

Papakeeche Lake
2016 Aquatic Vegetation Sampling Report
Kosciusko County, Indiana
November 15, 2016



Prepared for:
Papakeeche Lake Protective Association, Inc.
12698 New Road
Wakarusa, IN 46573

Prepared by:
**AQUATIC
CONTROL**
PO Box 100
Seymour, Indiana 4727

Executive Summary

Papakeechee Lake is a 178-acre impoundment located in Kosciusko County, Indiana and has a 3,301 acre watershed. The lake is upstream and drains into Lake Wawasee. Use of outboard motors or anything other than wind or human power is prohibited. The lake has an average depth of 5.0 feet and a maximum depth of 40.0 feet (Grant College 2014). The lake has been colonized by invasive curly-leaf pondweed (*Potamogeton crispus*). The association is managing lake vegetation with fluridone treatments.

The Papakeechee Lake Protective Association (PLPA) hired Aquatic Control to conduct surveys on Papakeechee Lake in 2016. The results from these surveys can be used as a baseline to compare the vegetation community in future surveys. Spring and summer invasive species and Tier II surveys were completed by Aquatic Control in 2016. The spring surveys revealed that curly-leaf pondweed was growing in 114.3 acres of Papakeechee Lake. Vegetation mapping was also conducted during the spring survey using hydro-acoustic hardware. The spring hydro-acoustic vegetation mapping showed that 85.5% of the lake area contained plants. No invasive species were found during the summer surveys, but coontail (*Ceratophyllum demersum*) and flat-stemmed pondweed (*Potamogeton zosteriformis*) were the most commonly collected species (86.0% and 62.0% respectively).

Surveying indicated that the lake had a severe curly-leaf pondweed infestation in the spring of 2016. Summer surveys found no invasive species and the lake contained a diverse and abundant native plant community. Vegetation controls appear to be limiting nuisance invasive species and maintaining good native species diversity and abundance. The association may consider an earlier application to reduce curly-leaf pondweed prior to turion production. Early control can also reduce the amount of nutrient released when curly-leaf pondweed dies.

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1.0 Introduction

This report will provide a baseline of vegetation data that may be used in the future to compare and contrast the plant community of Papakeeche Lake and assess management success. Papakeeche Lake has been colonized by invasive curly-leaf pondweed which produces dense mats that hinder recreational activities and potentially compete with beneficial native vegetation (Figures 1). This species can be especially troublesome in a lake that is used for shoreline fishing and is limited to wind or human powered vessels for offshore fishing.



Figure 1. Illustrations of curly-leaf pondweed (Illustration provided by Applied Biochemist).

2.0 2016 Sampling Results

Aquatic vegetation sampling should be completed in order to create an effective aquatic vegetation management plan. Sampling provides valuable data that allows managers to accomplish several tasks: locate areas of nuisance and beneficial vegetation; monitor changes in abundance of native and exotic species; monitor and react to changes in the overall plant community; monitor the effectiveness of management techniques; and compare the plant communities to other populations. In 2016, PLPA funded invasive species mapping and Tier II surveys.

2.1 Spring Survey Results

2.1.1 Invasive Survey Results

Spring invasive and Tier II surveys were completed on Papakeeche Lake on May 19, 2016. The invasive species survey revealed that approximately 114.3 acres of curly-leaf pondweed was growing in the lake (Figure 2).

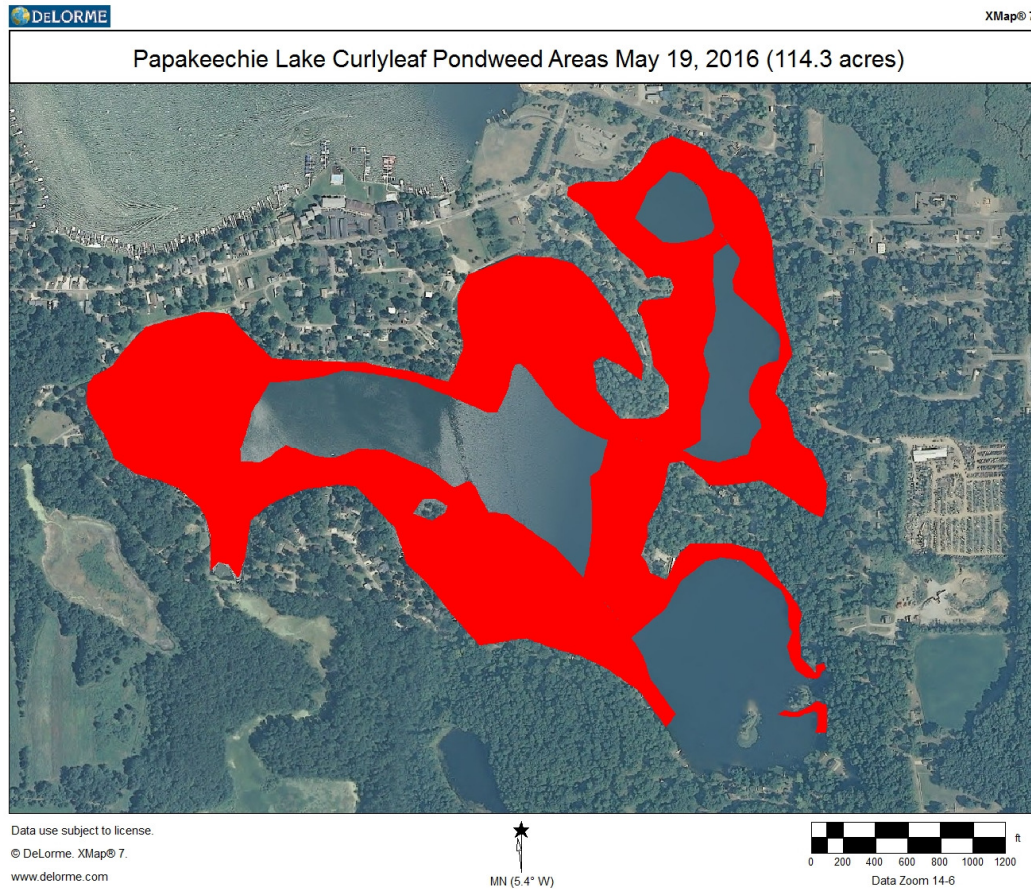


Figure 2. Papakeechee Lake curly-leaf pondweed areas, May 19, 2016.

