Frederic Remington: *Radisson and Groseilier,* **1905**

Aquatic Plant Surveys for Lee Lake, Lakeville, Minnesota, 2008

Summer Surveys: May 30 and September 2, 2008

Prepared for:
City of Lakeville
Lakeville, Minnesota

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Aquatic Plant Surveys for Lee Lake, Lakeville, Minnesota, 2008

Summary

Two aquatic plant surveys were conducted on Lee Lake in 2008. The early summer survey of May 30 emphasized the distribution and abundance of curlyleaf pondweed. The late summer survey of September 2 was to characterize any changes in the plant community and to scout for Eurasian watermilfoil. For each survey, 10 transects and 2 depths were checked.

Curlyleaf pondweed was the most common plant in Lee Lake in early summer and showed up at 80% of the stations (Table 1). In the early summer of 2008, curlyleaf pondweed was found around the perimeter of Lee Lake and out to about 9-feet of water. Coontail was found growing to 11 feet of water (Figure 1). Curlyleaf pondweed covered approximately 15 acres out of the 21 acre lake with nuisance coverage of about 4 acres.

In September, coontail was the most common plant followed by northern watermilfoil. Coontail did not grow to the nuisance conditions that curlyleaf pondweed did in the early summer survey. Eurasian watermilfoil was not found in Lee Lake in 2008. The acreage of aquatic submerged plants in Lee Lake in late summer was about 13 acres with coontail dominating the plant community.

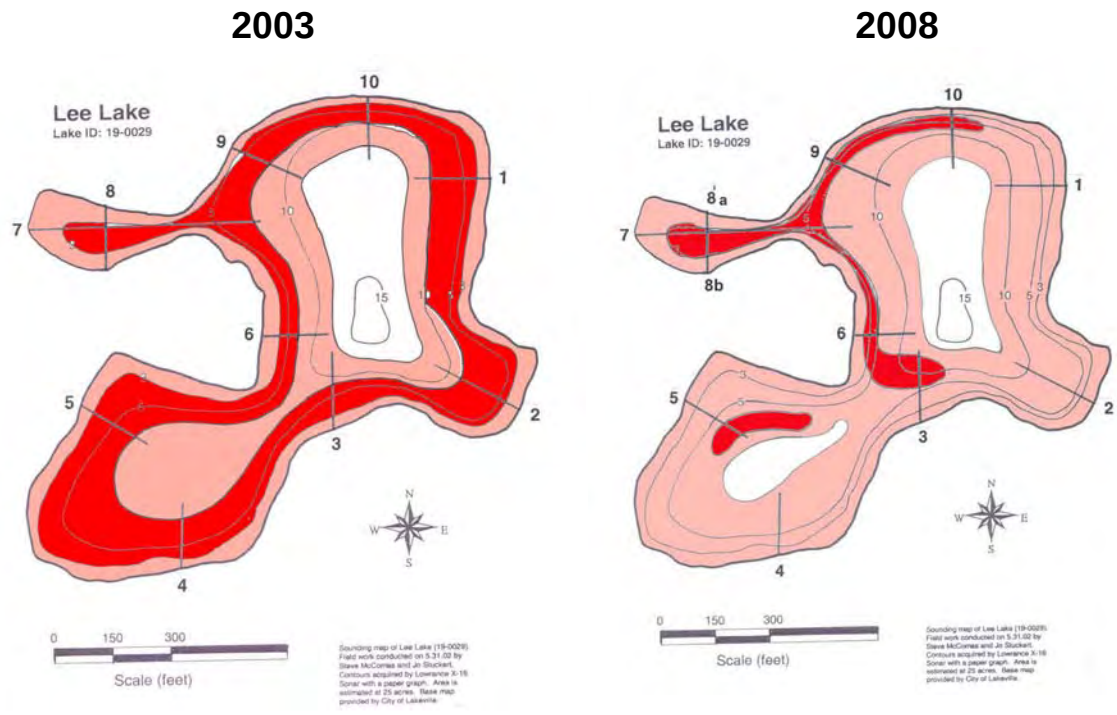

Figure 1. The coverage of aquatic plants in May of 2003 and 2008. Pink shading indicates either curlyleaf pondweed or coontail growth and nuisance curlyleaf pondweed is shown in red shading. It is estimated that nuisance curlyleaf pondweed covered 8 acres in 2003 and 3.5 acres in 2008.

