

# **2005 Annual Report**

## **Potters Lake**

**Required by the APM Permit and the AIS Grant.**

**Submitted to**  
**Wisconsin Department of Natural Resources**  
**May, 2006**

## INTRODUCTION

In 2003, the Potters Lake P & R District (District) received an Aquatic Invasive Species Grant from the Wisconsin Department of Natural Resources (WDNR) to conduct a demonstration whole-lake chemical treatment on Potters Lake. The Grant application included the project plan upon which the WDNR treatment permit was based. That plan, and the subsequent grant, requires extensive monitoring the year prior to treatment, the year of treatment, and three years post treatment. The aquatic plant community and the water quality are to be monitored under the grant. WDNR will monitor the fisheries. US Geological Survey (USGS) collected the water quality samples throughout the summer of 2005.

## WHOLE LAKE TREATMENT

The whole lake treatment was conducted on May 5, 2004 with a target fluridone concentration of 6 ppm. At the time of treatment, the lake had approximately 95% plant cover. The dominant species was Eurasian watermilfoil (*Myriophyllum spicatum*). Although the treatment was conducted early in the year, Eurasian watermilfoil was at or near the surface throughout the lake, much before similar conditions were noted on other lakes in the region.

This excessive growth resulted in a high volume of plant material to uptake the fluridone. An EffectEST™ (SePRO Corp) and FasTEST™ (SePRO Corp) indicated that fluridone levels had dropped below the target concentration of 4 ppm by early June 2004. A re-treatment (commonly referred to as a bump treatment) was conducted on June 11, 2004, applying 2.15 ppb Sonar to bring the fluridone concentrations in the lake back up to the target concentration.

At the time of the 2004 treatment, Eurasian watermilfoil was found throughout the littoral zone, and in most of the lake was within inches of the surface. This very early, rapid growth was not observed by the author on any other lakes in the region. The treatment took place, not knowing what to expect by treating this amount of biomass.

There was not sufficient control of Eurasian watermilfoil from the 2004 treatment. Small plants of Eurasian watermilfoil continued to be found throughout the lake through 2004. New shoots on viable root crowns and 8 to 12 inch stems were present in sufficient amounts that the manufacturer warranted his material and the applicator warranted the treatment. The herbicide manufacturer determined that the plants had enough carbohydrate stores to withstand the treatment.

The DNR amended the project permit to allow the spring 2005 whole-lake re-treatment. Permit conditions included conducting FasTESTs to ensure sufficient fluridone concentrations for control, and an EffectEST to verify efficacy. To ensure that the plants responded the dosage was raised from 6 ppb to 8 ppb.

The re-treatment was conducted at 8 ppb on May 6, 2005. Two FasTEST™ were conducted to measure the fluridone levels in the lake.

Table 1. 2005 Fluridone Levels in Potters Lake Following May 5, 2005 Treatment.

Date of Test	Fluridone Concentrations
5/24/05	5.6
6/6/05	5.1

The initial treatment was sufficient to eliminate the remaining Eurasian watermilfoil. A bump treatment and the EffectEST was not conducted because no plant material could be found to test. During subsequent lake inspections sediments were analyzed to try to find viable roots. Underwater video cameras and sonar equipment were used to try to locate any Eurasian watermilfoil.

### **AQUATIC PLANT SURVEY**

The week of July 15, 2005, Aron & Associates conducted a year-of-treatment (the second consecutive) aquatic plant survey on Potters Lake. This survey is part of an ongoing demonstration project to document changes in the aquatic plant community of Potters Lake. This information can be compared with past studies and may be used by future investigators to determine if the aquatic plant population is changing. The impact of various management techniques may be evaluated based on their respective impacts on the aquatic plants. This information should be used to guide future lake management decisions on Potters Lake.

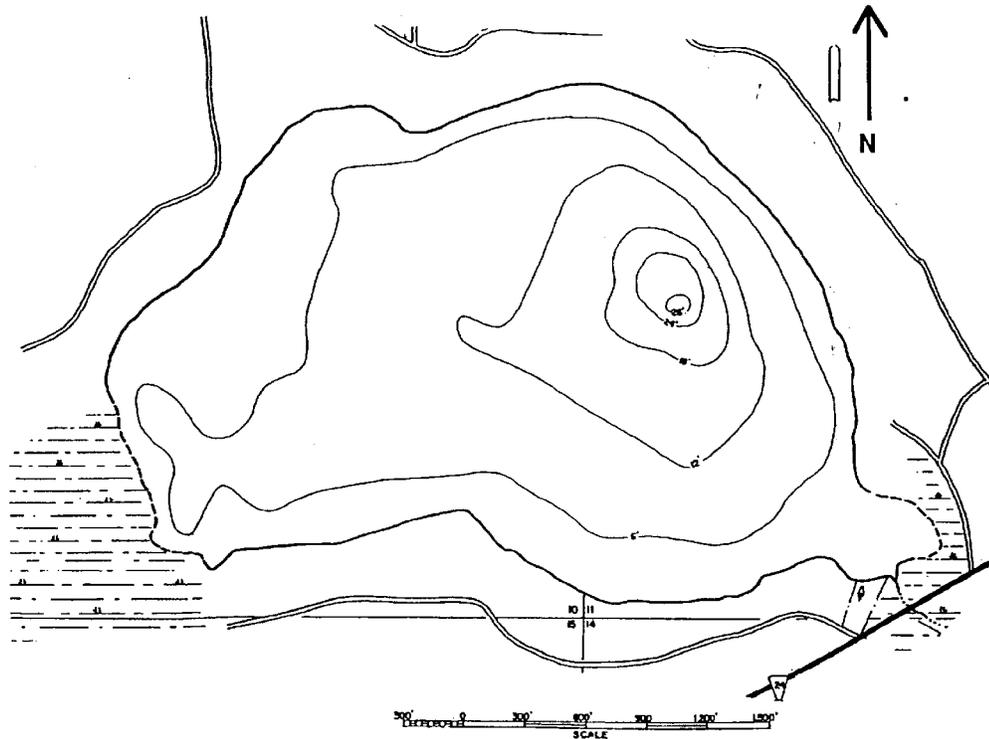
Potters Lake is located in the Town of East Troy, Walworth County, in Southeast Wisconsin. Hydrographic and morphometric data are presented in Table 2. A map of Potters Lake showing depth contours is presented in Map 1.

