School Section Lake
Aquatic Plant Management Plan
First Reassessment, 2005

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TABLE OF CONTENTS

Chapter I

INTRODUCTION

In 1989 the State of Wisconsin enacted the Lake Management Planning Grant program. The program was designed to provide cost-sharing assistance and incentives to local communities because they are the front line for lake management activities. The District received a grant to assist with the development of this Aquatic Plant Management Plan. This Plan is but one part of the continued effort by local residents to improve School Section Lake.

The plant management plan was developed by Aron & Associates. Comments by residents and board members, lake users, DNR records and Southeastern Wisconsin Regional Planning Commission (SEWRPC) records were all considered in the development of this plan. The district intends to use this plan to better manage their harvesting program, and to educate the residents on the merits of the issues addressed in the plan.

School Section Lake is a 117 acre lake located in Waukesha County, Wisconsin. In 1994, approximately 40% of the lake was hydraulically dredged. Because of that, current maps, including those in this plan are not accurate representations of the depths. The maximum depth is now approximately 19 to 20 feet. Prior to the dredging the maximum depth was 8 feet and the mean depth was 3 feet.

The School Section Lake Management District was formed in 1978 to rebuild the dike on the lake. The district purchased the existing harvester approximately 10 years ago. The plant management budget is approximately $24,300.

The harvesting program on School Section Lake is considered essential to residents. The program allows a reasonable level of recreational use by the community and has been fully supported by the local citizens.

WHY BOTHER?

Some may ask why aquatic plant management, and plant management planning, are important. Some may say just cut it, or just spray it, or just pull it out.

Some answers to this question, are more obvious than others.

- Recreational use impairments because of a nuisance plant condition, lead to social pressures to "do something”.
- Anglers who don’t catch fish, or can’t boat through weed masses, push for action.
- An algae problem may be extensive and smelly.
- Lake users can’t get their boats out from the pier.
- If your community wants to obtain grants to manage the nuisance conditions, a plan must be developed to analyze the specific conditions, and possible management activities, prior to being awarded a grant.

Other answers to this question are more subtle.

- There may be significant economic impacts arising from a nuisance aquatic vegetation problem. Lakes that are a popular fishing destination may see businesses suffer as tourists stay away. Residential property values will decline on lakes with severe plant problems. An Army Corps of Engineers study on Lake Guntersville Alabama showed that property values declined 17% because of a Hydrilla infestation.
- It may be necessary to manage the lake to prevent the spread of the exotic species to other lakes. This is particularly important because prevention and public education are the most successful ways to minimize the spread of exotic species.
- It may be necessary to protect the diversity in the lake. Lakes with increased infestations of exotic species, lose diversity and density of native species over time. As diversity declines, the entire food chain may be affected.
- Management of the nuisance may be the only way to bring the lake back into "balance".
- The exotic species can completely disrupt the natural processes in the lake. Native plants are low growing while exotic plants tend to form canopies. A major shift then occurs because light penetration cannot occur, stunting native plants. Another major shift occurs because the exotic plant's canopies prevent the natural cooling affect that takes place in areas with native plant beds. When cooling and mixing cannot occur, the temperature near the surface increases.

GOALS & OBJECTIVES

The difficult task facing those who attempt to manage aquatic plants is that user needs often conflict. Fish and wildlife need aquatic plants to thrive. Boaters and swimmers desire relief from nuisance aquatic plants. Those depending on the lake for "aesthetic viewing" desire an undisturbed lake surface.

The goals of the District, that is, broad statements of long range desires, are outlined below. The goals are followed by objectives to be used to accomplish each of the goals.

The District's goal is to work toward the preservation of aquatic systems that includes water quality, fisheries, and wildlife, while minimizing the conditions resulting from aquatic nuisances and to preserve and maintain recreational uses of School Section Lake. To achieve the goal, the development of this plan is one component of an effort that has included water quality monitoring, aquatic vegetation surveys, dredging, educational activities, and watershed improvement activities.

The District desires to:

- Maintain and acquire harvesting equipment as needed.
- Continue to improve the operation and efficiency of the harvesting program.
- Restore native plant communities and ecologically valuable areas.
    - —Encouraging landowners to protect native species.
    - —Using chemical treatments in shoreline areas if needed.
    - —Minimize fragments of aquatic plants.
    - —Aggressively respond to re-infestations of exotic species.
    - —Harvest where necessary to maintain navigational areas.
- Preserve and enhance the natural lake environment by:
    - —Educating landowners and lake users in lake ecology.
- Work with the Town, County and State governments to:
    - —Review existing ordinances, and if necessary, develop and enforce ordinances to protect School Section Lake.
    - —Continue to improve the watershed to protect School Section Lake.
    - —Identify and expand local educational efforts to improve the public's understanding of lake issues
    - —Encouraging community participation in lake management activities.
- Conduct in-lake management activities with the long-range goal of minimizing management to the extent possible by:
    - —Conducting year-end evaluations as to the success of plant management activities and the community reaction to the activities.
    - —Tracking annual progress of lake management activities.
    - —Conduct water quality monitoring efforts to assist in the documentation of results.

Chapter II

BACKGROUND

SHORELINE DEVELOPMENT & AESTHETIC FEATURES

School Section Lake and its watershed are relatively undeveloped. This drainage lake has an inlet and an outlet. According to data provided by SEWRPC the lake receives water from the 6.3 sq. miles that comprise its watershed. The drainage area to School Section Lake is predominately agricultural (42%). Residential and commercial/industrial areas make up only 13% of the watershed area. The remaining 45% is comprised of natural areas, lakes and forests.

The area surrounding School Section Lake is not sewered. Because of surrounding development proposals, discussions are beginning as to the viability of a sewer service area around the lake.

To see this affect, it is helpful to look at lakes with storm drain outlets or inlet areas, where it is possible to see the more concentrated effects of rural and urban impacts. Often, the lakebed area near storm drains and inlets have different plant and sediment characteristics than other areas of the lake bottom. The runoff from individual homesites, development, and agricultural lands adds to the nutrients and sediments in a lake. That in turn increases the plant growth, sometimes to nuisance conditions. Nutrients, sediments and other materials entering the lake can severely impact the plants, fish and wildlife. Lower oxygen levels, fish kills, and sedimentation of spawning beds can result. Lake use activities, such as skiing and boating, that are conducted in areas of a lake with insufficient depths, can also result in the disruption of sediments. Education of the general public, especially the lake front property owners and landowners in the watershed, should focus on activities to minimize impact on the lake.

A large natural area owned by Waukesha County covers the west half of School Section Lake. A tamarack swamp is located on the southeast side of the lake. Almost all of the northern shore is natural wetland and emergent aquatic plant species.

The extensive wetland conservancy areas on the lake provide refuge for fish, wildlife and humans seeking an area for quiet reflection. These undeveloped shorelines provide lake users with a natural view while on the water. The overall quiet nature of the lake and wetlands are an important feature of this resource.

ACCESS LOCATIONS

School Section Lake meets the Wisconsin Department of Natural Resources (WDNR) standards for public access to an inland lake. The primary access to the lake is provided by a Waukesha County boat launch (Figure 1).

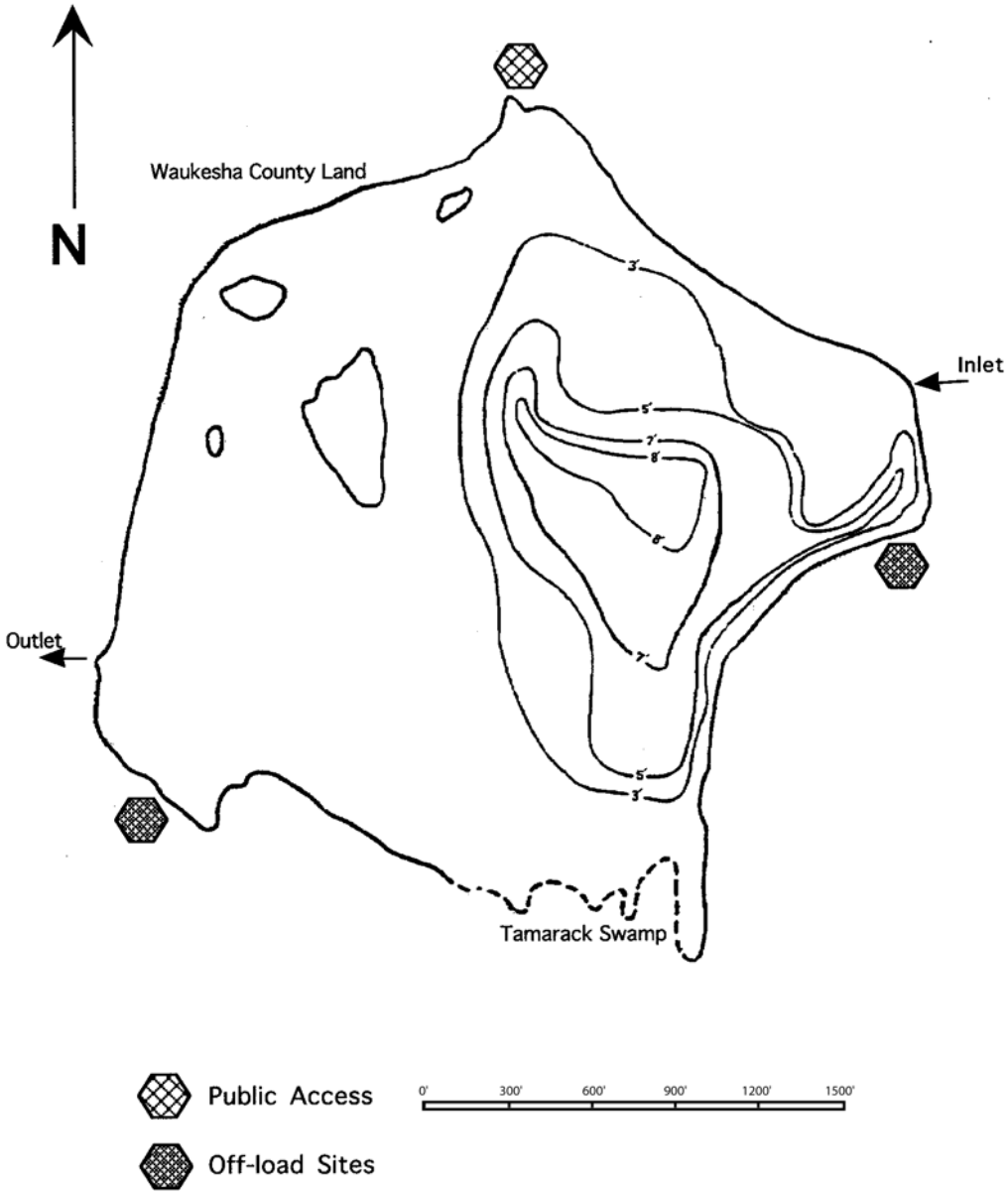


Figure 1 School Section Lake

Table 1 Hydrography and Morphology of School Section Lake
Waukesha County, Wisconsin, 1994

Area = 117 acres
Watershed area = 6.3 square miles
Maximum depth = 19 to 20 feet
Ratio of watershed area to lake area = 34:1 *

* Lakes with a ratio of greater than 10:1 tend to be more inclined to develop water quality problems.