Table 1. The percent occurrence of aquatic plants for Lee Lake in 2003 and 2008. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station on transects divided into the number of total stations for the survey. For example, if milfoil was found in 25 out of 50 stations, its percent occurrence would be 50%.

	May 31, 2003 (% occur)	May 30, 2008 (% occur)	Sept 25, 2003 (% occur)	Sept 2, 2008 (% occur)	Changes from 2003 to 2008
Duckweed	--	--	5	10	+
Cabbage	5	--	--	--	-
Chara	5	--	--	5	-
Coontail	65	75	85	85	0
Curlyleaf pondweed	90	80	5	--	-
Flatstem pondweed	--	--	15	5	-
Naiads	--	--	30	5	-
Northern watermilfoil	--	--	35	5	-
Sago pondweed	--	--	5	--	-
Spike rush	--	--	5	--	-
Stringy pondweed	5	5	25	40	+
Water stargrass	5	--	50	--	-
Filamentous algae	25	5	5 - benthic 5 - floating	10	

Conclusions and Recommendations

In Lee Lake, plant diversity is fair with twelve aquatic plant species found over the summer. Curlyleaf pondweed, a non-native plant grows to nuisance conditions in some areas of Lee Lake.

The extent of nuisance curlyleaf growth in 2008 is less compared to 2003. Iron filings were added to a total of 2 acres in Lee Lake on March 10, 2004 with the objective to control curlyleaf pondweed. Iron was added to the south of Transect 5. Nuisance curlyleaf was not observed in that area in 2008, although it was present prior to the iron treatment in 2003. However, nuisance curlyleaf was not observed at transects 1 and 2 and no iron was added there. The impact of iron filings to control curlyleaf is possible, but not certain. It is recommended that aquatic plant surveys continue on an annual basis to characterize curlyleaf distribution and abundance and to monitor other native plant species dynamics.

Lee Lake Dakota County (ID: 19-29)

Size: 21 acres
Maximum depth: 17 ft

Introduction

Lee Lake is a 21 acre moderately fertile lake in Lakeville, Minnesota. There is no public access on Lee Lake. The shoreline is primary urban development.

The plants of Lee Lake were sampled to evaluate curlyleaf pondweed and to look for Eurasian watermilfoil. Eurasian watermilfoil was confirmed in Lake Marion by the MnDNR in 1998. Eurasian watermilfoil has not been found in Lee Lake (as of September 2, 2008). Steve McComas, Blue Water Science, conducted two aquatic plant surveys on May 30 and September 2, 2008.

Methods

Ten transects were made at different locations around Lee Lake. A transect started at the weedline and headed into shore (Figure 1). Two depths along the transect were sampled with a rake to assess the aquatic plant composition. The amount of plants on the rake determined the density of each species at that location. Low density rated a "1" and a high density was a "5".

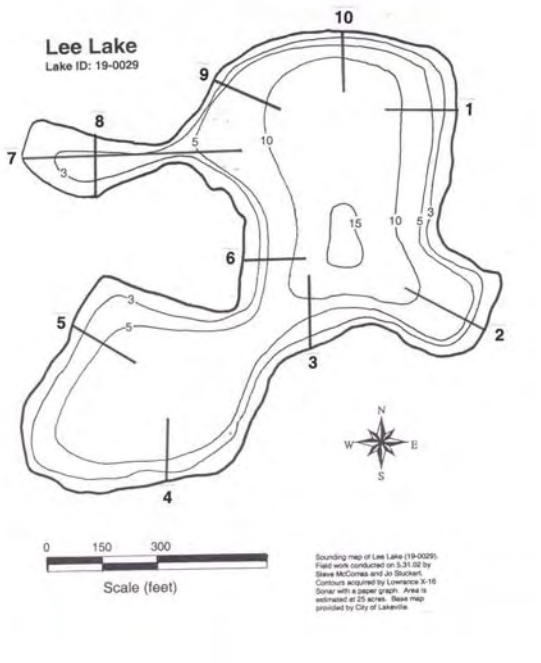

Figure 1. Transects for plant surveys on May 30 and September 2, 2008.

