BASS LAKE, STARKE COUNTY

AQUATIC VEGETATION MANAGEMENT

PLAN UPDATE – 2008

PREPARED FOR:

BASS LAKE CONSERVANCY DISTRICT
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Executive Summary

V3 Companies (V3) was contracted by the Bass Lake Conservancy District (BLCD) to complete aquatic vegetation sampling required for the Aquatic Vegetation Management Plan 2008 Update. 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 and was obtained by the Bass Lake Conservancy District. Funding for the LARE program is provided by an annual fee charged to boat owners. BLCD provided additional funding for this study. This update will serve as a prerequisite to continue LARE program funding to control exotic species.

Bass Lake is a 1,440 acre natural lake located five miles southeast of Knox, Indiana in Starke County. Aquatic vegetation is the foundation of healthy sustainable lake ecosystems and requires management to maintain balance within the vegetative community. The purpose of an Aquatic Vegetation Management Plan is to identify aquatic weed problem areas, describe management objectives, prescribe management strategies, and determine funding needs and sources necessary for the control of invasive species. Invasive species, such as Eurasian watermilfoil, displace native species, degrade biodiversity, impede recreational uses, and reduce real estate and aesthetic values. In order to protect diverse and stable native plant communities it is vital to prevent the spread of invasive species.

Bass Lake's primary nuisance species is Eurasian watermilfoil because of its ability to grow into dense weed beds and spread rapidly. Eurasian watermilfoil has been treated since 1985. Weed Patrol performed a whole lake fluridone treatment of Sonar AS on May 14, 2007, with a concentration of 8 parts per billion (ppb) to control Eurasian watermilfoil and was the first time a fluridone treatment was conducted at Bass Lake. A second treatment of 3 ppb, or bump, was applied on June 15, 2007, to maintain a fluridone concentration of 6 ppb within the lake. Following the 2007 fluridone treatment, Weed Patrol performed five reconnaissance surveys on Bass Lake to identify areas requiring follow up treatment however Eurasian watermilfoil was not found. V3 performed the required post-treatment Tier II survey and identified Eurasian watermilfoil at four sampling locations. Eurasian watermilfoil identified during the Tier II sampling effort resulted in Weed Patrol treating Bass Lake on August 13, 2008. Weed Patrol used the GPS points from the V3 survey to locate and treat areas of Eurasian watermilfoil with granular 2,4-D (Navigate ®) for a total of 11.5 acres.

The 2008 post-treatment sampling effort identified eight species within Bass Lake; six of which were native species. Vegetation was present up to a maximum depth of 6 feet and the secchi disk reading was 2 feet.

The primary goal of the Bass Lake Conservancy District is to reduce the impact of Eurasian watermilfoil while preserving and enhancing native plant communities. The fluridone treatment conducted in 2007 was effective in reducing Eurasian watermilfoil within Bass Lake as only 11.5 acres of Eurasian watermilfoil required follow up treatment with granular 2,4-D (Navigate ®). It is the recommendation of this plan that the Bass Lake Conservancy District pursue funding to conduct follow-up treatments and monitoring in 2009. Detection of new Eurasian watermilfoil and curlyleaf pondweed locations will be the primary focus of future management.

The proposed management schedule and budget for 2009 to 2011 is summarized below.

2009

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of granular 2,4-D (Navigate ®) (assumed 15 acres)	$7,500
Early Spring Systemic Herbicide Application of liquid Renovate (assumed 15 acres)	$9,000
Application of Aquathol K 1 ppm for curlyleaf pondweed (assumed 14 acres)	$4,200
Late season post treatment aquatic vegetation survey (Tier II) and plan update	$7,500

2010

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of granular 2,4-D (Navigate ®) (assumed 10 acres)	$5,000
Early Spring Systemic Herbicide Application of liquid Renovate (assumed 10 acres)	$6,000
Application of Aquathol K 1 ppm for curlyleaf pondweed (assumed 9 acres)	$2,700
Late season post treatment aquatic vegetation survey (Tier II) and plan update	$7,500

2011

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of granular 2,4-D (Navigate ®) (assumed 10 acres)	$5,000
Early Spring Systemic Herbicide Application of liquid Renovate (assumed 10 acres)	$6,000
Application of Aquathol K 1 ppm for curlyleaf pondweed (assumed 9 acres)	$2,700
Late season post treatment aquatic vegetation survey (Tier II) and plan update	$7,500
Native planting estimates for container plants, plugs and tubers	$30,000

Herbicide applications will depend on the results of the plant surveys.

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 Gwen White and Angela Sturdevant with IDNR's LARE program for providing funding and assistance in the completion of this study. We would like to recognize Bob Robertson and Chip Long, IDNR District Fisheries Biologists, for consultation and information. We would like to acknowledge the Bass Lake Conservancy District as the local sponsor that provided assistance and guidance including Joseph Carey and Cinndi Carey. We would like to recognize Tony Cunningham and Leslie Cunningham for their mapping, recommendation, and consultation. Finally, we would like to acknowledge V3 staff involved in the research, sampling, and document preparation including: Ed Belmonte, Wally Levernier, Brad Millis, Amy Halsall, and Jessica Dunn.

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Introduction and Background

V3 was contracted by the Bass Lake Conservancy District (BLCD) to complete aquatic vegetation sampling in order to create the Bass Lake Aquatic Vegetation Management Plan Update – 2008. Bass Lake is a 1,440-acre natural lake in Starke County, Indiana and is located five miles southeast of Knox. This plan will document changes in vegetative communities and suggest management options for nuisance vegetation within Bass Lake. The focus of aquatic vegetation management will be the control of exotic species as they disrupt lake ecosystems and provide poor habitat for fish and other organisms. Topics covered in this update include a review of the 2008 vegetation control, the 2008 sampling results, and updates to the budget and action plans. An aquatic vegetation survey was conducted on July 30, 2008 to document the aquatic vegetative community and provide the data necessary to make scientifically based recommendations for aquatic vegetation management.

The nuisance species within Bass Lake are the exotic Eurasian watermilfoil (*Myriophyllum spicatum*) and Curlyleaf pondweed (*Potamogeton crispus*). Curlyleaf pondweed creates dense surface mats in the spring and early summer which limits the growth of native species by shading. Eurasian watermilfoil and curlyleaf pondweed were present during the aquatic vegetation survey and have the potential to reach nuisance levels if management action is not taken. Aquatic vegetation management at Bass Lake must have an integrated approach and include stakeholders' concerns and views for successful implementation. This plan provides management recommendations that integrate scientific data with public concerns to successfully reduce nuisance levels of exotic invasive species within Bass Lake.

This update will serve as a prerequisite to continue Lake and River Enhancement (LARE) program funding to control exotic or nuisance species. The overall goal of the LARE program is to ensure the continued viability of public-access lakes and streams by utilizing a watershed approach to reduce non-point source sediment and nutrient pollution of Indiana's and adjacent states' surface waters to a level that meets or surpasses state water quality standards. To accomplish this goal, the LARE program provides technical and financial assistance to qualified projects. These include: a) studies, management plans, sediment removal, and design and construction activities involving specific lakes and streams; b) land treatment practices or management plans for designated watersheds; and c) management plans and control of exotic plants and animals in targeted lakes. Funding for the LARE program is provided by an annual fee charged to boat owners.

Waterbody Characteristics

The Bass Lake watershed is 3,060 acres and Bass Lake accounts for 47% of the watershed acreage. Much of the remaining portion of the watershed is forested (21%) or utilized for residential (15%) or agricultural (9.5%) purposes (J.F. New, 2002). Bass Lake is a 1,440 acre natural lake located five miles southeast of Knox, Indiana in Starke County. Bass Lake has a maximum depth of 30 feet and an average depth of 3.5 feet. Bass Lake's shoreline demographics are 90% is developed and 10% is wetland. Bass Lake is classified as Mesotrophic, which means the lake is moderately productive. Mesotrophic lakes are characterized by moderate nutrient levels (total phosphorus 10-30 µg/L), water is moderately turbid, less dissolved oxygen in the hypolimnion, and are able to support healthy populations of algae (Jones and Medrano 2006).

Bass Lake is used heavily for swimming, boating and fishing. Bass Lake is one of the busiest access sites in northwest Indiana as it is a popular boating lake. Bass Lake has many shallow areas and sandbars which are frequently used for recreation such as swimming and volleyball (Figure 1). Bass Lake has a state owned public access located on the southwest shore. Bass Lake offers many recreational activities around the lake such as picnic areas, handicapped-accessible camping, and the Bass Lake State Beach and beach house (Figure 1). There were no additional fisheries studies conducted since the 2007 Bass Lake Aquatic Vegetation Management Plan Update. A fisheries and creel study is anticipated in 2010.

Figure 1: Sandbar at Bass Lake (left) and Bass Lake State Beach house (right)

Problem Statement

Aquatic vegetation is an important component of lake ecosystems. Bass Lake is highly valued for its recreational uses which can become inhibited when vegetation reaches nuisance levels. The primary nuisance species within Bass Lake is Eurasian watermilfoil. Eurasian watermilfoil is an aggressive, invasive aquatic species that has a detrimental effect on native aquatic vegetative communities. This nuisance species grows and spreads rapidly, forming dense weed beds that out compete native species for light and nutrients. In lakes where Eurasian watermilfoil is left unchecked, even well-diversified plant communities can become dominated by a single species. Stands of Eurasian watermilfoil provide poor habitat for waterfowl, fish, and other wildlife. Significant rates of plant sloughing and leaf turnover, as well as the decomposition of high biomass at the end of the growing season, increase the internal loading of phosphorus and nitrogen to the water column. Dense Eurasian watermilfoil mats alter water quality by raising pH, decreasing oxygen under the mats, and increasing temperature. Eurasian watermilfoil is an extremely adaptable plant, able to tolerate and even thrive in a variety of environmental conditions. It grows in still to flowing waters, can tolerate salinities of up to 15 parts per thousand, and can survive under ice. Eurasian watermilfoil is able to tolerate pHs from 5.4-11. Relative to other submersed plants, Eurasian watermilfoil requires high light, has a high photosynthetic rate, and can grow over a broad temperature range (Madsen et al., 1991).

Curlyleaf pondweed is another submersed exotic species that is present in Bass Lake and has the ability to create nuisance conditions. Curlyleaf pondweed typically reaches peak biomass in the late spring or early summer months, forms turions, then declines and remains in a dormant state during the warmer months (Nichols and Shaw 1986). As water temperatures cool during the late summer or fall months, the turions germinate, grow through the winter months and reach peak biomass in the spring before most other submersed macrophytes begin their growth cycle. Once established the plants form colonies from rhizomes. Dense colonies of curlyleaf pondweed can restrict access to docks and sport fishing areas during spring and early summer months. Curlyleaf pondweed usually declines during the summer months and does not directly compete with many of the native submersed species. Long-term management of curlyleaf pondweed at Bass Lake will require the reduction or elimination of turions to interrupt its life cycle. Management activities to control curlyleaf pondweed involve using the herbicide Aquathol K. Application of Aquathol K should be conducted in very early spring when the water temperature is at or below 56-67 degrees Fahrenheit to have the maximum benefit.

Aquatic Vegetation Management Goals and Objectives

An aquatic vegetation management plan must have clear goals and objectives to be an effective long term management strategy. The following management goals have been established by the IDNR for all lakes applying for LARE funding. Any management practices implemented at Bass Lake must facilitate the achievement of these three 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 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.

Specific objectives are proposed as follows to facilitate achievement of the success of the actions listed below to achieve the overall LARE management goals for Bass Lake.

1. **Reduce Exotic Invasive Species.** Reduce Eurasian watermilfoil to less than 5% of littoral zone surface area and curlyleaf pondweed to 10% of littoral zone surface area in the early recreational season by 2009.

2. **Maintain and Enhance Diversity of the Native Aquatic Plant Community**. Reduce seeding of Eurasian watermilfoil and curlyleaf pondweed through educational outreach and herbicide control which will allow native plants to establish. The type of substrate affects a lake's ability to support aquatic vegetation. Lakes that have mucky, organic, nutrient-rich substrates have an increased potential for plant growth compared to lakes with gravelly, rocky substrates. The substrate of Bass Lake consists largely of sand although areas of muck and clay substrate exist as well. While sandy substrates typically support healthy aquatic plant communities, this is only true when sufficient organic material is mixed in with the sand to provide a nutritional base for the rooted plants. (Giolitto and Olyphant, 2002)

3. **Control Vegetation around Public Access Sites.** Control vegetation through educational outreach and herbicide treatment. Public access sites are a vector for the spread of exotic species therefore signage is most effective in these areas. Currently there is signage at the Bass Lake public access site informing lake users of the exotic species advisory from Sea Grant and DNR Regulations. Continued maintenance of these advisory signs will encourage lake users to be cognizant of exotic species negative impact on lake ecosystems. Herbicide treatments focused in the area 100 feet from the public access site may be effective in reducing the spread of Eurasian watermilfoil to other areas of Bass Lake.

Specific actions are proposed as follows to facilitate achievement of the overall LARE management goals for Bass Lake.

1. **Tier II Plant Surveys.** Tier II surveys should be conducted for the next two years to monitor the distribution and abundance of Eurasian watermilfoil and curlyleaf pondweed. Any changes in the native plant community of Bass Lake will be documented during the plant surveys. Survey results will be used to determine future management strategies and evaluate the success of past management efforts.

2. **Chemical/Follow-up Treatment of Eurasian Watermilfoil and curlyleaf pondweed.** Eurasian watermilfoil and curlyleaf pondweed should be closely monitored during 2009, and more concentrated dosages or aggressive treatments should be applied if necessary. Treatment applications for curlyleaf pondweed should be undertaken in spring or very early summer to maximize treatment results and benefits.

3. **Promote and Maintain the Diversity of Native Aquatic Plant Species.** Promote and maintain a healthy diversity of native aquatic plant species, while recognizing that some vegetation management may be necessary to provide reasonable public access for recreation.

