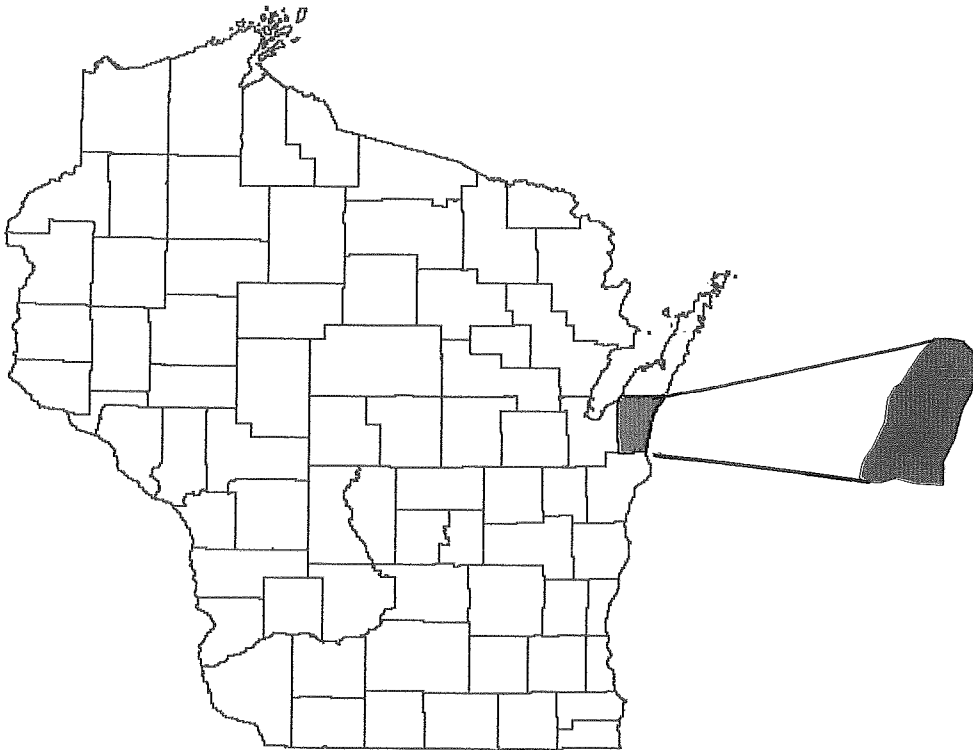


**1994 Limnological Assessment
of Shea Lake
Kewaunee County, Wisconsin**



Submitted by Scott Szymanski
Wisconsin Department of Natural Resources
Lake Michigan District Headquarters
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May 1995

Introduction

Shea Lake (T22N R23E Sec.21) in Kewaunee County is a 32 acre seepage lake averaging 11 feet in depth with a maximum depth of 24 feet. A public boat access is located on the southwest side of the lake. Primary species of fish include largemouth bass and panfish along with some northern pike present.

In 1994, Shea Lake was monitored as part of the Twin-Door-Kewaunee (TDK) Basin assessment. The TDK basin assessment lakes were chosen based on their ecological and recreational importance, the potential for significant anthropogenic impacts, and the lack of recent data. Among the goals of the program are:

- 1) Identification of high quality lakes that should receive highest priority for protection and/or management efforts.
- 2) Identification of lakes affected by non-point source pollution.
- 3) Identification of lakes which need monitoring.
- 4) Determination of information and criteria needed to make land management decisions.

The water quality data gathered from these lakes is also used in preparation of the 305b report to Congress, for dissemination to citizens, and to update Surface Water Inventories.

