Aquatic Enhancement
& Survey, Inc.

Aquatic Vegetation Management Plan Update 2008

Big Turkey Lake, LaGrange & Steuben County

Prepared for the Big Turkey Lake Improvement Association
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Scott Banfield, Aquatic Enhancement & Survey, Inc.

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1. Executive Summary

Big Turkey Lake is a 450 acre kettle lake located in Steuben County Indiana. Big Turkey Lake is generally nutrient rich (eutrophic) and has moderate warm season water clarity. It has an average depth of 16 feet and a maximum depth of 65 feet. The shoreline of the lake is approximately 90 percent developed with single family homes and cottages. Area residents can access the lake through an Indiana Department of Natural Resources (IDNR) public access ramp at the lakes north end. Boating, swimming, and fishing are the most popular activities on the lake. Big Turkey has a diverse aquatic flora including one state listed rare and one state listed threatened species, but has been colonized by the non-native plants Curlyleaf pondweed *Potamogeton crispus* and Eurasian watermilfoil *Myriophyllum spicatum*. For several years these plants have produced thick growth in certain areas of the lake, impaired the aesthetic quality of the lake, and provided a significant hindrance to the recreational activities of the lake's users. In the 2006 season the Big Turkey Lake Association sought and was granted cost-share assistance from the Indiana Department of Natural Resources Lake and River Enhancement Program (LARE) to develop an Aquatic Plant Management Plan *(Aquatic Plant Management Plan 2007-2011 Big Turkey Lake Lagrange, Steuben County, Indiana)* (Aquatic Enhancement & Survey, Inc. 2008) The plan was completed in 2008 and established the following overall goals: 1. Maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality. 2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species. 3. Provide reasonable public recreational access while minimizing the negative impacts on plant, fish, and wildlife resources. The plan also established the following measurable benchmarks for management success: 1. Limit the amount of the Big Turkey Lake littoral area in dense exotic plant growth to five percent or less. 2. Limit the occurrence of Curlyleaf pondweed and Eurasian watermilfoil in July Tier II sampling to five percent or less (8 acres). For 2008 the Big Turkey Lake Association applied to the LARE program to produce a plan update, treat 15 acres of Eurasian watermilfoil, and treat 40.5 acres of Curlyleaf pondweed. Funding was granted to produce the update and treat 15 acres of Eurasian watermilfoil growth. This update document complements the original plan by detailing activities associated with plant management in the 2008 season and adjusting the course of management activities as needed for the 2009 season. In 2008 15 acres of significant Eurasian watermilfoil growth was mapped and treated on June 10, 2008 using 2, 4-D granular aquatic herbicide (Navigate). Curlyleaf pondweed growth was also mapped on 40.5 acres of Big Turkey Lake, but was not treated. A Tier II aquatic plant survey was conducted on Big Turkey Lake on August 20th and 27th 2008. Sixteen species were identified showing good diversity. Overall Eurasian milfoil treatment results appeared to be very good. The Tier II Eurasian watermilfoil occurrence was only 3.8% with none of the lake's littoral area in dense Eurasian milfoil growth. A visit to the lake in October, however, showed that some regrowth of Eurasian watermilfoil had occurred in treatment areas and some areas of new growth outside the treatments were also noted. For 2009 it is recommended that the Big Turkey Lake Association plan to treat approximately 27 acres of Eurasian watermilfoil and up to 40.5 acres of problem Curlyleaf pondweed growth with Aquathol K ® liquid herbicide. A switch to a Triclopyr (Renovate 3 OTF ®) herbicide for milfoil control should be planned to see if longer lasting results can be achieved. This should be accompanied by continued efforts to track the health and diversity of the Big Turkey Lake aquatic plant community through exotic plantbed mapping and a late season Tier II Survey. The total estimated cost of surveys and aquatic plant management at Big Turkey Lake in 2009 is estimated to be $37,175.00. Efforts begun by the Big Turkey Lake Association in 2008 to educate users about the identification and management of non-native invasive aquatic plants should continue. Because it is represented by the Big Turkey Lake Association Henry Lake, connected to Big Turkey Lake via Mud Creek, should be checked for the presence of invasive exotic plants in 2009 to see if management is needed there.

2. Problem Statement

Exotic plants can provide impairment to Big Turkey Lake directly and indirectly by out-competing the luxuriant growth of more beneficial native species for resources, contributing to a loss of diversity, impairing recreational use, and providing a complex habitat that can alter fish community functioning. Additionally the eutrophic conditions of Big Turkey Lake can potentially be exacerbated if dense invasive vegetation is allowed to increase its area of colonization extensively and then managed by abruptly providing control in the later-season producing a nutrient rich situation where the plant community biomass is dominated by blue-green or filamentous algae.

3. Management History and Goals

Prior to 2007 Big Turkey Lake did not have a lakewide comprehensive program to control invasive aquatic plants. The lake association developed a plan to do so in 2007 with assistance from the LARE program and began exotic plant control activities under plan in 2008. The general purpose of this plant plan update and associated plant management activities at Big Turkey Lake is to help the Big Turkey Lake Association and IDNR direct management efforts toward the following set of goals:

1. Maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality.

2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species.

3. Provide reasonable public recreational access while minimizing the negative impacts on plant, fish, and wildlife resources.

Recommended management activities at Big Turkey Lake for 2008 have been geared toward attainment of these goals and the following measurable benchmarks for success in that regard were applied to Big Turkey Lake:

1. Limit the amount of the Big Turkey Lake littoral area in dense exotic plant growth to five percent or less.

2. Limit the occurrence of Curlyleaf pondweed and Eurasian watermilfoil in July Tier II sampling to five percent or less.

On June 10, 2008 time was spent on the water to map the extent of significant Curlyleaf pondweed and Eurasian watermilfoil growth at Big Turkey Lake. Approximately 40.5 acres of Curlyleaf pondweed growth was noted (figure 2 below). No cost-share funding was available for Curlyleaf at Big Turkey so most of this area remained untreated. This was the same pattern of growth seen in 2007. Although significant growth was present in these areas the growth density was much less than in 2007 and problems with these plants were less severe than in the previous season. Fifteen acres of Eurasian watermilfoil growth was noted and treated on 6/10/08 with 100 pounds per acre 2, 4-D granular aquatic herbicide (Navigate®). The pattern of growth for Eurasian milfoil was also similar to 2007. Results were good with few milfoil plants noted in the treatment areas at the time of the August 20th Tier II survey. Benchmarks established for the 2008 season were met. Less than one percent of Big Turkey's littoral area in dense exotic plant growth during the August Tier II survey (goal was less than five percent). The occurrence of Eurasian watermilfoil in the August sampling was only 3.8 percent, beating the benchmark of five percent or less. The occurrence of Curlyleaf in the August sampling was at the five percent benchmark. Since most of the Curlyleaf was untreated in 2008, this was largely a result of the normal natural die-off of this early-season plant. On October 5, 2008 another trip to the lake was

completed to look for areas of exotic growth with the Big Turkey Lake Association President. It was noted that Eurasian watermilfoil was present on approximately 10 acres of the June treatment area. Another 12 acres of new milfoil growth was noted where none had been during the June exotic plant survey. It is unknown whether regrowth noted in October was the result of new milfoil fragments finding their way into the treated area or regrowth of treated plants. New growth noted may have been the result of fall die-back of a large amount of native milfoil revealing Eurasian plants not previously noted. Recommendations for 2009 season management activities will take this information into account with a proposed alternative herbicide and increase in recommended treated acreage.