Results: May 30 -- Early Summer Survey

No Eurasian watermilfoil was found in this survey. The most abundant plant was curlyleaf pondweed and it was found at 80% of the 20 stations (Table 1). Overall aquatic plants grew to a depth of 11 feet. The occurrence and density of aquatic plants for each transect is shown in Table 2. An aquatic plant coverage map is shown in Figure 2. Curlyleaf pondweed coverage is basically the same as the aquatic plant coverage map. Curlyleaf coverage is 15 acres and nuisance curlyleaf pondweed covers about 3.5 acres of the 21 acre Lee Lake.

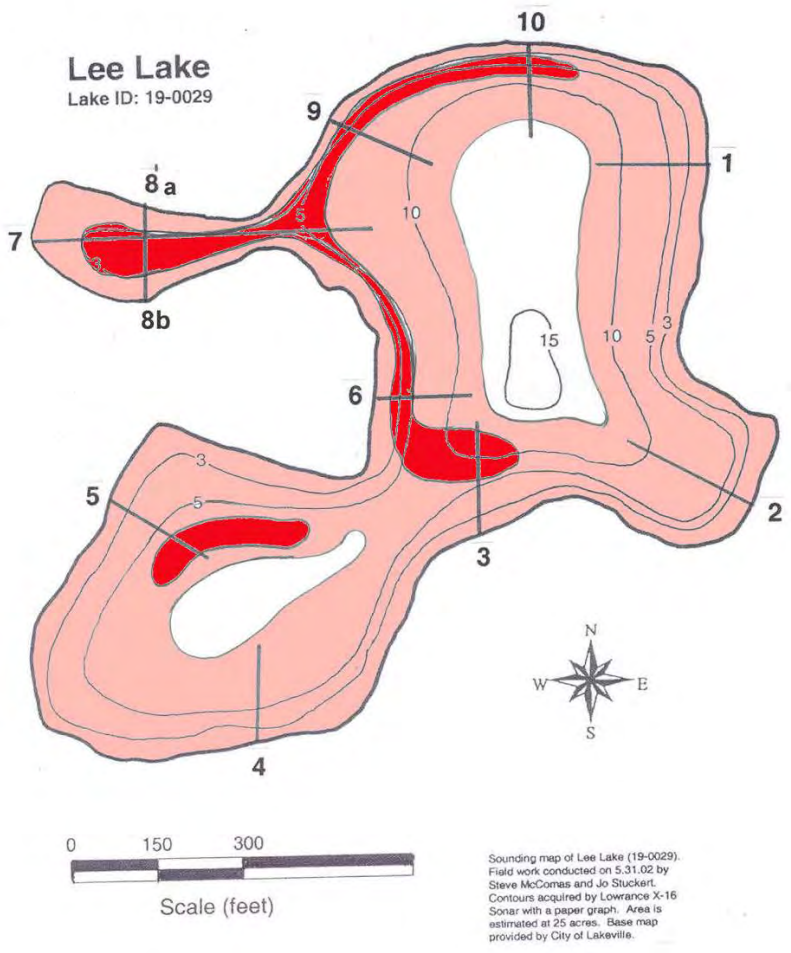

Figure 2. Aquatic plant coverage and curlyleaf coverage on May 31, 2003. Dark color represents nuisance curlyleaf growth. Lighter shading represents non-nuisance curlyleaf growth along with other plants.

Table 1. Lee Lake aquatic plant occurrences and densities for the May 30, 2008 survey based on twelve transects and two depths, for a total of 24 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-5 feet (n=10)			Depth 6-12 feet (n=10)			All Stations (n=20)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	8	80	1.4	7	70	2.2	15	75	1.7
Curlyleaf pondweed (*P. crispus*)	9	90	2.7	7	70	17.1	16	80	2.6
Stringy pondweed (*P. strictifolius*)	1	10	1.0	--	--	--	1	5	1.0
Filamentous algae	1	10	1.0	--	--	--	1	5	1.0

Table 2. Individual transect data for Lee Lake for May 30, 2008.

