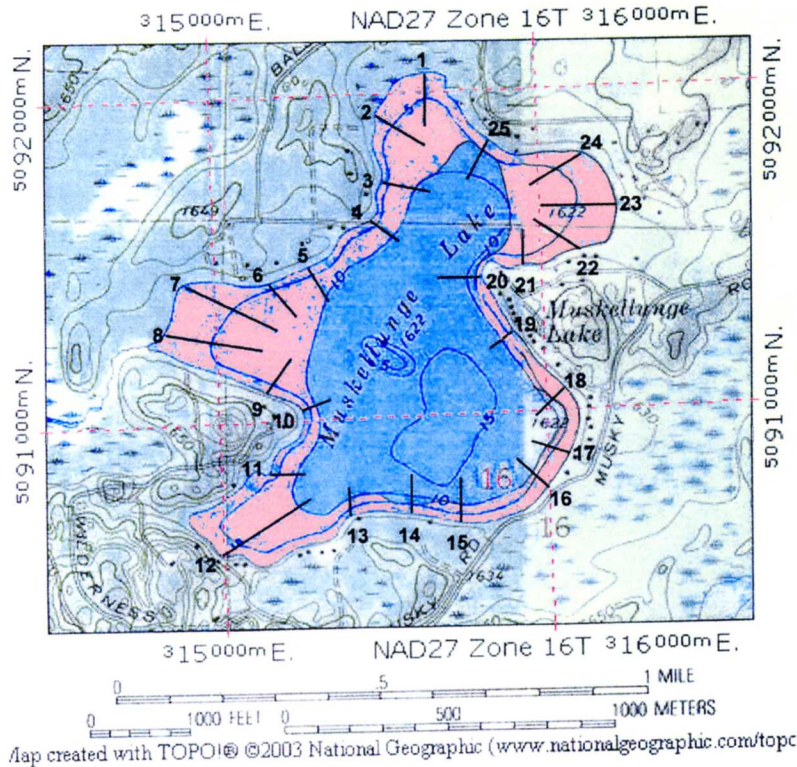


Early Summer Survey - May 25, 2004: Aquatic plants were surveyed in the early summer of 2004. The dominant plant was coontail, followed by whitestem pondweed. In May 2004, aquatic plant distribution was estimated to be at 143 acres (Figure 17). Of that coverage, plants grew to surface in a few areas.



Muskellunge Lake Transect Markers

Transect	GPS		Description
	East	North	
1	03 15 656	50 91 866	Landing.
2	03 15 602	50 91 839	Right of brown cabin.
3	03 15 640	50 91 578	Around the point, to the right of a little indentation, left of a gray shed on shore.
4	03 15 525	50 91 434	Red cabin.
5	03 15 292	50 91 391	Wooden dock with wooden porch on shore.
6	03 15 096	50 91 322	Right of brown shoreline boathouse.
7	03 14 988	50 91 296	Left of tan house and left of fallen trees.
8	03 14 988	50 91 268	Right into a dam.
9	03 15 100	50 91 210	Half way up peninsula.
10	03 15 331	50 91 087	On point.
11	03 15 257	50 90 833	Red house with second story white railing.
12	03 15 147	50 90 700	Down middle of bay.
13	03 15 314	50 90 771	Off of the point.
14	03 15 550	50 90 822	Right of shoreline bird house on pole.
15	03 15 775	50 90 810	Left of last dock, right of aeration system.
16	03 15 892	50 90 903	Right of log sided cabin.
17	03 15 954	50 90 967	Left of shoreline fish cleaning house.
18	03 15 866	50 91 073	Right of shoreline light house, by tan rambler.
19	03 15 848	50 91 191	Wooden steps down to lake with deck, green house.
20	03 15 755	50 91 341	Tan house with gazebo on the point.
21	03 15 835	50 91 529	First dock after the point.
22	03 15 986	50 91 570	Red cabin half log siding.
23	03 16 050	50 91 631	House with black paint job.
24	03 16 063	50 91 683	Gray house with gray garage.
25	03 15 732	50 91 743	Right of eagle's nest.