Figure 1 Eurasian milfoil growth spotted and treated with 2, 4-D granular 6-10-08 (represents all areas of growth)

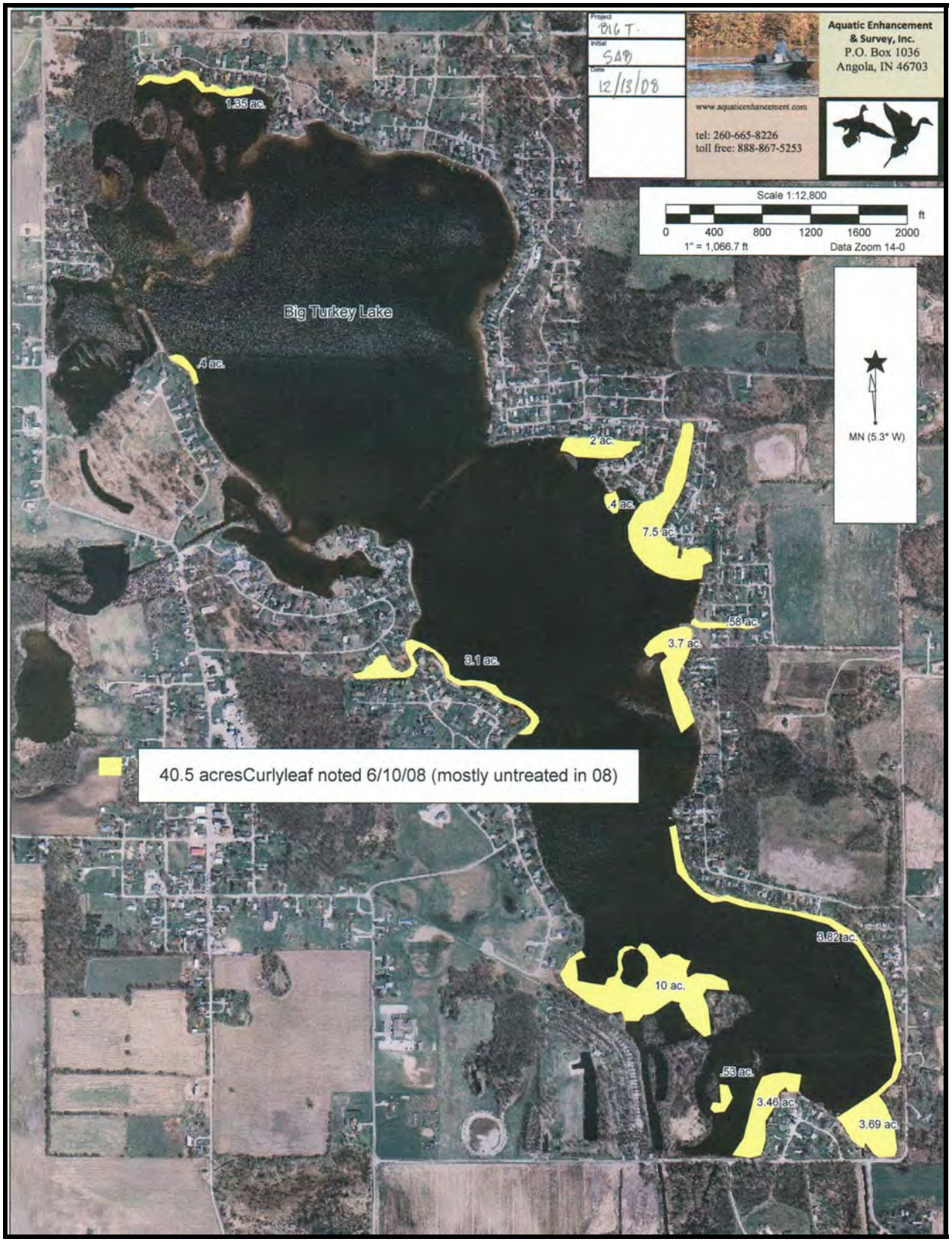

Figure 2 Areas of Curlyleaf pondweed growth noted 6-10-08. Most of this area remained untreated for Curlyleaf.

Figure 3 Areas of post-treatment regrowth and new milfoil growth noted 10-5-08

4. Watershed and Water Body Characteristics

Big Turkey Lake has a surface area of approximately 450 acres. The Big Turkey Lake watershed area is approximately 22,624 acres. Big Turkey Lake has undergone some changes in the 2008 season in the form of hydraulic dredging. This change is unlikely to have a large impact on plant management on Big Turkey Lake as a whole but dredged areas should be watched as possible sites for the growth of invasive plants in the 2009 season. No LARE report is currently available in regard to the dredging.

Figure 4 Areas of Big Turkey Lake Dredged in 2008

5. Plant Community Characterization

5.1 8/20, 27/08 (late season) Tier II Survey Results

The 2008 Tier II survey for Big Turkey Lake was conducted on August 20th and 27th in good weather conditions. The survey sampling points are shown in figure 6. For an overview of Tier II protocol see the original Big Turkey Lake Plant Management Plan (Aquatic Enhancement 2007). Sampling points used were identical to those used in the late season 2007 Tier II survey but a different set of points than those used in the early season in 2007. A summary of results is contained in table five below. Water clarity was considered to be relatively low with a Secchi depth of 4.1 feet recorded. However Big Turkey's overall Secchi depth history suggests that a trend toward clearer water may exist. This may help explain the sentiments of many lake users that plant growth is increasing. Plants were found to a depth of 15 feet. The 15 foot sampling depth for Big Turkey Lake appears to be marginal, but few plants are likely to occur below that depth. To maintain consistency and uniform waypoints across various surveys it may be best to retain the 15 foot sampling depth at this time. Sixteen species were identified in the survey including Whitestem pondweed *Potamogeton praelongus* a state "threatened" species. No voucher specimens were collected. This is well above the average number of 8 species for a set of 21 other northern Indiana lakes compiled by IDNR (Pearson 2004). The highest occurrence was Coontail (47.5 percent) followed by Chara (31.3 percent) and Spiny naiad (31.3 percent). Curlyleaf pondweed occurrence was five percent and Eurasian watermilfoil was 3.8 percent. Overall the Big Turkey Lake plant community appeared to be of well above average diversity in the survey and was dominated by native species. Plant maps for Eurasian watermilfoil, Curlyleaf pondweed, Coontail, and Chara are in figures 6 through 9 below. A summary of plant data collected at Big Turkey is displayed in figure

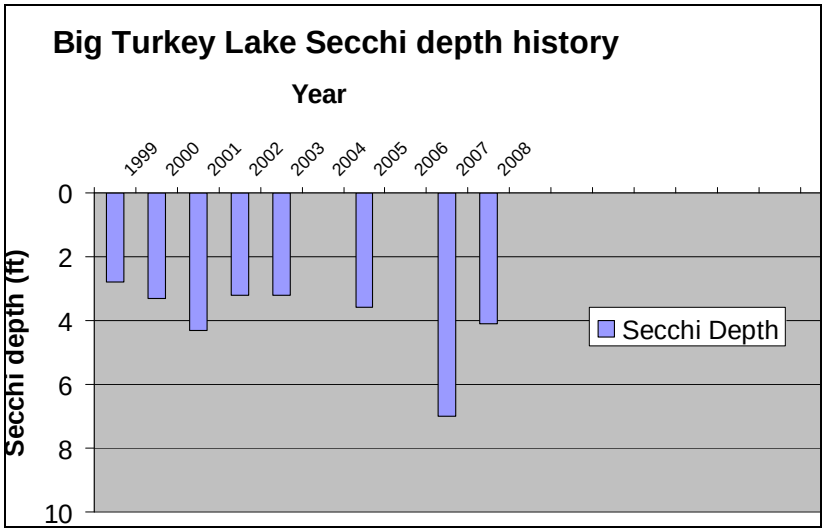

Figure 5 Big Turkey Lake Secchi Data History (volunteer July/August mean and AES August readings)

