

**Pretty Lake
Aquatic Vegetation Management Plan
2008 Update-draft
Marshall County, Indiana**

November 21, 2008



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Executive Summary

Aquatic Control was contracted by the Pretty Lake Association (PLA) to complete aquatic vegetation sampling in order to update the Pretty Lake 2007-2011 Aquatic Vegetation Management Plan (Aquatic Control 2007). Funding for the update was obtained from the Pretty Lake 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 will serve as a tool to track changes in the vegetation community, to adjust the action plan as needed, and to maintain eligibility for additional LARE funds. The major items covered include the 2008 sampling results, a review of the 2008 vegetation controls, and updates to the budget and action plans.

Aquatic vegetation is an important component of Indiana Lakes. Aquatic vegetation provides fish habitat, food for wildlife, prevents erosion, and can improve overall water quality. 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. Pretty Lake is a natural lake located in Plymouth, Indiana. The lake is approximately 97 acres, has a maximum depth of 40 feet, and an average depth of approximately 13 feet. The primary nuisance species within Pretty Lake is the invasive plant Eurasian watermilfoil (*Myriophyllum spicatum*), hereafter called milfoil. Curlyleaf pondweed (*Potamogeton crispus*) is another invasive species present in Pretty Lake. Purple loosestrife (*Lythrum salicaria*), is an invasive emergent species that appears to be spreading along the northwest shore of Pretty Lake.

Eurasian watermilfoil was found at 47.5% of the sites in the 2006 summer Tier II survey, in 24.8 acres during the 2006 spring Tier I survey, and 21.6 acres during the summer 2006 Tier I survey. This led to the recommendation to initiate a whole lake fluridone treatment on Pretty Lake in the spring of 2007. The Association received a LARE grant in 2007, but it was not enough to cover the entire cost of the treatment. No LARE funded vegetation surveys or treatments were completed on Pretty Lake in 2007. The PLA was awarded an additional LARE grant in 2008 for the fluridone treatment along with funds for plant sampling and plan updates. The PLA selected Aquatic Control Inc. to complete sampling, perform vegetation control, and update the plan. On April 23, 2008, a spring Invasive Species Mapping survey was completed to locate and record beds of invasive plants. Eurasian watermilfoil was recorded in 5.3 acres of the lake and curlyleaf pondweed was observed in 3.3 acres during the spring survey. On April 30, Sonar (active ingredient: fluridone) was applied to Pretty Lake in order to control milfoil. A bump application of Sonar was made on June 11. Fluridone concentrations were within the original plan's recommendation and remained above 3 parts per billion (ppb) for over 90 days.

On August 28, 2008, a Tier II survey was conducted. The purpose of this survey was to document changes within the native plant community and assess the success of the herbicide treatment. A total of 7 individual species were collected. The most abundant species collected was eel grass (*Vallisneria americana*). Eurasian watermilfoil and curlyleaf pondweed were not found during the post-treatment survey.

A public meeting was held on September 22, 2008 at the Plymouth County Club in order to inform lake users of the plant management activities and gain their input on the direction of the plan. Public response was favorable for continued efforts to vegetation management efforts within the lake. Another meeting was conducted with LARE biologists, District Fisheries Biologist and representatives from the lake association on November 6. Sampling and treatment data along with a potential budget and action plan were presented and discussed at this meeting.

In order to continue to meet the goals of this plan, several actions will need to be taken. Sampling and detection of new Eurasian watermilfoil infestations should be the primary action taken in 2009. It is recommended that two vegetation surveys be performed in 2009. The first is a spring Invasive Mapping Survey to locate and document the location of invasive species in Pretty Lake. It is unlikely that there will be any milfoil following the 2008 fluridone treatment, but if it is detected, it should be treated with Renovate aquatic herbicide as soon as possible to keep it from reaching pre-treatment levels. A Tier II survey should take place in mid to late summer in order to assess the changes in the native plant community and potentially locate any areas of milfoil. In addition to potential milfoil controls, purple loosestrife should also receive treatment. Approximately 1.8 acres of purple loosestrife (*Lythrum salicaria*) should be controlled with Renovate herbicide in 2009.

Currently, there is a relatively abundant and diverse native plant population present in Pretty Lake. This vegetation is very beneficial to the overall health of the lake ecosystem. Vegetation controls should be primarily focused on the use of highly selective controls in order to reduce damage to the native populations. However, some small-scale control of native vegetation may be needed in high use areas in order to reduce potential nuisance conditions that may arise after Eurasian watermilfoil is controlled.

The following is a list of actions that should be initiated in 2009:

1. Complete an invasive species mapping survey in the spring of 2009 in order to locate any areas of Eurasian watermilfoil and continue these surveys through 2011. Complete Tier II surveys in mid to late summer in order to document changes in the native community following and detect the presence of invasive species.
2. If detected, treat Eurasian watermilfoil wherever it is detected with Renovate aquatic herbicide in an effort to keep milfoil from returning to pre-fluridone treatment levels
3. Treat up to 1.8 acres of purple loostrife along the northwest shore near the club house.
4. Complete controls on native vegetation in high use areas to reduce potential nuisance conditions. Treatment should be limited to less than 50% of the shoreline.
5. Continue to assess, adjust, and update the Pretty Lake Management Plan through 2011.

Acknowledgements

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Table of Contents

Executive Summary	i
Acknowledgements	iii
Table of Contents	iv
List of Figures	v
List of Tables	vi
1.0 Introduction	1
2.0 Problem Statement	1
3.0 2008 Plant Sampling Results	1
3.1 Spring Survey (Invasive Plant Mapping)	1
3.2 Summer Survey (Tier II Survey)	3
3.3 Aquatic Vegetation Sampling Discussion	7
4.0 2008 Vegetation Control	11
5.0 Action Plan and Budget Update	13
6.0 Public Participation	14
7.0 References Cited	17
8.0 Appendix Update	18
8.1 August Tier II Survey Data	18
8.2 2009 Vegetation Control Permit Application	19

List of Figures

Figure 1. Pretreatment Eurasian watermilfoil beds, Pretty Lake, April 23, 2008	2
Figure 2. Pretreatment curlyleaf pondweed beds, Pretty Lake, April 23, 2008	3
Figure 3. Pretty Lake, eel grass distribution and abundance, August 28, 2008	5
Figure 4. Pretty Lake, chara distribution and abundance, August 28, 2008	6
Figure 5. Pretty Lake, coontail distribution and abundance, August 28, 2008.....	6
Figure 6. Pretty Lake, Richardson’s pondweed distribution and abundance, August 28, 2008	7
Figure 7. Pretty Lake, September 22, 2008, shallow area in north corner of Pretty Lake once dominated by topped out Eurasian watermilfoil bed.....	8
Figure 8. Pretty Lake, purple loostrike stands along northwest shore.....	11
Figure 9. Pretty Lake, FasTEST sampling sites, 2008.....	12
Figure 10. Pretty Lake, 2008 fluridone levels over time	13
Figure 11. Illustration of hydrilla and native elodea.....	16

