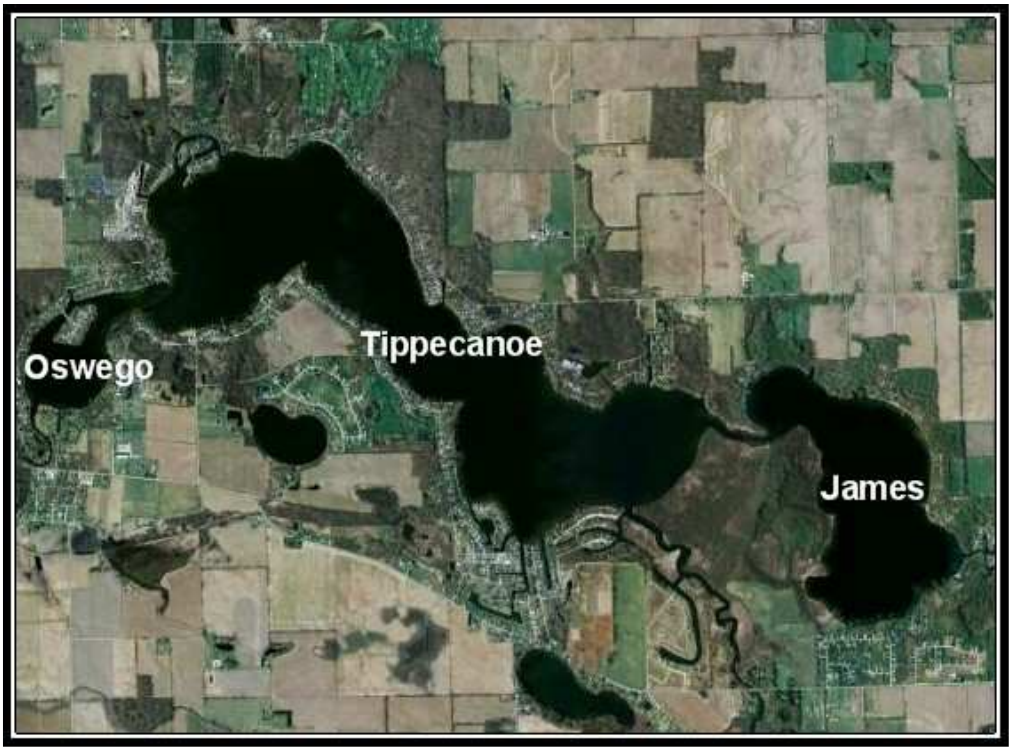
Lake Tippecanoe Aquatic Vegetation Management Plan
2009 Update
Kosciusko County, Indiana

February 18, 2010



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Executive Summary

Aquatic Control was contracted by the Lake Tippecanoe Property Owners Association (LTPOA) to complete aquatic vegetation sampling in order to update the Lake Tippecanoe Aquatic Vegetation Management Plan. Funding for development of this plan was obtained from the Lake Tippecanoe Property Owners Association and the Indiana Department of Natural Resources-Division of Fish and Wildlife as part of the Lake and River Enhancement program (LARE). The update serves as a tool to track changes in the vegetation community, to adjust the action plan as needed, and to maintain eligibility for LARE funds. Items covered include the 2009 Tier 2, invasive species, and ecozone sampling results, a review of the 2009 vegetation controls, and updates to the budget and action plans.

Aquatic vegetation is an important component of lakes in Indiana; however, as a result of many factors this vegetation can develop to a nuisance level. Nuisance aquatic vegetation, as used in this paper, describes plant growth that negatively impacts the present uses of the lake including fishing, boating, swimming, aesthetic, and lakefront property values. The primary invasive species within Lake Tippecanoe are Eurasian watermilfoil (*Myriophyllum spicatum*) and curlyleaf pondweed (*Potamogeton crispus*). Eel grass (*Vallisneria americana*) and filamentous bluegreen algae are also abundant in the Lake Tippecanoe chain and can also create nuisance conditions.

Previous plan recommendations for plant control within the Lake Tippecanoe chain included the use of Renovate herbicide (active ingredient: triclopyr) to selectively control Eurasian watermilfoil and early season treatments with Aquathol K herbicide (active ingredient: endothal) for control of curlyleaf pondweed throughout the lakes. The goals of the plant controls are to maintain Eurasian watermilfoil and curlyleaf pondweed below 10% frequency of occurrence in all three lakes while maintaining a minimum of 80% vegetative cover of the littoral zone. In addition to the herbicide applications, it was also recommended that plant surveys be conducted in order to map treatment areas and document changes in the native and invasive plant community.

The third, and potentially final, season of lakewide curlyleaf pondweed treatments was completed on April 27, 2009. The same 104 acre area that was treated in 2007 and 2008 was again treated at this time with 1.0 ppm of Aquathol K (active ingredient: endothal). Eurasian watermilfoil treatment areas were mapped on May 27, 2009. A total of 51.8 acres of milfoil was mapped within the three lakes and treated on June 8, 2009 with Renovate herbicide (active ingredient: triclopyr). Treatments effectively controlled invasive species in the targeted areas.

On August 11, 2009, an emergent plant survey was completed within the Tippecanoe ecozone. The purpose of the sampling was to collect data on the floating leaf and emergent vegetation community within the ecozone. This data will be used to track changes within this plant community that can be used to assess the effectiveness of the ecozone. Twelve emergent and floating leaf plant beds covered a 6.05 acre area within

the ecozone. This was a slight increase in the number of plant beds and acres covered by these beds when compared to 2008. A Tier 2 survey was completed on all three lakes on August 20, 2009. This survey was completed in order to document changes in the native plant community and document the results of the herbicide treatments. Milfoil continued to be below 10% frequency of occurrence in all three lakes. Native diversity metrics were slightly increased in James and Oswego but decreased in Tippecanoe.

A public meeting was held on October 19, 2009 in order to inform lake users of the plant management activities and gain their input on the direction of the plan. The primary concern that came out of the meeting was a need to address the problems caused by eel grass and filamentous bluegreen algae.

A great deal of information has been gathered over the past several years of vegetation management on the Lake Tippecanoe chain of lakes. That information is used to create the following list of recommendations:

- Continue with treatment of Eurasian watermilfoil with selective systemic herbicides throughout the lakes. Treatment should be completed following a late spring invasive species survey. Approximately 50 acres of milfoil may require treatment next season.

- Conduct a curlyleaf mapping survey in late April 2010 in order to document curyleaf abundance. Areas of curlyleaf that still remain should be treated if LTPOA budget allows. No more than 30 acres of curlyleaf will likely require treatment.

- Complete a late summer Tier 2 survey in order to assess the results of the invasive controls and changes within the native plant community.

- In 2012, complete a rooted floating and emergent vegetation survey within the ecozone in order to document changes within this important plant community and assess the effectiveness of the ecozone.

- Complete treatment of eel grass and bluegreen algae mats in areas where treatment has been permitted in the past. Additional areas will require IDNR approval. This may require a 1-2 hour tour of the lake during the summer with IDNR biologists, Association representatives, and herbicide contractors.

- Continue to educate lake users on best management practices that help reduce nutrient loading. The Tippecanoe Environmental Lake and Watershed Foundation (TELWF) and previous diagnostic studies are excellent sources for information and assistance for implementing these practices.

Acknowledgements

Funding for the vegetation sampling and the survey report was provided by the Indiana Department of Natural Resources (IDNR) Division of Fish and Wildlife Lake and River Enhancement Program and the Lake Tippecanoe Property Owners Association (LTPOA). Aquatic Control Inc. completed the field work, data processing, and map generation. Special thanks are given to Angela Sturdevant and Jed Pearson with the Indiana Department of Natural Resources for their assistance and review of this plan. Special thanks are also given to Holly LaSalle with the LTPOA for her assistance with this plan. Authors of this report are Nathan Long and Brendan Hastie of Aquatic Control. The authors would like to acknowledge the valuable input from Patrick Whitson, Joey Leach, and Barbie Huber of Aquatic Control for their field assistance, review, and editing of this report.

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1.0 INTRODUCTION

This report was created in order to update the Lake Tippecanoe Aquatic Vegetation Management Plan which was intended to cover the years 2005-2010. The plan update was funded by the Lake Tippecanoe Property Owners Association (LTPOA) and the Indiana Department of Natural Resources (IDNR) Lake and River Enhancement (LARE) program. The update serves as a tool to track changes in the vegetation community, to adjust the action plan as needed, and to maintain eligibility for LARE funds. Items covered include the 2009 sampling results, a review of the 2009 vegetation controls, and updates to the budget and action plans. Once reviewed and approved, the update should be included in the original vegetation management plan, following the 2007 update and prior to the original appendix.

Lake Tippecanoe, including James and Oswego lakes, is a 1,110 acre chain of natural lakes located 2 miles west of North Webster, Indiana (Figure 1). It lies within the Tippecanoe River watershed and drains 72,320 acres. The water level is maintained by a dam built in 1936 at the west end of Oswego Lake. The main inlets enter from Lake Webster (Tippecanoe River), and the Barbee Lakes (Grassy Creek). With a maximum depth of 122 feet, Lake Tippecanoe is the deepest natural lake in Indiana. The Tippecanoe Lake basin is steep-sided and has an average depth of 37 feet. The combined volume of the three basins is 35,230 acre-feet and their hydraulic retention time is 175 days. James Lake covers 272 acres, drains 35,776 acres and has a retention time of 73 days. Farming is the major land use in the watershed, but small towns, woodlots, wetlands, and lakes are present (Jones 1986). Nearly the entire shoreline of the lakes is residentially developed with the exception of the Ball Wetland area.

Aquatic vegetation is an important ecological component of the Lake Tippecanoe chain of lakes. This vegetation provides cover for fish and wildlife, helps slow erosion, provides food for waterfowl, and can help filter nutrients from the water column. Despite these many benefits, aquatic vegetation can develop to a nuisance level. Nuisance aquatic vegetation, as used in this paper, describes plant growth that negatively impacts the present uses of the lake including fishing, boating, swimming, aesthetic, and lakefront property values. Eurasian watermilfoil (*Myriophyllum spicatum*) and curlyleaf pondweed (*Potamogeton crispus*) are two invasive species which have been abundant in the Tippecanoe Chain for many years. These non-native species can create many problems for lake users if they are left unchecked. Native eel grass (*Vallisneria americana*) and filamentous bluegreen algae are also abundant in the Lake Tippecanoe chain and have historically reached nuisance levels throughout many of the shallow areas of the lakes.

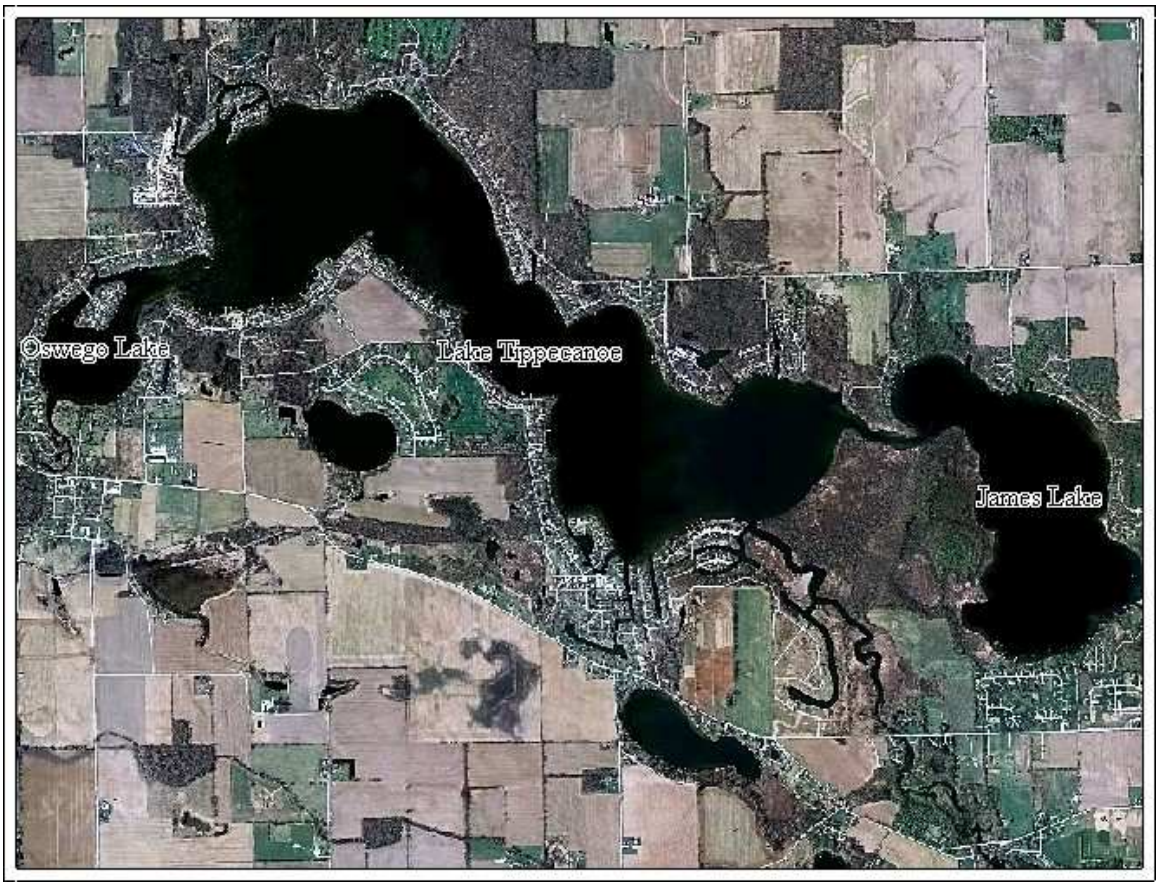

Figure 1. Lake Tippecanoe chain of lakes.

2.0 2009 PLANT SAMPLING

Three surveys were completed on Tippecanoe, Oswego, and James Lakes in order to document changes in the plant community, map potential treatment areas, to determine the success or failure of control techniques, and to aid in 2010 planning. An invasive species mapping survey was completed in May to document remaining areas of curlyleaf pondweed and to map Eurasian watermilfoil prior to the LARE funded treatment, rooted floating and emergent vegetation was mapped within the ecozone area in mid-August, and in late August a Tier 2 survey was completed in order to document changes in the native and invasive plant communities and to aid in the 2010 planning.

2.1 Invasive Mapping Survey

The Association received a grant from LARE to complete an Invasive Mapping Survey prior to the milfoil treatment. The invasive mapping survey was completed on May 27. The primary purpose of this survey was to determine areas of milfoil infestation that would require treatment. In addition, remaining areas of curlyleaf pondweed were also mapped. The survey was completed by boating over the littoral areas of the lake in a tight zigzag fashion. In shallow areas plants located by observation from the deck of the boat, while rakes were used in deeper areas. Locations of invasive species were recorded on a GPS and backed up by recording on a waterproof paper map. This information was

taken back to the office where it was downloaded into a mapping program that allowed for accurate acreage estimates.

2.1.1 Oswego Lake Invasive Mapping Survey

On May 27, 2009 an invasive mapping survey was completed on Oswego Lake. A total of 17.9 acres of Eurasian watermilfoil was documented (Figure 2). Milfoil was most abundant along the west shore and most of the dense beds were located in the southwest and southeast corners of the lake. No curlyleaf pondweed detected during the survey.

Figure 2. Oswego Lake, Eurasian watermilfoil areas, May 27, 2009.

2.1.2 Lake Tippecanoe Invasive Mapping

Lake Tippecanoe was surveyed on the same day as Oswego Lake. A total of 29.1 acres of milfoil was documented within Lake Tippecanoe (Figure 3). The largest areas of milfoil were located along the eastern shoreline. This area has historically contained dense beds of milfoil, but these beds contained more scattered patches of plants than in previous surveys. The densest area of milfoil was located along the northwest shore. Dense beds of milfoil had not been seen in this area for several years.

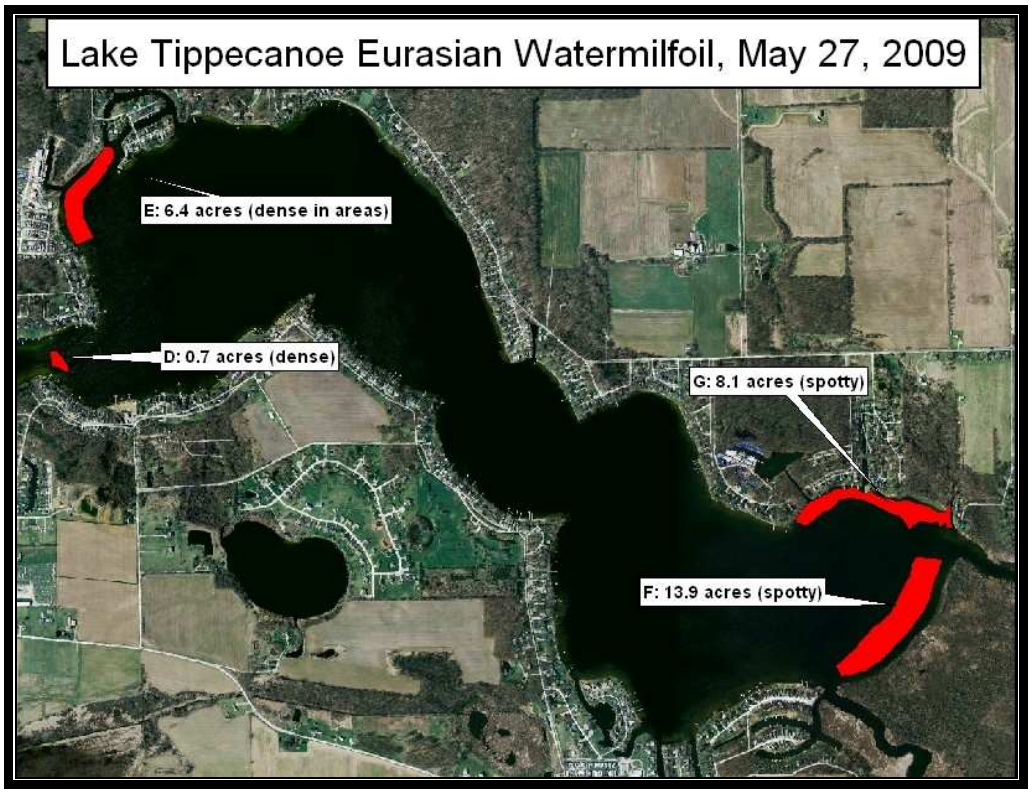

Figure 3. Lake Tippecanoe, Eurasian watermilfoil areas, May 27, 2009.

Curlyleaf pondweed was documented in one area encompassing 7.8 acres of Lake Tippecanoe (Figure 4). This area was located along the eastern shore near the mouth of Grassy Creek. Curlyleaf in this area was brown and appeared to be dead or dying. This was likely the result of the April treatment. This area was to be retreated during the June milfoil application, but plants had dropped out between the time of the invasive survey and the June treatment.