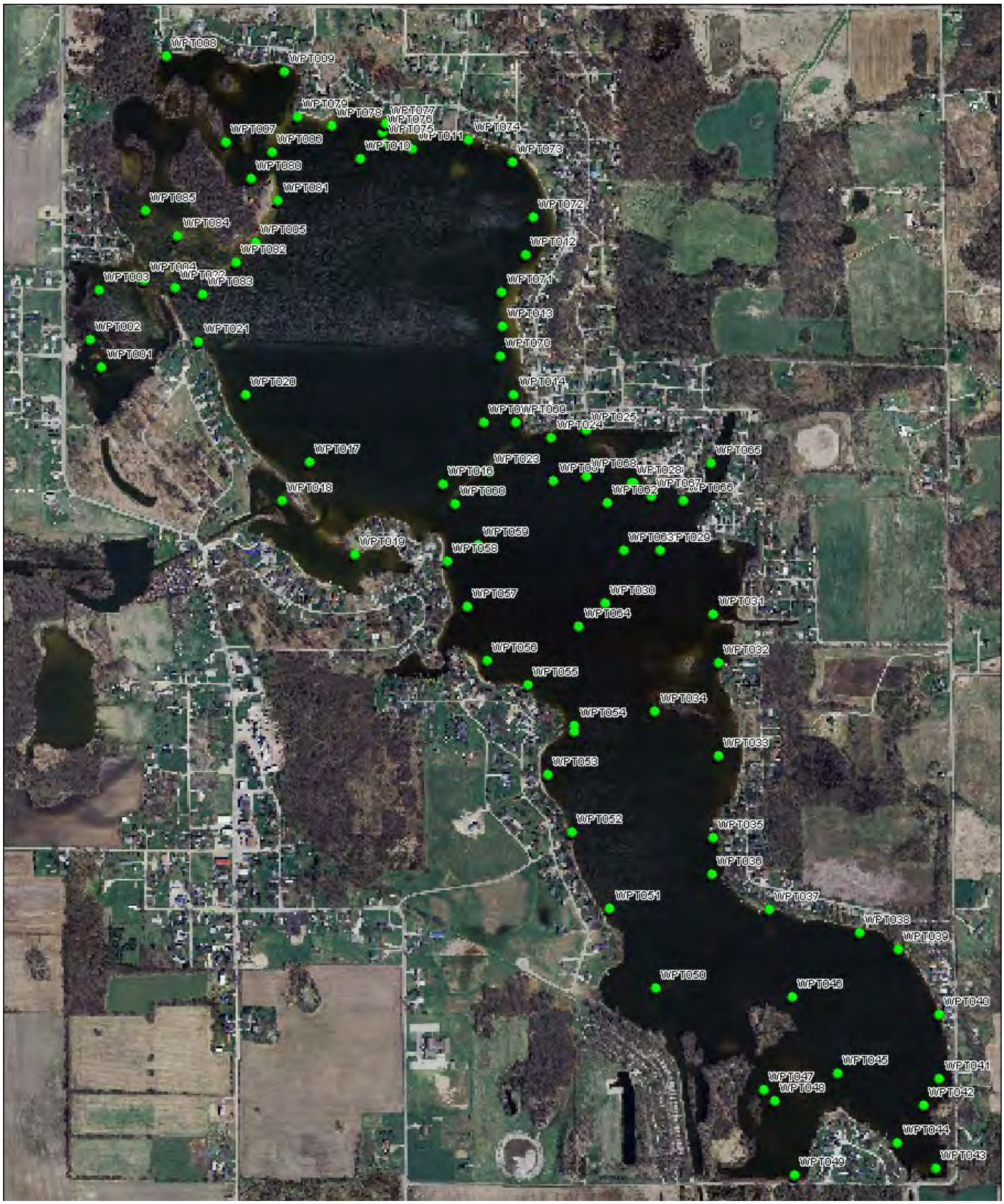

Figure 6 Tier II sampling points for Big Turkey Lake

Big Turkey Lake	AES	IDNR	AES	AES
Date	6/9/07	7/31/03	8/10/07	8/20,27/08
IDNR protocol 1 or 2	2	1	2	2
Depth range (ft)	0-15	0-15	0-15	0-15
Sample sites (n)	80	85	80	80
Secchi (ft)	7.0	n/d	7.0	4.1
Littoral depth (ft)	11.0	14.0	14.5	15.0
Occurence (%)	83.0	87.0	90.0	0.9
Species (N)	12	17	14	16
Native species (N)	10	14	12	14
Species/site (max)	6	6	7	7
Mean species/site	2.01	2.09	2.49	2.19
Mean Native species/site	1.58	1.91	1.86	2.10
Species diversity	0.87	0.86	0.90	0.87
Native diversity	0.83	0.84	0.86	0.86
Species occurrence				
Coontail	36.3	58.5	31.3	47.5
Variable watermilfoil*	31.3	31.7	23.8	27.5
Brittle naiad		20.7		
Chara	21.3	14.6	30.0	31.3
Eurasian watermilfoil	5	12.2	5.0	3.8
Flatstem pondweed	7.5	18.3	8.8	22.5
Sago pondweed	27.5	12.2	25.0	1.3
Small pondweed	17.5	9.8	25.0	16.3
Slender naiad	3.8	7.3	30.0	16.3
Variable pondweed	3.8	4.9	3.8	1.3
Elodea		4.9	2.5	2.5
Curlyleaf pondweed	37.5	4.9	27.5	5.0
Illinois pondweed		3.7	1.3	3.8
Nitella		1.2		
Great bladderwort	3.8	1.2		1.3
Leafy pondweed		1.2		
Richardson's pondweed		1.2	1.3	1.3
Spiny naiad	3.8		30.0	31.3
Whitestem pondweed	1.3			6.3
Water stargrass			3.8	
Algae occurrence (%)	6.3		3.8	7.5
Species dominance				
Coontail	12.8	28.0	18.3	33.5
Variable watermilfoil*	13.8	15.4	10.3	15.5
Brittle naiad		11.2		
Chara	6.8	8.8	15.0	21.3
Eurasian watermilfoil	2	5.1	1.0	0.8
Flatstem pondweed	2.5	5.1	3.8	8.0
Sago pondweed	12	5.1	9.0	0.3
Small pondweed	4.5	4.6	13.5	5.8
Slender naiad	0.8	3.9	15.5	10.8
Variable pondweed	0.8	2.2	0.8	0.3
Elodea		1.7	0.5	1.0
Curlyleaf pondweed	12.5	1.5	8.0	1.0
Illinois pondweed		1.2	0.3	0.8
Nitella		1.0		
Great bladderwort	0.8	0.5		0.3
Leafy pondweed		0.5		
Richardson's pondweed		0.2	0.3	0.3
Spiny naiad	0.8		21.0	15.8
Whitestem pondweed	1.3			3.3
Water stargrass			1.3	
* listed as Northern milfoil on IDNR data				

Table 1 Summary of Big Turkey Lake Tier II data.

6. Description of Beneficial and Problem Plant Areas

Beneficial and problem plant areas were similar to 2007, but additional areas of Eurasian watermilfoil colonization were noted at the south end of Big Turkey Lake (Fig. 3). All areas of dense Eurasian milfoil and Curlyleaf areas depicted in figures one through three above should be considered problem areas. All areas of native plant growth that do not seriously hinder recreational activities should be considered beneficial areas.