Methods

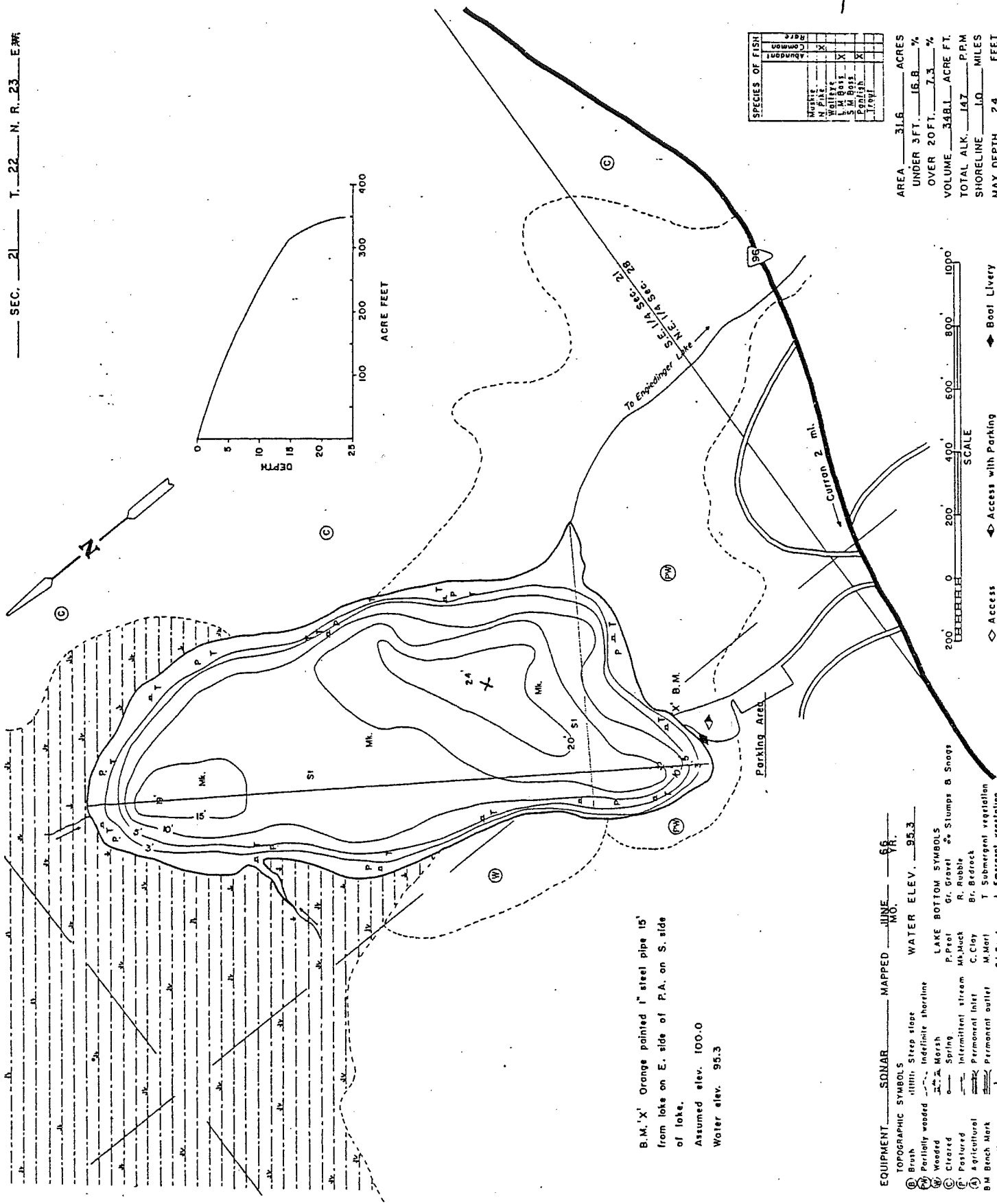
Water samples were collected in bottles provided by the Wisconsin State Laboratory of Hygiene (SLOH) and preserved following "Handling and Preservation Handbook" protocol (1988). Samples were taken at one meter below the surface and one meter above the bottom using a Van Dorn bottle. Winter samples were analyzed for total and dissolved phosphorus. They were monitored again during spring turnover for calcium, hardness, magnesium, potassium, sodium, silica, iron, alkalinity, color, turbidity, solids, nitrate-nitrites, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved phosphorus, and surface chlorophyll a. Finally, the lakes were monitored in June, July, and August for total and ortho phosphorus, and surface chlorophyll a. Water samples were chilled on ice and sent to the SLOH for analysis.

Temperature and dissolved oxygen (D.O.) profiles were obtained using either a YSI Model 54A D.O./Temp. meter or a YSI Model 3800 water quality data logger. pH readings were measured by using either an Orion 230A portable pH meter or the YSI datalogger. Conductivity readings were gathered using either an Orion Model 126 meter or the YSI datalogger. Secchi depth was determined during ice-free months.

WISCONSIN CONSERVATION DEPARTMENT
 SHEA'S LAKE
 SEC. 21 T. 22 N. R. 23 E. #8

LAKE SURVEY MAP

KEWANEE COUNTY



B.M. 'X' Orange painted 1" steel pipe 15' from lake on E. side of P.A. on S. side of lake.
 Assumed elev. 100.0
 Water elev. 95.3

SPECIES OF FISH		Abundance	%
Walleye		X	
Yellow Perch		X	
Rock Bass		X	
White Sucker		X	
Common Carp		X	
Bluegill		X	
Golden Shiner		X	
Brook Silverside		X	
Smallmouth Bass		X	
Spottail Shiner		X	
White Crayfish		X	

AREA 31.6 ACRES
 UNDER 3 FT. 16.8 %
 OVER 20 FT. 7.3 %
 VOLUME 3481.1 ACRE FT.
 TOTAL ALK. 147 P.P.M.
 SHORELINE 1.0 MILES
 MAX. DEPTH 24 FEET