2.1.2 Tier II Methods

The Tier II survey was completed at the same day as the invasive survey. The Tier II survey helps meet the following objectives:

1. To document the distribution and abundance of submersed and floating-leaved aquatic vegetation within selected areas and at a lake wide scale.
2. To compare present distribution and abundance with past distribution and abundance within select areas and at a lake wide scale.

Fifty (50) sites were randomly selected throughout the littoral zone (Figure 3). Once a site was reached the boat was slowed to a stop. A depth measurement was taken by dropping a two-headed standard sampling rake that was attached to a rope marked off in 1-foot increments. An additional ten feet of rope was released and the boat was reversed at minimum operating speed for a distance of ten feet. Once the rake was retrieved the individual plant abundance on the rake was scored with either a 0 (no plants retrieved), 1 (1-19% of rake teeth filled), 3 (20-99% of rake teeth filled), or 5 (100% of rake teeth filled) (IDNR 2014).

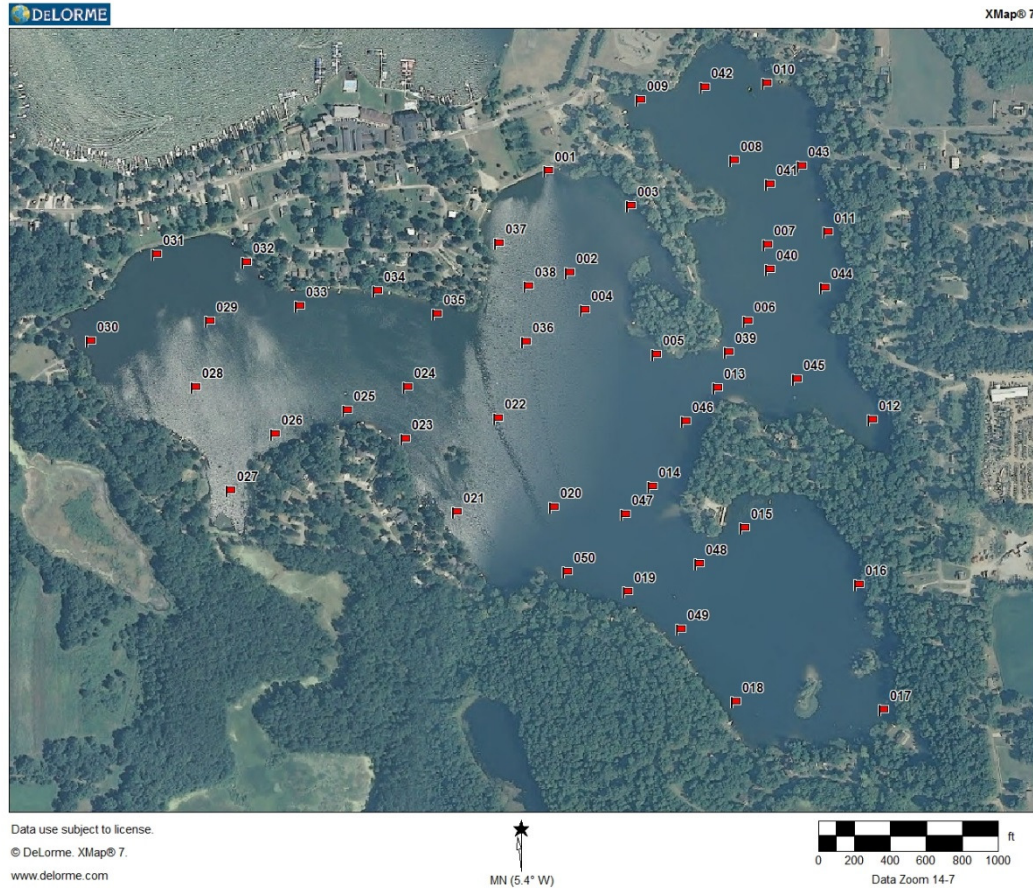


Figure 3. Papakeechee Lake Tier II Sample Sites.

2.1.3 Tier II Sampling Results

Fifty sites, down to a depth of 15 feet, were included in the May 19th survey. Vegetation was present at 97.9% of the sites. A total of eight species were collected, of which seven were native. Curly-leaf pondweed was the most abundant species and was collected at 70.0% of the sites (Figure 4). Coontail was discovered at 62.0% of the sites and was the second most abundant species (Figure 5), while Chara (*Chara sp.*) was found at 44.0% of the sites and was the third most abundant plant (Figure 6). The results of the spring 2016 Tier II survey of Papakeechee Lake can be found in Table 1.

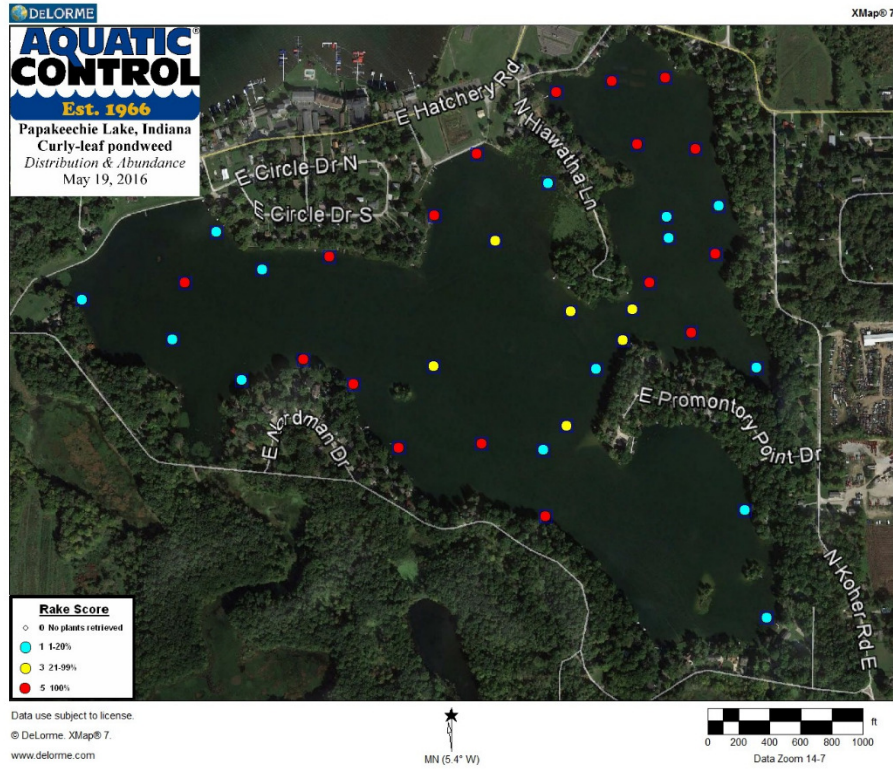


Figure 4. Papakeechee Lake, curly-leaf pondweed areas, May 19, 2016.