7. Aquatic Plant Management Alternatives

For the 2009 season a herbicide change is recommended in response to Eurasian milfoil growth noted in areas treated with 2, 4-D granular (Navigate®) in June of 2008. The treatment was effective eliminating Eurasian watermilfoil in the immediate post treatment period. A portion of the treatment area experienced regrowth. It is not unusual to experience regrowth in treatment areas during the season of application and this is noted on the Navigate® product label. This regrowth may be the result of newly established plant fragments that entered this area for other parts of the lake or it may be plants that emerged after the June treatment and hence were not subjected to the herbicide dosage. It also could be the result of plants that did not die in response to the treatment. Water movement at the south end of the lake or inflowing plant fragments from other parts of the watershed could also play a role. The exact cause of regrowth in the treatment area is not possible to determine with the available data. Because aquatic plants sometimes demonstrate varying levels of resistance to treatment or develop resistance over time in response to treatment alternating herbicide choices can provide advantages. For this reason it is recommended that triclopyr (Renovate OTF®) be used instead of 2, 4-D granular (Navigate®) in 2009. If effectiveness increases substantially in the 2009 season this should be taken into account when adjustments in the treatment regime are planned for 2010. It is recommended that the noted Eurasian milfoil acreage be treated with Renovate OTF® at the rate of 100 pounds per acre in the noted 27 acre area of substantial growth. The manufacturer has indicated this dosage may provide the needed control. It is intended that long term results can be achieved, decreasing the area in need of treatment each year.

Curlyleaf pondweed was not treated in 2008 but recommendations for its treatment remain as in the original plan. Treatment of the 40.5 acres of dense growth should proceed in April using Aquathol K® liquid herbicide at the rate of 1 ppm. This treatment should take place when water temperatures are in the 50-55 degree range to insure the destruction of developing turions. Four to five years of turion reducing early treatments are recommended as they can potentially deplete the turion bank available in Big Turkey Lake's hydrosoil, allowing for a substantial decrease in returning growth.

Limited herbicide treatments are done for native plants on Big Turkey Lake each season. Variable watermilfoil *Myriophyllum heterophyllum* is especially troublesome, completing extensive mat-forming during some seasons can seriously impeding boat traffic. Treatments with 2, 4-D granular (Navigate®) have proven very effective on this plant and typically provide satisfactory seasonal control. The Big Turkey Lake Improvement Association is considering implementing a control program for this plant in some high traffic areas of the lake. Coontail and Chara, while being particularly abundant in the survey data, do not seem to provide a significant hindrance to navigation or other recreational activities in the lake as a whole. Residents with very shallow slow-tapering bottoms in their docking areas do occasionally experience problems with Chara and it provides an annoyance where it occupies the bottom in swimming areas and Coontail growing near the south end of the lake does provide problems in areas where it reaches the surface, especially around shallow docking areas.

As stated in the original plan The Big Turkey Lake Improvement Association has completed a number of steps toward improving their watershed. The Association is advised to continue following up on recommendations from the work completed so far to continue reducing nutrient and sediment loads from the watershed. Recommendations should be reviewed periodically as opportunities for potential projects may arise as landowners and land uses in the watershed change.

Occurrence and abundance of submersed aquatic plants in Big Turkey Lake.					
County:	Steuben	Sites with plants:	70	Mean species/site:	2.19
Date:	8/20,27/08	Sites with native plants:	70	Standard error (ms/s):	0.16
Secchi (ft):	1.1	Number of species:	16	Mean native species/site:	2.10
Maximum depth (ft):	15	Number of native species:	14	Standard error (mns/s):	0.15
Trophic status:	Eutrophic	Maximum species/site:	7	Species diversity:	0.87
Total sites:	50			Native species diversity:	0.86

All depths (0 to 20 ft)	Frenquency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Coontail	47.5	52.5	13.8	7.5	26.3	33.5
Chara	31.3	68.8	12.5	0.0	18.8	21.3
Spiny naiad	31.3	68.8	17.5	3.8	10.0	15.8
Variable pondweed	27.5	72.5	12.5	5.0	10.0	15.5
Flatstem pondweed	22.5	77.5	17.5	1.3	3.8	8.0
Slender naiad	16.3	83.8	5.0	3.8	7.5	10.8
Small pondweed	16.3	83.8	12.5	1.3	2.5	5.8
Whitestem pondweed	6.3	93.8	3.8	0.0	2.5	3.3
Curlyleaf pondweed	5.00	95.0	5.0	0.0	0.0	1.0
Eurasian milfoil	3.80	96.3	3.8	0.0	0.0	0.8
Illinois pondweed	3.80	96.3	3.8	0.0	0.0	0.8
Elodea	2.5	97.5	1.3	0.0	0.0	1.0
Variable pondweed	1.3	98.8	1.3	0.0	0.0	0.3
Richardson's pondweed	1.3	98.8	1.3	0.0	0.0	0.3
Sago pondweed	1.3	98.8	1.3	0.0	0.0	0.3
Great bladderwort	1.3	98.8	1.3	0.0	0.0	0.3
Filamentous Algae	7.5					

All depths (0 to 5 ft)	Frenquency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Chara	42.6	52.4	19.0	0.0	28.6	32.4
Spiny naiad	42.9	57.1	26.2	7.1	9.5	19.0
Coontail	40.5	59.5	7.1	9.5	23.8	31.0
Variable pondweed	31.0	69.0	9.5	7.1	14.3	20.5
Flatstem pondweed	23.8	76.2	21.4	0.0	2.4	6.7
Slender Naiad	11.9	88.1	0.0	2.4	9.5	11.0
Small pondweed	9.5	90.5	7.1	0.0	2.4	3.8
Whitestem pondweed	7.1	92.9	2.4	0.0	4.8	5.2
Elodea	4.8	95.5	2.4	2.4	0.0	1.9
Eurasian milfoil	4.8	95.5	4.8	0.0	0.0	1.0
Curlylead pondweed	4.8	95.5	4.8	0.0	0.0	1.0
Illinois pondweed	4.8	95.5	4.8	0.0	0.0	1.0
Richardson's pondweed	2.4	97.6	2.4	0.0	0.0	0.5
Sago pondweed	2.4	97.6	2.4	0.0	0.0	0.5
Great bladderwort	2.4	97.6	2.4	0.0	0.0	0.5
Non-native 3	0.0	100.0	0.0	0.0	0.0	0.0
Variable pondweed	0.0	100.0	0.0	0.0	0.0	0.0
Filamentous Algae	7.1					

All depths (5-10 ft)	Frenquency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Coontail	67.9	32.1	21.4	7.1	39.3	47.9
Variable milfoil	32.1	67.9	21.4	3.6	7.1	13.6
Small pondweed	32.1	67.9	25.0	3.6	3.6	10.7
Slender naiad	28.6	71.4	14.3	7.1	7.1	14.3
Flatstem pondweed	28.6	71.4	17.9	3.6	7.1	12.9
Spiny naiad	25.0	75.0	10.7	0.0	14.3	16.4
Chara	17.9	82.1	7.1	0.0	10.7	12.1
Curlyleaf	7.1	92.9	7.1	0.0	0.0	1.4
Whitestem pondweed	7.1	92.9	7.1	0.0	0.0	0.7
Eurasian milfoil	3.6	96.4	3.6	0.0	0.0	0.7
Variable milfoil	3.6	96.4	3.6	0.0	0.0	0.7
Illinois pondweed	3.6	96.4	3.6	0.0	0.0	0.7