Bass Lake Treatment History

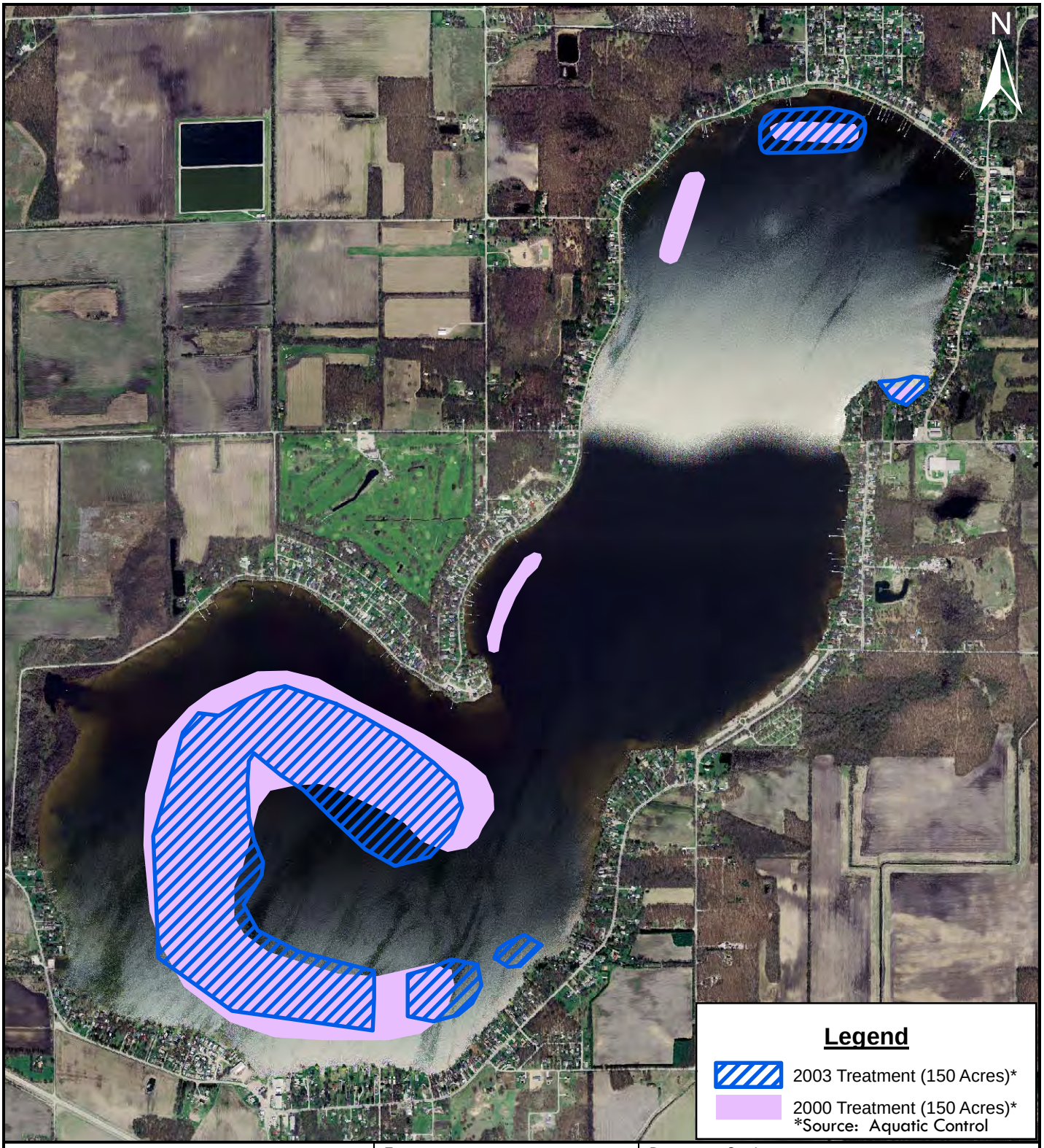
Herbicides have been used as an effective management tool to control nuisance and exotic species at Bass Lake. Herbicide treatments have been applied since 1985, with granular 2,4-D (Navigate ®) being the primary herbicide utilized (Table 1). An average of approximately 125 acres of Eurasian watermilfoil required treatment each year.

Table 1. Bass Lake Treatment History 1985 – 2008.

Year	Method of Control
1985	Bass Lake Property Owners Association treated Eurasian watermilfoil area in the south basin with 2,4-D herbicide
1990	Aquatic Control treated 120 acres of Eurasian watermilfoil in the south basin with 2,4-D herbicide
1991	Aquatic Control treated 100 acres of Eurasian watermilfoil in the south basin with 2,4-D herbicide
1993	Aquatic Control treated 105 acres of Eurasian watermilfoil in the south basin with 2,4-D herbicide
1998	Aquatic Control treated 140 acres of Eurasian watermilfoil with 2,4-D herbicide
2000	Aquatic Control treated 150 acres of Eurasian watermilfoil with 2,4-D herbicide
2003	Aquatic Control treated 150 acres of Eurasian watermilfoil with 2,4-D herbicide
2004	Aquatic Control treated 115 acres of Eurasian watermilfoil in the south basin with triclopyr herbicide
2005	Aquatic Control treated 136 acres of Eurasian watermilfoil with Renovate
2006	Aquatic Control treated 100 acres of Eurasian watermilfoil with Renovate
2007	Weed Patrol performed a whole lake fluridone treatment at 8 parts per billion
2008	Weed Patrol treated 11.5 acres of Eurasian watermilfoil with granular 2,4-D

**Years omitted from the table indicate years that herbicide was not applied.*

Aquatic Control treated 150 acres of Eurasian watermilfoil in 2000 and 2003, primarily in the southern basin with scattered populations in the northern basin (Figure 2). Eurasian watermilfoil was only present in the southern basin in 2004; whereas in 2005 the Eurasian watermilfoil had expanded into the northern basin of Bass Lake (Figure 3). The 2005 Renovate treatment was the first treatment in several years that the northern basin had Eurasian watermilfoil at nuisance levels specifically the northwest shoreline. The 2005 Renovate treatment was successful in removing Eurasian watermilfoil in the northern basin as Eurasian watermilfoil treated in 2006 was exclusively in the southern basin (Figure 4). In response to the 100 acres of Eurasian watermilfoil that required treatment in 2006, IDNR permitted a whole lake fluridone treatment for 2007 (Figure 4). Weed Patrol performed a whole lake fluridone treatment of Sonar AS on May 14, 2007, with a concentration of 8 parts per billion (ppb) and was the first fluridone treatment conducted on Bass Lake. A second treatment of 3 ppb, or bump, was applied on June 15, 2007, to maintain a concentration of 6 ppb within the lake. The 11.5 acres of Eurasian watermilfoil treated in 2008 was concentrated in the southern basin with one area of approximately 0.5 acres of milfoil in the north eastern shoreline (Figure 4).



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TITLE: **Eurasian Watermilfoil 2000 and 2003 Treatment Areas**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 2	SHEET: 1 OF: 1
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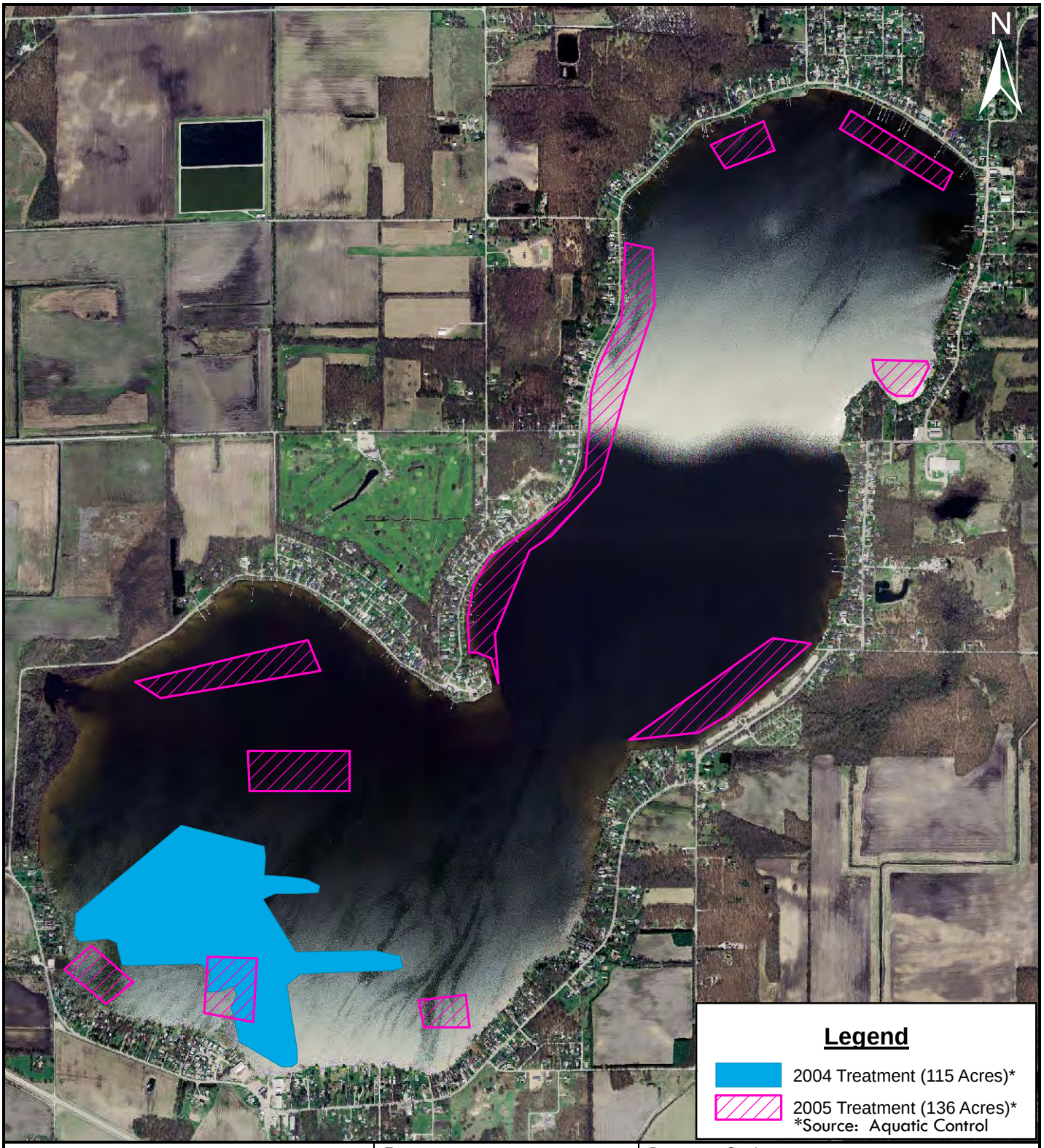

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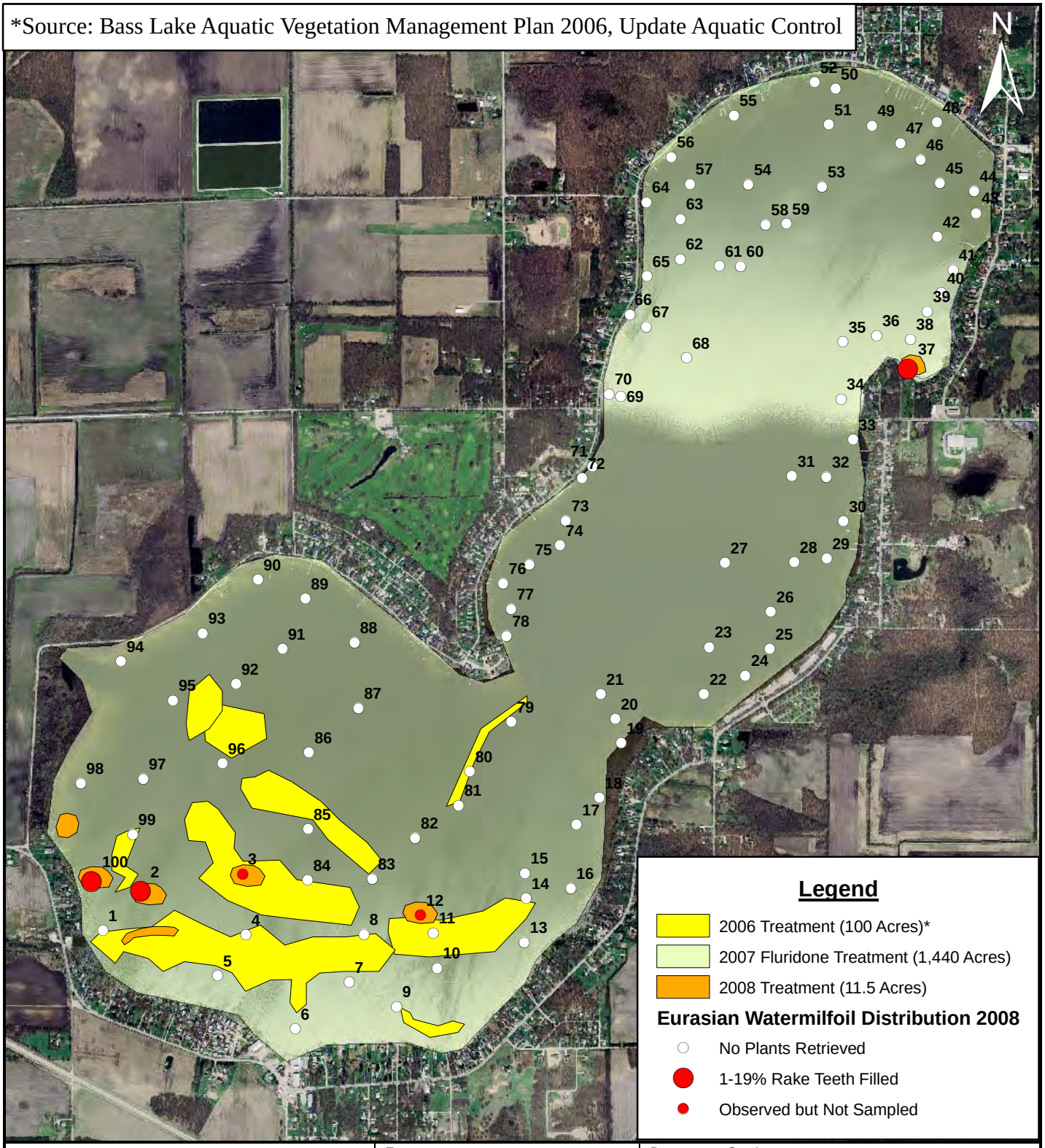
TITLE: **Eurasian Watermilfoil 2004 and 2005 Treatment Areas**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 3	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 02/11/09	SCALE: 1" = 1,750'

*Source: Bass Lake Aquatic Vegetation Management Plan 2006, Update Aquatic Control



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TITLE: **Eurasian Watermilfoil 2006 - 2008 Treatment Areas and Eurasian Watermilfoil 2008 Tier II Results**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 4	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 6/1/06	SCALE: 1" = 1,750'

2008 Vegetation Control

Weed Patrol performed five reconnaissance surveys to locate areas of Eurasian watermilfoil that required treatment however, no Eurasian watermilfoil was found. Weed Patrol performed surveys on May 17th, June 4th, June 24th, July 10th and July 25th of 2008. V3 conducted the mandatory post treatment Tier II survey on July 30, 2008 and three sampling locations had pulled up Eurasian watermilfoil on the sampling rake. Two of V3 sampling locations had Eurasian watermilfoil observed but not collected. Weed Patrol responded to the presence of Eurasian watermilfoil during V3's sampling effort and treated 11.5 acres on August 13, 2008 with granular 2,4-D (Figure 4).

Weed Patrol used a GPS unit with V3 sampling stations coordinates to locate milfoil areas that required treatment. Weed Patrol conducted visual surveys of remaining areas of Bass Lake which resulted in the treatment of three additional areas of treatment other than V3 sampling locations. The dosage for granular 2,4-D (Navigate ®) was 100 lbs. per acre. V3 sampling locations 2, 3, 12 and 100 were treated with 200 lbs of granular 2,4-D which accounted for an area of approximately 8 acres. V3 sampling location 37 was a shallow sandy area which was treated with 50 lbs of granular 2,4-D for a treatment area of 0.5 acre. Weed Patrol located a patch of Eurasian watermilfoil in front of the public access point and scattered Eurasian watermilfoil was found south of V3 sampling location 2. Areas located by Weed Patrol were treated with 150 lbs of granular 2,4-D for a total of 3 acres.

Sampling Results 2008

On July 30, 2008 a Tier II survey was conducted on Bass 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 vegetative community to past conditions. A table outlining the scientific and common names of species collected or observed in Bass Lake is listed below (Table 2). Eight species were collected and two species were observed. The two emergent species observed were white water lily and spatterdock.

Table 2. Species collected or observed in Bass Lake during Tier II sampling.

