

Dewart Lake Aquatic Vegetation Management Plan 2008 Update

Kosciusko County, Indiana



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Executive Summary

Dewart Lake was treated with Sonar (active ingredient: fluridone) on May 26, 2006. This treatment was designed to drastically reduce the Eurasian watermilfoil (EWM) population and allow native plants to colonize areas where the milfoil was previously dominant. Surveys by Aquatic Weed Control and the IDNR confirmed that the Sonar treatment had reduced EWM to the point that it was undetectable in fall of 2006.

Eurasian Watermilfoil (EWM) was still undetectable in Dewart Lake in August of 2007. A visual survey was conducted on June 13, 2007 for the presence of EWM, and a late season Tier II survey was conducted on August 15, 2007 to monitor both native and invasive plant populations following the whole lake Sonar treatment in 2006. These surveys found no EWM plants in the lake. Sago pondweed, a beneficial native plant, had become dominant in many areas previously infested by EWM.

In 2007, no herbicide treatments of any kind were conducted on the main lake. This allowed for native plants to re-establish themselves after the 2006 whole lake Sonar treatment. Algae treatments were allowed in the channel behind Blueberry Island.

The 2007 late season vegetation survey showed that many native plants were re-establishing themselves and that Eurasian watermilfoil was still undetectable in Dewart Lake. Aside from EWM the biggest population changes were seen in the coontail and sago pondweed populations. Coontail site frequency dropped from 43.3% in 2006 to 5.6 % in 2007. Sago pondweed frequency increased from 4.4% in 2006 to 28.9% in 2007. Curly leaf pondweed site frequency increased from 1.3% in 2005 to 7.8% in 2006, to 8.9% in 2007.

In 2008, coontail site frequency increased from 5.6% (2007) to 16.7%. This was encouraging to see, because coontail is a native plant whose population had been reduced after the Sonar treatment. Sago pondweed frequency declined only slightly from 28.9% in 2007 to 26.7% in 2008. Water stargrass, another native plant appears to be increasing in the lake. Its site frequency rose from 13.3% in 2007 to 23.3% in 2008. Curly leaf pondweed site frequency declined from 8.9% in 2007 to 1.1% on July 25, 2008. This is encouraging. However, late season Tier II surveys will not accurately describe true curly leaf pondweed abundance. The curly leaf pondweed population should be monitored closely in years to come to ensure that its abundance does not increase in areas where EWM has been reduced.

Eurasian watermilfoil started its return to the lake in 2008. Following visual inspection, four acres were treated with 2, 4-D on June 9, 2008 for EWM control. Nine more acres were treated with 2, 4-D for EWM control on August 6, 2008 using data collected in the late season tier II survey conducted on July 25, 2008.

An emergent vegetation survey in the proposed Dewart Lake Eco-zone area of was conducted by Aquatic Weed Control on August 13, 2008. The main purpose of this survey was to map acreages for emergent plant beds and describe species composition in these beds. This data can be used as a basis for comparison for future surveys on the proposed Eco-zone area.

Control from the Sonar treatment lasted longer than expected, and EWM abundance is still low. However, EWM is expected to have a much greater abundance in Dewart Lake in 2009. It is recommended that funding be set aside to treat up to 45 acres of EWM infestation with 2, 4-D in 2009.

2009 Management Recommendations

1. Chemically treat areas of Eurasian milfoil growth (depths of 3-13 feet)
 - A. Treat up to 45 acres for Eurasian milfoil with 2, 4-D \$16,650
2. The Dewart Lake Protective Association may opt to explore methods of Eurasian watermilfoil control other than herbicide applications.

2009 Surveying and Planning

Conduct a spring visual survey and late season Tier II aquatic vegetation survey to monitor both Eurasian milfoil and native plant populations. Emergent plant bed mapping may be conducted as well.

- A. Aquatic Vegetation Surveys (Tier II and Emergent) and AVMP Update Up to \$6,000

Total Cost Estimates

2, 4-D applications for Eurasian watermilfoil \$16,650

Vegetation surveys and AVMP update \$6,000

Total Estimated Costs: Up to \$22,650

Lake and River Enhancement share \$20,385

Association's share \$2,265

Acknowledgements

Aquatic vegetation surveys conducted on Dewart Lake were made possible by funding from the Dewart Lake Protective Association and the Indiana Department of Natural Resources through the Lake and River Enhancement Program. Aquatic Weed Control would like to extend special thanks to Indiana Department of Natural Resources (IDNR) District 3 biologist Jed Pearson for providing procedural training for Tier II aquatic vegetation surveys. Gwen White and Angela Sturdevant, aquatic biologists for the IDNR Division of Fish and Wildlife provided valuable consultation regarding the requirements and objectives of this lake management plan. Aquatic Weed Control would also like to thank the members of the Dewart Lake Protective Association for their commitment to improving this lake and for valuable discussion and input brought forward at the informational meeting held on July 26, 2008.

Table of Contents

Executive Summary	II
Acknowledgements.....	IV
Table of Contents.....	V
List of Figures	VI
List of Tables	VII
1.0 Introduction.....	8
2.0 Watershed and Lake Characteristics Update	12
3.0 Lake Uses Update.....	12
4.0 Fisheries Update.....	12
5.0 Problem Statement.....	12
6.0 Management Goals and Objectives.....	12
7.0 Plant Management History Update.....	14
8.0 Aquatic Plant Community Characterization Update.....	15
8.1 Methods Update	16
8.2 Tier II Results.....	17
8.3 Macrophyte Inventory Discussion.....	27
9.0 Aquatic Vegetation Management Alternatives	28
10.0 Public Involvement	28
11.0 Public Education	30
11.1 Hydrilla	30
12.0 Integrated Management Action Strategy	31
13.0 Project Budget.....	32
14.0 Monitoring and plan Update Procedures	32
15.0 References.....	33
16.0 Appendices.....	34
16.1 Dewart Lake Proposed Ecozone 2008 Emergent Survey Results.....	34
16.2 Herbicide Calculations	71
16.3 Species Distribution Maps.....	73
16.4 Data Sheets	90
16.5 IDNR Vegetation Control Permit.....	102

List of Figures

Figure 1: Dewart Lake Eurasian Watermilfoil Treatment Areas (shown in red)	14
Figure 2: 2008 Eurasian Watermilfoil Distribution	15
Figure 3: 2008 Curly Leaf Pondweed Locations	16
Figure 4: Dewart Lake Rake Sample Locations	17
Figure 5: Dewart Lake Secchi Depth History	18
Figure 6: Dewart Lake Site Frequency Histories	24
Figure 7: Dewart Lake Dominance Histories	26
Figure 8: 2008 Public Questionnaire	29
Figure 9: Dewart Lake No-Wake Zone Buoy Placement (DLPA, Online Posting)	36
Figure 10: 2008 Dewart Lake Proposed Ecozone Plant Beds	39
Figure 11: Emergent Beds 27 and 28	40
Figure 12: Emergent Bed 1	42
Figure 13: Emergent Bed 2	43
Figure 14: Emergent Bed 3	44
Figure 15: Emergent Bed 4	45
Figure 16: Emergent Bed 5	46
Figure 17: Emergent Bed 6	47
Figure 18: Emergent Bed 7	48
Figure 19: Emergent Bed 8	49
Figure 20: Emergent Bed 9	50
Figure 21: Emergent Bed 10	51
Figure 22: Emergent Bed 11	52
Figure 23: Emergent Bed 12	53
Figure 24: Emergent Bed 13	54
Figure 25: Emergent Bed 14	55
Figure 26: Emergent Bed 15	56
Figure 27: Emergent Bed 16	57
Figure 28: Emergent Bed 17	58
Figure 29: Emergent Bed 18	59
Figure 30: Emergent Bed 19	60
Figure 31: Emergent Bed 20	61
Figure 32: Emergent Bed 21	62
Figure 33: Emergent Bed 22	63
Figure 34: Emergent Bed 23	64
Figure 35: Emergent Bed 24	65
Figure 36: Emergent Bed 25	66
Figure 37: Emergent Bed 26	67
Figure 38: Emergent Bed 27	68
Figure 39: Emergent Bed 28	69
Figure 40: 2008 American Pondweed Locations	73
Figure 41: 2008 Bladderwort Locations	74
Figure 42: 2008 Brittle Naiad Locations	75
Figure 43: 2008 Chara Locations	76
Figure 44: 2008 Coontail Locations	77
Figure 45: 2008 Curly Leaf Pondweed Locations	78
Figure 46: 2008 Eel Grass Locations	79
Figure 47: 2008 Elodea Locations	80
Figure 48: 2008 EWM Locations	81
Figure 49: 2008 Flat- Stemmed Pondweed Locations	82

Figure 50: 2008 Illinois Pondweed Locations	83
Figure 51: 2008 Large Leaf Pondweed Locations	84
Figure 52: 2008 Nitella Locations	85
Figure 53: 2008 Sago Pondweed Locations.....	86
Figure 54: 2008 Slender Naiad Locations	87
Figure 55: 2008 Small Pondweed Locations	88
Figure 56: 2008 Water Stargrass Locations.....	89
Figure 57: July 2008 Data Cover Sheet	90
Figure 58: July 2008 Date Sheet 1	91
Figure 59: July 2008 Data Sheet 2.....	92
Figure 60: July 2008 Data Sheet 3.....	93
Figure 61: August 2008 Emergent Survey Data Sheet 1	94
Figure 62: August 2008 Emergent Survey Data Sheet 2	95

List of Tables

Table 1: Dewart Lake LARE History	9
Table 2: Common and Scientific Plant Names	10
Table 3: July 2008 Data Analysis: Overall	19
Table 4: July 2008 Data Analysis: 0 - 5 Feet.....	20
Table 5: July 2008 Data Analysis: 5 - 10.....	21
Table 6: July 2008 Data Analysis: 10 - 15 Feet.....	21
Table 7: July 2008 Data Analysis: 15 - 20 Feet.....	22
Table 8: Common and Scientific Names of Dewart Lake Emergent Species	38
Table 9: Emergent Plant Bed Statistics Summary	41
Table 10: GPS Coordinates for Rake Sample Locations	96
Table 11: Dewart Emergent Survey Waypoints	98

1.0 Introduction

Dewart Lake has been involved in the Lake and River Enhancement Program (LARE) since 2005, when the first LARE funded aquatic vegetation survey took place on May 19, 2005. Based on the results of the 2005 surveys, a whole lake Sonar treatment was conducted in the following spring on May 26, 2006 for the control of Eurasian watermilfoil. The treatment was successful, and Eurasian watermilfoil was not found in the late season plant surveys of 2006.

In 2007, no herbicide treatments were conducted on the main lake, giving native plants a chance to re-colonize areas of previous EWM infestation. A late season vegetation survey was conducted by Aquatic Weed Control on August 15, 2007. This survey found that EWM was still absent from the lake and that sago pondweed, a beneficial native plant, had become dominant in many areas previously infested by EWM.

Eurasian watermilfoil started its return to the lake in 2008. Following visual inspection, four acres were treated with 2, 4-D on June 9, 2008 for EWM control. Nine more acres were treated with 2, 4-D for EWM control on August 6, 2008 using data collected in the late season tier II survey conducted on July 25, 2008.

An emergent vegetation survey in the proposed Dewart Lake Eco-zone area was conducted by Aquatic Weed Control on August 13, 2008. The main purpose of this survey was to map acreages for emergent plant beds and describe species composition in these beds. . This data can be used as a basis for comparison for future surveys on the proposed Eco-zone area.

Table 1 summarizes all LARE funded activities on Dewart Lake. The original aquatic vegetation management strategy started in 2005 and runs through 2009.

Table 1: Dewart Lake LARE History

Year	Action	Date	Funding Source
2005	Spring and Late Season Aquatic Vegetation Surveys	Spring Survey May 19, 2005	Lake and River Enhancement
	Aquatic Vegetation Management Plan Development	Late Season Survey July 27, 2005	Dewart Lake Protective Association
2006	Whole Lake Sonar Treatment	Spring Survey May 18, 2006	Lake and River Enhancement
	Aquatic Vegetation Surveys and Aquatic Vegetation Management Plan Update	Sonar Treatment May 26, 2006	Dewart Lake Protective Association
		Late Season Survey August 10, 2006	
2007	Visual Vegetation Survey for EWM		Lake and River Enhancement
	No herbicide Treatments allowed to allow native plants to re-establish	Visual Survey June 13, 2007	Dewart Lake Protective Association
	Late Season Aquatic Vegetation Survey and Aquatic Vegetation Management Plan Update	Summer 2007	
2008	Visual Inspection for EWM	June 9, 2008	Lake and River Enhancement
	4 acres of EWM treated with 2, 4-D	June 9, 2008	Dewart Lake Protective Association
	Late Season Aquatic Vegetation Survey	July 25, 2008	
	9 acres of EWM treated with 2, 4-D	August 6, 2008	
	Emergent vegetation survey in proposed Eco-zone area	August 13, 2008	
	AVMP Update		

Table 2 was compiled by the IDNR and gives both common and scientific names of many plants mentioned in this report. It also gives species codes which may be referenced on some data sheets.