List of Tables

Table 1. Dissolved oxygen and temperature data, Pretty Lake, April 23, 2008.	2
Table 2. Occurrence and abundance of submersed aquatic plants in Pretty Lake August 28, 2008.	4
Table 3. Pretty Lake, percent occurrence by year... ..	9
Table 4. Comparison of Tier II data from Pretty Lake.	10
Table 5. Budget estimates for management options	14
Table 6. Pretty Lake public meeting survey results, September 22, 2008.....	15

1.0 INTRODUCTION

This report was created in order to update the Pretty Lake Aquatic Vegetation Management Plan. The plan update was funded by the Indiana Department of Natural Resources Lake and River Enhancement Program (LARE) and the Pretty Lake Association. 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 additional LARE funds. Major items covered include the 2008 sampling results, a review of the 2008 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 reference section and prior to the appendix.

Pretty Lake is an approximately 97 acre natural lake in Marshall County, Indiana with a maximum depth of 40 feet and an average depth of approximately 13.0 feet. The majority of the lake is residentially developed. There are currently two access sites on Pretty Lake, one along the south shore and one along the north shore. These are both private access sites but are available for public use for a fee.

2.0 PROBLEM STATEMENT

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 nuisance species within Pretty Lake is the invasive species Eurasian watermilfoil. Curlyleaf pondweed is another submersed invasive species that is present in Pretty Lake and has the potential to create nuisance conditions. Purple loosestrife is an invasive emergent species that was also detected and appears to be spreading along the northwest shore. Purple loosestrife will not likely create nuisance conditions for lake users, but could have negative impacts on native wetland species in and around Pretty Lake.

3.0 2008 PLANT SAMPLING RESULTS

Two surveys were completed in 2008 in order to document changes in the plant community and to determine success or failure of control techniques. A spring invasive species mapping survey was completed in April of 2008. The purpose of this survey was to document the abundance of invasive species. A Tier II survey was completed in August of the same year. This survey was conducted to monitor the effectiveness of the herbicide treatment, changes in the plant community, and to help plan for future plant management.

3.1 Spring Survey (Invasive Plant Mapping)

On April 23, 2008 a pretreatment survey for invasive plants was completed on Pretty Lake. A Secchi depth was taken prior to sampling and was found to be 15 feet. A dissolved oxygen profile was conducted prior to the survey. The results showed that the water was rich in oxygen throughout the water column (Table 1). The plant survey revealed that 5.3 acres of Eurasian watermilfoil (Figure 1) existed within Pretty Lake. Milfoil was distributed fairly evenly along the western shore and was found in one small patch on the eastern half of the lake. This survey was completed much earlier in the

season than a typical mapping survey due to the need to initiate the fluridone treatment early in the spring. This likely led to the reduced observed abundance of Eurasian watermilfoil. Curlyleaf pondweed was also found growing in 3.3 acres of Pretty Lake (Figure 2). This invasive species was confined to the northern area of the lake.

Table 1. Dissolved oxygen and temperature data, Pretty Lake, April 23, 2008.

Depth (ft)	Temp. (°F)	Dissolved Oxygen (mg/L)
surface	68.5	10.4
3	67.2	10.6
6	65.5	10.6
9	63.2	11.4
12	60.0	11.7
15	57.4	11.8
18	55.8	11.5
21	53.5	11.5
27	51.4	11.5

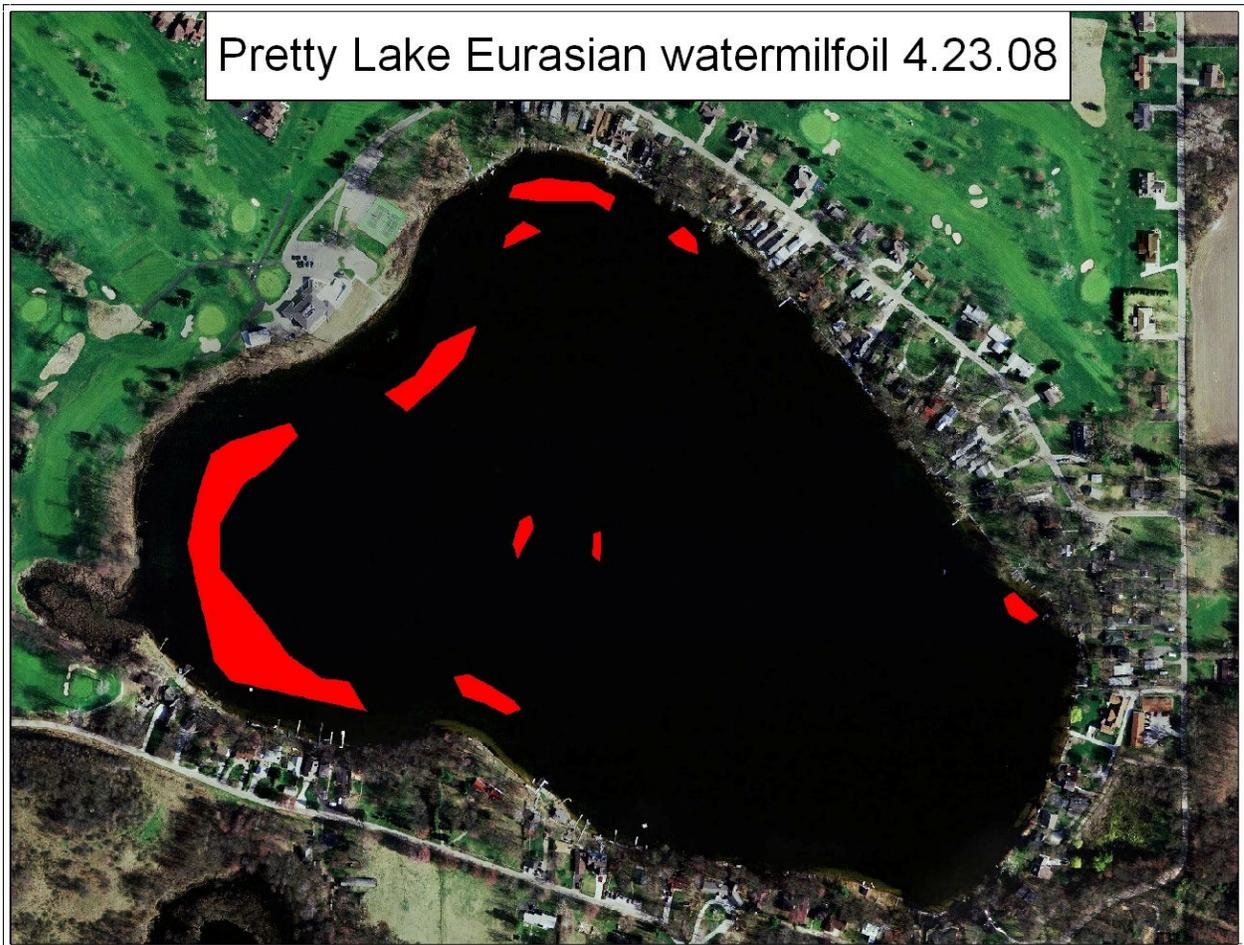


Figure 1. Pre-treatment Eurasian watermilfoil beds, Pretty Lake, April 23, 2008.