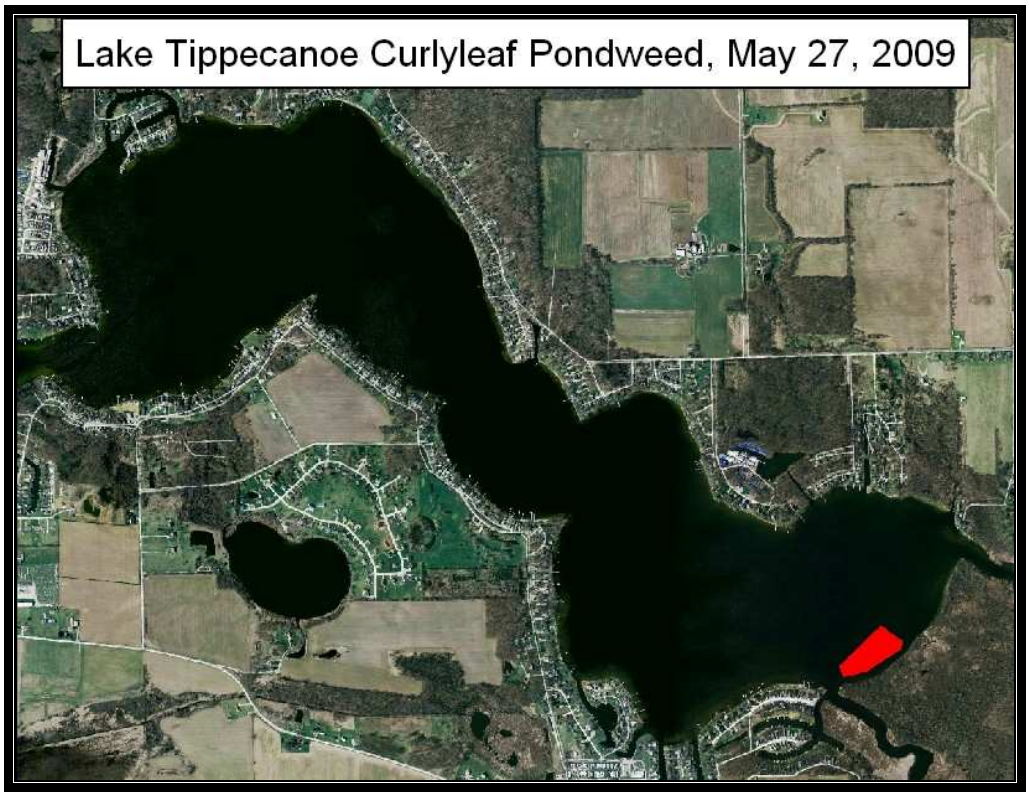

Figure 4. Lake Tippecanoe, curlyleaf pondweed areas, May 27, 2009.

2.1.3 James Lake Invasive Mapping Survey

James Lake was surveyed on the same day as Oswego and Lake Tippecanoe. A total of 4.8 acres of milfoil was detected (Figure 5). One 2.8-acre bed was located along the northwest shoreline and the other 2.0 acre bed was located along the eastern shore. Curlyleaf pondweed was not observed during the survey.

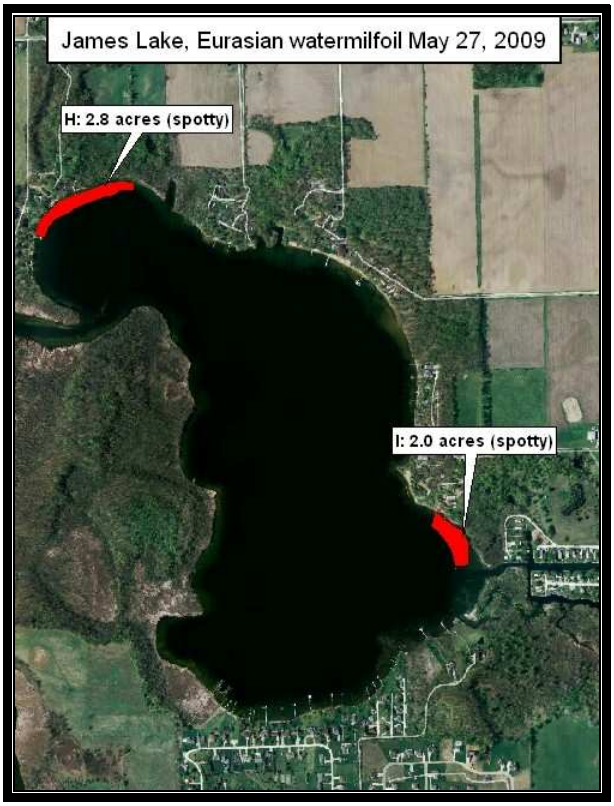

Figure 5. James Lake, Eurasian watermilfoil areas, May 27, 2009.

2.2 Tier 2 Surveys

Tier 2 surveys were completed on the Tippecanoe Chain on August 20, 2009. Surveys were completed according to IDNR Tier 2 surveying protocol (IDNR 2008). These surveys were completed in order to document changes in the native and invasive plant population. This survey also served as a tool for planning for 2010 plant management.

2.2.1 Oswego Lake Tier 2 Survey

A total of 40 sites were sampled throughout the littoral zone of Oswego Lake. These were the same sites that were sampled in 2007. Results of the sampling are listed in Table 1. A Secchi disk reading was taken prior to sampling and found to be 7.0 feet. Aquatic vegetation was present to a maximum depth of 18 feet and present at 25 of the 40 sites. A total of 11 species were collected of which 9 were native. The maximum number of species per site was 5 while the mean species per site was 1.50. The 5.0-10.0 foot depth range had the highest diversity of vegetation while sites deeper than 10.0 feet contained 1-2 species and were dominated by coontail. Eel grass was present at the highest percentage of overall sample sites (40.0%) and also the highest dominance rating (Figure 6). Eel grass was most abundant in the shallow water areas. Coontail (*Ceratophyllum demersum*) ranked second in overall site frequency (25.0%) and was most abundant in water greater than 10.0 feet (Figure 6). Chara (*Chara sp.)* and slender naiad (*Najas flexilis*) each occurred at 15% of sites. Richardson's pondweed (*Potamogeton richardsonii*), a species of concern in Indiana, was present at 12.5% of sites (Figure 7). Sago pondweed (*Potamogeton pectinatus*), and variable pondweed

(*Potamogeton gramineus*) were also present at 12.5% of sites. Brittle naiad (*Najas minor*), Eurasian watermilfoil, and elodea (*Elodea canadensis*) were each present at less than 10% of sites. Brittle naiad and Eurasian watermilfoil are each non-native species. Their locations are illustrated in Figures 7 and 8. Filamentous algae was present at 20% of the sample sites. Species that were observed but not collected on the rake include: sacred lotus (*Nelumbo lucifera*), white water lily (*Nymphaea odorata)*, swamp loosestrife (*Decodon verticillatus)*, and purple loosestrife (*Lythrum salicaria*).

Table 1. Oswego Lake Tier 2 survey results, August 20, 2009.

Occurrence and Abundance of Submersed Aquatic Plants in Oswego Lake (all depths).								
County:	Kos	Total Sites:	40				Mean species/site:	1.50
Date:	8.20.09	Sites with plants:	25				SE Mean species/site:	0.25
Secchi (ft):	7	Sites with native plants:	25				Mean native species/site:	1.38
Max Plant Depth (ft):	18	Number of species:	11				SE Mean natives/site:	0.23
Trophic Status:	Meso	# of native species:	9				Species diversity:	0.86
		Maximum species/site:	5				Native species diversity:	0.83
All Depths (0 to 20 ft)		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			**0**	**1**	**3**	**5**		
Eel grass		40.0	60.0	12.5	5.0	22.5	28.0	
Common coontail		25.0	75.0	15.0	2.5	7.5	12.0	
Chara		15.0	85.0	5.0	2.5	7.5	10.0	
Slender naiad		15.0	85.0	12.5	2.5	0.0	4.0	
Richardson's pondweed		12.5	87.5	10.0	2.5	0.0	3.5	
Sago pondweed		12.5	87.5	7.5	2.5	2.5	5.5	
Variableleaf pondweed		12.5	87.5	10.0	2.5	0.0	3.5	
Brttle naiad		7.5	92.5	7.5	0.0	0.0	1.5	
Eurasian watermilfoil		5.0	95.0	5.0	0.0	0.0	1.0	
Elodea		2.5	97.5	2.5	0.0	0.0	0.5	
Largeleaf pondweed		2.5	97.5	2.5	0.0	0.0	0.5	
Filamentous algae		20.0						
Other Species Observed: Sacred Lotus, White water lily, purple loosestrife, and swamp loosestrife								

Occurrence and Abundance of Submersed Aquatic Plants in Oswego Lake (0-5 ft).								
County:	Kos	Total Sites:	7				Mean species/site:	2.86
Date:	8.20.09	Sites with plants:	7				SE Mean species/site:	0.40
Secchi (ft):	7	Sites with native plants:	7				Mean native species/site:	2.86
Max Plant Depth (ft):	18	Number of species:	7				SE Mean natives/site:	0.40
Trophic Status:	Meso	# of native species:	7				Species diversity:	0.79
		Maximum species/site:	4				Native diversity:	0.79
Depth: 0 to 5 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			**0**	**1**	**3**	**5**		
Eel grass		100.0	0.0	14.3	14.3	71.4	82.9	
Chara		57.1	42.9	0.0	14.3	42.9	51.4	
Sago pondweed		42.9	57.1	14.3	14.3	14.3	25.7	
Richardson's pondweed		28.6	71.4	28.6	0.0	0.0	5.7	
Variableleaf pondweed		28.6	71.4	28.6	0.0	0.0	5.7	
Common coontail		14.3	85.7	14.3	0.0	0.0	2.9	
Slender naiad		14.3	85.7	14.3	0.0	0.0	2.9	

Occurrence and Abundance of Submersed Aquatic Plants in Oswego Lake (5-10 ft).								
County:	Kos	Total Sites:	17				Mean species/site:	2.00
Date:	8.20.09	Sites with plants:	13				SE Mean species/site:	0.41
Secchi (ft):	7	Sites with native plants:	13				Mean native species/site:	1.71
Max Plant Depth (ft):	18	Number of species:	10				SE Mean natives/site:	0.35
Trophic Status:	Meso	# of native species:	8				Species diversity:	0.86
		Maximum species/site:	5				Native diversity:	0.82
Depth: 5 to 10 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			**0**	**1**	**3**	**5**		
Eel grass		52.9	47.1	23.5	5.9	23.5	31.8	
Slender naiad		29.4	70.6	23.5	5.9	0.0	8.2	
Common coontail		23.5	76.5	11.8	5.9	5.9	11.8	
Brttle naiad		17.6	82.4	17.6	0.0	0.0	3.5	
Richardson's pondweed		17.6	82.4	11.8	5.9	0.0	5.9	
Variableleaf pondweed		17.6	82.4	11.8	5.9	0.0	5.9	
Chara		11.8	88.2	11.8	0.0	0.0	2.4	
Eurasian watermilfoil		11.8	88.2	11.8	0.0	0.0	2.4	
Sago pondweed		11.8	88.2	11.8	0.0	0.0	2.4	
Elodea		6	94	6	0	0	1.2	

Occurrence and Abundance of Submersed Aquatic Plants in Oswego Lake (10-15 ft).								
County:	Kos	Total Sites:	5				Mean species/site:	0.80
Date:	8.20.09	Sites with plants:	3				SE Mean species/site:	0.37
Secchi (ft):	7	Sites with native plants:	3				Mean native species/site:	0.80
Max Plant Depth (ft):	18	Number of species:	2				SE Mean natives/site:	0.37
Trophic Status:	Meso	# of native species:	2				Species diversity:	0.38
		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**		
Common coontail		60.0	40.0	20.0	0.0	40.0	44.0	
Largeleaf pondweed		20.0	80.0	20.0	0.0	0.0	4.0	

Occurrence and Abundance of Submersed Aquatic Plants in Oswego Lake (15-20 ft).								
County:	Kos	Total Sites:	11				Mean species/site:	0.18
Date:	8.20.09	Sites with plants:	2				SE Mean species/site:	0.12
Secchi (ft):	7	Sites with native plants:	2				Mean native species/site:	0.18
Max Plant Depth (ft):	18	Number of species:	1				SE Mean natives/site:	0.12
Trophic Status:	Meso	# of native species:	1				Species diversity:	0.00
		Maximum species/site:	1				Native diversity:	0.00
Depth: 15 to 20 ft		Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance	
Species			**0**	**1**	**3**	**5**		
Common coontail		18.2	81.8	18.2	0.0	0.0	3.6	

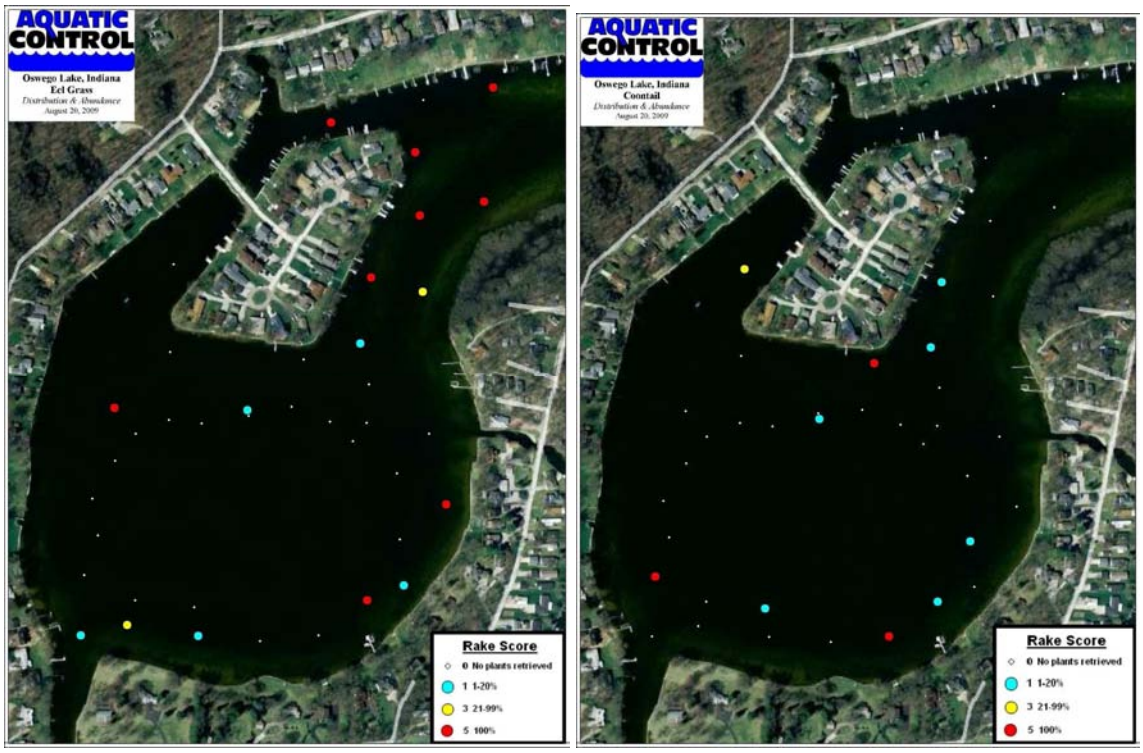

Figure 6. Oswego Lake, eel grass (left) and coontail (right) location August 20, 2009.

Figure 7. Oswego Lake, Richardson's pondweed (left) and brittle naiad (right) location, August 20, 2009.

Figure 8. Oswego Lake, Eurasian watermilfoil location, August 20, 2009.

2.2.2 Lake Tippecanoe Tier 2 Survey

A total of 89 sites were sampled throughout the littoral zone of Lake Tippecanoe. These were also the same sites that were sampled in 2007. Results of the sampling are listed in Table 2. A Secchi disk reading was taken prior to sampling and found to be 7.0 feet. Aquatic vegetation was present to a maximum depth of 18 feet and present at 67 of the 89 sites. A total of 11 species were collected of which 10 were native. The maximum number of species per site was 5 while the mean species per site was 1.36. The shallow depth range (0-5 feet) had the highest diversity of vegetation while sites deeper than 15.0 feet only contained coontail. Eel grass was present at the highest percentage of overall sample sites (60.7%) and also the highest dominance rating (Figure 9). Eel grass was most abundant in the shallow water areas. Coontail ranked second in overall site frequency (23.6%) and was most abundant in water greater than 10.0 feet (Figure 10). Richardson's pondweed was present at 14.6% of sites (Figure 11) followed by chara which was present at 11.2% of sites. Sago and variable pondweed were both present at 6.7% of sites. Eurasian watermilfoil was collected at 4.5% of sites and its location is illustrated in Figure 12. Slender naiad, common bladderwort (*Utricularia vulgaris*), flatstem pondweed (*Potamogeton zosteriformis*), and Illinois pondweed (*Potamogeton illinoensis*) were all present at less than 5% of sites, while filamentous algae was present at 11% of the sample sites. Species that were observed but not collected on the rake include: white water lily, spatterdock (*Nuphar sp.*), and common cattail (*Typha latifolia*).

Table 2. Lake Tippecanoe Tier 2 survey results, August 20, 2009.

Occurrence and Abundance of Submersed Aquatic Plants in Lake Tippecanoe (all depths).

County:	Kos	Total Sites:	89	Mean species/site:	1.36
Date:	8.20.09	Sites with plants:	67	SE Mean species/site:	0.12
Secchi (ft):	7	Sites with native plants:	67	Mean native species/site:	1.31
Max Plant Depth (ft):	18	Number of species:	11	SE Mean natives/site:	0.12
Trophic Status:	Meso	# of native species:	10	Species diversity:	0.75
		Maximum species/site:	5	Native species diversity:	0.73

All Depths	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Eel grass	60.7	39.3	13.5	14.6	32.6	44.0
Coontail	23.6	76.4	9.0	5.6	9.0	14.2
Richardson's pondweed	14.6	85.4	12.4	2.2	0.0	3.8
Chara	11.2	88.8	9.0	2.2	0.0	3.1
Sago pondweed	6.7	93.3	4.5	1.1	1.1	2.7
Variable pondweed	6.7	93.3	4.5	2.2	0.0	2.2
Eurasian watermilfoil	4.5	95.5	4.5	0.0	0.0	0.9
Slender naiad	4.5	95.5	4.5	0.0	0.0	0.9
Common bladder wort	1.1	98.9	1.1	0.0	0.0	0.2
Flatstem pondweed	1.1	98.9	1.1	0.0	0.0	0.2
Illinois pondweed	1.1	98.9	1.1	0.0	0.0	0.2

Species Observed: Common cattail, spatterdock, and white water lily.

Occurrence and Abundance of Submersed Aquatic Plants in Lake Tippecanoe (0-5 ft).

County:	Kos	Total Sites:	25	Mean species/site:	1.56
Date:	8.20.09	Sites with plants:	18	SE Mean species/site:	0.27
Secchi (ft):	7	Sites with native plants:	18	Mean native species/site:	1.48
Max Plant Depth (ft):	18	Number of species:	10	SE Mean natives/site:	0.24
Trophic Status:	Meso	# of native species:	9	Species diversity:	0.78
		Maximum species/site:	5	Native diversity:	0.76

Depth: 0 to 5 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Eel grass	60	40	20	12	28	39.2
Chara	32	68	24	8	0	9.6
Richardson's pondweed	16	84	16	0	0	3.2
Coontail	12	88	8	0	4	5.6
Variable pondweed	12	88	4	8	0	5.6
Eurasian watermilfoil	8	92	8	0	0	1.6
Flatstem pondweed	4	96	4	0	0	0.8
Illinois pondweed	4.0	96.0	4.0	0.0	0.0	0.8
Sago pondweed	4.0	96.0	4.0	0.0	0.0	0.8
Slender naiad	4.0	96.0	4.0	0.0	0.0	0.8

Occurrence and Abundance of Submersed Aquatic Plants in Lake Tippecanoe 5-10 ft).

County:	Kos	Total Sites:	37	Mean species/site:	1.57
Date:	8.20.09	Sites with plants:	33	SE Mean species/site:	0.18
Secchi (ft):	7	Sites with native plants:	33	Mean native species/site:	1.54
Max Plant Depth (ft):	18	Number of species:	9	SE Mean natives/site:	0.17
Trophic Status:	Meso	# of native species:	8	Species diversity:	0.67
		Maximum species/site:	5	Native diversity:	0.66

Depth: 5 to 10 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Eel grass	83.8	16.2	8.1	24.3	51.4	67.6
Richardson's pondweed	21.6	78.4	16.2	5.4	0.0	6.5
Coontail	16.2	83.8	8.1	8.1	0.0	6.5
Sago pondweed	13.5	86.5	8.1	2.7	2.7	5.9
Variable pondweed	8.1	91.9	8.1	0.0	0.0	1.6
Chara	5.4	94.6	5.4	0.0	0.0	1.1
Common bladder wort	2.7	97.3	2.7	0.0	0.0	0.5
Eurasian watermilfoil	2.7	97.3	2.7	0.0	0.0	0.5
Slender naiad	3	97	3	0	0	0.5

Occurrence and Abundance of Submersed Aquatic Plants in Lake Tippecanoe (10-15 ft).