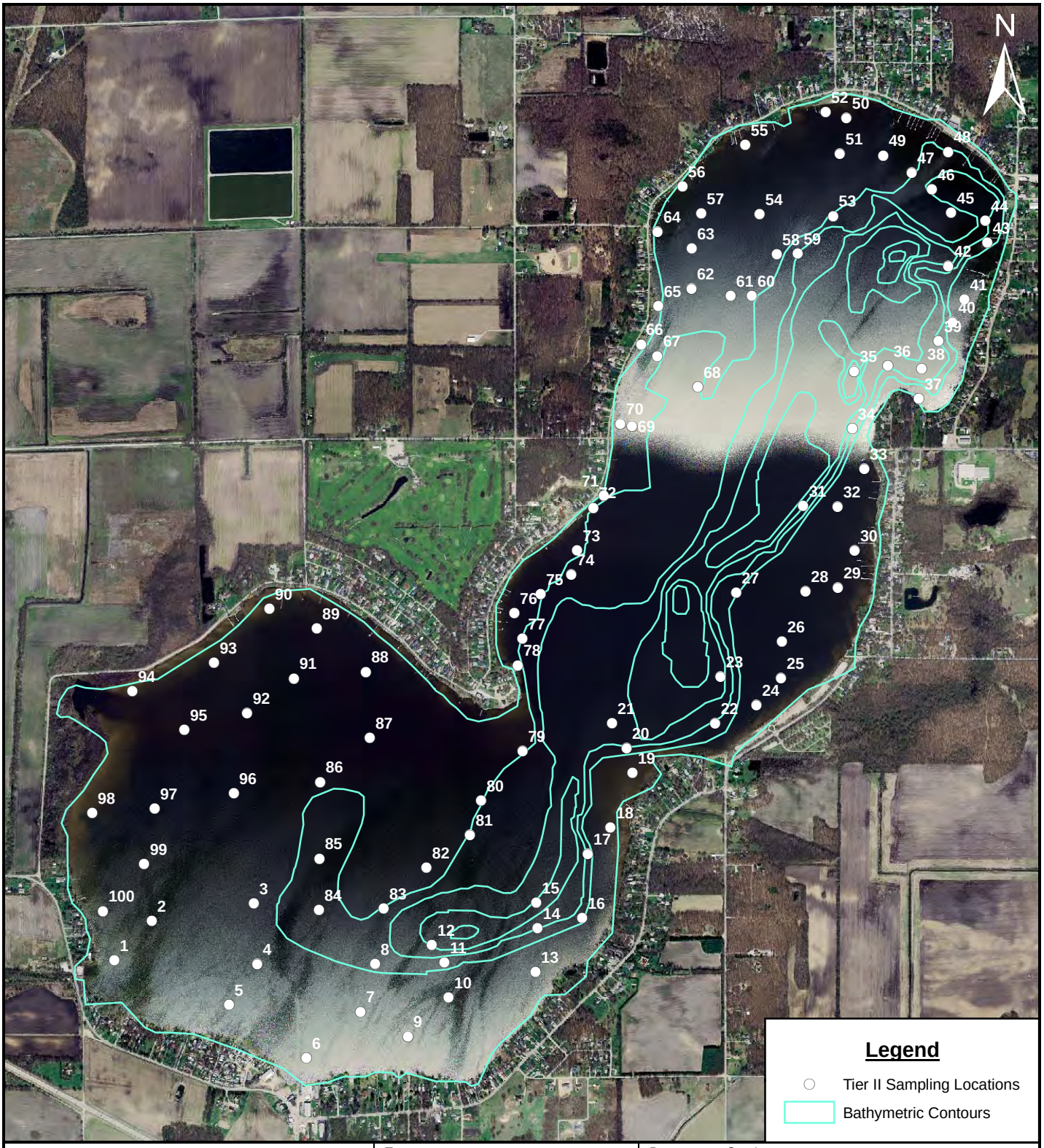
Scientific Name	Common Name
Chara sp.	Chara
Myriophyllum spicatum	Eurasian watermilfoil
Najas flexilis	Slender naiad
Najas marina	Spiny naiad
Nitella tenuissima	Nitella sp.
*Nuphar advena**	Spatterdock
*Nymphaea oderata**	White water lily
Potamogeton crispus	Curly-leaf pondweed
Potamogeton pusillus	Small pondweed
Utricularia resupinata	Northeastern bladderwort

*Emergent species observed during sampling effort

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 which included a representative sample of the species within Bass Lake. According to the IDNR protocol, the number and depth of sampling locations is based on trophic status and acreage. Bass Lake is classified as Mesotrophic which would require 10 sites from 15-20 feet but the maximum sampling depth for Bass Lake is 15 feet. The Tier II sampling was conducted at the eutrophic status so that sampling locations were apportioned to the required depth class. One hundred sites were sampled within the littoral zone (57 sites 0-5ft, 33 sites 5-10ft, and 10 sites 10-15ft) (Figure 5). Sampling locations for the 2007 aquatic vegetation survey were located with the GPS unit and used for the 2008 survey. Using the same survey locations allows for changes in vegetative community to be documented and treatment success to be determined. According to the sampling protocol, V3 threw ten random rake throws at depths greater than 15 feet, but did not retrieve any vegetation. Based on the results of the extra sampling there is currently no need to extend sampling locations in deeper zones.

At each station a sampling rake is used for collecting vegetation samples. Once a species is identified, vegetation abundance is scored as a 1 (1-19%), 3 (20-100%), or 5 (+100%) based on the vegetation 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 completion of the sampling effort a secchi disk reading and water quality measurements are taken.



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TITLE: **Tier II Sampling Locations**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 5	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 7/30/08	SCALE: 1" = 1,750'

Results of Summer Tier II Survey

The Tier II survey completed on July 30, 2008, identified a total of 8 species within Bass Lake. Vegetation was present up to a maximum depth of 6 feet. Ten additional sampling stations past 15 feet were raked to determine whether plants are growing at greater depths. No vegetation was recovered therefore there is no indication of sampling stations needed in deeper contours. The secchi disk reading was 2 feet. Results of the sampling are listed below in Table 3.

Table 3: Bass Lake Tier II survey results from July 30, 2008

County: Starke	Total sites: 100	Mean species/site: 0.44
Date: 7/30/2008	Sites with plants: 32	Standard error (ms/s): 0.0833
Secchi (ft): 2	Sites with native plants: 31	Mean native species/site: 0.37
Maximum plant depth (ft): 6	Number of species: 8	Standard error (mns/s): 0.0597
Trophic status: Mesotrophic	Number of native species: 6	Species diversity: 0.9772
Trophic status sampled: Eutrophic	Maximum species/site: 5	Native species diversity: 0.9729

All depths (0 to 15 ft)	Common Name	Frequency of	Rake score frequency per species				Plant Dominance
Species		Occurrence	0	1	3	5	
Chara spp.	Chara	30.0	70.0	28	2	0	7.0
Potamogeton crispus	Curlyleaf pondweed	5.0	95.0	5	0	0	1.0
Myriophyllum spicatum	Eurasian watermilfoil	3.0	97.0	3	0	0	0.4
Najas marina	Spiny naiad	2.0	98.0	2	0	0	0.4
Utricularia resupinata	Northeastern bladderwort	1.0	99.0	1	0	0	0.2
Nitella tenuissima	Nitella	1.0	99.0	1	0	0	0.2
Potamogeton pusillus	Small pondweed	1.0	99.0	1	0	0	0.2
Najas flexilis	Slender naiad	1.0	99.0	1	0	0	0.2
Depth: 0 to 5 ft	**Common Name**	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species		**Occurrence**	**0**	**1**	**3**	**5**	
Chara spp.	Chara	50.9	47	47	4	0	11.6
Potamogeton crispus	Curlyleaf pondweed	9.0	88	9	0	0	1.8
Myriophyllum spicatum	Eurasian watermilfoil	4.0	96	4	0	0	0.7
Najas marina	Spiny naiad	2.0	98	2	0	0	0.4
Utricularia resupinata	Northeastern bladderwort	2.0	98	2	0	0	0.4
Potamogeton pusillus	Small pondweed	2.0	98	2	0	0	0.4
Najas flexilis	Slender naiad	2.0	98	2	0	0	0.4
Nitella tenuissima	Nitella	2.0	98	2	0	0	0.4
Depth: 5 to 10 ft	**Common Name**	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species		**Occurrence**	**0**	**1**	**3**	**5**	
Chara spp.	Chara	6.1	85	6	0	0	1.2
Najas marina	Spiny naiad	3.0	97	3	0	0	0.6
Depth: 10 to 15 ft		**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species		**Occurrence**	**0**	**1**	**3**	**5**	
**No species were found in this depth range*							

Aquatic Vegetation Sampling Results Discussion

Eight species were collected during the Tier II survey. Chara was present at the highest percentage of sample sites (30%) followed by curlyleaf pondweed (5%). Location and density of curlyleaf pondweed is illustrated in Figure 6. Eurasian watermilfoil and spiny naiad were collected at 2% of sampling locations. Location and density of Eurasian watermilfoil is illustrated in Figure 7. Species observed within the vicinity of the sampling locations include white water lily and spatterdock. Datasheets from V3's sampling effort are located in Appendix I.

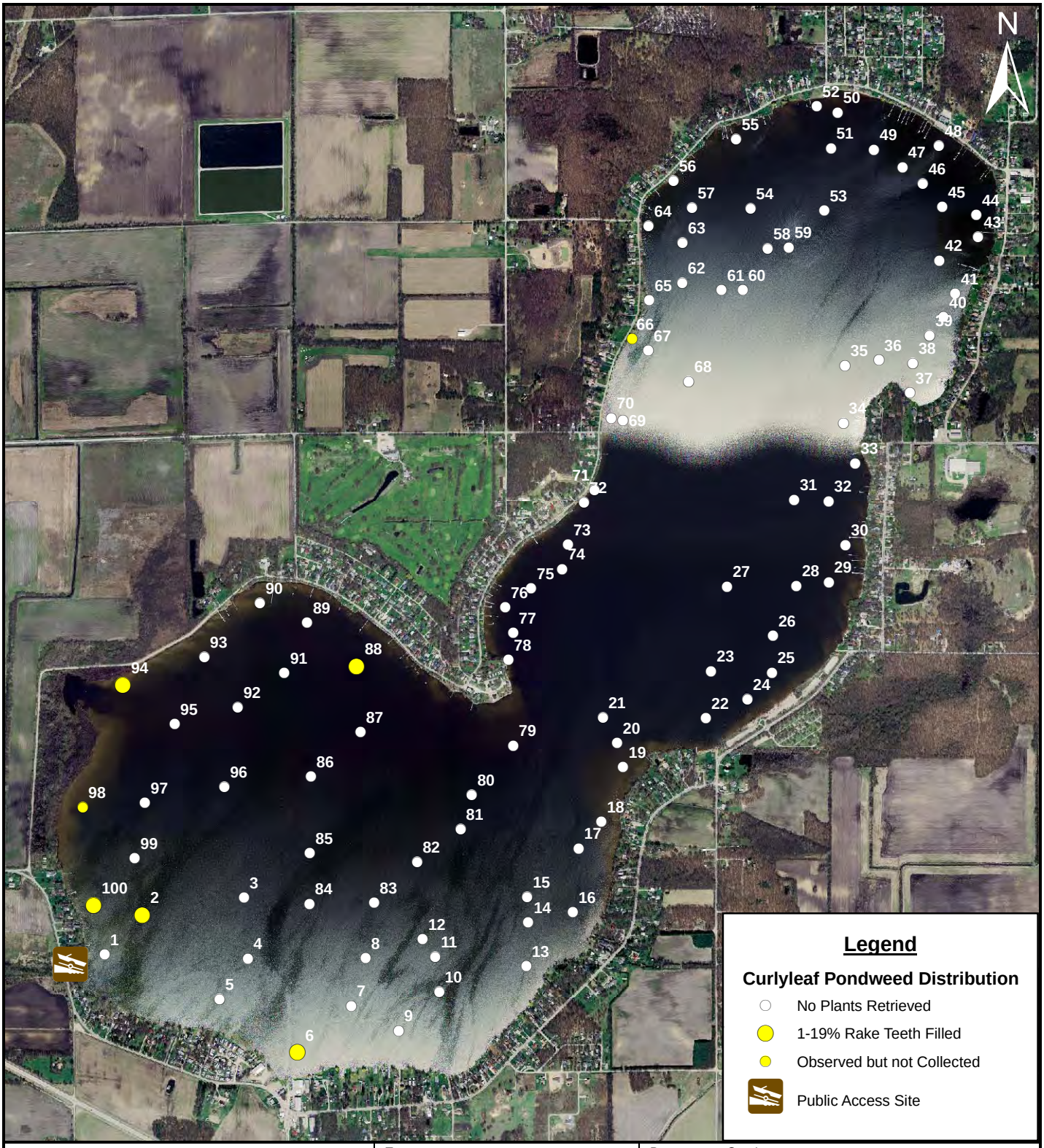
Comparing the results of the species dominance and frequency of occurrence from 2008 to the 2007 sampling effort provides information on management success and vegetative community changes. Chara remained the most dominant species within Bass Lake and increased overall dominance by approximately 3%. Chara was significantly dominant (11.6) within the 0-5 foot depth zone in 2008. Eurasian watermilfoil was present at 9% of sampling locations during the 2007 sampling effort and decreased to only 3% of sampling locations (Figure 5). Eurasian watermilfoil was collected at depths ranging from three to four feet. The decrease in abundance of Eurasian watermilfoil is attributed to the fluridone treatment in 2007. Curlyleaf pondweed experienced a slight increase in dominance in 2008 (0.2) and remained constant with a frequency of occurrence at 5% of sampling locations (Figure 5). Invasive exotic species accounted for 7% of sampling locations in 2008 which is a 50% decrease from the amount of sampling locations with exotic species in 2007.

The species frequency of occurrence results from the 2004 to 2008 Tier II studies demonstrates a trend of increase in species diversity within Bass Lake (Table 4). Chara was the most frequently occurring species with the exception of 2006 where Eurasian watermilfoil experienced a 50% increase in occurrence. Overall, the species results of the 2008 compared to the last three years demonstrates a decrease in exotic species frequency and an increase in the amount of native species collected. We believe this demonstrates a success in the 2007 fluridone treatment.

