Aquatic Plant Management Plan

Lipsett Lake

Burnett County, WI
September 2009

Sponsored By
Lipsett Lake Association

Aquatic Plant Advisory Committee Members:

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Prepared By

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Endangered Resource Services, LLC Matt Berg	Aquatic Plant Survey and Mapping

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Introduction

The Aquatic Plant Management Plan for Lipsett Lake is sponsored by the Lipsett Lakes Association. The planning phase of the project is funded, in part, by the Burnett County Land and Water Conservation Department and the Lipsett Lake Association.

With the discovery of Eurasian water milfoil (*Myriophyllum spicatum*) in nearby Ham Lake (WBIC 2467700) in 2003, concerned members of the Lipsett Lake Association authorized an extensive assessment of Lipsett Lake aquatic macrophytes using the Wisconsin Department of Natural Resources statewide guidelines for conducting systematic point intercept macrophyte sampling. This Aquatic Plant Management Plan for Lipsett Lake presents a strategy for managing aquatic plants by protecting native plant populations and preventing the establishment of invasive species. The plan includes data about the plant community, watershed, and water quality. Based on this data and public input, goals and strategies for the sound management of aquatic plants in Lipsett Lake are presented. This plan will guide the Lipsett Lake Association, Burnett County, and the Wisconsin Department of Natural Resources in aquatic plant management for Lipsett Lake over the next five years (from 2010 through 2014).

Public Input for Plan Development

On July 25th, 2009, several members of the Lipsett Lake Association met to discuss the process of creating an Aquatic Plant Management (APM) Plan. At this meeting, a tentative Aquatic Plant Advisory Committee was established. Furthermore, the recommendation of additional committee members was discussed with the assumption that additional members would be added in the near future. During this meeting a date was established (September 5, 2009) to hold a kick-off meeting. An announcement was sent to each lake home resident informing them about the meeting, including time and location. Also, an announcement was placed in the local paper three weeks prior to the event that included information pertaining to the meeting. Additionally, at the first meeting, those present reviewed aquatic plant management planning requirements and discussed initial concerns.

On September 5, 2009, a Public meeting was held to discuss the concerns of Lipsett Lake and to establish those concerns as the primary focus of writing the Aquatic Plant Management Plan for the lake. Prior to the meeting date, a Public Notice was advertised for three weeks in the Spooner Advocate. A total of 30 people were present for the meeting. Minutes of the meeting were recorded. A summary of the concerns are listed below:

- Protect, prevent and control the spread of aquatic invasive species
- Control and prevent nutrient run-off
- Issues concerning water flow, erosion control, septic systems/gray water
- Encouraging the growth of native plants
- Mass education on various subjects related to protecting and preserving this natural resource, including wildlife and fish species enhancement

The committee members met immediately after the public meeting and established goals to be addressed in the APM.

The committee met again on September 26, 2009 and discussed the established goals and developed actions for the goals. The implementation plan was finalized on October 24, 2009. On December 6, 2009, the committee met to review the finalized draft of the APM plan.

In addition to meeting with the committee, a conference call was made to Great Lakes Indian Fish and Wildlife Commision (GLIFWC). The purpose of this call was to discuss control methods of curly leaf pondweed. Furthermore, the discussion was had on how to protect the wild rice beds on Lipsett Lake. Specific goals, objectives and action items were read to the panel of GLIFWC members (See Page 53, Goal 6). Additionally, a copy of the unofficial APM was sent to GLIFWC for further study. The Overall approval of the APM was given by those present, with one amendment. The amendment that was made to a supplemental comment of goal 6, action item 2 can be found on page 53, and is as follows: ***The state is required to consult with Great Lakes Indian Fish and Wildlife Commission prior to any removal of wild rice.***

The Lipsett Lake Association board announced the availability of the draft Aquatic Plant Management Plan for review by March 5th, 2010. Copies will be available at the following locations: Burnett County Government Center Land and Water Conservation Department Room 21, online at the Burnett County Website, Rusk Town Hall and from Lipsett Lake Aquatic Plant Management committee members. Comments and suggestions can be mailed or emailed to the address/addresses below.

Schedule for Plan Completion	March 5th, 2010
Final draft for DNR and public review by	March 5th, 2010
Comments accepted on the plan through	April 9th, 2010

Send comments via mail or email to:
Brad Morris
Burnett County Land and Water Conservation Department
7410 County Road K, #109
Siren, WI 54872
bmorris@burnettcounty.org

Board meeting to review comments	May 1st, 2010

Lake Information

Lipsett Lake (WBIC 2678100) is a 393-acre, eutrophic stratified drainage lake located in east-central Burnett County. Water clarity is fair to poor with average Secchi visibility of no more than 6-9ft creating a littoral zone to 16ft under normal summer conditions.[1]

Table 1: Lake Information

	Lipsett Lake
Size (acres)	392.5
Mean depth (feet)	13
Maximum depth (feet)	24
Littoral zone depth (feet)	116

A Map of Lipsett Lake is found on the following pages in Figure 1 and Figure 2.

[1]Berg, Matthew S., Endangered Resources Services, LLC. Aquatic Macrophyte Survey for Lipsett Lake, Burnett County, Wisconsin. August 2007.

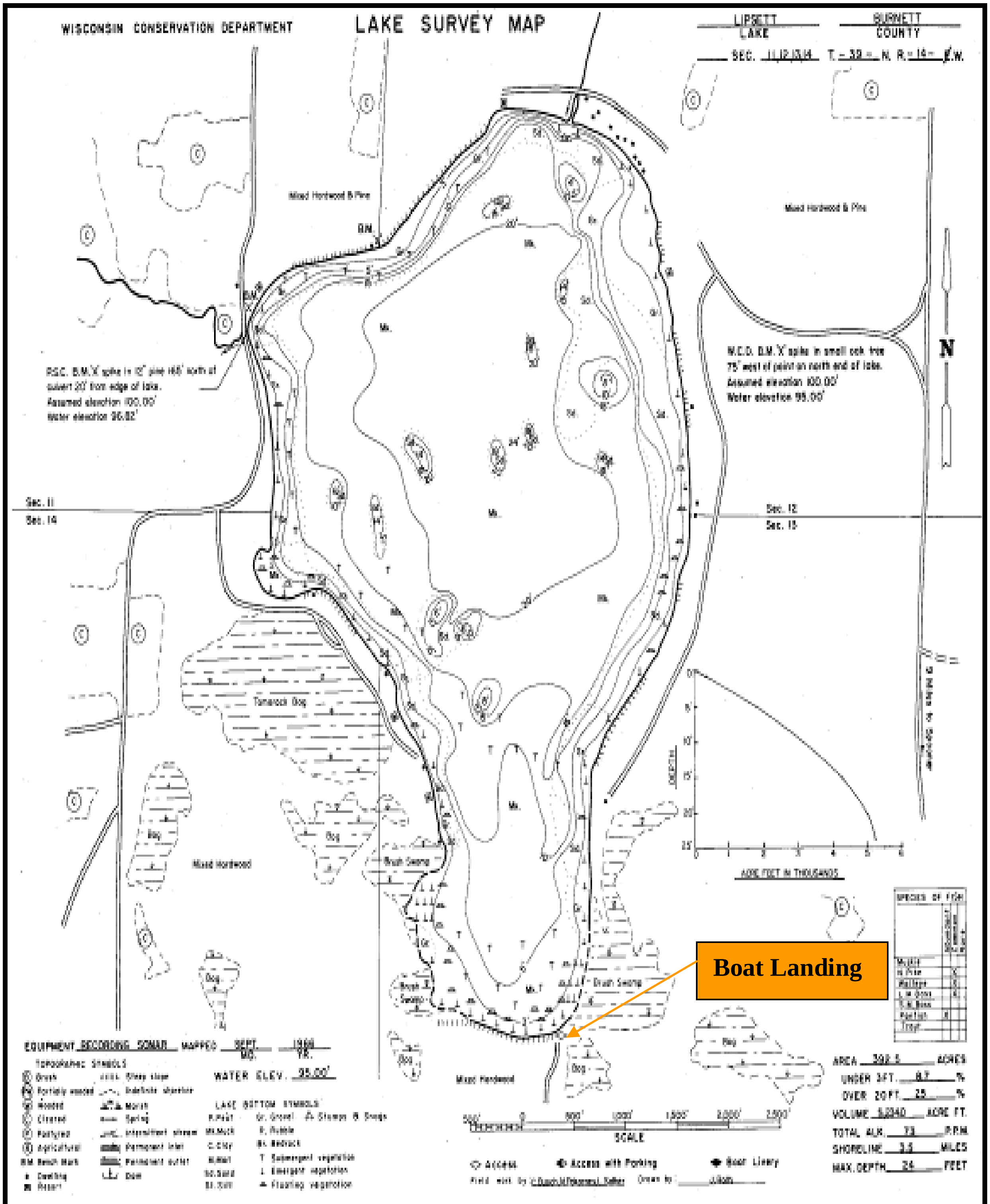

Figure 1: Lipsett Lake Map (Busch, C., et al. 1966).[2]

[2] **Lipsett Lake Map (Busch, C., et al. 1966)**

Figure 2: Aerial Photo of Lipsett Lake (2006 Burnett County Aerial Photo, 1 Foot Resolution**)**[3]

[3] Aerial Photo of Lipsett Lake (**2006 Burnett County Aerial Photo, 1 Foot Resolution**)

Water Quality

Water quality is frequently reported by the trophic state or nutrient level of the lake. Nutrient-rich lakes are classified as eutrophic. These lakes tend to have abundant aquatic plant growth and low water clarity due to algae blooms. Mesotrophic lakes have intermediate nutrient levels and only occasional algae blooms. Oligotrophic lakes are nutrient-poor with little growth of plants and algae.

Secchi depth readings are one way to assess the trophic state of a lake. The Secchi depth is the depth at which the black and white Secchi disk is no longer visible when it is lowered into the water. Greater Secchi depths occur with greater water clarity. Secchi depth readings, phosphorus concentrations, and chlorophyll measurements can each be used to calculate a Trophic State Index (TSI) for lakes. TSI values range from 0 – 110. Lakes with TSI values greater than 50 are considered eutrophic. Those with values in the 40 to 50 range are mesotrophic. Lakes with TSI values below 40 are considered oligotrophic.

Citizen lake monitoring volunteers have collected lake data annually since 1995. There is one data collection site on Lipsett Lake, at the deep hole, located on the north end of the lake.

The deep hole site was sampled 10 different days during the 2008 season. Annual results are available from the WDNR website. Last year's results are averaged and recorded in Table 2, found on the next page. The parameters sampled included water clarity, temperature, dissolved oxygen, total phosphorus, and chlorophyll. Trophic State Index classifications were then determined based on the chlorophyll values.

The average summer (July-Aug) secchi disk reading for Lipsett Lake - Deep Hole (Burnett County, WBIC: 2678100) was 6.75 feet. The average for the Northwest Georegion was 9 feet. Typically the summer (July-Aug) water was reported as **CLEAR** and **BLUE**.

The following Chemistry data was collected on Lipsett Lake in 2009. The average summer Chlorophyll was 9.8 µg/l (compared to a Northwest Georegion summer average of 13.6 µg/l). The summer Total Phosphorus average was 24.5 µg/l. Lakes that have more than 20 µg/l and impoundments that have more than 30 µg/l of total phosphorus may experience noticeable algae blooms.

The overall Trophic State Index (based on chlorophyll) for Lipsett Lake was 52. The TSI suggests that Lipsett Lake was **eutrophic**. This TSI usually suggests decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, and warm-water fisheries (pike, perch, bass, etc.) only.[4]

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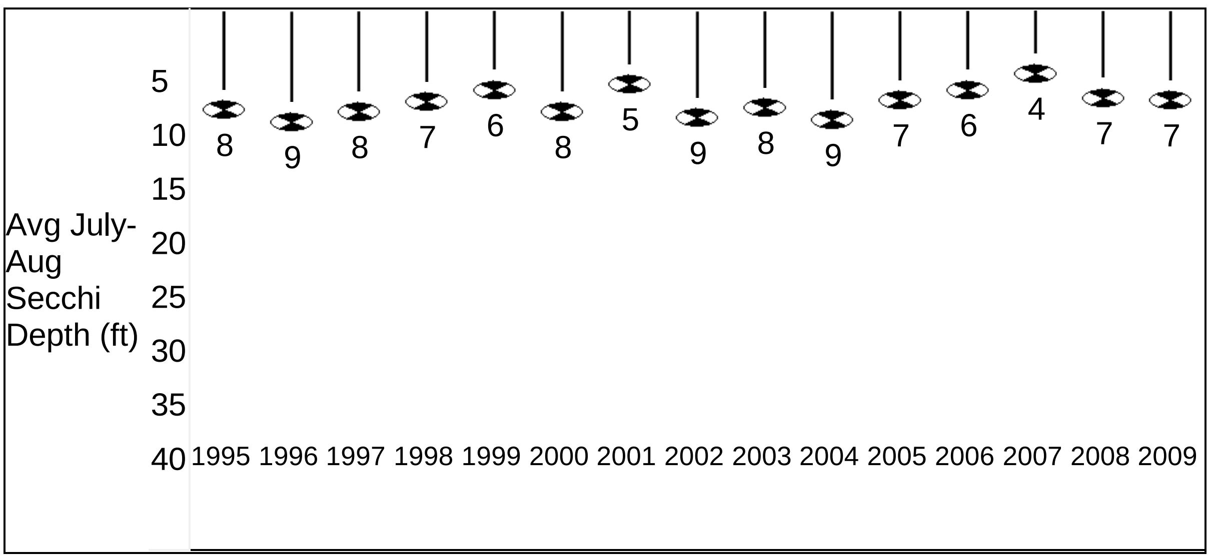
[4] Reports and Data: Burnett County. WDNR website. July 2009. <http://www.dnr.state.wi.us/lakes/CLMN/reportsanddata/>

Table 2: Citizen Lake Monitoring Results[5]

	Lipsett Lake – Deep Hole
Number of samples, 2008	10
Secchi Depth (ft)	6.75
Total Phosphorus (µg/l)	24.5
Chlorophyll (µg/l)	9.8
Trophic State Index (TSI)	52
TSI Classification (based on Chl.)	Eutrophic

Figure 3 illustrates the Secchi depth averages for Lipsett Lake dating back from 1995 to 2009. Table 3 illustrates the actual readings for the past 14 years. Figure 4 graphs the Trophic State Index for Lipsett Lake, based upon Secchi depth, chlorophyll, dissolved oxygen, and total phosphorus results.

Figure 3: Past secchi averages in feet (July and August only).[5]



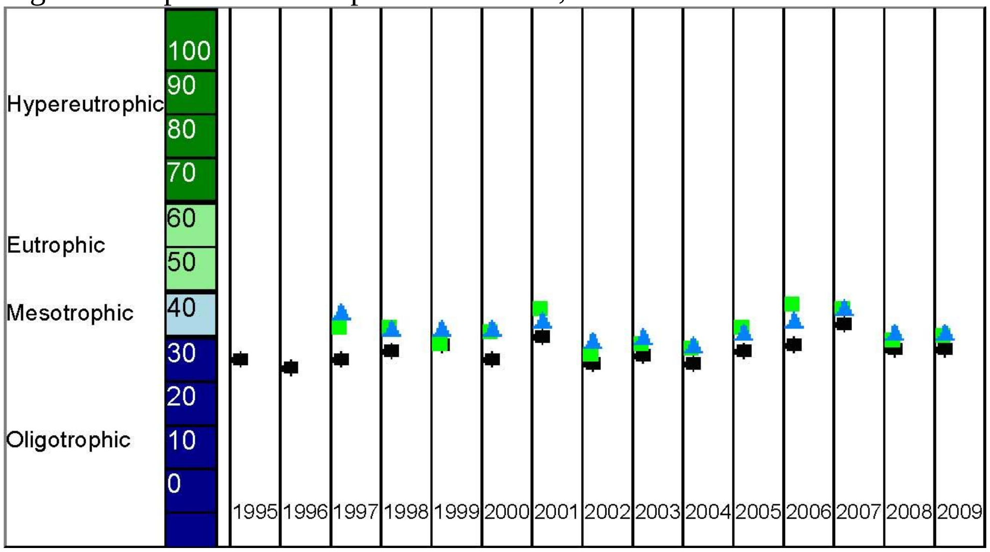
[5] Reports and Data: Burnett County. WDNR website. July 2009. <http://www.dnr.state.wi.us/lakes/CLMN/reportsanddata/>

Table 3: Secchi Readings from 1995 – 2009 [6]

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1995	8	5.5	11	8
1996	9.1	8.5	10.5	5
1997	8.1	5	11	4
1998	7.1	5	11.5	4
1999	6	4.5	9	3
2000	8.1	6	10	6
2001	5.4	3.5	10.5	5
2002	8.8	6	14	6
2003	7.7	5.5	12.5	5
2004	8.9	7.5	10.5	5
2005	6.9	4	12.5	4
2006	6	3	9	5
2007	4.3	3	5	3
2008	6.8	5	9	4
2009	7	6	8	2

[6] Reports and Data: Burnett County. WDNR website. July 2009. <http://www.dnr.state.wi.us/lakes/CLMN/reportsanddata/>

Figure 4: Lipsett Lake Trophic State Index, 2008 [7]



Watershed

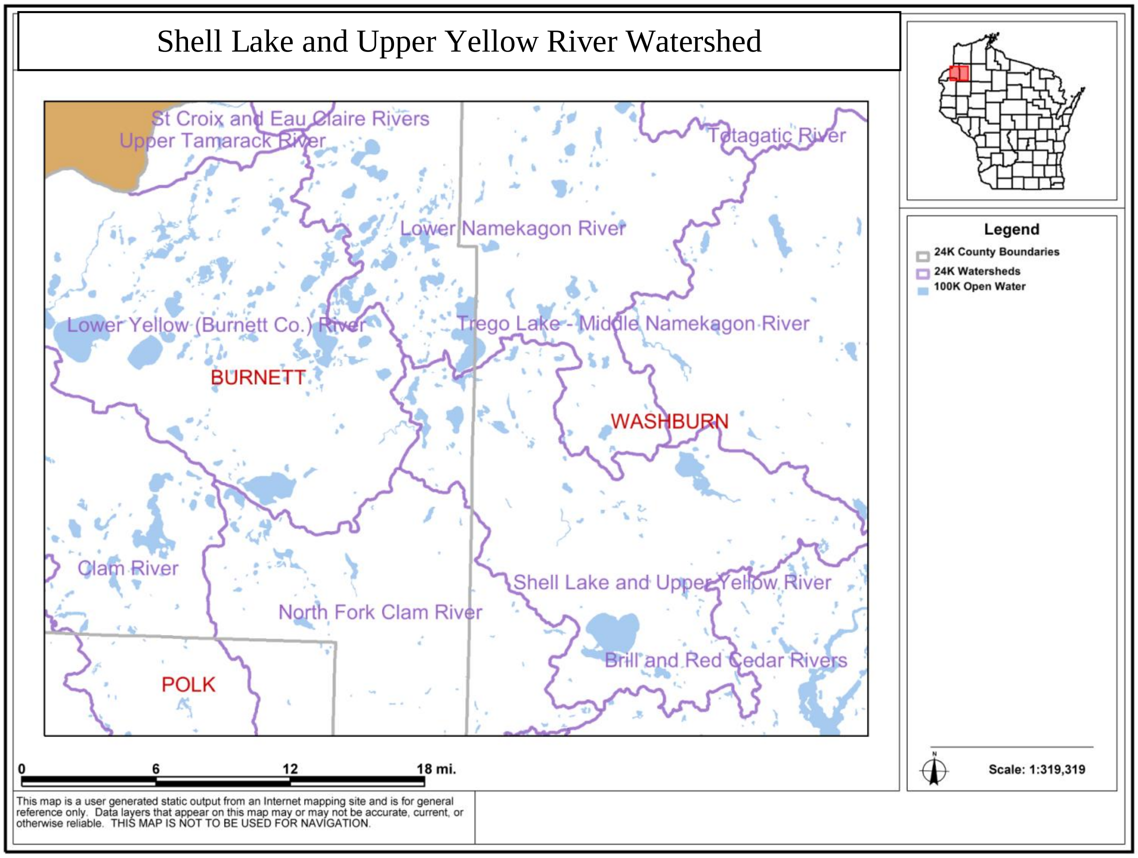
Lipsett Lake is part of the Upper Yellow River Watershed (Identification Key SC15-270). Lipsett Lake is also classified as a source of "excellent water quality."[8] In addition to its recognition as being an excellent water quality source, Lipsett Lake has been classified as a "Priority Watershed."[5] Such a classification illustrates existing priority watershed projects and those watersheds that have problems from nonpoint source runoff.[5] Lipsett Lake has received high priority rankings in the St. Croix Basin planning process. A high ranking indicates that the lake has documented problems or threats related to water quality and is likely to be responsive to watershed protection efforts.[9]Figure 5 and 6, on the following pages illustrates the Upper Yellow River Watershed and wetlands associated with the watershed, respectively.