All depths (10-15 ft)	Frenquency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Coontail	20.0	80.0	20.0	0.0	0.0	4.0

Figure 7 Summary table of Tier II data

Figure 8 Tier II Eurasian milfoil map

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Figure 9 Tier II Curlyleaf map

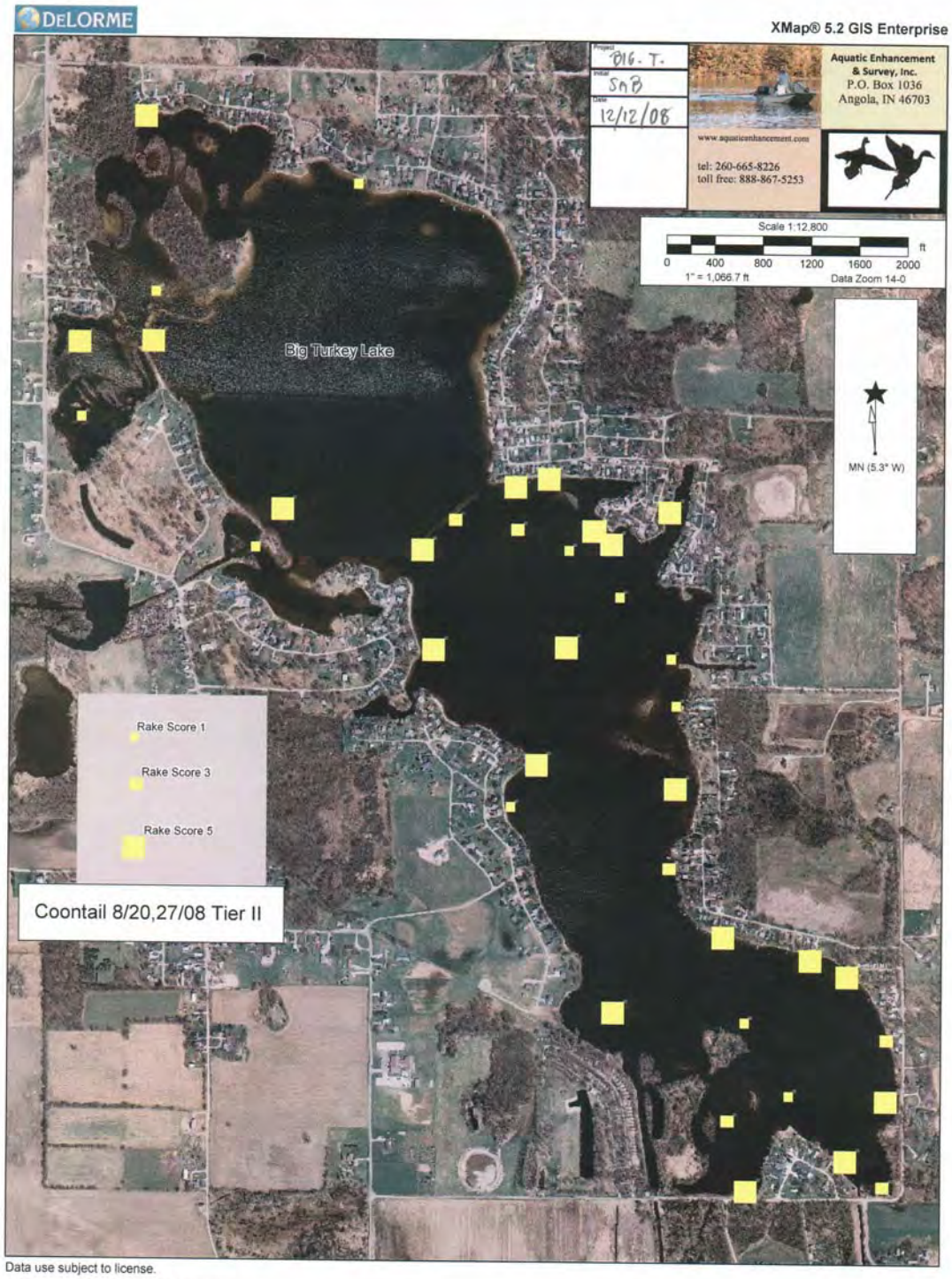

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Figure 10 Tier II Coontail map

