Koontz Lake Aquatic Vegetation Management Plan 2008-2012
Marshall and Starke Counties, Indiana

February 27, 2009

Prepared for:
Koontz Lake Association
c/o KLACC
PO Box 25
Walkerton, Indiana 46574

Prepared by:
JFNew
c/o Betsy Ewoldt
708 Roosevelt Road
Walkerton, IN 46574
Phone: 574.586.3400 Fax: 574.586.3446

KOONTZ LAKE AQUATIC VEGETATION MANAGEMENT PLAN 2008-2012
MARSHALL AND STARKE COUNTIES, INDIANA

EXECUTIVE SUMMARY

This document is intended to describe the aquatic plant community present in Koontz Lake during the spring and summer 2008 assessments. Additionally, the plan details options for addressing individual resident's concerns regarding aquatic plants within Koontz Lake and documents the selected treatment actions for the next five years. It is anticipated that this plan will serve as a baseline for aquatic plant management efforts at Koontz Lake and that subsequent surveys and treatment strategies will update the data collected during these assessments.

Tier II and exotic species surveys were conducted in the spring (May 15-June 15) and summer (July 15-August 30) to document the Koontz Lake aquatic plant community. Koontz Lake contains a decent aquatic plant community home to more than twenty-five emergent, submerged, and floating species. Nearly two-thirds of the aquatic plant diversity can be attributed to submerged species of which the invasive species, Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) dominate during a portion of the growing season. Additionally, a majority of the submerged species are members of the pondweed family. These species along with a few other high quality species comprise Koontz Lake's aquatic plant community.

During the spring survey, Eurasian watermilfoil, an invasive species, dominated the aquatic plant community. Eurasian watermilfoil still dominated the plant community during the summer survey, but coontail (*Ceratophyllum demersum*) was most frequently encountered. Eurasian watermilfoil and white-stem pondweed were present at more than 20% of the sampled sites during the spring, while coontail was the only species present at more than 20% of the sampled sites during the summer survey. Eurasian watermilfoil was present at 32.9% of the sampled sites during the spring survey and 14.3% of the sampled sites during the summer survey, while curly-leaf pondweed occurred at 18.6% of the sampled sites during the spring and was not identified during the summer. In comparing 2008 spring and summer Tier II survey data, the relative and mean densities of Eurasian watermilfoil increased and curly-leaf pondweed decreased throughout the lake.

Additional items including a public meeting, and a meeting between the contractor, LARE program staff, the district fisheries biologist, and representatives from the Koontz Lake Association (KLA), also occurred in concert with the development of this aquatic plant management plan. The details of these are not discussed here, but were utilized to generate recommendations as follows:

1. **Complete a whole-lake fluridone treatment on Koontz Lake in the spring of 2009.** This treatment should effectively control Eurasian watermilfoil for several seasons and control curly-leaf pondweed in 2009. Low doses of fluridone should be applied in order to reduce damage to the less susceptible native species. Initial application of 5 ppb in total volume above thermocline (if established at treatment date) or total lake volume if no thermocline. Collect FasTEST sample at 5 sites with first sample 2-3 days after application then at 14, 21, 42, 60, 90, and 120 days after initial application. Schedule initial bump at 21 days with calculated dose to bring residue to 5 ppb. Maintain residue between 2 to 4 ppb with bumps as required with dose sufficient to bring residue to 4 ppb after first bump through 90-120 days or until target plants are satisfactorily controlled.

2. **Initiate a curly-leaf pondweed treatment program in 2010.** This program should include treatments with 1.0 ppm of Aquathol K herbicides. Treatments should be completed in the early season, or once water reaches a consistent 50 degree. Early season treatments will help reduce turion production, cause little harm to native vegetation, and limit the severity of the nutrient release typically caused by natural summer curly-leaf die-off. Treatments should be continued for a minimum of three seasons. Herbicide should be applied to the same area each season.
3. **Post signs at access sites warning boaters of the potential for invasive plant species introductions from boat trailers.** Signs should implore boaters to clean trailers, props, and boats of all vegetation fragments when entering and leaving Koontz Lake. Information concerning the potential spread of Eurasian watermilfoil, hydrilla and other exotic species should be distributed to all Association members and lake users.
4. **Take steps to improve water quality in Koontz Lake**. These actions should be outlined in the Diagnostic Study and the Watershed Management Plan to be completed in 2009. Improved water quality should allow an increase in diversity and abundance of native vegetation and decrease the rate of re-infestation by invasive species.
5. **Maintain dock areas with physical plant removal when possible or by contracting professional applicators**. Treatments should not exceed 100 feet from shoreline for submersed vegetation and treatment of rooted floating vegetation should be limited to boating lanes.
6. **Continue pre- and post- treatment assessments to determine how the aquatic plant community within Koontz Lake changes over time**. These surveys should be continued through 2012.

Budget estimate for the action plan.

Task	2009	2010	2011	2012	2013
Whole Lake Fluridone Treatment	$90,000	-	-	-	-
Eurasian watermilfoil spot treatments	-	-	$5,000	$5,000	$5,000
Early season curly-leaf pondweed application	-	$15,000	$15,000	$15,000	-
High-use native spot treatment	-	$5,000	$5,000	$5,000	$5,000
Plant sampling and plan updates	$7,500	$7,500	$7,500	$7,500	$7,500
Total:	**$97,500**	**$27,500**	**$32,500**	**$32,500**	**$17,500**

Estimated costs for 2009 assessment and treatment are as follows:

- Whole-lake fluridone treatment estimated to total $90,000.
- Assessment and plan updates costs are based on 2007 LARE requirements and are estimated to total $7,500.
- Total fees for 2009 aquatic plant assessment, herbicide application, and plan updated are estimated at $97,500.

ACKNOWLEDGEMENTS

The Indiana Department of Natural Resources Division of Fish & Wildlife as part of the Lake and River Enhancement Program (LARE) provided funding for the development of this plan. The plan has been developed in cooperation with the Koontz Lake Association. Fieldwork, data analysis, and map generation was performed by JFNew with the assistance of the Koontz Lake Association volunteers. Special thanks to Jim Berger for his assistance and boat driving abilities, to lake association board member, Loretta Dobuck, for her enthusiastic leadership, and to Nate Long, Gwen White, and Angela Sturdevant for their insight and input. Contributors include: Betsy Ewoldt, Lynn Cudlip, Tom Estrem, and Heather Cecrle.

TABLE OF CONTENTS

PAGE

1.0 Introduction 1

2.0 Watershed and Lake Characteristics 4

3.0 Lake Uses 13

4.0 Fisheries 15

5.0 Problem Statement 17

6.0 Aquatic Vegetation Management Goals and Objectives 20

7.0 Plant Management History 21

8.0 Aquatic Plant Community Characterization 22

9.0 Aquatic Vegetation Management Alternatives 31

10.0 Public Involvement 40

11.0 Public Education 41

12.0 Integrated Management Action Strategy 42

13.0 Action Plan 48

14.0 Project Budget 50

15.0 Monitoring and Plan Update Procedures 53

16.0 References Cited 54

LIST OF FIGURES

PAGE

1. General location of the Koontz Lake Watershed 1
2. Koontz Lake subwatersheds 4
3. Land use in the Koontz Lake Watershed 6
4. Koontz Lake bathymetric map 7
5. Koontz Lake Depth-Area Curve 8
6. Koontz Lake Depth-Volume Curve 8
7. Temperature versus depth in Koontz Lake 9
8. Shoreline surface type observed at Koontz Lake, August 29, 2008 11
9. Perceived problems from Koontz Lake users 14
10. Percent community composition by number of fish collected for Koontz Lake 16
11. Eurasian watermilfoil (*Myriophyllum spicatum*) 18
12. Curly-leaf pondweed (*Potamogeton crispus*) 18
13. Purple loosestrife (*Lythrum salicaria*) 18
14. Reed canary grass (*Phalaris arundinacea*) 18
15. Eurasian watermilfoil treated in Koontz Lake, 2004-2008 21
16. Eurasian watermilfoil, curly-leaf pondweed, and coontail locations in Koontz Lake 24
17. Sampling locations for the May 27, 2008 Tier II Survey at Koontz Lake 26
18. Koontz Lake Eurasian watermilfoil locations and densities as surveyed May 27, 2008 26
19. Koontz Lake curly-leaf pondweed locations and densities as surveyed May 27, 2008 27
20. Sampling locations for the August 29, 2008 Tier II Survey at Koontz Lake 28
21. Koontz Lake Eurasian watermilfoil locations and densities as surveyed August 29, 2008 29
22. An aquatic weed cutter 34
23. Locations where aquatic plants are often found on boats and trailers 38
24. Typical emergent and rooted floating plant community present in Koontz Lake 43

LIST OF TABLES

PAGE

1. Detailed land use in the Koontz Lake watershed 5
2. Morphological characteristics of Koontz Lake 7
3. Tier II sampling strategy for Koontz Lake using the 2007 Tier II protocol 22
4. Survey schedule for exotic species and Tier II surveys 22
5. Aquatic plant species identified within Koontz Lake during the spring, May 27, 2008, and summer, August 29, 2008 aquatic plant surveys 23
6. Spring Tier II survey metrics and results for entire lake strata as collected May 27, 2008 25
7. Summer Tier II survey metrics and results for entire lake strata as collected August 29, 2008 28
8. A comparison of the aquatic plant community in Koontz Lake with the average values for plant community metrics found by Pearson (2004) in his survey of 21 northern Indiana lakes 29
9. Variation in site frequency, relative and mean density, and dominance of Eurasian watermilfoil and curly-leaf pondweed within Koontz Lake in 2008 30
10. Budget estimate for the action plan, 2009-2013 50
11. Budget estimate for the action plan, 2009-2013 51

LIST OF APPENDICES

Appendix A: Koontz Lake user survey results
Appendix B: Tier II survey raw data
Appendix C: Tier II survey results
Appendix D: Hydrilla Information for Distribution
Appendix E: Aquatic Plant Treatment Permit
Appendix F: Previous Aquatic Plant Treatment Permits

KOONTZ LAKE AQUATIC PLANT MANAGEMENT PLAN 2008-2012
MARSHALL AND STARKE COUNTIES, INDIANA

1.0 Introduction

Koontz Lake encompasses 346 acres (140 ha) and is currently comprised of three basins and dammed at its most western end. The dam, which was constructed in 1848, raised the level of water in two separate but closely aligned basins causing the formation of Koontz Lake with its current shoreline and depth configuration. Koontz Lake lies in both Marshall and Starke counties, Indiana (Figure 1) in Sections 1, 2, 11, 12, and 13 of Township 34 North, Range 1 West in Starke County and Sections 6, 7, 8, 15, 16, 17, 18, 20, 21, 22, 23, 26, 27, and 28 of Township 34 North, Range 1 East in Marshall County. The Koontz Lake watershed stretches out to the east and south of the lake encompassing approximately 4,158 acres (1,682.7 ha or 6.5 square miles; Figure 2). There are over three miles of waterways located within the watershed. Water flows into Koontz Lake via the Lawrence Pontius Ditch and Schoeder Ditch, and flows out through a dam and weir structure into what is called the Robbins Ditch. Robbins Ditch flows into the Kankakee River below US Hwy 30.

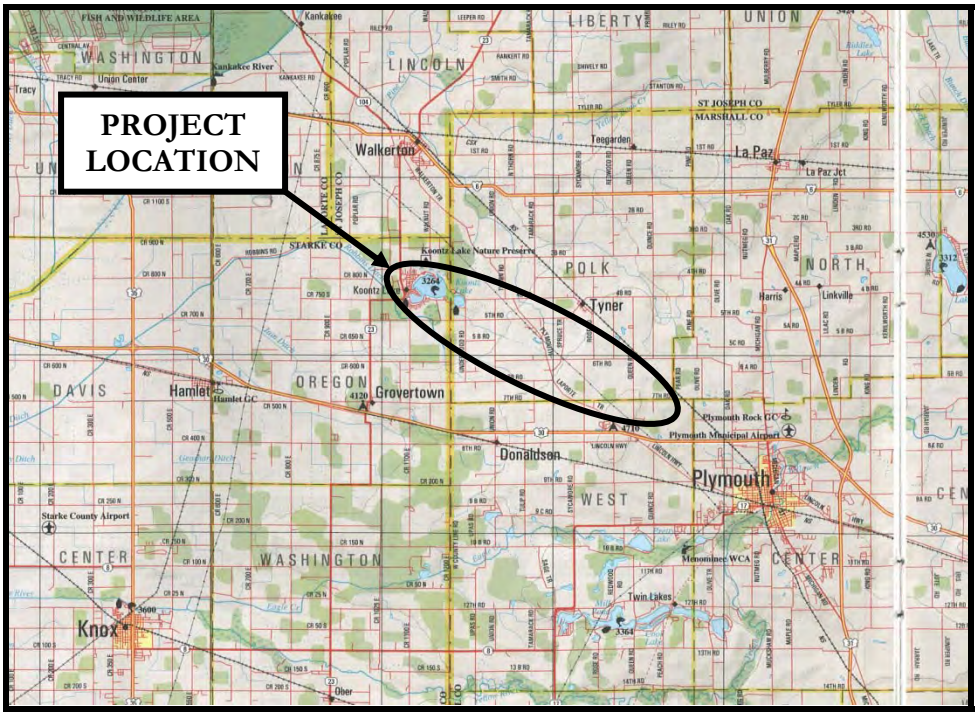


Figure 1. General location of the Koontz Lake watershed. Source: DeLorme, 1998.

The water quality in Koontz Lake is fair to poor and mesotrophic conditions exist. One diagnostic study indicated low transparency based on Secchi depth readings of 2.5-3.5 feet (0.7-1.1m) (Snell Environmental Group, 1999). Observed measurements through the Clean Lakes Program from 1990 through 2004 showed a range of transparency from 2.3 to 5.2 feet (0.7 to 1.6 m). Though a study completed in 1988 by Earth Source observed that the water quality had likely remained the same since 1965, growth of aquatic plants and algal blooms had markedly increased. Earth Source completed a diagnostic water quality study and measured nitrite-nitrates ranging from <0.001 to 0.28 mg/L, ammonia ranging from 0.02 to 0.12 mg/L and total phosphorus ranging from <0.01 to 0.075

mg/L, the latter of which is less than the median total phosphorus level measured in 456 Indiana lakes (2004). Though the chemical quality may be comparable to or better than other Indiana lakes, its poor water quality is exemplified most by the near anoxic conditions below 10 feet during the summer as reported by Earth Source (1988), its low transparency and abundant growth of exotic aquatic vegetation.

JFNew identified approximately 25 different species of plants representing all three strata (submerged, emergent, and floating) within Koontz Lake during their Tier II surveys in 2008. Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) dominated the littoral zone during the spring survey. Filamentous algae was noted at 65% and 74% of the sites during the spring and summer surveys, respectively. While the lake residents are very concerned about the exotic species, they are also concerned about the general amount of submerged and floating plant growth in the lake, not to mention the filamentous algae that form almost impenetrable mats near shore.

Prior to the 1930s, Koontz Lake was solely spring-fed with no substantive inlets. During the mid-1930s, the Lawrence Pontius Ditch was excavated to drain nearby agricultural fields. The ditch outlet flowed into the eastern basin of Koontz resulting in the delivery of nutrients and organic material to the lake. Earth Source (1988) noted that this connection was the prime factor in the nutrient enrichment of the lake. Sediment accumulation from the Lawrence Pontius Ditch became noticeable in 1940 and the Indiana Department of Natural Resources (IDNR) proposed diverting the ditch away from Koontz Lake into Robbins Ditch, a project that was never completed. As a result of the 1988 diagnostic study, the Koontz Lake Environmental Enhancement Committee (KLEEC), constructed 11-drop structure features on the Lawrence Pontius Ditch to serve as a sediment trap. Dredging of the lake has also been contemplated with requests from the US Congress for money to assess the feasibility of restoring Koontz Lake by dredging. A sediment study was completed in 1999 (Snell Environmental Group, 1999) and DNR had issued a permit to dredge the eastern basin. To date dredging has not been completed. Lake residents remain confronted with a lake of poor water quality supporting an abundance of plant growth and suspected increasing amounts of nutrient and sediment inputs.

This report serves as a baseline for management efforts of Koontz Lake's aquatic plant community. The plan will serve as a tool by which the IDNR can track future changes in the vegetation community, provide a baseline plan of action for controlling exotic species and improving the diversity of native species within the lake, and to maintain eligibility for additional LARE funds through the aquatic plant management program. Items covered include a review of spring and summer Tier II results from the 2008 season; details of exotic and high quality aquatic plant species and their locations; a recap from the public meeting; a management plan for future aquatic plant management efforts; and a discussion of potential management implications. The plan was funded by the Indiana Department of Natural Resources Lake and River Enhancement Program (LARE) and the Koontz Lake Association (KLA). This is the first year that that Koontz Lake has been involved in aquatic plant management planning through the LARE program.

During the 2008 growing season the following actions were taken.

- May 27, 2008; Tier II aquatic plant survey and exotic species survey completed.
- August 29, 2008; Tier II and exotic species aquatic plant surveys completed.

- September 13, 2008; Public meeting to discuss initial aquatic plant survey results and treatment.
- November 6, 2008; Meeting between the KLA, JFNew, Aquatic Control, Inc., and IDNR to discuss 2009 treatment options.

2.0 Watershed and Lake Characteristics

2.1.1 Watershed Characteristics

Surface water drains to Koontz Lake via through three primary routes: through Lawrence Pontius Ditch, through Schoeder Ditch, and through an unnamed drainage which enters on the north side of the lake, and via direct drainage. Lawrence Pontius Ditch drains approximately 3,006.5 acres (1,216.7 ha or 72%) of the watershed south of Koontz Lake. This stream empties into Koontz Lake in the lake's southern corner. Schoeder Ditch drains approximately 57.4 acres (23.2 ha or 1%) of the watershed southeast of Koontz Lake. This stream empties into Koontz Lake in the lake's southeast corner. An unnamed tributary transports water to Koontz Lake from the watershed north of the lake emptying into the lake along its northern boundary. In total, this tributary drains 561.8 acres (227.4 ha) of the Koontz Lake watershed. The remaining 13% of the land in the Koontz Lake watershed (533 acres or 215.7 ha) drains directly to Koontz Lake. Figure 2 illustrates the boundaries of each of these subwatersheds of Koontz Lake.

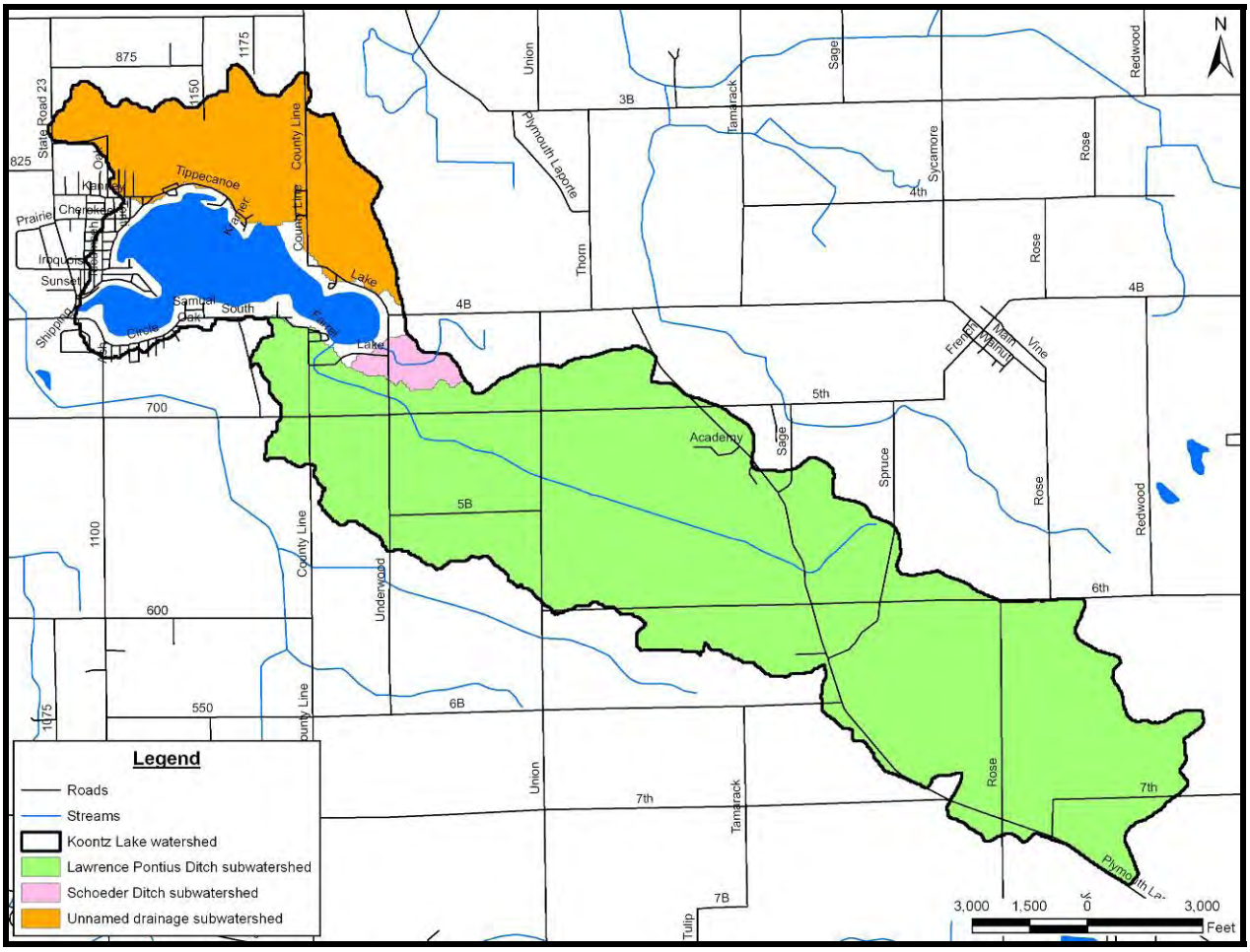


Figure 2. Koontz Lake subwatersheds.

2.1.2 Land Use

Figure 3 and Table 1 present current land use information for the Koontz Lake watershed. Like many Indiana watersheds, agricultural land use dominates the Koontz Lake watershed, accounting for approximately 65% of the watershed. Row crop agriculture makes up the greatest percentage of

agricultural land use at 49.1%, while pastures or hay vegetate another 16.3%. Land uses other than agriculture account for the remaining 35% of the watershed. Natural landscapes, including forests and wetland, cover approximately 21.4% of the watershed. Most of the natural acreage in the watershed is associated with the forested and emergent and woody wetland area around Koontz Lake. Open water, including Koontz Lake and a couple small ponds, accounts for another 8% of the watershed. Most of the remaining 5% of the watershed is occupied by low intensity residential land, with less than 1% of high intensity residential or commercial land. The urban recreational grasses classification relates to the Swan Lake Golf Course located to the southeast of the lake. Much of the residential land lies directly adjacent to Koontz Lake.

Table 1. Detailed land use in the Koontz Lake watershed.

Land Use	Area (acres)	Area (hectares)	% of Watershed
Row Crops	2,041.4	826.1	49.1%
Pasture/Hay	678.6	274.6	16.3%
Deciduous Forest	615.8	249.2	14.8%
Open Water	344.9	139.6	8.3%
Woody Wetlands	206.5	83.6	5.0%
Urban recreational grasses	133.6	54.1	3.2%
Low Intensity Residential	66.6	26.9	1.6%
Emergent Herbaceous Wetlands	49.3	19.9	1.2%
Evergreen Forest	17.1	6.9	0.4%
Commercial/Industrial/Transportation	3.6	1.4	0.1%
High Intensity Residential	2.8	1.1	0.1%
Mixed Forest	1.4	0.6	<0.1%
Entire Watershed	**4,158.4**	**1,682.8**	**100.0%**

Source: USGS EROS, 1992.

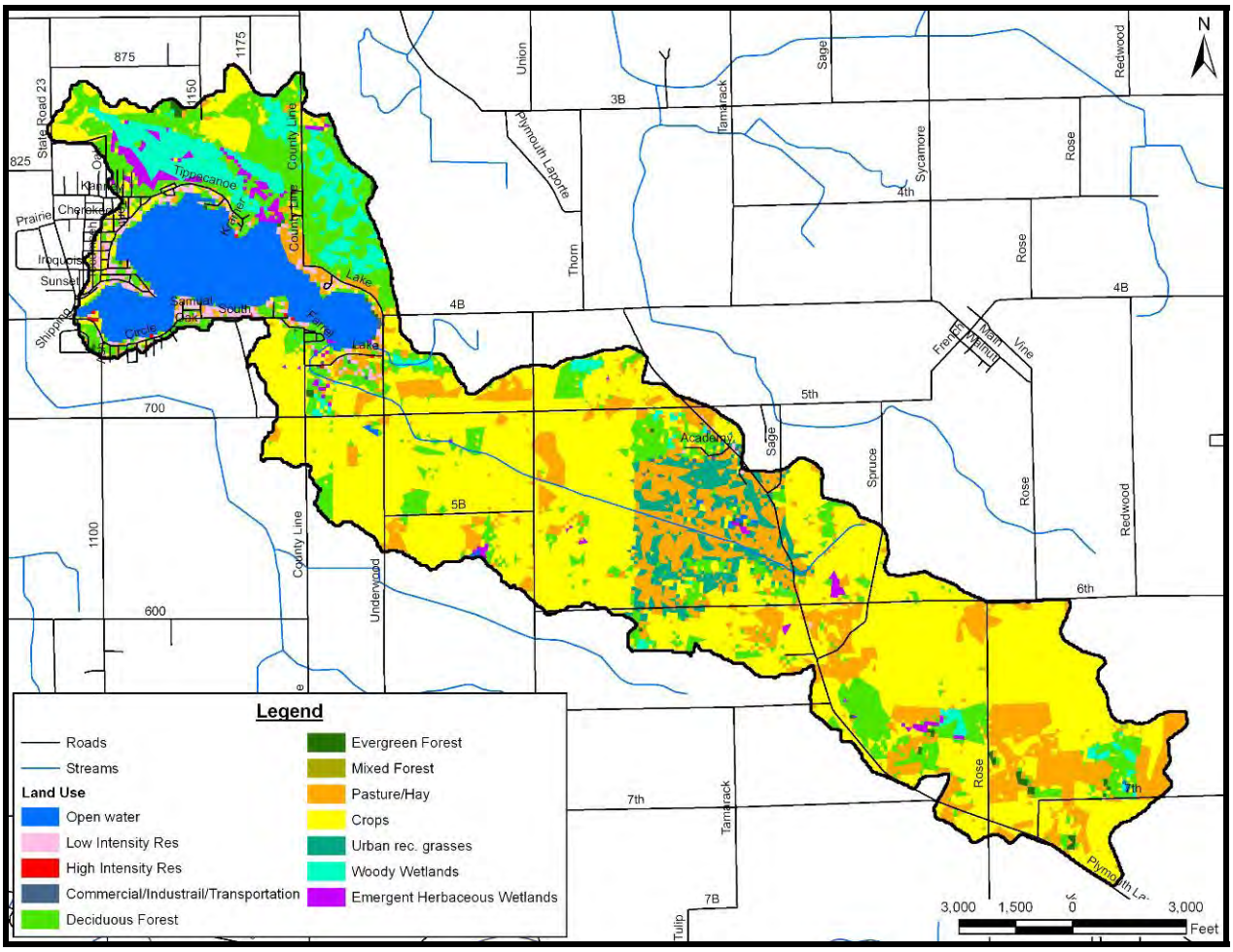


Figure 3. Land use in the Koontz Lake watershed.
Source: USGS EROS, 1992.

2.2 Lake Characteristics

2.2.1 Morphology

Figure 4 presents Koontz Lake's moderately complex morphology. The lake consists of three basins and is dammed at the western side of the lake where a weir-type outlet is located along State Road 23. The lake's deepest point lies in the center of the 346-acre (140-ha) lake. Here, the lake extends to its maximum depth of 31 feet (9.4 m; Table 2). The basin in the southeast part of the lake reaches a depth of 20 feet and receives the water coming in from Lawrence Pontius Ditch and Schoeder Ditch. The basin on the southwest side of the lake is shallow with two narrow areas reaching depths of 15 feet.

