RESULTS OF THE 1995 MACROPHYTE

SURVEY IN LONG LAKE

By

Bob Hoodie

Wisconsin Department of Natural Resources
N 7725 Hwy 28
Horicon, WI 53032

INTRODUCTION

The importance of macrophytes in the littoral zone of a lake has been well documented (e.g., Carpenter and Lodge 1986, Engel 1990). In any lake the presence of macrophytes can greatly influence water quality. Macrophytes help stabilize sediments, protect shorelines from wave erosion, function as a refugia for young of year fish and large bodied zooplankton that graze phytoplankton, compete for nutrients and otherwise promote clear water conditions (Winkelman 1995). Loss of macrophytes augments a turbid, algal condition caused by the winds resuspension of sediments and nutrients, increased shoreline erosion and reduced habitat for desired fish species.

Historically the water quality of Long Lake has remained clear through out the year, despite heavy fishing, boating and swimming pressure (Woodward-Clyde 1994, WDNR Lake Use Report 1973). Non Point source runoff, runoff from STH 67, seepage from faulty septic systems and the lack of a long range comprehensive land use management plan are issues that need to be resolved in order to maintain the water quality in Long Lake.

A macrophyte survey was conducted in August 1995 as part of the WDNR Long Term Trend Monitoring Program (LTTMP). The objectives of the survey were to determine the richness, distribution, relative densities, relative frequency and frequency of occurrence of macrophyte species in Long Lake.

STUDY SITE

Long Lake is a 427 acre mesotrophic lake located in the Town of Osceola, Fond du Lac County, Wisconsin. Long Lake is an elongate lake lying on a north south axis in the terminal moraine of the Green Bay lobe of the Wisconsin glacier.

The deepest point in the lake (47 feet) is centrally located in the main basin. Eleven percent of the lake area is under 3 feet deep while 41 percent of the lake area is deeper than 20 feet. The mean depth is 17 feet. The lake bottom consists of gradual sloping shelf extending from the east and west shoreline out about 200 feet, then drops off sharply into deep water. The majority of this littoral area was created in 1855 when a 5 foot high dam was built to provide power for a grist mill. The north and south shore drop off gradually to a depth of 20 to 30 feet.

Table I.

Land use in the Long Lake Watershed, 1993		
Land Use	**Acres**	**%**
Farmstead	76	1%
Wetland	1,496	15%
Grassland	1,844	19%
Pasture	204	2%
Woodlot	2,303	23%
Cropland	3,795	38%
Residential	217	2%
	9,935	100%

The lake is within an area designated as a National Ice Age Scientific Reserve, and this has special ecological significance. Much of the eastern shore is bordered by the state administered Long Lake Recreation Area. There is also a Boy Scout Camp located on the northern shore of the lake. The watershed to the lake encompasses 9,935 acres (15.5 square miles). The land use is summarized in Table I.

Tittle Lake, a 17 acre lake is located off the northwest shore of Long Lake on the inlet stream, Watercress Creek. A broad channel connects Tittle Lake to Long Lake. The outlet of Long Lake is the headwaters for the East Branch of the Milwaukee River.

METHODS

Aquatic plants were sampled between 14-17 August 1995. Appendix I gives a description of each of the regularly spaced transects.

A general survey of the lake was done before any transects were sampled. The objective of this survey was to collect as many of the plant species present in the lake and identify them prior to sampling. Knowing what species were present before doing rake casts helped speed up the survey.

Transects locations for this survey were duplicated as closely as possible from the 1988 survey (Molter 1988). Because some of the 1988 transect descriptions were vague or incomplete, and the photographs taken in 1988 couldn't be found, rough estimations of locations were made. In 1995 a new photograph, VHS videotape, and detailed description of each transect was made.

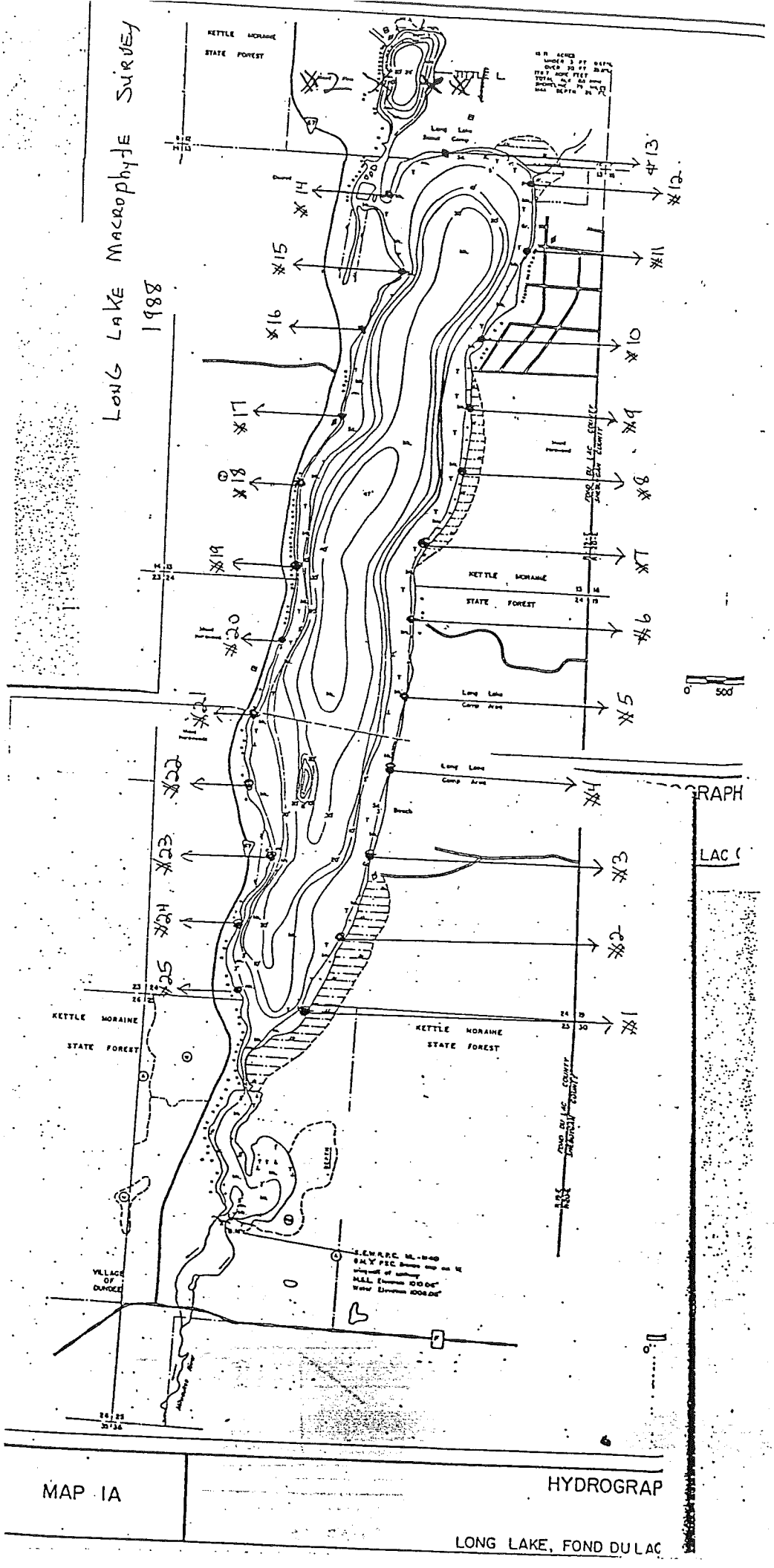
Each transect consisted of motoring perpendicular to the shoreline, to depths of 1.5, 6, 12 and 18 feet. Depths were determined with an Eagle LCD depthfinder, and confirmed with a marked pole. At each depth, the boat was faced into the wind and anchored from the front. Plants were sampled according to Deppe and Lathrop (1992) by throwing a weighted, double headed rake with a 36 cm wide head and 14 teeth, each 5 cm long. The rake was dragged approximately 2 m along the bottom of the lake by means of an attached line, As the rake was lifted off the bottom of the lake, it was rotated 180 degrees to prevent the ensnared plants from falling off the rake head, Any plants caught on the metal part of the rake head were placed on the rake teeth and included in the density rating (Winkelman et al. 1995). The rake was thrown four times at each depth; from the front left, front right, rear right and rear left of the boat.

