Aquatic Vegetation Management Plan

For Big and Little Chapman Lakes

Kosciusko County, IN

Update 2012

Prepared by:

ROBIN W. SCRIBAILO
&
MITCHELL S. ALIX

AQUATIC RESTORATION SYSTEMS, LLC

1555 COLEMAN STREET,
PORTER, INDIANA 46304

Biological Sciences
Purdue University North Central
1401 S. U.S. 421
Westville, Indiana 46391

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Prepared for:

Chapman Lakes Conservation Association

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&
Chapman Lakes Conservation Association

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EXECUTIVE SUMMARY

The Chapman Lakes Conservation Association was awarded funding for an Aquatic Vegetation Management Plan (AVMP) Update by the IDNR Lake and River Enhancement Program (LARE) in the spring of 2012. The aquatic plant management plan for Chapman Lakes should meet the following goals as specified by the LARE program: 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 3) provide reasonable public recreational access while minimizing the negative impacts on plant and wildlife resources. In addition to the more general goals above the following two objectives are quantifiable benchmarks that are realistic and attainable for this plan: 1) To reduce the frequency of occurrence at or below 10% for Eurasian water-milfoil in the post-treatment Tier II survey, 2) To increase the frequency of the five most common native submerged aquatic plant species over 20% through the management of Eurasian water-milfoil and curly-leaved pondweed. A mapping of invasive species and a pre-treatment Tier II survey were carried out on May 25th, 2012. Based on pre-treatment mapping 28 acres of EWM was treated with granular 2,4-D on Big Chapman and 17 acres of EWM was treated with liquid 2,4-D. The frequency of occurrence of EWM was 30% on Big Chapman Lake and 55% on Little Chapman Lake. The frequency of occurrence for curly-leaved pondweed was 8.9% on Big Chapman Lake and 10.2% on Little Chapman Lake. Sixteen submerged aquatic plant species (2 non-natives) were found on Big Chapman Lake compared with seven (2 non-natives) on Little Chapman Lake. The most frequent native aquatic plant species found in the pre-treatment Tier II survey was opposite stonewort (*Chara contraria)* on Big Chapman Lake (44.8%) though its frequency was only 18.4% on Little Chapman Lake. The second most frequent species on Big Chapman was coontail (33.3%) which was actually the dominant species on Little Chapman Lake (75.5%). Flexible stonewort (*Nitella flexilis*) had over a 32% frequency in Big Chapman Lake blanketing the bottom with dense mats but was not present in Little Chapman Lake. A post-season Tier II survey was done on July 30th, 2012. The frequency of EWM dropped from the pre-treatment levels of 30% and 55% for Big and Little Chapman Lakes respectively, to 13.3% and absent in the second survey. Curly-leaved pondweed had a frequency of 3.4% on Big Chapman and was absent from Little Chapman in the second Tier II survey which is expected since it is an early season species that often dies back by July. Native submerged aquatic plant diversity was the same in July as in May on Big Chapman Lake and was slightly higher on Little Chapman Lake (8 species). Two noticeable additions to this flora at the end of July were spiny naiad (*Najas marina*) which had a frequency of 13.3% on Big Chapman Lake and a frequency of 2.0% on Little Chapman Lake and brittle naiad (*Najas minor*) with a frequency of 8.2% at Little Chapman Lake. Fries pondweed (*Potamogeton friesii*) was found in both Big Chapman and Little Chapman Lakes. It was one of the most common species in little Chapman Lake in the early season survey with a frequency of 35%. This species is state threatened in Indiana though it is likely more common in the state than currently thought. A strategy for control of EWM was discussed at the IDNR permit meeting held on November 7th, 2012 at the IDNR offices in Columbia City. In attendance were Robin Scribailo (AQRS), Rod Edgell, Neil Ledet, and Jed Pearson (IDNR), and Bill Magurany (Chapman Lakes Conservation Association). Based on discussions it was decided that the current control strategies are working and that the same treatment strategy and acreage, with the addition of 20 acres of channels, should be used for the 2013 permit.

ACKNOWLEDGEMENTS

Funding for this project has been provided by a grant obtained from the Indiana Department of Natural Resources, Lake and River Enhancement (LARE) Program and cost-share assistance from the Chapman Lakes Conservation Association. We acknowledge Rod Edgell, Jed Pearson, and Greg Biberdorf of the Indiana Department of Natural Resources, Division of Fish and Wildlife, for their assistance during the course of this project. Special thanks are also given to Heath Davis, and Charlie Hawkins of All Things Water (Elkhart, IN) for their insight on herbicide options and assistance with permit applications. We also thank Bill Magurany of the Chapman Lakes Conservation Association for his support on this project. We thank Teresa Clark (Purdue University North Central) for assistance with data entry and management and Ryan Scribailo for assistance with field work.

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1.0. INTRODUCTION

The Chapman Lakes Conservation Association received a grant in April, 2012 from the Indiana Department of Natural Resources (IDNR) Lake and River Enhancement Program (LARE) to prepare an aquatic vegetation management plan (AVMP) update for 2012. Aquatic Restoration Systems, LLC was awarded the contract to prepare the AVMP update with a 20% match from the Chapman Lakes Conservation Association. Funding for herbicide application was awarded to All Things Water (Elkhart, Indiana). This AVMP update for Chapman Lakes summarizes data collected in 2012 and represents a continuation of LARE funding (with a six year hiatus) following an initial AVMP (Aquatic Weed Patrol (2004) and an update for 2005 and 2006 (JFNew 2007) .

The overall purpose of the LARE program as stated in the LARE brochure (INDR 2005):

> "… is to ensure the continued viability of Indiana's publicly accessible lakes, streams, and reservoirs. Program goals include (a) controlling inflows of eroded soil and associated nutrients to lakes, streams, and reservoirs and (b) where appropriate, forestalling or reversing degradation from these inflows through remedial actions. To accomplish these goals, the LARE Section of the IDNR Division of Fish and Wildlife provides technical and financial assistance to qualified projects. These include: (a) studies, management plans, sediment removal and design and construction activities involving specific lakes or 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."

1.1. Problem Statement

Big Chapman and Little Chapman Lakes, which are considered to be mesotrophic and eutrophic, respectively, have had management issues in the recent past with Eurasian water-milfoil (EWM) and to a lesser extent with curly-leaved pondweed. Although difficult to document, heavy growths of EWM are well known to frustrate the ability of anglers to fish without incessant line-snagging and reductions in the quality and size of fish catches, and snarl boat propellers reducing boat-related activities, such as water skiing. Reductions in the extent of EWM are correlated with overall increases in aquatic plant diversity (Carpenter 1980; Nichols and Lathrop 1994) as well as the diversity, abundance, and size of certain cohorts of game fish (e.g., Unmuth et al. 1999).

The aquatic plant management plan for Chapman Lake should meet the following goals as specified by the LARE program:

1. to 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. to direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species;

3. to provide reasonable public recreational access while minimizing the negative impacts on plant and wildlife resources.

1.2. Specific Objectives

No specific quantifiable objectives were articulated in the initial AVMP from (Aquatic Weed Patrol 2004). In addition to the more general LARE goals previously discussed, the following four objectives are quantifiable benchmarks that are realistic and attainable for this plan:

1. To reduce the frequency of occurrence at or below 20% for Eurasian water-milfoil in the post-treatment Tier II survey;

2. To increase the frequency of the five most common native submerged aquatic plant species over 20% through the management of Eurasian water-milfoil and curly-leaved pondweed;

3. To maintain at least a minimum of 11 native submerged species and at least a minimum native species diversity index of 0.82 for Big Chapman Lake in a post-treatment tier II survey;

4. To maintain at least a minimum of 8 native submerged species and at least a minimum native species diversity index of 0.78 for Little Chapman Lake in a post-treatment tier II survey.

1.3. Management History

Chapman Lakes have a long history of LARE funding for lake management issues. The herbicide application history of these lakes has been summarized in Tables 1.0 and 2.0, which includes information from the initial AVMP from 2004 (Aquatic Weed Patrol 2005) as well as information from updates for 2005 and 2006 (JFNew 2007). In the absence of LARE funding from 2007-2011, lake association funds were used to treat about 10 acres on the east shoreline of Big Chapman Lake and 10 acres at the northeast end of Little Chapman Lake for EWM each year (Bill Magurany, pers. comm.).

1.4. Watershed and Water Body Characteristics

Excellent detailed information on this subject is available from the Lake Diagnostic Study carried out by JFNew and the School of Public and Environmental Affairs of Indiana University (SPEA) in 2001 as well as the more recent Chapman Lakes Strategic Lakes Management Plan (JFNew & DJ Case 2007). The most recent report available summarizes efforts to remove sediment from various inflow sites on Big Chapman Lake (JFNew 2009). All of these reports are available online at the Lake and River Enhancement website of IDNR.

1.5. Current Water Body Uses

The lakes are used heavily for boating, water skiing (particularly on Big Chapman Lake), and sport fishing in the summer and winter. For additional details on this subject, refer to JFNew & SPEA (2001).

2.0. METHODS

To ensure some consistency among the surveys of the aquatic plant community in the Chapman Lakes, the coordinates from the August Tier II survey performed by JFNew (2006) were used as sampling points in 2012 (Figure 3.0). Aquatic plant sampling methods used in this survey are outlined in the Tier II Aquatic Vegetation

Survey Protocol (IDNR 2010a). The number of random sample points required for the various community metrics is based on lake surface area and the trophic state of the lake (Table 3.0). The sampling site locations for non-native species were mapped with a Trimble GeoXT™ global positioning system (GPS) real-time differential corrected receiver to determine the extent of their coverage and to locate beds for herbicide application.

Taxonomy and nomenclature of vascular aquatic macrophytes follows the familial treatments of the Flora of North America Editorial Committee (1997, 2000, 2002a, 2002b, 2002c) with the following exceptions: Haloragaceae (Scribailo and Alix, unpubl. data), and Lentibulariaceae (Taylor 1989). Taxonomic treatment of the Characeae follows Daily (1953) and Wood (1965), with nomenclatural revisions where necessary (e.g., see Scribailo and Alix 2010).

3.0. RESULTS

3.1. Mapping Non-native Species and Tier II Pre-treatment Survey

A mapping of invasive species and a pre-treatment Tier II survey were carried out on May 25th, 2012. Twenty-two beds of Eurasian water-milfoil were mapped in the two lakes, totaling 41 acres (Figure 1.0). Based on EWM mapping performed by All Things Water just prior to herbicide application in mid-June, four additional acres of EWM were identified bringing the total acreage to 45. The additional patches of EWM were located between beds 7 and 8, 8 and 10, and north of bed 5 on Big Chapman Lake (Figure 1.0).

Six native submerged aquatic plant species were found on Little Chapman Lake (Table 5.0) and 14 native submerged aquatic plant species were found on Big Chapman Lake (Table 6.0). Approximately 90% of the littoral zone of both lakes was vegetated. Although this percentage represented a substantial increase for Little Chapman Lake since 2005, Big Chapman Lake has shown a slight decline in littoral zone coverage. In addition, mean native species richness per site has increased historically during the spring surveys in Little Chapman Lake; however, this parameter has decreased for Big Chapman Lake since 2006. Several submerged species that have previously been recorded from the Chapman Lakes were not observed in our spring survey (Table 7.0). These include long-leaved pondweed (*Potamogeton nodosus*), leafy pondweed (*Potamogeton foliosus*), white-stemmed pondweed (*Potamogeton praelongus*), thread-like Naiad (*Najas gracillima*), slender water-weed (*Elodea nutallii*), and variable-leaved water-milfoil (*Myriophyllum heterophyllum*).

Results of the spring and summer Tier II surveys can be found in Tables 8.0 and 9.0. The most frequent native aquatic plant species found in Big Chapman Lake during the 2012 pre-treatment Tier II survey was opposite stonewort (*Chara contraria)* at 44.8%. Its frequency in Little Chapman Lake was only 18.4%. The second most frequent species on Big Chapman was coontail (33.3%), which was actually the dominant species in Little Chapman Lake (75.5%). Flexible stonewort (*Nitella flexilis*) had a frequency of over 32% in Big Chapman Lake, blanketing the bottom with dense mats, but was not present in Little Chapman Lake. This species is a desirable component of the aquatic flora because its dense growth habit precludes the growth of EWM and stabilizes sediments.

The maximum depth of aquatic plants in Big Chapman Lake was 20 ft. and 15 ft. in Little Chapman Lake (Tables 8.0 and 9.0). Secchi depth was 11.5 ft. on Big Chapman Lake and 9.0 ft. on Little Chapman Lake, which indicates average clarity for Indiana lakes. Historically, Secchi depths have ranged from 2.3 to 12.0 ft. (JF New & SPEA 2001). Unfortunately, two Secchi disk readings per season tell you very little about long-term trends in lake quality. These readings are more indicative of stochastic events, such as plankton blooms or wave action induced turbidity, occurring just prior to Secchi disk measurement.

Results of the 2012 pre-treatment Tier II survey (Figure 2.0) indicate problem beds of EWM throughout both lakes, though density of plants in these beds varied widely. The frequency of occurrence of this species was 31% on Big Chapman Lake (Table 8.0) and 55% on Little Chapman Lake (Table 9.0). Curly-leaved pondweed was also recorded during this survey, but it was found in such small quantities and so sporadically, particularly in Little Chapman Lake, that it was not mapped. The small quantities and sporadic distribution of this species might be due

to herbicide treatment that was conducted prior to our mapping. The frequency of occurrence for this species from the Tier II survey was 8.9% on Big Chapman Lake (Table 8.0) and 10.2% on Little Chapman Lake (Table 9.0).

3.2. Non-native Species Treatment

On June 11 and 12, 2012, 45 acres of EWM were treated in Big Chapman and in Little Chapman, using Navigate® and DMA® 4, respectively (Table 4.0). An additional 20.5 acres of EWM in channels and one acre of mixed aquatic plant beds were treated in the channel on the northwest side of Big Chapman on May 29, 2012 (non-LARE). On September 17, 2012, 12 acres of previously treated beds in the two lakes were treated with Navigate® (Table 4.0).

3.3. Tier II Post-treatment Survey

A post-treatment Tier II survey was done on July 30th, 2012. Eight native submerged aquatic plant species were found in Little Chapman Lake (Table 5.0) and 11 native submerged aquatic plant species were found in Big Chapman Lake (Table 6.0). Eighty percent of the littoral zone was vegetated for Little Chapman Lake and 84% was vegetated for Big Chapman Lake. This represents a slight decrease from the Spring Tier IIs survey and may be indicative of a decreased coverage of EWM and curly-leaved pondweed due to treatment. This is also suggested by the fact that the data shows a reduction in mean species richness per site between the two surveys.

The frequency of EWM dropped from the pre-treatment levels of 31% and 55% for Big and Little Chapman Lakes respectively, to 6.9% and 0.0%, respectively, in the second survey (Tables 7.0-10.0). The effectiveness of the herbicide treatment is an excellent example of the type of control that can be obtained with the proper application. Nevertheless, the re-growth by September from some of the original treated beds warranted a second application as noted previously. Curly-leaved pondweed had a frequency of 3.4% on Big Chapman and was absent from Little Chapman in the second Tier II survey, which is expected since it is an early season species that often dies back by July. Secchi disc transparency was 12.8 ft. in Big Chapman Lake and 7.5 ft. in Little Chapman Lake.

Native submerged aquatic plant diversity was the same in July as in May on Big Chapman Lake and was slightly higher on Little Chapman Lake (8 species). Two noticeable additions to this flora at the end of July were spiny naiad (*Najas marina*) which had a frequency of 13.3% on Big Chapman Lake and a frequency of 2.0% on Little Chapman Lake and brittle naiad (*Najas minor*) with a frequency of 8.2% at Little Chapman Lake. Both are considered non-native by the IDNR Nature Preserves but are not expected to interfere with recreational activity on the lake.

3.4. Threatened and Endangered Species

Fries' pondweed (*Potamogeton friesii*) was found in both Big Chapman and Little Chapman Lakes. It was one of the most common species in little Chapman Lake in the early season survey with a frequency of 35%. Fries' pondweed is an early summer species and dies back to turions by July, much like curly-leaved pondweed, and was thus absent from the post-treatment Tier II survey. The former species is state threatened in Indiana (IDNR 2010b), though it is likely more common in the state than currently documented. It has been noted in the lake since the initial AVMP by Aquatic Weed Patrol (2004).