Table 2: Common and Scientific Plant Names

Species Code	Scientific Name	Common Name	Vegetation Type
ALGA	Any species of filamentous alga (incl. <i>Spyrogyra</i> , <i>Cladophora</i> , <i>Hydrodictyon</i>)	algae	N
AZO001	<i>Azolla</i> sp.	A mosquito fern species	N
AZOCAR	<i>Azolla caroliniana</i>	Carolina mosquito fern	N
AZOMEX	<i>Azolla mexicana</i>	Mexican mosquito fern	N
CERDEM	<i>Ceratophyllum demersum</i>	coontail	S
CHARA	<i>Chara</i> sp.	A chara species	S
EGEDEN	<i>EGERIA DENSA</i>	BRAZILIAN ELODEA	S
ELOCAN	<i>Elodea Canadensis</i>	Canada waterweed	S
ELONUT	<i>Elodea nuttallii</i>	western waterweed	S
HYIVER	<i>HYDRILLA VERTICILLATA</i>	HYDRILLA	S
LEM001	<i>Lemna</i> sp.	duckweeds (species within Lemnaceae)	N
LEMMIO	<i>Lemna minor</i>	small or common duckweed	N
LEMTRI	<i>Lemna trisulca</i>	star duckweed	N
LUDDEC	<i>Ludwigia decurrens</i>	primrose-willow	F
MYRSIB	<i>Myriophyllum sibiricum</i>	northern watermilfoil	S
MYRSPI	<i>MYRIOPHYLLUM SPICATUM</i>	EURASIAN WATERMILFOIL	S
MYR001	<i>Myriophyllum</i> sp.	a watermilfoil species	S
NAJFLE	<i>Najas flexilis</i>	slender naiad	S
NAJGRA	<i>Najas gracillima</i>	Northern naiad	S
NAJGUA	<i>Najas guadalupensis</i>	Southern naiad	S
NAJMIN	<i>NAJAS MINOR</i>	BRITTLE WATERNYMPH	S
NELLUT	<i>Nelumbo lutea</i>	American lotus	F
NITELL	<i>Nitella</i> sp.	a nitella species	S
NOAQVG		no aquatic vegetation at site	N
NUPADV	<i>Nuphar advena</i>	spatterdock	F
NUPVAR	<i>Nuphar variegata</i> (formerly <i>N. luteum</i>)	bullhead lily (yellow pond lily)	F
NYMODT	<i>Nymphaea oderata subsp. tuberosa</i>	white water lily (fragrant water lily)	F

POTCRI	<i>POTAMOGETON CRISPUS</i>	CURLY-LEAF PONDWEED	S
POTEPI	<i>Potamogeton epihydrus</i>	ribbon-leaf pondweed	S
POTFOF	<i>Potamogeton foliosus</i>	leafy pondweed	S
POTGRA	<i>Potamogeton gramineus</i>	variable pondweed	S
POTILL	<i>Potamogeton illinoensis</i>	Illinois pondweed	S
POTNLV	<i>Potamogeton foliosus</i> , <i>P. pusillus</i> , or other unidentified narrow-leaved pondweeds	narrow-leaved pondweeds	S
POTNOD	<i>Potamogeton nodosus</i> (formerly <i>P. americanus</i>)	American pondweed	S
POTPRA	<i>Potamogeton praelongus</i>	white-stemmed pondweed	S
POTPUP	<i>Potamogeton pusillus</i>	small pondweed	S
POTRIC	<i>Potamogeton richardsonii</i>	Richardson's pondweed	S
POTZOS	<i>Potamogeton zosteriformis</i>	flat-stemmed pondweed	S
RANFLA	<i>Ranunculus flabellaris</i>	yellow water crowfoot (yellow water buttercup)	S
RANLON	<i>Ranunculus longirostris</i> (incl. <i>R. trichophyllus</i>)	white water crowfoot (rigid white water crowfoot)	S
RICCIA	<i>Riccia</i> sp., <i>Ricciocarpus</i> sp.	A liverwort species	N
SPIPOL	<i>Spirodela polyrhiza</i>	greater duckweed	N
STUPEC	<i>Stuckenia pectinata</i>	sago pondweed	S
UNKN01		Unknown specimen No. 1	
UNKN02		Unknown specimen No. 2	
UTRMAC	<i>Utricularia macrorhiza</i> (also known as <i>U. vulgaris</i>)	common bladderwort	S
VALAME	<i>Vallisneria americana</i>	wild celery or eel grass	S
WOA001	<i>Wolffia</i> sp.	A watermeal species	N
WOACOL	<i>Wolffia columbiana</i>	watermeal	N
ZANPAL	<i>Zannichellia palustris</i>	horned pondweed	S
ZOSDUB	<i>Zosterella dubia</i> (also known as <i>Heteranthera dubia</i>)	water stargrass	S

Note: The scientific and common names of EXOTIC species are shown in ALL CAPITAL LETTERS.

Key to Vegetation Types:

F = floating-leaved, rooted vegetation

N = non-rooted floating vegetation

S = submersed vegetation

2.0 Watershed and Lake Characteristics Update

Secchi depth was measured 13.0 feet on July 27, 2005. It was measured at 8.0 feet On August 10, 2006. Secchi depth was measured at 7.8 feet in Dewart Lake on August 15, 2007 and at 7.2 feet on July 25, 2008. It appears that water clarity has declined in the past 3 years. This could be due to plant decomposition as a result of the Sonar treatment. It could also be due to nutrient inputs or increased runoff, or many other factors. Decreased water clarity is a concern for lake residents, and rightfully so. Water clarity should be closely monitored in years to come to document long term trends. If the reduced water clarity is a result of the Sonar treatment, then it would be expected to improve as native plants re-colonize the lake.

3.0 Lake Uses Update

Lake uses have not changed significantly in Dewart Lake since the 2005 aquatic vegetation management plan. Detailed information on a recently completed creel survey for fishermen can be found in the 2007 AVMP.

4.0 Fisheries Update

A summary describing the results of the most recent IDNR fisheries survey on Dewart Lake can be found in the 2007 AVMP. No fisheries surveys were conducted on Dewart Lake in 2008.

5.0 Problem Statement

Eurasian watermilfoil will continue to be the major management challenge for Dewart Lake in 2009. The challenge in 2009 (as it was in 2008) will be to identify areas of EWM re-growth through proper vegetation survey techniques and manage them effectively with herbicide treatments. Much more EWM re-growth is expected in 2009 and spot treatments using 2, 4-D will likely be used to manage these areas.

The curly leaf pondweed population should also be monitored to ensure that it is not increasing in abundance in areas where EWM was previously dominant.

6.0 Management Goals and Objectives

The management goals outlined by the IDNR Division of Fish and Wildlife have not changed. They are restated below:

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.

Specific Objectives

The major objective for Dewart Lake has changed from a large scale treatment effort to reduce the dominant milfoil population, to smaller scale treatments in areas where re-growth is observed in the future. One specific measurable goal would be to keep Eurasian watermilfoil infestation below 45 acres in 2009. This is not a guarantee but a guideline for expectations based on results of other whole lake Sonar treatments.

Ideally, yet another increase in coontail site frequency would be seen in 2009. The longevity of control for Eurasian watermilfoil in Dewart Lake has surpassed expectations, as it was expected to return to Dewart Lake in the fall of 2007. Rapid re-colonization of previously infested areas with native plants has also surpassed expectations. In 2007 sago pondweed was very abundant in areas previously occupied by Eurasian watermilfoil. However, coontail experienced a large decline in site frequency from 2006 to 2007. Coontail site frequency almost tripled from 2007 to 2008. This is encouraging and the coontail population should be monitored to document long term effects following the Sonar treatment.

The curly leaf pondweed population should also be monitored. Ideally its site frequency in the fall of 2009 would remain below the fall of 2007 frequency of 8.9%. The removal of Eurasian watermilfoil could possibly trigger an increase in its abundance, as could the suspension of treatments on the main lake in the area where it is most abundant (Blueberry Island frontage).

7.0 Plant Management History Update

District 3 Biologist Jed Pearson was contacted to determine any significant changes to aquatic vegetation control permits. No herbicide treatments have been permitted on the main lake since the whole lake Sonar treatment on May 18, 2006. Spot treatments for EWM were permitted for 2007 but were not needed since EWM did not return to the lake in 2007.

In 2008, 13 total acres were treated for EWM with 2, 4-D through funding from the Lake and River Enhancement Program and the Dewart Lake Protective Association. Following visual inspection, four acres were treated with 2, 4-D on June 9, 2008 for EWM control. Nine more acres were treated with 2, 4-D for EWM control on August 6, 2008 using data collected in the late season tier II survey conducted on July 25, 2008. Eurasian watermilfoil treatment areas for 2008 are outlined in red in Figure 1 .

The only area privately treated in Dewart Lake in 2008 was in the channel system encircling Blueberry Island in the southeast end of the lake. This channel was treated for algae only in 2007 and 2008. This area is outlined in yellow in Figure 1.

Figure 1: Dewart Lake Eurasian Watermilfoil Treatment Areas (shown in red)



8.0 Aquatic Plant Community Characterization Update

Survey and data analysis methods have not changed since the 2007 Dewart Lake AVMP update. Eurasian watermilfoil and curly leaf pondweed are the major threat to the plant community of Dewart Lake. Species distribution maps for these species are included below. Figure 2 combines EWM data from the late season surveys of both Aquatic Weed Control and the IDNR to gain the best understanding of EWM distribution in Dewart Lake. Treatment areas are also shown as red polygons. It is important to note that not all locations where EWM was present were treated. The random samples where EWM was found should not be considered an exhaustive list of EWM infestation, and treatment areas were prioritized by the severity of the infestation. Much of the heaviest infestation was visible from a boat and was not necessarily represented in the Tier II sampling because of the random sampling. Together, this data from Aquatic Weed Control and the IDNR attempts to provide an overall picture of EWM distribution in Dewart Lake in 2008. The Aquatic Weed Control survey took place on July 25, 2008 while the DNR surveys took place on May 22 and July 29, 2008.

Note: Numbered dots outside of the red treatment polygons represent locations where EWM was collected on the sampling rake but not visible from the boat. Some of these smaller isolated clumps were not treated in order to focus herbicide treatments on the most problematic areas of infestation.

Figure 2: 2008 Eurasian Watermilfoil Distribution



Figure 3 shows curly leaf pondweed locations in Dewart Lake in 2008.

Figure 3: 2008 Curly Leaf Pondweed Locations



8.1 Methods Update

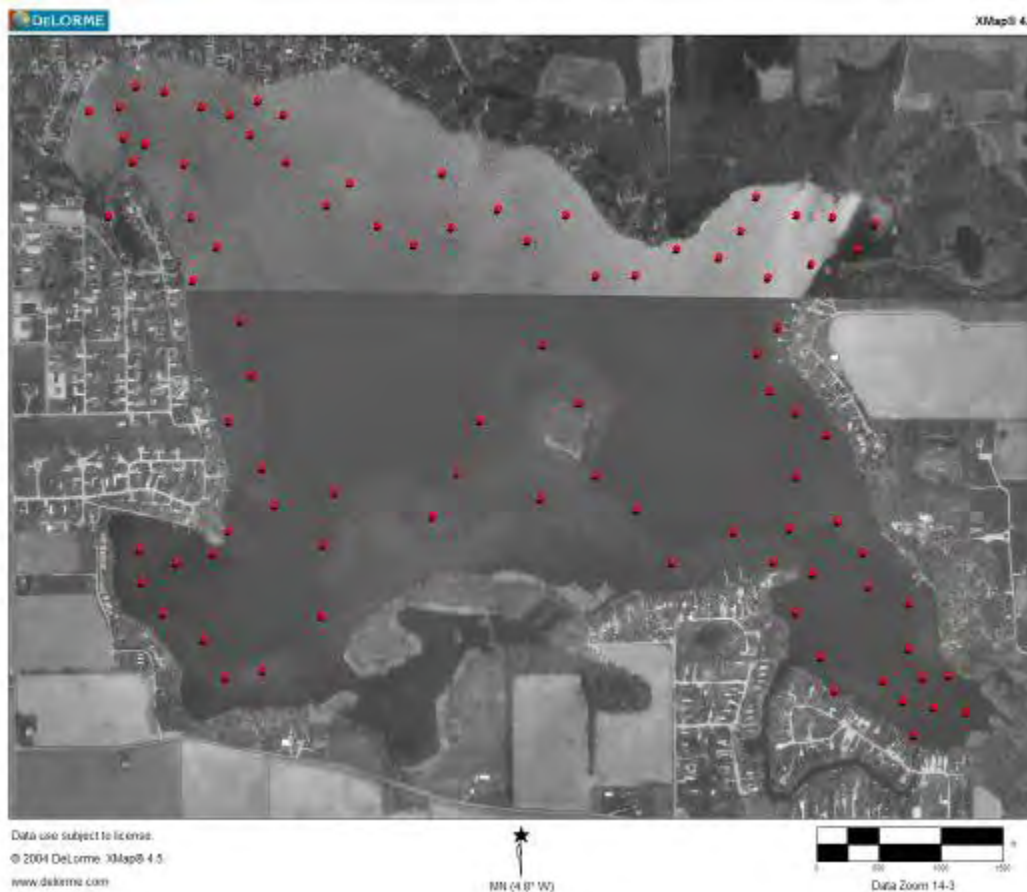
The Tier II survey protocol was updated by the IDNR in 2006 and 2007. The 2006 Tier II protocol requires that sample sites be stratified by depth contour, and that data analysis be provided for each depth contour. Rake scores for plant species are recorded as 1, 3, or 5, as opposed to the original scoring system of 1, 2, 3, 4, or 5.

Dewart Lake is characterized by the IDNR as mesotrophic with 551 surface acres. Based on these characteristics, 90 sample sites are distributed between the 5 foot depth contours of the littoral zone of Dewart Lake. At this time, the current sampling strategy for Dewart Lake appears adequate, and no changes are recommended for 2008.

8.2 Tier II Results

A 2008 late season Tier II survey was conducted on July 25, 2008 by Aquatic Weed Control. Secchi depth was measured at 7.2 feet. Based on Dewart Lake's classification as mesotrophic and its 551 surface acres, ninety rake samples were divided between each 5 foot depth contour of the littoral zone. A total of 16 species of submersed aquatic plants were collected during this survey which is up from 13 species in 2007. Figure 4 shows the locations of all sample sites during the 2006, 2007, and 2008 Tier II surveys.