Table 2. Hydrographic and Morphometric Data Potters Lake

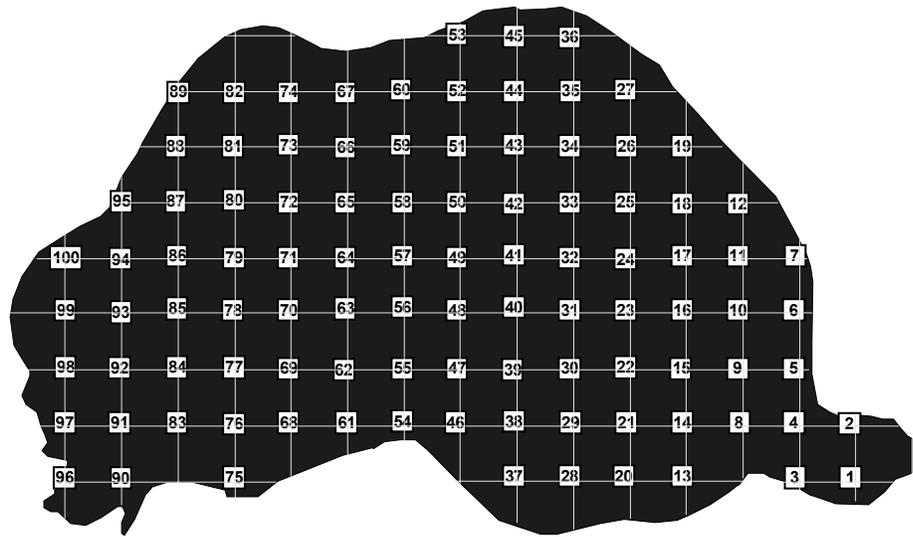
Size of Lake	162 acres
Lake Volume	1304.2 acre feet
Length of Shoreline	2.2 miles
Shore Development Factor*	1.23
Maximum Depth	26 feet
Mean Depth	8 feet
Percent of area less than 3 feet deep	19%
Percent of area greater than 20 feet deep	5.5%
Watershed Area	659.2 acres
Ratio of Watershed Area to Lake Area	4.1 (excluding lake area = 2.31)
Public Frontage, boat launch	100 feet

\* Shore Development Factor is defined as the ratio of shoreline to the circumference of a circle with the same area as the lake.

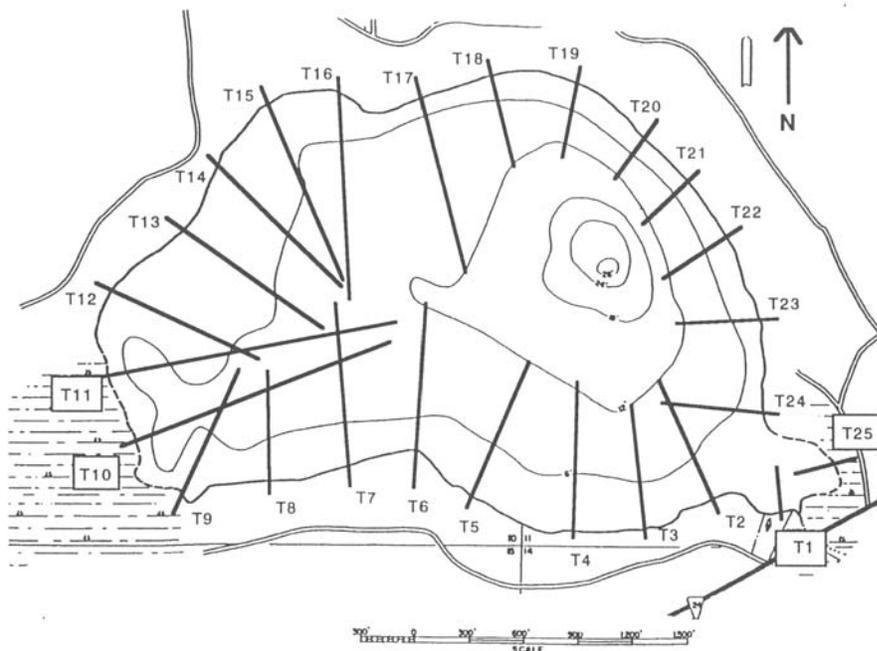
Source: WDNR



Map 1 - Bathymetric Map, Potters Lake, Wisconsin.