County:	Kos	Total Sites:	15	Mean species/site:	1.53
Date:	8.20.09	Sites with plants:	15	SE Mean species/site:	0.24
Secchi (ft):	7	Sites with native plants:	15	Mean native species/site:	1.47
Max Plant Depth (ft):	18	Number of species:	5	SE Mean natives/site:	0.22
Trophic Status:	Meso	# of native species:	4	Species diversity:	0.64
		Maximum species/site:	4	Native diversity:	0.61

Depth: 10 to 15 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Coontail	73.3	26.7	20.0	13.3	40.0	52.0
Eel grass	53.3	46.7	26.7	6.7	20.0	29.3
Slender naiad	13.3	86.7	13.3	0.0	0.0	2.7
Eurasian watermilfoil	6.7	93.3	6.7	0.0	0.0	1.3
Richardson's pondweed	6.7	93.3	6.7	0.0	0.0	1.3

Occurrence and Abundance of Submersed Aquatic Plants in Lake Tippecanoe (15-20 ft).

County:	Kos	Total Sites:	12	Mean species/site:	0.08
Date:	8.20.09	Sites with plants:	1	SE Mean species/site:	0.08
Secchi (ft):	7	Sites with native plants:	1	Mean native species/site:	0.08
Max Plant Depth (ft):	18	Number of species:	1	SE Mean natives/site:	0.08
Trophic Status:	Meso	# of native species:	1	Species diversity:	0.00
		Maximum species/site:	1	Native diversity:	0.00

Depth: 15 to 20 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Coontail	8.3	91.7	0.0	0.0	8.3	8.3

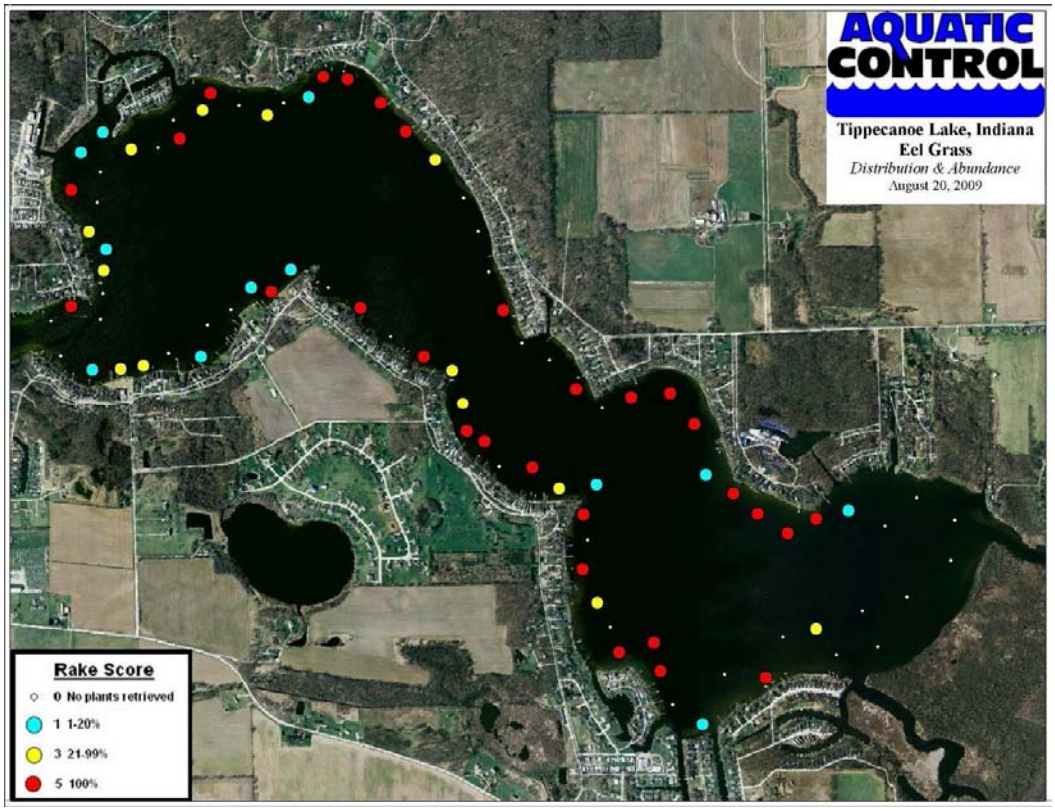

Figure 9. Lake Tippecanoe, eel grass location August 20, 2009.

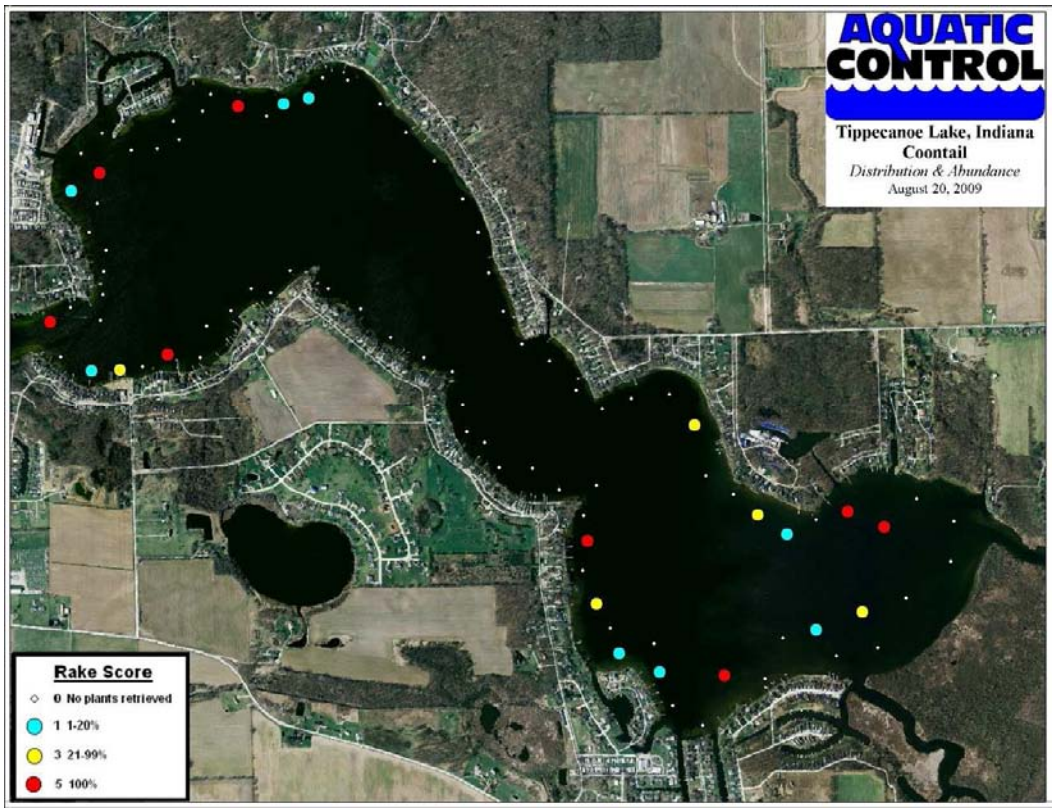

Figure 10. Lake Tippecanoe, coontail location August 20, 2009.

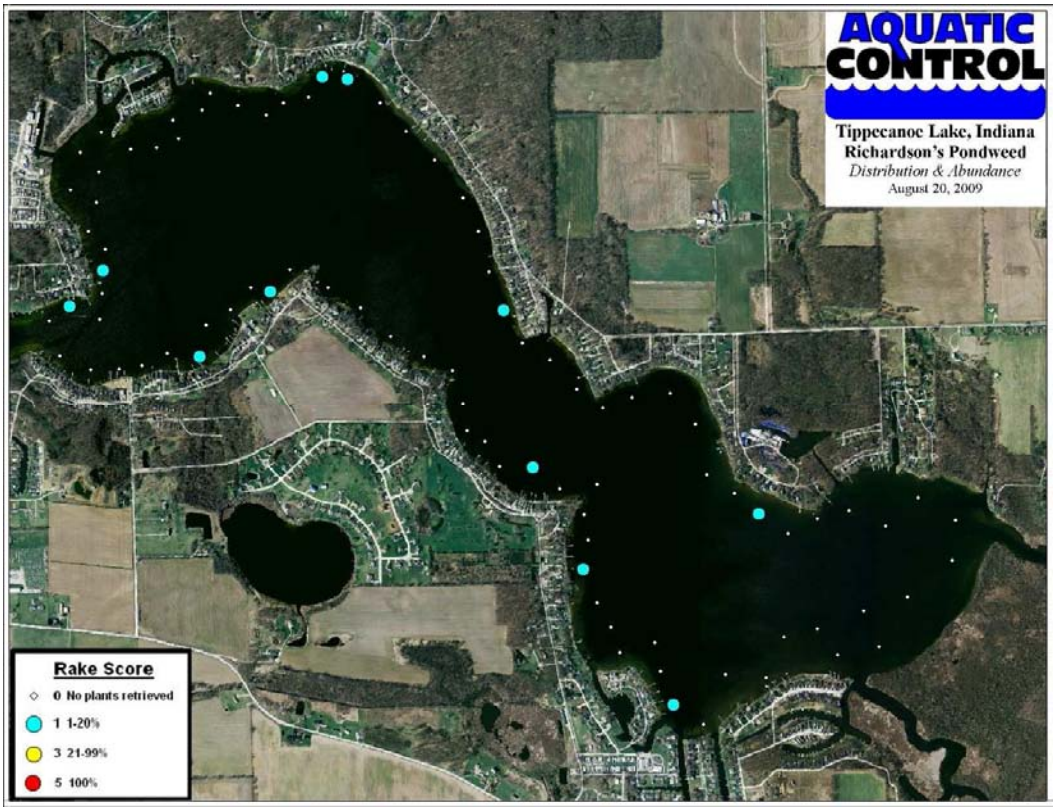

Figure 11. Lake Tippecanoe, Richardson's pondweed location August 20, 2009.

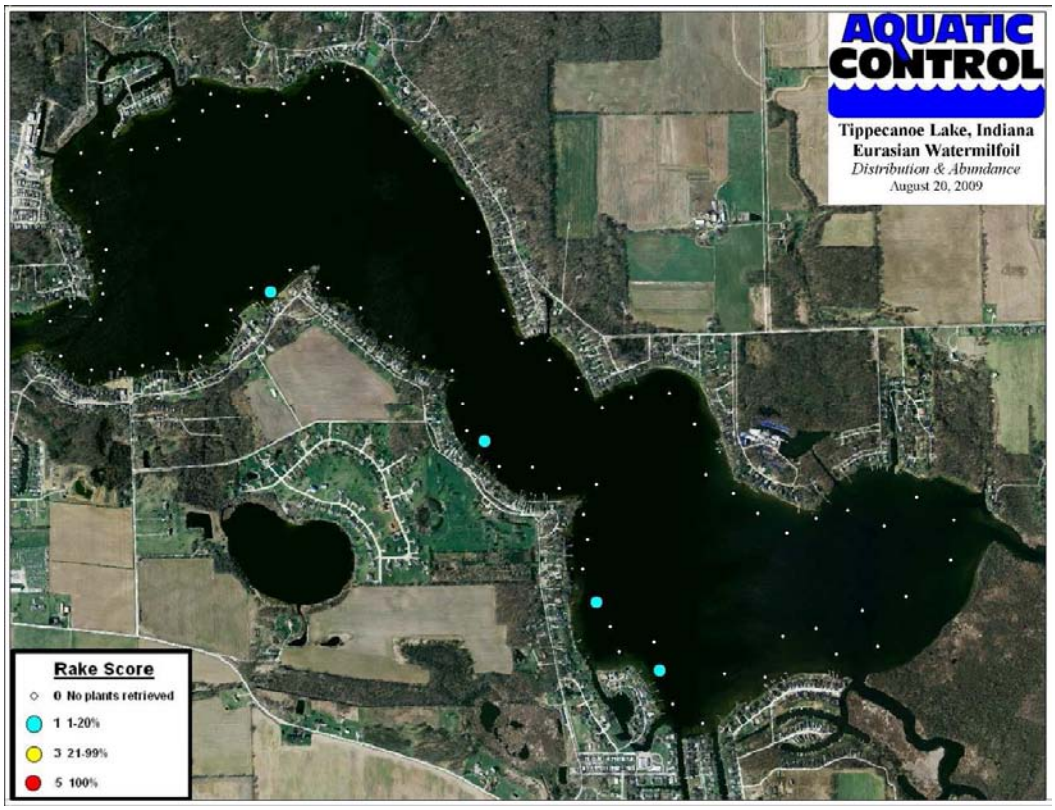

Figure 12. Lake Tippecanoe, Eurasian watermilfoil location August 20, 2009.

2.2.3 James Lake Tier 2 Survey

A total of 60 sites were sampled throughout the littoral zone of James Lake. These were the same sites that were sampled in 2007. Results of the sampling are listed in Table 3. A Secchi disk reading was taken prior to sampling and found to be 5.5 feet. Aquatic vegetation was present to a maximum depth of 18 feet and vegetation was present at 52 of the 60 sites. A total of 12 species were collected of which 10 were native. The maximum number of species per site was 4 while the mean species per site was 1.60. The shallow depth range (0-5 feet) had the highest diversity of vegetation while sites deeper than 10.0 feet only contained no more than two species. Coontail was present at the highest percentage of overall sample sites (51.7%) and also the highest dominance rating (Figure 13). Eel grass ranked second in overall percent occurrence (31.7%) (Figure 13). Chara ranked third in overall percent occurrence (26.7%), but was the most frequently occurring species in waters less then 5.0 feet. Slender naiad ranked 5th in percent occurrence, followed by sago pondweed, elodea, variable pondweed, water stargrass, common bladderwort, brittle naiad (Figure 14), curlyleaf pondweed (Figure 14), and Richardson's pondweed (Figure 15). Filamentous algae was present at 6.7% of the sample sites. Species that were observed but not collected on the rake include: arrowhead (*Sagittaria latifolia*), spatterdock, common cattail swamp rose mallow (*Hibiscus sp.)*, and swamp loosestrife.

Table 3. James Lake Tier 2 survey results, August 20, 2009.

Occurrence and Abundance of Submersed Aquatic Plants in Lake James (all depths).

County:	Kos	Total Sites:	60	Mean species/site:	1.57
Date:	8.20.09	Sites with plants:	52	SE Mean species/site:	0.14
Secchi (ft):	5.5	Sites with native plants:	52	Mean native species/site:	1.53
Max Plant Depth (ft):	18	Number of species:	12	SE Mean natives/site:	0.14
Trophic Status:	Meso	# of native species:	10	Species diversity:	0.80
		Maximum species/site:	4	Native species diversity:	0.79

All Depths (0 to 20 ft)	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Coontail	51.7	50.0	20.0	13.3	16.7	29.3
Eel Grass	31.7	68.3	8.3	5.0	18.3	23.0
Chara	26.7	73.3	20.0	3.3	3.3	9.3
Slender naiad	16.7	83.3	15.0	0.0	1.7	4.7
Sago pondweed	13.3	86.7	10.0	3.3	0.0	4.0
Elodea	3.3	96.7	3.3	0.0	0.0	0.7
Variable pondweed	3.3	96.7	1.7	0.0	1.7	2.0
Water stargrass	3.3	96.7	3.3	0.0	0.0	0.7
Common bladderwort	1.7	98.3	1.7	0.0	0.0	0.3
Brittle naiad	1.7	98.3	1.7	0.0	0.0	0.3
Curlyleaf pondweed	1.7	98.3	1.7	0.0	0.0	0.3
Richardson's pondweed	1.7	98.3	1.7	0.0	0.0	0.3
Filamentous Algae	6.7					

Other species observed: Arrowhead, spatterdock, common cattail, swamp rose mallow, and swamp loosestrife

Occurrence and Abundance of Submersed Aquatic Plants in Lake James (0-5 ft).

County:	Kos	Total Sites:	18	Mean species/site:	2.39
Date:	8.20.09	Sites with plants:	17	SE Mean species/site:	0.28
Secchi (ft):	5.5	Sites with native plants:	17	Mean native species/site:	2.33
Max Plant Depth (ft):	18	Number of species:	8	SE Mean natives/site:	0.27
Trophic Status:	Meso	# of native species:	7	Species diversity:	0.81
		Maximum species/site:	4	Native diversity:	0.80

Depth: 0 to 5 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Chara	72.2	27.8	50.0	11.1	11.1	27.8
Eel Grass	50.0	50.0	16.7	5.6	27.8	34.4
Sago pondweed	38.9	61.1	27.8	11.1	0.0	12.2
Slender naiad	33.3	66.7	27.8	0.0	5.6	11.1
Coontail	16.7	83.3	5.6	5.6	5.6	10.0
Elodea	11.1	88.9	11.1	0.0	0.0	2.2
Variable pondweed	11.1	88.9	5.6	0.0	5.6	6.7
Brittle naiad	5.6	94.4	5.6	0.0	0.0	1.1

Occurrence and Abundance of Submersed Aquatic Plants in Lake James (5-10 ft).

County:	Kos	Total Sites:	18	Mean species/site:	1.72
Date:	8.20.09	Sites with plants:	17	SE Mean species/site:	0.21
Secchi (ft):	5.5	Sites with native plants:	17	Mean native species/site:	1.67
Max Plant Depth (ft):	18	Number of species:	9	SE Mean natives/site:	0.21
Trophic Status:	Meso	# of native species:	8	Species diversity:	0.78
		Maximum species/site:	3	Native diversity:	0.77

Depth: 5 to 10 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Coontail	55.6	44.4	22.2	16.7	11.1	27.8
Eel Grass	50.0	50.0	5.6	11.1	33.3	41.1
Slender naiad	22.2	77.8	22.2	0.0	0.0	4.4
Chara	16.7	83.3	16.7	0.0	0.0	3.3
Common bladderwort	5.6	94.4	5.6	0.0	0.0	1.1
Curlyleaf pondweed	5.6	94.4	5.6	0.0	0.0	1.1
Richardson's pondweed	5.6	94.4	5.6	0.0	0.0	1.1
Sago pondweed	5.6	94.4	5.6	0.0	0.0	1.1
Water stargrass	5.6	94.4	5.6	0.0	0.0	1.1

Occurrence and Abundance of Submersed Aquatic Plants in Lake James (10-15 ft).

County:	Kos	Total Sites:	11	Mean species/site:	1.00
Date:	8.20.09	Sites with plants:	10	SE Mean species/site:	0.13
Secchi (ft):	5.5	Sites with native plants:	10	Mean native species/site:	1.00
Max Plant Depth (ft):	18	Number of species:	2	SE Mean natives/site:	0.13
Trophic Status:	Meso	# of native species:	2	Species diversity:	0.17
		Maximum species/site:	2	Native diversity:	0.17

Depth: 10 to 15 ft	Frequency of Occurrence	Rake score frequency per specie				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Coontail	90.9	9.1	27.3	18.2	45.5	61.8
Water stargrass	9.1	90.9	9.1	0.0	0.0	1.8

Occurrence and Abundance of Submersed Aquatic Plants in Lake James (15-18 ft).