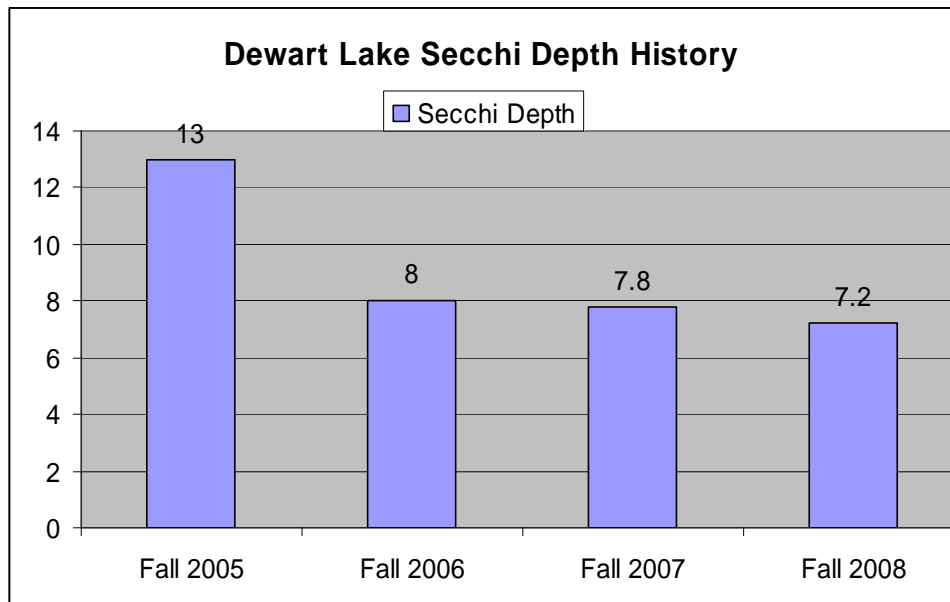
Figure 4: Dewart Lake Rake Sample Locations



Secchi Depth

Secchi depth in Dewart Lake appears to have decreased over the past four years. Secchi depth was measured at 13.0 feet in fall of 2005 but has remained at 7 to 8 feet since then. It is unclear whether this decline could be linked to the Sonar treatment or other factors, but Secchi depth should continue to be monitored in the years to come. Figure 5 shows the recent Secchi depth history in Dewart Lake.

Figure 5: Dewart Lake Secchi Depth History



Tier II Data Analysis

The following tables are data summaries for the 2008 aquatic vegetation survey. These tables help to describe the plant community, and will help identify any changes that take place in the years to come. Tables labeled “Overall” include every sample site in the survey, while the other tables describe each 5 foot depth contour of the lake’s littoral zone (0-5 feet, 5-10 feet, etc).

In the data analysis tables, “littoral sites” indicates the number of sample sites which had a depth that was less than the maximum depth at which plants were found. The littoral depth indicates the maximum depth at which plants were found.

Table 3: July 2008 Data Analysis: Overall

Occurrence and Abundance of Submersed Aquatic Plants - Overall					
Lake:	Dewart Lake	Secchi:	7.2	SE Mean Species/site:	0.15
Date:	7/25/2008	Littoral sites with plants:	70	Mean natives/site:	1.40
Littoral depth (ft):	17.0	Number of species:	16	SE Mean natives/site:	0.13
Littoral sites:	85	Maximum species/site:	8	Species diversity:	0.86
Total sites:	90	Mean number species/site:	1.49	Native diversity:	0.84
			Score Frequency		
Common Name	Site Frequency	1	3	5	Dominance
Chara	36.7	4.4	13.3	18.9	27.8
Sago Pondweed	26.7	5.6	8.9	12.2	18.7
Water Stargrass	23.3	6.7	13.3	3.3	12.7
Coontail	16.7	1.1	11.1	4.4	11.3
Illiois Pondweed	10.0	10.0	0.0	0.0	2.0
Flat Stemmed Pondweed	8.9	7.8	1.1	0.0	2.2
Slender Naiad	6.7	5.6	1.1	0.0	1.8
Eurasian Watermilfoil	5.6	3.3	2.2	0.0	2.0
Large Leaf Pondweed	3.3	0.0	2.2	1.1	2.4
Brittle Naiad	2.2	2.2	0.0	0.0	0.4
Nitella	2.2	2.2	0.0	0.0	0.4
Small Pondweed	1.1	0.0	1.1	0.0	0.7
American Pondweed	1.1	1.1	0.0	0.0	0.2
Bladderwort	1.1	1.1	0.0	0.0	0.2
Curly Leaf Pondweed	1.1	1.1	0.0	0.0	0.2
Eel Grass	1.1	1.1	0.0	0.0	0.2
Elodea	1.1	1.1	0.0	0.0	0.2
Filamentous Algae	0.0				

Table 4: July 2008 Data Analysis: 0 - 5 Feet

Occurrence and Abundance of Submersed Aquatic Plants 0-5 Feet					
Lake:	Dewart Lake	Secchi:	7.2	SE Mean Species/site:	0.29
Date:	7/25/2008	Littoral sites with plants:	27	Mean natives/site:	1.72
Littoral depth (ft):	17.0	Number of species:	12	SE Mean natives/site:	0.26
Littoral sites:	29	Maximum species/site:	8	Species diversity:	0.75
Total sites:	29	Mean number species/site:	1.79	Native diversity:	0.73
			Score Frequency		
Common Name	Site Frequency	1	3	5	Dominance
Chara	82.8	10.3	31.0	41.4	62.1
Illiois Pondweed	24.1	24.1	0.0	0.0	4.8
Coontail	17.2	0.0	10.3	6.9	13.1
Water Stargrass	13.8	6.9	6.9	0.0	5.5
Slender Naiad	10.3	10.3	0.0	0.0	2.1
Sago Pondweed	6.9	3.4	3.4	0.0	2.8
Eurasian Watermilfoil	3.4	0.0	3.4	0.0	2.1
American Pondweed	3.4	3.4	0.0	0.0	0.7
Bladderwort	3.4	3.4	0.0	0.0	0.7
Brittle Naiad	3.4	3.4	0.0	0.0	0.7
Eel Grass	3.4	3.4	0.0	0.0	0.7
Elodea	3.4	3.4	0.0	0.0	0.7
Flat Stemmed Pondweed	3.4	3.4	0.0	0.0	0.7

Table 5: July 2008 Data Analysis: 5 - 10

Occurrence and Abundance of Submersed Aquatic Plants 5-10 Feet					
Lake:	Dewart Lake	Secchi:	7.2	SE Mean Species/site:	0.25
Date:	7/25/2008	Littoral sites with plants:	26	Mean natives/site:	1.85
Littoral depth (ft):	17.0	Number of species:	10	SE Mean natives/site:	0.22
Littoral sites:	27	Maximum species/site:	5	Species diversity:	0.85
Total sites:	27	Mean number species/site:	2.00	Native diversity:	0.83
			Score Frequency		
Common Name	Site Frequency	1	3	5	Dominance
Sago Pondweed	55.6	14.8	18.5	22.2	36.3
Water Stargrass	33.3	11.1	14.8	7.4	18.5
Chara	25.9	3.7	7.4	14.8	20.0
Coontail	22.2	0.0	18.5	3.7	14.8
Flat Stemmed Pondweed	18.5	18.5	0.0	0.0	3.7
Large Leaf Pondweed	11.1	0.0	7.4	3.7	8.1
Slender Naiad	11.1	7.4	3.7	0.0	3.7
Eurasian Watermilfoil	11.1	11.1	0.0	0.0	2.2
Curly Leaf Pondweed	3.7	3.7	0.0	0.0	0.7
Illiois Pondweed	3.7	3.7	0.0	0.0	0.7
Nitella	3.7	3.7	0.0	0.0	0.7

Table 6: July 2008 Data Analysis: 10 - 15 Feet

Occurrence and Abundance of Submersed Aquatic Plants 10-15 Feet					
Lake:	Dewart Lake	Secchi:	7.2	SE Mean Species/site:	0.21
Date:	7/25/2008	Littoral sites with plants:	16	Mean natives/site:	1.04
Littoral depth (ft):	17.0	Number of species:	8	SE Mean natives/site:	0.20
Littoral sites:	24	Maximum species/site:	4	Species diversity:	0.81
Total sites:	24	Mean number species/site:	1.13	Native diversity:	0.78
			Score Frequency		
Common Name	Site Frequency	1	3	5	Dominance
Water Stargrass	33.3	4.2	25.0	4.2	20.0
Sago Pondweed	29.2	0.0	8.3	20.8	25.8
Coontail	16.7	4.2	8.3	4.2	10.0
Chara	8.3	0.0	4.2	4.2	6.7
Flat Stemmed Pondweed	8.3	4.2	4.2	0.0	3.3
Eurasian Watermilfoil	4.2	0.0	4.2	0.0	2.5
Small Pondweed	4.2	0.0	4.2	0.0	2.5
Brittle Naiad	4.2	4.2	0.0	0.0	0.8
Illiois Pondweed	4.2	4.2	0.0	0.0	0.8

Table 7: July 2008 Data Analysis: 15 - 20 Feet

Occurrence and Abundance of Submersed Aquatic Plants 15-20 Feet					
Lake:	Dewart Lake	Secchi:	7.2	SE Mean Species/site:	0.10
Date:	7/25/2008	Littoral sites with plants:	1	Mean natives/site:	0.10
Littoral depth (ft):	17.0	Number of species:	1	SE Mean natives/site:	0.10
Littoral sites:	5	Maximum species/site:	1	Species diversity:	0.00
Total sites:	10	Mean number species/site:	0.10	Native diversity:	0.00
			Score Frequency		
Common Name	Site Frequency	1	3	5	Dominance
Nitella	10.0	10.0	0.0	0.0	2.0

No plants were found deeper than 17 feet in 2008. In 2007, no plants were collected deeper than 14 feet.

Site Frequency

Site frequency is a measure of how often a species was collected during the Tier II survey. It can be calculated by the following equation:

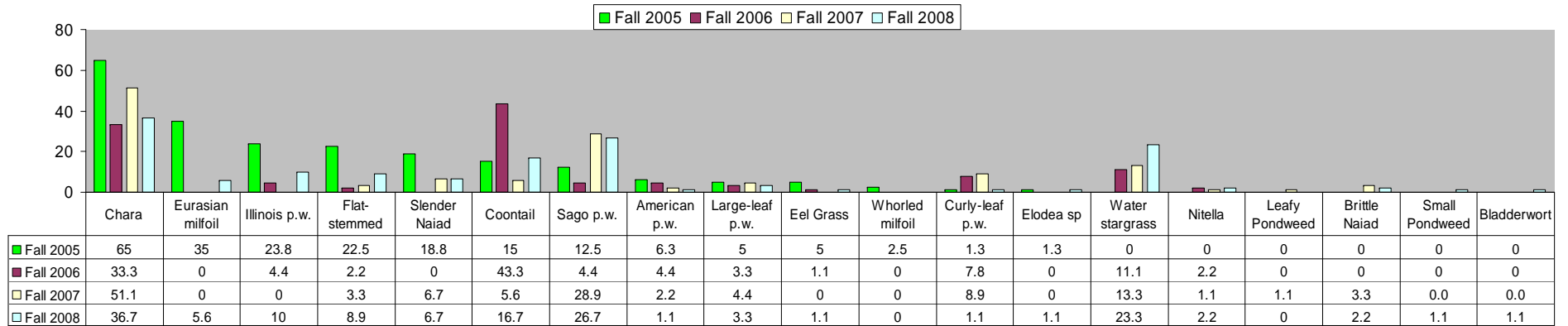
$$\text{Site Frequency} = \frac{(\# \text{ of sites where the species was collected}) \times 100}{\text{Total \# of littoral sample sites}}$$

Figure 6 shows site frequencies for every plant collected in fall of 2005, 2006, 2007, or 2008. Data from 2005 was collected before the whole lake Sonar treatment. Tier II survey protocol was changed in 2006, shifting more sample sites to deep water, and that change should be taken into consideration when viewing this information. Some plants like coontail and sago pondweed appear to be found more frequently in depths of 6 -10 feet than in depths of 0 – 5 feet. Before the change in protocol, Aquatic Weed Control took more sample sites in 0 – 5 feet of water.

The most significant changes over this 4 year period have been in the EWM, coontail and sago pondweed populations. Eurasian watermilfoil has declined greatly after the Sonar treatment, and is starting to increase in abundance. Coontail also showed large site frequency declines after the Sonar treatment and is also starting to increase in abundance. Sago pondweed increased in abundance following the Sonar treatment, and remains very common in Dewart Lake.

Figure 6: Dewart Lake Site Frequency Histories

Dewart Lake Site Frequency Changes 2005-2008



Species Diversity

The species diversity indices listed in data analysis tables help to describe the overall plant community. A species diversity index is actually measured as a value of uncertainty (H). If a species is chosen at random from a collection containing a certain number of species, the diversity index (H) is the probability that a chosen species will be different from the previous random selection. The diversity index (H) will always be between 0 and 1. The higher the H value, the more likely it is that the next species chosen from the collection at random will be different from the previous selection (Smith, 2001). This index is dependent upon species richness and species evenness, meaning that species diversity is a function of how many different species are present and how evenly they are spread throughout the ecosystem.

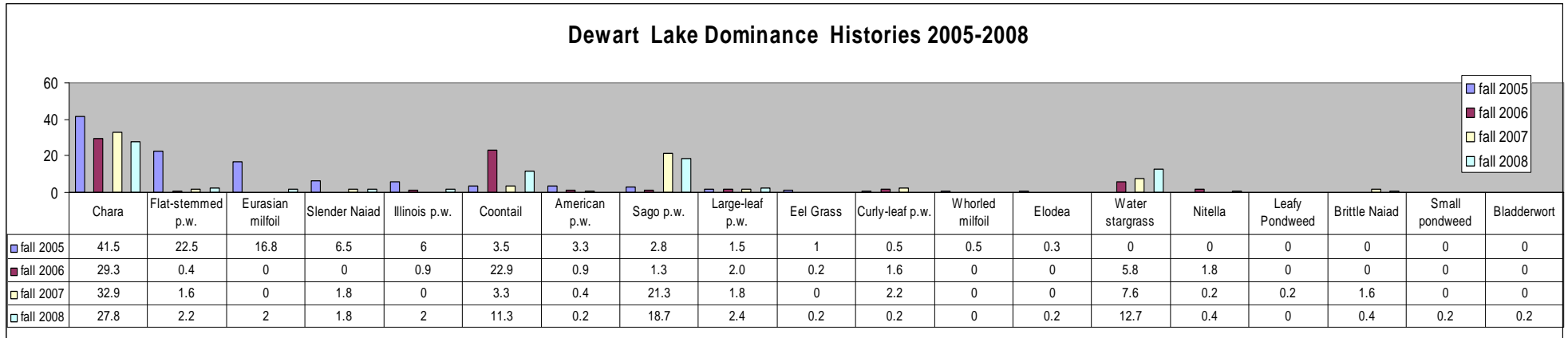
The overall species diversity index for Dewart Lake in July of 2008 was 0.86 which is up from 0.79 in 2007 and 0.77 in 2006. Native plant diversity in July of 2008 was 0.84 which is also up from 0.78 in 2007. Native diversity was 0.80 in July of 2005 which was before the Sonar treatment. From this data, it would appear that the native plant populations are doing very well following the Sonar treatment.