3.5. Discussion

Sixteen submerged aquatic plant species (three non-natives) were found in Big Chapman Lake compared to seven (three non-natives) in Little Chapman Lake. IDNR Division of Nature Preserves considers spiny naiad (*Najas marina*) to be a non-native species in Indiana and it is listed in this report as such. AQRS has conceded this for consistency regarding LARE funded reports, however this species is widely considered to be native throughout North America (Stuckey 1985, Flora of North America Editorial Committee 2000). The average number of species for Big Chapman Lake in particular, is well above the average number of eight submerged aquatic plant species

found for a set of 21 northern Indiana lakes (Pearson 2004). JFNew(2007) noted very similar trends in biodiversity based on Tier II sampling. From our experience, surveying well over 100 lakes in the state for aquatic plant biodiversity, this value is a very low estimate for Indiana lakes. The number for the Chapman Lakes is far less than the 28 submerged species recorded by JFNew (2007) when pooling the data from both Chapman Lakes, but including Tier I data (Table 7.0). The decision by LARE to move towards only doing one or two Tier II surveys in a season, as opposed to a Tier I survey followed by a post-treatment Tier II survey, represents a tremendous loss of biodiversity information since sampling only at random points can greatly underestimate species richness. With reference to the pooled data set mentioned above (Table 7.0), it should be noted that a great deal of the emergent aquatic plant biodiversity at the Chapman Lakes comes from the nature preserve on the west side of Little Chapman Lake. Although we were not surveying emergent habitat, we did note emergent species whenever they were observed even if not present at the sample points.

JFNew (2007) recorded lower Secchi disk transparencies for Little Chapman Lake during their pre- (3.3 ft.) and post-treatment (2.2 ft.) surveys compared to our values of 9.0 and 7.5 ft., respectfully. Historically, Secchi disk transparencies have ranged from 3.6 to 7.0 with (JFNew & SPEA. 2001), as such water clarity in our study was particularly good. Comparing the JFNew (2007) Tier II data to our data for 2012 indicates similar trends, with coontail having the highest frequency of any species on Little Chapman Lake both in pre- (36%) and post-treatment (42%) surveys compared with our values of 75% and 57% for the same surveys. Northern water-milfoil was present at a frequency of 26% pre-treatment, but was absent from our surveys of the lake. The increase in Eurasian water-milfoil and the loss of northern water-milfoil in Little Chapman Lake is cause for concern and raises questions about possible collateral damage from herbicide application. The other common species from the pre-treatment Tier II survey of JFNew (2007) on Little Chapman Lake were EWM (24%) and curly-leaved pondweed (16%). The post-treatment results were very similar. *Chara* was the fourth most abundant species in the 0-5 contour in both surveys. In our Tier II surveys, the frequency of *Chara* was relatively similar (18.4/22.4%). The frequency of EWM was much higher in our pre-treatment survey (55.1%), which is likely a reflection of an increase in abundance due to the limited herbicide treatment done on the lake from 2007-2011.

Big Chapman Lake had similar Secchi disk transparencies to those recorded here with a value of 13.5 ft in the first survey and 7.0 ft in the second compared to our values of 11.5 and 9.0 respectively. During the JFNew pre-treatment survey of Big Chapman Lake, *Chara*, EWM, coontail, and curly-leaved pondweed were the most prevalent species. *Chara* had the greatest site frequency (50%) across all contours. This value is very similar to the value (43.3%) we obtained in 2012. Eurasian water-milfoil was most dominant in the 5-10 ft. contour, whereas *Chara* was dominant throughout this zone in our study and EWM was second most dominant. Coontail dominated the 10-15 ft. contour as it did in our study. *Nitella* was present at depths ≥10 ft. and dominated the 15-20 ft. contour; however, it had a frequency of 10-15% across all depth zones in 2012. Curly-leaved pondweed was moderately abundant in the 5-10 and 15-20 ft. contour in both pre-treatment surveys.

Following treatment, *Chara* was still the most abundant species in Big Chapman Lake and was present at 46% of the sites in the JFNew study compared with a value of 44.8% in this study. *Chara* had the greatest relative and mean densities on average for all strata throughout the water column for both studies. Coontail also remained abundant and was present at 40% of the sample sites (44.8% in this study). Eurasian water-milfoil was found at 19% of the sites during the pre-treatment survey and at only 11% of sites post-treatment. This compares with close to 30% in both of our Tier II studies. Curly-leaved pondweed was identified at only 4% of sites during the post-treatment compared to 26% of sites during the pre-treatment survey. Our values were 20.7% versus 8.9% for these surveys, respectively.

Four specific quantifiable objectives for the Chapman Lakes were to 1) reduce the frequency of occurrence at or below 10% for Eurasian water-milfoil in the post-treatment Tier II survey, and 2) To increase the frequency of the five most common native submerged aquatic plant species to at least 20% through the management of Eurasian water-milfoil and curly-leaved pondweed, and 3) To maintain a minimum of 11 native submerged species and a minimum native species diversity index of 0.82 or greater for Big Chapman Lake, and 4) To maintain a minimum of 8 native submerged species and a minimum native species diversity index of 0.78 for Little Chapman Lake.

Post-treatment Tier II survey results for Big Chapman Lake indicate a frequency of 30.0% for EWM which is still higher than the desired value stated in objective one. Only three of the five most common native species had a frequency >20% which does not meet our second objective. Post-treatment Tier II survey results for Little Chapman Lake indicate no EWM from any of the sample points, which certainly meets the first objective. Only three of the most common native submerged aquatic species had a frequency ≥20%. Continued herbicide treatment should contribute to an increase in native species over the next few years and allow attainment of objective two. Objectives three and four will provide benchmarks for an assessment of the health of the submerged aquatic plant community over time as the lake is monitored in subsequent years. If the number of native submerged aquatic plant species and native species diversity index substantially declines, strategies for managing non-native species may have to be reassessed. A comparison of the aquatic plant species data for the Chapman Lakes indicates that little has changed over the last decade. Most of the species present have maintained similar frequencies and dominance. Eurasian water-milfoil continues to be the main problem invasive species on the lake and appeared to increase in frequency (2007-2011) without an aggressive control program. Curly-leaved pondweed is only a minor problem and the low nutrient status of Big Chapman Lake in particular tends to keep it as an infrequent species. Current dredging and construction projects to limit or remove nutrient inputs into the lakes, and a continued invasive aquatic plant management effort, should reduce the problem with EWM over the long-term and increase the frequency of native aquatic plant species. These efforts should bring about a continued improvement in lake quality and make attainment of the specific objectives possible in the coming years.

4.0. ACTION PLAN and BUDGET

A strategy for control of EWM was discussed at the IDNR permit meeting held on November 7th, 2012 at the IDNR offices in Columbia City. In attendance were Robin Scribailo (AQRS), Rod Edgell, Neil Ledet, and Jed Pearson (IDNR), and Bill Magurany and Derek Finch (Chapman Lakes Conservation Association). It was felt that the best strategy for 2013 was to continue with the same herbicide strategy and acreage as was used in 2012. EWM will be initially treated in early June with a second application in September depending upon the effectiveness of the first application.

4.1. Budget (all treatments are for EWM)

28 acres Big Chapman with Navigate® @ $395.00/acre (8.2 ft)	$11,060
17 acres Little Chapman with DMA® 4 (4 gallons per acre) @ $295.00/acre (7.43)	$5,015
20 acres in Channels with DMA® 4 (4 gallons per acre) @ $295.00/acre (4.0 ft)	$5,900
Aquatic vegetation management plan update (year 5) with two Tier II surveys	$7,800
TOTAL	**$29,775**

5.0. PUBLIC INVOLVEMENT

Robin Scribailo presented results from the AVMP to about 20 lake residents on February16th, 2013 at the Chapman Lakes clubhouse in Warsaw. The presentation gave a brief background on lake ecology, summarized the requirements of an aquatic plant management plant, discussed results of the surveys of the lakes, and presented management strategies for 2013. There were many excellent questions regarding the relative merits of whole lake herbicide and discussions concerning this topic from the lake meeting held with IDNR LARE staff in November were relayed to residents. The benefits of triploid grass carp and the possible use of water-milfoil weevils were also discussed. Questions about the lake quality of the Chapman Lakes compared to other Indiana lakes were mentioned in the context of future strategies for lake management.

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Figure 1.0. Coverage of *Myriophyllum spicatum* (Eurasian water-milfoil) on May 25, 2012. (Orthophotograph courtesy of the United States Geological Survey)

Figure 2.0. Distribution of sample locations. (Orthophotograph courtesy of the United States Geological Survey)

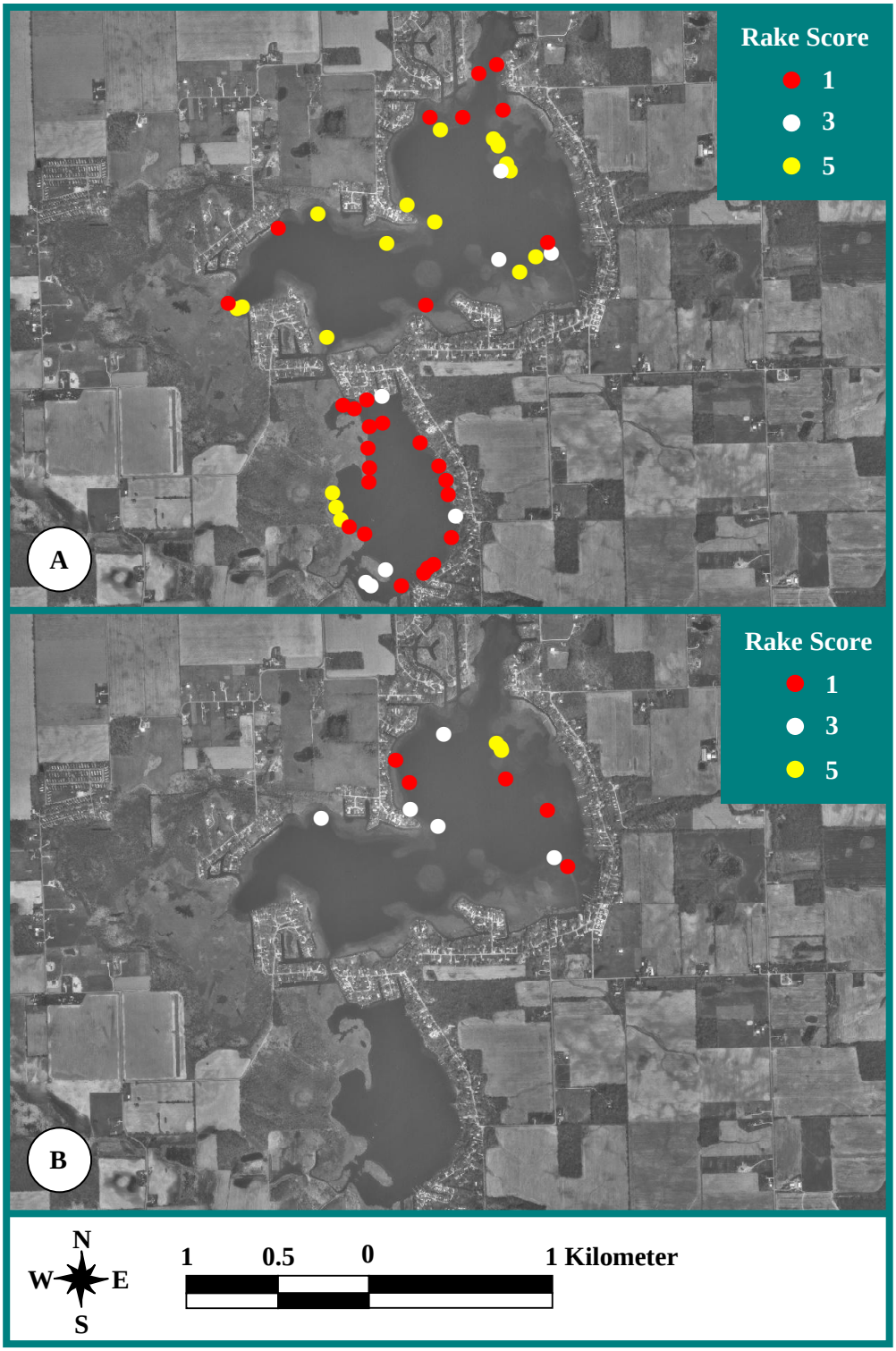

Figure 3.0. Distribution and abundance of *Myriophyllum spicatum* (Eurasian water-milfoil). A. Pre-treatment survey (05/24/2012). B. Post-treatment survey (07/30/2012). (Orthophotographs courtesy of the United States Geological Survey)

Figure 4.0. Distribution and abundance of *Potamogeton crispus* (curly-leaved pondweed). A. Pre-treatment survey (05/24/2012). B. Post-treatment survey (07/30/2012). (Orthophotographs courtesy of the United States Geological Survey)

Table 1.0. Treatment History of Eurasian water-milfoil, curly-leaved pondweed, sago pondweed, and other aquatic plants at Little Chapman Lake.

		Acres Treated			
Year	Company	Eurasian water-milfoil	Curly-leaved pondweed	Sago pondweed	Other
2005	Aquatic Control	13	—	—	—
2006	Aquatic Control	2	10	—	—
2007	Chapman Lake Assoc.	~10	—	—	—
2007	Weed Patrol	7	—	—	—
2008	Chapman Lake Assoc.	~10	—	—	—
2009	Chapman Lake Assoc.	~10	—	—	—
2010	Chapman Lake Assoc	~10	—	—	—
2010	Aquatic Weed Control	1.03	—	—	—
2011	Chapman Lake Assoc.	~10	—	—	—
2011	Aquatic Weed Control	1.58	—	—	—
2011	Clarke Aquatic Services	1.70	—	—	—
2012	Aquatic Weed Control	1.58	—	—	—
2012	All Things Water	19	—	—	—

Table 2.0. Treatment History of Eurasian water-milfoil, curly-leaved pondweed, sago pondweed, and other aquatic plants at Big Chapman Lake.

		Acres Treated			
Year	Company	Eurasian water-milfoil	Curly-leaved pondweed	Sago pondweed	Other
2005	Aquatic Control	7.5	—	—	—
2006	Aquatic Control	12	10	—	—
2006	Weed Patrol	7	—	—	—
2007	Chapman Lake Assoc.	~10	—	—	—
2007	Weed Patrol	11.5	—	—	—
2008	Chapman Lake Assoc.	~10	—	—	—
2009	Chapman Lake Assoc.	~10	—	—	—
2010	Chapman Lake Assoc	~10	—	—	—
2010	Aquatic Weed Control	4.53	—	—	—
2010	Clarke Aquatic Services	0.5	—	4	—
2011	Chapman Lake Assoc.	~10	—	—	—
2011	Aquatic Weed Control	0.5	—	—	—
2011	Clarke Aquatic Services	—	—	—	6.1
2012	Aquatic Weed Control	9.45	—	—	—
2012	All Things Water	38	—	—	—

Table 3.0. Protocol for the number of random samples required for the determination of aquatic vegetation abundance. The number of samples is based on lake surface area and trophic state, in which samples are distributed by depth class (modified from IDNR 2010). Boldfaced values correspond to sampling regime for Little Chapman and Big Chapman Lakes, respectively.

	Number of Random Samples														
		Hypereutrophic Contours		Eutrophic Contours			Mesotrophic Contours				Oligotrophic Contours				
Lake Surface Area (Acres)	Total	0-5	5-10	0-5	5-10	10-15	0-5	5-10	10-15	15-20	0-5	5-10	10-15	15-20	20-25
<10	20	10	10	10	7	3	10	5	3	2	10	4	3	2	1
10-49	30	20	10	10	10	10	10	10	7	3	10	10	5	3	2
50-99	40	30	10	17	13	10	10	10	10	10	10	10	10	7	3
100-199	**50**	40	10	**23**	**17**	**10**	14	14	12	10	10	10	10	10	10
200-299	60	50	10	30	20	10	18	16	16	10	14	12	12	12	10
300-399	70	60	10	37	23	10	22	20	18	10	17	15	14	14	10
400-499	80	70	10	43	27	10	25	25	22	10	19	18	17	16	10
500-799	**90**	80	10	50	30	10	**29**	**27**	**24**	**10**	22	21	19	18	10
≥800	100	90	10	57	33	10	33	31	26	10	25	23	22	20	10

Table 4.0. Summary of herbicide treatment at Big and Little Chapman Lakes in 2012. Dosage rates for DMA® 4 and Navigate® were 4 gallons per acre and 110 lbs per acre, respectively.