[7] Reports and Data: Burnett County. WDNR website. July 2009. <http://www.dnr.state.wi.us/lakes/CLMN/reportsanddata/

[8]The State of the St. Croix River Basin. Wisconsin Department of Natural Resources. 2002
Figure 5. Shell Lake and Upper Yellow River Watershed (SC15-270)

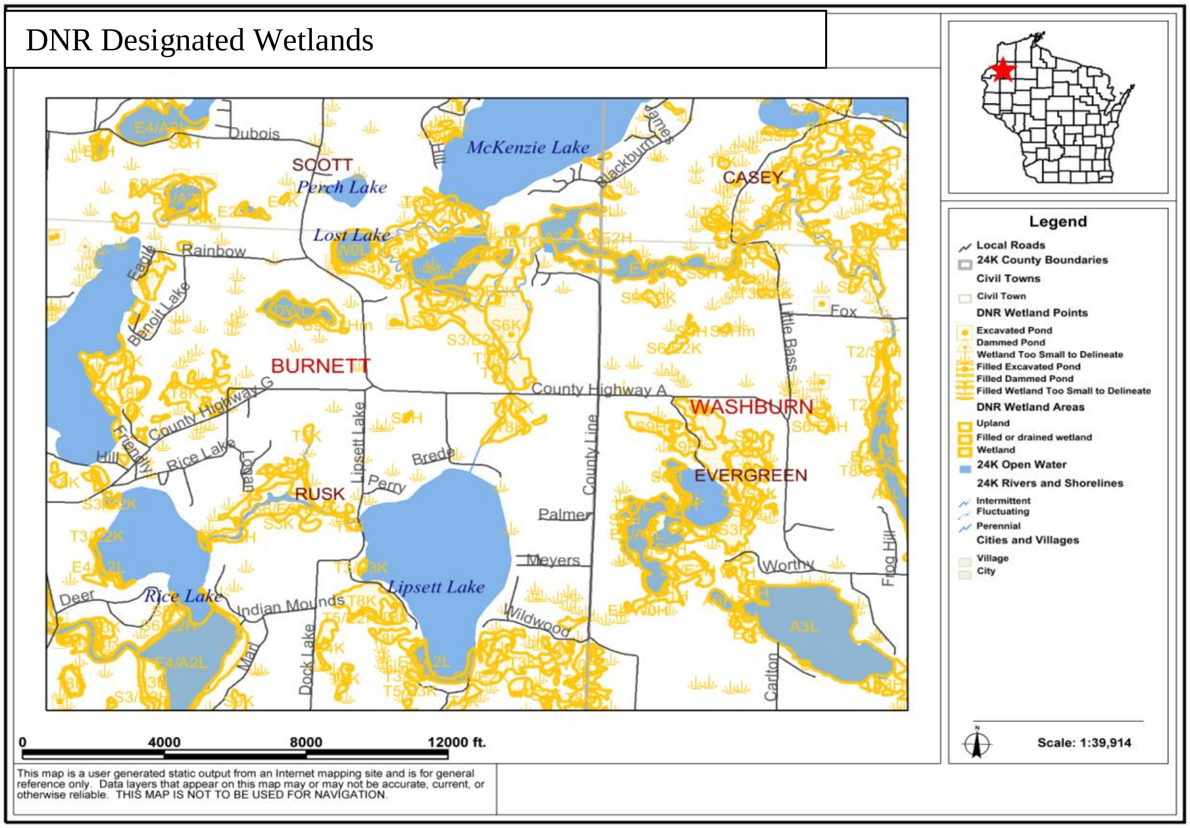
[9]Burnett County Land and Water Resources Plan

Figure 5: Shell Lake and Upper Yellow River Watershed[10]



[10] WISCLAND Digital Land Cover, Wisconsin Dept. Of Natural Resources. 1998. (Converted to polygon classification by Applied Data Consultants). Agricultural land may be under-reported because idle fields and poor hay fields may classify as grassland or shrubland in the satellite image. Developed areas near water bodies are also not likely to be represented accurately. Land units smaller than 5 acres are not reflected in this classification.

Figure 6: DNR Designated Wetlands[11]



[11] WISCLAND Digital Land Cover, Wisconsin Dept. Of Natural Resources. 1998. (Converted to polygon classification by Applied Data Consultants). Agricultural land may be under-reported because idle fields and poor hay fields may classify as grassland or shrubland in the satellite image. Developed areas near water bodies are also not likely to be represented accurately. Land units smaller than 5 acres are not reflected in this classification

Watershed Runoff

Land cover plays a critical role in a watershed. The type of land cover that exists in the watershed determines the amount of phosphorus (and sediment) that runs off the land and eventually makes its way to the lake. The actual amount of pollutants (nutrients, sediment, toxins, etc.) depends greatly on how the land within the watershed is used. Vegetated areas, such as forests, grasslands, and meadows, allow the water to permeate the ground and do not produce much surface runoff. On the other hand, agricultural areas, particularly row crops, along with residential/urban areas, minimize infiltration and increase surface runoff. The increased surface runoff associated with these land cover types leads to increased phosphorus and pollutant loading; which, in turn, can lead to nuisance algal blooms, increased sedimentation, overabundant macrophyte populations, and decreased dissolved oxygen levels.[12] Land that is maintained in a natural, vegetated state is beneficial to soil and water quality.

A 2002 State of the St. Croix River Basin report, identified four key priorities for the basin, all of which are directly associated with water quality:[13]

1. Protection and restoration of shoreland habitat
2. Control of nonpoint source runoff contamination of surface waters
3. Restoration of grasslands, prairies, and wetlands to protect soil and water quality, and to enhance wildlife habitat
4. Implementation of a Northwest Sands Integrated Ecosystem Management Plan

The majority of Burnett County's land cover is made up of forest, while grassland, open water and wetlands make up approximately one-third. Table 4 below represents the land cover of the Upper Yellow River Watershed. Figure 7 on the next page, illustrates the land cover found in the Upper Yellow River Watershed.

Table 4: Upper Yellow River Watershed Land Cover[14]

Land Cover	Acres	Percent of Total
Agriculture	353.2	2.3%
Barren	5.8	0%
Forest	8462.4	55.5%
Grassland	1660	10.9%
Open Water	2656.7	17.4%
Shrubland	459.5	3%
Unclassified	1.8	0%
Wetland	1652.6	10.8%

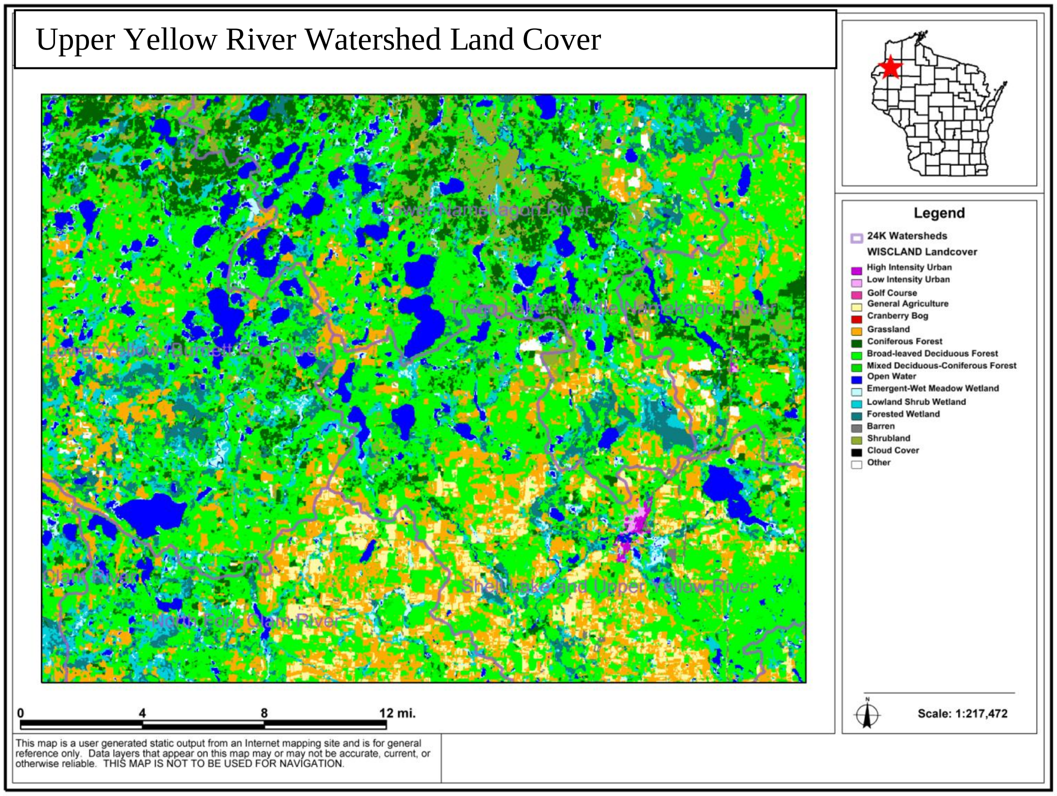
[12] Tim Hoyman & Eddie Heath. Onterra, LLC, Pike Lake Chain of Lakes , Comprehensive Management Plan, December 2008

[13] The State of the St. Croix River Basin. Wisconsin Department of Natural Resources. 2002

[14] WISCLAND Digital Land Cover, Wisconsin Dept. Of Natural Resources. 1998. (Converted to polygon classification by Applied Data Consultants). Agricultural land may be under-reported because idle fields and poor hay fields may classify as grassland or shrubland in the satellite image. Developed areas near water bodies are also not likely to be represented accurately. Land units smaller than 5 acres are not reflected in this classification.

Totals	**15252**	**100%**

Figure 7: Upper Yellow River Watershed Land Cover[15]



[15]WISCLAND Digital Land Cover, Wisconsin Dept. Of Natural Resources. 1998. (Converted to polygon classification by Applied Data Consultants). Agricultural land may be under-reported because idle fields and poor hay fields may classify as grassland or shrubland in the satellite image. Developed areas near water bodies are also not likely to be represented accurately. Land units smaller than 5 acres are not reflected in this classification.

Aquatic Habitats

Primary Human Use Areas

Residential development has increased tremendously since the early 1900's when Abigal Ann Clair (French) cleared timber from her house to the lake so she could see her boats. Transportation consisted of a rowboat, sailboat and snowshoes. During this time period only a few cottages and one resort were present on the lake. A lot has changed since that time. Currently, there are 104 parcels with 98 buildings/homes found on the lake. There is also one public access. The significant change in development over this short period of time has had an impact on the lake. Homeowners and others visiting the lake use the lake for fishing, swimming, boating, and just enjoying the wildlife.

Functions and Values of Native Aquatic Plants

Naturally occurring native plants are extremely beneficial to the lake. They provide a diversity of habitats, help maintain water quality, sustain fish populations, and support common lakeshore wildlife such as loons and frogs.

Water Quality

Aquatic plants can improve water quality by absorbing phosphorus, nitrogen, and other nutrients from the water that could otherwise fuel nuisance algal growth. Some plants can even filter and break down pollutants. Plant roots and underground stems help to prevent re-suspension of sediments from the lake bottom. Stands of emergent plants (whose stems protrude above the water surface) and floating plants help to blunt wave action and prevent erosion of the shoreline. The shoreline plant populations around Lipsett Lake are particularly important to reducing erosion along the shoreline, but these populations are also vulnerable to the nutrient loading and the resultant algae growth in the lakes.

Fishing

Habitat created by aquatic plants provides food and shelter for both young and adult fish. Invertebrates living on or beneath plants are a primary food source for many species of fish. Other fish such as bluegills graze directly on the plants themselves. Plant beds, such as the wild rice present on Lipsett Lake, provide important spawning habitat for many fish species.

Waterfowl

Plants offer food, shelter, and nesting material. Birds eat both the invertebrates that live on plants and the plants themselves.[16]

Protection against Invasive Species

Non-native invasive species threaten native plants in Northern Wisconsin. The most common are Eurasian water milfoil (EWM) and curly leaf pondweed (CLP). These species are described as opportunistic invaders. This means that they take over openings

[16] Above paragraphs summarized from Through the Looking Glass. Borman et al. 1997

in the lake bottom where native plants have been removed. Without competition from other plants, these invasive species may successfully become established in the lake. This concept of opportunistic invasion can also be observed on land, in areas where bare soil is quickly taken over by weeds.

Removal of native vegetation not only diminishes the natural qualities of a lake, but it increases the risk of non-native species invasion and establishment. Invasive species can change many of the natural features of a lake and often lead to expensive annual control plans. Allowing native plants to grow may not guarantee protection against invasive plants, but it can discourage their establishment. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.[17]

Aquatic Invasive Species Status

Purple loostrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), and curly leaf pondweed (*Potamogeton crispus*) have been observed on Lipsett Lake. No Eurasian water milfoil (*Myriophyllum spicatum*) was found on the lake, but it has been found in three nearby lakes in Burnett County: Ham Lake, Round Lake and Trade Lake (awaiting state confirmation)[18] It is therefore of paramount importance that the Lipsett Lake Association takes measures to avoid the introduction of EWM into the lake.

Sensitive Areas

The Wisconsin Department of Natural Resources has completed sensitive area surveys to designate areas within aquatic plant communities that provide important habitat for game fish, forage fish, macroinvertebrates, and wildlife, as well as important shoreline stabilization functions. The Department of Natural Resources is transitioning to designations of *critical habitat areas* that include both *sensitive areas* and *public rights features*. The c*ritical habitat area* designation will provide a holistic approach to ecosystem assessment and protection of those areas within a lake that are most important for preserving the very character and qualities of the lake.

Two other species of interest exist in Lipsett lake: Chinese mystery snails (*Bellamya chinensis*), and the Common carp (*Cyprinus carpio*). At this time, no negative effects to the aquatic plant community have been observed. Future monitoring of these two species should continue to ensure a healthy population of native aquatic plants.

Critical habitat areas include *sensitive areas* that offer critical or unique fish and wildlife habitat (including seasonal or lifestage requirements) or offer water quality or erosion control benefits to the area (Administrative code 107.05(3)(1)(1)). The Wisconsin Department of Natural Resources is given the authority for the identification and protection of sensitive areas of the lakes. *Public rights features* are areas that fulfill the right of the public for navigation, quality and quantity of water, fishing, swimming, or natural scenic beauty. Protecting these *critical habitat areas* requires the protection of

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[17]Taken from Aquatic Plant Management Strategy. DNR Northern Region. Summer 2007.
[18]According to the DNR *Listing of Wisconsin Waters with Eurasian Water-Milfoil infestations (current as of 03/31/09).*

shoreline and in-lake habitat. The *critical habitat area* designation will provide a framework for management decisions that impact the ecosystem of the lake.

There is no *critical habitat* or *sensitive area* designations for Lipsett Lake, however, nearby waters have such designations.

Rare and Endangered Species Habitat
Lipsett Lake is located in Rusk Township (T.39N. – R.14W.). Within each township, the Wisconsin Natural Heritage Inventory lists species that are considered threatened, endangered, or of special concern (see Table 5 below). Due to the fact that the listing is for Rusk Township in general, specific details for Lipsett Lake are unknown.

Table 5: Natural Heritage Inventory (NHI) Species Found in Lipsett Lake Area (T.39N. – R.14W.)[19]

Common Name	Scientific Name	WI State Status
Bald Eagle	*Haliaeetus leucocephalus*	SC/P
Greater Redhorse	*Moxostoma valenciennesi*	THR
Pugnose Shiner	*Notropis anogenus*	THR
Common Bog Arrow-grass	*Triglochin maritima*	SC

Key: **END** = endangered
THR = threatened
SC = Special Concern

WDNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are as follows:

SC/P = fully protected
SC/N = no laws regulating use, possession, or harvesting
SC/H = take regulated by establishment of open /closed seasons
SC/FL = Federally protected as endangered or threatened, but not so designated by state
SC/M = fully protected by federal and state laws under the Migratory Bird Act

[19] Natural Heritage Inventory County Data by Township. Wisconsin DNR. Last revised December 2008.

Lipsett Lake Fishery

Lipsett Lake is filled with a diverse range of fish. Below is a list of the various species found in Lipsett Lake.*

LIPSETT LAKE SPECIES LIST

Common Name	Scientific Name	Relative Abundance
Gamefish		
Walleye	Sander vitreum	Present
Northern pike	Esox lucius	Abundant
Muskellunge	Esox masquinongy	Present
Largemouth Bass	Micropterus salmoides	Abundant
Smallmouth Bass	Micropterus dolomieui	Rare
Panfish		
Bluegill	Lepomis macrochirus	Abundant
Black crappie	Pomoxis nigromaculatus	Abundant
Pumpkinseed	Lepomis gibbosus	Common
Rock bass	Amblopites rupestris	Common
Yellow perch	Perca flavecens	Common
Brown bullhead	Ictalurus nebulosus	Present
Yellow bullhead	Ictalurus natalis	Present
Forage and other species		
Bowfin	Amia calva	Common
White sucker	Catostomus commersoni	Common
Common Carp	Cyprinus carpio	Present
Golden shiner	Notemigonus crysoleucas	Present
Common shiner	Notropis cornutus	Present
Spottail shiner	Notropis hudsonius	Common
Blacknose shiner	Notropis heterolepis	Present
Blackchin shiner	Notropis heterodon	Present
Log perch	Percina caproides	Present
Iowa darter	Etheostoma exile	Present
Johnny darter	Etheostoma nigrum	Present
Brook silverside	Labidesthes sicculus	Common
Bluntnose minnow	Pimephales notatus	Present

* Information obtained from Larry Dammon, Fishery Biologist WI DNR

Table 6: Lipsett Lake Stocking History[20]

Year	Species	Age Class	Number Fish Stocked	Avg Fish Length (IN)
2008	WALLEYE	SMALL FINGERLING	13,770	1.4
2007	MUSKELLUNGE	LARGE FINGERLING	105	11.6
2006	WALLEYE	SMALL FINGERLING	13,749	1.7
2005	MUSKELLUNGE	LARGE FINGERLING	157	12.3
2004	WALLEYE	SMALL FINGERLING	19,600	2.2
2002	WALLEYE	SMALL FINGERLING	21,293	1.6
2001	MUSKELLUNGE	LARGE FINGERLING	200	11.3
2000	WALLEYE	SMALL FINGERLING	19,650	1.6
1998	WALLEYE	SMALL FINGERLING	20,970	1.4
1996	WALLEYE	FINGERLING	9,825	2.3
1994	WALLEYE	FINGERLING	11,871	5.25
1992	WALLEYE	FINGERLING	24,786	3.67
1991	WALLEYE	FINGERLING	2,600	3
1989	WALLEYE	FINGERLING	19,650	3
1986	WALLEYE	FINGERLING	19,908	3
1984	WALLEYE	FINGERLING	20,498	3
1983	WALLEYE	FRY	128,000	1
1982	WALLEYE	FINGERLING	7,965	3
1982	WALLEYE	FRY	200,000	

[20] Fish Stocking Summary. WI DNR 2008
http://infotrek.er.usgs.gov/traverse/f?p=220:1:0::NO::P1_COUNTY_NAME:BURNETT

Table 7: Bag Limits and Regulations for Lipsett Lake for 2009

Fish Species	**Open Season**	**Daily Limit**	**Minimum Length (inches)**
Walleye	May 3 — March 1	3	15
Largemouth and Smallmouth Bass	May 3 — March 1	5	14
Muskellunge	May 24 — November 30	1	40
Northern Pike	May 3 — March 1	5	none

Plant Community

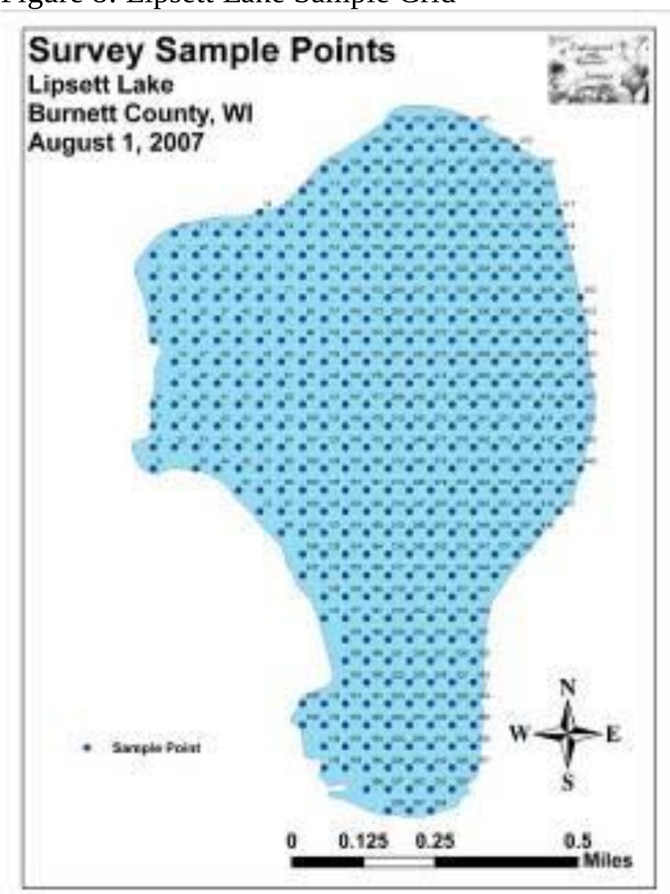
Aquatic Plant Survey Results

An aquatic plant survey was completed for Lipsett Lake in August of 2007. Prior to the whole lake monitoring, a curly leaf pondweed (CLP) survey was conducted to confirm the presence of this aquatic invasive species. Since CLP grows earlier than native species, it typically dies in early July; therefore, the CLP survey is done in early June while the plant is still robust. A general boat survey was also conducted prior to the point intercept survey to gain familiarity with the lake and the plant species found on the lake. The results discussed below are taken from these two surveys.

The survey and data analysis methods for the aquatic macrophyte surveys can be found in the following report: *Aquatic Macrophyte Survey for Lipsett Lake, Burnett County, Wisconsin*, conducted and prepared by Matthew S. Berg of Endangered Resource Services, LLC.

Using a standard formula based on a lake's shoreline shape and distance, islands, water clarity, depth, and size in acres, the Wisconsin Department of Natural Resources (WDNR) generated the sampling point grid of 440 sample points for Lipsett Lake. Figure 8 below shows the locations of these sampling points.

Figure 8: Lipsett Lake Sample Grid



Plants were found growing on approximately 40.7% of the entire lake bottom, and in 79.6% of the littoral zone. Diversity was very high with a Simpson Diversity Index value of 0.92. Species richness was also very high with 48 total species found growing in and immediately adjacent to the lake (Appendix V and VI). The majority of aquatic macrophytes were found growing in moderately deep water with an average depth of almost 6.6ft, and a median depth of 6.0ft. These 4-10ft areas of Lipsett, especially the south bay, supported diverse weed beds that provide important underwater habitat. Figures 9 and 10 illustrate the lake sediment type and the littoral zone respectively. Table 8 summarizes data from the completed survey.