Figure 17. Aquatic plant coverage on Muskellunge Lake on May 25, 2004.

A summary of aquatic plant statistics is shown in Table 9 and line drawings of common Muskellunge Lake aquatic plants are shown on the next page.

Table 9. Early summer aquatic plant survey summary.

	All Stations
Number of submerged aquatic plant species found	9
Common plant species	Coontail, whitestem pondweed
Rarest plant	Floatingleaf pondweed, claspingleaf, fern pondweed
Maximum depth of plant growth	9



Figure 18. Coontail is sampled on the rake at a density of 4 on Muskellunge Lake.

Common Plants in Muskellunge Lake

Coontail



Coontail (*Ceratophyllum demersum*) is dominant in all water depths.

Cabbage



Cabbage (*Potamogeton amplifolius*) is present in all water depths.



Figure 19. [top] Two common plant species found in Muskellunge Lake in May 2004. [bottom] Here a Muskellunge Lake volunteer holds a sample of whitestem pondweed.

Table 10. Muskellunge Lake aquatic plant occurrences and densities for the May 25, 2004 survey based on 25 transects and 2 depths, for a total of 50 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-5 feet (n= 25)			Depth 6-10 feet (n= 25)			All Stations (n= 50)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Spatterdock (<i>Nuphar variegatum</i>)	3	12	1.5	--	--	--	3	6	1.5
White waterlily (<i>Nymphaea sp</i>)	5	20	0.7	--	--	--	5	10	0.7
Floatingleaf burreed (<i>Sparganium sp</i>)	1	4	0.5	--	--	--	1	2	0.5
Coontail (<i>Ceratophyllum demersum</i>)	16	64	1.8	21	84	1.6	37	74	1.7
Elodea (<i>Elodea canadensis</i>)	9	36	1.0	3	12	0.5	12	24	0.9
Northern watermilfoil (<i>Myriophyllum sibiricum</i>)	1	4	0.5	--	--	--	1	2	0.5
Cabbage (<i>Potamogeton amplifolius</i>)	9	36	1.1	4	16	0.8	13	26	1.0
Whitestem pondweed (<i>P. praelongus</i>)	5	20	0.7	9	36	0.8	14	28	0.8
Claspingleaf pondweed (<i>P. richardsonii</i>)	1	4	1.0	--	--	--	1	2	1.0
Fern pondweed (<i>P. robbinsii</i>)	--	--	--	1	4	0.5	1	2	0.5
Flatstem pondweed (<i>P. zosteriformis</i>)	4	16	0.8	--	--	--	4	8	0.8
Water stargrass (<i>Zosterella dubia</i>)	8	32	0.9	--	--	--	8	16	0.9

Table 11. Individual transect data for Muskellunge Lake for May 25, 2004.

	T1		T2		T3		T4		T5		T6		T7	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Floatingleaf burreed														0.5
Cabbage	1										0.8			
Claspingleaf pondweed					1									
Coontail	2.25	1	0.5	2	1	1	0.5	0.5	0.5	1	2	1.5	2.5	
Elodea	0.5		2.5	0.5	0.5	0.5			0.5				1	
Fern pondweed				0.5										
Flatstem pondweed														
Northern watermilfoil														
Spatterdock													0.5	
Water stargrass					1				0.5					
White waterlily	0.5										1		0.5	
Whitestem pondweed			0.5								1	0.5		1
No plants														

	T8		T9		T10		T11		T12		T13		T14	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Floatingleaf burreed														
Cabbage		1		1				0.8		0.5				0.5
Claspingleaf pondweed														
Coontail	2	3.5	2	2.5	1	3	1	2.3	2		0.5	1		
Elodea	2		0.5					1.3						
Fern pondweed														
Flatstem pondweed			0.5						1.3				0.5	
Northern watermilfoil					0.5									
Spatterdock									1					
Water stargrass					0.5									
White waterlily													0.5	
Whitestem pondweed		1		1					0.5	0.5	0.5			
No plants														X