For each rake cast, a density rating of 0-5 was assigned to each species present on the rake. This rating was based on the extent of coverage of the rake teeth according to Deppe and Lathrop (1992): 0 = no plants recovered, 1 = 1-20% coverage, 2 = 21-40% coverage, 3 = 41-60% rake coverage, 4 = 61-80% coverage and 5 = greater than 80% coverage.

Filamentous algae were separated from the macrophytes so that the rake coverage reflects densities of plants alone. For the purposes of this report only vascular aquatic plants were

2. Lake

Sample sites



termed macrophytes. Filamentous algae were not assigned a density rating, rather they were noted as being present when they occurred on the rake head.

Emergent, wetland and shoreline vegetation was also separated from the macrophytes. Each emergent species within the 5 m wide transect was identified and assigned a rough density rating from 1(present) to 5(abundant). Because of heavy rains prior to the survey raising the water level of the lake, some species that are more commonly found on upland sites were included in the sampling.

Plants were identified using Fassett (1957), Gleason and Cronquist (1991) and Lopinot and Winterringer (1966). Scientific and common names of plant species found during the 1995 survey of Long Lake are listed in Table II and Table III.

Table II.

Riparian and emergent plants observed in Long Lake, 1995.

Common name	Scientific name
Alder, tag	*Alnus rugosa*
Arrowhead	*Sagittaria spp.*
Barnyard grass	*Echinochloa crusgalli*
Bedstraw, small	*Galium palustra*
Bellflower, marsh	*Campanula americana*
Bugleweed	*Lycopus americanus*
Bullrush, hardstem	*Scirpus acutus*
Bullrush, softstem	*Scirpus validus*
Bur-reed, giant	*Sparganium eurycarpum*
Cattail	*Typha spp.*
Dock, pale	*Rumex altissimus*
Dogwoood, red osier	*Cornus stolonifera*
Hemlock, water	*Cicuta bulbifera*
Jewelweed	*Impatiens capensis*
Joe pye weed	*Eupatorrium maculatum*
Loosestrife, purple	*Lythrum salicaria*
Loosestrife, swamp	*Decodon verticullatus*
Merigold, bur	*Bidens coronata*
Milkweed, marsh	*Asclepias incarnata*
Mint, wild	*Mentha arvensis*
Rice, wild	*Zizania aquatica*
Sedge, bottlebrush	*Carex lacustris*
Skullcap, marsh	*Scutelaria galericulata*
Smartweed	*Polygonium sp.*
Sunflower, woodland	*Helianthus strumosus*

1968 represents the earliest records of a vegetation survey in Long Lake (Lake Use Report WDNR 1973). The methods for this survey were not clearly defined other than by "aerial surveys and intensive water reconnaissance". Also, the report only listed the dominant species found and made no mention of lesser species. For this reason, only presence or absence of vegetation data can be used for comparison purposes. The 1988 survey utilized the same methodology as the 1995 survey and will be used for comparison.

Statistical analyses and Terminology

Several assessments of density were computed:(1) *Average density*. The average density values (n = 4 rake throws) were used in calculating transect densities and depth densities. (2) *Transect density* (also called additive density rating, ADR, in Deppe and Lathrop 1993). The total density of aquatic vegetation at each transect was determined by summing the individual depth values along the transect. (3) *Depth density* (called mean density rating, MDR, in Deppe and Lathrop 1993). The mean density of plants per depth was calculated by adding the density ratings obtained at each depth in all transects and dividing by the number of transects.

In addition to density, other terms were defined or analyzed made to quantify the macrophyte data collected: (1) *Plant cover*. Plant cover, also known as frequency of occurrence,

indicates the percent of the sampled littoral zone covered by plants and enables an evaluation of how common a species was in the lake; it is based on the presence and absence of species rather than densities. Plant cover is calculated as the number of depths in which a species occurred once, divided by the total number of depths that could be sampled (25 transects multiplied by 4 depths at each transect). (2) *Abundance*. Plant species were considered abundant if plant cover was in > 30% of the transects, very common if in 11 - 30% of the stations, common if in 1 - 10 % of the stations, and rare if in less than 1% of the stations. (3) *Relative frequency*. Relative frequency represents the relative proportion of each species in the macrophyte community; it does not reflect densities. Relative frequency for each species was determined by summing the number of times that each species was found on the rake and dividing it by the number of times plants were encountered on the rake on the littoral zone.

Table III.

Floating and submerged plants in Long Lake, 1995.

