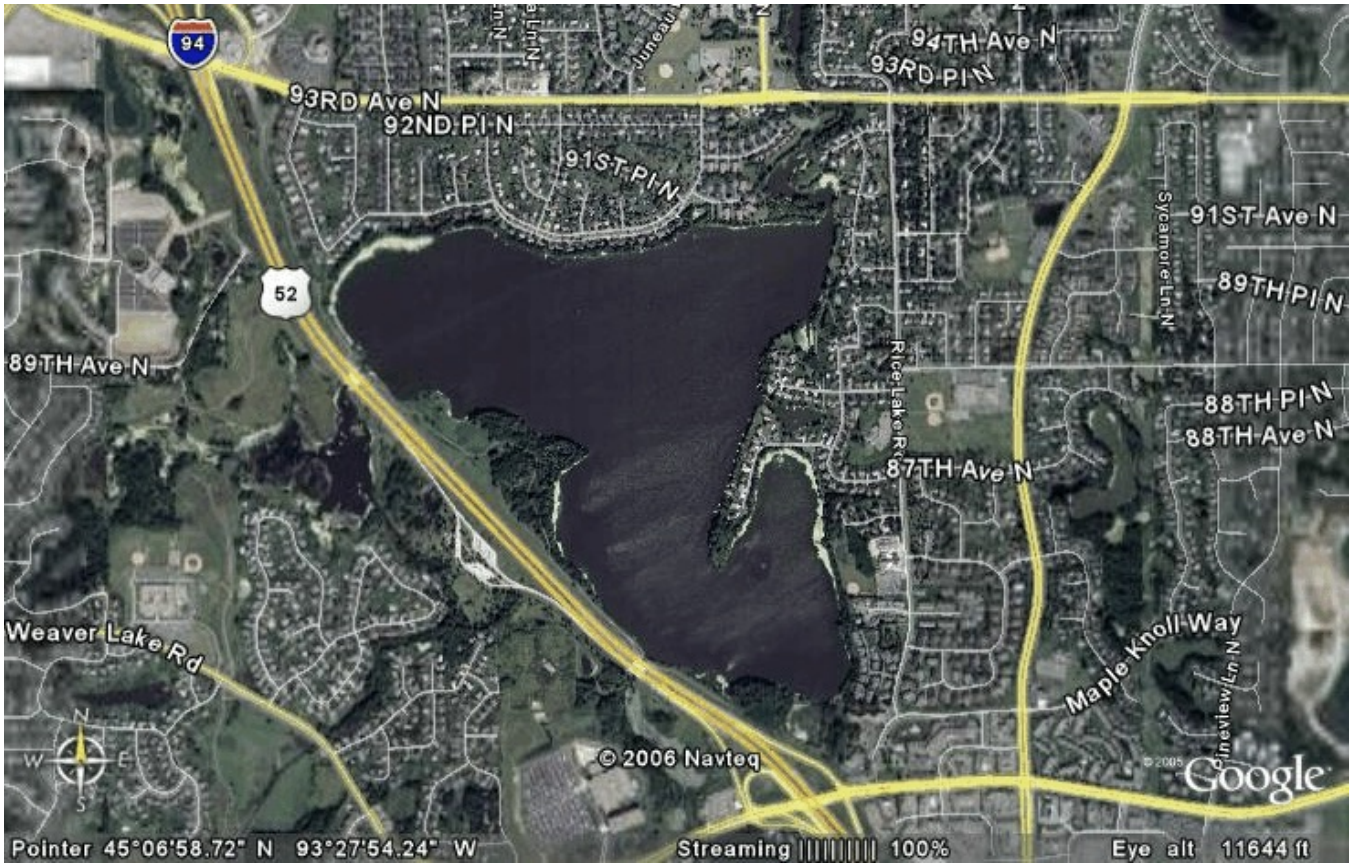

Rice Lake, Google

Aquatic Plant Surveys for Rice Lake, Maple Grove, Minnesota in 2007

Early Summer Survey: May 23, 2007
Late Summer Survey: August 20, 2007

Prepared for:
Rice Lake Association and
City of Maple Grove, Minnesota

Prepared by:
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Jo Stuckert
Blue Water Science
(651) 690.9602

November 2007

Aquatic Plant Surveys for Rice Lake, Maple Grove, Minnesota in 2007

Summary

Two aquatic plant line transect surveys were conducted on Rice Lake (314 acres) in the summer of 2007. The May 23 survey was to evaluate curlyleaf pondweed and native plants and the August 20 survey was to look for Eurasian watermilfoil and characterize native plants.

In the early summer of 2007, curlyleaf pondweed was found at 16 out of 41 stations (39% of the stations), growing out to about 5 feet of water. It did not produce nuisance matting conditions in Rice Lake.

In August, both curlyleaf pondweed and stringy pondweed (a native plant) had died back. Coontail was the only plant found in the lake and it was found at 4 out of 41 stations. Plants grew in water out to 4-feet.

The acreage of aquatic submerged plants in Rice Lake decreased from early to late summer (Table 1).

Table 1. The percent occurrence of aquatic plants for Rice Lake in 2007. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey. For example, if milfoil was found in 25 out of 50 stations, its percent occurrence would be 50%.