	T15		T16		T17		T18		T19		T20		T21	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Floatingleaf burreed														
Cabbage			1				1				1		1	
Claspingleaf pondweed														
Coontail		2.3	0.5	1		0.5				0.5			3.5	1
Elodea				0.5										
Fern pondweed														
Flatstem pondweed													1	
Northern watermilfoil														
Spatterdock	3													
Water stargrass					0.5		1		0.5		2			
White waterlily													1	
Whitestem pondweed		0.5												0.5
No plants								X			X			

	T22		T23		T24		T25	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Floatingleaf burreed								
Cabbage	2.3				1			
Claspingleaf pondweed								
Coontail	1.5	3	2	2	4	2.3		
Elodea							0.5	
Fern pondweed								
Flatstem pondweed								
Northern watermilfoil								
Spatterdock								
Water stargrass							1	
White waterlily								
Whitestem pondweed		1	1	1				
No plants								X

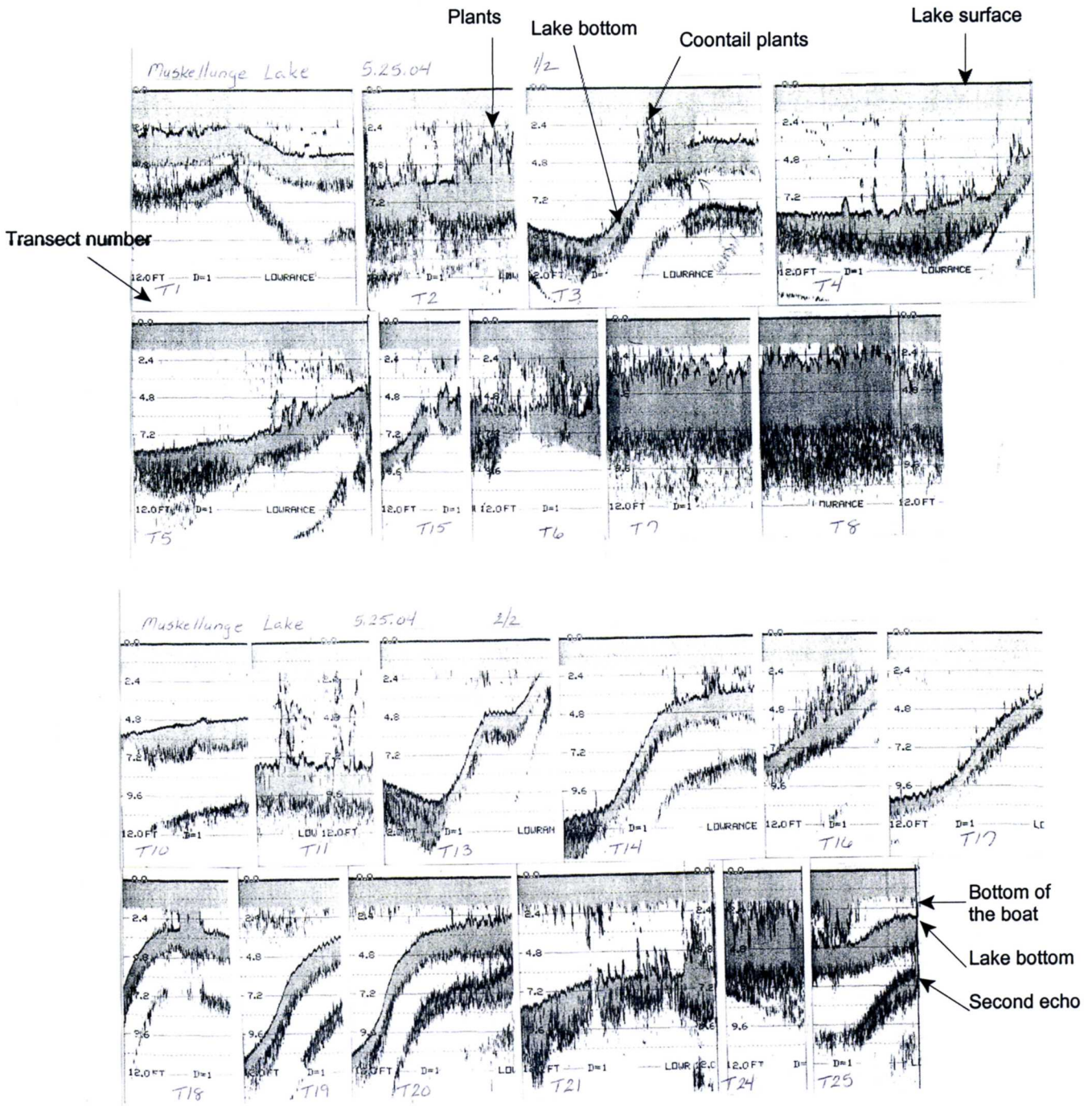


Figure 20. Sonar graphs show the aquatic plant canopy in Muskellunge Lake on May 25, 2004.

Late Summer Survey - August 25, 2004: On August 25, 2004 the dominant aquatic plant was coontail (Table 12).

In August 2004 aquatic plant distribution was estimated to be at 145 acres (Figure 21). Of that coverage, there were only a few areas where native plants grew to the lake surface.