Table 4: Tier II Survey Frequency of Occurrence Results 2004 – 2008*

Species	August 2004	August 2006	August 2007	July 2008
Chara	**37.3**	25.0	**13.0**	**31.0**
Eurasian Watermilfoil	19.0	**38.0**	9.0	2.0
Curlyleaf Pondweed	0.6	-	5.0	5.0
Spiny naiad	-	2.0	-	2.0
Nitella sp.	-	2.0	-	-
Needle spikerush	-	1.0	-	-
Variable Pondweed	-	9.0	-	-
Yellow water lily	-	-	2.0	-
Small pondweed	-	-	-	1.0
Slender naiad	-	-	-	1.0
Northeastern bladderwort	-	-	-	1.0
Dwarf stonewort	-	-	-	1.0

**Species with greatest frequency value are shown in bold*
**2005 omitted from the table because Tier II vegetation sampling was not conducted.*



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7325 Janes Avenue
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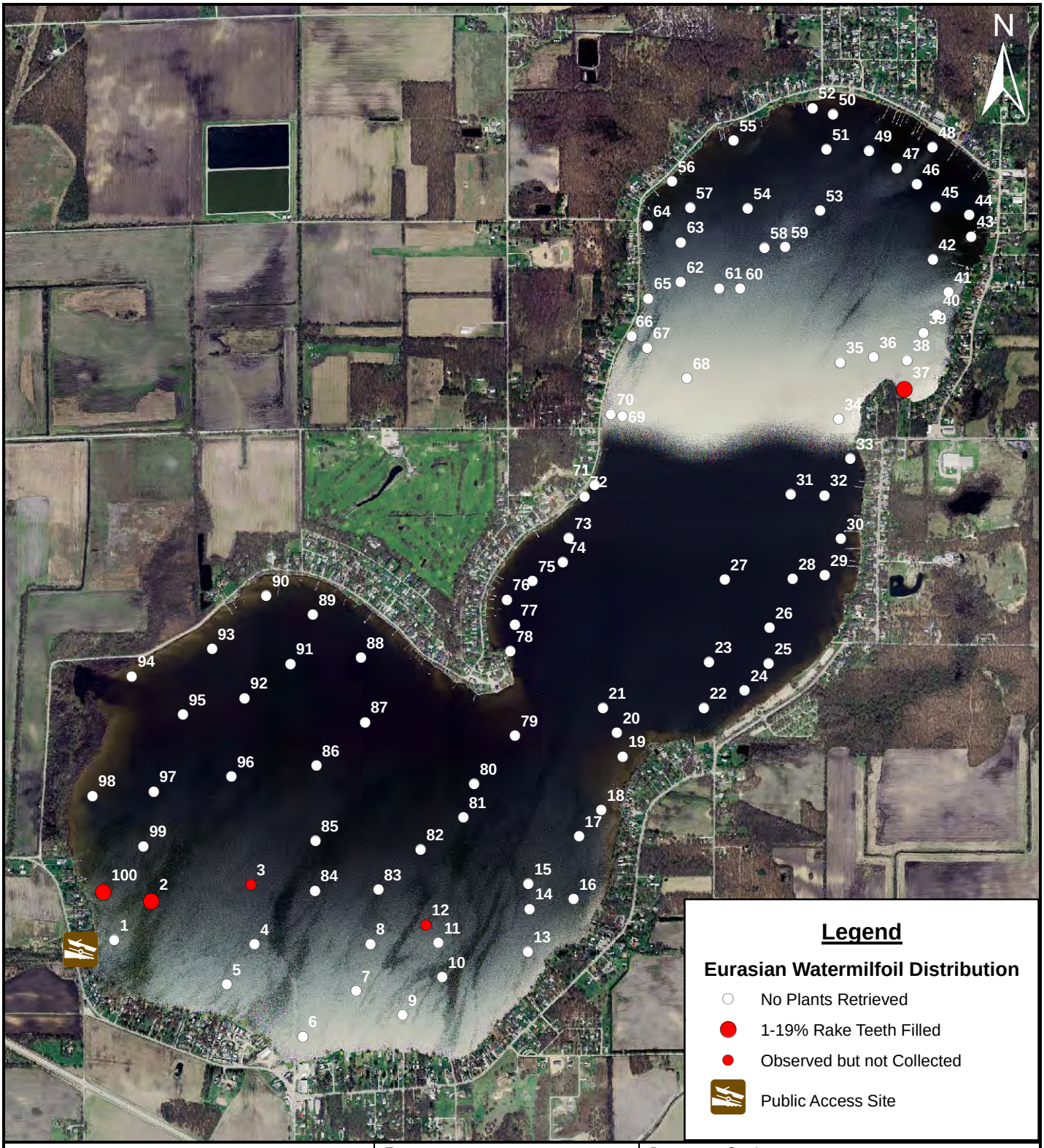
TITLE: **Curlyleaf Pondweed Distribution and Abundance**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 6	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 7/30/08	SCALE: 1" = 1,750'



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TITLE: **Eurasian watermilfoil Distribution and Abundance**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 7	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 7/30/08	SCALE: 1" = 1,750'

The goal of this plan is to reduce nuisance conditions caused by invasive plant species, while still maintaining the abundance of beneficial native species. A diverse native plant community is vital in providing proper fish habitat, shoreline stabilization, and preventing the spread and/or establishment of invasive species. Herbicide treatments have been applied since 1985 to reduce the amount of Eurasian watermilfoil within Bass Lake. The Tier II studies conducted since 2004 show the changes in Eurasian watermilfoils' frequency of occurrence in response to treatment (Figure 8).

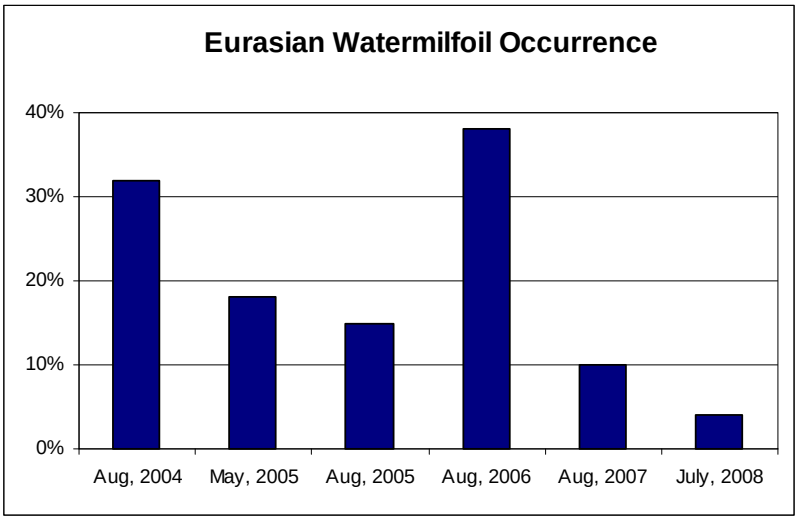


Figure 8: Bass Lake, Eurasian watermilfoil percent occurrence in the last six surveys.

Bass Lake is characterized by shallow depths which are optimal conditions for Eurasian watermilfoil growth. Weed Patrol performed a whole lake fluridone treatment herbicide application in May of 2007 using Sonar AS. Fluridone treatments do not target specific areas of Eurasian watermilfoil growth; rather it establishes a fluridone concentration throughout the lake. The 10% of Eurasian watermilfoil collected during the August 2007 Tier II survey consisted of dead stems with identifiable leaflets and floating fragments within the vicinity of a sampling location. Subsequent to the fluridone treatment neither Weed Patrol nor V3 identified any growing Eurasian watermilfoil in Bass Lake. Weed Patrol applied granular 2,4-D (Navigate ®) to 11.5 acres of Eurasian watermilfoil on August 13, 2008. V3's Tier II sampling effort identified Eurasian watermilfoil at only 2% of sampling stations which is the lowest frequency of the six surveys. This significant reduction is attributed to the success of the fluridone treatment in 2007. The reduction of Eurasian watermilfoil is most effective when lake users recognize their role in invasive and exotic species introduction. Eurasian watermilfoil fragments attached to trailers or boat motors is a major source of introduction into Indiana lakes. Signage at the public access site for Bass Lake encourages lake users to examine their boat for plant material prior to launching to reduce the introduction of exotic species such as Eurasian watermilfoil.

Sandy sediments throughout Bass Lake are stirred up during periods of heavy boat traffic attributing to increased turbidity. Turbidity is a measure of the degree to which the water looses its transparency due to the presence of suspended particulates. Turbid water at Bass Lake impacts the ability for native plants to establish and gives exotic species such as Eurasian watermilfoil and curlyleaf pondweed a competitive advantage as they are able to grow in low light conditions. A secchi disk is an 8-inch disk with alternating black and white quadrants that is used to measure the transparency of the water. The disk is lowered into the water until it can be no longer seen by the observer and the depth in which the secchi disk is no longer visible is recorded. Secchi disk depth measurements indicate water clarity trends within a lake ecosystem. The 2008 secchi disk reading of 2.0 feet was approximately 0.5 feet under the average value of secchi disk readings over the past five years. The secchi disk readings at Bass Lake over the past five years are illustrated in Figure 9.

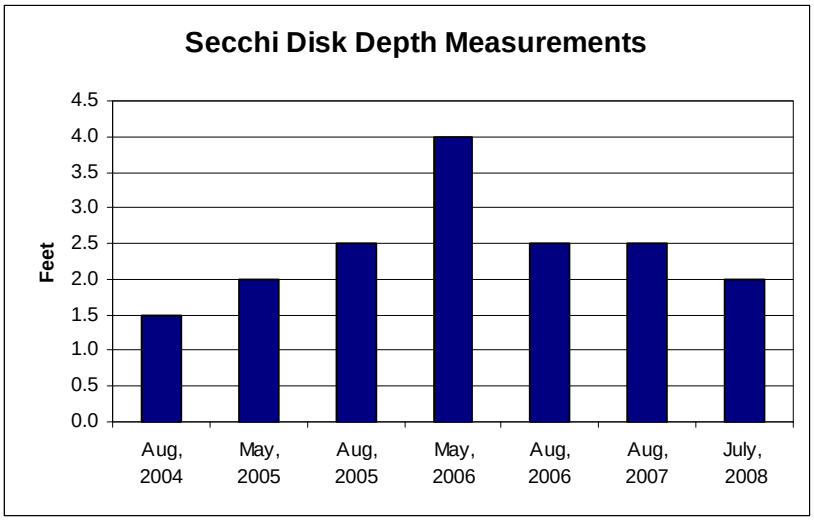


Figure 9: Bass Lake secchi disk readings over the past five years.

High turbidity limits plant growth by limiting light penetration. Bass Lake has a low density and diversity of submersed aquatic vegetation and is attributed to the reduced water clarity. The 2008 sampling effort had 32% of sampling locations with vegetation present (Figure 10). The percentage of sites with vegetation demonstrates a recovery in plant communities by almost 10% from last year's survey.

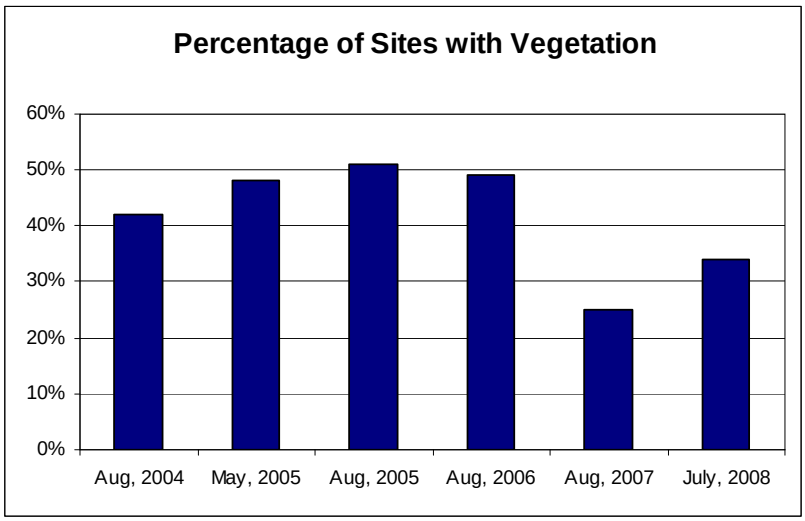


Figure 10: Bass Lake, comparison of sites with vegetation in the last six surveys.

Aquatic vegetation diversity at Bass Lake remains a problem although the 2008 results demonstrate an increase in the amount of native species collected. Thirty-three out of thirty-four sampling locations had native vegetation (Figure 11). Native species collected include chara, spiny naiad, slender naiad, small pondweed, Northeastern bladderwort and Northeastern bladderwort. Native emergent species observed include spatterdock and white water lily. Factors that influence the establishment of native vegetation include high turbidity, competition with exotic species, and/or wave action caused by boat traffic (Yousef et al., 1978).

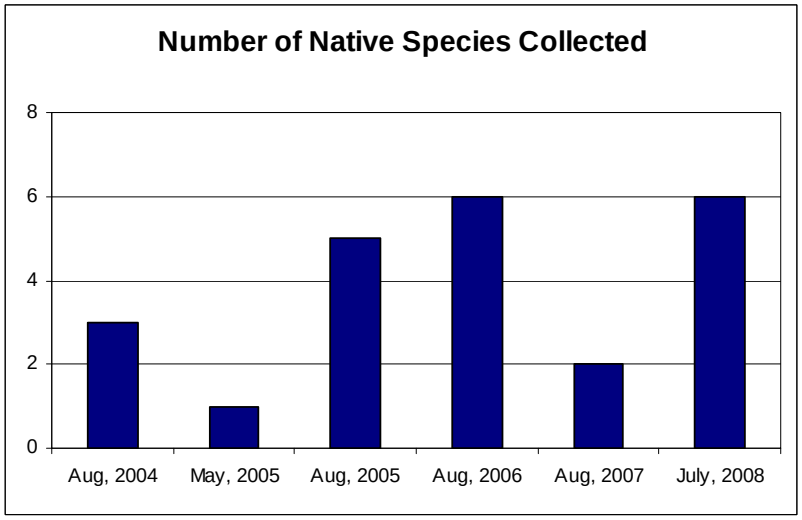


Figure 11: Bass Lake, comparison of native species collected in the last six surveys.

Threatened and Endangered Species at Bass Lake

The Indiana Natural Heritage Data Center database provides information on the presence of rare species, threatened and endangered species, and high quality natural communities and areas. The database serves as a tool for setting management priorities in areas where these species are encountered. V3 encountered the state endangered Northeastern bladderwort (*Utricularia resupinata*) during the Tier II sampling on the western flat of Bass Lake (Figure 13). A voucher specimen was sent on August 4th to Dr. Robin Scribailo with Purdue University's Aquatic Plant Herbarium. Vegetatively the specimen appeared to be Northeastern bladderwort but the plant would need to produce a flower so that full confirmation of this rare species through the distinctive flower structure would be undisputable. Subsequently, Purdue University students collected specimens and returned with them to Dr. Scribailo's herbarium with the intention of growing specimens that would produce flowers. Purdue University is currently in the process of attempting to obtain flowering specimens for verification purposes. Photos were taken under the microscope and were used for identification (Figure 12). Future management must consider the impact that herbicide treatment will have on the state endangered Northeastern bladderwort. Correspondence as well as threatened and endangered species lists are located in Appendix II.