	May 23, 2007 % Occurrence (41 stations)	August 20, 2007 % Occurrence (41 stations)	Changes from May to August (+/-)
Coontail (*Ceratophyllum demersum*)	2	10	+
Curlyleaf pondweed (*Potamogeton crispus*)	39	--	-
Stringy pondweed (*P. sp*)	15	--	-
Aquatic Plant Coverage (acres)	17	4	-
Secchi disc (ft)	3.0	1.3	-

Conclusions and Recommendations for Aquatic Plant Management in Rice Lake

The aquatic plant community had three species of submerged plants in early summer and only one species in late summer. This is a low plant diversity condition. Curlyleaf pondweed was present in early summer, but it was scarce. Eurasian watermilfoil was not found in the lake in 2007.

Curlyleaf pondweed covers 17 acres in early summer and then dies back. It grows sparsely and does not require control at this time.

Native plant distribution is limited due to poor water clarity and maybe from fish effects. If water clarity improved in the future, native plant coverage would probably increase and possibly sustain long-term improved water clarity. However, there may be too many fish in Rice Lake which also could be limiting aquatic plant growth. Rough fish removal is a potential project.

If curlyleaf grows to nuisance conditions in the future, a drawdown is recommended.

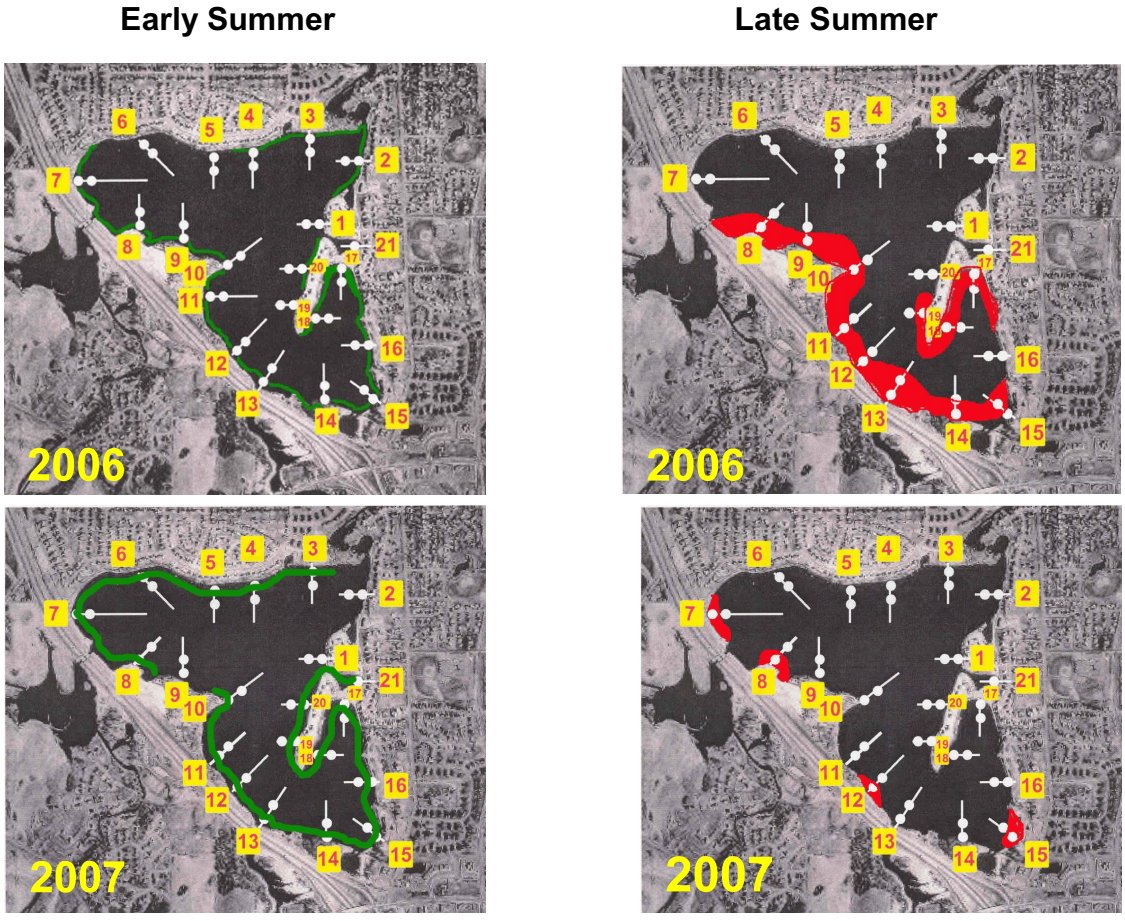


Figure 1. (left) Early summer aquatic plant coverage in 2006 (top) and 2007 (bottom). Curlyleaf pondweed (shown in green) covers about 22 acres in 2006 and about 17 acres in 2007 out of a total of 314 acres. (right) Late summer aquatic plant coverage in 2006 (top) and 2007 (bottom). The red area shows coverage of aquatic plants. Plants covered about 60 acres in 2006 and about 4 acres in 2007.

Rice Lake, Maple Grove, Minnesota

Lake ID: 27-0116
Size: 314 acres (source: MnDNR)
Littoral area: 314 acres (source: MnDNR
Maximum depth: 11.5 ft (source: MnDNR)
Mean Depth: feet

Introduction

Rice Lake is a 314 acre moderately fertile lake in Maple Grove, Minnesota.

