

CLEAR LAKE AQUATIC PLANT SURVEY - 2000

INTRODUCTION

In July 2000, Aron & Associates conducted an aquatic plant survey on Clear Lake. This survey was conducted to provide assess the aquatic plant community. The data would be used to develop a Demonstration Project to chemically treat Eurasian Watermilfoil on a whole lake basis. The project would attempt to remove Eurasian Watermilfoill, restore the native plant community, and prevent the further spread of Eurasian Watermilfoil to surrounding, high-use lakes and rivers. The information may also be used by future investigators to further document changes in the aquatic plant community and evaluate the impact of plant management and lake management techniques upon the plant communities. These data can be used to guide future lake management decisions on Clear Lake.

Clear Lake is located in Sawyer County, Wisconsin. Hydrographic and morphological information are presented in Table 1 and Map 1.

Table 1. Hydrographic and Morphologic Data of Clear Lake.

Surface Area	77 acres
Volume	1076.4 acre feet
Maximum Depth	37 feet
Mean Depth	25 feet

Source: DNR

METHODOLOGY

General Survey

A preliminary survey of the lake was made by boat. An attempt was made to locate all plant communities in the lake by region. Plants were collected, preserved, pressed and mounted. Nomenclature follows Fassett (1956) and Helquist and Crow (1980). The 2000 maximum rooting depth in Clear Lake was determined to be nineteen feet. Map 2 illustrates the area of the lake that was available for aquatic plant growth in 2000.

Transect Survey

The methodology for the transect survey follows the methods utilized by the Wisconsin Department of Natural Resources (WDNR) in their Long Term Trend Monitoring Program. Twenty-five transects were established along the lake perimeter. Each transect was identified by a landmark and way point. Transects extended from shore to the maximum rooting depth (18 feet) or to a point approximately half way to the opposite shore (way point). Map 3 shows the transect locations.

Four sampling locations along each transect were established at water depths of 2, 5, 8, and 13 feet. At each sampling point an imaginary six foot diameter circle was divided into four quadrants. Sampling of aquatic vegetation took place once within each quadrant producing a total of four samples for each sample point. A rake with a telescoping handle was used to collect plant samples. Samples were collected by casting the rake into each of the four quadrants and pulling the rake to the center of each sampling point. Each plant species retrieved was recorded and given a density rating in accordance with the following criteria:

<u>Rake Recovery of Aquatic Plant</u>	<u>Density Rating</u>	<u>Descriptive Term</u>
Rake teeth full, all 4 casts	5	Heavy
Teeth partly full, all 4 casts	4	Dense
Plants taken on 3 casts	3	Moderate
Plants taken on 2 casts	2	Scattered
Plants taken on 1 cast	1	Sparse

The data collected were then used to calculate frequency of occurrence, and density ratings for each species along each transect at each sample depth.

The abundance of each species was determined using four estimates:

- 1) The **frequency** is an estimate 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.

A Sitek strip chart recorder was used to obtain a permanent record of the depth profile and plant distribution along each transect.

RESULTS

During the July 2000 survey, a total of fourteen (14) aquatic plant species were observed. Of those species, all were native plants except for Eurasian watermilfoil (*Myriophyllum spicatum*). All of the species were found in the transect survey. No additional species were found in the general survey (Table 2). Emergent plant species were observed along the shoreline, however, these were not included in the aquatic plant survey.

Table 2. Aquatic Plant Species Observed in Clear Lake, July 2000.

Scientific Name	Common Name
<i>Brasenia Schreberi</i>	Watershield
<i>Elodea canadensis</i>	Waterweed
<i>Najas flexilis</i>	Slender Naiad
<i>Nitella</i> sp.	Nitella
<i>Myriophyllum spicatum</i>	Eurasian Watermilfoil
<i>Nuphar</i> sp. *	Yellow Water Lily
<i>Polygonum amphibium</i>	Water Smartweed
<i>Potamogeton amplifolius</i>	Large-leaf Pondweed
<i>P. diversifolius</i>	Water-thread Pondweed
<i>P. foliosus</i>	Leafy Pondweed
<i>P. Robbinsii</i>	Robins Pondweed
<i>P. zosterformis</i>	Flat-stem Pondweed
<i>Vallisneria americana</i>	Wild Celery
<i>Zosterella dubia</i> *	Water Star Grass

* formerly known as *Heteranthera dubia*.