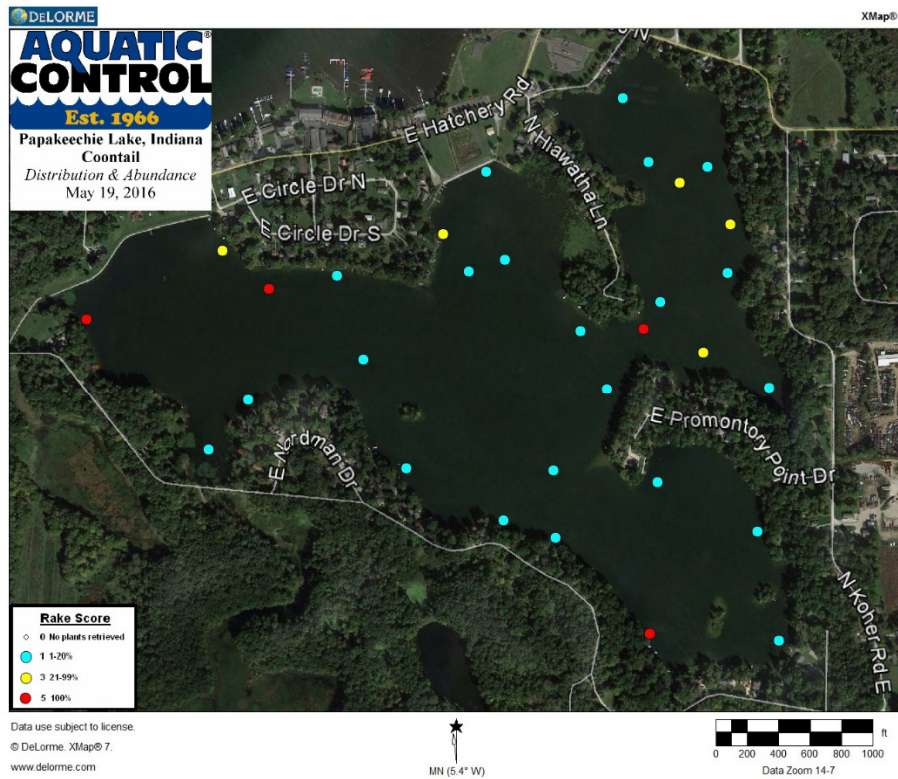


Figure 5. Papakeechee Lake, coontail areas, May 19, 2016.

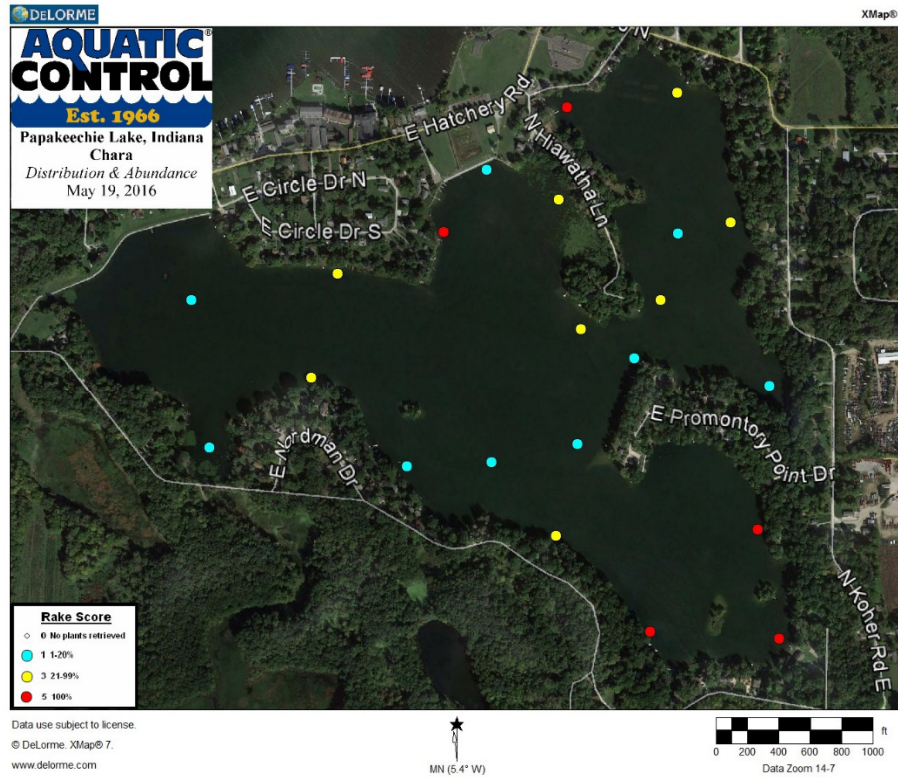


Figure 6. Papakeechee Lake, Chara areas, May 19, 2016.

Table 1. Tier 2 survey results for Papakeechee Lake May 19, 2016.

Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (all depths).							
County:	Kos	Total Sites:	50	Mean species/site:	2.86		
Date:	5.19.16	Sites with plants:	46	SE Mean sp/site:	0.20		
Secchi (ft):	7.5	Sites with native plants:	46	Mean native sp/site:	2.12		
Max Plant Depth (ft):	12.0	Number of species:	8	SE Mean natives/site:	0.16		
Trophic Status:	Meso	# of native species:	7	Species diversity:	0.82		
Littoral Sites:	47	Maximum species/site:	6	Native species diversity:	0.80		
All Depths (0 to 15 ft)	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species		0	1	3	5		
Curlyleaf pondweed	74.0	26.0	28.0	12.0	34.0	46.8	
Coontail	62.0	38.0	44.0	10.0	8.0	22.8	
Chara	44.0	56.0	18.0	16.0	10.0	23.2	
Large-leaved pondweed	44.0	56.0	26.0	10.0	8.0	19.2	
Flat-stemmed pondweed	34.0	66.0	24.0	6.0	4.0	12.4	
Nitella	14.0	86.0	4.0	2.0	8.0	10.0	
Water stargrass	8.0	92.0	6.0	2.0	0.0	2.4	
Sago pondweed	6.0	94.0	4.0	2.0	0.0	2.0	
Filamentous Algae	28.0						
Other species observed: White water lily, spatterdock, Arrowhead and Bladderwort.							