Figure 9: Lipsett Lake Sediment Type

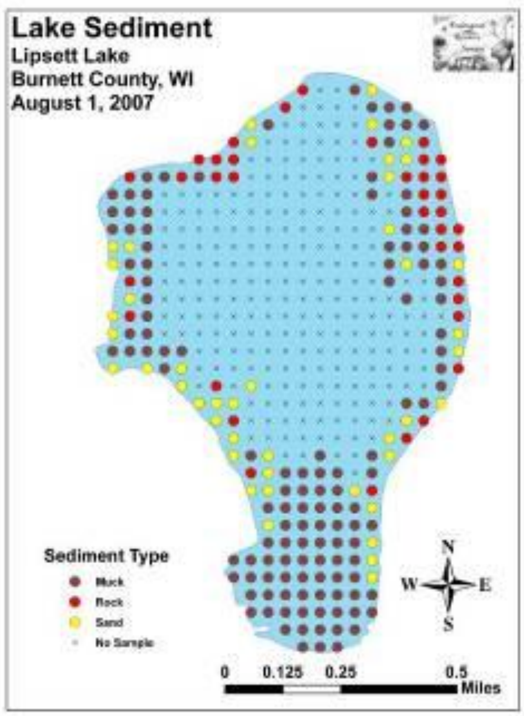


Figure 10. Lipsett Lake Littoral Zone

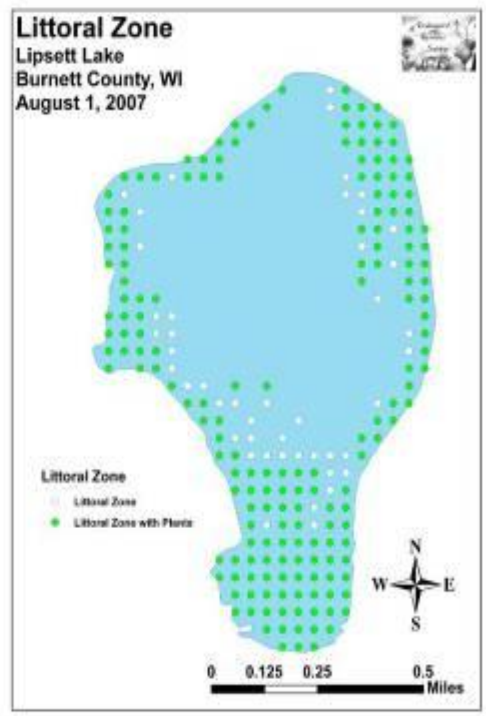


Table 8: Lipsett Lake Aquatic Macrophytes Survey Summary Statistics

Summary Statistics:

Total number of points sampled	316
Total number of sites with vegetation	179
Total number of sites shallower than the maximum depth of plants	225
Frequency of occurrence at sites shallower than maximum depth of plants	79.6
Simpson Diversity Index	0.92
Maximum depth of plants (ft)	16.0
Number of sites sampled using rope rake (R)	24
Number of sites sampled using pole rake (P)	207
Average number of all species per site (shallower than max depth)	2.81
Average number of all species per site (veg. sites only)	3.53
Average number of native species per site (shallower than max depth)	2.62
Average number of native species per site (veg. sites only)	3.47
Species Richness	38
Species Richness (including visuals)	42
Species Richness (including visuals and boat survey)	50
Mean depth of plants (ft)	6.6
Median depth of plants (ft)	6.0

Table 9: Lipsett Lake Species Frequencies and Mean Rake Fullness

Species	Common Name	Total Sites	Relative frequency (%)	Frequency of occurrence vegetated	Frequency of occurrence littoral	Mean rake fullness
Ceratophyllum demersum	Coontail	99	15.66	55.31	44.00	1.48
Potamogeton zosteriformis	Flat-stem pondweed	95	15.03	53.07	42.22	1.53
Potamogeton pusillus	Small pondweed	67	10.60	37.43	29.78	1.55
Vallisneria americana	Wild celery	55	8.70	30.73	24.44	1.13
Najas flexilis	Bushy pondweed	34	5.38	18.99	15.11	1.47
	Filamentous algae	29	4.59	16.20	12.89	1.45
Potamogeton gramineus	Variable pondweed	25	3.96	13.97	11.11	1.12
Chara sp.	Muskgrass	23	3.64	12.85	10.22	1.00
Elodea canadensis	Common waterweed	22	3.48	12.29	9.78	1.09
Heteranthera dubia	Water star-grass	21	3.32	11.73	9.33	1.24
Potamogeton praelongus	White-stemmed pondweed	20	3.16	11.17	8.89	1.15
Potamogeton robbinsii	Robbins (fern) pondweed	19	3.01	10.61	8.44	1.47
Potamogeton crispus	Curly-leaf pondweed	14	2.22	7.82	6.22	1.00
Myriophyllum sibiricum	Northern water milfoil	12	1.90	6.70	5.33	1.08
Potamogeton friesii	Fries' pondweed	12	1.90	6.70	5.33	1.17
Potamogeton richardsonii	Clasping-leaf pondweed	11	1.74	6.15	4.89	1.00
Nymphaea odorata	White water lily	10	1.58	5.59	4.44	1.50
Zizania palustris	Northern wild rice	10	1.58	5.59	4.44	2.60
Potamogeton amplifolius	Large-leaf pondweed	9	1.42	5.03	4.00	1.22
Potamogeton alpinus	Alpine pondweed	6	0.95	3.35	2.67	1.00
Lemna trisulca	Forked duckweed	5	0.79	2.79	2.22	1.00
Megalodonta beckii	Water marigold	5	0.79	2.79	2.22	1.40
Isoetes echinospora	Spiny-spored quillwort	4	0.63	2.23	1.78	1.00
Nuphar variegata	Spatterdock	4	0.63	2.23	1.78	2.00

Ranunculus aquatilis	Stiff water crowfoot	3	0.47	1.68	1.33	1.00
Sagittaria rigida	Sessile-fruited arrowhead	3	0.47	1.68	1.33	1.33
Eleocharis acicularis	Needle spikerush	2	0.32	1.12	0.89	1.50
Schoenoplectus acutus	Hardstem bulrush	2	0.32	1.12	0.89	1.50
Spirodela polyrhiza	Large duckweed	2	0.32	1.12	0.89	1.00
Brasenia schreberi	Watershield	1	0.16	0.56	0.44	1.00
Eleocharis palustris	Creeping spikerush	1	0.16	0.56	0.44	1.00
Equisetum fluviatile,	Water horsetail	1	0.16	0.56	0.44	1.00
Lemna minor	Small duckweed	1	0.16	0.56	0.44	1.00
Nitella sp.	Nitella	1	0.16	0.56	0.44	1.00
Schoenoplectus pungens	Three-square	1	0.16	0.56	0.44	2.00
Typha latifolia	Broad-leaved cattail	1	0.16	0.56	0.44	1.00
Utricularia gibba	Creeping bladderwort	1	0.16	0.56	0.44	1.00
Utricularia vulgaris	Common bladderwort	1	0.16	0.56	0.44	1.00
Elatine minima	Waterwort	**	**	**	**	**
Potamogeton illinoensis	Illinois pondweed	**	**	**	**	**
Potamogeton strictifolius	Stiff pondweed	**	**	**	**	**
Stuckenia pectinata	Sago pondweed	**	**	**	**	**
Calla palustris	Water arum	***	***	***	***	***
Cicuta bulbifera	Bulb-bearing water hemlock	***	***	***	***	***
Lythrum salicaria	Purple loosestrife	***	***	***	***	***
Phalaris arundinacea	Reed canary grass	***	***	***	***	***
Potamogeton natans	Floating-leaf pondweed	***	***	***	***	***
Sagittaria cuneata	Arum-leaved arrowhead	***	***	***	***	***
Schoenoplectus tabernaemontani	Softstem bulrush	***	***	***	***	***
Sparganium eurycarpum	Common bur-reed	***	***	***	***	***

** Visual Only
*** Boat Survey Only

Coontail (*Ceratophyllum demersum*), Flat-stem pondweed (*Potamogeton zosteriformis*), Small pondweed (*Potamogeton pusillus*), and Wild celery (*Vallisneria americana*) were the most common species found in Lipsett Lake. They were found at 55.31%, 53.07%, 37.432% and 30.73% of survey points with vegetation respectively (Figure 10). The first three were widely distributed throughout the lake over muck bottoms while wild celery was more common in firm bottom areas (Figure 11). Although many species were widely distributed, none were found with a relative frequency over 15%, and only these three species were over 10%.

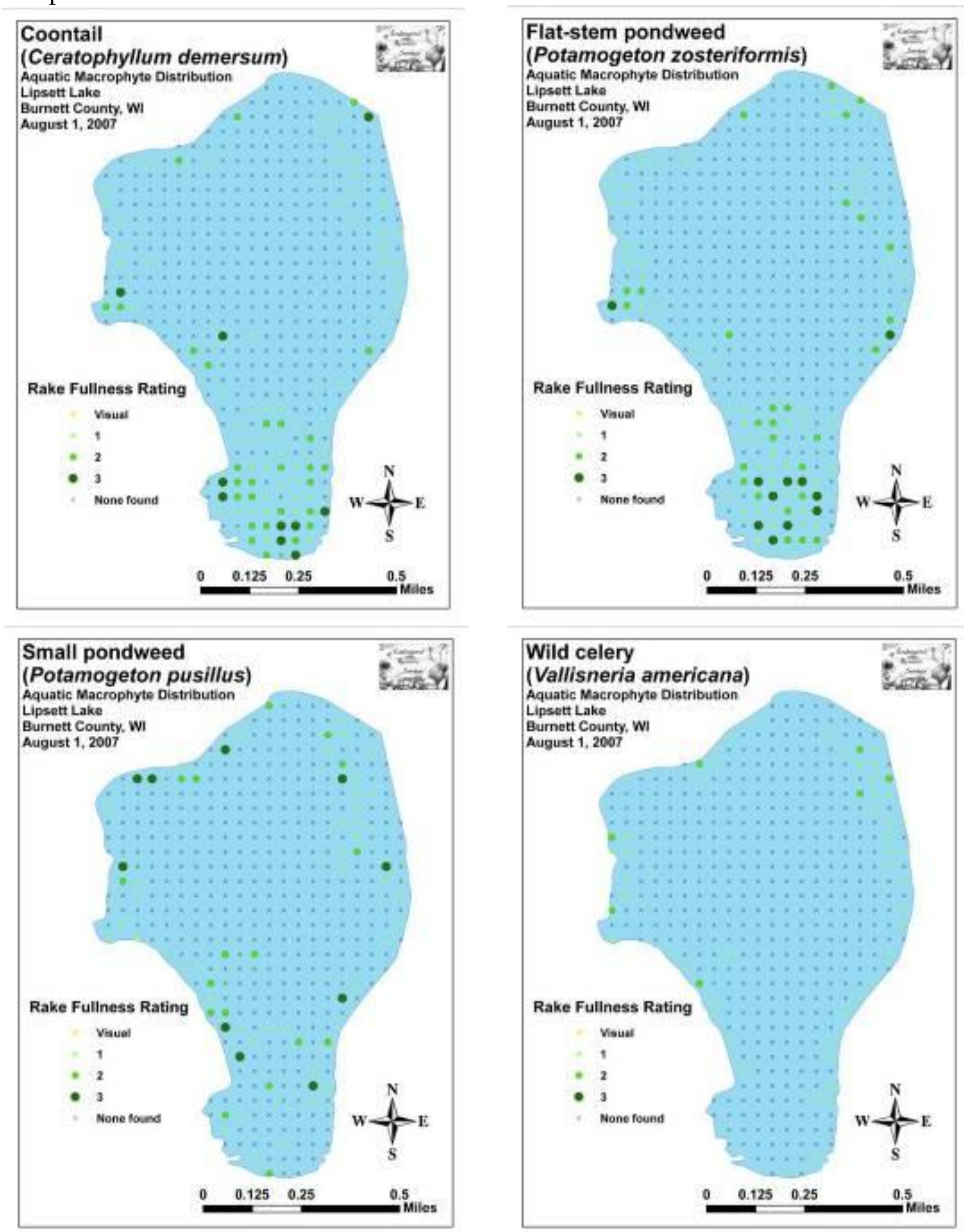


Figure 11: Lipsett Lake's Most Common Species

Distribution maps of the remaining plant species are included in Appendix VII of the Aquatic Macrophyte Survey Report.[21]

The Floristic Quality Index (FQI) is an index developed by Dr. Stanley Nichols of the University of Wisconsin-Extension. This index is a measure of the plant community response to development and human influence on the lake. It takes into account the species of aquatic plants present, and their tolerance for changing water quality and habitat characteristics. A plant's tolerance is expressed as a coefficient of conservatism (C). Native plants in Wisconsin are assigned a conservatism value between 0 and 10. A plant with a high conservatism value has more specialized habitat requirements and is less tolerant of disturbance and/or water quality changes. Those with lower values are more able to adapt to disturbed or changing conditions, and can therefore be found in a wider range of habitats.

The FQI is calculated using the number of species present and these plants' species conservatism values. A higher FQI generally indicates a healthier aquatic plant community. Table 10, on the following page, illustrates the Floristic Quality Index of Lipsett Lake.

[21] Berg, Matthew S., Endangered Resources Services, LLC. Aquatic Macrophyte Survey for Lipsett Lake, Burnett County, Wisconsin. August 2007.

Table 10: Lipsett Lake FQI Species and Conservatism Values

Species	Common Name	C
Brasenia schreberi	Watershield	7
Calla palustris	Wild arum	9
Ceratophyllum demersum	Coontail	3
Chara sp.	Muskgrass	7
Cicuta bulbifera	Bulb-bearing water hemlock	7
Elatine minima	Waterwort	9
Eleocharis acicularis	Needle spikerush	5
Eleocharis palustris	Creeping spikerush	6
Elodea canadensis	Common waterweed	3
Equisetum fluviatile	Water horsetail	7
Heteranthera dubia	Water star-grass	6
Isoetes echinospora	Spiny-spored quillwort	8
Lemna minor	Small duckweed	5
Lemna trisulca	Forked duckweed	6
Megalodonta beckii	Water marigold	8
Myriophyllum sibiricum	Northern water-milfoil	7
Najas flexilis	Bushy pondweed	6
Nitella sp.	Nitella	7
Nuphar variegata	Spatterdock	6
Nymphaea odorata	White water lily	6
Potamogeton alpinus	Alpine pondweed	9
Potamogeton amplifolius	Large-leaf pondweed	7
Potamogeton friesii	Fries' pondweed	8
Potamogeton gramineus	Variable pondweed	7
Potamogeton illinoensis	Illinois pondweed	6
Potamogeton natans	Floating-leaf pondweed	5
Potamogeton praelongus	White-stem pondweed	8
Potamogeton pusillus	Small pondweed	7
Potamogeton richardsonii	Clasping-leaf pondweed	5
Potamogeton robbinsii	Robbins (fern) pondweed	8
Potamogeton strictifolius	Stiff pondweed	8
Potamogeton zosteriformis	Flat-stem pondweed	6
Ranunculus aquatilis	Stiff water crowfoot	7
Sagittaria cuneata	Arum-leaved arrowhead	7
Sagittaria rigida	Sessile-fruited arrowhead	8
Schoenoplectus acutus	Hardstem bulrush	5
Schoenoplectus pungens	Three-square	5
Schoenoplectus tabernaemontani	Softstem bulrush	4
Sparganium eurycarpum	Common bur-reed	5
Spirodela polyrhiza	Large duckweed	5
Stuckenia pectinata	Sago pondweed	3
Typha latifolia	Broad-leaved cattail	1
Utricularia gibba	Creeping bladderwort	9

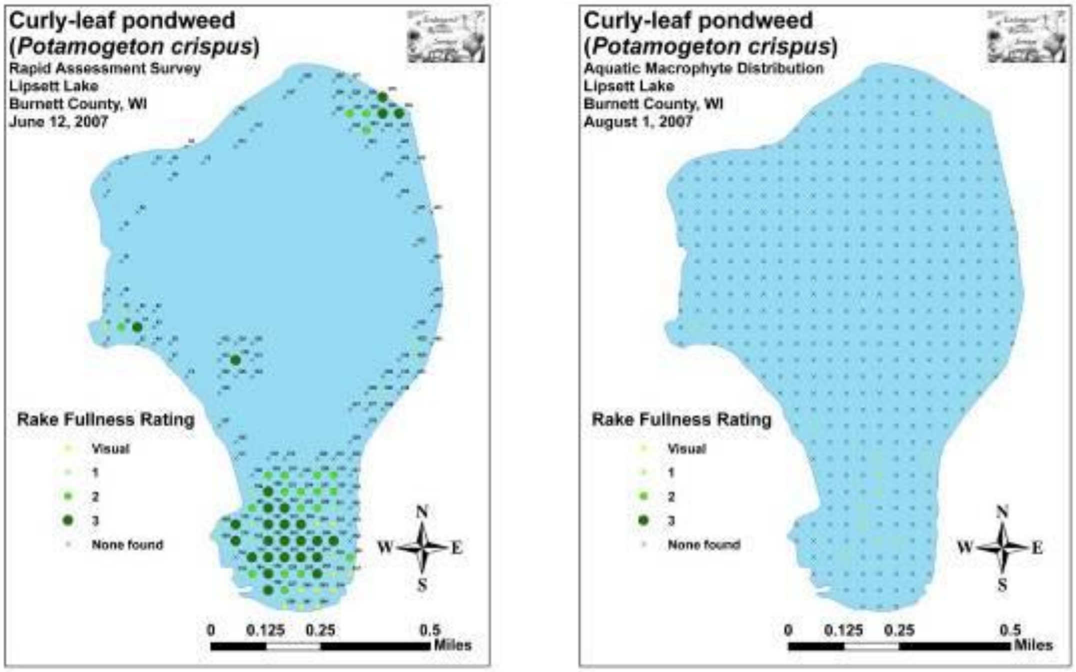
Utricularia vulgaris	Common bladderwort	7
Vallisneria americana	Wild celery	6
Zizania palustris	Northern wild rice	8
N		46
mean C		6.3
FQI		43.1

A total of 46 native species in and immediately adjacent to Lipsett Lake were identified. They produced a mean Coefficient of Conservation 6.3 and a Floristic Index of 43.1 (Table 10). Nichols (1999) reported an Average mean C for the Northern Lakes and Forest Region of 6.7 putting Lipsett Lake slightly below average for this part of the state. However, the FQI was much higher than the mean FQI of 24.3 for the Northern Lakes and Forest Region (Nichols 1999). The below average mean C is a result of having fewer than normal sensitive plants. This may be a reflection of low water clarity, excessive nutrients from runoff, being out competed by the large amount of CLP or may simply be due to the lake's small size. The high FQI is a result of Lipsett Lake's above average plant diversity.

Curly Leaf Pondweed Survey

Curly-leaf pondweed, an exotic invasive species, was found at 58 sites during the June rapid assessment survey (Figure 12). Plants were very dense, and the average rakefull rating was 2.24. It was the dominant plant in the south bay were it was found growing from shore to the edge of the littoral zone, and appeared to exclude most other plants at this location. Another large bed was located in the northeast corner, a dense but small bed centered on point 125, and another cluster of small beds surrounding point 20. During the full survey in early August, we found CLP at only 14 sites; all with a rakefull rating of 1.00.

Figure 12: Curly-leaf pondweed Distribution, June and August 2007



[22]

Aquatic Plant Management

This section reviews the potential management methods available, and reports recent management activities on the lakes. The application, location, timing, and combination of techniques must be considered carefully.

Discussion of Management Methods

Permitting Requirements

The Department of Natural Resources regulates the removal of aquatic plants when chemicals are used, when plants are removed mechanically, and when plants are removed manually from an area greater than thirty feet in width along the shore. The requirements for chemical plant removal are described in Administrative Rule NR 107 – Aquatic Plant Management. A permit is required for any aquatic chemical application in Wisconsin. Additional requirements exist when a lake is considered an ASNRI (Area of Special Natural Resource Interest) due, in the case of Lipsett Lake, to the presence of wild rice.

The requirements for manual and mechanical plant removal are described in NR 109 – Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations. A permit is required for manual and mechanical removal except for when a riparian (waterfront) landowner manually removes or gives permission to someone to manually

[22] Berg, Matthew S., Endangered Resources Services, LLC. Aquatic Macrophyte Survey for Lipsett Lake, Burnett County, Wisconsin. August 2007. Pg. 19-28

remove plants, (with the exception of wild rice) from his/her shoreline up to a 30-foot corridor. A riparian landowner may also manually remove the invasive plants Eurasian water milfoil, curly leaf pondweed, and purple loosestrife along his or her shoreline without a permit. Manual removal refers to the control of aquatic plants by hand or hand–held devices without the use or aid of external or auxiliary power.[23]

Techniques to control the growth and distribution of aquatic plants are discussed in the following text. Again, the application, location, timing and combination of techniques must be considered carefully. A summary table of Management Options for Aquatic Plants from the DNR follows the narrative descriptions below.

Manual Removal[24]

Manual removal—hand pulling, cutting, or raking—will effectively remove plants from small areas. It is likely that plant removal will need to be repeated more than once during the growing season. The best timing for hand removal of herbaceous plant species is after flowering but before seed head production. For plants with rhizomatous (underground stem) growth, pulling roots is not generally recommended since it may stimulate new shoot production. Hand pulling is a strategy recommended for rapid response to a Eurasian water milfoil establishment and for private landowners who wish to remove small areas of curly leaf pondweed growth. Raking is recommended to clear nuisance growth in riparian area corridors up to twenty feet wide.

SCUBA divers may engage in manual removal for invasive species like Eurasian water milfoil. Care must be taken to ensure that all plant fragments are removed from the lake. Manual removal with divers is recommended for shallow areas with sporadic EWM growth.

Mechanical Control

Larger-scale control efforts require more mechanization. Mechanical cutting, mechanical harvesting, diver-operated suction harvesting, and rotovating (tilling) are the most common forms of mechanical control available. WDNR permits under Chapter NR 109 are required for mechanical plant removal.

Aquatic plant harvesters are floating machines that cut and remove vegetation from the water. The cutter head uses sickles similar to those found on farm equipment, and generally cut to depths from one to six feet. A conveyor belt on the cutter head brings the clippings onboard the machine for storage. Once full, the harvester travels to shore to discharge the load of weeds off of the vessel.

The size, and consequently the harvesting capabilities, of these machines vary greatly. As they move, harvesters cut a swath of aquatic plants that is between 4 and 20 feet wide,

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[23] More information regarding DNR permit requirements and aquatic plant management contacts is found on the DNR web site: www.dnr.state.wi.us.

[24] Information from APIS (Aquatic Plant Information System) U.S. Army Corps of Engineers. 2005 and the Aquatic plant management planning

and can be up to 10 feet deep. The on-board storage capacity of a harvester ranges from 100 to 1000 cubic feet (by volume) or 1 to 8 tons (by weight).