Common name	Scientific name
Buttercup	*Ranuncules longirostris*
Bladderwort	*Utricularia purpurea*
Chara	*Chara sp.*
Coontail	*Ceratophyllum demersum*
Duckweed, big	*Lemna perpusilla*
Duckweed, great	*Spirodella polyrhiza*
Duckweed, star	*Lemna trisulca*
Elodea	*Elodea canadensis*
Niad	*Najas guadalupensis*
Nitella	*Nitella sp.*
Pond lily, yellow	*Nuphar varigatum*
Pondweed, flatstem	*Potamogeton zosteriformis*
Pondweed, floating leaf	*Potamogeton natans*
Pondweed, Illinois	*Potamogeton illinoensis*
Pondweed, large leaf	*Potamogeton amplifolius*
Pondweed, Richardson	*Potamogeton richardsoni*
Pondweed, sago	*Potamogeton pectinatius*
Water celery	*Vallisneria americana*
Water lily, white	*Nymphea odorata*
Water marigold	*Megalodonta beckii*
Water milfoil	*Myriophyllum exalbesence*
Water stargrass	*Zosterella dubia*

RESULTS

A total of 47 submersed, floating, emergent and riparian species were observed in the shoreline and littoral areas of Long Lake in 1995. Not counting duckweed species (*Lemna spp.)* eighteen species were sampled with the rake during the survey. Buttercup (*Ranuncules longirostris*) was observed at various locations during the survey, but was never retrieved on a rake throw.

Eurasian milfoil (*Myriophyllum spicatum*) was not encountered during the rake survey or observed rooted between transects, but 1 stem was found floating west of the state boat landing. Because Eurasian milfoil is a detrimental and aggressive exotic, additional transects were done in the vicinity of the boat landings to specifically look for it, with none being found.

Purple loosestrife (*Lythrum salicaria*) another invasive exotic, was present in a large portion of the wetland. Due to its aggressive nature control of Purple loosestrife is necessary to keep it from displacing native and beneficial wetland vegetation.

Species richness was higher in 1995 than in any other previous macrophyte surveys. This is probably due to a more thorough investigation of the rake head which revealed the less common species. It is unlikely that Water stargrass (*Zosterella dubia*), Water marigold

Table IV.

Relative frequencies of macrophytes in Long Lake, 1988* and 1995.

Plant species	1988	1995
Bladderwort	0.6	1.1
Chara	13.9	12.8
Coontail	8.1	17.5
Elodea	1.2	2.2
Niad	7.5	2.2
Nitella	-	0.1
Pond lily, yellow	5.2	1.8
Pondweed, flatstem	8.1	8.0
Pondweed, floating leaf	-	0.4
Pondweed, Illinois	16.2[1]	2.2
Pondweed, large leaf	-	4.4
Pondweed, Richardson	2.3	4.4
Pondweed, sago	4.6	3.6
Water celery	1.7	1.1
Water lily, white	-	2.9
Water marigold	-	3.3
Water milfoil	30.6	28.1
Water stargrass	-	3.3

* 1988 data from Molter(1988), 1995 data from this study.
[1] Combined value from Large leaf pondweed and Illinois pondweed.

(*Megalodonta beckii*), Floating leaf pondweed (*Potamogeton natans*) and Nitella (*Nitella sp.*) are new to the lake, but because they are relatively rare they were not found in previous surveys. Also the duckweeds (*Lemna and Spirodella sp.*) which were keyed only to the genus level in previous surveys were keyed to species in the 1995 survey.

The 18 foot depth had more occurrence of vegetation in 1995 (N = 20) compared to 1988 (N = 0). Increased water clarity over 1988 is the major contributing factor for this increase in maximum rooting depth. The late cool spring in 1995 created clearer water not only in Long Lake, but in many lakes across the state.

Water milfoil, chara, coontail and flatstem pondweed were the most widely distributed species in the lake occurring in 100%, 92%, 88% and 72% of transects respectively.

Plant Cover and Relative Frequency

In comparing the 1995 and 1988 surveys, the overall plant cover for all species was similar (table V) 95% versus 89% respectively. In addition, the relative frequencies for individual species remained similar for all species except coontail and Illinois pondweed. In 1988 coontail made up only 8.1% of the plant frequency as compared to 17.5% in 1995 (Table

Table V.

Percent plant cover* in the littoral zone (<18 feet) of Long Lake, 1988 and 1995.

Plant species	1988**	1995
Bladderwort	1	3
Chara	32	35
Coontail	19	48
Elodea	3	5
Niad	17	6
Nitella	-	1
Pond lily, yellow	12	5
Pondweed, flatstem	19	22
Pondweed, floating leaf	-	1
Pondweed, Illinois	37[1]	6
Pondweed, large leaf	-	12
Pondweed, Richardson	5	12
Pondweed, sago	11	22
Water celery	4	3
Water lily, white	-	8
Water marigold	-	9
Water milfoil	71	77
Water stargrass	-	9
All species combined	89	95

*Calculated as the number of depths where a species occurred at least once, divided the total number of sites (100).
** 1988 data from Molter (1988), 1995 data from this study.
[1] Combined value for Illinois pondweed and Large leaf pondweed.

IV). The increased coontail in 1995 can be somewhat attributed to the clearer water which allowed it to grow at the 18 foot depth where in 1988 no plants were found at that depth. The higher relative frequency of Illinois pondweed in 1988 is probably due to the misidentification and inclusion of Largeleaf pondweed with Illinois pondweed.

Densities

The overall rake densities for 1995 were commonly 3 and 4. It was quite common for rake densities to be 5 when shallow water sites were sampled. Rake densities of 4 and 5 were most often filled with Coontail, Chara and Water milfoil which grew in large, dense beds.

Depth densities. Depth densities were very good in 1995 with the highest total rake densities occurring at the 1.5 and 6 foot depth (Figure 1). With a maximum value of 5, total rake

densities reached values of 3.7 and 4.0 at these depths respectively. Water milfoil and chara had the highest species densities of 2.7 and 2.1 at the 6 and 12 foot depths respectively.

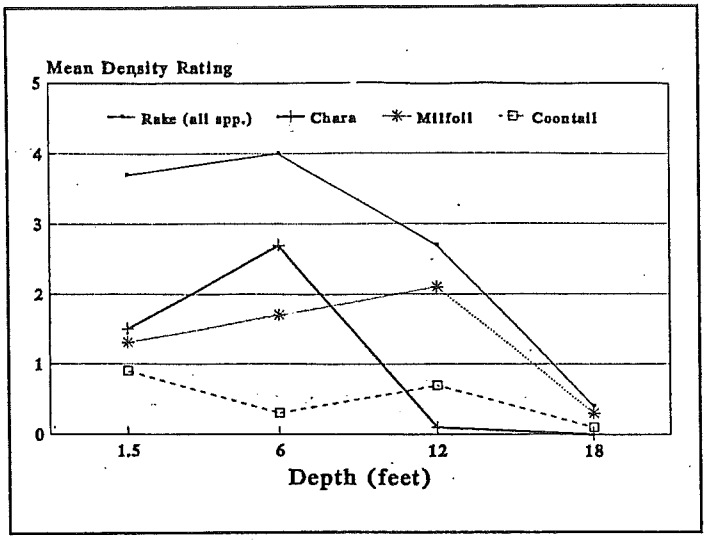


Figure 1. Mean density for all species (rake), Chara, Coontail and Water milfoil at each depth sampled in Long Lake, 1995. Maximum value is 5.