Table 1 continued

Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (0-5 ft).								
County:	Kos	Total Sites:	20	Mean species/site:	3.25			
Date:	5.19.16	Sites with plants:	20	SE Mean species/site:	0.26			
Secchi (ft):	7.5	Sites with native plants:	20	Mean native species/site:	2.40			
Max Plant Depth (ft):	12.0	Number of species:	8	SE Mean natives/site:	0.22			
Trophic Status:	Meso	# of native species:	7	Species diversity:	0.82			
Littoral Sites:	20	Maximum species/site:	6	Native diversity:	0.79			
Depth: 0 to 5 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			0	1	3	5		
Curlyleaf pondweed		85.0	15.0	30.0	10.0	45.0	57.0	
Coontail		70.0	30.0	50.0	10.0	10.0	26.0	
Chara		55.0	45.0	20.0	20.0	15.0	31.0	
Large-leaved pondweed		50.0	50.0	30.0	5.0	15.0	24.0	
Flat-stemmed pondweed		40.0	60.0	25.0	10.0	5.0	16.0	
Sago pondweed		10.0	90.0	10.0	0.0	0.0	2.0	
Water stargrass		10.0	90.0	5.0	5.0	0.0	4.0	
Nitella		5.0	95.0	0.0	0.0	5.0	5.0	
Filamentous Algae		40.0						
Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (5-10 ft).								
County:	Kos	Total Sites:	20	Mean species/site:	3.15			
Date:	5.19.16	Sites with plants:	19	SE Mean species/site:	0.28			
Secchi (ft):	7.5	Sites with native plants:	19	Mean native species/site:	2.35			
Max Plant Depth (ft):	12.0	Number of species:	7	SE Mean natives/site:	0.23			
Trophic Status:	Meso	# of native species:	6	Species diversity:	0.82			
Littoral Sites:	20	Maximum species/site:	5	Native diversity:	0.79			
Depth: 5 to 10 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			0	1	3	5		
Curlyleaf pondweed		80.0	20.0	25.0	20.0	35.0	52.0	
Coontail		60.0	40.0	40.0	15.0	5.0	22.0	
Large-leaved pondweed		55.0	45.0	30.0	20.0	5.0	23.0	
Chara		50.0	50.0	20.0	20.0	10.0	26.0	
Flat-stemmed pondweed		40.0	60.0	30.0	5.0	5.0	14.0	
Nitella		25.0	75.0	5.0	5.0	15.0	19.0	
Water stargrass		5.0	95.0	5.0	0.0	0.0	1.0	
Filamentous Algae		30.0						
Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (10-15 ft).								
County:	Kos	Total Sites:	10	Mean species/site:	1.50			
Date:	5.19.16	Sites with plants:	7	SE Mean species/site:	0.43			
Secchi (ft):	7.5	Sites with native plants:	7	Mean native species/site:	1.10			
Max Plant Depth (ft):	12.0	Number of species:	8	SE Mean natives/site:	0.31			
Trophic Status:		# of native species:	7	Species diversity:	0.79			
Littoral Sites:	7	Maximum species/site:	4	Native diversity:	0.74			
Depth: 10 to 15 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			0	1	3	5		
Coontail		50.0	50.0	40.0	0.0	10.0	18.0	
Curlyleaf pondweed		40.0	60.0	30.0	0.0	10.0	16.0	
Chara		10.0	90.0	10.0	0.0	0.0	2.0	
Flat-stemmed pondweed		10.0	90.0	10.0	0.0	0.0	2.0	
Large-leaved pondweed		10.0	90.0	10.0	0.0	0.0	2.0	
Nitella		10.0	90.0	10.0	0.0	0.0	2.0	
Sago pondweed		10.0	90.0	0.0	10.0	0.0	6.0	
Water stargrass		10.0	90.0	10.0	0.0	0.0	2.0	

2.1.4 Hydroacoustic Vegetation Mapping Results

Hydroacoustic vegetation abundance data was collected passively while the invasive species and Tier II surveys were being conducted. The data was taken and recorded on a Lowrance HDS-8 fish finder GPS. The data was uploaded to BioBase servers for map generation and data summarization. The results show that overall plant area coverage was 85.5% and biovolume (volume of the lake occupied by vegetation) was 62.4%. Figures 7 illustrates plant coverage of Papakeechee Lake on May 19, 2016. Areas of dark red indicated a higher biovolume of vegetation, blue areas contained no vegetation, and unfilled areas are deep areas of the lake that were not surveyed.