SENSITIVE AREAS

The level of development around lakes and the amount of recreational use lakes receive severely restricts the value of the resources to fish and wildlife. Often, people tend to underestimate the affect they have on their environment. But their affect can be significant. Wildlife will avoid areas frequented by boats and noisy lake users. Waves from the continuous use of watercraft can erode shorelines and drive furbearers from their nests. Neatly manicured urban lawns do not protect shorelines from the corrosive action of waves, nor do they provide shelter or shade for wildlife. Retaining walls do not provide areas for small invertebrates to hide, an essential element in the food supply for fish. Spawning areas can be disrupted by propellers or personal watercraft. Migrating birds and waterfowl seek quiet resting places or nesting areas.

In March 1989, the State enacted legislation to protect special or "Sensitive" lake areas from some negative impacts. The WDNR was charged to administer an aquatic nuisance control program which includes Sensitive Area Designation. Administrative Code NR 107 and NR 109 provide the guidance used to administer the WDNR's aquatic plant management (APM) program. The APM program seeks to protect native vegetation that is important to fish and wildlife. The WDNR may restrict activities that would prove detrimental to the native plants. These restricted activities may include dredging, filling, shoreline alterations or sand blankets.

Many plant management activities are now regulated by the state. Administrative rules require permits for activities including chemical treatment, aquatic plant harvesting, native species re-introductions, among others.

While the WDNR has not conducted a Sensitive Area designation on School Section Lake, much of this determination was done in conjunction with the approval of the permit for the extensive dredging project. Figure 2 shows the high value wetland and conservancy areas, based on an assessment in 2004. These areas were determined to be extremely important to the health of the fisheries, wildlife and water quality of School Section Lake.

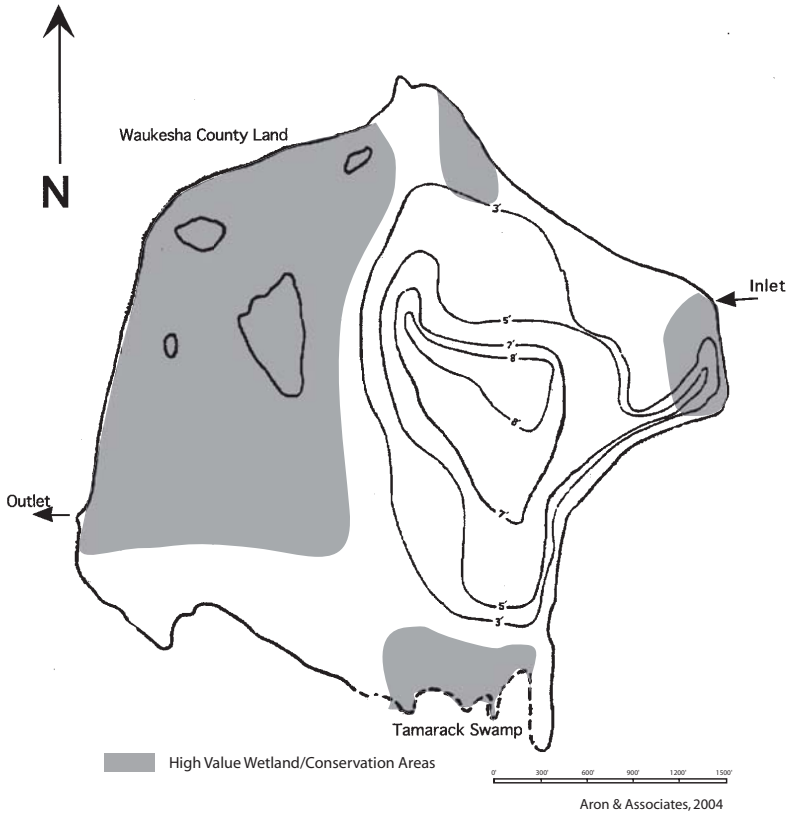


Figure 2 High Value Areas on School Section Lake, 2004

FISH AND WILDLIFE

Habitat abounds for small largemouth bass, northern pike, perch, crappies, and bluegills. The deep water areas of the lake provide habitat for cruising adult game fish. Extensive emergent vegetation provides habitat for northern pike spawning. Aquatic plants provide feeding shelter areas for fish in School Section Lake. The high quality wetlands are very valuable to waterfowl, terns, wading birds and furbearers. Quiet wetland areas and important resting points during migration.

Reduction of sediment and nutrients entering the lake is critical to the long term success of the fishery management programs. The natural shoreline areas and the adjacent wetlands enhance the spawning and nursery habitat for game fish. Native aquatic plants provide feeding and shelter areas for most of the fish species in School Section Lake. The wetlands also provide refuge and cover for waterfowl. Birds and fur-bearers inhabit the natural shorelines for feeding shelter, rearing and nesting. Quiet wetland areas, such as the bay areas, are important resting points during migration.

A problem facing many lakes in Southeast Wisconsin is the non-migratory Canada goose. These geese are an entirely different species than the migratory geese and cause significant problems, both for residents and for the water quality of the lake. The non-migratory geese remain in an area year-round. They especially like mowed lawns and open water, making lakeshore areas prime tar-

gets. People often enjoy watching a few of these geese, but the problems arise as the numbers increase.

LAKE USE

School Section Lake receives a moderate degree of recreational pressure, due in large part to the nuisance plant conditions and large areas of shallow water. The majority of recreational uses are scenic viewing, canoeing and fishing. The lake receives its greatest use during the weekends and holidays.

BOATING ORDINANCE

The Town of Ottawa has a boating ordinance in effect on School Section Lake. The local ordinacnes are available by accessing the Town website at www.townofottawa.com. The local ordinances are occasionally reviewed. In addition, state laws are in effect on the lake and are enforced by the Conservation Wardens.

WATER QUALITY

Water quality impacts many aspects of a lake. Excessive nutrients contribute to the growth of plants and algae. The types and densities of aquatic plants and algae affects water clarity, fisheries, and lake use. Suspended sediment that enters a lake also carries nutrients that contribute to water quality problems.

Collection of water quality data is a very important tool for lake managers. The information is critical to document changes in the lake over time, the impact of ongoing management activities, and the planning of future management actions. Water quality in a lake changes over time, so it is important to undertake and maintain a monitoring program.

Water quality studies on School Section Lake have been limited. WNDR has collected data as part of their water resource program. The data may be accessed on the WDNR website by going to: www.dnr.state.wi.us/org/water/fhp/lakes/index.htm. Once there select ‘"Lake Data". Contact WDNR water resources staff for more information.

The District has collected water quality data since 1987 under the University of Wisconsin Stevens Point Environmental Task Force Lakes Program. Contact the District for more details on the data collected under this program.

Based on the water quality data available, School Section Lake is considered mesotrophic (District records). Meostrophic lakes have good fisheries, increased production, occasional algal blooms, and accumulated organic matter. The nutrient levels have remained consistent over time, with a slight decrease in concentrations in years following the dredging.

EXOTIC SPECIES

During the aquatic plant survey, School Section Lake was evaluated for exotic species.

Eurasian watermilfoil and curly-leaf pondweed are exotic plant species present in the lake. Exotic plant species do not provide the benefits the native plant species provide. Exotic plant species tend to be more dense, and often grow to the surface where they interfere with recreational uses. Some

exotic plant species will create 'canopies' that prevent light from reaching native plants underneath. These canopies also raise the temperature of the water beneath the canopies.

No zebra mussels have been found in School Section Lake to date (WDNR website, 2003). Because zebra mussels are in a number of nearby lakes, educational programs should focus on the preventative actions that can be taken by lake users to prevent the introduction of invasive, exotic species. This can include newsletters and boat launch signs and programs that explain how exotics are transferred from lake to lake and what actions can be undertaken by individuals to prevent infestation.

Purple loosestrife is an exotic perennial wetland herb that is present around School Section Lake. It is a prolific seed-producer that grows 3 to 7 feet tall, with purple flower spikes that bloom from July to September. This plant can quickly invade wetlands, crowding out more beneficial, native plants.

Chapter III

AQUATIC PLANTS

BACKGROUND

Aquatic plants are very important to the health of a lake. They provide food and cover for fish and wildlife. They also contribute to dissolved oxygen production. Invertebrates which fish depend on for food, spend much of their life cycle on or near plants. Young fish and wildlife use plants for shelter and protection from predators. Plants also stabilize sediments, helping control shoreline erosion, and turbidity. Without plants, nutrients in the water column are readily available to fuel algae blooms. Native plant beds rarely experience oxygen or pH problems that are often associated with exotic species. An aquatic plant monitoring program may also provide an early warning signal that the lake is reacting to negative impacts from the watershed. Loss of diversity or an increase in nuisance species can signal the existence of watershed problems.

