WINONA LAKE, KOSCIUSKO COUNTY
AQUATIC PLANT MANAGEMENT
PLAN UPDATE 2007

PREPARED FOR:

WINONA LAKE PRESERVATION ASSOCIATION
2012 NORTH BAY DRIVE
WARSAW, IN 46580

PREPARED BY:

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FEBRUARY, 2008

Executive Summary

Winona Lake is a 562-acre mesotrophic lake in Warsaw, Kosciusko County, Indiana. The Winona Lake Preservation Association (WLPA) contracted V3 Companies Ltd. (V3) to complete aquatic vegetation sampling in order to update an aquatic vegetation management plan which was created in 2006. The update was funded in part by the Lake and River Enhancement fund (LARE) as part of the Indiana Department of Natural Resources (IDNR) Division of Fish and Wildlife which was obtained by the WLPA. Funding for the LARE program is provided by an annual fee charged to boat owners. This update will also serve as a prerequisite to continue LARE program funding to control exotic or nuisance species.

Eurasian watermilfoil is an aggressive invasive aquatic species that has detrimental effects on native aquatic plant communities, provides poor fish habitat, inhibits boat navigation, and impedes recreational lake uses. Eurasian watermilfoil was not treated in 2007 but coontail is a native species that creates nuisance conditions when present in abundance. Reward was applied to 47 acres of Winona Lake in June and targeted areas where coontail was present. Reward is commonly used in aquatic applications because the herbicide concentration rapidly decreases as it is absorbed onto soil, vegetation, and organic matter.

The 2007 vegetation surveys performed by V3 identified a diverse aquatic plant community covering Winona Lake in depths less than 16 feet. Nine species were collected during the Tier II survey. Coontail was present at the highest percentage of sample sites (53%). Slender naiad ranked second in frequency of occurrence followed by eel grass and chara. Sago pondweed, small pondweed, water stargrass, Eurasian watermilfoil and American pondweed were also collected but found at a small percentage of sampling sites (<7%). Although coontail remained dominant, the 2007 contact herbicide treatment was effective in reducing frequency of occurrence of coontail by 21% when compared to the 2006 Tier II survey results.

The following actions are proposed for 2008 to identify and treat areas with Eurasian watermilfoil re-growth, and document the overall health, diversity, and distribution of desirable native aquatic plants. A Target Species Distribution Map and Proposed Treatment Area Map will be created during early spring 2008 to determine the extent of follow-up chemical application that will be necessary to treat Eurasian watermilfoil. An early spring (3rd week of April to mid-May) systemic herbicide application of 2,4-D granular is proposed to treat any Eurasian watermilfoil that may re-grow from the 2007 herbicide application. A proposed treatment area map should be created to determine the extent of follow-up chemical application that is necessary to treat Eurasian watermilfoil. A post treatment Tier II survey is proposed during the summer of 2008 to document diversity, distribution, and abundance of plant communities. Follow-up plant surveys and herbicide applications should be conducted during 2009 to understand if the Eurasian watermilfoil is being controlled and native plant communities remain protected.

The proposed management schedule and budgets for 2008 and 2009 are summarized below.

2008

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of 2,4-D (assumed 35 acres)	$13,125
Early Spring Systemic Herbicide Application of Renovate (assumed 35 acres)	$15,750
Late season post treatment aquatic plant survey (Tier II) and plan update	$6,000

2009

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of 2,4-D or (assumed 35 acres)	$13,125
Early Spring Systemic Herbicide Application of Renovate (assumed 35 acres)	$15,750
Late season (post treatment) aquatic plant survey (Tier II) and plan update	$6,000

Any herbicide applications will depend on the results of the surveys.

These management activities and plant surveys are proposed to improve Winona Lake's ecosystem and facilitate the achievement of overall goals established by the IDNR. These overall goals established by the IDNR for all lakes applying for LARE funding are: 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; and 3) provide reasonable public recreational access while minimizing the negative impacts on plant and wildlife resources.

Acknowledgements

We would like to acknowledge Angela Sturdevant and Gwen White with IDNR's LARE program for providing funding and assistance in the completion of this study. We would like to recognize Ed Braun and Rod Edgell, IDNR District Fisheries Biologists, for consultation and information. We would like to acknowledge the WLPA as the local sponsor that provided assistance and guidance including: Chris Cummins. We would like to recognize Tony Cunningham and Leslie Cunningham of Weed Patrol for their mapping, recommendation and consultation. Finally, we would like to acknowledge V3 staff involved in the research, sampling and document preparation including: Juli Mason, Wally Levernier, Desiree Poole, Amy Halsall, Jessica Dunn and Ed Belmonte.

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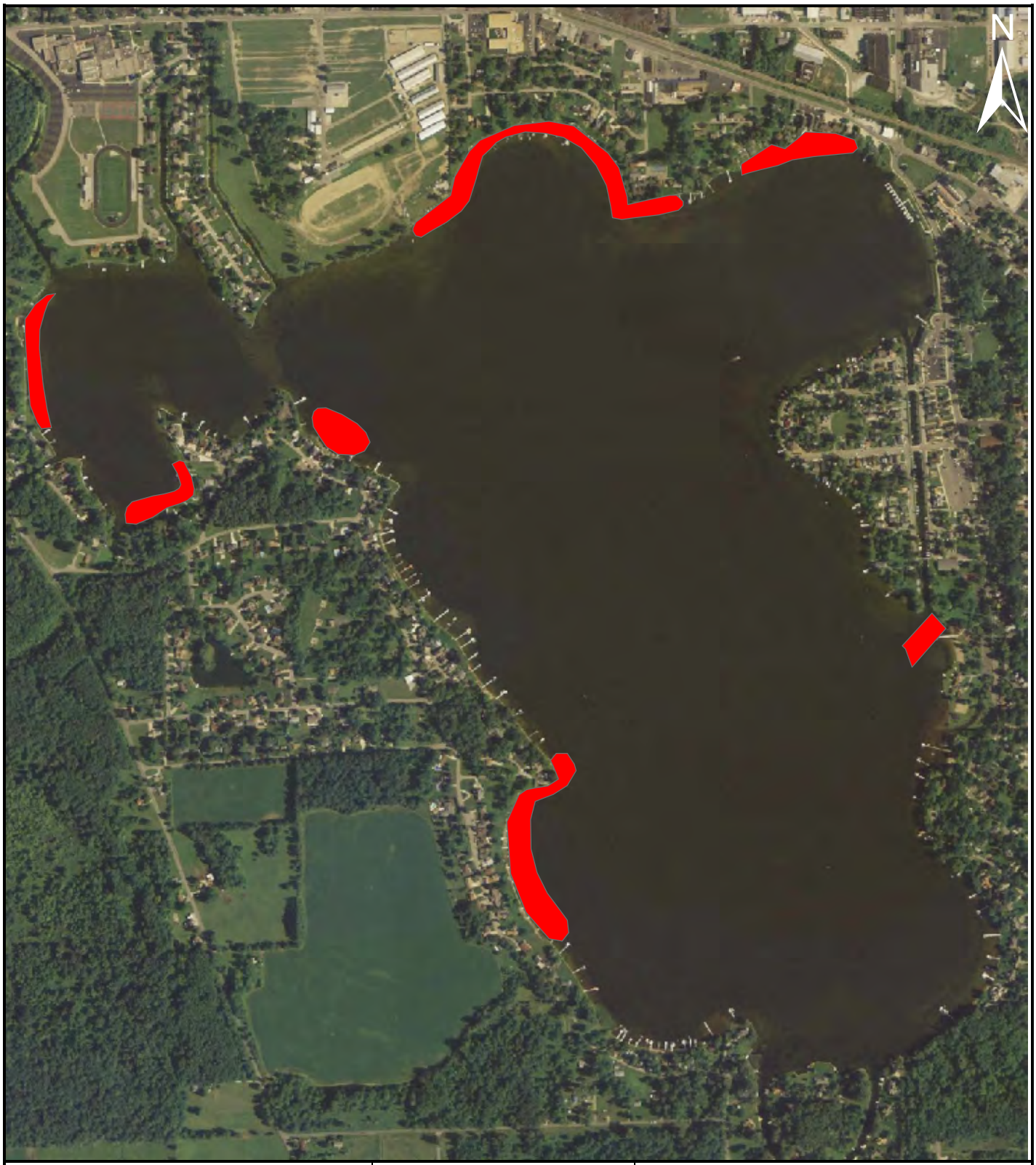
Introduction and Background

Winona Lake is a 562-acre mesotrophic lake in Warsaw, Kosciusko County, Indiana. Winona Lake has a maximum depth of 79 feet and an average depth of 30 feet. The Winona Lake watershed consists of 18,730 acres of agricultural, forested, and urban land use coverage's.

The lake is used heavily for recreational activities such as fishing, swimming, skiing and boating. The last fisheries survey (June 27-29, 2005) used electrofishing, gill nets, and trap nets to collect twenty-seven species of fish. Bluegills were the most abundant fish by number and the second most abundant fish by weight. Walleye ranked first in weight and second in number (V3 2007). The 2007 Winona Lake creel survey and general fisheries survey reports will be available in upcoming months and results will be included in the 2008 update. The state-owned access at Kiwanis Park at the northwestern corner of the lake provides a handicap accessible boat ramp, dock, and parking. The near shoreline areas of the lake are heavily populated with the urban portion of Warsaw along the northern shore. The historic district of Winona Lake Village is located on the northeastern edge of the lake. Walkways and viewing areas provide opportunities for residents to appreciate the water.

Eurasian watermilfoil is an aggressive invasive aquatic species that can have a detrimental effect on the native aquatic plant community, provides poor fish habitat, inhibits boat navigation, and causes annoyances and serious health hazards to swimmers, and other members of the general public who wish to enjoy the lake. Eurasian watermilfoil has been present in Winona Lake for many years, experienced a die-off in 1997-98, and had re-established by the fall of 2004. During the spring and early summer of 2006, Eurasian watermilfoil was present in moderate abundances. Pre-treatment distribution of Eurasian watermilfoil within Winona Lake in 2007 is seen in Exhibit I.

This report was created in order to update the Winona Lake Aquatic Vegetation Management Plan which was funded by the IDNR's LARE Program and the WLPA. This report will serve as a tool to track changes in vegetation community, monitor for invasive or nuisance species, to adjust the action plan, and to maintain eligibility for any additional LARE funding. Topics covered in this update include the 2007 sampling results, a review of the 2007 vegetation controls, and updates to the budget and action plans. Once reviewed and approved, this report should be included in the original vegetation management plan, following the 2006 update.