In some cases the plants are transported to shore by the harvester itself for disposal, while in other cases a barge is used to store and transport the plants in order to increase the efficiency of the cutting process. The plants are deposited on shore, where they can be transported to a local farm (the nutrient content of composted aquatic plants is comparable to that of cow manure) or to an upland landfill for proper disposal. Most harvesters can cut between 2 and 8 acres of aquatic vegetation per day, and the average lifetime of a mechanical harvester is 10 years.

Mechanical harvesting of aquatic plants presents both positive and negative consequences to any lake. Its results—open water and accessible boat lanes—are immediate, and can be enjoyed without the restrictions on lake use which follow herbicide treatments. In addition to the human use benefits, the clearing of thick aquatic plant beds may also increase the growth and survival of some fish. By eliminating the upper canopy, harvesting reduces the shading caused by aquatic plants. The nutrients stored in the plants are also removed from the lake, and the sedimentation that would normally occur as a result of the decaying of this plant matter is prevented. Additionally, repeated treatments may result in thinner, more scattered growth.

Aside from the obvious effort and expense of harvesting aquatic plants, there are many environmentally-detrimental consequences to consider. The removal of aquatic species during harvesting is non-selective. Native and invasive species alike are removed from the target area. This loss of plants results in a subsequent loss of the functions they perform, including sediment stabilization and wave absorption. Shoreline erosion may therefore increase. Other organisms such as fish, reptiles, and insects are often displaced or removed from the lake in the harvesting process. This may have adverse effects on these organisms' populations as well as the lake ecosystem as a whole.

While the enjoyed results of harvesting aquatic plants may be short term, the negative consequences are not so short lived. Much like mowing a lawn, harvesting must be conducted numerous times throughout the growing season. Although the harvester collects most of the plants that it cuts, some plant fragments inevitably persist in the water. This may allow the invasive plant species to propagate and colonize in new, previously unaffected areas of the lake. Harvesting may also result in re-suspension of contaminated sediments and the excess nutrients they contain.

Disposal sites are a key component when considering the mechanical harvesting of aquatic plants. The sites must be on shore and upland to make sure the plants and their reproductive structures don't make their way back into the lake or to other lakes. The number of available disposal sites and their distance from the targeted harvesting areas will determine the efficiency of the operation, in terms of time as well as cost.

Timing is also important. The ideal time to harvest, in order to maximize the efficiency of the harvester, is just before the aquatic plants break the surface of the lake. For curly leaf pondweed, it should also be before the plants form turions to avoid spreading of the turions within the lake. If the harvesting is conducted too early, the plants will not be close enough to the surface, and the cutting will not do much damage to them. If too late, there may be too much plant matter on the surface of the lake for the harvester to cut effectively.

If the harvesting work is contracted, be sure to inspect the equipment before and after it enters the lake. Since these machines travel from lake to lake, they may carry plant fragments with them, and facilitate the spread of aquatic invasive species from one body of water to another. One must also consider prevailing winds, since cut vegetation can be blown into open areas of the lake or along shorelines.

Diver dredging operations use pump systems to collect plant and root biomass. The pumps are mounted on a barge or pontoon boat. The dredge hoses are from 3 to 5 inches in diameter and are handled by one diver. The hoses normally extend about 50 feet in front of the vessel. Diver dredging is especially effective against the pioneering establishment of submersed invasive plant species. When a weed is discovered in a pioneering state, this methodology can be considered. To be effective, the entire plant, including the subsurface portions, should be removed.

Plant fragments can result from this type of operation, but fragmentation is not as great a problem when infestations are small. Diver dredging operations may need to be repeated more than once to be effective. When applied to a pioneering infestation, control can be complete. However, periodic inspections of the lake should be performed to ensure that all the plants have been found and collected.

Lake substrates play an important part in the effectiveness of a diver dredging operation. Soft substrates are very easy to work in. Divers can remove the plant and root crowns with little difficulty. Hard substrates, however, pose more of a problem. Divers may need hand tools to help dig the root crowns out of hardened sediment.

Rotovation involves using large underwater rototillers to remove plant roots and other plant tissue. Rotovators can reach bottom sediments to depths of 20 feet. Rotovating may significantly affect non-target organisms and water quality as bottom sediments are disturbed. However, the suspended sediments and resulting turbidity produced by rotovation settles fairly rapidly once the tiller has passed. Tilling contaminated sediments could possibly release toxins into the water column. If there is any potential of contaminated sediments in the area, further investigation should be performed to determine the potential impacts from this type of treatment. Tillers do not operate effectively in areas with many underwater obstructions such as trees and stumps. If operations are releasing large amounts of plant material, harvesting equipment should be on hand to collect this material and transport it to shore for disposal.

Biological Control[25]

Biological control is the purposeful introduction of parasites, predators, and/or pathogenic microorganisms to reduce or suppress populations of plant or animal pests. Biological control counteracts the problems that occur when a species is introduced into a new region of the world without a complex or assemblage of organisms that feed directly upon it, attack its seeds or progeny through predation or parasitism, or cause severe or debilitating diseases. With the introduction of native pests to the target invasive organism, the exotic invasive species may be maintained at lower densities.

Weevils[26] *have potential for use as a biological control agent against Eurasian water milfoil. There are several documented "natural" declines of EWM infestations. In these cases, EWM was not eliminated but its abundance was reduced enough so that it did not achieve dominance. These declines are attributed to an ample population of native milfoil weevils (Euhrychiopsis lecontei). Weevils feed on native milfoils but will shift preference over to EWM when it is present. Lakes where weevils can become an effective control have an abundance of native Northern water milfoil and fairly extensive natural shoreline where the weevils can over winter. Because native milfoils are susceptible to higher doses of herbicides, any control strategy for EWM that would also harm native milfoil may hinder the ability of this natural bio-control agent. Lakes with large bluegill populations are not good candidates for weevils because bluegills feed on the weevils. The presence and efficacy of stocking weevils in EWM lakes is being evaluated in Wisconsin lakes. So far, stocking does not appear to be effective.*

The effectiveness of biocontrol efforts varies widely (Madsen, 2000). Beetles are commonly used to control Purple loosestrife populations in Wisconsin with good success. As mentioned above, weevils are used as an experimental control for Eurasian water milfoil once the plant is established. Tilapia and carp are used to control the growth of filamentous algae in ponds. Grass carp, an herbivorous fish, is sometimes used to feed on pest plant populations, but grass carp introduction is not allowed in Wisconsin.

There are advantages and disadvantages to the use of biological control as part of an overall aquatic plant management program. Advantages include longer-term control relative to other technologies, lower overall costs, and plant-specific control. On the other hand there are several disadvantages to consider, including very long control times (years instead of weeks), a lack of available agents for particular target species, and relatively specific environmental conditions necessary for success.

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[25] Information from APIS (Aquatic Plant Information System) U.S. Army Corps of Engineers. 2005.

[26] *Control of Eurasian Water Milfoil & Large-scale Aquatic Herbicide Use*. July 2006. Wisconsin Department of Natural Resources.

Biological control is not without risks; new non-native species introduced to control a pest population may cause problems of its own. Biological control is not currently proposed for management of aquatic plants in Lipsett Lake, although it will be considered for Purple loosestrife control.

Re-vegetation with Native Plants

Another aspect to biological control is native aquatic plant restoration. The rationale for re-vegetation is that restoring a native plant community should be the end goal of most aquatic plant management programs (Nichols 1991; Smart and Doyle 1995). However, in communities that have only recently been invaded by nonnative species, a propagule (seed) bank probably exists that will restore the community after nonnative plants are controlled (Madsen, Getsinger, and Turner, 1994). Re-vegetation following plant removal is probably not necessary on Lipsett Lakes because a healthy, diverse native plant population is present.

Physical Control[27]

In physical management, the environment of the plants is manipulated, which in turn acts upon the plants. Several physical techniques are commonly used: dredging, drawdown, benthic (lake bottom) barriers, and shading or light attenuation. Because they involve placing a structure on the bed of a lake and/or affect lake water level, a Chapter 30 or 31 DNR permit would be required.

Dredging removes accumulated bottom sediments that support plant growth. Dredging is usually not performed solely for aquatic plant management but to restore lakes that have been filled in with sediments, have excess nutrients, need deepening, or require removal of toxic substances (Peterson 1982). Lakes that are very shallow due to sedimentation tend to have excess plant growth. Dredging can form an area of the lake too deep for plants to grow, thus creating an area for open water use (Nichols 1984). By opening more diverse habitats and creating depth gradients, dredging may also create more diversity in the plant community (Nichols 1984). Results of dredging can be very long term. However, due to the cost, environmental impacts, and the problem of disposal, dredging should not be performed for aquatic plant management alone. It is best used as a lake remediation technique. Dredging is not suggested for the Lipsett Lake as part of the aquatic plant management plan.

Benthic barriers or other bottom-covering approaches are another physical management technique. The basic idea is to cover the plants with a layer of a growth-inhibiting substance. Many materials have been used, including sheets or screens of organic, inorganic, and synthetic materials; sediments such as dredge sediment, sand, silt or clay; fly ash; and various combinations of the above materials (Cooke 1980b; Nichols 1974; Perkins 1984; Truelson 1984). The problem with using sediments is that new plants establish on top of the added layer (Engel and Nichols 1984). The problem with synthetic sheeting is that the gasses evolved from plant and sediment decomposition collect underneath and lift the barrier (Gunnison and Barko 1992). Benthic barriers will typically

[27] Information from APIS (Aquatic Plant Information System) U.S. Army Corps of Engineers. 2005.

kill the plants under them within 1 to 2 months, after which time they may be removed (Engel 1984). Sheet color is relatively unimportant; opaque (particularly black) barriers work best, but even clear plastic barriers will work effectively (Carter et al. 1994). Sites from which barriers are removed will be rapidly re-colonized (Eichler et al. 1995). Synthetic barriers, if left in place for multi-year control, will eventually become sediment-covered and will allow colonization by plants. Benthic barriers may be best suited to small, high-intensity use areas such as docks, boat launch areas, and swimming areas. However, they are too expensive to use over widespread areas, and heavily affect benthic communities by removing fish and invertebrate habitat. A WDNR permit would be required for a benthic barrier.

Shading or light attenuation reduces the light plants need to grow. Shading has been achieved by fertilization to produce algal growth, by application of natural or synthetic dyes, shading fabric, or covers, and by establishing shade trees (Dawson 1981, 1986; Dawson and Hallows 1983; Dawson and Kern-Hansen 1978; Jorga et al. 1982; Martin and Martin 1992; Nichols 1974). During natural or cultural eutrophication, algae growth alone can shade aquatic plants (Jones et al. 1983). Although light manipulation techniques may be useful for narrow streams or small ponds, in general these techniques are of only limited applicability. Physical control is not currently proposed for management of aquatic plants in Lipsett Lake.

Herbicide and Algaecide Treatments

Herbicides are chemicals used to kill plant tissue. Currently, no product can be labeled for aquatic use if it poses more than a one in a million chance of causing significant damage to human health, the environment, or wildlife resources. In addition, it may not show evidence of biomagnification, bioavailability, or persistence in the environment (Joyce, 1991). Thus, there are a limited number of active ingredients that are assured to be safe for aquatic use (Madsen, 2000).

An important caveat is that these products are considered safe when used according to the label. The U.S. Environmental Protection Agency (EPA)-approved label gives guidelines protecting the health of the environment, the humans using that environment, and the applicators of the herbicide. WDNR permits under Chapter NR 107 are required for herbicide application.

General descriptions of herbicide classes are included below.[28]

Contact herbicides

Contact herbicides act quickly and are generally lethal to all plant cells that they contact. Because of this rapid action, or other physiological reasons, they do not move extensively within the plant and are effective only where they contact plants directly. They are generally more effective on annuals (plants that complete their life cycle in a single year). Perennial plants (plants that persist from year to year) can be defoliated by contact

[28] This discussion is taken from: Managing Lakes and Reservoirs. North American Lake Management Society.

herbicides, but they quickly resprout from unaffected plant parts. Submersed aquatic plants that are in contact with sufficient concentrations of the herbicide in the water for long enough periods of time are affected, but regrowth occurs from unaffected plant parts, especially plant parts that are protected beneath the sediment. Because the entire plant is not killed by contact herbicides, retreatment is necessary, sometimes two or three times per year. **Endothall, diquat,** and **copper** are contact aquatic herbicides.

Systemic herbicides

Systemic herbicides are absorbed into the living portion of the plant and move within the plant. Different systemic herbicides are absorbed to varying degrees by different plant parts. Systemic herbicides that are absorbed by plant roots are referred to as soil active herbicides and those that are absorbed by leaves are referred to as foliar active herbicides. **2,4-D, dichlobenil, fluridone, and glyphosate** are systemic aquatic herbicides. When applied correctly, systemic herbicides act slowly in comparison to contact herbicides. They must move to the part of the plant where their site of action is. Systemic herbicides are generally more effective for controlling perennial and woody plants than contact herbicides. Systemic herbicides also generally have more selectivity than contact herbicides.

Broad spectrum herbicides

Broad spectrum (sometimes referred to as nonselective) herbicides are those that are used to control all or most species of vegetation. This type of herbicide is often used for total vegetation control in areas such as equipment yards and substations where bare ground is preferred. **Glyphosate** is an example of a broad spectrum aquatic herbicide. **Diquat, endothall, and fluridone** are used as broad spectrum aquatic herbicides, but can also be used selectively under certain circumstances.

Selective herbicides

Selective herbicides are those that are used to control certain plants but not others. Herbicide selectivity is based upon the relative susceptibility or response of a plant to an herbicide. Many related physical and biological factors can contribute to a plant's susceptibility to an herbicide. Physical factors that contribute to selectivity include herbicide placement, formulation, timing, and rate of application. Biological factors that affect herbicide selectivity include physiological factors, morphological factors, and stage of plant growth.

Environmental considerations

Aquatic communities consist of aquatic plants including macrophytes (large plants) and phytoplankton (free floating algae), invertebrate animals (such as insects and clams), fish, birds, and mammals (such as muskrats and otters). All of these organisms are interrelated in the community. Organisms in the community require a certain set of physical and chemical conditions to exist such as nutrient requirements, oxygen, light, and space. Aquatic weed control operations can affect one or more of the organisms in the community, and in turn affect other organisms or weed control operations. These operations can also impact water chemistry which may result in further implications for aquatic organisms.

Table 11: Herbicides Recently Used to Manage Aquatic Plants in Lipsett Lake

Brand Name(s)	Chemical	Target Plants
Cultrine Plus, Komeen, $CuSO_4$	Copper compounds	Filamentous algae, coontail, wild celery, elodea, and pondweeds
Reward	Diquat	Coontail, duckweed, elodea, water milfoil, and pondweeds
Aquathol, Aquathol K, Hydrothol 191	Endothall	Coontail, water milfoil, pondweeds, and wild celery as well as other submersed weeds and algae
Rodeo	Glyphosate	Cattails, grasses, bulrushes, purple loosestrife, and water lilies
Navigate, Aqua-Kleen	2, 4-D	Water milfoils, water lilies, and bladderwort

General descriptions of the breakdown of commonly used aquatic herbicides are included below.[29]

Copper

Copper is a naturally occurring element that is essential at low concentrations for plant growth. It does not break down in the environment, but it forms insoluble compounds with other elements and is bound to charged particles in the water. It rapidly disappears from water after application as an herbicide. Because it is not broken down, it can accumulate in bottom sediments after repeated or high rates of application. Accumulation rarely reaches levels that are toxic to organisms or significantly above background concentrations in the sediment.

2,4-D

2,4-D photodegrades on leaf surfaces after being applied to leaves, and is broken down by microbial degradation in water and in sediments. Complete decomposition usually takes about 3 weeks in water but can be as short as 1 week. 2,4-D breaks down into naturally occurring compounds.

29 These descriptions are taken from Hoyer/Canfield: Aquatic Plant Management. North American Lake Management Society. 1997.

Diquat

When applied to enclosed ponds for submersed weed control, diquat is rarely found longer than 10 days after application and is often below detection levels 3 days after application. The most important reason for the rapid disappearance of diquat from water is that it is rapidly taken up by aquatic vegetation and bound tightly to particles in the water and bottom sediments. When bound to certain types of clay particles, diquat is not biologically available. When diquat is bound to organic matter, it can be slowly degraded by microorganisms. When diquat is applied foliarly, it is degraded to some extent on the leaf surfaces by photodegradation. Because it is bound in the plant tissue, a proportion is probably degraded by microorganisms as the plant tissue decays.

Endothall

Like 2,4-D, endothall is rapidly and completely broken down into naturally occurring compounds by microorganisms. The by-products of endothall dissipation are carbon dioxide and water. Complete breakdown usually occurs in about 2 weeks in water and 1 week in bottom sediments.

Fluridone

Dissipation of fluridone from water occurs mainly by photodegradation. Metabolism by tolerant organisms and microbial breakdown also occurs, and microbial breakdown is probably the most important method of breakdown in bottom sediments. The rate of breakdown of fluridone is variable and may be related to time of application. Applications made in the fall or winter, when the sun's rays are less direct and days are shorter, result in longer half-lives. Fluridone usually disappears from pondwater after about 3 months but can remain up to 9 months. It may remain in bottom sediment between 4 months and 1 year.

Glyphosate

Glyphosate is not applied directly to water for weed control, but when it does enter the water it is bound tightly to dissolved and suspended particles and to bottom sediments and becomes inactive. Glyphosate is broken down into carbon dioxide, water, nitrogen, and phosphorus over a period of several months.

Copper Compounds

Copper-based compounds are generally used to treat filamentous algae. Common chemicals used are copper sulfate and Cutrine Plus, a chelated copper algaecide.

Herbicide Use to Manage Invasive Species

Eurasian water milfoil

The Army Corps of Engineers Aquatic Plant Information System (APIS) identifies the following herbicides for control of Eurasian water milfoil: 2,4-D, diquat, endothall, fluridone, and triclopyr.[30] All of these herbicides with the exception of diquat are available in both granular and liquid formulations. It is possible to target invasive species by using the appropriate herbicide and timing. The herbicide 2,4-D is most commonly used to treat EWM in Wisconsin. This herbicide kills dicots including native aquatic species such as northern water milfoil, coontail, water lilies, spatterdock, and watershield. Early season (April to May) treatment of Eurasian water milfoil is recommended to limit the impact on native aquatic plant populations because EWM tends to grow before native aquatic plants.

Granular herbicide formulations are more expensive than liquid formulations (per active ingredient). However, granular formulations release the active ingredient over a longer period of time. Granular formulations, therefore, may be more suited to situations where herbicide exposure time will likely be limited, as is the case in small bands or blocks. In large, shallow lakes with widespread EWM, a whole lake treatment with a low rate of liquid herbicide may be most cost effective because exposure time is greater. Factors that affect exposure time are size and configuration of treatment area, water flow, and wind.

Application rates for liquid and granular formulations are not interchangeable. A rate of 1 to 1.5 mg/L 2,4-D applied as a liquid is a middle rate that will require a contact time of 36 to 48 hours. Application rates recommended for Navigate (granular 2,4-D) are 100 pounds per acre for depths of 0 to 5 feet, 150 pounds per acre for 5 to 10 feet, and 200 pounds per acre for depths greater than 10 feet.

Curly leaf pondweed

The Army Corps of Engineers Aquatic Plant Information System (APIS) identifies three herbicides for control of curly leaf pondweed: diquat, endothall, and fluridone. Fluridone requires exposure of 30 to 60 days making it infeasible to target a discreet area in a lake system. The other herbicides act more rapidly. Herbicide labels provide water use restriction following treatment. Diquat (Reward) has the following use restrictions: drinking water 1-3 days, swimming and fish consumption 0 days. Endothall (Aquathol K) has the following use restrictions: drinking water 7 – 25 days, swimming 0 days, fish consumption 3 days.

Studies have demonstrated that curly leaf pondweed can be controlled with Aquathol K (a formulation of endothall) in 50 to 60 degree F water, and that treatments of CLP this early in its life cycle can prevent turion formation.[31] Since curly leaf pondweed is actively growing at these low water temperatures and many native aquatic plants are still dormant, early season treatment selectively targets curly leaf pondweed. Staff from the

[30] Additional information provided by John Skogerboe, Army Corps of Engineers, personal communication. February 14, 2008.

[31] Research in Minnesota on Control of Curly Leaf Pondweed. Wendy Crowell, Minnesota Department of Natural Resources. Spring 2002.

Minnesota Department of Natural Resources and the U.S Army Engineer Research and Development Center are conducting trials of this method.

Because the dosage is at lower rates than the dosage recommended on the label, a greater herbicide residence time is necessary. To prevent drift of herbicide and allow greater contact time, application in shallow bays is likely to be most effective. Herbicide applied to a narrow band of vegetation along the shoreline is likely to drift, rapidly decrease in concentration, and be rendered ineffective.[32]

Current and Past Aquatic Plant Management

Chemical treatment of algae and aquatic macrophytes has been conducted on Lipsett Lake since 2004 (see Table 12 below). These treatments occurred along various locations around the lake, primarily in the Northeast, South, and West side of the lake. Treatments were conducted for 4 to 12 individuals per year. Permits were issued to control nuisance submerged and floating water plants as well as algae. Several purposes were considered including: reduce nuisance algae accumulation, maintain navigation channel for common use, maintain private access for boating, maintain private access for fishing, and improve swimming.

Table 12: Recent Waterfront Treatments on Lipsett Lake

Year	Individual Properties	Maximum Acres Allowed for Treatment
2004	6	1.03
2005	4	0.69
2006	12	3.09
2007	5	2

[32] Personal communication, Frank Koshere. March 2005.

Activities, Monitoring and Education

Lipsett Lake Association Receives a Small-scale Management Grant from Wisconsin DNR[34]

In the spring of 2007, Greg Heber, President of the Lipsett Lake Association was awarded $3,000 from the Wisconsin DNR to coordinate a number of educationally related activities in and around Lipsett Lake. Below is a summary of the results to date.