	T1		T2		T3		T4		T5	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Coontail	2	2.5	2	2.7	1	1	2	3	1	4
Curlyleaf pondweed	2	0.5	0.5	0.3		4	0.5		0.5	
Stringy pondweed					1					
Filamentous algae	1									

	T6		T7		T8		T9		T10	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Coontail	1	1					1		1	1
Curlyleaf pondweed	4.5	3	4.5	4.5	4		4.5	1.3	4	3.5
Stringy pondweed										
Filamentous algae										

Results: September 2 -- Late Summer Survey

No Eurasian watermilfoil was found in this survey. Overall, aquatic plants grow to a depth of 11 feet. The occurrence and density of plants for each transect is shown in Table 3. A map of aquatic plant coverage is shown in Figure 3. Aquatic plants covered about 13 acres.

The dominant plants in September are coontail (Table 4). Typical plant conditions in September are shown in Figure 4.

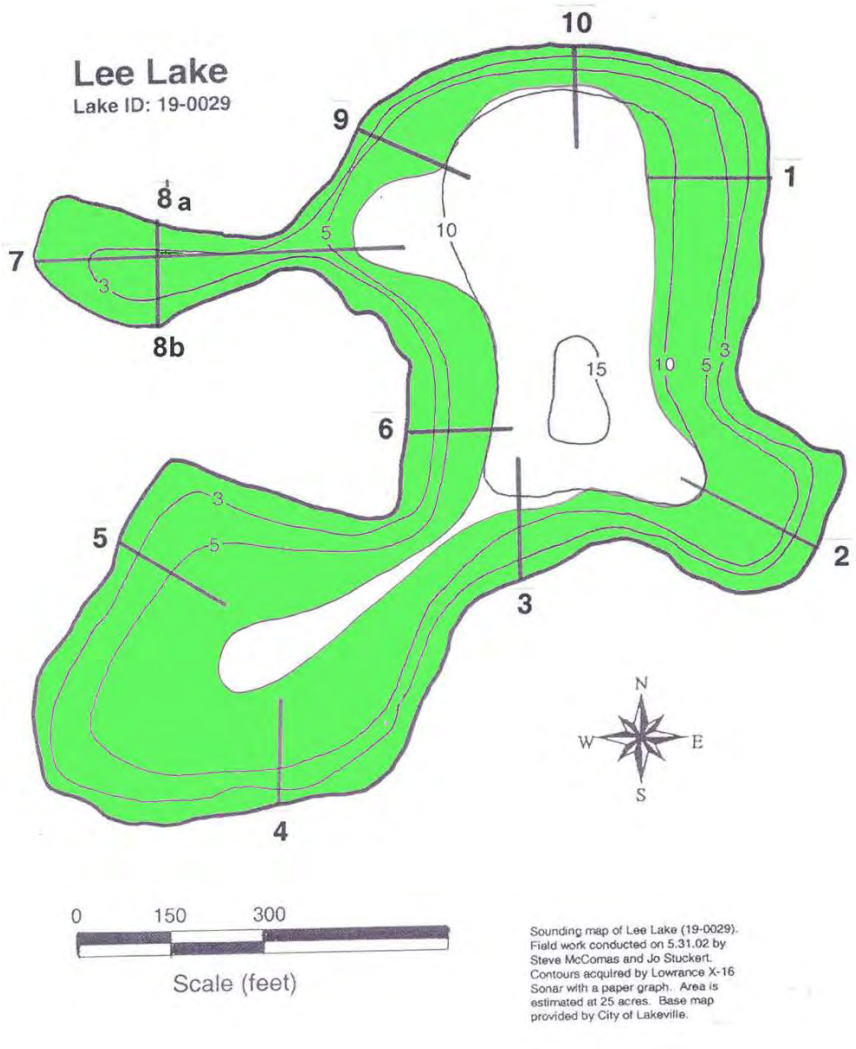

Figure 3. Aquatic plant coverage map for Lee Lake on September 2, 2008. The green area shows coverage of aquatic plants.