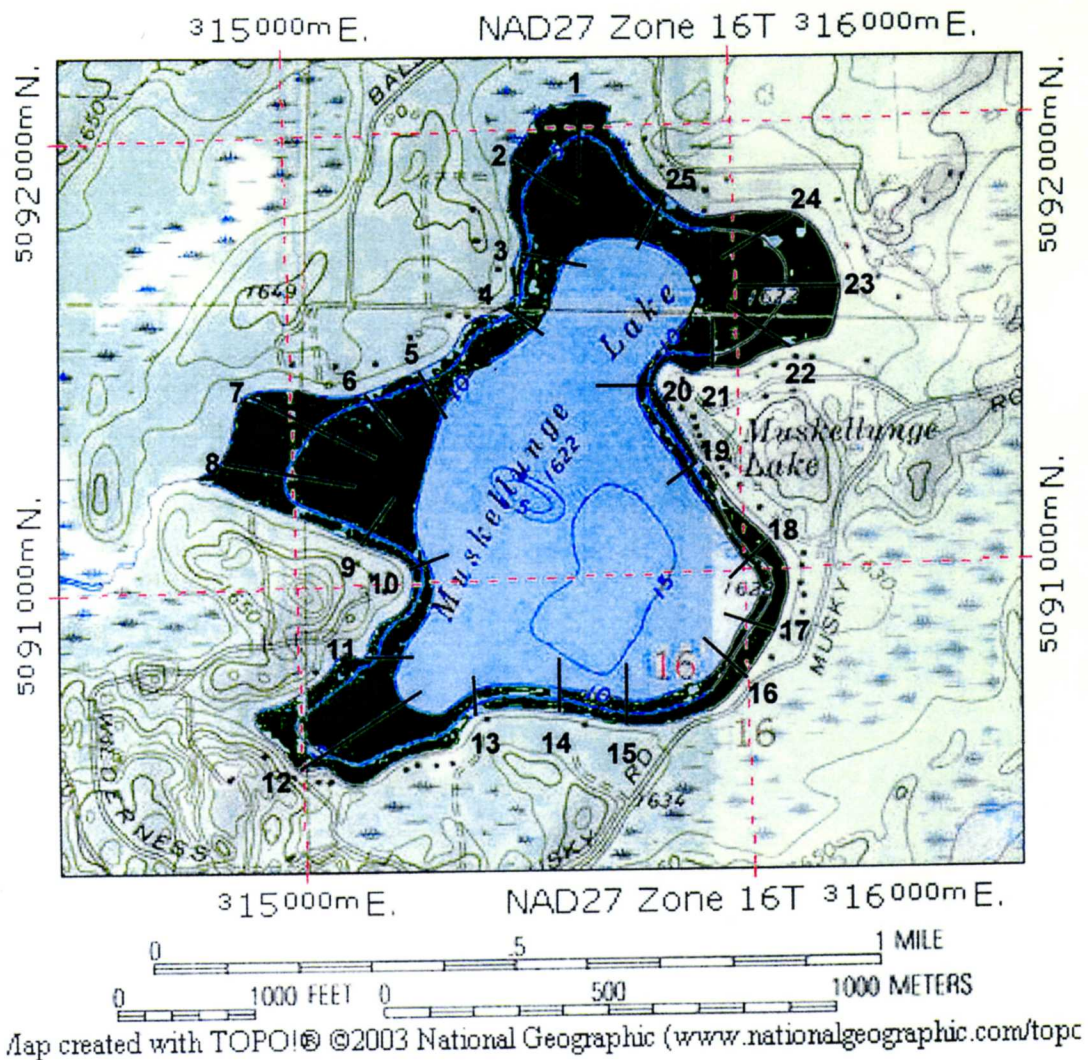


Figure 21. Aquatic plant coverage on Muskellunge Lake on August 25, 2004.

A summary of aquatic plant statistics is shown in Table 12 and line drawings of common Muskellunge Lake aquatic plants are shown on the next page.

Table 12. Early summer aquatic plant survey summary.

	All Stations
Number of submerged aquatic plant species found	13
Common plant species	Coontail, elodea
Rarest plant	Stonewort, fern pondweed
Maximum depth of plant growth	9



Figure 22. Aquatic plants on a sample rake on August 25, 2004. Whitestem pondweed is shown on the left and coontail is on the right.

Common Plants in Muskellunge Lake

Coontail



Coontail (*Ceratophyllum demersum*) is dominant in all water depths.

Elodea



Elodea (*Elodea canadensis*) is present in all water depths.



Figure 23. [top] Two of the common plants found in Muskellunge Lake on August 25, 2004. [bottom] Fern pondweed mixed in with cabbage was common in the August 25 Muskellunge Lake aquatic plant survey.

Table 13. Muskellunge Lake aquatic plant occurrences and densities for the August 25, 2004 survey based on 25 transects and 2 depths, for a total of 50 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-5 feet (n= 25)			Depth 6-10 feet (n= 25)			All Stations (n= 50)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Sedges (<i>Carex sp</i>)	1	4	0.5	--	--	--	1	2	0.5