- A 4x8 ft sign was constructed and placed at the public access asking lake users to make certain to inspect their boats, trailers, and equipment and remove any visible plants, animals, and mud in an effort to avoid the introduction of exotic aquatic species to the lake.
- The Association monitored the public access from the fishing opener in May until late October through the Clean Boats, Clean Waters program. 324 hours were spent monitoring, 196 boats were inspected, and 408 people contacted. 64% of the boats leaving the water had vegetation on them most of which was removed by the boat operator or Association members. 20 of the 130 boats inspected (16%) had last been used in a lake infested with exotic species such as Eurasian Water Milfoil. Additionally, a total of 32 lake association members have been trained in the CBCW program.
- 34 parcels completely surrounding the lake were sampled for soil nutrient analysis. All participants were offered $10-off coupons for phosphorous-free fertilizer at ACE Hardware in Spooner. Only the phosphorous data are summarized here. 30 of the 34 samples had high to excessively high levels of phosphorous, ranging between 26 and 165 parts per million (ppm). Since some of the samples came from undeveloped parcels with native vegetation and from properties where the owners have never used any type of fertilizer, the high phosphorous levels appear to be related to the glacial geology in northwest Wisconsin rather than to fertilizer overuse. Studies in Polk County have shown that the glacial deposits, especially the sand and gravel units, have naturally high phosphorous concentrations. Lipsett Lake is located in the knob and kettle topography associated with the gravel-rich Hertel ice margin (moraine) that formed about 14,000 years ago. Our results make it clear the phosphorous bearing fertilizer is NOT needed near Lipsett Lake since the soil already contains more phosphorous than plants can possibly use. See data on Table 13 on the following page.
- In August 2007 Harmony Environmental, on behalf of Burnett County Land and Water Conservation Department, presented a workshop on shoreline restoration for Association members. This was a hands-on workshop where participants brought photos of their lake shorelines for planning and design purposes. It also included site visits to lakeshore properties and recommendations for the appropriate plants to improve both the natural beauty of the lakeshore and the habitat for aquatic animals. Each participant received up to a $50 reimbursement for the purchase of native plants from the DNR grant.

[34] Lipsett Lake Association. Bob Baker

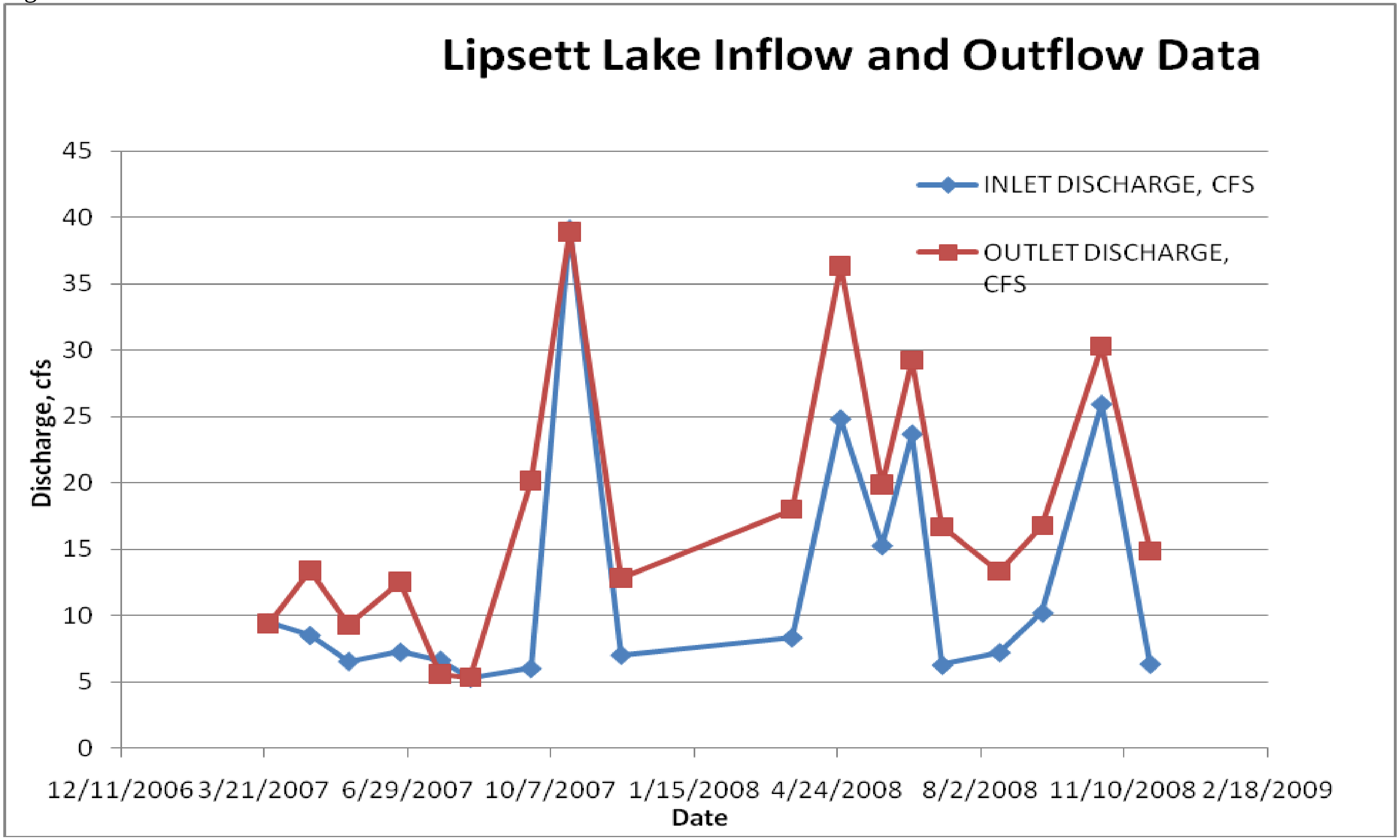
- Stage gauges for measuring daily changes in water level were placed in the inlet and outlet streams and on a dock directly in Lipsett Lake. 257 readings were made between early July and late October by Doris Perry, Tom Twining, and Don Loftus and showed how precipitation events effected water levels in the lake more rapidly than in the outlet stream. The inlet stream levels fluctuated considerably with no apparent relationship to precipitation events. This may be related to a cranberry operation that periodically impounds and releases water into the inlet stream. Hopefully additional readings this summer will shed light on this puzzling result. Velocity measurements were made monthly in the inlet and outlet streams and were used to calculate the discharge of both streams in cubic feet per second. Results showed that for 9 of the 10 months we have data, the discharge of the outlet stream is equal to or exceeds the discharge of the inlet stream, again suggesting an influence from the cranberry operation on the volume of water entering the inlet stream. Thus far almost 100 hours have been spent monitoring water levels and flow rates. Table 13 below illustrates the inlet and outlet flow rates over the monitoring time period.

Table 13: Lipsett Lake Flow Rates[34]

MONTH	INLET DISCHARGE, CFS	OUTLET DISCHARGE, CFS
3/24/2007	9.5	9.39
4/22/2007	8.55	13.43
5/19/2007	6.6	9.31
6/24/2007	7.29	12.58
7/22/2007	6.68	5.6
8/12/2007	5.34	5.36
9/23/2007	6.06	20.18
10/20/2007	39.11	38.93
11/25/2007	7.07	12.85
3/23/2008	8.38	18.02
4/26/2008	24.83	36.32
5/25/2008	15.3	19.87
6/15/2008	23.69	29.25
7/6/2008	6.32	16.7
8/15/2008	7.26	13.36
9/14/2008	10.24	16.78
10/25/2008	25.93	30.3
11/28/2008	6.4	14.89

[34] Lipsett Lake Association. Bob Baker

Figure 13: Inflow and Outflow Data

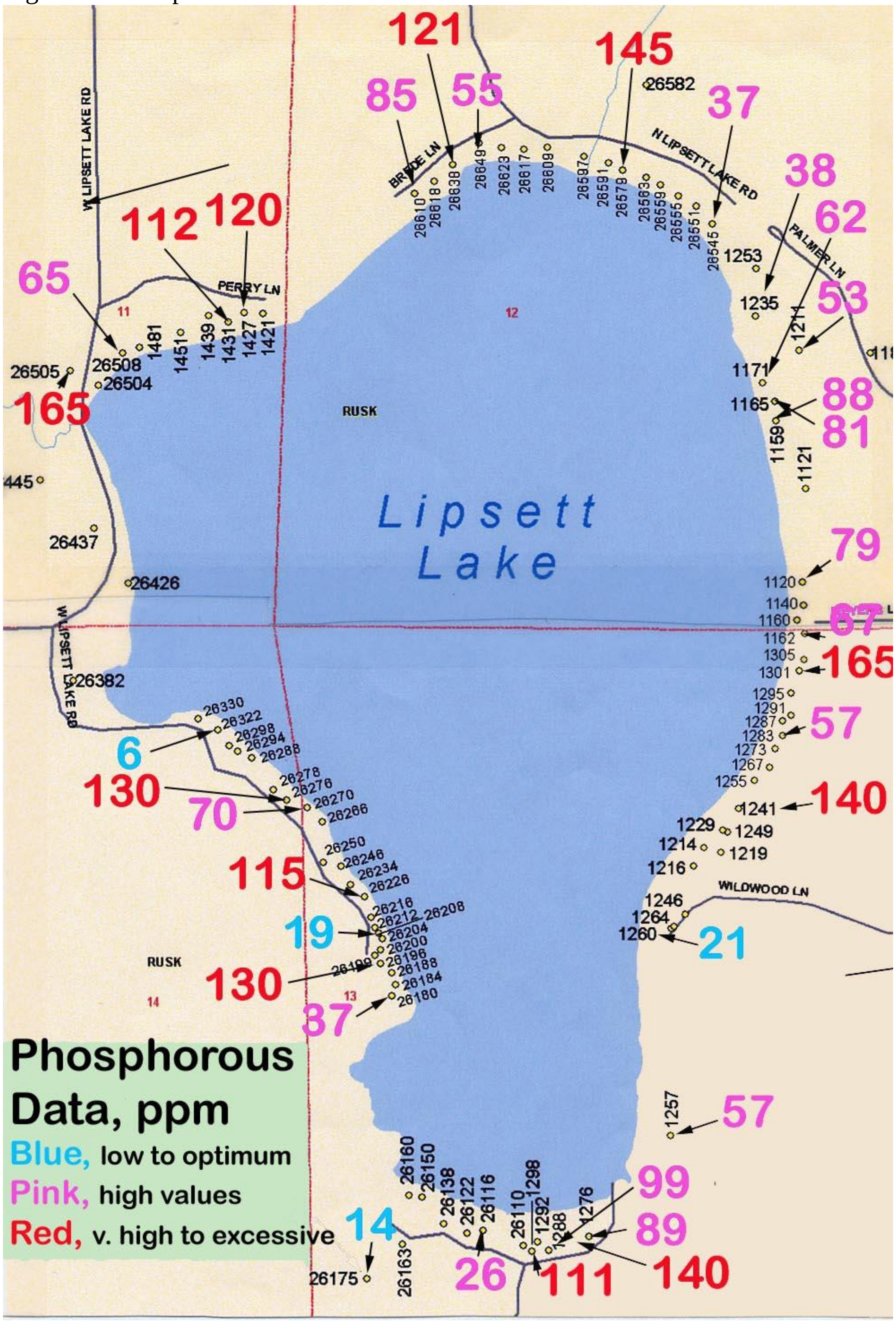


[34]

[34] Lipsett Lake Association. Bob Baker

- Separate from the DNR grant described above, during the summer of 2007 Lipsett Lake was selected for a survey of aquatic plants. The survey was coordinated by Dave Ferris, Burnett County Land and Water Conservation Department, conducted by Matt Berg, Endangered Resources Services and was cost-shared ($1262.50) through Burnett County Land and Water Conservation Department. Funds for this project were provided by an AIS DNR grant. A total of 316 points were sampled and 179 sites were found to have vegetation (macrophytes). Plants were found on 40.7% of the entire lake bottom and 79.6% of the shallow south end of the lake. Two measures of the health of the plant community in the lake were high; the Simpson Diversity Index was 0.92 on a scale from 0 to 1.0, which is very high, and the Floristic Quality Index was 43.1, which is much higher than the average of 24.3 for the Northern Lakes and Forest Region of Wisconsin.
- In summary, the small-scale planning grant from DNR has allowed the Lipsett Lake Association to:
    - Add a layer of protection from exotic species through the "Clean Boats, Clean Waters" program and the sign placed at our public access.
    - Obtain soil-nutrient data showing fertilizer application near the lake is <u>not</u> needed.
    - Organize a workshop on shoreline preservation to improve the beauty and aquatic habitat of our lakeshore.
    - Gather data on water levels and inflow and outflow discharge that are essential for developing a Water Budget for Lipsett Lake.
    - Cost share a survey of aquatic plants, which is the first step in developing an Aquatic Plant Management Plan.

Figure 14: Phosphorus Levels 2007[35]



35 Lipsett Lake Association. Bob Baker

Burnett County Land and Water Conservation (LWCD)

Burnett County assists the Lipsett Lake Association in management of aquatic invasive species. They have two part time positions available to assist with the following tasks:

- Conduct watercraft inspection at public access points.
- Complete in-lake monitoring for EWM and other invasive species.
- Carry out public outreach and education events related to invasive species including lake meetings, fishing tournaments, county fairs, and local festivals.
- Post signs at boat landings and other public lake access points to inform residents of the new Burnett County "do not transport" ordinance.
- Train local lake residents and others to monitor their own boat landings as part of the WDNR "Clean Boats, Clean Waters" (CBCW) program.
- Train lake residents and others in Citizen Lake Monitoring, which includes CBCW, Secchi, Water Chemistry, and Aquatic Invasive Species identification.
- Assist in "rapid response" actions to identify and respond to new invasive species infestations reported by the public.
- Conduct integrated pest management for purple loosestrife control including beetle rearing and release, and offer assistance with clipping and herbicide application for individual infestations.

In-lake monitoring focuses on searching for potential establishment of Eurasian water milfoil and other aquatic invasive species at boat landings and other areas with high public use. Grab samples are taken at regular intervals at these high public use areas and at random locations around the littoral zone. All Burnett County boat landings are monitored each year.

Workshops and trainings include Clean Boats, Clean Waters training, plant identification, and whole lake monitoring workshops. Staff generally travels to local lakes to encourage participation and provide more focused training.

The Rapid Response Plans will involve a team of resource professionals from various agencies who can directly assist the lake organization in managing newly discovered invasive species and develop a plan to restore the native plant community. This Rapid Response SWAT team will assist with identifying appropriate management methods, coordinating and, in some instances, carrying out control measures, grant writing, and completing or hiring consultants to complete aquatic plant surveys and management plans.[36]

[36] Templates taken from Harmony Environmental. *Aquatic Plant Management Plan. Yellow and Little Yellow Lakes, Burnett County, Wisconsin.* June 2009.

Plan Goals and Strategies

Overall Purpose

This section of the plan lists goals for aquatic plant management for Lipsett Lakes. It also presents a detailed strategy of actions that will be used to reach Aquatic Plant Management Plan goals. Educational strategies that outline audience, messages, and methods are included under each goal.[37]

Plan Goals

The APM committee established six goals and prioritized them in the following order:

1. Prevent the introduction and spread of aquatic invasive species.
2. Reduce and control the population of curly leaf pondweed and purple loosestrife.
3. Enhance and maintain the diverse populations of native aquatic plants.
4. Maintain and improve water quality conditions.
5. Educate the Lipsett Lake community regarding aquatic plant management, management strategies found in the plan and appropriate plant management actions.
6. Create and maintain navigable channels for fishing and boating.

Goal 1: Prevent the introduction and spread of aquatic invasive species

Objectives

A. 100% of boaters inspect, clean, and drain boats, trailers and equipment.

B. 100% enforcement of Burnett County's Do Not Transport Ordinance.

C. Lipsett Lake is monitored regularly for AIS introduction.

D. Lipsett Lake Association is ready to rapidly respond to identified AIS in the lakes and river.

Actions

1. Maintain I-Lids cameras at each landing. (OBJ A,B,C)

2. Conduct Clean Boats Clean Waters monitoring and education at the boat landing using paid and/or volunteer staff. (OBJ A,C)

3. Work with the Burnett County Sheriff's Department to encourage increased enforcement and potentially increased fines for the Do Not Transport Ordinance. (OBJ B)

[37] Templates taken from Harmony Environmental. *Aquatic Plant Management Plan. Yellow and Little Yellow Lakes, Burnett County, Wisconsin.* June 2009.

4. Monitor boat landings and other areas with high potential for introduction of AIS. (OBJ A)

5. Train volunteer monitors to identify and monitor for aquatic invasive species. (Burnett County Land and Water Conservation Department will train volunteers with support from LLA.) (OBJ C)

6. Review and update the existing rapid response plan for Eurasian water milfoil found in Appendix D. (OBJ D)

Goal 2: Reduce the growth of, and control the population of curly leaf pondweed and purple loosestrife.

Objectives

A. Control the growth existing populations of purple loosestrife on Lipsett Lake.

B. Identify and remove purple loosestrife plants from any newly colonized area on Lipsett Lake.

C. Monitor the growth of curly leaf pondweed, and consider control efforts if beds increase to 20% of the lake surface area, which would be an increase of 8% from the 2007 baseline mapping of the lake.

Actions

1. Provide information to the Lipsett Lake community so they can identify purple loosestrife (PL) and they know who to contact if they have a suspected plant. (Burnett County LWCD will provide volunteer training for plant identification. Burnett County AIS coordinator and lake association AIS representative will provide identification assistance.) (OBJ B)

2. Monitor Lipsett Lake for PL growth each year. (Volunteers) (OBJ B)

3. Cut and spray individual PL plants where identification is confirmed. (Volunteers) (OBJ A and B)

4. Note each area where PL is sprayed and monitor subsequent years. (Volunteers) (OBJ A)

5. Map all beds of curly leaf pondweed (CLP) on the lakes each year. (OBJ C)

6. Consider CLP control efforts using early season chemical treatment or other accepted method, if CLP spreads to an unacceptable level. (OBJ C)

Goal 3: Enhance and maintain the diverse populations of native aquatic plants.

Objectives

A. Implement strict adherence with treatment standards and monitoring methods prior to and following herbicide treatment.

B. Prevent removal of native plants using herbicides, with special consideration to wild rice beds.

C. Increase Lipsett Lake community's understanding of the role and importance of aquatic plants and their impacts on them.

Discussion

The plant community in the Lipsett Lake is very diverse and extensive. It is important to understand that these plants play a very important role in the lake ecosystem. Aquatic plants in the lake provide habitat for a diverse fish population. They also provide protection from shoreline erosion. Removing native plants could lead to adverse effects in the lakes. Healthy native plant populations prevent colonization by invasive plants. Erosion and runoff from waterfront property may alter sediment characteristics encouraging spread of invasive plants. Boating disturbance near the shoreline can remove aquatic plants and the valuable functions they provide. Boating disturbance near shore also creates sediment disturbance and the release of excess phosphorus, which can lead to access algal blooms.

Actions

1. Consider alternative methods for removing native plants, other than using herbicide treatment, for individual access corridors. (OBJ B)

2. Conduct a point intercept survey of the lake every five to ten years, or as needed. (OBJ C)

3. Update the aquatic plant management plan every five to ten years, or as needed. (OBJ A, B and C)
   Educational activities are detailed in the discussion for Goal 5.

Goal 4: Maintain and improve water quality conditions.

Objectives

A. Continue to sample and record both water samples and Secchi readings to ensure water quality.

B. Encourage lake residents to restore and preserve shoreline buffers of native vegetation.

Messages

1. Shoreline buffers protect water quality and provide fish and wildlife habitat. Describe ways to restore shoreline buffers (natural recovery, stop mowing, plant natives).
2. Cost sharing for restoration shoreline buffers is available from Burnett County.
3. Describe the Burnett County shoreline buffer requirements and how to report violations of these requirements.
4. Highlight good examples of shoreline buffers on private waterfront property.

C. Reduce phosphorus and sediment loads from immediate watershed.

D. Encourage Riparian land owners to adopt and implement storm water runoff controls for existing structures and all new constructions.

Adaptive Management Approach

Lipsett Lake has a relatively small watershed draining to it and as a result, the impacts that are most controllable at this time originate along the lake's immediate shoreline. These sources include faulty septic systems, the use of phosphorus-containing fertilizers, shoreland areas that are maintained in an unnatural manner, and impervious surfaces. To reduce these impacts, the Lipsett Lake Association will conduct an educational initiative aimed at raising awareness among shoreland property owners concerning their impacts on the lake. This will include news letter articles and guest speakers at Association meetings. This Management Action will be completed in conjunction with the Shoreland Restoration Action listed below.

Action Steps:

1. Recruit facilitators
2. Facilitators summarize educational material collected from WDNR, UW-Extension, and County Land and Water Conservation sources for the creation of informative materials
3. Facilitators disperse materials to stakeholders

***Actions*:**

1. Continue to monitor water quality through WDNR Citizens Lake Monitoring Network advanced water chemistry program and Secchi disk sampling and record data in the Surface Water Integrated Monitoring System (SWIMS) system. (OBJ A)

2. Incorporate the Adaptive Management Approach to reduce phosphorus and sediment loads from immediate watershed. (OBJ B, C)

3. Educate and assist Lipsett Lake community members in the restoration and preservation of shoreland buffers and shoreland vegetation. Continue implementation of shoreline owners' education program. (OBJ B, C, D)

Goal 5: Educate the Lipsett Lake community regarding aquatic plant management, management strategies found in the plan and appropriate plant management actions.

Audience: Lipsett Lake Community

A. All lake residents
B. Business owners
C. Lake users
D. Residents who treated waterfront with herbicides in the past

Messages

1. Summary of APM plan, notice of public meeting, and how to get full APM plan
2. List of APM dos and don'ts
3. Contact list for APM include web resources
4. Native aquatic plant values
5. Limit impacts to native aquatic plants by traveling with no wake in shallow areas, using hand removal methods near docks and swimming areas, etc.
6. Explain procedure for individual corridor herbicide applications and describe conditions where herbicide treatment may be allowed.
7. Explain location and procedures for curly leaf pondweed herbicide treatment
8. Identification of CLP and methods for removal (include illustrations)
9. Identification of PL and methods for removal (include illustrations)
10. Identification of EWM and contact if suspected (include illustrations)
11. Locations of nearby lakes with EWM
12. Describe new potential invasive species and why they are a threat
13. Native plant identification
14. Inspect, clean, and drain boats and equipment.
15. Burnett County has a new ordinance that makes it illegal to transport aquatic plants on public roads.