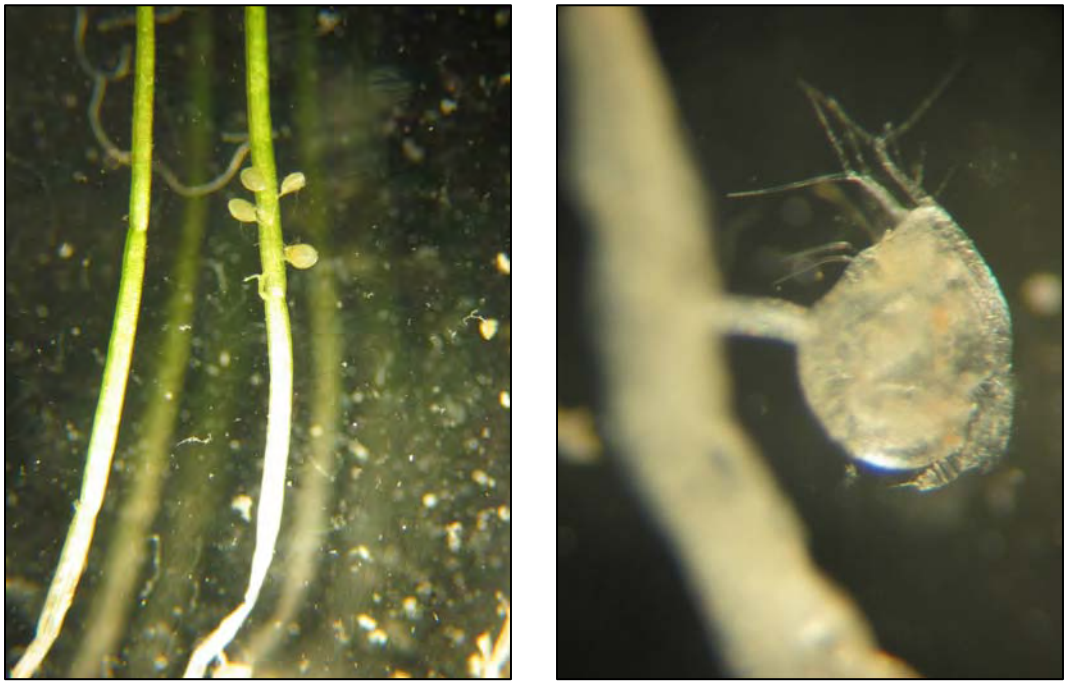
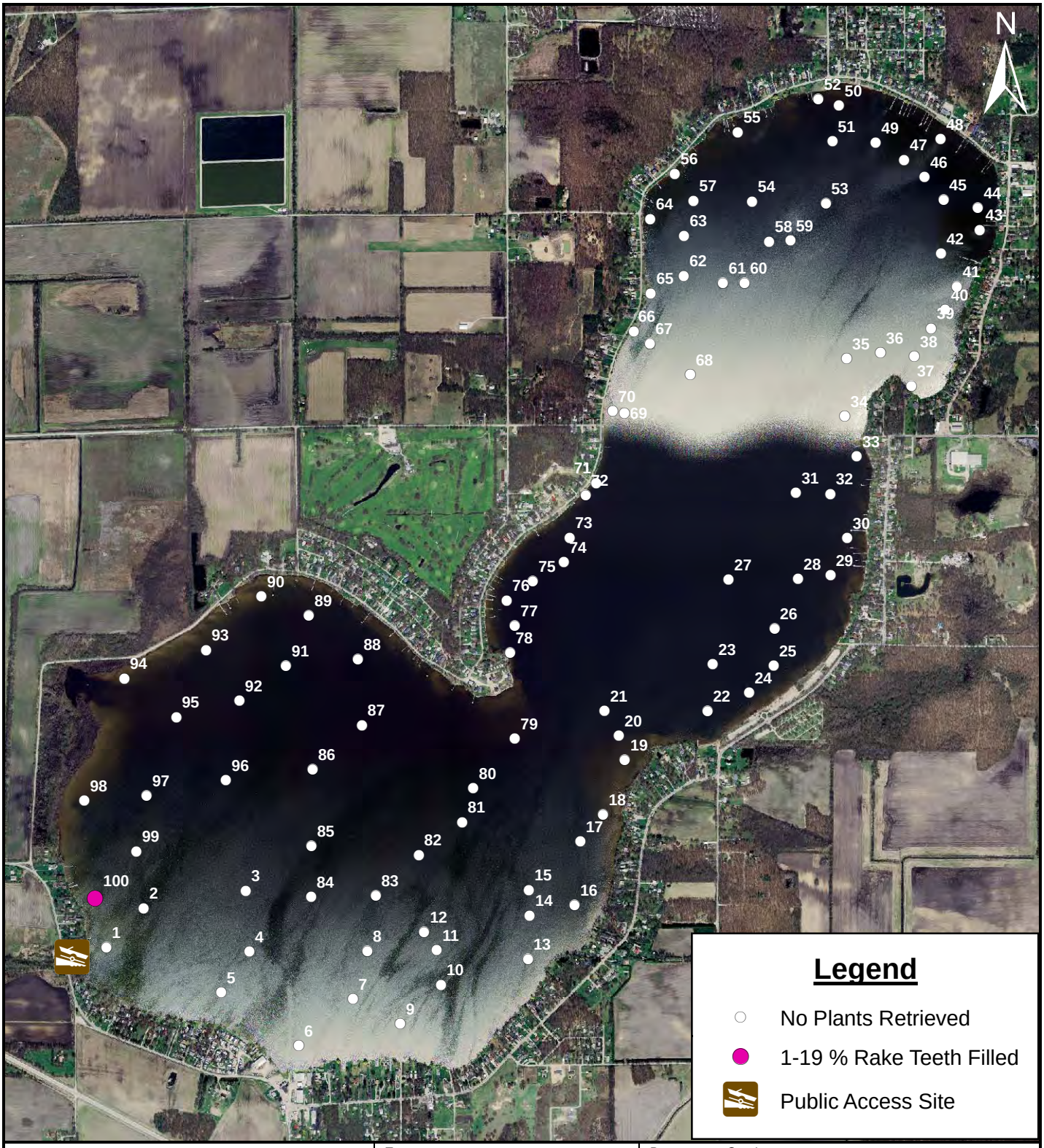


Figure 12: Northeastern Bladderwort photographs taken under V3 microscope.



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TITLE: ***Utricularia resupinata*** **Distribution and Abundance within Bass Lake**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 13	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 7/30/08	SCALE: 1" = 1,750'

Aquatic Vegetation Management Alternatives

At the present time, the health of Bass Lake aquatic vegetative community is recovering. Native plant diversity has improved but density still remains low. Continued management efforts to maintain the Eurasian watermilfoil population at a low level is desirable to prevent Eurasian watermilfoil from becoming the dominant species in the lake. Additionally, watershed activities to improve the water quality of Bass Lake are important to restore native plant diversity and improve water clarity.

Many management strategies have been used to control Eurasian watermilfoil in Indiana lakes. A management strategy should be chosen based on its selectivity to the target species, its long-term effectiveness, and its 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 watermilfoil population with minimal negative effects on non-target plants or fish species.

Although dense beds of native aquatic vegetation can be a nuisance where they inhibit lake access, aquatic vegetation is important to maintaining a healthy lake ecosystem. Aquatic vegetation provides 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 vegetation can also 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 Bass Lake or along the shoreline has not occurred and can not be discussed. Different types of aquatic vegetation management alternatives are discussed below. One or more of these alternatives may be employed to meet the objectives of Bass Lake. This discussion of management alternatives is adapted from Aquatic Weed Control (2005).

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 (Madsen, 1993). Recent 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 lower dose 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 turbid conditions within Bass Lake indicate presence of single-cell algae (positively charged), Reward will bind with algae in the water column and not affect the Eurasian watermilfoil. Although Reward is not marketed as an algaecide, alga is shown on the label as controlled by this product. Since alga is moderately abundant during mid-summer at Bass Lake, the effectiveness of a low-dose contact treatment may 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); Navigate, Aqua Kleen, 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.

Triclopyr and 2,4-D 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, triclopyr 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. The ability of Triclopyr to control Eurasian watermilfoil for more than a year has not been substantiated by any scientific study. 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.

Public Involvement

The Bass Lake Conservancy District has been representing residents of Bass Lake for approximately 15 years. The Conservancy District consists of five directors which hold regularly scheduled monthly meetings at the Bass Lake Community Center and residents are encouraged to attend. Resident attendance at monthly meetings is variable and attendance typically increases as residents become dissatisfied with the abundance of aquatic vegetation, especially Eurasian watermilfoil. The property owners association publishes a spring newsletter to residents of Bass Lake and the Conservancy District uses it to provide information, such as aquatic vegetation management and exotic species.

A public meeting was held November 5, 2008, at the Bass Lake Community Center in Knox, Indiana. Nine individuals attended the meeting who collectively represented property owners and lake association members. The number of attendees was similar to what was estimated by the Bass Lake Conservancy District based on the expressed satisfaction of the treatment by residents. V3 discussed current plant management activities, results of the Tier II survey, and future management. A lake use survey form was handed out after the meeting and nine individuals participated. Summary totals from the completed lake use survey are shown in Figure 14. Seventy-eight percent (78%) of lake property owners had been at the lake between 5 - 10 years. The remaining 22% had been at the lake for more than 10 years. Questions concerning lake use found that 100% of those surveyed used the lake for swimming and boating and 78% for fishing. One participant indicated they used the lake for irrigation purposes. Many participants indicated verbally aesthetic qualities of the lake such as sunsets or nature. Nobody surveyed used the lake for drinking water. Questions concerning problems with the lake found that 5 out of 9 participants believed too many boats access the lake and that too many jet skis are on the lake. Overall the group expressed satisfaction by the reduction of Eurasian watermilfoil through Weed Patrol's fluridone herbicide treatment as well as the follow up treatments. Concern was also expressed in the lack of vegetation in Bass Lake however it was not reflected in the results from the lake use survey.

The 2008 lake use survey results are very similar to results of the 2007 lake use survey. The survey questions remained the same so trends could be identified. The top recreational uses at Bass Lake remain swimming, boating and fishing. The main issues concerning lake use are too many boats having access to the lake as well as jet skis on the lake which was consistent with 2007 results. The importance of native vegetation within lake ecosystems has been thoroughly discussed during public meetings held at the Bass Lake Community Center. The desire for more aquatic plants was indicated by two participants in the 2008 survey whereas no one indicated that desire in 2007.

Aquatic Plant Management Plan
Lake Use Survey for Bass Lake

Are you a lake property owner? Yes 9 No 0

Are you currently a member of your lake association? Yes 9 No 0

How many years have you been at the lake?

2 or less	0
2-5 years	0
5-10 years	7
Over 10 years	2

How do you use the lake (mark all that apply)

9	Swimming	1	Irrigation
9	Boating		Drinking water
7	Fishing		Other _____

Do you have aquatic plants at your shoreline in nuisance quantities? Yes 6 No 2

Do you currently participate in a weed control project on the lake? Yes 7 No 0

Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes 4 No 5

Does the level of vegetation in the lake affect your property values? Yes 2 No 5

Are you in favor of continuing efforts to control vegetation on the lake? Yes 9 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 8 No 1

Mark any of these you think are problems on your lake:

5	Too many boats access the lake
5	Use of jet skis on the lake
	Too much fishing
	Fish population problem
1	Dredging needed
2	Overuse by nonresidents
1	Too many aquatic plants
2	Not enough aquatic plants
	Poor water quality
1	Pier/funneling problem

Please add any comments:

_____

Figure 14. Summary totals from completed Lake Use Survey Forms.

Public involvement and educational outreach are critical with respect to exotic species in lake ecosystems. A new threat to Indiana lakes is from an invasive aquatic species called Hydrilla (*Hydrilla verticillata*), which was found in Lake Manitou in August 2006. Hydrilla posses a significant threat to Bass Lake as it has a heavily used public access site and is approximately 35 miles from Lake Manitou. Bass Lake is also a shallow turbid lake which is conducive to Hydrilla growth as it has far lower light requirements than other submersed aquatic vegetation. Hydrilla displaces native aquatic vegetation, changes the ecosystem, reduces recreational opportunities, and causes property values to drop. For all of these reasons, hydrilla has been declared a federal noxious aquatic plant (IDNR, 2006). Hydrilla can be distinguished from native elodea in that there are typically 3 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 15 (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/

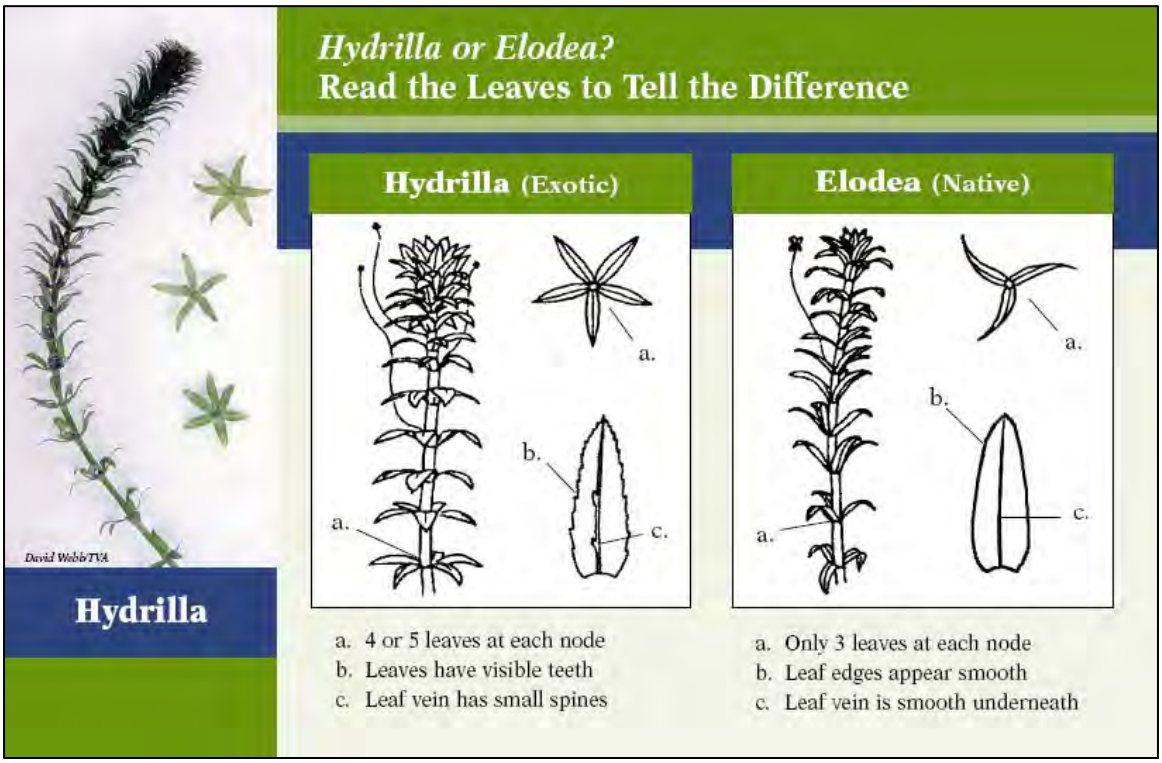


Figure 15: Illustration of Hydrilla compared to native elodea. (Illustrations provided by Michigan Sea Grant)

In addition to these state and lake-wide issues, residents can be educated regarding practical steps that can reduce nutrient loading and improve the Bass 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. 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 erodible 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.

The Bass Lake Conservancy District and the Bass Lake Homeowners Association have taken actions to limit lake residents' use of fertilizer close to the lake. The BLCD will be including articles concerning proper maintenance of boat motors and proper disposal of grass clippings in their newsletter. Information concerning agricultural and urban best management practices can be communicated verbally at meetings and distributed through handouts.

Additional Funding Sources

Identifying additional funding sources for improvement at Bass Lake is important as state funding is limited. In addition to the LARE Program, there are many other sources of potential funding to help improve the quality of Indiana Lakes such as Bass Lake. Many government agencies assist in projects designed to improve environmental quality.

The USDA has many programs to assist in environmental improvement. More information on the following programs can be found at www.usda.gov.

- Watershed Protection and Flood Prevention Program
- Wetlands Reserve Program
- Grasslands Reserve Program
- Wildlife Habitat Incentive Program
- Small Watershed Rehabilitation Program

The following programs are offered by the U.S Fish and Wildlife Service. More information about the Fish and Wildlife Service can be found at www.fws.gov.

- Partners for Fish and Wildlife Program
- Bring Back the Natives Program
- Native Plant Conservation Program

The Environmental Protection Agency, the Indiana Department of Environmental Management, and the U.S. Forest Service also have numerous programs for funding. A few of these are listed below. More information can be found at www.in.gov/idem and www.fs.fed.us/.

- U.S Environmental Protection Agency Environmental Education Program (EPA)
- Community Forestry Grant Program (U.S. Forest Service)

Timeline for LARE Grant Applications

LARE grants are available on a competitive basis for actions that can address the ecology and management of public lakes and their watersheds. The Bass Lake Conservancy District must comply with IDNR grant deadlines to remain eligible for funding assistance with management of invasive aquatic plants such as Eurasian watermilfoil.

Associations must apply for funding assistance by January 15 and grant application forms can be obtained through the LARE website (www.in.gov/dnr/fishwild/3302.htm). Aquatic vegetation control permits should be ideally completed by January 31st and submitted to DNR Division of Fish and Wildlife commercial license clerk. Award notices are announced in March. If a lake has received funding a request for proposals that is prepared by LARE staff should ideally be submitted to contractors by the end of March. Contractor qualifications and experience should be thoroughly reviewed before a final selection is made. Contracts for a planning consultant and herbicide treatment contractor should ideally be signed by the month of April to accommodate early spring treatments and pre-treatment surveys if applicable.

