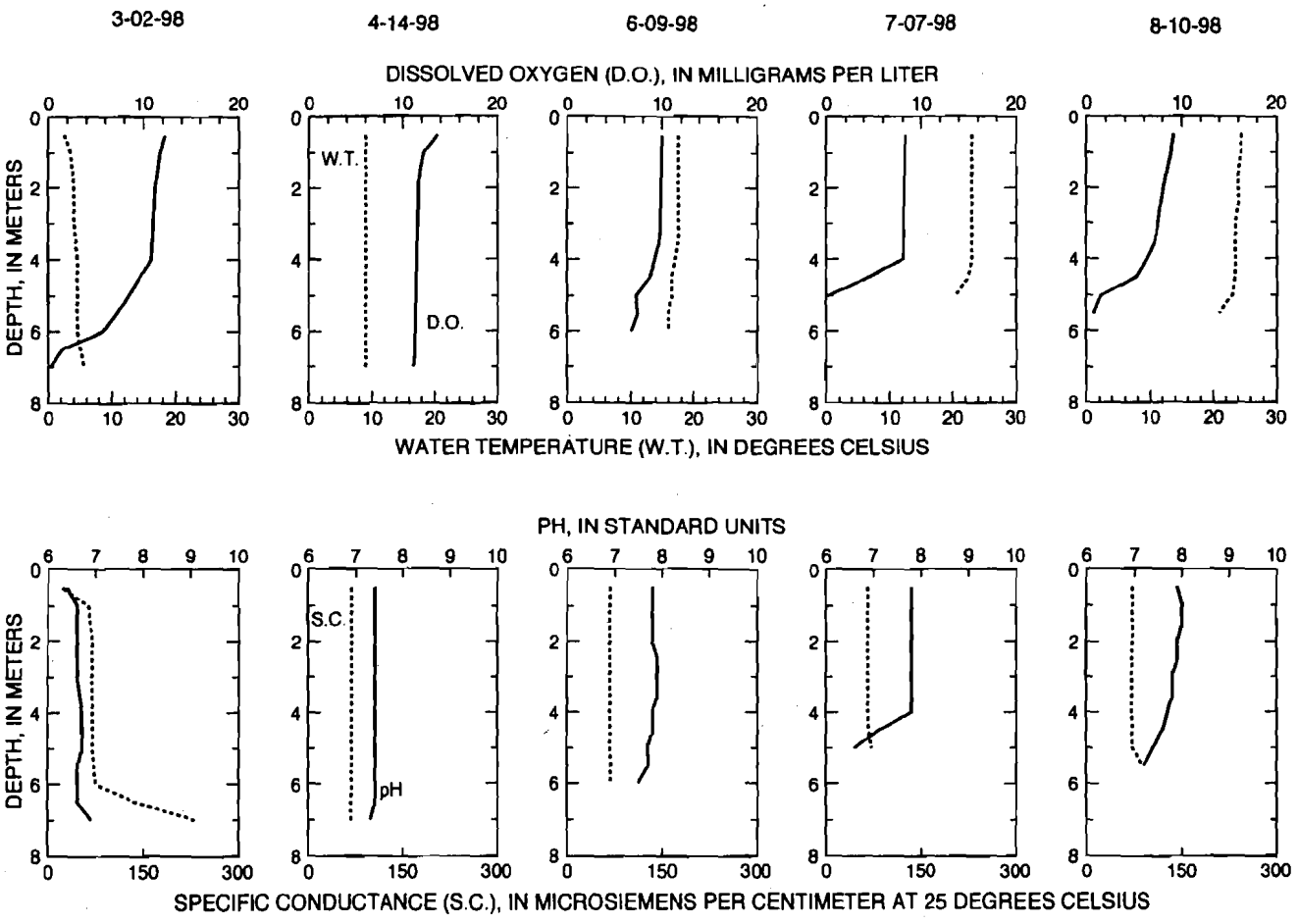
PERIOD OF RECORD.--March to August 1998.