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TITLE: **Pre-treatment Distribution of Eurasian Watermilfoil**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data Service 2005 Orthophotography	PROJECT NO. 06099.01	EXHIBIT: I	SHEET: 1 OF: 1
CLIENT: Winona Lake Preservation Association 2012 North Bay Drive Warsaw, IN 46580	QUADRANGLE: N/A	DATE: 12/12/07	SCALE: 1"=1000'

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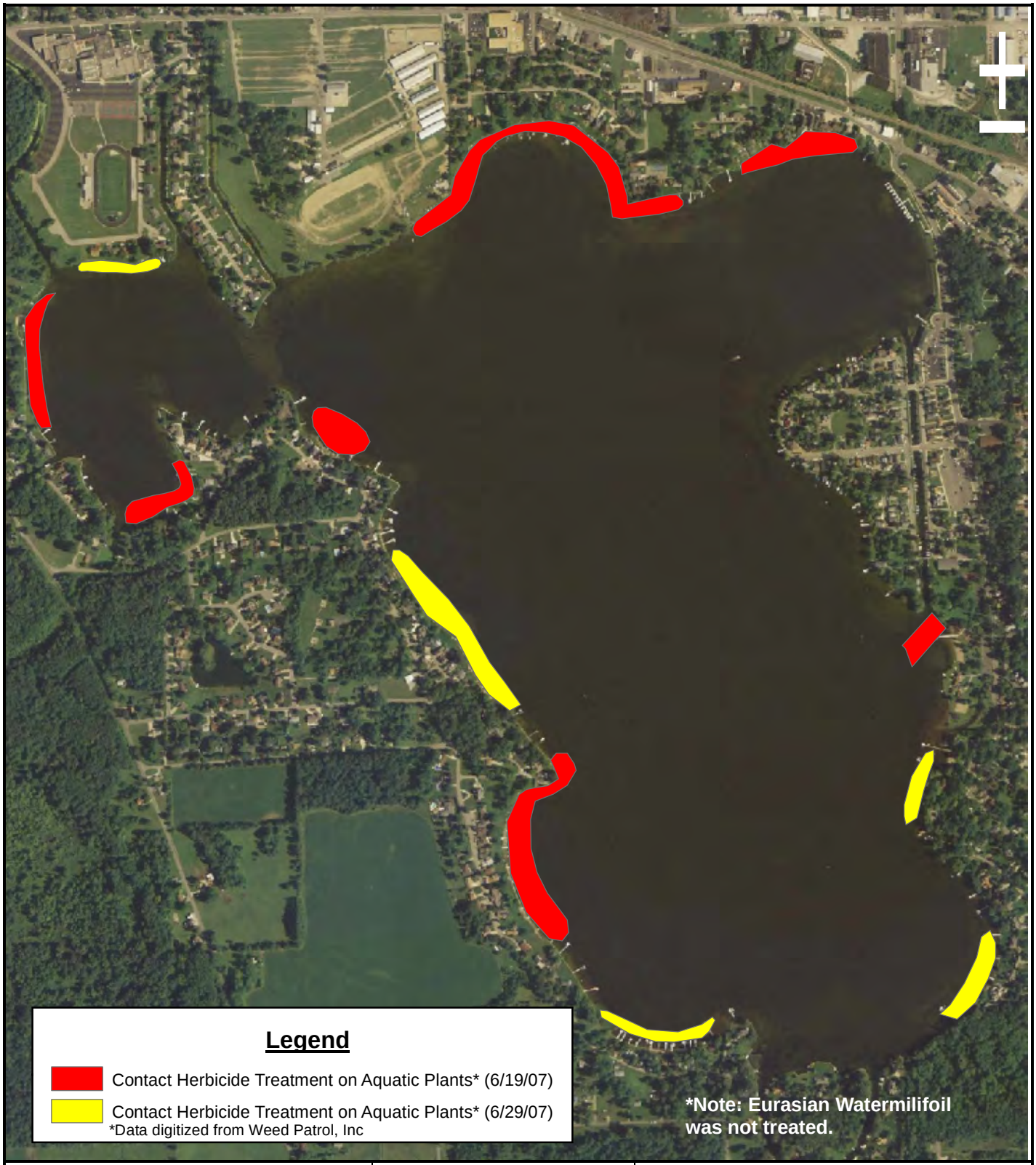
Problem Statement

In part due to water quality problems, Eurasian watermilfoil has been present in Winona Lake for many years. As summarized by International Science & Technology (IST 1991), sediment and nutrient loading have been identified as the predominant water quality impairments to Winona Lake. Sediment loading has also been observed at the mouth of Wyland Ditch for over 50 years.

The biology and life cycle of Eurasian watermilfoil provide it with a significant advantage over native species. Eurasian watermilfoil lies dormant during the winter months, instead of dying back completely like many native species. As spring arrives, the dormant Eurasian watermilfoil is able to grow earlier and reach the surface faster than other native species. It then grows horizontally across the water surface to form a canopy and effectively shades out other plants.

In order to maintain recreational opportunities at Winona Lake, it is vital that Eurasian watermilfoil populations are controlled. Herbicide treatments for 2007 include: contact herbicide of Reward to 47 acres of Winona Lake (Exhibit II) and 68 acres of algae treatments (Exhibit III). Reward herbicide treatments were targeted towards coontail, which although is a native species, is also known to negatively impact recreational activities when abundances reach nuisance levels. Treatments on Winona Lake should be continued over a three to four year period so that nuisance native species are maintained at manageable levels and recreational activities are not inhibited.



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TITLE: **Contact Herbicide-Reward Treatment Map**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data Service 2005 Orthophotography	PROJECT NO. 06099.01	EXHIBIT: II	SHEET: 1 OF: 1
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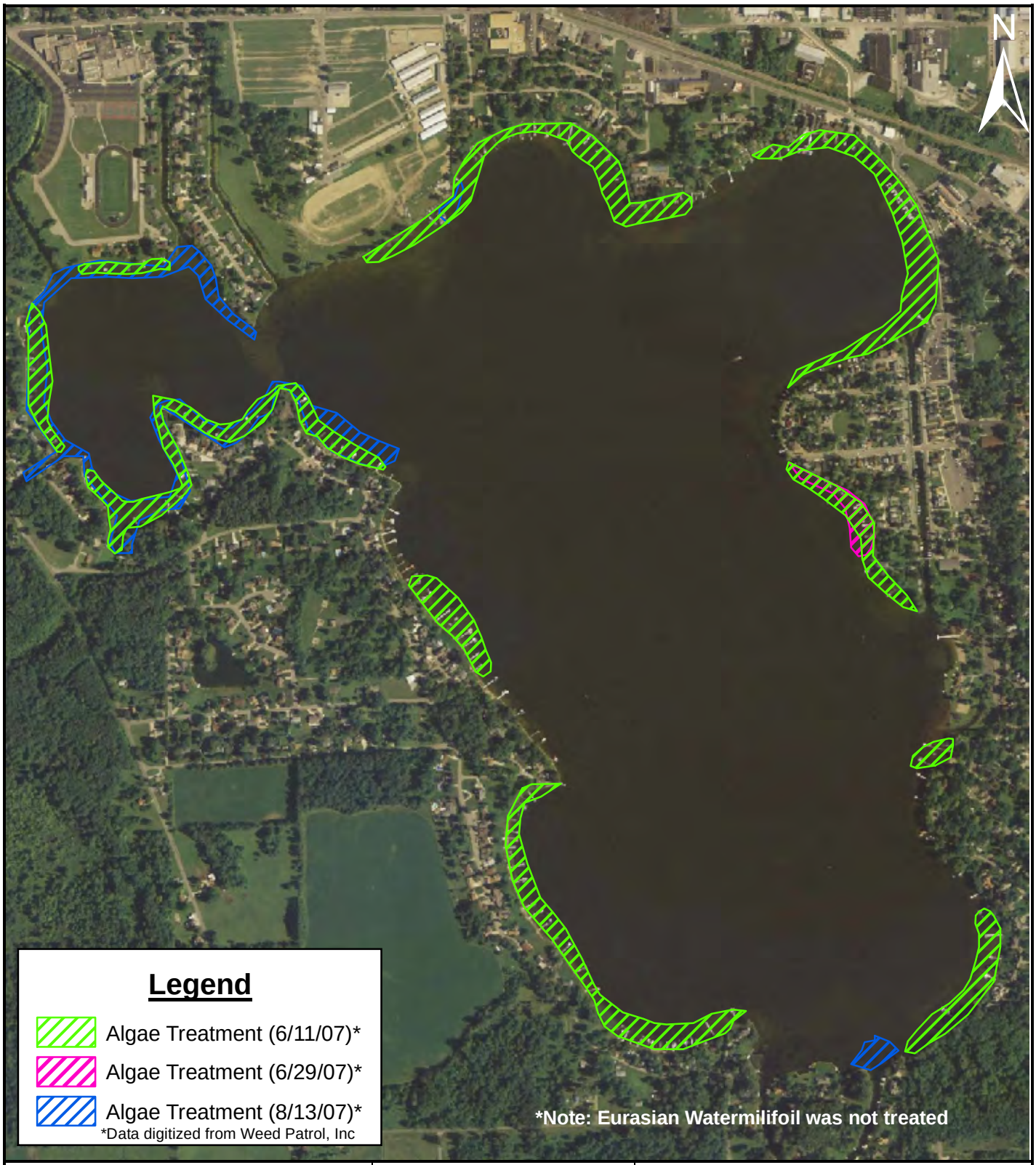

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TITLE: **Algae Herbicide Treatments**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data Service 2005 Orthophotography	PROJECT NO. 06099.01	EXHIBIT: III	SHEET: 1 OF: 1
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Sampling Results

On July 25, 2007 a Tier II survey was conducted on Winona Lake. The Tier II Aquatic Vegetation Survey Protocol, designated by the IDNR, serves as a standardized method to document the distribution and abundance of aquatic vegetation within selected areas at a state-wide scale. The information collected can be used to compare present trends in distribution and abundance of the aquatic plant community to past conditions. A table outlining the scientific and common names of species collected or observed in Winona Lake is listed below (Table 1). Nine species were collected and two species, algae and white water lily, were observed.

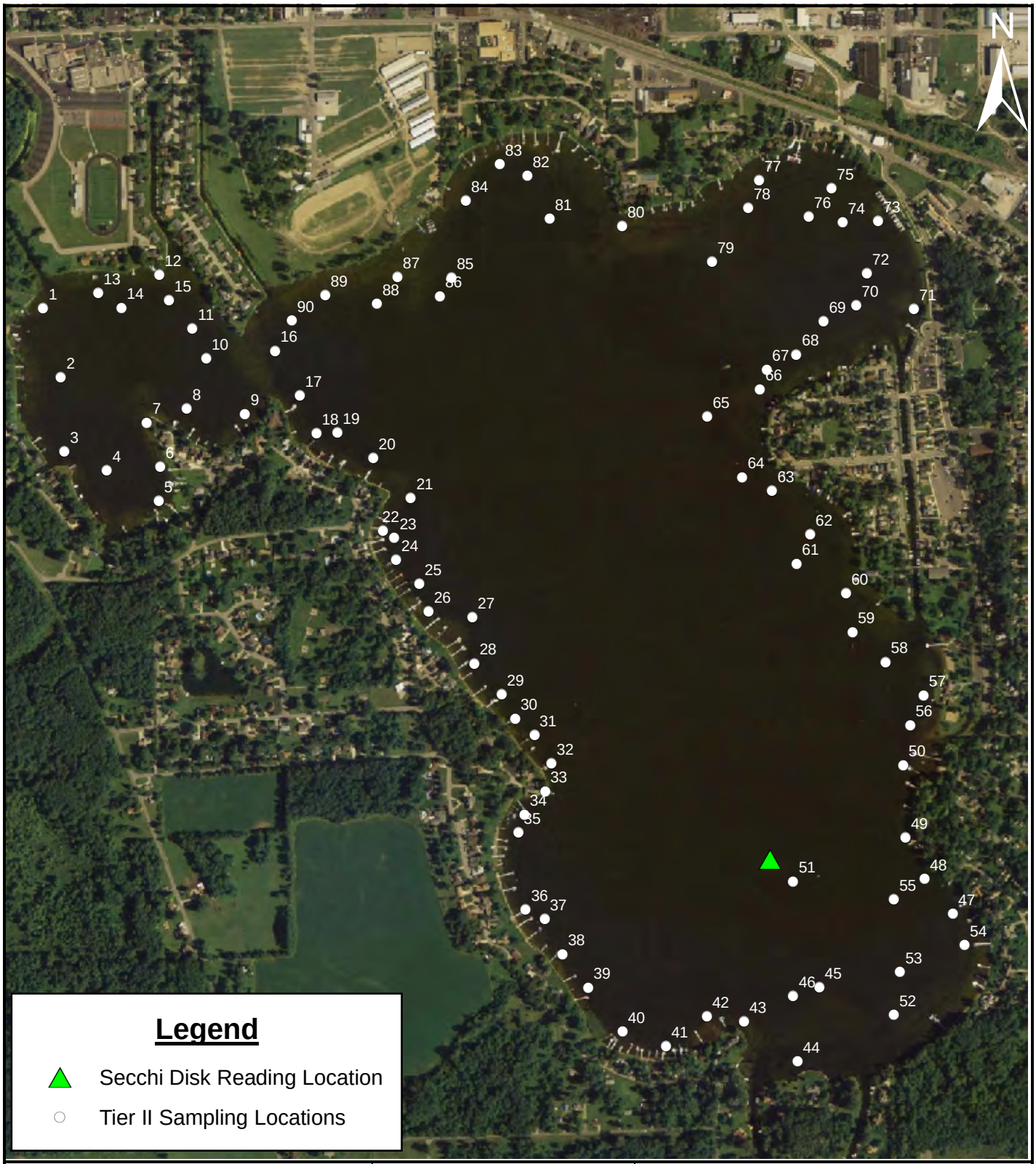
Table 1. Scientific and common names of species collected and observed in Winona Lake.