Lake	ID	Acreage	Acre feet	Average Depth (ft)	Chemical
Big Chapman	1	1.57	4.71	6.0	Navigate®
Little Chapman	2	0.38	1.14	7.5	DMA® 4
Little Chapman	3	0.65	1.95	5.0	DMA® 4
Big Chapman	4	0.52	1.56	5.0	Navigate®
Big Chapman	5	0.77	2.31	3.0	Navigate®
Big Chapman	6	0.63	1.89	3.0	Navigate®
Big Chapman	7	0.72	2.31	7.0	Navigate®
Big Chapman	8	0.81	2.43	9.0	Navigate®
Big Chapman	9	0.45	1.35	7.0	Navigate®
Big Chapman	10	1.33	3.99	9.0	Navigate®
Big Chapman	11	1.28	3.84	10.0	Navigate®
Big Chapman	12	1.15	3.45	12.0	Navigate®
Big Chapman	13	0.25	0.75	15.0	Navigate®
Big Chapman	14	1.78	5.34	2.0	Navigate®
Little Chapman	15	3.87	11.61	4.0	DMA® 4
Little Chapman	16	6.33	18.99	13.0	DMA® 4
Little Chapman	17	2.35	7.05	14.0	DMA® 4
Little Chapman	18	1.49	4.47	3.0	DMA® 4
Big Chapman	19	13.44	40.32	20.0	Navigate®
Big Chapman	20	0.76	2.28	9.0	Navigate®
Little Chapman	21	0.33	0.99	6.0	DMA® 4
Little Chapman	22	0.21	0.63	7.0	DMA® 4
Big Chapman	—	3.93	11.79	6.0	Navigate®
Sum		**45.00**			

Table 5.0. Summary of aquatic plant community metrics for Little Chapman Lake.

	Spring Surveys					Summer Surveys						
Metric	2005[b]	2006[b]	2006[c]	2007	2012	2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2012
% littoral sites with plants	86	80	80	74	92	92	74	90	65	80	70	80
Total number of species	6	7	10	7	8	11	7	9	8	10	6	9
Total number of native species	4	5	8	5	6	9	5	5	7	8	5	8
$\bar{}$ species richness /site	1.41	1.06	1.35	1.36	2.08	1.98	1.02	1.97	0.98	1.56	1.12	1.51
$\bar{}$ native species richness/site	0.57	0.56	0.61	0.94	1.43	1.50	0.77	1.72	0.70	1.34	0.72	1.51
Species diversity	0.71	0.77	0.84	0.76	0.76	0.82	0.75	0.83	0.77	0.80	0.76	0.78
Native species diversity	0.41	0.67	0.76	0.68	0.65	0.78	0.66	0.59	0.71	0.74	0.74	0.78

Table 6.0. Summary of aquatic plant community metrics for Big Chapman Lake.

	Spring Surveys					Summer Surveys							
Metric	2005[b]	2006[b]	2006[c]	2007[b]	2012	2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2011[b]	2012
% littoral sites with plants	93	95	86	95	89	99	98	100	95	92	93	93	84
Total number of species	13	13	13	15	16	16	17	19	13	17	10	13	13
Total number of native species	11	10	11	12	13	14	14	15	10	15	7	10	11
$\bar{}$ species richness/site	1.63	2.32	1.50	2.07	1.83	2.54	2.44	3.39	2.32	2.83	1.84	2.22	1.70
$\bar{}$ native species richness/site	1.03	1.79	1.06	1.58	1.44	2.26	1.91	2.70	1.79	2.72	1.17	1.69	1.56
Species diversity	0.82	0.86	0.84	0.86	0.86	0.88	0.88	0.89	0.86	0.88	0.85	0.88	0.84
Native species diversity	0.72	0.81	0.77	0.80	0.82	0.86	0.85	0.86	0.81	0.86	0.79	0.84	0.82

[a]Surveys conducted by Aquatic Weed Patrol.
[b]Surveys conducted by Indiana Department of Natural Resources
[c]Surveys conducted by JFNew and Associates.

Table 7.0. Summary of frequency of occurrence data, apportioned by depth class, collected from spring surveys conducted on Little Chapman Lake. Synonyms provided in parentheses. Horizontal bar (—) = not recorded.

		Survey Year				
Taxon	Common Name	2005[a]	2006[a]	2006[b]	2007[a]	2012
0-15 FT CONTOUR						
Ceratophyllum demersum	Coontail	42.9	28.0	36.0	46.0	75.5
Chara spp.	Stonewort	7.1	12.0	10.0	18.0	18.4
Elodea sp.	Waterweed	1.8	——	——	——	——
Heteranthera dubia	Water star-grass	——	——	——	——	2.0
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	26.0	——	——
Myriophyllum spicatum	Eurasian water-milfoil	53.6	36.0	24.0	40.0	55.1
Najas flexilis	Common naiad	——	——	——	——	2.0
Najas guadalupensis	Southern Naiad	——	——	4.0	——	——
Najas marina	Spiny naiad	——	——	——	——	——
Najas minor	Brittle naiad	——	——	——	——	——
Nitella sp.	Stonewort	——	——	——	2.0	——
Potamogeton crispus	Curly-leaved pondweed	30.4	14.0	16.0	2.0	10.2
Potamogeton friesii	Fries' pondweed	——	——	——	——	18.4
Potamogeton foliosus	Leafy pondweed	——	——	——	——	——
Potamogeton gramineus	Variable-leaved pondweed	——	——	6.0	——	——
Potamogeton illinoensis	Illinois pondweed	——	2.0	——	——	——
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	2.0	——	——
Potamogeton zosteriformis	Flat-stem pondweed	5.4	4.0	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	12.0	12.0	——
Vallisneria americana	Eel-grass	17.9	10.0	2.0	16.0	26.5
0-5 FT CONTOUR						
Ceratophyllum demersum	Coontail	59.1	43.5	48.0	56.5	77.3
Chara spp.	Stonewort	13.6	17.4	22.0	30.4	18.2
Elodea sp.	Waterweed	4.5	——	——	——	——
Heteranthera dubia	Water star-grass	——	——	——	——	4.5
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	43.0	——	——
Myriophyllum spicatum	Eurasian water-milfoil	59.1	52.2	26.0	56.5	59.1
Najas guadalupensis	Southern Naiad	——	——	9.0	——	——
Potamogeton amplifolius	Broad-leaved pondweed	——	4.3	——	——	——
Potamogeton crispus	Curly-leaved pondweed	22.7	17.4	9.0	——	22.7
Potamogeton friesii	Fries' pondweed	——	——	——	——	13.6
Potamogeton gramineus	Variable-leaved pondweed	——	——	13.0	——	——
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	4.0	——	——
Potamogeton zosteriformis	Flat-stem pondweed	9.1	4.3	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	17.0	26.1	——
Vallisneria americana	Eel-grass	——	21.7	——	21.7	9.1

Table 7.0..–Continued

Taxon	Common Name	Survey Year 2005[a]	2006[a]	2006[b]	2007[a]	2012
5-10 FT CONTOUR						
Ceratophyllum demersum	Coontail	47.8	23.5	41.0	41.2	64.7
Chara spp.	Stonewort	4.3	11.8	——	11.8	23.5
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	12.0	——	——
Myriophyllum spicatum	Eurasian water-milfoil	65.2	35.3	41.0	35.3	58.8
Najas flexilis	Common naiad	——	——	——	——	5.9
Nitella sp.	Stonewort	——	——	——	5.9	——
Potamogeton crispus	Curly-leaved pondweed	52.2	17.6	35.0	5.9	——
Potamogeton friesii	Fries' pondweed	——	——	——	——	35.3
Potamogeton zosteriformis	Flat-stem pondweed	——	5.9	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	12.0	——	——
Vallisneria americana	Eel-grass	——	——	6.0	11.8	64.7
10-15 FT CONTOUR						
Ceratophyllum demersum	Coontail	——	——	——	30.0	90.0
Chara spp.	Stonewort	——	——	——	——	10.0
Myriophyllum spicatum	Eurasian water-milfoil	22.2	——	——	10.0	40.0
Potamogeton amplifolius	Broad-leaved pondweed	——	——	——	——	——
Potamogeton zosteriformis	Flat-stem pondweed	11.1	——	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	——	——	——
Vallisneria americana	Eel-grass	——	——	——	10.0	——

[a]Surveys conducted by Indiana Department of Natural Resources
[b]Surveys conducted by JFNew and Associates.

Table 8.0. Summary of frequency of occurrence data, apportioned by depth class, collected from summer surveys conducted on Little Chapman Lake. Synonyms provided in parentheses. Horizontal bar (—) = not recorded.

		Survey Year						
Taxon	Common Name	2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2012
0-15 FT CONTOUR								
Ceratophyllum demersum	Coontail	55.0	39.3	51.7	32.0	42.0	28.0	57.1
Chara spp.	Stonewort	22.5	10.7	21.7	8.0	16.0	14.0	26.5
Heteranthera dubia	Water star-grass	——	1.8	——	——	2.0	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	10.0	——	——	——	20.0	——	——
Myriophyllum spicatum	Eurasian water-milfoil	50.5	23.2	20.0	28.0	18.0	40.0	——
Najas sp.	Naiad	——	——	——	4.0	——	4.0	——
Najas flexilis	Common naiad	——	——	——	——	2.0	——	12.2
Najas guadalupensis	Southern Naiad	——	——	10.0	——	4.0	——	——
Najas marina	Spiny naiad	5.0	——	——	——	——	——	2.0
Najas minor	Brittle naiad	7.5	——	16.7	——	——	——	8.2
Potamogeton amplifolius	Broad-leaved pondweed	——	——	——	——	2.0	——	4.1
Potamogeton crispus	Curly-leaved pondweed	——	1.8	5.0	——	4.0	——	——
Potamogeton diversifolius	Water-thread pondweed	——	——	——	2.0	——	——	——
Potamogeton friesii	Fries' pondweed	——	——	——	——	2.0	——	——
Potamogeton foliosus	Leafy pondweed	——	——	1.7	——	——	——	——
Potamogeton gramineus	Variable-leaved pondweed	5.0	——	——	——	6.0	——	——
Potamogeton illinoensis	Illinois pondweed	——	——	——	2.0	——	——	——
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	——	——	——	——	6.1
Potamogeton zosteriformis	Flat-stem pondweed	5.0	——	——	——	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	5.0	7.1	36.7	6.0	18.0	10.0	8.2
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	——	——	2.0	——	——
Vallisneria americana	Eel-grass	52.5	17.9	33.3	16.0	18.0	16.0	26.5

Table 8.0.–Continued

Taxon	Common Name	Survey Year 2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2012
0-5 FT CONTOUR								
Ceratophyllum demersum	Coontail	——	47.6	——	52.2	48.0	34.8	68.2
Chara spp.	Stonewort	——	28.6	——	17.4	26.0	26.1	22.7
Heteranthera dubia	Water star-grass	——	——	——	——	4.0	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	——	——	35.0	——	——
Myriophyllum spicatum	Eurasian water-milfoil	——	38.1	——	52.2	30.0	56.5	——
Najas sp.	Naiad	——	——	——	8.7	——	8.7	——
Najas flexilis	Common naiad	——	——	——	——	4.0	——	9.1
Najas guadalupensis	Southern Naiad	——	——	——	——	4.0	——	——
Najas marina	Spiny naiad	——	——	——	——	——	——	4.5
Najas minor	Brittle naiad	——	——	——	——	——	——	——
Potamogeton amplifolius	Broad-leaved pondweed	——	——	——	——	4.0	——	4.5
Potamogeton crispus	Curly-leaved pondweed	——	4.8	——	——	9.0	——	——
Potamogeton diversifolius	Water-thread pondweed	——	——	——	4.3	——	——	——
Potamogeton friesii	Fries' pondweed	——	——	——	——	4.0	——	——
Potamogeton foliosus	Leafy pondweed	——	——	——	——	——	——	——
Potamogeton gramineus	Variable-leaved pondweed	——	——	——	——	13.0	——	——
Potamogeton illinoensis	Illinois pondweed	——	——	——	——	——	——	——
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	——	——	——	——	4.5
Potamogeton zosteriformis	Flat-stem pondweed	——	——	——	——	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	14.3	——	13.0	35.0	21.7	——
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	——	——	4.0	——	——
Vallisneria americana	Eel-grass	——	38.1	——	30.4	35.0	30.4	13.6

Table 8.0.–Continued

Taxon	Common Name	Survey Year 2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2012
5-10 FT CONTOUR								
Ceratophyllum demersum	Coontail	——	54.5	——	17.6	41.0	35.3	47.1
Chara spp.	Stonewort	——	——	——	——	6.0	5.9	41.2
Heteranthera dubia	Water star-grass	——	4.5	——	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	——	——	12.0	——	——
Myriophyllum spicatum	Eurasian water-milfoil	——	22.7	——	11.8	6.0	41.2	——
Najas flexilis	Common naiad	——	——	——	——	——	——	23.5
Najas guadalupensis	Southern Naiad	——	——	——	——	6.0	——	——
Najas minor	Brittle naiad	——	——	——	——	——	——	23.5
Potamogeton illinoensis	Illinois pondweed	——	——	——	5.9	——	——	——
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	——	——	——	——	11.8
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	4.5	——	——	——	——	23.5
Vallisneria americana	Eel-grass	——	9.1	——	5.9	6.0	5.9	58.8

Table 8.0.–Continued

Taxon	Common Name	Survey Year 2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2012
10-15 FT CONTOUR								
Ceratophyllum demersum	Coontail	——	——	——	30.0	10.0	——	50.0
Chara spp.	Stonewort	——	——	——	10.0	——	——	10.0
Myriophyllum spicatum	Eurasian water-milfoil	——	——	——	20.0	——	——	——
Potamogeton amplifolius	Broad-leaved pondweed	——	——	——	——	——	——	10.0
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	——	20.0	——	——	——

[a]Surveys conducted by Aquatic Weed Patrol.
[b]Surveys conducted by Indiana Department of Natural Resources
[c]Surveys conducted by JFNew and Associates.

Table 9.0. Summary of frequency of occurrence data, apportioned by depth class, collected from spring surveys conducted on Big Chapman Lake. Synonyms provided in parentheses. Horizontal bar (—) = not recorded.