The distribution of plants by water depth is summarized in Table 3. Of those species found during the transect survey, eight (8) were found at all sample depths and include *Nitella* (*Nitella* sp.), Eurasian watermilfoil (*Myriophyllum spicatum*), large leaf pondweed (*P. amplifolius*), slender naiad (*Najas flexilis*), leafy pondweed (*P. foliosis*), Robins pondweed (*P. Robbinsii*), flat stem pondweed (*P. zosterformis*), and wild celery (*Vallisneria americana*). All of the plants found in the survey were found in the 2-foot depth.

Table 3. Clear Lake Aquatic Plant Species Distribution by Depth, July 2000.

Plant Species	Depth			
	2	5	8	13
<i>Brasenia Shreberi</i>	x			
<i>Elodea canadensis</i>	x	x	x	
<i>Myriophyllum spicatum</i>	x	x	x	x
<i>Najas flexilis</i>	x	x	x	x
<i>Nitella</i> sp.	x	x	x	x
<i>Nuphar</i> sp.	x			
<i>Potamogeton amplifolius</i>	x	x	x	x
<i>P. diversifolius</i>	x	x	x	
<i>P. foliosis</i>	x	x	x	x
<i>P. Robbinsii</i>	x	x	x	x
<i>P. zosterformis</i>	x	x	x	x
<i>Polygonum amphibium</i>	x	x		
<i>Vallisneria americana</i>	x	x	x	x
<i>Zosterella dubia</i>	x			

Using the total mean density ratings for each species (Appendix), the most abundant species were *Najas flexilis*, *Nitella* sp., and *Vallisneria americana*, respectively.

Plants were found in each sampling point. The shallow depths were the most diverse. *Myriophyllum spicatum* was found most often, followed by *Vallisneria americana*, *P. amplifolius*, and *P. zosterformis*.

The mid depths were dominated by *Najas flexilis*, *Myriophyllum spicatum*, *Vallisneria americana*, *P. Robbinsii* and *Nitella* sp.

The deep depths were dominated by *Nitella* sp. and *Najas flexilis*. However, *Myriophyllum spicatum* was found frequently outside of the actual sampling points.

Areas dominated by *Myriophyllum spicatum* did contain a variety of native plants, however in less frequency than in areas without *Myriophyllum spicatum*. The decline of native species in *Myriophyllum spicatum* choked areas should be expected to continue.

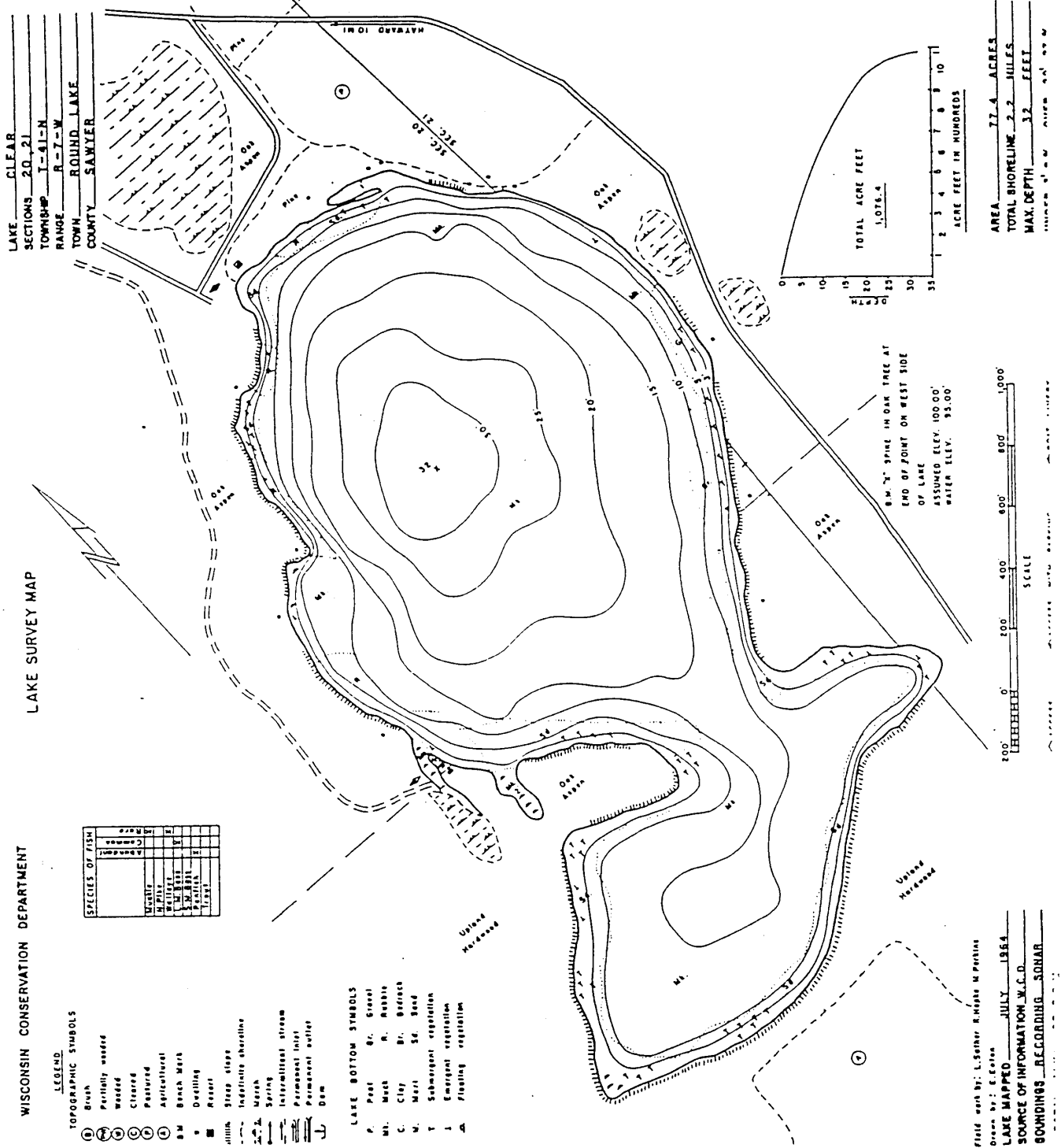
Myriophyllum spicatum was first identified in Clear Lake by local residents approximately 3 to 4 years ago. Since that time, the plant has continued to spread rapidly around the lake. Efforts to prevent its spread have been unsuccessful.