Scientific Name	Common Name
Filamentous alga	algae
Ceratophyllum demersum	coontail
Chara sp.	chara
Myriophyllum spicatum	Eurasian watermilfoil
Najas flexilis	slender naiad
Nymphaea tuberosa	white water lily
Potamogeton nodosus	long leaf pondweed
Potamogeton pectinatus	sago pondweed
Potamogeton pusillus	small pondweed
Vallisneria americana	eel grass
Zosterella dubia	water stargrass

Sampling Methodology for Summer Tier II Survey

Plant communities typically reach peak diversity between July 15 and August 31. One sampling effort occurred during this time frame which provides a representative sample of the species within Winona Lake. Winona Lake required a total of 90 sampling stations based on trophic status and acreage. According to the IDNR protocol, Winona Lake is classified as Eutrophic which would reach a maximum sampling depth of 15 feet. The maximum sampling depth for Winona Lake is set at 20 feet based on previous studies data showing that plants reached depths up to 19 feet. The Tier II sampling was conducted at the mesotrophic trophic status so that sampling locations were apportioned to the required depth class. Ninety sites were sampled within the littoral zone (29 sites 0-5ft, 27 sites 5-10ft, 24 sites 10-15 ft, and 10 sites 15-20 ft) (Exhibit IV).

A double-headed thatched rake with attached nylon rope was used to sample the aquatic vegetation at each sampling location. Once a species is identified, a vegetation abundance is scored as a 1 (1-19%), 3 (20-99%), or 5 (+100%) based on density on the rake. Species are scored as a 9 if they are observed within the vicinity of the sampling station but not collected. After completing sampling at all 90 stations, a secchi disk depth reading and water quality measurements are taken to complete the field effort.



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TITLE: **Tier II (2007) Sampling Locations**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 06099.01	EXHIBIT: IV	SHEET: 1 OF: 1
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Results of Summer Tier II Survey

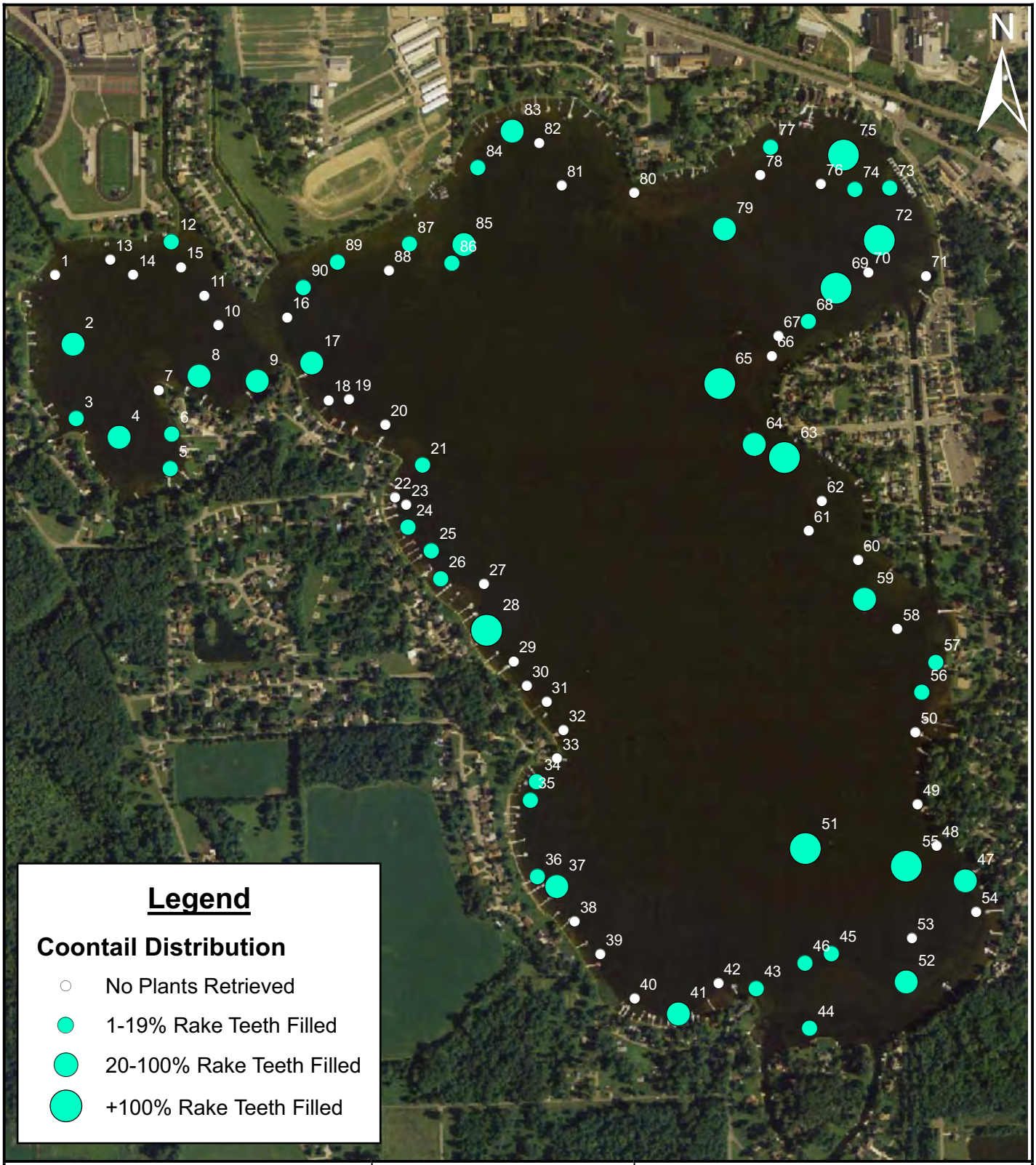
The Tier II survey completed on July 25, 2007, identified a total of eleven species (9 collected, 2 observed) within Winona Lake. Vegetation was present up to a depth of 16 feet. A secchi disk depth reading was taken after sampling and was recorded at nine feet (Exhibit IV). Sampling results for the nine species that were collected by rake are listed in Table 2.

Table 2: Occurrence and abundance of aquatic plants in Winona Lake on July 25, 2007.

County:	Kosciusko	Sites with plants:	75
Date:	7/25/2007	Sites with native species:	75
Secchi (ft):	9	Number of species collected:	9
Maximum plant depth (ft):	16	Number of native species:	10
Trophic status:	Eutrophic	Maximum species/site:	9
Trophic status sampled:	Mesotrophic	Total Sites:	90

All depths (0 to 20 ft)		Frequency of	Rake score frequency per species				Plant
Common Name	Species	Occurrence	0	1	3	5	Dominance
Coontail	Ceratophyllum demersum	53.0	47.0	29.0	16.0	8.0	24.0
Slender naiad	Najas flexilis	28.0	66.0	17.0	9.0	2.0	12.0
Eel grass	Vallisneria americana	22.0	70.0	8.0	12.0	2.0	11.11
Chara	Chara spp.	20.0	78.0	16.0	4.0	0.0	5.78
Sago pondweed	Potamogeton pectinatus	7.0	90.0	6.0	1.0	0.0	1.78
Small pondweed	Potamogeton pusillus	7.0	90.0	7.0	0.0	0.0	1.33
Water stargrass	Zosterella dubia	3.0	97.0	3.0	0.0	0.0	0.67
Eurasian watermilfoil	Myriophyllum spicatum	2.0	96.0	2.0	0.0	0.0	0.44
American pondweed	Potamogeton nodosus	1.0	96.0	1.0	0.0	0.0	0.22
Depth: 0 to 5 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Common Name	**Species**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Slender naiad	Najas flexilis	58.0	28.0	20.0	28.0	10.0	31.03
Eel grass	Vallisneria americana	55.0	28.0	17.0	31.0	7.0	28.97
Chara	Chara spp.	48.0	45.0	34.0	14.0	0.0	15.17
Coontail	Ceratophyllum demersum	48.0	52.0	41.0	7.0	0.0	12.41
Sago pondweed	Potamogeton pectinatus	18.0	72.0	14.0	4.0	0.0	4.83
Water stargrass	Zosterella dubia	10.0	90.0	10.0	0.0	0.0	2.07
Small pondweed	Potamogeton pusillus	7.0	83.0	7.0	0.0	0.0	1.38
American pondweed	Potamogeton nodosus	4.0	86.0	4.0	0.0	0.0	0.69
Eurasian watermilfoil	Myriophyllum spicatum	3.0	90.0	3.0	0.0	0.0	0.69
Depth: 5 to 10 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Common Name	**Species**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	Ceratophyllum demersum	70.0	30.0	26.0	26.0	18.0	39.26
Slender naiad	Najas flexilis	22.0	74.0	22.0	0.0	0.0	4.44
Chara	Chara spp.	11.0	89.0	11.0	0.0	0.0	2.22
Eel grass	Vallisneria americana	11.0	85.0	7.0	4.0	0.0	3.70
Small pondweed	Potamogeton pusillus	7.0	93.0	7.0	0.0	0.0	1.48
Eurasian watermilfoil	Myriophyllum spicatum	4.0	96.0	4.0	0.0	0.0	0.74
Sago pondweed	Potamogeton pectinatus	4.0	96.0	4.0	0.0	0.0	0.74
Depth: 10 to 15 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Common Name	**Species**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	Ceratophyllum demersum	56.0	44.0	28.0	20.0	8.0	22.50
Slender naiad	Najas flexilis	12.0	88.0	12.0	0.0	0.0	2.50
Small pondweed	Potamogeton pusillus	8.0	92.0	8.0	0.0	0.0	1.67
Chara	Chara spp.	4.0	96.0	4.0	0.0	0.0	0.83
Eel grass	Vallisneria americana	4.0	92.0	0.0	4.0	0.0	2.50
Depth: 15 to 20 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Common Name	**Species**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	Ceratophyllum demersum	11.0	89.0	0.0	0.0	11.0	20.0

Coontail was present at the highest percentage of sample sites (53%) (Exhibit V). Slender naiad ranked second in frequency of occurrence (28%). Eel grass ranked third in frequency of occurrence (22%) (Exhibit VI) followed closely by chara (20%). Sago pondweed, small pondweed, water stargrass, Eurasian watermilfoil and American pondweed were also collected but found at a small percentage of sites. Location and density of Eurasian watermilfoil is illustrated in Exhibit VII. Species observed within the vicinity of the sampling locations include white water lily and algae. Datasheets from V3's sampling effort are located in Appendix I.