Map 2 - Point Intercept Survey Sample Points, Potters Lake, Wisconsin, 2005.



Map 3 -Line Transect Survey Locations on Potters Lake, established in 1992.

### Earlier Studies

In October 1997, a whole-lake chemical treatment was conducted on Potters Lake using Sonar™ (SePRO Corporation). Eurasian watermilfoil (*Myriophyllum spicatum*) was the primary target species. The goal of the project was to eliminate Eurasian watermilfoil,

enhancing conditions for native species. A condition of the WDNR permit for the project required that aquatic plants in the lake be monitored. Pre-treatment monitoring has been conducted annually since the 1997 treatment. The monitoring for those years was conducted using the line-transect method.

As Eurasian watermilfoil has re-infested Potters Lake, the District has used harvesting and 2-4,D chemical spot treatments to slow the return of Eurasian watermilfoil.

## 2005 Methodology

### General Survey

A preliminary survey of the lake was made by boat. An attempt was made to locate all plant communities on the lake by region. Nomenclature follows Crow & Hellquist (2000). No plants samples were collected and preserved since all species found had been collected during previous surveys. The maximum rooting depth on Potters Lake in 2005 was determined to be 12.5 feet (3.8 m), that is, no plants were found growing in water deeper than 12.5 feet (3.8 m). Table 3 illustrates the maximum rooting depth for the years that aquatic plant surveys were conducted.

Table 3. Comparison of Maximum Rooting Depths, Potters Lake, 1992 to 2005

Year*	Maximum Rooting Depth, ft (m)
1992	15 (4.9)
1997	14 (4.3)
1998	15 (4.9)
1999	14 (4.3)
2000	14 (4.3)
2001	10 (3.0)
2002	14 (4.3)
2003	12 (3.7)
2004	16 (4.9 m)
2005	12.5 (3.8)

\*No surveys were conducted in years 1993 through 1996.

### Point Intercept Survey

The methodology for the point intercept survey was developed by the WDNR Bureau of Research for the state's Whole Lake Treatment Protocol. A grid and global positioning satellite (GPS) coordinates for sampling, were developed by WDNR and provided to Aron & Associates for use in the Demonstration Whole Lake Treatment Project surveys on Potters Lake.

The initial grid established 100 sample points, Map 2. Samples points were located using a 2004 Garmin GPS LMS330 with an LGC-2000 Receiver. Four rake tows were conducted at each sample point. Each plant species retrieved was recorded and given a density rating in accordance with the WDNR criteria, between 1 and 5. An overall density rating and the dominant species at each sample point was also identified.

The data collected were then used to the mean density and percent of frequency for each species. Lake depth at each sample point was determined by using the Garmin after calibration in the field. That data are provided at the end of this report.

The abundance of each species was determined using four estimates:

- 1) The frequency is the rating of how often a species occurs in the sample points.
- 2) The average density rating, or the average density of a species in the sample point where it occurred.
- 3) The relative density rating, or the average density of a species averaged over all sample points whether or not any species were present.
- 4) The relative density rating averaged over all sample points in which any species occurred.

### **2005 Results, Aquatic Plant Survey**

A total of thirteen aquatic macrophytes were found during the survey in 2004. Ten species were found during the point-intercept survey. Wetland fringe species are not included in the list of species. Three species, slender naiad (*Najas flexilis*), great bladderwort (*Utricularia vulgaris*), and horned pondweed (*Zannichellia palustris*) were found only during the general survey. Of those three species, great bladderwort had not been identified as present in Potters Lake during previous surveys.

The plants found in the lake are listed in Table 4. Chara (*Chara* sp.) dominated the shallow water plant community. Eurasian watermilfoil dominated the mid to deep water zones. It was also common in the shallow depths. Sago pondweed (*Stuckenia pectinata*) was found primarily in the 5 to 10 foot (1.5 to 3 m) deep areas. The results of the survey data for the July 2004 survey for all species at each sample depth are included at the end of this report.

The maximum rooting depth in 2004 was 16 feet (4.9 m). Sediments in Potters Lake range from sand and gravel to muck. At 1.5 feet (0.5 m) the substrate is primarily sand and gravel. At 15 feet (4.6 m) the substrate is muck.

Table 4. Potters Lake Aquatic Plant Species - 1997 to 2003

Species	% Frequency						
	1997	1998	1999	2000	2001	2002 <sup>a</sup>	2003
<i>Chara</i> sp.	62	46	68	91	96	88	52
<i>Ceratophyllum demersum</i>	38	41	4	4	0	5	8
<i>Elodea canadensis</i>	53	0	0	0	0	2	6
<i>Lemna minor</i>							
<i>Myriophyllum spicatum</i>	99	0	0	0	0	66	56
<i>Najas flexilis</i>	22	0	0	0	0	0	6
<i>Nuphar</i> sp.							
<i>Nymphaea</i> sp.	X	1	1	2	2	2	1
<i>Potamogeton crispus</i>	16	0	8	26	25	16	21
<i>P. zosterformis</i>		0					
<i>Stuckenia pectinata</i>	21	19	21	76	60	55	28
<i>Utricularia vulgaris</i>	1						
<i>Zannichellia palustris</i>	1	0	0	0	0	1	2
<i>Zosteralla dubia</i>		9	0		0	5	6

Notes: <sup>a</sup> Two sampling periods averaged together.  
 X Found only in the general survey.  
 Shaded columns indicate whole-lake treatment seasons.