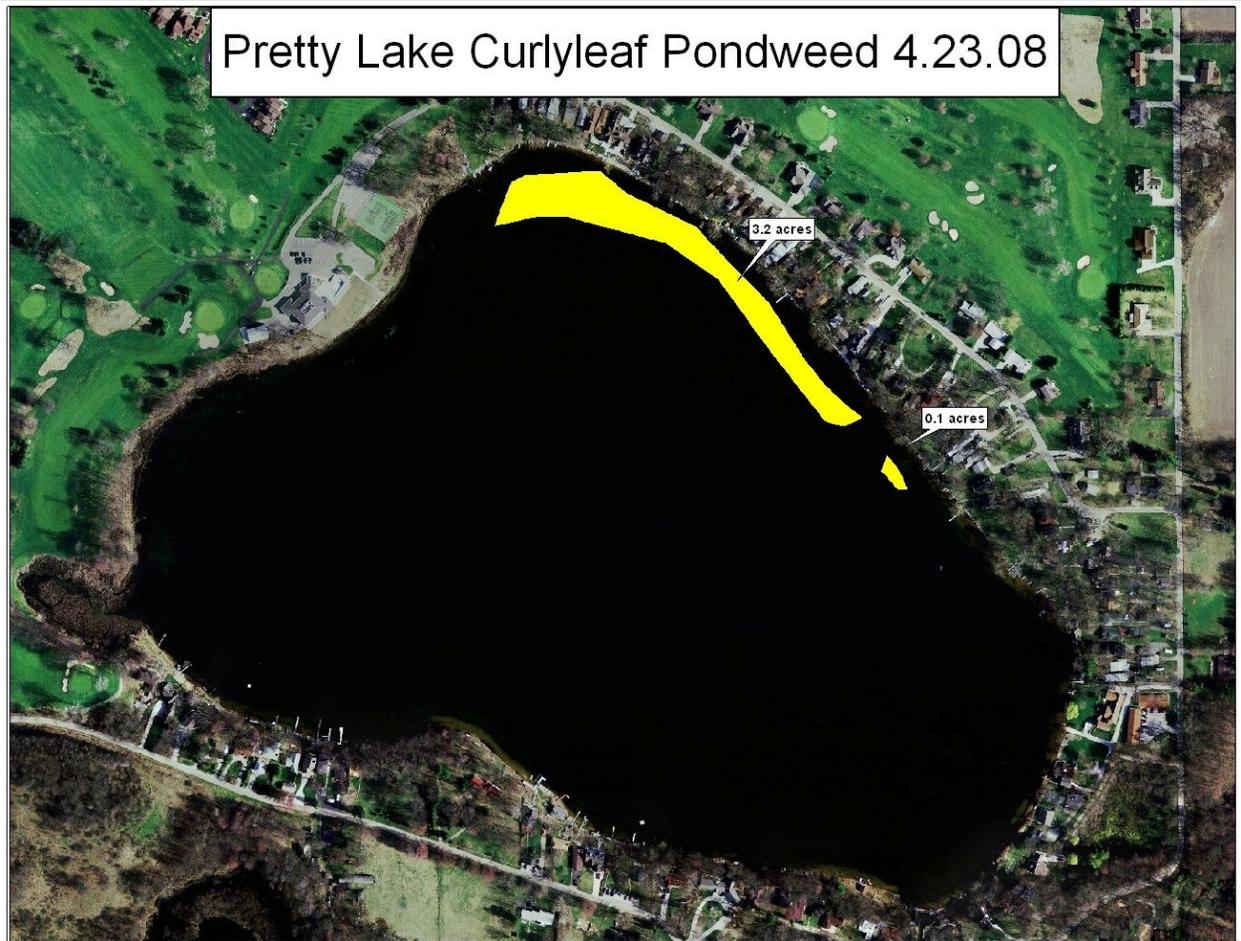


Figure 2. Pre-treatment curlyleaf pondweed beds, Pretty Lake, April 23, 2008.

3.2 Summer Survey (Tier II Survey)

Tier II sampling took place on August 28, 2008. A Secchi disk reading was taken prior to sampling and was found to be 9.0 feet. Plants were present to a maximum depth of 20.0 feet. Forty sites were sampled throughout the littoral zone. The same points used in the 2006 Tier II survey were used in the 2008 survey. A total of 7 species were collected of which all were native. Thirty-two of the forty sites contained native vegetation. The maximum number of species collected at a site was 4 and the average number of species per site was 1.35. Table 2 shows the results from the Tier II survey.

Table 2. Occurrence and abundance of submersed aquatic plants in Pretty Lake August 28, 2008.

Occurrence and abundance of submersed aquatic plants in Pretty Lake						
County: Marshall	Sites with plants: 32	Mean species/site: 1.35				
Date: 8/28/2008	Sites with native plants: 32	Standard error (ms/s): 0.15				
Secchi (ft): 9	Number of species: 7	Mean native species/site: 1.35				
Maximum plant depth (ft): 20	Number of native species: 7	Standard error (mns/s): 0.15				
Trophic status Mesotrophic	Maximum species/site: 4	Species diversity: 0.72				
Total sites: 40		Native species diversity: 0.72				
Depths 0 to 20 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
eel grass	55.0	45.0	12.5	10.0	32.5	21.0
Chara	37.5	62.5	10.0	5.0	22.5	25.5
common coontail	25.0	75.0	10.0	7.5	7.5	8.0
water stargrass	7.5	92.5	0.0	2.5	5.0	2.5
large leaf pondweed	5.0	95.0	2.5	2.5	0.0	1.0
leafy pondweed	2.5	97.5	2.5	0.0	0.0	0.5
Richardson's pondweed	2.5	97.5	0.0	2.5	0.0	0.5
Depths 0 to 5 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
eel grass	80.0	20.0	10.0	0.0	70.0	36.0
Chara	60.0	40.0	10.0	0.0	50.0	52.0
common coontail	30.0	70.0	10.0	0.0	20.0	10.0
water stargrass	20.0	80.0	0.0	0.0	20.0	8.0
leafy pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Depths 5 to 10 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
eel grass	58.8	41.2	17.6	5.9	35.3	21.2
Chara	52.9	47.1	17.6	11.8	23.5	29.4
common coontail	17.6	82.4	5.9	5.9	5.9	8.2
Depths 10 to 15 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
common coontail	25.0	75.0	25.0	0.0	0.0	5.0
eel grass	25.0	75.0	0.0	25.0	0.0	15.0
large leaf pondweed	25.0	75.0	25.0	0.0	0.0	5.0
water stargrass	25.0	75.0	0.0	25.0	0.0	5.0
Depths 15 to 20 ft						
Species	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
common coontail	33.3	66.7	11.1	22.2	0.0	6.7
eel grass	33.3	66.7	11.1	22.2	0.0	6.7
Richardson's pondweed	11.1	88.9	0.0	11.1	0.0	2.2
large leaf pondweed	11.1	88.9	0.0	11.1	0.0	2.2

Other plants observed: purple loosestrife, white waterlily, common cattail, spatterdock, pickrelweed.