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TITLE: Coontail Distribution		PROJECT: Winona Lake Aquatic Plant Management Plan	
BASE LAYER: Indiana Spatial Data 2006 Orthophotography		PROJECT NO. 06099.01	EXHIBIT: V	SHEET: 1 OF: 1
CLIENT: Winona Lake Preservation Association 2012 North Bay Drive Warsaw, IN 46580		QUADRANGLE: N/A	DATE: 2/11/08	SCALE: 1"=1000'

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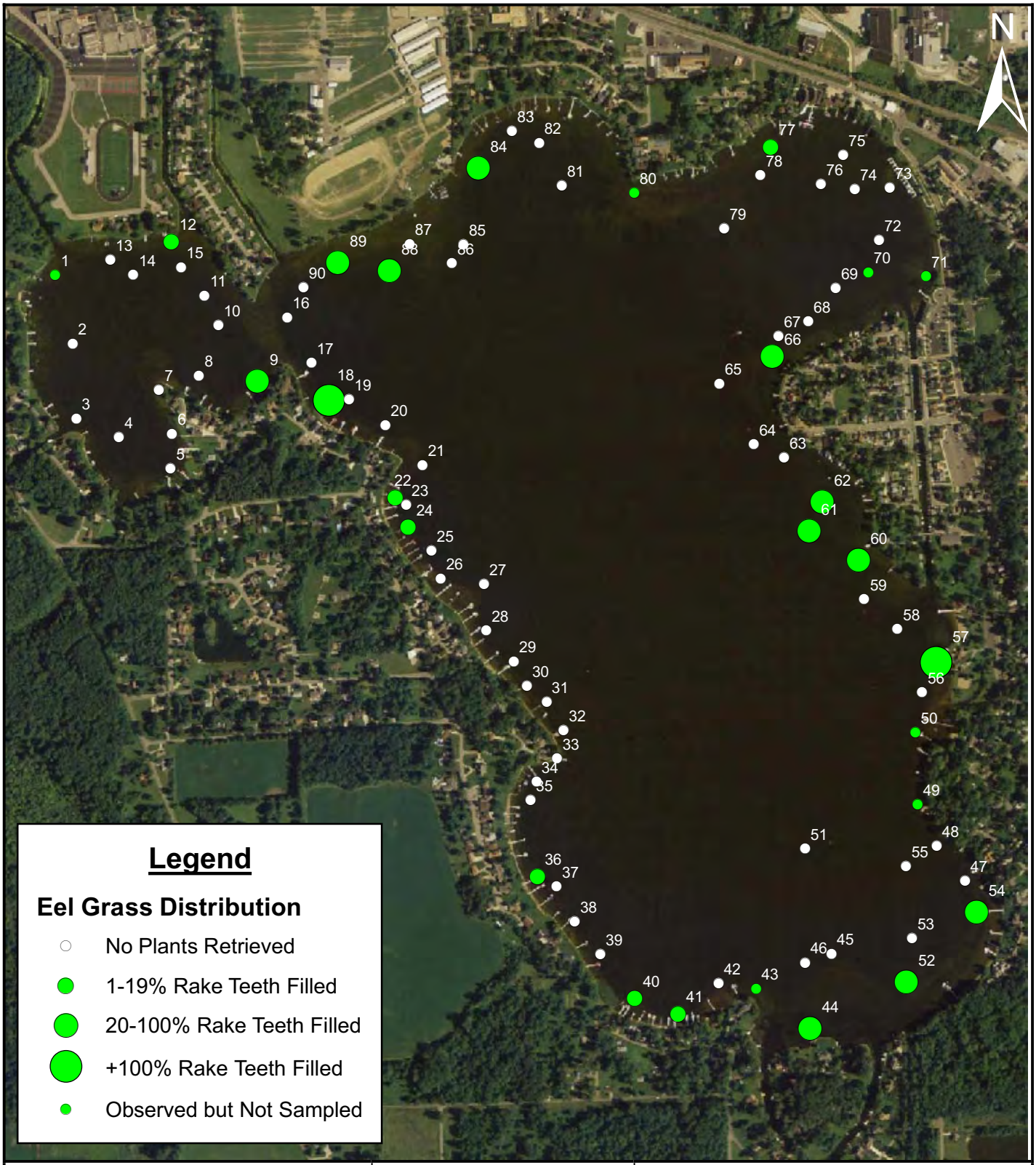

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TITLE: **Eel Grass Distribution**		PROJECT: **Winona Lake Aquatic Plant Management Plan**	
BASE LAYER: Indiana Spatial Data 2006 Orthophotography		PROJECT NO. 06099.01	EXHIBIT: VI	SHEET: 1 OF: 1
CLIENT: Winona Lake Preservation Association 2012 North Bay Drive Warsaw, IN 46580		QUADRANGLE: N/A	DATE: 2/11/08	SCALE: 1"=1000'

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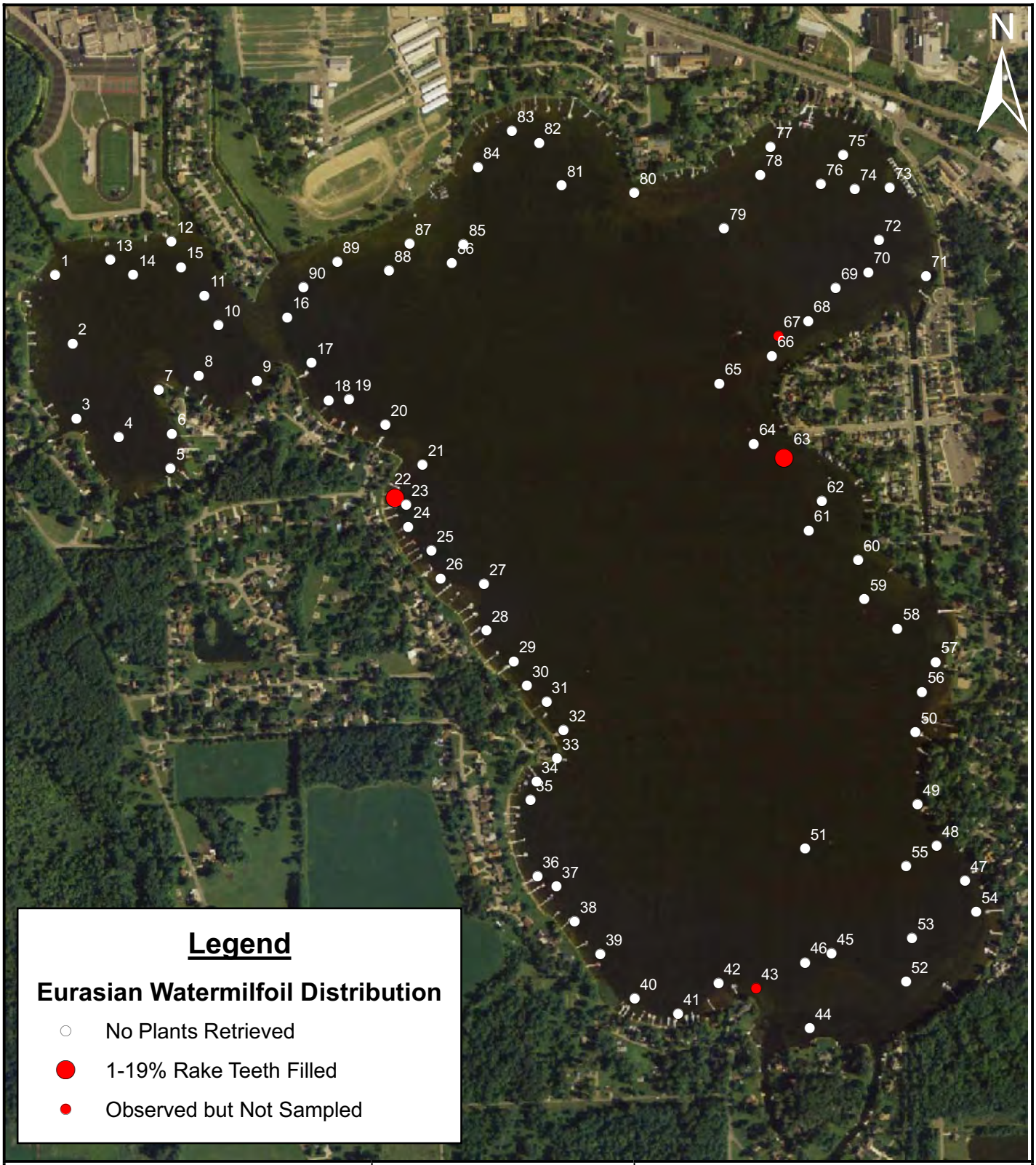

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TITLE: **Eurasian Watermilfoil Distribution and Abundance**		PROJECT: **Winona Lake Aquatic Plant Management Plan**	
BASE LAYER: Indiana Spatial Data 2006 Orthophotography		PROJECT NO. 06099.01	EXHIBIT: VII	SHEET: 1 OF: 1
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Aquatic Vegetation Sampling Discussion

The goals of the plan are to reduce nuisance conditions caused by invasive plant species and nuisance native species while still maintaining the abundance of beneficial native species. A diverse native plant community is vital in providing a source of food, habitat, improved water clarity, and nutrient absorption. A healthy plant community inhibits the spread of exotic species such as Eurasian watermilfoil. Quantitative sampling of the aquatic plant community was conducted in 2005 by the IDNR (Benson 2006) and in 2006 and 2007 by V3. Although the sampling methods varied through the years, a summary of sampling data is provided in Table 3.

Table 3. **Tier II Data Comparison from 2005 to 2007**

Sampling Date:	July 28,2005	August 1, 2006	July 25, 2007
Secchi disk depth (ft):	6	6	9
Number of Sites:	100	90	90
Max Plant Depth (ft):	13	19	16
Percent of Sites Sampled with Vegetation	86	92	83
Number of Species	18	14	11
Number of Native Species:	17	12	10

The 2007 secchi disk depth reading was the highest measurement of the past three surveys by three feet. The maximum plant depth for 2007 was 16 feet and represented the average of the past three surveys. Nearly all of the sampling stations were vegetated (75/90, 83%). The depth range from 15 to 20 feet accounted for the sampling stations that remained unvegetated (80%). The depth class from 15 to 20 feet, where vegetated, was dominated by coontail (11%). Native plants accounted for 91% of species collected. The only exotic species collected was Eurasian watermilfoil. Eurasian watermilfoil was present in depths ranging from 0 to 10 feet but overall was only representative of a small percentage of sites (2%). Ten additional sampling stations past the 20 foot depth zone were raked with no vegetation recovered. Since no vegetation was recovered there is no indication to extend sampling stations into deeper contours.

Aquatic vegetation sampling is an important component in management and monitoring because it enables trends in species composition to be identified. Coontail was recorded from 40% of sampling locations and had a dominance index (DI) value of 11.4 during the 2005 Tier II aquatic plant survey (Benson 2006). In comparison, the DI value of coontail was 41.1 in 2006, and it was recorded from 74% of sampling locations. When analyzed for the 0 to 5 foot depth zone, coontail had a DI of 11.0. In the 6 to 15 foot depth zones, coontail was strongly dominant, with DI values of 61.5 and 55.8. In the deepest depth zone (16-20’), coontail was also dominant (DI 38.0), although it was less abundant than it had been in the medium depth zones. The increase in coontail abundance in 2006 may be attributed to the change in Tier II sampling protocol between 2005 and 2006; more sampling locations were taken from a shallower depth in 2005. In part, the much higher dominance of coontail in 2006 may be due to more sampling locations at greater depths. The 2007 Tier II sampling results identified coontail as the dominant species with a DI value of 24.0 and was recorded at 53% of sampling locations. Although there was a decrease in coontail frequency of occurrence by 21% from 2006 to 2007, coontail still dominated the depth range from 15 to 20 feet.