The aquatic plants of Rice Lake were sampled to evaluate curlyleaf pondweed and to look for Eurasian watermilfoil and to document the extent of native plant coverage. Steve McComas, Blue Water Science, conducted two aquatic plant surveys on Rice Lake on May 23 and August 20, 2007.

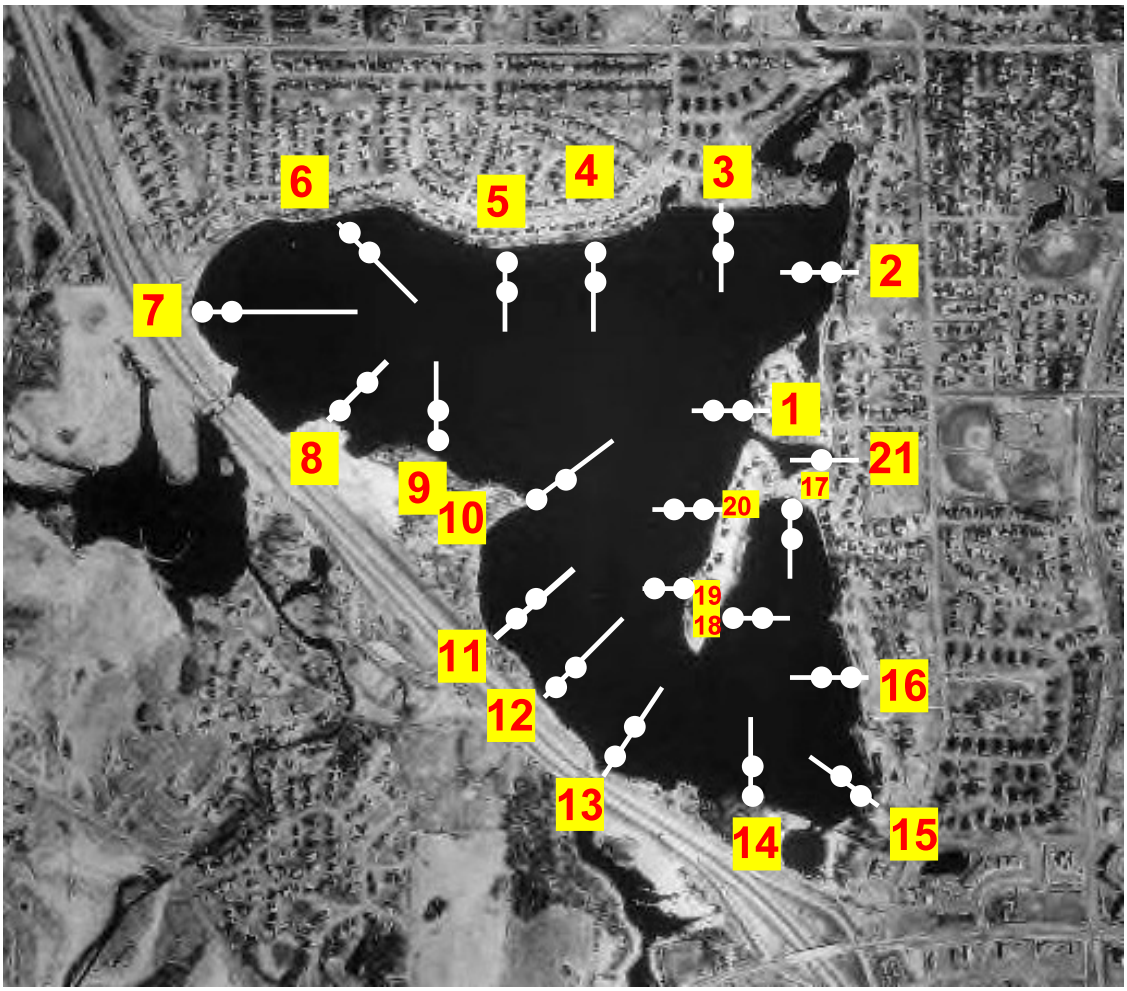


Figure 1. Transects for plant surveys conducted in 2007.

Methods

Several techniques were used to characterize aquatic plants in Rice Lake. We used 21 line transects (Figure 1). Two depths (0-4 feet and 5-9 feet) on a transect were randomly sampled with a rake to characterize species presence and density. A recording sonar (Lowrance X-16) was used to delineate the depths of weed colonization.

Aquatic plant density was estimated based on a scale from 1-5 with 1 being the less dense and 5 representing plants matting at the surface. An example of a plant density of a "1" and a "2" are shown in Figure 2. Plant density ratings were based on the amount of plants collected on a rake head. A single stem or a trace of an identifiable plant was rated at a density of "1". If plants were collected up to at least one half of the rake head (7 out of 14 tines) it was rated at a density of "2". If plants covered all of the rake tines, the density was a "3". If plants covered all 14 tines and was dense on all tines (even obscuring them) the density was a "4". A density of "5" was only assigned to plants matting at the surface.

Two to four rake samples were collected at each depth interval. A density for each plant species was determined for each rake sample and the species density was averaged based on the number of rake samples for a depth interval.

For plant surveys of this type, depth intervals are determined based on the maximum depth of plants found in the lake. Two depth intervals are used if plant growth is 10 feet or less and three depth intervals are used if plant growth is 12 feet or greater. Aquatic plants colonized out to 9 feet in Rice Lake, so the two depth zones were used and they were: 0-4 feet and 5-9 feet.