Eel Grass (*Vallisneria americana*) was found at the highest percentage of sample sites (55.0%) for all depths (Figure 3). It also had the highest frequency of occurrence and dominance ratings for the 0-5 foot depth range. Chara (*Chara spp.*) was the second most frequently occurring species (37.5%) in Pretty Lake at the time of this survey (Figure 4). Chara was mostly found growing in the southern half of the lake. Common coontail

(*Ceratophyllum demersum*) was found at 25.0% of the sample sites and was observed only in the northern half of the lake (Figure 5). Water stargrass (*Zosterella dubia*) was the fourth most frequently occurring species (7.5%), followed by largeleaf pondweed (*Potamogeton amplifolius*) (5.0%), and leafy pondweed (*Potamogeton foliosus*) (2.5%). Richardson's pondweed (*Potamogeton richardsonii*), listed as imperiled and rare in the state of Indiana, was present at a single location along the eastern shoreline (Figure 6).

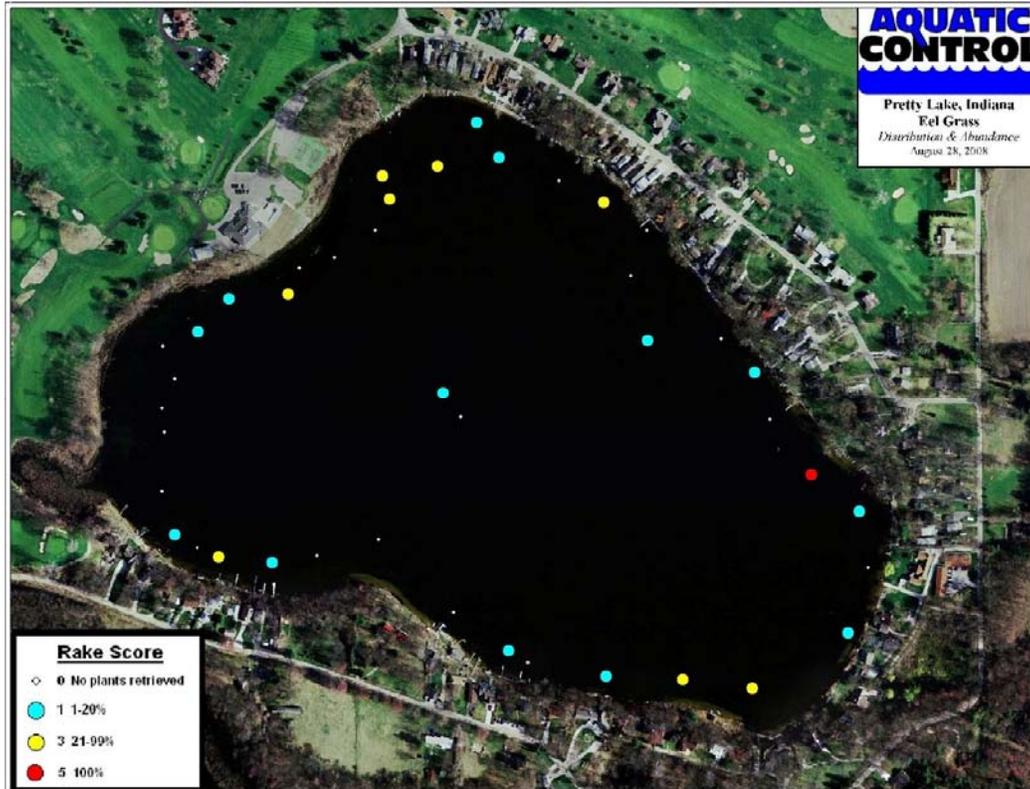


Figure 3. Pretty Lake, eel grass distribution and abundance, August 28, 2008.

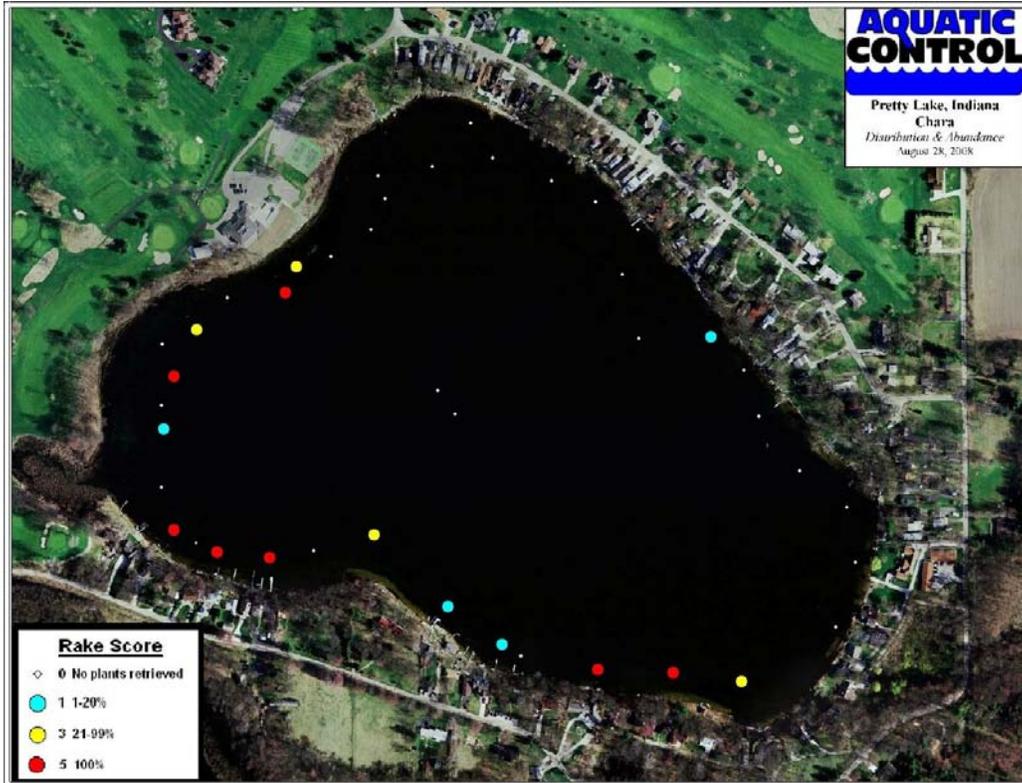


Figure 4. Pretty Lake, chara distribution and abundance, August 28, 2008.