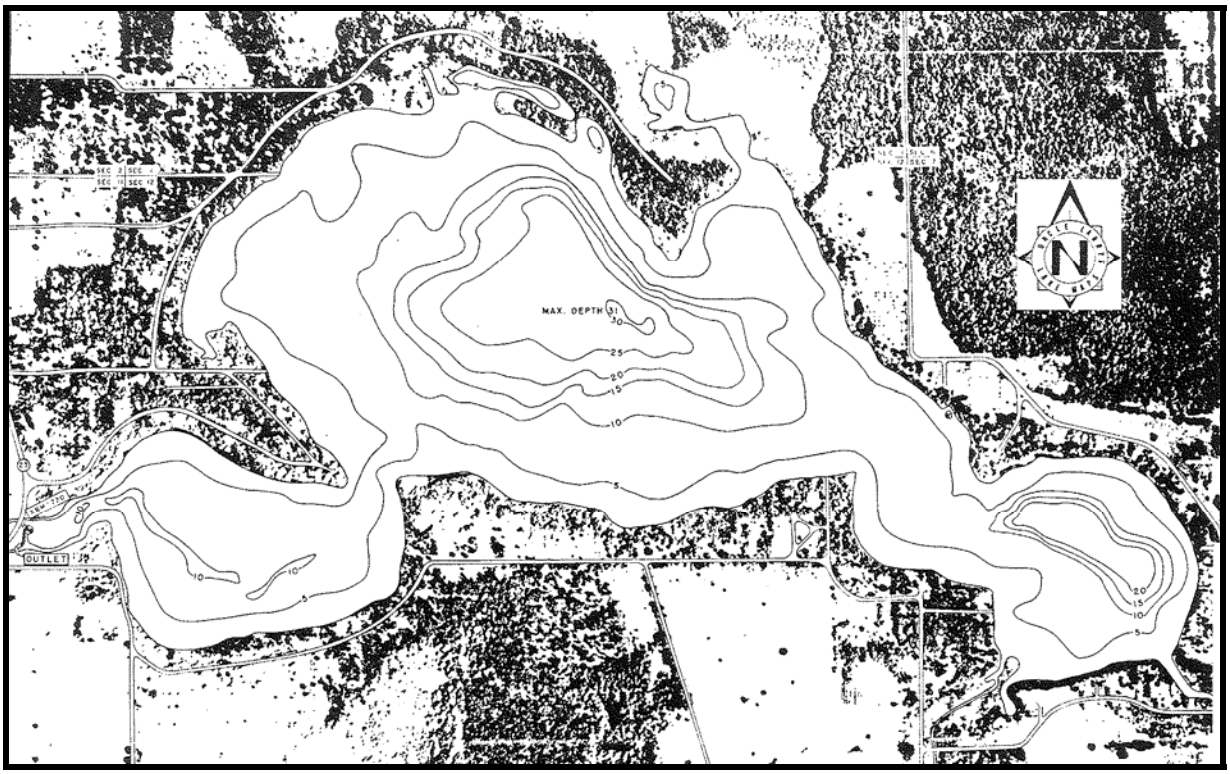


Figure 4. Koontz Lake bathymetric map. Source: IDNR, 1955.

Table 2. Morphological characteristics of Koontz Lake.

Characteristic	Value
Surface Area	346 acres (140 ha)
Volume	4,016.8 acre-feet (4,954,690 m^3)
Maximum Depth	31 feet (9.4 m)
Retention Time	1.7 years
Mean Depth	12 feet (3.7 m)
Shallowness Ratio	0.28
Shoalness Ratio	0.84
Shoreline Length	36,448.9 feet (11,109.6 m)
Shoreline Development Ratio	1.22

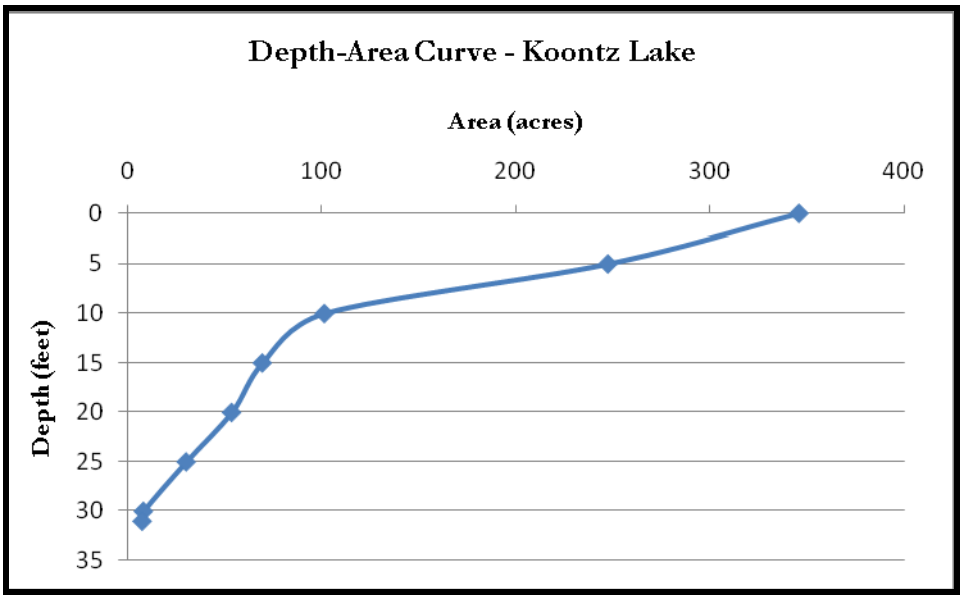


Figure 5. Koontz Lake Depth-Area Curve.

Koontz Lake possesses moderate to extensive expanses of shallow water. According to a depth-area curve based on the 1955 DNR bathymetric map (Figure 5), nearly 98.4 acres (39.8 ha) of the lake is covered by water less than 5 feet (1.5 m) deep, while nearly 292 acres (118.2 ha) is covered by water less than 20 feet (6.1 m) deep. This translates into a very low shallowness ratio of 0.28 (ratio of area less than 5 feet (1.5 m) deep to total lake area) and a moderately high shoalness ratio of 0.84 (ratio of area less than 20 feet (6.1 m) deep to total lake area) (Table 2), as defined by Wagner (1991). A small portion of the lake's acreage (approximately 22.6 acres or 9.1 ha) covers waters deeper than 25 feet (7.6 m). The lake's area increases with depth to a water depth of about 10 feet (3 m) before the rate of change increases. This rate (slope of lake-bottom) continues to the lakes maximum depth (31 feet or 9.4 m).

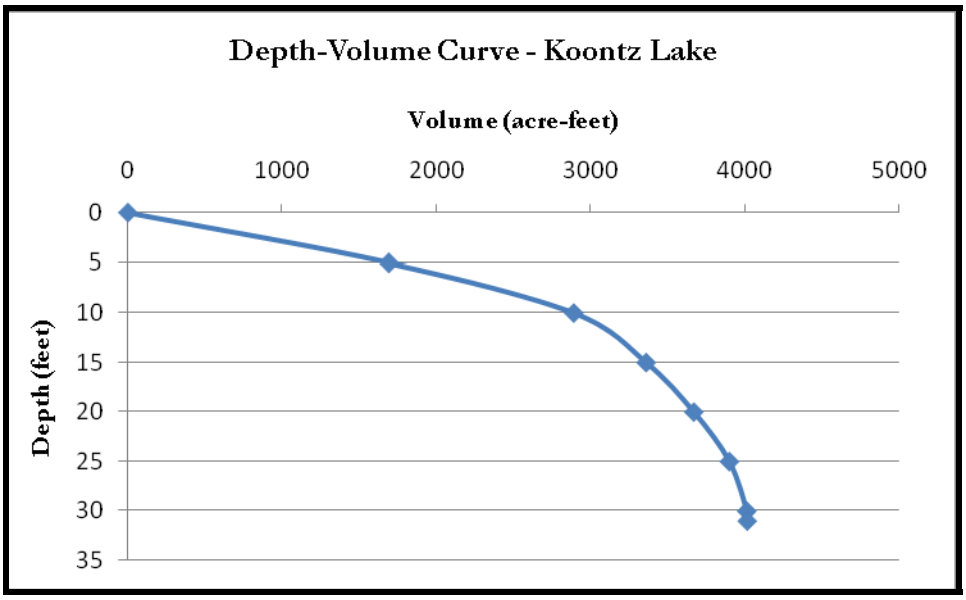


Figure 6. Koontz Lake Depth-Volume Curve

Koontz Lake holds approximately 4,016.8 acre-feet (4,954,690 m^3) of water. As illustrated in the depth-volume curve (Figure 6), most of the lake's volume is contained in the shallower areas of the lake. More than 85% (3,475 acre-feet) of the lake's volume is contained in water that is less than 15 feet (4.6 m) deep. The lake's volume decreases with depth to the lake's maximum water depth of about 31 feet (9.4 m). Estimated retention time is approximately 1.7 years based on a volume of 346 ac-ft and a discharge rate of 3 cfs. The lake's thermocline occurs typically at about 10 to 15 feet (Figure 7).

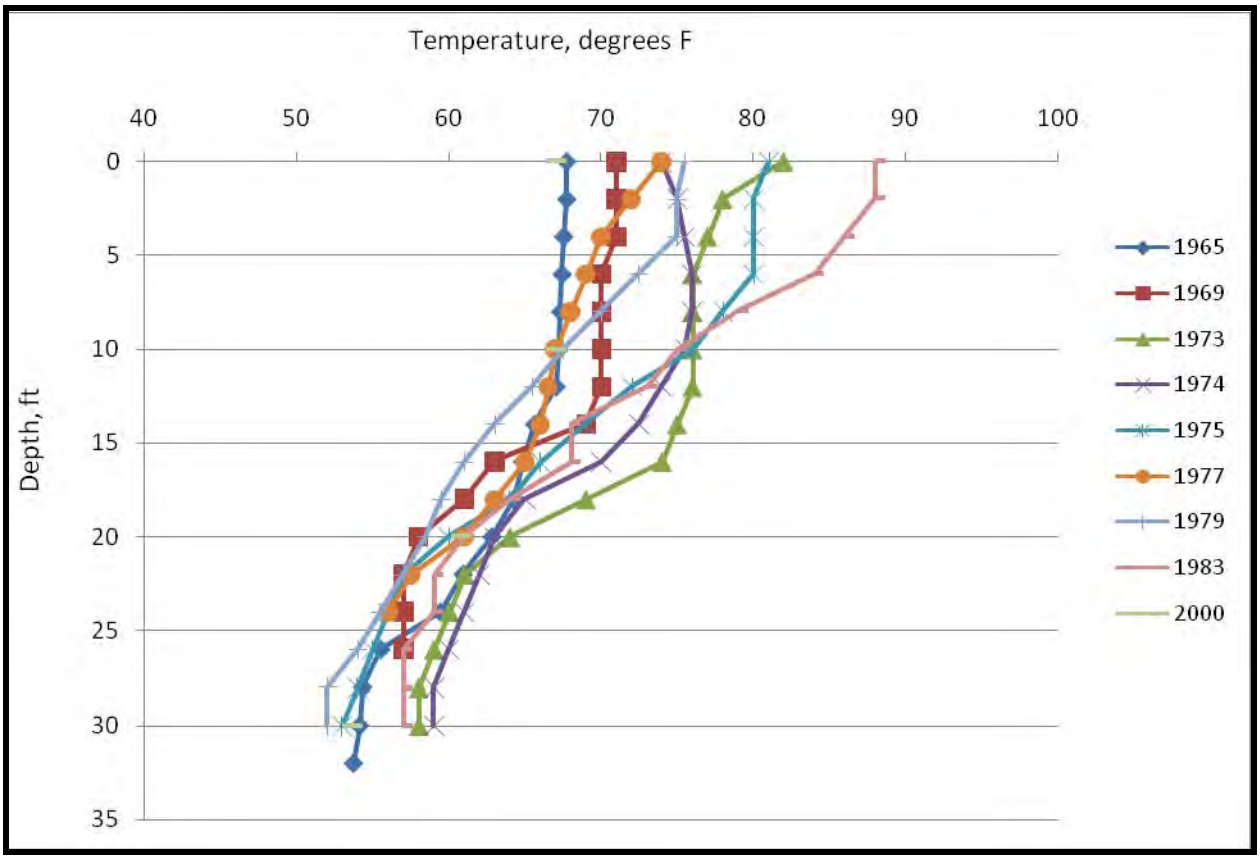


Figure 7. Temperature versus depth in Koontz Lake. Source: DNR fisheries reports water quality data

A lake's morphology can play a role in shaping the lake's biotic communities. For example, Koontz Lake's moderate to extensive shallow area and wide, shallow shelf around much of the perimeter of the lake coupled with its poor water clarity suggests that the lake is somewhat capable of supporting a quality rooted plant community. (The lake's morphology is based on a 1955 DNR bathymetric map. Earth Source (1988) developed a new bathymetric map indicating a much greater area of the lake within the 0-5 foot contour. The Tier II sampling did not corroborate the 1988 findings, and may indicate that development of another bathymetric map is beneficial.) To the contrary, the lake supports an extensive aquatic plant population, and its size and composition are the reason for this aquatic vegetation management plan. Koontz Lake's littoral zone (or the zone capable of supporting aquatic rooted plants) extends from the shoreline to the point where water depths are approximately 15 feet (4.5 m).

Referring to Koontz Lake's depth-area curve, this means that the lake's littoral zone is approximately 240 acres (97.1 ha) in size or approximately 69% of the lake. This size littoral zone can impact other biotic communities in the lake such as fish that use the plant community for forage, spawning, cover, and resting habitat. This size zone can also be subject to colonization by invasive aquatic vegetation as evidenced by an abundance of Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) observed during the Tier II 2008 survey.

2.2.2 Shoreline Development

Development around Koontz Lake began early (circa 1848) with the installation of a dam and grist mill at its western end. By 1915 numerous cottages dotted the south shores of the lake, and by 1950, approximately 700 cottages were located along Koontz Lake's shoreline (Allen, 2008). Since that time the shoreline has been almost entirely developed with individual residences and some commercial properties. A recent aerial photograph (Indiana Spatial Data Portal, 2005 Orthophotography, Starke County, IN) confirms the presence of houses along the entire shoreline of Koontz Lake, with the exceptions being the wetland area on the north side of the lake and the channel near the public access site on the southern side of the lake.

Given the plethora of houses along Koontz Lake's shoreline, it is not surprising that nearly 82% of Koontz Lake's shoreline has been altered in some form. Along part of Koontz Lake's shoreline (29%; 10,566.3 feet or 3,220.5 m), trees and emergent vegetation have been thinned; however, these areas possess at least a narrow band of emergent plants (Figure 8). These areas are mapped as modified natural shoreline because they still possess at least a small portion of all these strata (submerged, emergent, and floating). Other portions of the shoreline that are also mapped as modified natural include those areas where individuals removed only the portion of the shoreline vegetation required to view or access the lake.

Figure 8. Shoreline surface type observed at Koontz Lake, August 29, 2008.
Source: ISDP, 2005 Orthophotography, Starke County, Indiana.

Approximately 53% of Koontz Lake's shoreline has been largely altered from its natural state (Figure 8). Along these portions of Koontz Lake's shoreline, emergent and floating rooted vegetation has been completely removed from areas adjacent to the shoreline. This leaves bare soils or mowed, residential lawns exposed to wave action. In some areas, wooden railroad timbers, concrete seawalls, glacial stone, or riprap cover the shoreline. This type of shoreline is especially prevalent in the lake's southeastern basin where wind and wave energy is higher than other areas of the lake. This area of the lake is subject to higher wave energy due to prevailing winds and possessing the highest ***fetch*** (longest distance that the wind travels without touching land) of anywhere on the lake. Ice formation can also exacerbate problems with exposed shoreline and cause additional erosion.

Natural shoreline remains along approximately 18% of Koontz Lake's shoreline where bands of trees, emergent vegetation, floating vegetation, and submerged vegetation are located in distinct zones along the lakeshore (Figure 8). In these areas, the submerged, floating, emergent, and shoreline canopy layers all remain intact.

The shoreline surface becomes especially important in and adjacent to shallow portions of Koontz Lake. In areas where concrete seawalls are present, wave energy from wind and boats strike the flat

surface and reflect back into the lake. This creates an almost continuous turbulence in the shallow areas of the lake. Where the waves revert back to the lake and meet incoming waves, wave height increases resulting in additional in-lake turbulence. This turbulence re-suspends bottom sediments thereby increasing the transfer of nutrients from the sediment-water interface to the water column. Continuous disturbance in shallow areas can also encourage the growth of disturbance-oriented plants.

In contrast, shorelines vegetated with emergent or rooted floating vegetation or those areas covered by sand will absorb more of the wave energy created by wind or boats. In these locations, wave energy will dissipate along the shoreline each time a wave meets the shoreline surface. Similarly, stone seawalls or those covered by wood can decrease shallow water turbulence and lakeward wave energy reflection while still providing shoreline stabilization.

3.0 Lake Uses

A public meeting was held September 13, 2008 to discuss aquatic plant survey results and to distribute the lake use survey to lake residents to fill out regarding their concerns about the lake. (Appendix A contains detailed results from the user survey.) Figure 9 details the responses of users in regards to perceived problems in Koontz Lake. Forty-three lake users responded to the survey this year. The main concern of Koontz Lake users are dredging needs in the lake (91%). Concerns regarding too many aquatic plants in the lake are an issue for 77% of Koontz Lake users, while 58% of lake users think Koontz Lake's poor water quality is a problem. Use of personal watercraft (PWC; 44%) and fish population problems (26%) are also of concern to Koontz Lake users. Only 12% of lake users had complaints about non-resident use including noise pollution, speeding on and off the lake, and installation of docks at non-resident locations.

A few lake users commented on the need for weed control in the lake and realize that they may have too many invasive aquatic plant species and not enough native plant species. The need to treat Eurasian watermilfoil will continue to be a priority for this lake if it is to be used for recreation. There were no specific comments about dredging even though 91% of users think it is a problem.

Individuals who responded to the survey were also asked to note what their primary use of the lake is. The majority of people who responded to the survey use Koontz Lake for boating (93%). Eighty-four percent of individuals use the lake for swimming and seventy percent of lake users fish on Koontz Lake. Another 19% of individuals on Koontz Lake use it for irrigation purposes. No one who responded to the survey admitted to using the lake for drinking water. A small percentage of lake users (2%) responded with "other" activities as their primary use on Koontz Lake. The public access site for Koontz Lake is located on the south side of the lake off of South Lake Drive.

Overall, the use of Koontz Lake is for high and low-speed recreation and swimming. As such, the public does not prioritize specific areas for high or low-impact recreation. Furthermore, no specific areas were identified by the public survey where aquatic plant densities or communities interfere with lake use, but one person did suggest that a whole-lake treatment is needed to control the aquatic plants.

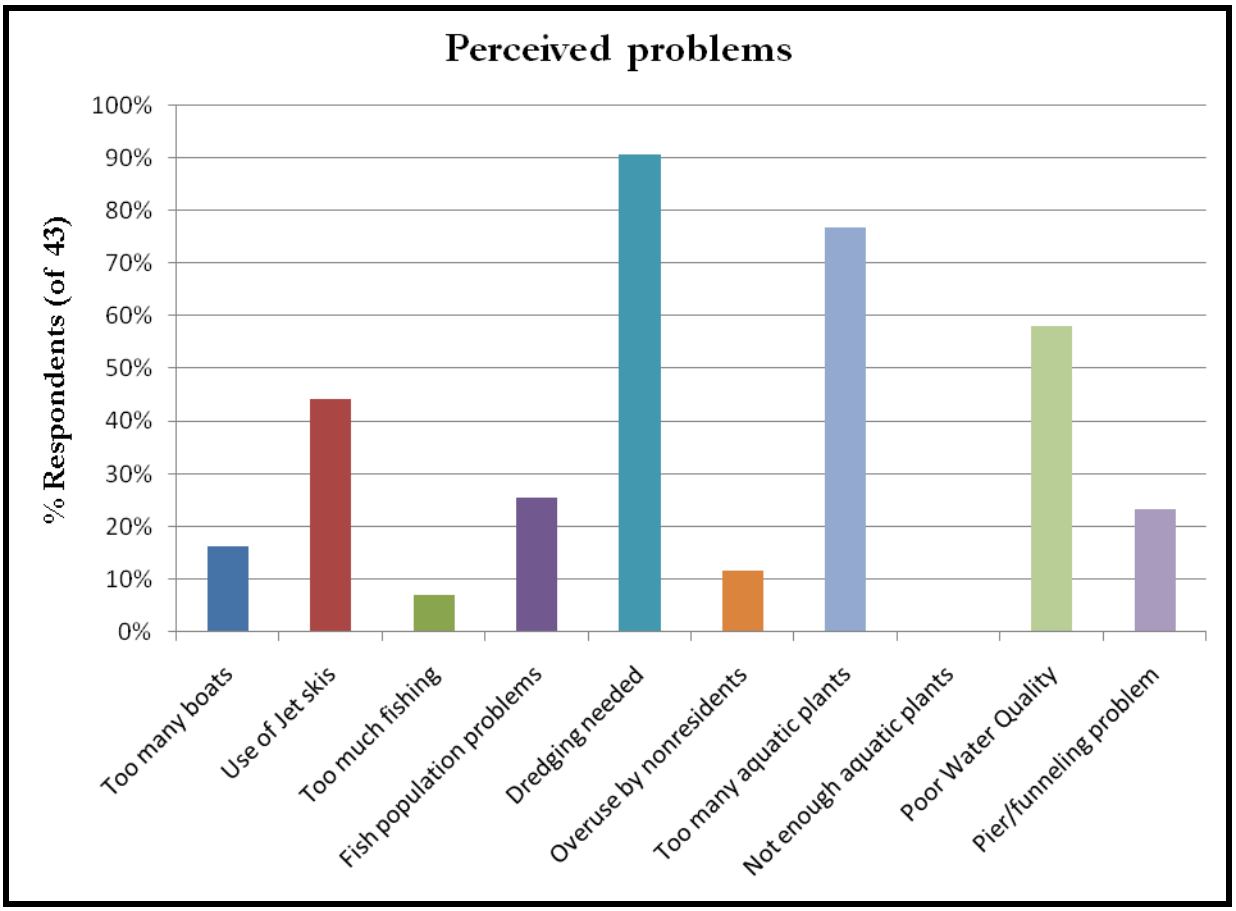


Figure 9. Perceived problems from Koontz Lake users.

4.0 Fisheries

The Koontz Lake fishery was initially surveyed by the Indiana Department of Natural Resources (IDNR) in 1965 with subsequent general fish surveys in 1969, 1971-1975, 1977, 1979, 1983, and 2000. Koontz Lake was renovated and restocked in 1970 due to an observed over abundance of small yellow perch and low abundances of bluegill and largemouth bass during the 1965 and 1969 general fish surveys. Fish species restocked included largemouth bass, bluegill, redear, northern pike, channel catfish, black crappie, and walleye. Success of the renovation/restocking effort was investigated during the 1971-1975 general fish surveys. In 1984, Koontz Lake implemented a 14 inch (35.6 cm) minimum size limit on largemouth bass. To assess the impact of the minimum size limit on the largemouth bass population surveys were conducted from 1984 to 1987 and in 1989 targeting largemouth bass specifically during May and June utilizing electrofishing techniques. In 1994, IDNR carried out a study on Koontz Lake investigating the impact of largemouth bass on bluegill abundance, size structure, and growth (Hudson, 1995).

Koontz Lake can be described as a panfish-largemouth bass fishery with additional angling opportunities for northern pike and yellow perch (Figure 10). Historically, the Koontz Lake fishery has provided anglers with less than desirable to adequate fishing opportunities. Largemouth bass catch rates from sampling efforts overtime have ranged from a high of 251.8 individuals per hour in 1989 to 5 individuals per hour in 1975. The most recent survey in 2000 collected 23 bass per hour.

Growth and condition of bluegill and largemouth bass has been average to above average during all sampling events. This would suggest that Koontz Lake provides a sufficient forage base, and species population sizes are at levels where intra-specific competition (within a species) is not limiting growth.

Proportional stock density (PSD), a measure of the balance between stock and quality sized individuals within a species population, was determined for bluegill in 1992 and largemouth bass as of the 1984 survey. Stock size is generally defined as the minimum size at which a species becomes available to anglers while quality size is generally defined as the minimum size anglers consider the species harvestable. PSDs indicative of balance in a target species population are based on sustainable harvest of sizes preferred by anglers (Hubert and Kohler, 1999). Different species have varying desirable PSD value ranges. For example, the desired PSD range in bluegill is 20-40 while largemouth bass is 40-70. From 1984 to 1989 the calculated PSD value for the largemouth bass population ranged from 7-15 suggesting the population was dominated by smaller individuals. In 1992, largemouth bass PSD increased to 44 and increased again to 53 in 2000, suggesting during those years the largemouth bass population was balanced. Bluegill PSD was determined only during the 1992 survey and was calculated at 26, suggesting the population was balanced.

While the Koontz Lake fishery has been surveyed a number of times the majority of those events took place in the 1970's and 1980 thereby providing little information on fish species distribution in recent years. The most recent survey of Koontz Lake in 2000 collected 1,176 fish representing 18 species. Gizzard shad was the most abundant fish species collected by number (45.4%), followed by bluegill (27.1%), green sunfish (10.5%), and yellow perch (3.1%; Figure 10). Gizzard shad was the most abundant species collected by weight (32.0%), followed by carp (19.4%), bluegill (16.1%), and northern pike (7.4%). Largemouth bass was the fifth most abundant species collected by number and weight accounting for 2.4% and 6.3% of the sample respectively. The 2000 survey reveals a major change has occurred in the Koontz Lake fish community since the last general survey in 1983.

Gizzard shad have become the most abundant fish species, despite only one individual being collected during a diagnostic study in 1999 (Snell Environmental Group, 1999). Gizzard shad when smaller (generally less than six inches) can be an important forage species for predator species such as largemouth bass and northern pike; however, due to the high growth rates of gizzard shad and their ability to reproduce quickly their population can become overly abundant in a short amount of time. Young developing shad compete with developing gamefish such as bluegill for food and can have negative effects on bluegill recruitment. A general fish survey would need to be completed to determine the current state of the fishery.

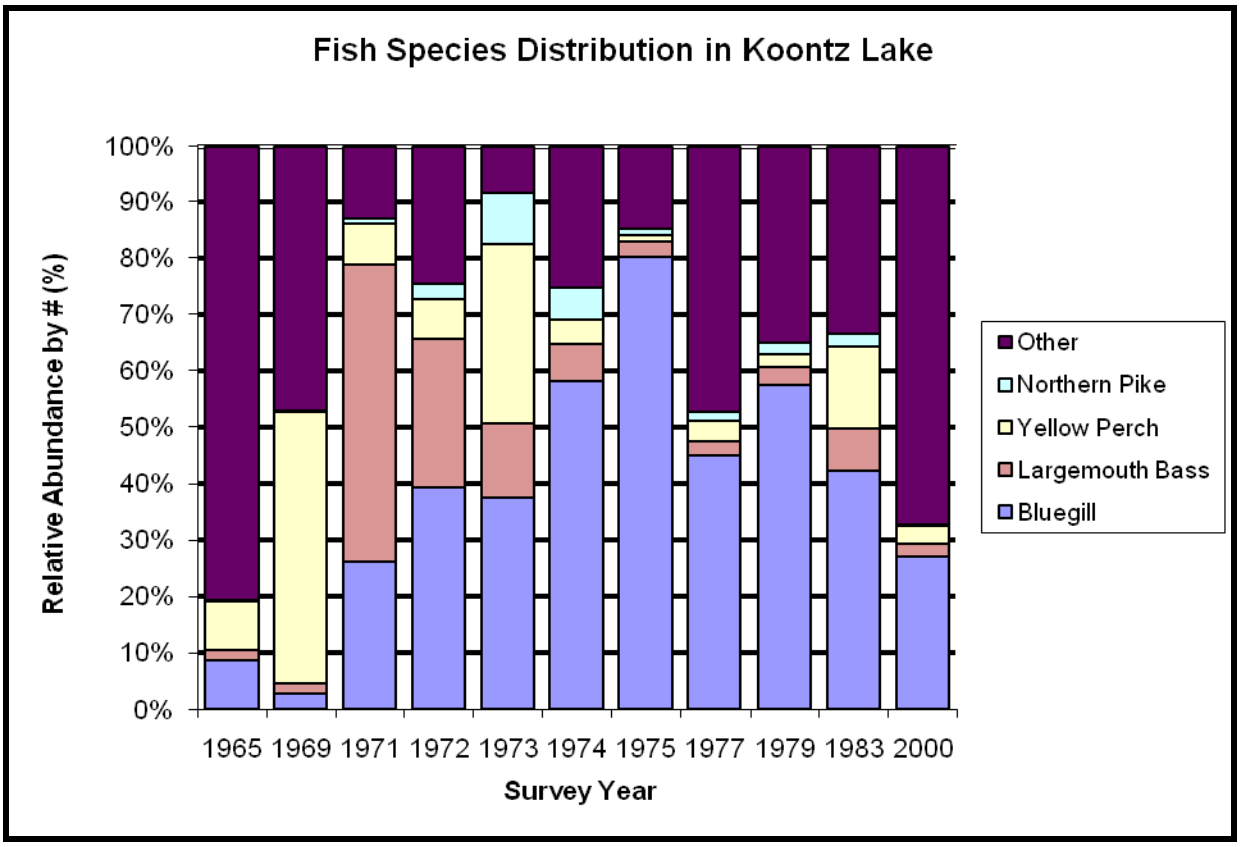


Figure 10. Percent community composition by number of fish collected for Koontz Lake. Source: Brindza, 2001; Robertson, 1969, 1974, 1975a, 1975b, 1978, 1980, 1984: Turner, 1967.