Species Dominance

Species dominance is dependent upon how many times a species occurs, and its relative coverage area or biomass within the system. In this survey, the abundance rating given to each species at each sample site was used to determine dominance. The dominance of a particular species in this Tier II survey increases as its site frequency and relative abundance increase.

Figure 7 tracks dominance values for each plant collected at Dewart Lake during its involvement in the LARE program. Trends are similar to sight frequency, with Eurasian watermilfoil dominance dropping to 0 after the Sonar treatment and remaining at 0 through the 2007 growing season. Dominance of many native plants dropped as well after the treatment, but most plants were near pre-treatment dominance values in 2008.

Figure 7: Dewart Lake Dominance Histories



8.3 Macrophyte Inventory Discussion

The submersed plant community of Dewart Lake covers roughly 260 acres of the lake, or 47% of the lake's total surface area. Eurasian watermilfoil was dominant in about 140 of these acres before the Sonar treatment. After treatment, Eurasian watermilfoil was reduced to the point that it was undetectable in the fall of 2006 and 2007. After treatment in 2006, slight reductions were seen in overall species richness and plant diversity, and populations of some native plants were reduced. In 2007, species richness increased to 13 species and many native populations were increasing. Sago pondweed increased rapidly in areas previously infested by EWM. Its site frequency increased from 4.4 in 2006, to 28.9 in 2007. Coontail showed a large decrease in site frequency from 43.3 % in 2006 to just 5.6% in 2007.

In 2008, 16 different plant species were collected in Dewart Lake which is up from 13 species in 2007. Native diversity in 2008 was 0.84, which is greater than the pre-Sonar native diversity of 0.80 in 2005. Coontail site frequency increased from 5.6% in 2007 to 16.7% in 2008. Water stargrass frequency increased from 13.3% in 2007 to 23.3% in 2008. Sago pondweed remained abundant, especially in depths of 5 to 15 feet with a site frequency of 26.7%.

Curly leaf abundance remains low in the late season surveys although late season surveys are generally not accurate in determining peak curly leaf pondweed abundance. Curly leaf pondweed abundance had increased from 1.3% in 2005 to 7.8% in 2006, to 8.9% in 2007. However, in 2008 curly leaf pondweed frequency declined to 1.1%. This invasive population should continue to be monitored so to see if it will increase in areas where EWM abundance has been reduced.

Eurasian watermilfoil had a site frequency of 5.6% on July 25, 2008. Data collected in this survey as well as IDNR data was used to help determine priority treatment areas for a late season EWM treatment. Nine acres of EWM were treated with 2, 4-D on August 6, 2008 after the late season survey. EWM control from the Sonar treatment has been more complete for a longer period of time than expected. This is encouraging, however, EWM abundance is expected to increase in 2009. Exact acreages cannot be determined at this time but since 2009 will be the fourth year of EWM control from the Sonar treatment, it is proposed that up to 45 acres in Dewart Lake could need treatment for EWM.

Threatened and Endangered Species

The Indiana Natural Heritage Data Center is part of the Natural Heritage Network, a worldwide system of Heritage Programs. This program is designed to provide information about Indiana's diversity of natural ecosystems, species, landscape features, and outdoor amenities, and to assure adequate methods for evaluating this information and setting sound land protection priorities. The inventory is a continuous attempt to determine the state's most significant natural areas through an intensive statewide inventory.

The Indiana Natural Heritage Data Center has compiled a list of Indiana plant species that are federally or state listed as endangered, threatened or rare. The following is an excerpt taken directly from the Indiana Natural Heritage Database website. Link: [Indiana Natural Heritage Data Center](#).

“The Indiana Natural Heritage Data Center, set up in 1978, represents a comprehensive process, becoming an increasingly valuable tool for decision makers and scientists as it progresses.”

No state or federally listed plant species were found in Dewart Lake in 2008. No vouchers were taken that were suspected to be threatened or endangered in the Tier II or the emergent vegetation surveys.

9.0 Aquatic Vegetation Management Alternatives

Major Eurasian watermilfoil control practices have not changed significantly from the 2005 Alternatives.

No Action

If no action is taken in 2009, it is likely that EWM will increase in abundance. As expected, EWM has returned to Dewart Lake and is expected to increase in 2009. Areas of heaviest infestation should be treated with liquid 2, 4-D to reduce EWM abundance and prevent its spread.

Renovate and 2, 4-D Treatments: The differences between Renovate and 2, 4-D treatments for spot treatments of Eurasian watermilfoil are still being documented. Both of these herbicides are commonly used for spot treatments of Eurasian watermilfoil. They are both systemic herbicides, meaning they are translocated from the foliage of the plant into the root system. Renovate is more expensive than 2, 4-D, although the chemistries of the two products are very similar. The justification for the extra expense is that Renovate is said to have the potential for multiple years of control on Eurasian milfoil. It is also said that Renovate may have less impact on native species like coontail. However, in Aquatic Weed Control’s experience these characteristics of Renovate have not been documented. Both provide very effective, year long control of Eurasian watermilfoil.

10.0 Public Involvement

A LARE meeting was held on November 10, 2008 to discuss issues pertaining to Dewart Lake. District 3 Fisheries Biologist Jed Pearson, a lake representative, Aquatic Weed Control and LARE Aquatic Biologist Angela Sturdevant were all present and discussed the plant community of Dewart Lake.

A public lake meeting was held for Dewart Lake on July 26, 2008. Ten people were in attendance which is down from 31 people in attendance in 2007. Jim Donahoe of Aquatic Weed Control summarized LARE management activities and outlined the future management strategy for maintaining the Eurasian watermilfoil population at a low level with spot herbicide treatments.

One major concern of lake residents is reduced water clarity in recent years. Survey data from Aquatic Weed Control supports the fact that water clarity has declined recently.

Lake residents also expressed interest in exploring other methods of EWM control other than herbicide treatments. Detailed information about other common management practices for Eurasian watermilfoil can be found in the original Dewart Lake Aquatic Vegetation Management Plan.

The Dewart Lake Association is active, and lake association meetings help to keep the public informed about management practices on Dewart Lake. Other avenues that may be used to inform the public would be periodic newsletters, an email list, an association website, or posting signs at public access sites.

Figure 8: 2008 Public Questionnaire

total: 10

Lake Use Survey Lake name: Dewart Lake

Are you a lake property owner? Yes 10 No 0

Are you currently a member of your lake association? Yes 10 No 0

How many years have you been at the lake? 2 or less - 0
2 - 5 years - 0
5-10 years - 0
Over 10 years - 10

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

<u>9</u> Swimming	<u>0</u> Irrigation
<u>9</u> Boating	<u>1</u> Drinking water
<u>9</u> Fishing	<u>0</u> Other

Do you have aquatic plants at your shoreline in nuisance quantities? Yes 1 No 7

Do you currently participate in a weed control project on the lake? Yes 4 No 4

Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes 3 No 7

Does the level of vegetation in the lake affect your property values? Yes 2 No 7

Are you in favor of continuing efforts to control vegetation on the lake? Yes 8 No 2

Are you aware that the LARE funds will only apply to work controlling invasive exotic species, and more work may need to be privately funded? Yes 10 No 0

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

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

Please add any comments:

Quality wasn't a problem - now is! ; need to use other methods than spraying sonar.

11.0 Public Education

The Dewart Lake Association has been very aggressive in preventing the spread of invasive aquatic vegetation. They have privately helped to fund herbicide treatments and have submitted a proposal to the LARE program for additional herbicide treatment of Eurasian watermilfoil. This proposal resulted in the whole lake Sonar treatment.

More information on stopping the spread of invasive aquatic organisms can be found at <http://www.protectyourwaters.net/>. These items include thoroughly cleaning equipment after use in a lake and removing all water from bilges, livewells, etc.

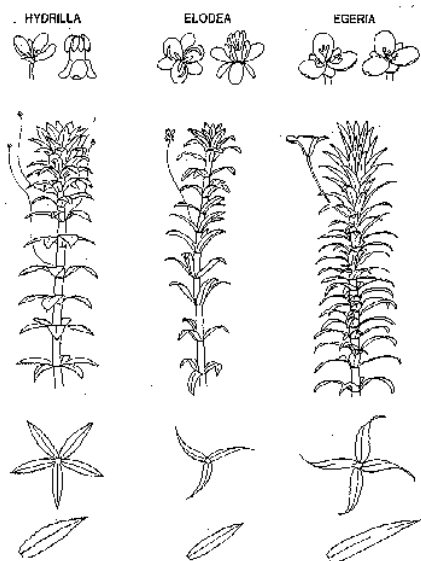
11.1 Hydrilla

Hydrilla (*Hydrilla verticillata*) is an invasive aquatic plant species common throughout the southern United States. It is federally listed as a noxious weed and causes severe ecological



and recreational problems wherever it grows. It is considered to be much more destructive than other invasives like Eurasian watermilfoil and curly leaf pondweed because of its reproductive adaptations. It grows by fragmentation, as does Eurasian watermilfoil, but it also produces turions which can remain dormant in the sediment for 4 years or more (Van and Steward, 1990). It produces tubers at its root tips which can also reproduce after multiple years of dormancy. It can grow 1 inch each day and it quickly out-competes native plants. It forms dense beds that eliminate native plants, stunt fish populations, impede recreation and cause a drastic decrease in biodiversity (Colle and Shireman, 1980). Millions of dollars are spent each year for hydrilla maintenance each year in Florida alone.

Eradication is unlikely once a population has been well established, although eradication has been achieved in newly infested waters using a herbicide called Sonar. Sonar is applied at a rate of 6 parts per billion and this



concentration is maintained in the water for 180 days. Early detection can be crucial to an effective eradication program, and all lake residents and users are encouraged to be on the look-out for this invader.

In fall of 2006, this plant was found in Lake Manitou, in Rochester, Indiana. This is the first instance of hydrilla in the upper Midwest. Prior to its appearance in Lake Manitou, The closest infestations of hydrilla were in Tennessee and Pennsylvania.

Hydrilla can easily be confused with native elodea. The major difference is that elodea has sets of leaves on the stem in whorls of three, while hydrilla usually has whorls of 5 leaves, although 4 to 9 leaves per whorl are possible with hydrilla. Hydrilla will also

have small serrations on the leaf edges. More information on hydrilla can be found at the University of Florida's Center for Aquatic Invasive Plants (<http://plants.ifas.ufl.edu/>). More general information on aquatic invaders can be found at www.protectyourwaters.net.

12.0 Integrated Management Action Strategy

Eurasian watermilfoil began its return to Dewart Lake in 2008. Approximately 13 acres were treated with 2, 4-D for EWM control. Control from the Sonar treatment has been more complete for a longer period of time than expected. However, 2009 will be the fourth year of EWM control from the Sonar treatment and more EWM re-growth is expected. A vegetation control permit may be submitted without exact treatment areas for 2009, since it is unknown where areas of EWM re-growth may occur.

It is recommended that funding be set aside to treat up to 45 acres of EWM infestation in 2009. Areas of EWM infestation will be treated with 2, 4-D herbicide in 2009. It is important to note that although 2, 4-D provides adequate season long control of EWM, it does not provide multiple years of control as Sonar can. Areas treated in 2008 will likely need treatment in 2009. Also, 2, 4-D herbicide should not be expected to reduce EWM abundance over time when applied to the same areas in consecutive years.

Maintenance of the Eurasian watermilfoil population should be the highest priority. Spot herbicide treatments should be limited to areas of Eurasian watermilfoil infestation to protect the native species that are re-colonizing the lake. Treatment of native plants on the main lake may be looked at on a case by case basis in 2009 by IDNR fisheries biologists. This could give the native plants a competitive advantage over Eurasian watermilfoil.

Herbicide Treatment Specifications

If 2, 4-D is used for herbicide treatments, then a concentration at or near 1.76 parts per million should be used to ensure adequate control.

Lake and River Enhancement Deadlines

December 15 – Rough drafts of LARE AMVPs and AVMP updates due to LARE staff

January 15 – Grant application due to LARE Staff

February 15 – Revisions of AVMPs and updates due back to contractors

March 1 – Final drafts of AVMPs and AVMP updates due to LARE Staff

March 15 – LARE funding decisions announced

13.0 Project Budget

2009 Management Recommendations

1. Chemically treat areas of Eurasian milfoil growth (depths of 3-13 feet)
 - A. Treat up to 45 acres for Eurasian milfoil with 2, 4-D \$16,650
2. The Dewart Lake Protective Association may opt to explore methods of Eurasian watermilfoil control other than herbicide applications.

2009 Surveying and Planning

Conduct a spring visual survey and late season Tier II aquatic vegetation survey to monitor both Eurasian milfoil and native plant populations. Emergent plant bed mapping may be conducted as well.

- A. Aquatic Vegetation Surveys (Tier II and Emergent) and AVMP Update Up to \$6,000

Total Cost Estimates

2, 4-D applications for Eurasian watermilfoil	\$16,650
Vegetation surveys and AVMP update	<u>\$6,000</u>
Total Estimated Costs:	Up to \$22,650
Lake and River Enhancement share	\$20,385
Association's share	\$2,265

14.0 Monitoring and plan Update Procedures

In 2009 Aquatic Weed Control will conduct a spring visual vegetation survey to search for areas of Eurasian watermilfoil re-growth. When areas of re-growth are observed, 2, 4-D treatments will follow provided they fall under allowed areas and acreages of the 2009 aquatic vegetation control permit for Dewart Lake. A late season Tier II aquatic vegetation survey will also be conducted to evaluate both native and invasive plant populations. These surveys should help to detect any additional areas of Eurasian watermilfoil re-growth and will also document changes in the native plant community, as well as provide more data on the response of plant populations to whole lake Sonar treatments.