		Survey Year				
Taxon	Common Name	2005[a]	2006[a]	2006[b]	2007[a]	2012
0-20 FT CONTOUR						
Ceratophyllum demersum	Coontail	23.0	20.0	32.0	27.8	33.3
Chara spp.	Stonewort	48.0	42.2	50.0	51.1	43.3
Elodea sp.	Water-weed	1.0	1.1	——	1.1	——
Elodea canadensis	Canadian water-weed	——	——	7.0	——	1.1
Elodea nuttallii	Slender water-weed	——	——	1.0	——	——
Heteranthera dubia	Water star-grass	7.0	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	2.0	4.4	3.3
Myriophyllum spicatum	Eurasian water-milfoil	39.0	23.3	19.0	32.2	30.0
Najas sp.	Naiad	——	3.3	——	3.3	——
Najas flexilis	Common naiad	——	——	1.0	——	1.1
Najas guadalupensis	Southern Naiad	——	——	3.0	——	——
Najas marina	Spiny naiad	——	——	9.0	6.7	——
Najas minor	Brittle naiad	——	——	3.0	——	——
Nitella sp.	Stonewort	6.0	1.1	12.0	1.1	15.6
Potamogeton amplifolius	Broad-leaved pondweed	1.0	3.3	3.0	——	1.1
Potamogeton crispus	Curly-leaved pondweed	22.0	21.1	26.0	10.0	8.9
Potamogeton friesii	Fries' pondweed	——	——	——	——	7.8
Potamogeton gramineus	Variable-leaved pondweed	7.0	10.0	6.0	3.3	2.2
Potamogeton illinoensis	Illinois pondweed	1.0	——	3.0	4.4	11.1
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	1.0	——	——
Potamogeton richarsonii	Richardson's pondweed	1.0	——	——	——	——
Potamogeton zosteriformis	Flat-stem pondweed	4.0	13.3	——	1.1	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	18.0	33.3	14.4
Utricularia sp.	Bladderwort	5.0	3.3	——	8.9	——
Utricularia geminiscapa	Mixed bladderwort	——	——	2.0	——	——
Utricularia gibba	Creeping bladderwort	——	——	1.0	——	——
Utricularia intermedia	Northern bladderwort	——	——	——	——	6.7
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	6.0	——	1.1
Vallisneria americana	Eel-grass	——	4.4	1.0	17.8	2.2
Zannichelliaceae palustris	Horned-pondweed	——	3.3	——	——	——
0-5 FT CONTOUR						
Ceratophyllum demersum	Coontail	2.9	3.4	7.0	6.7	34.5
Chara spp.	Stonewort	91.2	86.2	97.0	90.0	44.8
Elodea canadensis	Canadian water-weed	——	——	——	——	3.4
Heteranthera dubia	Water star-grass	8.8	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	——	3.3	——
Myriophyllum spicatum	Eurasian water-milfoil	14.7	3.4	10.0	20.0	31.0
Najas sp.	Naiad	——	6.9	——	——	——

Table 9.0.–Continued

Taxon	Common Name	Survey Year 2005[a]	2006[a]	2006[b]	2007[a]	2012
Najas marina	Spiny naiad	——	——	13.0	6.7	——
Nitella sp.	Stonewort	——	——	——	2.0	20.7
Potamogeton amplifolius	Broad-leaved pondweed	2.9	3.4	——	——	——
Potamogeton crispus	Curly-leaved pondweed	——	6.9	3.0	——	20.7
Potamogeton gramineus	Variable-leaved pondweed	14.7	17.2	3.0	6.7	——
Potamogeton illinoensis	Illinois pondweed	——	——	——	6.7	6.9
Potamogeton zosteriformis	Flat-stem pondweed	2.9	6.9	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	21.0	30.0	13.8
Utricularia sp.	Bladderwort	8.8	6.9	——	——	——
Utricularia geminiscapa	Mixed bladderwort	——	——	3.0	——	——
Utricularia gibba	Creeping bladderwort	——	——	3.0	——	——
Utricularia intermedia	Northern bladderwort	——	——	——	——	3.4
Utricularia macrorhiza	Common bladderwort	——	——	17.0	——	——
Vallisneria americana	Eel-grass	——	10.3	——	——	——
Zannichelliaceae palustris	Horned-pondweed	——	3.4	——	——	——
5-10 FT CONTOUR						
Ceratophyllum demersum	Coontail	27.8	14.8	22.0	33.3	18.5
Chara spp.	Stonewort	41.7	40.7	48.0	48.1	55.6
Elodea sp.	Water-weed	——	——	——	3.7	——
Elodea canadensis	Canadian water-weed	——	——	11.0	——	——
Heteranthera dubia	Water star-grass	5.6	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	4.0	3.7	——
Myriophyllum spicatum	Eurasian water-milfoil	47.2	40.7	26.0	44.4	37.0
Najas sp.	Naiad	——	——	——	3.7	——
Najas flexilis	Common naiad	——		4.0	——	——
Najas marina	Spiny naiad	——	——	15.0	7.4	——
Najas minor	Brittle naiad	——	——	4.0	——	——
Nitella sp.	Stonewort	——	——	——	——	14.8
Potamogeton amplifolius	Broad-leaved pondweed	——	7.4	4.0	——	——
Potamogeton crispus	Curly-leaved pondweed	16.7	14.8	11.0	11.1	——
Potamogeton friesii	Fries' pondweed	——	——	——	——	18.5
Potamogeton gramineus	Variable-leaved pondweed	2.8	14.8	7.0	3.7	——
Potamogeton illinoensis	Illinois pondweed	——	——	7.0	3.7	7.4
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	4.0	——	——
Potamogeton zosteriformis	Flat-stem pondweed	5.6	25.9	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	12.0	51.9	3.7
Utricularia sp.	Bladderwort	5.6	3.7	——	3.7	——
Utricularia geminiscapa	Mixed bladderwort	——	——	4.0	——	——
Utricularia intermedia	Northern bladderwort	——	——	——	——	11.1
Vallisneria americana	Eel-grass	——	3.7	4.0	29.6	3.7
Zannichelliaceae palustris	Horned-pondweed	——	3.7	——	——	——

Table 9.0.–Continued

Taxon	Common Name	Survey Year 2005[a]	2006[a]	2006[b]	2007[a]	2012
10-15 FT CONTOUR						
Ceratophyllum demersum	Coontail	20.0	41.7	75.0	43.5	50.0
Chara spp.	Stonewort	13.3	4.2	13.0	17.4	41.7
Elodea canadensis	Canadian water-weed	——	——	4.0	——	——
Elodea nuttallii	Slender water-weed	——	——	4.0	——	——
Heteranthera dubia	Water star-grass	6.7	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	4.0	8.7	12.5
Myriophyllum spicatum	Eurasian water-milfoil	80.0	37.5	30.0	43.5	25.0
Najas flexilis	Common naiad	——	——	——	——	4.2
Najas guadalupensis	Southern Naiad	——	——	8.0	——	——
Najas marina	Spiny naiad	——	——	——	8.7	——
Nitella sp.	Stonewort	6.7	4.2	21.0	4.3	12.5
Potamogeton amplifolius	Broad-leaved pondweed	——	——	——	——	4.2
Potamogeton crispus	Curly-leaved pondweed	60.0	41.7	67.0	21.7	8.3
Potamogeton friesii	Fries' pondweed	——	——	——	——	4.2
Potamogeton gramineus	Variable-leaved pondweed	——	——	13.0	——	4.2
Potamogeton illinoensis	Illinois pondweed	6.7	——	——	4.3	20.8
Potamogeton zosteriformis	Flat-stem pondweed	——	8.3	——	4.3	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	——	30.4	29.2
Utricularia intermedia	Northern bladderwort	——	——	——	——	8.3
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	——	——	4.2
Vallisneria americana	Eel-grass	——	——	——	26.1	4.2
Zannichelliaceae palustris	Horned-pondweed	——	4.2	——	——	——
15-20 FT CONTOUR						
Ceratophyllum demersum	Coontail	81.8	30.0	30.0	40.0	30.0
Chara spp.	Stonewort	——	10.0	20.0	20.0	10.0
Elodea sp.	Water-weed	9.1	10.0	——	——	——
Heteranthera dubia	Water star-grass	9.1	——	——	——	——
Myriophyllum spicatum	Eurasian water-milfoil	36.4	——	——	10.0	20.0
Najas sp.	Naiad	——	10.0	——	20.0	——
Najas guadalupensis	Southern Naiad	——	——	20.0	——	——
Nitella sp.	Stonewort	27.3	——	50.0	——	10.0
Potamogeton crispus	Curly-leaved pondweed	54.5	30.0	20.0	10.0	——
Potamogeton friesii	Fries' pondweed	——	——	——	——	10.0
Potamogeton gramineus	Variable-leaved pondweed	9.1	——	13.0	——	10.0
Potamogeton illinoensis	Illinois pondweed	——	——	——	——	10.0
Potamogeton richarsonii	Richardson's pondweed	9.1	——	——	——	——
Potamogeton zosteriformis	Flat-stem pondweed	9.1	10.0	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	——	40.0	——	10.0
Vallisneria americana	Eel-grass	——	——	——	20.0	——

[a]Surveys conducted by Indiana Department of Natural Resources
[b]Surveys conducted by JFNew and Associates.

Table 10.0. Summary of frequency of occurrence data, apportioned by depth class, collected from summer surveys conducted on Big Chapman Lake,. Synonyms provided in parentheses. Horizontal bar (—) = not recorded.

		Survey Year							
Taxon	Common Name	2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2011[b]	2012
0-25 FT CONTOUR									
Ceratophyllum demersum	Coontail	26.9	25.0	25.5	30.0	40.0	13.3	24.4	27.8
Chara spp.	Stonewort	70.5	52.0	77.1	47.8	46.0	38.9	42.2	51.1
Elodea sp.	Water-weed	3.8	4.0	——	3.3	——	——	——	——
Elodea canadensis	Canadian water-weed	——	——	8.4	——	7.0	——	——	——
Heteranthera dubia	Water star-grass	9.0	2.0	——	——	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	12.8	——	8.4	5.6	9.0	——	——	——
Myriophyllum spicatum	Eurasian water-milfoil	23.1	15.0	19.3	13.3	11.0	33.3	25.6	13.3
Najas sp.	Naiad	7.7	11.0	——	5.6	——	——	2.2	——
Najas flexilis	Common naiad	——	——	——	——	——	——	——	8.9
Najas guadalupensis	Southern Naiad	——	——	12.1	——	2.0	——	——	——
Najas marina	Spiny naiad	17.9	35.0	48.2	36.7	20.0	32.2	24.4	13.3
Najas minor	Brittle naiad	——	——	3.6	——	——	——	——	——
Nitella sp.	Stonewort	——	8.0	2.4	6.7	13.0	2.2	3.3	8.9
Potamogeton amplifolius	Broad-leaved pondweed	6.4	1.0	2.4	——	1.0	——	——	——
Potamogeton crispus	Curly-leaved pondweed	7.7	3.0	4.8	3.3	4.0	2.2	3.3	1.1
Potamogeton foliosus	Leafy pondweed	——	——	2.4	——	——	——	4.4	——
Potamogeton gramineus	Variable-leaved pondweed	12.8	8.0	9.6	45.6	6.0	11.1	20.0	——
Potamogeton illinoensis	Illinois pondweed	5.1	5.0	9.6	——	1.0	——	——	17.8
Potamogeton natans	Floating-leaved pondweed	2.6	——	——	——	——	——	——	——
Potamogeton nodosus	Long-leaved pondweed	——	2.0	6.0	——	1.0	——	——	——
Potamogeton praelongus	White-stemmed pondweed	3.8	——	——	——	——	——	——	——
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	——	——	1.0	——	——	1.1
Potamogeton zosteriformis	Flat-stem pondweed	5.0	3.0	7.2	2.2	——	——	1.1	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	25.6	34.0	56.6	25.6	26.0	20.0	16.7	17.8

Table 10.0.–Continued

Taxon	Common Name	Survey Year 2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2011[b]	2012
Utricularia sp.	Bladderwort	——	8.0	——	6.7	——	7.8	20.0	——
Utricularia intermedia	Northern bladderwort	——	——	——	——	——	——	——	5.6
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	12.8	——	30.1	——	7.0	——	——	2.2
Vallisneria americana	Eel-grass	25.6	29.0	26.5	——	16.0	23.3	34.4	1.1
0-5 FT CONTOUR									
Ceratophyllum demersum	Coontail	——	6.3	——	3.6	31.0	6.5	10.3	34.5
Chara spp.	Stonewort	——	93.8	——	78.6	93.0	87.1	82.8	41.4
Elodea sp.	Water-weed	——	3.1	——	3.6	——	——	——	——
Elodea canadensis	Canadian water-weed	——	——	——	——	7.0	——	——	——
Heteranthera dubia	Water star-grass	——	3.1	——	——	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	——	7.1	3.0	——	——	——
Myriophyllum spicatum	Eurasian water-milfoil	——	3.1	——	3.6	14.0	9.7	3.4	6.9
Najas sp.	Naiad	——	12.5	——	——	——	——	3.4	——
Najas flexilis	Common naiad	——	——	——	——	——	——	——	10.3
Najas guadalupensis	Southern Naiad	——	——	——	——	3.0	——	——	——
Najas marina	Spiny naiad	——	43.8	——	46.4	31.0	12.9	24.1	13.8
Nitella sp.	Stonewort	——	——	——	——	——	——	——	20.7
Potamogeton amplifolius	Broad-leaved pondweed	——	3.1	——	——	3.0	——	——	——
Potamogeton crispus	Curly-leaved pondweed	——	——	——	3.6	——	——	——	3.4
Potamogeton gramineus	Variable-leaved pondweed	——	12.5	——	57.1	14.0	13.0	41.4	——
Potamogeton illinoensis	Illinois pondweed	——	9.4	——	——	——	——	——	17.2
Potamogeton nodosus	Long-leaved pondweed	——	6.3	——	——	——	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	31.3	——	28.6	21.0	16.1	10.3	20.7
Utricularia sp.	Bladderwort	——	9.4	——	7.1	——	6.5	31.0	——

Table 10.0.–Continued

Taxon	Common Name	Survey Year							
		2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2011[b]	2012
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	——	——	14.0	——	——	——
Vallisneria americana	Eel-grass	——	25.0	——	——	24.0	——	6.9	3.4
5-10 FT CONTOUR									
Ceratophyllum demersum	Coontail	——	23.3	——	25.0	37.0	18.5	22.2	25.9
Chara spp.	Stonewort	——	63.3	——	57.1	44.0	22.2	37.0	63.0
Elodea sp.	Water-weed	——	6.7	——	3.6	——	——	——	——
Elodea canadensis	Canadian water-weed	——	——	——	——	4.0	——	——	——
Heteranthera dubia	Water star-grass	——	3.3	——	——	——	——	——	——
Myriophyllum sibiricum (*Myriophyllum exalbescens*)	Northern water-milfoil	——	——	——	10.7	26.0	——	——	——
Myriophyllum spicatum	Eurasian water-milfoil	——	26.7	——	17.9	19.0	44.4	33.3	18.5
Najas sp.	Naiad		16.7	——	7.1	——	——	3.7	——
Najas flexilis	Common naiad	——	——	——	——	——	——	——	14.8
Najas marina	Spiny naiad	——	46.7	——	57.1	30.0	63.0	48.1	22.2
Nitella sp.	Stonewort	——	——	——	10.7	4.0	——	——	3.7
Potamogeton crispus	Curly-leaved pondweed	——	3.3	——	7.1	4.0	——	3.7	——
Potamogeton foliosus	Leafy pondweed	——	——	——	——	——	——	3.7	——
Potamogeton gramineus	Variable-leaved pondweed		10.0	——	60.7	4.0	25.9	22.2	——
Potamogeton illinoensis	Illinois pondweed	——	6.7	——	——	4.0	——	——	18.5
Potamogeton nodosus	Long-leaved pondweed	——	——	——	——	4.0	——	——	——
Potamogeton zosteriformis	Flat-stem pondweed	——	——	——	3.6	——	——	3.7	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	36.7	——	46.4	56.0	29.6	33.3	18.5
Utricularia sp.	Bladderwort	——	13.3	——	14.3	——	11.1	33.3	——
Utricularia intermedia	Northern bladderwort	——	——	——	——	——	——	——	11.1

Table 10.0.–Continued

Taxon	Common Name	Survey Year 2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2011[b]	2012
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	——	——	7.0	——	——	——
Vallisneria americana	Eel-grass	——	46.7	——	——	26.0	44.4	66.7	——
10-15 FT CONTOUR									
Ceratophyllum demersum	Coontail	——	40.0	——	63.6	65.0	8.7	41.7	20.8
Chara spp.	Stonewort	——	15.0	——	22.7	9.0	8.7	16.7	62.5
Elodea sp.	Water-weed	——	——	——	4.5	——	——	——	——
Elodea canadensis	Canadian water-weed	——	——	——	——	13.0	——	——	——
Myriophyllum spicatum	Eurasian water-milfoil	——	25.0	——	27.3	——	56.5	54.2	16.7
Najas sp.	Naiad	——	5.0	——	13.6	——	——	——	——
Najas flexilis	Common naiad	——	——	——	——	——	——	——	4.2
Najas guadalupensis	Southern Naiad	——	——	——	——	4.0	——	——	——
Najas marina	Spiny naiad	——	30.0	——	18.2	4.0	34.8	8.3	8.3
Nitella sp.	Stonewort	——	5.0	5.0	13.6	35.0	4.3	4.2	4.2
Potamogeton crispus	Curly-leaved pondweed	——	10.0	——	——	13.0	8.7	8.3	——
Potamogeton foliosus	Leafy pondweed	——	——	——	——	——	——	8.3	——
Potamogeton gramineus	Variable-leaved pondweed	——	5.0	——	36.4	——	——	——	——
Potamogeton illinoensis	Illinois pondweed	——	——	——	——	——	——	——	20.8
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	——	——	4.0	——	——	——
Potamogeton zosteriformis	Flat-stem pondweed	——	5.0	——	——	——	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	50.0	——	9.1	9.0	21.7	12.5	20.8
Utricularia sp.	Bladderwort	——	5.0	——	——	——	8.7	——	——
Utricularia intermedia	Northern bladderwort	——	——	——	——	——	——	——	8.3
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	——	——	——	——	——	——	——	8.3

Table 10.0.–Continued

Taxon	Common Name	Survey Year 2004[a]	2005[b]	2005[c]	2006[b]	2006[c]	2007[b]	2011[b]	2012
Vallisneria americana	Eel-grass	——	25.0	——	——	——	39.1	45.8	——
15-20 FT CONTOUR									
Ceratophyllum demersum	Coontail	——	50.0	——	41.7	20.0	33.3	30.0	30.0
Chara spp.	Stonewort	——	——	——	——	——	——	——	20.0
Elodea sp.	Water-weed	——	7.1	——	——	——	——	——	——
Myriophyllum spicatum	Eurasian water-milfoil	——	7.1	——	——	10.0	22.2	——	10.0
Najas sp.	Naiad	——	7.1	——	——	——	——	——	——
Najas marina	Spiny naiad	——	7.1	——	——	——	——	——	——
Nitella sp.	Stonewort	——	28.6	——	——	30.0	11.1	20.0	——
Potamogeton foliosus	Leafy pondweed	——	——	——	——	——	——	10.0	——
Potamogeton illinoensis	Illinois pondweed	——	——	——	——	——	——	——	20.8
Potamogeton pusillus subsp. *tenuissimus*	Small pondweed	——	——	——	——	——	——	——	10.0
Potamogeton zosteriformis	Flat-stem pondweed	——	14.3		8.3	——	——	——	——
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	——	21.4	——	——	——	——	——	——
Vallisneria americana	Eel-grass	——	14.3	——	——	——	——	——	——
20-25 FT CONTOUR									
Nitella sp.	Stonewort	——	75.0	——	——	——	——	——	——

[a]Surveys conducted by Aquatic Weed Patrol.
[b]Surveys conducted by Indiana Department of Natural Resources
[c]Surveys conducted by JFNew and Associates.