Table 5. Potters Lake Aquatic Plant Species - 2004 and 2005

Species	% Frequency		
	2004 <sup>a</sup>	2004 <sup>b</sup>	2005
<i>Chara</i> sp.	61	48	67
<i>Ceratophyllum demersum</i>	7	2	—
<i>Elodea canadensis</i>	4	2	—
<i>Lemna minor</i>	1	79	—
<i>Myriophyllum spicatum</i>	78	1	0
<i>Najas flexilis</i>	4	3	—
<i>Nuphar</i> sp.	X	X	—
<i>Nymphaea</i> sp.	2	2	1
<i>Potamogeton crispus</i>	0	0	0
<i>P. zosterformis</i>	1	1	—
<i>Stuckenia pectinata</i>	24	12	17
<i>Utricularia vulgaris</i>	X	—	—
<i>Zannichellia palustris</i>	X	X	—
<i>Zosterella dubia</i>	—	X	2

Notes: <sup>a</sup> Conducted using the line transect method.  
<sup>b</sup> Conducted using the grid intercept method.  
X Found only in the general survey.  
Shaded columns indicate whole-lake treatment seasons.

## Summary

The District has conducted significant aquatic plant management activities over the years to keep Potters Lake open to recreational use. Early efforts focused on aquatic plant harvesting, with more recent years using primarily chemical treatment. A demonstration chemical treatment was conducted using Sonar in fall 1997. As Eurasian watermilfoil returned, there were diligent attempts to slow the reinfestation by chemically treating the plants using 2,4-D. However, in 2002, the survey conducted the end of June showed a 50% frequency of Eurasian watermilfoil. A rapid growth of Eurasian watermilfoil occurred immediately after the June survey. An August 2002 survey showed Eurasian watermilfoil had increased to 75% frequency, and 100% frequency by September.

Potters Lake experienced rapid, early growth of Eurasian watermilfoil in 2004. By the May 5th treatment date, Eurasian watermilfoil had reached or was nearly at the surface throughout the lake up to the 16 foot (4.9 m) depth. This early growth resulted in the plants' ability to withstand the effects of the fluridone longer than normally expected.

The survey conducted in early July documented the extent of the still-viable Eurasian watermilfoil plants. Late summer 2004 inspections using rake pulls and an underwater video camera showed that much of the Eurasian watermilfoil biomass had died, although small, 6 to 8 inch green Eurasian watermilfoil stems were commonly found with one or two tiny leaflets on the stems. These stems later in the season were only occasionally found.

Curly-leaf pondweed was eliminated at least temporarily from the lake following the 2004 and 2005 treatments because curly-leaf pondweed is highly susceptible to the whole-lake treatments at these dosages.

Although highly susceptible to fluridone, both waterweed (*Elodea canadensis*) and slender naiad were present and viable during the 2004 survey, but not during the 2005 survey.

Eurasian watermilfoil appears to have been completely eliminated from Potters Lake. Under-water cameras, sonar, visual inspections, and rake hauls found no evidence of Eurasian watermilfoil. Rake hauls included digging into the sediments to try to find viable Eurasian watermilfoil roots. None were found.

## **FISHERIES**

Doug Welch (WDNR Fisheries Biologist) conducted a pre whole-lake treatment fish survey on Potters Lake on May 5, 2004. The entire shoreline was electrofished. His summary is included here:

*Largemouth bass were the most abundant gamefish in the sample. The catch rate was 54 per hour. Lengths ranged between 4 and 18.1 inches and the mean length was 14 inches. 37% of the bass in the sample were legal size fish (14 inches or larger). Several year classes were represented. I was impressed with the overall size structure.*

*Northern pike were caught and ranged in length between 17.5 and 25.4 inches.*

*Bluegills were the most abundant panfish in the sample. The catch rate was 132 per hour. Bluegills were between 3.2 and 6.6 inches long. The mean length was 4.5 inches.*

*Other panfish caught were black crappie, pumpkinseed, yellow perch, black bullhead, and brown bullhead.*

*21 carp were captured for a catch rate of 42 per hour. Length range was 13 to 22.8 inches, and the mean length was 18 inches.*

*Two white suckers and 8 golden shiners were also collected.*

## **WATER QUALITY DATA**

The USGS conducted water quality monitoring in 2005 water year (October 1, 2004 through October 1, 2005). The results of the monitoring follow this report. Water quality declined in Potters Lake. The changes in 2004 and 2005 is most likely a result of the whole lake treatment. Eurasian watermilfoil completely filled the water column throughout the lake at the time of treatment. The phosphorus contained in all the vegetation was released into the water column leading to increased algae blooms, declining water clarity, and an increased total phosphorus concentrations.

## **EFFECTEST**

The EffectEST by SePRO evaluates the reaction of the plants to the fluridone. Plants are collected from four locations around the lake and shipped to the SePRO laboratory. The dosage of treatment, days since treatment, and conditions of the plants are analyzed by lab to see if the plants are reacting properly and whether the current fluridone level is sufficient to control the plants.