Arrowhead (<i>Sagittaria sp</i>)	1	4	0.5	--	--	--	1	2	0.5
Bulrush (<i>Scirpus sp</i>)	6	24	0.8	--	--	--	6	12	0.8
Cattails (<i>Typha sp</i>)	2	8	0.5	--	--	--	2	4	0.5
Wild rice (<i>Zizania aquatica</i>)	1	4	0.5	--	--	--	1	2	0.5
Spatterdock (<i>Nuphar variegatum</i>)	6	24	1.2	--	--	--	6	12	1.2
White waterlily (<i>Nymphaea sp</i>)	6	24	0.8	1	4	0.5	7	14	0.8
Coontail (<i>Ceratophyllum demersum</i>)	20	80	1.8	20	80	2.3	40	80	2.0
Elodea (<i>Elodea canadensis</i>)	14	56	0.8	10	4	0.9	24	48	0.8
Water marigold (<i>Bidens Beckii</i>)	3	12	0.7	--	--	--	3	6	0.7
Northern watermilfoil (<i>Myriophyllum sibiricum</i>)	13	52	0.7	1	4	1.0	14	28	0.7
Naiads (<i>Najas flexilis</i>)	1	4	1.0	3	12	1.2	4	8	1.1
Stonewort (<i>Nitella sp</i>)	1	4	2.0	--	--	--	1	2	2.0
Cabbage (<i>Potamogeton amplifolius</i>)	14	56	1.0	1	4	1.0	15	30	1.0
Whitestem pondweed (<i>P. praelongus</i>)	1	40	0.6	11	44	1.2	21	42	0.9
Fern pondweed (<i>P. robbinsii</i>)	1	4	0.5	--	--	--	1	2	0.5
Stringy pondweed (<i>P. sp</i>)	6	24	0.8	2	8	0.8	8	16	0.8
Flatstem pondweed (<i>P. zosteriformis</i>)	18	72	0.9	3	12	1.7	21	42	1.0
Water celery (<i>Vallisneria americana</i>)	14	56	0.8	4	16	0.9	18	36	0.8
Water stargrass (<i>Zosterella dubia</i>)	3	12	0.7	--	--	--	3	6	0.7