Project plans are being considered to conduct a whole-lake Sonar treatment to eliminate *Myriophyllum spicatum*, restore the native plant community, and to prevent the spread of the nuisance to surrounding water resources.

REFERENCES

- Aron & Associates, 2000. Draft Demonstration Sonar Project, Clear Lake Wisconsin.
- Borman, S., R. Korth, J. Tempte, 1997. Through the Looking Glass. The Wisconsin Lakes Partnership, UWEX. 248 pp.
- Fassett, N. C., 1940. A Manual of Aquatic Plants. The University of Wisconsin Press, 405 pp.
- Nichols, S. A. and Byron H. Shaw, 1986. Ecological Life Histories of the Three Aquatic Nuisance Plants, *Myriophyllum spicatum*, *Potamogeton crispus*, and *Elodea canadensis*. Hydrobiologia 131, 3-21pp.
- Nichols, S. A. and J. G. Vinnie, 1991. Attributes of Wisconsin Lake Plants. Wisconsin Geological and Natural History Survey Informational Circular No. 73, 19pp.

FIGURE 1. Clear Lake Sawyer County, Wisconsin DNR Base Map.



LAKE CLEAR
 SECTION 20, 21
 TOWNSHIP T-41-N
 RANGE R-7-W
 TOWN ROUND LAKE
 COUNTY SAWYER

LAKE SURVEY MAP

WISCONSIN CONSERVATION DEPARTMENT

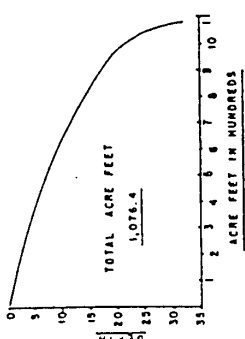
LEGEND

- TOPOGRAPHIC SYMBOLS
- ① Brush
 - ② Perennially wooded
 - ③ Wooded
 - ④ Cleared
 - ⑤ Pastured
 - ⑥ Agricultural
 - ⑦ Branch Mark
 - ⑧ Ditching
 - ⑨ Resort
 - ⑩ Steep slope
 - ⑪ Indefinite shoreline
 - ⑫ Marsh
 - ⑬ Spring
 - ⑭ Intermittent stream
 - ⑮ Perennial inlet
 - ⑯ Perennial outlet
 - ⑰ Dam

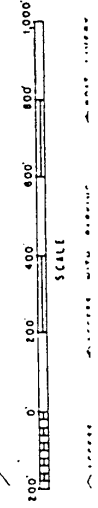
SPECIES OF FISH

Symbol	Species
①	Walleye
②	Yellow Perch
③	Smallmouth Bass
④	Brook Trout
⑤	White Bass
⑥	Rock Bass
⑦	Bluegill
⑧	Crappie
⑨	Shiner
⑩	Golden Shiner
⑪	White Sucker
⑫	Blackchin Shiner
⑬	Common Carp
⑭	Channel Catfish
⑮	Striped Bass
⑯	Rock Bass
⑰	White Bass
⑱	Brook Trout
⑲	Smallmouth Bass
⑳	Yellow Perch
㉑	Walleye