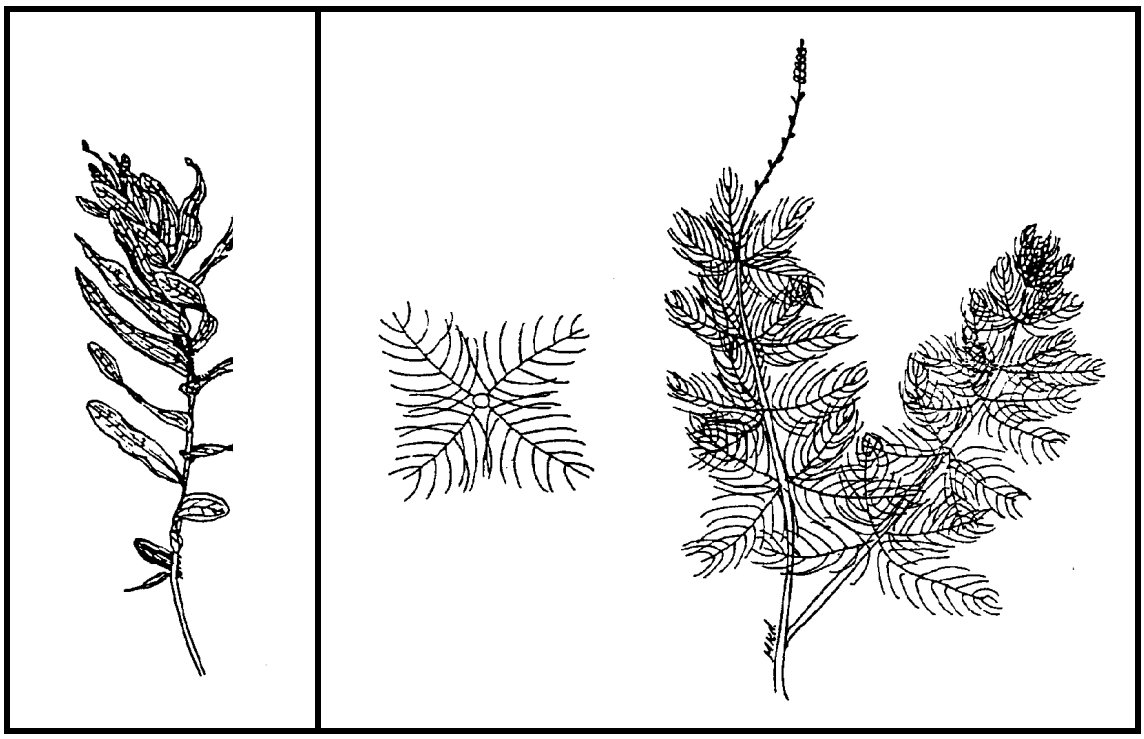


Figure 3 Curly-leaf Pondweed and Eurasian Watermilfoil, Two Exotic Species.

Many aquatic plants are important food sources for waterfowl. Others provide habitat, spawning and shelter areas for fish and amphibians. Exotic plant species do not provide these benefits as well as the native plant species. Exotic plant species tend to grow more densely, and often grow to the surface where they interfere with recreational uses. Some exotic plant species will create "canopies" that prevent light from reaching native plants underneath, raising water temperatures, and

stressing native plants. Protection of native species is important to help reduce problems from exotic species. Just as crabgrass and dandelions are the first plant to invade a disturbed area of a backyard, Eurasian watermilfoil is one of the first to invade disturbed sediments in a lake.

Types of Aquatic Plants

There are four types of aquatic plants: emergents, floating-leaved, submergents, and freely-floating. Emergent plants are rooted in the lakebed with the tops of the plant extending out of the water. The sediments are either submersed or partially inundated with water. Common emergent species include bulrushes, cattails, and reeds. Floating-leaved plants are rooted in the lakebed and the leaves float on the waters surface. Floating-leaved plants usually have larger rhizomes. The most common of these plants are waterlilies. Floating-leaved plants are usually found in quieter, protected areas of a lake. Submergent plants grow completely submersed under the water, although flowering or seed portions may extend out of the water. These plants include pondweeds, Eurasian watermilfoil, and others. Muskgrass is an algae that is frequently discussed along with aquatic plants. Submersed plants are affected by the amount of light that can penetrate the water. Freely-floating plant species are entirely dependent on the water movement in a lake. These plants include coontail and duckweed. Freely-floating plants are found where ever the winds and water current take them.

Littoral Zone

The term littoral zone is commonly used to describe the area of the lake from the shore out to the depth where plants no longer grow. This area receives sufficient light to grow vegetation, with coarse sediments and fluctuating water temperatures.

Plants within the littoral zone are affected by a number of factors. Steeply sloping lake bed areas do not support the vegetation that flatter lakebed areas support. Soft sediments usually support more plants than hard sand or gravel areas. Exotic plants tend to favor soft sediments. Wind and wave action impacts plant growth.

Even the shape of the shoreline impacts plant growth. Interior bay areas of the shoreline collect sediments and debris, creating soft sediments that support abundant amounts of vegetation; while jutting shoreline areas tend to erode, sending their sediments into bays and depressional areas.

Prior to the extensive dredging, the littoral zone was the entire lake. In 2004, the littoral zone was estimated at approximately 95 of the 117 acres.

PLANT SPECIES DESCRIPTIONS

Pondweeds

Pondweeds are important species of plants for a lake. Pondweeds do not grow as quickly or as dense as exotic species. They do not create a dense canopy like exotic species such as Eurasian watermilfoil. Pondweeds support food and provide cover for fish. Most pondweeds provide good to excellent food for waterfowl. Different species of pondweeds become important at different times of the year. Pondweeds support much greater populations of macroinvertebrates than exotic plant species such as Eurasian watermilfoil. Plant management on lakes should focus on protection and enhancement of the pondweeds, while controlling nuisance species.

The Wisconsin Legislature sought to protect native pondweeds in 1989 with the passage of NR107. That legislation names 12 aquatic plant species that should be protected and enhanced. The protected plants that are found in School Section Lake are sago pondweed (*Stuckenia pectinata)* and wild celery (*Vallisneria americana)*. Other high value species in School Section Lake include Fries pondweed (*P. friesii),* Alpine pondweed *(P. alpinus),* flat-stem pondweed *(P. natans),* and slender naiad (*Najas flexilis)*.

Curly-leaf Pondweed (*Potamogeton crispus*)

Curly-leaf pondweed is an exotic plant species. It gains an advantage over native plants by becoming established very early in the season. Curly-leaf pondweed tends to be more dominant in early summer, dying off in mid-July and August. Curly-leaf pondweed produces dormant structures called turions by the end of June and early July. The turions rest on the bottom until fall, when they begin to germinate and produce small plants. The fall growth over-winters in a green condition (Nichols and Shaw, 1990). In spring, when water temperatures and light intensities increase, Curly-leaf is ready to grow, out-competing other plants that must germinate from seeds or re-establish rootstocks. Curly-leaf reaches the peak of its life-cycle in June and July. Then it dies back in mid-July when other plants are beginning their peak growth periods. If curly-leaf pondweed dominates the plant community in a lake, the die-off can create algae blooms when the decaying plants release the nutrients. Curly-leaf pondweed provides a good food source for waterfowl, especially as an invertebrate substrate, which is also used by fish. Curly-leaf pondweed may provide good cover for fish as long as densities do not reach nuisance levels.

Curly-leaf pondweed is present in School Section Lake. Two of the most effective means of controlling curly-leaf pondweed is to protect the native plants and to prevent turion production on the curly-leaf plants. This would mean conducting plant management activities prior to the formation of the turions. Early season, low-dose chemical treatments is one option, harvesting the plants is another option. Exercise caution when determining which plant management technique should be used because native pondweeds may be impacted by some management techniques that target curly-leaf pondweed.

Curly-leaf pondweed is common in School Section Lake early in the year.

Eurasian Watermilfoil (*Myriophyllum spicatum*)

Eurasian watermilfoil is an exotic plant that quickly takes advantage of opportunities for growth. In many lakes it can become a severe nuisance, creating dense plants with large canopies on the surface that shade out other more desirable plant species. Fishing and boating is impaired or restricted and swimming becomes dangerous in the long, stringy plants. Eurasian watermilfoil can contribute to stunted panfish populations by providing too much protection from predator fish (WDNR, 1988). Eurasian watermilfoil stands have been found to support fewer macro invertebrates than comparable stands of pondweeds and wild celery (Smith and Barko, 1990). This in turn affects the fisheries that can be supported by the plants. Eurasian watermilfoil has been thought to spread primarily by fragmentation, however, there is now evidence that seeds play a much more important role than previously believed (Aron, 2002).

Eurasian watermilfoil is abundant in School Section Lake. Non-management of areas of Eurasian watermilfoil will lead to a continued decline in the density and frequency of native plants and a loss of species diversity.

Muskgrass

Muskgrass (*Chara* sp.) is actually an algae, but is usually included in discussions of aquatic plant management. Muskgrass is low growing and can help prevent or reduce the growth of Eurasian watermilfoil. It can also protect lake sediments from the effects of boaters. Muskgrass will not thrive in lakes with high turbidity problems. Muskgrass is an excellent producer of fish food for large and small mouth bass (Fassett, 1985). Nitella is a similar species of algae that shares Chara's characteristics.

Nitella is found infrequently in the deeper areas of School Section Lake. Muskgrass is abundant throughout the lake and in most circumstances should be protected to help reduce infestations of other potential nuisances such as Eurasian watermilfoil. Muskgrass can be a problem for some lakes, becoming very dense with large mats lifting off the lakebed and up into the boating areas.

Coontail

Coontail (*Ceratophyllum demersum*) is a plant that was rarely found in 1992, but has increased in density since then. Historically, coontail was found in abundant densities (WDNR 1968). Coontail is a somewhat bushy plant that prefers soft sediments. The plants do not have a root system and float in the water column. The seeds and foliage are used by waterfowl as a source of food. Coontail also provides good spawning habitat and cover for young fish. Coontail provides a source of food either directly or by supporting fish food fauna. Coontail is able to draw nutrients from the water column. Coontail may grow to nuisance conditions.

Coontail is abundant in School Section Lake.