Table 3. Lee Lake aquatic plant occurrences and densities for the September 2, 2008 survey based on ten transects and two depths, for a total of 20 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-5 feet (n=10)			Depth 6-12 feet (n=10)			All Stations (n=20)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Duckweed (*Lemna sp*)	2	20	1.5	--	--	--	2	10	1.5
Coontail (*Ceratophyllum demersum*)	9	90	2.9	8	80	2.0	17	85	2.5
Chara (*Chara sp*)	1	10	1.5	--	--	--	1	5	1.5
Northern watermilfoil (*Myriophyllum sibiricum*)	1	10	0.5	--	--	--	1	5	0.5
Naiads (*Najas sp*)	1	10	0.5	--	--	--	1	5	0.5
Flatstem pondweed (*Potamogeton zosteriformis*)	--	--	--	1	10	1.0	1	5	1.0
Stringy pondweed (*P. strictifolius*)	5	50	1.9	3	30	0.6	8	40	1.4
Filamentous algae	2	20	1.3	--	--	--	2	10	1.3

Table 4. Individual transect data for Lee Lake for September 2, 2008.

	T1		T2		T3		T4		T5	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Duckweed	1									
Coontail	3	1.5	4	0.5	4	3	2	2	3	2
Chara										
Northern watermilfoil	0.5									
Naiads	0.5									
Flatstem pondweed				1						
Stringy pondweed									0.5	0.5
Filamentous algae	0.5									

	T6		T7		T8		T9		T10	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Duckweed									2	
Coontail	2.5	2	1.5				2	2.5	4	2.5
Chara	1.5									
Northern watermilfoil										
Naiads										
Flatstem pondweed										
Stringy pondweed	0.5	0.3	1.5	1	3		4			
Filamentous algae									2	

Comparison of Early and Late Summer Plants in 2003 and 2008

In the early summer of 2003, Curlyleaf pondweed was found around the perimeter of Lee Lake and out to about 12 feet of water although it was a nuisance in water depths of under 9 feet. In 2008, curlyleaf pondweed was still the dominant plant in early summer with growth out to a depth of 9 feet. Coontail was found out to 11 feet.

In the early part of September 2003, curlyleaf pondweed distribution was down and coontail was the most common plant followed by water stargrass (Table 5). In 2008, curlyleaf pondweed was not present in September and coontail was the dominant plant showing up in 85% of the stations and out to a depth of 11 feet.

The species composition changed from 2003 to 2008. Some plant species were not present in 2008 that were present in 2003 including cabbage, sago pondweed, spike rush, and water stargrass.

Table 5. The percent occurrence of aquatic plants for Lee Lake in 2003 and 2008. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station on transects divided into the number of total stations for the survey. For example, if milfoil was found in 25 out of 50 stations, its percent occurrence would be 50%.

	May 31, 2003 (% occur)	May 30, 2008 (% occur)	Sept 25, 2003 (% occur)	Sept 2, 2008 (% occur)	Changes from 2003 to 2008
Duckweed	--	--	5	10	+
Cabbage	5	--	--	--	-
Chara	5	--	--	5	-
Coontail	65	75	85	85	0
Curlyleaf pondweed	90	80	5	--	-
Flatstem pondweed	--	--	15	5	-
Naiads	--	--	30	5	-
Northern watermilfoil	--	--	35	5	-
Sago pondweed	--	--	5	--	-
Spike rush	--	--	5	--	-
Stringy pondweed	5	5	25	40	+
Water stargrass	5	--	50	--	-
Filamentous algae	25	5	5 - benthic 5 - floating	10	

Conclusions and Recommendations

In Lee Lake, plant diversity is fair with twelve aquatic plant species found over the summer. Curlyleaf pondweed, a non-native plant grows to nuisance conditions in some areas of Lee Lake.

The extent of nuisance curlyleaf growth in 2008 is less compared to 2003. Iron filings were added to a total of 2 acres in Lee Lake on March 10, 2004 with the objective to control curlyleaf pondweed. Iron was added to the south of Transect 5. Nuisance curlyleaf was not observed in that area in 2008, although it was present prior to the iron treatment in 2003. However, nuisance curlyleaf was not observed at transects 1 and 2 and no iron was added there. The impact of iron filings to control curlyleaf is possible, but not certain. It is recommended that aquatic plant surveys continue on an annual basis to characterize curlyleaf distribution and abundance and to monitor other native plant species dynamics.