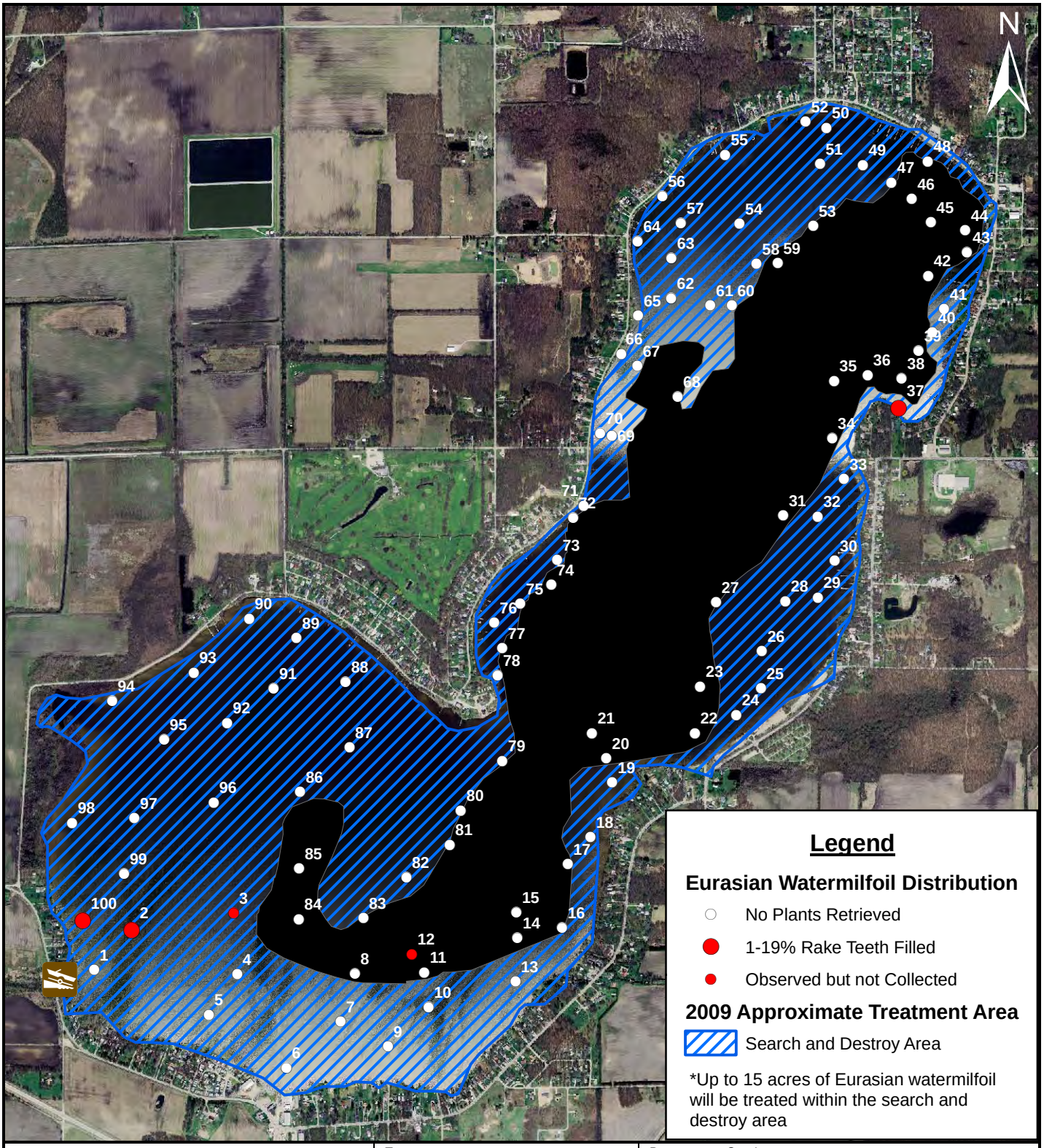
Action Plan

V3 recommends that a search and destroy survey for Eurasian watermilfoil and curlyleaf pondweed be conducted in 2009 (Figure 16 and Figure 17 respectively). The search and destroy area is approximately 880 acres and was made based on areas of the lake shallower than 15 feet. The search and destroy area covers where vegetation is growing as the maximum plant depth of the 2008 Tier II survey was 6 feet. A total of 15 acres are requested for Eurasian watermilfoil treatment in 2009, using Renovate or 2,4-D (Navigate ®). Renovate and 2,4-D have been used successfully on Bass Lake for Eurasian watermilfoil treatment. Determining whether to use Renovate or 2,4-D will depend on available funding. Liquid formulations work best at shallow depths and where the vegetation is dense whereas granular formulations are more effective at greater depths and when vegetation is scattered. A total of 14 acres are requested for curlyleaf pondweed treatment in 2009, using 1ppm of Aquathol K in very early spring when water temperatures are at or below 56-67 degrees Fahrenheit. Priority treatment area location and acreage are described within the Application for Aquatic Vegetation Control Permit located in Appendix III. Areas surrounding the public access should be thoroughly inspected as a point of introduction. The state extirpated Northeastern bladderwort was collected during the Tier II Survey. All future management as it relates to the use of the vegetation control herbicides must mitigate for any negative impacts to this native species.

The fluridone treatment conducted in 2007 was the first herbicide treatment of this kind at Bass Lake. Bass Lake's shallow depths and active public access site allow for Eurasian watermilfoil to establish and spread rapidly. Follow up surveys and treatments are necessary so Eurasian watermilfoil does not reach pre-fluridone treatment levels (100+ acres). An additional fluridone treatment is not recommended unless Eurasian watermilfoil reaches 10% of surface area of Bass Lake which indicates pre-fluridone treatment levels. Future Tier II survey results will demonstrate how long a fluridone treatment with follow up treatments will remain effective. The results of the 2008 Tier II survey estimate that up to 4 years of Eurasian watermilfoil control may be achieved through the 2007 fluridone treatment with follow up treatment as needed.

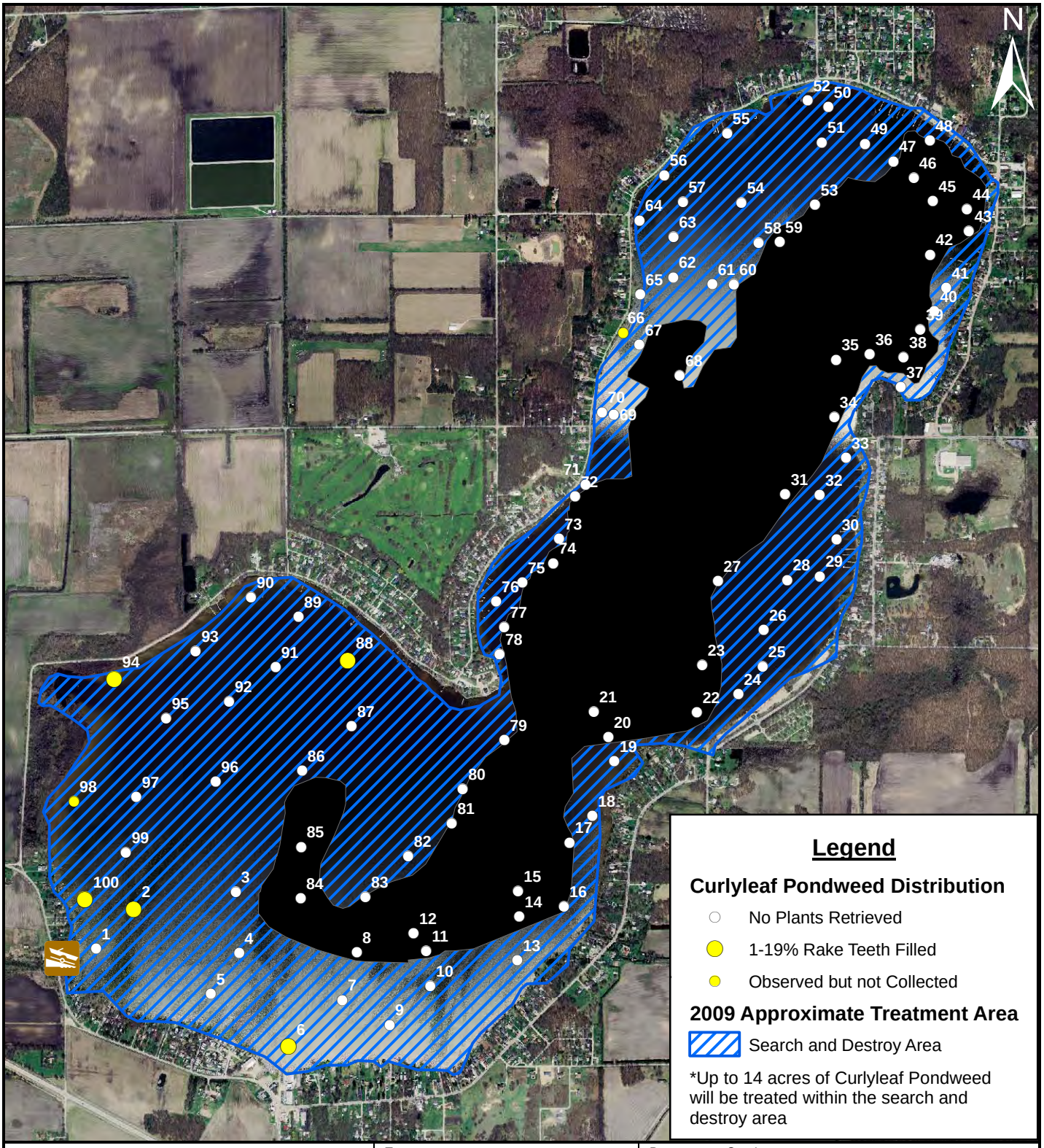
Anticipated strategy for 2009 to 2011 includes additional surveys which will be conducted in order to determine how the Eurasian watermilfoil population and the native aquatic plant beds are reacting to treatment.

As the action plan is implemented, aquatic plant surveys will help to monitor the effectiveness of the management strategy. The 2009 treatment will be based on post-treatment survey work and maps that will be sent to the DNR in the spring to provide an accurate representation of the areas requiring treatment. The abundance and distribution of exotic species will be recorded using the current IDNR Tier II sampling protocol. After the spring 2009 Target Species Distribution Map is created, the distribution and abundance of Eurasian watermilfoil and curlyleaf pondweed will be identified and treatment maps will be prepared. 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 Bass Lake. 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 management of the Bass Lake ecosystem.



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

TITLE: **Tier II Eurasian Watermilfoil Results with Approximate Treatment Areas for 2009**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 16	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 10/1/08	SCALE: 1" = 1,750'



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630.724.9202 fax
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TITLE: **Tier II Curlyleaf Pondweed Results with Approximate Treatment Areas for 2009**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 17	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 10/1/08	SCALE: 1" = 1,750'

Implementation of Action Plan

The management goal for 2009 is to keep the Eurasian watermilfoil and curlyleaf pondweed populations below nuisance quantities. The overall goal for Bass Lake is the results of the 2009 sampling are equal to or less than the 2008 Eurasian watermilfoil and curlyleaf pondweed distribution and abundance which would demonstrate effective herbicide treatments and management.

Eurasian watermilfoil Action Plan

1. Spring 2009 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 2008 chemical treatment effectively reduced the Eurasian watermilfoil population to only 2% of sampling locations. The Spring 2009 mapping will determine the extent and location of Eurasian watermilfoil re-growth.

2. Follow-up Herbicide Treatment to Eurasian watermilfoil. An early spring (3rd week of April to mid-May) systemic herbicide application of granular 2,4-D (Navigate ®) is proposed during 2009 to treat the Eurasian watermilfoil that has re-grown since the 2008 herbicide application.

3. Summer 2009 Tier II Aquatic Vegetation Survey. A Tier II aquatic vegetation survey should be conducted during the Summer 2009 to document the diversity, distribution and abundance of aquatic vegetation. This data is important to ensure that the native plant community is protected, and that Eurasian watermilfoil is kept under control.

Curlyleaf pondweed Action Plan

1. Early Spring 2009 Target Species Distribution Map, and Proposed Treatment Area Map for curlyleaf pondweed. 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 curlyleaf pondweed. As of July, curlyleaf pondweed was found at 5% of sampling locations. The Spring 2009 mapping will determine the extent and location of curlyleaf pondweed.

2. Follow-up Herbicide Treatment to curlyleaf pondweed. Application of Aquathol K should be conducted in very early spring when the water temperature is at or below 56-67 degrees Fahrenheit is proposed in 2009 to treat curlyleaf pondweed in Bass Lake.

3. Summer 2009 Tier II Aquatic Vegetation Survey. A Tier II aquatic vegetation survey should be conducted to document the diversity, distribution and abundance of aquatic vegetation. This data is important to ensure that the native plant community is protected, and that the curlyleaf pondweed is kept under control.

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 2009 and 2010 are summarized below. Deviations from the budget presented in the 2007 Update include decreased treatment acreage for curlyleaf pondweed in 2009 and 2010.

2009

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of granular 2,4-D (Navigate ®) (assumed 15 acres)	$7,500
Early Spring Systemic Herbicide Application of liquid Renovate (assumed 15 acres)	$9,000
Application of Aquathol K 1 ppm for curlyleaf pondweed (assumed 14 acres)	$4,200
Late season post treatment aquatic vegetation survey (Tier II) and plan update	$7,500

2010

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of granular 2,4-D (Navigate ®) (assumed 10 acres)	$5,000
Early Spring Systemic Herbicide Application of liquid Renovate (assumed 10 acres)	$6,000
Application of Aquathol K 1 ppm for curlyleaf pondweed (assumed 9 acres)	$2,700
Late season post treatment aquatic vegetation survey (Tier II) and plan update	$7,500

2011

Target Species Distribution Map and Proposed Treatment Area Map	$1,000
Early Spring Systemic Herbicide Application of granular 2,4-D (Navigate ®) (assumed 10 acres)	$5,000
Early Spring Systemic Herbicide Application of liquid Renovate (assumed 10 acres)	$6,000
Application of Aquathol K 1 ppm for curlyleaf pondweed (assumed 9 acres)	$2,700
Late season post treatment aquatic vegetation survey (Tier II) and plan update	$7,500
Native planting estimates for container plants, plugs and tubers	$30,000

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

The Bass Lake Conservancy District is grateful for LARE funding that is used to control invasive exotic species. The BLCD supports the cost share strategy and has funds prepared for the cost share.

Renovate and 2,4-D have been used successfully on Bass Lake for Eurasian watermilfoil treatment. Determining whether to use Renovate or 2,4-D will mainly depend on available funding. Navigate with the active ingredient of 2,4-D has been effective in killing Eurasian watermilfoil within Bass Lake. Both products are systemic herbicides and effectively control Eurasian watermilfoil. Renovate is an option for future herbicide treatment as Eurasian watermilfoil has the ability to develop a resistance to 2,4-D. Liquid formulations work best at shallow depths and where the vegetation is dense whereas granular formulations are more effective at greater depths and when vegetation is scattered.

These management activities and plant surveys are proposed to improve Bass 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.

Timeline for LARE Grant Applications

LARE grants are available on a competitive basis for actions that can address the ecology and management of public lakes and their watersheds. The Bass Lake Conservancy District must comply with IDNR grant deadlines to remain eligible for funding assistance with management of invasive aquatic plants such as Eurasian watermilfoil.

Associations must apply for funding assistance by January 15 and grant application forms can be obtained through the LARE website (www.in.gov/dnr/fishwild/3302.htm). Aquatic vegetation control permits should be ideally completed by January 31st and submitted to DNR Division of Fish and Wildlife commercial license clerk. Award notices are announced in March. If a lake has received funding a request for proposals that is prepared by LARE staff should ideally be submitted to contractors by the end of March. Contractor qualifications and experience should be thoroughly reviewed before a final selection is made. Contracts for a planning consultant and herbicide treatment contractor should ideally be signed by the month of April to accommodate early spring treatments and pre-treatment surveys if applicable.