REMARKS.--Lake sampled near the deepest part of the North Bay. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 02 TO AUGUST 10, 1998

(Milligrams per liter unless otherwise indicated)

	Mar. 02		Apr. 14	June 09	July 07		Aug. 10	
Lake stage (ft)	---		5.88	5.65	5.71		5.29	
Secchi-depth (meters)	---		2.2	2.4	2.1		2.1	
Chlorophyll a, phytoplankton (µg/L)	---		10.6	7.32	6.83		3.87	
Depth of sample (m)	0.5	7.0	0.5	0.5	0.5	5.0	0.5	5.5
Water temperature (°C)	2.4	5.7	9.1	17.5	22.8	20.4	24.6	20.8
Specific conductance (µS/cm)	23	231	68	68	66	72	71	87
pH (units)	6.4	6.9	7.4	7.8	7.8	6.6	7.9	7.2
Dissolved oxygen	12.2	0.2	13.6	10.0	8.3	0.1	9.1	0.7
Phosphorus, total (as P)	0.469	0.187	0.032	0.017	0.019	0.032	0.020	0.046



454800091312900 BIG SISSABAGAMA LAKE, NORTH SITE, NEAR STONE LAKE, WI

LOCATION.--Lat 42°48'00", long 91°31'29", in NE 1/4 SE 1/4 sec.6, T.38 N., R.9 W., Sawyer County, Hydrologic Unit 07050001, near Stone Lake.

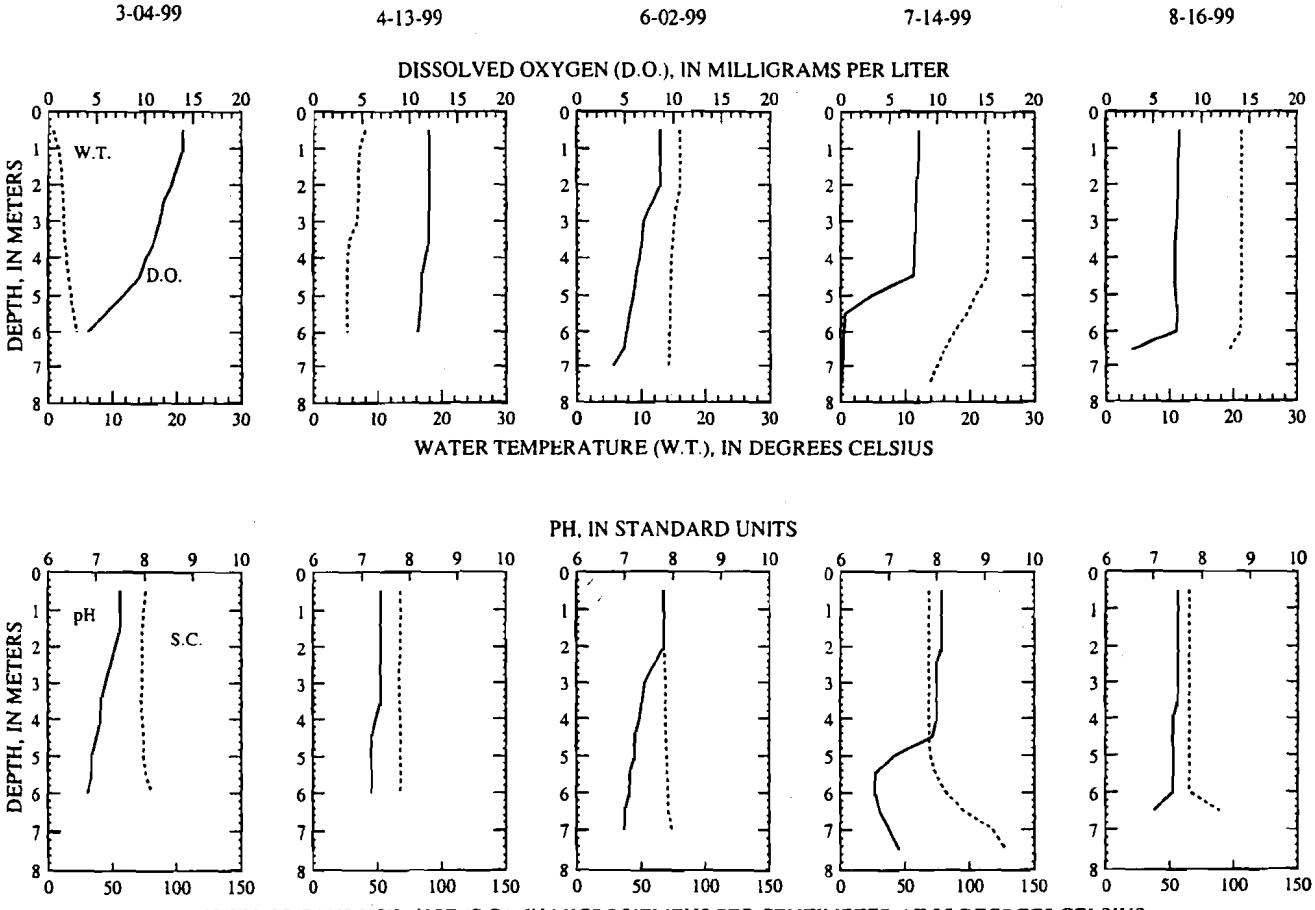
DRAINAGE AREA.--9.47 mi^2.