Eurasian watermilfoil was recorded from 5% of the sampling locations and had a DI 1.08 value of during the 2005 Tier II aquatic plant survey (Benson 2006). In comparison, the DI value of Eurasian watermilfoil decreased to 0.4 in 2006, and it was recorded from 2% of sampling locations. In 2007 Eurasian watermilfoil abundance remained consistent with the results from the 2006 survey; Eurasian watermilfoil was recorded at 2% of sampling stations and had a DI value of 0.4. Although Eurasian watermilfoil has been present in Winona Lake in moderate abundances close monitoring and management is necessary to protect the lake from Eurasian watermilfoil become the dominant species.

Eel grass was recorded from 35.5% of sampling locations and had a DI value of 9.68 during the 2005 Tier II aquatic plant survey (Benson 2006). In comparison, the DI value of eel grass decreased to 6.2 in 2006, and it was recorded from 17% of sampling locations. In 2007, eel grass was recorded from 22% of sampling stations and had a DI value of 11.11. When analyzed for the 0 to 5 foot depth zone eel grass had a DI of 28.8 which is significantly greater than the DI value of 17.2 within this depth zone in 2006. Although eel grass abundance is not as dominant in 2007 as it was in 2005 it still impedes recreational activities on Winona Lake. Eel grass can reach nuisance levels and is worsened when propellers from high speed boating creates floating fragments. Management is necessary to keep eel grass from creating nuisance conditions by its overabundance.

Aquatic Plant Management Alternatives

At the present time, the health of Winona Lake's aquatic plant communities is good. Native plant diversity is relatively high, despite the presence of Eurasian watermilfoil. Additionally, a relatively good diversity of native plants is present despite an extensive history of herbicide applications to control these invasive plant species as well as dense native plants that have been perceived as a nuisance. Undoubtedly, continued management efforts to maintain nuisance native species at manageable levels providing limited inhibition to recreational activities. Eurasian watermilfoil populations must also be closely monitored to see if they are remaining at low densities. It is incredibly important to prevent Eurasian watermilfoil from becoming a dominant species within Winona Lake.

Many management strategies have been used to control nuisance species within Indiana's lakes. A management strategy should be chosen based on selectivity to the target species, long-term effectiveness, and potential for detrimental side-effects (i.e., effects on non-target species). The foremost objective is to choose a management strategy that will effectively control the nuisance species with minimal negative effects on non-target plants or fish species.

Although dense beds of native aquatic plants can be a nuisance where they inhibit lake access, aquatic vegetation is important to maintaining a healthy lake ecosystem. Aquatic plants provide habitat for plankton, insects, crustaceans, fish, and amphibians. They take nutrients like phosphorus and nitrogen out of the water column, increase water clarity, prevent harmful algal blooms, produce oxygen and provide food for waterfowl. Aquatic plants can even remove pollutants from contaminated water and prevent the suspension of particulate matter by stabilizing sediment and preventing erosion from wave action or current.

Because of the overall importance of beneficial aquatic vegetation, one of the most basic goals of the LARE aquatic vegetation program is to maintain healthy aquatic ecosystems by maintaining or improving biodiversity in Indiana lakes, which includes protecting beneficial aquatic vegetation. As such, it is recognized that competing uses of the lakes including access for boating and maintaining plant beds to provide habitat for juvenile fish must be incorporated into an overall management strategy for the lake.

Implementation projects involving best management practices for establishing native submergent or emergent aquatic plant communities within Winona Lake or along the shoreline has not occurred and can not be discussed. Different types of aquatic plant management alternatives are discussed below. One or more of these alternatives may be employed to meet the objectives of Winona Lake. This discussion of management alternatives is adapted from Aquatic Weed Control (2005).

1 No Action

If no action is taken, the Eurasian watermilfoil abundance may remain stable, or it may increase from year to year. Eurasian watermilfoil spreads by fragmentation; when the plant is cut, the fragment has the ability to form an entirely new plant. Eurasian watermilfoil also over-winters

as an adult plant and sprouts early in the spring. These reproductive characteristics cause milfoil beds to become denser over time, creating a monoculture as it out-competes and eliminates native species. A major goal of this aquatic plant management plan is to prevent Eurasian watermilfoil from becoming a monoculture, as it was prior to 1996, and to maintain and enhance the current diversity of native aquatic plants. Therefore, it is imperative that Eurasian watermilfoil be controlled while its population is still small. Taking no action might allow the Eurasian watermilfoil population to expand and become as dominant as it had been prior to 1996.

The nutrient levels and lake morphology naturally promote dense vegetation growth in almost all shallow areas (i.e., < 20' deep). If no action is taken, it is likely that individual residents and groups will continue to apply herbicides to native plant beds in a haphazard fashion to improve their lake access. By formulating a more comprehensive, integrated management strategy that incorporates all competing uses of Winona Lake, the goal of this plan is to facilitate vegetation management as needed to meet lake objectives, but minimize haphazard management that may have detrimental side-effects.

2 Environmental Manipulation

Draw down of the lake water level is one option that may decrease the Eurasian watermilfoil population. Lower water levels expose the Eurasian watermilfoil roots to freezing and thawing, which may kill milfoil root systems. However, a lake drawdown will not only kill Eurasian watermilfoil but all native plants as well. Also, reducing the lake level may make new areas of the lake available for vegetative growth, and Eurasian watermilfoil may have an advantage in the colonization of these new areas.

The water level at Winona Lake is lowered one foot between November 1 and May 1 to reduce ice damage to seawalls and prevent damage to the control mechanisms of the dam (D.J. Case & Assoc. 2005). However, to expose the milfoil roots to freezing, the lake water level would have to be lowered several additional feet. This would severely damage the beneficial, diverse native plant beds at Winona Lake.

3 Chemical Controls – Aquatic Herbicides

There are two major categories of aquatic herbicides: contact and systemic herbicides. Contact herbicides are not selective, and thus are best used to control plants around piers and in navigation channels. Given the lack of selectivity and their inability to eliminate the root systems of treated plants, contact herbicides have the potential to cause unnecessary damage to native species. Additionally, there is potential for re-infestation of Eurasian watermilfoil. Reward (active ingredient: diquat) and Aquathal (active ingredient: endothal) are two examples of contact herbicides.

Although contact herbicides generally are not selective, timing and dosage can be adjusted to make them affect the target species with less damage to non-target species. The phenological timing method of contact herbicide treatment for Eurasian watermilfoil has shown some success. Tests have shown that by adjusting the dosage higher and timing the treatment exactly, a systemic effect on Eurasian watermilfoil can be achieved with contact herbicides. This method

involves treating the plants very early in the spring when carbohydrate reserves of Eurasian watermilfoil have left the root structure, promoting rapid growth in the other plant structures. Since Eurasian watermilfoil is growing more actively earlier in the spring than other species, the risk to non-target plants is relatively low if timed properly.

The contact herbicide commonly used for selective low-dose control of Eurasian watermilfoil in mid-season is Reward. A low-dose contact herbicide application can be relatively selective, since Eurasian watermilfoil is susceptible to some herbicides at a dose lower than most native plants due to their high growth rate. As a complicating factor, low-dose applications to control Eurasian watermilfoil with Reward are difficult in lakes where high levels of single-cell algae are present. Reward's mode of action is that it binds with positively charged particles in the water column. Since single-cell algae are positively charged, Reward will bind with algae in the water column and not affect the milfoil. Although Reward is not marketed as an algaecide, alga is shown on the label as controlled by this product. Since alga is relatively abundant during mid-summer at Winona Lake, the effectiveness of a low-dose contact treatment would be compromised.

Systemic herbicides are absorbed by the plant and transported to the root systems where they kill both the roots and the plant. Examples of systemic herbicides are Sonar and Avast (active ingredient: fluridone); DMA4 (active ingredient: 2,4-D), and Renovate (active ingredient: triclopyr). All of these products effectively kill Eurasian watermilfoil plants and roots. Whole lake treatments of fluridone are often used in lakes that have become severely infested with Eurasian watermilfoil. Fluridone can be applied at low rates to control the Eurasian watermilfoil while causing minimal damage to most of the native plant species present. Curly-leaf pondweed is also susceptible to fluridone at the low dose used on Eurasian watermilfoil.

2,4-D and Triclopyr, also known as Renovate, are both systemic herbicides that are often used for spot treatments in small areas of Eurasian watermilfoil. These herbicides kill all dicots (broadleaf plants such as coontail, waterweed, watermilfoils, etc.) but do not affect monocots (such as eel grass or pondweeds). In preliminary studies, Renovate may have the ability to control Eurasian watermilfoil in select areas longer than 2,4-D, but this potential benefit is outweighed by higher cost. An additional advantage of Renovate is that it is available in liquid formulation whereas 2,4-D is approved for in-water use only as a granule formulation. 2,4-D granules are used for specific plant species such as Eurasian watermilfoil, coontail, and waterlilies. Since 2,4-D is a broadleaved weed killer, it can be used selectively to remove these target species. Neither chemical affects curly-leaf pondweed.

The public's primary concern with the use of aquatic herbicides is safety. Each chemical registered for aquatic applications has undergone extensive testing prior to becoming available for use. It is imperative that any aquatic herbicide be applied by a licensed professional in accordance with its label to minimize potential side-effects.

2007 Vegetation Control

Weed Patrol performed a contact herbicide treatment for nuisance native species using Reward on June 19, 2007 for 43 acres and again on June 29, 2007 for 3.6 acres (Exhibit II). Treatment was limited to around piers and swimming areas by IDNR. Weed Patrol provided algae treatments on June 11, June 29, and August 13 for a total of 67.7 acres (Exhibit III). Weed Patrol also treated the channels monthly from May to September with the exception of July. No herbicide treatment for Eurasian watermilfoil was performed on Winona Lake during 2007.

Eurasian watermilfoil was present at 2% of the 2007 Tier II sampling stations. Our study's results compared to the previous year's survey indicate the treatment was effective in reducing densities of Eurasian watermilfoil.

There are no known state or federally protected threatened or endangered species present within Winona Lake. No voucher specimens were collected during the efforts of this project. There are no anticipated adverse impacts to any state or federally protected threatened or endangered species as it relates to the use of the vegetation control herbicides recommended within this plan.

Public Involvement

Public meetings have been held annually by the WLPA to discuss the vegetation management plan. A public meeting was held October 17, 2007 in Warsaw, Indiana. Approximately ten individuals attended the meeting. The meeting discussed current plant management activities, results of the 2007 Tier II survey, and future management. WLPA as well as attendees of the public meeting expressed an appreciation for changes in state funding which now provides grants designed for weed control treatments on lakes through the LARE program.

The lake use survey was distributed before and during the October board meeting, however, no survey forms were returned. An alternate time to distribute survey forms might be necessary in order to solicit more information from the public and increase survey participation. A preferable time for distributing surveys would be at the annual public meeting where more residents are in attendance, and we had significant participation from the residents during spring 2007 with respect to the 2006 study. Board meetings are quarterly but there is additional effort to have meetings every three months. Ten to twelve individuals usually attend the board meeting. Chris Cummins, the president of WLPA, spoke in great detail of the general sentiments of lake residents. Most of the Winona Lake residents have been residents for more than 15 years and the main recreational uses are boating, fishing, swimming, and other various watercraft sports. Residents feel there are too many aquatic plants mainly being nuisance native vegetation and all residents are in favor of LARE continuing contributions to weed treatments. The WLPA publishes a quarterly newsletter that includes current issues impacting Winona Lake and is a great resource for educational outreach. The contributions that the LARE program has made regarding Winona Lake enhancement have been greatly discussed in the newsletters. Residents who have lakefront property where vegetation is concentrated feel there is a decrease in their property values as well as it is responsible for inhibiting their recreational use of the lake. Residents have noted an explosion in eel grass abundance that they attribute to the herbicide treatments that target non-grass like species. The elimination of these species has allowed monocot species such as eel grass to thrive in treated areas. Eel grass was also related to the floating mats of chopped up vegetation that were collecting in certain areas of the lake. Residents have noted an improvement in water quality they attribute to exotic zebra mussels presence in Winona Lake.