Monitoring and Plan Updates

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

Deviations from the original 5 year budget include the management option of native vegetative planting. Aquatic vegetation planting was included in the original plan and was estimated as a management option for 2007 and 2008. Planting may be more feasible as a management option for 2011 as funding opportunities become available. The public meeting held in November had many residents expressing a desire for more beneficial native vegetation within emergent and submergent zones of Bass Lake which indicates support for planting efforts.

The results of the 2008 post-treatment sampling reflect progress toward the goals stated in the 5 year plan. Subsequent surveys will demonstrate whether or not the absence of Eurasian watermilfoil will allow for native species to re-establish within Bass Lake. Water quality may be a larger focus in future management. There were no species found past 10 foot depth zone and should be monitored within the following years to ensure Eurasian watermilfoil doesn't establish in the deeper zones.

After the Spring 2009 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 in the plant community of Bass Lake.

In years to follow, additional surveys will be conducted to determine how the Eurasian watermilfoil population and the native aquatic vegetative 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 Bass Lake ecosystem.

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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

Waterbody Name: Bass Lake

Lake ID:

County(s): Starke County

Date: 7/29 - 7/30, 2008

Habitat Stratum: 1L

Avg. Lake Depth (ft):

Lake Level:

Crew Leader: Ed Belmonte

GPS Metadata

Datum:

Zone: 16

Accuracy:

Recorder: Wally Levernier

Method:

Secchi Depth (ft): 2.0

Turb - 12 NTU

Total # of Points Surveyed: 100

Total # of Species: 10

Littoral Zone Size (acres):

- ☐ Measured
- ☐ Estimated

Littoral Zone Max. Depth (ft):

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

Cond - 245
Temp - 30° C
D.O. = 11.83
sp. Cond - 225
sal. = 0.1 ppt
pH = 8.76

Notable Conditions:

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME: Bass Lake	**DATE:** 7/29/08
COUNTY: Starke Co	**SECCHI DEPTH (FT):** 2.0 Ft.
SITE ID:	**MAX PLANT DEPTH (FT):** 6 Ft.
SURVEYING ORGANIZATION: V3 companies	**WEATHER:** Sunny & hot
CREW LEADER: Ed Belmonte	**COMMENTS (Include voucher codes - V1, V2...):**
RECORDER: Wally Levernier	
CONTACT INFO: Ed Belmonte	***Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.***

Point #	R/T	Latitude	Longitude	Depth	Species Codes: Chara	Najmar	Potcri	MYRSPI	Pot Pus	NajFle			Notes
1	R			2	1								
2	R			3	3	1	1	1	1				
3	R			6		1		9					Floating Myr.spi
4	R			5	9								no veg
5	R			4									no veg
6	R			3	1		1			1			
7	R			4									no veg
8	R			9									no veg
9	R			2	1								tiny chara
10	R			3									no veg
11	R			8									no veg
12	R			15				9	9				no veg
13	R			2	1								tiny chara
14	R			7	9								no veg
15	R			14									no veg
16	R			3	1								tiny chara
17	R			6									no veg
18	R			2	1								tiny chara
19	R			2	1								tiny chara
20	R			6									no veg
21	R			13									no veg
22	R			6									no veg
23	R			11									no veg
24	R			4									no veg
25	R			3									no veg
26	R			3									no veg
27	R			6									no veg
28	R			8									no veg
29	R			2	1								
30	R			2	1								tiny chara
31	R			7									no veg
32	R			4	1								
33	R			2	1								

Other plant species observed at lake:

- Myrspi cut up & Floating by public boat launch

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME: Bass Lake	**DATE:** 7/29/08
COUNTY: Starke Co	**SECCHI DEPTH (FT):** 2.0
SITE ID:	**MAX PLANT DEPTH (FT):** 6. Ft
SURVEYING ORGANIZATION:	**WEATHER:** Sunny on 7/29 → cloudy, rain, on 7/30
CREW LEADER: Ed Belmonte	**COMMENTS (Include voucher codes - V1, V2...):**
RECORDER: Wally Levernier	
CONTACT INFO: Ed Belmonte	***Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.***

Point #	R/T	Latitude	Longitude	Depth	Species Codes: Myrspi	nymsbt	Nyspdu	chara	Potcri				Notes
34	R			6									no veg
35	R			11									no veg
36	R			7									no veg
37	R			4	1	9	9						
38	R			13									no veg
39	R			8									no veg
40	R			4				1					sing chara
41	R			3				1					
42	R			9									no veg
43	R			3									no veg
44	R			9				9					no veg
45	R			10									no veg
46	R			14									no veg
47	R			6				9					no veg
48	R			2									no veg
49	R			5									no veg
50	R			2									no veg
51	R			4									no veg
7/30 → 52	R			2									no veg
53	R			6									no veg
54	R			4									no veg
55	R			2									no veg
56	R			7				1					lytsal?
57	R			3									no veg
58	R			6									no veg
59	R			14									no veg
60	R			6									no veg
61	R			5									no veg
62	R			6									no veg
63	R			4									no veg
64	R			3		9	9	1					lytsal?
65	R			5				1					
66	R			3					9				

sciacu & typang on shore

pharu & lytsal on shore

typang on shore

salix on shore

Other plant species observed at lake:

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME: Bass Lake	**DATE:** 7/30
COUNTY: Starke Co.	**SECCHI DEPTH (FT):** 2.0
SITE ID:	**MAX PLANT DEPTH (FT):** 6.0 Ft
SURVEYING ORGANIZATION: V3 Corporate	**WEATHER:** Sunny, rainy & cool
CREW LEADER: Ed Belmonte	**COMMENTS (Include voucher codes - V1, V2...):**
RECORDER: Will Levonius	UTERES is voucher 1 / NIT is V2
CONTACT INFO: Ed Belmonte	***Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.***

Species Codes: MYRSP= MYMOOT, NUDADU, CHARA, POTCRI, UTERES, NAJFLE, NITSP

Point #	R/T	Latitude	Longitude	Depth	MYRSP=	MYMOOT	NUDADU	CHARA	POTCRI	UTERES	NAJFLE	NITSP	Notes
67	R			7									No veg
68	R			10									No veg
69	R			7									No veg
70	R			5									no veg
71	R			8									No veg
72	R			2				1					
73	R			7									No veg
74	R			11									No veg
75	R			7									No veg
76	R			4									No veg
77	R			6									no veg
78	R			2				1					
79	R			3									no veg
80	R			8									No veg
81	R			6									No veg
82	R			6				1					
83	R			7									No veg
84	R			6									no veg
85	R			2									no veg
86	R			3									No veg
87	R			4									No veg
88	R			5				1	1				
89	R			2				1					
90	R			2									no vegetation
91	R			4				1					
92	R			4									no veg
93	R			3				1					
94	R			3				3	1				
95	R			4				1					
96	R			6				1					
97	R			4				1					
98	R			2		9		1	9	9 WL	9	1	
99	R			3									no veg
100	R			3	1			1	1	1			

Other plant species observed at lake:

Bass Lake Aquatic Plant Management Plan Update-2008, Tier II Sampling, July 2008

Tier II Sampling Location Number	Latitude	Longitude
1	41.21241	-86.61026
2	41.21375	-86.60855
3	41.21433	-86.6039
4	41.21224	-86.60375
5	41.21085	-86.60505
6	41.20902	-86.60153
7	41.2106	-86.59906
8	41.21224	-86.59839
9	41.20975	-86.59691
10	41.21107	-86.59506
11	41.21227	-86.59524
12	41.21289	-86.59581
13	41.21194	-86.5911
14	41.21344	-86.59101
15	41.21431	-86.59105
16	41.21378	-86.58897
17	41.21597	-86.5887
18	41.21688	-86.58766
19	41.21875	-86.58666
20	41.21958	-86.58692
21	41.22044	-86.58757
22	41.22042	-86.58289
23	41.22202	-86.58264
24	41.22104	-86.581
25	41.22196	-86.57988
26	41.22322	-86.57983
27	41.22491	-86.5819
28	41.22493	-86.57875
29	41.22505	-86.57727
30	41.22632	-86.5765
31	41.22787	-86.57883
32	41.22783	-86.57726
33	41.22911	-86.57604
34	41.2305	-86.57657
35	41.23247	-86.57648
36	41.23266	-86.57494
37	41.23152	-86.57354
38	41.23254	-86.5734
39	41.23349	-86.57263
40	41.23412	-86.57199
41	41.23491	-86.57145
42	41.23605	-86.57217
43	41.23685	-86.5704
44	41.23761	-86.57048
45	41.23789	-86.57203
46	41.23869	-86.5729
47	41.23926	-86.57382
48	41.23997	-86.57216
49	41.23986	-86.57511
50	41.24114	-86.57677

Tier II Sampling Location Number	Latitude	Longitude
51	41.23991	-86.57708
52	41.24136	-86.57772
53	41.23779	-86.5774
54	41.23787	-86.58075
55	41.24024	-86.58139
56	41.23883	-86.58425
57	41.2379	-86.58341
58	41.23649	-86.57998
59	41.23652	-86.57902
60	41.23507	-86.58112
61	41.23508	-86.58209
62	41.23532	-86.58387
63	41.2367	-86.58385
64	41.23728	-86.58539
65	41.23474	-86.58538
66	41.23343	-86.58616
67	41.23302	-86.58543
68	41.23195	-86.5836
69	41.23063	-86.5866
70	41.23071	-86.58713
71	41.22824	-86.5879
72	41.22783	-86.58838
73	41.22638	-86.58912
74	41.22554	-86.58939
75	41.22489	-86.5908
76	41.22424	-86.59199
77	41.22336	-86.59163
78	41.22244	-86.59185
79	41.2195	-86.59165
80	41.21781	-86.59355
81	41.21664	-86.59406
82	41.21553	-86.59604
83	41.21414	-86.598
84	41.21411	-86.60094
85	41.21586	-86.60091
86	41.21848	-86.60085
87	41.21999	-86.59859
88	41.22224	-86.59876
89	41.22375	-86.60098
90	41.22442	-86.60313
91	41.22203	-86.60203
92	41.22085	-86.60416
93	41.22258	-86.60567
94	41.22163	-86.60939
95	41.22029	-86.60703
96	41.21812	-86.60479
97	41.2176	-86.6084
98	41.21745	-86.61123
99	41.2157	-86.60888
100	41.21409	-86.61077

APPENDIX II

THREATENED AND ENDANGERED SPECIES

T R A N S M I T T A L L E T T E R

Company: Aquatic Plant Herbarium
Biological Sciences
Purdue University North Central
1401 S. U.S. 421
Westville, IN 46391-9528

August 4, 2008

Project: Bass Lake

Attention: Dr. Robin Scribailo

Project No: 07122.01 W32C

Via: ☐ Federal Express ☐ Messenger ☒ V3 Delivery ☐ Mail ☐ Overnight ☐ Pick Up

For Your: ☒ Information/Use ☐ Review/Comment ☐ Approval

The Following: ☐ Drawing ☐ Specifications ☐ Disk ☒ Other

Specimens	Description	Date
#1	Plant found in mud flat on the west side of the lake.	07/30/06

Remarks

Enclosed is a specimen collected from mud/sand flats that has the characteristics of *Utricularia resupinata.* Please select a representative sample, and please identify which of the species of bladderwort is represented. I have also enclosed $15.00 cash, as directed by Dr. Robin Scribailo. If you have any questions, please feel free to contact me at 630 729-6290, or on my cell at 630-330-7321. Thank you

Copy To: V3 File

By: Wally Levernier

7325 Janes Avenue, Suite 100 ◆ Woodridge, IL 60517
Tel: 630/724-9200 ◆ Fax: 630/724-9202

Indiana County Endangered, Threatened and Rare Species List

County: Starke

Species Name	Common Name	FED	STATE	GRANK	SRANK
Insect: Coleoptera (Beetles)					
Nicrophorus americanus	American Burying Beetle	LE	SX	G2G3	SH
Insect: Lepidoptera (Butterflies & Moths)					
Atrytonopsis hianna	Dusted Skipper		ST	G4G5	S1S2
Catocala praeclara	Praeclara Underwing		SR	G5	S2S3
Chortodes enervata	The Many-lined Cordgrass Moth		ST	G4	S1
Dasychira cinnamomea	A Moth		SR	G4	S1
Eucoptocnemis tripars	Pearly Dune Moth		ST	GNR	S2
Euxoa albipennis	White-striped Dart		SR	G4G5	S1S3
Grammia figurata	The Figured Grammia		SR	G5	S2S3
Grammia oithona	Oithona's Grammia		SR	G4Q	S2S3
Grammia phyllira	The Sand Barrens Grammia		SR	G4	S2S3
Iodopepla u-album	A Noctuid Moth		SR	G5	S2
Lesmone detrahens	A Moth		SR	G5	S2
Leucania inermis	A Moth		SR	G4	S2S3
Macrochilo absorptalis	A Moth		SR	G4G5	S2S3
Macrochilo hypocritalis	A Noctuid Moth		SR	G4	S2
Melanomma auricinctaria	Huckleberry Eye-spot Moth		SR	G4	S2S3
Papaipema beeriana	Beer's Blazing Star Borer Moth		ST	G2G3	S1S3
Papaipema limpida	The Ironweed Borer Moth		SR	G4	S1S2
Papaipema speciosissima	The Royal Fern Borer Moth		ST	G4	S2S3
Fish					
Moxostoma valenciennesi	Greater Redhorse		SE	G4	S2
Amphibian					
Ambystoma laterale	Blue-spotted Salamander		SSC	G5	S2
Hemidactylium scutatum	Four-toed Salamander		SE	G5	S2
Rana pipiens	Northern Leopard Frog		SSC	G5	S2
Reptile					
Clemmys guttata	Spotted Turtle		SE	G5	S2
Emydoidea blandingii	Blanding's Turtle		SE	G4	S2
Kinosternon subrubrum	Eastern Mud Turtle		SE	G5	S2
Ophisaurus attenuatus	Slender Glass Lizard			G5	S2
Sistrurus catenatus catenatus	Eastern Massasauga	C	SE	G3G4T3T4	S2
Terrapene ornata	Ornate Box Turtle		SE	G5	S2
Bird					
Ardea alba	Great Egret		SSC	G5	S1B
Ardea herodias	Great Blue Heron			G5	S4B
Botaurus lentiginosus	American Bittern		SE	G4	S2B
Buteo lineatus	Red-shouldered Hawk		SSC	G5	S3
Certhia americana	Brown Creeper			G5	S2B
Circus cyaneus	Northern Harrier		SE	G5	S2
Cistothorus palustris	Marsh Wren		SE	G5	S3B
Cistothorus platensis	Sedge Wren		SE	G5	S3B
Dendroica cerulea	Cerulean Warbler		SSC	G4	S3B
Ixobrychus exilis	Least Bittern		SE	G5	S3B
Lophodytes cucullatus	Hooded Merganser			G5	S2S3B
Rallus elegans	King Rail		SE	G4	S1B
Rallus limicola	Virginia Rail		SE	G5	S3B
Sturnella neglecta	Western Meadowlark		SSC	G5	S2B
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		SE	G5	S1B
Mammal					
Lynx rufus	Bobcat	No Status		G5	S1
Myotis sodalis	Indiana Bat or Social Myotis	LE	SE	G2	S1
Spermophilus franklinii	Franklin's Ground Squirrel		SE	G5	S2
Taxidea taxus	American Badger			G5	S2

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Indiana County Endangered, Threatened and Rare Species List