Two EffectESTs were collected in 2004, the first on May 26, 2004, and the second on June 7, 2004. Plants and FastEST samples were placed in a cooler with ice and shipped by overnight to the lab. According to the lab, the plants were responding to the fluridone exposure, and the fluridone levels were determined to be sufficient to achieve control. No EffectEST was conducted in 2005 because no plants could be found to analyze.

## **FASTEST**

FastEST by SePRO is an analysis of the fluridone concentration in lake water. The samples are collected, and shipped on ice by overnight to the lab. Two FastESTs were required as part of the treatment permit on Potters Lake in 2005. The results are provided in Table 1.

## **LAKE INSPECTIONS**

Regular lake inspections were conducted on the following days:

May 24, 2005

June 6, 2005

June 27, 2005

Aug. 16, 2005

Sept. 8, 2005

During those, the lake was checked for any signs of new growths of milfoil. No Eurasian watermilfoil, milfoil fragments, or viable roots were found from June 6 through Sept 8, 2005.

The lake inspections required under the permit and the grant will be conducted in 2006.

## **SPOT TREATMENTS**

No spot treatments were conducted in 2005.

## **WATERCRAFT INSPECTIONS**

In 2005, the District worked with the Clean Waters Clean Boats staff to provide training for the volunteers.

Watercraft inspections were conducted at the DNR Boat Launch on Potters Lake by the volunteers in 2005.

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424905088204000 POTTER LAKE NEAR MUKWONAGO, WI

LOCATION.--Lat 42°49'05", long 88°20'40", in NW ¼ SW ¼ sec.11, T.4 N., R.18 E., Walworth County, Hydrologic Unit 07120006, 3.3 mi south of Mukwonago.

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

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

WATER-QUALITY DATA, FEBRUARY 9 TO SEPTEMBER 27, 2005  
(Milligrams per liter unless otherwise indicated)

Date	Time	Gage height, feet (00065)	Trans- parency Secchi disc, meters (00078)	Sam- pling depth, meters (00098)	Temper- ature, water, deg C (00010)	Specif. conduc- tance, wat unfltrd uS/cm 25 degC (00095)	pH, unfltrd field, std units (00400)	Dis- solved oxygen, mg/L (00300)	Chloro- phyll a wat unfltrd method, uncorr, ug/L (32210)	Phos- phorus, water, unfltrd mg/L (00665)	Ortho- phos- phate, water, fltrd, mg/L as P (00671)	Total nitro- gen, water, unfltrd mg/L (00600)
FEB 2005												
09...	1245	--	--	.50	3.2	555	8.1	10.9	--	.019	--	--
09...	1252	--	--	7.0	4.8	591	7.6	3.5	--	.027	--	--
APR												
11...	1150	--	--	.50	13.8	486	8.3	11.0	11.1	.021	.002	.97
11...	1157	--	--	7.0	8.5	505	7.4	1.7	--	.048	--	--
11...	1210	8.25	1.40	--	--	--	--	--	--	--	--	--
JUN												
07...	1930	--	--	.50	25.7	493	8.3	10.0	12.2	.036	--	--
07...	1943	--	--	7.0	13.1	539	7.4	.2	--	.047	--	--
07...	1945	7.84	1.75	--	--	--	--	--	--	--	--	--
JUL												
12...	1200	--	--	.50	26.8	504	8.3	8.0	11.3	.042	--	--
12...	1213	--	--	7.0	14.4	559	7.0	.0	--	.150	--	--
12...	1215	7.40	1.25	--	--	--	--	--	--	--	--	--
28...	1300	--	--	.50	26.0	493	8.3	7.8	22.4	.056	.024	--
28...	1313	--	--	7.0	16.9	568	6.8	.0	--	.321	--	--
28...	1315	7.42	.75	--	--	--	--	--	--	--	--	--
AUG												
09...	1210	--	--	.50	28.4	498	8.4	8.7	15.4	.096	--	--
09...	1222	--	--	6.5	18.8	581	6.8	.0	--	.295	--	--
09...	1225	7.18	.95	--	--	--	--	--	--	--	--	--
25...	1320	--	--	.50	23.6	490	8.3	7.9	17.0	.072	--	--
25...	1328	--	--	6.5	20.1	597	6.8	.1	--	.261	--	--
25...	1330	7.22	.95	--	--	--	--	--	--	--	--	--
SEP												
27...	1105	--	--	.50	20.4	480	8.3	7.4	23.6	.071	--	--
27...	1116	--	--	6.0	19.7	481	8.3	7.0	--	.063	--	--
27...	1145	7.50	.60	--	--	--	--	--	--	--	--	--

424905088204000 POTTER LAKE NEAR MUKWONAGO, WI

WATER-QUALITY DATA, FEBRUARY 9 TO SEPTEMBER 27, 2005--CONTINUED

(Milligrams per liter unless otherwise indicated)