Transect densities. In 1995, macrophytes grew through out the littoral zone of Long Lake. A transect density of 20 would occur if all depths sampled had a maximum density of 5. The average density for all species combined (total rake density) was 10.9. The highest individual transects were 18 and 16 with values of 16.5 and 15 respectively (Figure 2). The lowest transect densities occurred in the vicinity of the state boat landing and swim area. The mean transect density on the developed west shore was higher (11.6) than from the undeveloped east shore (10.1).

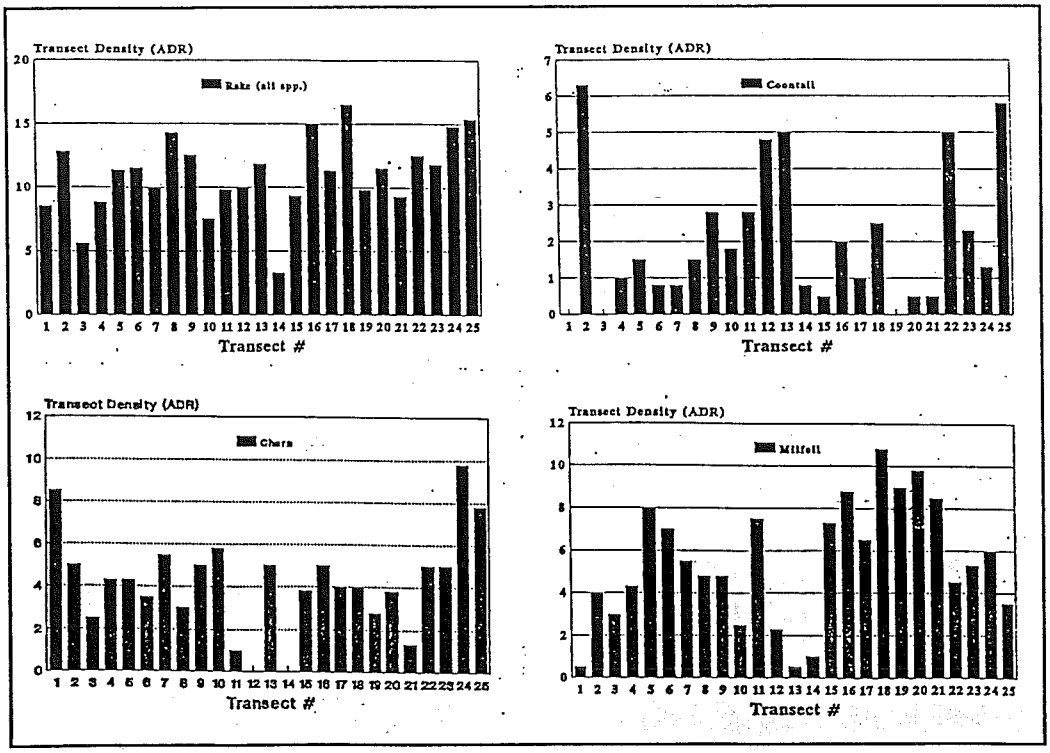


Figure 2. Transect densities (ADR) for all species (rake), Coontail, Chara and Water milfoil. Maximum value is 20.

DISCUSSION

The diversity of Long Lake indicates its stable and high quality macrophyte community. The great diversity of submerged, floating, emergent and riparian species are greatly responsible for the high water quality found in Long Lake. This dense macrophyte beds are of major importance in that they provide valuable habitat for fish and wildlife, as well as a forming a wave absorbing buffer which reduces shoreline erosion.

Although no Eurasian milfoil was found during the rake throw portion of the survey, in all likelihood it is present in Long Lake. The high boat use and the fact that Eurasian milfoil fragments can be transported from infested lakes on boats and boat trailers and will regenerate new plants if suitable conditions occur. However, because Long Lake has a healthy macrophyte community, Eurasian milfoil shouldn't become a serious threat.

Because over half (57%) of the its watershed lies within the boundaries of the Kettle Moraine State Forest and is and undisturbed state (i.e. wetland, grassland and woodlot) Long Lake is not in serious danger of the effects of cultural eutrophication. However, excessive nutrients are still entering the lake via septic systems, agricultural and highway runoff and to a lesser extent lawn fertilizers. This is evident by the increased macrophyte densities which occurred in the developed portions of the lake basin.

Long Lake is a good example of a healthy macrophyte community. The designation of sensitive areas along large portions of the east and north shore will help protect this community. Controlling exotic plant species, nutrient and sediment runoff are factors that need to be addressed to insure the continued health of Long Lake.

Appendix 1.

1995 Long Lake Transect Descriptions.

Transect #	Description
1	1600 feet south of boat landing on east shore, across from brown house with red roof, with a flagpole on their south boundary.
2	800 feet south of boat landing, across from northern most house.
3	200 feet north of landing, straight east of pavilion.
4	Between the two beaches, straight out from the wooded area.
5	About 100 yards north of the fishing pier.
6	Clump of 5 willows, 300 yards north of the fishing pier.
7	200 feet north of point, across from the house with large cedar trees blocking view of the lake.
8	1000 feet south of first pier and cottage, across from the sandy beach between the boat slips.
9	200 feet south of first cottage.
10	Between fifth and sixth cottage from the south, fifth cottage is dark brown sixth cottage is white with lime green trim and a rip rap shore.
11	100 feet north of western most road running along the shore, straight out from cream cabin with blue trim, 1 weeping willow and 1 black willow next to shore.
12	Half way between inlet and ditch.
13	100 feet east of boy scout pier, straight off sandy hill.
14	South end of east side of channel leading into Tittle Lake
15	Straight off large oak tree on the point.
16	South end of rip rap,straight off cinder block building.
17	Directly north of RV park boat landing.
18	Straight out from 3 cedar trees south of light blue cement block garage.
19	50 feet north of yellow cottage with RR tie bank stabilizers and 2 flag poles on the pier.
20	Blue cottage with large weeping willow and concrete retaining wall, there is rip rap to the south and sheet piling to the north.
21	100 feet north of Mr. Ed's boat landing, between beach and landing.
22	50 feet north of blacktopped private landing, street light at landing, directly in front of garage with overhead door.
23	Wooded point directly across from public landing.
24	First cottage south of wooded point.
25	In front of ninth cottage from the north, cottage is tan with brown trim.