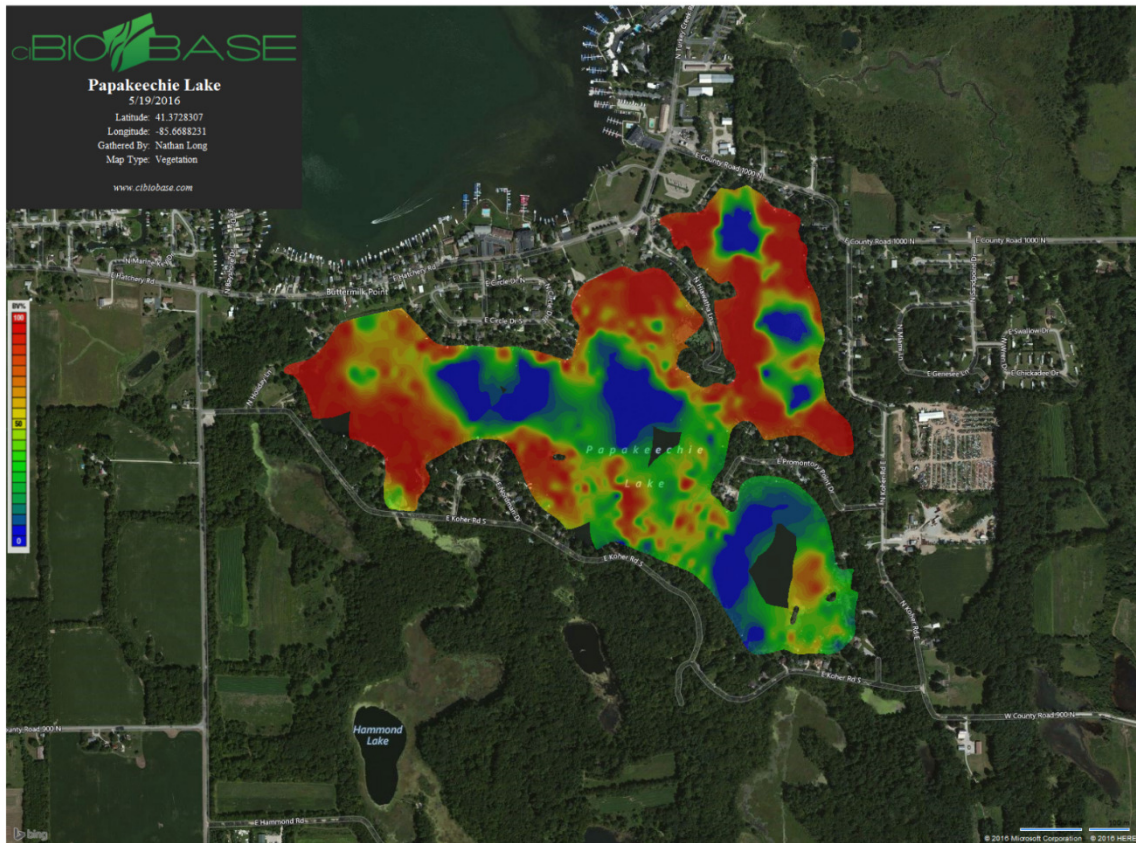


Figure 7. Papakeechee Lake, plant coverage, May 19, 2016.

2.2 Summer Survey Results

2.2.1 Invasive Survey

An invasive species survey was conducted on July 28, 2016. The survey did not discover any invasive species growing in Papakeechee Lake.

2.2.2 Tier II Survey Results

A Tier II survey was conducted on Papakeechee Lake on the same time as the invasive survey. Plants were found to a depth of 15.5 feet and 47 of the 50 sample sites contained vegetation. No invasive species were discovered during the survey. Coontail (86.0%) was found to be the most abundant plant in the lake (Figure 9). Flat-stemmed pondweed

was the second most abundant species and was found at 62.0% of the sample sites (Figure 10). The third most abundant species was large-leaved pondweed which was collected at 58.0% of the sites (Figure 11). The results of the summer Tier II survey are summarized in Table 2.

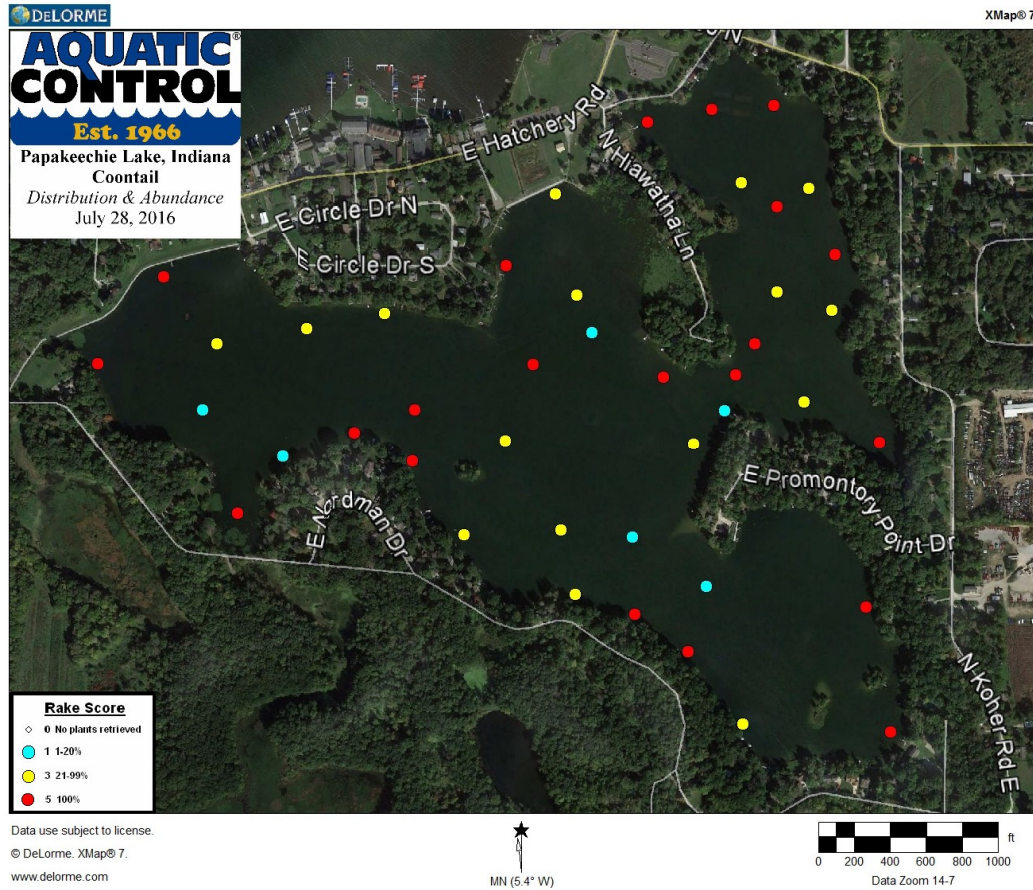


Figure 8. Papakeechee Lake, coontail areas, July 28, 2016.