Date	Sam- pling depth, meters (00098)	Ammonia water, fltrd, mg/L as N (00608)	Ammonia + org-N, water, fltrd, mg/L as N (00623)	Ammonia + org-N, water, unfltrd mg/L as N (00625)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Tur- bidity, NTU (00076)	Appar- ent color, water, unfltrd Pt-Co units (00081)	Hard- ness, water, mg/L as CaCO3 (00900)	Calcium water, fltrd, mg/L (00915)	Magnes- ium, water, fltrd, mg/L (00925)	Sodium, water, fltrd, mg/L (00930)	Potas- sium, water, fltrd, mg/L (00935)
FEB 2005												
09...	.50	--	--	--	--	--	--	--	--	--	--	--
09...	7.0	--	--	--	--	--	--	--	--	--	--	--
APR												
11...	.50	<.015	--	.90	.067	27	15	210	47.5	21.7	22.8	2.00
11...	7.0	--	--	--	--	--	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	--	--	--	--
JUN												
07...	.50	--	--	--	--	--	--	--	--	--	--	--
07...	7.0	--	--	--	--	--	--	--	--	--	--	--
07...	--	--	--	--	--	--	--	--	--	--	--	--
JUL												
12...	.50	--	--	--	--	--	--	--	--	--	--	--
12...	7.0	--	--	--	--	--	--	--	--	--	--	--
12...	--	--	--	--	--	--	--	--	--	--	--	--
28...	.50	.024	.81	--	<.019	--	--	--	--	--	--	--
28...	7.0	--	--	--	--	--	--	--	--	--	--	--
28...	--	--	--	--	--	--	--	--	--	--	--	--
AUG												
09...	.50	--	--	--	--	--	--	--	--	--	--	--
09...	6.5	--	--	--	--	--	--	--	--	--	--	--
09...	--	--	--	--	--	--	--	--	--	--	--	--
25...	.50	--	--	--	--	--	--	--	--	--	--	--
25...	6.5	--	--	--	--	--	--	--	--	--	--	--
25...	--	--	--	--	--	--	--	--	--	--	--	--
SEP												
27...	.50	--	--	--	--	--	--	--	--	--	--	--
27...	6.0	--	--	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--	--	--	--

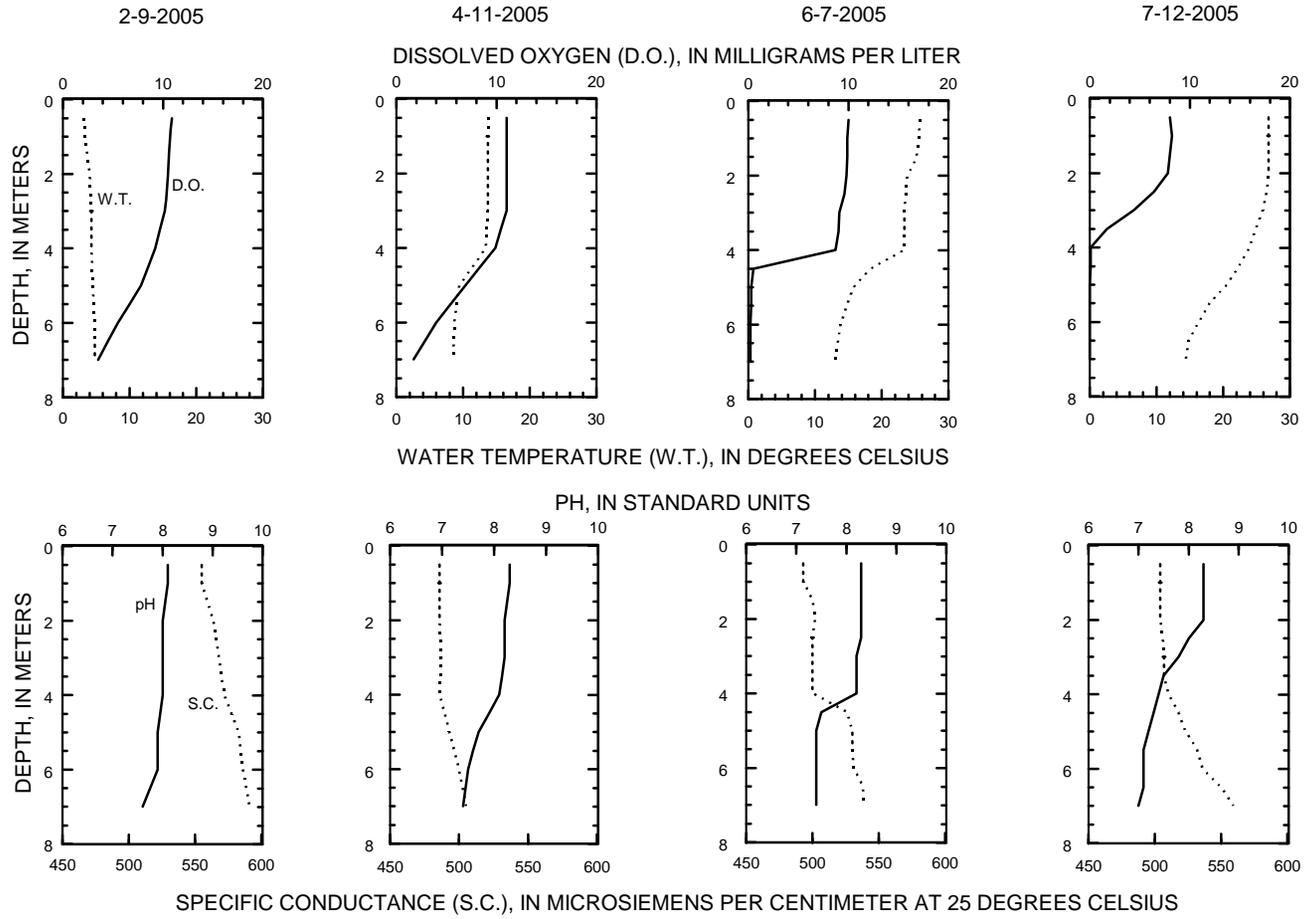
424905088204000 POTTER LAKE NEAR MUKWONAGO, WI