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Long Lake Macrophyte Survey Aug 1995

Date: 14 Aug 95

Observers: [illegible]

Transect # 1

Site Description: East from [illegible] South of boat landing, across from Brown house with [illegible] roof Flag pole on South Shore

AERIAL PHOTO'S

Loran Coordinates: N 43 39 54 W 88 10 47

SPECIES	Depth					SPECIES	Depth				
(common name)	1.5	6'				(common name)	1.5				
chara	55.32 4	5,545 5				coontail					
M. exalbescens	1,1 1					elodea					
water celery						scirpus Sp. Hard stem	3				
flatstem						P. illinois					
sago						duckweed					
richardson's						spirodella					
amplifolious						burreed					
white lilly	4					wild rice					
yellow lilly	4					carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad						P. puscillus					
P. natans											
P. americanus ?											

depths are approximate with a 50% range around each depth

Comments: heavy rains last week raised lake level

- Visually ranked water lillies based on % coverage of quadrant.
- 2 sides Taken from milfoil variants from 1.5' Transect # 8,9
- slide #10 Transect 1 Facing east, # 11 Facing west
- 1.5' depth was Taken about 100 yards from east shore line, dense lilly growth between Transect + Shore
- 6' Transect Taken in middle of Channel

1.5	6
5,5,3,2	5,5,4,5
3.8	4.8

1/2 acre Bullrush

Long Lake Macrophyte Survey Aug 1995

Date: Aug '95

Observers: Heidi Spicer

Transect # 2

Site Description: across from last cottage on west shore; 800' south of boat launch

Loran Coordinates: N 1.5' 43 39 67 / 6' 43 39 65 / 12' 43 39 68 / 18' 43 39 68 W 58 10 36 / 58 10 41 / 58 10 43 / 58 10 46

SPECIES (common name)	Depth 1.5	6'	12'	18'	SPECIES (common name)	Depth 1.5	6	12'	18'
chara	5				coontail	1	5,5,3 3	4,4,2,2 3	1
M. exalbescens		5,2,3 3	1,1,1,2 1	1 1	elodea				
water celery					scirpus Sp.				
flatstem		3 1	1		P. illinois				
sago					duckweed				
richardson's					spirodella				
amplifolious					burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass					arrowhead				
bladderwort					filamentous				
southern niad					P. puscillus	1			
P. natans									
P. americanus ?	1								
5									

Comments: - 1.5' depth NO Rake Tosses done all visual
- Slide 12 East Shot, Slide 13/14 West looking Photo

1.5 / 5

6 / 5,5,5 / 3.8

12 / 5,5,3,2 / 3.8

18 / .3

Long Lake Macrophyte Survey Aug 1995

Date: [illegible]

Observers: [illegible]

Transect #: [illegible]

Site Description: [illegible] straight out from pavilion

Loran Coordinates:

Depth	N	W
1.5'	4339 82	88 10 27
6'	4339 83	88 10 25
12	4339 84	88 10 24
18	4339 83	88 10 24

SPECIES (common name)	1.5	6'	12'	18'		SPECIES (common name)	1.5	6'	12'	18'	
chara		1,1,4,4 3				coontail					
M. exalbescens	1		4,4,1,1 3	1		elodea					
water celery						scirpus Sp.					
flatstem						P. illinois		1,1,1 1			
sago						duckweed					
richardson's						spirodella					
amplifolious	1					burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad						P. puscillus	√				
P. natans											
P. americanus ?											

Amplifolius - long petiole
illinoisis - short petiole

Comments: 1.5' area is used heavily for docking boats, about 50' North much vegitation.
Photo 16 is east, 17 is west
12' area is a very steep drop. difficult to get in depth
12' + 18' are almost identical positions

Long Lake Macrophyte Survey Aug 1995

Date: 14 Aug 95

Observers: Hoodin, Sesing

Transect # 41

Site Description: 200' N of beach, between 2 beaches in wooded area

Loran Coordinates: N 12' 43 39 99 / 6' 43 39 98 / 1.5' 43 39 98 W 88 10 20 / 88 10 23 / 88.1017

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5'	6'	12'	18'
chara		5,5,25,4			coontail	13,1			
M. exalbescens	2,3,3	1,1	1,1,2	1,1	elodea				
water celery					scirpus Sp.				
flatstem	1,1,1				P. illinois		1,1		
sago					duckweed				
richardson's	1,1,1				spirodella				
amplifolious	1,1				burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass					arrowhead				
bladderwort					filamentous				
southern niad					P. puscillus				
P. natans									
P. americanus ?									

Can tell difference where boats travel

Comments: Photo's 18 + 19 rejected

" 20 + 21 represent E + W view respectively

1.5' located in dense bed of vegetation, much diversity

12' is on a steep drop off

Long Lake Macrophyte Survey Aug 1995

Date: 14 Aug 95

Observers: Woodie Tesky

Transect # 5

Site Description: 100 yards North of fishing pier across from N. side beach

Loran Coordinates: N 18' 43 40 19 / 12' 43 40 19 / 6' 43 40 18 / 1.5 43 40 19 W 88 10 21 / 88 10 20 / 88 10 19 / 88 10 08

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5'	6'	12'	18'
chara	1,4 1	3,3,3,4 3			coontail	1,3,1 4		1 1	
M. exalbescens	4,5,5,2 4	1 1	1,5,5,3 2	1 1	elodea				
water celery					scirpus Sp.				
flatstem	1 1				P. illinois				
sago					duckweed				
richardson's					spirodella				
amplifolious	1 1				burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass	1 1				arrowhead				
bladderwort					filamentous				
southern niad					P. puscillus				
P. natans									
P. americanus ?									
Jewelweed	2								

Pictures 22 + 23 East + West at This Site, 24 is Heddie minus blowfish

Comments: Plant Community is different from Shore it is emergent, Submerged, Emerged then Submerged.

- 12' on steep Drop off
- steep drop from 8' To 22'
- Bullfrog bed ~100' from Shore

Long Lake Macrophyte Survey Aug 1995

Date: 14 Aug 95

Observers: [illegible]

Transect # 6

Site Description: Clump of [illegible], [illegible] North of Fishing Pier

Loran Coordinates:

Depth	N	W
18'	43 40 35	88 10 22
12'	43 40 35	88 10 21
6'	43 40 35	88 10 22
1.5'	43 40 20	88 10 19

SPECIES (common name)	Depth 1.5	6'	12'	18'		SPECIES (common name)	Depth 1.5	6'	12'	18'	
chara	3 / 1	3,3,5 / 3	—	—		coontail	1,1 / 1	1 / 1	|	|	
M. exalbescens	1,2,3,1 / 2	3,1 / 1	3,3,5,9 / 4	1,1 / 1		elodea			|	|	
water celery	1 / 1		|	|		scirpus Sp.			|	|	
flatstem	1 / 1	1 / 1	|	|		P. illinois			|	|	
sago			|	|		duckweed			|	|	
richardson's			|	|		spirodella			|	|	
amplifolious			|	|		burreed			|	|	
white lilly	4,4,1,2 / 3		|	|		wild rice	1		|	|	
yellow lilly			|	|		carex Sp.			|	|	
star grass			|	|		arrowhead			|	|	
bladderwort			|	|		filamentous			|	|	
southern niad	1,		|	|		P. puscillus			|	|	
P. natans	1,1 / 1		|	|					|		
P. americanus ?											