It is also possible that emergent plant beds in Dewart Lake may be mapped again as well. Emergent beds in the proposed Dewart Lake Eco-Zone were mapped in 2008.

15.0 References

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16.0 Appendices

16.1 Dewart Lake Proposed Ecozone 2008 Emergent Survey Results

Dewart Lake Ecozone Emergent Vegetation Survey Results

August 13, 2008



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Overview

In 2007, a no wake zone was established in the southwest corner of Dewart Lake. This no wake zone was established to protect shallow water emergent vegetation and the organisms that depend upon this vegetation for survival. In recent years, wave action and turbulence caused by boating activities has had a detrimental effect on plant beds along the south shore of the lake. Of special concern are off shore beds, primarily composed of hard-stem bulrush (*Scirpus acutus*) and cattails (*Typha sp.*). Ten no wake zone buoys were supplied by the IDNR and placed around these shallow water emergent plant beds to protect the beds while minimally restricting normal lanes of boat travel (DLPA, Online Posting). The following map is copied directly from the Dewart Lake Protective Association's website and identifies the locations of the buoys indicating the Dewart Lake No-Wake Zone. Although an ecozone has not officially been established, this figure shows the area where an ecozone may be established in the future.

Figure 9: Dewart Lake No-Wake Zone Buoy Placement (DLPA, Online Posting)



On August 13, 2008, Aquatic Weed Control conducted an emergent vegetation survey of this protected area. The purpose of this survey and this report is to provide a basis by which changes to the plant community in this area of the lake can be documented in some quantifiable way. This is the first year Aquatic Weed Control conducted an emergent plant survey in Dewart Lake through the LARE program. However, the IDNR did

perform an emergent survey on Dewart Lake in 2006. Data provided in these reports will serve as a baseline for future comparison.

Emergent Survey Methods

Mapping of emergent vegetation in Dewart Lake was completed using GPS waypoints, a rangefinder, GIS software (X-map), and visual observation. Only emergent plant beds within the Dewart Lake no-wake zone were mapped, with the exception of two offshore bulrush beds in the northwest section of the lake.

A transect was taken perpendicular to shore at the linear beginning of each plant bed in relation to shore. Plants in contact with the boat on the lakeward edge of the bed were documented as a "1" on data sheets provided by the IDNR. Plants observed along the perpendicular transect but not in contact with the boat were documented as a "9" on the data sheets. A range finder was used to estimate the distance between the shoreline and the maximum lakeward extent of the emergent bed at this transect.

GPS coordinates were taken at the lakeward edge of the bed. Once measurements were recorded at the beginning of the bed, the boat was moved parallel to the shoreline along the lakeward edge of the bed. Whenever species composition changed significantly, another transect, measurement and GPS coordinates were recorded. This process was repeated along the lakeward edge of the plant bed until the vegetation stopped or species composition changed enough to warrant a separate plant bed.

Many additional GPS coordinates were recorded to map irregularities in the lakeward edge of the plant beds, even though species composition had not changed significantly. For these points where composition did not change significantly, no transects were recorded. In offshore beds, GPS coordinates were taken around the entire perimeter of the emergent beds.

Emergent Survey Results

In the August 13th survey, 28 separate, significant emergent plant beds were mapped ranging in size from 25 square feet to 24.6 acres. The total combined acreage of these beds is an estimated 44.9 acres. Eleven major emergent species were documented in these beds. Table 8 is a species list for all emergent plants documented in the 2008 survey. Both common and scientific names are included for reference.

Table 8: Common and Scientific Names of Dewart Lake Emergent Species

Common Name	Scientific Name
American Water Willow	<i>Justicia americana</i> (L.) Vahl
Cattails	<i>Typha</i> sp.
Spatterdock	<i>Nuphar luteum</i>
White Water Lily	<i>Nymphaea odorata</i>
Water Smartweed	<i>Polygonum amphibium</i>
Pickerel Weed	<i>Pontederia cordata</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Common Arrowhead	<i>Sagittaria latifolia</i>
Arum Leaved Arrowhead	<i>Sagittaria cuneata</i>
American Pondweed	<i>Potamogeton nodosus</i>
Hard-stem Bulrush	<i>Scirpus acutus</i>

The emergent plant beds in the Dewart Lake no-wake zone are outlined in Figure 10. These beds were made using GPS waypoints as well as a rangefinder to determine distances in areas where boat travel was not possible. GIS Software was used to estimate acreage for plant bed 4, where boat travel was not possible and vegetation blocked line of sight for the range finder.

Emergent plant beds in Figure 10 are color coded according to the most dominant plant in each bed. It is important to note that multiple species are present in many beds and not just the dominant species.

Note that beds 27 and 28 are absent from Figure 10. These are two small offshore bulrush beds in the northwest section of the lake. For readability purposes, these two beds are omitted from this figure to achieve greater zoom and more detail for the Dewart Lake proposed ecozone area. Beds 27 and 28 are described in Figure 11.

Table 9 attempts to summarize the most important attributes of each emergent plant bed documented in the 2008 survey. Acreage for each plant bed, species richness, dominant species and species composition are all available in this table. Species composition is estimated based on transect data, visual observation and reference photos.

Figure 10: 2008 Dewart Lake Proposed Ecozone Plant Beds

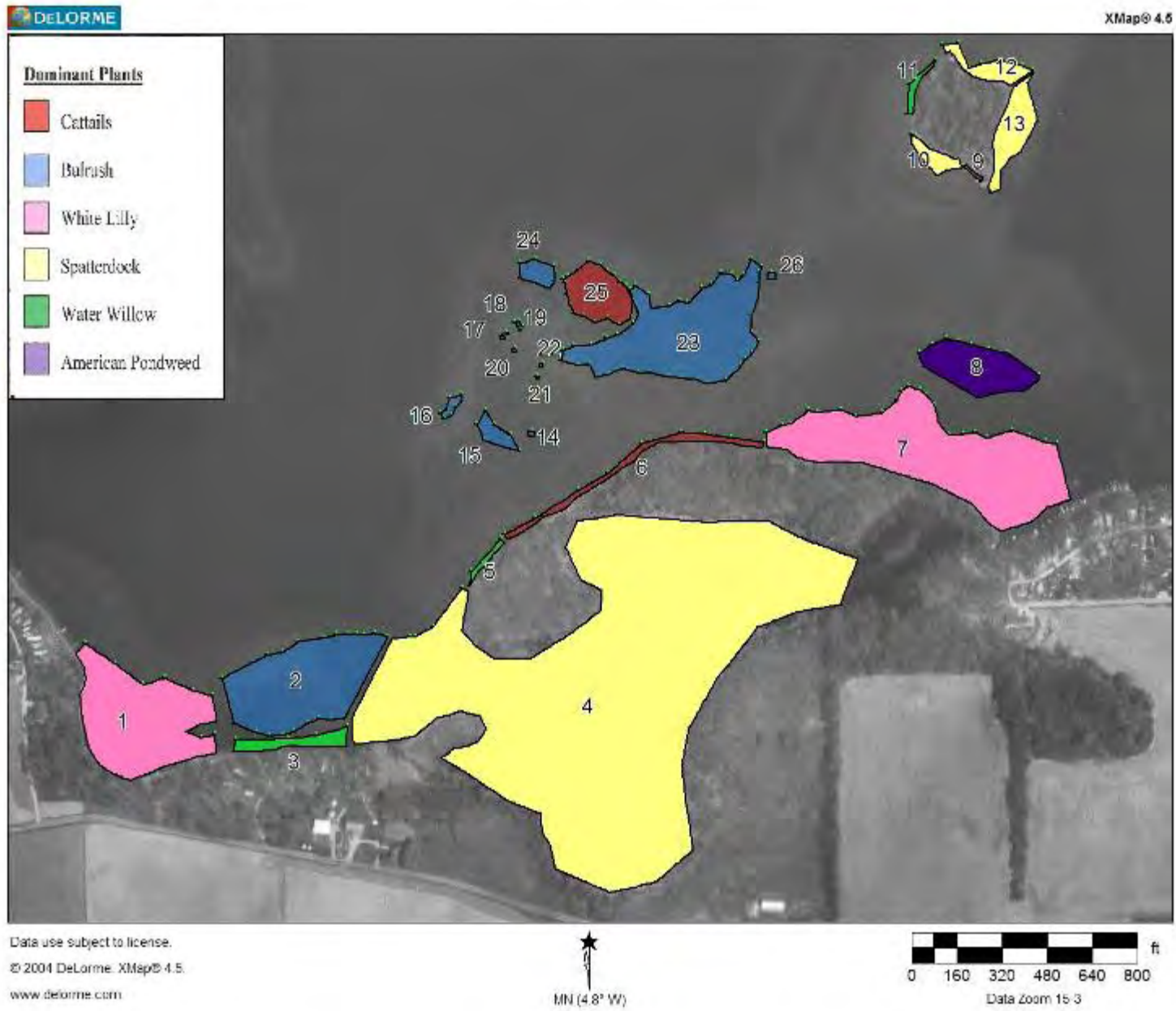


Figure 11: Emergent Beds 27 and 28



Table 9: Emergent Plant Bed Statistics Summary

Bed #	Size	Dominant Species	# of Species	Species Present/Percent Occurrence										
				White Lily	Spatterdock	Cattail	Arrowhead	Arrow Arum	Water Willow	American P.W.	Bulrush	Pickereel Weed	Purple loosestrife	Smartweed
1	3.32 ac	White lily	7	30%	10%	25%	20%	5%	5%	5%				
2	3.10 ac	bulrush	3	35%					5%		60%			
3	0.38 ac	water willow	2	30%					70%					
4	24.58 ac	spatterdock	5	10%	60%	15%				5%		10%		
5	0.07 ac	water willow	2						70%		30%			
6	0.48 ac	cattail	3			80%	15%		5%					
7	5.45 ac	white lily	5	25%	10%	25%	25%			15%				
8	1.21 ac	American P.W.	3	10%						85%	5%			
9	0.02 ac	cattail	4			80%	10%						5%	5%
10	0.23 ac	spatterdock	6		60%	15%	10%					5%	5%	5%
11	0.09 ac	water willow	2						95%		5%			
12	0.37 ac	spatterdock	7	20%	30%	10%	10%				20%	5%	5%	
13	0.72 ac	spatterdock	5	20%	60%			10%			5%		5%	
14	0.003 ac	bulrush	1								100%			
15	0.20 ac	bulrush	1								100%			
16	0.06 ac	bulrush	1								100%			
17	0.002 ac	cattail	1			100%								
18	0.001 ac	bulrush	1								100%			
19	0.001 ac	cattail	1			100%								
20	0.002 ac	bulrush	2			30%					70%			
21	0.0006 ac	bulrush	1								100%			
22	0.002 ac	bulrush	1								100%			
23	3.58 ac	bulrush	1								100%			
24	9,091 ft ²	bulrush	1								100%			
25	37,019 ft ²	cattail	2			80%				20%				
26	100 ft ²	bulrush	1								100%			
27	1467 ft ²	bulrush	1								100%			
28	4,117 ft ²	bulrush	2	5%							95%			

Emergent Plant Bed Descriptions

Bed: 1

Size: 3.32 ac

Dominant Species: White lily

Waypoints: 1-6

Number of species: 7

Description: This plant bed on the south side of Crowl Bay extends approximately 105 yard from shore near its center, while extending only 15 yards from shore at its west end. White lily is the most common plant in this bed although cattails, arrowhead, arrow arum, water willow and American pondweed are all abundant. The near shore area is dominated by cattails while the lakeward edge is dominated by white lily.

Figure 12: Emergent Bed 1



Bed: 2

Size: 3.10 ac

Dominant Species: bulrush

Waypoints: 7-22, 25 -35

Number of species: 3

Description: This bed is adjacent to bed 1 but is dominated by bulrushes. White lilies are still common and are dispersed through the bulrushes. More sparse water willow is also present in this bed. This bed is slightly offshore and extends 95 yards into the lake.

Figure 13: Emergent Bed 2



Bed: 3

Size: 16,460 square feet

Dominant Species: water willow

Waypoints: 23-25

Number of species: 2

Description: Bed 3 is a narrow near shore bed along the campground on the south side of the lake. It extends approximately 8 yards into the lake from shore in most spots. Water willow is dominant although white lilies are common as well.

Figure 14: Emergent Bed 3



Bed: 4

Size: 24.58 ac

Dominant Species: spatterdock

Waypoints: 36-39

Number of species: 5

Description: This is by far the largest emergent plant bed on Dewart Lake. Much of this bed cannot be mapped with a boat since it is not navigable. The range from the lakeward edge to the trees in the background of the picture was 890 yards. Spatterdock appears dominant although cattails are very abundant around the shoreline of this bed. Pickerel weed, white lily, and American pondweed are all abundant. This large emergent bed should be protected if at all possible. Back corners of this bed were mapped using GIS software because vegetation inhibited the use of the rangefinder in many areas. Aerial photos from Delorme X-Map were used to map this bed. The photos were taken in 2003 during the growing season (leaf-on).

Figure 15: Emergent Bed 4



Bed: 5

Size: 3,226 square feet

Dominant Species: water willow

Waypoints: 40 - 42

Number of species: 2

Description: Bed 5 is a narrow band of water willow and bulrushes. It is located along the peninsula on the south shore of the ecozone. Most of this bed extends 5 to 6 yards into the lake.

Figure 16: Emergent Bed 5



Bed: 6

Size: 20,707 square feet

Dominant Species: cattails

Waypoints: 43 - 51

Number of species: 3

Description: This bed is adjacent to bed 5 but differs significantly in species composition. Cattails become dominant in this area along the peninsula on the south side of the ecozone. Cattails are dominant throughout the bed, and arrowhead and water willow are common on the lakeward edge of the bed.

Figure 17: Emergent Bed 6



Bed: 7

Size: 5.45 ac

Dominant Species: white lily

Waypoints: 52 - 74

Number of species: 5

Description: Bed 7 is similar to bed 6 in the fact that cattails are dominant near shore. However this bed is much wider than bed 6 and has much more vegetation on the lakeward edge of the cattails. This bed extends as much as 68 yards from shore. White lilies, spatterdock, arrowhead and water willow are all abundant in this bed.