- LAKE BOTTOM SYMBOLS
- P Peat
 - G Gravel
 - M Mud
 - R. Robin
 - C. Clay
 - B. Barren
 - M. Mud
 - S. Sand
 - S. Substratum vegetation
 - I. Emergent vegetation
 - A. Floating vegetation

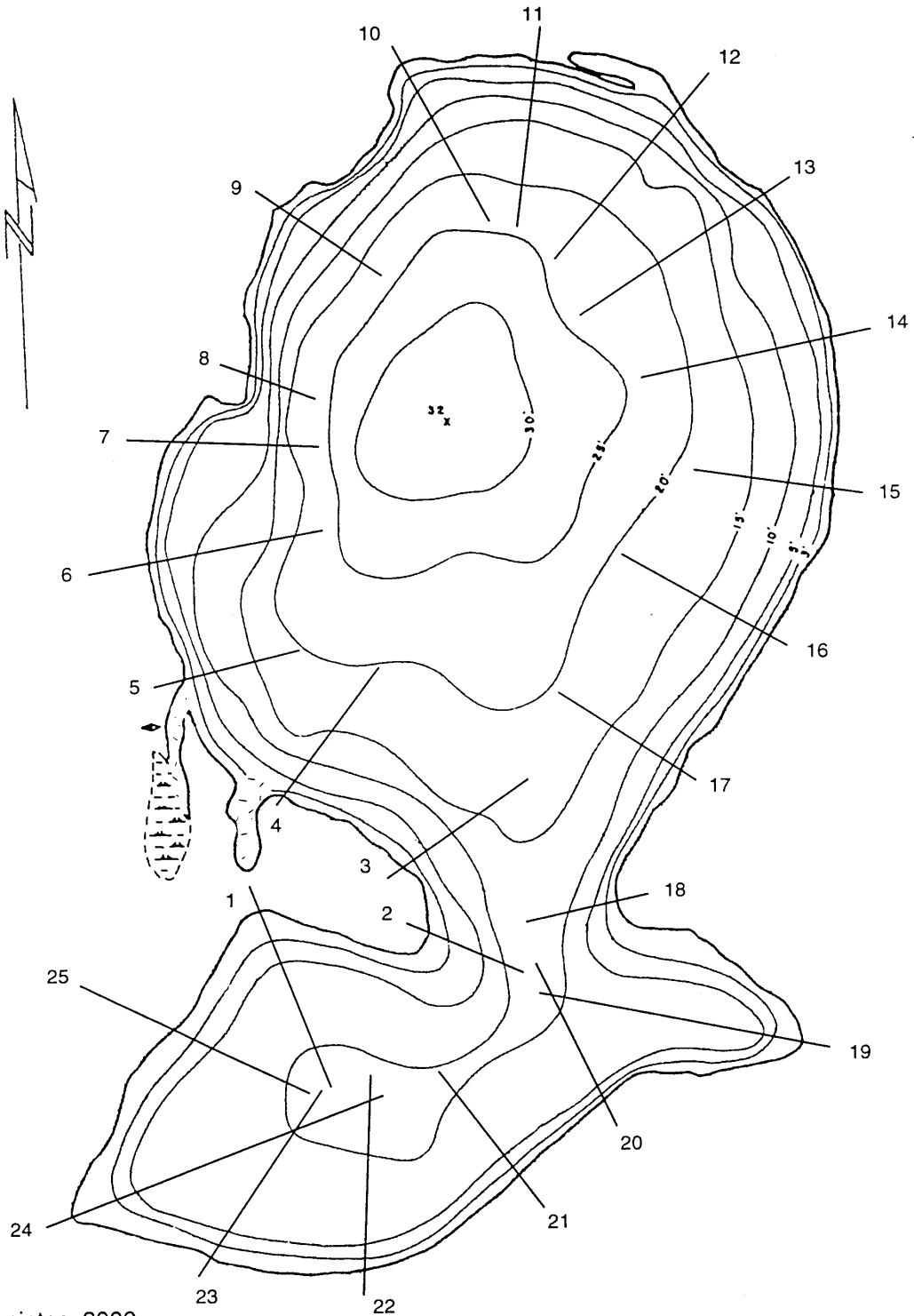


AREA 77.4 ACRES