5.0 Problem Statement

The composition and structure of the lake's rooted plant community often provide insight into the long term water quality of a lake. While sampling the lake water's chemistry (dissolved oxygen, nutrient concentrations, etc.) is important, water chemistry sampling offers a single snapshot of the lake's condition. Because rooted plants live for many years in a lake, the composition and structure of this community reflects the water quality of the lake over a longer term.

The composition and structure of a lake's rooted plant community also help determine the lake's fish community composition and structure. Submerged aquatic vegetation provides cover from predators and is a source of forage for many different species of fish (Valley et al., 2004). However, extensive and dense stands of exotic aquatic vegetation can have a negative impact on the fish community. For example, a lake's bluegill population can become stunted because dense vegetation reduces their foraging ability, resulting in slower growth. Additionally, dense stands reduce predation by largemouth bass and other piscivorous fish on bluegill which results in increased intraspecific competition among both prey and predator species (Olsen et al., 1998). Vegetation removal can have variable results on improving fish growth rates (Cross et al., 1992, Olsen et al., 1998). Conversely, lakes with depauperate plant communities may have difficulty supporting some top predators that require emergent vegetation for spawning. In these and other ways, the lake's rooted plant community illuminates possible reasons for a lake's fish community composition and structure.

A lake's rooted plant community impacts the recreational uses of the lake. Swimmers and power boaters desire lakes that are relatively plant-free, at least in certain portions of the lake. In contrast, anglers prefer lakes with adequate rooted plant coverage, since those lakes offer the best fishing opportunity. Before lake users can develop a realistic management plan for a lake, they must understand the existing rooted plant community and how to manage that community. This understanding is necessary to achieve the recreational goals lake users may have for a given lake.

5.1 Nuisance and Exotic Plants

Several nuisance and/or exotic aquatic plant species grow in Koontz Lake. As nuisance species, these species will continue to proliferate if unmanaged, so data collected during the plant survey will be outdated quickly and should not be used to precisely locate nuisance species individuals or stands. (Additionally, it is likely that the watershed supports many terrestrial nuisance species plant species, but this discussion will focus on the aquatic nuisance species.) The plant survey revealed the presence of two submerged, aggressive exotics: Eurasian watermilfoil (Figure 11) and curly-leaf pondweed (Figure 12). Koontz Lake may also support two emergent exotic plant species: purple loosestrife (Figure 13) and reed canary grass (Figure 14). As exotic invasive species, these species have the potential to proliferate if left unmanaged.

Figures 11. Eurasian watermilfoil (*Myriophyllum spicatum*) and Figure 12. Curly-leaf pondweed (*Potamogeton crispus*).

Figure 13. Purple loosestrife (*Lythrum salicaria*) and Figure 14. Reed canary grass (*Phalaris arundinacea*).

5.1.1 Eurasian watermilfoil

The presence of Eurasian watermilfoil in Koontz Lake is of concern, but it is not uncommon for lakes in the region. Eurasian watermilfoil is an invasive and aggressive, non-native species common in northern Indiana lakes. It often grows in dense mats excluding the establishment of other plants. For example, once the plant reaches the water's surface, it will continue growing horizontally across the water's surface. This growth pattern has the potential to shade other submerged species preventing their growth and establishment. In addition, Eurasian watermilfoil does not provide the same habitat potential for aquatic fauna as many native pondweeds. Its leaflets serve as poor substrate for aquatic insect larva, the primary food source of many panfish.

5.1.2 Curly-leaf pondweed

Depending upon water chemistry, curly-leaf pondweed can be more or less aggressive than Eurasian watermilfoil. Its presence in the lake is a concern because, like Eurasian watermilfoil, curly-leaf pondweed can spread across the lake's surface forming dense mats ultimately shading out native species. Like many exotic invasive species, curly-leaf pondweed gains a competitive advantage over native submerged species by sprouting early in the year. The species can do this because it is more tolerant of cooler water temperature than many of the native submerged species. Curly-leaf pondweed experiences a die-back during early to mid-summer. This die-back can degrade water quality by releasing nutrients into the water column and increasing the biological oxygen demand.

5.1.3 Purple loosestrife

Purple loosestrife is an aggressive, exotic species introduced into this country from Eurasia for use as an ornamental garden plant. Like Eurasian watermilfoil, purple loosestrife has the potential to dominate habitats, in this case wetland and shoreline communities, excluding native plants. The stiff, woody composition of purple loosestrife makes it a poor food source substitute for many of the native emergents it replaces. In addition, the loss of diversity that occurs as purple loosestrife takes over plant communities lowers the wetland and shoreline habitat quality for waterfowl, fishes, and aquatic insects. No purple loosestrife has been observed around the lake.

5.1.4 Reed canary grass

Like purple loosestrife, reed canary grass is native to Eurasia. Farmers used (and many likely still use) the species for erosion control along ditch banks or as marsh hay. The species escaped via ditches and has spread to many of the wetlands in the area. Swink and Wilhelm (1994) indicate that reed canary grass commonly occurs at the toe of the upland slope around a wetland. Reed canary grass was often observed above the ordinary high water mark around Koontz Lake. Like other nuisance species, reed canary grass forms a monoculture mat excluding native wetland/shoreline plants. This limits a wetland's or shoreline's diversity ultimately impacting the habitat's functions.

5.1.5 Hydrilla

Although it was not identified in Koontz Lake during the aquatic plant survey, another exotic, invasive species, hydrilla (*Hydrilla verticillata*), was identified for the first time in Indiana at Lake Manitou in Fulton County in 2006. Hydrilla is a submerged plant that resembles common water weed. However, hydrilla can tolerate lower light levels and higher nutrient concentrations than most native aquatic species. Because of its special adaptations, hydrilla can live in deeper water and photosynthesize earlier in the morning than other aquatic species. Because of these factors, hydrilla is often present long before it becomes readily apparent. It often grows quickly below the water and becomes obvious only after out-competing other species and forming a monoculture. Dense mats of hydrilla often cause pH imbalances and temperature and dissolved oxygen fluctuations. This allows hydrilla to out-compete other aquatic-plant species and can cause imbalances in the fish community.

6.0 AquaticVegetation Management Goals and Objectives

Listed below are three goals formulated by the LARE program staff and the IDNR Division of Fish and Wildlife Biologists and approved by the Koontz Lake Conservation Club. The objectives and actions used to meet the goals are discussed in the **Management Action Strategy Section**.

Aquatic Plant Management Goals:

1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality and is resistant to minor habitat disturbances and invasive species.
2. Direct efforts to prevent and/or control the negative impacts of aquatic invasive species.
3. Provide reasonable public recreational access while minimizing the negative impacts on plant and fish and wildlife resources.
4. Implement nutrient management reduction plan.

7.0 Plant Management History

This year (2008) represents the first year that Koontz Lake participated in the LARE-funded aquatic plant management program. No locally sponsored treatment of exotic vegetation has occurred on Koontz Lake in the last few years (2004-2008). The only aquatic plant treatment to take place at Koontz Lake has been by private landowners.

Aquatic Vegetation Permit Reporting Reports indicate that from 2004 to 2008 eleven permits were issued to spot treat invasive species. Areas of chemical treatment ranged from less than 1 acre to 11 acres and were sponsored by individual lakeshore property owners. In 2004, seven areas totaling 37.85 acres were treated for Eurasian watermilfoil and curly-leaf pondweed. Other species potentially affected by the treatment included chara, coontail, common water weed, Richardson's pondweed, and sago pondweed. In subsequent years, additional acreage was treated as follows: in 2005, 45.62 acres at 26 sites; in 2006, 48.62 acres at 27 sites; in 2007, 38.92 acres at 24 sites; and in 2008, 41.35 acres at 24 sites. In years 2005-2008, other species potentially affected by the treatment include coontail, chara, American elodea, common naiad, eel grass, and flat-stem pondweed.

Based on the reporting records, from 2004 to 2008, a total of 212.36 acres of exotic aquatic vegetation was permitted for treatment and was treated in Koontz Lake (Figure 15). Appendix F provides copies of previous permits to treat aquatic plants.

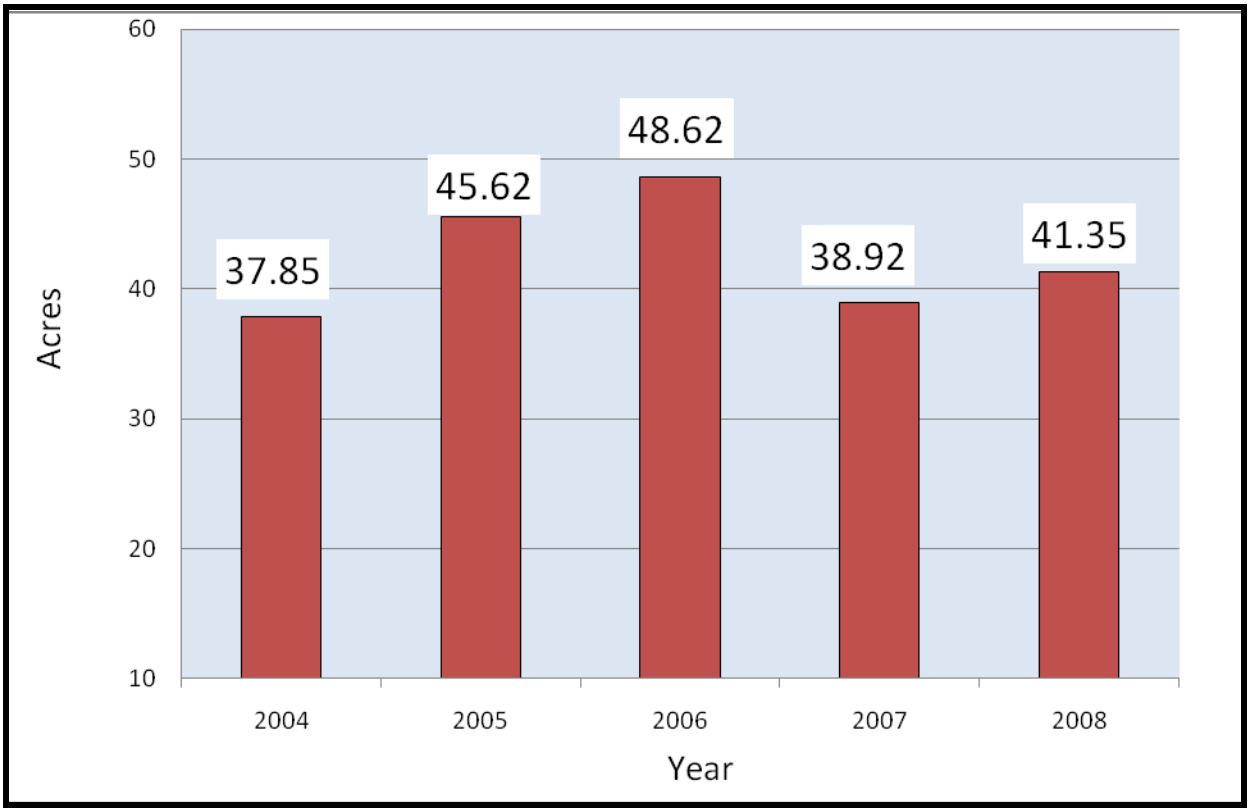


Figure 15. Eurasian watermilfoil treated in Koontz Lake, 2004-2008.

8.0 Aquatic Plant Community Characterization

8.1 Methods

JFNew surveyed Koontz Lake's plant community on May 27 and August 29, 2008 according to the Indiana Department of Natural Resources sampling protocols (IDNR, 2007). JFNew examined the entire littoral zone of the lake during each of the two assessments. Surveys were completed using the Tier II survey protocol updated by the IDNR LARE staff in May 2007 (IDNR, 2007). The survey protocol generally follows previous Tier II protocols and is most similar to the 2006 protocol, which requires that the sampling points be stratified over the entire depth of the lake's littoral zone. Total points sampled per stratum were determined as follows:

1. Appendix D of the survey protocol was consulted to determine the number of points to be sampled. This determination was based on the lake size (surface area) and trophic status.
2. Table 3 of the survey protocol was referenced as an indicator of the number of sample points per stratum. Table 3 lists the sampling strategy for Koontz Lake.

Stratum refers to depth at which plants were observed. Dominance presented in subsequent tables was calculated by the IDNR protocol. The frequency per species scale presented in subsequent tables provides a measure of the frequency of a species. The percentage of plants found within a density measure indicates the frequency of plants found over all the sampling points.

Table 3. Tier II sampling strategy for Koontz Lake using the 2007 Tier II protocol.

Lake	Size	Trophic Status	Number of Points	Stratification of Points
Koontz Lake	346 acres	Mesotrophic	70	22 pts 0-5 foot stratum 20 pts 5-10 foot stratum 18 pts 10-15 foot stratum 10 pts 15-20 foot stratum

8.2 2007 Sampling Results

Spring (May) and summer (August) exotic species surveys and spring and summer Tier II surveys were completed on Koontz Lake in 2008 by JFNew. The survey schedule is detailed in Table 4. No samples were sent to an outside taxonomist for vouchering or identification.

Table 4. Survey schedule for exotic species and Tier II surveys.

Survey	Date
Spring exotic species survey	May 27, 2008
Summer exotic species survey	August 29, 2008
Spring Tier II -Spring	May 27, 2008
Summer Tier II -Summer	August 29, 2008

8.2.1 Exotic Species and Plant Community Mapping

Exotic species locations are shown in Figure 16. Additional plant community information is discussed in detail in the following sections.

Spring Assessment

The dominant plant species found in Koontz Lake are Eurasian watermilfoil, white-stem pondweed, curly-leaf pondweed, and chara (Table 5). There are a number of problem areas located throughout the lake. (These are discussed in more detail in the Beneficial and Problem Plants Section.) Eurasian

watermilfoil was identified in multiple locations along the shoreline throughout the lake. The main concerns identified during the spring assessment were the presence of Eurasian watermilfoil and curly-leaf pondweed along most of the shoreline in Koontz Lake. In total, Eurasian watermilfoil covered approximately 82 acres of Koontz Lake during the spring survey. Shoreline areas in each basin contained 42 acres of curly-leaf pondweed that were identified during the spring assessment (Figure 16). However, surveys were not conducted at the peak of curly-leaf pondweed growth. To adequately assess the density of curly-leaf pondweed, an assessment should be conducted in April or early May to adequately quantify the presence and location of curly-leaf pondweed within Koontz Lake. No endangered, threatened, or rare species were identified within Koontz Lake during the spring assessment.

Table 5. Aquatic plant species identified within Koontz Lake during the spring, May 27, 2008 and summer, August 29, 2008, aquatic plant surveys.

Scientific Name	Common Name	Stratum	Spring	Summer
Ceratophyllum demersum	Coontail	Submergent	X	X
Chara species	Chara species	Submergent	X	X
Decodon verticillatus	Whirled loosestrife	Emergent	X	X
Elodea canadensis	Common water weed	Submergent		X
Filamentous algae	Filamentous algae	Algae	X	X
Heteranthera dubia	Water star grass	Submergent		X
Myriophyllum exalbescens	Northern watermilfoil	Submergent		X
Myriophyllum spicatum	Eurasian watermilfoil	Submergent	X	X
Najas guadalupensis	Southern naiad	Submergent	X	X
Najos minor	Brittle naiad	Submergent	X	
Nuphar advena	Spatterdock	Floating	X	X
Numphaea tuberosa	White water lily	Floating	X	X
Phalaris arundinacea	Reed canary grass	Emergent	X	X
Potamogeton amplifolius	Large-leaf pondweed	Submergent	X	X
Potamogeton crispus	Curly leaf pondweed	Submergent	X	
Potamogeton gramineus	Grassy pondweed	Submergent	X	X
Potamogeton illinoensis	Illinois pondweed	Submergent	X	X
Potamogeton pectinatus	Sago pondweed	Submergent	X	X
Potamogeton praelongus	White-stem pondweed	Submergent	X	X
Potamogeton zosteriformis	Flat-stem pondweed	Submergent	X	X
Scirpus acutus	Hard-stem bulrush	Emergent	X	X
Scirpus pungens	Chairmaker's rush	Emergent	X	X
Typha angustifolia	Narrow leafed cattail	Emergent	X	X
Typha latifolia	Broad leafed cattail	Emergent	X	X
Vallisneria americana	Eel grass	Submergent	X	X

Summer Assessment

As in the spring survey, JFNew biologists identified Eurasian watermilfoil as a dominant species. Coontail was also a dominant species identified during the summer survey. Eurasian watermilfoil density decreased from spring to summer. Dense areas of Eurasian watermilfoil were identified in along the shoreline in the western basin, most of the shoreline in the central part of the lake, and on the north and eastern shoreline of the eastern basin. In total, Eurasian watermilfoil was identified in

a total of 82 acres of Koontz Lake during the summer survey. No curly-leaf pondweed was found in Koontz Lake during the summer survey. No endangered, threatened, or rare species were identified within Koontz Lake during the summer assessment.

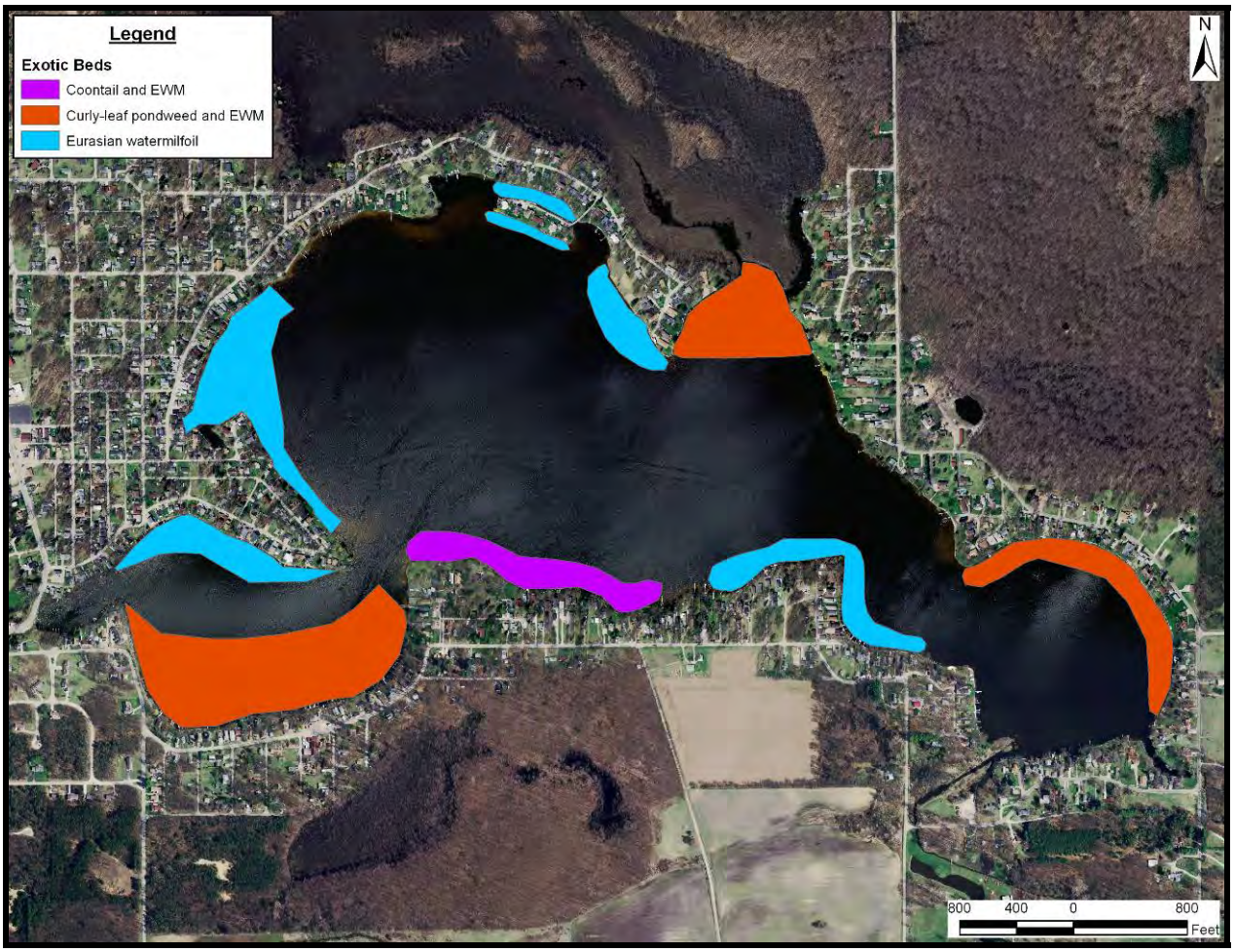


Figure 16. Eurasian watermilfoil, curly-leaf pondweed, and coontail locations in Koontz Lake.

8.2.2 Tier II

Two Tier II surveys were completed in Koontz Lake in order to document changes in the plant community throughout the growing season. The Tier II surveys were completed on May 27, 2008 (spring) and on August 29, 2008 (summer). The raw dataset is included in Appendix B.

Transparency was measured at the deepest spot in the lake using a Secchi disk prior to both sampling events. Transparency was found to be 7.1 (2.2 m) feet during the spring and 4.0 feet (1.2 m) during the summer survey. Other than transparency, no other observations were made or samples collected for water quality. Based on the survey protocol, plants were sampled to a depth of 20 feet. However, plants were only present to a maximum depth of 15 feet during the spring survey and at 14 feet during the summer survey. Seventy sites were randomly selected within the littoral zone based on the stratification indicated in the protocol. Results of the sampling are listed in Appendix C.

During the spring survey, Eurasian watermilfoil dominated the plant community over all depths (0-20 feet; Table 6). This species was found at the highest percentage of sites throughout the entire sampled water column (33%). Throughout the entire sampled water column, white-stem pondweed, curly-leaf pondweed, and chara were relatively dense and were found at 20%, 19%, and 17% of sites, respectively (Appendix C). Chara dominated the shallowest stratum (0-5 foot) and was identified at 58% of sites in this stratum. Eurasian watermilfoil and large-leaf pondweed possessed the highest dominance (16.8) and were found at 53% and 32% of the sites in this stratum, respectfully. White-stem pondweed, sago pondweed, curly-leaf pondweed, and southern naiad were also prevalent in the 0-5 foot stratum and were present at 47%, 37%, 26%, and 21% of the sample sites. In deeper water, Eurasian watermilfoil maintained its frequency; however, it was only present at 53% of sites in the 5-10 foot stratum and 18% of sites in the 10-15 foot stratum. There was no Eurasian watermilfoil identified in the 15-20 foot stratum. Eurasian watermilfoil's density increased with dominance of 23.1 in the 5-10 foot stratum and decreased with dominance of 3.5 at 10-15 foot stratum. Curly-leaf pondweed also increased with dominance of 9.5 in the 5-10 foot stratum and decreased with dominance of 1.1 in the 10-15 foot stratum. White-stem pondweed, sago pondweed, and southern naiad decreased in frequency and density with increasing depths. Figures 17-19 document sampling locations (Figure 17) and sites where Eurasian watermilfoil (Figure 18) and curly-leaf pondweed (Figure 19) were identified during the spring survey.

Table 6. Spring Tier II survey metrics and results for entire lake strata as collected May 27, 2008.

Occurrence and abundance of submersed aquatic plants in Koontz Lake.					
County:	Marshall/Starke	Sites with plants:	33	Mean species/site:	1.4
Date:	5/27/2008	Sites with native plants:	28	Standard error (ms/s):	0.21
Secchi (ft):	7.1	Number of species:	12	Mean native species/site:	0.89
Maximum plant depth (ft):	15	Number of native species:	10	Standard error (mns/s):	0.16
Trophic status:	Mesotrophic	Maximum species/site:	6	Species diversity:	0.87
Total sites:	70			Native species diversity:	0.85

All depths (0-20 feet)		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Myriophyllum spicatum	Eurasian watermilfoil	32.86	67.14	22.86	7.14	2.86	11.71
Potamogeton praelongus	White-stem pondweed	20.00	80.00	18.57	1.43	0.00	4.57
Potamogeton crispus	Curly-leaf pondweed	18.57	81.43	15.71	2.86	0.00	4.86
Chara species	Chara species	17.14	82.86	15.71	1.43	0.00	4.00
Stuckenia pectinatus	Sago pondweed	11.43	88.57	11.43	0.00	0.00	2.29
Potamogeton amplifolius	Large-leaf pondweed	11.43	88.57	7.14	1.43	2.86	5.14
Ceratophyllum demersum	Coontail	11.43	88.57	11.43	0.00	0.00	2.29
Najas guadalupensis	Southern naiad	5.71	94.29	5.71	0.00	0.00	1.14
Vallisneria americana	Eel grass	4.29	95.71	4.29	0.00	0.00	0.86
Potamogeton zosteriformis	Flat-stem pondweed	2.86	97.14	2.86	0.00	0.00	0.57
Potamogeton illinoensis	Illinois pondweed	2.86	97.14	2.86	0.00	0.00	0.57
Potamogeton gramineus	Grassy pondweed	1.43	98.57	1.43	0.00	0.00	0.29
Filamentous algae	Filamentous algae	65.71					

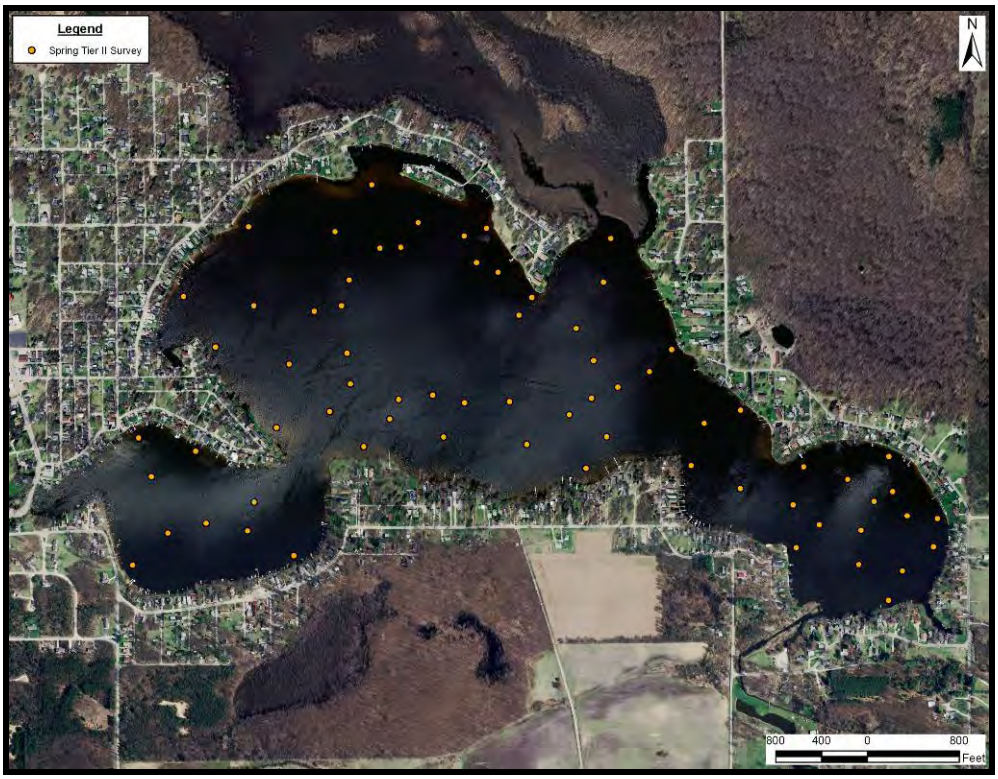


Figure 17. Sampling locations for the May 27, 2008 Tier II Survey at Koontz Lake.

Figure 18. Koontz Lake Eurasian watermilfoil locations and densities as surveyed May 27, 2008.

Figure 19. Koontz Lake curly-leaf pondweed locations and densities as surveyed May 27, 2008.