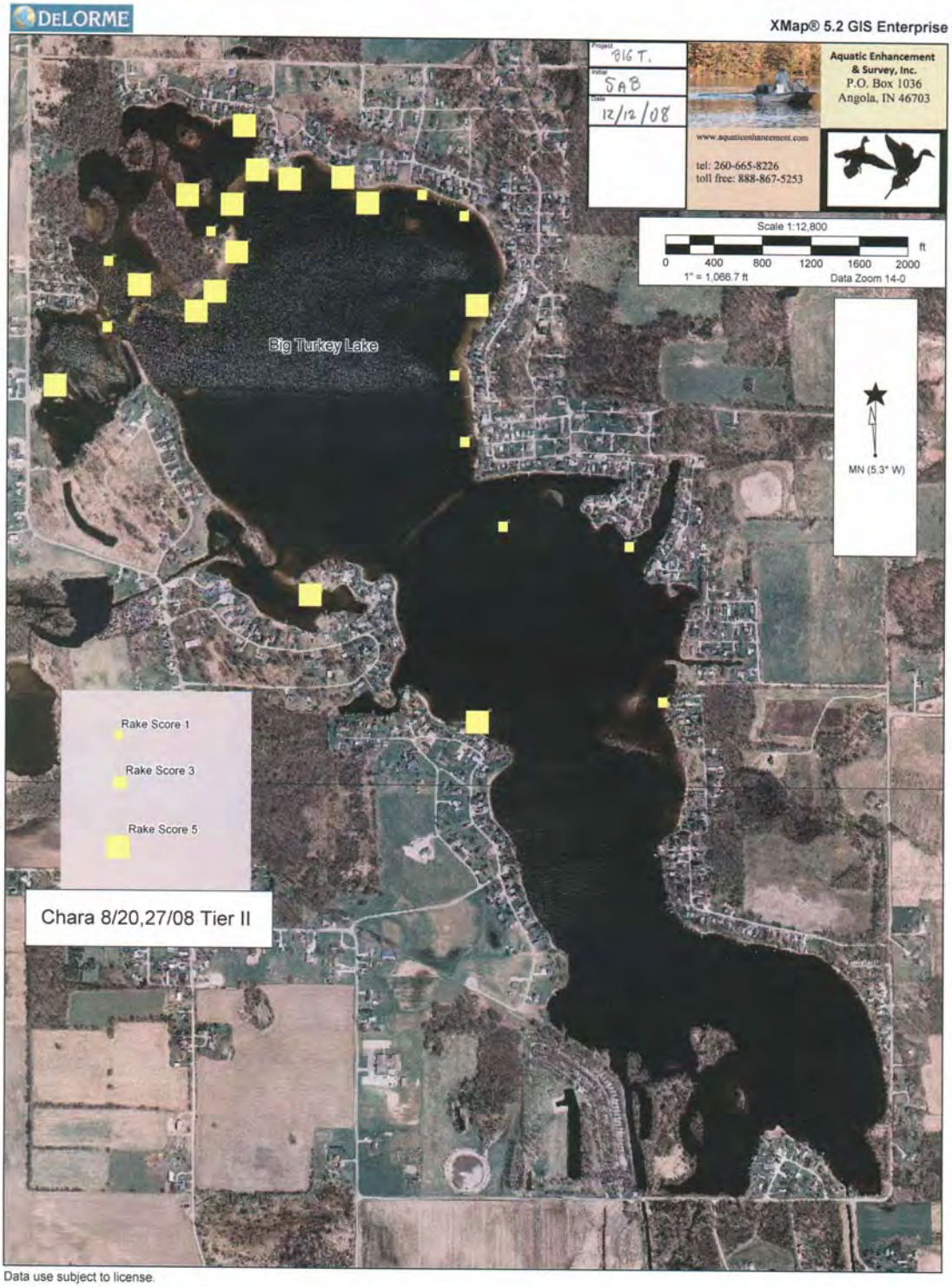


Figure 11 Tier II Chara map

8. Public Involvement

Aquatic Enhancement & Survey, Inc. attended a total of three Big Turkey Lake Improvement Association meetings in 2008. A public meeting was incorporated into a regular association meeting on 9/6/08. Approximately 69 were in attendance nearly all of whom were lake residents. Attendance at Big Turkey Association meetings is occasionally substantially higher. A discussion of the aquatic plant management program in general was held with Aquatic Enhancement & Survey, Inc. and an IDNR fisheries biologist present to answer questions. A short survey was filled out by attendees and collected. Questions and responses are below. Residents generally expressed sentiments toward drastically reducing the amount of aquatic plant growth in the lake. Frustration with the excessive growth of Native milfoil was especially noticeable. Survey results were very close to those collected in 2007 but a slight change occurred in opinions about controlling plants. In 2007 44 of 45 (98%) said aquatic plants had detracted from their enjoyment of the lake at some point. In 2008 this decreased slightly to 37 of 43 (86%). Nevertheless, approval and support for continuing to manage exotic plants on a lake-wide basis overall was strong.

Big Turkey Lake User Survey 9/6/08

1. Are you a Big Turkey Lake property owner? Yes___**42**___ No____**2**___

2. How many years have you been at the lake? (circle one) 0-5 years **6**
6-10 years **9**
11-20 years **10**
More than 20 years **18**

3. Has the growth of aquatic plants on Big Turkey Lake ever negatively affected your enjoyment of the lake? Yes__**37**___ No___**6**____

4. How do you use the lake? (mark all that apply)
_**39** Swimming **10**_Irrigation (including lawn) _**36**__Enjoy View and Atmosphere
_**42**_Boating _**37**__Fishing __**23**___View Wildlife
Other ____Duck hunting_____

5. Do you feel that Big Turkey has Aquatic plants in nuisance quantities at this time (2007)?
Yes _**37**__ No _**4**__

6. Do you feel the level of vegetation in the lake can negatively affect your property value?
Yes _**39**__ No _**7**__

7. Are you in favor of your lake association initiating efforts to control vegetation on the lake?
Yes _**40**__ No _**3**__

8. Are you a member of your lake association? Yes__**43**___ No___**1**___

9. Mark any of these you think are problems on your lake:
_24__ Too much fishing
_24_ Canada Geese
__6_ Excessive boat traffic
_24_ Dredging needed
_32_ Too many aquatic plants
__0_ Not enough aquatic plants
_20_ Poor water clarity
_14_ Additional Speed enforcement needed

9. Implementation of Action Plan

Elements of the Big Turkey Lake action plan remain much the same as in the original Big Turkey Lake Management Plan. Eurasian watermilfoil and Curlyleaf pondweed should be treated on a seek and destroy basis with Curlyleaf treatment taking place early to prevent turion production. However, the original plan designated 2.4-D granular for Eurasian watermilfoil treatment. Because regrowth occurred in some areas it is proposed that triclopyr (Renovate OTF®) be used in 2009 in place of 2, 4-D. This regime is expected to be repeated through 2012. This represents a substantial increase in Eurasian watermilfoil treatment costs due to the use of a more expensive herbicide on a per acre basis, and also increases the amount of treated acreage over 2007. If control/longevity of control is improved, however, the long-term costs associated with controlling this plant is expected to decrease. The Big Turkey Lake Improvement Association is in agreement with this course of action and prepared to provide the associated 10 percent cost-share. Important dates for the Big Turkey Lake Improvement Association are listed in table three.

2009 Season ●**Success Benchmarks:** 5% of littoral area or less in dense exotic plant growth (8 acres post treatment) 5% or less occurrence of Curlyleaf and Eurasian milfoil in July Tier II Survey			
Month	**Activity**	**Acreage**	**Cost Estimate**
April	Map Curlyleaf pondweed And Eurasian watermilfoil growth		1000.00
April/May (H20 Temp. approx. 55 or shortly after emergence)	Treat Curlyleaf pondweed as needed (1-.5 ppm Aquathol K)	40.5	14175.00
May	Eurasian treatment on main lake as needed, 27 ac. (Renovate)	27	17,550.00
July	Tier II Survey		1900.00
As arranged	Public Meeting		350.00
October/November	Permit Meeting		200.00
December	Plan Update Document Due		2000.00
	Total		**$37175.00**

Table 2 2009 season timeline and cost schedule for Big Turkey Lake

Important program dates for the ALA in the 2009 season are below. These dates are based on a timeline needed if the ALA intends to have an early-season Curlyleaf treatment done. There is

considerably more flexibility in timing if only a milfoil treatment is being performed as milfoil treatments generally do not begin until May.

March 1	Send in treatment permit form to IDNR
March 15, 2009	IDNR funding decisions
March 20	Send a request for proposals to planning and application contractors due in one week
March 27	Receive bids from contractors
March 31	Select and notify contractor(s) and call IDNR to have application contractor noted on permit (260-244-6805)
April 10	Obtain signed contract(s)
May 15	Schedule Lake Association Meeting with contractor (s)
November 1	Last day for contractors to provide maps for management plan or plan updates and schedule a meeting with DNR Fisheries and LARE biologists
December 15	First draft of management plan or plan updates due from contractors
January 15	Grant application due for current year funding
March 1	Final copy of revised plan or update due from contractors

Table 3 Important dates in 2009 for the Big Turkey Lake Improvement Association

10. Education

In 2008 plant control was discussed at three Association meetings. Elements of the Big Turkey Lake Plan were discussed and slides were shown to help lake residents identify invasive plant species. In 2008 another species was added to the list of non-native invasive aquatic plants colonizing Indiana's natural lakes. Parrot feather *Myriophyllum aquaticum* was discovered growing in Meserve Lake in Steuben County. These plants are often introduced through the aquarium industry where they are marketed for use in fish tanks and garden ponds. Big Turkey Lake residents and users should be made aware of the extensive ecological damage that can occur if imported plants are discarded in the lake or intentionally transplanted. Raising awareness of this mode of introduction of problem species in the Big Turkey Lake newsletter and at association meetings in coming seasons can help prevent new introductions that can be extremely costly in future years.

11. Monitoring and Evaluation Plan

There are no significant changes for the 2009 season. Monitoring efforts should be continued as planned. For more information see the original Big Turkey Lake Plant Management Plant (Aquatic Enhancement 2007).