Prints Photo 1+2 are East + West

Comments: - good diversity in 1.5'

Bullrush Bed 100' from Shore, and Next to Small

Wild Rice bed to the north

Long Lake Macrophyte Survey Aug 1995

Date: [illegible]

Observers: Hoodle Survey

Transect # 7

Site Description: 200' North of point, across from large house with 7 Cedar trees. These Trees block The house's View of Lake

Loran Coordinates: N 18' 43 40 60 / 12' 43 40 59 / 6' 43 40 54 / 1.5 43 40 53 W 8888 10 08 / 8888 10 09 / 8888 10 11

SPECIES (common name)	Depth 1.5	6'	12	18'	SPECIES (common name)	Depth 1.5	6'	12	18'
chara	2,5,5,5 5				coontail			2 1	
M. exalbescens	3,5,1,1 2	2,3,4 3	2,1,1 1		elodea	1 1			
water celery					scirpus Sp.				
flatstem	1 1				P. illinois				
sago	1 1				duckweed				
richardson's					spirodella				
amplifolious	1 1				burreed				
white lilly	2,3 2				wild rice				
yellow lilly					carex Sp.				
star grass					arrowhead				
bladderwort					filamentous				
southern niad					P. puscillus				
P. natans					Butter cup	1			
P. americanus ?									

Comments: Thick bed of milfoil at The 3-5 foot depth

LOST snorkel + mask here outside 6' contour

Photo 3 milfoil mark

Photo 4+5 East and West from Transect

Long Lake Macrophyte Survey Aug 1995

Date: 14 Aug 95

Observers: [illegible]

Transect # 8

Site Description: Straight across from sandy point 1000 feet south of first [illegible] cottage (beaches between both sites)

Loran Coordinates:

Depth	N			W		
18'	43	40	75	88	10	07
12'	43	40	75	88	10	09
6'	43	40	75	88	10	06
1.5'	43	40	72	88	10	00

SPECIES (common name)	Depth 1.5'	6'	12'	18'		SPECIES (common name)	Depth 1.5	6'	12'	18'	
chara		5,3,4 3				coontail	1,2 1		1 1	1,1 1	
M. exalbescens	1,1,5 1	5 1	1,3,1,4 2			elodea					
water celery						scirpus Sp.					
flatstem						P. illinois					
sago	1,1,1 1					duckweed					
richardson's	1					spirodella					
amplifolious						burreed					
white lilly	3 3 3 3 3					wild rice					
yellow lilly	1 1					carex Sp.					
star grass	3,1,1 1					arrowhead					
bladderwort	1 1					filamentous					
southern niad	1 1					P. puscillus					
P. natans											
P. americanus ?											

Comments: Water lilly abundance noted by visual estimate at 1.5'
Picture 6-7 are E + W View

Long Lake Macrophyte Survey Aug 1995

Date: [illegible]

Observers: Aaadic Secns

Transect # 9

Site Description: 200' S[illegible] of first Cottage

Loran Coordinates: N 18' 43 46 51 / 12' 43 40 84 / 6' 43 40 83 W 88 10 12 / 88 10 10 / 88 10 06

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5'	6'	12'	18'
chara	—	5555 5	—	/	coontail	3221 2	1 1	2 1	1
M. exalbescens	1,1 1	1 1	3333 3	/	elodea				
water celery	1 1		1	/	scirpus Sp.				
flatstem	1,1 1	1 1	/	/	P. illinois				
sago	1,1 1		/	/	duckweed				
richardson's			/	/	spirodella				
amplifolious			/	/	burreed				
white lilly			/	/	wild rice				
yellow lilly	2222 2		/	/	carex Sp.				
star grass	2 1		/	/	arrowhead				
bladderwort			/	/	filamentous				
southern niad	1 1		/	/	P. puscillus				
P. natans			/	/	Buttercup	1,122 2			
P. americanus ?			/	/					

Pictures 8-9 are Transect E + W

Comments: Lilly is estimate by sight

12' is located on a steep drop off

Long Lake Macrophyte Survey Aug 1995

Date: 14 Aug 95

Observers: Woodie Seeing

Transect # 10

Site Description: Between 5th and 6th Cottage, 5th cottage is dark brown 6th cottage is white with limegreen Trim, rock riprap Shore

Loran Coordinates: N 18' 43 40 93 / 12' 43 40 93 / 1.5' 43 40 92 W 88 10 07 / 88 10 06 / 88 10 60

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5	6'	12'	18'
chara	2,4,3 3	5,5,3 3		1	coontail	1,2,1 1		3 1	
M. exalbescens	2,2 1	4 1	2 1		elodea	1,4,2, 2			
water celery					scirpus Sp.				
flatstem	1 1				P. illinois		1 1		
sago					duckweed				
richardson's					spirodella				
amplifolious	1,2 1				burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass					arrowhead				
bladderwort					filamentous				
southern niad					P. puscillus				
P. natans									
P. americanus ?									

Comments: Picture #10 is water merigold.
" #11-12 E + west Views

12' is steep drop off

Long Lake Macrophyte Survey Aug 1995

Date: 15 Aug 95

Observers: Heddie
Michelle LaBrosse

Transect # 11 NORTHERN

Site Description: 100 FT N of ~~Westerly~~ most road coming down to lake
Right in front of Cream cabin with blue Trim, weeping willow and 1 black willow next to water

Loran Coordinates: N 43° 41.11' W 088° 10.23'
43° 40.5' 88° 11.71'
43° 41.03" 88° 10.04'

SPECIES (10 OK) Depth 41.10 SPECIES 9.92 Depth

(common name)	1.5'	6'	12'	18'		(common name)	1.5'	6'	12'	18'	
chara		4 4				coontail	2 2	1	3 2	1	
M. exalbescens (milfoil)	3 3 5 4 4	2 3 2 2 3	2 1			elodea	2 1 1				
water celery						scirpus Sp.					
flatstem	1 1					P. illinois	1				
sago						duckweed					
richardson's	1 1					spirodella					
amplifolious						burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort	2 2 2					filamentous					
southern niad	1 1 1					P. puscillus					
P. natans						Buttercup	1 1				
P. americanus ?											
Cattail											