During the summer survey, JFNew biologists observed that coontail was the most abundant species in Koontz Lake (Table 7). Coontail was found at the highest percentage of sites throughout the entire sampled water column (24%). Eurasian watermilfoil was identified at only 14% of the sites throughout the entire sampled water column, but had the highest dominance of 12.6. Coontail had the second highest dominance of 4.9. Sago pondweed dominated the shallowest stratum (0-5 foot) and was identified at 46% of the sites in this stratum (Appendix C). Southern naiad, chara, eel grass, and coontail were also prevalent in the 0-5 foot stratum and were all present at 38.5% of the sample sites. Coontail was present at 36% of sites in the 5-10 foot stratum, 13% of sites in the 10-15 foot stratum, and none of the sites in the 15-20 foot stratum. Coontail's density decreased as well with a dominance of 7.7 at 0-5 foot, 7.1 at 5-10 foot and 2.7 at 10-15 foot. Southern naiad, sago pondweed, chara, and eel grass decreased in frequency and dominance from the 0-5 foot to the 5-10 foot stratum, as well as from the 5-10 to 10-15 foot stratum. None of these species were found in the 15-20 foot stratum. Eurasian watermilfoil was present at 39% of sites in the 0-5 foot stratum, 14% of sites in the 5-10 foot stratum, and 6.7% of sites in the 10-15 foot stratum. Dominance of Eurasian watermilfoil decreased from the 0-5 foot to the 5-10 foot strata measuring 32.3 and 12.9, respectfully. Curly-leaf pondweed was absent from all depths in Koontz Lake during the summer survey. Figures 20-21 document sampling locations (Figure 20) and sites where Eurasian watermilfoil (Figure 21) was identified during the summer survey.

Table 7. Summer Tier II survey metrics and results for entire lake strata as collected August 29, 2008.

Occurrence and abundance of submersed aquatic plants in Koontz Lake.					
County:	Marshall/Starke	Sites with plants:	32	Mean species/site:	1.21
Date:	8/29/2008	Sites with native plants:	32	Standard error (ms/s):	0.21
Secchi (ft):	4	Number of species:	14	Mean native species/site:	1.07
Maximum plant depth (ft):	14	Number of native species:	13	Standard error (mns/s):	0.18
Trophic status:	Mesotrophic	Maximum species/site:	7	Species diversity:	0.89
Total sites:	70			Native species diversity:	0.88

All depths (0-20 ft)		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Ceratophyllum demersum	Coontail	24.29	75.71	24.29	0.00	0.00	4.86
Myriophyllum spicatum	Eurasian watermilfoil	14.29	85.71	1.43	1.43	11.43	12.57
Stuckenia pectinatus	Sago pondweed	12.86	87.14	12.86	0.00	0.00	2.57
Najas guadalupensis	Southern naiad	11.43	88.57	11.43	0.00	0.00	2.29
Chara species	Chara species	11.43	88.57	11.43	0.00	0.00	2.29
Vallisneria americana	Eel grass	11.43	88.57	10.00	1.43	0.00	2.86
Potamogeton praelongus	White-stem pondweed	11.43	88.57	8.57	1.43	1.43	4.00
Potamogeton zosteriformes	Flat-stem pondweed	7.14	92.86	7.14	0.00	0.00	1.43
Potamogeton gramineus	Grassy pondweed	5.71	94.29	5.71	0.00	0.00	1.14
Elodea canadensis	Common elodea	4.29	95.71	4.29	0.00	0.00	0.86
Myriophyllum exacbescens	Northern watermilfoil	2.86	97.14	2.86	0.00	0.00	0.57
Potamogeton illinoiensis	Illinois pondweed	1.43	98.57	1.43	0.00	0.00	0.29
Potamogeton ampifolius	Large-leaf pondweed	1.43	98.57	1.43	0.00	0.00	0.29
Heteranthera dubia	Water star grass	1.43	98.57	1.43	0.00	0.00	0.29
Filamentous algae	Filamentous algae	74.29					

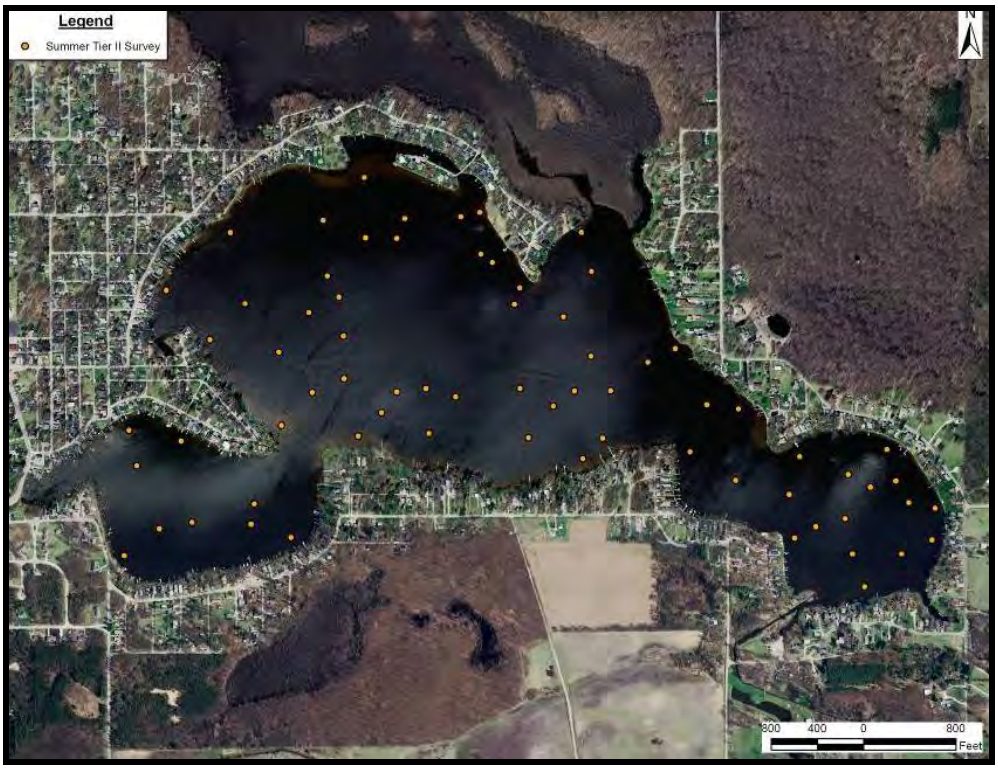


Figure 20. Sampling locations for the August 29, 2008 Tier II Survey at Koontz Lake.

Figure 21. Koontz Lake Eurasian watermilfoil locations and densities as surveyed August 29, 2008.

When recently collected data is compared with data collected by Pearson (2004), Koontz Lake possessed greater rake diversity, but lower species richness than the lakes surveyed by Pearson (Table 8). Koontz Lake possessed 12 to 14 species during the spring and summer surveys, while Pearson collected only eight species on average. Koontz Lake also possessed more native species (10 and 13 compared to Pearson's 7).

Table 8. A comparison of the aquatic plant community in Koontz Lake with the average values for plant community metrics found by Pearson (2004) in his survey of 21 northern Indiana lakes.

	Spring (5/27/08)	Summer (8/29/08)	Indiana Average (2004)
Percentage of littoral sites containing plants	80	46	-
Number of species collected	12	14	8
Number of native species collected	10	13	7
Rake Diversity (SDI)	0.87	0.89	0.62
Native Rake Diversity (SDI)	0.85	0.88	0.5
Species Richness (Avg # species/site)	1.4	1.21	1.61
Native Species Richness	0.89	1.07	1.33
Site Species Native diversity	0.21	0.21	0.56

Aquatic Vegetation Sampling Discussion

The primary focus of an aquatic vegetation management plan is to document changes within the aquatic plant community throughout the growing season, to document changes in the aquatic plant community over a number of years, and to develop plans for future work. Eurasian watermilfoil was found at more sites during the spring survey (32.9% compared to 14.3% during summer). Similarly, curly-leaf pondweed was not identified during the summer survey compared to 18.6% of sites during the spring survey. Additionally, common elodea, northern watermilfoil, and water star grass were identified during the summer survey. None of these species were present during the spring survey.

8.3 Macrophyte Inventory Discussion

Considering the number of spatial variables that impact the plant community, such as boat-traffic and changes in nutrient availability, or temporal variables such as climactic conditions, we cannot easily summarize the cause and effect for changes in plant community within in Koontz Lake. Still, general trends emerge from the one year's data that are useful for the purpose of management decisions. Table 9 details changes in the site frequency, relative and mean density and dominance of Eurasian watermilfoil and curly-leaf pondweed in 2008 within Koontz Lake.

Table 9. Variation in site frequency and dominance of Eurasian watermilfoil and curly-leaf pondweed within Koontz Lake in 2008.

Common Name	Date	Site Frequency	Dominance
Eurasian watermilfoil	5/27/08	32.9	11.7
	8/29/08	14.3	12.6
Curly-leaf pondweed	5/27/08	18.6	4.9
	8/29/08	--	--

These data serve as a baseline by which future variations in the plant community can be compared. Additionally, these data should allow for some determination of future changes in the plant community due to herbicide treatment or other factors (i.e. climate).

As mentioned previously, the peak growth of curly-leaf pondweed occurs in April or early May. It's disappearance due to die-back may spur growth of other species; die-back will contribute to internal nutrient loading, whereby the dead plant materials release nutrients back in to the water for use by other aquatic vegetation, including exotic species. Continued growth of Eurasian watermilfoil has the obvious impact of shading out other native species and preventing their beneficial nature of providing habitat for fish and other organisms. However, the abundance of coontail observed during the spring and summer surveys can also reduce the growth of other native species. If whole-lake treatment were to occur, the Eurasian watermilfoil and curly-leaf pondweed would be knocked back as would some native species. The following year little Eurasian watermilfoil is likely to be present, but curly-leaf pondweed would need additional early season control as would high-traffic areas.

9.0 Aquatic Vegetation Management Alternatives

Koontz Lake contains a variety of aquatic plant species and a moderately diverse aquatic plant community. The plants present in the lake are representative of the water quality present in Koontz Lake. However, the presence of Eurasian watermilfoil and curly-leaf pondweed are of concern. These four actions will also be listed in the Koontz Lake Watershed Management Plan:

1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality, and is resistant to minor habitat disturbances and invasive species.
2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species by reducing Eurasian watermilfoil to below 10% frequency of occurrence and by reducing curly-leaf pondweed to below 10% occurrence in spring surveys.
3. Provide reasonable public recreational access while minimizing the negative impacts on plant, fish, and wildlife resources.
4. Implement nutrient management reduction plan.

Koontz Lake's Aquatic Plant Management plan should incorporate these four objectives. However, the KLA should not limit their plant management efforts without first exploring all of the options available to them in regards to aquatic plant management at Koontz Lake. A good aquatic plant management plan includes a variety of management techniques applicable to different parts of a lake depending on the lake's water quality, the characteristics of the plant community in different parts of the lake, and lake users' goals for different parts of the lake. Many aquatic plant management techniques, including chemical control, harvesting, and biological control, require a permit from the IDNR. Depending on the size and location of the treatment area, even individual residents may need a permit to conduct a treatment. Residents should contact the IDNR Division of Fish and Wildlife before conducting any treatment.

The following paragraphs describe some aquatic plant management techniques that may be applicable to Koontz Lake, given its specific ecological condition. The alternatives that will be discussed include no action, institutional protection, environmental manipulation, nutrient reduction, mechanical harvesting, bottom covers, biological control, chemical control, and preventive measures.

9.1 No Action

As discussed in **Section 7.0 Plant Management History** from 2004 to 2008, a total of 212.36 acres of exotic aquatic vegetation was permitted for treatment through individual lake residents' efforts at Koontz Lake. With no change in treatment type or methodology, these individuals will likely continue to treat aquatic plants separately without coordination. This will result in limited control of exotic and/or nuisance species. Additionally, Eurasian watermilfoil and curly-leaf pondweed will likely continue to spread throughout Koontz Lake. Without any action, these species could continue to grow unchecked throughout the 3 basins resulting in a species population that is at a minimum the same size or larger than that observed during the 2008 surveys. This will result in a decrease in native plant density and diversity, the formation of a monoculture of exotic species, such as Eurasian watermilfoil, and a loss of the moderate quality species observed in Koontz Lake. Additionally, the growth of these nuisance species could increase nutrient cycling within Koontz Lake thereby making more nutrients available to plants and algae ultimately resulting in a decline in the lake's water quality.

9.2 Institutional Protection of Beneficial Vegetation

Invasive species often colonize disturbed areas first before moving to other areas of the lake. The protection of native and/or beneficial aquatic vegetation can prevent the growth of exotic or nuisance species. This can be accomplished in two ways: limiting user impacts to beneficial plants due to boating or recreational uses and not over-treating beneficial plant beds. Users can restrict the use of specific areas of Koontz Lake through the use of buoys or the establishment of user zones. The second methodology, over-treating native plant beds, could be a concern in Koontz Lake in the future. This issue occurs when a beneficial, native plant bed is deemed to be nuisance and treatment of this area begins. Once the native plant community is weakened through treatment, exotic species can move into these areas colonizing open sediment. Once a foothold is established, the aggressive, exotic species can then out-compete native varieties. As aquatic plant treatment at Koontz Lake has not occurred on a large-scale before, this has likely not been an issue in the past, but could be an outcome of whole-lake treatment, although an unlikely one. Additionally, as intact natural and modified natural plant communities exist along portions of the Koontz Lake shoreline (Figure 7), efforts should be made to protect these areas and maintain natural shoreline and submerged vegetation, if possible. With this in mind, the Koontz Lake Association should be aware of this issue and tailor their treatment efforts to not impact beneficial native species.

9.3 Environmental Manipulation

Environmental manipulation often refers to water-level based changes refer to manipulating the lake's water level to control vegetation. This occurs by raising water levels resulting in drowning the plants or lowering the water level to freeze or heat the aquatic plant community. This type of treatment is limited to lakes where water levels are easily manipulated. Koontz Lake's water control structure does not offer ease of water-level manipulation. Additionally, using this methodology could result in negative impacts to Koontz Lake's plant community. However, coordinating the anticipated move of the dam and State Road 23 in September 2009 with lake drawdown, fish management involving rotenone could benefit the lake's fisheries. This action would remove carp that can uproot aquatic vegetation and increase lake turbidity. Carp removed could remove lake clarity and reduce disturbance to native plant species.

9.4 Nutrient Reduction

Like terrestrial vegetation, aquatic vegetation has several habitat requirements that need to be satisfied in order for the plants to grow or thrive. Aquatic plants depend on sunlight as an energy source. The amount of sunlight available to plants decreases with depth of water as algae, sediment, and other suspended particles block light penetration. Consequently, most aquatic plants are limited to maximum water depths of approximately 10-15 feet (3-4.5 m), but some species, such as Eurasian watermilfoil, have a greater tolerance for lower light levels and can grow in water deeper than 32 feet (10 m) (Aiken et al., 1979). Hydrostatic pressure rather than light often limits plant growth at deeper water depth (15-20 feet or 4.5-6 m).

Water clarity affects the ability of sunlight to reach plants, even those rooted in shallow water. Lakes with clearer water have an increased potential for plant growth. In the spring, Koontz Lake possesses better water clarity than the average Indiana lake. The Secchi disk depth measured during the plant survey was 7.1 feet (2.2 m) in the spring and 4 feet (1.2 m) in the summer. As a general rule of thumb, rooted plant growth is restricted to the portion of the lake where water depth is less than or equal to 2 to 3 times the lake's Secchi disk depth. This holds mostly true in Koontz Lake,

where rooted plants were observed in water to a depth of approximately 25 feet (7.6 m), which is about two times the lake's average Secchi disk depth.

Aquatic plants also require a steady source of nutrients for survival. Many aquatic macrophytes differ from microscopic algae (which are also plants) in their uptake of nutrients. Aquatic macrophytes receive most of their nutrients from the sediments via their root systems rather than directly utilizing nutrients in the surrounding water column. Some competition with algae for nutrients in the water column does occur. The amount of nutrients taken from the water column varies for each macrophyte species. Because macrophytes obtain most of their nutrients from the sediments, lakes which receive high watershed inputs of nutrients to the water column will not necessarily have aquatic macrophyte problems. However, lakes with large sources of readily-available nutrients (phosphorus and nitrogen), typically contain higher density aquatic plant communities. Reductions in nutrients can both increase and decrease aquatic plant density. Increases in plant density occur due to improved water clarity, which often results in more plant growth. Koontz Lake contains relatively low nutrient levels and therefore would be expected to contain a low density aquatic plant community. However, good light penetration and a reservoir of nutrients provide a relatively dense and very diverse community. The reduction of nutrient inputs to Koontz Lake will likely not alter the aquatic plant community as a whole. Rather, localized effects of the nutrient reduction will likely occur in the areas of the lake closest to the change in nutrient resources. A detailed list of recommendations targeting nutrient reduction within Koontz Lake is included in the **Integrated Management Action Strategy Section**.

9.5 Mechanical Harvesting

Harvesting involves the physical removal of vegetation from lakes. Harvesting should also be viewed as a short-term management strategy. Like chemical control, harvesting needs to be repeated yearly and sometimes several times within the same year. (Some carry-over from the previous year has occurred in certain lakes.) Despite this, harvesting is often an attractive management technique because it can provide lake users with immediate access to areas and activities that have been affected by excessive plant growth. Mechanical harvesting is also beneficial in situations where removal of plant biomass will improve a lake's water chemistry. (Chemical control leaves dead plant biomass in the lake to decay and consume valuable oxygen.)

Macrophyte response to harvesting often depends upon the species of plant and particular way in which the management technique is performed. Pondweeds, which rely on sexual reproduction for propagation, can be managed successfully through harvesting. However, many harvested plants, especially milfoil, can re-root or reproduce vegetatively from the cut pieces left in the water. Plants harvested several times during the growing season, especially late in the season, often grow more slowly the following season (Cooke et al., 1993). Harvesting plants at their roots is usually more effective than harvesting higher up on their stems (Olem and Flock, 1990). This is especially true with Eurasian watermilfoil and curly-leaf pondweed. Benefits are also derived if the cut plants and the nutrients they contain are removed from the lake. Harvested vegetation that is cut and left in the lake ultimately decomposes, contributing nutrients and consuming oxygen.

Hand harvesting is recommended in small areas where human uses are hampered by extensive growths (docks, piers, beaches, boat ramps). In these small areas, plants can be efficiently cut and removed from the lake with hand cutters such as the Aqua Weed Cutter (Figure 22). In less than one hour every 2-3 weeks, a homeowner can harvest 'weeds' from along docks and piers.

Depending on the model, hand-harvesting equipment for smaller areas cost from $50 to $1500 (McComas, 1993). To reduce the cost, several homeowners can invest together in such a cutter. Alternatively, a lake association may purchase one for its members. This sharing has worked on other Indiana lakes with aquatic plant problems. Use of a hand harvester is more efficient and quick-acting, and less toxic for small areas than spot herbicide treatments. Hand harvesting or using a boat-mounted mechanical harvester to harvest vegetation covering areas larger than 625 square feet requires a permit from the IDNR Division of Fish and Wildlife. (The IDNR Division of Fish & Wildlife can assist lake residents in determining whether a permit is needed and how to obtain one.)

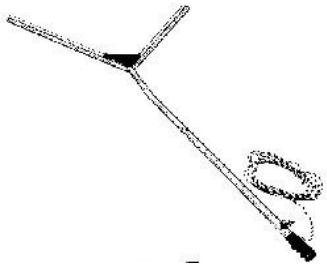


Figure 22. An aquatic weed cutter designed to cut emergent weeds along the edge of ponds. It has a 48" cutting width, uses heavy-duty stainless steel blades, can be sharpened, and comes with an attached 20' rope and blade covers.

9.6 Bottom Covers

Bottom shading by covering bottom sediments with fiberglass or plastic sheeting materials provides a physical barrier to macrophyte growth. Buoyancy and permeability are key characteristics of the various sheeting materials. Buoyant materials (polyethylene and polypropylene) are generally more difficult to apply and must be weighted down. Unfortunately, sand or gravel anchors used to hold buoyant materials in place can act as substrate for new macrophyte growth. Any bottom cover materials placed on the lake bottom must be permeable to allow gases to escape from the sediments; gas escape holes must be cut in impermeable liners. Commercially available sheets made of fiberglass-coated screen, coated polypropylene, and synthetic rubber are non-buoyant and allow gases to escape, but cost more (up to $66,000 per acre or $163,000 per hectare for materials, Cooke and Kennedy, 1989). Indiana regulations specifically prohibit the use of bottom covering material as a base for beaches.

Due to the prohibitive cost of the sheeting materials, sediment covering is recommended for only small portions of lakes, such as around docks, beaches, or boat mooring areas. This technique may be ineffective in areas of high sedimentation, since sediment accumulated on the sheeting material provides a substrate for macrophyte growth. The IDNR requires a permit for any permanent structure on the lake bottom, including anchored sheeting.

9.7 Biological Control

Biological control involves the use of one species to control another species. Often when a plant species that is native to another part of the world is introduced to a new region with suitable habitat, it grows rapidly because its native predators have not been introduced to the new region along with the plant species. This is the case with some of the common pest plants in northeast Indiana such

as Eurasian watermilfoil and purple loosestrife. Neither of these species is native to Indiana, yet both exist in and around Starke and Marshall Counties.

Researchers have studied the ability of various insect species to control both Eurasian watermilfoil and purple loosestrife. Cooke et al. (1993) point to four different species that may reduce Eurasian watermilfoil infestations: *Triaenodes tarda*, a caddisfly, *Cricotopus myriophylii*, a midge, *Acentria nivea*, a moth and *Litodactylus leucogaster*, a weevil. Recent research efforts have focused on the potential for *Euhrychiopsis lecontei*, a native weevil, to control Eurasian watermilfoil. Purple loosestrife biocontrol researchers have examined the potential for three insects, *Gallerucella calmariensis, G. pusilla*, and *Hylobius transversovittatus,* to control the plant.

While the population of purple loosestrife on Koontz Lake is relatively small and therefore may not be suitable for biological control efforts, it may be worthwhile for Koontz Lake residents to understand the common biocontrol mechanisms for this species should the situation on the lake change. Likewise, as Eurasian watermilfoil is present in Koontz Lake, residents should be cognizant of infestation issues and biocontrol mechanisms for Eurasian watermilfoil. Therefore, treatment options for the plant are discussed below merely as reference material for use in case of future infestation. Residents should also be aware that under new regulations an IDNR permit is required for the implementation of a biological control program on a lake.

9.7.1 Biological Control of Eurasian Watermilfoil

Euhrychiopsis lecontei has been implicated in a reduction of Eurasian watermilfoil in several Northeastern and Midwestern lakes (USEPA, 1997). *E. lecontei* weevils reduce milfoil biomass by two means: one, both adult and larval stages of the weevil eat different portions of the plant and two, tunneling by weevil larvae cause the plant to lose buoyancy and collapse, limiting its ability to reach sunlight. The weevils' actions also cut off the flow of carbohydrates to the plant's root crowns impairing the plant's ability to store carbohydrates for over wintering (Madsen, 2000). Techniques for rearing and releasing the weevil in lakes have been developed and under appropriate conditions, use of the weevil has produced good results in reducing Eurasian watermilfoil. A nine-year study of nine southeastern Wisconsin lakes suggested that weevil activity might have contributed to Eurasian watermilfoil declines in the lakes (Helsel et al, 1999).

Cost effectiveness and environmental safety are among the advantages to using the weevil rather than traditional herbicides in controlling Eurasian watermilfoil (Christina Brant, EnviroScience, personal communication). Cost advantages include the weevil's low maintenance and long-term effectiveness versus the annual application of an herbicide. In addition, use of the weevil does not have use restrictions that are required with some chemical herbicides. Use of the weevil has a few drawbacks. The most important one to note is that reductions in Eurasian watermilfoil are seen over the course of several years in contrast to the immediate response seen with traditional herbicides. Therefore, lake residents need to be patient. Additionally, the weevils require natural shorelines for over-wintering.

The Indiana Department of Natural Resources released *E. lecontei* weevils in three Indiana lakes to evaluate the effectiveness of utilizing the weevils to control Eurasian watermilfoil in Indiana lakes. The results of this study were inconclusive (Scribailo and Alix, 2003), and the IDNR considers the use of the weevils on Indiana lakes an unproven technique and only experimental (Rich, 2005). If future infestation of Eurasian watermilfoil should occur, Koontz Lake residents should take the lack

of proven usefulness in Indiana lakes into consideration before attempting treatment of the lake's Eurasian watermilfoil with the *E. lecontei* weevils.

9.7.2 Biological Control of Purple Loosestrife

Biological control may also be possible for inhibiting the growth and spread of the emergent purple loosestrife. Like Eurasian watermilfoil, purple loosestrife is an aggressive non-native species. Once purple loosestrife becomes established in an area, the species will readily spread and take over the shallow water and moist soil environment, excluding many of the native species which are more valuable to wildlife. Conventional control methods including mowing, herbicide applications, and prescribed burning have been unsuccessful in controlling purple loosestrife.

Some control has been achieved through the use of several insects. A pilot project in Ontario, Canada reported a decrease of 95% of the purple loosestrife population from the pretreatment population (Cornell Cooperative Extension, 1996). Four different insects were utilized to achieve this control. These insects have been identified as natural predators of purple loosestrife in its native habitat. Two of the insects specialize on the leaves, defoliating a plant (*Gallerucella calmariensis* and *G. pusilla*); one specializes on the flower, while one eats the roots of the plant (*Hylobius transversovittatus*). Insect releases in Indiana to date have had mixed results. After six years, the loosestrife of Fish Lake in LaPorte County is showing signs of deterioration.

Like biological control of Eurasian watermilfoil, use of purple loosestrife predators offers a cost-effective means for achieving long-term control of the plant. Complete eradication of the plant cannot be achieved through use of a biological control. Insect (predator) populations will follow the plant (prey) populations. As the population of the plant decreases, so will the population of the insect since their food source is decreasing.

9.8 Chemical Control

Herbicides are the most traditional means of controlling aquatic vegetation. No recorded herbicide control occurred within Koontz Lake (Starke County) before 2004. As explained in **Section 7.0 Plant Management History**, herbicides have been used recently on Koontz Lake. Residents have likely conducted their own spot treatments around piers and swimming areas, and therefore it is important for residents to remember that any chemical herbicide treatment program should always be developed with the help of a certified applicator who is familiar with the water chemistry of the target lake. In addition, application of a chemical herbicide may require a permit from the IDNR, depending on the size and location of the treatment area. Information on permit requirements is available from the IDNR Division of Fish and Wildlife or conservation officers.

There are two major disadvantages associated with chemical control of aquatic plants. The primary concern associated with chemical use is user concerns regarding safety. Chemicals undergo rigorous testing prior to licensing. Testing is completed by the USEPA with the final registration occurring within each state. All herbicides are required to result in low toxicity to humans and wildlife and to not persist or bioaccumulate within the environment. Secondarily, users are often concerned due to water use restriction. Restrictions must be posted prior to treatment and can be in the form of irrigation or full body contact. Finally, nutrient releases can occur due to the large volume of dying plant material. This disadvantage can be controlled through correct timing of aquatic plant treatment.

Herbicides vary in their specificity to given plants, method of application, residence time in the water, and the use restrictions for the water during and after treatments. Herbicides occur in two forms: contact and systemic. There are three primary contact herbicides used for controlling submerged aquatic vegetation: diquat (trade name Reward), endothal (trade name Aquathol), and copper-based formulations (trade names Komeen, Clearigate, and Nautique). Contact herbicides are effective for controlling submerged vegetation on the short term. Such herbicides have historically lacked selectivity resulting in the killing non-target plants and sometimes even fish species in a lake. However, recent research suggests that some contact herbicides can be effective for the control of exotic species with relatively minor effects on native species (Skogerboe and Getsinger, 2002). Additionally, it should be noted that the timing and dosage of contact herbicides can improve their selectivity and control. Reward is the typical contact herbicide used for mid-season treatment. Diquat or other copper-based contact herbicides are fast-acting and, based on this; these herbicides are typically used to control nuisance vegetation around docks or in high-use areas. However, plants can recover quickly from treatments of these herbicides; recovery can occur as quickly as four to eight weeks after treatment.

Systemic herbicides are those that work within the system of the plant itself. These herbicides are transported to the root system resulting in killing the entire plant. The three most common systemic herbicides used for the control of Eurasian watermilfoil are fluridone (trade name Sonar or Avast!), 2,4-D (trade name Aqua-Kleen, DMA4, or Navigate), and triclopyr (trade name Renovate). (Additionally, imazapyr, glyphosate, and triclopyr can be used for the control of purple loosestrife.) Fluridone is typically recommended for whole lake treatment of Eurasian watermilfoil and curly-leaf pondweed due to the lower tolerance of these species to fluridone compared with other aquatic plant species. Smith (2002) noted control of Eurasian watermilfoil to the point of limited detectability following whole-lake treatment with fluridone. Additionally, most Eurasian watermilfoil strains have a lower tolerance to fluridone than most other aquatic plant species; therefore, if fluridone is properly applied, control of Eurasian watermilfoil can occur with little harm to native species (AERF, 2005).