Residents expressed that the proposed fairground naturalized shoreline project would enhance water quality, reduce erosion, and add an amenity of restoration and enhancement to Winona Lake. There is currently a problem with sand drifting and filling a north side channel. Creating an underwater structure encouraging sandbar formation in an area immediately to the east of the channel with the depositional sand problem would allow for sand to deposit behind the bar. The feasibility study for this project has been applied for as a LARE grant by the WLPA.

Lake residents play an important role in establishing and maintaining a healthy lake community. Lake association meetings and newsletters are excellent mechanisms through which information about management practices at Winona Lake can be distributed. In addition, these meetings provide a forum where issues regarding conflicting uses and goals for the lake may be discussed and keep the public informed of lake issues.

Public involvement and educational needs are critical with respect to a new threat to Indiana lakes from an invasive aquatic plant called Hydrilla (*Hydrilla verticillata*). In 2006, on Lake Manitou (adjacent to Rochester in Fulton County), an area infested with this problematic aquatic plant was identified. Efforts are currently underway to resolve the problem, but it is critical if this plant is seen on Winona Lake for the state to be notified as soon as possible.

Hydrilla can be differentiated from the native elodea in that there are typically three leaves per whorl on the native elodea and there are as many as eight leaves per whorl in Hydrilla. Elodea is also smooth to the touch where as Hydrilla is rough. Figure 1 (Michigan Sea Grant 2007) demonstrates a means of comparative identification.

Additional information can be found from the national campaign to *Stop Aquatic Hitchhikers!* at http://www.protectyourwaters.net/

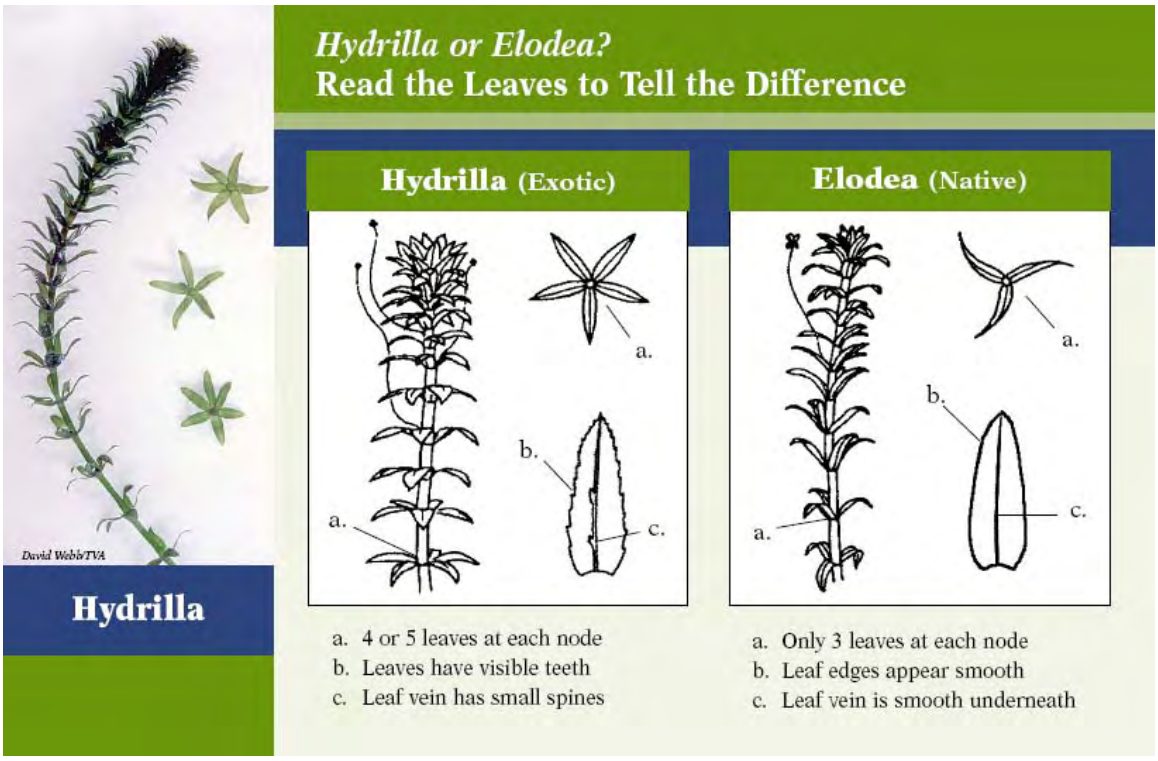


Figure 1: Illustration of Hydrilla compared to native elodea. (Illustrations provided by Michigan Sea Grant)

In addition to these state and lake-wide issues, residents can be educated regarding practical steps that can reduce nutrient loading and improve the Winona Lake ecosystem, when such practices are implemented collectively.

1. **Proper Maintenance of Boat Motors**. Improperly maintained boats may leak gasoline or oil directly into the lake, which is detrimental to the lake's ecosystem. Educating lake users about the importance of properly maintaining their boat motors is an easy and effective step to improve water quality.

2. **Limit Lawn Fertilizer Use Adjacent to Lake**. If a fertilizer application must be applied, avoid spreading fertilizer directly into the lake, on sidewalks, or seawall where it will wash into the lake. Fertilizer application should be avoided within 30 feet of the lakeshore, if possible. In addition, a buffer strip of native vegetation along the lakeshore allows runoff to be filtered before it enters the lake.

3. **Promote Agricultural Best Management Practices**. Work with farmers within the upstream watershed to increase filtration and purification of agricultural runoff before water reaches the lake. Indiana offers incentives for farmers to address soil and water concerns through the U.S. Department of Agriculture. The Indiana Conservation Reserve Program (CRP) provides technical and financial aid to reduce soil erosion, reduce sediment in lakes and streams, and improve overall water quality. Farmers owning highly erodable land or property adjacent to tributary streams or lakes may be eligible for funding to implement practices that increase water quality. Further information is available from the Indiana Natural Resources Conservation Service (NRCS).

4. **Disposal of Grass Clippings**. Avoid blowing grass clippings and tree leaves into the lake. Grass clippings blown into a pond or lake quickly can turn into a floating mat of algae because cut and decaying vegetation rapidly releases nutrients into the water.

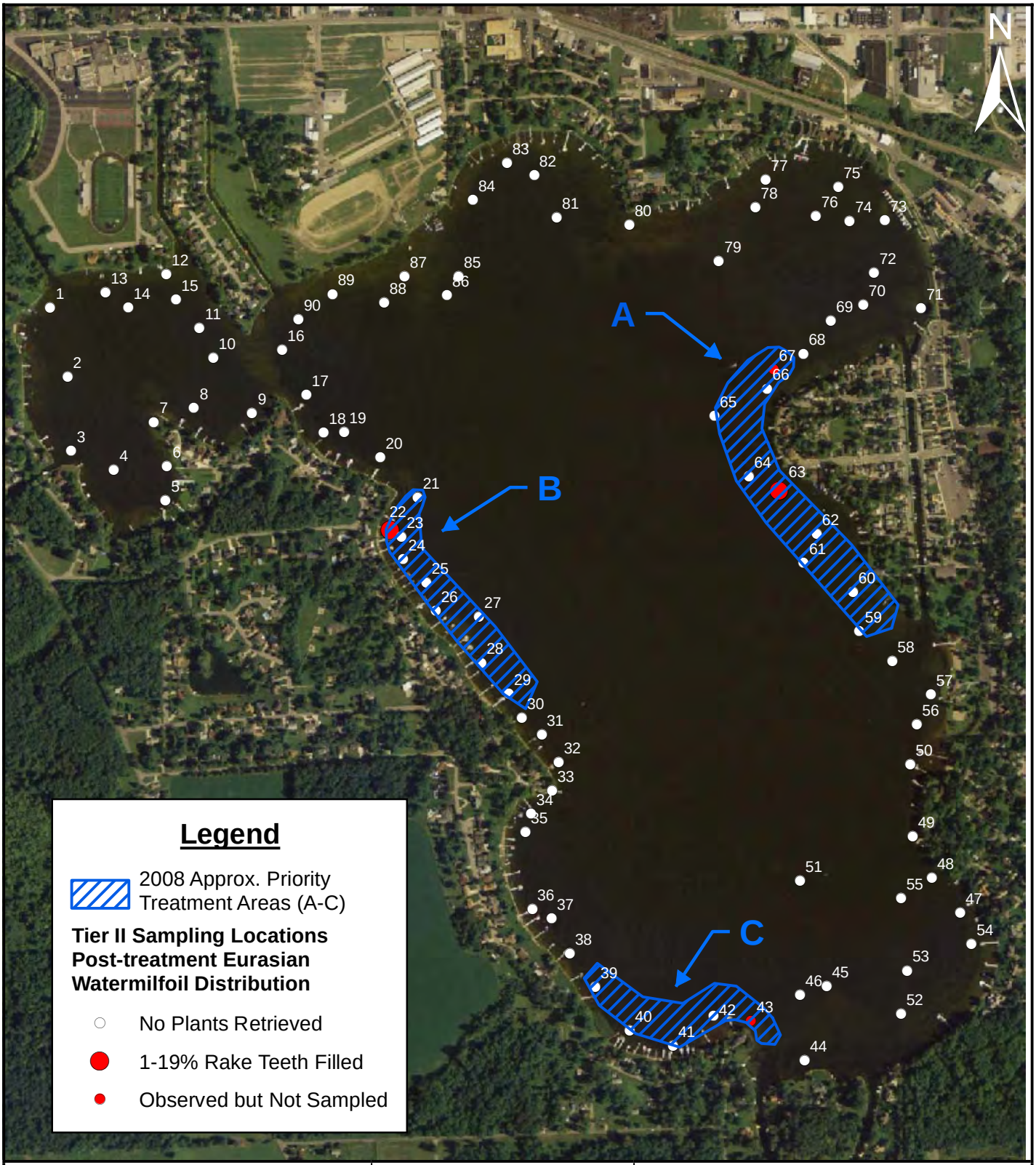
5. **Urban Stormwater Best Management Practices**. Prevent or reduce urban and industrial runoff flowing directly into the lake. Urban runoff can be one of the most detrimental factors influencing water quality. Nutrients and sediment are conveyed into the lake through storm sewers. Additionally, oil, antifreeze, gasoline, road salt, and other pollutants are washed from pavement through the storm sewer system, and are detrimental to a lake's ecosystem.

Action Plan

V3 identified three approximate priority treatment areas for 2008 based on the results of the post treatment aquatic vegetation survey (Exhibit VIII). A total of 35 acres are requested for 2,4-D or Renovate treatment for Eurasian Watermilfoil in 2008. Priority treatment area locations and acreage are described with the Application for Aquatic Vegetation Control Permit located in Appendix II.

As the action plan is implemented, aquatic plant surveys will help to monitor the effectiveness of the management strategy. The abundance distribution of Eurasian watermilfoil will be recorded using the current IDNR Tier II sampling protocol. After the Spring 2008 Target Species Distribution Map is created, the distribution and abundance of Eurasian watermilfoil will be identified and treatment maps will be prepared. The survey will also document whether native plants have re-colonized areas of previous Eurasian watermilfoil infestation. The new data analysis results will be incorporated into the current lake management plan. This will provide property owners, applicators, and the IDNR with detailed records describing the changes within the plant communities of Winona Lake. In years to follow, additional surveys will be conducted to determine how the Eurasian watermilfoil population and the native aquatic plant beds are reacting to any treatment. These surveys will provide a basis for evaluation of the management strategy and can be presented to the public should the management strategy need to be modified. They will also serve to keep the public informed about management practices at the lake so they will be motivated and educated to actively participate in conservation of the Winona Lake ecosystem.