Figure 4. Stringy pondweed found in the September 2008 aquatic plant survey.

APPENDIX

2003 Aquatic Plant Data

May 31, 2003 -- Early Summer Survey

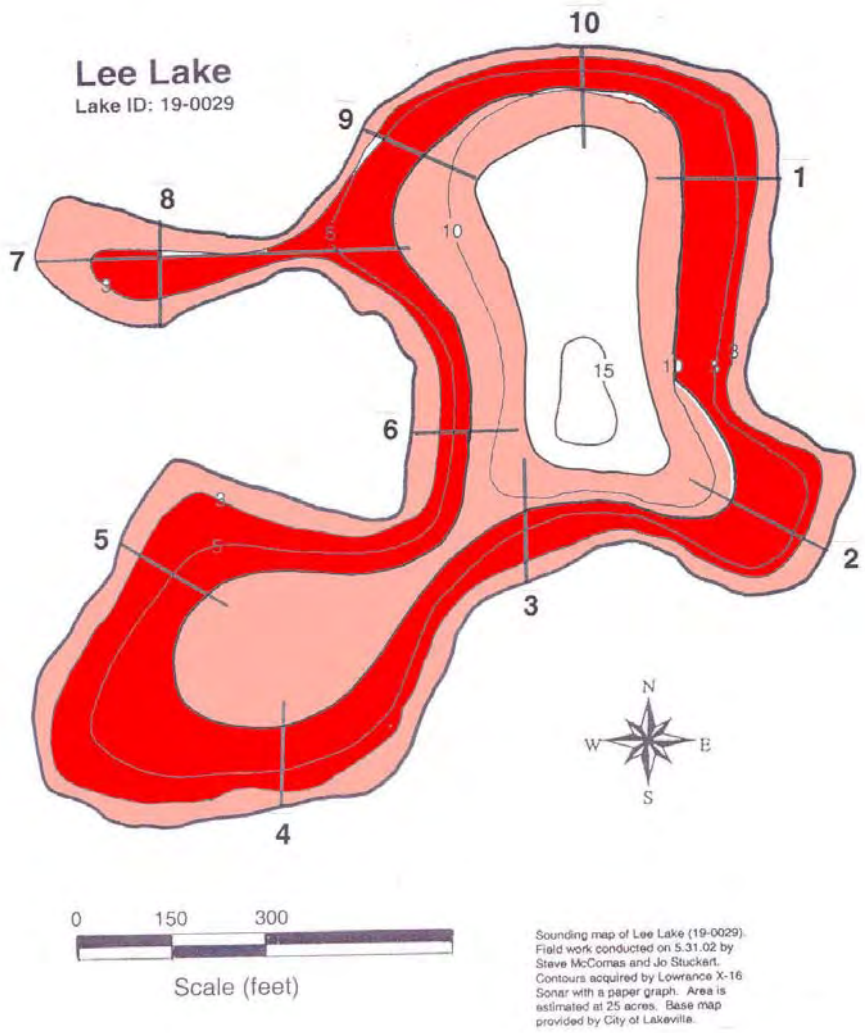

Figure 1. Aquatic plant coverage and curlyleaf coverage on May 31, 2003. Dark color represents nuisance curlyleaf growth. Lighter shading represents non-nuisance curlyleaf growth along with other plants.

Table 1. Lee Lake aquatic plant occurrences and densities for the May 31, 2003 survey based on ten transects and two depths, for a total of 20 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-5 feet (n=10)			Depth 6-12 feet (n=10)			All Stations (n=20)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	9	90	1.4	4	40	0.8	13	65	1.2
Chara (*Chara sp*)	1	10	1.0	--	--	--	1	5	1.0
Cabbage (*Potamogeton amplifolius*)	1	10	0.5	--	--	--	1	5	0.5
Curlyleaf pondweed (*P. crispus*)	9	90	3.1	9	90	3.0	18	90	3.0
Stringy pondweed (*P. pusillus*)	1	10	0.5	--	--	--	1	5	0.5
Water stargrass (*Zosterella dubia*)	1	10	1.0	--	--	--	1	5	1.0
Filamentous algae	5	50	0.9	--	--	--	5	25	0.9

Table 2. Individual transect data for Lee Lake for May 31, 2003.