Table 11.0. Summary of aquatic macrophyte surveys conducted on the Chapman Lakes. Synonyms provided in parentheses. X = present; – = not recorded.

		Survey Year							
Taxon	Common Name	Historical*	2000	2004	2005	2006	2007	2011	2012
SUBMERGENT									
Ceratophyllum demersum	Coontail	X	X	–	X	X	X	X	X
Chara sp.	Stonewort	X	X	–	–	–	X	X	X
Chara contraria	Opposite stonewort	–	–	–	–	–	–	–	X
Chara globularis	Fragile stonewort	–	–	–	–	–	–	–	X
Chara haitensis	Haitian stonewort	–	–	–	–	–	–	–	X
Elodea sp.	Waterweed	–	–	–	–	–	X	–	–
Elodea canadensis	Common water-weed	X	X	–	X	X	–	–	X
Elodea nutallii	Slender water-weed	–	–	–	X	X	–	–	–
Heteranthera dubia	Water star-grass	–	–	X	X	X	X	–	–
Myriophyllum heterophyllum	Variable-leaved water-milfoil	–	–	X	–	–	–	–	–
Myriophyllum sibiricum	Northern water-milfoil	–	–	X	X	X	X	–	X
Myriophyllum spicatum	Eurasian water-milfoil	X	X	X	X	X	X	X	X
Najas sp.	Naiad	–	–	–	–	–	X	X	–
Najas flexilis	Common naiad	–	X	X	X	X	–	–	X
Najas gracillima	Thread-like naiad	–	–	–	X	X	–	–	–
Najas guadalupensis	Southern Naiad	X	X	X	X	X	–	–	–
Najas marina	Spiny naiad	–	–	X	–	–	X	X	X
Najas minor	Brittle naiad	X	–	–	X	X	–	–	X
Nitella sp.	Stonewort	–	–	X	–	–	X	X	–
Nitella flexilis	Flexible Stonewort	–	–	–	–	–	–	–	X
Polygonum lapathifolium	Heartsease	–	–	–	X	X	–	–	–
Potamogeton amplifolius	Broad-leaved pondweed	X	–	X	X	X	–	–	X
Potamogeton crispus	Curly-leaved pondweed	X	X	X	X	X	X	X	X
Potamogeton foliosus	Leafy pondweed	–	–	X	X	X	X	X	–
Potamogeton friesii	Fries' pondweed	–	–	–	X	X	–	–	X
Potamogeton gramineus	Variable-leaved pondweed	–	X	X	–	–	X	X	–
Potamogeton illinoensis	Illinois pondweed	–	–	X	–	–	X	–	X
Potamogeton nodosus	Long-leaf pondweed	–	–	X	X	X	–	–	–

Table 11.0.–Continued

Taxon	Common Name	Survey Year							
		Historical*	2000	2004	2005	2006	2007	2011	2012
Potamogeton praelongus	White-stemmed pondweed	–	–	X	X	X	–	–	–
Potamogeton pusillus subsp. *tenuissimus*	Broad-leaved small pondweed	–	–	X	–	–	–	–	X
Potamogeton zosteriformis	Flat-stem pondweed	–	X	X	X	X	X	–	–
Stuckenia pectinata (*Potamogeton pectinatus*)	Sago pondweed	X	X	X	X	X	X	X	X
Utricularia sp.	Bladderwort	–	–	–	–	X	X	–	–
Utricularia gibba	Humped bladderwort	–	–	X	–	X	X	–	–
Utricularia intermedia	Northern bladderwort	–	–	–	–	–	–	–	X
Utricularia macrorhiza (*Utricularia vulgaris*)	Common bladderwort	–	–	X	X	X	–	–	X
Vallisneria americana	Eel-grass	X	X	X	X	X	X	X	X
EMERGENT									
Asclepias incarnata	Swamp milkweed	–	X	–	X	–	–	–	–
Cephalanthus occidentalis	Buttonbush	–	X	–	–	–	–	–	–
Cladium mariscoides	Twig-rush	–	–	–	X	X	–	–	X
Decodon verticillatus	Swamp loosestrife	–	X	–	–	–	–	–	X
Dryopteris thelypteris	Marsh shield fern	–	–	–	X	X	–	–	X
Hibiscus palustris	Rose mallow	–	X	–	X	X	–	–	X
Impatiens capensis	jewelweed	–	X	–	X	X	–	–	X
Juncus effusus	Soft rush	X	–	–	–	–	–	–	–
Justicia americana	Water-willow	X	–	–	X	X	–	–	X
Leersia oryzoides	Rice cut-grass	–	–	–	–	X	–	–	X
Lythrum salicaria	Purple loosestrife	–	X	–	X	X	–	–	X
Phalaris arundinacaea	Reed canary grass	–	–	–	X	X	–	–	X
Pontederia cordata	Pickerel weed	X	X	–	X	X	–	–	X
Sagittaria latifolia	Common arrowhead	X	–	–	X	X	–	–	X
Schoenoplectus pungens (*Scirpus americanus*)	Three-square bulrush	–	–	–	X	X	–	–	X

Table11.0.–Continued

Taxon	Common Name	Survey Year							
		Historical*	2000	2004	2005	2006	2007	2011	2012
Schoenoplectus tabernaemontani (Scirpus validus)	Softstem bulrush	X	–	–	X	X	–	–	X
Typha angustifolia	Narrow-leaved cat-tail	X	X	–	X	X	–	–	–
Typha latifolia	Broad-leaved cattail	–	–	–	X	X	–	–	X
Utricularia cornuta	Horned bladderwort	–	–	–	X	X	–	–	–
Utricularia gemniscapa	Bog bladderwort	–	X	–	X	–	–	–	–
FLOATING-LEAVED									
Lemna minor	Small duckweed	X	X	–	X	X	–	–	X
Lemna trisulca	Forked duckweed	–	X	–	X	–	–	–	–
Nuphar advena (*N. luteum*)	Common Spatterdock	X	X	–	X	X	–	–	X
Nuphar microphylla	Small-leaved pond lily	–	–	–	X	X	–	–	–
Nuphar variegata	Bull-head pond lily	–	–	–	X	X	X	–	–
Nymphaea odorata subsp. *tuberosa* (*N. tuberosa*)	Fragrant water-lily	–	X	–	X	X	–	–	X
Spirodela polyrrhiza	Great duckweed	–	–	–	X	X	–	–	X
Wolffia brasiliensis	Brazilian watermeal	–	–	–	–	–	X	–	–
Wolffia columbiana	Columbian watermeal	–	–	–	X	X	–	–	–

*From IDNR Fisheries Reports

Table 12.0. Big Chapman Lake summary of frequency and dominance values of aquatic macrophytes partitioned by depth and calculated from data collected during the pre-treatment survey (May 2012).

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.83
Date:	5/25/2012	Sites with plants:	80	SE Mean species/site:	0.12
Secchi (ft):	11.5	Sites with native plants:	77	Mean native species/site:	1.44
Maximum Plant Depth (ft):	20.0	Number of species:	16	SE Mean natives/site:	0.11
Trophic Status:	Mesotrophic	Number of native species:	14	Species diversity:	0.86
		Maximum species/site:	5	Native species diversity:	0.82

All Depths (0 to 20 ft)		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	43.3	56.7	24.4	14.4	4.4	18.0
Coontail	CERDEM	33.3	66.7	25.6	6.7	1.1	10.2
Eurasian water-milfoil	MYRSPI	30.0	70.0	10.0	3.3	16.7	20.7
Nitella sp.	—	15.6	84.4	7.8	4.4	3.3	7.6
Sago pondweed	STUPEC	14.4	85.6	13.3	1.1	0.0	3.3
Illinois pondweed	POTILL	11.1	88.9	10.0	1.1	0.0	2.7
Curly-leaved pondweed	POTCRI	8.9	91.1	8.9	0.0	0.0	1.8
Fries' pondweed	POTFRI	7.8	92.2	7.8	0.0	0.0	1.6
Northern bladderwort	UTRINT	6.7	93.3	6.7	0.0	0.0	1.3
Northern water-milfoil	MYRSIB	3.3	96.7	3.3	0.0	0.0	0.7
Variable-leaved pondweed	POTGRA	2.2	97.8	2.2	0.0	0.0	0.4
Eel-grass	VALAME	2.2	97.8	2.2	0.0	0.0	0.4
Canadian water-weed	ELOCAN	1.1	98.9	1.1	0.0	0.0	0.2
Common naiad	NAJFLE	1.1	98.9	1.1	0.0	0.0	0.2
Broad-leaved pondweed	POTAMP	1.1	98.9	1.1	0.0	0.0	0.2
Common bladderwort	UTRMAC	1.1	98.9	1.1	0.0	0.0	0.2
Filamentous Algae	—	1.1					

Table 12.0. -Continued

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.79
Date:	5/25/2012	Sites with plants:	26	SE Mean species/site:	0.21
Secchi (ft):	11.5	Sites with native plants:	25	Mean native species/site:	1.28
Maximum Plant Depth (ft):	20.0	Number of species:	9	SE Mean natives/site:	0.15
Trophic Status:	Mesotrophic	Number of native species:	8	Species diversity:	0.84
		Maximum species/site:	5	Native diversity:	0.76

Depth: 0 to 5 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	44.8	55.2	17.2	20.7	6.9	22.8
Coontail	CERDEM	34.5	65.5	27.6	3.4	3.4	11.0
Eurasian water-milfoil	MYRSPI	31.0	69.0	6.9	6.9	17.2	22.8
Nitella sp.	—	20.7	79.3	10.3	6.9	3.4	9.7
Curly-leaved pondweed	POTCRI	20.7	79.3	20.7	0.0	0.0	4.1
Sago pondweed	STUPEC	13.8	86.2	13.8	0.0	0.0	2.8
Illinois pondweed	POTILL	6.9	93.1	3.4	3.4	0.0	2.8
Canadian water-weed	ELOCAN	3.4	96.6	3.4	0.0	0.0	0.7
Northern bladderwort	UTRINT	3.4	96.6	3.4	0.0	0.0	0.7
Filamentous Algae	—	0.0					

Table 12.0. - Continued

County: Kosciusko	Total Sites: 90			Mean species/site: 1.70	
Date: 5/25/2012	Sites with plants: 25			SE Mean species/site: 0.20	
Secchi (ft): 11.5	Sites with native plants: 23			Mean native species/site: 1.33	
Maximum Plant Depth (ft): 20.0	Number of species: 9			SE Mean natives/site: 0.19	
Trophic Status: Mesotrophic	Number of native species: 8			Species diversity: 0.81	
	Maximum species/site: 4			Native diversity: 0.76	

Depth: 5 to 10 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	55.6	44.4	22.2	25.9	7.4	27.4
Eurasian water-milfoil	MYRSPI	37.0	63.0	18.5	0.0	18.5	22.2
Coontail	CERDEM	18.5	81.5	14.8	3.7	0.0	5.2
Fries' pondweed	POTFRI	18.5	81.5	18.5	0.0	0.0	3.7
Nitella sp.	—	14.8	85.2	7.4	7.4	0.0	5.9
Northern bladderwort	UTRINT	11.1	88.9	11.1	0.0	0.0	2.2
Illinois pondweed	POTILL	7.4	92.6	7.4	0.0	0.0	1.5
Sago pondweed	STUPEC	3.7	96.3	3.7	0.0	0.0	0.7
Eel-grass	VALAME	3.7	96.3	3.7	0.0	0.0	0.7
Filamentous Algae	—	3.7					

Table 12.0. - Continued

County:	Kosciusko	Total Sites:	90	Mean species/site:	2.33
Date:	5/25/2012	Sites with plants:	24	SE Mean species/site:	0.23
Secchi (ft):	11.5	Sites with native plants:	24	Mean native species/site:	2.00
Maximum Plant Depth (ft):	20.0	Number of species:	15	SE Mean natives/site:	0.23
Trophic Status:	Mesotrophic	Number of native species:	13	Species diversity:	0.88
		Maximum species/site:	5	Native diversity:	0.85

Depth: 10 to 15 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	50.0	50.0	37.5	12.5	0.0	15.0
Chara spp.	—	41.7	58.3	41.7	0.0	0.0	8.3
Sago pondweed	STUPEC	29.2	70.8	25.0	4.2	0.0	7.5
Eurasian water-milfoil	MYRSPI	25.0	75.0	8.3	0.0	16.7	18.3
Illinois pondweed	POTILL	20.8	79.2	20.8	0.0	0.0	4.2
Northern water-milfoil	MYRSIB	12.5	87.5	12.5	0.0	0.0	2.5
Nitella sp.	—	12.5	87.5	4.2	0.0	8.3	9.2
Curly-leaved pondweed	POTCRI	8.3	91.7	8.3	0.0	0.0	1.7
Northern bladderwort	UTRINT	8.3	91.7	8.3	0.0	0.0	1.7
Common naiad	NAJFLE	4.2	95.8	4.2	0.0	0.0	0.8
Broad-leaved pondweed	POTAMP	4.2	95.8	4.2	0.0	0.0	0.8
Fries' pondweed	POTFRI	4.2	95.8	4.2	0.0	0.0	0.8
Variable-leaved pondweed	POTGRA	4.2	95.8	4.2	0.0	0.0	0.8
Common bladderwort	UTRMAC	4.2	95.8	4.2	0.0	0.0	0.8
Eel-grass	VALAME	4.2	95.8	4.2	0.0	0.0	0.8
Filamentous Algae	—	0.0					

Table 12.0. - Continued

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.10
Date:	5/25/2012	Sites with plants:	5	SE Mean species/site:	0.41
Secchi (ft):	11.5	Sites with native plants:	5	Mean native species/site:	0.90
Maximum Plant Depth (ft):	20.0	Number of species:	8	SE Mean natives/site:	0.38
Trophic Status:	Mesotrophic	Number of native species:	7	Species diversity:	0.84
		Maximum species/site:	3	Native diversity:	0.81

Depth: 15 to 20 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	30.0	70.0	20.0	10.0	0.0	10.0
Eurasian water-milfoil	MYRSPI	20.0	80.0	0.0	10.0	10.0	16.0
Chara sp.	—	10.0	90.0	10.0	0.0	0.0	2.0
Nitella sp.	—	10.0	90.0	10.0	0.0	0.0	2.0
Fries' pondweed	POTFRI	10.0	90.0	10.0	0.0	0.0	2.0
Variable-leaved pondweed	POTGRA	10.0	90.0	10.0	0.0	0.0	2.0
Illinois pondweed	POTILL	10.0	90.0	10.0	0.0	0.0	2.0
Sago pondweed	STUPEC	10.0	90.0	10.0	0.0	0.0	2.0
Filamentous Algae	—	0.0					

Table 13.0. Little Chapman Lake summary of frequency and dominance values of aquatic macrophytes partitioned by depth and calculated from data collected during the pre-treatment survey (May 2012).