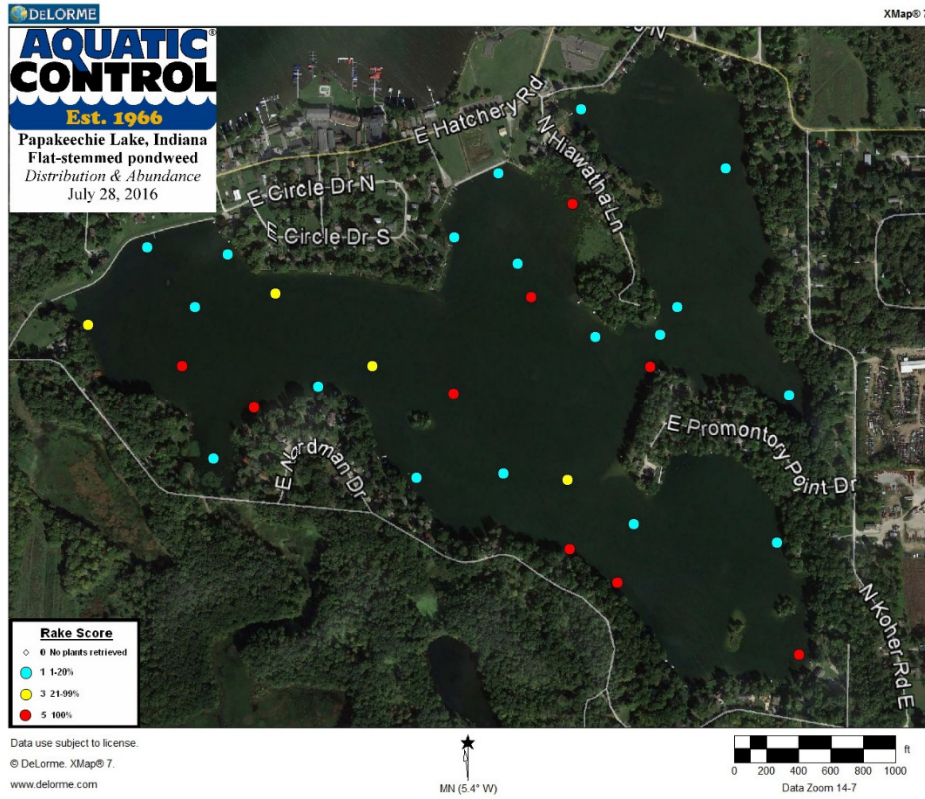


Figure 9. Papakeechee Lake, flat-stemmed pondweed areas, July 28, 2016.

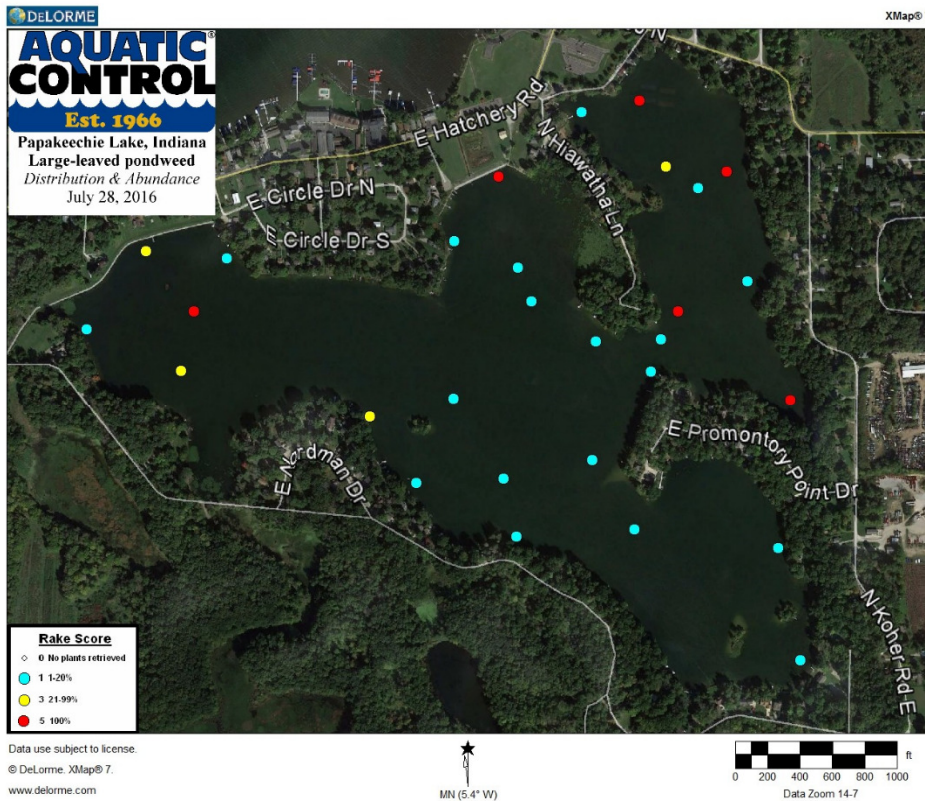


Figure 10. Papakeechee Lake, large-leaved pondweed areas, July 28, 2016.

Table 2. Tier 2 survey results for Papakeechee Lake July 28, 2016.

Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (all depths).							
County:	Kos	Total Sites:	50	Mean species/site:	2.70		
Date:	7.28.16	Sites with plants:	47	SE Mean sp/site:	0.16		
Secchi (ft):	3.5	Sites with native plants:	47	Mean native sp/site:	2.70		
Max Plant Depth (ft):	15.5	Number of species:	6	SE Mean natives/site:	0.16		
Trophic Status:	Meso	# of native species:	6	Species diversity:	0.78		
Littoral Sites:	49	Maximum species/site:	5	Native species diversity:	0.78		
Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (0-5 ft).							
County:	Kos	Total Sites:	20	Mean species/site:	2.95		
Date:	7.28.16	Sites with plants:	20	SE Mean species/site:	0.15		
Secchi (ft):	3.5	Sites with native plants:	20	Mean native species/site:	2.95		
Max Plant Depth (ft):	15.5	Number of species:	5	SE Mean natives/site:	0.15		
Trophic Status:	Meso	# of native species:	5	Species diversity:	0.75		
Littoral Sites:	20	Maximum species/site:	4	Native diversity:	0.75		
Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (5-10 ft).							
County:	Kos	Total Sites:	24	Mean species/site:	2.88		
Date:	7.28.16	Sites with plants:	23	SE Mean species/site:	0.25		
Secchi (ft):	3.5	Sites with native plants:	23	Mean native species/site:	2.88		
Max Plant Depth (ft):	15.5	Number of species:	6	SE Mean natives/site:	0.25		
Trophic Status:	Meso	# of native species:	6	Species diversity:	0.80		
Littoral Sites:	24	Maximum species/site:	5	Native diversity:	0.80		

All Depths (0 to 20 ft)	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		0	1	3	5	
Coontail	86.0	14.0	12.0	32.0	42.0	63.6
Flat-stemmed pondweed	62.0	38.0	36.0	8.0	18.0	30.0
Large-leaved pondweed	58.0	42.0	38.0	8.0	12.0	24.4
Chara	30.0	70.0	26.0	2.0	2.0	8.4
Sago pondweed	20.0	80.0	12.0	6.0	2.0	8.0
Nitella	14.0	86.0	10.0	4.0	0.0	4.4

Other species observed: Spatterdock, Arrowhead, Water willow, Purple loosestrife and Pickeral weed.