	T1		T2		T3		T4		T5	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Cabbage					0.5					
Chara					1					
Coontail	1		0.5		1		2	1	2	1
Curlyleaf pondweed	3	1.5	4	3	1.5	4		2.5	0.5	2.5
Stringy pondweed										
Water stargrss	1									
Filamentous algae	1		0.5		0.5		2			

	T6		T7		T8		T9		T10	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Cabbage										
Chara										
Coontail	2		1				0.5	0.5	1	0.5
Curlyleaf pondweed	4	2	3	4	4		3.5	4	4	3.5
Stringy pondweed			0.5							
Water stargrss										
Filamentous algae			0.5							

September 25, 2003 -- Late Summer Survey

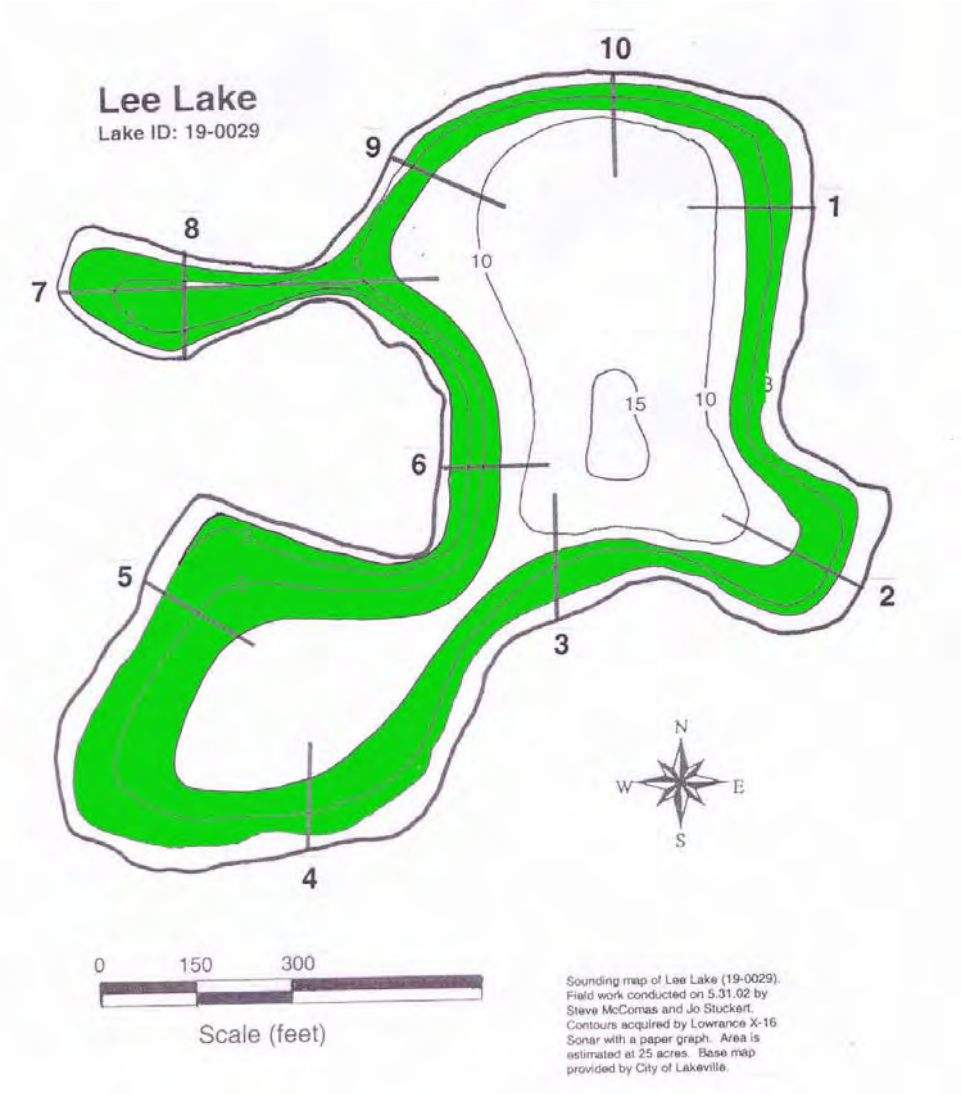

Figure 2. Aquatic plant coverage map for Lee Lake on September 25, 2003. The green area shows coverage of aquatic plants.