- EQUIPMENT SONAR MAPPED JUNE 56
 WATER ELEV. 95.3
- TOPOGRAPHIC SYMBOLS
 (1) Brush
 (2) Partially wooded
 (3) Wooded
 (4) Cleared
 (5) Pastured
 (6) Agricultural
 (7) Branch Mark
 (8) Ditching
 (9) Retort
- LAKE BOTTOM SYMBOLS
 P. Peat
 M. Muck
 C. Clay
 M. Marl
 Sd. Sand
 Sl. Silt
- Gr. Gravel
 R. Rubble
 Br. Bedrock
 T. Submergent vegetation
 E. Emergent vegetation
 F. Flooding vegetation
- Stumps & Snags
 Indefinite shoreline
- Marsh
 Spring
 Intermittent stream
 Permanent Inlet
 Permanent outlet
 Dam

Scale: 0 200 400 600 800 1000
 Access with Parking
 Access
 Boat Livery
 Field work by: H. Schmidt, I. Cobbell. Drawn by: C. Hall

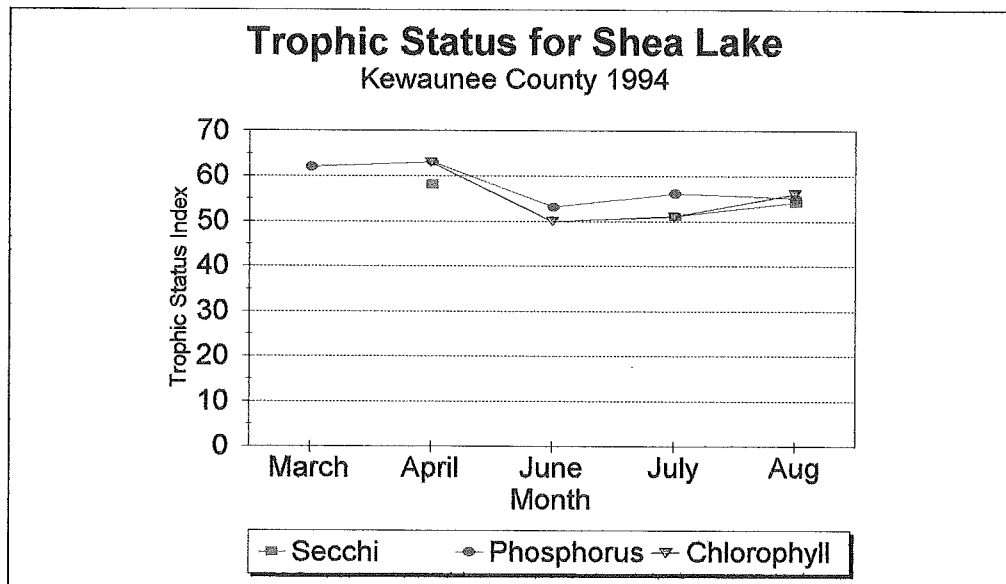
1994 Shea Lake Monitoring Data
Kewaunee County

STORET #313029 Master Waterbody #0083400

Date	Depth meters	Chl a ug/l	Tot P mg/l	NO ₂ + NO ₃ mg/l	Alk mg/l	D.O. ppm	pH su	Temp. °C	Cond umhos	Secchi (M) %CC
3/9/94	1	---	0.076	---	---	8.1	8.08	2.7	287	---
	4.5	---	0.098	---	---	0.4	7.88	3.3	477	---
4/11/94	1	39	0.093	<0.007	182	10.1	---	6.8	410	1.14
	5.5	---	0.141	<0.007	220	0.4	---	4.8	486	100%
6/27/94	1	7.56	0.025	---	---	7.9	8.93	23.2	362	---
	6	---	0.106	---	---	0.5	7.47	10.5	312	40%
7/18/94	1	8.96	0.035	---	---	7.3	8.46	23.9	360	1.83
	6	---	0.197	---	---	1.5	7.36	11.9	332	30%
8/15/94	1	17.1	0.033	---	---	8.7	8.59	23.2	384	1.52
	5	---	0.087	---	---	0.3	7.85	13.2	403	---

Shea Lake Trophic Status

Month	Secchi Value (M)	Secchi TSI	Phosphorus Value (mg/l)	Phosphorus TSI	Chlorophyll Value (ug/l)	Chlorophyll TSI
March				62		
April	1.14	58	0.093	63	39	63
June			0.025	53	7.56	50
July	1.83	51	0.035	56	8.96	51
Aug	1.52	54	0.033	55	17.1	56
1994 Average	1.50	54	0.047	58	18.16	57