 TOTAL SHORELINE 2.2 MILES
 MAX. DEPTH 32 FEET



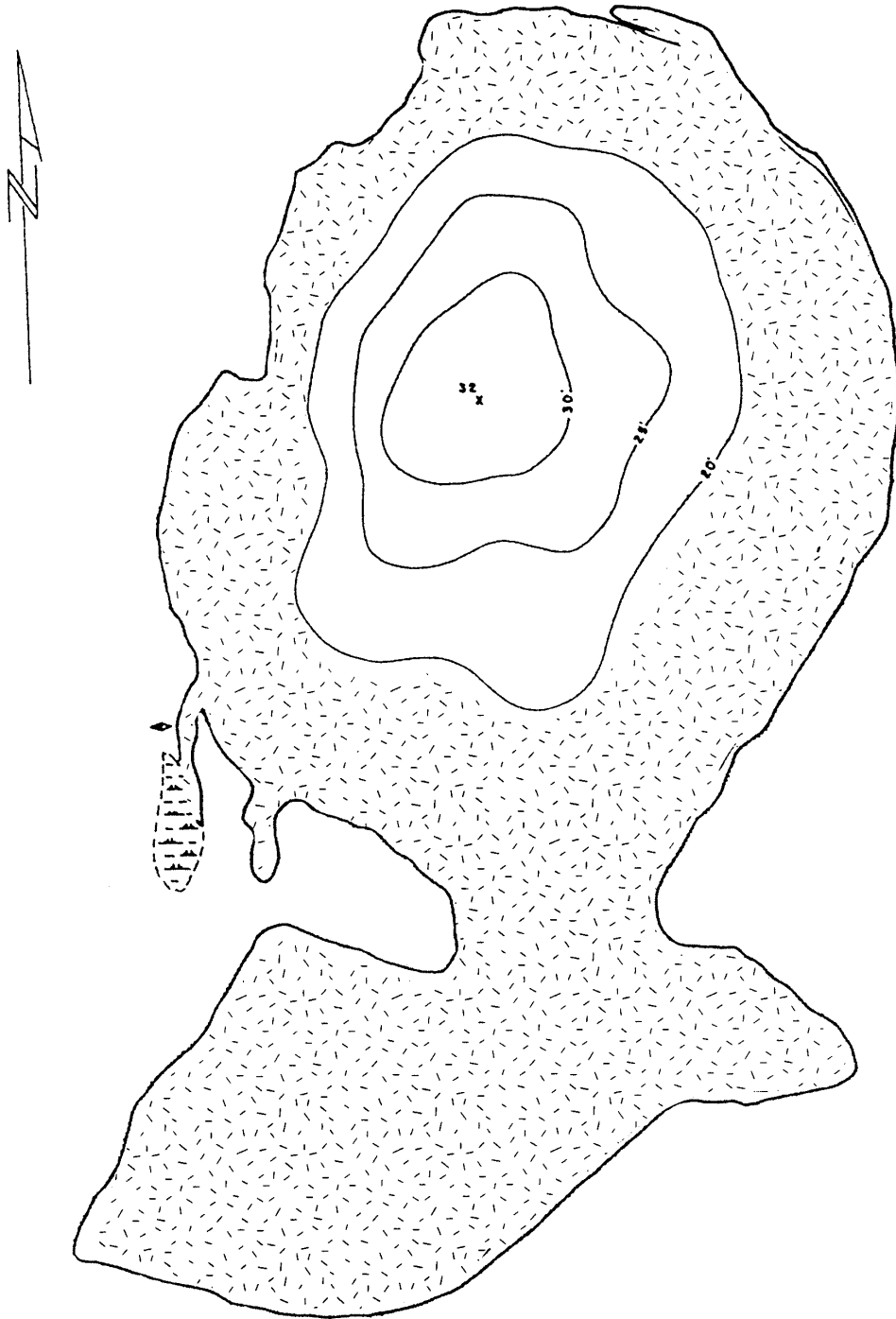
Field work by: L. Schorr, R. Hepp, M. Prater
 Drawn by: C. Colon
 LAKE MAPPED JULY 1954
 SOURCE OF INFORMATION W.C.D.
 SOUNDINGS RECORDING SONAR