PERIOD OF RECORD.--March 1998 to current year.

REMARKS.--Lake sampled near the deepest part of the North Bay. Lake ice-covered during March sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 04 TO AUGUST 16, 1999
(Milligrams per liter unless otherwise indicated)

	Mar-4	Apr-13	Jun-2	Jul-14		Aug-16
Lake stage (ft)	---	5.92	5.75	5.84		5.76
Secchi-depth (m)	---	2.6	1.9	2.5		1.6
Chlorophyll a, phytoplankton (µg/L)	---	3.28	5.88	4.94		16.0
Depth of sample (m)	0.5	0.5	0.5	0.5	7.5	0.5
Water temperature (°C)	0.7	8.0	16.1	23.0	13.8	21.3
Specific conductance (µS/cm)	76	68	68	69	129	65
pH (units)	7.5	7.4	7.8	8.1	7.2	7.5
Dissolved oxygen (mg/L)	14.0	12.0	8.6	8.1	0.1	7.7
Phosphorus, total (as P)	0.014	0.014	0.017	0.022	0.063	0.024



454800091312900 BIG SISSABAGAMA LAKE, NORTH SITE, NEAR STONE LAKE, WI

LOCATION.--Lat 42°48'00", long 91°31'29", in NE 1/4 SE 1/4 sec.6, T.38 N., R.9 W., Sawyer County, Hydrologic Unit 07050001, near Stone Lake.