County:	Kos	Total Sites:	13	Mean species/site:	0.69
Date:	8.20.09	Sites with plants:	8	SE Mean species/site:	0.17
Secchi (ft):	5.5	Sites with native plants:	8	Mean native species/site:	0.69
Max Plant Depth (ft):	18	Number of species:	2	SE Mean natives/site:	0.17
Trophic Status:	Meso	# of native species:	2	Species diversity:	0.20
		Maximum species/site:	2	Native diversity:	0.20

Depth: 15 to 20 ft	Frequency of Occurrence	Rake score frequency per sp.				Plant Dominance
Species		**0**	**1**	**3**	**5**	
Coontail	61.5	38.5	30.8	15.4	15.4	30.8
Eel Grass	7.7	92.3	7.7	0.0	0.0	1.5

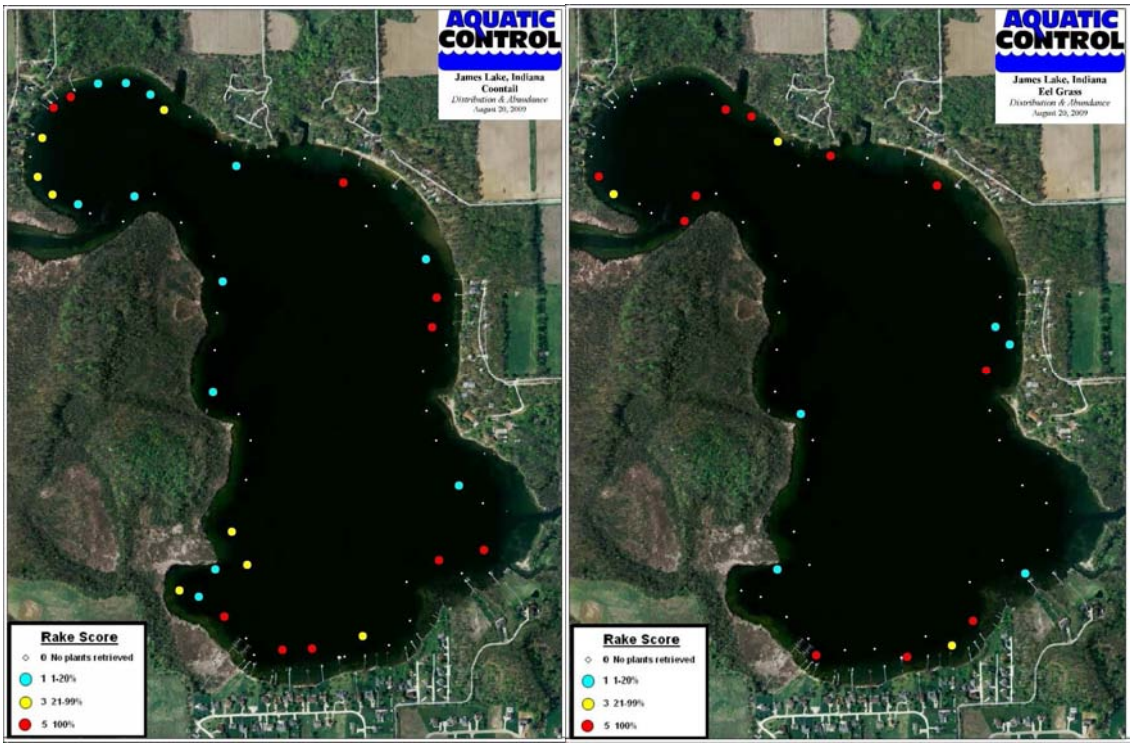

Figure 13. James Lake, coontail (left) and eel grass (right) location August 20, 2009.

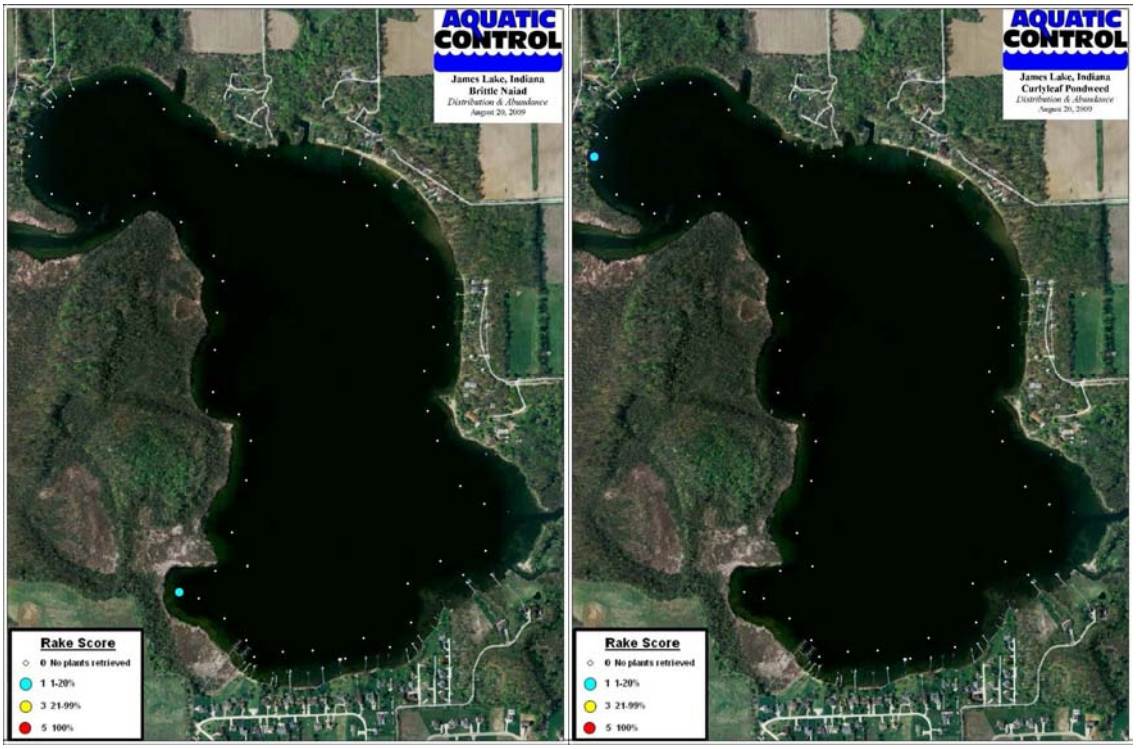

Figure 14. James Lake, brittle naiad (left) and curlyleaf pondweed (right) location August 20, 2009.

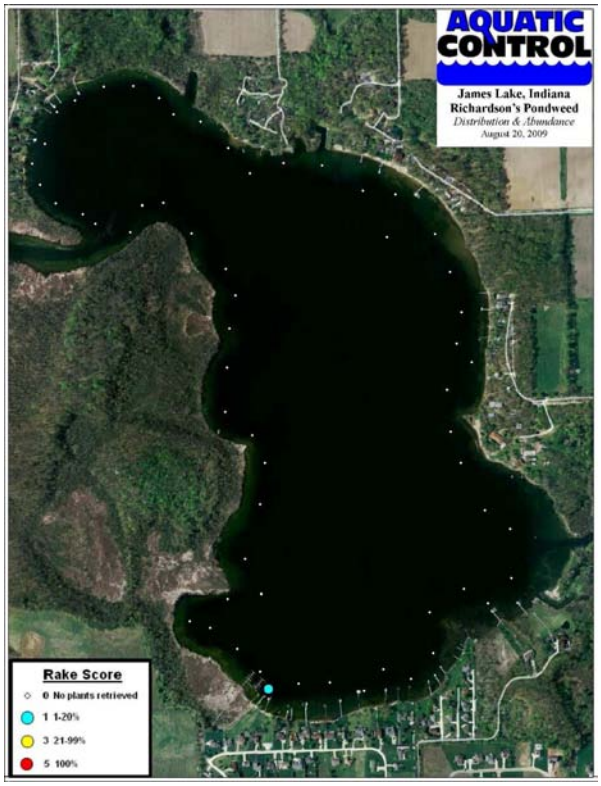

Figure 15. James Lake, Richardson's pondweed location, August 20, 2009.

2.3 Ecozone Survey

The sampling method used for the floating leaf emergent vegetation survey is described by IDNR fisheries biologist Jed Pearson in *Guidelines for Sampling Floating-Leaf Emergent Plants in Indiana Lakes*. This method was designed to delineate and characterize the species composition of floating-leaf emergent plant beds, primarily spatterdock (*Nuphar variegate*) and white water lily (*Nymphaea odorata).* Beds were delineated with a Global Positioning System (GPS) unit and range finder, while beds were characterized based on the dominance of floating-leaf species along transects within the beds. Supplemental data was also obtained on the presence of shallow-water emergent plants associated with floating-leaf beds (Pearson 2004).

Twelve beds totaling 6.054 acres were defined within the Ecozone area. Of the 61 transects examined 83% contained spatterdock and 67% contained white water lily. Nine other shallow-water emergent and floating leaf species were associated with the plant beds. Table 4 describes each plant bed in more detail. The bed locations, size, along with the perceived shoreline are illustrated in Figure 16 (perceived shoreline created by kayaking to edge of cattails and recording track and waypoints, perceived shoreline data collected on August 25, 2009) . Photographs of the plant beds are included following Table 4 (Figures 17-27).

Table 4. Tippecanoe Chain Ecozone plant bed summary, August 11, 2009 (Gage height: 5.12 ft).

					Species Frequency of Occurrence														
Bed	# of Sites	Mean Latitude	Mean Longitude	Mean Width (ft)	SPA	WAL	ARA	SWL	CAT	PIK	PRL	ARH	BUB	STB	HIB	# of Species	#/Site	Acres	Shoreline Length (ft)
1	3	41.31254	-85.73021	12.0	0.0	100.0	0.0	66.7	66.7	0.0	0.0	0.0	0.0	0.0	0.0	3	2.33	0.040	140
2	7	41.31357	-85.730931	60.9	42.9	100.0	0.0	14.3	85.7	14.3	14.3	14.3	0.0	0.0	57.1	7	3.43	0.922	581
3	5	41.31529	-85.73042	43.8	80.0	0.0	80.0	0.0	60.0	40.0	0.0	20.0	40.0	0.0	0.0	6	3.20	0.263	232
4	12	41.31889	-85.730452	42.5	66.7	0.0	100.0	0.0	16.7	16.7	8.3	0.0	16.7	8.3	58.3	6	2.92	1.199	1090
5	2	41.32038	-85.730582	30.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2	1.00	0.078	113
6	4	41.32162	-85.730977	34.5	100.0	25.0	50.0	0.0	25.0	25.0	0.0	0.0	25.0	50.0	75.0	6	3.75	0.263	315
7	4	41.32222	-85.733431	69.8	100.0	0.0	0.0	25.0	50.0	25.0	0.0	0.0	0.0	0.0	50.0	4	2.50	0.438	284
8	10	41.32276	-85.735172	46.2	60.0	20.0	100.0	10.0	0.0	0.0	0.0	10.0	30.0	0.0	0.0	6	2.30	0.592	517
9	3	41.32309	-85.739133	141.0	100.0	33.3	33.3	0.0	33.3	0.0	0.0	0.0	0.0	0.0	33.3	4	2.33	0.728	607
10	1	41.3235	-85.739554	20.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	1.00	0.009	20
11	3	41.32253	-85.739106	40.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	1	1.00	0.073	76
12	7	41.31847	-85.744028	115.7	71.4	57.1	0.0	57.1	28.6	0.0	42.9	0.0	0.0	0.0	0.0	5	2.57	1.450	547

SPA=Spatterdock, WAL=Water Lily, ARA=Arrow Arum, SWL=Swamp Loosestrife, CAT=Cattail
PIK=Pickeral Weed, PRL=Purple Loosestrife, ARH= Arrowhead, BUB=Buttonbush, STB= Soft-stem Bullrush, and HIB=Hibiscus

Figure 16. Tippecanoe Ecozone, floating leaf plant bed location (yellow) dominant species, and perceived shoreline (blue line), August 11, 2009 (WAL=white water lily, SPA=spatterdock, ARA=arrow arum,).

Figure 17. James Lake, photograph of bed 1, August 11, 2009.

Figure 18. James Lake, photograph of bed 2, August 11, 2009.

Figure 19. James Lake, photograph of bed 3, August 11, 2009

Figure 20. James Lake, photograph of bed 4, August 11, 2009.

Figure 21. James Lake, photograph of bed 5, August 11, 2009.

Figure 22. James Lake, photograph of bed 6, August 11, 2009.

Figure 23. James Lake, photograph of bed 7, August 11, 2009.

Figure 24. James Lake, photograph of bed 8, August 11, 2009.

Figure 25. Lake Tippecanoe, photograph of bed 9, August 11, 2009.

Figure 26. Lake Tippecanoe, photograph of bed 11, August 11, 2009.

Figure 27. Lake Tippecanoe, photograph of bed 12, August 11, 2009.

2.4 Plant Sampling Discussion

LTPOA membership includes residents from all three lakes in the Tippecanoe Chain. These lakes are all connected to one another, but there are differences in water quality, average depth, and shoreline development. These differences lead to some variation in plant communities, and thus the plant sampling and sampling discussion focuses on the individual lakes.

2.4.1 Oswego Lake Sampling Discussion

One of the primary goals of the vegetation management plan is to reduce nuisance conditions created by invasive species. Oswego Lake has a higher percentage of shallow areas when compared to the other two lakes, so it tends to have a higher incidence of nuisance vegetation problems, particularly with invasive curlyleaf pondweed and Eurasian watermilfoil. Both of these species tend to grow across entire bays within Oswego Lake as illustrated by the photo below (Figure 28). Several seasons of selective herbicide treatments have been completed on the lake in order to reduce nuisance conditions caused by these species. Spring invasive surveys continue to detect curyleaf pondweed and milfoil, but the density of the beds have declined over the years. These species are typically at low levels or non-detectable by late summer (Figure 29).

Figure 28. Photo taken of curlyleaf pondweed and Eurasian watermilfoil beds in Oswego Lake, May 22, 2006.

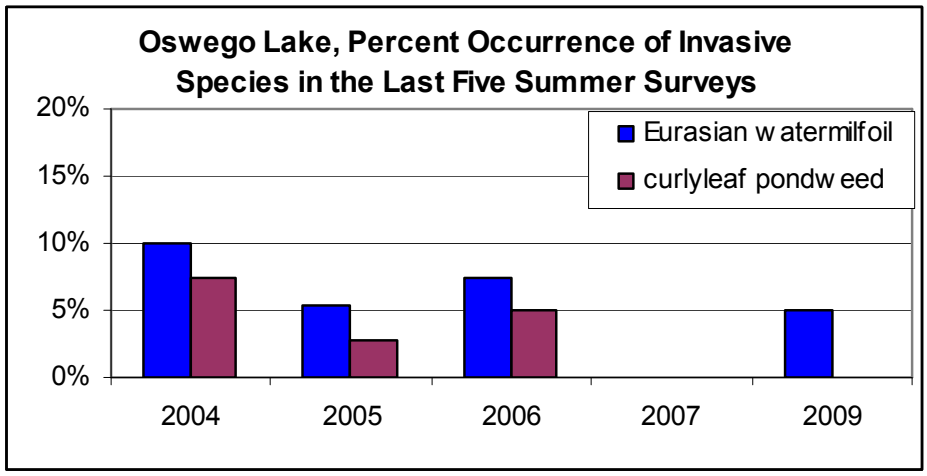

Figure 29. Oswego Lake, percent occurrence of invasive species in the last 5 summer surveys.

Table 5 compares the frequency of occurrence of individual species collected during the last five summer Tier 2 surveys. Species that were collected in past surveys but not in the 2009 survey include curlyleaf pondweed, Illinois pondweed, largeleaf pondweed,

flatstem pondweed, small pondweed, spiny naiad (*Najas marina*), southern naiad (*Najas guadalupensis*), whorled milfoil (*Myriophyllum verticillatum*), variable milfoil (*Myriophyllum heterophyllum*), and northern milfoil (*Myriophyllum sibiricum*). Most of these species previously occurred at less than 10% of sites. Eurasian watermilfoil, American elodea, slender naiad, Richardson's pondweed, variable pondweed, and eel grass all exhibited increases in percent occurrence while common coontail and sago pondweed each decreased when compared to the 2007 survey.

Table 5. Percent occurrence of species in Oswego Lake in the last six Tier 2 surveys completed by Aquatic Control Inc.

Species	% of survey sites (8/04)	% of survey sites (8/05)	% of survey sites (8/06)	% of survey sites (7/07)	% of survey sites (8/09)
Eurasian watermilfoil	10.0%	5.4%	7.5%		5.0%
curlyleaf pondweed	7.5%	2.7%	5.0%		
common coontail	50.0%	37.8%	45.0%	40.0%	25.0%
Chara	35.0%	51.4%	30.0%	15.0%	15.0%
American elodea	2.5%		5.0%		2.5%
northern watermilfoil		5.4%			
variable milfoil			2.5%		
whorled milfoil		5.4%			
Slender naiad	7.5%	5.4%	12.5%		15.0%
southern naiad		2.7%			
spiny naiad	5.0%	13.5%	2.5%	2.5%	
sago pondweed	17.5%	13.5%	5.0%	20.0%	12.5%
small pondweed		8.1%			
flatstem pondweed	5.0%	8.1%	2.5%	5.0%	
Richardson's pondweed	5.0%	8.1%	7.5%	7.5%	12.5%
largeleaf pondweed		2.7%			
variable pondweed			7.5%	2.5%	12.5%
Illinois pondweed	5.0%		2.5%	10.0%	
common bladderwort		2.7%			
eel grass	37.5%	59.5%	55.0%	37.5%	40.0%

Another goal of the plan is to maintain the abundance and diversity of native vegetation. Table 6 and Figure 30 compare data collected during the past five summer surveys. It appears that the number of sites with vegetation have declined significantly. A closer look at the 2009 data leads one to believe that this decline may have occurred due to the lack of vegetation in the deeper water sites (only 2 of the 11 sites from 15-20 feet had vegetation in 2009). The reason for the reduction in the amount of vegetation in the deeper water sites is not clear, but may be related to changes in water clarity that may have occurred during the growing season. It is unlikely that vegetation controls impacted the amount of vegetation in the deeper water since most controls take place in shallow water areas. There appears to be little change in overall diversity within Oswego Lake.

Table 6. Oswego Lake Tier 2 metrics in the last five surveys.

Tier 2 Metric	Aug, 2004	Aug, 2005	Aug, 2006	July, 2007	Aug, 2009
Secchi	6.0	5.5	7.5	6.0	7.0
Max Plant Depth	18	19	20	19	18
Total Sites	40	40	40	40	40
Sites with Plants	38	37	34	29	25
Sites with Native Plants	38	37	34	29	25
Number of Species	12	16	14	9	10
Number of Native Species	10	14	12	9	8
Maximum Species/Site	5	6	4	4	5
Mean Species/Site	1.88	2.15	1.90	1.40	1.50
Mean Native Species/Site	1.70	2.08	1.78	1.40	1.38
Species Diversity Index	0.77	0.85	0.82	0.80	0.86
Native Species Diversity Index	0.75	0.84	0.80	0.80	0.83

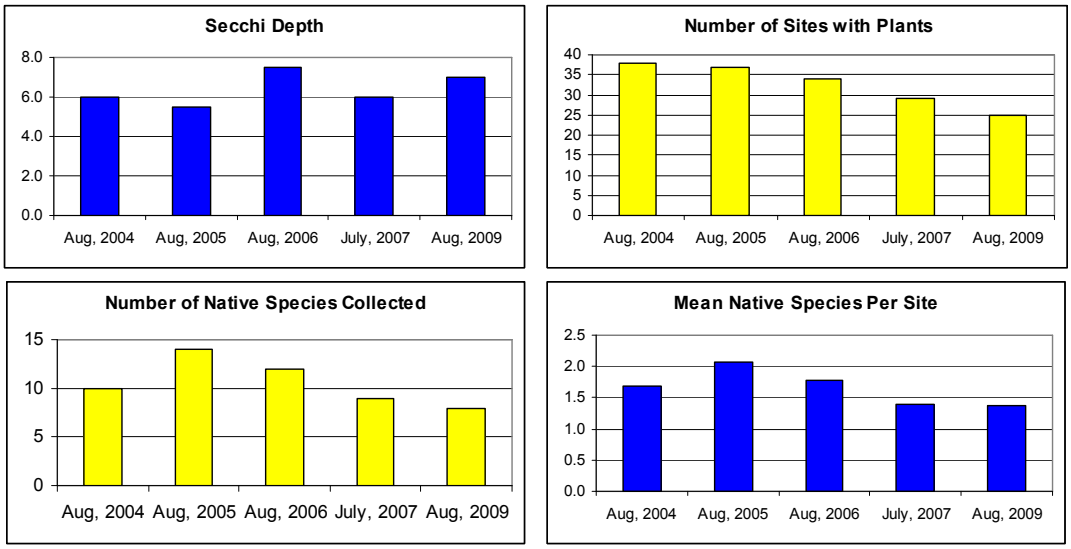

Figure 30. Oswego Lake, Secchi, sites with native plants, number of native species collected, and mean number of native species per site in the last 5 survey. (data from Table 6)

2.4.2 Lake Tippecanoe Sampling Discussion

Lake Tippecanoe is one of the deepest natural lakes in Indiana. This fact limits the amount of nuisance vegetation growth. However, there are dense beds of vegetation growing near shore and in high-use areas. Typically, curlyleaf pondweed and Eurasian watermilfoil are the primary nuisance species in the spring and early summer while native eel grass is the primary nuisance submersed species in the summer. In addition to the eel grass, mats of filamentous bluegreen algae identified as *Lyngbya wollei* tend to create nuisance conditions in the eastern side of Lake Tippecanoe and likely limit beneficial submersed vegetation growth. Since 2003, the focus of LTPOA sponsored controls has been on Eurasian watermilfoil and curlyleaf pondweed with limited spot treatments on eel grass. These treatments were completed in order to meet the plant management goals of the Association, which are to reduce nuisance conditions caused primarily by invasive species, while preserving and enhancing the native plant

community. There appears to have been a decline in percent occurrence of both species (Figure 31).