FIGURE 2. Aquatic Plant Survey Transect Locations, Clear Lake, Wisconsin



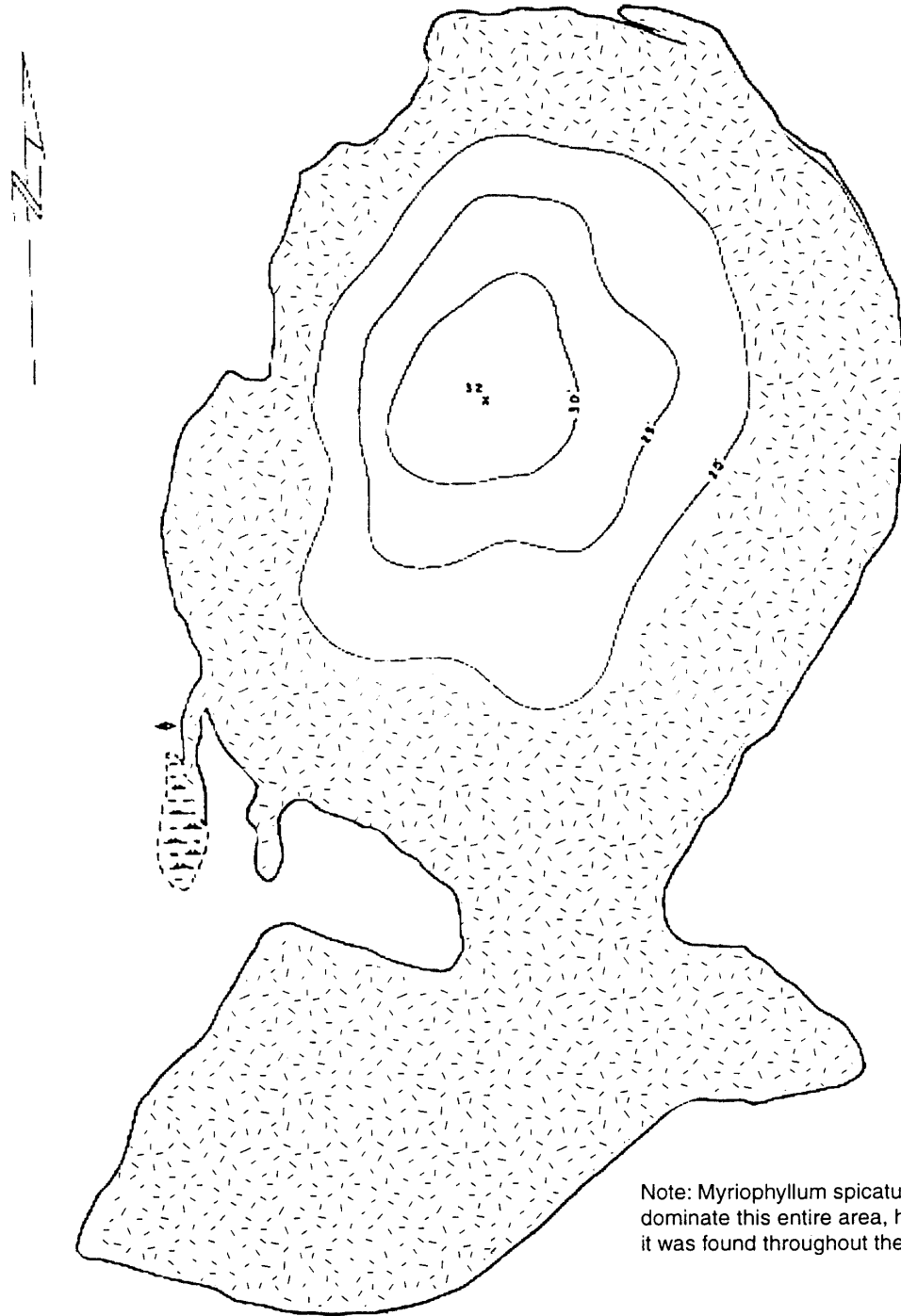
Aron & Associates, 2000

FIGURE 3. Area Available for Aquatic Plant Growth, Clear Lake Wisconsin, 2000 - 2003



Aron & Associates, 2000

FIGURE 4. Areas of Clear Lake with Eurasian Watermilfoil in 2000, Prior To A Whole-Lake Treatment



Note: *Myriophyllum spicatum* does not dominate this entire area, however, it was found throughout the lake.

CLEAR LAKE AQUATIC PLANT SURVEY, JULY 2000

LAKE	YEAF	TRAN	DEPT	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
CLEAR	00	1	2		4	4	3	3	2		4	3					
CLEAR	00	2	2	4		2	3	3			1						
CLEAR	00	3	2			3	3		2				3				
CLEAR	00	4	2	3		1		3	1								
CLEAR	00	5	2		2	2	2		4					2			
CLEAR	00	6	2		2	3			2						1		
CLEAR	00	7	2		2	1			2	3		3					
CLEAR	00	8	2		3	2	2				1	4			1		
CLEAR	00	9	2		4	2			2		4	2					
CLEAR	00	10	2		4	3								2		1	
CLEAR	00	11	2		4		1					1			1		
CLEAR	00	12	2														
CLEAR	00	13	2	3					2								
CLEAR	00	14	2	2	1		1									1	
CLEAR	00	15	2				1	1				2				2	
CLEAR	00	16	2	3	1			1		3	2	2				1	
CLEAR	00	17	2		1	1						2					
CLEAR	00	18	2	2												2	
CLEAR	00	19	2		2	2			2							1	
CLEAR	00	20	2		1	2		1								1	
CLEAR	00	21	2		3											2	
CLEAR	00	22	2		2			2				2				1	
CLEAR	00	23	2		4	2			2	2		4				1	
CLEAR	00	24	2	1	5		1		2		1					1	
CLEAR	00	25	2		1	4						1					1