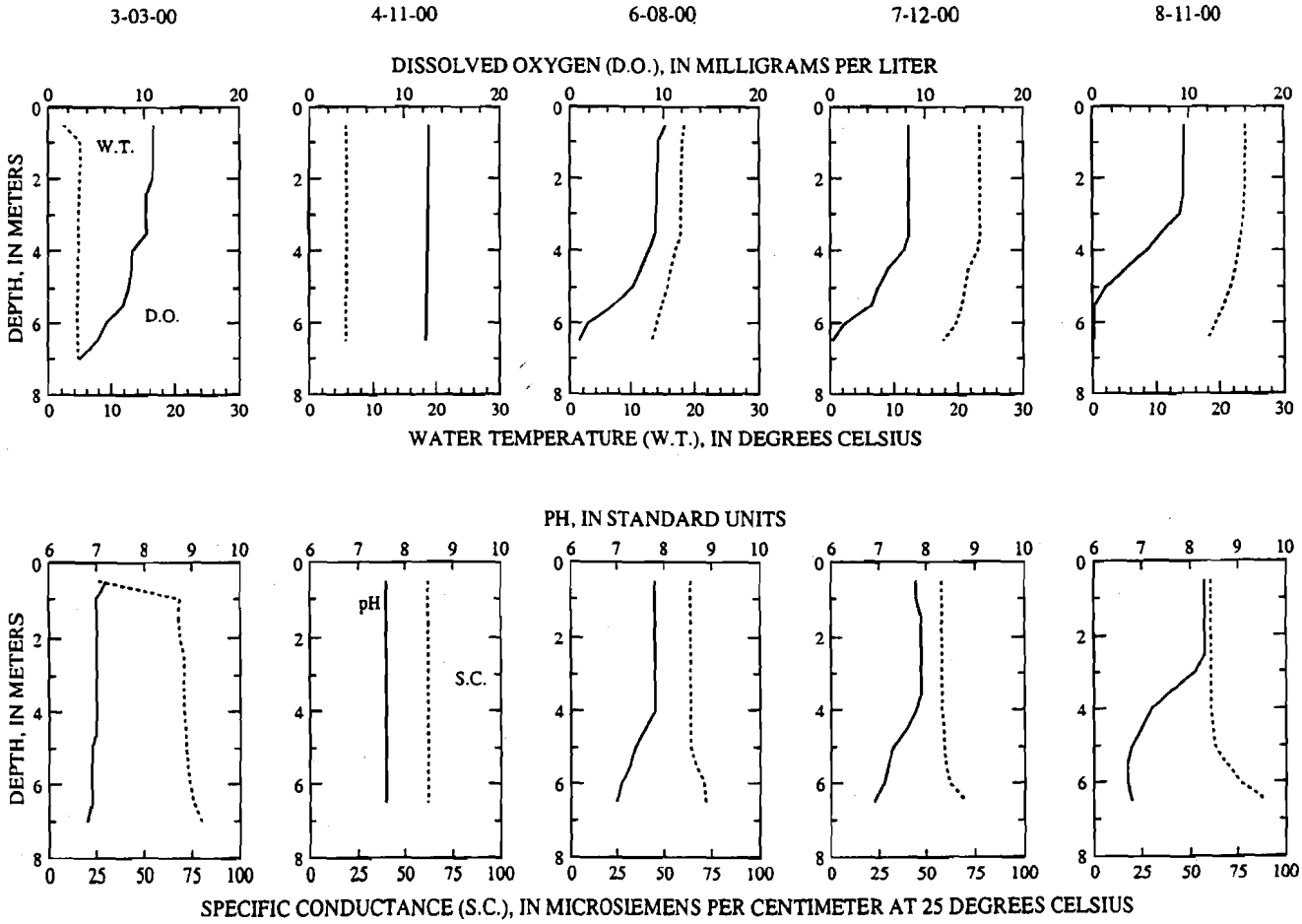
DRAINAGE AREA.--9.47 mi^2.

PERIOD OF RECORD.--March 1998 to current year.

REMARKS.--Lake sampled near the deepest part of the North Bay. Lake ice-covered during March sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 03 TO AUGUST 11, 2000
(Milligrams per liter unless otherwise indicated)

	Mar-3	Apr-11	Jun-8	Jul-12		Aug-11	
Lake stage (ft)	---	5.96	5.77	6.32		5.82	
Secchi-depth (m)	---	2.3	3.4	2.6		2.3	
Chlorophyll a, phytoplankton (µg/L)	---	6	2.9	3.3		7	
Depth of sample (m)	0.5	0.5	0.5	0.5	6.0	0.5	6.0
Water temperature (°C)	2.2	5.8	18.4	23.4	19.7	23.4	19.3
Specific conductance (µS/cm)	26	62	64	58	62	58	76
pH (units)	7.2	7.6	7.8	7.8	7.1	7.8	6.7
Dissolved oxygen (mg/L)	11.0	12.6	10.2	8.3	1.6	8.3	0.1
Phosphorus, total (as P)	0.014	0.028	0.014	0.019	0.022	0.049	0.023