Methods

Summary of APM plan

AIS education workshops for all lake users

Improvements to signage at boat landings

Updates to AIS handouts

Newsletter articles

Mailings to lake residents

Develop and update Web site

Clean Boats, clean Waters monitoring/education

Annual meeting/special meetings

Door-to-door distribution of information

Plastic peel-off stickers for boats

Method	Audience	Message
APM plan summary	A - D	1
AIS workshops	A – C	4, 8-15
Signage	A – C	14, 15
AIS handouts	A – D	4, 6-15
Newsletter articles	A – B	1–15
Mailings	A – B	1 –15
Web site updates	A – D	1 -15
Clean Boats, Clean Waters	C	8-11, 14, 15
Annual and special meetings	A – B	1-15
Door-to-door distribution	A	4-15
Plastic peel-off stickers	A – C	14, 15

Goal 6: Allow Riparian landowners the right to create and maintain navigable channels for fishing and boating.

Objectives

A. Allow individual riparian landowners the right to maintain navigation channels through dense beds of curly leaf pondweed on Lipsett Lake.

B. All herbicide treatments are conducted legally. Permits are required for aquatic application of herbicides in Wisconsin.

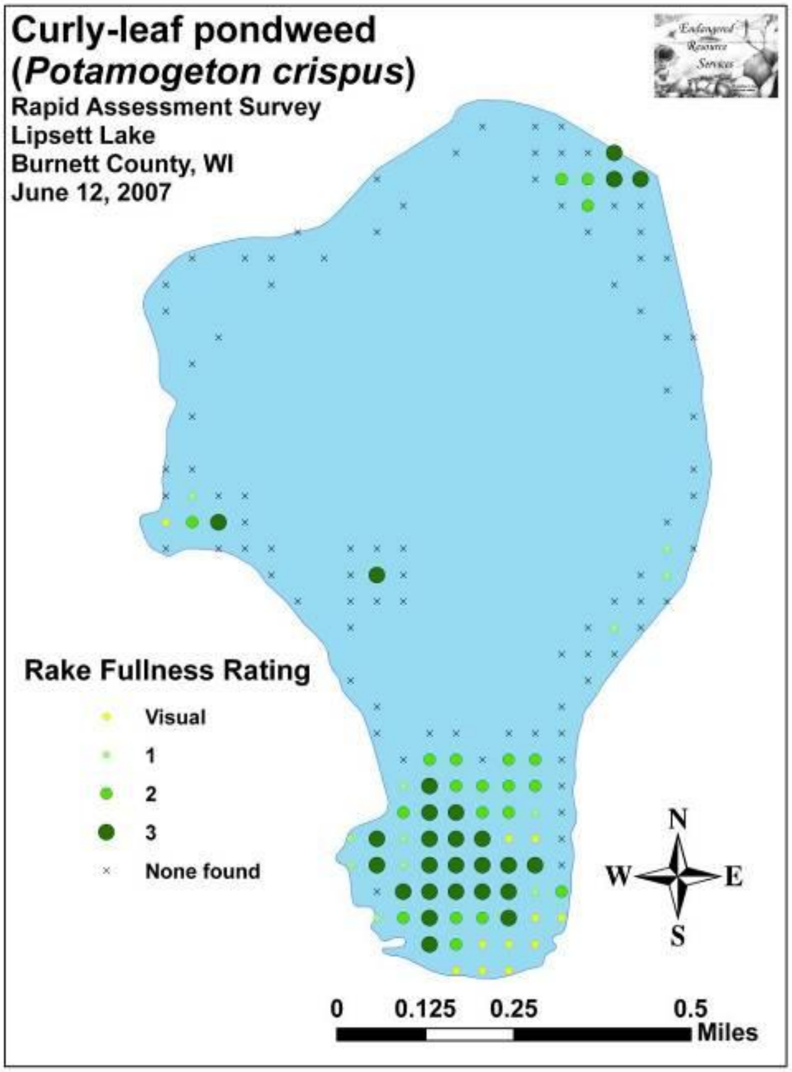
Action

1. Follow all Wisconsin DNR requirements for obtaining permits for the herbicide treatment for individual access corridors. **(See Appendix F for specific details of management options for aquatic plants)**

2. Hand removal methods will be recommended for navigation impairment created by native plants.

Information about individual access corridors
The only time a permit is not required to control aquatic plants is when a waterfront property owner manually removes (i.e. hand-pulls or rakes), or gives permission to someone to manually remove plants (except wild rice) from his/her shoreline in an area that is 30 feet or less in width along the shore and is not within a Designated Sensitive Area. The non-native invasive plants (Eurasian watermilfoil, curlyleaf pondweed, and purple loosestrife) may be manually removed beyond 30 feet without a permit, as long as native plants are not harmed. Wild rice removalalways requires a permit. ***The state is required to consult with Great Lakes Indian Fish and Wildlife Commission prior to any removal of wild rice.***

Individual Access Corridors are the openings from a waterfront property owner's shoreline out into the lake. These corridors may be a maximum of thirty feet wide.



Procedure for Individual Corridor Permitting and Monitoring

Document nuisance conditions (landowner/contractor provide in permit application in February/March)

- Indicate when plants cause problems and how long problems persist
- Include dated photos of nuisance conditions from previous season (or location relative to curly leaf pondweed bed map)
- List depth at end of dock
- Provide examples of specific activities that are limited because of presence of nuisance aquatic plants
- Describe practical alternatives to herbicide use that were considered. These might include:

    - Hand removal/raking of aquatic plants
    - Extending dock to greater depth
    - Altering the route to and from the dock
    - Use of another type of watercraft or motor i.e., is the type of watercraft used common to other sites with similar conditions on this lake?
  - Spraying for curly leaf pondweed may occur along the entire length of a waterfront property owner's shoreline. Spraying areas with wild rice will not be permitted.
  - Aquatic herbicide applicator to provide this information in permit application based on information from the landowner.

- **<u>Verify/refute nuisance conditions/navigation impairment</u>**
  - Landowners will document conditions with photographs and submit request for treatment to WDNR.
  - For curly leaf pondweed treatment, verification must occur the year before treatment in May or June. Once CLP nuisance is verified and a permit is approved, additional verification is not needed for three subsequent years (although permit applications must be completed each year).
  - Treatment for CLP must occur with water temperatures from 50 - 58 degrees F.
  - WDNR will contact herbicide applicator and owner with a notice to proceed with treatment.

Implementation Plan[38]

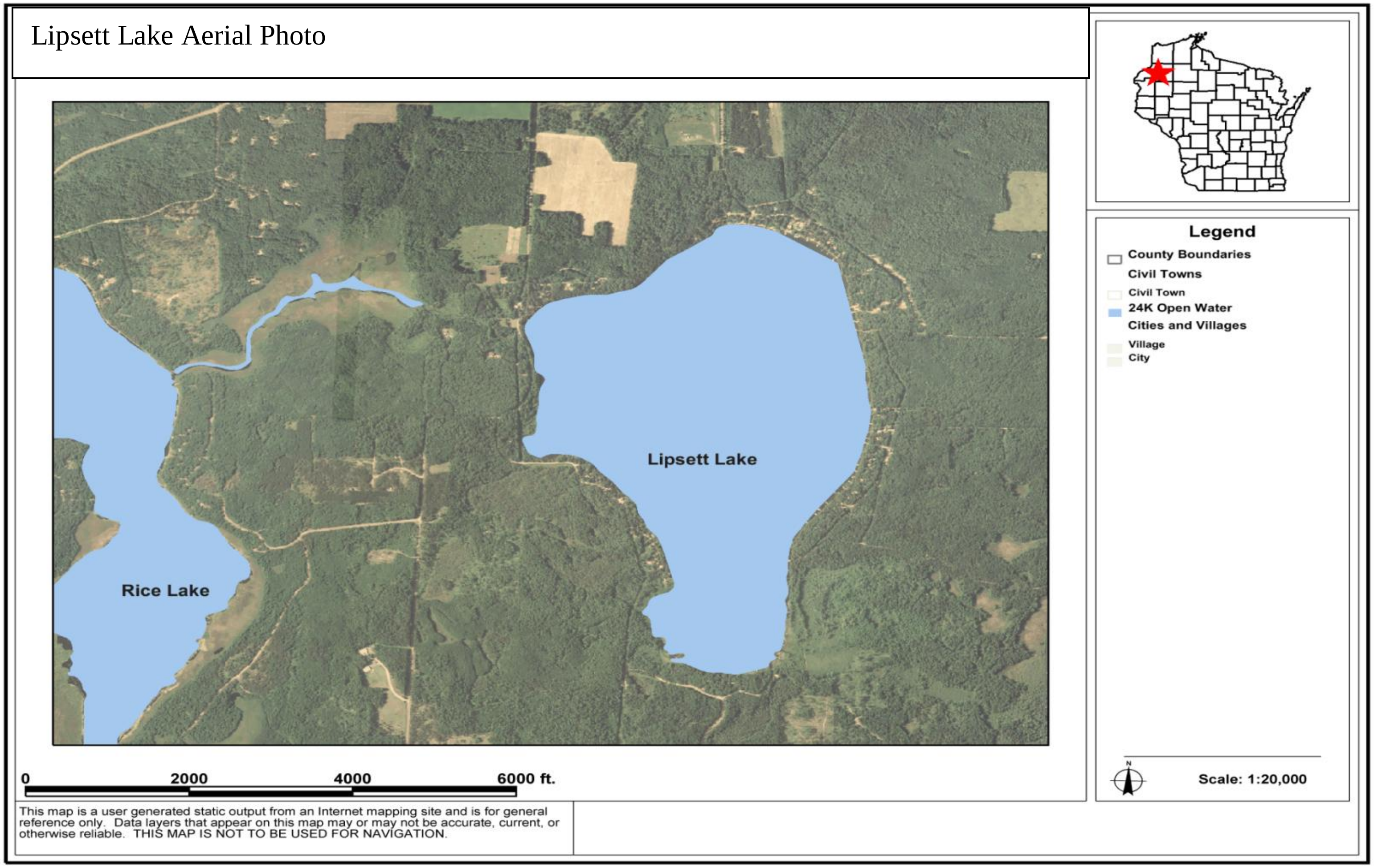
Action Items	Timeline	Cost 2010	Cost 2011	Cost 2012	Responsible Parties
Prevent AIS Introduction					
Maintain I-Lids cameras at each landing	2010	$2,100	$2,100	$2,100	LLA, BCLRA & DNR
Identify and organize volunteer workers/employers for CBCW program	ongoing	10 hours	10 hours	10 hours	LLA President
Conduct CBCW program	ongoing	10 hours	10 hours	10 hours	LLA President
Increase enforcement of BC Do Not Transport Ordinance	Ongoing	4 hours	4 hours	4 hours	LLA, BC Sheriff Dept. and LWCD
Monitor boat landings	Annually	$0	$0	$0	LLA, Burnett County LWCD
Train Volunteer monitors in CLMN	As needed	$0	$0	$0	Burnett County LWCD
Rapid Response plan review	Ongoing	3 hours	3 hours	3 hours	LLA, Burnett County LWCD
AIS Reduction and Prevention					
Provide Identification information and encourage volunteer monitoring	May - August	20 hours	20 hours	20 hours	LLA AIS Committee, BC LWCD
Monitor Lake for PL growth	July/August	20 hours	20 hours	20 hours	LLA/community
Cut and Spray plants as needed	July/August	$100	$100	$100	LLA/community
Track and monitor previously sprayed areas in previous years	Ongoing	20 hours	20 hours	20 hours	LLA/community

[38] Templates taken from Harmony Environmental. *Aquatic Plant Management Plan. Yellow and Little Yellow Lakes, Burnett County, Wisconsin.* June 2009.

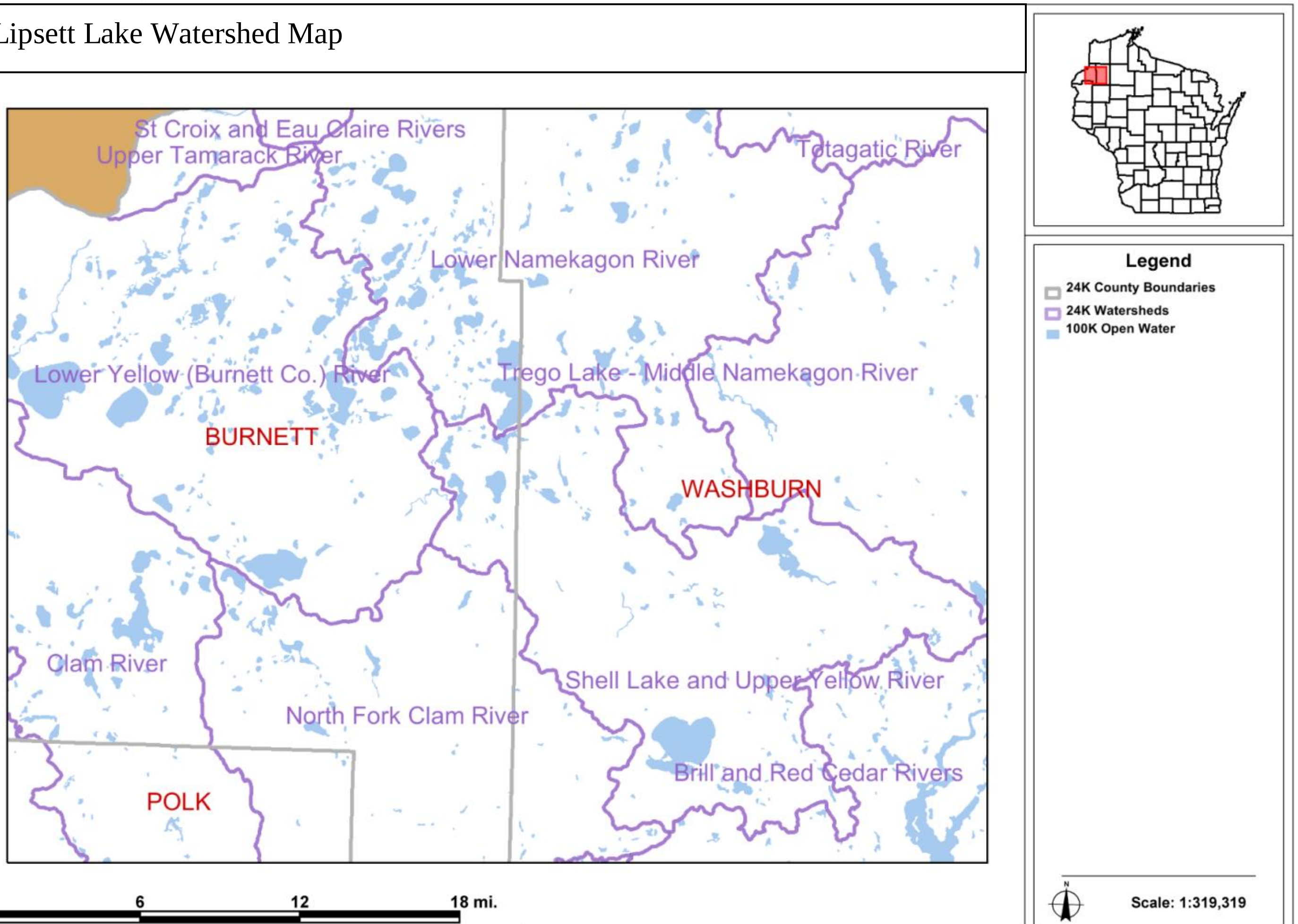
Action Items	Timeline	Cost 2011	Cost 2012	Cost 2013	Responsible Parties
Map all CLP beds	Mid June	$600			Endangered Resource Services
Consider if CLP control is warranted	September	TBD			LLA
Preserve Native Plants					
Conduct a point intercept survey of the lake	2012-2017		$4000		LLA
Update APM plan	2013-2018		$4000		LLA
Water Quality					
Water chemistry and Secchi sampling	ongoing	20 hours	20 hours	20 hours	LLA
Reduce phosphorus and sediment loads from immediate watershed	Ongoing	TBD			LLA, BC LWCD
Educate and assist Lipsett Lake community members in the restoration and preservation of shoreland buffers and shoreland vegetation	Ongoing	TBD			LLA, BC LWCD
Continue implementation of shoreline owners' education program	Ongoing	TBD			LLA, BC LWCD
Educate Lipsett Lake Community					
AIS workshops	Ongoing	$0	$0	$0	BC LWCD
AIS signage	As needed	$0	$0	$0	BC LWCD
Handouts, mailings, door-to door distribution	Ongoing	$500	$500	$500	LLA
LLA newsletter articles	Ongoing	$500	$500	$500	LLA
LLA Website updates	Ongoing	30 hours/Vol	20 hours/Vol	20 hours/Vol	LLA
Annual and special meetings	Ongoing	$200	$200	$200	LLA

Action Items	Timeline	Cost 2011	Cost 2012	Cost 2013	Responsible Parties
Maintain Navigable Channels					
Individual Riparian Owners estimate the need for navigable channels	Mid June				Riparian Land Owners
Develop RFP for CLP treatment and select applicator as needed	January				Riparian Land Owners
Apply for permits	February	$270 4 hours	$270 4 hours	$270 4 hours	Riparian Land Owners WDNR
Conduct treatment	Late May				Authorized Applicator
Monitor for effectiveness of treatment	Late June				Riparian Land Owners
Provide information to guide individual corridor treatment permits	January	4 hours Vol			LLA, BC LWCD
Encourage hand removal methods of individual corridor clearing	January				Riparian Land Owners

Appendix A. Plan

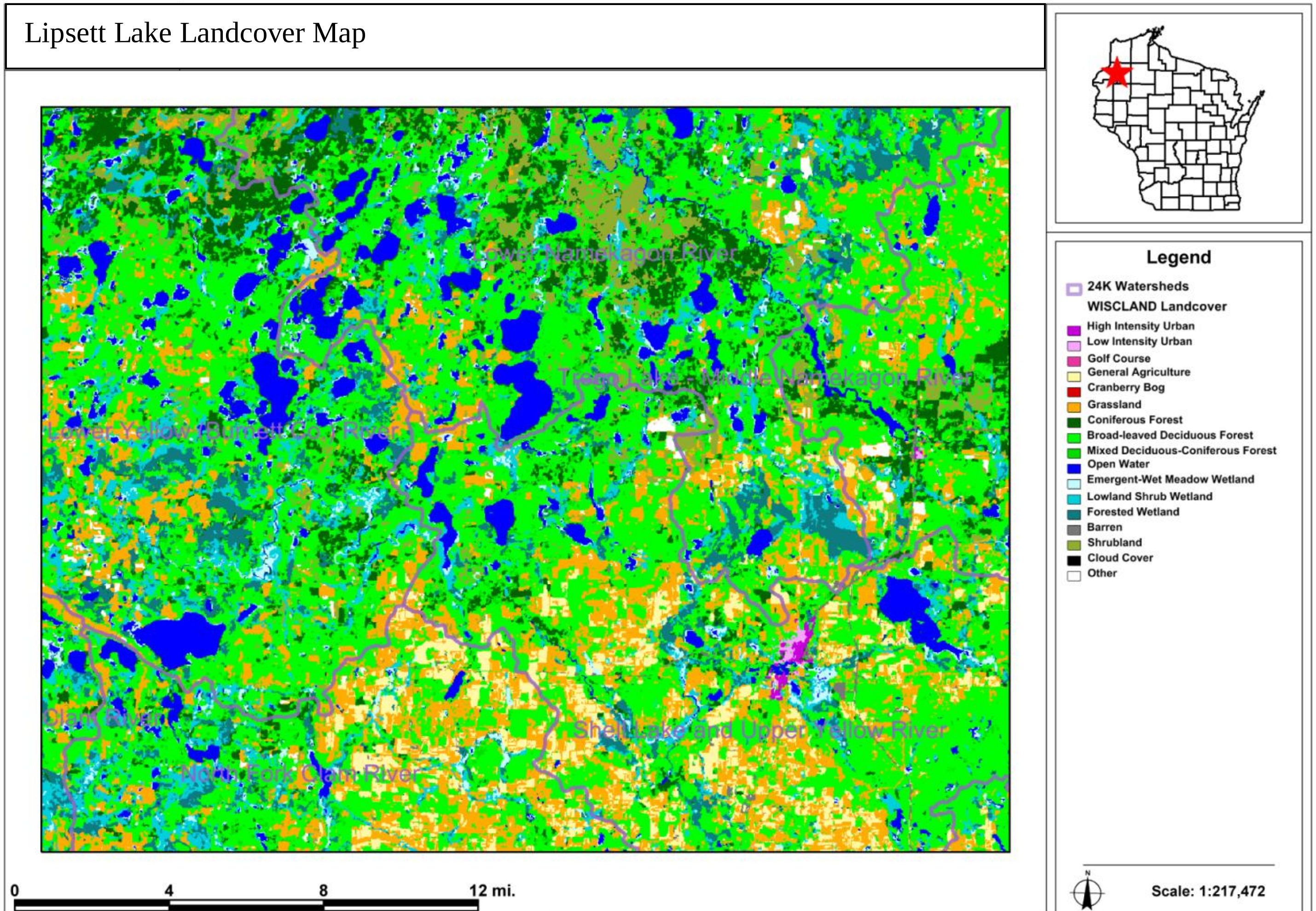


Lipsett Lake Watershed Map



This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Lipsett Lake Landcover Map



This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Appendix B. Invasive Species Information

Curly Leaf Pondweed
Curly leaf pondweed is specifically designated as an invasive aquatic plant (along with Eurasian water milfoil and Purple loosestrife) to be the focus of a statewide program to control invasive species in Wisconsin. Invasive species are defined as a "non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health (23.22(c)."