Wild Celery

Wild celery (*Vallisneria americana*) is a perennial plant that prefers hard substrates. The seeds and foliage are considered an excellent food source for waterfowl. Wild celery is a prime spawning habitat for northern pike. In late March to early April, the northern pike spawn on the wild celery that is left from the previous summers growth. Wild celery also provides cover for fish as well as supporting fauna that are utilized by fish for food. Wild celery may also grow to nuisance levels.

Wild celery is found occasionally on School Section Lake.

Sago Pondweed

Sago pondweed (*Stuckenia pectinata*, formerly known as *Potamogeton pectinatus*) is an excellent food source, and cover, for fish. Sago pondweed has narrow leaves that create an open structure, reducing the likelihood of becoming a nuisance. The plant has the ability to survive in low light conditions. Because of its value to wildlife, sago is often planted in ponds and shallow lakes.

Sago pondweed is common in School Section Lake.

AQUATIC PLANT SURVEYS

Determining what plants are present in a lake can be done a number of different ways. One way, including transect and point-intercept surveys, is to measure the species composition, frequency, and densities of aquatic plants at a number of points around a lake. Another, called a general survey, is to traverse the area of the lake of the lake that is available for plant growth, called the littoral zone, covering all the depths and as much of the littoral zone as possible, to develop a species composition list.

Aquatic plants are very important to the health of a lake. They provide food and cover for fish and wildlife as well as contribute to dissolved oxygen production. Plants also stabilize sediments, helping control shoreline erosion, and turbidity. An aquatic plant monitoring program may also provide an early warning signal that the lake is reacting to negative impacts from the watershed.

Two plant surveys were conducted on School Section Lake in the 1980s. One was done by the WDNR in the development of the Feasibility Study in 1981. The second survey was conducted by the SEWRPC in the 1989. It is not known what survey techniques were used in these surveys. The 1981 survey listed muskgrass (*Chara* sp.) as the dominant submergent plant in the lake. Coontail (*Ceratophyllum demersum*) was the dominant plant in 1994.

An aquatic plant survey was conducted by Aron & Associates (A&A) in September of 1994. Transects were established at the direction of WDNR. Four sampling depths were established along 6 transects. The survey was done at the 1.5, 3, 5.0, and 7.0 foot depths. Maximum rooting depth was found to be 8 feet, the maximum depth of the lake at that time. Figure 4 shows the transect locations for the aquatic plant survey conducted on School Section Lake. Figure 5 shows the areas that were dredged. During the 1994 survey, 18 species were observed (Table 2). In 1994, floating-leaf pondweed (*P. natans*) was found in large areas of the lake, primarily along the South shore and throughout the conservancy area.

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) conducted an aquatic plant survey in 2003. Fourteen species were observed (Table 2). In both the 1994 and the 2003 surveys, two exotic species, Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) were present.

Table 2 Comparison of Aquatic Plants in School Section Lake, 1981 to 2004

Scientific Name	Common Name	1981	1989	1994	2003	2004
Ceratophyllum demersum	Coontail	X	X	X	X	X
Chara sp.	Muskgrass	X	X	X	X	X
Elodea canadensis	Elodea	X		X	X	X
Lemna minor	Small duckweed		X	X		X
Myriophyllum sp.	Unidentified Milfoil	X	X			

Table 2 Comparison of Aquatic Plants in School Section Lake, 1981 to 2004

Scientific Name	Common Name	1981	1989	1994	2003	2004
M. spicatum	Eurasian Water Milfoil			X	X	X
M. verticillatum	Whorled Water Milfoil			X		
Najas flexilis	Slender Naiad			X	X	X
N. marina	Brittle Naiad			X	X	X
N. sp.	Unidentified Naiad	X	X			
Nitella sp.	Nitella					X
Nuphar sp.	Yellow Water Lily	X	X	X	X	X
*Nymphaea s*p.	White Water Lily	X	X	X	X	X
Potamogeton alpinus	Alpine Pondweed			X		X
P. crispus	Curly-leaf Pondweed			X	X	X
P. friesii	Fries Pondweed			X		X
P. gramineus	Variable-leaf Pondweed	X		X	X	X
P. natans	Floating-leaf Pondweed	X		X	X	X
P. praelongus	White-stem Pondweed					X
P. zosterformis	Flat-Stem Pondweed	X				
P. sp.	Unidentified Pondweed	X				
Stuckenia pectinata	Sago Pondweed	X	X	X	X	X
Utricularia vulgaris	Bladderwort	X	X	X	X	X
Vallisneria americana	Water Celery, Eel Grass	X	X	X	X	X
Zosterella dubia	Water stargrass					X

Note: 1981 survey by DNR, 1989 and 2003 surveys by SEWRPC. 1994 and 2004 surveys by Aron & Associates.

2004 SURVEY METHODOLOGY

General Survey

A preliminary survey of the lake was made by boat. An attempt was made to locate all plant communities on the lake by region. Nomenclature follows Crow & Hellquist (2000). Newly located plant samples were collected and preserved. The maximum rooting depth on School Section Lake in 2004 was determined to be 15 feet (4.6 m), the maximum depth of the lake, up from 8 feet (the maximum depth of the lake at that time) in 1994.

Line Transect Survey

The methodology for the line transect survey follows the protocol used by the WDNR Water Resources in the Ambient Lakes Monitoring Program. Transects that were established around the shoreline in 1994 were repeated in 2004 (Figure 4). Samples points were located using a 2004 Garmin GPS LMS330 with an LGC-2000 Receiver. Four rake tows were conducted at each sample point. Each plant species retrieved was recorded and given a density rating in accordance with the WDNR criteria, between 1 and 5.

The data collected were then used to calculate the mean density and percent of frequency for each species. Lake depth at each sample point was determined by using the Garmin after calibration in the field. That data are provided at the end of this report.

The abundance of each species was determined using four estimates:

1) The frequency is the rating of how often a species occurs in the sample points.
2) The average density rating, or the average density of a species in the sample point where it occurred.
3) The relative density rating, or the average density of a species averaged over all sample points whether or not any species were present.
4) The relative density rating averaged over all sample points in which any species occurred.

SCHOOL SECTION LAKE AQUATIC PLANTS - 2004

An aquatic plant survey was conducted by Aron & Associates the week of July 12, 2004. The aquatic macrophytes observed in School Section Lake during the survey are listed in Table . Twenty species were observed, two of which, duckweed (*Lemna minor*) and yellow water lily (*Nuphar* sp.) were only found in the general survey. Three species that were previously undetected in School Section Lake were found in 2004. These include white-stem pondweed, Nitella, and water stargrass. Pressed samples of white-stem pondweed, nitella, and water stargrass have been provided to the District to add to their collection. The aquatic macrophyte population of School Section Lake is dominated primarily by Eurasian Watermilfoil, muskgrass, coontail, and slender naiad. The maximum rooting depth was determined to be 15 feet.

Slender naiad was very dense, in some areas limiting navigational access. Muskgrass was most commonly found in the 1 to 6 foot depths. Nitella, very similar to muskgrass, was found in the deeper zones. Coontail was also very thick in areas, limiting navigational access.

Wild celery (*Vallisneria americana*) was found in the Eastern bay, and well as the Northwest area.

The boat launch area contained water lilies, Eurasian watermilfoil, curly-leaf pondweed, bladderwort, spiny naiad, fries pondweed, and Alpine pondweed.

The Northeastern shoreline area has water lilies, sago pondweed, coontail, muskgrass, floating-leaf pondweed, fries pondweed, Alpine pondweed, variable-leaf pondweed, duckweed, and Eurasian watermilfoil.

The west side of the lake has large areas of emergent vegetation, including bulrush, reeds and decodon. This area also has muskgrass, floating-leaf pondweed, water lilies, bladderwort, variable-leaf pondweed, and Eurasian watermilfoil. In this area, Eurasian watermilfoil is most often found on the fringe of the emergent vegetation.

During the general survey plants were inspected for signs of the "milfoil weevil" (*Euhrychiopsis lecontei*). Damaged, blackened stems, and stressed plants were not located. Random bucket tests of milfoil were also done, but no weevils were found. Lakes with harvesting programs are not expected to support the weevil because harvesting removes the portions of the plant that the weevil needs for survival. The “milfoil weevil” was not found in School Section Lake during the 2004 aquatic plant survey.

General Conclusions

- School Section Lake has good aquatic plant diversity.
- The area available for aquatic plant growth in School Section Lake was greater than that seen in previous surveys. The area identified in 1994 was limited by the maximum depth of the lake. Now that the dredging has been conducted, the maximum rooting depth of 15 feet was almost double that found in 1994.
- Native aquatic plant diversity has increased since earlier surveys.
- Eurasian watermilfoil and curly-leaf pondweed are exotic species in the lake.
- Efforts should be taken to control the amount of Eurasian watermilfoil and curly-leaf pondweed in the lake.
- Efforts should be taken to eradicate Purple Loosestrife around the lake.

Table 3 List of Plant Species in School Section Lake, 2004

Scientific Name	Common Name	Value[a]
Ceratophyllum demersum	Coontail	• Good shelter for fish. • Supports insects which are food for fish and waterfowl.
Chara sp.	Muskgrass	• Excellent producer of fish food for bluegill and bass. • Stabilizes bottom sediments. • Has softening effect on water by removing lime and carbon dioxide.
Elodea canadensis	Elodea	• Supports insects which are food for fish.
*Lemna minor**	Small duckweed	• Food for waterfowl, muskrat, beaver and fish. • Large mats provide shade and cover for insects. • Can inhibit mosquito breeding if extensive.
Myriophyllum spicatum	Eurasian Water Milfoil	• Exotic invasive plant that contributes to declines in native plants. • Can provide cover for some invertebrates.
Najas flexilis	Slender Naiad	• Good food and shelter for fish. • Stems, foliage and seeds are important waterfowl food.
Najas marina	Spiny Naiad	• Good food and shelter for fish. • Good food for waterfowl.
Nitella sp.	Nitella	• Provides food for waterfowl. • Attracts small aquatic animals.
Nuphar sp.*	Yellow Water Lily	• Provides shade and shelter for fish. • Leaves support insects. • Leaves, stems, and flowers eaten by deer. • Roots eaten by beaver.
Nymphaea sp.	White Water Lily	• Provides shade and shelter for fish. • Seeds eaten by waterfowl. • Roots and stalks eaten by muskrat. • Roots eaten by deer and beaver.
Potamogeton alpinus	Alpine pondweed	• Good shelter for fish. • Supports insects which are food for fish and waterfowl.
P. crispus	Curly-leaf Pondweed	• Exotic invasive plant that can lead to a decline in native plants and an increase in algae problems. • Can provide food, shelter and shade for fish.
P. friesii	Fries Pondweed	• Important for ducks.