	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
FREQUENCY	7	18	15	9	7	10	4	6	12	1	2	13	1	1
% FREQUENCY	28.00	72.00	60.00	36.00	28.00	40.00	16.00	24.00	48.00	4.00	8.00	52.00	4.00	4.00
SUM DENSITY	18	46	34	17	14	21	10	13	29	3	4	16	1	1
SPEC MEAN DENSITY	2.57	2.56	2.27	1.89	2.00	2.10	2.50	2.17	2.42	3.00	2.00	1.23	1.00	1.00
TOT MEAN DENSITY	0.72	1.84	1.36	0.68	0.56	0.84	0.40	0.52	1.16	0.12	0.16	0.64	0.04	0.04
TMD W/PLANTS	0.75	1.92	1.42	0.71	0.58	0.88	0.42	0.54	1.21	0.13	0.17	0.67	0.04	0.04

CLEAR LAKE AQUATIC PLANT SURVEY, JULY 2000

LAKE	YEAR	TRAN	DEPTH	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
CLEAR	00	1	5				1		4		1						
CLEAR	00	2	5	4		2		3									
CLEAR	00	3	5	3							1						
CLEAR	00	4	5	2		4		4									
CLEAR	00	5	5	4	2	4		2					1				
CLEAR	00	6	5			4											
CLEAR	00	7	5			3	1	1	3	2			4				
CLEAR	00	8	5		3	3			2		2	4					
CLEAR	00	9	5		2	3			3		3				1		
CLEAR	00	10	5			4			4			2					
CLEAR	00	11	5		4				4		2	4				2	
CLEAR	00	12	5	4	2			1									
CLEAR	00	13	5	3		2		4									
CLEAR	00	14	5		2	2	2	1									
CLEAR	00	15	5			2		1	1							1	
CLEAR	00	16	5	1					4	3	3	2				3	
CLEAR	00	17	5			4			4	4							
CLEAR	00	18	5	1	2			1									
CLEAR	00	19	5		2	1		1								2	
CLEAR	00	20	5	1	2			2								1	
CLEAR	00	21	5			3		4								1	
CLEAR	00	22	5	2	1	2		4	4								
CLEAR	00	23	5	1	4			3	2							3	
CLEAR	00	24	5	1	3			1	2							2	
CLEAR	00	25	5	1	2			2	1			1					

	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
FREQUENCY	13	13	16	4	14	13	3	6	7	0	0	9	0	0
% FREQUENCY	52	52	64	16	56	52	12	24	28	0	0	36	0	0
SUM DENSITY	28	31	44	8	30	38	9	12	18	0	0	16	0	0
SPEC MEAN DENSITY	2.15	2.38	2.75	2.00	2.14	2.92	3.00	2.00	2.57	#DIV/0!	#DIV/0!	1.78	#DIV/0!	#DIV/0!
TOT MEAN DENSITY	1.12	1.24	1.76	0.32	1.20	1.52	0.36	0.48	0.72	0.00	0.00	0.64	0.00	0.00
TMD W/PLANTS	1.12	1.24	1.76	0.32	1.20	1.52	0.36	0.48	0.72	0.00	0.00	0.64	0.00	0.00

CLEAR LAKE AQUATIC PLANT SURVEY, JULY 2000

LAKE	YEAR	TRAN	DEPTH	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
CLEAR	00	1	8	4		2									4		
CLEAR	00	2	8	4	2	2											
CLEAR	00	3	8	4		2		3									
CLEAR	00	4	8	4				2	1		1						
CLEAR	00	5	8	4		4	2				1				3		
CLEAR	00	6	8			4			3		3	2					
CLEAR	00	7	8			2	1	3	3	2		4					
CLEAR	00	8	8	4	2				3		4						
CLEAR	00	9	8	4	2	1		4			2						
CLEAR	00	10	8		2			1	3			1					
CLEAR	00	11	8		4	2		2	3			2					
CLEAR	00	12	8	4	3	1									2		
CLEAR	00	13	8	4		1		4									
CLEAR	00	14	8	3	2	2		4									
CLEAR	00	15	8	2		1		3							1		
CLEAR	00	16	8	2		4		3			4						
CLEAR	00	17	8		1			2		3							
CLEAR	00	18	8	2				3									
CLEAR	00	19	8		1			4							1		
CLEAR	00	20	8					4									
CLEAR	00	21	8			2		4							2		
CLEAR	00	22	8			1		4	2						1		
CLEAR	00	23	8		2	2		1		2					3		
CLEAR	00	24	8	3	1												
CLEAR	00	25	8	4				1			3	1					