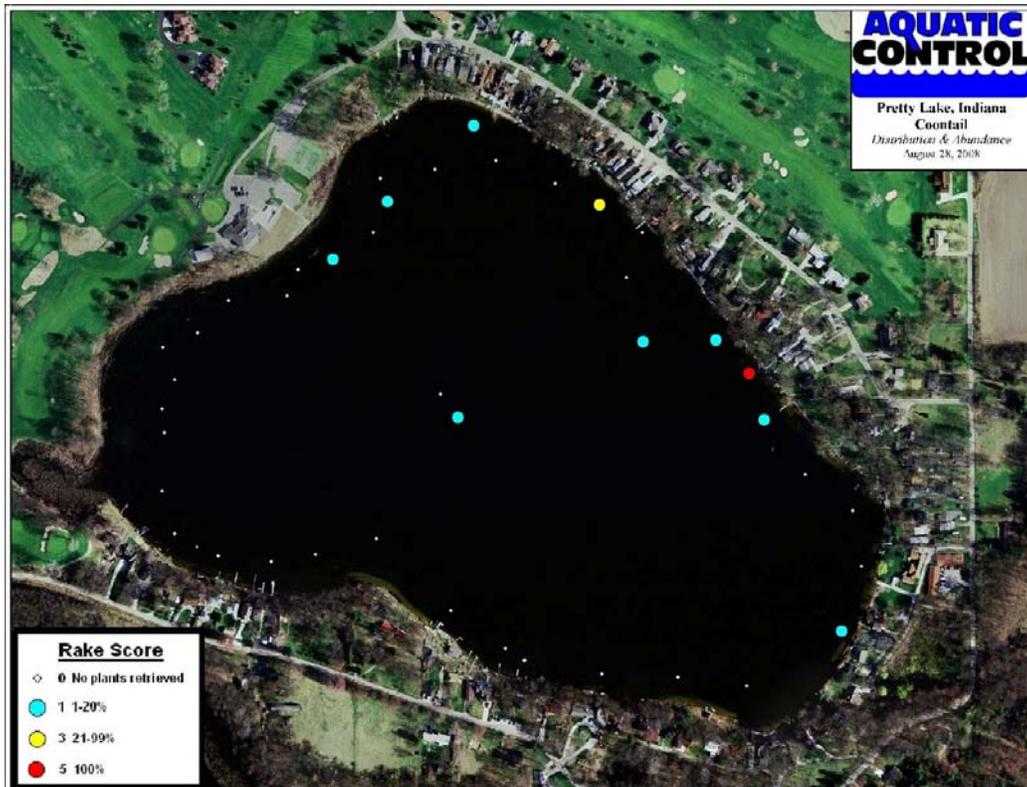


Figure 5. Pretty Lake, coontail distribution and abundance, August 28, 2008.



Figure 6. Pretty Lake, Richardson's pondweed distribution and abundance, August 28, 2008.

3.3 Aquatic Vegetation Sampling Discussion

The 2008 Tier II survey revealed that Pretty Lake has a healthy and diverse plant community. Seven species of native plants were collected during the 2008 summer survey. A diverse native plant community is important for the water quality and fish production of Pretty Lake and should be preserved. The goal of this plan is to preserve the native species while achieving control of nonnative and nuisance species.

Eurasian watermilfoil was found at 47.5% of the sites in the 2006 summer Tier II survey, in 24.8 acres during the 2006 spring Tier I survey, 21.6 acres during the summer 2006 Tier I survey, and 5.3 acres during the 2008 spring invasive species mapping survey. No Eurasian watermilfoil was found in Pretty Lake following the 2008 fluridone treatment (Figure 7 & Table 3 on page 9). The treatment appears to have been successful at controlling this non-native invasive species. In addition, no milfoil was observed growing in Pretty Lake following the July 9 FasTEST sample collection.



Figure 7. Pretty lake, September 22, 2008, shallow area in north corner of Pretty Lake once dominated by topped out Eurasian watermilfoil bed.

Curlyleaf pondweed was found growing in over 21.6 acres of Pretty Lake during the 2006 spring Tier I survey. It was present in only 3.3 acres during the 2008 invasive species mapping survey. No curlyleaf pondweed was found during the 2008 summer Tier II survey (it usually dies out during the warmer months of summer).

Eel grass has been the most abundant native species within Pretty Lake. Eel grass was at 52.5% of the sampling sites during the 2006 Tier II survey and at 55.0% of sampling stations during the summer 2008 Tier II survey. The data suggests that vegetation control techniques used thus far have had little affect on the eel grass population within Pretty Lake.

Richardson's pondweed was found at 2.5% of the sampling sites during the 2008 summer Tier II survey. This species was not observed during the 2006 Tier II survey. Richardson's pondweed is listed on the Endangered, Rare, and Extirpated Plants of Indiana as imperiled and rare. Special attention to its distribution and locations should be made in order to limit the amount of damage to this species through future management practices.

Other species that were not observed in the 2006 Tier II survey but were collected in 2008 include leafy pondweed and water stargrass. Plants that were found in 2006, but not in 2008 were slender naiad, small pondweed, nitella, Illinois pondweed, and bur

marigold. Bur marigold is another species of concern. It is listed as imperiled and threatened on the Endangered, Rare and Extirpated Plants of Indiana. Bur marigold has a low tolerance to fluridone, so its population may have been adversely affected by the whole lake treatment. Future Tier II surveys will help document whether reintroduction of this species is necessary,

Table 3. Pretty Lake, percent occurrence by year.