Table 3 List of Plant Species in School Section Lake, 2004

Scientific Name	Common Name	Value[a]
P. gramineus	Variable-leaf Pondweed	• Provides food and shelter for fish. • Provides food for waterfowl.
P. natans	Floating-leaf Pondweed	• Important for ducks. • Roots, nuts provide food for ducks. • Good environment for fish.
P. praelongus	White-stem Pondweed	• Good shelter for fish. • Supports insects which are food for fish and waterfowl.
Stuckenia pectinata	Sago Pondweed	• Good food and shelter for fish. • A very important plant for waterfowl.
Utricularia vulgaris	Bladderwort	• Good food and shelter for fish.
Vallisneria americana	Water Celery, Eel Grass	• Good shade and shelter for fish. • Valuable fish food. • Supports insects which are food for fish and waterfowl.
Zosterella dubia	Water Stargrass	• Provides food and shelter for fish. • Important food for waterfowl.

a. Source: Fasset, 1969. A Manual of Aquatic Plants.

*Found only in the general survey.

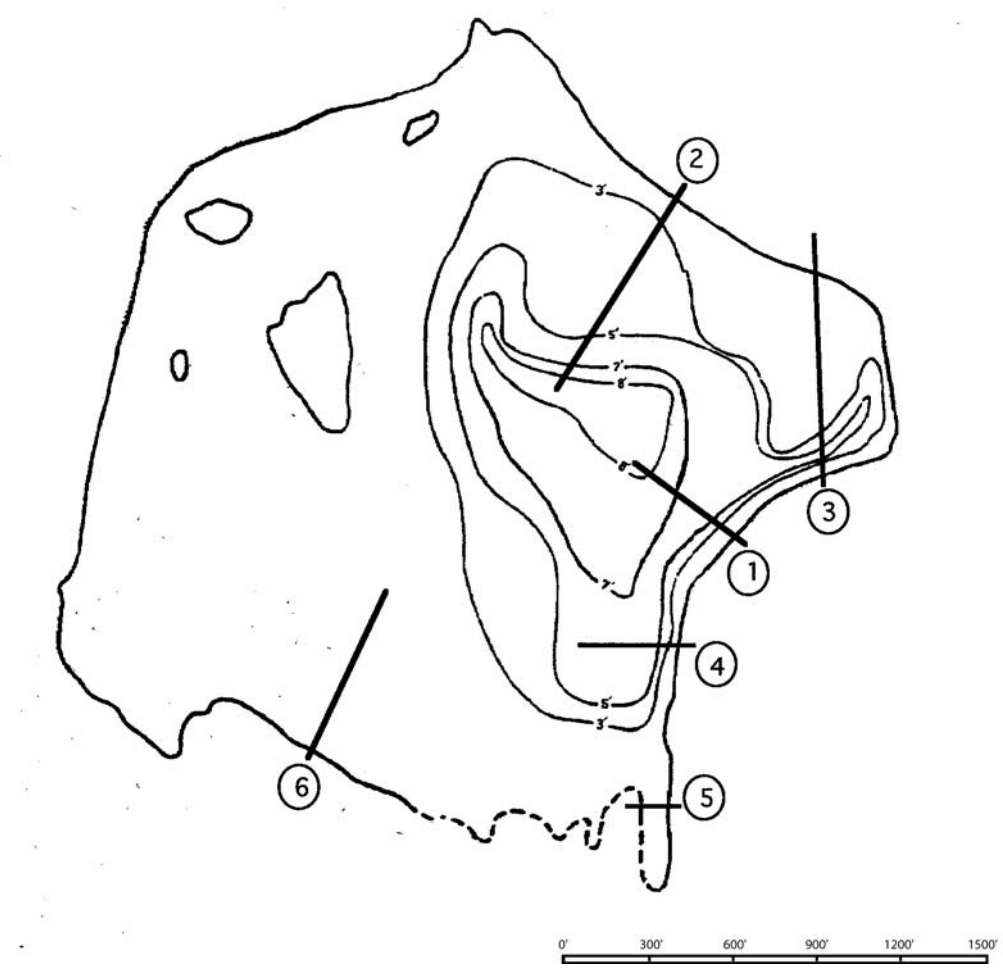


Figure 4 Transect Locations for Aquatic Plant Survey, 2004 on School Section Lake

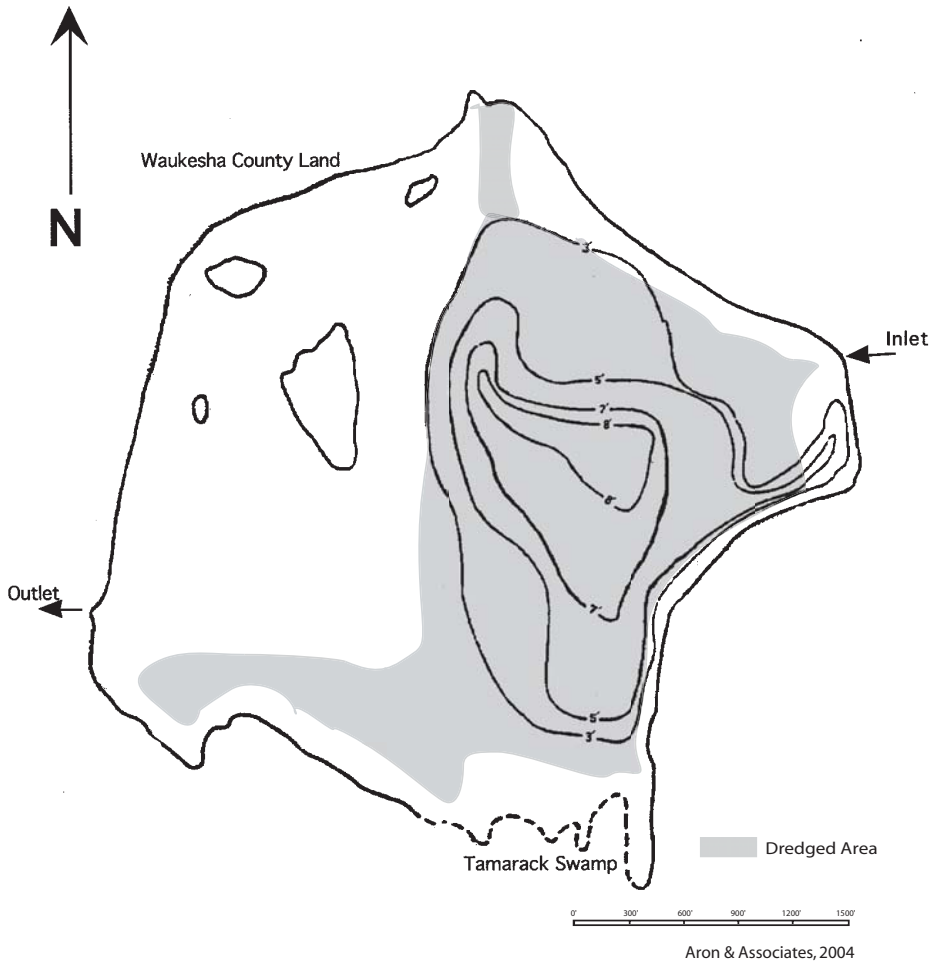


Figure 5 Areas of School Section Lake Dredged in 1994.

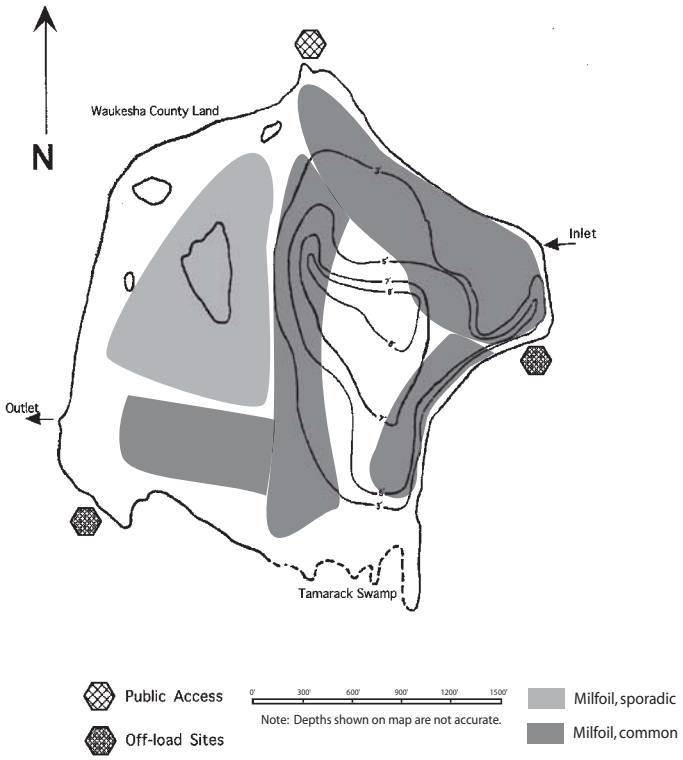


Figure 6 Areas of School Section Lake with Eurasian watermilfoil.