Figure 18: Emergent Bed 7



Bed: 8

Size: 1.21 ac

Dominant Species: American pondweed

Waypoints: 75-90

Number of species: 3

Description: Bed 8 is composed primarily of floating leaved plants although some bulrushes are present as well. American pondweed is the most dominant plant in the bed, and white lilies are common as well. This is an offshore bed and is approximately 62 yards wide from east to west.

Figure 19: Emergent Bed 8



Bed: 9

Size: 823 square feet

Dominant Species: cattails

Waypoints: 91-92

Number of species: 4

Description: This bed is located along the south shore of the island in Dewart Lake. Cattails are the dominant species in this bed. Water smartweed was present in this bed, along with arrowhead. Purple loosestrife (an invasive species) was also present in low abundance. This narrow plant bed only extended into the lake 2 to 5 yards from shore.

Figure 20: Emergent Bed 9



Bed: 10

Size: 9,928 square feet

Dominant Species: spatterdock

Waypoints: 93-96

Number of species: 6

Description: Bed 10 is also located along the south shore of the island in Dewart Lake. Spatterdock is the dominant species. Six plant species were present in this bed including spatterdock, cattails, arrowhead, pickerel weed, purple loosestrife, and water smartweed. This bed extended 30 yards into the lake from shore at its thickest point.

Figure 21: Emergent Bed 10



Bed: 11

Size: 3,933 square feet

Dominant Species: water willow

Waypoints: 97-100

Number of species: 2

Description: This emergent bed is located along the west shoreline of the island in Dewart Lake. It is a narrow bed extending approximately 6 yards from shore. Water willow is the dominant species in this bed with some bulrushes being present as well.

Figure 22: Emergent Bed 11



Bed: 12

Size: 15,919 square feet

Dominant Species: spatterdock

Waypoints: 101-109

Number of species: 7

Description: This bed is located along the north shore of the island in Dewart Lake. At its thickest point, this bed extended approximately 40 yards into the lake. Six plant species were present including white lily, spatterdock, cattail, arrowhead, bulrush, pickerel weed, and purple loosestrife.

Figure 23: Emergent Bed 12



Bed: 13

Size: 31,250 square feet

Dominant Species: spatterdock

Waypoints: 110-119

Number of species: 5

Description: This bed is located along the east shoreline of the island in Dewart Lake. At its thickest point, this bed extends approximately 44 yards into the lake. Although spatterdock is dominant, white lily, arrow arum, bulrush, and purple loosestrife are also present.

Figure 24: Emergent Bed 13



Bed: 14

Size: 150 square feet

Dominant Species: bulrush

Waypoints: 120

Number of species: 1

Description: This is a small, isolated, offshore cluster of hard-stem bulrushes in the ecozone area.

Figure 25: Emergent Bed 14



Bed: 15

Size: 8,587 square feet

Dominant Species: bulrush

Waypoints: 121-126

Number of species: 1

Description: Bed 15 is another isolated offshore clump of bulrushes in the ecozone.

Figure 26: Emergent Bed 15



Bed: 16

Size: 2,755 square feet

Dominant Species: bulrush

Waypoints: 127-134

Number of species: 1

Description: Bed 16 is an offshore clump of bulrushes in the ecozone.

Figure 27: Emergent Bed 16



Bed: 17

Size: 100 square feet

Dominant Species: cattails

Waypoints: 135

Number of species: 1

Description: Bed 17 is an offshore clump of cattails in the ecozone. This clump of cattails is approximately 10 feet by 10 feet and is in the middle of sparse bulrush beds.

Figure 28: Emergent Bed 17



Bed: 18

Size: 50 square feet

Dominant Species: bulrush

Waypoints: 136

Number of species: 1

Description: Bed 18 is a very small offshore stand of bulrushes adjacent to bed 17.

Figure 29: Emergent Bed 18



Bed: 19

Size: 366 square feet

Dominant Species: cattails

Waypoints: 137-140

Number of species: 1

Description: Bed 19 is another offshore stand of only cattails. It is also located inside the buoyed off ecozone area.

Figure 30: Emergent Bed 19



Bed: 20

Size: 100 square feet

Dominant Species: bulrush

Waypoints: 141

Number of species: 2

Description: Bed 20 contains a combination of both bulrushes and cattails, with bulrushes being dominant. This is also an offshore bed in the ecozone.

Figure 31: Emergent Bed 20



Bed: 21

Size: 25 square feet

Dominant Species: bulrush

Waypoints: 142

Number of species: 1

Description: Bed 21 is another small offshore clump of bulrushes in the ecozone.

Figure 32: Emergent Bed 21



Bed: 22

Size: 100 square feet

Dominant Species: bulrush

Waypoints: 143

Number of species: 1

Description: Bed 22 is another small offshore bed of bulrushes.

Figure 33: Emergent Bed 22



Bed: 23

Size: 3.58 ac

Dominant Species: bulrush

Waypoints: 144-187

Number of species: 1

Description: Bed 23 is by far the largest offshore bulrush bed in the Dewart Lake Ecozone. Even though distribution is sparse, no other emergent plants are found growing throughout the bulrushes in this bed.

Figure 34: Emergent Bed 23



Bed: 24

Size: 9,091 square feet

Dominant Species: bulrush

Waypoints: 188-194

Number of species: 1

Description: Bed 24 is another offshore bed of bulrushes in the Dewart Lake Ecozone

Figure 35: Emergent Bed 24



Bed: 25

Size: 37,019 square feet

Dominant Species: cattails

Waypoints: 195-212

Number of species: 2

Description: Bed 25 is the largest offshore stand of cattails in the ecozone area. It is near the north edge of the ecozone. American pondweed is also present around the outer edges of this plant bed. This is a very dense stand, with no bulrushes found within the cattails.

Figure 36: Emergent Bed 25



Bed: 26

Size: 100 square feet

Dominant Species: bulrush

Waypoints: 213

Number of species: 1

Description: This is another small offshore stand of bulrushes in the ecozone area. It is approximately 10 feet by 10 feet.

Figure 37: Emergent Bed 26



Bed: 27

Size: 1,467 square feet

Dominant Species: bulrush

Waypoints: 214-218

Number of species: 1

Description: Bed 27 is not located in the ecozone at the south end of the lake. It does not appear in Figure 10. It is one of two small bulrush stands in the northwest quarter of the lake. This small bed is approximately 186 yards from shore at the closest point.

Figure 38: Emergent Bed 27



Bed: 28

Size: 4,117 square feet

Dominant Species: bulrush

Waypoints: 219-225

Number of species: 2

Description: Bed 28 is also located in the northwest quarter of Dewart Lake. This small stand of bulrushes is approximately 215 yards from shore at the closest point. Even though this bed is not big, it is one of the most dense bulrush beds in Dewart Lake.

Figure 39: Emergent Bed 28



Emergent Plant Community Discussion

As mentioned in the overview, this is the first year for emergent vegetation surveys of this nature on Dewart Lake. There are no past results for comparison, but data from 2008 will be used as the baseline for future comparisons.

Total Beds and acreage

In 2008, 28 total emergent plant beds were mapped in Dewart Lake. These emergent plant beds total an estimated 44.9 acres in Dewart Lake. Twenty six of these plant beds were located in the recently established ecozone along the south shore of the lake. Two beds (beds 27 and 28) were outside of this ecozone, in a buoyed off area in the northwest quarter of the lake. These are two offshore bulrush beds.

Off-Shore Beds

Of the offshore beds, hard-stem bulrush was the most frequently observed plant species along transects. Hard-stem bulrush was the most dominant plant in 13 of the 28 plant beds and it was observed in 18 of the 28 beds. Cattails were dominant in two off-shore beds and American pondweed was dominant in one offshore bed.

Near Shore Beds

Cattails were the second most observed species and were much more common in the near shore beds. Cattails were present in 11 different plant beds. Cattails were dominant in five total plant beds while spatterdock was dominant in four beds, including the largest emergent bed. Water willow was dominant in 3 emergent beds, while white lilies were dominant in two beds. American Pondweed was dominant in one emergent bed. White lilies were present in 9 beds, while spatterdock, common arrowhead, and water willow were present in six beds each. Purple loosestrife (an invasive species) was present in 4 plant beds, although it was generally seen in low abundance. Pickerel weed was present in 3 beds, while water smartweed was present in 2 beds.

Species Richness

More species richness was seen in the near shore beds, with as many as 7 different emergent plant species being documented in a single plant bed. Offshore beds were less diverse, usually with 1 to 3 different emergent species. Offshore beds of bulrushes tended to be devoid of other plant species. These beds may be interesting to watch over time as the ecozone is now protected by buoys. One might expect these beds to expand, become more dense, or even more diverse if they are protected from wave action.

Bed Size

While the largest emergent bed in Dewart Lake is an estimated 24.58 acres, the majority of beds mapped in this report were less than 1 acre. A special effort was made to map even very small stands, especially in off-shore areas of the proposed ecozone. It is in these small beds that changes may be quickly seen if wave action and turbulence are reduced in the ecozone area. Emergent surveys in the future will re-define bed areas and composition. These results can then be compared to 2008 results to determine if the size and diversity of the emergent plant community is changing as a result of the new protection provided by the no wake zone and the proposed ecozone.

16.2 Herbicide Calculations

The following chart outlines rate calculations for DMA – 4 IVM Herbicide. It was taken directly from the DMA – 4 IVM specimen label on Dow AgroSciences website.

<http://www.dowagro.com/ivm/invasive/prod/dma.htm>

Submerged Aquatic Weeds: Including Eurasian Water Milfoil (*Myriophyllum spicatum*)

Treatment Site	Maximum Application Rate ¹	Specific Use Directions
Aquatic Weed Control in Ponds, Lakes, Reservoirs, Marshes, Bayous, Drainage Ditches, Canals, Rivers and Streams that are Quiescent or Slow-Moving, Including Programs of the Tennessee Valley Authority.	2.84 gallons (10.8 lb of acid equivalent) per acre foot	<p>Application Timing: For best results, apply in spring or early summer when aquatic weeds appear. Check for weed growth in areas heavily infested the previous year. A second application may be needed when weeds show signs of recovery, but no later than mid-August in most areas.</p> <p>Subsurface Application: Apply DMA 4 IVM undiluted directly to the water through a boat mounted distribution system. Shoreline areas should be treated by subsurface injection application by boat to avoid aerial drift.</p> <p>Surface Application: Use power operated boat mounted boom sprayer. If rate is less than 5 gallons per acre, dilute to a minimum spray volume of 5 gallons per surface acre.</p> <p>Aerial Application: Use drift control spray equipment or thickening agents mixed with sprays to reduce drift. Apply through standard boom systems in a minimum spray volume of 5 gallons per surface acre. For Microfoil® drift control spray systems, apply DMA 4 IVM in a total spray volume of 12 to 15 gallons per acre. Apply to attain a concentration of 2 to 4 ppm (see table below).</p>

¹DMA 4 IVM contains 3.8 lb of acid equivalent per gallon of product.

Amount to Apply to Attain a Concentration of 2 to 4 ppm			
Surface Area	Average Depth (ft)	2,4-D Acid Equivalent to Apply (lb/acre)	Amount of DMA 4 IVM to Apply (gal/acre)
1 acre	1	5.4 to 10.8	1.42 to 2.84
	2	10.8 to 21.6	2.84 to 5.68
	3	16.2 to 32.4	4.26 to 8.53
	4	21.6 to 43.2	5.68 to 11.37
	5	27.0 to 54.0	7.10 to 14.21

The following table outlines rate calculations for Renovate 3 herbicide based on desired PPM and average depth of treatment area. It is taken directly from the Renovate 3 specimen label on SePRO Corporation's website:

www.sepro.com

Concentration of Triclopyr Acid in Water (ppm ae)					
	Gallons of Renovate 3 per surface acre at specified depth				
Water Depth (feet)	0.75 ppm	1.0 ppm	1.5 ppm	2.0 ppm	2.5 ppm
1	0.7	0.9	1.4	1.8	2.3
2	1.4	1.8	3.3	3.6	4.6
3	2.1	2.9	4.1	5.4	6.8
4	2.7	3.6	5.4	7.2	9.1
5	3.4	4.5	6.8	9.0	11.3
6	4.1	5.4	8.1	10.9	13.6
7	4.8	6.3	9.5	12.7	15.8
8	5.5	7.2	10.9	14.5	18.1
9	6.1	8.1	12.2	16.3	20.4
10	6.8	9.0	13.6	18.1	22.6
15	10.2	13.6	20.4	27.2	33.9
20	13.6	18.1	27.2	36.2	45.3