Depth: 0 to 5 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		0	1	3	5	
Coontail	90.0	10.0	15.0	25.0	50.0	68.0
Flat-stemmed pondweed	85.0	15.0	45.0	5.0	35.0	47.0
Large-leaved pondweed	75.0	25.0	45.0	10.0	20.0	35.0
Sago pondweed	25.0	75.0	15.0	10.0	0.0	9.0
Chara	20.0	80.0	15.0	5.0	0.0	6.0

Depth: 5 to 10 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		0	1	3	5	
Coontail	87.5	12.5	12.5	37.5	37.5	62.5
Flat-stemmed pondweed	54.2	45.8	33.3	12.5	8.3	22.5
Large-leaved pondweed	54.2	45.8	37.5	8.3	8.3	20.8
Chara	41.7	58.3	37.5	0.0	4.2	11.7
Nitella	29.2	70.8	20.8	8.3	0.0	9.2
Sago pondweed	20.8	79.2	12.5	4.2	4.2	9.2

Table 2 continued

Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (10-15 ft).								
County:	Kos	Total Sites:	4	Mean species/site:	1.00			
Date:	7.28.16	Sites with plants:	3	SE Mean species/site:	0.41			
Secchi (ft):		Sites with native plants:	3	Mean native species/site:	1.00			
Max Plant Depth (ft):	15.5	Number of species:	2	SE Mean natives/site:	0.41			
Trophic Status:		# of native species:	2	Species diversity:	0.38			
Littoral Sites:	4	Maximum species/site:	2	Native diversity:	0.38			
Depth: 10 to 15 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			0	1	3	5		
Coontail		75.0	25.0	0.0	50.0	25.0	55.0	
Chara		25.0	75.0	25.0	0.0	0.0	5.0	
Occurrence and Abundance of Submersed Aquatic Plants in Papakeechee Lake (15-20 ft).								
County:	Kos	Total Sites:	2	Mean species/site:	1.50			
Date:	7.28.16	Sites with plants:	1	SE Mean species/site:	1.50			
Secchi (ft):		Sites with native plants:	1	Mean native species/site:	1.50			
Max Plant Depth (ft):	15.5	Number of species:	3	SE Mean natives/site:	1.50			
Trophic Status:		# of native species:	3	Species diversity:	0.67			
Littoral Sites:	1	Maximum species/site:	3	Native diversity:	0.67			
Depth: 15 to 20 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			0	1	3	5		
Coontail		50.0	50.0	0.0	0.0	50.0	50.0	
Flat-stemmed pondweed		50.0	50.0	50.0	0.0	0.0	10.0	
Large-leaved pondweed		50.0	50.0	50.0	0.0	0.0	10.0	

2.3 Plant Sampling Discussion

The 2016 data shows that there is relatively good native species diversity in Papakeechee Lake and extensive native plant coverage. The decline of invasive curly-leaf pondweed from spring to summer is expected. This decline is most probably attributed to the herbicide treatment and that curly-leaf pondweed tends to die back as the water temperature increases. Coontail, flat-stemmed pondweed, and large-leaved pondweed were some of the most abundant species found throughout the season. Surprisingly, no Eurasian watermilfoil was detected in any of the surveys. This may be due to the fact that Eurasian watermilfoil to low rates of fluridone.

3.0 Conclusion

Aquatic vegetation is an important component for a healthy aquatic ecosystem as it provides cover for fish, food for wildlife, can help stabilize shoreline sediments, and improve water clarity through filtration. Without an abundant plant community it is likely that Papakeechee Lake would be dominated by filamentous or planktonic algae. However, if left unchecked, some species can create problems for lake users and the ecosystem. These nuisance species are usually non-native or invasive species. Only one invasive species, curly-leaf pondweed, was detected in the 2016 survey. This is somewhat surprising given the amount of invasive milfoil and starry stonewort thriving in public lakes in the surrounding area. The lack of a public boat ramp likely reduces the chance that these invasive species find their way into the lake. In addition, annual

fluridone treatments likely keep invasive milfoil in check, as it is susceptible to low doses of this herbicide.

For 2017, it is recommended that treatment with low rates of fluridone be continued. The Association may want to consider an earlier spring treatment (the exact timing is dependent on weather conditions and product formulation, but some treatments start as early as April 1). Advantages of the early treatment would be that you can control curly-leaf pondweed before it produces its reproductive structures called turions thus limiting regrowth the next season, you can control the plant before it assimilates a large biomass thus reducing nutrient release and transfer from the sediment to the water column, and you can control the invasive with less harm to beneficial native species which typically don't start growing until later in the spring. Some disadvantages to the earlier treatment would be that you run the risk of losing fluridone in heavy spring rains and you will get less control of some native species that may be considered a nuisance to some residents. A newer formulation of fluridone, called SonarONE, may help reduce the risk of losing product in the spring rains. SonarOne is a slow release granular aquatic herbicide that can be applied early and maintain a low, steady concentration of herbicide throughout the growing season.

With the abundance of invasive species in the area it also recommended that similar plant surveys be repeated every 2-3 years. Residents should also help keep watch for starry stonewort and other invasive species that are present in Lake Wawasee. Signage identifying invasive species and reminders to clean boats prior to launching can aid in preventing these species from gaining a foothold. Information on identifying and slowing the spread of these species can be found on the following websites:

http://iiseagrant.org/topic_ais.php

<http://plants.ifas.ufl.edu/>

<https://nas.er.usgs.gov/>

<http://www.protectyourwaters.net/>

<http://www.aquatics.org/>

4.0 REFERENCES CITED

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http://lakes.grace.edu/files/uploads/health%20reports/CFLS_LakeBrochure_Papakeechee_16d_EO.pdf

IDNR. 2014. Tier II Aquatic Vegetation Survey Protocol. IN Department of Natural Resources. Division of Fish & Wildlife, Indianapolis, Indiana.