Eel grass was recorded from 22% of sampling stations and had a DI value of 11.11 during the 2007 study. When analyzed for the 0 to 5 foot depth zone eel grass had a frequency of occurrence of 55% of sampling stations. Although eel grass abundance is not as dominant in 2007 as it was in 2005 it still negatively impacts recreational activities on Winona Lake. Eel grass also creates a problem when propellers from high speed boating cuts up the vegetation. When the vegetation is cut up it creates floating fragments that drift and collect in areas of Winona Lake. Establishing ecozones in shallow areas where eel grass beds are present would protect the eel grass from shredding from boats. Ecozones would reduce impacts by watercrafts and significantly decrease the amount of floating fragments. Two potential ecozone areas have been identified for Winona Lake and are shown in Exhibit IX. Management is necessary to keep eel grass from creating nuisance conditions by its overabundance.



V3 Companies
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630.724.9202 fax
www.v3co.com

TITLE: **Eurasian Watermilfoil Results with Priority Treatment Areas for 2008**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 06099.01	EXHIBIT: VIII	SHEET: 1 OF: 1
CLIENT: Winona Lake Preservation Association 2012 North Bay Drive Warsaw, IN 46580	QUADRANGLE: N/A	DATE: 2/25/08	SCALE: 1"=1000'

E:\2006\06099\06099.01\Reports\Natural Resources\Wetland\Exhibits\06099.01 Exhibit VIII Priority Treatment 2008.mxd

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TITLE: **Potential Ecozones**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 06099.01	EXHIBIT: IX	SHEET: 1 OF: 1
CLIENT: Winona Lake Preservation Association 2012 North Bay Drive Warsaw, IN 46580	QUADRANGLE: N/A	DATE: 2/25/08	SCALE: 1"=1000'

E:\2006\06099\06099.01\Reports\Natural Resources\Wetland\Exhibits\06099.01 Exhibit IX Potential Ecozones.mxd

Implementation of Action Plan

1. Spring 2008 Target Species Distribution Map, and Proposed Treatment Area Map. The site visit and investigation necessary to create these two maps will allow for the determination of the extent of follow-up chemical treatment that will be necessary to treat Eurasian watermilfoil. As of July, the 2007 chemical treatment effectively reduced the Eurasian watermilfoil population. The Spring 2008 mapping will determine the extent and location of milfoil re-growth.

2. Follow-up Herbicide Treatment to Eurasian watermilfoil. An early spring (3rd week of April to mid-May) systemic herbicide application of 2,4-D is proposed during 2008 to treat the Eurasian watermilfoil that has re-grown since the 2007 herbicide application.

3. Summer 2008 Tier II Aquatic Plant Survey. A Tier II aquatic plant survey should be conducted during Summer 2008 to document the diversity, distribution and abundance of aquatic plants. This data is important to understand if the native plant community is being protected, and that the Eurasian watermilfoil population is kept under control.

The management goal for 2008 is to keep the Eurasian watermilfoil populations below nuisance quantities. The overall goal for Winona Lake is the results of the 2008 sampling are equal to or less than the 2007 Eurasian watermilfoil density and abundance which would demonstrate effective herbicide treatments and management.

Budget Update

The following costs are estimated based on lake size, average depth, chemical and application costs, as well as LARE survey requirements. The proposed management schedule and budgets for 2008 and 2009 are summarized below.

2008

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of 2,4-D (assumed 35 acres)	$13,125
Early Spring Systemic Herbicide Application of Renovate (assumed 35 acres)	$15,750
Late season post treatment aquatic plant survey (Tier II) and plan update	$6,000

2009

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of 2,4-D or (assumed 35 acres)	$13,125
Early Spring Systemic Herbicide Application of Renovate (assumed 35 acres)	$15,750
Late season (post treatment) aquatic plant survey (Tier II) and plan update	$6,000

Any herbicide applications will depend on the results of the surveys.

These management activities and plant surveys are proposed to improve Winona Lake's ecosystem and facilitate the achievement of overall goals established by the IDNR. These overall goals established by the IDNR for all lakes applying for LARE funding are: 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; and 3) provide reasonable public recreational access while minimizing the negative impacts on plant and wildlife resources.

Monitoring and Plan Updates

As the action plan is implemented, aquatic plant surveys will help to monitor the effectiveness of the management strategy. The abundance distribution of Eurasian watermilfoil will be recorded using the current IDNR Tier II sampling protocol.

The results of the 2007 post-treatment sampling reflect progress toward the goals stated in the 5 year plan. Coontail, eel grass, and slender naiad (all native species) accounted for the three most dominant species within Winona Lake. Native species accounted for 90% of the aquatic plants collected. Eurasian watermilfoil was only found up to 10 feet and was found within the vicinity of a sampling location twice. Species were found within all sampling depth ranges.

After the Spring 2008 Target Species Distribution Map is created, the distribution and abundance of Eurasian watermilfoil will be identified and treatment maps will be prepared. One post-treatment Tier II survey will be conducted during the summer, preferably between July 15 and August 31 of 2008. The survey will also document whether native plants have re-colonized areas of previous Eurasian watermilfoil infestation. The new data analysis results will be incorporated into the current lake management plan. This will provide property owners, applicators, and the IDNR with detailed records describing the changed in the plant community of Winona Lake.

In years to follow, additional surveys will be conducted to determine how the Eurasian watermilfoil population and the native aquatic plant beds are reacting to any treatment regimes. These surveys will provide a basis for evaluation of the management strategy and can be presented to the public should the management strategy need to be modified. They will also serve to keep the public informed about management practices at the lake so they will be motivated and educated to actively participate in conservation of the Winona Lake ecosystem.

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Appendices

Appendix I- Data Sheets and Tier II Latitude/Longitude
Appendix II- Vegetation Control Permit

APPENDIX I

DATA SHEETS AND TIER II LATITUDE/LONGITUDE

Aquatic Vegetation Random Sampling (Tier 2)

Waterbody Cover Sheet

Surveying Organization: V3 Companies

Contact Information: Ed Belmonte (630) 729-6160

Waterbody Name: Winona

Lake ID:

County(s): Kosciusko

Date: 7-26-07

Habitat Stratum: IL

Avg. Lake Depth (ft):

Lake Level:

Crew Leader: Walter Levernier

GPS Metadata

Datum:

Zone: 16

Accuracy:

Recorder: Jessica Dunn

Method:

Secchi Depth (ft):

Total # of Points Surveyed: 90

Total # of Species: 11

Littoral Zone Size (acres):

- ☐ Measured
- ☐ Estimated

Littoral Zone Max. Depth (ft):

- ☐ Measured
- ☐ Estimate (historical Secchi)
- ☐ Estimated (current Secchi)

Notable Conditions:

DO 8.46
Water temp 24.5°C

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME: Winona Lake	**DATE:** 07252007
COUNTY: Kosciusko	**SECCHI DEPTH (FT):** 9
SITE ID: 06099	**MAX PLANT DEPTH (FT):** 16
SURVEYING ORGANIZATION: V3 Companies	**WEATHER:** Mostly Sunny
CREW LEADER: Walter Levernier	**COMMENTS (Include voucher codes - V1, V2...):**
RECORDER: Jessica Dunn	
CONTACT INFO:	***Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.***

GPS #	Point #	R/T	Latitude	Longitude	Depth	CHARA	ALGA	POTPEC	VALAME	CERDEM	POTPUS	NAJFLE	NYMTUB	Notes
						Species Codes:								
1	1	R			3'	1	9	9	9			3		
163	2	R			11'					3				
169	3	R			6'					1				
173	4	R			11'	1	9			3				
5	5	R			4'		9	1		1				
6	6	R			6'		9			1				
7	7	R			2'	3	9	9			9	9		lots of algae
8	8	R			9'					3				
9	9	R			3'	3	9	9	3	3		9	9	
174	10	R			16'									no veg
11	11	R			13'									no veg
12	12	R			3'	3	9		1	1		9	9	
13	13	R			8'									no veg
210	14	R			16'									no veg
211	15	R			13'									no veg
	16	R			9'		9					1		
	17	R			6'		9			3				
	18	R			2'	1			5			1		
	19	R			16'									no veg
	20	R			12'		9					1		
	21	R			6'		9			1		1		algae abundant
	22	R			3'		9		1			3		POTMOD-9, MYRSPI, 1
	23	R			17'									no veg
	24	R			7'				1	1				
	25	R			14'					1				
	26	R			3'		9	1		1		3		
	27	R			13'									no veg
	28	R			9'					5				
	29	R			18'									no veg.
	30	R			2'							5		
	31	R			11'							1		
	32	R			7'	1	9					1		
	33	R			3'	1	9					3		

Other plant species observed at lake:

562 acre, Eutrophic

29 pts → 0-5 ft

27 pts → 5-10 ft

24 pts → 10-15 ft.

10 pts → 15-20 ft.

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME: Winona	**DATE:** 07-25-2007
COUNTY: Kosciusko	**SECCHI DEPTH (FT):**
SITE ID:	**MAX PLANT DEPTH (FT):** 10
SURVEYING ORGANIZATION: V3 Companies	**WEATHER:**
CREW LEADER: Walter Leverinier	**COMMENTS (Include voucher codes - V1, V2...):**
RECORDER: Jessica Dunn	
CONTACT INFO:	***Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.***

Species Codes:

Point #	R/T	Latitude	Longitude	Depth	CHARA	ALGA	POTPEC	VALAME	CERDEM	POTPUS	NAJFLE	NYMTUB	Notes
34	R			8'					1				
35	R			12'					1				
36	R			4'	1	9		1	1		3		POTNOD-9
37	R			8'		9	1		3				
38	R			3'	3	9					1		
39	R			12'						1			
40	R			4'	1	9		1			3		ZOSDUB-1
41	R			9'				1	3		1		
42	R			9'	~~9~~	~~9~~	~~1~~	~~9~~	~~1~~	~~9~~	~~3~~		no veg ~~1, MYRSPI-~~ JLD
43	R			2'	9	9	1	9	1	9	3		ZOSDUB-1, MYRSPI-
44	R			4'		9		3	1		1		
45	R			6'					1				
46	R			13'		9			1				
47	R			7'				3	3				
48	R			12'									no veg
49	R			2'	1	9		9		1	5		ZOSDUB-1
50	R			12'		9		9		1			
213-51	R			16'					5				
52	R			3'		9	3	3	3				POTNOD-9
53	R			10'									no veg
54	R			4'		9		3					zebra mussels
212-55	R			14'					5				
56	R			11'					1				
57	R			3'		9		5	1		9		
58	R			7'									no veg
59	R			11'					3				
60	R			3	3	9		3		1	1		zebra mussels POTPUS
61	R			17'				3					
62	R			4'			1	3					
63	R			8'				3	5	1			MYRSPI-1
64	R			12'				3	3				
65	R			6'		9			5	1			POTI
66	R			3'	9	9		3			9		POTNOD-9

Other plant species observed at lake:

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME: Winona	**DATE:** 07 26 2007 (pts 72-90)
COUNTY: Kosciusko	**SECCHI DEPTH (FT):**
SITE ID:	**MAX PLANT DEPTH (FT):** 11.0
SURVEYING ORGANIZATION: V3 Companies	**WEATHER:** Cloudy (pts 72-90)
CREW LEADER: Walter Levernier	**COMMENTS (Include voucher codes - V1, V2...):**
RECORDER: Jessica Dunn	
CONTACT INFO:	***Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.***