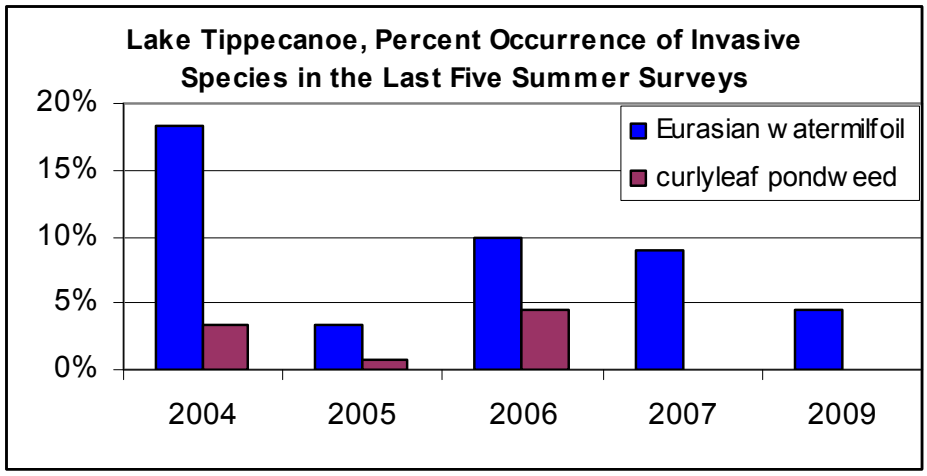

Figure 31. Lake Tippecanoe percent occurrence of invasive species in the last 5 surveys.

Native vegetation percent occurrence in the last five surveys is illustrated in Table 7 and Figure 32. Species that were collected in past surveys but were not collected during 2009 include curlyleaf pondweed, American elodea, variable and whorled milfoil, southern and spiny naiad, small pondweed, leafy pondweed, and water stargrass. Common bladderwort was collected for the first time during the 2009 survey. Eurasian watermilfoil, common coontail, chara, and sago pondweed all experienced decreases in percent occurrence in 2009, while eel grass variable pondweed, Richardson's pondweed, and slender naiad all increased.

Table 7. Percent occurrence of species in Lake Tippecanoe in the last five summer Tier 2 surveys.

Species	% of survey sites (8/04)	% of survey sites (8/05)	% of survey sites (8/06)	% of survey sites (7/07)	% of survey sites (8/09)
Eurasian watermilfoil	18.3%	3.4%	10.0%	9.0%	4.5%
curlyleaf pondweed	3.4%	0.8%	4.4%		
common coontail	26.1%	26.9%	35.6%	36.0%	23.6%
Chara	23.5%	18.5%	25.6%	37.1%	11.2%
American elodea		0.8%	3.3%	2.2%	
variable milfoil			1.1%		
whorled milfoil			1.1%		
Slender naiad	5.9%	1.7%	4.4%	1.1%	4.5%
southern naiad		3.4%		1.1%	
spiny naiad			6.7%		
sago pondweed	10.9%	10.1%	5.6%	13.5%	6.7%
small pondweed		0.8%			
Illinois pondweed	1.7%	2.5%		1.1%	1.1%
leafy pondweed			5.6%		
flatstem pondweed	6.7%	11.8%		12.4%	1.1%
Richardson's pondweed	9.2%	7.6%	10.0%	4.5%	14.6%
variable pondweed	3.4%		2.2%	4.5%	6.7%
common bladderwort					1.1%
eel grass	61.3%	58.0%	55.6%	58.4%	60.7%
water stargrass	5.0%	16.0%	11.1%	6.7%	

Table 8 and Figure 32 compare the results from the last five Tier 2 surveys. It appears that there have been some declines in community metrics. Some of the declines, like the number of sites with vegetation, may be related to the fact that out of the twelve sites from 15-20 feet that were sampled, only a single site contained vegetation.

Table 8. Lake Tippecanoe Tier 2 metrics in the last five surveys.

Tier 2 Metric	Aug, 2004	Aug, 2005	Aug, 2006	July, 2007	Aug, 2009
Secchi	6.0	6.0	7.0	6.0	7.0
Max Plant Depth	19	22	17	22	18
Total Sites	119	119	90	89	89
Sites with Plants	105	98	78	81	67
Sites with Native Plants	103	98	76	81	67
Number of Species	12	15	16	13	11
Number of Native Species	10	13	14	12	10
Maximum Species/Site	5	4	5	5	5
Mean Species/Site	1.76	1.74	1.87	1.88	1.36
Mean Native Species/Site	1.54	1.70	1.72	1.79	1.31
Species Diversity Index	0.82	0.75	0.84	0.81	0.75
Native Species Diversity Index	0.78	0.74	0.82	0.80	0.73

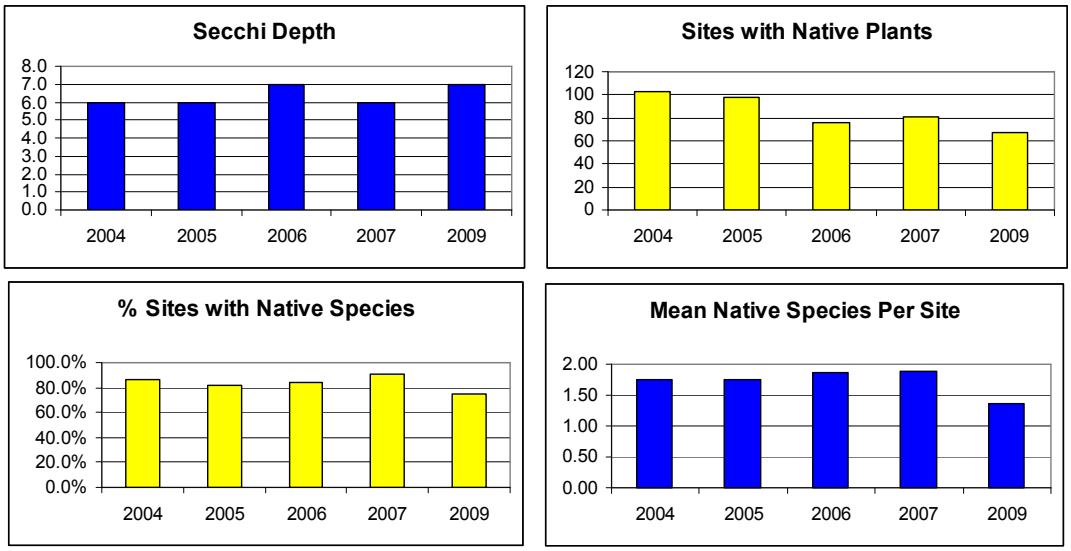

Figure 32. Lake Tippecanoe, Secchi, number of sites with plants, percent of sites with native species, and mean number of native species per site in the last 5 survey. (data from Table 8)

2.4.3 James Lake Sampling Discussion

In 2004, James Lake had a relatively high abundance of invasive species (Figure 33). Invasive treatments have targeted these species over the past several year and these controls appear to have been effective at reducing invasive abundance.

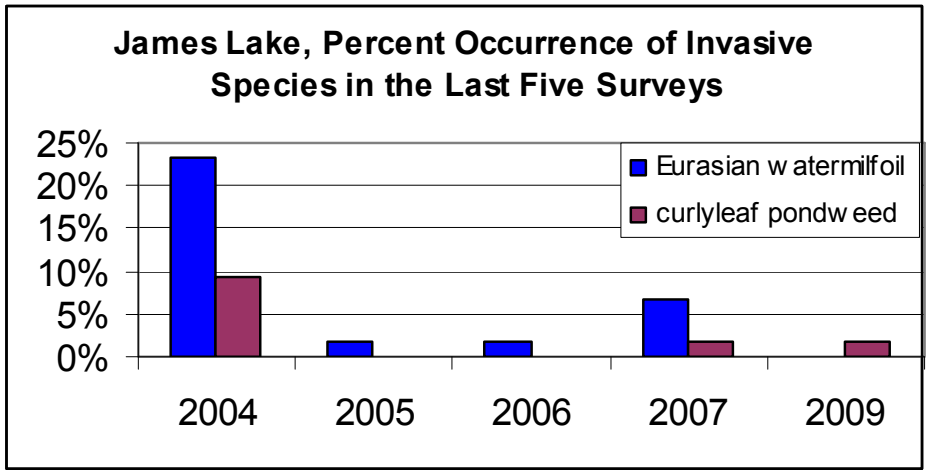

Figure 33. James Lake percent occurrence of invasive species in the last 5 surveys.

Individual species percent occurrence in the last five surveys is illustrated in Table 9. Species that were collected in past surveys but were not collected during 2009 include Eurasian watermilfoil, prickly coontail (*Ceratophyllum echinatum*), northern watermilfoil, whorled watermilfoil, southern naiad, spiny naiad, small pondweed, leafy pondweed, flatstem pondweed, and white water buttercup(*Ranunculus longirostris*). With the exception of Eurasian watermilfoil, all of these species occurred at less than 10% of sites in previous surveys. In 2009, common coontail and chara experienced decreases in percent occurrence when compared to 2007, while elodea, slender naiad,

brittle naiad, sago pondweed, Richardson's pondweed, variable pondweed, common bladderwort, eel grass, and water stargrass all increased in percent occurrence.

Table 9. Percent occurrence of species in James Lake in the last five summer Tier 2 surveys.

Species	% of survey sites (8/04)	% of survey sites (8/05)	% of survey sites (8/06)	% of survey sites (7/07)	% of survey sites 8/09)
Eurasian watermilfoil	23.4%	1.6%	1.7%	6.7%	
curlyleaf pondweed	9.4%			1.7%	1.7%
common coontail	57.8%	54.7%	61.7%	56.7%	51.7%
Chara	35.9%	28.1%	15.0%	26.7%	16.7%
prickly coontail			1.7%		
American elodea	4.7%	6.3%	6.7%		3.3%
northern watermilfoil		3.1%			
whorled milfoil		1.6%			
Slender naiad	15.6%	12.5%	8.3%	10.0%	16.7%
southern naiad		3.1%			
spiny naiad	1.6%			1.7%	
brittle naiad			10.0%		1.7%
sago pondweed	6.3%		6.7%	3.3%	13.3%
small pondweed		1.6%			
leafy pondweed	3.1%		1.7%		
flatstem pondweed	9.4%	4.7%	6.7%		
Richardson's pondweed		1.6%	1.7%		1.7%
variable pondweed	6.3%				3.3%
white water buttercup			1.7%		
common bladderwort	1.6%				1.7%
eel grass	42.2%	37.5%	18.3%	26.7%	31.7%
water stargrass	6.3%	3.1%	3.3%		3.3%

Table 10 and Figure 34 compare the overall plant abundance and diversity metrics collected during the past five surveys. It appears that the majority of metrics increased in 2009.

Table 10. James Lake Tier 2 metrics in the last five surveys.

Tier 2 Metric	Aug, 2004	Aug, 2005	Aug, 2006	July, 2007	Aug, 2009
Secchi	6.0	9.0	4.5	7.0	5.5
Max Plant Depth	20	23	16	20	18
Total Sites	64	64	60	60	60
Sites with Plants	62	56	50	47	52
Sites with Native Plants	61	56	50	47	52
Number of Species	14	14	14	10	12
Number of Native Species	11	13	13	8	10
Maximum Species/Site	5	4	5	5	4
Mean Species/Site	2.23	1.61	1.45	1.43	1.60
Mean Native Species/Site	1.91	1.59	1.43	1.37	1.50
Species Diversity Index	0.85	0.69	0.78	0.76	0.80
Native Species Diversity Index	0.82	0.69	0.77	0.74	0.80

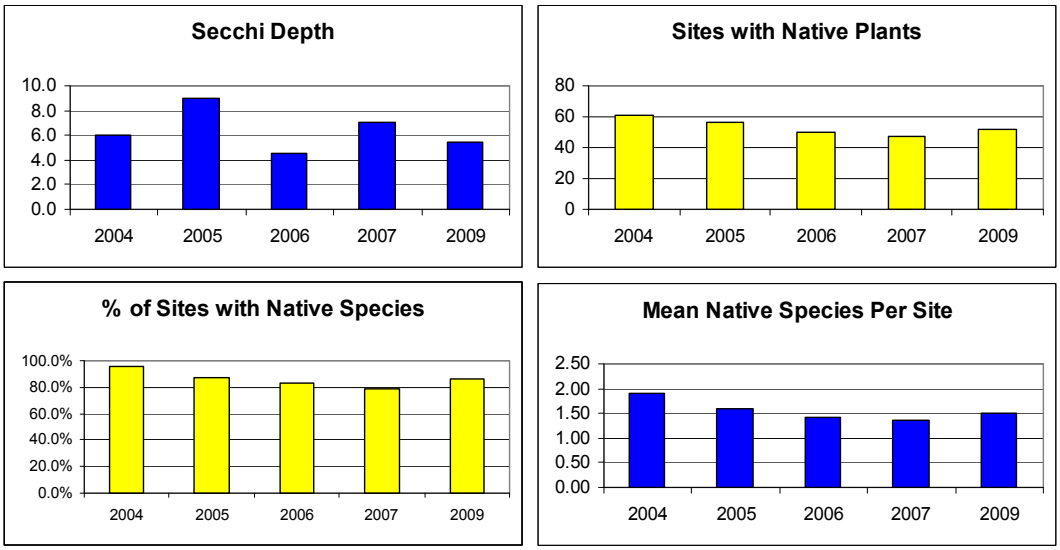

Figure 34. James Lake, Secchi, number of sites with plants, percent of sites with native vegetation, and mean number of native species per site in the last 5 survey. (data from Table 10)

2.4.4 Ecozone Sampling Discussion

Ecozone bed data collected in 2008 (Aquatic Control 2009) can serve as a baseline for future comparison. While working on the 2009 data, it was discovered that a step in the data analysis was missed leading to incorrect bed acreage calculations in 2008. The corrected 2008 data along with 2009 data is illustrated in Table 11, and the 2008 and 2009 maps are illustrated side by side in Figure 35. There were two additional beds added in 2009, so the bed numbers vary between surveys (bed 1 and bed 10 were mapped in 2009 but were not documented in 2008).

Table 11. Ecozone plant bed data from 2008 and 2009. (2008 data corrected)

2008 Data

					Species Frequency of Occurrence												
Bed	# of Sites	Mean Latitude	Mean Longitude	Mean Width (ft)	SPA	WAL	ARA	SWL	CAT	PIK	PRL	BUL	HIB	# of Species	#/Site	Acres	Shoreline Length (ft)
1	7	41.31374	-85.731	65.6	42.9	100.0		14.3	100.0	42.9			71.4	5	3.71	1.100	649
2	2	41.31536	-85.73034	49.5	50.0	50.0	50.0		100.0	100.0				5	3.50	0.180	154
3	7	41.3187	-85.73044	50.1	85.7		71.4		42.9	28.6		14.3	42.9	6	3.14	1.231	1063
4	2	41.32038	-85.73058	36.0	50.0		50.0		100.0					3	3.00	0.087	105
5	4	41.3216	-85.73099	33.5	50.0	25.0	50.0		50.0	25.0		25.0	50.0	6	2.75	0.290	349
6	3	41.32222	-85.73347	74.0	100.0	66.7		33.3						3	2.00	0.500	304
7	6	41.32276	-85.73519	53.5	66.7	16.7	100.0			16.7				4	2.00	0.710	521
8	2	41.32307	-85.73936	132.0	100.0	100.0			100.0				100.0	4	4.00	0.450	148
9	3	41.32257	-85.73912	37.0	100.0						66.7		100.0	3	2.67	0.090	104
10	4	41.31885	-85.744	142.8	75.0	75.0								2	0.20	1.170	324

SPA=Spatterdock, WAL=Water Lily, ARA=Arrow Arum, SWL=Swamp Loosestrife, CAT=Cattail
PIK=Pickeral Weed, PRL=Purple Loosestrife, BUL=Bulrush, HIB=Hibiscus

2009 Data

					Species Frequency of Occurrence														
Bed	# of Sites	Mean Latitude	Mean Longitude	Mean Width (ft)	SPA	WAL	ARA	SWL	CAT	PIK	PRL	ARH	BUB	STB	HIB	# of Species	#/Site	Acres	Shoreline Length (ft)
1	3	41.31254	-85.73021	12.0	0.0	100.0	0.0	66.7	66.7	0.0	0.0	0.0	0.0	0.0	0.0	3	2.33	0.040	140
2	7	41.31357	-85.730931	60.9	42.9	100.0	0.0	14.3	85.7	14.3	14.3	14.3	0.0	0.0	57.1	7	3.43	0.922	581
3	5	41.31529	-85.73042	43.8	80.0	0.0	80.0	0.0	60.0	40.0	0.0	20.0	40.0	0.0	0.0	6	3.20	0.263	232
4	12	41.31889	-85.730452	42.5	66.7	0.0	100.0	0.0	16.7	16.7	8.3	0.0	16.7	8.3	58.3	6	2.92	1.199	1090
5	2	41.32038	-85.730582	30.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2	1.00	0.078	113
6	4	41.32162	-85.730977	34.5	100.0	25.0	50.0	0.0	25.0	25.0	0.0	0.0	25.0	50.0	75.0	6	3.75	0.263	315
7	4	41.32222	-85.733431	69.8	100.0	0.0	0.0	25.0	50.0	25.0	0.0	0.0	0.0	0.0	50.0	4	2.50	0.438	284
8	10	41.32276	-85.735172	46.2	60.0	20.0	100.0	10.0	0.0	0.0	0.0	10.0	30.0	0.0	0.0	6	2.30	0.592	517
9	3	41.32309	-85.739133	141.0	100.0	33.3	33.3	0.0	33.3	0.0	0.0	0.0	0.0	0.0	33.3	4	2.33	0.728	607
10	1	41.3235	-85.739554	20.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	1.00	0.009	20
11	3	41.32253	-85.739106	40.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	1	1.00	0.073	76
12	7	41.31847	-85.744028	115.7	71.4	57.1	0.0	57.1	28.6	0.0	42.9	0.0	0.0	0.0	0.0	5	2.57	1.450	547

SPA=Spatterdock, WAL=Water Lily, ARA=Arrow Arum, SWL=Swamp Loosestrife, CAT=Cattail
PIK=Pickeral Weed, PRL=Purple Loosestrife, ARH= Arrowhead, BUB=Button, STB= Soft-stem Bullrush, and HIB=Hibiscus

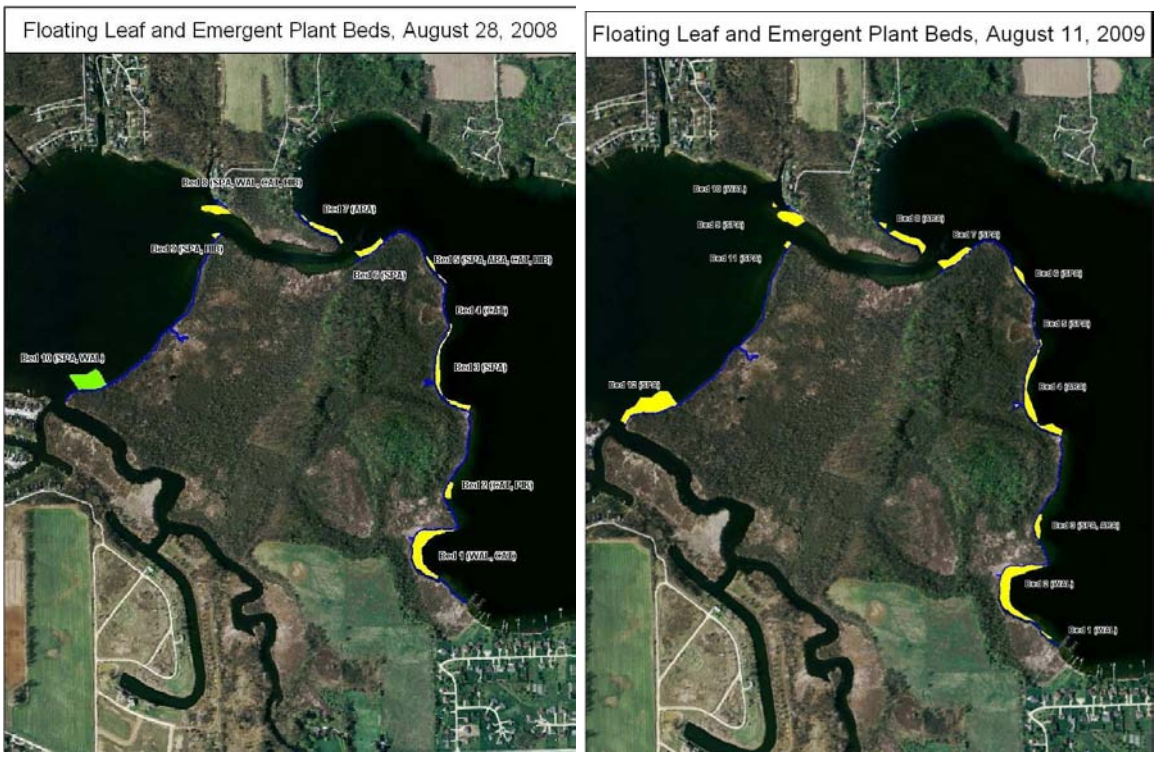

Figure 35. Ecozone bed locations in 2008 (left) and 2009 (right).