16.3 Species Distribution Maps

Figure 40: 2008 American Pondweed Locations



Figure 41: 2008 Bladderwort Locations



Figure 42: 2008 Brittle Naiad Locations



Figure 43: 2008 Chara Locations



Figure 44: 2008 Coontail Locations



Figure 45: 2008 Curly Leaf Pondweed Locations



Figure 46: 2008 Eel Grass Locations



Figure 47: 2008 Elodea Locations



Figure 48: 2008 EWM Locations



Figure 49: 2008 Flat- Stemmed Pondweed Locations



Figure 50: 2008 Illinois Pondweed Locations

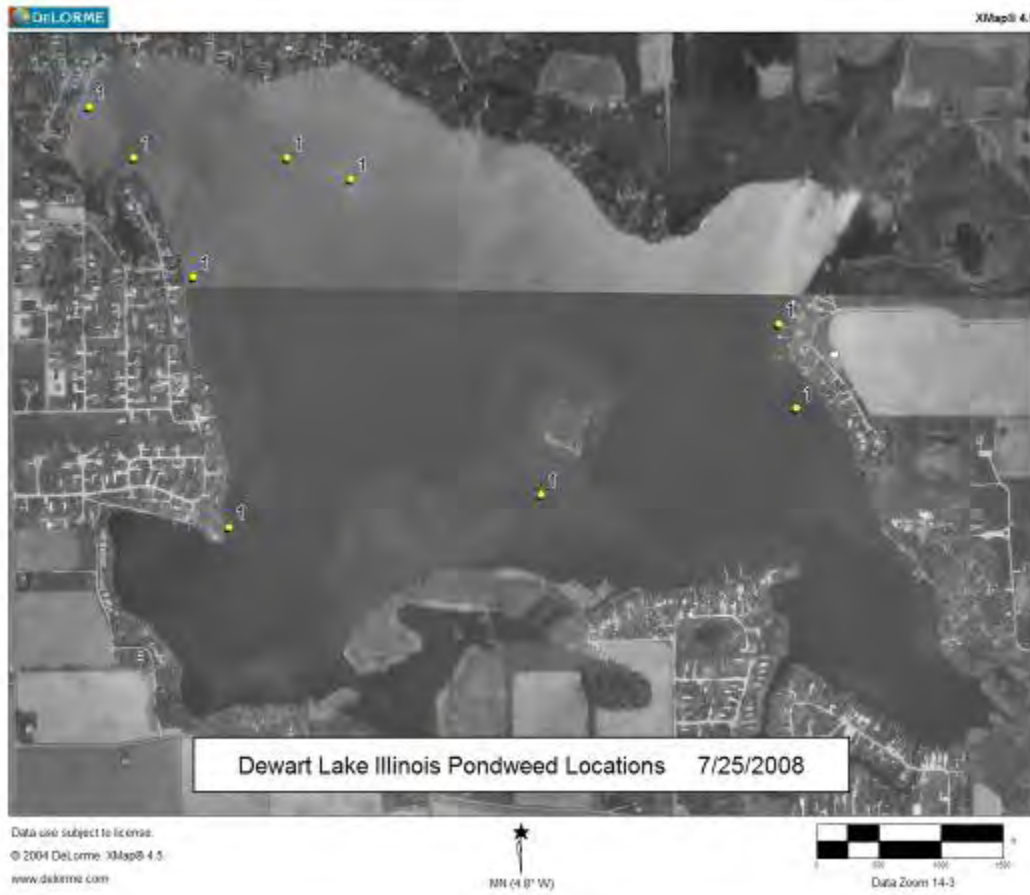


Figure 51: 2008 Large Leaf Pondweed Locations



Figure 52: 2008 Nitella Locations



Figure 53: 2008 Sago Pondweed Locations



Figure 54: 2008 Slender Naiad Locations



Figure 55: 2008 Small Pondweed Locations



Figure 56: 2008 Water Stargrass Locations



16.4 Data Sheets

Figure 57: July 2008 Data Cover Sheet

Aquatic Vegetation Random Sampling (Tier 2)		
Waterbody Cover Sheet		
Surveying Organization:	Aquatic Weed Control	
Contact Information:	574-533-2597	
Waterbody Name:	Dewert Lake	Lake ID: Dewert
County(s):	Kosciusko	Date: 7-25-08
Habitat Stratum:	IL	Avg. Lake Depth (ft): 16 ft
		Lake Level: Avg
GPS Metadata		
Crew Leader:	Dave Keister	Datum: Zone: Accuracy:
		NAD83 16 30ft
Recorder:	Dave Keister	Method: WAAS Enabled GPS
Secchi Depth (ft):	7.2	Total # of Points Surveyed: 90
		Total # of Species: 17
Littoral Zone Size (acres):	227	Littoral Zone Max. Depth (ft): 13 ft
<input type="checkbox"/> Measured		<input type="checkbox"/> Measured
<input checked="" type="checkbox"/> Estimated		<input type="checkbox"/> Estimate (historical Secchi)
		<input checked="" type="checkbox"/> Estimated (current Secchi)
		Max. Plane Depth
Notable Conditions:	EWTN covered many of the littoral zone. Also observed some of the...	

Figure 58: July 2008 Date Sheet 1

Submersed Aquatic Vegetation Survey (Tier II) Datasheet

Page 1 of 3

WATERBODY NAME: <u>Duck Lake</u>				DATE: <u>7-25-08</u>										
COUNTY: <u>Kosciusko</u>				SEC#& DEPTH (FT): <u>7.2 Ft</u>										
SITE ID: <u>Duck Lake</u>				MAX PLANT DEPTH (FT): <u>13.4</u>										
SURVEYING ORGANIZATION: <u>Aquatic Weed Control</u>				WEATHER: <u>partly cloudy</u>										
CREW LEADER: <u>Dave Keister</u>				COMMENTS (include voucher codes - V1, V2...):										
RECORDER: <u>Tina Weislow</u>														
CONTACT INFO: <u>574-533-2577</u>				Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.										
Point #	RIT	Latitude	Longitude	Depth	Species Codes:							Fossil Notes		
					CEPES	SPPEC	CHARS	WTRNLC	MYRAN	ELIAL	ZOORP		VALM	
1	R	GAS Waypoints		3	3	3	1	1						
2				3			5							
3	↓			8			3							N17-1
4		↓	↓	12	-									
5				17	-									
6				4			5							
7				7		3								
8				12		5								
9				3			5							
10				6			5							
11				14	-									
12				2			3							
13				6		3	1			3				slender-1
14				11	-		5							
15				1										
16				8			5							
17				17	-									N.T-1
18				12		5								flat-1
19				3			5							
20				2			5							
21				6			5							
22				3										
23				12	-									
24				10			5							
25				10							1			flat-1
26				13			3							
27				3			2							
28				3		5								
29				3			5							
30				13						3				Small-3
31				10		1								flat-1
32				3			3							Coast-1
33				9	3									

Other plant species observed at lake:

Figure 59: July 2008 Data Sheet 2

Submersed Aquatic Vegetation Survey (Tier II) Datasheet Page 2 of 3

WATERBODY NAME: <u>Dewar Lake</u>				DATE: <u>7-25-08</u>													
COUNTY: <u>Kosciusko</u>				SECCHI DEPTH (FT): <u>7.2 ft</u>													
SITE ID: <u>Dewar Lake</u>				MAX PLANT DEPTH (FT): <u>13 ft</u>													
SURVEYING ORGANIZATION: <u>Aquatic Weed Control</u>				WEATHER: <u>Partly Cloudy</u>													
CREW LEADER: <u>Dave Krister</u>				COMMENTS (Include voucher codes - V1, V2...):													
RECORDER: <u>Low Krister</u>																	
CONTACT INFO: <u>574-533-2597</u>				Rake score (1, 3, 5). 9 = algae, emergent or species observed but not sampled.													
Point #	R/T	Latitude	Longitude	Depth	Species Codes:								Notes				
					CER	PER	ST	PEC	CH	ER	UTR	W		W	EL	CO	UB
34	R	GPS Max Points		3					5								
35	↓	↓	↓	9													layer
36				13													
37				20	-												
38				2	3				5								straggler
39				7													
40				11	1												Ext
41				3													
42				8	5												Layer
43				3	5	1											straggler
44				3	3												
45				19	-												
46				11	-												Ext
47				12	-												
48				16	-												
49				10	3												
50				14	-				3								
51				7	-				3								
52				12	-				5								
53				4	-				3								
54				7	-				5								
55				11	-				5								
56				17	-												
57				2	-					1							
58				8	-				3								
59				12	-												
60				4	5												Ext - 3 ft
61				6	3	1											Layer - 3 ft
62				11	-												
63				16	-												
64				4	-				5								American - 1 straggler
65				4	-				1								
66				13	-												

Other plant species observed at lake:

Figure 60: July 2008 Data Sheet 3

Submersed Aquatic Vegetation Survey (Tier II) Datasheet Page 3 of 3

WATERBODY NAME: <u>Downs Lake</u>				DATE: <u>7-25-08</u>									
COUNTY: <u>Kosciusko</u>				SECCHI DEPTH (FT): <u>1, 2, 4</u>									
SITE ID: <u>Downs Lake</u>				MAX PLANT DEPTH (FT): <u>13.4</u>									
SURVEYING ORGANIZATION: <u>Aquatic Weed Control</u>				WEATHER: <u>Partly Cloudy</u>									
CREW LEADER: <u>Dave Kruse</u>				COMMENTS (include voucher codes - V1, V2...):									
RECORDER: <u>Dave Kruse</u>													
CONTACT INFO: <u>574-538-2597</u>				Rate score (1, 3, 5). 0 = algae, emergent or species observed but not sampled.									
Point #	RIT	Latitude	Longitude	Depth	Species Codes:							POTL Notes	
					CEPHE	CTUC	CHIR	UTRAN	NKTAJ	ELOCA	ZOSOB		VALAN
67	R	GPS Way Points		3			3						
68	↓	↓	↓	8		3							
69	↓	↓	↓	13									
70				3			3						
71				8		5				1		EW	A-1
72				11		3				5			
73				15		3							
74				1			1						
75				19									
76				6	3	5				3		TEA	-1
77				2			3					TEA	ill-1
78				8		5							
79				13	3	5				3		1	
80				2			3						
81				6	3	3				3		EW	-1 (stems)
82				19									
83				3			5						
84				14									
85				9									
86				1		5							T-FA T-5
87				2			5					TEA	EW -1 (stems)
88				2			5					ill-1	
89				6		1	5						
90				3		3							

Other plant species observed at lake:

Figure 61: August 2008 Emergent Survey Data Sheet 1

10 of 2

Aquatic Plant Survey Form

*2008
10/16/08*

Lake: <u>Duckert</u>		Secchi: <u>7, 2</u>													
County: <u>Washtenaw</u>		Max Plant Depth: <u>nd</u>													
Date: <u>8-13-08</u>		Weather: <u>Partly Sunny</u>													
Biologist: <u>Diana R. Korte</u>		Comments:													
Units of Measure: <u>yds</u>		Raize score (1,3,5) observed(9), algae (p), emergent contact (1), emergent visual (9)													
R/T		Use acronyms/codes for identified species, use V1, V2...for voucher specimens													
Site	S/E/C	Latitude	Longitude	Dep(est)	Dep/Wid	All	White	Sp	Cent	Line	A Line	Water	Plant	Plant	Plant
1	E			pic 1 3	15 yds		1					9			
2				pic 2	7.5 yds		1	7	7	4	1				
3				pic 4	10.5 yds		9	9	9	9					
6	E			pic 5	7.2 yds		1					9			
7	S	(18-22)		pic 7	9.5 yds		9					9			1
		25-35		pic 8			9								1
43	S	pic 9-10			3 yds										
25	E				2 yds		1					9			
34	S			pic 12	39 yds		9	9	9					1	9
39	E				3 yds				1						
40	S				5 yds									1	
41				pic 14	6 yds									1	9
42	E				1 yds									1	9
43	S			pic 16	17				9					1	
44					5 yds				9		1				
46					5 yds				9		1				
47					5 yds				9		1				
51	E				5 yds				9		1				
52	S			pic 18	21		1		9	9				1	
55					4.5 yds		1		9	9				1	
74	E			pic 22	6.8 yds		1	9	9					1	
75	S	(14-20)		pic 24	25		1							1	9
91	S			pic 26	27				9	1					
92	E				5 yds				9	1					
93	S			pic 28	5		1	9	1						1
94					30 yds				9	9					9
96	E				2 yds					1					

Figure 62: August 2008 Emergent Survey Data Sheet 2

Aquatic Plant Survey Form 2 of 2

Lake: <u>Dumont</u>		Secchi: <u>7.2</u>													
County: <u>Keweenaw</u>		Max Plant Depth: <u>~6</u>													
Date: <u>8-13-08</u>		Weather: <u>Partly Sunny</u>													
Biologist: <u>Dave West</u>		Comments:													
Units of Measure: <u>pts</u>		Rake score (1,3,5) observed(9), algae (p), emergent contact (1), emergent visual (9) Use acronyms/codes for identified species, use V1, V2... for voucher specimens													
Site	S/E/C	Latitude	Longitude	Dep(est)	Dep/Wid	All	Willy	Spot	Cat	Hyacinth	A. Horn	Willow	Sp. Sp.	Rush	Trif.
97	S	675 W	675 W	pic 27	5 yds										
99					10 yds									9	
100	E				1 yd										
101	S			pic 30	10 yds				9	9				1	
102					25			1						1	
109	E				40 yds			9		9				1	9
110	S			pic 31-32	25 yds			1						1	9
113				pic 33	44 yds		1	1							
119	E				15 yds			1			9				
120	C			pic 34-37	15 x 10									1	
131	S	(121-120)												1	
137	S	(127-134)		pic 38										1	
138	E			pic 39	10 x 10				1						
139	C			pic 40	5 x 10									1	
137	C	(137-140)		pic 41					1						
141	C			pic 42	10 x 10				1					1	
142	C			pic 43	5 x 5									1	
143	C			pic 44	10 x 10									1	
144	S	(144-147)		pic 45-46										1	
148	S	(148-194)		pic 47										1	
145	E	(145-147)		pic 48-51					1					1	
								1							
146	C			pic 52	10 x 10									1	
144	C/E	(211-212)		pic 54, 55										1	
149	S			pic 56, 57										1	
									1						

Rake Sample Location GPS Coordinates

Table 10: GPS Coordinates for Rake Sample Locations

Latitude	Longitude	site
41.37388	-85.7843	1
41.37508	-85.7836	2
41.37503	-85.7821	3
41.37386	-85.7819	4
41.37321	-85.7811	5
41.37245	-85.7818	6
41.3716	-85.7804	7
41.37038	-85.7801	8
41.36936	-85.7808	9
41.36833	-85.7798	10
41.36752	-85.7795	11
41.36695	-85.7808	12
41.36646	-85.7812	13
41.36626	-85.7823	14
41.36654	-85.7834	15
41.36583	-85.7833	16
41.36515	-85.7827	17
41.36457	-85.7815	18
41.36374	-85.7809	19
41.36388	-85.7798	20
41.36509	-85.7781	21
41.36666	-85.778	22
41.36782	-85.7777	23
41.3673	-85.7748	24
41.36824	-85.7741	25
41.36939	-85.7734	26
41.36767	-85.7716	27
41.37105	-85.7716	28
41.36977	-85.7705	29
41.36819	-85.77	30
41.36744	-85.7688	31
41.36625	-85.7678	32
41.36695	-85.766	33
41.36628	-85.7648	34
41.36602	-85.7637	35
41.36517	-85.7642	36
41.36418	-85.7634	37
41.36345	-85.763	38
41.36368	-85.7616	39
41.36323	-85.761	40
41.36247	-85.7607	41
41.36309	-85.7601	42
41.36298	-85.7592	43
41.36379	-85.7597	44
41.36374	-85.7604	45
41.36437	-85.7609	46