Table 3. Lee Lake aquatic plant occurrences and densities for the September 25, 2003 survey based on ten transects and two depths, for a total of 20 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-5 feet (n=10)			Depth 6-12 feet (n=10)			All Stations (n=20)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Duckweed (*Lemna sp*)	1	10	1.0	--	--	--	1	5	1.0
Coontail (*Ceratophyllum demersum*)	10	100	1.9	7	70	0.7	17	85	1.4
Spike rush (*Eleocharis sp*)	1	10	0.5	--	--	--	1	5	0.5
Northern watermilfoil (*Myriophyllum sibiricum*)	7	70	0.5	--	--	--	7	35	0.5
Naiads (*Najas sp*)	6	60	0.5	--	--	--	6	30	0.5
Curlyleaf pondweed (*Potamogeton crispus*)	1	10	0.5	--	--	--	1	5	0.5
Flatstem pondweed (*P. zosteriformis*)	3	30	0.5	--	--	--	3	15	0.5
Stringy pondweed (*P. pusillus*)	5	50	1.0	--	--	--	5	25	1.0
Sago pondweed (*Stuckenia pectinata*)	1	10	0.5	--	--	--	1	5	0.5
Water stargrass (*Zosterella dubia*)	10	100	0.6	--	--	--	10	50	0.6
Filamentous algae - benthic	1	10	0.5	--	--	--	1	5	0.5
Filamentous algae - floating	1	10	0.5	--	--	--	1	5	0.5

Table 4. Individual transect data for Lee Lake for September 25, 2003.

	T1		T2		T3		T4		T5	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Duckweed										
Coontail	2	0.5	2	1	2	0.5	2	0.5	3	1
Spike rush										
Northern watermilfoil	0.5		0.5		0.5		0.5			
Naiads	0.5				0.5		0.5			
Curlyleaf pondweed							0.5			
Flatstem pondweed	0.5		0.5		0.5					
Stringy pondweed							0.5			
Sago pondweed					0.5					
Water stargrass	1		0.5		0.5		1		0.5	
Filamentous algae-benthic										
Filamentous algae-floating									0.5	
No plants										

	T6		T7		T8		T9		T10	
Depth (ft)	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12	0-5	6-12
Duckweed			1							
Coontail	2	1	1.5		1		2		1.5	0.5
Spike rush					0.5					
Northern watermilfoil	0.5		0.5				0.5			
Naiads	0.5				0.5		0.5			
Curlyleaf pondweed										
Flatstem pondweed										
Stringy pondweed	0.5		2.5		1		0.5			
Sago pondweed										
Water stargrass	0.5		0.5		0.5		0.5		0.5	
Filamentous algae-benthic					0.5					
Filamentous algae-floating										
No plants				X		X		X		

Comparison of Early and Late Summer Plants in 2003

Table 5. The percent occurrence of aquatic plants for Lee Lake in 2003. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station on transects divided into the number of total stations for the survey. For example, if milfoil was found in 25 out of 50 stations, its percent occurrence would be 50%.

	May 31, 2003 (% occur)	September 25, 2003 (% occur)	Changes from May to Sept
Duckweed	--	5	+
Cabbage	5	--	-
Chara	5	--	-
Coontail	65	85	+
Curlyleaf pondweed	90	5	-
Flatstem pondweed	--	15	+
Naiads	--	30	+
Northern watermilfoil	--	35	+
Sago pondweed	--	5	+
Spike rush	--	5	+
Stringy pondweed	5	25	+
Water stargrass	5	50	+
Filamentous algae	25	5 - benthic 5 - floating	