Comments: #13 looking East did NOT Turn out
Take picture, #13 & #14 are looking W.
12' contour is on a steep drop

- land owner Transplanted wetland Plants along Shoreline on 23 Aug 95

Long Lake Macrophyte Survey Aug 1995

Date: 15 Aug 95

Observers: Hoodie
Michelle LaBrosse

Transect # 12

Site Description: Half way between inlet & ditch

Loran Coordinates:

	N		W	
3'	43	40.47	88	12.20
6'	43	39.97	88	13.89
12'	43	41.21	88	9.95
18'	43	41.21	88	9.98

SPECIES (common name)	Depth 3'	6'	12'	18'	SPECIES (common name)	Depth 3'	6'	12'	18'
chara					coontail	4 1 1 3	1 1	4 3 3 3	1 1
M. exalbescens	1 1 1 1	1 1	14 3		elodea				
water celery		1 1			scirpus Sp.				
flatstem	1 2 1				P. illinois				
sago	1 1				duckweed	1 1 1			
richardson's	1 1	1 1 1			spirodella				
amplifolious		1 1			burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass		1 1			arrowhead				
bladderwort					filamentous	1 1 1 1 1		1 1	
southern niad					P. puscillus				
P. natans					Buttercup	2 2	3 3 3 5 4		
P. americanus ?									

Comments:

1.5' is closer to 3', 3' right up near shore

Stumps make rake hard to retrieve

Pictures #15 + #16, E & W respectively

12' is on a cliff

Long Lake Macrophyte Survey Aug 1995

Date: 15 Aug 95

Observers: Hoodie
Michelle Lacrosse

Transect # 13

Site Description: 100' E of pier, off of sandy hill at Boy Scout camp

1.5	43	41.33	88	10.07
6	43	41.31	88	10.08
12	43	41.23		10.13
18	43	41.25	W 88	10.05

Loran Coordinates: N

SPECIES (common name)	Depth 1.5'	6'	12'	18'		SPECIES (common name)	Depth 1.5'	6'	12'	18'	
chara		5555 5				coontail			4555 5	1	
M. exalbescens	1		1			elodea					
water celery						scirpus Sp.					
flatstem	2					P. illinois					
sago						duckweed					
richardson's						spirodella					
amplifolious						burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad						P. puscillus					
P. natans											
P. americanus ?											
Jewelweed	3										

Comments:

1.5' rubble bottom, few plants

Picture 17 is looking N.

Emergents are included on this sheet

Long Lake Macrophyte Survey Aug 1995

Date: Aug 15, '95

Observers: Hoodie
Michelle LaBrosse

Transect # 14

Site Description: S. pt., heading into Tittle Lic. (N. side of pt)

1.5	43°	39.50'	22°	12.81'
6		40.66		12.00
12		41.22		10.22
18		41.22		10.21

Loran Coordinates: N ____ W ____

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5'	6'	12'	18'
chara					coontail	1	1		
M. exalbescens	1	1	1		elodea				
water celery					scirpus Sp.				
flatstem		2			P. illinois				
sago		2	1		duckweed	1			
richardson's		1	1		spirodella				
amplifolious					burreed				
white lilly	3				wild rice				
yellow lilly					carex Sp.				
star grass	1	1			arrowhead				
bladderwort					filamentous	5	2	4	1
southern niad					P. puscillus				
P. natans					Buttercup	1	1		
P. americanus ?									

Comments:

Pictures 18 + 19, looking W + E respectively

Long Lake Macrophyte Survey Aug 1995

Date: 8/15/95

Observers: Woodie
Michelle Labrosse

Transect # 15

Site Description: Right of F, by oak

1.5'	43°	41.35'	22°	9.21'
6		40.60		10.26
12		40.49		11.93

Loran Coordinates: N 18 40.48 W 11.87

SPECIES (common name)	Depth 1.5'	6'	12'	18'		SPECIES (common name)	Depth 1.5	6'	12'	18'	
chara	2 41	5 55				coontail			1 11		
M. exalbescens	1 11 5 5 3	4	4 3 3	1		elodea					
water celery						scirpus Sp.					
flatstem						P. illinois	2 2				
sago						duckweed					
richardson's						spirodella					
amplifolious						burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad	1 11					P. puscillus					
P. natans											
P. americanus ?											
Shore Pine	1										

Comments: 1.5', some rubble, therefore less plants
12' on cliff

pictures: 20 & 21, E & W respectively

NO separate emergent shot

Long Lake Macrophyte Survey Aug 1995

Date: 8/-/95

Observers: Hardie, Michelle Lacrosse

Transect # 16

Site Description: Sand & rip rap, off of cinder box building, guard rail 100' away

Loran Coordinates: N 1.5 43 39.92 88 10.20
6 40.33 12.06
12 39.31 13.73
18 40.91 W 10.24

SPECIES (common name)	Depth 1.5	6	12	18		SPECIES (common name)	Depth 1.5	6	12	18	
chara	5555 5					coontail			25 3	1 1	
M. exalbescens	1 1	5555 5	5522 4			elodea					
water celery						scirpus Sp.					
flatstem			1 1			P. illinois					
sago						duckweed					
richardson's	1 1					spirodella					
amplifolious						burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad						P. puscillus					
P. natans						Jam weed	1				
P. americanus ?											
Joe Pie	1										

Comments: Picture: West facing #22

- Not really wetland, rip rap
- No Separate Emergent Shelf

Long Lake Macrophyte Survey Aug 1995

Date: 8 Aug 95

Observers: Hoodie
Michie + LaBrosse

Transect # 17

Site Description: 1st from [illegible] RV park boat landing on N end

Loran Coordinates: N 1.5 43 40 63 / 6 40 23 / 12 40 87 / 18 40 78 W 88 11.05 / 12.10 / 11.20 / 10.30

SPECIES (common name)	Depth 1.5	6	12	18		SPECIES (common name)	Depth 1.5	6	12	18	
chara		5555 5				coontail	1'	1' 2'			
M. exalbescens	1 3 3 2 2	2 3 3	5 5 2 2 4			elodea					
water celery						scirpus Sp.					
flatstem	1''					P. illinois	1' 1				
sago						duckweed					
richardson's	1'					spirodella					
amplifolious	2 2'					burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass	2 2					arrowhead					
bladderwort						filamentous					
southern niad						P. puscillus					
P. natans											
P. americanus ?											
Jacked	2										

Comments: Rubble

Picture 23 is looking W.