Triclopyr and 2,4-D are typically used for spot treatment of small areas of broad-leaf plants (dicots) like coontail, watermilfoil, and waterweed. Treatment with triclopyr is a good option if Eurasian watermilfoil populations are not dense or abundant. Treatment using triclopyr must be aggressive in order to result in adequate Eurasian watermilfoil control. Neither chemical affects monocots such as eel grass or pondweeds and are not effective in the control of curly-leaf pondweed. 2,4-D is a cheaper alternative than triclopyr; however, 2,4-D can impact other native species like coontail.

While providing a short-term fix to the nuisances caused by aquatic vegetation, chemical control is not a lake restoration technique. Herbicide and algaecide treatments do not address the reasons why there is an aquatic plant problem, and treatments need to be repeated each year to obtain the desired control. In addition, some studies have shown that long-term use of copper sulfate (algaecide) has negatively impacted some lake ecosystems. Such impacts include an increase in sediment toxicity, increased tolerance of some algal species, including some blue-green (nuisance) species, to copper sulfate, increased internal cycling of nutrients, and some negative impacts on fish and other members of the food chain (Hanson and Stefan, 1984 cited in Olem and Flock, 1990).

Chemical treatment should be used with caution on Koontz Lake since treated plants are often left to decay in the water. This will contribute nutrients to the lake's water column. Additionally, plants

left to decay in the water column will consume oxygen. The in-lake sampling conducted in the past showed that Koontz Lake possesses relatively low nutrient concentrations compared to many Indiana lakes. Nonetheless, as evidenced during the plant survey, the lake's total phosphorus concentration is high enough to support filamentous algae and, based on the Tier II surveys, the lake experiences extensive algal blooms. The plankton community present in Koontz Lake further reflects this issue in that the community is dominated by blue-green algae. Furthermore, the blue-green algae that comprised the largest portion of the plankton community have been known to cause taste, odor, and toxicity problems in other lakes. Chemical treatment is likely the best way to control growth and spread of Eurasian watermilfoil in Koontz Lake, and whole-lake treatment is likely the best means of treating the exotics based on history of treatment and extent of growth. The whole-lake treatment is likely not to prevent algal blooms, but instead cause the algae to bloom closer to the lake bottom since the treated plants would not be present to provide a surface upon which to allow algal reproduction. Treatment of algae is very difficult, costly, and requires repeat treatment throughout the growing season.

Treatment with either fluridone or triclopyr does require restrictions with respect to swimming, boating or fishing. Treatment with 2,4-D requires restrictions on swimming for one day post-treatment. No immediate adverse impacts to fish or macroinvertebrates are anticipated with the proposed rate of application.

9.9 Preventive Measures

Preventive measures are necessary to curb the spread of nuisance aquatic vegetation. Although milfoil is thought to 'hitchhike' on the feet and feathers of waterfowl as they move from infected to uninfected waters, the greatest threat of spreading this invasive plant is humans. Plant fragments snag on boat motors and trailers as boats are hauled out of lakes (Figure 23). Milfoil, for example, can survive for up to a week in this state; it can then infect a milfoil-free lake when the boat and trailer are launched next. It is important to educate boaters to clean their boats and trailers of all plant fragments each time they retrieve them from a lake. The Stop Aquatic Hitchhikers! campaign offers information on the prevention of spreading exotic invasive species. Visit their website at for more information: www.protectyourwaters.net

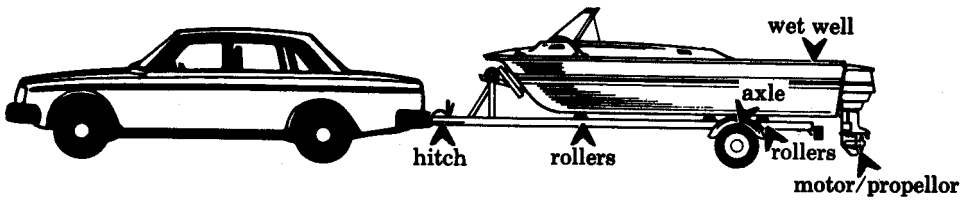


Figure 23. Locations where aquatic plants are often found on boats and trailers.

Educational programs are effective ways to manage and prevent the spread of aquatic nuisance species (ANS) such as Eurasian watermilfoil, zebra mussels, and others. Of particular help are signs at boat launch ramps asking boaters to check their boats and trailers both before launching and after retrieval. All plants should be removed and disposed of in refuse containers where they cannot make their way back into the lake. The Illinois-Indiana Sea Grant Program has examples of boat ramp signs and other educational materials that can be used at Koontz Lake. Eurasian watermilfoil is present in Koontz Lake and other area lakes; therefore, educational programs and lake signage will help prevent the spread of this nuisance species into other parts of the lake or into other area lakes.

This is particularly important given the popularity of Koontz Lake. Non-resident anglers and other visitors will use their boats in other lakes in addition to Koontz Lake, potentially spreading Eurasian watermilfoil to uninfested lakes. Signs addressing any best management practices to prevent the spread of nuisance aquatic species will ultimately help protect all lakes as new nuisance (often non-native) species are finding their way to Indiana lakes all the time.

10.0 Public Involvement

The public meeting for the aquatic plant management plan occurred on September 13, 2008, and 47 people attended. There is a high level of concern about aquatic vegetation in the lake and the turnout to discuss the issue and other lake issues was good for a lake of this size. During this meeting, the aquatic plant management program and specifics regarding the plant surveys and results were discussed. Results from the surveys were discussed and a lake user survey was administered at the time of the meeting. Additionally, the outline of future activities associated with aquatic plant treatment within Koontz Lake was presented. A majority of attendants representing Koontz Lake indicated that aquatic plant control in the future was both necessary and beneficial. Additional details regarding the user survey are included in the **Lake Uses Section**.

The LARE biologist, district fisheries biologist, association representative, and JFNew representatives met November 6, 2008 to discuss the 2008 aquatic plant treatment and identify aquatic plant treatment options for 2009. JFNew biologists identified nearly 82 acres of Eurasian watermilfoil and 42 acres of curly-leaf pondweed that are recommended for treatment in 2009. Based on cost estimates, the KLA has agreed that it would be more effective to treat the whole lake next rather than doing spot treatments in the lake in 2009. If funding for a whole-lake treatment is granted to the KLA, they will continue to monitor change in the aquatic plant community over the next few seasons and will pursue exotic species control if either Eurasian watermilfoil or curly-leaf pondweed populations increase in their coverage of the lake after initial treatment.

The Koontz Lake Association is also proceeding through a watershed management planning process that calls for two more public meetings. These meetings and additional steering committee meetings will develop the goals and objectives to meet water quality in Koontz Lake. As part of the plan KLA will also complete a water quality diagnostic study.

11.0 Public Education

Future public education efforts associated with the Koontz Lake Aquatic Plant Management Plan follow efforts that will be identified in the Koontz Lake Watershed Management Plan scheduled to be completed in 2009. In addition, the KLA intends to provide information at their next annual meeting (early summer 2009) regarding aquatic vegetation treatment and types of chemicals used for exotic aquatic plant control.

Additionally, education efforts targeting information about Indiana's newest aquatic species of concern hydrilla, which was identified in Lake Manitou (Fulton County) in 2006. Hydrilla is an extremely aggressive submerged aquatic plant species that looks similar to common elodea. The basic difference is the number of leaves: hydrilla contains five leaves while common elodea only contains three leaves. Appendix D contains more detailed information on hydrilla, its habitat, and its distribution. Efforts to education individuals on the control, spread, and issues associated with this and other exotic species should follow the Stop Aquatic Hitchhikers! Campaign which can be found at www.protectyourwaters.net. At a minimum, the KLA should post warnings and send information to Koontz Lake residents about this plant.

Finally, the KLA should inform their members of exotic and invasive species concerns through their newsletter and at regularly scheduled meetings held throughout the summer at their clubhouse, at monthly board meetings, and at summer Koontz Lake community events.

12.0 Integrated Management Action Strategy

The focus of the action strategy should be to meet the four goals that were mentioned earlier. These are as follows:

1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality, and is resistant to minor habitat disturbances and invasive species.
2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species by reducing Eurasian watermilfoil to below 10% frequency of occurrence and by reducing curly-leaf pondweed to below 10% occurrence in spring surveys.
3. Provide reasonable public recreational access while minimizing the negative impacts on plant, fish, and wildlife resources.
4. Implement nutrient management reduction plan.

Each goal, along with objectives to meet this goal, is listed below. Following each objective are the actions which should be taken in order to achieve the objective. The strategy for goal 2 is long-term, whereby a 5-year approach is taken, and in addition, two long-term options are described.

12.1 Goal 1: Maintain a stable and diverse aquatic plant community.

The focus of the first goal is on the development and maintenance of a stable, diverse aquatic plant community. To meet this goal, the KLA should focus both on the emergent plant community and on the submerged plant community as both of these combine to create the aquatic plant community currently present within Koontz Lake.

Objective 1: Maintain the diversity of the rooted floating and emergent portions of the aquatic plant community.

Koontz Lake's moderate rooted plant diversity and moderate quality plant species should be protected. The typical community displayed in Figure 24 details the density and diversity that is present in the lake. (Figure 8 details locations around the lake where natural and modified natural shoreline is present.) The low density and diversity of the shallow water, emergent plant community allows shoreline erosion and sediment suspension; increases the ability for nuisance waterfowl to enter and exit the water onto the shoreline; does not provide habitat and cover for fish, frogs, birds, and other wildlife; and filters some nutrients that enter the lake from the lakeshore. Management techniques that are not species specific, or targeted to control the exotic aquatic species, should be avoided to ensure the protection of the community. Additionally, Koontz Lake residents may wish to consider re-establishing portions of the emergent plant community that previously existed in the lake.

Figure 24. Typical emergent and rooted floating plant community present in Koontz Lake.

Koontz Lake residents should be aware of purple loosestrife and reed canary grass. Both of these species are introduced from Eurasia and spread rapidly through prolific seed production, vegetative growth, and cultivation. Without individual control, both species can spread along the lakeshore inhibiting boat mooring and individual access to the lake. The LARE program does not provide funding for the control of either of these species at this time. Nonetheless, residents should become familiar with these plants and methods for their control. The two easiest ways to control the spread of both species is through hand pulling or digging and the application of herbicides. Removal of these species and restoration of the shoreline would return many of the functions provided by healthy riparian areas. Landowners should replace these plants with native species that provide equal or better quality aesthetics and are more useful to birds, butterflies, and other wildlife as habitat and a food source. Reed canary grass should be replaced with switch grass, Indian grass, or even big blue stem depending on the landowner's desired landscaping. Swamp blazing star, swamp milkweed, cardinal flower, blue-flag iris, or blue lobelia all offer more habitat and aesthetic variety than that offered by purple loosestrife. A mixture of these species will also allow for colorful blooms throughout the growing season.

Objective 2: Maintain the density and diversity of the submerged portion of the aquatic plant community.
Koontz Lake's aquatic plant community is moderately diverse. The lake's submerged community contained 14 species at the time of the study, 6 of which were pondweeds. The variety of submerged plant species present in Koontz Lake provides fish cover and habitat for macroinvertebrates, amphibians, and reptiles; filters nutrients; and increases the aesthetic conditions present in Koontz Lake. Lake residents and users should become aware of the quality of their aquatic plant community and should limit the control or removal of the native populations of submerged aquatic plants. Native species should be controlled only in those locations where the density of aquatic plants limits the aesthetic value or negatively impacts lake use. Control of native communities should be limited in shallow areas or around docks; treatment should only occur if there are difficulties in maneuvering boats to and from docks or other shoreline structures.

12.2 Goal 2: Reduce negative impacts from exotic and/or invasive species.
The focus of the second goal is on reducing the negative impacts from aquatic exotic or invasive species. This goal can be accomplished by reducing the density and coverage of current populations of exotic and/or invasive species and preventing the introduction of new species and the spread of current species to areas of the lake where exotic, invasive species are currently not present. Goal 2 builds on the objectives detailed in Goal 1 in that efforts to reach Goal 2 will assist the KLA in reaching Goal 1.

Objective 1: Reduce Eurasian watermilfoil to below 10% frequency of occurrence
Eurasian watermilfoil is present in relatively high density along most of the shoreline in Koontz Lake. In order to prevent the continued spread of Eurasian watermilfoil to other locations within the lake, a control program should be enacted. Eurasian watermilfoil reproduces through fragmentation and can rapidly spread to other areas of the lake and can reach nuisance levels. This species can displace native vegetation and has a tendency to form dense canopies that shade out native vegetation.

In order to control Eurasian watermilfoil within Koontz Lake, the use of fluridone is recommended for a whole-lake treatment. Whole-lake treatment in Koontz Lake would cost up to $90,000, and is the preferred option. Follow-up treatment of this species in 2010 would not be required due to whole-lake treatment's likely success, but in years 2011 through 2013, spot treatment costing approximately $5,000/year would be required.

Another option for treating Eurasian watermilfoil is application of 2,4-D or triclopyr at specific sites around the lake. Approximately, 82 acres of Eurasian watermilfoil were identified during the Tier II survey and plant community survey in 2008. Treating 82 acres of Eurasian watermilfoil at $500/acre would cost a maximum of approximately $41,000. Subsequent years' treatment from 2010 to 2013 would likely cost $20,000 per year, then $10,000, and finally $5,000 per year thereafter.

In order to aid in the control of Eurasian watermilfoil, lake residents and users should be educated as to their impact on the spread of the plant. Furthermore, boaters should avoid locations identified in Figure 14 so as to minimize the transport of Eurasian watermilfoil around the lake. Eurasian watermilfoil spreads through fragmentation, which allows one small piece of Eurasian watermilfoil to colonize other areas of the lake. It is very important that boaters avoid driving through areas of the lake currently infested with Eurasian watermilfoil as this can chop the plant thereby creating fragments. These fragments can then be carried to other areas on boat propellers or float to other

areas of the lake. It is also important the boaters remove all plant fragments from their boat propeller and trailer before traveling from lake to lake. If signs are currently not posted at the boat ramp detailing the need to clean boats and trailers, then signs should be posted warning boats to check their equipment for plant fragments.

Objective 2: Reduce curly-leaf pondweed to below 10% occurrence in spring surveys
Treatment of curly-leaf pondweed through the LARE program has typically been limited to those lakes where infestations cover large percentages of the water's surface area. Curly-leaf pondweed typically senesces during the height of the recreational season, which is one reason that treatment of this species is not always of high priority. However, curly-leaf pondweed can be a nuisance and control should be initiated as part of the long-term strategy to protect and improve the native submerged plant community. Curly-leaf pondweed is currently found in quite a few areas covering approximately 42 acres of Koontz Lake.

One option includes application of Aquathol K as spot treatments at these areas and should occur over several consecutive summers to reduce the growth of the plant and production of turions, which can last for multiple seasons after treatment. Cost for first year treatment using Aquathol K ranges from $250-$350/acre making the total cost for the early season treatment $10,625-$14,875/year. The herbicide would be applied at a concentration of 1.0 ppm in the treatment areas and in the early spring prior to production of turions. Treatments should be completed once the water reaches a consistent 50 degrees. This treatment will likely need to be completed for 3 to 4 consecutive years in order to deplete the turion supply. In subsequent years (2010-2012), treatment area would be reduced.

The other option includes whole-lake treatment, and along with effectively treating Eurasian watermilfoil, this option would treat curly-leaf pondweed if completed early enough in the season. The cost for whole-lake treatment as mentioned before is approximately $90,000 and would target both exotic species. Follow-up treatment of curly-leaf pondweed for the next 3 to 4 years would be required at a cost of approximately $15,000/year. Whole-lake treatment for Koontz Lake would be the most effective course of action for 2009. Whether treatment occurs in 2009 or is delayed until the KLA can obtain funding, the KLA should educate their residents and lake users regarding the effects of curly-leaf pondweed.

Objective 3: Prevent the spread of purple loosestrife and reed canary grass.
Both purple loosestrife and reed canary grass can be detrimental to native shoreline and wetland species. Currently, control of these species is not funded through the LARE program. Nonetheless, if either of these species is present on an individual property, then the species should be removed through hand pulling and removal of the root structure. Removal should occur prior to the plants flowering.

Objective 4: Educate lake users and shoreline owners about the impacts of exotic and invasive species.
Currently, Indiana is home to five aquatic exotic, invasive species: Eurasian watermilfoil, curly-leaf pondweed, Brazilian elodea, hydrilla, and parrot feather. To date, hydrilla has only been identified in Lake Manitou in Rochester, Indiana. Brazilian elodea has been found in Griffy Lake in Bloomington, Indiana and a number of private ponds in Southern Indiana. Parrot Feather (*Myriophyllum aquaticum*) has recently been discovered in Meserve Lake, Steuben County. In order to prevent the spread of this and other exotic species, lake users should be educated regarding the

potential impacts of these species and the threat of their spread. All five species spread by fragmentation allowing them to colonize from one area to another within a lake and from lake to lake. Therefore, it is imperative that users remove all plant fragments from boats and trailers when entering and exiting lakes. Posting signs at the boat ramp will help reinforce this effort. The KLA should include information about hydrilla, Brazilian elodea, parrot feather, Eurasian watermilfoil, and curly-leaf pondweed in their newsletters. In addition to their spread by boats and boat trailers, invasive species are also known to be spread by transplanting backyard pond plants and dumping aquaria into lakes. Educational information about these and other exotic species can be found at the Stop Aquatic Hitchhikers! website (www.protectyourlake.net).

12.3 Goal 3: Provide reasonable recreational access while minimizing the negative impacts on plants, fish, and wildlife resources.

This goal focuses on the control of exotic species for recreational purposes; however, the control of a limited number of native species may also be necessary to meet reasonable recreational access goals. Koontz Lake is primarily a low-impact recreation lake where swimming, fishing, and pleasure boating are high priority. In order to maintain and improve the aesthetic and ecological quality for which Koontz Lake is known, it may be necessary to forego some recreational access.

Objective 1: Allow boat access through the control of aquatic vegetation around boat docks.

Native species proliferate in many areas of Koontz Lake. If allowed to continue to grow, these plants may begin to restrict shoreline owner access to the lake from their dock. In these areas, hand removal or spot chemical treatment of plants should be implemented. Up to 625 square feet of vegetation can be removed from an individual shoreline without a permit. Removal of aquatic vegetation should be limited in Koontz Lake to only those areas where boat access is necessary. This typically measures 20 to 30 feet. Additionally, aquatic plants should not be treated farther than 100 feet from the lakeshore. No extraneous removal of aquatic vegetation is recommended at this time. If plants are removed from the lake by hand, they should not be left along the shoreline to desiccate. Rather, plants should be removed from the lakeshore and deposited in compost piles, gardens, or bagged for removal. If hand-pulling is not an option, residents should contact a certified aquatic applicator to implement treatment.

Goal 4: Implement Nutrient Management Reduction Plan

The following list summarizes the recommendations for maintaining and improving Koontz Lake's chemical, biological, and physical condition. Each of the following recommendations should be implemented and will help improve Koontz Lake's water quality. The list is prioritized based on the current ecological conditions of Koontz Lake and its watershed. These conditions may change as land and lake use change requiring a change in the order of prioritization. Watershed stakeholders may also wish to prioritize these management recommendations differently to accommodate specific needs or desired uses of the lake. It is important for watershed stakeholders to know that action need not be taken in this order. Some of the smaller, less expensive recommendations, such as the individual property owner recommendations, may be implemented while funds are being raised to implement some of the larger projects. Many of the larger projects will require feasibility studies to ensure landowner willingness to participate in the project and regulatory approval of the project.

1. Stabilize actively eroding streams (Lawrence Pontius Ditch) by reducing the volume and velocity of water moving through the streams. Consider the cleaning the current sediment traps located on the Lawrence Pontius Ditch.

2. Implement individual property owner management techniques. These apply to all watershed property owners rather than simply those who live immediately adjacent to Koontz Lake.
    a. Reduce the frequency and amount of fertilizer and herbicide/pesticide used for lawn care.
    b. Use only phosphorus-free fertilizer. (This means that the middle number on the fertilizer package listing the nutrient ratio, nitrogen:phosphorus:potassium is 0.)
    c. Consider re-landscaping lawn edges, particularly those along the watershed's lakes and streams, to include low profile prairie species that are capable of filtering runoff water better than turf grass.
    d. Consider planting native emergent vegetation along shorelines or in front of existing seawalls to provide fish and invertebrate habitat and dampen wave energy. Additionally, consider replacing or refacing concrete seawalls with glacial stone seawalls.
    e. Keep organic debris like lawn clippings, leaves, and animal waste out of the water.
    f. Examine all drains that lead from roads, driveways, or rooftops to the watershed's lakes and/or streams; consider alternate routes for these drains that would filter pollutants before they reach the water. Stabilize bare drainage ditches with vegetation where possible or rock where flow rates are too high for vegetation.
    g. Obey no-wake zones.
    h. Clean boat propellers after lake use and refrain from dumping bait buckets into the lake to prevent the spread of exotic species.

3. Restore wetland habitat within the Koontz Lake watershed where feasible.

4. Monitor and improve erosion control techniques on residential and commercial development sites. Bring areas of concern to the attention of the appropriate authorities such as the Starke County and Marshall County SWCD.

5. Construct a wastewater treatment system to treat the human waste stream from residences near the lake.

6. Increase usage of the Conservation Reserve Program in the Koontz Lake watershed particularly on land mapped in highly erodible soils.

7. Implement stormwater filtration projects including assessment of the number of storm drains adjacent to the lake and determining pollutant loads for each.

The KLA can address these items in their Watershed Management Plan.

13.0 Action Plan

The purpose of the LARE grant is to fund surveys and aquatic vegetation control on public lakes. Listed below, in order of importance, are recommended actions in order to meet the goals and objectives of the aquatic vegetation management plan. Some of these actions may be funded by LARE, but many will require participation by the lake residents, Koontz Lake Association and the Koontz Lake Aquatic Control Committee.

The short-term goal (1-2 years) is to reduce Eurasian watermilfoil to less than 10% of Tier II sample sites during the spring and summer surveys. The long-term goal for the species is to maintain Eurasian watermilfoil below 10% littoral zone coverage during subsequent spring and summer surveys. The short-term goal for curly-leaf pondweed is to reduce its occurrence to less than 10% of the Tier II sample points in spring surveys. The long-term goal for curly-leaf pondweed is to maintain its occurrence to below 10% littoral zone coverage in spring surveys. To meet these short- and long-term goals the following actions should be taken.

1. **Complete a whole-lake fluridone treatment on Koontz Lake in the spring of 2009.** This treatment should effectively control Eurasian watermilfoil and control curly-leaf pondweed in 2009. Low doses of fluridone should be applied in order to reduce damage to the less susceptible native species. The fluridone treatment would include an initial application of 5 ppb in total volume above thermocline (if established at treatment date) or 5 ppb total lake volume if no thermocline is established. FasTEST samples will be collected at 5 sites with first sample 2-3 days after application then at 14, 21, 42, 60, 90, and 120 days after initial application. An initial bump will be scheduled at 21 days with calculated doses to bring residue to 5 ppb. The residue will be maintained between 2 to 4 ppb with bumps as required and with a dose sufficient to bring residue to 4 ppb after first bump through 90-120 days or until target plants are satisfactorily controlled. The 5 ppb rate of application versus an application rate of 6 or 8 ppb reduces the potential for unacceptable damage to the whitestem pondweed.

   Another option given funding availability is spot treat of 82 acres of Eurasian watermilfoil in 2009 with 2,4-D or triclopyr with subsequent treatment from 2010-2013. In addition, spot treat 42 acres of curly-leaf pondweed with Aquathol K (1.0 ppm) for 2009 with 4 years of subsequent treatment would be required to control this exotic species. Treatments should be completed in the early season, or once water reaches a consistent 50 degree.

2. **Monitor plant community with plant surveys for next five years in order to assess the effectiveness of controls and response of native plant community.** Plant surveys will also be invaluable to quickly detect and control potential re-infestation of Eurasian watermilfoil. Surveys should consist of a spring invasive mapping survey and a summer Tier II survey. These surveys should be continued through 2013. If funding for curly-leaf pondweed is obtained then early spring Tier II surveys should be initiated in order to assess the long-term effectiveness of the curly-leaf treatments. The short-term goal is to reduce Eurasian watermifoil

3. **Initiate a curly-leaf pondweed treatment program in 2010 following whole-lake treatment.** This program would follow whole-lake treatment in 2009 and should include treatments with 1.0 ppm of Aquathol K herbicide. Treatments should be completed in the

early season, or once water reaches a consistent 50 degree. Early season treatments will help reduce turion production, cause little harm to native vegetation, and limit the severity of the nutrient release typically caused by natural summer curly-leaf die-off. Treatments should be continued for a minimum of three seasons. Herbicide should be applied to the same area each season.

4. **Post signs at access sites warning boaters of the potential for invasive plant species introductions from boat trailers.** Signs should implore boaters to clean trailers, props, and boats of all vegetation fragments when entering and leaving Kuntz Lake. Information concerning the potential spread of Eurasian watermilfoil and hydrilla should be distributed to all Association members and lake users.

5. **Take steps to improve water quality in Koontz Lake**. These potential actions should be outlined in the Watershed Management Plan. Improved water quality should allow an increase in diversity and abundance of native vegetation and decrease the rate of re-infestation by invasive species.

6. **Maintain dock areas with physical plant removal when possible or by contracting professional applicators**. Treatments should not exceed 100 feet from shoreline for submersed vegetation and treatment of rooted floating vegetation should be limited to boating lanes.

14.0 Project Budget

Table 10 contains **estimated** budgets for the aquatic vegetation management action plan for Koontz Lake. The action plan includes two options based on the level of funding provided through the LARE program. The first option includes whole-lake treatment with fluridone. Costs for aquatic plant assessment and treatment in 2009 are as follows:

- Whole-lake Fluridone treatment is expected to cost up to $90,000.
- Standard LARE assessment, public meeting, and plan update costs are based on 2007 LARE requirements (pre-treatment exotic species distribution survey; one post-treatment Tier II survey; public meeting; plan update). Assessment costs are estimated to total $2,500, while the meetings and plan update are anticipated to occur at a cost of $5,000 for a total cost of $7,500.

Total fees for 2009 aquatic plant assessment, herbicide application, and plan update are estimated at $97,500. The KLA would be able to contribute 10% or $9,750 of the 2009 total whole-lake treatment budget. A permit for this treatment option is included in Appendix E. This permit should be submitted by the association and, once a contractor is selected for the treatment, the permit can be completed. The estimated budget for years 2010 through 2013 include spot treatment for Eurasian watermilfoil and curly-leaf pondweed and plan updates. Treatment for Eurasian watermilfoil would skip 2010 and continue in 2011 through 2013 at a cost of $5,000 per year. Treatment for curly-leaf pondweed would continue from 2010 through 2012 at a cost of $15,000 per year. The line item in Table 10 for native plant spot treatment would be pursued at the discretion of individuals who had received permits and costs would be borne by them.

Table 10. Budget estimate for the whole-lake treatment action plan.

Task	2009	2010	2011	2012	2013
Whole Lake Fluridone Treatment	$90,000	-	-	-	-
Eurasian watermilfoil spot treatments	-	-	$5,000	$5,000	$5,000
Early season curly-leaf pondweed application	-	$15,000	$15,000	$15,000	-
High-use native spot treatment	-	$5,000	$5,000	$5,000	$5,000
Plant sampling and plan updates	$7,500	$7,500	$7,500	$7,500	$7,500
Total:	**$97,500**	**$27,500**	**$32,500**	**$32,500**	**$17,500**

The second option includes spot treatment for Eurasian watermilfoil and curly-leaf pondweed. Approximately 82 acres of Eurasian watermilfoil would be controlled by applying 2,4-D or triclopyr at sites shown in Figure 14 and in Appendix E. The curly-leaf pond weed control would include the use of Aquathol (1ppm) over approximately 42 acres. Figure 16 and Appendix E indicate the location of this plant in Koontz Lake. Table 11 provides the 5-year budget estimate for the action plan if spot treatment of Eurasian watermilfoil and curly-leaf pondweed were to occur. Costs for aquatic plant assessment and treatment in 2009 are as follows:

- Spot treatment for Eurasian watermilfoil and curly-leaf pondweed is expected to cost up to $54,875.
- Standard LARE assessment, public meeting, and plan update costs are based on 2007 LARE requirements (pre-treatment exotic species distribution survey; one post-treatment Tier II

survey; public meeting; plan update). Assessment costs are estimated to total $2,500, while the meetings and plan update are anticipated to occur at a cost of $5,000 for a total cost of $7,500.