454800091312900 BIG SISSABAGAMA LAKE, NORTH SITE, NEAR STONE LAKE, WI

LOCATION.--Lat 42°48'00", long 91°31'29", in NE 1/4 SE 1/4 sec.6, T.38 N., R.9 W., Sawyer County, Hydrologic Unit 07050001, near Stone Lake.

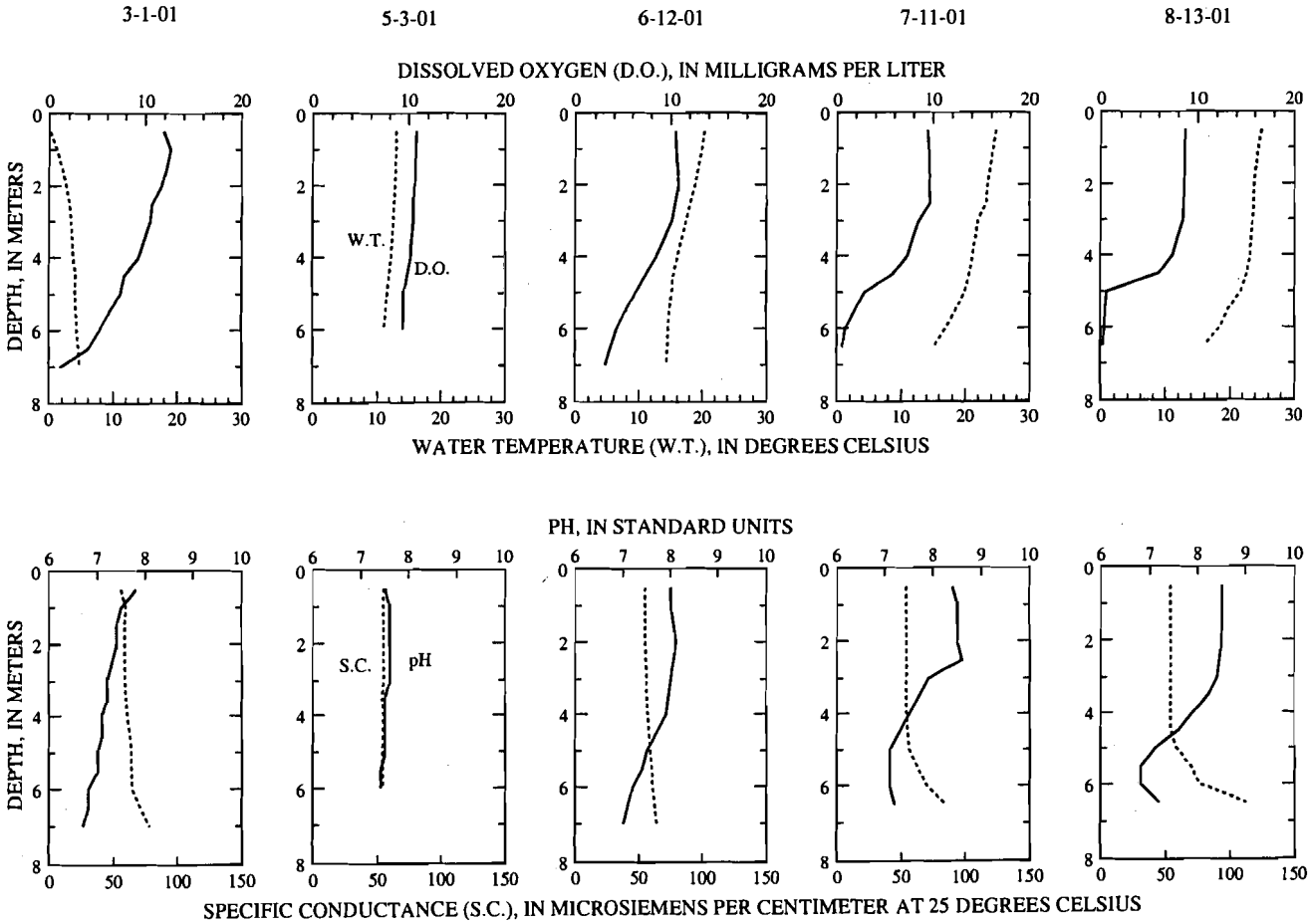
DRAINAGE AREA.--9.47 mi^2.