Figure 2. Aquatic plants were sampled with a rake. Here is a rake with curlyleaf pondweed at a density of a "1" and stringy pondweed at a density of a "2".

Results of the Early Summer Survey -- May 23

The most abundant plant in early summer in Rice Lake was curlyleaf pondweed and was found at about 39% of the 41 stations (Table 1). Curlyleaf pondweed was found growing out to water depths of 5 feet. No nuisance conditions were observed. Native plants were scarce in Rice Lake.

An aquatic plant coverage map is shown in Figure 3. Curlyleaf pondweed coverage is basically the same as the aquatic plant coverage map. Curlyleaf coverage is about 17 acres of the 314 acre Rice Lake.

A summary of plant density and occurrence for individual transects is shown in Table 2. Eurasian watermilfoil was not found in this survey.

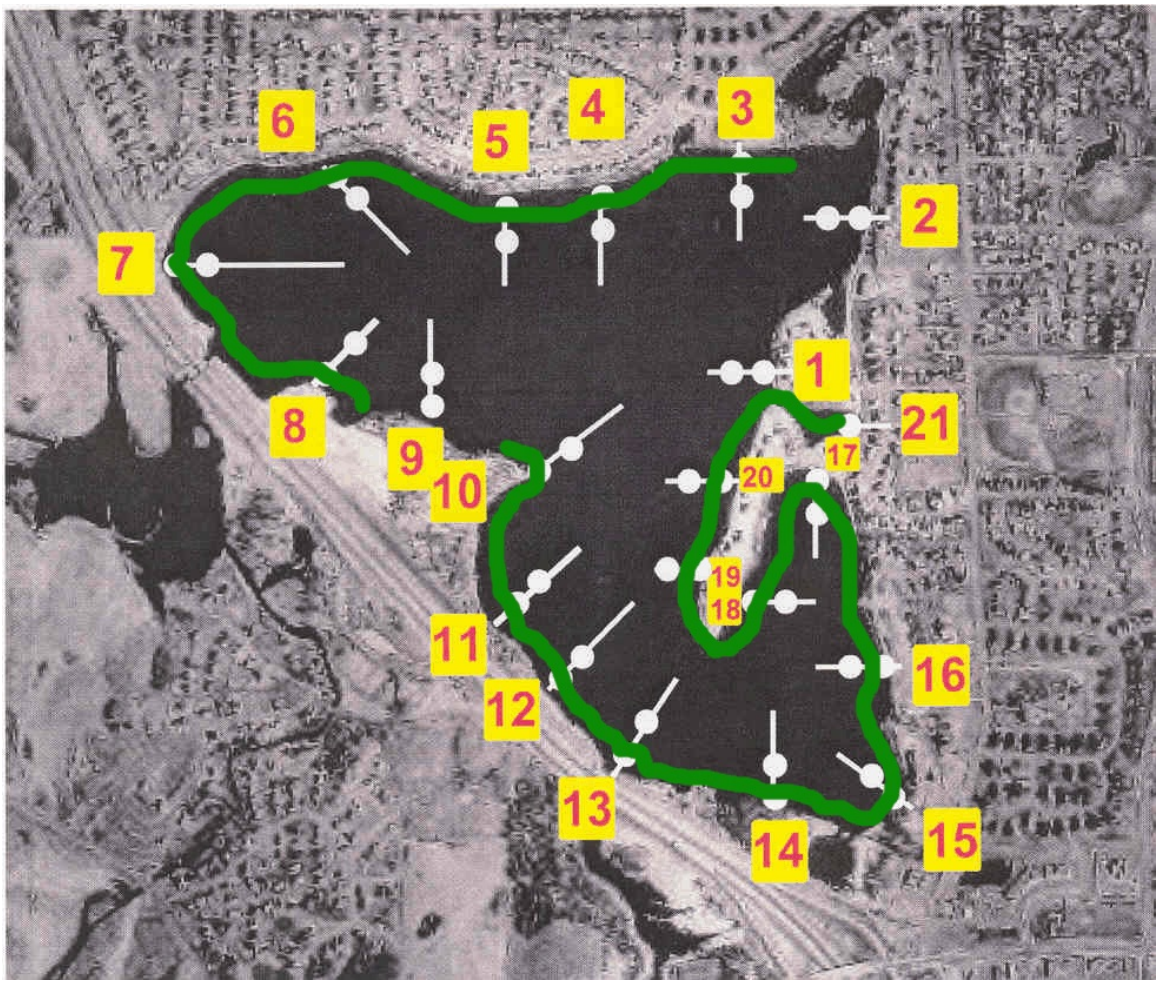


Figure 1. Early summer aquatic plant coverage in 2007. Curlyleaf pondweed coverage is shown and covers about 17 acres out of a total of 314 acres (shown in green).

Table 1. Rice Lake aquatic plant occurrences and densities for the May 23, 2007 survey based on 21 transects and 2 depths, for a total of 41 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0 - 4 feet (n=21)			Depth 5 - 8 feet (n=20)			All Stations (n=41)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	1	5	1.0	--	--	--	1	2	1.0
Elodea (*Elodea canadensis*)									
Curlyleaf pondweed (*Potamogeton crispus*)	15	71	1.5	1	5	1.0	16	39	1.5
Stringy pondweed (*P. sp*)	6	29	1.0	--	--	--	6	15	1.0

Table 2. Individual transect data for Rice Lake on May 23, 2007. Data from T7.1 and T7.2 were not used in statistics.