18' no veg

Long Lake Macrophyte Survey Aug 1995

Date: 24 Aug 95

Observers: Hoodie, Angie Schrauthage

Transect # 18

Site Description: 3 cedar trees South of Light blue cement block garage, 100' South of Northern edge of where slab stone retaining wall begins across Hwy 67

Loran Coordinates: N _____ W _____

SPECIES (common name)	Depth 1.5'	6	12	18	SPECIES (common name)	Depth 1.5	6	12	18
chara	3 1	4415 4			coontail	3203 3			
M. exalbescens	323 2	23 1	4434 4	4344 4	elodea				
water celery					scirpus Sp.				
flatstem	2235 3				P. illinois				
sago					duckweed				
richardson's	11 1				spirodella				
amplifolious					burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass	1 1				arrowhead	1 1			
bladderwort	1 1				filamentous	455 4			
southern niad					P. puscillus				
P. natans									
P. americanus ?									

Comments: Slide 14 is facing West

Long Lake Macrophyte Survey Aug 1995

Date: 16 Aug 95

Observers: Hoodie

Transect # 19

Site Description: 50' North of yellow cottage with 3 flags on The pier, cottage has railroad Tie Bank stabilizers.

Loran Coordinates: N 45 43 39 - 34 W 88 11 27

SPECIES (common name)	Depth 1.5	6'	12'	18'		SPECIES (common name)	Depth 1.5	6'	12'	18'	
chara	5 1	4 1	11 1			coontail					
M. exalbescens	3 4 5 2 4	5 5 1 5 4	11 2 1, 1	1 1		elodea					
water celery						scirpus Sp.					
flatstem	11 1		1 1			P. illinois					
sago						duckweed					
richardson's						spirodella					
amplifolious	1 1					burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad						P. puscillus					
P. natans											
P. americanus ?						Razor grass	1				
jewelweed	3										

Comments: 12' is on a steep drop off

Picture # 24 is looking west

- Riprap Shore, it goes from water to lawn

- No Seperate Emergent Sheet

Long Lake Macrophyte Survey Aug 1995

Date: 16 Aug 95

Observers: Hoody

Transect #20

Site Description: large weeping willow Tree in front of blue cottage, Shore stabilization is rock riprap to the south, Concrete wall at site, Sheet piling with white pole barn tin to the north

Loran Coordinates: N 18' 1.5' | 43 40 31 | 43 40 31 W 88 10 41 | 88 10 45

SPECIES (common name)	Depth 1.5	6'	12'	18'	SPECIES (common name)	Depth 1.5	6'	12'	18'
chara	–	55 5 4	–	–	coontail	1,1 1			
M. exalbescens	2 2 2 2 2	5 5 3	5 5 2 5 4	2 2 1	elodea	1 1 1 1 1			
water celery					scirpus Sp.				
flatstem	3,1 1				P. illinois				
sago	1 1				duckweed				
richardson's	1 1				spirodella				
amplifolious	1 1				burreed				
white lilly					wild rice				
yellow lilly					carex Sp.				
star grass					arrowhead				
bladderwort					filamentous			1 1	1 1
southern niad					P. puscillus				
P. natans									
P. americanus ?									

Comments: Print #25 is looking west
Slide # 1 " " "

No emergents - concrete wall

No separate sheet

Long Lake Macrophyte Survey Aug 1995

Date: 16 Aug 95

Observers: Hoodie

Transect #21

Site Description: 100' North of Mr. Ed's boat landing, between landing and beach

Loran Coordinates: N 15 18' 43 43 14 ? W 88 13 08 50 ??? > NOT Really That Far

SPECIES (common name)	Depth 1.5'	6'				SPECIES (common name)	Depth 1.5'	6'	12'		
chara	–	5 1	–	–		coontail	1,1 1				
M. exalbescens	2,2,2 2	2,5,5,5 4	2,2,3,3 3	1 1		elodea					
water celery						scirpus Sp.					
flatstem	1 1	1 1				P. illinois					
sago	1 1					duckweed					
richardson's						spirodella					
amplifolious						burreed					
white lilly						wild rice					
yellow lilly						carex Sp.					
star grass						arrowhead					
bladderwort						filamentous					
southern niad	1,1 1					P. puscillus					
P. natans											
P. americanus ?											

Comments: Slide #2 is looking west

Shore TO ~ 3' of water is rocky sand with little vegitation

No wetland - lawn mowed right up to water

Long Lake Macrophyte Survey Aug 1995

Date: 16 Aug 95

Observers: Hoodie

Transect #22

Site Description: 50' North of blacktoped private landing, Street light at landing, directly in front of Gold boat house with overhead doors, natural vegetation on shore, Jewelweed, Scirpus

Loran Coordinates: N 12' 43 39 44 / 43 39 14 W 88 10 50 / 88 11 73 — 12' depth is correct

10 for Lat long

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5'	6'	12'
chara		5,5,5 5			coontail	5,5,5 5		
M. exalbescens		2,2,2 2	3,3,1 3	2 1	elodea	1,1,1 1		
water celery					scirpus Sp.			
flatstem					P. illinois			
sago	1				duckweed			
richardson's					spirodella			
amplifolious	1				burreed			
white lilly	3				wild rice			
yellow lilly					carex Sp.			
star grass					arrowhead			
bladderwort					filamentous			
southern niad					P. puscillus			
P. natans					Jewel weed	3		
P. americanus ?					Sawtooth Redstem	2		
Softstem	3							

Comments: dense stand of amplifolius between 1.5' and 6'

milfoil Chara edge at ~ 7'

12' area is a drop from 7' - 14'

No Seperate Emergent Sheet

Long Lake Macrophyte Survey Aug 1995

Date: 8/7/95

Observers: Hoodie
Michelle LaBrosse

Transect # ~4

Site Description: [illegible] wooded [illegible] (farm house)

Loran Coordinates: N 15 40 24 39 67 39 67 W 10 61 10 55 10 55 10 58

SPECIES (common name)	Depth 1.5'	6'	12'	18'	SPECIES (common name)	Depth 1.5'	6'	12'	18'
chara	5 5 5 4	5 5 5 5			coontail	2 2	2 2		1 1
M. exalbescens	2 2 1	3 3	5 4 5 5		elodea	1 1			
water celery					scirpus Sp.				
flatstem	1 1				P. illinois				
sago		1 1			duckweed	2 2			
richardson's					spirodella				
amplifolious	1 1				burreed	1 1			
white lilly	3 3				wild rice				
yellow lilly	4 4				carex Sp.				
star grass					arrowhead				
bladderwort					filamentous				
southern niad					P. puscillus				
P. natans					Buttercup	1 1		1 1	
P. americanus ?									

Comments:

6' is on drop off

[illegible] W

No Emergent — grass cut to water