Table 14. Individual transect data for Muskellunge Lake for August 25, 2004.

	T1		T2		T3		T4		T5		T6		T7	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Sedges											0.5			
Arrowhead														0.5
Bulrush					0.5		0.5		1					
Cattails														0.5
Wild rice			0.5											
Spatterdock			1											0.5
White waterlily							0.5				0.5			0.5
Coontail	0.5	2	1	4	1.5	2	1.5	2	1	1.5	3	2	3	3
Elodea	0.5	2	0.5		0.5	0.5	0.5	0.5		0.5			1.5	1
Water marigold					0.5						0.5			
Northern watermilfoil			0.5		0.5		0.5		1		0.5		0.5	
Naiads														
Stonewort														
Cabbage	1		1				0.5				1		1	
Whitestem pondweed		1		1						0.5	0.5	1	0.5	
Fern pondweed							0.5							
Stringy pondweed								0.5	1	1				
Flatstem pondweed	0.5				0.5								1	
Water celery	0.5				0.5		1	1			1			
Water stargrass							0.5				0.5			
No plants														

	T8		T9		T10		T11		T12		T13		T14	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Sedges														
Arrowhead														
Bulrush														
Cattails							0.5							
Wild rice														
Spatterdock							1							2
White waterlily							1		1.5	0.5				
Coontail	2.5	3.5	1	2			1.5	2	1.5	2.5			1	1
Elodea	1		1	1	0.5				1			0.5		
Water marigold			1											
Northern watermilfoil	1		1				1						1	
Naiads												1.5		1
Stonewort											2			
Cabbage	1		1						1					
Whitestem pondweed	0.5			2			0.5	2.5	0.5	0.5			1	1
Fern pondweed														
Stringy pondweed			1											
Flatstem pondweed	1	2	1		1		0.5		1.5				1	
Water celery	1				1	1					1	0.5		
Water stargrass					1									
No plants														

Table 14. Individual transect data for Muskellunge Lake for August 25, 2004 concluded.

	T15		T16		T17		T18		T19		T20		T21	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Sedges														
Arrowhead														
Bulrush											0.5			
Cattails														
Wild rice														
Spatterdock														
White waterlily														
Coontail	3	2		1	0.5	2					0.5		2	2
Elodea					1	0.5							1.5	1
Water marigold														
Northern watermilfoil	0.5	1												
Naiads											1	1		
Stonewort														
Cabbage			1				1							
Whitestem pondweed	1	1	0.5	2										
Fern pondweed														
Stringy pondweed	0.5				0.5				1					
Flatstem pondweed					0.5		1		1		1	2	1	
Water celery	1	1	0.5		0.5		1		1		0.5		1	
Water stargrass														
No plants								X		X				