	T1		T1.1		T2		T3		T4		T5		T6		T7	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail																
Elodea																
Curlyleaf pondweed			1.8				1.3		2		2		2.5		1.5	
Stringy pondweed							1								0.3	
No Plants	X	X		X	X	X		X		X		X		X		X

	T7.1		T7.2		T8		T9		T10		T11		T12		T13	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail			1												1	
Elodea	0.5															
Curlyleaf pondweed			1.5						1.5		1.5		2.5	1		
Stringy pondweed					2								0.5			
No Plants		X		X		X	X	X		X		X				X

	T14		T15		T16		T17		T18		T19		T20		T21
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4
Coontail															
Elodea															
Curlyleaf pondweed	0.3		1		1.3		3		1		0.5		0.5		
Stringy pondweed	1.5												0.5		
No Plants		X		X		X		X		X		X		X	X

Results of the Late Summer Survey -- August 20

A significant change in the plant community was found in the August survey compared to the May survey. The growth of curlyleaf pondweed and stringy pondweed found in May had died back and was not observed in August. This was due, in part, because of a change in water clarity. The Secchi reading was 3.0 feet on May 23 and was 1.3 feet on August 20. Coontail was the only plant found in Rice Lake in August (Table 3).

A map of aquatic plant coverage is shown in Figure 5. Aquatic plants covered about 4 acres of the bottom. Within the 4 acres, coontail was sparse. Eurasian watermilfoil was found in this survey at three sites.

The occurrence and density of plants for individual transects are shown in Table 4.

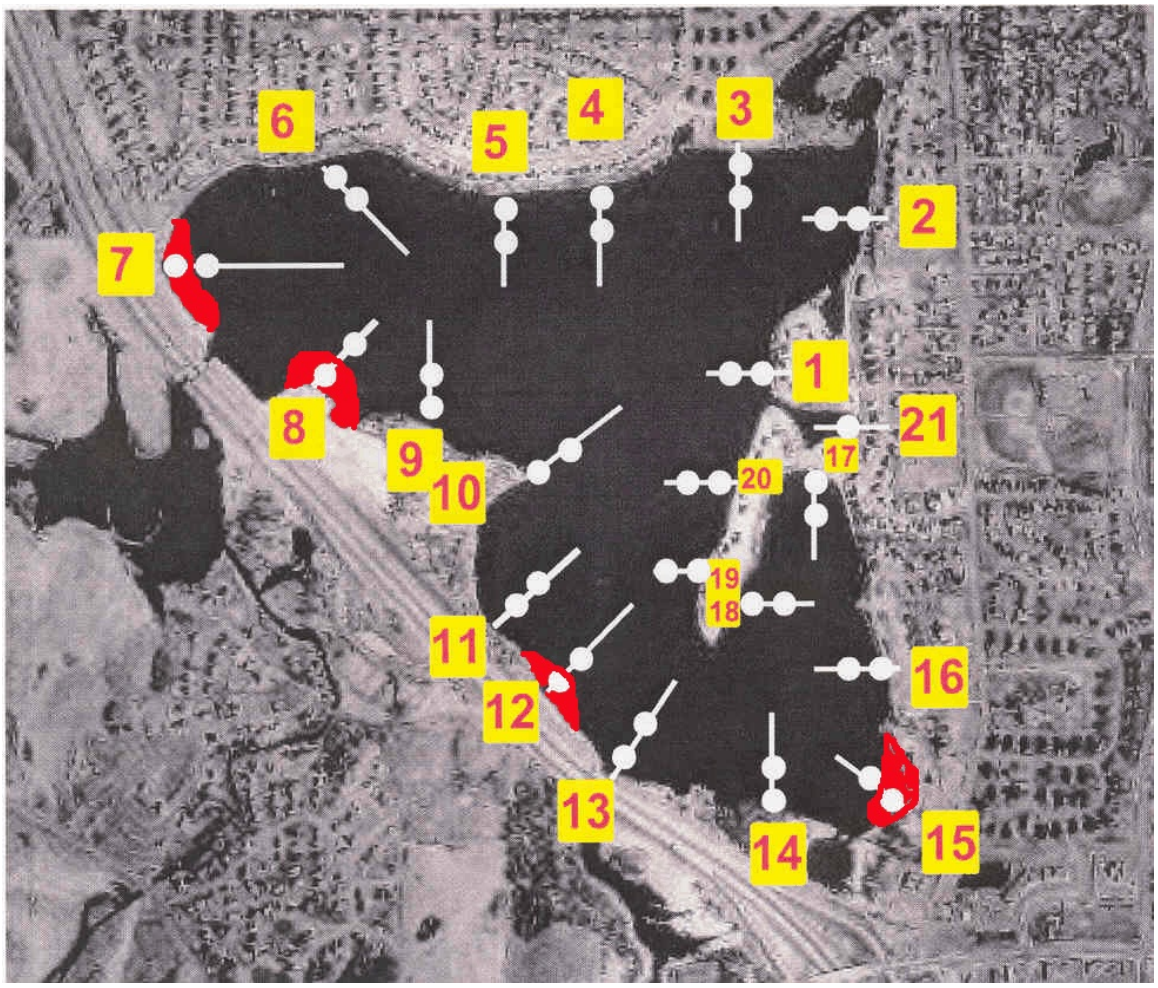


Figure 5. Late summer aquatic plant coverage in 2007. The red area shows coverage of aquatic plants. Plants covered about 4 acres.