Comparison of the bed data reveals that there have been some minor changes in the abundance of rooted floating and emergent plant beds over a one year period. The number of plant beds increased from ten in 2008 to twelve in 2009, the number of species observed increased from 9 to 11, and there was a 4.2% increase in acreage of rooted floating and emergent plant beds since the initial survey. Spatterdock continued to be the most frequently occurring species (Table 12).

Table 12. Emergent and rooted floating plant bed comparison.

	2008	2009
Total Number of Beds	10	12
Total Number of Species	9	11
Most Frequently Occurring Species	Spatterdock	Spatterdock
Total Bed Acres	5.808	6.054

The area between beds 11 and 12, located along the eastern shore of Lake Tippecanoe, continues to lack rooted floating and emergent vegetation (Figure 36). At the time of the survey this area was dominated by thick beds of filamentous bluegreen algae. As long as this bluegreen algae mat persists it may be difficult for emergent and rooted floating vegetation to become established.

Figure 36. Lake Tippecanoe, large shallow area between beds 11 and 12 that is lacking rooted floating vegetation, August 28, 2008.

3.0 2009 VEGETATION CONTROL

The LTPOA has sponsored invasive species treatments on the Tippecanoe chain since 2003 (Table 13). These controls have incorporated the use of selective herbicides or treatment timing has been such to select for invasive species. Curlyleaf pondweed and Eurasian watermilfoil have been the targets of the controls.

Table 13. LTPOA sponsored treatments since 2003.

Year	Species Targeted	Lakes Treated	Acres Treated
2003	Milfoil & Curlyleaf	Tippe & Oswego	35.0
2004	Milfoil & Curlyleaf	Tippe & Oswego	32.0
2005	Milfoil & Curlyleaf	Tippe, James, & Oswego	21.5
2006*	Milfoil	Tippe, James, & Oswego	37.0
2007*	Milfoil & Curlyleaf	Tippe, James, & Oswego	CLP-104 & EWM-34.0
2008*	Milfoil & Curlyleaf	Tippe, James, & Oswego	CLP-104 & EWM-32.5
2009*	Milfoil & Curlyleaf	Tippe, James, & Oswego	CLP-104 & EWM-51.8

*LARE funded $20,000 for controls.

The first treatment on the Tippecanoe chain was completed on April 27, 2009. This treatment was designed to target curlyleaf pondweed early in the season, prior to turion formation and prior to heavy growth of native vegetation. This was the third consecutive season of treatment to the same 104-acre areas (Figure 37). Aquathol K (active ingredient: endothal) was used in the treatment. The treatment successfully controlled

remaining curlyleaf pondweed in the lakes. Some damaged stems remained in the eastern end of Lake Tippecanoe, but dropped out by early June.

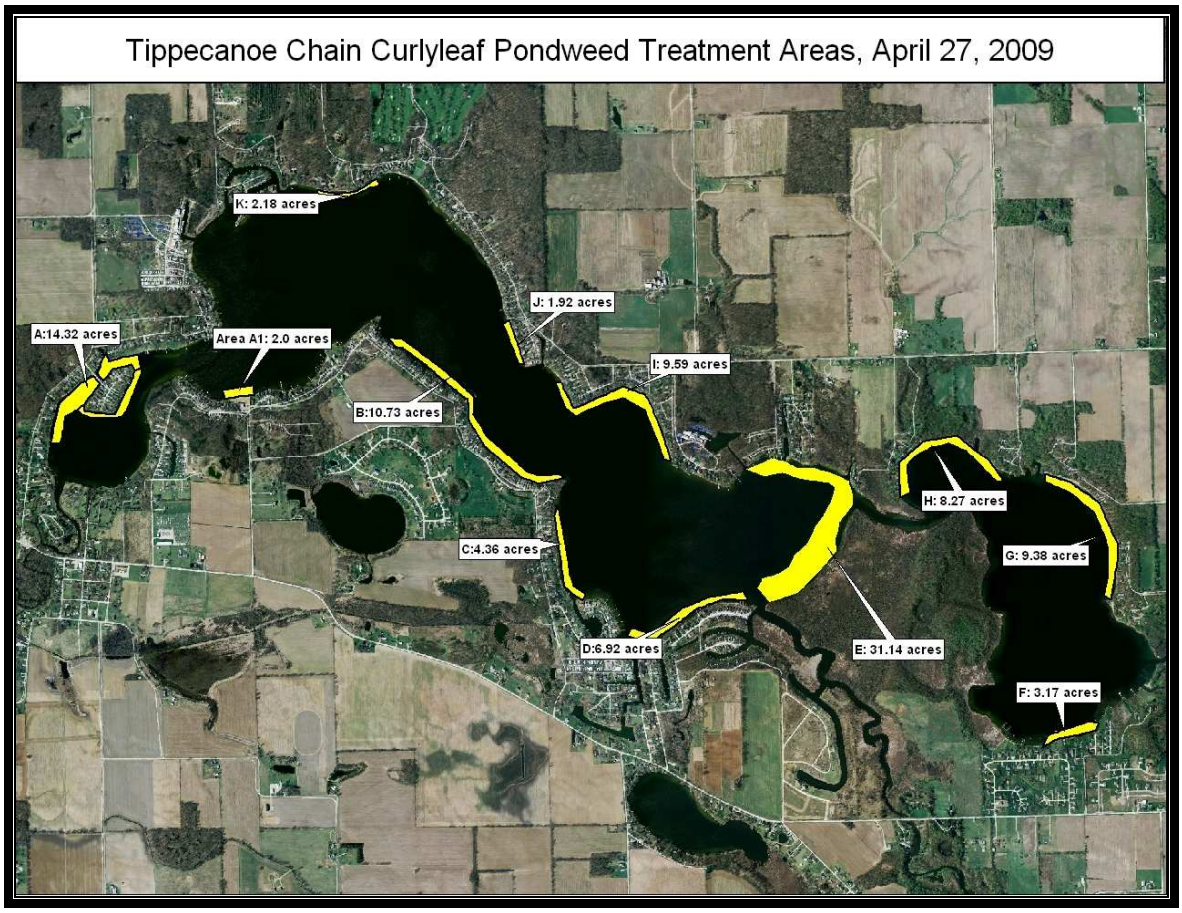

Figure 37. Lake Tippecanoe Chain curlyleaf pondweed treatment areas, April 27, 2009.

Eurasian watermilfoil treatment areas were mapped on May 27, 2009 and treated on June 8, 2009. A total of 51.8 acres of milfoil was mapped within the three lakes (Figure 38). Lake Tippecanoe accounted for the most acres of milfoil treated, but Oswego Lake had the highest percentage of milfoil areas when compared to lake area. The treatment was completed using Renovate herbicide (active ingredient: triclopyr). The treatment effectively controlled milfoil in the targeted areas as illustrated by the results of the August Tier 2 survey.

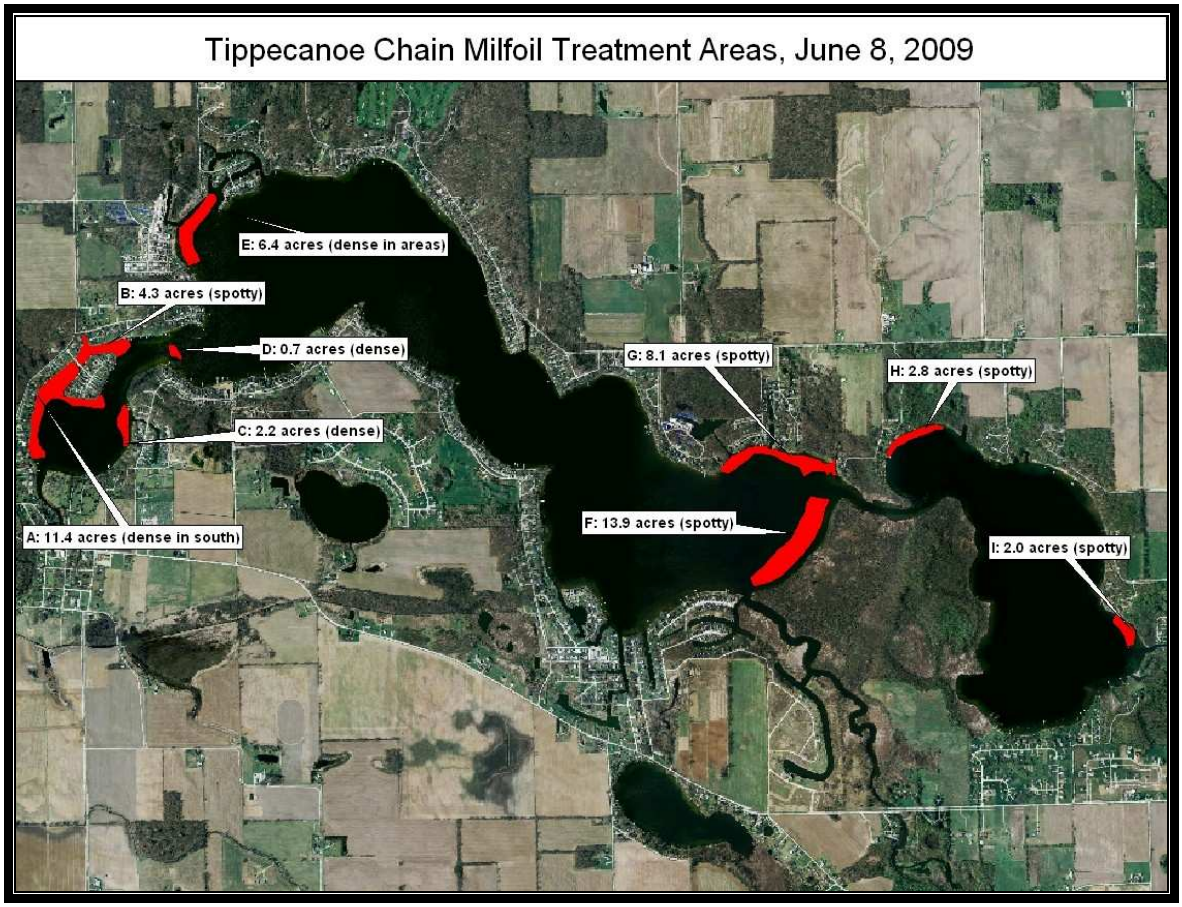

Figure 38. Lake Tippecanoe Chain Eurasian watermilfoil treatment areas, June 8, 2009.

LTPOA did not sponsor any treatment of eel grass or filamentous bluegreen algae this season due to budget shortfalls. By late summer these species were considered a nuisance by many residents on Lake Tippecanoe. Selected areas of nuisance algae and eel grass should be considered for treatment in 2010 if LTPOA budget and IDNR allows.

4.0 ACTION PLAN AND BUDGET UPDATE

Over the past three seasons LTPOA has made a large investment in an effort to control curlyleaf pondweed. Based on the reduced growth observed in the spring of 2008 and 2009 it appears that the turion banks are being exhausted by these treatments. Based on experience on other lakes that have completed similar programs it is likely that up to 30 acres may remain next season. These areas should be mapped out in mid-April and treated before the end of the month. The cost of this treatment will likely not exceed $9,000.

From 2003-2005 LTPOA took on the responsibility of reducing the negative impacts caused by Eurasian watermilfoil. LARE helped fund treatments in 2006-2009. There has been a steady decline in Eurasian watermilfoil since the inception of the treatment program in 2003 until this season. This phenomenon was seen on several lakes in the area in 2009 and may be due to the cooler temperatures (milfoil prefers to grow in cooler water and often times growth ceases during warm summer months). This seasons spring

treatments effectively controlled the targeted areas, but some Eurasian watermilfoil remains in the lakes and there is a great deal present in the watershed. Milfoil has the ability to quickly recolonize areas, so treatments should be continued so that it doesn't return to pre-2003 levels. Eurasian watermilfoil should be treated anywhere it occurs within the chain of lakes It is estimated that up to 50 acres may require treatment on the Tippecanoe Chain in 2010. Actual treatment areas should be determined following a visual survey that should be completed in the spring. Renovate or 2,4-D should be used in these treatments in order to selectively control milfoil while limiting native damage. Treatments should be completed in the spring of the year to prevent spread throughout the busy boating season.

Eel grass is a beneficial native species that typically reaches its maximum density in late summer. This species has created some nuisance conditions in the three lakes, especially Lake Tippecanoe. LTPOA has treated some of the most impaired areas when funds are available. As long as proper permits are obtained, traditional treatment areas can be treated without IDNR inspection. These traditional areas are illustrated in Figure 39. If LTPOA wishes to expand out of these areas additional inspections will be required (the permit and permit map contain possible treatment areas, but these areas will only be treated if needed and upon IDNR inspection and approval). In Lake Tippecanoe, IDNR wishes to maintain eel grass at or above 50% of sample sites in the 0-5 ft depth range (eel grass occurred at 60.0% of sites in this depth range in the 2009 summer Tier 2 survey and there has been little change since surveys began in 2004).

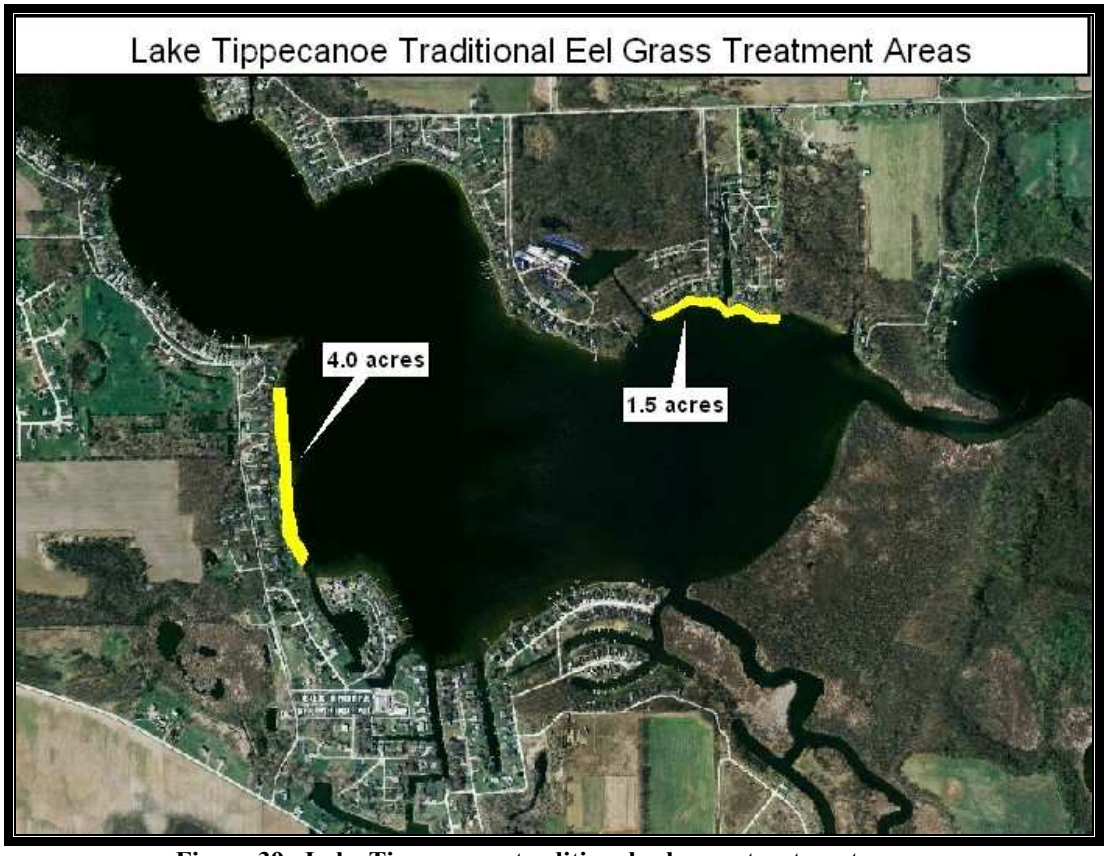

Figure 39. Lake Tippecanoe, traditional eel grass treatment areas.

Filamentous bluegreen algae continues to be an issue for residents on Lake Tippecanoe. The algae was identified as *Lyngbya wolleii*. This type of algae forms mats along the bottom of the lake which periodically break off and float. Algae accumulates along windward banks and can impede boating, swimming and fishing. In addition, algae appears to be crowding out native plant species along the eastern shore of the lake where it accumulates in thick mats. Chemical and physical control of this type of algae is difficult and expensive. An ecozone was established along the western shore of Lake Tippecanoe in 2009. An ecozone prohibits motorized boating in an area in an effort to reduce erosion and increase native plant growth, specifically rooted floating and emergent species. It is anticipated that once the native plant beds become reestablished that less algae will be able to grow. In addition, the native plant beds will provide beneficial fish cover and also help buffer wave action thus protecting the Ball wetlands area. This area was monitored for the past two seasons in order to establish baseline data that will assess the effectiveness of the ecozone. Additional surveys designed to assess the effectiveness of the ecozone should be completed in 2012.

In addition to protection and monitoring of the ecozone area, residents of the Tippecanoe Chain and lakes within the watershed should be encouraged to do their part in reducing nutrient inputs into the lakes. This may include limiting fertilizer use to Phosphorus free brands, not dumping organic debris into the lakes, and improvements in sewage management to name a few. Additional steps that can be taken can be found the Lake Tippecanoe Diagnostic Study. The Tippecanoe Environmental Lakes and Watershed Foundation (TELWF) is also an excellent source of information on best management practices that can be implemented by individual lot owners.

Listed below in Table 7 is a budget estimate for vegetation management over the next four seasons. The potential LARE funded items include the curlyleaf pondweed treatment, Eurasian watermilfoil treatment, and continued vegetation sampling (spring invasive surveys and summer Tier 2 survey) and plan updates. LTPOA should request $42,000 from the LARE program. Specifically, $9,000 for early season curlyleaf treatment to 30 acres, $24,000 for treatment of up to 50 acres of Eurasian watermilfoil, and $6,000 for plant sampling and plan updates. Treatment of eel grass will not be funded by LARE.

Table 14. Four year budget estimate for plant management on the Tippecanoe Chain.

	2010	2011	2012	2013
Curlyleaf pondweed treatment:	$9,000	$5,000	$5,000	$5,000
Eurasian watermilfoil treatment:	$24,000	$20,000	$18,000	$16,000
[1]Eel grass treatment:	$4,000	$4,250	$4,500	$4,750
[2]Plant sampling and plan update:	$6,000	$6,000	$9,000[2]	$6,000

[1]Cannot be funded by LARE
[2]Includes Ecozone Survey

5.0 PUBLIC INVOLVEMENT

A public meeting was held October 19, 2009 at the North Webster Community Center. This meeting was designed to gain further input from lake users; to educate lake users of the 2009 vegetation management activities, and to inform users of potential vegetation management plan updates. Approximately 15 individuals were in attendance and 10 of those individuals filled out a lake user survey form. The results of the survey are outlined in Table 15. Most of the comments were about the high levels of eel grass and filamentous algae experienced during the summer months.