WATER-QUALITY DATA, FEBRUARY 9 TO SEPTEMBER 27, 2005--CONTINUED  
(Milligrams per liter unless otherwise indicated)

Date	Sam- pling depth, meters (00098)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (00417)	Chlor- ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Silica, water, fltrd, mg/L (00955)	Iron, water, fltrd, ug/L (01046)	Mangan- ese, water, fltrd, ug/L (01056)	Residue on evap. at 180degC wat flt mg/L (70300)	Sam- pling method, code (82398)
FEB 2005									
09...	.50	--	--	--	--	--	--	--	100
09...	7.0	--	--	--	--	--	--	--	100
APR									
11...	.50	169	49.5	10.1	1.99	<100	M	284	100
11...	7.0	--	--	--	--	--	--	--	100
11...	--	--	--	--	--	--	--	--	--
JUN									
07...	.50	--	--	--	--	--	--	--	100
07...	7.0	--	--	--	--	--	--	--	100
07...	--	--	--	--	--	--	--	--	--
JUL									
12...	.50	--	--	--	--	--	--	--	100
12...	7.0	--	--	--	--	--	--	--	100
12...	--	--	--	--	--	--	--	--	--
28...	.50	--	--	--	--	--	--	--	100
28...	7.0	--	--	--	--	--	--	--	100
28...	--	--	--	--	--	--	--	--	--
AUG									
09...	.50	--	--	--	--	--	--	--	100
09...	6.5	--	--	--	--	--	--	--	100
09...	--	--	--	--	--	--	--	--	--
25...	.50	--	--	--	--	--	--	--	100
25...	6.5	--	--	--	--	--	--	--	100
25...	--	--	--	--	--	--	--	--	--
SEP									
27...	.50	--	--	--	--	--	--	--	100
27...	6.0	--	--	--	--	--	--	--	100
27...	--	--	--	--	--	--	--	--	--

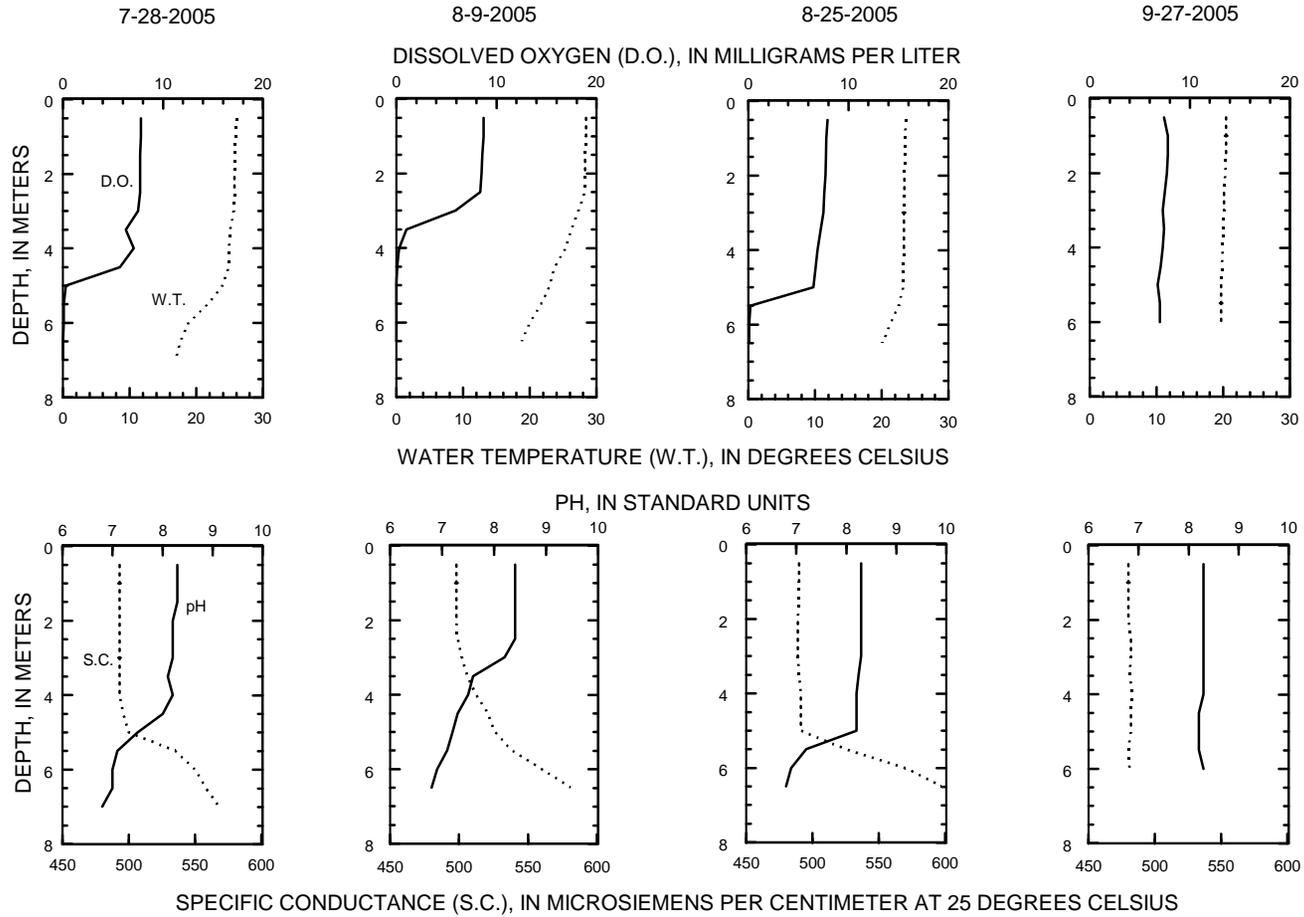
424905088204000 POTTER LAKE NEAR MUKWONAGO, WI