12. Literature Cited

Aquatic Enhancement & Survey, Inc. 2007, Aquatic Plant Management Plan 2007-2011. Big Turkey Lake. LaGrange, Steuben County, Indiana. Aquatic Enhancement & Survey, Inc. Angola. Indiana 46703

Appendix A
Application for Aquatic Vegetation Control Permit

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT

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

[ ] Whole Lake [x] Multiple Treatment Areas
Check type of permit

INSTRUCTIONS: Please print or type information

FOR OFFICE USE ONLY
License No.
Date Issued
Lake County

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

FEE: $5.00

Applicant's Name: Big Turkey Lake Association	Lake Assoc. Name: Big Turkey Lake Association	
Rural Route or Street: P.O. Box 186		Phone Number: 260-351-3573
City and State: Stroh, IN		ZIP Code: 46789
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): Big Turkey	Nearest Town: Stroh	County: Lagrange
Does water flow into a water supply		[ ] Yes [x] No

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

Treatment Area # 1	LAT/LONG or UTM's N 41 deg 35.257' W85 deg 11.118'		
Total acres to be controlled: Up to 50	Proposed shoreline treatment length (ft): Up to 16K	Perpendicular distance from shoreline (ft): Varies	
Maximum Depth of Treatment (ft): 7 ft	Expected date(s) of treatment(s): 28-Apr-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. Aquathol K low dose early season Curlyleaf treatment, per LARE Plan

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

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Curlyleaf	x	40
Coontail		20
Variable milfoil		10
Sago pondweed		10
Chara		10
Small pondweed		10

Treatment Area # 2	LAT/LONG or UTM's N 41 deg 35.257' W85 deg 11.118'		
Total acres to be controlled Up to 40	Proposed shoreline treatment length (ft) 12K	Perpendicular distance from shoreline (ft) Varies	
Maximum Depth of Treatment (ft) 7	Expected date(s) of treatment(s) 25-May		

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. Navigate 2,4-D granular or Renovate 3

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

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil	x	40
Coontail		20
Variable milfoil		10
Sago pondweed		10
Chara		10
Small pondweed		10

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

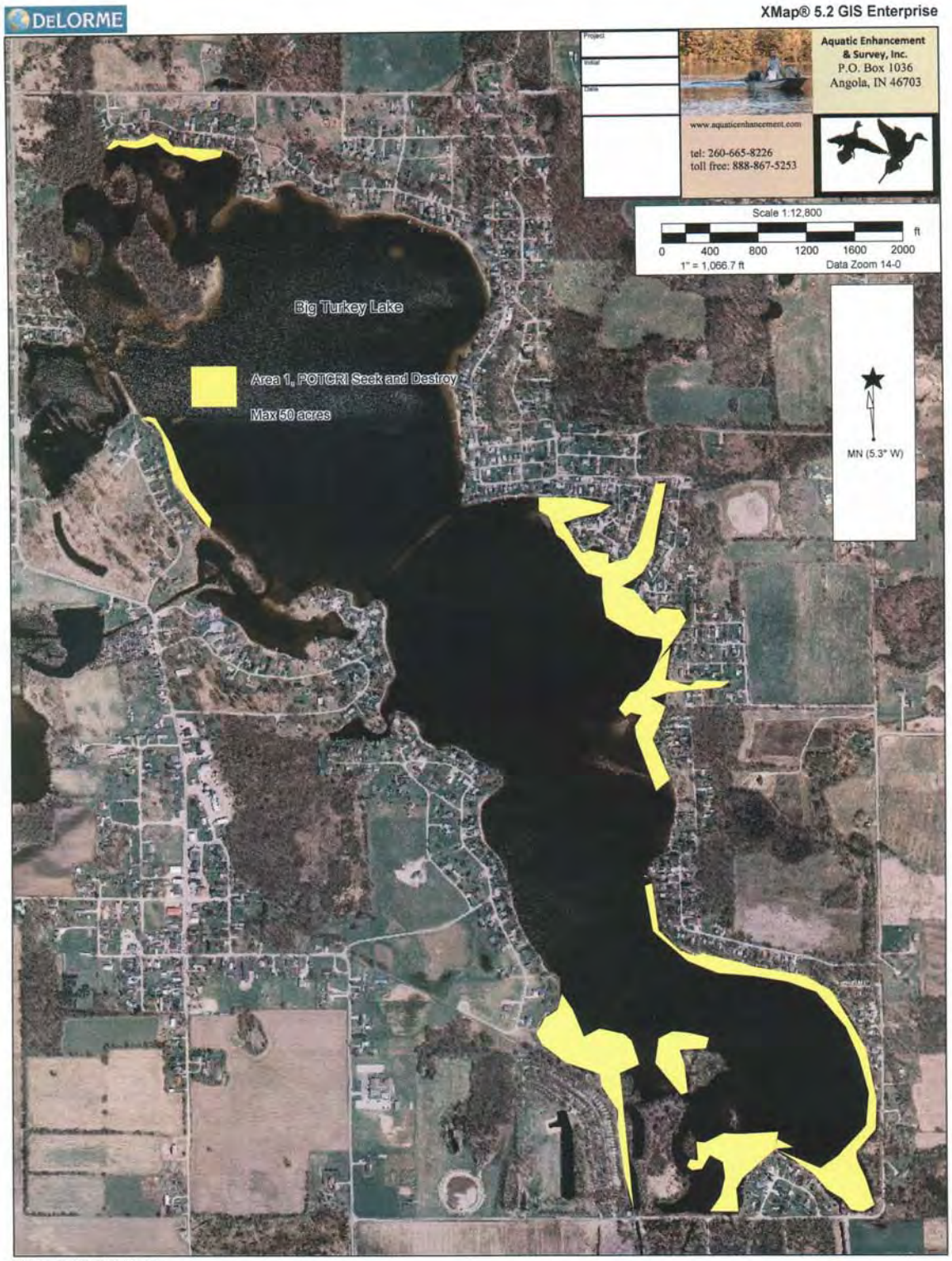
Applicant Signature	Date
Certified Applicant's Signature	Date

FOR OFFICE ONLY

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

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

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



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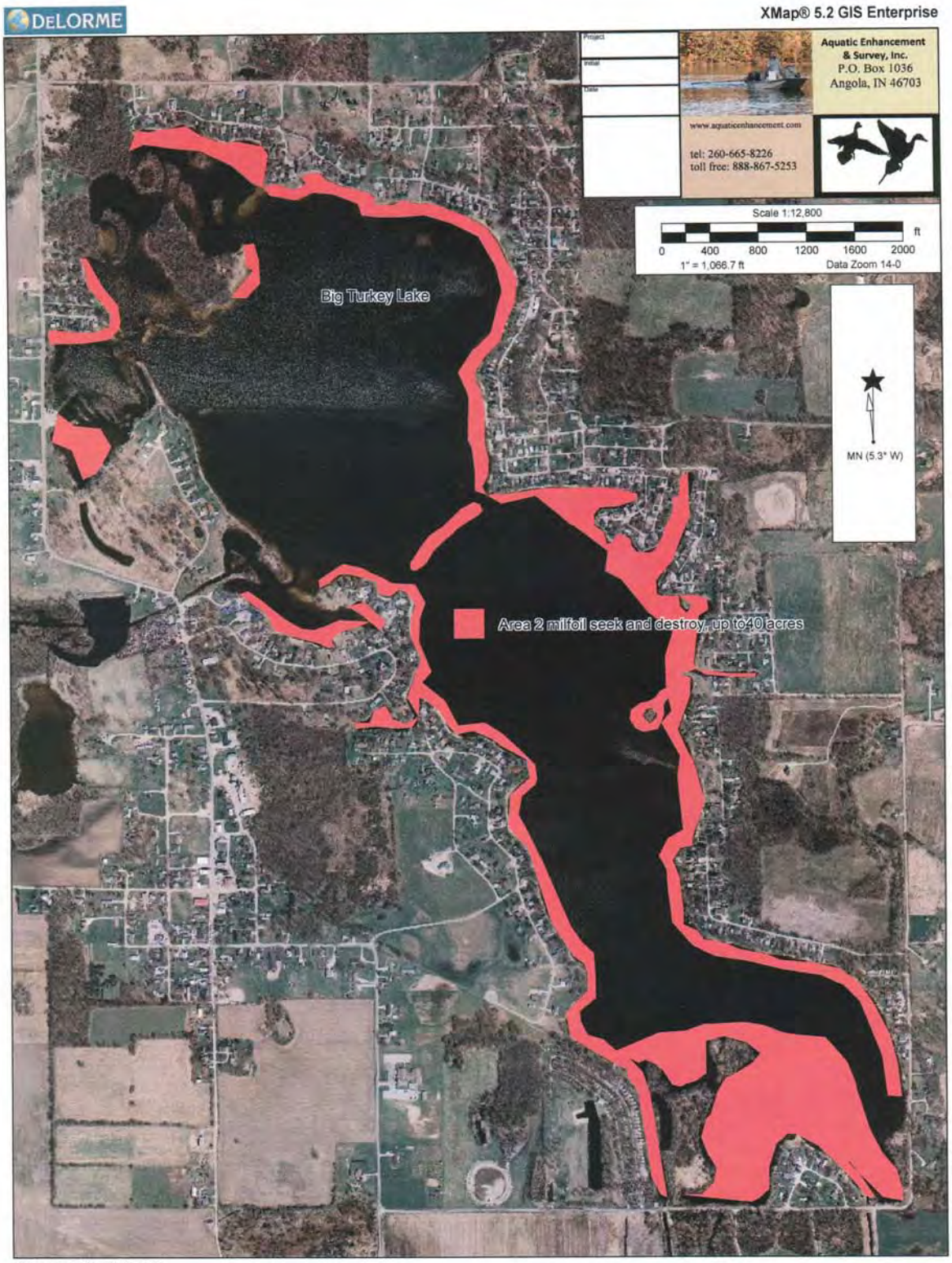
www.delorme.com