Total fees for 2009 aquatic plant assessment, herbicide application, and plan update are estimated at $62,375. Should the KLA be awarded LARE funding, they would bank the award, because LARE caps grants at $20,000 for spot treatment, and the lake association would not be able to fund the remaining $42,375 2009 budget. A permit for this treatment option is included in Appendix E. The estimated budget for years 2010 through 2013 include spot treatment for Eurasian watermilfoil and curly-leaf pondweed and plan updates.

Table 11. Budget estimate for the spot treatment action plan.

Task	2009	2010	2011	2012	2013
Eurasian watermilfoil spot treatments (82 ac)	$41,000	$20,000	$10,000	$5,000	$5,000
Early season curly-leaf pondweed application (42 ac)	$14,875	$15,000	$15,000	$15,000	-
High-use native spot treatment	-	$5,000	$5,000	$5,000	$5,000
Plant sampling and plan updates	$7,500	$7,500	$7,500	$7,500	$7,500
Total:	**$62,375**	**$47,500**	**$37,500**	**$32,500**	**$17,500**

If the state does issue the grant for the fluridone treatment, the lake association cannot afford the fluridone treatment nor can it afford spot treatment. Instead individuals are likely to seek their own permits for treatment, and consequently pay for it by themselves. Based on past years of treatment, permits requesting about 40 acres of treatment would be submitted.

The KLA is also interested in treatment of algal blooms in their lake. Estimates of $2,000 to $3,000 were provided for treatment knowing that treatment of filamentous algae is very difficult and likely more costly than indicated. LARE does not fund treatment of algae and therefore an estimated budget is not provided.

The Koontz Lake Association prefers whole-lake treatment for several reasons. First, over the years individuals have initiated individual treatment of exotic vegetation within the lake. Coordination of these efforts has not occurred, various applicators have been used and there has never been a cohesive plan to address the problem from a whole-lake perspective. Figure 15 provides documentation of this spot treatment indicating that an average of 42 acres per year from 2004 to 2008 was treated. The lake residents are not satisfied with the results of spot treatment and are seeking another means of dealing with the exotic plant problem in their lake. A coordinated whole-lake treatment would provide the type of control they are interested in. Second, the KLA is in a position to contribute funds to whole-lake treatment, but would have to bank any funds awarded for spot treatment. The KLACC, which is a committee of KLA, has been charged with dealing with the aquatic vegetation problem in the lake, and if they bank the money for future years, the KLA board and the lake residents will feel that KLACC efforts, though worthy, were needless. Lastly, while the spot treatment option includes a greater number of acres compared to the acreage treated in the past, whole-lake treatment is likely to achieve greater success at less cost, since all areas of exotics would be treated The initial cost would be higher than a spot treatment with a selective systemic herbicide like 2,4-D or triclopyr, but this expense will likely be made up in the following years when little to no milfoil control is required. Another advantage of the fluridone application would be the

fact that curly-leaf pondweed is also susceptible to fluridone and would not reach nuisance levels in 2009. If fluridone is applied early enough in the year, this treatment can help reduce turion (curly-leaf reproductive structures) production for that season. Chemical treatment is likely the best way to control growth and spread of Eurasian watermilfoil and curly-leaf pondweed in Koontz Lake, and whole-lake treatment is likely the best means of treating the exotics based on history of treatment and extent of growth. With these reasons in mind, the whole-lake treatment is the preferred option.

A schedule for pursuing the permits and LARE grants, and for hiring a contractor is as follows. Items that are highlighted are those that KLA are responsible for. Most importantly, after the grant is awarded, KLA should seek bids from certified applicators, discuss those with LARE and finalize the applicator:

- **KLA submits DRAFT Aquatic Management Plan - 12/15/08 (completed)**
- **KLA submits treatment permit applications to DNR – Winter (completed)**
- **KLA submits LARE grant applications – January 15 (completed)**
- DNR reviews AVMPs and provides comments – mid-Feb (completed)
- Consultant finalizes AVMP based on comments and submits – March 1(completed)
- LARE awards grant – mid-March
- **KLA selects a certified applicator after reviewing bids with LARE- ASAP**
- DNR reviews permit applications
- DNR sends approved permit application to organization
- **KLA gives a copy of approved permit to applicator**
- **KLA sends the applicators name, certification # and contact number to DNR**
- **KLA ensures plant survey conducted before treatment**
- **KLA ensures applicator provides treatment report to DNR**
- **KLA ensures post-treatment plant survey completed**

15.0 Monitoring and Plan Update Procedures

Monitoring shall follow procedures determined by the LARE program. Likewise, plan updates will conform to LARE requirements. This includes, but is not limited to: early season assessment and treatment for curly-leaf pondweed, post-treatment surveys, exotic species map development, and public meeting and outreach. This will allow for continued monitoring of the aquatic plant community within Koontz Lake, which in one of the primary goals of the LARE aquatic plant management planning program. Additionally, continued monitoring will allow for the determination of the effectiveness of control methods, identify changes in the native plant community, and detect the extent of known and future exotic species infestations. Each year's data should be analyzed and used to revise or update this plan and implantation strategy which may subsequently lead to changes in the initial recommendations in this plan.

16.0 References Cited

Aikens, S.A. P.R. Newroth, and I. Wile. 1979. The biology of Canadian weeds, 34 *Myriophyllum spicatum*. L. Can. J. Plant Sci. 59:201-215.

Allen, Marvin. 2008. A History of Koontz Lake. Starke County Historian.

Aquatic Ecosystem Restoration Foundation (AERF). 2005. Aquatic Plant Management: Best management practices in support of fish and wildlife habitat.

Brindza, N. 2001. Koontz Lake, Starke-Marshall Counties: Fish Management Report 2000. Indiana Department of Natural Resources, Indianapolis, Indiana.

Cooke, G.D., and R.H. Kennedy. 1989. Water Quality Management for Reservoirs and Tailwaters. Report 1. In-lake Reservoir Water Quality Management Techniques. Tech. Rep. E-89-1. U.S. Army Corps of Engineers. Vicksburg, Mississippi.

Cooke, G.D., E.B. Welch, S.A. Peterson and P.R. Newroth. 1993. Restoration and Management of Lakes and Reservoirs, Second Edition. Lewis Publishers, Boca Raton.

Cornell Cooperative Extension. 1996. Video- "Restoring the Balance: Biological Control of Purple Loosestrife". Cornell University Media Services, Ithaca, New York.

Cross, T. K., M. C. McInherny, and R. A. Davis. 1992. Macrophyte removal to enhance bluegill, largemouth bass and northern pike populations. Section of Technical Services Investigational Report 415. Minnesota Department of Natural Resources, Division of Fish and Game, St. Paul, MN.

DeLorme. 1998. Indiana Atlas and Gazetteer.

Earth Source, Inc. 1988. The Cultural Eutrophication of Koontz Lake.

Hanson, M.J. and H.G. Stefan. 1984. Side effects of 58 year of copper sulfate treatment of the Fairmont Lakes, Minnesota. Water Res. Bull. 20:889-900.

Helsel, D.R., S.A. Nichols and R.S. Wakeman. 1999. Impact of aquatic plant management methods on Eurasian watermilfoil populations in southeast Wisconsin. J. Lake and Reserv. Mgmt., 15(2): 159-167.

Indiana Department of Natural Resources. 1955. Koontz Lake, Starke County bathymetric map. Indiana Department of Natural Resources, Division of Water, Indianapolis, Indiana.

Indiana Department of Natural Resources. 2007. Tier II Aquatic Vegetation Survey Protocol. May 2007 Update. Indiana Department of Natural Resources, Division of Fish and Wildlife, Indianapolis, Indiana.

Indiana Spatial Data Portal. 2005 Orthophotography. Starke County, Indiana. Aerial flown spring 2005.

Kohler, Christopher C. and Wayne A Hubert, ed. Inland Fisheries Management in North America. 2nd ed. Bethesda, Maryland, 1999. Section 7.

Madsen, J.D. 2000. Advantages and disadvantages of aquatic plant management. LakeLine, 20(1):22-34.

McComas, S. 1993. Lake Smarts. The Terrene Institute, Washington, D. C. 215 pp.

Olem, H. and G. Flock, eds. 1990. Lake and Reservoir restoration guidance manual. 2nd edition. EPA 440/4-90-006. Prepared by NALMS for USEPA, Washington, D.C.

Olsen, M. H., S. R. Carpenter, P. Cunningham, S. Gafny, B. R. Herwig, N. P. Nibbelink, T. Pellett, C. Storlie, A. S. Trebitz, and K. A. Wilson. 1998. Managing macrophytes to improve fish growth: a multi-lake experiment. Fisheries 23:6-12.

Pearson, J. 2004. A sampling method to assess occurrence, abundance and distribution of submersed aquatic plants in Indiana lakes. Indiana Department of Natural Resources, Division of Fish and Wildlife, Indianapolis, Indiana.

Rich, C.F. 2005. Correspondence with JFNew regarding the Four Lakes Diagnostic Study dated June 17, 2005.

Robertson, B. 1969. Koontz Lake, Starke-Marshall Counties: Fish Management Report. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1973. Koontz Lake, Starke-Marshall Counties: Fish Management Report. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1974. Koontz Lake, Starke-Marshall Counties: Fish Management Report. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1975. Koontz Lake, Starke-Marshall Counties: Fish Management Report. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1977. Koontz Lake, Starke-Marshall Counties: Fish Management Report 1977. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1979. Koontz Lake, Starke-Marshall Counties: Fish Management Report 1979. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1984. Koontz Lake, Starke-Marshall Counties: Fish Management Report 1983. Indiana Department of Natural Resources, Indianapolis, Indiana.

Robertson, B. 1995. "Impacts of Largemouth Bass on Bluegill abundance, size structure and growth at Koontz Lake, 1994." Indiana Department of Natural Resources, Indianapolis, Indiana.

Scribailo, R.W. and M.S. Alix. 2003. Final report on the weevil release study for Indiana lakes. Indiana Department of Natural Resources, Division of Soil Conservation, Indianapolis, Indiana.

Skogerboe, J.G. and K.D. Getsinger. 2002. Endothall species selectivity evaluation: northern latitude aquatic plant community. Journal of Aquatic Plant Management, 40: 1-5.

Smith, C.S. 2002. Houghton Lake management feasibility study. Prepared for the Houghton Lake Improvement Board. Remetrix LLC, Indianapolis, Indiana.

Snell Environmental Group, Inc. 1999. Diagnostic Study of Koontz Lake, Indiana, Draft Report. October 1999.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago region. 4th Edition. Indianapolis: Indiana Academy of Science.

Turner, D. 1967. Koontz Lake, Starke-Marshall Counties: Lake Survey Report 1965. Indiana Department of Natural Resources, Indianapolis, Indiana.

United States Environmental Protection Agency. 1997. Use of aquatic weevils to control a nuisance weed in Lake Bomoseen, Vermont. Watershed Protection: Clean Lakes Case Study. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA 841-F-97-002.

Valley, R. D., T. K. Cross, and P. Radomski. 2004. The role of submersed aquatic vegetation as habitat for fish in Minnesota lakes, including implications of non-native plant invasions and their management. Special Publication 160. Minnesota Department of Natural Resources, Division of Fish and Wildlife, St. Paul, MN.

Wagner, K.J. 1991. Assessing the impacts of motorized watercraft on lakes: Issues and perceptions. pp: 77-93. In: Proceedings of a National Conference on Enhancing States' Lake Management Programs, May 1990. Northeastern Illinois Planning Commission, Chicago, Illinois.

APPENDIX A:

LAKE USER SURVEY RESULTS

KOONTZ LAKE
AQUATIC PLANT MANAGEMENT PLAN 2008-2012

Lake Use Survey Results: September 13, 2008
43 Respondents

Lake Name: Koontz Lake (2008)

Are you a lake property owner? Yes 91% No 7%

Are you currently a member of your lake association? Yes 88% No 7%

How many years have you been at the lake? <2 yrs 2% 2 – 5 yrs 9% 5-10 yrs 21%
> 10 years 67%

How do you use the lake (mark all that apply)
84% Swimming 19% Irrigation
93% Boating 0% Drinking water
70% Fishing 2% Other – Real estate sell

Do you have aquatic plants at your shoreline in nuisance quantities? Yes 67% No 28%

Do you currently participate in a weed control project on the lake? Yes 65% No 26%

Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes 84% No 12%

Does the level of vegetation in the lake affect your property values? Yes 79% No 9%

Are you in favor of continuing efforts to control vegetation on the lake? Yes 98% 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 67% No 16%

Mark any of these you think are problems on your lake:
16% Too many boats access the lake
44% Use of jet skis on the lake
7% Too much fishing
26% Fish population problem
91% Dredging needed
12% Overuse by nonresidents
77% Too many aquatic plants
0% Not enough aquatic plants
58% Poor water quality
23% Pier/funneling problem

APPENDIX B:

TIER II SURVEY RAW DATA

KOONTZ LAKE
AQUATIC PLANT MANAGEMENT PLAN 2008-2012

Koontz Lake spring Tier II survey raw data as collected May 27, 2008.

DEPTH	FILALG	CERDEM	CHARA	MYRSPI	NAJGUA	POTAMP	POTCRI	POTGRA	POTILL	POTPEC	POTPRA	POTZOS	VALAME	X_COOR	Y_COOR
2			1							1				543637.04	4585421.48
2	p			1		1				1		1		545022.16	4584337.25
2			1							1		1		543694.23	4584709.48
3			3			1					1			543423.41	4584762.38
3			1		1					1			1	543938.53	4585331.35
3			1							1				544061.30	4585149.52
3	p					5	1				3			544776.61	4584677.98
3	p			1		5	1		1		1			544492.95	4584682.58
4		1	1	1										543008.48	4584751.51
4	p		1	1	1				1	1	1			543243.14	4584979.95
4	p	1	1	1							1		1	544242.00	4585295.31
4	p			1		3	1				1			545140.80	4584558.87
4	p		1	1	1					1	1			544210.11	4584688.80
4				5			1							543441.07	4584466.99
5			1	3										543041.89	4584394.85
5											1			544447.15	4584988.79
5			1		1								1	544619.65	4584847.37
5	p			1		1	3				1			545019.32	4584710.80
5	p													545137.70	4584476.51
6	p		1	3										543154.56	4584729.75
6	p			1										543309.13	4585319.69
6	p	1		5			1							544233.45	4585178.75
7	p	1		3			1							543149.06	4585121.55
7	p					1	3				1			544778.51	4584463.85
8	p			1			1				1			543333.28	4585091.85
8	p			1										545067.23	4584407.18
8	p						1	1		1	1			544269.17	4584747.85
8		1		3			1				1			543544.88	4584837.97
8	p													543322.96	4584526.04
9	p			1										543986.70	4585193.04
9	p													545011.55	4584622.22
9	p			1		1								544639.81	4584639.85
9	p													543195.53	4584532.26
10	p													543024.02	4584636.51
10	p	1		3			1				1			543565.55	4585309.59
10	p													543885.69	4585322.02
10	p													544513.98	4584803.86
10	p													543827.87	4584761.54
11	p													544381.88	4584929.74
12	p	1		1										543485.58	4585079.41

DEPTH	FILALG	CERDEM	CHARA	MYRSPI	NAJGUA	POTAMP	POTCRI	POTGRA	POTILL	POTPEC	POTPRA	POTZOS	VALAME	X_COOR	Y_COOR
12	p													543780.01	4585328.24
12														543932.31	4585225.67
12	p													545067.76	4584555.76
12	p			1			1							544070.74	4584740.05
12	p													543104.62	4584517.50
13	p													544279.31	4584886.23
13	p													544194.29	4584812.16
14	p													543333.28	4584606.98
14														544904.05	4584637.58
14	p													543689.41	4584810.00
15	p													543566.39	4585104.28
15	p													543649.47	4585269.19
15														544052.41	4585090.17
15	p	1		1										544942.90	4584421.17
15														543890.04	4584850.12
16														544989.79	4584589.59
16														544932.36	4584519.79
16	p													544756.75	4584577.30
16														544000.81	4584845.73
16														543803.01	4584868.77
17	p													543424.97	4584941.10
17	p													544829.79	4584516.69
17	p													543600.83	4584900.13
18														544231.27	4584964.71
19														543588.86	4585200.81
19														543713.50	4584858.95
20	p													543555.51	4584990.83
20														543720.96	4585272.29
20	p													544203.93	4585056.76
20														544230.03	4584860.49

Koontz Lake summer Tier II survey raw data as collected August 29, 2008.

DEPTH	FILALG	CERDEM	CHARA	ELOCAN	HETDUB	MYREXA	MYRSPI	NAJGUA	POTAMP	POTGRA	POTILL	POTPRA	POTZOS	STUPEC	VALAME	X_COOR	Y_COOR
2	p		1											1		543424.13	4584771.65
3	p						5	1						1	3	543120.53	4585129.86
3	p		1													543948.00	4585335.15
3			1					1							1	544216.31	4585282.56
3													1	1	1	543626.49	4584743.02
4	p	1	1			1	5							1		543022.33	4584759.74
4	p	1				1	5							1	1	543289.86	4585282.97
4			1		1			1					1	1	1	543643.56	4585427.49
4		1						1		1			1			544463.99	4584974.24
4	p															545149.35	4584550.89
5		1		1			5	1								544630.80	4584814.08
5	p															545022.55	4584706.47
5	p	1					1									544778.33	4584472.11
6	p	1					5						1	1	1	543235.66	4584998.85
6																543981.69	4585202.61
6	p	1		1			5									543448.95	4584474.90
7		1					3									543008.99	4584427.02
7	p		1													543159.29	4584731.20
7	p								1			1				544792.37	4584688.05
7	p															543188.32	4584515.77
8																543898.20	4585323.46
8	p	1						1								544546.50	4584825.45
8	p	1		1												544963.47	4584343.45
8	p										1					544502.53	4584700.23
8																543688.19	4584805.39
8	p															543343.77	4584510.45
8	p															543101.69	4584498.74
9	p															543951.65	4585224.31
9	p															545140.94	4584467.55
9	p	1														544764.86	4584588.17
9	p	1					5			1						544075.92	4584739.01
9	p	1														543813.63	4584750.89
10	p											1				543042.33	4584665.20
10	p									1		3				543417.55	4584965.37
10	p									1		5				543328.62	4585093.58
10	p	1														544243.30	4585178.15
10	p	1										1				544391.48	4584937.82
10	p															545079.81	4584565.55
10	p															544912.47	4584523.18
10	p															544622.76	4584625.40
10	p		1					1						1	1	544219.86	4584682.55
11																543728.12	4584860.23
12	p															543750.19	4585318.88
12	p															545060.98	4584430.03
12	p															543352.27	4584564.23

DEPTH	FILALG	CERDEM	CHARA	ELOCAN	HETDUB	MYREXA	MYRSPI	NAJGUA	POTAMP	POTGRA	POTILL	POTPRA	POTZOS	STUPEC	VALAME	X_COOR	Y_COOR
13	p											1				543505.95	4584858.92
13	p											1				543534.73	4585314.43
13	p															545045.64	4584623.45
14	p															543497.16	4585069.83
14	p															543646.83	4585268.54
14		1	1				5	1					1	1	1	544053.92	4585135.23
14	p															544930.99	4584430.21
14	p	1										1				544272.15	4584736.93
14																544142.26	4584821.40
14	p															543884.67	4584847.35
15	p															544833.89	4584502.42
16	p															543546.01	4585166.66
16																544039.37	4585091.59
16																544169.05	4585057.99
16																544978.22	4584606.75
16	p															544198.12	4584861.97
16																543805.53	4584869.36
17	p															543589.58	4584895.29
17	p															544292.90	4584863.11
17																544920.04	4584640.34
17	p															544054.22	4584868.61
18	p															543587.72	4585008.30
19																543728.38	4585266.90
20	p															543576.80	4585111.68
20	p															544241.04	4584953.74

APPENDIX C:

TIER II SURVEY RESULTS

KOONTZ LAKE
AQUATIC PLANT MANAGEMENT PLAN 2008-2012

Occurrence and abundance of submersed aquatic plants in Koontz Lake.					
County:	Marshall/Starke	Sites with plants:	33	Mean species/site:	1.4
Date:	5/27/2008	Sites with native plants:	28	Standard error (ms/s):	0.21
Secchi (ft):	7.1	Number of species:	12	Mean native species/site:	0.89
Maximum plant depth (ft):	15	Number of native species:	10	Standard error (mns/s):	0.16
Trophic status:	Mesotrophic	Maximum species/site:	6	Species diversity:	0.87
Total sites:	70			Native species diversity:	0.85

All depths (0-20 feet)		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Myriophyllum spicatum	Eurasian watermilfoil	32.86	67.14	22.86	7.14	2.86	11.71
Potamogeton praelongus	White-stem pondweed	20.00	80.00	18.57	1.43	0.00	4.57
Potamogeton crispus	Curly-leaf pondweed	18.57	81.43	15.71	2.86	0.00	4.86
Chara species	Chara species	17.14	82.86	15.71	1.43	0.00	4.00
Stuckenia pectinatus	Sago pondweed	11.43	88.57	11.43	0.00	0.00	2.29
Potamogeton amplifolius	Large-leaf pondweed	11.43	88.57	7.14	1.43	2.86	5.14
Ceratophyllum demersum	Coontail	11.43	88.57	11.43	0.00	0.00	2.29
Najas guadalupensis	Southern naiad	5.71	94.29	5.71	0.00	0.00	1.14
Vallisneria americana	Eel grass	4.29	95.71	4.29	0.00	0.00	0.86
Potamogeton zosteriformis	Flat-stem pondweed	2.86	97.14	2.86	0.00	0.00	0.57
Potamogeton illinoensis	Illinois pondweed	2.86	97.14	2.86	0.00	0.00	0.57
Potamogeton gramineus	Grassy pondweed	1.43	98.57	1.43	0.00	0.00	0.29
Filamentous algae	Filamentous algae	65.71					

Depth: 0-5 ft		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara species	Chara species	57.89	42.11	52.63	5.26	0.00	13.68
Myriophyllum spicatum	Eurasian watermilfoil	52.63	47.37	42.11	5.26	5.26	16.84
Potamogeton praelongus	White-stem pondweed	47.37	52.63	42.11	5.26	0.00	11.58
Stuckenia pectinatus	Sago pondweed	36.84	63.16	36.84	0.00	0.00	7.37
Potamogeton amplifolius	Large-leaf pondweed	31.58	68.42	15.79	5.26	10.53	16.84
Potamogeton crispus	Curly-leaf pondweed	26.32	73.68	21.05	5.26	0.00	7.37
Najas guadalupensis	Southern naiad	21.05	78.95	21.05	0.00	0.00	4.21
Vallisneria americana	Eel grass	15.79	84.21	15.79	0.00	0.00	3.16
Potamogeton zosteriformis	Flat-stem pondweed	10.53	89.47	10.53	0.00	0.00	2.11
Potamogeton illinoensis	Illinois pondweed	10.53	89.47	10.53	0.00	0.00	2.11
Ceratophyllum demersum	Coontail	10.53	89.47	10.53	0.00	0.00	2.11
Filamentous algae	Filamentous algae	47.37					

Depth: 5-10 ft		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Myriophyllum spicatum	Eurasian watermilfoil	52.63	47.37	26.32	21.05	5.26	23.16
Potamogeton crispus	Curly-leaf pondweed	36.84	63.16	31.58	5.26	0.00	9.47
Potamogeton praelongus	White-stem pondweed	26.32	73.68	26.32	0.00	0.00	5.26
Ceratophyllum demersum	Coontail	21.05	78.95	21.05	0.00	0.00	4.21
Potamogeton amplifolius	Large-leaf pondweed	10.53	89.47	10.53	0.00	0.00	2.11
Stuckenia pectinatus	Sago pondweed	5.26	94.74	5.26	0.00	0.00	1.05
Potamogeton gramineus	Grassy pondweed	5.26	94.74	5.26	0.00	0.00	1.05
Chara species	Chara species	5.26	94.74	5.26	0.00	0.00	1.05
Filamentous algae	Filamentous algae	94.74					

Depth: 10-15 ft		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Myriophyllum spicatum	Eurasian watermilfoil	17.65	82.35	17.65	0.00	0.00	3.53
Ceratophyllum demersum	Coontail	11.76	88.24	11.76	0.00	0.00	2.35
Potamogeton crispus	Curly-leaf pondweed	5.88	94.12	5.88	0.00	0.00	1.18
Filamentous algae	Filamentous algae	76.47					

Depth: 15-20 ft		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Filamentous algae	Filamentous algae	40.00					

Occurrence and abundance of submersed aquatic plants in Koontz Lake.					
County:	Marshall/Starke	Sites with plants:	32	Mean species/site:	1.21
Date:	8/29/2008	Sites with native plants:	32	Standard error (ms/s):	0.21
Secchi (ft):	4	Number of species:	14	Mean native species/site:	1.07
Maximum plant depth (ft):	14	Number of native species:	13	Standard error (mns/s):	0.18
Trophic status:	Mesotrophic	Maximum species/site:	7	Species diversity:	0.89
Total sites:	70			Native species diversity:	0.88

All depths (0-20 ft)		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Ceratophyllum demersum	Coontail	24.29	75.71	24.29	0.00	0.00	4.86
Myriophyllum spicatum	Eurasian watermilfoil	14.29	85.71	1.43	1.43	11.43	12.57
Stuckenia pectinatus	Sago pondweed	12.86	87.14	12.86	0.00	0.00	2.57
Najas guadalupensis	Southern naiad	11.43	88.57	11.43	0.00	0.00	2.29
Chara species	Chara species	11.43	88.57	11.43	0.00	0.00	2.29
Vallisneria americana	Eel grass	11.43	88.57	10.00	1.43	0.00	2.86
Potamogeton praelongus	White-stem pondweed	11.43	88.57	8.57	1.43	1.43	4.00
Potamogeton zosteriformes	Flat-stem pondweed	7.14	92.86	7.14	0.00	0.00	1.43
Potamogeton gramineus	Grassy pondweed	5.71	94.29	5.71	0.00	0.00	1.14
Elodea canadensis	Common elodea	4.29	95.71	4.29	0.00	0.00	0.86
Myriophyllum exacbescens	Northern watermilfoil	2.86	97.14	2.86	0.00	0.00	0.57
Potamogeton illinoiensis	Illinois pondweed	1.43	98.57	1.43	0.00	0.00	0.29
Potamogeton ampifolius	Large-leaf pondweed	1.43	98.57	1.43	0.00	0.00	0.29
Heteranthera dubia	Water star grass	1.43	98.57	1.43	0.00	0.00	0.29
Filamentous algae	Filamentous algae	74.29					

Depth: 0-5 ft		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Stuckenia pectinatus	Sago pondweed	46.15	53.85	46.15	0.00	0.00	9.23
Myriophyllum spicatum	Eurasian watermilfoil	38.46	61.54	7.69	0.00	30.77	32.31
Najas guadalupensis	Southern naiad	38.46	61.54	38.46	0.00	0.00	7.69
Chara species	Chara species	38.46	61.54	38.46	0.00	0.00	7.69
Vallisneria americana	Eel grass	38.46	61.54	30.77	7.69	0.00	10.77
Ceratophyllum demersum	Coontail	38.46	61.54	38.46	0.00	0.00	7.69
Potamogeton zosteriformes	Flat-stem pondweed	23.08	76.92	23.08	0.00	0.00	4.62
Myriophyllum exacbescens	Northern watermilfoil	15.38	84.62	15.38	0.00	0.00	3.08
Potamogeton gramineus	Grassy pondweed	7.69	92.31	7.69	0.00	0.00	1.54
Heteranthera dubia	Water star grass	7.69	92.31	7.69	0.00	0.00	1.54
Elodea canadensis	Common elodea	7.69	92.31	7.69	0.00	0.00	1.54
Filamentous algae	Filamentous algae	61.54					

Depth: 5-10 ft		Frequency of	Rake score frequency per species				Plant
Scientific Name	**Common Name**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Ceratophyllum demersum	Coontail	35.71	64.29	35.71	0.00	0.00	7.14
Potamogeton praelongus	White-stem pondweed	17.86	82.14	10.71	3.57	3.57	7.86
Myriophyllum spicatum	Eurasian watermilfoil	14.29	85.71	0.00	3.57	10.71	12.86
Potamogeton gramineus	Grassy pondweed	10.71	89.29	10.71	0.00	0.00	2.14
Najas guadalupensis	Southern naiad	7.14	92.86	7.14	0.00	0.00	1.43
Elodea canadensis	Common elodea	7.14	92.86	7.14	0.00	0.00	1.43
Chara species	Chara species	7.14	92.86	7.14	0.00	0.00	1.43
Vallisneria americana	Eel grass	7.14	92.86	7.14	0.00	0.00	1.43
Stuckenia pectinatus	Sago pondweed	7.14	92.86	7.14	0.00	0.00	1.43
Potamogeton illinoiensis	Illinois pondweed	3.57	96.43	3.57	0.00	0.00	0.71
Potamogeton ampifolius	Large-leaf pondweed	3.57	96.43	3.57	0.00	0.00	0.71
Potamogeton zosteriformes	Flat-stem pondweed	3.57	96.43	3.57	0.00	0.00	0.71
Filamentous algae	Filamentous algae	85.71					

Depth: 10-15 ft		Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Scientific Name	**Common Name**		**0**	**1**	**3**	**5**	
Potamogeton praelongus	White-stem pondweed	20.00	80.00	20.00	0.00	0.00	4.00
Ceratophyllum demersum	Coontail	13.33	86.67	13.33	0.00	0.00	2.67
Myriophyllum spicatum	Eurasian watermilfoil	6.67	93.33	0.00	0.00	6.67	6.67
Najas guadalupensis	Southern naiad	6.67	93.33	6.67	0.00	0.00	1.33
Chara species	Chara species	6.67	93.33	6.67	0.00	0.00	1.33
Vallisneria americana	Eel grass	6.67	93.33	6.67	0.00	0.00	1.33
Stuckenia pectinatus	Sago pondweed	6.67	93.33	6.67	0.00	0.00	1.33
Potamogeton zosteriformes	Flat-stem pondweed	6.67	93.33	6.67	0.00	0.00	1.33
Filamentous algae	Filamentous algae	80.00					
Depth: 15-20 ft		**Frequency of Occurrence**	**Rake score frequency per species**				**Plant Dominance**
Scientific Name	**Common Name**		**0**	**1**	**3**	**5**	
Filamentous algae	Filamentous algae	57.14					

APPENDIX D:

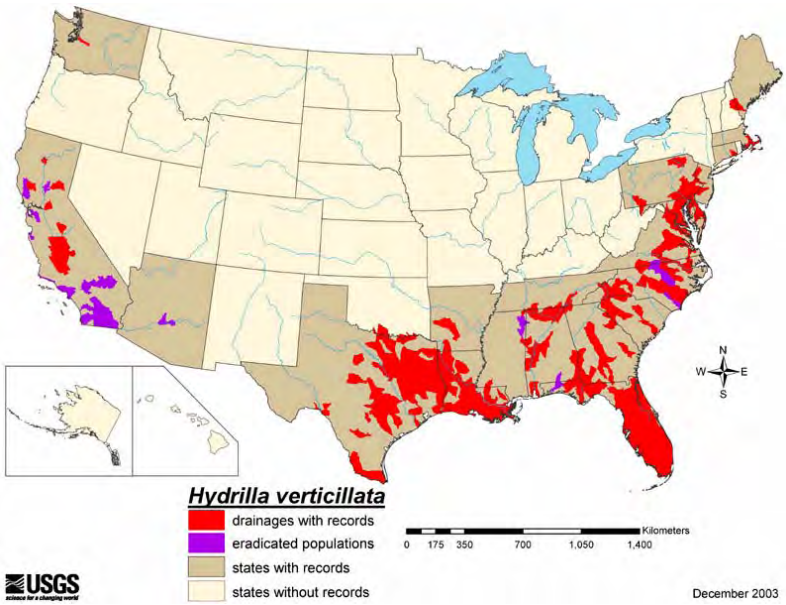
HYRDILLA INFORMATION FOR DISTRIBUTION

KOONTZ LAKE
AQUATIC PLANT MANAGEMENT PLAN 2008-2012

HYDRILLA

COMMON NAME: Hydrilla
Hydrilla is also known as water thyme, Florida elodea, Wasserquirl and Indian star-vine.