	T22		T23		T24		T25	
	0-5	6-10	0-5	6-10	0-5	6-10	0-5	6-10
Sedges								
Arrowhead								
Bulrush	1						1.5	
Cattails								
Wild rice								
Spatterdock	1.5		1					
White waterlily			1					
Coontail	3.5	3	2.5	3	3	2	1	3
Elodea			0.5		1	1	0.5	
Water marigold								
Northern watermilfoil	0.5				0.5			
Naiads								
Stonewort								
Cabbage	1		1	1	1		1.5	
Whitestem pondweed	0.5	1			0.5			
Fern pondweed								
Stringy pondweed							0.5	
Flatstem pondweed	0.5		1		1	1	1	
Water celery								
Water stargrass								
No plants								

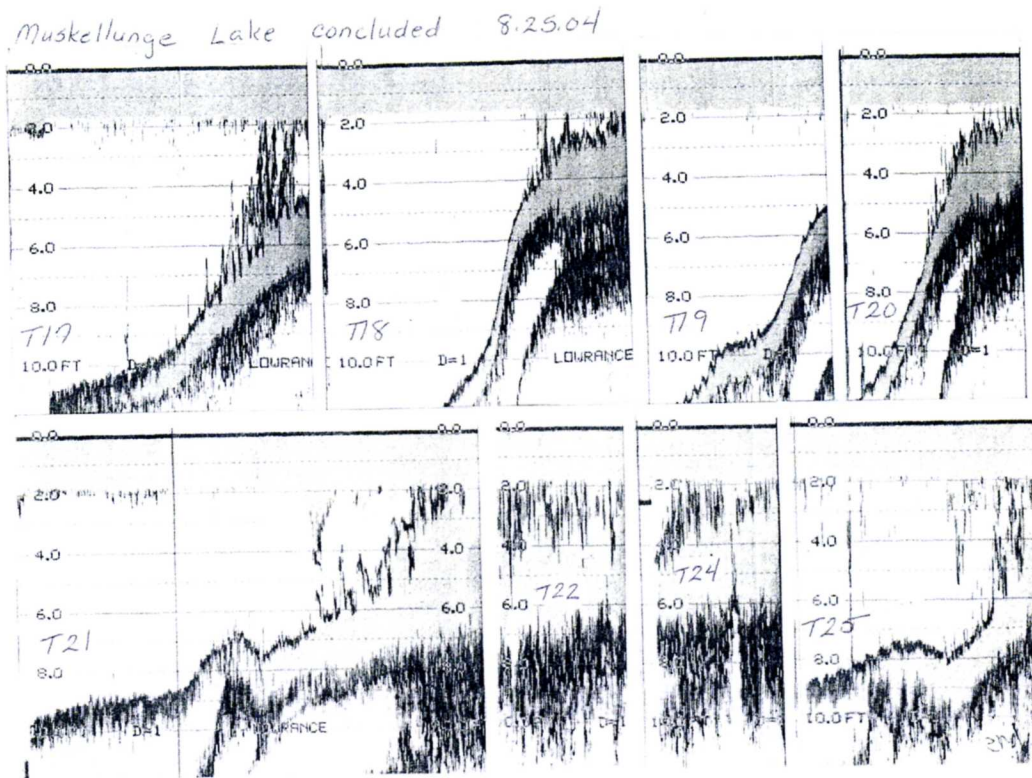
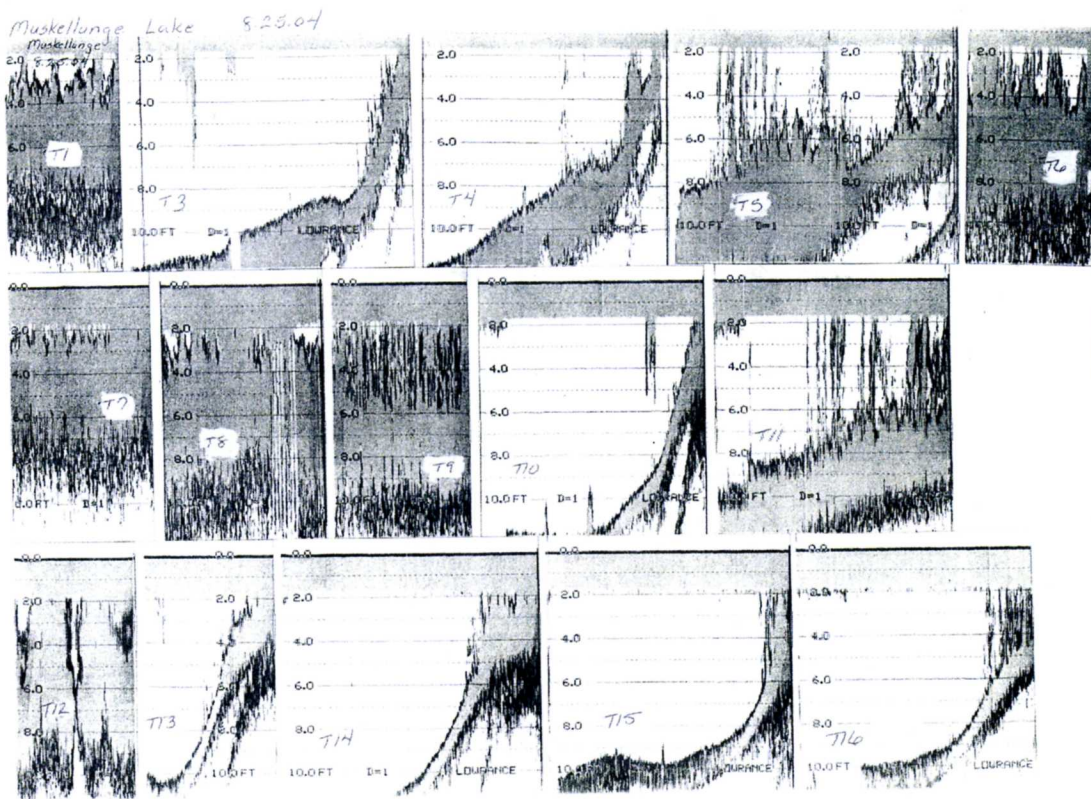