41.36536	-85.7608	47
41.36574	-85.7621	48
41.36649	-85.7622	49
41.36717	-85.7629	50
41.36701	-85.7643	51
41.36816	-85.7641	52
41.36908	-85.7633	53
41.36957	-85.7642	54
41.37003	-85.7649	55
41.37085	-85.7653	56
41.37143	-85.7647	57
41.37253	-85.765	58
41.37283	-85.7637	59
41.37313	-85.7624	60
41.37372	-85.7619	61
41.37386	-85.7631	62
41.37391	-85.7641	63
41.37431	-85.7653	64
41.37355	-85.7658	65
41.37298	-85.7664	66
41.37316	-85.7677	67
41.37258	-85.7689	68
41.37256	-85.77	69
41.37391	-85.7709	70
41.37334	-85.772	71
41.37403	-85.7729	72
41.37363	-85.7743	73
41.37482	-85.7745	74
41.37324	-85.7754	75
41.37367	-85.7764	76
41.3746	-85.7772	77
41.37412	-85.7779	78
41.37508	-85.7791	79
41.37612	-85.7792	80
41.37567	-85.7801	81
41.37611	-85.7807	82
41.37641	-85.7799	83
41.37628	-85.7816	84
41.37661	-85.7827	85
41.37673	-85.7835	86
41.37629	-85.784	87
41.3762	-85.7849	88
41.37561	-85.7839	89
41.37547	-85.7832	90

END

Table 11: Dewart Emergent Survey Waypoints

Dewart Lake Emergent Survey Mapping Points
41.364093,-85.782184,001,Red Flag
41.363898,-85.781800,002,Red Flag
41.363691,-85.781437,003,Red Flag
41.363760,-85.781157,004,Red Flag
41.363636,-85.780795,005,Red Flag
41.363587,-85.780546,006,Red Flag
41.363754,-85.780417,007,Red Flag
41.363323,-85.780267,008,Red Flag
41.363339,-85.780490,009,Red Flag
41.363310,-85.780707,010,Red Flag
41.363238,-85.780889,011,Red Flag
41.363183,-85.780687,012,Red Flag
41.363211,-85.780515,013,Red Flag
41.363160,-85.780243,014,Red Flag
41.363228,-85.779978,015,Red Flag
41.363199,-85.779809,016,Red Flag
41.363205,-85.779641,017,Red Flag
41.363239,-85.779497,018,Red Flag
41.363321,-85.779314,019,Red Flag
41.363367,-85.779169,020,Red Flag
41.363351,-85.779026,021,Red Flag
41.363375,-85.778834,022,Red Flag
41.363289,-85.778805,023,Red Flag
41.363201,-85.779213,024,Red Flag
41.363169,-85.779566,025,Red Flag
41.363980,-85.779840,026,Red Flag
41.364008,-85.779639,027,Red Flag
41.364109,-85.779441,028,Red Flag
41.364147,-85.779124,029,Red Flag
41.364179,-85.778947,030,Red Flag
41.364183,-85.778786,031,Red Flag
41.364180,-85.778689,032,Red Flag
41.364171,-85.778586,033,Red Flag
41.364191,-85.778451,034,Red Flag
41.364161,-85.778284,035,Red Flag
41.364157,-85.777999,036,Red Flag
41.364160,-85.777933,037,Red Flag
41.364255,-85.777700,038,Red Flag
41.364632,-85.777325,039,Red Flag
41.364657,-85.777220,040,Red Flag
41.364792,-85.777201,041,Red Flag
41.365107,-85.776823,042,Red Flag
41.365150,-85.776777,043,Red Flag
41.365309,-85.776375,044,Red Flag
41.365579,-85.775819,045,Red Flag
41.365745,-85.775437,046,Red Flag
41.366029,-85.775007,047,Red Flag
41.366138,-85.774495,048,Red Flag
41.366123,-85.774188,049,Red Flag
41.366086,-85.773856,050,Red Flag
41.366043,-85.773429,051,Red Flag
41.366137,-85.773398,052,Red Flag
41.366208,-85.773196,053,Red Flag
41.366222,-85.773082,054,Red Flag
41.366355,-85.772854,055,Red Flag
41.366329,-85.772737,056,Red Flag
41.366361,-85.772432,057,Red Flag
41.366291,-85.772233,058,Red Flag
41.366327,-85.771903,059,Red Flag
41.366452,-85.771707,060,Red Flag
41.366543,-85.771657,061,Red Flag
41.366584,-85.771559,062,Red Flag
41.366548,-85.771415,063,Red Flag
41.366500,-85.771326,064,Red Flag
41.366400,-85.771223,065,Red Flag
41.366238,-85.771180,066,Red Flag

41.366111,-85.771044,067,Red Flag
41.366120,-85.770858,068,Red Flag
41.366143,-85.770708,069,Red Flag
41.366085,-85.770546,070,Red Flag
41.366161,-85.770230,071,Red Flag
41.366105,-85.770005,072,Red Flag
41.366055,-85.769800,073,Red Flag
41.366025,-85.769649,074,Red Flag
41.366691,-85.769874,075,Red Flag
41.366643,-85.769892,076,Red Flag
41.366540,-85.770076,077,Red Flag
41.366524,-85.770409,078,Red Flag
41.366477,-85.770666,079,Red Flag
41.366547,-85.770831,080,Red Flag
41.366620,-85.770995,081,Red Flag
41.366681,-85.771141,082,Red Flag
41.366773,-85.771355,083,Red Flag
41.366904,-85.771426,084,Red Flag
41.366984,-85.771266,085,Red Flag
41.367050,-85.771072,086,Red Flag
41.367024,-85.770915,087,Red Flag
41.366989,-85.770751,088,Red Flag
41.366944,-85.770530,089,Red Flag
41.366908,-85.770287,090,Red Flag
41.368570,-85.770625,091,Red Flag
41.368717,-85.770860,092,Red Flag
41.368701,-85.770867,093,Red Flag
41.368626,-85.771186,094,Red Flag
41.368751,-85.771348,095,Red Flag
41.369029,-85.771515,096,Red Flag
41.369218,-85.771571,097,Red Flag
41.369508,-85.771554,098,Red Flag
41.369603,-85.771445,099,Red Flag
41.369746,-85.771210,100,Red Flag
41.369893,-85.771121,101,Red Flag
41.369912,-85.770915,102,Red Flag
41.369791,-85.770850,103,Red Flag
41.369671,-85.770779,104,Red Flag
41.369709,-85.770625,105,Red Flag
41.369745,-85.770396,106,Red Flag
41.369720,-85.770257,107,Red Flag
41.369689,-85.770098,108,Red Flag
41.369650,-85.769955,109,Red Flag
41.369525,-85.770025,110,Red Flag
41.369450,-85.770004,111,Red Flag
41.369264,-85.769923,112,Red Flag
41.369157,-85.769905,113,Red Flag
41.369021,-85.769996,114,Red Flag
41.368857,-85.770116,115,Red Flag
41.368798,-85.770248,116,Red Flag
41.368686,-85.770361,117,Red Flag
41.368488,-85.770385,118,Red Flag
41.368465,-85.770489,119,Red Flag
41.366147,-85.776423,120,Red Flag
41.365956,-85.776580,121,Red Flag
41.366059,-85.777036,122,Red Flag
41.366219,-85.777134,123,Red Flag
41.366348,-85.777017,124,Red Flag
41.366212,-85.776902,125,Red Flag
41.366115,-85.776698,126,Red Flag
41.366509,-85.777325,127,Red Flag
41.366437,-85.777333,128,Red Flag
41.366385,-85.777402,129,Red Flag
41.366304,-85.777460,130,Red Flag
41.366272,-85.777553,131,Red Flag
41.366324,-85.777601,132,Red Flag
41.366368,-85.777520,133,Red Flag
41.366468,-85.777485,134,Red Flag
41.367078,-85.776786,135,Red Flag

41.367099,-85.776755,136,Red Flag
41.367201,-85.776643,137,Red Flag
41.367211,-85.776593,138,Red Flag
41.367165,-85.776541,139,Red Flag
41.367129,-85.776565,140,Red Flag
41.366952,-85.776631,141,Red Flag
41.366680,-85.776359,142,Red Flag
41.366803,-85.776275,143,Red Flag
41.366834,-85.776039,144,Red Flag
41.366789,-85.775823,145,Red Flag
41.366799,-85.775683,146,Red Flag
41.366673,-85.775590,147,Red Flag
41.366699,-85.775446,148,Red Flag
41.366762,-85.775254,149,Red Flag
41.366713,-85.775044,150,Red Flag
41.366721,-85.774900,151,Red Flag
41.366679,-85.774674,152,Red Flag
41.366663,-85.774481,153,Red Flag
41.366614,-85.774156,154,Red Flag
41.366644,-85.773917,155,Red Flag
41.366773,-85.773733,156,Red Flag
41.366845,-85.773673,157,Red Flag
41.366904,-85.773576,158,Red Flag
41.367018,-85.773493,159,Red Flag
41.367112,-85.773596,160,Red Flag
41.367274,-85.773584,161,Red Flag
41.367457,-85.773498,162,Red Flag
41.367586,-85.773485,163,Red Flag
41.367691,-85.773489,164,Red Flag
41.367739,-85.773455,165,Red Flag
41.367820,-85.773587,166,Red Flag
41.367655,-85.773692,167,Red Flag
41.367609,-85.773771,168,Red Flag
41.367669,-85.773840,169,Red Flag
41.367686,-85.773985,170,Red Flag
41.367569,-85.774096,171,Red Flag
41.367532,-85.774224,172,Red Flag
41.367385,-85.774411,173,Red Flag
41.367418,-85.774519,174,Red Flag
41.367363,-85.774651,175,Red Flag
41.367345,-85.774876,176,Red Flag
41.367473,-85.774919,177,Red Flag
41.367562,-85.775084,178,Red Flag
41.367522,-85.775154,179,Red Flag
41.367386,-85.775104,180,Red Flag
41.367301,-85.775040,181,Red Flag
41.367196,-85.775107,182,Red Flag
41.367081,-85.775320,183,Red Flag
41.367057,-85.775463,184,Red Flag
41.366983,-85.775655,185,Red Flag
41.366974,-85.775882,186,Red Flag
41.366933,-85.776014,187,Red Flag
41.367629,-85.776570,188,Red Flag
41.367777,-85.776577,189,Red Flag
41.367816,-85.776384,190,Red Flag
41.367747,-85.776136,191,Red Flag
41.367602,-85.776120,192,Red Flag
41.367533,-85.776195,193,Red Flag
41.367583,-85.776348,194,Red Flag
41.367626,-85.776023,195,Red Flag
41.367647,-85.775958,196,Red Flag
41.367796,-85.775689,197,Red Flag
41.367763,-85.775548,198,Red Flag
41.367702,-85.775455,199,Red Flag
41.367655,-85.775360,200,Red Flag
41.367593,-85.775281,201,Red Flag
41.367553,-85.775206,202,Red Flag
41.367404,-85.775116,203,Red Flag
41.367233,-85.775158,204,Red Flag

41.367182,-85.775302,205,Red Flag
41.367244,-85.775455,206,Red Flag
41.367202,-85.775608,207,Red Flag
41.367264,-85.775747,208,Red Flag
41.367289,-85.775874,209,Red Flag
41.367368,-85.775929,210,Red Flag
41.367481,-85.775967,211,Red Flag
41.367587,-85.776001,212,Red Flag
41.367681,-85.773335,213,Red Flag
41.374542,-85.775833,214,Red Flag
41.374548,-85.775905,215,Red Flag
41.374608,-85.775957,216,Red Flag
41.374689,-85.775890,217,Red Flag
41.374638,-85.775796,218,Red Flag
41.375170,-85.777368,219,Red Flag
41.375095,-85.777334,220,Red Flag
41.375051,-85.777421,221,Red Flag
41.375027,-85.777574,222,Red Flag
41.375043,-85.777683,223,Red Flag
41.375122,-85.777676,224,Red Flag
41.375161,-85.777551,225,Red Flag
41.375218,-85.777357,226,Red Flag
END

16.5 IDNR Vegetation Control Permit



APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT

State Form 26727 (R4 / 2-04)
 Approved State Board of Accounts 2004
 Whole Lake Multiple Treatment Areas
 Check type of permit

FOR OFFICE USE ONLY	
License No.	
Date Issued	
Lake County	

Return to: Page 1 of
 DEPARTMENT OF NATURAL RESOURCES
 Division of Fish and Wildlife
 Commercial License Clerk
 402 West Washington Street, Room W273
 Indianapolis, IN 46204

FEE: \$5.00

INSTRUCTIONS: Please print or type information

Applicant's Name		Lake Assoc. Name Dewart Lake Protective Association Inc.	
Rural Route or Street P. O. Box 152		Phone Number 574-658-9762	
City and State Syracuse IN		ZIP Code 46567	
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number	
Rural Route or Street		Phone Number	
City and State		ZIP Code	
Lake (One application per lake) Dewart Lake	Nearest Town Syracuse	County Kosciusko	
Does water flow into a water supply		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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

Treatment Area #	1	LAT/LONG or UTM's		N 41 degrees 22.196 W85 degrees 46.413
Total acres to be controlled	45	Proposed shoreline Length (ft)	Perpendicular distance from shoreline (ft)	
Maximum Depth of Treatment (ft)	5	Expected date(s) of treatment(s)		
Treatment method:		<input checked="" type="checkbox"/> Chemical	<input type="checkbox"/> Physical	<input type="checkbox"/> Biological Control
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		
Plant survey method:		<input checked="" type="checkbox"/> Rake	<input type="checkbox"/> Visual	<input type="checkbox"/> Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian Watermilfoil	X	80%
Areas done based on surveys		
Plant species present based on surveys		