Point #	R/T	Latitude	Longitude	Depth	Species Codes: CHARA	ALGA	POTPEC	VALAME	CERDEM	POTPUS	NAJFLE	NYMTUB	Notes
67	R			11.0'									no veg
68	R			12'					1				
69	R			12'					5				
70	R			7'	1	9		9			9		
71	R			3'	1	9		9					
72	R			8'					5				
73	R			3'					1		5		POTMOD-1, MYRSPI-9
74	R			11'					1				
75	R			7'	1	9			5		1		
76	R			17'									no veg
77	R			3'		9		1	1				
78	R			8'		9					1		lots of algae
79	R			11'					3				
80	R			8'	1			9			1		
81	R			11'		9							some algae
82	R			11.0'									no veg
83	R			8'					3				
84	R			5'				3	1				
85	R			8'		9			3				lots of algae
86	R			12'					1				
87	R			3'		9			1		3		
88	R			12'		9		3			1		
89	R			3'	1	9		3	1		1		
90	R			6'		9			1				

Other plant species observed at lake:

Winona Lake Aquatic Plant Management Plan Update-2007
Tier II Sampling, July 2007

Tier II Sampling Location Number	Latitude	Longitude
1	41.22898	-85.84527
2	41.22763	-85.84484
3	41.22617	-85.84477
4	41.22579	-85.84367
5	41.22517	-85.84233
6	41.22584	-85.84228
7	41.22671	-85.84261
8	41.22698	-85.84156
9	41.22686	-85.84005
10	41.22796	-85.84104
11	41.22854	-85.84139
12	41.22961	-85.84223
13	41.22927	-85.84383
14	41.22897	-85.84323
15	41.22911	-85.84199
16	41.22809	-85.83924
17	41.22721	-85.83862
18	41.22646	-85.83819
19	41.22647	-85.83765
20	41.22596	-85.83672
21	41.22516	-85.83576
22	41.22453	-85.83649
23	41.22439	-85.8362
24	41.22395	-85.83616
25	41.22348	-85.83556
26	41.22293	-85.83533
27	41.2228	-85.8342
28	41.2219	-85.83416
29	41.22129	-85.83346
30	41.22081	-85.83312
31	41.22048	-85.83261
32	41.21992	-85.83217
33	41.21937	-85.83235
34	41.21892	-85.83291
35	41.21856	-85.83307
36	41.21705	-85.83291
37	41.21686	-85.83241
38	41.21616	-85.83195
39	41.21551	-85.83129
40	41.21464	-85.83041
41	41.21433	-85.82929
42	41.21491	-85.82822
43	41.2148	-85.82725
44	41.21401	-85.82587
45	41.21546	-85.82527

Tier II Sampling Location Number	Latitude	Longitude
46	41.21529	-85.82596
47	41.21686	-85.82177
48	41.21755	-85.82249
49	41.21837	-85.82298
50	41.21979	-85.82301
51	41.21753	-85.82592
52	41.2149	-85.82334
53	41.21624	-85.82148
54	41.21574	-85.82317
55	41.21716	-85.8233
56	41.22057	-85.82282
57	41.22116	-85.82245
58	41.22182	-85.82344
59	41.22241	-85.82429
60	41.22318	-85.82444
61	41.22377	-85.82572
62	41.22434	-85.82536
63	41.22521	-85.82633
64	41.22549	-85.82711
65	41.22669	-85.82799
66	41.22721	-85.82661
67	41.22759	-85.82643
68	41.22788	-85.82565
69	41.22852	-85.82493
70	41.22882	-85.82407
71	41.22874	-85.82257
72	41.22945	-85.82378
73	41.23048	-85.82348
74	41.23047	-85.8244
75	41.23114	-85.82468
76	41.23058	-85.82528
77	41.23131	-85.82657
78	41.23077	-85.82685
79	41.22972	-85.82782
80	41.23045	-85.83014
81	41.23062	-85.83203
82	41.23146	-85.83261
83	41.2317	-85.83332
84	41.23099	-85.83422
85	41.22948	-85.83462
86	41.22912	-85.83493
87	41.2295	-85.83603
88	41.22899	-85.83657
89	41.22917	-85.83791
90	41.22868	-85.8388

APPENDIX II

VEGETATION CONTROL PERMIT

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT

State Form 26727 (R4 / 2-04)
Approved State Board of Accounts 2004

[ ] 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: Chris Cummins	Lake Assoc. Name: Winona Lake Preservation Association	
Rural Route or Street: 2012 North Bay Drive		Phone Number: (574) 267-7500
City and State: Warsaw, IN		ZIP Code: 46580
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): Winona Lake	Nearest Town: Warsaw	County: Kosciusko
Does water flow into a water supply	[ ] Yes	[X] No

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

Treatment Area # A (17 acres) LAT/LONG or UTM's Lat: 41.22521 Lon: -85.82633

Total acres to be controlled: sum of 35 acres for lake
Proposed shoreline treatment length (ft): 2,203 ft
Perpendicular distance from shoreline (ft): adjacent

Maximum Depth of Treatment (ft): 20 ft
Expected date(s) of treatment(s): 03/15/08 - 08/15/08

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.

There are three Eurasian watermilfoil priority treatment areas for Winona Lake in 2008. The 35 acres will be treated with an herbicide application of 2,4-D or Renovate in 2008. Selected treatment locations for Eurasian watermilfoil are shown in the attached Eurasian watermilfoil priority treatment exhibit.

Plant survey method: [X] Rake [ ] Visual [ ] Other (specify) Based on Tier II sampling conducted during July 2007

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Coontail		70
Slender naiad		22
Eel grass		11
Chara		11
Sago pondweed		4
Eurasian watermilfoil	x	4

Treatment Area # B (13 acres)	LAT/LONG or UTM's Lat: 41.22439 Lon:-85.8362		
Total acres to be controlled: sum of 35 acres for lake	Proposed shoreline treatment length (ft) 1,983 ft	Perpendicular distance from shoreline (ft) adjacent	
Maximum Depth of Treatment (ft): 10 ft	Expected date(s) of treatment(s) 03/15/08 - 08/15/08		

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. same as previously stated on page 1

Plant survey method: [X] Rake [ ] Visual [ ] Other (specify) Based on Tier II sampling conducted during August 2007

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Slender naiad		58
Eel grass		55
Chara		48
Coontail		48
Sago pondweed		18
Water stargrass		10
Small pondweed		7
American pondweed		4
Eurasian watermilfoil	x	3

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

Treatment Area #	C (8 acres)	LAT/LONG or UTM's	Lat: 41.2148 Lon: -85.82725
Total acres to be controlled	sum of 65 acres for lake	Proposed shoreline treatment length (ft)	1,583 ft
Perpendicular distance from shoreline (ft)	adjacent		
Maximum Depth of Treatment (ft)	10 ft	Expected date(s) of treatment(s)	03/15/08 - 08/15/08

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. same as previously stated on page 1

Plant survey method: [X] Rake [ ] Visual [ ] Other (specify) Based on Tier II sampling conducted during August 2007

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Slender naiad		58
Eel grass		55
Chara		48
Coontail		48
Sago pondweed		18
Water stargrass		10
Small pondweed		7
American pondweed		4
Eurasian watermilfoil	x	3

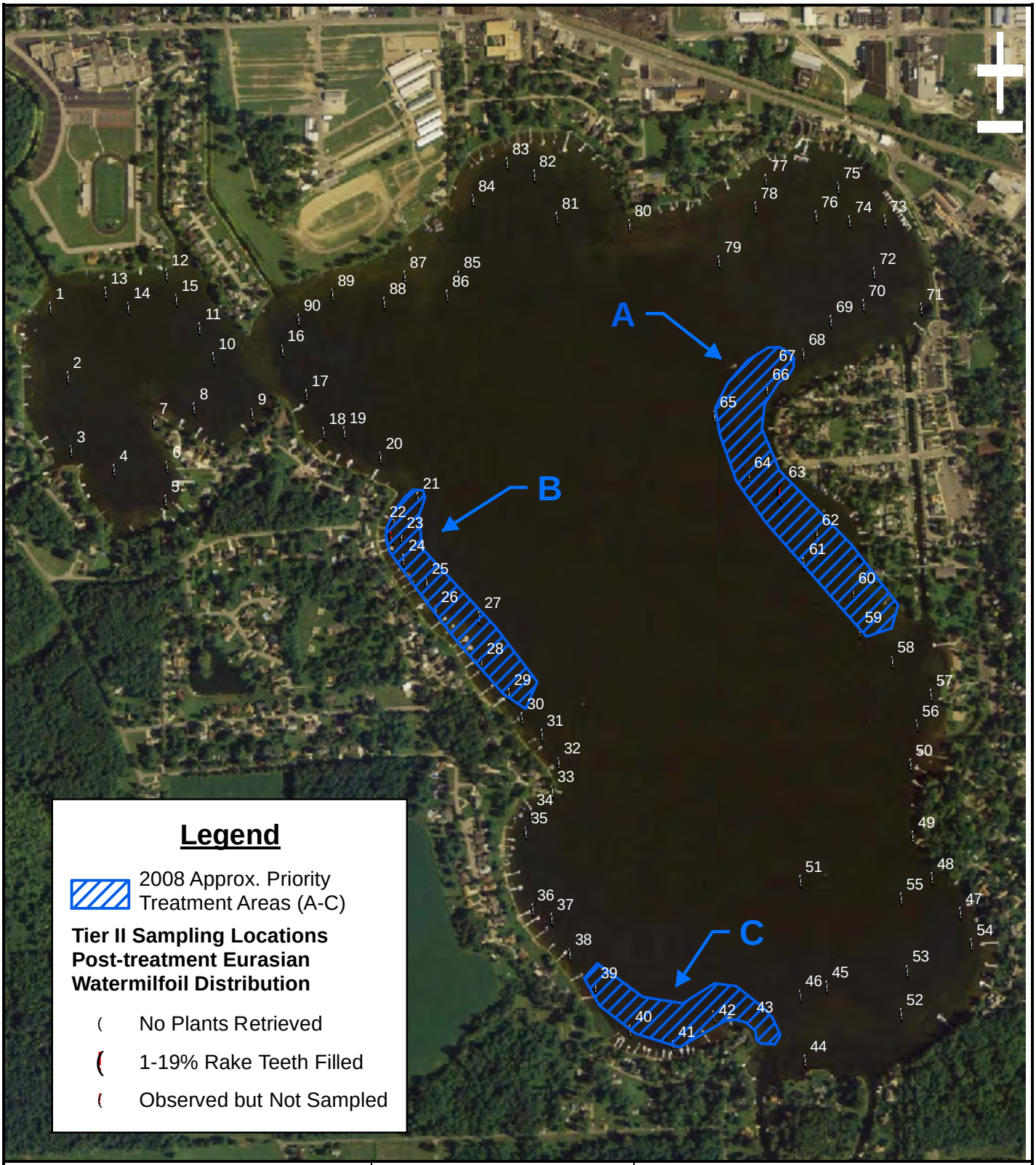
Treatment Area #		LAT/LONG or UTM's	Lat: Lon:
Total acres to be controlled		Proposed shoreline treatment length (ft)	
Perpendicular distance from shoreline (ft)			
Maximum Depth of Treatment (ft)		Expected date(s) of treatment(s)	

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



V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com

TITLE: **Eurasian Watermilfoil Results with Priority Treatment Areas for 2008**	PROJECT: **Winona Lake Aquatic Plant Management Plan**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 06099.01	EXHIBIT:	SHEET: 1 OF: 1
CLIENT: Winona Lake Preservation Association 2012 North Bay Drive Warsaw, IN 46580	QUADRANGLE: N/A	DATE: 2/25/08	SCALE: 1"=1000'

E:\2006\06099\06099.01\Reports\Natural Resources\Wetland\Exhibits\06099.01 Exhibit VIII Priority Treatment 2008.mxd