Table 3. Rice Lake aquatic plant occurrences and densities for the August 20, 2007 survey based on 21 transects and 2 depths, for a total of 41 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0 - 4 feet (n=21)			Depth 5 - 8 feet (n=20)			All Stations (n=41)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	4	19	0.8	--	--	--	4	10	0.8

Table 4. Individual transect data for Rice Lake on August 20, 2007.

	T1		T2		T3		T4		T5		T6		T7	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail													0.5	
No Plants	X	X	X	X	X	X	X	X	X	X	X	X		X

	T8		T9		T10		T11		T12		T13		T14	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail	0.5								1					
No Plants		X	X	X	X	X	X	X		X	X	X	X	X

	T15		T16		T17		T18		T19		T20		T21
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4
Coontail	1												
No Plants		X	X	X	X	X	X	X	X	X	X	X	X

Comparison of Early and Late Summer Aquatic Plant Surveys in 2007

In the early summer of 2007, curlyleaf pondweed was found around some of the nearshore areas of Rice Lake and out to about 5 feet of water. It was not found to produce nuisance matted growth.

By the end of August, curlyleaf pondweed and stringy pondweed had died back. Coontail was the only plant in the August survey (Table 5).

The acreage of aquatic submerged plants in Rice Lake decreased from early to late summer.

Table 5. The percent occurrence of aquatic plants for Rice Lake in 2007. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey. For example, if milfoil was found in 25 out of 50 stations, its percent occurrence would be 50%.

	May 23, 2007 % Occurrence (41 stations)	August 20, 2007 % Occurrence (41 stations)	Changes from May to August (+/-)
Coontail (*Ceratophyllum demersum*)	2	10	+
Curlyleaf pondweed (*Potamogeton crispus*)	39	--	-
Stringy pondweed (*P. sp*)	15	--	-
Aquatic Plant Coverage (acres)	17	4	+
Secchi disc (ft)	3.0	1.3	-

Curlyleaf pondweed was present, but was not abundant on the May 23, 2007 survey.

Coontail was the only plant observed on the August 20, 2007 survey.

Review of Recent Aquatic Plant Surveys

Results of recent Rice Lake plant surveys show that curlyleaf pondweed is present but sparse, and that native plant diversity is low (Table 6). The curlyleaf community has not produced nuisance growth conditions in the last few years, but somewhat surprisingly, native plant community also has a sparse growth condition.

Is it possible that the last drawdown has inhibited the growth of both curlyleaf and native plants? There might be more than just a lake drawdown involved. Rice Lake drawdowns have been drawing water down about 5.5 feet but curlyleaf has been controlled out to water depths of 8 feet deep. Curlyleaf at the 8-foot depth should not have been impacted by a drawdown, so there might be some other factors influencing aquatic plant growth in Rice Lake.

It's possible that changes to sediment composition or that bottom feeding activity of fish are factors that have impacted aquatic plant growth in Rice Lake.

Table 6. Rice Lake aquatic plant survey results for 2003 (late summer only) and 2006 and 2007. Data show percent occurrence.

	2003 Sep 30 (20 sites)	2006 May 24 (41 sites)	2006 Aug 27 (41 sites)	2007 May 23 (41 sites)	2007 Aug 20 (41 sites)
Coontail (*Ceratophyllum demersum*)	--	5	7	2	10
Eurasian watermilfoil (*Myriophyllum spicatum*)	--	--	7	--	--
Curlyleaf pondweed (*Potamogeton crispus*)	5	39	--	39	--
Stringy pondweed (*P. sp*)	--	41	--	15	--
Sago pondweed (*Stuckenia pectinata*)	35	--	27	--	--

Conclusions and Recommendations for Aquatic Plant Management in Rice Lake

The aquatic plant community had three species of submerged plants in early summer and only one species in late summer. This is a low plant diversity condition. Curlyleaf pondweed was present in early summer, but it was scarce. Eurasian watermilfoil was not found in the lake in 2007.

Curlyleaf pondweed covers 17 acres in early summer and then dies back. It grows sparsely and does not require control at this time.

Native plant distribution is limited due to poor water clarity and maybe from fish effects. If water clarity improved in the future native plant coverage would probably increase and possibly sustain long-term improved water clarity. However, there may be too many fish in Rice Lake which also could be which are limiting aquatic plant growth. Rough fish removal is a potential project.

If curlyleaf grows to nuisance conditions in the future, a drawdown is recommended.