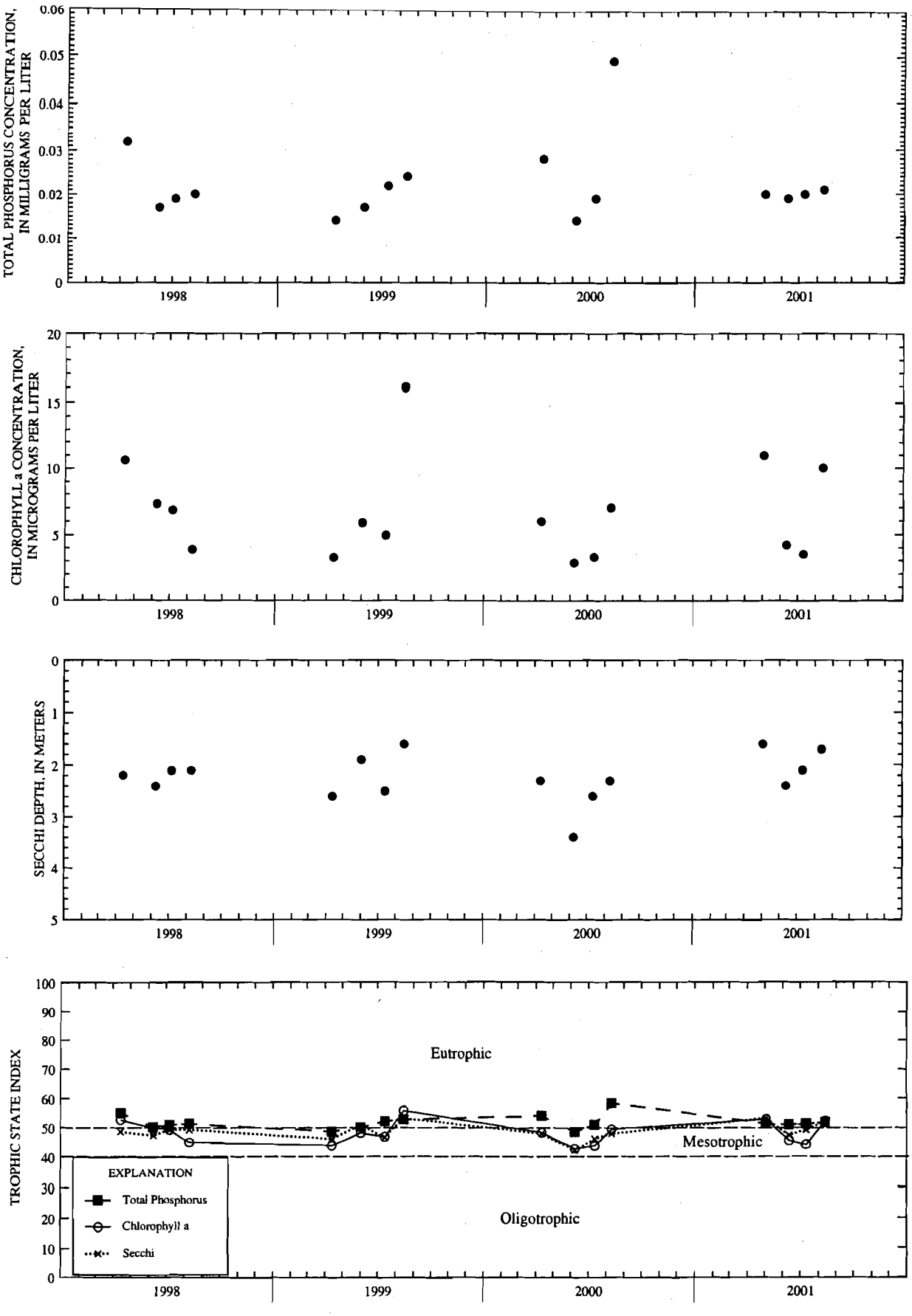
PERIOD OF RECORD.--March 1998 to current year.