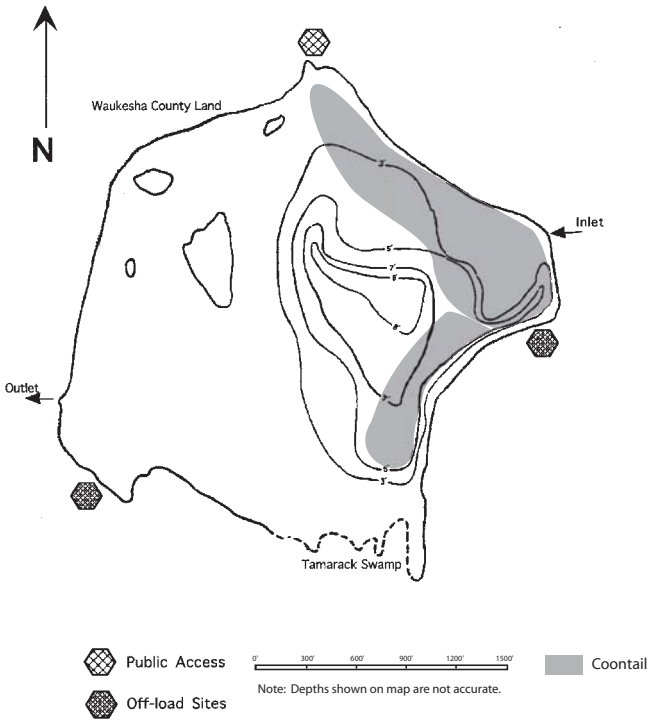


Figure 7 Areas on School Section Lake with Coontail.

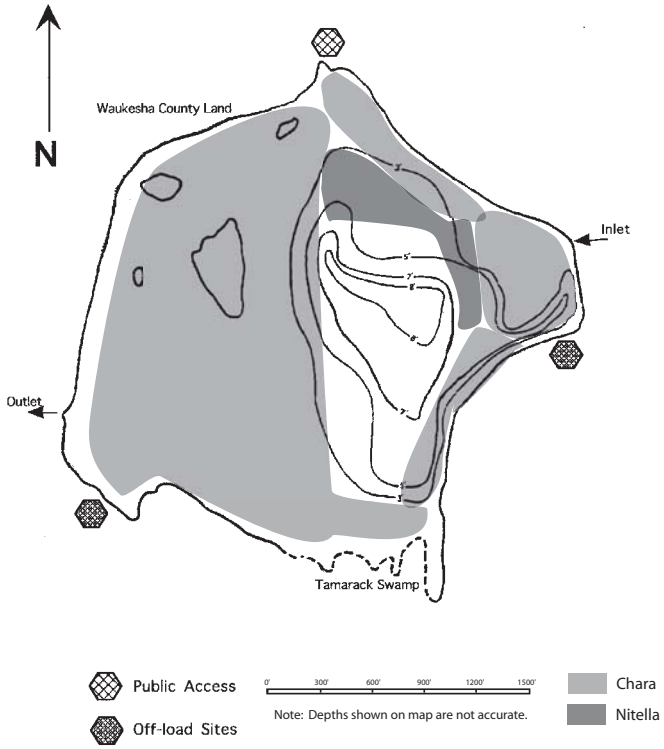


Figure 8 Areas on School Section Lake with Chara and Nitella.

Chapter IV

PROBLEMS

Although School Section Lake is considered a quality water resource, its waters and sediments contain sufficient amounts of nutrients to promote aquatic plant and algae growth. Phosphorus and nitrogen have been determined to be the most critical components that drive aquatic plant growth. Water quality data collected on School Section Lake show a nitrogen to phosphorus ratio of more than 40:1. Because the ratio is higher than 15, phosphorus is likely the limiting nutrient in School Section Lake.

Dense plant beds in the bays clog boat motors and pier areas, impairing boat traffic. Dense weeds impair swimming along shorelines and creates unsafe conditions for lake users. It also contributes to stunted panfish populations by reducing opportunities for grazing by predators. Additionally, the excessive plants mar the aesthetic value of a lake when surface weeds collect algae and debris and become odoriferous.

Eurasian watermilfoil, curly-leaf pondweed, and coontail are causing the nuisance problems in School Section Lake.

In spite of poor water clarity, plants, primarily Eurasian watermilfoil, curly-leaf pondweed, and coontail, were thriving in depths up to 15 feet. The fertile soils in the region contribute to the excessive plant problems in School Section Lake. High levels of recreational use also create problems in the lake, disrupting game fish spawning areas, suspending sediments, reducing water clarity, and negatively impacting the aquatic plant conditions. As the amount of impervious surfaces increase in the lake watershed, the potential for water quality problems, and the resulting aquatic plant problems, increases. Without adequate buffers, the runoff carries sediment, and nutrients that fuels aquatic plant growth.

School Section Lake area is not sewered. Septic systems that are old or failing can be a source of nutrients in a lake.

Recent publications also point to the role of various lake-side living activities as a significant source of nutrients. Maintenance of golf course-type lawns, with high doses of fertilizers and pesticides are a big contributor of nutrients to lakes. A recent USGS publication, USGS Water-Resources Investigation Report 02-4130, cites a study conducted on Lauderdale Lakes in Walworth County. In that study, the quality of runoff from the use of no-phosphorus fertilized areas was nearly identical to that from non-fertilized areas, indicating the advantages of limiting phosphorus application. In addition, nitrogen also plays an important role in plant growth and should also be avoided. Other human activities that negatively impact water quality include the excess use of salt in winter, pet waste, and discharges from automobiles.

Recreational boating use, coupled with dense plant beds also contribute to plants cut by boats or harvesters, known as floaters, that wash up on shorelines and re-root. Parts of plants broken by wind and wave action, or by motors (even electric ones), float around the lake, create shoreline

debris, and reroot into new areas. Also, swimming perils exist in long Eurasian watermilfoil and curly-leaf pondweed strands.

Dense Eurasian watermilfoil bed can contribute to stunted panfish populations by reducing opportunities for grazing by predators. Excessive curly-leaf pondweed can contribute to poor water clarity and algal problems, when the plants begin to die off in early summer, releasing nutrients into the water column.

Eurasian watermilfoil, curly-leaf pondweed, and coontail are causing the aquatic plant nuisance problems in School Section Lake.

It is important to remember that it is far cheaper to prevent a problem than it is to correct a problem. A cars' oil change costs only $20 but a new engine costs over $1000. The same holds true for lakes. Public information efforts to prevent problems and the cost of annual monitoring programs are much cheaper than major lake restoration projects. Stopping erosion and nutrients from entering the lake is much more cost effective than attempting to dredge or correct plant and algae problems.

Chapter V

HISTORICAL PLANT MANAGEMENT

BUDGET

The 2004 plant control budget for School Section Lake was $24,300.

EQUIPMENT

The District has an Inland harvester that is 11 years old. It has a 9-foot wide cut. The District has a conveyor to remove the material from the harvester, and a truck is used to transport to the disposal site.

CHEMICAL TREATMENT

School Section Lake residents have occasionally used chemical treatment to control aquatic vegetation and algae and their shorelines since 1956. Treatments for aquatic nuisances, primarily Eurasian watermilfoil and coontail, were conducted in 1956, 1969, 1982, 1984, 1985, and 2002. Treatments to control purple loosestrife were conducted in 1990 and 1992 (DNR treatment records).

HARVESTING PROGRAM

The harvesting program is administered by the District, including all bookkeeping, payroll and office procedures. The harvesting program is run by the district board who provide oversight of the program. A District volunteer interacts with and assists one paid part-time staff person.

The harvesting program on School Section Lake is funded by the School Section Lake Management District taxing authority.

The District has two off-load sites, one on the East side of the lake and one on the Southwest end (Map 1). Harvested plant material is hauled to J. Rienhoffer's farm field at the end of Dalmer Park Road on the Southwest end of the lake.

The harvesting program evaluates the lake prior to harvesting to determine priorities based on current plant growth. The primary target plant is Eurasian watermilfoil. Most years, the harvester first targets the pier zone area, that is the area outside of the property owners' piers, to allow access to the main lake area. The next priority is the deeper water zones along the North, Northeast and East sides of the lake. Then, the South shore area out from the piers and the West side of the deep water area, located just East of the conservancy area, are harvested.

OTHER ACTIVITIES

Landowners have maintained their shorelines by raking and removing floating debris.

Chapter VI

PLANT MANAGEMENT ALTERNATIVES

Control of exotic or nuisance plant species is an uphill battle. The very nature of all aquatic plant species survival provides the means to spread. For instance, wild celery can spread by releasing from the sediments and floating to new areas in late summer and fall. With exotic or nuisance plants, the growth and spread of the plants is more prolific. Fragmentation is important for Eurasian watermilfoil. It is now suspected that Eurasian watermilfoil can spread significantly through seeds as well as fragments (Aron, 2002). The recent documentation of hybrid species of milfoil confirms the importance of seeds in its reproduction. Curly-leaf pondweed spreads by creating turions from which new plants grow.

Realistic expectations are important in aquatic plant management. It is unlikely that exotic plants species can ever be completely removed from a lake. It is more likely that a combination of lake management techniques, along with public education, are most effective in minimizing the long-term impact of exotic plant species in a lake.

A discussion of a variety of plant management alternatives follows.

NO MANAGEMENT

Nuisance levels of aquatic plants can be left to do what they will with no active management from people. Under this alternative, it should be expected that Eurasian watermilfoil and curly-leaf pondweed will continue to expand their range in School Section Lake. While the firm, sandy shorelines will not see much Eurasian watermilfoil growth, the soft sediment portions of the lake will likely see expanded areas of Eurasian watermilfoil. The downside of this is that the more shading from Eurasian watermilfoil, the less light can reach the native understory, further increasing water temperatures and reducing the native plant community, allowing Eurasian watermilfoil even more opportunity for growth. Expanded areas of Eurasian watermilfoil may impact the fisheries, increasing the areas for small panfish to hide from predators. While the short term cost of the No Management option is nothing, the long term cost may be much higher than if even minimal management occurred. Once seed beds are established, and the nuisance plants shade out the natives, it may take aggressive, costly activities to re-establish a balanced plant population.

Conclusion—Although No Management is technically feasible for School Section Lake, it should not be considered in the best, long term interest of the water resource.