County: Starke

Species Name	Common Name	FED	STATE	GRANK	SRANK
Vascular Plant					
Androsace occidentalis	Western Rockjasmine		ST	G5	S2
Arabis glabra	Tower-mustard		WL	G5	S2
Arabis missouriensis var. deamii	Missouri Rockcress		SE	G4G5QT3?Q	S1
Aralia hispida	Bristly Sarsaparilla		SE	G5	S1
Aristida intermedia	Slim-spike Three-awn Grass		SR	GNR	S2
Armoracia aquatica	Lake Cress		SE	G4?	S1
Aster sericeus	Western Silvery Aster		SR	G5	S2
Azolla caroliniana	Carolina Mosquito-fern		ST	G5	S2
Botrychium matricariifolium	Chamomile Grape-fern		SR	G5	S2
Carex atlantica ssp. atlantica	Atlantic Sedge		ST	G5T4	S2
Carex conoidea	Prairie Gray Sedge		ST	G5	S1
Carex echinata	Little Prickly Sedge		SE	G5	S1
Carex flava	Yellow Sedge		ST	G5	S2
Carex pseudocyperus	Cyperus-like Sedge		SE	G5	S1
Carex straminea	Straw Sedge		ST	G5	S2
Corydalis sempervirens	Pale Corydalis		ST	G4G5	S1
Cyperus dentatus	Toothed Sedge		SE	G4	S1
Diervilla lonicera	Northern Bush-honeysuckle		SR	G5	S2
Drosera intermedia	Spoon-leaved Sundew		SR	G5	S2
Epigaea repens	Trailing Arbutus		WL	G5	S3
Eriocaulon aquaticum	Pipewort		SE	G5	S1
Geranium bicknellii	Bicknell Northern Crane's-bill		SE	G5	S1
Hymenopappus scabiosaeus	Carolina Woollywhite		SE	G4G5	S1
Juncus articulatus	Jointed Rush		SE	G5	S1
Linum intercursum	Sandplain Flax		SE	G4	S1
Ludwigia sphaerocarpa	Globe-fruited False-loosestrife		SE	G5	S1
Lycopodium obscurum	Tree Clubmoss		SR	G5	S2
Lycopus amplectens	Sessile-leaved Bugleweed		SE	G5	S1
Panicum boreale	Northern Witchgrass		SR	G5	S2
Panicum columbianum	Hemlock Panic-grass		SR	G5	S2
Panicum leibergii	Leiberg's Witchgrass		ST	G5	S2
Panicum longifolium	Long-leaved Panic-grass		SX	G4	SX
Panicum subvillosum	A Panic-grass		SE	GNRQ	S1
Platanthera ciliaris	Yellow-fringe Orchis		SE	G5	S1
Platanthera leucophaea	Prairie White-fringed Orchid	LT	SE	G3	S1
Polygonum careyi	Carey's Smartweed		ST	G4	S2
Polytaenia nuttallii	Prairie Parsley		SE	G5	S1
Potamogeton strictifolius	Straight-leaf Pondweed		ST	G5	S1
Psilocarya nitens	Short-beaked Bald-rush		SX	G4?	SX
Psilocarya scirpoides	Long-beaked Baldrush		ST	G4	S2
Rubus deamii	Deam Dewberry		SX	G4?	SX
Scirpus purshianus	Weakstalk Bulrush		SR	G4G5	S1
Scirpus torreyi	Torrey's Bulrush		SE	G5?	S1
Scleria reticularis	Reticulated Nutrush		ST	G4	S2
Spiranthes lucida	Shining Ladies'-tresses		SR	G5	S2
Spiranthes magnicamporum	Great Plains Ladies'-tresses		SE	G4	S1
Trichostema dichotomum	Forked Bluecurl		SR	G5	S2
Utricularia geminiscapa	Hidden-fruited Bladderwort		SE	G4G5	S1
Utricularia resupinata	Northeastern Bladderwort		SX	G4	SX
Viola primulifolia	Primrose-leaf Violet		ST	G5	S2
High Quality Natural Community					
Forest - flatwoods sand	Sand Flatwoods		SG	G2?	S1
Forest - upland dry-mesic	Dry-mesic Upland Forest		SG	G4	S4
Forest - upland mesic	Mesic Upland Forest		SG	G3?	S3

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Indiana County Endangered, Threatened and Rare Species List

County: Starke

Species Name	Common Name	FED	STATE	GRANK	SRANK
Lake - lake	Lake		SG	GNR	S2
Prairie - mesic	Mesic Prairie		SG	G2	S2
Prairie - sand dry	Dry Sand Prairie		SG	G3	S2
Prairie - sand dry-mesic	Dry-mesic Sand Prairie		SG	G3	S3
Prairie - sand wet-mesic	Wet-mesic Sand Prairie		SG	G1?	S2
Prairie - wet	Wet Prairie		SG	G3	S1
Savanna - sand dry	Dry Sand Savanna		SG	G2?	S2
Savanna - sand dry-mesic	Dry-mesic Sand Savanna		SG	G2?	S2S3
Wetland - fen	Fen		SG	G3	S3
Wetland - marsh	Marsh		SG	GU	S4
Wetland - meadow sedge	Sedge Meadow		SG	G3?	S1
Wetland - swamp forest	Forested Swamp		SG	G2?	S2
Other					
Migratory Bird Concentration Area	Migratory Bird Concentration Site		SG	GNR	SNR

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APPENDIX III

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	Lake Assoc. Name	
Cinndi Carey	Bass Lake Conservancy District	
Rural Route or Street		Phone Number
3620 South County Road 210		(574) 772-5794
City and State		ZIP Code
Knox, IN		46534
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Rural Route or Street		Phone Number
City and State		ZIP Code

Lake (One application per lake)	Nearest Town	County
Bass Lake	Knox	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 # (880 acres)		LAT/LONG or UTM's Lat: 41.23883 Lon: -86.58425	
Total acres to be controlled	sum of 15 acres for lake	Proposed shoreline treatment length (ft)	sum of 2,285 ft
Perpendicular distance from shoreline (ft)	adjacent		
Maximum Depth of Treatment (ft)	15 ft	Expected date(s) of treatment(s)	03/15/09 - 08/15/09

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.

A search and destroy area for Eurasian watermilfoil priority treatment areas for Bass Lake in 2009 consists of 880 acres based on depths below 15 feet. The 15 acres within the search and destroy area will be treated with a systemic herbicide application of granular 2,4-D or Renovate in 2009. Search and destroy area for Eurasian watermilfoil is 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 2008

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Chara		30
Curlyleaf pondweed	x	5
Eurasian watermifloil	x	3
Spiny naiad		2
Small pondweed		1

Treatment Area # (880 acres)		LAT/LONG or UTM's Lat: 41.23343 Lon:-86.58616	
Total acres to be controlled	sum of 14 acres for lake	Proposed shoreline treatment length (ft)	sum of 2,285 ft
Perpendicular distance from shoreline (ft)	adjacent		
Maximum Depth of Treatment (ft)	15 ft	Expected date(s) of treatment(s)	03/15/09 - 08/15/09

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.

A search and destroy area for curlyleaf pondweed priority treatment area for Bass Lake in 2009 consists of 880 acres based on depths below 15 feet. The 14 acres within the search and destroy area will be treated with a systemic herbicide application of 1ppm of Aquathol K in 2009. Search and destroy area for curlyleaf pondweed is shown in the attached priority treatment exhibit.

Plant survey method: [X] Rake [ ] Visual [ ] Other (specify) Based on Tier II sampling conducted during July 2008

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Chara		30
Curlyleaf pondweed	x	5
Eurasian watermifloil	x	3
Spiny naiad		2

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.

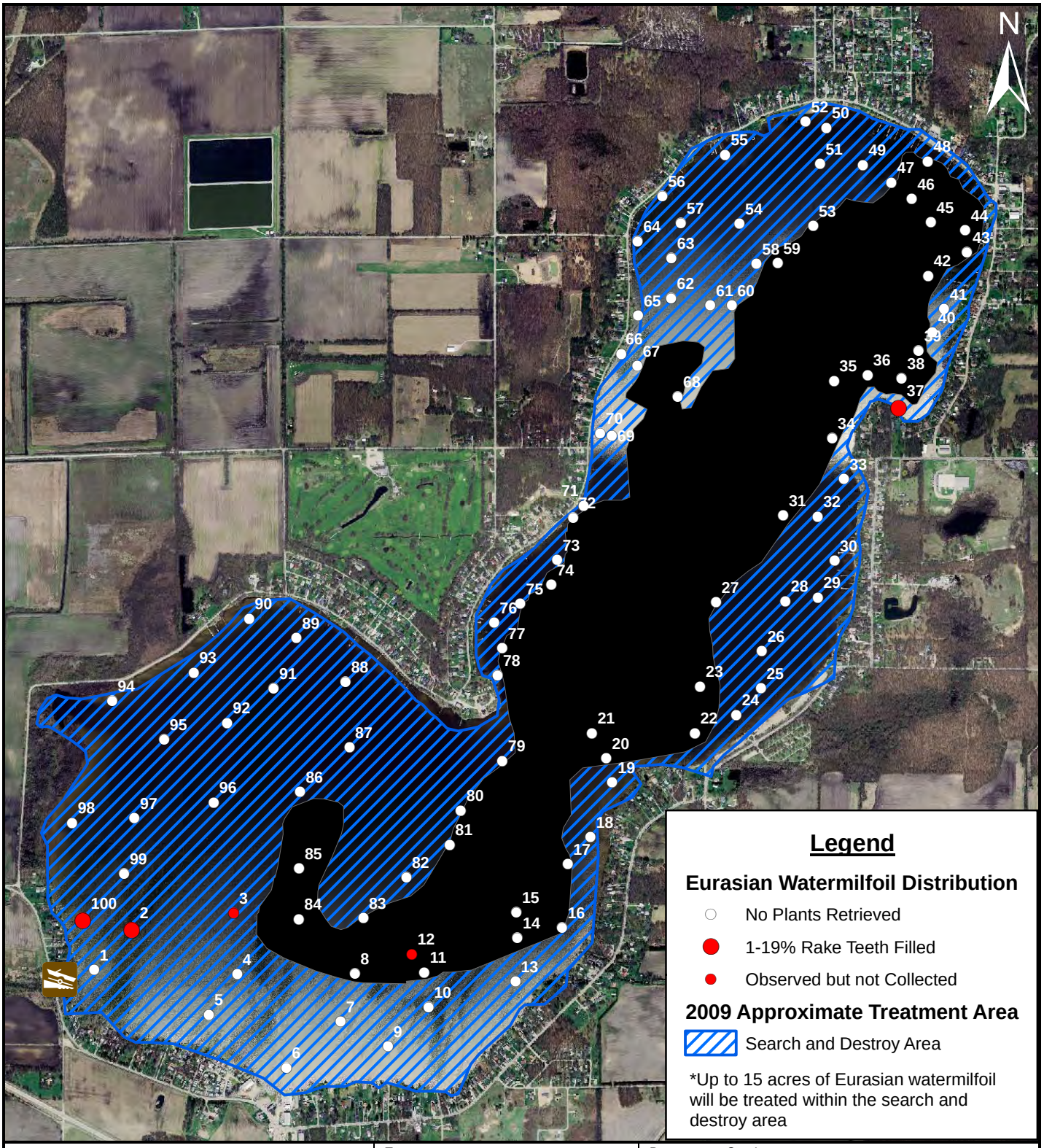
Applicant Signature	Date
Certified Applicant's Signature	Date

FOR OFFICE ONLY

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

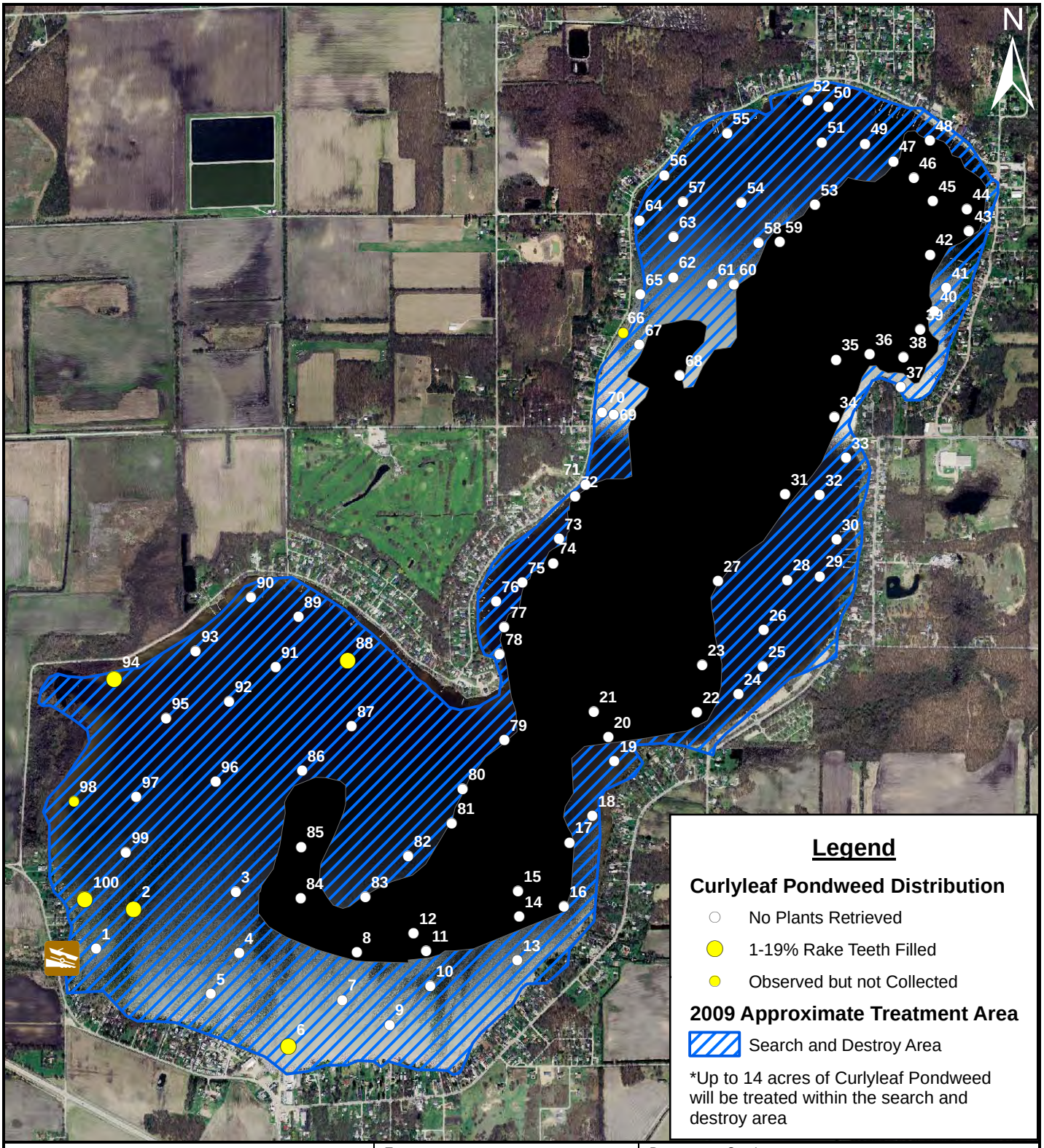
Mail check or money order in the amount of $5.00 to:

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



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

TITLE: **Tier II Eurasian Watermilfoil Results with Approximate Treatment Areas for 2009**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 16	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 10/1/08	SCALE: 1" = 1,750'



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

TITLE: **Tier II Curlyleaf Pondweed Results with Approximate Treatment Areas for 2009**	PROJECT AND SITE LOCATION: **Bass Lake Aquatic Plant Management Plan Update - 2008**		
BASE LAYER: Indiana Spatial Data 2006 Orthophotography	PROJECT NO. 07122.01	FIGURE: 17	SHEET: 1 OF: 1
CLIENT: **Bass Lake Conservancy District 3620 South CR 210 Knox, IN 46534**	QUADRANGLE: N/A	DATE: 10/1/08	SCALE: 1" = 1,750'