Table 15. Lake user survey, October 19, 2009.

Tippecanoe chain of Lakes 10/19/09		
Are you a lake property owner?	Yes 100%	No 0%
Are you currently a member of your lake association?	Yes 100%	No 0%
How many years have you been at the lake?	2 or Less: 0%	5 to 10: 30%
	2 to 5: 0%	Over 10: 60%
How do you use the lake (mark all that apply)	Swimming 80%	Irrigation 40%
	Boating 100%	Drinking water 0%
	Fishing 70%	Other? _____
Do you have aquatic plants at your shoreline in nuisance quantities?	Yes: 90% No: 10%	
Does aquatic vegetation interfere with your use or enjoyment of the lake?	Yes: 70% No: 30%	
Does the level of vegetation in the lake affect your property values?	Yes: 60% No: 20%	
Are you in favor of continuing efforts to control vegetation on the lake?	Yes: 90% No: 0%	
Are you aware that the LARE funds will only apply to work controlling invasive exotic species, and more work may need to be privately funded?	Yes: 100% No: 0%	
Were you satisfied with the results of the LARE funded invasive treatments this season?	Yes: 50% No: 40% N/A: 10%	
Mark any of these you think are problems on your lake:		
10% Too many boats access the lake		
30 % Use of jet skis on the lake		
0 % Too much fishing		
30% Fish population problem		
20 % Dredging needed		
10% Overuse by nonresidents		
50 % Too many aquatic plants		
0% Not enough aquatic plants		
40% Poor water quality		
10% Pier/funneling problem		

It is also beneficial to examine the public perception of lake problems and management actions taken thus far over the course of the LARE funded AVMP project. Table 16 displays the results from the public surveys conducted in 2007 and 2009. There appears to be very little change in the results of the past two surveys.

Table 16. Tippecanoe Lake, lake user survey results, 2007 and 2009.

Survey participant information	2007	2009
Is a lake property owner	100%	100%
Is a member of the lake association	94%	100%
Have been on the lake for more than 10 years	84%	60%
Uses of lake		
Swimming	94%	80%
Boating	97%	100%
Fishing	61%	70%
Irrigation	26%	40%
Drinking water	0%	0%
Other	0%	0%
Perception of aquatic vegetation and management		
Plants at shoreline in nuisance quanities	87%	90%
Vegetation interferes with lake use and enjoyment	81%	70%
Aquatic vegetation affects property values	68%	60%
In favor of continuing vegetation control on lake	90%	90%
Are aware that LARE funds are only for control of invasive plants	81%	100%
Are satisfied with results from LARE funded activities	32%	50%
Problems on lake		
Too many boats access the lake	26%	10%
Use of jet skis is a problem on the lake	35%	30%
Too much fishing	0%	0%
Fish population problems	6%	30%
Dredging is needed	26%	20%
Overuse by nonresidents	22%	10%
Too many aquatic plants in lake	58%	50%
Not enough aquatic plants in lake	0%	0%
Poor water quality	32%	40%
Pier/funneling problems exist on lake	19%	10%

6.0 REFERENCE CITED

Aquatic Control Inc. 2008. Lake Tippecanoe Aquatic Vegetation Management Plan 2007 Update. Report to Lake Tippecanoe Property Owners Association. Syracuse, Indiana.

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Jones, W. 1986. A Diagnostic and Feasibility Study of Lake Tippecanoe. Bloomington, Indiana.

Pearson, J. 2004. Guidelines for sampling floating-leaf emergent plant in Indiana lakes. IN Department of Natural Resources. Division of Fish & Wildlife. Indianapolis, IN.

Williams Creek Consulting. 2006. Ecozone Feasibility Lake Tippecanoe Kosciusko County, Indiana. Report to Lake Tippecanoe Property Owners Association. Syracuse, Indiana.

7.0 APPENDIX UPDATE

7.1 2009 Sampling Data

Lake Tippecanoe Tier 2 Data

WPT	Lat	Long	Depth	Rake score	Eurasian watermilfoil	Fil. Algae	Coontail	Eel grass	Richardson's pondweed	Chara	Variablele pondweed	Slender naiad	Sago pondweed	Common bladder wort	Illinois pondweed	Flatstem pondweed
1	41.328204	-85.777431	10	5			3	3	3							
2	41.328712	-85.775322	12	5			5									
3	41.329643	-85.773605	6	0												
4	41.330895	-85.771664	11	1				1								
5	41.33147	-85.769914	5	1				1								
6	41.330896	-85.768256	18	0												
7	41.330218	-85.766825	6	5				5								
8	41.329269	-85.765498	16	0												
9	41.328611	-85.764031	10	5				5								
10	41.328144	-85.762773	5	3				3		1	1					
11	41.327052	-85.762321	8	3				3								
12	41.326123	-85.76214	6	5				5								
13	41.325777	-85.761345	11	5	1			5				1				
14	41.324935	-85.760697	5	5						3	3					
15	41.324916	-85.759228	7	5				5	1				1			
16	41.324233	-85.758057	5	5				3		3	3					
17	41.324364	-85.756407	10	1				1								
18	41.323357	-85.756982	6	5				5					1			
19	41.322541	-85.756801	5	5			5									
20	41.321564	-85.757022	6	5				5	1							
21	41.320453	-85.756391	9	5	1		3	3					5			
22	41.319665	-85.755803	20	0												
23	41.318829	-85.755404	5	5			1	5								
24	41.319147	-85.753859	6	5				5								
25	41.318192	-85.753599	5	5	1		1	5								
26	41.317091	-85.753037	6	1		P			1							
27	41.316462	-85.751712	4	1				1		1						
28	41.318097	-85.750765	13	5			5									
29	41.317995	-85.748948	4	5				5		1			1			
30	41.319323	-85.748181	5	0		P										
31	41.319605	-85.746716	7	3		P	1	3								
32	41.31874	-85.745822	5	0		P										
33	41.319017	-85.743988	4	0		P										
34	41.320199	-85.744685	14	3			3									
35	41.320647	-85.742727	6	0		P										
36	41.321847	-85.740786	5	0		P										
37	41.323165	-85.74061	8	1		P								1		
38	41.323922	-85.742285	6	0		P										
39	41.32299	-85.743691	14	5			5									
40	41.323501	-85.745302	11	5			5	1								
41	41.323234	-85.746704	6	5				5								
42	41.322735	-85.747984	7	5			1	5								
43	41.323402	-85.74928	15	5			3	5	1			1				
44	41.324056	-85.750354	5	5				5								
45	41.324681	-85.751587	6	1				1								

Tippe Tier 2 Data Continued

46	41.326352	-85.752094	10	5			3	5								
47	41.327405	-85.753172	8	5				5								
48	41.327247	-85.754867	8	5				5								
49	41.326891	-85.756155	16	0												
50	41.327524	-85.757309	6	5				5					3			
51	41.328492	-85.75848	19	0												
52	41.329071	-85.759699	20	0												
53	41.330139	-85.760535	6	5				5	1							
54	41.331405	-85.761159	16	0												
55	41.332729	-85.761634	20	0												
56	41.333843	-85.762297	16	0												
57	41.335093	-85.76355	9	3				3								
58	41.336051	-85.764806	7	5				5			1					
59	41.336982	-85.765942	10	5				5								
60	41.337768	-85.767387	7	5				5	1	1						
61	41.337833	-85.768485	6	5				5	1							
62	41.337164	-85.76911	11	1			1	1								
63	41.336971	-85.770222	14	1			1									
64	41.336582	-85.770951	6	3				3								
65	41.336912	-85.77221	18	5			5									
66	41.337313	-85.773449	5	5				5		1						
67	41.336731	-85.773796	14	3				3								
68	41.336419	-85.775075	5	0												
69	41.33581	-85.774817	11	5				5								
70	41.335506	-85.775789	20	0												
71	41.335448	-85.776939	6	3		P		3								
72	41.33601	-85.778217	5	1				1		1						
73	41.335332	-85.779154	5	1				1								
74	41.334693	-85.77832	15	5			5									
75	41.334122	-85.779603	10	5			1	5	3		1		1			
76	41.333718	-85.778437	20	0												
77	41.332739	-85.778804	6	3				3		1		1				
78	41.332138	-85.778065	10	1				1								
79	41.33144	-85.77817	5	3				3	1							
80	41.330687	-85.77821	5	0												
81	41.329843	-85.77831	6	0												
82	41.330266	-85.779611	5	5				5	1							
83	41.329785	-85.780509	11	5			5									
84	41.328625	-85.780055	5	1						1						
85	41.328168	-85.77868	12	1			1	1								
86	41.328303	-85.776432	6	3				3			1					
87	41.328593	-85.773884	5	3				1	1			1				
88	41.330159	-85.772536	5	0												
89	41.330761	-85.770773	5	5	1			5	1						1	1

Oswego Lake Tier 2 Data

WPT	Lat	Long	Depth	Rake score	Eurasian watermilfoil	Brttle naiad	Fil. Algae	Chara	Eel grass	Variableleaf pondweed	Slender naiad	Elodea	Richardson's pondweed	coontail	Largeleaf Pondweed	Sago pondweed
1	41.329775	-85.782915	5	5				5	5	1						
2	41.329647	-85.783899	7	1	1			1			1					
3	41.329411	-85.785196	6	5				1	5		1	1	1			
4	41.329092	-85.78401	5	5				3	5		1		1			
5	41.328427	-85.783947	5	5					5				1			1
6	41.327774	-85.784631	5	5				5	5					1		5
7	41.327084	-85.784789	6	3	1				1		1			1		1
8	41.326647	-85.784664	6	1												1
9	41.326238	-85.784699	10	0												
10	41.326913	-85.785582	7	5										5		
11	41.326409	-85.785756	11	0												
12	41.326373	-85.786368	9	1					1							
13	41.326313	-85.786356	15	1										1		
14	41.326235	-85.787014	8	0												
15	41.32627	-85.787475	20	0												
16	41.32699	-85.787461	6	0												
17	41.327913	-85.787409	7	5							3			3		
18	41.326397	-85.788236	7	5					5							
19	41.326128	-85.787942	20	0												
20	41.32584	-85.788232	19	0												
21	41.325445	-85.788554	17	0												
22	41.325056	-85.788471	20	0												
23	41.324637	-85.788667	15	5										5		
24	41.324006	-85.788714	5	5				5	1	1						
25	41.324372	-85.787952	19	0												
26	41.324301	-85.78712	16	1										1		
27	41.323945	-85.786198	15	0												
28	41.324006	-85.785377	11	5										5	1	
29	41.324373	-85.784686	8	5		1			5				3	1		
30	41.325016	-85.784228	18	1										1		
31	41.325385	-85.783582	6	5		1			5	1						
32	41.325709	-85.784274	20	0												
33	41.326049	-85.784891	20	0												
34	41.326254	-85.785211	18	0												
35	41.326123	-85.78382	6	0												
36	41.324531	-85.784173	6	3		1			1	1						
37	41.323996	-85.787066	7	3					1	3	1					
38	41.324112	-85.788063	6	3					3				1			
39	41.327624	-85.783909	5	3					3							
40	41.328574	-85.783051	5	5					5							3

James Lake Tier 2 Data

WPT	Lat	Long	Depth	Rake score	Brittle naiad	Curlyleaf pondweed	Fil. Algae	Eel Grass	Sago pondweed	Chara	Waterstar grass	Coontail	Slender naiad	Richardson's pondweed	Variable pondweed	Elodea	Common bladder wort
1	41.322327	-85.733135	5	5				5	1								
2	41.322978	-85.732155	15	0													
3	41.322295	-85.731323	4	1						1							
4	41.321508	-85.730298	20	0													
5	41.320924	-85.730016	15	1							1	1					
6	41.320177	-85.730186	4	1						1			1				
7	41.3193	-85.730257	18	0													
8	41.3183	-85.730305	14	1								1					
9	41.317778	-85.729503	4	3				1	1	1			1				
10	41.317156	-85.729125	5	0													
11	41.316232	-85.72927	16	0													
12	41.315013	-85.729715	17	3								3					
13	41.314229	-85.729243	15	3								3					
14	41.31412	-85.73025	6	1				1				1					
15	41.313629	-85.731376	5	5	1				3	1		3					
16	41.313478	-85.730753	18	1								1					
17	41.313006	-85.729947	10	5								5					
18	41.312493	-85.729281	19	0													
19	41.312106	-85.729032	7	5				5					1	1			
20	41.31222	-85.728127	11	5								5					
21	41.312248	-85.727204	18	5								5					
22	41.312069	-85.726177	4	5				5	3	5			5				
23	41.312546	-85.725604	18	3								3					
24	41.31233	-85.724789	4	5				3		3					5		
25	41.312905	-85.724127	5	5				5					1				
26	41.313828	-85.724225	6	1					1								
27	41.31433	-85.723216	14	5								5					
28	41.314029	-85.722491	4	5				1		5					1		
29	41.314578	-85.721796	5	5						1		5					
30	41.315673	-85.721836	7	0			P										
31	41.316092	-85.722587	16	1								1					
32	41.317151	-85.723301	19	0													
33	41.317857	-85.723613	5	1					1								
34	41.318806	-85.72372	6	5				5									
35	41.31942	-85.722986	4	1				1	1								
36	41.319849	-85.723424	18	5				1				5					
37	41.320541	-85.723288	11	5								5					
38	41.321441	-85.723627	16	1								1					
39	41.322284	-85.724072	5	1						1			1				
40	41.322216	-85.725501	7	1			P			1							
41	41.323166	-85.725248	6	5				5		1							
42	41.323242	-85.726217	13	5								5					
43	41.323803	-85.727433	4	3						3							
44	41.323858	-85.728576	5	5				5		1			1				
45	41.323629	-85.729573	17	1								1					
46	41.3242	-85.730225	8	5				3				2	1				
47	41.324785	-85.731044	4	5				5	1	1						1	
48	41.324941	-85.731848	8	5				5				3					
49	41.325306	-85.732276	10	1								1					
50	41.325573	-85.733056	15	1								1					
51	41.32557	-85.733927	4	1			P			1		1				1	
52	41.325263	-85.734786	10	5								5					
53	41.325006	-85.735329	12	5								5					
54	41.324288	-85.735676	13	3								3					
55	41.32384	-85.736047	7	1		1							1				
56	41.32337	-85.735817	7	5				5		1		3					
57	41.322955	-85.73535	10	5				3				3	1				
58	41.322734	-85.734554	10	1							1	1					
59	41.322519	-85.73417	8	1			P										1
60	41.322913	-85.732784	9	5				5				1					

Ecozone Survey Data

Lake	Date	Site	Point	Wid_ft	Wid©	Wid©	SPA	WAL	ARA	SWL	CAT	PIK	CMR	PRL	BUL	ARH	SMW	BUB	PHR	YPL	WAW	STB	HIB	Spe	Bed
Tippe Chain	8/11/09	1	S	15	15	15		1		9	9													3	1
Tippe Chain	8/11/09	2		15	15	15		1		9	9													3	1
Tippe Chain	8/11/09	3	E	6	4	4		1																1	1
Tippe Chain	8/11/09	4	S	9	8	8	1	9			9	9				9								5	2
Tippe Chain	8/11/09	5		30	32	32	9	1						9									9	4	2
Tippe Chain	8/11/09	6		60	66	66	9	1		9	9													4	2
Tippe Chain	8/11/09	7		132	149	149		1			9												9	3	2
Tippe Chain	8/11/09	8		120	135	135		1			9												9	3	2
Tippe Chain	8/11/09	9		60	66	66		1			9													2	2
Tippe Chain	8/11/09	10	E	15	15	15		1			9												9	3	2
Tippe Chain	8/11/09	11	S	15	15	15			9			1						1						3	3
Tippe Chain	8/11/09	12		57	63	63	1					9				9		9						4	3
Tippe Chain	8/11/09	13		54	60	60	1		9		9													3	3
Tippe Chain	8/11/09	14		63	70	70	1		9		9													3	3
Tippe Chain	8/11/09	15	E	30	32	32	1		9		9													3	3
Tippe Chain	8/11/09	16	S	63	70	70	1		9		9			9									9	5	4
Tippe Chain	8/11/09	17		81	91	91	1		9		9												9	4	4
Tippe Chain	8/11/09	18		30	32	32	9		1														9	3	4
Tippe Chain	8/11/09	19		57	63	63	1		9														9	3	4
Tippe Chain	8/11/09	20		69	77	77	1		9			9											9	4	4
Tippe Chain	8/11/09	21		30	32	32	9		1									9					9	4	4
Tippe Chain	8/11/09	22		36	39	39	1		9			9						9						4	4
Tippe Chain	8/11/09	23		66	73	73	1		9															2	4
Tippe Chain	8/11/09	24		15	15	15			1															1	4
Tippe Chain	8/11/09	25		30	32	32			1															1	4
Tippe Chain	8/11/09	26		18	18	18			1														9	2	4
Tippe Chain	8/11/09	27	E	15	15	15			1														9	2	4
Tippe Chain	8/11/09	28	S	30	32	32	1	9																2	5
Tippe Chain	8/11/09	29	E	30	32	32																		0	5
Tippe Chain	8/11/09	30	S	12	11	11	1																9	2	6
Tippe Chain	8/11/09	31		30	32	32	1	9	9									9				9	9	6	6
Tippe Chain	8/11/09	32		66	73	73	1				9	9											9	4	6
Tippe Chain	8/11/09	33	E	30	32	32	1		9														9	3	6
Tippe Chain	8/11/09	34	S	36	39	39	1																	1	7
Tippe Chain	8/11/09	35		69	77	77	1				9												9	3	7
Tippe Chain	8/11/09	36		75	84	84	1				9	9											9	4	7
Tippe Chain	8/11/09	37		99	111	111	1			9														2	7
Tippe Chain	8/11/09	38	S	33	35	35	1		9															2	8
Tippe Chain	8/11/09	39		69	77	77	1		9	9														3	8
Tippe Chain	8/11/09	40		81	91	91	1		9									9						3	8
Tippe Chain	8/11/09	41		72	80	80	1		9															2	8
Tippe Chain	8/11/09	42		60	66	66	1		9															2	8
Tippe Chain	8/11/09	43		57	63	63	1		9															2	8
Tippe Chain	8/11/09	44		3	1	1			1							9		9						3	8
Tippe Chain	8/11/09	45		3	1	1			1									9						2	8
Tippe Chain	8/11/09	46		54	60	60		1	9															2	8
Tippe Chain	8/11/09	47	E	30	32	32		1	9															2	8
Tippe Chain	8/11/09	48	S	120	135	135	9	1	9															3	9
Tippe Chain	8/11/09	49		135	153	153	1				9												9	3	9
Tippe Chain	8/11/09	50	E	168	191	191	1																	1	9
Tippe Chain	8/11/09	51	S		-3	-3		1																1	10
Tippe Chain	8/11/09	52	S	30	32	32																		0	11
Tippe Chain	8/11/09	53		45	49	49	1																9	2	11
Tippe Chain	8/11/09	54	E	45	49	49	1																	1	11
Tippe Chain	8/11/09	55	S	156	177	177		1		9														2	12
Tippe Chain	8/11/09	56		150	170	170	1	9		9				9										4	12
Tippe Chain	8/11/09	57		138	156	156	1			9				9										3	12
Tippe Chain	8/11/09	58		129	146	146	1																	1	12
Tippe Chain	8/11/09	59		81	91	91	1			9				9										3	12
Tippe Chain	8/11/09	60		72	80	80	1	9			9													3	12
Tippe Chain	8/11/09	61	E	84	94	94		1			9													2	12

7.2 2010 Vegetation Control Permits

2010 Lake Tippecanoe Vegetation Control Permit Application

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT
State Form 26727 (R / 11-03)
Approved State Board of Accounts 1987
☐ Whole Lake ☒ Multiple Treatment Areas
Check type of permit

INSTRUCTIONS: Please print or type information

FOR OFFICE USE ONLY
License No.
Date Issued
Lake County

Return to: Page 1 of 6
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Commercial License Clerk
402 West Washington Street, Room W273
Indianapolis, IN 46204

FEE: $5.00

Applicant's Name	Lake Assoc. Name	
Lake Tippecanoe POA	Lake Tippecanoe POA	
Rural Route or Street		Phone Number
67 EMS T49A		812-497-2410
City and State		ZIP Code
Syracuse, IN		46567
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Rural Route or Street		Phone Number
City and State		ZIP Code

Lake (One application per lake)	Nearest Town	County
Lake Tippecanoe	North Webster	Kosciusko
Does water flow into a water supply		☐ Yes ☒ No

Please complete one section for *EACH* treatment area. Attach lake map showing treatment area and denote location of any water supply intake.