SCIENTIFIC NAME: *Hydrilla verticillata* (L.f.) Royle
Hydrilla's scientific name is made up of the Greek word "hydro" meaning "water" and the Latin word "verticillus" that means "the whorl of a spindle". Appropriately named, it is an aquatic plant with leaves that are whorled around the stem. Hydrilla is in the Frog's Bit family, or Hydrocharitaceae. It is the only species of the genus *Hydrilla* in the world though it resembles many of the other species in the family.



DISTRIBUTION: It is not really known where exactly hydrilla originated. Some sources give a broad native range of parts of Asia, Africa and Australia. Other sources are more specific and say that the dioecious form of hydrilla originated from the Indian subcontinent and the monoecious form originated from Korea. Currently the only continent without records of hydrilla is Antarctica.

Indiana: Hydrilla has not been detected in Indiana waters but it is on our Aquatic Nuisance Species watch list.

DESCRIPTION:

Leaves: Leaves are small about 2-4 mm wide and 6-20 mm long. They are strap-like with pointed tips and have visible saw-tooth margins. The leaves are whorled around the nodes in groups of 4-8 leaves. The leaf midvein is reddish in color and usually has a row of spines on it. This gives the plant a rough texture. The leaves are usually a green color, though topped out leaves could be bleached by the sun and appear more yellowish. Hydrilla has an axillary leaf scale called a squamula intravaginalis that is found next to the stem at the base of the leaf. This distinguishes it from the other species in the Hydrocharitaceae family. One may confuse hydrilla with another exotic weed, Brazilian elodea (*Egeria densa*). Hydrilla will have rough teeth on the underside of the leaves where Brazilian elodea will not. There is also a native species found in Indiana, American elodea (*Elodea canadensis*), which looks somewhat like hydrilla.

Identification Characteristics of the Hydrocharataceae

Character	**Brazilian Elodea** *(Egeria densa)*	**American Elodea** *(Elodea canadensis)*	**Hydrilla (monoecious)** (*Hydrilla verticillata*	**Hydrilla (dioecious)** (*Hydrilla verticillata)*
Leaves per Whorl	4 (3-5)	3(2)	5(2-8)	4-5 (2-8)
Serrated Edges Visible	With magnification	With magnification	Distinct on older plants	Distinct
Leaf Size	Up to 4cm	Up to 1.5 cm	1-2 cm	1-2 cm
Flowers	Male only, up to 2 cm	Tiny, male and female on separate plants	Male and female on same plants, to 1 cm	Only female plants in US, to 1 cm
Tubers Present	No	No	Yes	Yes

Roots/Stem: New root sprouts are white and when growing in highly organic soil they may be become brown. They are submerged and buried in the hydro-soil. Hydrilla stems are very slender only about 1/32 of an inch wide, but they can grow to lengths of 30 feet. When the stem nears the waters surface it branches out considerably. The monoecious form of hydrilla will usually start to branch out at the sediment level rather than at the top of the water.

Flowers: The flowers are imperfect (meaning there are separate male and female flowers) but the plant can be monoecious (flowers of both sexes on one plant) or dioecious (flowers of one

sex being produced per plant). The female flower is white with three petals that alternate with three whitish sepals. The male flower has petals and sepals similar to the female flower, but the color could be white, reddish, or brown.

Fruits/Seeds: Hydrilla produce two different hibernacula to cover its buds. One is called a tuber, which forms terminally on rhizomes. They can be 5-10 mm long and are off white to yellow colored. Hydrilla also produces a turions which are compact dormant buds in the leaf axil. They are 5-8 mm long, dark green in color, and they appear to be spiny. The turion will break off and settle to the bottom of the water to start a new plant. The tubers are able to over winter and re-sprout as new plants as well. Seeds are also produced.

LIFE CYCLE BIOLOGY: Hydrilla is a submersed, herbaceous, perennial aquatic plant. It is capable of living in many different freshwater habitats. It will grow in springs, lakes, marshes, ditches, rivers, or anywhere there is a few inches of water. Hydrilla can tolerate low nutrient and high nutrient conditions as well as a salinity of up to 7%. Another adaptation hydrilla possesses, that enable it to out compete native plants, is the ability to grow in low light conditions. It is able to grow at deeper depths and can begin to photosynthesize earlier in the morning than most other aquatic plants. In the beginning stages of life hydrilla elongates at a rate of one inch per day. This continues until the plant comes close to the top of the water, here it begins to branch out. It produces a large mat of vegetation at the waters surface intercepting the light before it can reach other plants.

Hydrilla can reproduce in four different ways, fragmentation, tubers, turions, and seed. Fragmented pieces of hydrilla that contain at least one node are capable of sprouting into a new plant. The tubers of hydrilla are formed on the rhizomes and each one can produce 6,000 new tubers. When out of water a tuber can remain viable for several days, it can even lie dormant for over 4 years in undisturbed soil before sprouting a new plant. Turions are formed in the leaf axils of the plant. They are broken off and once settled in the sediment they can sprout into a new plant. Uncharacteristic of most plants, seed production in hydrilla is of least importance for reproduction. It seems that seed production is mostly used for long distance dispersal by means of ingestion by birds. The monoecious form of hydrilla puts more energy into tuber and turion production than does the dioecious form. It is good to know which form you have to decide on the best management technique.

The main adaptations that give hydrilla an advantage over other native plants are: it can grow at low light intensities, it is better at absorbing carbon dioxide from the water, it is able to store nutrients for later use, it can tolerate a wide range of water quality conditions, and it can propagate in four different ways.

PATHWAYS/HISTORY: Under the name Indian star-vine, hydrilla was imported into Florida as an aquarium plant in the 1950's. A farmer living near Tampa acquired the plant but was not impressed with it and threw it out into a canal behind his business. A few months later the farmer noticed that the hydrilla grew very well and decided to market it. By the 1960's severe problems caused by hydrilla were being reported. In 1990 hydrilla could be found in 187 lakes and rivers in Florida. Because there are two different strains of hydrilla found in the United States, the monoecious strain and the dioecious strain, it is believed that there was a separate introduction outside of Florida. The dioecious form is mainly found in the southern states and California and the monoecious form is found north of South Carolina. Hydrilla was brought to

national attention in 1980 when it was discovered in the Potomac River in Washington D.C. Currently hydrilla is found in approximately 690 bodies of water within 190 drainage basins of 21 states.

DISPERSAL/SPREAD: Once established hydrilla can easily spread to new areas. Fragmented pieces of the plant are able to root and develop into a new plant. These plant fragments are transported to new waters via boats and fishing equipment. Hydrilla's tubers and turions allow it to persist in an area. They can live dormant in the ground and can even resist a drought. Waterfowl are a vector of transport for hydrilla as well. Some waterfowl feed on the plant and may regurgitate the tubers into other bodies of water. It has been found that these tubers are still able to sprout. Birds can also spread seeds. Hydrilla is still sold for aquarium use over the Internet, which could mean expansion of its range through more introductions, accidental or otherwise.

RISKS/IMPACTS: Hydrilla is sometimes called an invisible menace because most of the time you don't know it is there until it has filled the water. It will shade out native aquatic plants until they are eliminated. This forms a monoculture, which will reduce biodiversity and alter the ecosystem. Hydrilla does not only pose a threat to other plants but to animals as well. When hydrilla becomes over abundant, fish population imbalances are likely. The dense mats of hydrilla will alter the waters chemistry by raising pH, cause wide oxygen fluctuations, and increase water temperature.

Hydrilla is an economic drain. Millions of dollars are lost due to reduced recreational opportunities as hydrilla mats interfere with boating, swimming, fishing, etc. In flowing waters hydrilla will greatly reduce flow and can cause flooding. For operations that require water intake, hydrilla can pose a problem by clogging the intake pipes. Waterfront property values drop in areas infested with hydrilla. Millions of dollars are annually spent trying to control this aquatic pest.

MANAGEMENT/PREVENTION: Control of aquatic weeds is difficult and eradication sometimes can be an unrealistic goal. Before any type of management technique can be implemented there needs to be a positive identification of the plant. Some native plants look similar to hydrilla so it is important to have proper identification.

Hydrilla has not yet appeared in Indiana, however it is not far away. If this plant shows up in Indiana waters, it needs to be eliminated immediately. While there are many methods available to control aquatic plants, the method most suitable for complete and fast elimination is chemical control. Aquatic herbicides containing the active ingredient endothall, fluridone, or diquat are all labeled for use on hydrilla.

For states that have major infestations of this pest plant, they have looked to hydrilla's native range for any insects that could be used as a biological control. Four hydrilla-attacking insects have been released. *Bagous affinis*, a hydrilla tuber-attacking weevil and *Hydrellia pakistanae*, a leaf-mining fly both were released in 1987. *Hydrellia balciunasi* is another leaf mining fly that was released in 1989. *Bagous hydrillae*, a stem-mining weevil, was released in 1991. Many different states have released one or a combination of the four insects. It is still too early to know what long-term impacts these insects will have on hydrilla. One Indiana company is helping to develop a biological control method for hydrilla. SePro Inc. of Carmel, Indiana is a

cooperator in a project with U.S. Army Engineer Research and Development Center Environmental Laboratory to grow an endemic fungal pathogen that attacks hydrilla.

Hydrilla has been listed by the U.S. government as a Federal Noxious Weed. With this designation, it is illegal to import or sell the plant in the United States. However, it is likely that internet sales still occur.

Like all invasive species, the key to preventing their spread is knowledge! You can also help by practicing a few good techniques to stop the spread of hydrilla and other aquatic invasive plants.

- ✓ Rinse any mud and/or debris from equipment and wading gear and drain any water from boats before leaving a launch area.

- ✓ Remove all plant fragments from the boat, propeller, and boat trailer. The transportation of plant material on boats, trailers, and in livewells is the main introduction route to new lakes and rivers.

- ✓ Do not release aquarium or water garden plants into the wild, rather seal them in a plastic bag and dispose in the trash.

- ✓ Consider using plants native to Indiana in aquariums and water gardens.

- ✓ If you detect this plant in a lake, pond, or stream, immediately contact the Indiana Department of Natural Resources, Division of Fish and Wildlife.
    - (317)232-4080
    - dkeller@dnr.IN.gov
    - 402 W. Washington St., Rm W273
      Indianapolis, IN 46204

REFERENCES:

Balciunas, J.K., M.J. Grodowitz, A.F. Confrancesco, and J.F. Shearer. Hydrilla. 5 Nov 2003. Invasive.org. 30 June 2004. <www.invasive.org/eastern/biocontrol/7Hydrilla.html>.

Jacono, C.C. and M.M. Richerson. *Hydrilla verticillata*. 18 Dec 2002. U.S. Geological Survey. 30 June 2004. <nas.er.usgs.gov/plants/docs/hy_verti.html>.

Langeland, K.A. 1996. *Hydrilla verticillata* (L.F.) Royle (Hydrocharitaceae), "The Perfect Aquatic Weed". Castanea 61:293-304. 1 July 2004. <aquat1.ifas.ufl.edu/hydcirc.html>.

McCann, James A., Lori N. Arkin, and James D. Williams. Nonindigenous Aquatic and Selected Terrestrial Species of Florida. March 1996. University of Florida. 1 July 2004. <plants.ifas.ufl.edu/mcplnt1a.html>.

Non-Native Freshwater Plants:Hydrilla. 24 Feb 2003. Washington State Department of Ecology. 1 July 2004. <www.ecy.wa.gov/programs/wq/plants/weeds/aqua001.html>.

Ramey, Victor. Non-Native Invasive Aquatic Plants in the United States. Aug 2001. Center for Aquatic and Invasive Plants, University of Florida and Sea Grant. 1 July 2004. <plants.ifas.ufl.edu/seagrant/hydver2.html>.

Species Profiles-Hydrilla. 20 May 2004. National Agricultural Library. 1 July 2004. <invasivespecies.gov/profiles/hydrilla.shtml>.

Swearingen, J., K. Reshetiloff, B. Slattery, and S. Zwicker. Plant Invaders of Mid-Atlantic Natural Areas:Hydrilla. 2002. National Park Service and U.S. Fish and Wildlife Service. 1 July 2004. <www.nps.gov/plants/alien/pubs/midatlantic/hyve.htm>.

PHOTOGRAPHS compliments of the Washington Department of Ecology

Updated 3/05

APPENDIX E:

AQUATIC PLANT TREATMENT PERMIT

KOONTZ LAKE
AQUATIC PLANT MANAGEMENT PLAN 2008-2012

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:
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 KLA (contact: Jim Berger)	Lake Assoc. Name Koontz Lake Association	
Rural Route or Street P.O. Box 25		Phone Number 574-586-7406
City and State Walkerton, IN		ZIP Code 46574
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) Koontz Lake	Nearest Town Koontz Lake	County Starke
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 Treat where milfoil occurs following spring invasive mapping survey (potential areas attached)	
Total acres to be controlled 70-90 acres	Proposed shoreline treatment length (ft) n.a.	Perpendicular distance from shoreline (ft) n.a.
Maximum Depth of Treatment (ft) 15	Expected date(s) of treatment(s) late May to early June	

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. Milfoil areas to be treated with 2,4-D or Renovate following spring Invasive mapping survey

Plant survey method: [x] Rake [ ] Visual [ ] Other (specify) Data from 2008 JFNew T2 surveys

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil		20
Common coontail		15
Sago pondweed		10
Whitestem pondweed		10
Curlyleaf pondweed		10
Chara		10
Largeleaf pondweed		5
Southern naiad		5
Eel grass		5
Flatstem pondweed		5
Illinois pondweed		1
Variable pondweed		1
Northern watermilfoil		1
Water Stargrass		1
Common elodea		1

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

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

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT

State Form 26727 (R / 11-03)
Approved State Board of Accounts 1987

[x] 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:
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: KLA (contact: Jim Berger)	Lake Assoc. Name: Koontz Lake Association	
Rural Route or Street: P.O. Box 25		Phone Number: 574-586-7406
City and State: Walkerton, IN		ZIP Code: 46574
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): Koontz Lake	Nearest Town: Koontz Lake	County: Starke
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: Whole Lake	
Total acres to be controlled: 346	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): First treatment late April early May with bumps as needed in 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. Whole Lake Sonar treatment. Initial dose 6 ppb. Bump back to 6 ppb after 30 days. Maintain above 2 ppb for 120 days

Plant survey method: [x] Rake [ ] Visual [ ] Other (specify) Data from 2008 JFNew T2 surveys

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil		20
Common coontail		15
Sago pondweed		10
Whitestem pondweed		10
Curlyleaf pondweed		10
Chara		10
Largeleaf pondweed		5
Southern naiad		5
Eel grass		5
Flatstem pondweed		5
Illinois pondweed		1
Variable pondweed		1
Northern watermilfoil		1
Water Stargrass		1
Common elodea		1

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

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.

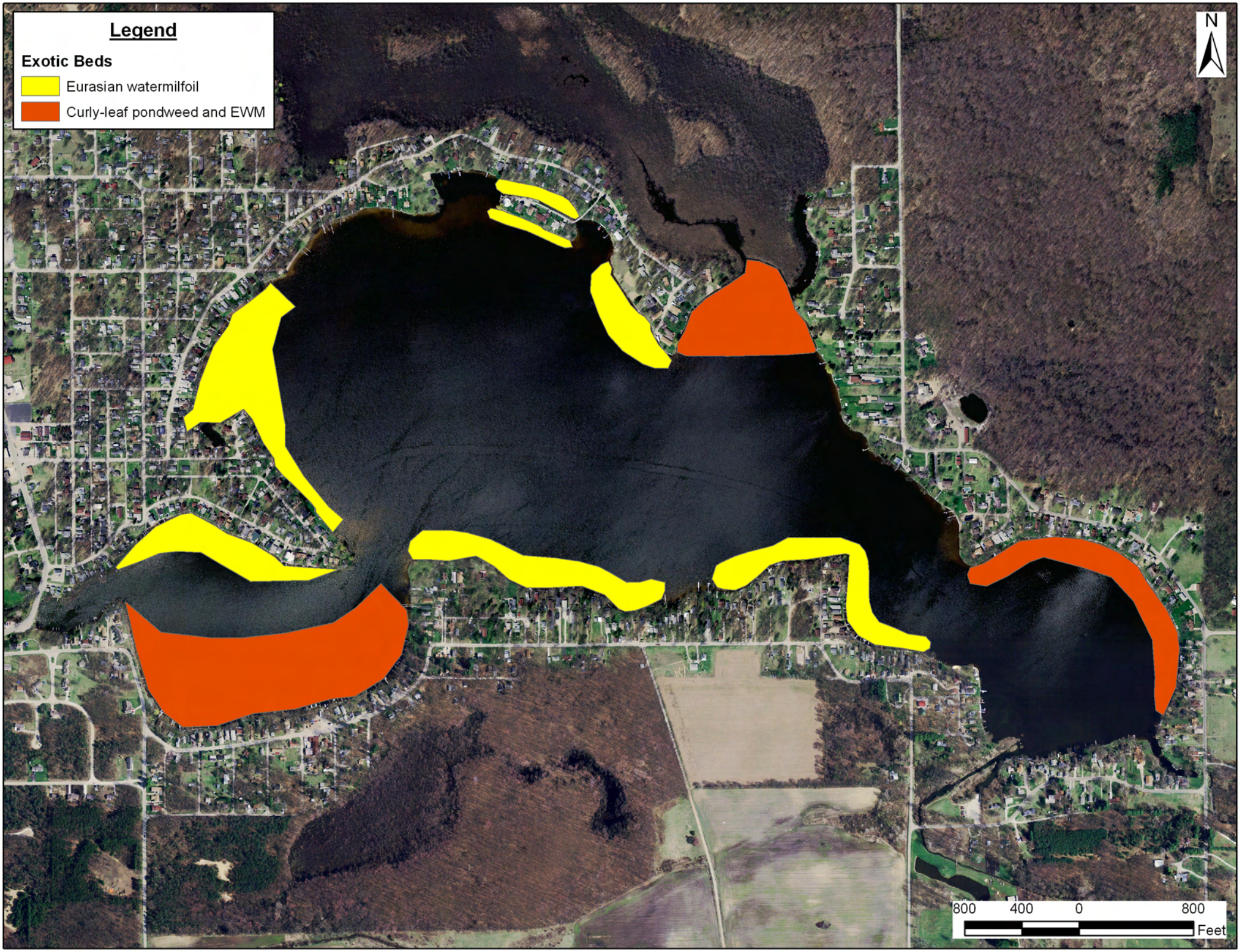
Applicant Signature	Date
Certified Applicant's Signature	Date

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


Legend
Exotic Beds
Eurasian watermilfoil
Curly-leaf pondweed and EWM
N
800
400
0
800
Feet

APPENDIX F:

PREVIOUS AQUATIC PLANT TREATMENT PERMITS

KOONTZ LAKE
AQUATIC PLANT MANAGEMENT PLAN 2008-2012

AV Control Permit Reporting Report

Permit/License No.: **2029** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name Pinecrest Industries

Applicant: Richard Soper Phone: (269) 545-8125 Phone 2:

Address: 4355 Spring Creek Rd. Addy 2 Fax

City, State, Zip: GALIEN MI 49113 Email

Certified Applicator: Richard Soper Certification No.: 10211

Company Name: Pinecrest Industries

Address: 4355 Spring Creek Rd Phone: (269) 545-8125

City, State, Zip: GALIEN MI 49113 Email pinecrestind@aol.com

Water Name: Koontz Lake Nearest Town: Walkerton County Name: Marshall

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: 1 Projection: Map with Report ☐ RID REP-65

N Lat D 41 24 45 W Long -86 28 10

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 5/20/2004 Date Signed: 5/18/2004 Date Trt: 5/14/2004

Acreage: 9.3 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	25
Eurasian Watermilfoil	60
Richardson's Pondweed	5
American Elodea	10

TreatArea: 2 Projection: Map with Report ☐ RID REP-66

N Lat D 41 24 45 W Long -86 28 10

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 5/20/2004 Date Signed: 5/18/2004 Date Trt: 5/17/2004

Acreage: 5.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Sago Pondweed	7
Eurasian Watermilfoil	75
Curly-leaf Pondweed	18

Date Applied: 3/14/2004 Date Issued/Denied: 4/28/2004

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2136** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name Weed Patrol Inc.

Applicant: Charles Cunningham Phone: (574) 389-3212 Phone 2:

Address: 1922 Fieldhouse Avenue Addy 2 Fax

City, State, Zip: ELKHART IN 46517 Email

Certified Applicator: Charles/Leslie Cunningham Certification No.: F28315

Company Name: Weed Patrol, Inc.

Address: 1922 Fieldhouse Avenue Phone: (574) 389-3212

City, State, Zip: ELKHART IN 46517 Email leslie@weedpatrol.com

Water Name: Koontz Lake Nearest Town: Koontz Lake County Name: Starke

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: 1 Projection: Map with Report ☐ RID REP-45

N Lat D W Long

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 10/4/2004 Date Signed: 9/28/2004 Date Trt: 7/12/2004

Acreage: 3 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Large-leaf Pondweed	20
Chara	20
Coontail	40
Eurasian Watermilfoil	10
Large-leaf Pondweed	5
Richardson's Pondweed	5
Chara	5
Sago Pondweed	10
Curly-leaf Pondweed	20
Eurasian Watermilfoil	40
Coontail	5

Date Applied: 5/3/2004 Date Issued/Denied: 5/21/2004

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2298** ☐ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Richard Soper Phone: (269) 545-8125 Phone 2:

Address: 4355 Spring Creek Rd. Addy 2 Fax

City, State, Zip: GALIEN MI 49113 Email

Certified Applicator: Richard Soper Certification No.: 10211

Company Name: Pinecrest Industries

Address: 4355 Spring Creek Rd Phone: (269) 545-8125

City, State, Zip: GALIEN MI 49113 Email pinecrestind@aol.com

Water Name: Koontz Nearest Town: Walkerton County Name: Marshall

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: **1** Projection: Map with Report ☑ RID REP-79

N Lat D 41 24.41 W Long -86 29.45

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 9 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	25
Coontail	8
Eel Grass a/k/a Vallisneria	11
Southern Naiad	5
Illinois Pondweed	7
Richardson's Pondweed	12
Chara	10
Curly-leaf Pondweed	22

TreatArea: **2** Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.41 W Long -86 25.69

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 4.03 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	14
Curly-leaf Pondweed	27
Richardson's Pondweed	10
Illinois Pondweed	2
American Elodea	3
Chara	5

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Eurasian Watermilfoil	31
Eel Grass a/k/a Vallisneria	8

TreatArea: 3 Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.56 W Long -86 25.86
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 1.4 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	31
Coontail	14
Richardson's Pondweed	7
Chara	20
Curly-leaf Pondweed	28

TreatArea: 4 Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.56 W Long -86 25.88
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.93 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Filamentous Algae	1
Eurasian Watermilfoil	43
Coontail	21
Curly-leaf Pondweed	21
Richardson's Pondweed	6
Chara	8

TreatArea: 5 Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.57 W Long -86 26.03
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.68 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	38
American Elodea	4

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: 2

Appvd/Disappvd By Fish Staff: Stuart Shipman

Coontail	22
Curly-leaf Pondweed	34
Chara	12

TreatArea: 6 Projection: Map with Report ☑ RID REP-82

N Lat D 41 24.6 W Long -86 26.28
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 2.02 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	23
Chara	8
Sago Pondweed	2
Coontail	28
Eurasian Watermilfoil	36
American Elodea	3

TreatArea: 7 Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.56 W Long -86 25.71
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 1.65 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	3
Eurasian Watermilfoil	34
Curly-leaf Pondweed	31
Coontail	24
Illinois Pondweed	2
American Elodea	6

TreatArea: 8 Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.42 W Long -86 26.41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.85 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Chara	7
Eurasian Watermilfoil	29
Curly-leaf Pondweed	31
Coontail	28
American Elodea	5

TreatArea: **9** Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.41 W Long -86 26.37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 3.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	20
Curly-leaf Pondweed	25
Richardson's Pondweed	14
Chara	11
American Elodea	3
Coontail	27

TreatArea: **10** Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.42 W Long -86 26.41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.06 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	28
Coontail	5
Curly-leaf Pondweed	36
Eurasian Watermilfoil	31

TreatArea: **11** Projection: Map with Report ☑ RID REP-82

N Lat D 41 24.56 W Long -86 26.49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 1.5 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Curly-leaf Pondweed	31
Southern Naiad	2
Chara	4
Coontail	26
Eurasian Watermilfoil	37

TreatArea: **12** Projection: Map with Report ☑ RID REP-82

N Lat D 41 24.59 W Long -86 26.49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 0.94 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	21
Coontail	29
Curly-leaf Pondweed	28
Chara	18
Southern Naiad	4

TreatArea: **13** Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.55 W Long -86 26.81
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 3.1 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	25
Curly-leaf Pondweed	32
Eurasian Watermilfoil	38
Coontail	5

TreatArea: **14** Projection: Map with Report ☑ RID REP-80

N Lat D 41 24.56 W Long -86 26.37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.87 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	37

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Curly-leaf Pondweed	19
Southern Naiad	4
American Elodea	5
Coontail	25
Chara	10

TreatArea: **15** Projection: Map with Report ☑ RID REP-81

N Lat D 41 24.74 W Long -86 26.39
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.85 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	14
Coontail	22
Southern Naiad	3
Curly-leaf Pondweed	21
Eurasian Watermilfoil	40

TreatArea: **16** Projection: Map with Report ☑ RID REP-81

N Lat D 41 24.74 W Long -86 26.41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 1.86 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Illinois Pondweed	13
Coontail	22
Eurasian Watermilfoil	36
Southern Naiad	3
Chara	8
Richardson's Pondweed	18

TreatArea: **17** Projection: Map with Report ☑ RID REP-81

N Lat D 41 24.91 W Long -86 26.42
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.92 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

TreatArea: **20** Projection: Map with Report ☑ RID REP-82

N Lat D 41 25.08 W Long -86 26.27
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 1.06 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
White Waterlily	5
Eurasian Watermilfoil	38
Curly-leaf Pondweed	23
Coontail	17
Southern Naiad	1
American Elodea	2
Chara	14

TreatArea: **21** Projection: Map with Report ☑ RID REP-82

N Lat D 41 21.97 W Long -86 26.03
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 3.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	26
Spatterdock	7
Coontail	30
Eurasian Watermilfoil	23
Chara	12
American Elodea	2

TreatArea: **22** Projection: Map with Report ☑ RID REP-82

N Lat D 41 24.92 W Long -86 25.87
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 1.17 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Richardson's Pondweed	18
Chara	6
Curly-leaf Pondweed	29

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

White Waterlily	1
Eurasian Watermilfoil	21
Coontail	7
Southern Naiad	18

TreatArea: **23** Projection: Map with Report ☑ RID REP-82

N Lat D 41 25.08 W Long -86 25.84
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 0.99 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	8
Curly-leaf Pondweed	37
Eurasian Watermilfoil	22
American Elodea	27
Sago Pondweed	2
Spatterdock	4

TreatArea: **24** Projection: Map with Report ☑ RID REP-81

N Lat D 41 24.6 W Long -86 25.69
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/17/2005 Date Signed: 6/13/2005 Date Trt: 6/10/2005

Acreage: 0.53 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	3
American Elodea	3
Coontail	38
Curly-leaf Pondweed	27
Eurasian Watermilfoil	29

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Common Name:	Rel Abundance
Richardson's Pondweed	10
American Elodea	2
Coontail	33
Illinois Pondweed	9
Eurasian Watermilfoil	41
Chara	6

TreatArea: **18** Projection: Map with Report ☑ RID REP-82

N Lat D 41 24.93 W Long -86 25.71

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 1.17 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	18
White Waterlily	21
Eurasian Watermilfoil	42
Curly-leaf Pondweed	7
Coontail	28
American Elodea	3

TreatArea: **19** Projection: Map with Report ☑ RID REP-82

N Lat D 41 24.97 W Long -86 26.33

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/21/2005 Date Signed: 6/17/2005 Date Trt: 6/16/2005

Acreage: 0.71 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
White Waterlily	3
Chara	17
American Elodea	5
Coontail	26
Eurasian Watermilfoil	40
Curly-leaf Pondweed	9

Date Applied: 3/28/2005 Date Issued/Denied: 5/19/2005

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2286** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Charles Cunningham Phone: (574) 389-3212 Phone 2:

Address: 1922 Fieldhouse Avenue Addy 2 Fax

City, State, Zip: ELKHART IN 46517 Email

Certified Applicator: Charles/Leslie Cunningham Certification No.: F28315

Company Name: Weed Patrol, Inc.