Early Summer **Late Summer**

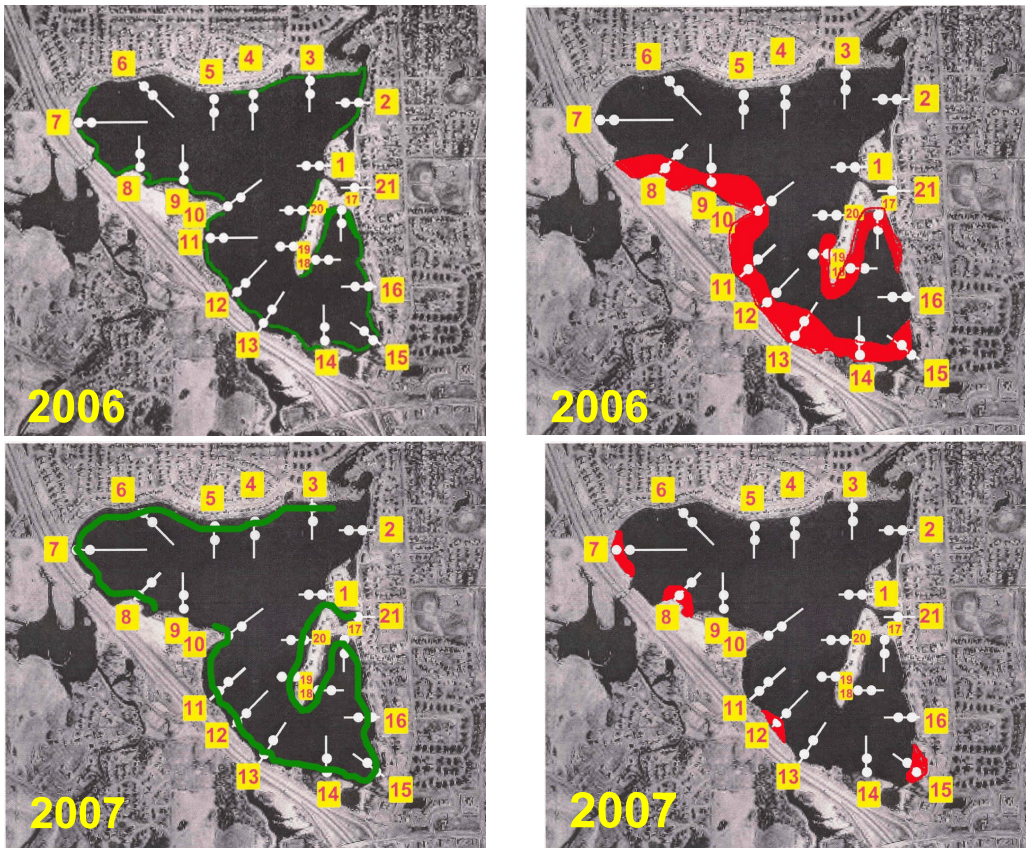
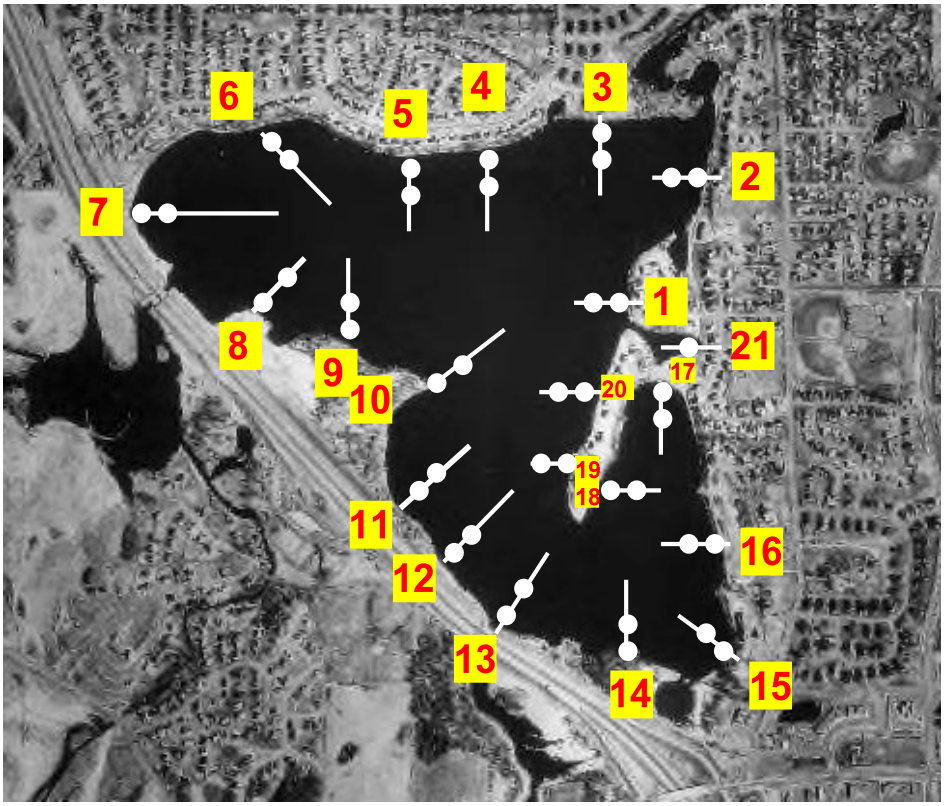


Figure 7. (left) Early summer aquatic plant coverage in 2006 (top) and 2007 (bottom). Curlyleaf pondweed (shown in green) covers about 22 acres in 2006 and about 17 acres in 2007 out of a total of 314 acres. (right) Late summer aquatic plant coverage in 2006 (top) and 2007 (bottom). The red area shows coverage of aquatic plants. Plants covered about 60 acres in 2006 and about 4 acres in 2007.