County:	Kosciusko	Total Sites:	49	Mean species/site:	2.08
Date:	5/24/2012	Sites with plants:	45	SE Mean species/site:	0.17
Secchi (ft):	9.0	Sites with native plants:	45	Mean native species/site:	1.43
Maximum Plant Depth (ft):	15.0	Number of species:	8	SE Mean natives/site:	0.14
Trophic Status:	Eutrophic	Number of native species:	6	Species diversity:	0.76
		Maximum species/site:	5	Native species diversity:	0.65

All Depths (0 to 15 ft)		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	75.5	24.5	63.3	6.1	6.1	22.4
Eurasian water-milfoil	MYRSPI	55.1	44.9	38.8	10.2	6.1	20.0
Eel-grass	VALAME	26.5	73.5	26.5	0.0	0.0	5.3
Chara sp.	—	18.4	81.6	12.2	2.0	4.1	7.8
Fries' pondweed	POTFRI	18.4	81.6	18.4	0.0	0.0	3.7
Curly-leaved pondweed	POTCRI	10.2	89.8	10.2	0.0	0.0	2.0
Water-star-grass	HETDUB	2.0	98.0	2.0	0.0	0.0	0.4
Common naiad	NAJFLE	2.0	98.0	2.0	0.0	0.0	0.4
Filamentous Algae	—	0					

Table 13.0. - Continued

County: Kosciusko	Total Sites: 49			Mean species/site: 2.05	
Date: 5/24/2012	Sites with plants: 20			SE Mean species/site: 0.25	
Secchi (ft): 9.0	Sites with native plants: 20			Mean native species/site: 1.23	
Maximum Plant Depth (ft): 15.0	Number of species: 7			SE Mean natives/site: 0.16	
Trophic Status: Eutrophic	Number of native species: 5			Species diversity: 0.75	
	Maximum species/site: 4			Native diversity: 0.56	

Depth: 0 to 5 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	77.3	22.7	59.1	13.6	4.5	24.5
Eurasian water-milfoil	MYRSPI	59.1	40.9	40.9	4.5	13.6	24.5
Curly-leaved pondweed	POTCRI	22.7	77.3	22.7	0.0	0.0	4.5
Chara sp.	—	18.2	81.8	9.1	4.5	4.5	9.1
Fries' pondweed	POTFRI	13.6	86.4	13.6	0.0	0.0	2.7
Eel-grass	VALAME	9.1	90.9	9.1	0.0	0.0	1.8
Water-star-grass	HETDUB	4.5	95.5	4.5	0.0	0.0	0.9
Filamentous Algae	—	0.0					

Table 13.0. - Continued

County:	Kosciusko	Total Sites:	49			Mean species/site:	2.53
Date:	5/24/2012	Sites with plants:	15			SE Mean species/site:	0.33
Secchi (ft):	9.0	Sites with native plants:	15			Mean native species/site:	1.94
Maximum Plant Depth (ft):	15.0	Number of species:	6			SE Mean natives/site:	0.30
Trophic Status:	Eutrophic	Number of native species:	5			Species diversity:	0.79
		Maximum species/site:	5			Native diversity:	0.73

Depth: 5 to 10 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	64.7	35.3	64.7	0.0	0.0	12.9
Eel-grass	VALAME	64.7	35.3	64.7	0.0	0.0	12.9
Eurasian water-milfoil	MYRSPI	58.8	41.2	52.9	5.9	0.0	14.1
Fries' pondweed	POTFRI	35.3	64.7	35.3	0.0	0.0	7.1
Chara sp.	—	23.5	76.5	23.5	0.0	0.0	4.7
Common naiad	NAJFLE	5.9	94.1	5.9	0.0	0.0	1.2
Filamentous Algae	—	0					

County:		Total Sites:	49			Mean species/site:	1.40
Date:	5/24/2012	Sites with plants:	10			SE Mean species/site:	0.16
Secchi (ft):	9.0	Sites with native plants:	10			Mean native species/site:	1.00
Maximum Plant Depth (ft):	15.0	Number of species:	3			SE Mean natives/site:	0.00
Trophic Status:	Eutrophic	Number of native species:	2			Species diversity:	0.50
		Maximum species/site:	2			Native diversity:	0.18

Depth: 10 to 15 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	90.0	10.0	70.0	0.0	20.0	34.0
Eurasian water-milfoil	MYRSPI	40.0	60.0	10.0	30.0	0.0	20.0
Chara sp.	—	10.0	90.0	0.0	0.0	10.0	10.0
Filamentous Algae	—	0.0					

Table 14.0. Big Chapman Lake summary of frequency and dominance values of aquatic macrophytes partitioned by depth and calculated from data collected during the post-treatment survey (July 2012).

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.70
Date:	7/30/2012	Sites with plants:	76	SE Mean species/site:	0.13
Secchi (ft):	12.8	Sites with native plants:	72	Mean native species/site:	1.42
Maximum Plant Depth (ft):	20.0	Number of species:	13	SE Mean natives/site:	0.11
Trophic Status:	Mesotrophic	Number of native species:	10	Species diversity:	0.84
		Maximum species/site:	6	Native species diversity:	0.79

All Depths (0 to 20 ft)		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	51.1	48.9	20.0	16.7	14.4	28.4
Coontail	CERDEM	27.8	72.2	14.4	6.7	6.7	13.6
Illinois pondweed	POTILL	17.8	82.2	16.7	1.1	0.0	4.0
Sago pondweed	STUPEC	17.8	82.2	15.6	2.2	0.0	4.4
Eurasian water-milfoil	MYRSPI	13.3	86.7	6.7	3.3	3.3	6.7
Spiny naiad	NAJMAR	13.3	86.7	11.1	2.2	0.0	3.6
Common naiad	NAJFLE	8.9	91.1	8.9	0.0	0.0	1.8
Nitella sp.	—	8.9	91.1	4.4	2.2	2.2	4.4
Northern bladderwort	UTRINT	5.6	94.4	5.6	0.0	0.0	1.1
Common bladderwort	UTRMAC	2.2	97.8	2.2	0.0	0.0	0.4
Curly-leaved pondweed	POTCRI	1.1	98.9	1.1	0.0	0.0	0.2
Small pondweed	POTPUS	1.1	98.9	1.1	0.0	0.0	0.2
Eel-grass	VALAME	1.1	98.9	1.1	0.0	0.0	0.2
Filamentous Algae	—	0.0					

Table 14.0. - Continued

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.76
Date:	7/30/2012	Sites with plants:	25	SE Mean species/site:	0.20
Secchi (ft):	12.8	Sites with native plants:	24	Mean native species/site:	1.48
Maximum Plant Depth (ft):	20.0	Number of species:	10	SE Mean natives/site:	0.17
Trophic Status:	Mesotrophic	Number of native species:	8	Species diversity:	0.85
		Maximum species/site:	4	Native diversity:	0.81

Depth: 0 to 5 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	41.4	58.6	10.3	17.2	13.8	26.2
Coontail	CERDEM	34.5	65.5	20.7	6.9	6.9	15.2
Nitella sp.	—	20.7	79.3	10.3	3.4	6.9	11.0
Sago pondweed	STUPEC	20.7	79.3	13.8	6.9	0.0	6.9
Illinois pondweed	POTILL	17.2	82.8	13.8	3.4	0.0	4.8
Spiny naiad	NAJMAR	13.8	86.2	6.9	6.9	0.0	5.5
Common naiad	NAJFLE	10.3	89.7	10.3	0.0	0.0	2.1
Eurasian water-milfoil	MYRSPI	6.9	93.1	6.9	0.0	0.0	1.4
Curly-leaved pondweed	POTCRI	3.4	96.6	3.4	0.0	0.0	0.7
Eel-grass	VALAME	3.4	96.6	3.4	0.0	0.0	0.7
Filamentous Algae	—	0.0					

Table 14.0. - Continued

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.93
Date:	7/30/2012	Sites with plants:	23	SE Mean species/site:	0.29
Secchi (ft):	12.8	Sites with native plants:	23	Mean native species/site:	1.56
Maximum Plant Depth (ft):	20.0	Number of species:	9	SE Mean natives/site:	0.21
Trophic Status:	Mesotrophic	Number of native species:	8	Species diversity:	0.83
		Maximum species/site:	6	Native diversity:	0.77

Depth: 5 to 10 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	63.0	37.0	22.2	25.9	14.8	34.8
Coontail	CERDEM	25.9	74.1	11.1	11.1	3.7	12.6
Spiny naiad	NAJMAR	22.2	77.8	22.2	0.0	0.0	4.4
Eurasian water-milfoil	MYRSPI	18.5	81.5	7.4	11.1	0.0	8.1
Illinois pondweed	POTILL	18.5	81.5	18.5	0.0	0.0	3.7
Sago pondweed	STUPEC	18.5	81.5	18.5	0.0	0.0	3.7
Common naiad	NAJFLE	14.8	85.2	14.8	0.0	0.0	3.0
Northern bladderwort	UTRINT	11.1	88.9	11.1	0.0	0.0	2.2
Nitella sp.	—	3.7	96.3	3.7	0.0	0.0	0.7
Filamentous Algae	—	0					

Table 14.0. - Continued

County:	Kosciusko	Total Sites:	90	Mean species/site:	1.75
Date:	7/30/2012	Sites with plants:	23	SE Mean species/site:	0.20
Secchi (ft):	12.8	Sites with native plants:	20	Mean native species/site:	1.50
Maximum Plant Depth (ft):	20.0	Number of species:	10	SE Mean natives/site:	0.23
Trophic Status:	Mesotrophic	Number of native species	8	Species diversity:	0.81
		Maximum species/site:	4	Native diversity:	0.76

Depth: 10 to 15 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Chara sp.	—	62.5	37.5	33.3	12.5	16.7	30.8
Coontail	CERDEM	20.8	79.2	8.3	0.0	12.5	14.2
Illinois pondweed	POTILL	20.8	79.2	20.8	0.0	0.0	4.2
Sago pondweed	STUPEC	20.8	79.2	20.8	0.0	0.0	4.2
Eurasian water-milfoil	MYRSPI	16.7	83.3	8.3	0.0	8.3	10.0
Spiny naiad	NAJMAR	8.3	91.7	8.3	0.0	0.0	1.7
Northern bladderwort	UTRINT	8.3	91.7	8.3	0.0	0.0	1.7
Common bladderwort	UTRMAC	8.3	91.7	8.3	0.0	0.0	1.7
Common naiad	NAJFLE	4.2	95.8	4.2	0.0	0.0	0.8
Nitella sp.	—	4.2	95.8	0.0	4.2	0.0	2.5
Filamentous Algae	—	0.0					

Table 14.0. - Continued

County:	Kosciusko	Total Sites:	90			Mean species/site:	0.80
Date:	7/30/2012	Sites with plants:	5			SE Mean species/site:	0.29
Secchi (ft):	12.8	Sites with native plants:	5			Mean native species/site:	0.70
Maximum Plant Depth (ft):	20.0	Number of species:	5			SE Mean natives/site:	0.26
Trophic Status:	Mesotrophic	Number of native species:	4			Species diversity:	0.75
		Maximum species/site:	2			Native diversity:	0.69

Depth: 15 to 20 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	30.0	70.0	20.0	10.0	0.0	10.0
Chara sp.	—	20.0	80.0	10.0	0.0	10.0	12.0
Eurasian water-milfoil	MYRSPI	10.0	90.0	0.0	0.0	10.0	10.0
Illinois pondweed	POTILL	10.0	90.0	10.0	0.0	0.0	2.0
Small pondweed	POTPUS	10.0	90.0	10.0	0.0	0.0	2.0
Filamentous Algae	—	0.0					

Table 15.0. Little Chapman Lake summary of frequency and dominance values of aquatic macrophytes partitioned by depth and calculated from data collected during the post-treatment survey (July 2012).

County:	Kosciusko	Total Sites:	49	Mean species/site:	1.51
Date:	7/30/2012	Sites with plants:	39	SE Mean species/site:	0.18
Secchi (ft):	7.5	Sites with native plants:	39	Mean native species/site:	1.41
Maximum Plant Depth (ft):	15.0	Number of species:	9	SE Mean natives/site:	0.16
Trophic Status:	Eutrophic	Number of native species:	7	Species diversity:	0.78
		Maximum species/site:	5	Native species diversity:	0.75

All Depths (0 to 15 ft)		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	57.1	42.9	24.5	18.4	14.3	30.2
Chara sp.	—	26.5	73.5	16.3	6.1	4.1	11.0
Eel-grass	VALAME	26.5	73.5	18.4	8.2	0.0	8.6
Common naiad	NAJFLE	12.2	87.8	6.1	6.1	0.0	4.9
Brittle naiad	NAJMIN	8.2	91.8	8.2	0.0	0.0	1.6
Sago pondweed	STUPEC	8.2	91.8	6.1	2.0	0.0	2.4
Small pondweed	POTPUS	6.1	93.9	6.1	0.0	0.0	1.2
Broad-leaved pondweed	POTAMP	4.1	95.9	4.1	0.0	0.0	0.8
Spiny naiad	NAJMAR	2.0	98.0	2.0	0.0	0.0	0.4
Filamentous Algae	—	0.0					

Table 15.0. - Continued

County: Kosciusko	Total Sites: 49			Mean species/site: 1.27	
Date: 7/30/2012	Sites with plants: 18			SE Mean species/site: 0.20	
Secchi (ft): 7.5	Sites with native plants: 18			Mean native species/site: 1.23	
Maximum Plant Depth (ft): 15.0	Number of species: 7			SE Mean natives/site: 0.19	
Trophic Status: Eutrophic	Number of native species: 6			Species diversity: 0.66	
	Maximum species/site: 3			Native diversity: 0.64	

Depth: 0 to 5 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0.0**	**1.0**	**3.0**	**5.0**	**Dominance**
Coontail	CERDEM	68.2	31.8	27.3	22.7	18.2	37.3
Chara sp.	—	22.7	77.3	4.5	13.6	4.5	13.6
Eel-grass	VALAME	13.6	86.4	9.1	4.5	0.0	4.5
Common naiad	NAJFLE	9.1	90.9	0.0	9.1	0.0	5.5
Spiny naiad	NAJMAR	4.5	95.5	4.5	0.0	0.0	0.9
Broad-leaved pondweed	POTAMP	4.5	95.5	4.5	0.0	0.0	0.9
Small pondweed	POTPUS	4.5	95.5	4.5	0.0	0.0	0.9
Filamentous Algae	—	0.0					

Table 15.0. - Continued

County:	Kosciusko	Total Sites:	49	Mean species/site:	2.29
Date:	7/30/2012	Sites with plants:	14	SE Mean species/site:	0.37
Secchi (ft):	7.5	Sites with native plants:	14	Mean native species/site:	2.29
Maximum Plant Depth (ft):	15.0	Number of species:	7	SE Mean natives/site:	0.37
Trophic Status:	Eutrophic	Number of native species:	6	Species diversity:	0.83
		Maximum species/site:	5	Native diversity:	0.83

Depth: 5 to 10 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Eel-grass	VALAME	58.8	41.2	41.2	17.6	0.0	18.8
Coontail	CERDEM	47.1	52.9	35.3	11.8	0.0	14.1
Chara sp.	—	41.2	58.8	41.2	0.0	0.0	8.2
Common naiad	NAJFLE	23.5	76.5	17.6	5.9	0.0	7.1
Brittle naiad	NAJMIN	23.5	76.5	23.5	0.0	0.0	4.7
Sago pondweed	STUPEC	23.5	76.5	17.6	5.9	0.0	7.1
Small pondweed	POTPUS	11.8	88.2	11.8	0.0	0.0	2.4
Filamentous Algae	—	0					