REMARKS.--Lake sampled near the deepest part of the North Bay. Lake ice-covered during March sampling. Water-quality analyses done by Wisconsin State Laboratory of Hygiene.

WATER-QUALITY DATA, MARCH 01 TO AUGUST 13, 2001
(Milligrams per liter unless otherwise indicated)

	Mar-1	May-3	Jun-12	Jul-11	Aug-13	
Lake stage (ft)	---	6.11	5.88	5.68	5.66	
Secchi-depth (m)	---	1.6	2.3	2.1	1.7	
Chlorophyll a, phytoplankton (µg/L)	---	11	4.2	3.5	10	
Depth of sample (m)	0.5	0.5	0.5	0.5	0.5	6.5
Water temperature (°C)	0.1	13.0	20.3	24.8	25.0	15.9
Specific conductance (µS/cm)	56	55	55	54	54	113
pH (units)	7.8	7.5	8.0	8.4	8.5	7.2
Dissolved oxygen (mg/L)	11.9	10.8	10.5	9.4	8.7	0.2
Phosphorus, total (as P)	0.012	0.020	0.019	0.020	0.021	0.041





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

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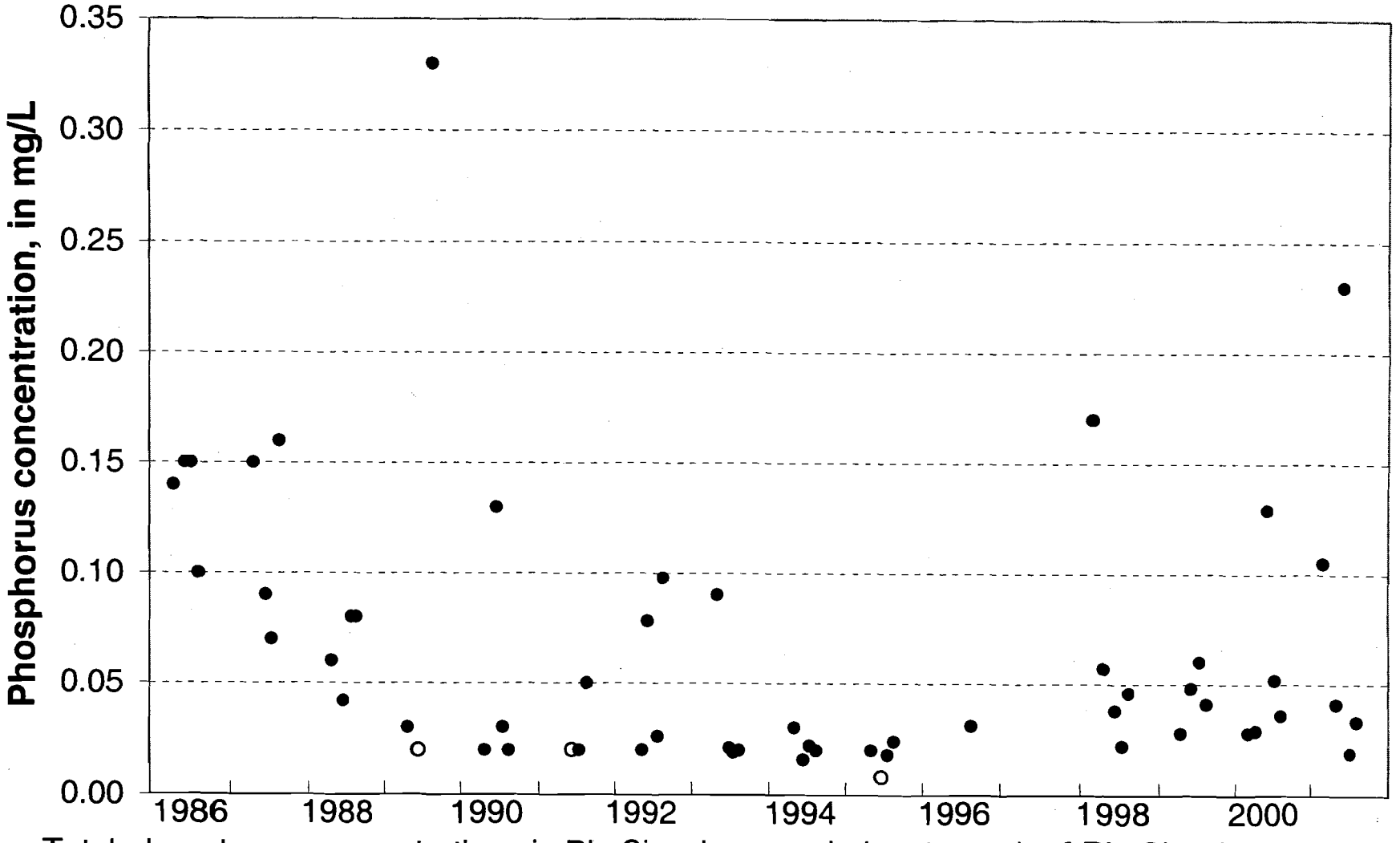
Water-quality data for Big Sissabagama Lake at mouth of Big Sissabagama Tributary (bog outlet), 1998-2001