Appendix

Transect Descriptions
2006 Survey Transect Data
2003 Survey Transect Data



Transect Descriptions

Transect Number	GPS Coordinates (WGS 84)		Descriptions
	East	North	
1	04 63 566	49 95 944	Left of cove opening.
2	04 63 776	49 96 210	Left of cove opening.
3	04 63 519	49 96 343	Right of cove.
4	04 63 287	49 96 250	Left of brown wood framed house.
5	04 62 956	49 96 257	Right of tan house with wooden stairs to the lake.
6	04 62 661	49 96 266	Left of culvert.
7	04 62 943	49 96 143	Toward highway into a bunch of willows.
8	04 62 655	49 96 033	Overturned tree on the shoreline in cattails, left of Elm Cr inlet.
9	04 63 012	49 95 588	Middle of long wooded shoreline.
10	04 63 212	49 95 683	Left of point.
11	04 63 103	49 95 480	In-between two dead tree stands.
12	04 63 186	49 95 306	Right of where trees stop.
13	04 63 365	49 95 185	Right in on bridge.
14	04 63 483	49 95 151	Tree with three trunks.
15	04 63 800	49 95 082	Left of cove, right of 2-story apartment building.
16	04 63 772	49 95 354	Cattail bed.
17	04 63 731	49 95 611	End of the bay.
18	04 63 655	49 95 443	Left of overhanging willow.
19	04 63 426	49 95 535	1st house on peninsula.
20	04 63 568	49 95 821	2nd house to the right of the cove opening.
21			In cove.

2006 Survey Transect Data

Table 1. Rice Lake aquatic plant occurrences and densities for the May 24, 2006 survey based on 21 transects and 2 depths, for a total of 41 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0 - 4 feet (n=21)			Depth 5 - 8 feet (n=20)			All Stations (n=41)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	1	5	0.5	1	5	0.2	2	5	0.4
Curlyleaf pondweed (*Potamogeton crispus*)	12	57	1.4	4	20	0.7	16	39	1.2
Stringy pondweed (*P. sp*)	12	57	1.6	5	25	0.6	17	41	1.3

Table 2. Individual transect data for Rice Lake on May 24, 2006.

	T1		T2		T3		T4		T5		T6		T7	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail														
Curlyleaf pondweed			1		2									0.5
Stringy pondweed					2	0.5	1.5						2	
No Plants	X	X		X				X	X	X	X	X		

	T8		T9		T10		T11		T12		T13		T14	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail												0.2	0.5	
Curlyleaf pondweed	1		0.5		0.3		2	1	3	0.5			1	
Stringy pondweed	2		1						3	1.5			1	
No Plants		X		X		X					X			X

	T15		T16		T17		T18		T19		T20		T21
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4
Coontail													
Curlyleaf pondweed	0.5		2		1	0.8	2						
Stringy pondweed	1	0.3		0.2	1	0.5	1		2		2		
No Plants								X		X		X	X

2006 Survey Transect Data

Table 3. Rice Lake aquatic plant occurrences and densities for the August 27, 2006 survey based on 21 transects and 2 depths, for a total of 41 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0 - 4 feet (n=21)			Depth 5 - 8 feet (n=20)			All Stations (n=41)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	2	10	0.8	1	5	0.5	3	7	0.7
Eurasian watermilfoil (*Myriophyllum spicatum*)	3	14	1.0	--	--	--	3	7	1.0
Sago pondweed (*Stuckenia pectinata*)	10	48	1.0	1	5	1.0	11	27	1.0

Table 4. Individual transect data for Rice Lake on August 27, 2006.

	T1		T2		T3		T4		T5		T6		T7	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail														
Eurasian watermilfoil														
Sago pondweed														
No Plants	X	X	X	X	X	X	X	X	X	X	X	X	X	X

	T8		T9		T10		T11		T12		T13		T14	
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8
Coontail													1	
Eurasian watermilfoil					0.3				2		1			
Sago pondweed	1		1		0.5		1.5		1		1	1	1	
No Plants		X		X		X		X		X				X

	T15		T16		T17		T18		T19		T20		T21
	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4	5 - 8	0 - 4
Coontail		0.5					0.5						
Eurasian watermilfoil													
Sago pondweed					0.3		1		2				
No Plants	X		X	X		X		X		X	X	X	X

2003 Survey Transect Data

Table 5. Rice Lake aquatic plant occurrences and densities for the September 30, 2003 survey based on 10 transects and 2 depths, for a total of 20 stations. Density ratings are 1-5 with 1 being low and 5 being most dense.

	Depth 0-3 feet (n=10)			Depth 4-6 feet (n=10)			All Stations (n=20)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Curlyleaf pondweed (*Potamogeton crispus*)	1	10	0.5	--	--	--	1	5	0.5
Sago pondweed (*Stuckenia pectinata*)	7	70	1.0	--	--	--	7	35	1.0

Table 6. Individual transect data for Rice Lake, September 30, 2003. Transect EC was not used in the statistics.

	T1		T2		T3		T4		T5	
	0-3	4-6	0-3	4-6	0-3	4-6	0-3	4-6	0-3	4-6
Coontail										
Curlyleaf pondweed									0.5	
Sago pondweed	0.5								0.5	
Filamentous algae										
No plants		X	X	X	X	X	X	X		X

	T6		T7		T8		T9		T10		T EC	
	0-3	4-6	0-3	4-6	0-3	4-6	0-3	4-6	0-3	4-6	0-3	4-6
Coontail											0.5	
Curlyleaf pondweed												
Sago pondweed	1		2		1		1		1		1	
Filamentous algae												
No plants		X		X		X		X		X		X