	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
FREQUENCY	15	11	16	2	18	7	3	7	5	0	0	8	0	0
% FREQUENCY	60.00	44.00	64.00	8.00	72.00	28.00	12.00	28.00	20.00	0.00	0.00	32.00	0.00	0.00
SUM DENSITY	52	22	33	3	52	18	7	18	10	0	0	17	0	0
SPEC MEAN DENSITY	3.47	2.00	2.06	1.50	2.89	2.57	2.33	2.57	2.00	#DIV/0!	#DIV/0!	2.13	#DIV/0!	#DIV/0!
TOT MEAN DENSITY	2.08	0.88	1.32	0.12	2.08	0.72	0.28	0.72	0.40	0.00	0.00	0.68	0.00	0.00
TMD W/PLANTS	2.08	0.88	1.32	0.12	2.08	0.72	0.28	0.72	0.40	0.00	0.00	0.68	0.00	0.00

CLEAR LAKE AQUATIC PLANT SURVEY, JULY 2000

LAKE	TRAN	DEPTH	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
CLEAR 00	1	13	4												4	
CLEAR 00	2	13	4		1		3								1	
CLEAR 00	3	13	3				4									
CLEAR 00	4	13	4		2			2								
CLEAR 00	5	13	3		1		4									
CLEAR 00	6	13	4				4									
CLEAR 00	7	13	2		1		4								2	
CLEAR 00	8	13	4				3	2							1	
CLEAR 00	9	13	3				3	2		2						
CLEAR 00	10	13		2	2		3									
CLEAR 00	11	13		2			1	4								
CLEAR 00	12	13	4	1			4				2					
CLEAR 00	13	13	4				4	2								
CLEAR 00	14	13	4				4									
CLEAR 00	15	13	4				4	3								
CLEAR 00	16	13	3				4								2	
CLEAR 00	17	13	4		1		4	1								
CLEAR 00	18	13	3				3									
CLEAR 00	19	13					4									
CLEAR 00	20	13	2				3									
CLEAR 00	21	13	2				3	4				1				
CLEAR 00	22	13	2				4									
CLEAR 00	23	13	1													
CLEAR 00	24	13	2				4									
CLEAR 00	25	13	4				4	3				1			1	

	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
FREQUENCY	22	3	6	0	22	9	0	2	2	0	0	6	0	0
% FREQUENCY	88	12	24	0	88	36	0	8	8	0	0	24	0	0
SUM DENSITY	70	5	8	0	78	23	0	4	2	0	0	11	0	0
SPEC MEAN DENSITY	3.18	1.67	1.33	#DIV/0!	3.55	2.56	#DIV/0!	2.00	1.00	#DIV/0!	#DIV/0!	1.83	#DIV/0!	#DIV/0!
TOT MEAN DENSITY	2.80	0.20	0.32	0.00	3.12	0.92	0.00	0.16	0.08	0.00	0.00	0.44	0.00	0.00
TMD W/PLANTS	2.80	0.20	0.32	0.00	3.12	0.92	0.00	0.16	0.08	0.00	0.00	0.44	0.00	0.00

COMBINED VALUES FOR ALL DEPTHS

	NITELLA	MYRSPI	VALAM	ELOCA	NAJFL	POTRO	POTDI	POTFO	POTZO	HETDU	BRASH	POTAM	POLNA	NUPHAR
FREQUENCY MAX = 100	57	45	53	15	61	39	10	21	26	1	2	36	1	1
% FREQUENCY	57	45	53	15	61	39	10	21	26	1	2	36	1	1
SUM DENSITY MAX = 500	168	104	119	28	174	100	26	47	59	3	4	60	1	1
SPEC MEAN DENSITY	2.95	2.31	2.25	1.87	2.85	2.56	2.60	2.24	2.27	3.00	2.00	1.67	1.00	1.00
TOT MEAN DENSITY	1.68	1.04	1.19	0.28	1.74	1.00	0.26	0.47	0.59	0.03	0.04	0.60	0.01	0.01
TMD W/PLANTS	1.70	1.05	1.20	0.28	1.76	1.01	0.26	0.47	0.60	0.03	0.04	0.61	0.01	0.01