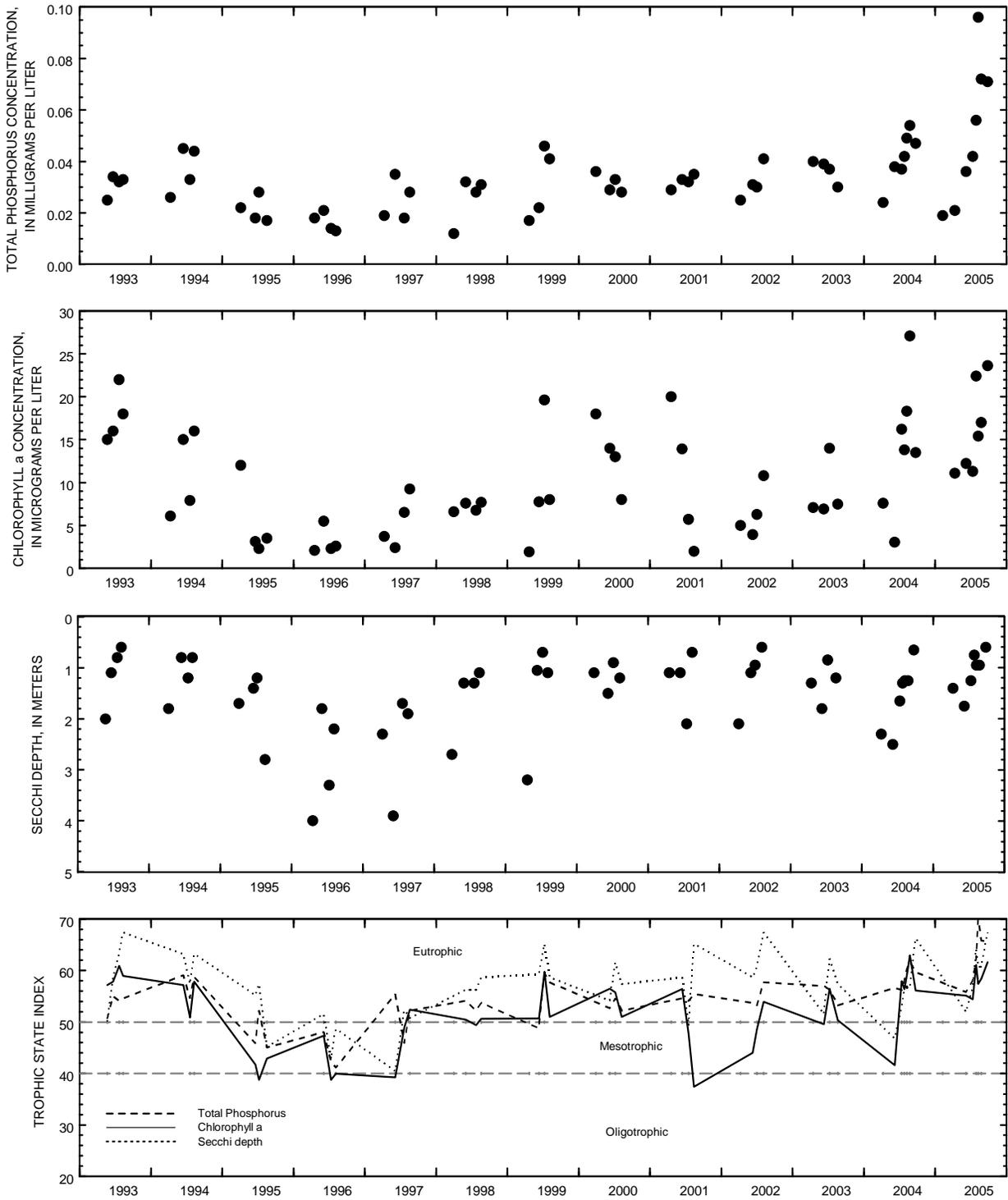
LAKE-DEPTH PROFILES, FEBRUARY 9 TO JULY 12, 2005



424905088204000 POTTER LAKE NEAR MUKWONAGO, WI

LAKE-DEPTH PROFILES, JULY 28 TO SEPTEMBER 27, 2005





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