Treatment Area #	1	LAT/LONG or UTM's	Treatment of EWM and CLP where they occur (no more than 70 acres, see avmp)
Total acres to be controlled	<70	Proposed shoreline treatment length (ft)	Perpendicular distance from shoreline (ft)
Maximum Depth of Treatment (ft)	18	Expected date(s) of treatment(s)	Early Spring Depending on Water Temp.

Treatment method: ☒ Chemical ☐ Physical ☐ Biological Control ☐ Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate or 2,4-D for EWM control and low dose Aquathol for selective CLP control (see avmp)

Plant survey method: ☒ Rake ☒ Visual ☐ Other (specify) spring abundance

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Curlyleaf Pondweed	X	15
Flatstem Pondweed		5
Chara		15
Coontail		20
Elodea		5
Eurasian Watermilfoil	X	10
Richardson's Pondweed		10
Eel Grass		5
Variable pondweed		5
Sago Pondweed		10

Treatment Area #	2	LAT/LONG or UTM's	Center of bed @ N41.32835 W85.77511		
Total acres to be controlled	1.86	Proposed shoreline treatment length (ft)	996	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol herbicide will be used for control of eel grass in nuisance areas only

Plant survey method: [x] Rake [X] Visual [ ] Other (specify) Summer Data

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	30
Flat-stemmed pondweed		10
chara		10
Common naiad		10
Sago pondweed		10
common coontail		20
filamentous algae	x	10

Treatment Area #	3	LAT/LONG or UTM's	Center of bed @ N41.32234 W85.75774		
Total acres to be controlled	16	Proposed shoreline treatment length (ft)	10084	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol herbicide will be used for control of eel grass only in nuisance areas

Plant survey method: [x] Rake [X] Visual [ ] Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel Grass	X	30
Coontail		10
Sago pondweed		10
Chara		10
filamentous algae		10
Richardson's pondweed		10
Variable pondweed		10
Common naiad		10

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Treatment Area #	4	LAT/LONG or UTM's	Center of bed @ N41.32483 W85.74374		
Total acres to be controlled	1.5	Proposed shoreline treatment length (ft)	609	Perpendicular distance from shoreline (ft)	50-100
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		
Treatment method:	[X] Chemical	[ ] Physical	[ ] Biological Control	[ ] Mechanical	
Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control.	Nautique and Hydrothol herbicide will be used for control of eel grass only in nuisance areas				
Plant survey method:	[X] Rake	[X] Visual	[ ] Other (specify)	Summer Survey	

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	40
Coontail		20
filamentous algae	x	20
Eurasian watermiloil		5
Richardson's pondweed		5
Sago pondweed		5
common naiad		5

Treatment Area #	5	LAT/LONG or UTM's	Center of bed @ N41.32737 W85.75197		
Total acres to be controlled	2.75	Proposed shoreline treatment length (ft)	1735	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		
Treatment method:	[X] Chemical	[ ] Physical	[ ] Biological Control	[ ] Mechanical	
Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control.	Nautique and Hydrothol herbicide will be used for control of eel grass only in nuisance areas				
Plant survey method:	[X] Rake	[X] Visual	[ ] Other (specify)	Summer survey	

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	60
Coontail		10
Chara		10
common naiad		10
filamentous algae		10

Treatment Area #	6	LAT/LONG or UTM's	Center of bed @ N41.33011 W85.7602		
Total acres to be controlled	3.25	Proposed shoreline treatment length (ft)	1933	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol herbicide will be used for control of eel grass only in nuisance areas

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) Summer Survey

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	50
filamentous algae	x	10
Common naiad		10
Coontail		10
Chara		10
sago pondweed		10

Treatment Area #	7	LAT/LONG or UTM's	Center of bed @ N41.33741 W85.77077		
Total acres to be controlled	3.22	Proposed shoreline treatment length (ft)	2126	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol herbicide will be used for control of eel grass in nuisance areas

Plant survey method: [ ] Rake [X] Visual [ ] Other (specify) Summer Survey

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	40
Eurasian watermilfoil		10
Chara		10
Coontail		20
Flat-stemmed pondweed		10
Richardson's pondweed		10

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Treatment Area #	8	LAT/LONG or UTM's	Center of Bed @ N41.33295 W85.77929		
Total acres to be controlled	2.63	Proposed shoreline treatment length (ft)	1711	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol herbicide will be used for control of eel grass in nuisance areas

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) _____

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	30
Chara		20
Coontail		20
Common naiad		20
filamentous algae	x	10

INSTRUCTIONS: Whoever treats the lake fills in "Applicant's Signature" unless they are a professional. If they are a professional company who specializes in lake treatment, they should sign on the "Certified Applicant" line.

Applicant Signature	Date
Certified Applicant's Signature	Date

FOR OFFICE ONLY

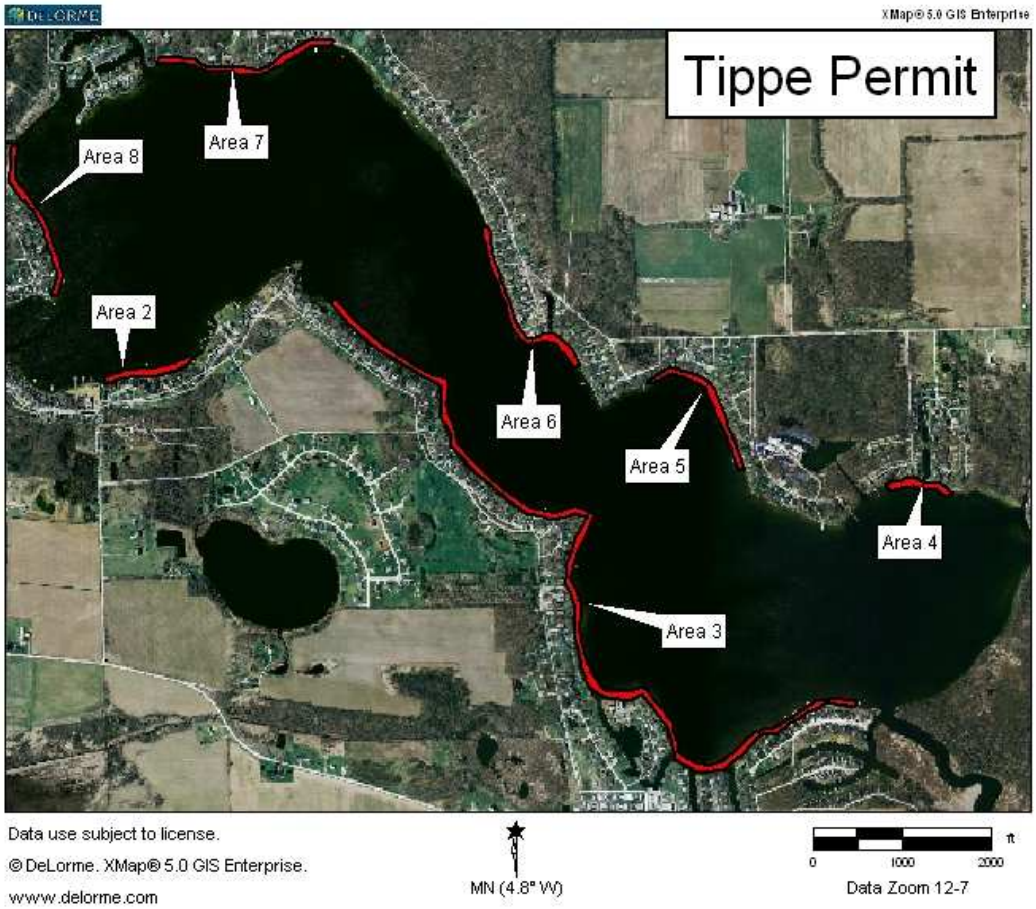
[ ] Approved [ ] Disapproved	Fisheries Staff Specialist
[ ] Approved [ ] Disapproved	Environmental Staff Specialist

Mail check or money order in the amount of $5.00 to:

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
COMMERCIAL LICENSE CLERK
402 WEST WASHINGTON STREET ROOM W273
INDIANAPOLIS, IN 46204

AQUATIC CONTROL

Lake Tippecanoe-Vegetation Control Permit Map (Page 6)



2010 James Lake-Vegetation Control Permit Application

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT
State Form 26727 (R / 11-03)
Approved State Board of Accounts 1987
☐ Whole Lake ☒ Multiple Treatment Areas
Check type of permit

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Commercial License Clerk
402 West Washington Street, Room W273
Indianapolis, IN 46204

FEE: $5.00

Applicant's Name	Lake Assoc. Name	
Lake Tippecanoe POA	Lake Tippecanoe POA	
Rural Route or Street		Phone Number
67 EMS T49 A		574-834-2185
City and State		ZIP Code
Syracuse, IN		46567
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Rural Route or Street		
City and State		ZIP Code

Lake (One application per lake)	Nearest Town	County	
Lake James	North Webster	Kosciusko	
Does water flow into a water supply		☐ Yes	☒ No

Please complete one section for *EACH* treatment area. Attach lake map showing treatment area and denote location of any water supply intake.

Treatment Area # 1	LAT/LONG or UTM's	Treatment of Eurasian watermilfoil and curlyleaf where it occurs (see avmp update)
Total acres to be controlled <30 acres	Proposed shoreline treatment length (ft)	Perpendicular distance from shoreline (ft)
Maximum Depth of Treatment (ft) 18	Expected date(s) of treatment(s)	Early April (water temp dependent)

Treatment method: ☒ Chemical ☐ Physical ☐ Biological Control ☐ Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate or 2,4-D for EWM and low dose Aquathol K for curlyleaf pondweed

Plant survey method: ☒ Rake ☒ Visual ☐ Other (specify) Spring Survey Results

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Curlyleaf Pondweed	X	20
Coontail		20
Chara		10
Eurasian watermilfoil	X	10
Flatstem Pondweed		10
White water lily		5
Richardsons pondweed		5
Sago pondweed		5
Eel Grass		15

Treatment Area #	2	LAT/LONG or UTM's	Center of bed @ N41.32471 W85.73584		
Total acres to be controlled	1.75	Proposed shoreline treatment length (ft)	970	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol herbicide will be used for control of eel grass in nuisance areas only

Plant survey method: [x] Rake [X] Visual [ ] Other (specify) Summer Survey Results

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	35
Coontail		25
Common naiad		15
Sago pondweed		5
Flat-stemmed pondweed		5
filamentous algae	x	15

Treatment Area #	3	LAT/LONG or UTM's	Center of bed @ N41.32359 W85.72535		
Total acres to be controlled	1.86	Proposed shoreline treatment length (ft)	1190	Perpendicular distance from shoreline (ft)	50
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer depending on plant growth		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and hydrothol herbicide will be used for control of eel grass in nuisance areas only

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) Summer Survey Results

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	40
Coontail		35
Common naiad		10
Chara spp.		5
Variable pondweed		5
filamentous algae	x	5

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Treatment Area #	4	LAT/LONG or UTM's	Center of bed @ N41.31750 W85.72284		
Total acres to be controlled	1.5	Proposed shoreline treatment length (ft)	930	Perpendicular distance from shoreline (ft)	50-100
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and hydrothol herbicide will be used for control of eel grass in nuisance areas only

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) Summer Survey Results

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	35
Coontail		30
Chara		10
Common naiad		15
Water stargrass		5
Filamentous algae		5

Treatment Area #		LAT/LONG or UTM's			
Total acres to be controlled		Proposed shoreline treatment length (ft)	channel	Perpendicular distance from shoreline (ft)	channel
Maximum Depth of Treatment (ft)		Expected date(s) of treatment(s)			

Treatment method: [ ] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control.

Plant survey method: [ ] Rake [ ] Visual [ ] Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community

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Treatment Area #	5	LAT/LONG or UTM's	Center of bed @ N41.31256 W85.72381
Total acres to be controlled	1	Proposed shoreline treatment length (ft)	515
Perpendicular distance from shoreline (ft)	50-100		
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s)	mid to late summer

Treatment method: [x] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique herbicide will be used for control of eel grass in nuisance areas only

Plant survey method: [x] Rake [x] Visual [ ] Other (specify) Summer Survey results

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	60
Chara		20
Coontail		10
filamentous algae	x	5
Common naiad		5

INSTRUCTIONS: Whoever treats the lake fills in "Applicant's Signature" unless they are a professional. If they are a professional company who specializes in lake treatment, they should sign on the "Certified Applicant" line.

Applicant Signature	Date
Certified Applicant's Signature	Date

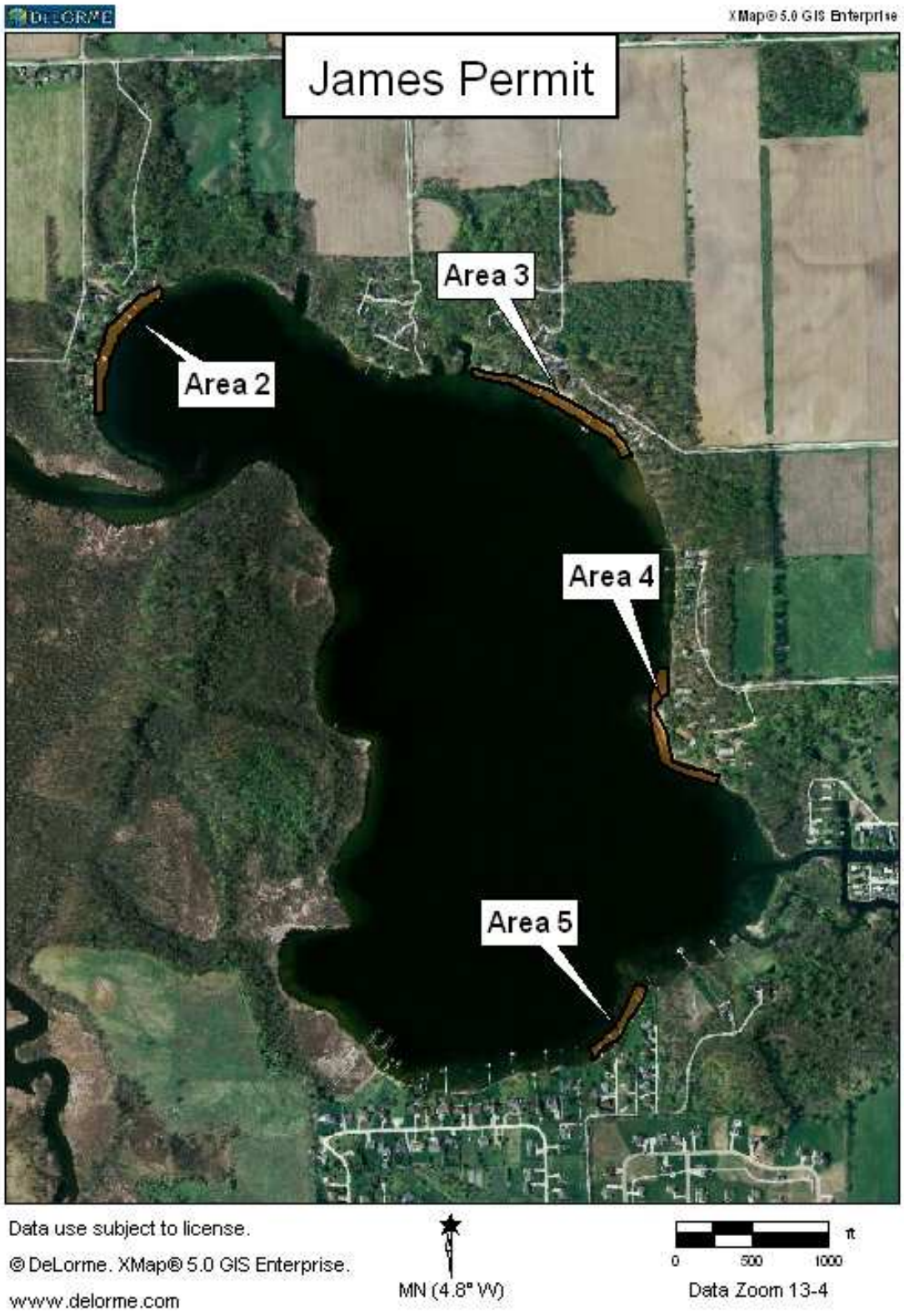
FOR OFFICE ONLY

[ ] Approved [ ] Disapproved	Fisheries Staff Specialist
[ ] Approved [ ] Disapproved	Environmental Staff Specialist

Mail check or money order in the amount of $5.00 to:

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
COMMERCIAL LICENSE CLERK
402 WEST WASHINGTON STREET ROOM W273
INDIANAPOLIS, IN 46204

James Lake-Vegetation Control Permit Map (Page 5)



2010 Oswego Lake-Vegetation Control Permit Application

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT
State Form 26727 (R / 11-03)
Approved State Board of Accounts 1987
[ ] Whole Lake [X] Multiple Treatment Areas
Check type of permit

INSTRUCTIONS: Please print or type information

FOR OFFICE USE ONLY
License No.
Date Issued
Lake County

Return to: Page 1 of 3
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Commercial License Clerk
402 West Washington Street, Room W273
Indianapolis, IN 46204

FEE: $5.00

Applicant's Name	Lake Assoc. Name	
Lake Tippecanoe POA	Lake Tippecanoe POA	
Rural Route or Street		Phone Number
67 ENS T49A		812-497-2410
City and State		ZIP Code
Syracuse, IN		46567
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Rural Route or Street		Phone Number
City and State		ZIP Code

Lake (One application per lake)	Nearest Town	County
Oswego Lake	North Webster	Kosciusko
Does water flow into a water supply		[ ] Yes [X] No

Please complete one section for *EACH* treatment area. Attach lake map showing treatment area and denote location of any water supply intake.

Treatment Area #	1	LAT/LONG or UTM's	Treatment of EWM and CLP throughout lake (areas determined following survey, no more than 20 acres)
Total acres to be controlled	<20 acres	Proposed shoreline treatment length (ft)	Perpendicular distance from shoreline (ft)
Maximum Depth of Treatment (ft)	18	Expected date(s) of treatment(s)	Early April for Curlyleaf and EWM (potential later treatment for EWM)

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate or 2,4-D granular for selective control of EWM and low dose Aquathol K for selective control of CLP (see 2009 avmp update)

Plant survey method: [X] Rake [x] Visual [ ] Other (specify) spring abundance

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Chara		30
Coontail		30
Curlyleaf Pondweed	X	10
Flatstem Pondweed		6
Variable watermilfoil		1
Eurasian Watermilfoil	X	10
Richardson's Pondweed		1
Illinois pondweed		1
Eel grass		10
American elodea		1

Treatment Area # 2	LAT/LONG or UTM's Center of Bed @ N41.32923 W85.78409		
Total acres to be controlled 2.12	Proposed shoreline treatment length (ft) 2100	Perpendicular distance from shoreline (ft) 50	
Maximum Depth of Treatment (ft) 6	Expected date(s) of treatment(s) mid to late summer depending on plant growth		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Nautique and Hydrothol will be used to control eel grass only in nuisance areas

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) Summer Survey

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eel grass	X	30
Chara		15
Coontail		20
Slender naiad		10
Sago pondweed		5
Brittle naiad		5
Richardson's Pondweed		5
Variable pondweed		5
Eurasian watermilfoil		5
Filamentous algae	x	

INSTRUCTIONS: Whoever treats the lake fills in "Applicant's Signature" unless they are a professional. If they are a professional company who specializes in lake treatment, they should sign on the "Certified Applicant" line.

Applicant Signature	Date
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INDIANAPOLIS, IN 46204

Oswego Lake-Vegetation Control Permit Application Map (Page 3)