The Wisconsin Comprehensive Management Plan for Aquatic Invasive Species describes curly leaf pondweed impacts as follows:

> It is widely distributed throughout Wisconsin lakes, but the actual number of waters infested is not known. Curly-leaf pondweed is native to northern Europe and Asia where it is especially well adapted to surviving in low temperature waters. It can actively grow under the ice while most plants are dormant, giving it a competitive advantage over native aquatic plant species. By June, curly-leaf pondweed can form dense surface mats that interfere with aquatic recreation. By mid-summer, when other aquatic plants are just reaching their peak growth for the year, it dies off. Curly-leaf pondweed provides habitat for fish and invertebrates in the winter and spring when most other plants are reduced to rhizomes and buds, but the mid-summer decay creates a sudden loss of habitat. The die-off of curly-leaf pondweed also releases a surge of nutrients into the water column that can trigger algal blooms and create turbid water conditions. In lakes where curly-leaf pondweed is the dominant plant, the summer die-off can lead to habitat disturbance and degraded water quality. In other waters where there is a diversity of aquatic plants, the breakdown of curly-leaf may not cause a problem.[40]

The state of Minnesota DNR web site explains that curly leaf pondweed often causes problems due to excessive growth. At the same time, the plant provides some cover for fish and some waterfowl species feed on the seeds and winter buds.[41]

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[40] Wisconsin's Comprehensive Management Plant to Prevent Further Introductions and Control Existing Populations of Aquatic Invasive Species. Prepared by Wisconsin DNR. September 2003.
[41] Information from Minnesota DNR (www.dnr.state.mn.us/aquatic_plants).

The following description is taken from a Great Lakes Indian Fish and Wildlife Commission handout.

Curly Leaf Pondweed (*Potamogeton crispus*)[42]

Identification

Curly leaf pondweed is an invasive aquatic species found in a variety of aquatic habitats, including permanently flooded ditches and pools, rivers, ponds, inland lakes, and even the Great Lakes. Curly leaf pondweed prefers alkaline or high nutrient waters one to three meters deep. Its leaves are strap-shaped with rounded tips and undulating and finely toothed edges. Leaves are not modified for floating, and are generally alternate on the stem. Stems are somewhat flattened and grow to as long as two meters. The stems are dark reddish-green to reddish-brown, with the mid-vein typically tinged with red. Curly leaf pondweed is native to Eurasia, Africa, and Australia and is now spread throughout most of the United States and southern Canada.

Characteristics

New plants typically establish in the fall from freed turions (branch tips). The winter form is short, with narrow, flat, relatively limp, bluish-green leaves. This winter form can grow beneath the ice and is highly shade-tolerant. Rapid growth begins with warming water temperatures in early spring – well ahead of native aquatic plants.

Reproduction and Dispersal

Curly leaf pondweed reproduces primarily vegetatively. Numerous turions are produced in the spring. These turions consist of modified, hardened, thorny leaf bases interspersed with a few to several dormant buds. The turions are typically 1.0 – 1.7 cm long and 0.8 to 1.4 cm in diameter. Turions separate from the plant by midsummer, and may be carried in the water column supported by several leaves. Humans and waterfowl may also disperse turions. Stimulated by cooler water temperatures, turions germinate in the fall, over-wintering as a small plant. The next summer plants mature, producing reproductive tips of their own. Curly leaf pondweed rarely produces flowers.

Ecological Impacts

Rapid early season growth may form large, dense patches at the surface. This canopy overtops most native aquatic plants, shading them and significantly slowing their growth. The canopy lowers water temperature and restricts absorption of atmospheric oxygen into the water. The dense canopy formed often interferes with recreational activities such as swimming and boating.

In late spring, curly leaf pondweed dies back, releasing nutrients that may lead to algae blooms. Resulting high oxygen demand caused by decaying vegetation can adversely affect fish

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[42] Information from GLIFWC Plant Information Center (http://www.glifwc.org/epicenter).

populations. The foliage of curly leaf pondweed is relatively high in alkaloid compounds possibly making it unpalatable to insects and other herbivores.

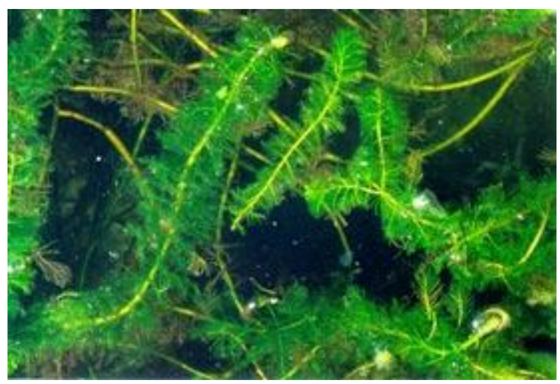
Control

Small populations of curly leaf pondweed in otherwise un-infested water bodies should be attacked aggressively. Hand pulling, suction dredging, or spot treatments with contact herbicides are recommended. Cutting should be avoided because fragmentation of plants may encourage their re-establishment. In all cases, care should be taken to remove all roots and plant fragments, to keep them from re-establishing.

Control of large populations requires a long-term commitment that may not be successful. A prudent strategy includes a multi-year effort aimed at killing the plant before it produces turions, thereby depleting the seed bank over time. It is also important to maintain, and perhaps augment, native populations to retard the spread of curly leaf and other invasive plants. Invasive plants may aggressively infest disturbed areas of the lake, such as those where native plant nuisances have been controlled through chemical applications.

Eurasian Water Milfoil *(Myriophyllum spicatum)*

Introduction



Eurasian water milfoil is a submersed aquatic plant native to Europe, Asia, and northern Africa. It is the only non-native milfoil in Wisconsin. Like the native milfoils, the Eurasian variety has slender stems whorled by submersed feathery leaves and tiny flowers produced above the water surface. The flowers are located in the axils of the floral bracts, and are either four-petaled or without petals. The leaves are threadlike, typically uniform in diameter, and aggregated into a submersed terminal spike. The stem thickens below the inflorescence and doubles its width further down, often curving to lie parallel with the water surface. The fruits are four-jointed nut-like bodies. Without flowers or fruits, Eurasian water milfoil is nearly impossible to distinguish from Northern water milfoil. Eurasian water milfoil has 9-21 pairs of leaflets per leaf, while Northern milfoil typically has 7-11 pairs of leaflets. Coontail is often mistaken for the milfoils, but does not have individual leaflets.

Distribution and Habitat

Eurasian milfoil first arrived in Wisconsin in the 1960's. During the 1980's, it began to move from several counties in southern Wisconsin to lakes and waterways in the northern half of the state. As of 1993, Eurasian milfoil was common in 39 Wisconsin counties (54%) and at least 75 of its lakes, including shallow bays in Lakes Michigan and Superior and Mississippi River pools.

Eurasian water milfoil grows best in fertile, fine-textured, inorganic sediments. In less productive lakes, it is restricted to areas of nutrient-rich sediments. It has a history of becoming dominant in eutrophic, nutrient-rich lakes, although this pattern is not universal. It is an opportunistic species that prefers highly disturbed lake beds, lakes receiving nitrogen and phosphorous-laden runoff, and heavily used lakes. Optimal growth occurs in alkaline systems with a high concentration of dissolved inorganic carbon. High water temperatures promote multiple periods of flowering and fragmentation.

Life History and Effects of Invasion

Unlike many other plants, Eurasian water milfoil does not rely on seed for reproduction. Its seeds germinate poorly under natural conditions. It reproduces vegetatively by fragmentation, allowing it to disperse over long distances. The plant produces fragments after fruiting once or twice during the summer. These shoots may then be carried downstream by water currents or inadvertently picked up by boaters. Milfoil is readily dispersed by boats, motors, trailers, bilges, live wells, or bait buckets, and can stay alive for weeks if kept moist.

Once established in an aquatic community, milfoil reproduces from shoot fragments and stolons (runners that creep along the lake bed). As an opportunistic species, Eurasian water milfoil is adapted for rapid growth early in spring. Stolons, lower stems, and roots persist over winter and store the carbohydrates that help milfoil claim the water column early in spring, photosynthesize, divide, and form a dense leaf canopy that shades out native aquatic plants. Its ability to spread rapidly by fragmentation and effectively block out sunlight needed for native plant growth often results in monotypic stands. Monotypic stands of Eurasian milfoil provide only a single habitat, and threaten the integrity of aquatic communities in a number of ways: For example, dense stands disrupt predator-prey relationships by fencing out larger fish, and reducing the number of nutrient-rich native plants available for waterfowl.

Dense stands of Eurasian water milfoil also inhibit recreational uses like swimming, boating, and fishing. Some stands have been dense enough to obstruct industrial and power generation water intakes. The visual impact that greets the lake user on milfoil-dominated lakes is the flat yellow-green of matted vegetation, often prompting the perception that the lake is "infested" or "dead". Cycling of nutrients from sediments to the water column by Eurasian water milfoil may lead to deteriorating water quality and algae blooms of infested lakes. [43]

[43] Taken in its entirety from WDNR, 2008 http://www.dnr.state.wi.us/invasives/fact/milfoil.htm

Reed Canary Grass (*Phalaris arundinacea*)

Description
Reed canary grass is a large, coarse grass that reaches 2 to 9 feet in height. It has an erect, hairless stem with gradually tapering leaf blades 3 1/2 to 10 inches long and 1/4 to 3/4 inch in width. Blades are flat and have a rough texture on both surfaces. The lead ligule is membranous and long. The compact panicles are erect or slightly spreading (depending on the plant's reproductive stage), and range from 3 to 16 inches long with branches 2 to 12 inches in length. Single flowers occur in dense clusters in May to mid-June. They are green to purple at first and change to beige over time. This grass is one of the first to sprout in spring, and forms a thick rhizome system that dominates the subsurface soil. Seeds are shiny brown in color.

Both Eurasian and native ecotypes of reed canary grass are thought to exist in the U.S. The Eurasian variety is considered more aggressive, but no reliable method exists to tell the ecotypes apart. It is believed that the vast majority of our reed canary grass is derived from the Eurasian ecotype. Agricultural cultivars of the grass are widely planted.

Reed canary grass also resembles non-native orchard grass (*Dactylis glomerata*), but can be distinguished by its wider blades, narrower, more pointed inflorescence, and the lack of hairs on glumes and lemmas (the spikelet scales). Additionally, bluejoint grass (*Calamagrostis canadensis*) may be mistaken for reed canary in areas where orchard grass is rare, especially in the spring. The highly transparent ligule on reed canary grass is helpful in distinguishing it from the others. Ensure positive identification before attempting control. The ligule is a transparent membrane found at the intersection of the leaf stem and leaf.

Distribution and Habitat
Reed canary grass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. It has become naturalized in much of the northern half of the U.S., and is still being planted on steep slopes and banks of ponds and created wetlands.

Reed canary grass can grow on dry soils in upland habitats and in the partial shade of oak woodlands, but does best on fertile, moist organic soils in full sun. This species can invade most types of wetlands, including marshes, wet prairies, sedge meadows, fens, stream banks, and seasonally wet areas; it also grows in disturbed areas.

Life History and Effects of Invasion
Reed canary grass reproduces by seed or creeping rhizomes. It spreads aggressively. The plant produces leaves and flower stalks for 5 to 7 weeks after germination in early spring, then spreads laterally. Growth peaks in mid-June and declines in mid-July. A second growth spurt occurs in the fall. The shoots collapse in mid to late summer, forming a dense, impenetrable mat of stems

and leaves. The seeds ripen in late June and shatter when ripe. Seeds may be dispersed from one wetland to another by waterways, animals, humans, or machines.

This species prefers disturbed areas, but can easily move into native wetlands. Reed canary grass can invade a disturbed wetland in less than twelve years. Invasion is associated with disturbances including ditching of wetlands, stream channelization, deforestation of swamp forests, sedimentation, and intentional planting. The difficulty of selective control makes reed canary grass invasion of particular concern. Over time, it forms large, monotypic stands that harbor few other plant species and are subsequently of little use to wildlife. Once established, reed canary grass dominates an area by building up a tremendous seed bank that can eventually erupt, germinate, and recolonize treated sites.[44]

Purple Loosestrife (*Lythrum salicaria*)[45]

Description

Purple loosestrife is a non-native plant common in Wisconsin. By law, purple loosestrife is a nuisance species in Wisconsin. It is illegal to sell, distribute, or cultivate the plants or seeds, including any of its cultivars.

Purple loosestrife is a perennial herb 3-7 feet tall with a dense bushy growth of 1-50 stems. The stems, which range from green to purple, die back each year. Showy flowers vary from purple to magenta, possess 5-6 petals aggregated into numerous long spikes, and bloom from July to September. Leaves are opposite, nearly linear, and attached to four-sided stems without stalks. It has a large, woody taproot with fibrous rhizomes (underground stems) that form a dense mat.

Characteristics

Purple loosestrife is a wetland herb that was introduced as a garden perennial from Europe during the 1800's. It is still promoted by some horticulturists for its beauty as a landscape plant, and by beekeepers for its nectar-producing capability. Currently, about 24 states have laws prohibiting its importation or distribution because of its aggressively invasive characteristics. It has since extended its range to include most temperate parts of the United States and Canada. The plant's reproductive success across North America can be attributed to its wide tolerance of physical and chemical conditions characteristic of disturbed habitats, and its ability to reproduce prolifically by both seed dispersal and vegetative propagation. The absence of natural predators, like European species of herbivorous beetles that feed on the plant's roots and leaves, also contributes to its proliferation in North America.

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[44] Taken in its entirety from WDNR, 2008 http://www.dnr.state.wi.us/invasives/fact/reed_canary.htm

[45] Wisconsin DNR invasive species factsheets from http:/dnr.wi.gov/invasives.

Purple loosestrife was first detected in Wisconsin in the early 1930's, but remained uncommon until the 1970's. It is now widely dispersed in the state, and has been recorded in 70 of Wisconsin's 72 counties. This plant's optimal habitat includes marshes, stream margins, river flood plains, sedge meadows, and wet prairies. It is tolerant of moist soil and shallow water sites such as pastures and meadows, although established plants can tolerate drier conditions. Purple loosestrife has also been planted in lawns and gardens, which is often how it has been introduced to many of our wetlands, lakes, and rivers.

Reproduction and Dispersal

Purple loosestrife spreads mainly by seed, but it can also spread vegetatively from root or stem segments. A single stalk can produce from 100,000 to 300,000 seeds per year. Seed survival is up to 60-70%, resulting in an extensive seed bank. Most of the seeds fall near the parent plant, but water, animals, boats, and humans can transport the seeds long distances. Vegetative spread through local disturbance is also characteristic of loosestrife; clipped, trampled, or buried stems of established plants may produce shoots and roots. It is often very difficult to locate non-flowering plants, so monitoring for new invasions should be done at the beginning of the flowering period in mid-summer.

Any sunny or partly shaded wetland is susceptible to purple loosestrife invasion. Vegetative disturbances such as water drawdown or exposed soil accelerate the process by providing ideal conditions for seed germination. When the right disturbance occurs, loosestrife can spread rapidly, eventually taking over the entire wetland.

Ecological Impacts

Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. As native vegetation is displaced, rare plants are often the first species to disappear. Eventually, purple loosestrife can overrun wetlands thousands of acres in size, and almost entirely eliminate the open water habitat. The plant can also be detrimental to recreation by choking waterways.

Mechanical Control

Purple loosestrife (PL) can be controlled by cutting, pulling, digging and drowning. Cutting is best done just before plants begin flowering. Cutting too early encourages more flower stems to grow than before. If done too late, seed may have already fallen. Since lower pods can drop seed while upper flowers are still blooming, check for seed. If none, simply bag all cuttings (to prevent them from rooting). If there is seed, cut off each top while carefully holding it upright, then bend it over into a bag to catch any dropping seeds. Dispose of plants/seeds in a capped landfill, or dry and burn them. Composting will not kill the seeds. Keep clothing and equipment seed-free to prevent its spread. Rinse all equipment used in infested areas before moving into uninfested areas, including boats, trailers, clothing, and footwear.

Pulling and digging can be effective, but can also create disturbed bare spots, which are good sites for PL seeds to germinate, or leave behind root fragments that grow into new plants. Use these methods primarily with small plants in loose soils, since they do not usually leave behind large gaps, nor root tips while large plants with multiple stems and brittle roots often do. Dispose of plants as described above.

Mowing has not been effective with loosestrife unless the plants can be mowed to a height where the remaining stems will be covered with water for a full twelve months. Burning has also proven largely ineffective. Mowing and flooding are not encouraged because they can contribute to further dispersal of the species by disseminating seeds and stems.

Follow-up treatments are recommended for at least three years after removal.

Chemical Control

This is usually the best way to eliminate PL quickly, especially with mature plants. The chemicals used have a short soil life. Timing is important. Treat in late July or August, but before flowering to prevent seed set. Always back away from sprayed areas as you go, to prevent getting herbicide on your clothes. Generally, the formula designed for use on wet sites should be used. The best method is to cut stems and paint the stump tops with herbicide. The herbicide can be applied with a small drip bottle or spray bottle, which can be adjusted to release only a small amount. Try to cover the entire cut portion of the stem, but not let the herbicide drip onto other plants since it is non-selective and can kill any plant it touches.

Glyphosate herbicides: Roundup and Glyfos are typically used, but if there is any open water in the area use Rodeo, a glyphosate formulated and listed for use over water. Currently, glyphosate is the most commonly used chemical for killing loosestrife. Glyphosate must be applied in late July or August to be most effective. Since you must treat at least some stems of each plant and they often grow together in a clump, all stems in the clump should be treated to be sure all plants are treated.

Another method is using very carefully targeted foliar applications of herbicide (NOT broadcast spraying). This may reduce costs for sites with very high densities of PL, since the work should be easier and there will be few other plant species to hit accidentally. Use a glyphosate formulated for use over water. A weak solution of around 1% active ingredient can be used and it is generally necessary to wet only 25% of the foliage to kill the plant.

You must obtain a permit from WDNR before applying any herbicide over water. The process has been streamlined for control of purple loosestrife and there is no cost. Contact your regional Aquatic Plant Management Coordinator permit information.

Biological Control

Conventional control methods like hand pulling, cutting, flooding, herbicides, and plant competition have only been moderately effective in controlling purple loosestrife. Biocontrol is now considered the most viable option for more complete control for heavy infestations. The DNR, in cooperation with the U.S. Fish and Wildlife Service, is introducing several natural insect enemies of purple loosestrife from Europe. A species of weevil (*Hylobius transversovittatus*) has been identified that lays eggs in the stem and upper root system of the plant; as larvae develop, they feed on root tissue. In addition, two species of leaf eating beetles (*Galerucella calmariensis* and *G. pusilla*) are being raised and released in the state, and another weevil that feeds on flowers (*Nanophyes marmoratus*) is being used to stress the plant in multiple ways. Research has shown that most of these insects are almost exclusively dependent upon purple loosestrife and do not threaten native plants, although one species showed some cross-over to native loosestrife. These insects will not eradicate loosestrife, but may significantly reduce the population so cohabitation with native species becomes a possibility

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Appendix D

Rapid Response for Early Detection of Eurasian Water Milfoil (DRAFT 9/19/09)

1. The Lipsett Lake Association (LLA) community will be directed to contact the EWM identification (ID) lead Bob Baker, if they see a plant in the lakes they suspect might be Eurasian water milfoil (EWM). Signs at the public boat landings, web pages, and newsletter articles will provide contact information and instructions.

2. If plant is likely EWM, the AIS ID lead will confirm identification with WDNR and inform the rest of the LLA board.

3. Mark the location of suspected EWM (AIS ID Lead). Use GPS points, if available, or mark the location with a small float.

4. Confirm identification of EWM (or other AIS) with the WDNR (within 72 hours) (AIS ID Lead). Two entire intact rooted adult specimens of the suspect plants will be collected and bagged and delivered to the WDNR. WDNR may confirm identification with the herbarium at the University of Wisconsin – Stevens Point or the University of Wisconsin – Madison.

5. If the suspect plants are determined to be EWM, the location of EWM will be marked with a more permanent marker. (AIS ID Lead).

6. If identification is positive, inform the board, Burnett County LWCD, herbicide applicator, the person who reported the EWM, lake management consultant, and all lake residents. (AIS ID Lead).

7. If identification is positive, post a notice at the public landing and include a notice in the next newsletter. These notices will inform residents and visitors of the approximate location of EWM and provide appropriate means to avoid spread. (LLA board)

8. Contact Burnett County LWCD to seek assistance in EWM control efforts. The county has a rapid response plan in place that includes assisting lakes where EWM is discovered. Request that the county determine the extent of the EWM introduction and conduct initial removal efforts. If unavailable to assist within two weeks, proceed to step 9.

9. Hire a consultant to determine the extent of the EWM introduction. A diver may be used. If small amounts of EWM are found during this assessment, the consultant will be directed to identify locations with GPS points and hand pull plants found. All plant fragments will be removed from the lake when hand pulling.

10. Select a control plan in cooperation with Burnett County AIS Coordinator and WDNR (board of directors). Additional guidance regarding EWM treatment is found in DNR's *Response for Early Detection of Eurasian Water Milfoil Field Protocol*.

Control methods may include hand pulling, use of divers to manually or mechanically remove the EWM from the lake bottom, application of herbicides, and/or other effective and approved control methods.

The goal of the control plan will be eradication of the EWM.

11. Implement the selected control plan including applying for the necessary permits. Regardless of the control plan selected, it will be implemented by persons who are qualified and experienced in the technique(s) selected.

12. LLA funds may be used to pay for any reasonable expense incurred in implementing the selected control plan, and implementation will not be delayed by waiting for WDNR to approve or fund a grant application.

13. The President of the LLA will work with the WDNR to confirm, as soon as possible, a start date for an Early Detection and Rapid Response AIS Control Grant. Thereafter, the LLA shall formally apply for the grant.

14. LLA shall have the authority to accept donations or borrow money for the purpose of paying for control of EWM.

15. Frequently inspect the area of the EWM to determine the effectiveness of the treatment and whether additional treatment is necessary.

16. Contract for professional monitoring to supplement volunteer monitoring in years following EWM discovery.

EXHIBIT A[10]

Lipsett Lake Association

President	Greg Heber
EWM ID Lead	Bob Baker

Burnett County Land and Water Conservation Department – 715-349-2186

Brad Morris, AIS Coordinator
Dave Ferris, County Conservationist

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Grants	Pamela Toshner: 715-635-4073
Permits	Mark Sundeen: 715-635-4074
EWM Notice	Frank Koshere: 715-392-0807

LAKE MANAGEMENT CONSULTANT

Endangered Resource Services	Matt Berg: 715-483-2847

DIVERS

Endangered Resource Services	Matt Berg: 715-483-2847

[10] This list will be reviewed and updated each year.