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Appendix B
Tier II Survey Data Sheets

Aquatic Vegetation Random Sampling (Tier 2)

Waterbody Cover Sheet

Surveying Organization: Aquatic Enhancement & Survey, Inc.

Contact Information: (260) 665 - 8226

Waterbody Name: Big Turkey Lake

Lake ID:

County(s): La Grange

Date:

Habitat Stratum:

Avg. Lake Depth (ft):

Lake Level:

Crew Leader: Scott Banfield

GPS Metadata

Datum: Zone: Accuracy:

Recorder: Joseph Closson

Method:

Secchi Depth (ft):

Total # of Points Surveyed:

Total # of Species:

Littoral Zone Size (acres):

- ☐ Measured
- ☐ Estimated

Littoral Zone Max. Depth (ft):

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

Notable Conditions:

0-7 43 42
5-10 27 27
10-15 10

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

Page 1 of 3

WATERBODY NAME: Big Turkey lake	DATE: 8-20-08 / 8-27-08
COUNTY: La Grange	SECCHI DEPTH (FT): 4'1" (8-27)
SITE ID:	MAX PLANT DEPTH (FT):
SURVEYING ORGANIZATION: Aquatic Enhancement	WEATHER: Sunny 80° NW Wind 5mph
CREW LEADER: Scott Banfield	COMMENTS (Include voucher codes - V1, V2...):
RECORDER: Joseph Closson / Carey Abrams	
CONTACT INFO: (260) 665-8226	Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.

Species Codes:

Point #	R/T	Latitude	ALGE	~~Longitude~~ MYRHET	Depth	CHARA	NASMAR	CERDEM	UTRMAC	POTPUS	POTILL	ELOCAN	NASFLE	POT205 ~~Notes~~
1					6.5		5	1						
2					5.0	5	5		1					
3					7			5						
4					3	1								
5					2.5	5	1							
6					7.5	5								
7					2	5	5							
8					4.9		1	5				3		
9					5.1	5	5							
11					4	5	1							
12					7.5	5	1			3			5	
13				1	7.5	1				1			1	
14			P		5.1	1							5	
15					14									
16				5	5.1									
17					8.5			5						
18					8.5		1	1						
19					3	5	1							
20					14									
21				1	4.5								5	
22					7		5	5		1				
23				1	6.5			3					1	1
24				1	5.5		1	5					3	
25				1	3.5		1	5						
26	9				4.9			5						1
28					3.5			5						1
29					8.5			1		1				
30				5	9			5						1
31				3	5.5		1	1						
32					3	1		1						
33					4.5			5						1
34				5	3.5									
35				5	2.5			3						1

Other plant species observed at lake: POT ILL

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

WATERBODY NAME:	DATE:
COUNTY:	SECCHI DEPTH (FT):
SITE ID:	MAX PLANT DEPTH (FT):
SURVEYING ORGANIZATION:	WEATHER:
CREW LEADER:	COMMENTS (Include voucher codes - V1, V2...): V2 POTPRA (8-27-08)
RECORDER:	
CONTACT INFO:	Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.

Species Codes:

Point #	POTGRA R/T	~~Latitude~~ LEMIN	STUPEC	POTPRA Longitude (ft)	Depth	CHARA	CERDEM	POTCRI	POTRIC	POTPUS	NAJMAR	MYRHET	NAJPE	~~Notes~~ ELOCAN	POTZOS	MYRSPI
36				13	~~3.5~~											
37				5	4.5	~~2.5~~		5								
38				1	7	~~13~~		5			1			1	1	
39					5.5	~~4.5~~		5	1					1	1	
40			1		2.5	~~7~~		3	START TAIL ROW				3	5		
41	9	[illegible]			8	~~5.5~~		5							1	
42				1	3	~~2.5~~					1	1	5	5	1	1
43	9	1			1.5	~~9~~		3	START						5	
44					5.1	~~3~~		5	1						3	
45					9.8	~~1.5~~		1			1					
46	9				12	~~5.1~~		1								
47						4										
48						9		3								
49	9					4		5							1	
50						4.5		5							5	
51	1					7					1		1	5		
52						4							5			
53						6		1			5			3		
54						5.1		5					1		5	
55				5		2.5	5									
56						4.9			1				3			
57				1		8.5		5			1					
58						4.5							3	5		
59						14										
60						7		5							5	
61						4.9	1	3					5		1	
62						15		1								
63						14.5										
64						14.5										
65						4.5		5							1	
V1 66						3	1			1			1		1	
67						4		5				~~5~~	5		1	
68						4					1	1	1	3		

Other plant species observed at lake:

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

Page 3 of 3

WATERBODY NAME:	DATE:
COUNTY:	SECCHI DEPTH (FT):
SITE ID:	MAX PLANT DEPTH (FT):
SURVEYING ORGANIZATION:	WEATHER:
CREW LEADER:	COMMENTS (Include voucher codes - V1, V2...):
RECORDER:	
CONTACT INFO:	*Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.*

Species Codes:

Point #	R/T	Latitude	~~Longitude~~ POTZOS	Depth	CHARA	NAJMAR	CERDEM	UTRMAC	POTPUS	POTILL	MYRSPI	MYRHET	POTCRI ~~Notes~~
70				14									
71				13									
72				4									
73			1	4.9	1	3			5				1
74				4	1	3			1	1	1		
77				3.5	5	5	1						
78				3	5	1							
79				1.5	5								
80				3.5	1	5							
81				3.5	5					1			
82				3	5	1							
84				1	5	1	1						
85				4	1	3				+			
86				1.5									
				6.5		5				1	1	1	
				8		5				3			
				4									

3076
*
~~075~~
~~010~~
~~065~~

Other plant species observed at lake:

Appendix C
Tier II Survey Waypoint Coordinates

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41.598017,-85.200783,WPT258,GREEN DOT
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41.576100,-85.178383,WPT296,GREEN DOT
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