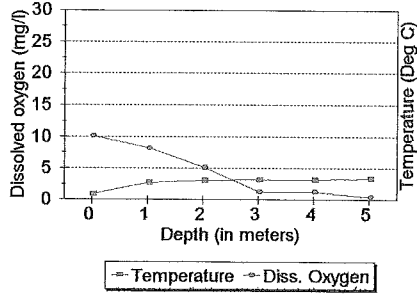


Trophic Category Descriptions

<u>Category</u>	<u>TSI</u>	<u>Lake Characteristics</u>
Oligotrophic	1 - 40	Clear water; oxygen rich at all depths, except if close to mesotrophic border; then may have low or no oxygen; cold-water fish likely in deeper lakes.
Mesotrophic	41 - 50	Moderately clear; increasing probability of low to no oxygen in bottom waters.
Eutrophic	51 - 70	Decreased water clarity; probably no oxygen in bottom waters during summer; warm-water fisheries only; blue-green algae likely in summer in upper range; plants also excessive.
Hypereutrophic	70 - 100	Heavy algal blooms throughout the summer; if >80, fish kills likely in summer and rough fish dominate.

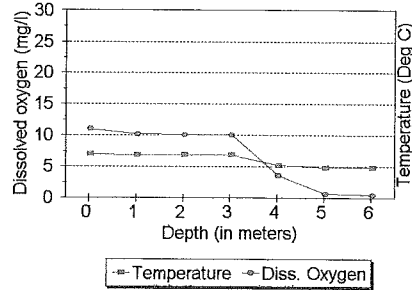
Dissolved Oxygen vs Temperature

Shea Lake 3/9/94



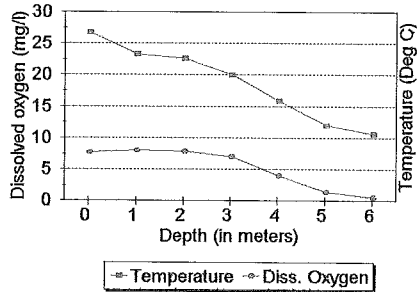
Dissolved Oxygen vs Temperature

Shea Lake 4/11/94



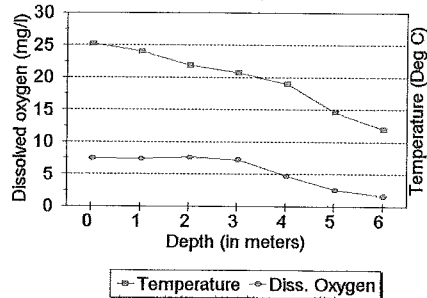
Dissolved Oxygen vs Temperature

Shea Lake 6/27/94



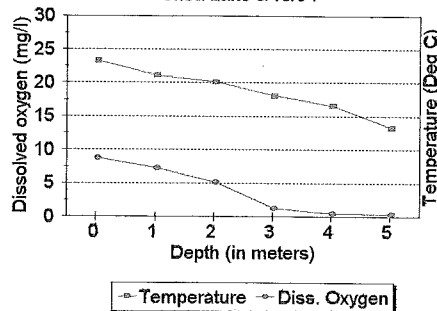
Dissolved Oxygen vs Temperature

Shea Lake 7/18/94



Dissolved Oxygen vs Temperature

Shea Lake 8/15/94



Results and Discussion

Shea Lake is eutrophic based on phosphorus concentration, chlorophyll *a* concentration, and Secchi depth as expressed in Wisconsin's Trophic State Index (WTSI) (Lillie, Graham, Rasmussen, 1993). Average surface phosphorus levels of 47 ug/l and chlorophyll concentrations of 18 ug/l indicate that nuisance algae blooms do occur. Secchi disk measurements averaged 1.5 meters.

Dissolved oxygen and temperature profiles reveal that epilimnic water column dissolved oxygen concentrations remain around 7 ppm throughout the summer. Dissolved oxygen concentrations fell below the State standard of 5 ppm at a depth of 2 to 3 meters during the summer. Winter dissolved oxygen readings ranged fell below 5 ppm at 2 meters which limits the ability for fish to utilize the entire water column.

With an alkalinity of around 200 mg/l, Shea Lake can be classified as an extremely hardwater lake. Surface pH readings were around 8.5 with bottom readings one unit lower. Risk of acidification is very minimal.

Shea Lake is fringed by wetlands with significant adjoining wetlands to the north also present. Agricultural practices including a large farming operation above the southwest shore appear to be significant sources of nutrients. Residential dwellings on the south shore are prevalent with more lots being developed.

At present, water quality for Shea Lake is fair. Both residential and agricultural practices in the two square mile watershed are impacting the lake, particularly with steep slopes creating highly erodible land in the near-lake vicinity. Shea Lake is at risk of further eutrophication if protective measures aren't considered.

Acknowledgements

Special thanks to Greg Cleereman (WRM/LMD) for significantly contributing to the sampling effort and to Mike Hronek (WS/LMD) for developing the cover page of this report.