DRAWDOWN

Drawdown can be used to control some plant growth. Use of this method entails dropping the lake X number of feet for a period of time. This exposes the plants to extreme temperatures, drying and freezing. Some plants respond very favorably to drawdown, while other plants react negatively, or unpredictably. Eurasian water milfoil and coontail react unpredictably (Nichols 1991). Locally, Big Muskego Lake was drawn down for a lake restoration plan. While Eurasian watermilfoil was reduced for a while, the plant returned to a level requiring aggressive management. Other lakes

have had good success with extended drawdowns that thoroughly freeze the lakebed, especially those areas with soft sediments in shallow shoreline areas.

A source of water to refill the lake, and a means to draw the lake down, are also important considerations. The procedure is rarely effective. Some valuable plants can be destroyed while more nuisance plants can be encouraged. Time is also a factor in drawdowns. Usually a lake is drawn down for 4 to 6 months and often needs to be repeated for maximum effectiveness. Drawdown also reduces the recreational opportunities on the lake. Timing of a drawdown can have a negative impact on fisheries if spawning areas are no longer accessible to fish. Turtles and frogs hibernate in shoreline muds and can also be affected by drawdowns.

Costs associated with drawdowns depend on the outlet control structure. Pumping to lower the lake requires costs for equipment, electricity and staff. Costs can be minimal if the lake can be lowered by opening a gate.

Conclusion— Because of the recreational demands on the lake, because the exotic species are located throughout the lake, and because it is not effective for controlling milfoil, drawdown for the purpose of aquatic plant control on School Section Lake is not recommended.

NUTRIENT INACTIVATION

Nutrient inactivation is used to control the release of nutrients, primarily phosphorus, from the sediments. One of the most common substances used is aluminum sulfate, or alum. The alum treatment creates a floc formation covering the bottom sediments, preventing phosphorus from being released into the water. Nonpoint source pollution controls must be implemented prior to the use of alum, or the floc will be covered with newer nutrients. Based on the volume of the lake and the cost of alum, an alum treatment on School Section Lake would cost approximately $15,000.

This treatment will not prevent plant growth but will reduce problems from algae growth. Improved water clarity from an alum treatment may increase aquatic plant densities. Water chemistry information must be collected prior to use to ensure sufficient buffering exists to prevent acidification and aluminum toxicity. Waters deeper than five feet are usually treated with Alum. WDNR approval is required. Many of the areas with the existing nuisance conditions would not be treated with alum, so localized problems would not be corrected and in fact may be increased.

Conclusion—Limited surface water quality data are available for School Section Lake. Unless more extensive monitoring is conducted and internal nutrients are shown to be a problem, nutrient inactivation is not recommended for School Section Lake.

DREDGING FOR AQUATIC PLANT CONTROL

Dredging is most often used to increase depths for navigation in shallow waters, especially for channels, rivers, and harbors. Dredging for the sole purpose of plant control has met with mixed success. To be considered successful for aquatic plant control, dredging would need to bring the lake bed to depths beyond 15 feet deep, the maximum rooting depth in the lake. Eurasian watermilfoil prefers soft sediments. To minimize rapid re-infestation of the remaining sediments, dredging would need to be done to a hard pan layer. Dredging is the most costly form of plant management

control. Costs range from $5.00 per cubic yard up to $20.00 or more per cubic yard depending on site conditions, method used and disposal costs. A WDNR permit is required. The availability disposal sites often restrict the size and scope of dredging projects.

Conclusion—A large-scale dredging project has already be conducted on School Section Lake. Dredging for the purposes of aquatic plant control is not recommended for School Section Lake.

AERATION

Aeration entails installation, operation and maintenance of a system to artificially pump oxygen into the lake depths. Artificial aeration has been used to correct oxygen deficiency problems in lakes that produce numerous algae blooms and subsequent fish kills. Aeration is used when internal nutrient sources are high compared to external sources, if nuisance algae conditions exist, or if low oxygen levels are a problem. It is most useful on lakes with low dissolved oxygen levels and large internal releases of phosphorus.

Aeration is an expensive lake management technique. Initial capital costs for a lake this size is approximately $100,000 to $150,000 and an annual maintenance and operational cost of approximately $10,000. Problems may result with improperly sized aeration systems so initial planning and engineering must be done carefully to prevent creating greater problems. Annual operational problems and costs are difficult for small lake organization budgets and staff.

There has been no documented effect of aeration on plant growth. WDNR approval is required.

Conclusion—School Section Lake should be monitored for dissolved oxygen levels to protect the fishery. Unless School Section Lake shows depleted oxygen levels to be a problem, aeration should not be considered at this time.

SCREENS

Light screens are similar to window screens that are placed on the lake bottom to control plant growth. Screens come in rolls that are spread out along the bottom and anchored by stakes, rods, or other weights.

Screens create little environmental disturbance if confined to small areas that are not important fish or wildlife habitat. Although they are relatively easy to install over small areas, installation in deep water may require SCUBA. Screens must be removed each fall and reinstalled in spring. Care must be taken to use screens where sufficient water depth exists, reducing the opportunity for damage by outboard motors. Screens cost approximately $300 for a 700 sq. ft. roll. Screens may be used by individual home owners along their shorelines or piers to create swimming areas. A negative impact of using screens is that all plant species are affected by the installation of screens, even native plants. WDNR permit is required.

Conclusion—Screens may be a viable alternative for the limited applications by individual property owners to improve conditions in swimming areas, however, they are contradictory to the WDNR's stated goal of protecting native plants. They not viable for use on School Section Lake.

BIOMANIPULATION

The use of biological controls for aquatic plant management purposes is currently limited to the grass carp and a few species of insects. Most of these controls are theoretically possible, however they have limited application. Non-native biological controls are risky: there are a number of instances where the solution caused new problems when a non-target organism was preferred. Biological controls also produce slower, less reliable, and less complete control than mechanical or chemical control activities.

Grass Carp (*Ctenopharyngodon idella* Val.) is an exotic species originally imported from Malaysia. It is considered to be a voracious eater of aquatic plants and prefers elodea, pondweeds and hydrilla. Studies have shown that Grass Carp can reduce or eliminate vegetation at low densities. Grass Carp generally will graze on more beneficial plants before going after Eurasian watermilfoil, thereby compounding nuisance problems. Overstocking can eliminate all plants. In the United States, only a few states allow the use of a sterile form of Grass Carp. Grass Carp are illegal in the State of Wisconsin and are not an option on School Section Lake.

In British Columbia, Canada, the larval stage of two aquatic insects, the caddisfly (*Triaenodes tarda* Milne.) and the chironomid larvae (*Cricotopus* sp.) have been observed to graze on Milfoil plants. These two insect species are currently being studied as forms of biological controls.

Recently, a naturally occurring fungus (*Mycoleptodiscus terredtris*) has been observed to effectively control a species of milfoil in New Hampshire.

A weevil (*Eurhychiopsis lecontei*) has been found to help control Eurasian watermilfoil in some lakes in Wisconsin and Illinois. The weevil does major damage to the milfoil plant as it is closely associated with it during its entire life cycle. The adult female lays eggs on the tips of the milfoil. When the larvae hatch, they feed in the growing tips and then burrow into the stem. Pupation (when the larvae changes to an adult) occurs in the stem. In fall, adult weevils burrow into the shoreline litter and remain until spring. Weevils mature from egg to adult within 30 days and reproduce from May through September. Lakes with intensive management using harvesters or chemicals are less likely to support good populations of the weevil. Weevils do not usually like other plants so it does not affect other plant species. Weevils are now available commercially. Although the weevils can dramatically impact milfoil beds, it may not be enough to control the nuisance. In Wind Lake in Racine County, the milfoil beds frequently reach the surface by mid-June, but the weevils' life-cycle on the lake does not begin to drop the milfoil until the beginning of July. This time lag can negatively affect the riparians acceptance of the weevil as a management technique.

Efforts to introduce the weevil into new lakes has not been successful enough to justify the expense of the weevils ($1.00 per weevil). As the technology, and science, as well as the experiences with weevils improve, the weevils may be a viable option for management of Eurasian watermilfoil on School Section Lake. Additional research is needed before many of the biomanipulation techniques can be commonly implemented in lake management (AERF, 2005).

Another beetle, *Galerucella calmariensis* (commonly referred to as Cella Chow), is being used around Wisconsin to combat the spread of purple loosestrife. Purple loosestrife is a wetland inva-

sive species that is a prolific seed producer. Plants produce over 2 million seeds per season and can quickly take over a wetland, displacing native plants. It is illegal to sell or cultivate purple loosestrife in Wisconsin. The Cella beetle is being distributed into infested areas, especially those too large for manual control. Volunteers obtain incubator populations of the beetle, raise them through the beetles' four life-stages, and then release the new beetles into established purple loosestrife areas. The WDNR website http://dnr.wi.gov/org/land/er/invasive/factsheets/loosecontrol.htm has specific information on purple loosestrife control, including manual, chemical, and biological.

Conclusion—Neither the Grass Carp, insects, nor fungus are viable alternatives for School Section Lake. Because of the harvesting program of Eurasian watermilfoil, and the cost of the weevils, introduction of the milfoil weevil is not a feasible management option at this time. The purple loosestrife beetle, as well as hand and chemical controls, may be used to control purple loosestrife around School Section Lake.

NATIVE SPECIES REINTRODUCTION-SHORELINE EDGES AND ADJACENT UPLANDS

Native plants are being re-introduced into lakes to try to diminish the spread of exotics and to try to reduce the need for other, more costly, plant management tools. Native plants are usually less of a management problem because they tend to grow in less dense populations and are more often low-growing. Native plants also provide better food and habitat for fish and wildlife.

Careful consideration of the species introduced needs to be given to avoid creating another problem.

Native species re-introduction or expansion has very limited application as a plant management alternative for School Section Lake. Small, isolated destruction or removal of Eurasian watermilfoil beds could be combined with planting or transplanting Chara, water lilies or a number of different pondweeds. The planting of native emergent plant species such as bulrushes and associated upland plantings along developed shorelines could be considered. The emergent plant species would provide a buffer zone between the water and shoreline thereby reducing the effects of wave action upon the shore, and erosion. The emergent plants would also provide important habitat for fish and macro invertebrates as well as increase the aesthetic value of School Section Lake. Emergent plants should blend into shoreline buffer zones to further enhance their environmental value.