Species	% of survey sites (8/06)	% of survey sites (8/08)
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	47.5%	-
common coontail (<i>Ceratophyllum demersum</i>)	45.0%	25.0%
Chara (Chara spp.)	5.0%	37.5%
Slender naiad (<i>Najas flexillis</i>)	15.0%	-
small pondweed (<i>Potamogeton pusillus</i>)	2.5%	-
eel grass (<i>Vallisneria americana</i>)	52.5%	55.0%
leafy pondweed (<i>Potamogeton foliosus</i>)	-	2.5%
Richardson's pondweed (<i>Potamogeton richardsonii</i>)	-	2.5%
largeleaf pondweed (<i>Potamogeton amplifolius</i>)	2.5%	5.0%
water stargrass (<i>Zosterella dubia</i>)	-	7.5%
nitella (<i>Nitella spp.</i>)	2.5%	-
bur marigold (<i>Bidens beckii</i>)	2.5%	-
Illinois pondweed (<i>Potamogeton illinoensis</i>)	47.5%	-

Data collected concerning overall diversity and abundance metrics from the 2006 and 2008 Tier II surveys is displayed in Table 4. The data suggest that there has been a slight drop in native species abundance. This is most likely a result from the whole lake Sonar treatment and should correct itself in 2009. Concern was expressed about the decline in lake clarity during the 2008 treatment season. The decrease in clarity was likely caused by decaying Eurasian watermilfoil and should recover next season. Residents reported that clarity had greatly increased by early fall.

Table 4. Comparison of Tier II data from Pretty Lake.

Tier II Metric	Aug-06	Aug-08
Secchi	15	9
Max Plant Depth	20	20
Total Sites	40	40
Sites with Plants	39	32
Sites with Native Plants	37	32
Number of Species	10	7
Number of Native Species	9	7
Maximum Species/Site	4	4
Mean Species/Site	2.25	1.35
Mean Native Species/Site	1.78	1.35
Species Diversity Index	0.81	0.72
Native Species Diversity Index	0.70	0.72

No surveys designed to document emergent or rooted floating vegetation were completed in 2008. However, dense stands of purple loosestrife were observed growing along the northwest shore near the lake club house (Figure 8). This area comprised approximately 1.8 acres. Very little purple loosestrife was observed in this area in 2006. If left unchecked, this invasive species has the potential to create nuisance conditions along the shoreline and disrupt native emergent vegetation.



Figure 8. Pretty Lake, purple loosestrife stands along northwest shore (pictures from September 22, 2008 and map created from August 28, 2008 data).

4.0 2008 VEGETATION CONTROL

Eurasian watermilfoil was the target of vegetation management in 2008. The 2006 AVMP plan called for a whole lake selective systemic treatment of milfoil using a fluridone based aquatic herbicide. The treatment called for Sonar (active ingredient: fluridone) to be applied in split applications with a goal of maintaining 3 ppb of fluridone for a minimum of 90 days. Initial application was to be completed with a theoretical concentration of 8 ppb of Sonar AS. FastESTs were to be taken from two locations four days after initial treatment, and then every two weeks after first test for 90 days. If concentration goes below 4 ppb a bump application was to be completed.

On April 30, 2008 Aquatic Control initiated the LARE funded whole lake treatment of Pretty Lake to control Eurasian watermilfoil. An initial dose of Sonar was applied throughout the lake from a treatment boat via dropper hoses. Testing for fluridone residues began on May 6th to ensure that the chemical had ample time to mix throughout the water column. Figure 9 shows the FastTESTs sampling sites.



Figure 9. Pretty Lake, FasTEST sampling sites, 2008.

Test results showed that average fluridone concentrations were 5.7 ppb on May 6th and 7.1 ppb on May 12. This increase in concentration was unexpected and there is no clear explanation for the increase. By the time of the May 28th testing, the average concentration of fluridone had dropped to 4.8 ppb. On June 11, 2008, Aquatic Control Inc. completed a bump treatment on Pretty Lake. Unfortunately, the June 13th testing date was missed, and PLA was not charged for the testing on that date. Testing resumed on the 28th of June and showed an average fluridone concentration of 8.7 ppb. Testing through July showed a steady drop in concentration down to 5.6 ppb. The final samples were taken on August 7, 2008. The results showed that fluridone was still present at 2.5 ppb. The data from the FasTEST results is illustrated in Figure 10. Fluridone concentrations were slightly higher than desired. This may be due to the lack of accurate volumetric data; however, the higher concentrations appeared to have minimal negative impact on the native plant community.

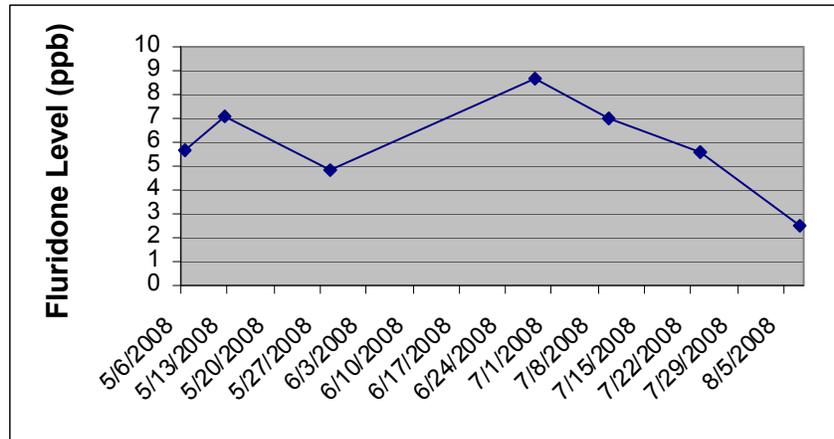


Figure 10. Pretty Lake, 2008 fluridone levels over time.

5.0 ACTION PLAN AND BUDGET UPDATE

The primary plant management recommendation for the 2009 season is vegetation sampling. At least two surveys should be completed in 2009. The first survey should be completed in late May or early June and be focused on detecting any areas of Eurasian watermilfoil that have returned. If any areas are located, the location should be recorded on a GPS device and downloaded onto a GIS program. These areas should be treated with Renovate aquatic herbicide as soon as possible. The second survey should be completed in late summer and focus on assessing the native plant community and locating potential areas of invasive species. A Tier II survey, similar to the one completed in 2008, should be sufficient.

It is also recommended that the association have the 1.8 acre stand of purple loosestrife near the club house treated during the 2009 treatment season. Renovate should be used in this application and the treatment should take place after the purple loosestrife is at the bud to mid-flowering stage. This treatment should not cost more than \$2,500.

There may still be a need for some shoreline spot treatments for control of native nuisance species funded by individual lot owners. IDNR limits the amount of treatment to less than half of the shoreline. If more than half of the residents request treatment, it will be up to the Association and their plant manager to decide on what areas are most impaired by nuisance vegetation. It is unlikely that more than half of the shoreline would require treatment.

The action plan will need to be updated in 2009. The update should include all data gathered from 2009 surveys, 2009 vegetation controls, and action plan and budget updates.

Pretty Lake has excellent water quality when compared to other lakes in the region. This is somewhat surprising since nearly the entire shoreline is developed. However, actions by the Association that led to the installation of a sewer system around Pretty Lake have likely helped maintain the water clarity. The Association and LARE are currently funding a Diagnostic Study on the lake. This study should point towards other actions that the PLA can undertake in order to maintain and improve the water quality.