Appendix E

Management Options for Aquatic Plants

Draft updated Oct 2006

Option	Permit Needed?	How it Works	PROS	CONS
No Management	N	Do not actively manage plants	Minimizing disturbance can protect native species that provide habitat for aquatic fauna; protecting natives may limit spread of invasive species; aquatic plants reduce shoreline erosion and may improve water clarity	May allow small population of invasive plants to become larger, more difficult to control later
			No immediate financial cost	Excessive plant growth can hamper navigation and recreational lake use
			No system disturbance	May require modification of lake users' behavior and perception
			No unintended effects of chemicals	
			Permit not required	
Mechanical Control	May be required under NR 109	Plants reduced by mechanical means	Flexible control	Must be repeated, often more than once per season
		Wide range of techniques, from manual to highly mechanized	Can balance habitat and recreational needs	Can suspend sediments and increase turbidity and nutrient release
a. Handpulling/Manual raking	Y/N	SCUBA divers or snorkelers remove plants by hand or plants are removed with a rake	Little to no damage done to lake or to native plant species	Very labor intensive
		Works best in soft sediments	Can be highly selective	Needs to be carefully monitored
			Can be done by shoreline property owners without permits within an area <30 ft wide OR where selectively removing exotics	Roots, runners, and even fragments of some species, particularly Eurasian watermilfoil (EWM) will start new plants, so all of plant must be removed
			Can be very effective at removing problem plants, particularly following early detection of an invasive exotic species	Small-scale control only

Management Options for Aquatic Plants

Draft updated Oct 2006

Option	Permit Needed?	How it Works	PROS	CONS
b. Harvesting	Y	Plants are "mowed" at depths of 2-5 ft, collected with a conveyor and off-loaded onto shore	Immediate results	Not selective in species removed
		Harvest invasives only if invasive is already present throughout the lake	EWM removed before it has the opportunity to autofragment, which may create more fragments than created by harvesting	Fragments of vegetation can re-root
			Minimal impact to lake ecology	Can remove some small fish and reptiles from lake
			Harvested lanes through dense weed beds can increase growth and survival of some fish	Initial cost of harvester expensive
			Can remove some nutrients from lake	
Biological Control	Y	Living organisms (e.g. insects or fungi) eat or infect plants	Self-sustaining; organism will over-winter, resume eating its host the next year	Effectiveness will vary as control agent's population fluctates
			Lowers density of problem plant to allow growth of natives	Provides moderate control - complete control unlikely
				Control response may be slow
				Must have enough control agent to be effective
a. Weevils on EWM	Y	Native weevil prefers EWM to other native water-milfoil	Native to Wisconsin: weevil cannot "escape" and become a problem	Need to stock large numbers, even if some already present
			Selective control of target species	Need good habitat for overwintering on shore (leaf litter) associated with undeveloped shorelines
			Longer-term control with limited management	Bluegill populations decrease densities through predation

Management Options for Aquatic Plants

Draft updated Oct 2006

	Option	Permit Needed?	How it Works	PROS	CONS
b.	Pathogens	Y	Fungal/bacterial/viral pathogen introduced to target species to induce mortalitiy	May be species specific	Largely experimental; effectiveness and longevity unknown
				May provide long-term control	Possible side effects not understood
				Few dangers to humans or animals	
c.	Allelopathy	Y	Aquatic plants release chemical compounds that inhibit other plants from growing	May provide long-term, maintenance-free control	Initial transplanting slow and labor-intensive
				Spikerushes (*Eleocharis* spp.) appear to inhibit Eurasian watermilfoil growth	Spikerushes native to WI, and have not effectively limited EWM growth
					Wave action along shore makes it difficult to establish plants; plants will not grow in deep or turbid water
d.	Planting native plants	Y	Diverse native plant community established to repel invasive species	Native plants provide food and habitat for aquatic fauna	Initial transplanting slow and labor-intensive
				Diverse native community may be "resistant" to invasive species	Nuisance invasive plants may outcompete plantings
				Supplements removal techniques	Largely experimental; few well-documented cases
					If transplants from external sources (another lake or nursury), may include additional invasive species or "hitchhikers"

Management Options for Aquatic Plants

Draft updated Oct 2006

Option	Permit Needed?	How it Works	PROS	CONS
Physical Control	Required under Ch. 30 / NR 107	Plants are reduced by altering variables that affect growth, such as water depth or light levels		
a. Fabrics/ Bottom Barriers	Y	Prevents light from getting to lake bottom	Reduces turbidity in soft-substrate areas	Eliminates all plants, including native plants important for a healthy lake ecosystem
			Useful for small areas	May inhibit spawning by some fish
				Need maintenance or will become covered in sediment and ineffective
				Gas accumulation under blankets can cause them to dislodge from the bottom
				Affects benthic invertebrates
				Anaerobic environment forms that can release excessive nutrients from sediment
b. Drawdown	Y, May require Environmental Assessment	Lake water lowered with siphon or water level control device; plants killed when sediment dries, compacts or freezes	Winter drawdown can be effective at restoration, provided drying and freezing occur. Sediment compaction is possible over winter	Plants with large seed bank or propagules that survive drawdown may become more abundant upon refilling
		Season or duration of drawdown can change effects	Summer drawdown can restore large portions of shoreline and shallow areas as well as provide sediment compaction	May impact attached wetlands and shallow wells near shore
			Emergent plant species often rebound near shore providing fish and wildlife habitat, sediment stabilization, and increased water quality	Species growing in deep water (e.g. EWM) that survive may increase, particularly if desirable native species are reduced
			Success demonstrated for reducing EWM, variable success for curly-leaf pondweed (CLP)	Can affect fish, particularly in shallow lakes if oxygen levels drop or if water levels are not restored before spring spawning
			Restores natural water fluctuation important for all aquatic ecosystems	Winter drawdawn must start in early fall or will kill hibernating reptiles and amphibians
				Navigation and use of lake is limited during drawdown

Management Options for Aquatic Plants

Draft updated Oct 2006

	Option	Permit Needed?	How it Works	PROS	CONS
c.	Dredging	Y	Plants are removed along with sediment	Increases water depth	Severe impact on lake ecosystem
			Most effective when soft sediments overlay harder substrate	Removes nutrient rich sediments	Increases turbidity and releases nutrients
			For extremely impacted systems	Removes soft bottom sediments that may have high oxygen demand	Exposed sediments may be recolonized by invasive species
			Extensive planning required		Sediment testing may be necessary
					Removes benthic organisms
					Dredged materials must be disposed of
d.	Dyes	Y	Colors water, reducing light and reducing plant and algal growth	Impairs plant growth without increasing turbidity	Appropriate for very small water bodies
				Usually non-toxic, degrades naturally over a few weeks	Should not be used in pond or lake with outflow
					Impairs aesthetics
					Effects to microscopic organisms unknown
e.	Non-point source nutrient control	N	Runoff of nutrients from the watershed are reduced (e.g. by controlling construction erosion or reducing fertilizer use) thereby providing fewer nutrients available for plant growth	Attempts to correct source of problem, not treat symptoms	Results can take years to be evident due to internal recycling of already-present lake nutrients
				Could improve water clarity and reduce occurrences of algal blooms	Requires landowner cooperation and regulation
				Native plants may be able to better compete with invasive species in low-nutrient conditions	Improved water clarity may increase plant growth

Management Options for Aquatic Plants

Draft updated Oct 2006

Option	Permit Needed?	How it Works	PROS	CONS
Chemical Control	Y, Required under NR 107	Granules or liquid chemicals kill plants or cease plant growth; some chemicals used primarily for algae	Some flexibility for different situations	Possible toxicity to aquatic animals or humans, especially applicators
		Results usually within 10 days of treatment, but repeat treatments usually needed	Some can be selective if applied correctly	May kill desirable plant species, e.g. native water-milfoil or native pondweeds; maintaining healthy native plants important for lake ecology and minimizing spread of invasives
		Chemicals must be used in accordance with label guidelines and restrictions	Can be used for restoration activities	Treatment set-back requirements from potable water sources and/or drinking water use restrictions after application, usually based on concentration
				May cause severe drop in dissolved oxygen causing fish kill, depends on plant biomass killed, temperatures and lake size and shape
				Often controversial
a. 2,4-D	Y	Systemic[1] herbicide selective to broadleaf[2] plants that inhibits cell division in new tissue	Moderately to highly effective, especially on EWM	May cause oxygen depletion after plants die and decompose
		Applied as liquid or granules during early growth phase	Monocots, such as pondweeds (e.g. CLP) and many other native species not affected	May kill native dicots such as pond lilies and other submerged species (e.g. coontail)
			Can be selective depending on concentration and seasonal timing	Cannot be used in combination with copper herbicides (used for algae)
			Can be used in synergy with endothol for early season CLP and EWM treatments	Toxic to fish
			Widely used aquatic herbicide	

Management Options for Aquatic Plants

Draft updated Oct 2006

	Option	Permit Needed?	How it Works	PROS	CONS
b.	Endothall	Y	Broad-spectrum[3], contact[4] herbicide that inhibits protein synthesis	Especially effective on CLP and also effective on EWM	Kills many native pondweeds
			Applied as liquid or granules	May be effective in reducing reestablishment of CLP if reapplied several years in a row in early spring	Not as effective in dense plant beds; heavy vegetation requires multiple treatments
				Can be selective depending on concentration and seasonal timing	Not to be used in water supplies; post-treatment restriction on irrigation
				Can be combined with 2,4-D for early season CLP and EWM treatments, or with copper compounds	Toxic to aquatic fauna (to varying degrees)
				Limited off-site drift	
c.	Diquat	Y	Broad-spectrum, contact herbicide that disrupts cellular functioning	Mostly used for water-milfoil and duckweed	May impact non-target plants, especially native pondweeds, coontail, elodea, naiads
			Applied as liquid, can be combined with copper treatment	Rapid action	Toxic to aquatic invertebrates
				Limited direct toxicity on fish and other animals	Must be reapplied several years in a row
					Ineffective in muddy or cold water (<50°F)
d.	Fluridone	Y; special permit and Environmental Assessment may be required	Broad-spectrum, systemic herbicide that inhibits photosynthesis	Effective on EWM for 1 to 4 years with aggressive follow-up treatments	Affects non-target plants, particularly native milfoils, coontails, elodea, and naiads, even at low concentrations
			Must be applied during early growth stage	Some reduction in non-target effects can be achieved by lowering dosage	Requires long contact time at low doses: 60-90 days
			Available with a special permit only; chemical applications beyond 150 ft from shore not allowed under NR 107	Slow decomposition of plants may limit decreases in dissolved oxygen	Demonstrated herbicide resistance in hydrilla subjected to repeat treatments
			Applied at very low concentration at whole lake scale	Low toxicity to aquatic animals	In shallow eutrophic systems, may result in decreased water clarity
					Unknown effect of repeat whole-lake treatments on lake ecology

Management Options for Aquatic Plants

Draft updated Oct 2006

Option	Permit Needed?	How it Works	PROS	CONS
e. Glyphosate	Y	Broad-spectrum, systemic herbicide that disrupts enzyme formation and function	Effective on floating and emergent plants such as purple loosestrife	RoundUp is often incorrectly substituted for Rodeo - Associated surfactants of RoundUp believed to be toxic to reptiles and amphibians
		Usually used for purple loosestrife stems or cattails	Selective if carefully applied to individual plants	Cannot be used near potable water intakes
		Applied as liquid spray or painted on loosetrife stems	Non-toxic to most aquatic animals at recommended dosages	Ineffective in muddy water
			Effective control for 1-5 years	No control of submerged plants
f. Triclopyr	Y	Systemic herbicide selective to broadleaf plants that disrupts enzyme function	Effective on many emergent and floating plants	Impacts may occur to some native plants at higher doses (e.g. coontail)
		Applied as liquid spray or liquid	More effective on dicots, such as purple loosestrife; may be more effective than glyphosate	May be toxic to sensitive invertebrates at higher concentrations
			Control of target plants occurs in 3-5 weeks	Retreatment opportunities may be limited due to maximum seasonal rate (2.5 ppm)
			Low toxicity to aquatic animals	Sensitive to UV light; sunlight can break herbicide down prematurely
			No recreational use restrictions following treatment	Relatively new management option for aquatic plants (since 2003)
g. Copper compounds	Y	Broad-spectrum, systemic herbicide that prevents photosynthesis	Reduces algal growth and increases water clarity	Elemental copper accumulates and persists in sediments
		Used to control planktonic and filamentous algae	No recreational or agricultural restrictions on water use following treatment	Short-term results
		Wisconsin allows small-scale control only	Herbicidal action on hydrilla, an invasive plant not yet present in Wisconsin	Long-term effects of repeat treatments to benthic organisms unknown
				Toxic to invertebrates, trout and other fish, depending on the hardness of the water
				Clear water may increase plant growth

[1]Systemic herbicide - Must be absorbed by the plant and moved to the site of action. Often slower-acting than contact herbicides.
[2]Broadleaf herbicide - Affects only dicots, one of two groups of plants. Aquatic dicots include waterlilies, bladderworts, watermilfoils, and coontails.
[3]Broad-spectrum herbicide - Affects both monocots and dicots.
[4]Contact herbicide - Unable to move within the plant; kills only plant tissue it contacts directly.
Specific effects of herbicide treatments dependent on timing, dosage, duration of treatment, and location.
References to registered products are for your convenience and not intended as an endorsement or criticism of that product versus other similar products.
This document is intended to be a guide to available aquatic plant control techniques, and is not necessarily an exhaustive list.
Please contact your local Aquatic Plant Management Specialist when considering a permit.

Appendix F

AQUATIC PLANT MANAGEMENT STRATEGY

Northern Region WDNR
Summer, 2007

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

ISSUES

- Protect desirable native aquatic plants.
- Reduce the risk that invasive species replace desirable native aquatic plants.
- Promote "whole lake" management plans
- Limit the number of permits to control native aquatic plants.

BACKGROUND

As a general rule, the Northern Region has historically taken a protective approach to allow removal of native aquatic plants by harvesting or by chemical herbicide treatment. This approach has prevented lakes in the Northern Wisconsin from large-scale loss of native aquatic plants that represent naturally occurring high quality vegetation. Naturally occurring native plants provide a *diversity of habitat* that *helps maintain water quality*, helps *sustain the fishing* quality known for Northern Wisconsin, supports common lakeshore wildlife from loons to frogs, and helps to provide the *aesthetics* that collectively create the "up-north" appeal of the northwoods lake resources.

In Northern Wisconsin lakes, an inventory of aquatic plants may often find 30 different species or more, whereas a similar survey of a Southern Wisconsin lake may often discover less than half that many species. Historically, similar species diversity was present in Southern Wisconsin, but has been lost gradually over time from stresses brought on by cultural land use changes (such as increased development, and intensive agriculture). Another point to note is that while there may be a greater variety of aquatic vegetation in Northern Wisconsin lakes, the vegetation itself is often *less dense*. This is because northern lakes have not suffered as greatly from nutrients and runoff as have many waters in Southern Wisconsin.

The newest threat to native plants in Northern Wisconsin is from invasive species of aquatic plants. The most common include Eurasian Water Milfoil (EWM) and CurlyLeaf Pondweed (CLP). These species are described as *opportunistic invaders*. This means that these "invaders" benefit where an opening occurs from removal of plants, and without competition from other plants may successfully become established in a lake. Removal of native vegetation not only diminishes the natural qualities of a lake, it *may increase the risk that an invasive species can successfully invade onto the site where native plants have been removed*. There it may more easily establish itself without the native plants to compete against. This concept is easily observed on land where bared soil is quickly taken over by replacement species (often weeds) that crowd in and establish themselves as new occupants of the site. While not providing a certain guarantee against invasive plants, protecting and allowing the native plants to remain may reduce the success of an invasive species becoming established on a lake. Once established, the invasive species cause far more inconvenience for all lake users, riparian and others included; can change many of the natural features of a lake; and often lead to *expensive annual control plans*. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.

To the extent we can maintain the normal growth of native vegetation, Northern Wisconsin lakes can continue to offer the water resource appeal and benefits they've historically provided. A regional position on removal of aquatic plants that carefully recognizes how native aquatic plants benefit lakes in Northern Region can help prevent a gradual decline in the overall quality and recreational benefits that make these lakes attractive to people and still provide abundant fish, wildlife, and northwoods appeal.

GOALS OF STRATEGY:

1. Preserve native species diversity which, in turn, fosters natural habitat for fish and other aquatic species, from frogs to birds.
2. Prevent openings for invasive species to become established in the absence of the native species.
3. Concentrate on a" whole-lake approach" for control of aquatic plants, thereby fostering systematic documentation of conditions and specific targeting of invasive species as they exist.
4. Prohibit removal of wild rice. WDNR – Northern Region will not issue permits to remove wild rice unless a request is subjected to the full consultation process via the Voigt Tribal Task Force. We intend to discourage applications for removal of this ecologically and culturally important native plant.
5. To be consistent with our WDNR Water Division Goals (work reduction/disinvestment), established in 2005, to "not issue permits for chemical or large scale mechanical control of native aquatic plants – develop general permits as appropriate or inform applicants of exempted activities." This process is similar to work done in other WDNR Regions, although not formalized as such.

BASIS OF STRATEGY IN STATE STATUTE AND ADMINISTRATIVE CODE

State Statute 23.24 (2)(c) states:

"The requirements promulgated under par. (a) 4. may specify any of the following:

1. The **quantity** of aquatic plants that may be managed under an aquatic plant management permit.
2. The **species** of aquatic plants that may be managed under an aquatic plant management permit.
3. The **areas** in which aquatic plants may be managed under an aquatic plant management permit.
4. The **methods** that may be used to manage aquatic plants under an aquatic plant management permit.
5. The **times** during which aquatic plants may be managed under an aquatic plant management permit.
6. The **allowable methods** for disposing or using aquatic plants that are removed or controlled under an aquatic plant management permit.
7. The requirements for plans that the department may require under sub. (3) (b). "

State Statute 23.24(3)(b) states:

"The department may require that an application for an aquatic plant management permit contain a plan for the department's approval as to how the aquatic plants will be introduced, removed, or controlled."

Wisconsin Administrative Code NR 109.04(3)(a) states:

"The department may require that an application for an aquatic plant management permit contain an aquatic plant management plan that describes how the aquatic plants will be introduced, controlled, removed or disposed. Requirements for an aquatic plant management plan shall be made in writing stating the reason for the plan requirement. In deciding whether to require a plan, the department shall consider the potential for effects on protection and development of diverse and stable communities of native aquatic plants, for conflict with goals of other written ecological or lake management plans, for cumulative impacts and effect on the ecological values in the body of water, and the long-term sustainability of beneficial water use activities."

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

APPROACH

1. After January 1, 2009* no individual permits for control of native aquatic plants will be issued. Treatment of native species may be allowed under the auspices of an approved lake management plan, and only if the plan clearly documents "impairment of navigation" and/or "nuisance conditions". Until January 1, 2009, individual permits will be issued to previous permit holders, only with adequate documentation of "impairment of navigation" and/or "nuisance conditions". No new individual permits will be issued during the interim.

2. Control of aquatic plants (if allowed) in documented sensitive areas will follow the conditions specified in the report.

3. Invasive species must be controlled under an approved lake management plan, with two exceptions (these exceptions are designed to allow sufficient time for lake associations to form and subsequently submit an approved lake management plan):
   a. Newly-discovered infestations. If found on a lake with an approved lake management plan, the invasive species can be controlled via an amendment to the approved plan. If found on a lake without an approved management plan, the invasive species can be controlled under the WDNR's Rapid Response protocol (see definition), and the lake owners will be encouraged to form a lake association and subsequently submit a lake management plan for WNDR review and approval.
   b. Individuals holding past permits for control of *invasive* aquatic plants and/or "mixed stands" of native and invasive species will be allowed to treat via individual permit until January 1, 2009 if "impairment of navigation" and/or "nuisance conditions" is adequately documented, unless there is an approved lake management plan for the lake in question.

4. Control of invasive species or "mixed stands" of invasive and native plants will follow current best management practices approved by the Department and contain an explanation of the strategy to be used. Established stands of invasive plants will generally use a control strategy based on Spring treatment. (typically, a water temperature of less than 60 degrees Fahrenheit, or approximately May 31st, annually).

5. Manual removal (see attached definition) is allowed (Admin. Code NR 109.06).

** Exceptions to the Jan. 1, 2009 deadline will be considered only on a very limited basis and will be intended to address unique situations that do not fall within the intent of this approach.*

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DOCUMENTATION OF IMPAIRED NAVIGATION AND/OR NUISANCE CONDITIONS

Navigation channels can be of two types:

- Common use navigation channel. This is a common navigation route for the general lake user. It often is off shore and connects areas that boaters commonly would navigate to or across, and should be of public benefit.

- Individual riparian access lane. This is an access lane to shore that normally is used by an individual riparian shore owner.

Severe impairment or nuisance will generally mean vegetation grows thickly and forms mats on the water surface. Before issuance of a permit to use a regulated control method, a riparian will be asked to document the problem and show what efforts or adaptations have been made to use the site. (This is currently required in NR 107 and on the application form, but the following helps provide a specific description of what impairments exist from native plants).

Documentation of *impairment of navigation* by native plants must include:

a. Specific locations of navigation routes (preferably with GPS coordinates)
b. Specific dimensions in length, width, and depth
c. Specific times when plants cause the problem and how long the problem persists
d. Adaptations or alternatives that have been considered by the lake shore user to avoid or lessen the problem
e. The species of plant or plants creating the nuisance (documented with samples or from a Site inspection)

Documentation of the *nuisance* must include:

a. Specific periods of time when plants cause the problem, e.g. when does the problem start and when does it go away.
b. Photos of the nuisance are encouraged to help show what uses are limited and to show the severity of the problem.
c. Examples of specific activities that would normally be done where native plants occur naturally on a site but can not occur because native plants have become a nuisance.

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DEFINITIONS

Manual removal: Removal by hand or hand-held devices without the use or aid of external or auxiliary power. Manual removal cannot exceed 30 ft. in width and can only be done where the shore is being used for a dock or swim raft. The 30 ft. wide removal zone cannot be moved, relocated, or expanded with the intent to gradually increase the area of plants removed. Wild rice may not be removed under this waiver.

Native aquatic plants: Aquatic plants that are indigenous to the waters of this state.

Invasive aquatic plants: Non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Sensitive area: Defined under s. NR 107.05(3)(i) (sensitive areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water).

Rapid Response protocol: This is an internal WDNR document designed to provide guidance for grants awarded under NR 198.30 (Early Detection and Rapid Response Projects). These projects are intended to control pioneer infestations of aquatic invasive species before they become established.