Address: 1922 Fieldhouse Avenue Phone: (574) 389-3212

City, State, Zip: ELKHART IN 46517 Email leslie@weedpatrol.com

Water Name: Koontz Lake Nearest Town: Koontz Lake County Name: Starke

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: **1** Projection: Map with Report ☐ RID REP-11

N Lat D W Long

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 10/4/2005 Date Signed: 9/28/2005 Date Trt: 7/6/2005

Acreage: 2.93 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Richardson's Pondweed	10
Chara	10
Eurasian Watermilfoil	40
Large-leaf Pondweed	10
Sago Pondweed	10
Coontail	10
Filamentous Algae	10

Date Applied: 3/28/2005 Date Issued/Denied: 5/9/2005

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2433** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Richard Soper Phone: (269) 545-8125 Phone 2:

Address: 4355 Spring Creek Rd. Addy 2 Fax

City, State, Zip: GALIEN MI 49113 Email

Certified Applicator: Richard Soper Certification No.: 10211

Company Name: Pinecrest Industries

Address: 4355 Spring Creek Rd Phone: (269) 545-8125

City, State, Zip: GALIEN MI 49113 Email pinecrestind@aol.com

Water Name: Koontz Lake Nearest Town: Walkerton County Name: Marshall

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: 1 Projection: Map with Report ☐ RID REP-12

N Lat D 41 24 41 W Long -86 29 45

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 9 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	25
Richardson's Pondweed	7
Chara	8
Coontail	11
Curly-leaf Pondweed	20
Illinois Pondweed	7
Eurasian Watermilfoil	21
Southern Naiad	5
Southern Naiad	3
Coontail	6
Chara	10
Illinois Pondweed	7
Eurasian Watermilfoil	28
Eurasian Watermilfoil	40
Eel Grass a/k/a Vallisneria	5
Richardson's Pondweed	25
Eel Grass a/k/a Vallisneria	11

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

TreatArea: **2** Projection: Map with Report ☐ RID REP-12

N Lat D	41	24	41	W Long	-86	25	69
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 4.03 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	5
American Elodea	3
Illinois Pondweed	2
Richardson's Pondweed	9
Curly-leaf Pondweed	26
Eel Grass a/k/a Vallisneria	8
Coontail	12
Eurasian Watermilfoil	45
Eurasian Watermilfoil	35

TreatArea: **3** Projection: Map with Report ☐ RID REP-12

N Lat D	41	24	56	W Long	-86	25	86
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/25/2006

Acreage: 1.4 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Richardson's Pondweed	7
Chara	19
Eurasian Watermilfoil	50
Curly-leaf Pondweed	26
Eurasian Watermilfoil	32
Coontail	16

TreatArea: **4** Projection: Map with Report ☑ RID REP-15

N Lat D	41	24	56	W Long	-86	25	88
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.93 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	8

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Coontail	18
Filamentous Algae	1
Richardson's Pondweed	7
Eurasian Watermilfoil	44
Filamentous Algae	1
Curly-leaf Pondweed	20
Eurasian Watermilfoil	44
Chara	8
Curly-leaf Pondweed	22
Coontail	18
Richardson's Pondweed	7

TreatArea: 5 Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 57 W Long -86 26 3

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.68 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
American Elodea	3
Chara	7
Curly-leaf Pondweed	31
Coontail	24
Eurasian Watermilfoil	35
Eurasian Watermilfoil	40
Coontail	18
Curly-leaf Pondweed	27
American Elodea	4
Chara	11

TreatArea: **6** Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 60 W Long -86 26 28

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 2.02 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Sago Pondweed	3
Sago Pondweed	3
Curly-leaf Pondweed	28
Chara	8
Coontail	26

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Eurasian Watermilfoil	35
American Elodea	3
Eurasian Watermilfoil	40
Eurasian Watermilfoil	35
Curly-leaf Pondweed	28
Coontail	26
Chara	8
American Elodea	3

TreatArea: **7** Projection: Map with Report ☐ RID REP-12

N Lat D 41 24 56 W Long -86 25 71
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 1.65 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	37
Coontail	21
Curly-leaf Pondweed	33
Coontail	25
American Elodea	5
Illinois Pondweed	3
Chara	2
Curly-leaf Pondweed	30
Chara	3
Eurasian Watermilfoil	32
American Elodea	6
Illinois Pondweed	3

TreatArea: **8** Projection: Map with Report ☐ RID REP-12

N Lat D 41 24 42 W Long -86 26 41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 0.85 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	29
Coontail	24
Eurasian Watermilfoil	33
Chara	9
American Elodea	5

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

TreatArea: 9 Projection: Map with Report ☐ RID REP-12

N Lat D 41 24 41 W Long -86 26 37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 3.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	32
Richardson's Pondweed	12
Coontail	26
Chara	11
Eurasian Watermilfoil	32
American Elodea	3
Curly-leaf Pondweed	16
Coontail	26
Richardson's Pondweed	12
Chara	11
American Elodea	3
Curly-leaf Pondweed	16

TreatArea: 10 Projection: Map with Report ☐ RID REP-12

N Lat D 41 24 42 W Long -86 26 41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 0.6 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	28
Chara	26
Curly-leaf Pondweed	37
Coontail	9

TreatArea: 11 Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 56 W Long -86 26 49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 1.5 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: 2

Appvd/Disappvd By Fish Staff: Stuart Shipman

Southern Naiad	2
Eurasian Watermilfoil	38
Curly-leaf Pondweed	34
Coontail	22
Chara	4

TreatArea: **12** Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 59 W Long -86 26 49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.94 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	19
Eurasian Watermilfoil	26
Coontail	24
Curly-leaf Pondweed	27
Southern Naiad	4

TreatArea: **13** Projection: Map with Report ☐ RID REP-12

N Lat D 41 24 55 W Long -86 26 81
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/25/2006 Date Signed: 5/23/2006 Date Trt: 5/19/2006

Acreage: 3.1 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	24
Eurasian Watermilfoil	36
Curly-leaf Pondweed	35
Coontail	5

TreatArea: **14** Projection: Map with Report ☐ RID REP-13

N Lat D 41 24 56 W Long -86 26 37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 0.87 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	22

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = **4**: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Eurasian Watermilfoil	36
American Elodea	5
Chara	11
Coontail	22
Southern Naiad	4

TreatArea: **15** Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 74 W Long -86 26 39
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.85 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Southern Naiad	4
Coontail	20
Eurasian Watermilfoil	40
Curly-leaf Pondweed	29
Coontail	18
Eurasian Watermilfoil	42
Chara	7
Curly-leaf Pondweed	26
Chara	11
Southern Naiad	3

TreatArea: **16** Projection: Map with Report ☐ RID REP-13

N Lat D 41 24 74 W Long -86 26 41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 1.86 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Illinois Pondweed	12
Eurasian Watermilfoil	38
Coontail	20
Richardson's Pondweed	19
Southern Naiad	3
Chara	8

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

TreatArea: 17 Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 91 W Long -86 26 42
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.92 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	4
Illinois Pondweed	8
Coontail	35
Richardson's Pondweed	12
American Elodea	2
Chara	6
Eurasian Watermilfoil	37
Coontail	41
Eurasian Watermilfoil	34
American Elodea	1
Illinois Pondweed	8
Richardson's Pondweed	12

TreatArea: 18 Projection: Map with Report ☐ RID REP-13

N Lat D 41 24 93 W Long -86 25 71
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 1.17 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	4
Eurasian Watermilfoil	40
Coontail	12
American Elodea	3
Chara	20
White Waterlily	21

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

TreatArea: **19** Projection: Map with Report ☐ RID REP-13

N Lat D 41 24 97 W Long -86 26 33
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 0.71 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	37
Curly-leaf Pondweed	4
Coontail	24
American Elodea	5
Chara	17
White Waterlily	3

TreatArea: **20** Projection: Map with Report ☐ RID REP-13

N Lat D 41 25 8 W Long -86 26 27
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 1.06 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Southern Naiad	1
Eurasian Watermilfoil	35
American Elodea	2
Curly-leaf Pondweed	25
Coontail	16
White Waterlily	5
Chara	16

TreatArea: **21** Projection: Map with Report ☐ RID REP-13

N Lat D 41 21 97 W Long -86 26 3
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 3.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Coontail	26
Curly-leaf Pondweed	25
American Elodea	2

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Spatterdock	7
Eurasian Watermilfoil	28
Chara	12

TreatArea: **22** Projection: Map with Report ☐ RID REP-13

N Lat D 41 24 92 W Long -86 25 87
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 5/30/2006 Date Signed: 5/25/2006 Date Trt: 5/24/2006

Acreage: 1.17 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	6
Eurasian Watermilfoil	18
Curly-leaf Pondweed	36
Coontail	8
Chara	6
Richardson's Pondweed	19
Southern Naiad	18
White Waterlily	1
White Waterlily	1
Eurasian Watermilfoil	26
Southern Naiad	12
Coontail	5
Curly-leaf Pondweed	34
Richardson's Pondweed	16

TreatArea: **23** Projection: Map with Report ☑ RID REP-15

N Lat D 41 25 8 W Long -86 25 84
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.99 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Sago Pondweed	2
Eurasian Watermilfoil	22
American Elodea	22
Curly-leaf Pondweed	42
Spatterdock	4
Chara	8

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

TreatArea: **24** Projection: Map with Report ☑ RID REP-15

N Lat D 41 24 60 W Long -86 25 69

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/28/2006 Date Signed: 6/23/2006 Date Trt: 6/19/2006

Acreage: 0.53 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	35
Chara	3
Coontail	25
Chara	3
Eurasian Watermilfoil	34
American Elodea	3
Eurasian Watermilfoil	34
Coontail	25
American Elodea	3
Curly-leaf Pondweed	35

Date Applied: 2/12/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2525** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Charles Cunningham Phone: (574) 389-3212 Phone 2:

Address: 1922 Fieldhouse Avenue Addy 2 Fax

City, State, Zip: ELKHART IN 46517 Email

Certified Applicator: Charles/Leslie Cunningham Certification No.: F28315

Company Name: Weed Patrol, Inc.

Address: 1922 Fieldhouse Avenue Phone: (574) 389-3212

City, State, Zip: ELKHART IN 46517 Email leslie@weedpatrol.com

Water Name: Koontz Lake Nearest Town: Koontz Lake County Name: Starke

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: 1 Projection: Map with Report ☐ RID REP-14

N Lat D W Long

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/19/2006 Date Signed: 6/15/2006 Date Trt: 6/9/2006

Acreage: 3 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	10
Eurasian Watermilfoil	90

Date Applied: 3/16/2006 Date Issued/Denied: 4/12/2006

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2786** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Charles Cunningham Phone: (574) 389-3212 Phone 2:

Address: 1922 Fieldhouse Avenue Addy 2 Fax

City, State, Zip: ELKHART IN 46517 Email

Certified Applicator: Charles/Leslie Cunningham Certification No.: F28315

Company Name: Weed Patrol, Inc.

Address: 1922 Fieldhouse Avenue Phone: (574) 389-3212

City, State, Zip: ELKHART IN 46517 Email leslie@weedpatrol.com

Water Name: Koontz Lake Nearest Town: Koontz Lake County Name: Starke

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: **1** Projection: Map with Report ☐ RID REP-20

N Lat D W Long

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/1/2007 Date Signed: 5/27/2007 Date Trt: 5/22/2007

Acreage: 3 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	15
Eurasian Watermilfoil	75
Large-leaf Pondweed	10

Date Applied: 3/28/2007 Date Issued/Denied: 4/25/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **2664** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Pinecrest Industries Phone: (269) 545-8125 Phone 2:

Address: 4355 Spring Creek Rd. Addy 2 Fax

City, State, Zip: GALIEN MI 49113 Email

Certified Applicator: Richard Soper Certification No.: 10211

Company Name: Pinecrest Industries

Address: 4355 Spring Creek Rd Phone: (269) 545-8125

City, State, Zip: GALIEN MI 49113 Email pinecrestind@aol.com

Water Name: Koontz Lake Nearest Town: Walkerton County Name: Marshall

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: 1 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 41 W Long -86 29 45

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 8.4 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Richardson's Pondweed	12
Southern Naiad	5
Curly-leaf Pondweed	22
Chara	10
Coontail	2
Eurasian Watermilfoil	44
Illinois Pondweed	5

TreatArea: **2** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 41 W Long -86 25 69

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 4.08 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	5
Eurasian Watermilfoil	52
Chara	5
American Elodea	3
Curly-leaf Pondweed	22
Eel Grass a/k/a Vallisneria	1

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Richardson's Pondweed	10
Illinois Pondweed	2

TreatArea: 3 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 56 W Long -86 25 86
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 1.3 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	8
Coontail	6
Eurasian Watermilfoil	51
Richardson's Pondweed	9
Curly-leaf Pondweed	26

TreatArea: 4 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 56 W Long -86 25 88
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.83 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Filamentous Algae	1
Chara	6
Curly-leaf Pondweed	15
Coontail	8
Eurasian Watermilfoil	61
Richardson's Pondweed	9

TreatArea: 5 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 57 W Long -86 26 3
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 1.26 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	20
Chara	14

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: 2

Appvd/Disappvd By Fish Staff: Stuart Shipman

American Elodea	5
Eurasian Watermilfoil	56
Coontail	5

TreatArea: 6 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 60 W Long -86 26 28

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.48 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	9
Sago Pondweed	3
American Elodea	4
Coontail	7
Curly-leaf Pondweed	22
Eurasian Watermilfoil	55

TreatArea: 7 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 56 W Long -86 25 71

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 1.65 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	60
Curly-leaf Pondweed	27
Coontail	4
American Elodea	4
Chara	3
Illinois Pondweed	2

TreatArea: 8 Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 42 W Long -86 26 41

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.44 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: 2

Appvd/Disappvd By Fish Staff: Stuart Shipman

Eurasian Watermilfoil	59
Curly-leaf Pondweed	22
Coontail	5
Chara	8
American Elodea	6

TreatArea: **9** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 41 W Long -86 26 37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 3.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	53
Richardson's Pondweed	11
Chara	11
American Elodea	7
Coontail	4
Curly-leaf Pondweed	14

TreatArea: **10** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 56 W Long -86 26 49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.91 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Southern Naiad	1
Eurasian Watermilfoil	58
Curly-leaf Pondweed	35
Coontail	4
Chara	2

TreatArea: **11** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 59 W Long -86 26 49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.57 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Common Name:	Rel Abundance
Coontail	5
Southern Naiad	3
Curly-leaf Pondweed	21
Eurasian Watermilfoil	52
Chara	19

TreatArea: **12** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 55 W Long -86 26 81
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 3.1 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	28
Coontail	2
Chara	10
Eurasian Watermilfoil	60

TreatArea: **13** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 56 W Long -86 26 37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.87 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	58
Curly-leaf Pondweed	20
Chara	11
Coontail	6
Southern Naiad	2
American Elodea	3

TreatArea: **14** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 74 W Long -86 26 39
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.85 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Common Name:	Rel Abundance
Southern Naiad	3
Chara	13
Coontail	9
Curly-leaf Pondweed	20
Eurasian Watermilfoil	55

TreatArea: **15** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 74 W Long -86 26 41

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 1.86 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Richardson's Pondweed	18
Illinois Pondweed	7
Chara	8
Southern Naiad	3
Coontail	7
Eurasian Watermilfoil	57

TreatArea: **16** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 91 W Long -86 26 41

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.8 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	6
American Elodea	2
Richardson's Pondweed	12
Coontail	17
Eurasian Watermilfoil	59
Illinois Pondweed	4

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: 2

Appvd/Disappvd By Fish Staff: Stuart Shipman

TreatArea: **17** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 93 W Long -86 25 71
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.45 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
White Waterlily	21
Eurasian Watermilfoil	55
Chara	10
Curly-leaf Pondweed	6
Coontail	5
American Elodea	3

TreatArea: **18** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 97 W Long -86 26 33
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 1.7 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	4
Coontail	10
American Elodea	7
Chara	18
White Waterlily	3
Eurasian Watermilfoil	58

TreatArea: **19** Projection: Map with Report ☑ RID REP-21

N Lat D 41 25 8 W Long -86 26 27
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.98 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	9
Eurasian Watermilfoil	57
American Elodea	2
White Waterlily	6

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Curly-leaf Pondweed	10
Southern Naiad	1
Chara	15

TreatArea: **20** Projection: Map with Report ☑ RID REP-21

N Lat D 41 21 97 W Long -86 26 3

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 1.8 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
American Elodea	2
Chara	12
Coontail	12
Curly-leaf Pondweed	8
Eurasian Watermilfoil	60
Spatterdock	6

TreatArea: **21** Projection: Map with Report ☑ RID REP-21

N Lat D 41 24 92 W Long -86 25 87

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/11/2007 Date Signed: 6/2/2007 Date Trt: 5/30/2007

Acreage: 0.39 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	6
Curly-leaf Pondweed	10
White Waterlily	1
Chara	4
Richardson's Pondweed	16
Eurasian Watermilfoil	57
Southern Naiad	6

Date Applied: 2/13/2007 Date Issued/Denied: 5/17/2007

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **3100** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Nathan Long Phone: (812) 497-2410 Phone 2:

Address: 418 W. St Rd. 258 Addy 2 PO Box 100 Fax

City, State, Zip: SEYMOUR IN 47274 Email

Certified Applicator: Nathan Long Certification No.: 38005/15824

Company Name: Aquatic Control Inc.

Address: 418 W. State Rd. 258 Phone: (812) 497-2410

City, State, Zip: SEYMOUR IN 47274 Email natel@aquaticcontrol.com

Water Name: Koontz Lake Nearest Town: Koontz Lake County Name: Starke

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: **1** Projection: Map with Report ☑ RID REP-28

N Lat D 41 41.7191 W Long -86 47.1875

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/16/2008 Date Signed: 6/16/2008 Date Trt: 6/11/2008

Acreage: 2.5 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe: Aquathal K

Common Name:	Rel Abundance
Horned Pondweed	10
Curly-leaf Pondweed	10
Coontail	10
Eurasian Watermilfoil	40
Chara	5
White Waterlily	5
Large-leaf Pondweed	20

Date Applied: 5/7/2008 Date Issued/Denied: 5/23/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **3008** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Pinecrest Industries Phone: (269) 545-8125 Phone 2:

Address: 4355 Spring Creek Rd. Addy 2 Fax

City, State, Zip: GALIEN MI 49113 Email

Certified Applicator: Richard Soper Certification No.: 10211

Company Name: Pinecrest Industries

Address: 4355 Spring Creek Rd Phone: (269) 545-8125

City, State, Zip: GALIEN MI 49113 Email pinecrestind@aol.com

Water Name: Koontz Lake Nearest Town: Walkerton County Name: Marshall

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: 1 Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 41 W Long -86 29 45

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 8.4 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	2
Curly-leaf Pondweed	18
Chara	10
Richardson's Pondweed	12
Illinois Pondweed	5
Southern Naiad	5
Eurasian Watermilfoil	36

TreatArea: **2** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 41 W Long -86 25 69

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 4.08 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	5
Eel Grass a/k/a Vallisneria	1
Eurasian Watermilfoil	52
Coontail	5
Richardson's Pondweed	10
Illinois Pondweed	2
American Elodea	3

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Curly-leaf Pondweed	22

TreatArea: 3 Projection: Map with Report ☑ RID REP-29

N Lat D	41	24	56	W Long	-86	25	86
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 1.3 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	26
Richardson's Pondweed	9
Chara	8
Coontail	6
Eurasian Watermilfoil	51

TreatArea: 4 Projection: Map with Report ☑ RID REP-29

N Lat D	41	24	56	W Long	-86	25	88
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.83 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	6
Richardson's Pondweed	9
Curly-leaf Pondweed	15
Eurasian Watermilfoil	61
Coontail	8
Filamentous Algae	1

TreatArea: 5 Projection: Map with Report ☑ RID REP-29

N Lat D	41	24	57	W Long	-86	26	3
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 1.26 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	20
American Elodea	5
Coontail	5

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Eurasian Watermilfoil	56
Chara	14

TreatArea: **6** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 60 W Long -86 26 28
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.48 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	22
Coontail	7
American Elodea	4
Sago Pondweed	3
Chara	9
Eurasian Watermilfoil	55

TreatArea: **7** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 56 W Long -86 25 71
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 1.65 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	3
Eurasian Watermilfoil	60
Curly-leaf Pondweed	27
Coontail	4
American Elodea	4
Illinois Pondweed	2

TreatArea: **8** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 42 W Long -86 26 41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.44 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	8

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

American Elodea	6
Coontail	5
Eurasian Watermilfoil	59
Curly-leaf Pondweed	22

TreatArea: **9** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 41 W Long -86 26 37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 3.2 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
American Elodea	7
Chara	11
Richardson's Pondweed	11
Coontail	4
Eurasian Watermilfoil	53
Curly-leaf Pondweed	14

TreatArea: **10** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 56 W Long -86 26 49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.91 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	58
Curly-leaf Pondweed	35
Coontail	4
Chara	2
Southern Naiad	1

TreatArea: **11** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 59 W Long -86 26 49
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.57 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Chara	19
Eurasian Watermilfoil	52
Coontail	5
Southern Naiad	3
Curly-leaf Pondweed	21

TreatArea: **12** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 55 W Long -86 26 81
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 3.1 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	10
Eurasian Watermilfoil	60
Curly-leaf Pondweed	28
Coontail	2

TreatArea: **13** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 56 W Long -86 26 37
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.87 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance
Chara	11
Eurasian Watermilfoil	58
Curly-leaf Pondweed	20
Coontail	6
American Elodea	3
Southern Naiad	2

TreatArea: 14 Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 74 W Long -86 26 39
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.85 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical
Permittee reported no treatment, if this is checked. ☐
Describe:

Common Name:	Rel Abundance

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008
Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Coontail	9
Eurasian Watermilfoil	55
Southern Naiad	3
Chara	13
Curly-leaf Pondweed	20

TreatArea: **15** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 74 W Long -86 26 41
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 1.86 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Southern Naiad	3
Richardson's Pondweed	18
Chara	8
Coontail	7
Illinois Pondweed	7
Eurasian Watermilfoil	57

TreatArea: **16** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 91 W Long -86 26 42
N Lat D W Long
UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.8 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Eurasian Watermilfoil	59
Illinois Pondweed	4
Coontail	17
Richardson's Pondweed	12
American Elodea	2
Chara	6

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

TreatArea: **17** Projection: Map with Report ☑ RID REP-29

N Lat D	41	24	93	W Long	-86	25	71
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.45 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	6
Eurasian Watermilfoil	55
White Waterlily	21
Coontail	5
American Elodea	3
Chara	10

TreatArea: **18** Projection: Map with Report ☑ RID REP-29

N Lat D	41	24	97	W Long	-86	26	33
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 1.7 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Curly-leaf Pondweed	4
Coontail	10
American Elodea	7
Chara	18
White Waterlily	3
Eurasian Watermilfoil	58

TreatArea: **19** Projection: Map with Report ☑ RID REP-29

N Lat D	41	25	8	W Long	-86	26	27
N Lat D				W Long			
UTM 1				UTM 2:			

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.98 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	9
Curly-leaf Pondweed	10
Southern Naiad	1
White Waterlily	6

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

Chara	15
Eurasian Watermilfoil	57
American Elodea	2

TreatArea: **20** Projection: Map with Report ☑ RID REP-29

N Lat D 41 21 97 W Long -86 26 3

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 1.8 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Chara	12
Spatterdock	6
American Elodea	2
Coontail	12
Curly-leaf Pondweed	8
Eurasian Watermilfoil	60

TreatArea: **21** Projection: Map with Report ☑ RID REP-29

N Lat D 41 24 92 W Long -86 25 87

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/24/2008 Date Signed: 6/17/2008 Date Trt: 6/13/2008

Acreage: 0.39 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Coontail	6
Eurasian Watermilfoil	57
Chara	4
Richardson's Pondweed	16
White Waterlily	1
Southern Naiad	6
Curly-leaf Pondweed	10

Date Applied: 3/3/2008 Date Issued/Denied: 4/7/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman

AV Control Permit Reporting Report

Permit/License No.: **3035** ☑ Whole or Multiple (checked=Multiple)

Lake Assn Name

Applicant: Weed Patrol, Inc. Phone: (574) 389-3212 Phone 2:

Address: 1922 Fieldhouse Avenue Addy 2 Fax

City, State, Zip: ELKHART IN 46517 Email

Certified Applicator: John C. Hawkins Certification No.: F205364

Company Name: Weed Patrol, Inc.

Address: 1922 Fieldhouse Avenue Phone: (574) 389-3212

City, State, Zip: ELKHART IN 46517 Email leslie@weedpatrol.com

Water Name: Koontz Lake Nearest Town: Koontz Lake County Name: Starke

Does water flow into a water supply (yes=checked) ☐

Reporting back to DNR

TreatArea: **1** Projection: Map with Report ☐ RID REP-29

N Lat D W Long

N Lat D W Long

UTM 1 UTM 2:

Date Rec'd: 6/25/2008 Date Signed: 6/8/2008 Date Trt: 6/4/2008

Acreage: 2.93 ☑ Chemical ☐ Physical ☐ Biological ☐ Mechanical

Permittee reported no treatment, if this is checked. ☐

Describe:

Common Name:	Rel Abundance
Large-leaf Pondweed	10
Eurasian Watermilfoil	90

Date Applied: 3/7/2008 Date Issued/Denied: 4/17/2008

Approved = 1, Approved with Comments = 2, Disapproved = 3, Unknown = 4: **2**

Appvd/Disappvd By Fish Staff: Stuart Shipman