Maintaining the water quality should help prevent nuisance algae blooms, help preserve the diverse native plant community, and lessen nuisance conditions caused by plant species that gain a competitive advantage in nutrient rich waters.

Table 5 shows the projected budget estimate for the next three years. **It is recommended that the Association request \$4,000 for treating up to 8 acres of Eurasian watermilfoil with triclopyr, \$2,500 for treatment of up to 1.7 acres of purple loosestrife with triclopyr, and \$4,000 for plant sampling and updating the 2008 plan.**

Table 5. Budget estimates for management options

	2009	2010	2011
Selective treatment of Eurasian watermilfoil with Renovate herbicide	\$4,000	\$4,000	\$4,000
Treatment of purple loosestrife along the southern shore	\$2,500	\$1,200	-
Plant sampling and plan updates (potential LARE funding with 10% match)	\$4,000	\$4,000	\$4,000
Total:	\$10,500	\$9,200	\$8,000

6.0 PUBLIC PARTICIPATION

An effective aquatic vegetation management plan must include input from lake users. A public meeting was held on September 22, 2008 at the Plymouth Country Club. The meeting was advertised in the local newspaper. The public meeting was held in order to gain input concerning the plan from lake users, educate lake users on the benefits of native vegetation, inform lake users about the 2008 vegetation controls, and to update lake users on 2009 plans. Twenty-five people were present for the meeting including Gwen White from LARE and John Richardson from JFNew. Fourteen of those in attendance took the time to fill out a survey form. Table 6 shows the results from the survey. The survey respondents indicated that 93% were property owners, and 100% were members of the lake association. As far as uses of the lake, 100% of them used the lake for boating, 71% used the lake for fishing, and 7% used the lake for irrigation.

Concerning problems with the lake, 37% said that there was too much boating, 14% felt that there are too many plants, 7% felt that there is a problem with jet ski usage on the lake, 7% said that there is too much use by nonresidents, and 7% believed there are water quality issues.

All of the individuals that responded to the question indicated that they were in favor of continuing with the aquatic plant treatments and were happy with the results thus far.

Table 6. Pretty Lake, public meeting survey results, September 22, 2008.

Pretty Lake 9/22/08		
Are you a lake property owner?	Yes 93%	No 7%
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: 21%
	2 to 5: 7%	Over 10: 57%
How do you use the lake (mark all that apply)	Swimming 86%	Irrigation 7%
	Boating 100%	Drinking water 0%
	Fishing 71%	Other? _____
Do you have aquatic plants at your shoreline in nuisance quantities?	Yes: 29% No: 64%	
Does aquatic vegetation interfere with your use or enjoyment of the lake?	Yes: 36% No: 57%	
Does the level of vegetation in the lake affect your property values?	Yes: 29% No: 36%	
Are you in favor of continuing efforts to control vegetation on the lake?	Yes: 79% No: 14%	
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: 93% No: 7%	
Mark any of these you think are problems on your lake:		
36% Too many boats access the lake		
7% Use of jet skis on the lake		
0% Too much fishing		
0% Fish population problem		
0% Dredging needed		
7% Overuse by nonresidents		
14% Too many aquatic plants		
0% Not enough aquatic plants		
7% Poor water quality		
0% Pier/funneling problem		

Another topic discussed at the public meeting was the recent discovery of hydrilla (*Hydrilla verticillata*) in Lake Manitou. Hydrilla is an invasive aquatic species that was originally discovered in Florida in the 1960's. There are many characteristics of hydrilla that make it a threat to Indiana waterways. This species can grow in lower light conditions than most native species, grows faster than most native species, and can shade out other species by forming a surface canopy. Hydrilla can be easily confused with native elodea. The best way to distinguish hydrilla from native elodea is that hydrilla typically has five leaves along each whorl along with visible serrated edges along the leaf margin (Figure 11). What makes controlling the spread of hydrilla difficult is the fact

that it can be spread by fragments. **That is why it is vitally important that lake users remove all plants and sediment from their boats when entering and leaving Pretty Lake.** At this time, hydrilla has not been discovered in Pretty Lake. More information about controlling the spread of hydrilla can be found at www.protectyourwaters.net.



Figure 11. Illustration of hydrilla on the left compared to native elodea on the right. Hydrilla typically contains five toothed leaves per whorl while native elodea typically has three leaves per whorl and the teeth are not visible on the leaves (Illustrations provided by Applied Biochemist).

7.0 REFERENCES CITED

Aquatic Control Inc. 2007. Pretty Lake Aquatic Vegetation Management Plan.
Prepared for the Pretty Lake Association. Plymouth, IN.

Endangered, Threatened, and Rare Vascular Plant Species Documented from Indiana 10
April 1996. Division of Natural Preserves, Indiana Department of Natural
Resources. 14 February 2008.
< <http://www.in.gov/dnr/naturepr/endanger/plant.html> >

8.0 APPENDIX UPDATE

8.1 August Tier II Survey Data

Lake	Date	Latitude	Longitude	Site	Depth	RAKE	CEDE4	CH?AR	VAAM3	POFO3	POR12	POAM	ZODU
Pretty	8/28/08	41.324612	-86.368401	1	20.0	0							
Pretty	8/28/08	41.325182	-86.368517	2	5.0	1			1				
Pretty	8/28/08	41.325555	-86.369155	3	8.0	5			5				
Pretty	8/28/08	41.326109	-86.369721	4	14.0	1	1						
Pretty	8/28/08	41.326592	-86.36992	5	10.0	5	5		1				
Pretty	8/28/08	41.326925	-86.370376	6	5.0	1	1	1		1			
Pretty	8/28/08	41.326911	-86.371359	7	6.0	3	1		1				
Pretty	8/28/08	41.327562	-86.371586	8	16.0	0							
Pretty	8/28/08	41.328022	-86.371366	9	13.0	1						1	
Pretty	8/28/08	41.328304	-86.371952	10	5.0	5	3		3				
Pretty	8/28/08	41.328521	-86.372553	11	10.0	0							
Pretty	8/28/08	41.328761	-86.373361	12	20.0	1			1				
Pretty	8/28/08	41.329116	-86.373651	13	17.0	3	1		1				
Pretty	8/28/08	41.328667	-86.374187	14	4.0	5			3				3
Pretty	8/28/08	41.32857	-86.374922	15	12.0	3			3				1
Pretty	8/28/08	41.328338	-86.374831	16	4.0	5	1		3				1
Pretty	8/28/08	41.328021	-86.375016	17	7.0	0							
Pretty	8/28/08	41.327752	-86.375567	18	19.0	1	1						
Pretty	8/28/08	41.327649	-86.376043	19	10.0	3		3					
Pretty	8/28/08	41.32738	-86.376188	20	4.0	5		5	3				
Pretty	8/28/08	41.327334	-86.376988	21	10.0	1			1				
Pretty	8/28/08	41.326998	-86.377401	22	6.0	5		3	1				
Pretty	8/28/08	41.326854	-86.377872	23	18.0	0							
Pretty	8/28/08	41.326528	-86.377714	24	5.0	5		5					
Pretty	8/28/08	41.326217	-86.377882	25	19.0	0							
Pretty	8/28/08	41.325976	-86.377854	26	6.0	1		1					
Pretty	8/28/08	41.325384	-86.377888	27	17.0	0							
Pretty	8/28/08	41.324948	-86.377714	28	5.0	5		5	1				
Pretty	8/28/08	41.324721	-86.377124	29	5.0	5		5	3				
Pretty	8/28/08	41.324664	-86.376407	30	5.0	5		5	1				
Pretty	8/28/08	41.324736	-86.375805	31	14.0	0							
Pretty	8/28/08	41.324899	-86.374972	32	10.0	3		3					
Pretty	8/28/08	41.326127	-86.373873	33	10.0	1	1						
Pretty	8/28/08	41.326379	-86.374112	34	7.0	1			1				
Pretty	8/28/08	41.324162	-86.37397	35	7.0	1		1					
Pretty	8/28/08	41.323776	-86.373224	36	6.0	1		1	1				
Pretty	8/28/08	41.323521	-86.37192	37	10.0	5		5	1				
Pretty	8/28/08	41.323488	-86.370882	38	6.0	5		5	3				
Pretty	8/28/08	41.3234	-86.369953	39	9.0	5		3	3				
Pretty	8/28/08	41.323954	-86.368661	40	18.0	3	1		1		1	1	