Date & time	Temperature (°C)	Dissolved oxygen (mg/L)	pH	Specific conductance (µS/cm)	Total-phosphorus (mg/L)
4/14/98 12:25	9.9	11.1	7.4	66	0.057
6/9/98 11:40	16	11.2	7.8	66	0.038
7/7/98 10:40	22.5	8.3	7.7	66	0.022
8/10/98 13:15	25.3	8.3	7.6	72	0.046
3/4/99 16:25	0.5	11.6	6.8	67	--
4/13/99 13:00	70	11.2	7.1	70	0.028
6/2/99 9:35	15.7	8.6	7.9	68	0.048
7/14/99 9:10	22.4	5.2	7	68	0.06
8/16/99 9:15	20.8	6.8	7.3	61	0.041
3/3/00 11:05	1.6	10.8	6.7	42	0.028
4/11/00 10:50	6.1	11.9	7.5	64	0.029
6/8/00 9:25	17.7	7.3	7.3	63	0.129
7/12/00 10:00	22.2	6.5	7.3	54	0.052
8/11/00 10:00	24.4	9.9	87	56	0.036
3/1/01 17:00	0.4	4	6.8	79	0.105
5/3/01 9:30	12.6	8.8	7.3	54	0.041
6/12/01 14:05	24.2	11.5	7.5	55	0.23
7/11/01 13:30	26.7	9.5	8.8	55	0.019
8/13/01 17:05	26.6	11.1	9	58	0.033



Total-phosphorus concentrations in Big Sissabagama Lake at mouth of Big Sissabagama Tributary (bog outlet) near Stone Lake, Wisconsin, 1986 -2001.

(Circles indicate laboratory detection limit for these particular analyses--actual concentrations are less than the plotted circles)