5.0 APPENDICIES

5.1 Spring Tier II Data Sheets

WPT	Lat	Long	Depth	Curlyleaf pondweed	Fil. Algae	Coontail	Chara	Large-leaved pondweed	Flat- stemmed pondweed	Nitella	Sago pondweed	Water stargrass
1	41.37584	-85.6698	4.0	5		1	1	1	1			
2	41.37429	-85.6693	6.0	3		1			1			
3	41.37531	-85.6681	3.0	1	P		3	1	5			
4	41.37373	-85.669	13.0									
5	41.37305	-85.6676	6.0	3		1	3	3	1			
6	41.37355	-85.6657	7.0	5		1	3	1	1			
7	41.37472	-85.6653	11.0	1			1					
8	41.376	-85.666	5.0	5		1		1				
9	41.37692	-85.6679	4.0	5	P		5	5				
10	41.37717	-85.6653	6.0	5			3	1				
11	41.37491	-85.6641	7.0	1	P	3	3					
12	41.37206	-85.6632	4.0	1		1	1	5				
13	41.37254	-85.6663	5.0	3			1	3	1			
14	41.37103	-85.6677	7.0	3	P		1	3	1			
15	41.3704	-85.6658	12.0			1						
16	41.36954	-85.6635	6.0	1	P	1	5	1				
17	41.36765	-85.663	4.0	1	P	1	5	1				
18	41.36777	-85.666	7.0			5	5					
19	41.36943	-85.6682	4.0	5		1	3		1			
20	41.37071	-85.6697	7.0	5			1					
21	41.37064	-85.6716	6.0	5	P	1	1		3			
22	41.37208	-85.6708	9.0	3				1		1		
23	41.37177	-85.6727	4.0	5	P			1				
24	41.37256	-85.6726	12.0			1						
25	41.37221	-85.6739	4.0	5			3		3			
26	41.37185	-85.6753	5.0	1		1			1			
27	41.37097	-85.6762	3.0		P	1	1					
28	41.37256	-85.6769	7.0	1					5			
29	41.37355	-85.6766	7.0	5			1	3	1			
30	41.37325	-85.6791	4.0	1	P	5						
31	41.37457	-85.6777	6.0		P				1	5		
32	41.37445	-85.6759	4.0	1		3					1	
33	41.37379	-85.6748	11.0	1		5			1		3	
34	41.37402	-85.6732	4.0	5		1	3	1			1	1
35	41.37366	-85.672	15.0									
36	41.37324	-85.6702	14.0									
37	41.37474	-85.6708	4.0	5		3	5					3
38	41.37409	-85.6702	12.0			1						1
39	41.37309	-85.6661	4.0	3		5			1			
40	41.37434	-85.6653	12.0	1						1		
41	41.37564	-85.6653	6.0			3		3				
42	41.37711	-85.6666	11.0	5		1		1				
43	41.37591	-85.6646	5.0	5	P	1		5				
44	41.37406	-85.6642	6.0	5	P	1		1		5		
45	41.37267	-85.6647	7.0	5		3		5				
46	41.37204	-85.667	7.0	1		1				3		
47	41.37061	-85.6682	7.0	1		1		1		5		1
48	41.36985	-85.6667	7.0									
49	41.36887	-85.6671	5.0							5		
50	41.36974	-85.6694	4.0		P	1			3			

5.2 Summer Tier II Data Sheets

WPT	Lat	Long	Depth	Coontail	Chara	Large-leaved pondweed	Flat-stemmed pondweed	Nitella	Sago pondweed
1	41.37584	-85.6698	5.5	3		5	1		
2	41.37429	-85.6693	5.0	3		1	1		1
3	41.37531	-85.6681	2.0		1		5		
4	41.37373	-85.669	6.5	1	1	1	5		5
5	41.37305	-85.6676	5.0	5		1	1		
6	41.37355	-85.6657	5.0	5		5	1		
7	41.37472	-85.6653	7.0		5				
8	41.376	-85.666	4.0	3		3			1
9	41.37692	-85.6679	4.0	5		1	1		
10	41.37717	-85.6653	11.0	5					
11	41.37491	-85.6641	9.0	5	1				
12	41.37206	-85.6632	4.0	5		5	1		
13	41.37254	-85.6663	4.0	1		1	5		
14	41.37103	-85.6677	7.0			1		3	1
15	41.3704	-85.6658	8.0						
16	41.36954	-85.6635	8.0	5	1	1	1		
17	41.36765	-85.663	5.0	5	1	1	5		
18	41.36777	-85.666	8.0	3					
19	41.36943	-85.6682	4.0	5			5		
20	41.37071	-85.6697	6.0	3		1	1		
21	41.37064	-85.6716	6.0	3		1	1		
22	41.37208	-85.6708	4.0	3		1	5		1
23	41.37177	-85.6727	6.0	5		3			1
24	41.37256	-85.6726	6.0	5	1		3	1	
25	41.37221	-85.6739	7.0	5	1		1		3
26	41.37185	-85.6753	5.0	1	1		5		
27	41.37097	-85.6762	2.0	5			1		
28	41.37256	-85.6769	5.0	1		3	5		
29	41.37355	-85.6766	5.5	3		5	1		
30	41.37325	-85.6791	5.0	5		1	3		3
31	41.37457	-85.6777	6.0	5		3	1	1	
32	41.37445	-85.6759	5.0			1	1		3
33	41.37379	-85.6748	6.0	3	1		3		
34	41.37402	-85.6732	10.5	3					
35	41.37366	-85.672	19.0						
36	41.37324	-85.6702	7.5	5				3	
37	41.37474	-85.6708	15.5	5		1	1		
38	41.37409	-85.6702	10.5						
39	41.37309	-85.6661	5.0	5		1	1		
40	41.37434	-85.6653	12.0	3	1				
41	41.37564	-85.6653	7.5	5		1			
42	41.37711	-85.6666	4.0	5		5			
43	41.37591	-85.6646	4.0	3		5	1		
44	41.37406	-85.6642	8.0	3	1	1			
45	41.37267	-85.6647	7.5	3					
46	41.37204	-85.667	5.0	3	3				
47	41.37061	-85.6682	7.0	1	1		3	1	
48	41.36985	-85.6667	6.0	1		1	1		1
49	41.36887	-85.6671	6.5	5			5	1	
50	41.36974	-85.6694	6.0	3	1	1		1	

5.3 Papakeechee Lake Submersed Aquatic Plant Species List

<i>Scientific Name</i>	<i>Common Name</i>
<i>Potamogeton crispus</i>	Curly-leaf pondweed
<i>Ceratophyllum demersum</i>	Coontail
<i>Chara sp.</i>	Chara
<i>Potamogeton amplifolius</i>	Large-leaved pondweed
<i>Potamogeton zosteriformis</i>	Flat-stemmed pondweed
<i>Nitella sp.</i>	Nitella
<i>Heteranthera dubia</i>	Water stargrass
<i>Stuckenia pectinata</i>	Sago Pondweed