8.2 2009 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

FOR OFFICE USE ONLY	
License No.	
Date Issued	
Lake County	

Return to: Page 1 of 5
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Commercial License Clerk
402 West Washington Street, Room W273
Indianapolis, IN 46204

INSTRUCTIONS: Please print or type information

FEE: \$5.00

Applicant's Name Sue Palumbo	Lake Assoc. Name Pretty Lake Conservation Club
Rural Route or Street 319 W. Jefferson St.	Phone Number 574-935-0610
City and State Plymouth, IN	ZIP Code 46563
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) Pretty Lake	Nearest Town Plymouth	County Marshall
Does water flow into a water supply		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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 center @ N41.32769 W86.37108	
Total acres to be controlled 5.9	Proposed shoreline treatment length (ft) 2770	Perpendicular distance from shoreline (ft) 100
Maximum Depth of Treatment (ft) 6	Expected date(s) of treatment(s) Prior to July 1	
Treatment method: <input checked="" type="checkbox"/> Chemical <input type="checkbox"/> Physical <input type="checkbox"/> Biological Control <input type="checkbox"/> 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. Combination of Reward, Aquathol, and Komeen		
Plant survey method: <input checked="" type="checkbox"/> Rake <input checked="" type="checkbox"/> Visual <input type="checkbox"/> Other (specify) June 6 Tier I survey		

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
eel grass	x	40
chara	x	20
largeleaf pondweed		10
water stargrass	x	5
leafy pondweed	x	3
richardsons pondweed		2
common coontail	x	20



Treatment Area #	2	LAT/LONG or UTM's center @ N41.32312 W86.36934	
Total acres to be controlled	1.6	Proposed shoreline treatment length (ft)	962
		Perpendicular distance from shoreline (ft)	100
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s) Prior to July 1	
Treatment method:	<input checked="" type="checkbox"/> Chemical <input type="checkbox"/> Physical <input type="checkbox"/> Biological Control <input type="checkbox"/> 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. Reward, Komeen, Aquathol combination			
Plant survey method:	<input checked="" type="checkbox"/> Rake <input checked="" type="checkbox"/> Visual <input type="checkbox"/> Other (specify) <u>June T1 survey</u>		
Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community	
eel grass	x	20	
chara	x	30	
largeleaf pondweed		5	
water stargrass	x	5	
leafy pondweed	x	5	
richardsons pondweed		5	
common coontail	x	30	
Treatment Area #	3	LAT/LONG or UTM's center @ N41.32462 W86.37705	
Total acres to be controlled	2.1	Proposed shoreline treatment length (ft)	1020
		Perpendicular distance from shoreline (ft)	100
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s) Prior to July 1	
Treatment method:	<input checked="" type="checkbox"/> Chemical <input type="checkbox"/> Physical <input type="checkbox"/> Biological Control <input type="checkbox"/> 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. Reward, Komeen, Aquathol Combination			
Plant survey method:	<input checked="" type="checkbox"/> Rake <input checked="" type="checkbox"/> Visual <input type="checkbox"/> Other (specify) _____		
Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community	
eel grass	x	40	
chara	x	10	
largeleaf pondweed		5	
water stargrass	x	5	
leafy pondweed	x	5	
richardsons pondweed		5	
common coontail	x	30	

Treatment Area #	4	LAT/LONG or UTM's center @ N41.32735 W86.37801	
Total acres to be controlled	1.8	Proposed shoreline treatment length (ft)	1850
		Perpendicular distance from shoreline (ft)	100
Maximum Depth of Treatment (ft)	6	Expected date(s) of treatment(s) Late June or July	
Treatment method:	<input checked="" type="checkbox"/> Chemical	<input type="checkbox"/> Physical	<input type="checkbox"/> Biological Control
		<input type="checkbox"/> 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 for selective purple loosestrife control			
Plant survey method:	<input checked="" type="checkbox"/> Rake	<input checked="" type="checkbox"/> Visual	<input type="checkbox"/> Other (specify)
Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community	
Purple loosestrife	x	90	
Swamp loosestrife		2	
Pickeral weed		2	
Common cattail		2	
bulrush		1	
spatterdock		1	
sedge species		2	
Treatment Area #	5	LAT/LONG or UTM's Treatment of Eurasian watermilfoil where and if it is found	
Total acres to be controlled	n.a.	Proposed shoreline treatment length (ft)	n.a.
		Perpendicular distance from shoreline (ft)	n.a.
Maximum Depth of Treatment (ft)	n.a.	Expected date(s) of treatment(s) n.a.	
Treatment method:	<input checked="" type="checkbox"/> Chemical	<input type="checkbox"/> Physical	<input type="checkbox"/> Biological Control
		<input type="checkbox"/> 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 herbicide for selective Eurasian watermilfoil control			
Plant survey method:	<input checked="" type="checkbox"/> Rake	<input checked="" type="checkbox"/> Visual	<input type="checkbox"/> Other (specify)
Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community	
Eurasian watermilfoil	x	0	
eel grass		40	
Chara	x	20	
Coontail		20	
water stargrass	x	5	
largeleaf pondweed		5	
leafy pondweed	x	5	
Richardsons pondweed		5	