Figure 24. Sonar graphs show the aquatic plant canopy in Muskellunge Lake on August 25, 2004.

4.7. Fishery Status (prepared by WDNR)

The fishery status of Muskegon Lake has been characterized by the WDNR. Currently, the lake is managed for walleyes and muskies. These two species are stocked into the lake. The results of a boomshocker survey revealed a couple of findings. Walleyes are naturally reproducing in Muskegon Lake. However, the overall walleye and muskie catch rate is considered low.

Walleye recruitment survey conducted on October 4, 2000. Sampling was conducted using a boomshocker for 1.5 hours and 3.6 miles of shoreline (full shoreline) were sampled.

Species	Number Caught	Size Range	Catch/Unit	
Walleye (age 0+)	47	5.3 - 7.3	31/hour	13.1/mile
Walleye (other)	52	10.2 - 20.9	35/hour	14.4/mile
Largemouth Bass	3	2.6 - 6.9	2/hour	0.8/mile
Muskegon	1	16.0 - 16.4	0.7/hour	0.3/mile
Walleye (age 1+)	0	--	--	--
Smallmouth	0	--	--	--
Northern pike	0	--	--	--

Several other fish species are present in Muskegon Lake and panfish are abundant.

It's possible that the abundance of bluegills could be impacting water clarity. In some lakes, this sequence occurs: too few gamefish (walleyes, bass, etc) are present to keep the numbers of smaller fish in check. Therefore, the number of smallfish, such as bluegills, increase in number. One of the food items in a bluegill's diet is zooplankton. Zooplankton, especially daphnia, which are about the size of a pinhead, are good grazers on algae. High numbers of bluegills will keep the daphnia numbers down, and algae numbers can increase. To reduce algae, sometimes enhancing the gamefish population will reduce the panfish numbers and zooplankton will increase and algae numbers will decrease. This may be a future biomanipulation project.