County:	Kosciusko	Total Sites:	49	Mean species/site:	0.70
Date:	7/30/2012	Sites with plants:	7	SE Mean species/site:	0.15
Secchi (ft):	7.5	Sites with native plants:	7	Mean native species/site:	0.70
Maximum Plant Depth (ft):	15.0	Number of species:	3	SE Mean natives/site:	0.15
Trophic Status:	Eutrophic	Number of native species:	3	Species diversity:	0.45
		Maximum species/site:	1	Native diversity:	0.45

Depth: 10 to 15 ft		**Frequency of**	**Rake score frequency per species**				**Plant**
Species	**ID**	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	CERDEM	50.0	50.0	0.0	20.0	30.0	42.0
Chara sp.	—	10.0	90.0	0.0	0.0	10.0	10.0
Broad-leaved pondweed	POTAMP	10.0	90.0	10.0	0.0	0.0	2.0
Filamentous Algae	—	0.0					

7.0. APPENDICES

7.1. Chapman Lakes Tier II Data Sheets—Pre-treatment Survey (May 2012)

WATERBODY NAME: Chapman Lake	DATE: 05/24/2012-05/25/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft):11.5
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS :
RECORDER: Robin W. Scribailo	POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Point ID	R/T	Easting	Northing	Depth (ft)	Species Codes: CHACON	VALAME	POTCRI	CERDEM	MYRSPI	NUPVAR	HETDUB	VALAME	POTFRI																			NOTES
1	T	600885.000	4570470.000	2.0	3					1																						
2	T	600963.000	4570330.000	2.0	1	1	1			1																						
3	T	600993.000	4570210.000	2.0			1	1	1	1																						
4	T	600933.000	4570160.000	2.0				5		1																						
5	T	601016.000	4570190.000	2.5			1	1		1																						
6	T	601055.000	4570190.000	2.5				3	1	1																						
7	T	601132.000	4570150.000	3.0				1		1																						
8	T	601141.000	4570110.000	3.0				1		1																						
9	T	601143.000	4570090.000	3.0			1	3	1	1																						
10	T	601135.000	4569970.000	3.0				1	1	1																						MUP
11	T	601142.000	4569860.000	3.0				1	1																							
12	T	601140.000	4569780.000	3.5				1	1		1	1																				
13	T	601055.000	4569770.000	4.0																												0
14	T	600936.000	4569720.000	4.0	5			3	5																							
15	T	600954.000	4569640.000	4.0				1	5	3																						
16	T	600982.000	4569570.000	5.0				1	5	3			1																			
17	T	601031.000	4569530.000	5.0				1	1																							
18	T	601031.000	4569590.000	5.0				1																								
19	T	601115.000	4569490.000	5.0				1	1																							
20	T	601126.000	4570240.000	2.0	1			1	1				1																			

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Pre-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 05/24/2012-05/25/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft):11.5
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…):
RECORDER: Robin W. Scribailo	POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	MYRSPI	POTFRI	CERDEM	CHACON	VALAME	NAJFLE																			NOTES
21	T	601213.000	4570260.000	5.0	3	1																							
22	T	601182.000	4570160.000	5.0																									0
23	T	601275.000	4570220.000	5.0		1	1	1																					
24	T	601364.000	4570130.000	5.5			1	1	1																				
25	T	601383.000	4570090.000	5.5		1	1	1	1																				
26	T	601216.000	4570110.000	6.0	1		1		1																				
27	T	601385.000	4570020.000	6.0																									0
28	T	601427.000	4570000.000	6.0	1	1	1		1																				
29	T	601530.000	4569870.000	6.0	1		1																						
30	T	601571.000	4569790.000	7.0	1				1																				
31	T	601583.000	4569710.000	7.5	1		1		1																				
32	T	601626.000	4569590.000	7.5	3				1																				
33	T	601601.000	4569470.000	8.0	1	1	1		1	1																			
34	T	601564.000	4569480.000	8.0																									0
35	T	601582.000	4569400.000	9.0		1																							
36	T	601550.000	4569380.000	9.0		1		1																					
37	T	601502.000	4569320.000	9.5	1		1																						
38	T	601470.000	4569300.000	9.5	1		1		1																				
39	T	601445.000	4569270.000	10.0	1		1		1																				
40	T	601361.000	4569230.000	10.0			1		1																				

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Pre-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 05/24/2012-05/25/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft): 11.5
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes –. POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: Robin W. Scribailo	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	CERDEM	MYRSPI	MYMODT	CHACON	NITFLE	STUPEC	SCHTAB	ELOCAN	POTCRI																		NOTES
41	T	601303.000	4569240.000	11.0	1																										
42	T	601322.000	4569200.000	12.0	1	1																									
43	T	601237.000	4569200.000	13.0	1																										
44	T	601231.000	4569180.000	13.0	1																										
45	T	601152.000	4569200.000	13.0	5	3	3																								
46	T	601122.000	4569220.000	13.0	5	3	3																								
47	T	601232.000	4569290.000	14.0		3		5																							
48	T	601113.000	4569390.000	14.0	1																										
49	T	601133.000	4569460.000	15.0	1																										
50	T	602139.000	4571120.000	2.0		1			1																						
51	T	602157.000	4571060.000	2.0	1	3				1																					
52	T	602232.000	4571010.000	2.0	1			1			1																				
53	T	602071.000	4571040.000	2.0	1	5				1																					
54	T	602059.000	4570900.000	2.0																											0
55	T	601981.000	4570950.000	2.0		5		3		1																					
56	T	601967.000	4571050.000	3.0					1			1																				
57	T	601866.000	4571020.000	3.0	5	3		1	3				1																		
58	T	601811.000	4570960.000	3.0																											0
59	T	601727.000	4570880.000	3.0				1		1																					
60	T	601654.000	4570960.000	3.0					5				1																		

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Pre-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 05/24/2012-05/25/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft): 11.5
SITE ID:	MAXIMUM PLANT DEPTH (ft):20
SURVEYING ORGANIZATION: Aquatic restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS: POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: Robin W. Scribailo	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Point ID	R/T	Easting	Northing	Depth (ft)	Species Codes: CERDEM	CHACON	POTILL	SCHTAB	MYRSPI	POTCRI	UTRINT	NITFLE	NUPADV																			NOTES
61	T	601583.000	4571020.000	3.0	1																											
62	T	601741.000	4571040.000	3.0	1	3	3																									
63	T	601586.000	4570760.000	3.0		1		1																								
64	T	601457.000	4570770.000	3.0	1				1	1																						
65	T	601397.000	4570760.000	4.0				1																								
66	T	601350.000	4570710.000	4.0		1																										
67	T	601520.000	4571180.000	4.0	1																											
68	T	601507.000	4571230.000	5.0	3				5																							
69	T	601434.000	4571190.000	5.0		3					1																					
70	T	601453.000	4571110.000	5.0		3																										
71	T	601315.000	4571100.000	5.0		1	1																									
72	T	601241.000	4571110.000	5.0					5	1		3																				
73	T	601158.000	4571120.000	5.0																												0
74	T	601091.000	4570610.000	5.0		3																										
75	T	600904.000	4570590.000	5.0	1				5	1																						
76	T	600890.000	4570550.000	5.0		5							3																			
77	T	600829.000	4570750.000	5.0		5				1																						
78	T	600713.000	4570910.000	5.0		3																										
79	T	600498.000	4570830.000	6.0								3																				
80	T	600431.000	4570760.000	6.0					5																							

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Pre-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 05/24/2012-05/25/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft): 11.5
SITE ID:	MAXIMUM PLANT DEPTH (ft):20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: Robin W. Scribailo	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	MYRSPI	POTFRI	CHACON	NYMODT	POTILL	UTRINT	CERDEM	SCHTAB	NITFLE	VALAME	NOTES
81	T	600403.000	4570750.000	6.0	5	1									
82	T	600353.000	4570780.000	6.0	1	1	5	1							
83	T	600405.000	4570960.000	6.0			3		1						
84	T	600475.000	4571050.000	6.0			3		1	1					
85	T	600424.000	4571030.000	7.0		1									
86	T	600633.000	4571200.000	7.0	1										
87	T	600732.000	4571250.000	7.0			3				1				
88	T	600766.000	4571290.000	7.0			3								
89	T	600856.000	4571280.000	8.0	5										
90	T	600937.000	4571260.000	8.0			1								
91	T	601059.000	4571200.000	9.0			3								
92	T	601224.000	4571180.000	8.0		1	1								
93	T	601319.000	4571180.000	9.0			3					1			
94	T	601352.000	4571330.000	9.0	5						1				
95	T	601379.000	4571430.000	9.0							1		1		
96	T	601347.000	4571480.000	9.0							3		1		
97	T	601276.000	4571440.000	10.0			1								
98	T	601270.000	4571600.000	9.0		1	1			1				1	
99	T	601539.000	4571750.000	9.0	5						1				
100	T	601481.000	4571820.000	8.0	1					1			3		

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Pre-treatment Survey continued.

WATERBODY NAME: Chapman Lake	**DATE:** 05/24/2012-05/25/2012
COUNTY: Kosciusko	**SECCHI DEPTH (ft):** 11.5
SITE ID:	**MAXIMUM PLANT DEPTH (ft):** 20
SURVEYING ORGANIZATION: Aquatic Restoration	**WEATHER:** Clear
CREW LEADER: Robin W. Scribailo	**COMMENTS :** **POINTS 1-2 = sites in channel between Big and Little Chapman Lakes** **POINTS 3-49 = Sites in Little Chapman Lake** **POINTS 50-139 = Sites in Big Chapman Lake**
RECORDER: Robin W. Scribailo	
CONTACT INFO: rscribailo@pnc.edu	***Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.***

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	MYRSPI	CHACON	STUPEC	POTILL	CERDEM	NITFLE	POTCRI	MYRSIB	POTFRI	UTRINT	NOTES
101	T	601664.000	4571820.000	9.0	1	1	1								
102	T	601667.000	4571940.000	9.0											0
103	T	601753.000	4572060.000	9.0	1	1									
104	T	601834.000	4572280.000	10.0		3									
105	T	601867.000	4572180.000	10.0		5									
106	T	601856.000	4572110.000	11.0	1	1		1							
107	T	601860.000	4572010.000	11.0		1									
108	T	601878.000	4571920.000	11.0			1	1	1						
109	T	601890.000	4571860.000	11.0	1	1	3								
110	T	601806.000	4571920.000	11.0						5					
111	T	601781.000	4571850.000	12.0			1			5	1	1			
112	T	601812.000	4571800.000	13.0		1		1							
113	T	601937.000	4571780.000	13.0		3									
114	T	601834.000	4571700.000	13.0	5				3						
115	T	601864.000	4571660.000	13.0	5				1				1		
116	T	601800.000	4571650.000	13.0					1						
117	T	601910.000	4571560.000	13.0	5				1						
118	T	601928.000	4571520.000	14.0	5				3						
119	T	601885.000	4571500.000	14.0					1	1					
120	T	602082.000	4571530.000	15.0			1		1			1		1	

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Pre-treatment Survey continued.

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WATERBODY NAME: Chapman Lake	DATE: 05/24/2012-05/25/2012	Aquatic Restoration Systems AQRS, LLC
COUNTY: Kosciusko	SECCHI DEPTH (ft):11.5	
SITE ID:	MAXIMUM PLANT DEPTH (ft):20	
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear	
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake	
RECORDER: Robin W. Scribailo		
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*	

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	CERDEM	POTCRI	POTILL	POTGRA	STUPEC	CHACON	POTAMP	UTRINT	UTRMAC	MYRSIB	NAJFLE	VALAME	POTFRI	NITFLE	MYRSPI												NOTES
121	T	602016.000	4571430.000	15.0	1	1																									
122	T	602028.000	4571680.000	15.0			1																								
123	T	602107.000	4571600.000	15.0				1	1	1	1	1																			
124	T	602185.000	4571520.000	15.0					1	1			1																		
125	T	602119.000	4571320.000	15.0	3									1																	
126	T	602200.000	4571360.000	15.0						1																					
127	T	602279.000	4571370.000	15.0	1				1																						
128	T	602310.000	4571200.000	15.0	1					1					1	1															
129	T	602105.000	4571430.000	15.0			1																								
130	T	602320.000	4571521.000	17.0				1		1																					
131	T	602122.000	4571231.000	17.0						1																					0
132	T	601875.000	4571425.000	19.0																											0
133	T	601753.000	4571675.000	19.0																											0
134	T	601834.000	4571525.000	19.0	1										1		1	1													
135	T	601867.000	4571325.000	20.0																											0
136	T	601856.000	4571610.000	20.0			1		1	1																					
137	T	601860.000	4571670.000	20.0	1														5												
138	T	601878.000	4571520.000	20.0	3														3												
139	T	601890.000	4571250.000	20.0																											0

Other plant species observed at lake:

7.2. Chapman Lakes Tier II Data Sheets—Post-treatment Survey (July 2012)

WATERBODY NAME: Chapman Lake	DATE: 07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft):12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Point ID	R/T	Easting	Northing	Depth (ft)	Species Codes: CERDEM	VALAME	NYMODT	NUPADV	NUPVAR	POTPUS	CHACON	NAJFLE	NAJMAR																	NOTES
1	T	600885.000	4570470.000	2.0				3			3	3	1																	
2	T	600963.000	4570330.000	2.0		3						3																		
3	T	600993.000	4570210.000	2.0																										0
4	T	600933.000	4570160.000	2.0	5																									
5	T	601016.000	4570190.000	2.5	5																									
6	T	601055.000	4570190.000	2.5	3																									
7	T	601132.000	4570150.000	3.0																										0
8	T	601141.000	4570110.000	3.0	1																									Alg
9	T	601143.000	4570090.000	3.0	5																									
10	T	601135.000	4569970.000	3.0																										0
11	T	601142.000	4569860.000	3.0	5																									
12	T	601140.000	4569780.000	3.5	3						5																			
13	T	601055.000	4569770.000	4.0																										0
14	T	600936.000	4569720.000	4.0	1						3																			
15	T	600954.000	4569640.000	4.0	3	1		3			1																			
16	T	600982.000	4569570.000	5.0	3		3	3	3	1																				
17	T	601031.000	4569530.000	5.0	3																									
18	T	601031.000	4569590.000	5.0	1																									
19	T	601115.000	4569490.000	5.0		1																								
20	T	601126.000	4570240.000	5.0	1																									

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Post-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE:07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft):12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	CHACON	CHAHAI	POTAMP	CERDEM	VALAME	NAJFLE	NAJMIN	POTPUS	STUPEC																	NOTES
21	T	601213.000	4570260.000	5.0	3	1	1	1																						
22	T	601182.000	4570160.000	5.0				1																						
23	T	601275.000	4570220.000	5.5		1		3	1																					
24	T	601364.000	4570130.000	5.5																										0
25	T	601383.000	4570090.000	6.0				1	3																					
26	T	601216.000	4570110.000	6.0																										0
27	T	601385.000	4570020.000	6.0				1																						
28	T	601427.000	4570000.000	6.0					1	3	1	1																		
29	T	601530.000	4569870.000	7.0									1																	
30	T	601571.000	4569790.000	7.5	1				3				3																	
31	T	601583.000	4569710.000	7.5		1			1		1		1																	
32	T	601626.000	4569590.000	8.0	1	1				1	1																			
33	T	601601.000	4569470.000	8.0				1	1																					
34	T	601564.000	4569480.000	9.0																										0
35	T	601582.000	4569400.000	9.0				1	1																					
36	T	601550.000	4569380.000	9.5	1			1				1																		
37	T	601502.000	4569320.000	9.5	1			3	1				1																	
38	T	601470.000	4569300.000	10.0					3	1																				
39	T	601445.000	4569270.000	10.0	1			1	1	1	1																			
40	T	601361.000	4569230.000	10.5			1																							

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Post-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft): 12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Point ID	R/T	Easting	Northing	Depth (ft)	CERDEM	NUMODT	CHACON	STUPEC	MYRSPI	SCHTAB	VALAME	NAJMAR	NITTLE	CHAHAI	NOTES
					Species Codes:										
41	T	601303.000	4569240.000	11.0											0
42	T	601322.000	4569200.000	12.0	5										
43	T	601237.000	4569200.000	13.0	3										
44	T	601231.000	4569180.000	13.0	3										
45	T	601152.000	4569200.000	13.0	5	3									
46	T	601122.000	4569220.000	13.0	5	3									
47	T	601232.000	4569290.000	14.0			5	1							
48	T	601113.000	4569390.000	14.0											0
49	T	601133.000	4569460.000	15.0											0
50	T	602139.000	4571120.000	2.0											0
51	T	602157.000	4571060.000	2.0	1				3	1					
52	T	602232.000	4571010.000	2.0			1		1		1	1			
53	T	602071.000	4571040.000	2.0	1										
54	T	602059.000	4570900.000	2.0											0
55	T	601981.000	4570950.000	2.0	3							1			
56	T	601967.000	4571050.000	3.0											0
57	T	601866.000	4571020.000	3.0	5								1		
58	T	601811.000	4570960.000	3.0											0
59	T	601727.000	4570880.000	3.0				1						5	
60	T	601654.000	4570960.000	3.0									5		

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Post-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft): 12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft):20
SURVEYING ORGANIZATION: Aquatic restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Point ID	R/T	Easting	Northing	Depth (ft)	NAJMAR	STUPEC	NUPADV	CHACON	CERDEM	POTILL	NAJFLE	NITFLE	MYRSPI	SCHTAB	POTCRI	CHAHAI	NOTES
61	T	601583.000	4571020.000	3.0					1			3					
62	T	601741.000	4571040.000	3.0				5		3							
63	T	601586.000	4570760.000	3.0				1		1							
64	T	601457.000	4570770.000	3.0				5	1								
65	T	601397.000	4570760.000	4.0		1		3						1			
66	T	601350.000	4570710.000	4.0				1	1		1				1	1	
67	T	601520.000	4571180.000	4.0					3								
68	T	601507.000	4571230.000	5.0									3				
69	T	601434.000	4571190.000	5.0	3			3			1						
70	T	601453.000	4571110.000	5.0	1	1					1						
71	T	601315.000	4571100.000	5.0				3		1							
72	T	601241.000	4571110.000	5.0					1			1					
73	T	601158.000	4571120.000	5.0								5					
74	T	601091.000	4570610.000	5.0								1					
75	T	600904.000	4570590.000	5.0					5								
76	T	600890.000	4570550.000	5.0	3	3	3	3									
77	T	600829.000	4570750.000	5.0				5		1							
78	T	600713.000	4570910.000	5.0				1		1							
79	T	600498.000	4570830.000	6.0													0
80	T	600431.000	4570760.000	6.0				5									

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Post-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft): 12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft):20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Point ID	R/T	Easting	Northing	Depth (ft)	Species Codes: CHACON	POTILL	NYMODT	CHAHAI	NAJFLE	NAJMAR	UTRINT	CERDEM	NITFLE	MYRSPI	SCHTAB	STUPEC	NOTES
81	T	600403.000	4570750.000	6.0	1	1											
82	T	600353.000	4570780.000	6.0	5		3	1									
83	T	600405.000	4570960.000	6.0	1	1	1	1	1	1							
84	T	600475.000	4571050.000	6.0	3	1											
85	T	600424.000	4571030.000	7.0	1			1	1	1	1						
86	T	600633.000	4571200.000	7.0	3							5	1				
87	T	600732.000	4571250.000	7.0	3	1		1									
88	T	600766.000	4571290.000	7.0	3			1		1							
89	T	600856.000	4571280.000	8.0								3	3	3			
90	T	600937.000	4571260.000	8.0													0
91	T	601059.000	4571200.000	9.0	1				1	1							
92	T	601224.000	4571180.000	8.0	5												
93	T	601319.000	4571180.000	9.0	3			1	1						1	1	
94	T	601352.000	4571330.000	9.0							1	1		3		1	
95	T	601379.000	4571430.000	9.0								3					
96	T	601347.000	4571480.000	9.0								3		1			
97	T	601276.000	4571440.000	10.0													0
98	T	601270.000	4571600.000	9.0	1					1	1	1		1		1	
99	T	601539.000	4571750.000	9.0						1		1		3		1	
100	T	601481.000	4571820.000	8.0													0

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Post-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE: 07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft):12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft): 20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	CHACON	STUPEC	POTILL	CHAHAI	UTRINT	NITFLE	CERDEM	MYRSPI																			NOTES
101	T	601664.000	4571820.000	9.0	3	1	1																								
102	T	601667.000	4571940.000	9.0	1																										
103	T	601753.000	4572060.000	9.0	5																										
104	T	601834.000	4572280.000	10.0				3																							
105	T	601867.000	4572180.000	10.0	3			1																							
106	T	601856.000	4572110.000	11.0			1	1																							
107	T	601860.000	4572010.000	11.0	1		1	1	1																						
108	T	601878.000	4571920.000	11.0	1	1	1	1	1																						
109	T	601890.000	4571860.000	11.0	1			1																							
110	T	601806.000	4571920.000	11.0																											0
111	T	601781.000	4571850.000	12.0						3	1																				
112	T	601812.000	4571800.000	13.0	3						1																				
113	T	601937.000	4571780.000	13.0	3																										
114	T	601834.000	4571700.000	13.0								5																			
115	T	601864.000	4571660.000	13.0								5																			
116	T	601800.000	4571650.000	13.0							5																				
117	T	601910.000	4571560.000	13.0							5																				
118	T	601928.000	4571520.000	14.0							5																				
119	T	601885.000	4571500.000	14.0	1							1																			
120	T	602082.000	4571530.000	15.0	1	1																									

Other plant species observed at lake:

Chapman Lakes Tier II Data Sheets—Post-treatment Survey continued.

WATERBODY NAME: Chapman Lake	DATE:07/30/2012
COUNTY: Kosciusko	SECCHI DEPTH (ft):12.8
SITE ID:	MAXIMUM PLANT DEPTH (ft):20
SURVEYING ORGANIZATION: Aquatic Restoration	WEATHER: Clear
CREW LEADER: Robin W. Scribailo	COMMENTS (Include voucher codes – V1, V2…): POINTS 1-2 = sites in channel between Big and Little Chapman Lakes POINTS 3-49 = Sites in Little Chapman Lake POINTS 50-139 = Sites in Big Chapman Lake
RECORDER: M. S. Alix; malix@pnc.edu	
CONTACT INFO: rscribailo@pnc.edu	*Rake score (1, 3, or 5). 9 = algae, emergent, or species observed but not sampled.*

Aquatic Restoration Systems AQRS, LLC

Species Codes:

Point ID	R/T	Easting	Northing	Depth (ft)	MYRSPI	CERDEM	CHACON	POTILL	POTPUS	UTRMAR	CHAHAI	STUPEC	NAJMAC	POTNOD	NAJFLE	NOTES
121	T	602016.000	4571430.000	15.0												0
122	T	602028.000	4571680.000	15.0			1			1	1					
123	T	602107.000	4571600.000	15.0			5	1				1				
124	T	602185.000	4571520.000	15.0			5						1			
125	T	602119.000	4571320.000	15.0	1											
126	T	602200.000	4571360.000	15.0			3			1						
127	T	602279.000	4571370.000	15.0			1					1				
128	T	602310.000	4571200.000	15.0			1					1	1		1	**
129	T	602105.000	4571430.000	15.0			5	1								
130	T	602320.000	4571521.000	17.0			1									
131	T	602122.000	4571231.000	17.0												0
132	T	601875.000	4571425.000	19.0												0
133	T	601753.000	4571675.000	19.0												0
134	T	601834.000	4571525.000	19.0		1			1							
135	T	601867.000	4571325.000	20.0												0
136	T	601856.000	4571610.000	20.0			5	1								
137	T	601860.000	4571670.000	20.0	5	1										
138	T	601878.000	4571520.000	20.0		3										
139	T	601890.000	4571250.000	20.0												0

Other plant species observed at lake: **128 Large patches of MYRSPI outside of point

7.3. Big Chapman Lake Herbicide Application Permit

			Return to: Page **1** of **2**
	APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT	**FOR OFFICE USE ONLY**	DEPARTMENT OF NATURAL RESOURCES
	State Form 26727 (R4 / 2-04)	License No.	Division of Fish and Wildlife
	Approved State Board of Accounts 2004		Commercial License Clerk
	☐ Whole Lake ☒ Multiple Treatment Areas	Date Issued	402 West Washington Street, Room W273
	Check type of permit		Indianapolis, IN 46204
	INSTRUCTIONS: Please print or type information	Lake County	FEE: $5.00

Applicant's Name	Lake Assoc. Name	
Bill Magurany	Chapman Lakes Association	
Rural Route or Street		Phone Number
69 EMS-C2 Lane		574-269-5654
City and State		ZIP Code
Warsaw, Indiana		46582
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Charlie Hawkins	All Things Water	
Rural Route or Street		Phone Number
29916 Connecticut Avenue		574-596-0829
City and State		ZIP Code
Elkhart, Indiana		46516-1356

Lake (One application per lake)	Nearest Town	County
Big Chapman Lake	Warsaw	Kosciusko
Does water flow into a water supply		☐ Yes ☒ 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 #	see map	LAT/LONG or UTM's	see attached map Big Chapman Lake		
Total acres to be controlled	28	Proposed shoreline treatment length (ft)		Perpendicular distance from shoreline (ft)	on map
Maximum Depth of Treatment (ft)	15	Expected date(s) of treatment(s)	early June 2013		

Treatment method: ☒ Chemical ☐ Physical ☐ Biological Control ☐ Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. 2,4-D granular (Navigate)

Plant survey method: ☐ Rake ☒ Visual ☐ Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian water-milfoil	X	30%
Chara spp.		20%
Coontail		20%
Nitella spp.		20%
Sago pondweed		10%

Treatment Area #	see map	LAT/LONG or UTM's	see attached map Big Chapman Lake (channels with arrows)
Total acres to be controlled	18	Proposed shoreline treatment length (ft)	Perpendicular distance from shoreline (ft)
Maximum Depth of Treatment (ft)	4	Expected date(s) of treatment(s)	Jun-13

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. 2,4-D liquid (DMA-4)

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

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian water-milfoil	X	60%
Curly-leaved pondweed		20%
Sago pondweed		10%
Illinois pondweed		10%

INSTRUCTIONS: Applicant must sign the application and is the only signature required. If applicant is also a certified chemical applicator, sign the "certified applicator" signature box

Applicant Signature	Date
Certified Applicator'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

7.4. Little Chapman Lake Herbicide Application Permit

Return to: Page 1 of 2

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

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT

State Form 26727 (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

FEE: $5.00

Applicant's Name	Lake Assoc. Name	
Bill Magurany	Chapman Lakes Association	
Rural Route or Street		Phone Number
69 EMS-C2 Lane		574-269-5654
City and State		ZIP Code
Warsaw, Indiana		46582
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Charlie Hawkins	All Things Water	
Rural Route or Street		Phone Number
29916 Connecticut Avenue		574-596-0829
City and State		ZIP Code
Elkhart, Indiana		46516-1356

Lake (One application per lake)	Nearest Town	County
Little Chapman Lake	Warsaw	Kosciusko
Does water flow into a water supply	[ ] Yes	[X] No

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

Treatment Area #	see map	LAT/LONG or UTM's	see attached map Little Chapman Lake		
Total acres to be controlled	17	Proposed shoreline treatment length (ft)		Perpendicular distance from shoreline (ft)	on map
Maximum Depth of Treatment (ft)	15	Expected date(s) of treatment(s)	early June 2013		

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. 2,4-D liquid (DMA-4)

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

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian water-milfoil	X	30%
coontail		30%
Chara spp.		20%
Common naiad		10%
Sago pondweed		10%

Treatment Area #	see map	LAT/LONG or UTM's	see attached map Little Chapman Lake (channels with arrows)
Total acres to be controlled	2	Proposed shoreline treatment length (ft)	Perpendicular distance from shoreline (ft)
Maximum Depth of Treatment (ft)	4	Expected date(s) of treatment(s)	Jun-13

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. 2,4-D liquid (DMA-4)

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

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian water-milfoil	X	40%
Curly-leaved pondweed		20%
Sago pondweed		10%
mixed aquatics		30%

INSTRUCTIONS: Applicant must sign the application and is the only signature required. If applicant is also a certified chemical applicator, sign the "certified applicator" signature box

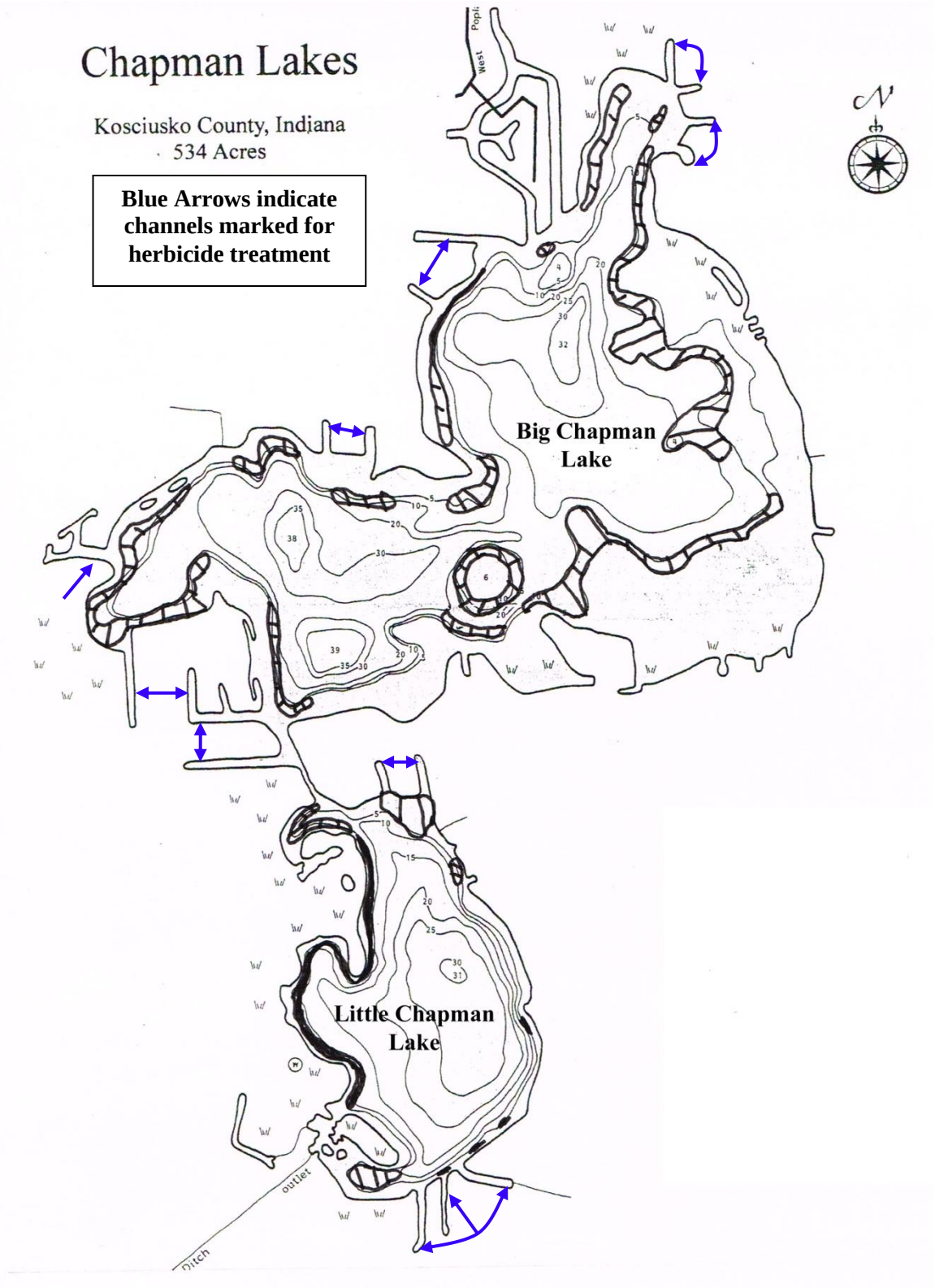
Applicant Signature	Date
Certified Applicator's Signature	Date

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


Chapman Lakes
Kosciusko County, Indiana
534 Acres
Blue Arrows indicate channels marked for herbicide treatment
Big Chapman Lake
Little Chapman Lake
West
outlet
ditch