Costs to conduct plantings vary with the number and type of plants, and whether volunteers or paid staff do the work. Successful plantings can be affected by a number of factors, including health of the new plants, weather, timing, bottom substrate, water clarity, and waterfowl grazing. The WDNR should be consulted before conducting any planting activities to ensure the protection of the resource, the necessity for a permit, and the likelihood of success.

Conclusion—Shoreline plantings and upland restoration may be considered by the District or individual landowners. Landowners should be encouraged to allow the upland shoreline edge to re-vegetate into a stable buffer zone. This could be done as simply as not mowing. This, along with supplemental plantings of native upland plants, would provide habitat for birds, turtles, frogs, and other wildlife, while helping to filter out nutrients and sediments. This will indirectly help with the in-

lake nuisance aquatic plants by reducing the nutrients in the lake used by the plants, and by creating a more stable near-shore area. Natural shoreline vegetation also provides a natural barrier that Canadian geese avoid. Although an established buffer will require less work than a lawn, there will be maintenance required. This may include cutting, mowing, or elimination of exotic species such as purple loosestrife. Landowners should consult with a professional to determine specific maintenance requirements and scheduling for their shoreline buffers. Permits will be needed for aquatic plantings and the County should be consulted for the need for upland restoration permits.

HAND CONTROLS

A method of aquatic plant control on a small scale is hand or manual control. This can consist of hand pulling or raking plants. A rake with a rope attached is thrown out into the water and dragged back into shore. Plants are then removed and disposed of. Skimmers or nets can be used to scrape filamentous algae or duckweed off the lake surface. These methods are more labor intensive and should be used by individuals to deal with localized plant problems such as those found around individual piers and swimming areas. Hand controls cannot include the use of auxiliary power. For instance, a boat motor cannot be used to drag a rake. Hand controls are very inexpensive when compared to other techniques. Various rakes and cutters are available for under $100. Cutters pose risks to users because of their extreme sharpness. Although labor intensive, hand controls, especially using rakes, is an effective way to remove plants from a small area.

NR 109 allows riparian landowners to manually remove Eurasian watermilfoil and curly-leaf pondweed plants within their “riparian zone” without permit. Residents may remove plants in a single area that is not more than 30 feet wide as measured parallel to the shoreline, including any swimming and pier areas, as long as the area is not a WDNR Sensitive Area. The 30-foot area must remain the same each year. It is illegal to remove native plants outside the 30-foot wide area without a permit.

Conclusion—Hand controls may be used by individual landowners to clear swimming areas. Landowners should be encouraged to be selective in their clearing, again focusing on Eurasian watermilfoil or curly-leaf pondweed. Landowners should maintain a natural area of vegetation both on their shoreline and in the water. The District may consider acquiring some rakes and cutters to loan out to property owners.

Riparian landowners may manually (without any auxiliary power) remove Eurasian watermilfoil and curly-leaf pondweed plants within their “riparian zone” without permit. Residents may remove plants in a single area that is not more than 30 feet wide, including any swimming and pier areas, as long as the area is not a WDNR Sensitive Area. However, because of the ease with which Eurasian watermilfoil spreads, landowners should not attempt to remove native plants. Doing so will create a far worse condition when Eurasian watermilfoil fills the void created by removing the native plants. Consult WDNR regarding any permits needed for removal of plants.

CHEMICAL TREATMENT

Chemical treatment of aquatic plants in lakes is governed by WDNR under Wisc. Admin Code NR107. Chemical treatment for the control of aquatic plants is one of the more controversial methods of aquatic plant control. Debate over the toxicity and long term effects of chemicals continues in many communities. Many changes have occurred over the years. Today, the half-life of the herbicides is days and weeks, rather than months and years. Instead of broadcast applications, todays treatments are targeted. Very low application rates are used today, where in the past, very high rates were used. A WDNR permit is required prior to any chemical treatment.

With chemical treatments, the plant material impacted by the treatment dies and contributes to the sediment accumulation on the lake bed. When plants are treated, the decaying process of the plants uses oxygen. Depending on the chemical used, if too much plant material is treated at once, oxygen depletion may occur, stressing or killing fish.

Another concern about the use of chemical treatments is the ability to quickly shift a lake from one dominated by aquatic plants to one dominated by algae. The importance of aquatic plants to the fisheries community is another reason to use caution when conducting chemical treatment or other management activity that removes large amounts of plant material. If too much plant material is removed, fisheries food and habitat is negatively affected.

Identification of the target species is very important. Different chemicals should be used for different plant species. Dosage also affects the results. Too little chemical may stunt growth but not kill the plant. Too much chemical may negatively impact fish, amphibians, or invertebrates. If native plant communities are destroyed by chemicals, the areas may be invaded by exotic plants such as Eurasian watermilfoil and curly-leaf pondweed. The formulation of the chemical, whether liquid or granular, is a factor to consider. Another factor to consider is the contact period the chemical would have with the vegetation.

Care should be taken to alternate the chemicals used whenever possible. This will help minimize the chance of the nuisance species developing a resistance to the chemical. Currently, there are only two documented species in Florida which have developed a resistance. However, the very nature of aquatic plant control reduces the options when resistance does occur.

Chemical treatment is more selective than harvesting. Chemical treatment may also be more appropriate in some situations, especially where mono-typic stands of exotics exist in shallow water where harvesters cannot work, such as in marina areas. It may also be the method of choice to treat early infestations of Eurasian watermilfoil when hand-pulling cannot be used. When used appropriately, chemical treatment can be economical and effective.

Modern herbicides have been tested extensively. Tests include determining toxicity levels to be sure that humans, animals and fish are not affected. Test results must also show that the herbicides do not bioaccumulate in fish or other organisms and that their persistence in the environment is low. Product labels contain the requirements for use. Approved labels state that “there is reasonable certainty that the pesticide can be used with no unreasonable adverse affect on human health or the environment”. Material safety data sheets are available for all herbicides approved for use in

Wisconsin. Chemicals must be used according to the approved use applications listed on the labels. Application rates, as well as any use restrictions, are indicated on the product labels. Licensed applicators must follow the label requirements.

Shoreline treatments may need to be repeated at least annually. Shoreline treatments will likely not eliminate the nuisance. Invasive plant material from elsewhere in the lake may quickly re-enter the area. Shoreline treatments are usually spot treatments to alleviate a nuisance condition, whereas whole-lake treatments are usually lake restoration-based treatments. Whole-lake treatments have been used to eliminate Eurasian watermilfoil from a lake for at least three years (Aron, 2003). Large- area treatments (greater than 10 acres) have been used to dramatically reduce curly-leaf pondweed problems. Lake Barrington in northern Illinois has been successfully treated with Sonar™ as part of a multi-faceted approach to shift the lake from one dominated entirely by curly-leaf pondweed, to one with a more diverse plant community. Long term studies of water quality and fishers on lakes using whole-lake treatments are scarce. To date, there have been some documented negative impacts on water quality following whole-lake treatments (Hauxwell et al, 2005). Whole-lake treatments are not appropriate for all lakes. Extensive studies must be conducted prior to requesting a permit for a whole-lake treatment.

Although “mail order” chemicals can be purchased, their use is strongly discouraged and should not be used without a permit from WDNR. They may be completely ineffective if they are used to try to treat the wrong plant species. Unregulated, uneducated use may result in overuse of a chemical and cause damage to the “good” weeds, fish and wildlife, and humans.

Prior to any chemical treatment, a permit is required from WDNR. Only Wisconsin and EPA approved herbicides may be used, following all label directions and restrictions. In most situations, herbicides may only be applied by licensed applicators certified in aquatic application by the Wisconsin Department of Agriculture, Trade, and Consumer Protection. Proper handling and application techniques must be followed, including those to protect the applicators. All applications must comply with current laws in the State of Wisconsin.

Although individuals may apply for permits to apply aquatic herbicides, residents are strongly encouraged to work with their lake protection district on any questions or concerns about aquatic plants prior to undertaking any plant management activities.

Systemic Herbicides — Systemic herbicides are translocated throughout the entire plant, including the roots. Examples of systemic herbicides are 2,4-D, Fluridone, and trichlopyr. 2,4-D and trichlopyr are used to control Eurasian watermilfoil in localized areas. Fluridone is primarily used to control Eurasian watermilfoil in whole-lake, or large area situations.

Contact Herbicides — Contact herbicides kill the exposed portions of the plant that they come into contact with. They are not translocated to roots and will only rarely kill entire plants. Herbicides with the active ingredients of diquat and endothall are common contact herbicides. Contact herbicides are frequently used to provides short-term nuisance relief.

Copper Compounds — Copper sulfate is used for the control of algae. Cutrine Plus is an herbicide that uses copper as its active ingredient. This is used to control various types of algae. Although it can sometimes control Chara (also known as muskgrass), a more desirable algae, it is more commonly used to control filamentous, green and blue-green algae. Liquid formulations, especially the chopper chelated products (those combined with other compounds that help prevent the loss of active copper from the water) are more effective. These tend to remain in solution longer, allowing more contact time between soluble copper and the algae cells. Cutrine Plus and Cleargate have no restrictions on lake use following a treatment.

Aquathol — Super K is a formulation containing the active ingredient endothall. This is a contact herbicide that prevents certain plants from producing needed proteins for growth. It is used to control certain pondweeds, coontail, and Eurasian watermilfoil. The timing of an application affects what plants are impacted. Aquathol has use restrictions including 1 day for swimming; 3 days for fish consumption and 7 to 25 days for irrigation and human and animal drinking.

Reward — Reward, previously known as Diquat, is a non-selective contact herbicide that is used to control a wide variety of plants. It is absorbed by plants and damages cell tissues. Reward kills the parts of the plants that it comes into contact with directly. Reward loses its effectiveness in muddy, silt-laden waters. If too much plant material is killed in an area, the decomposing vegetation may result in very low oxygen levels that may be harmful or fatal to fish. Areas that are treated with Reward cannot be used for activities requiring full or partial body contact for at least 24 hours after treatment. Animal consumption, irrigation, and other domestic uses require waiting at least 14 days after treatment. Reward works quickly, with results usually seen in 6 to 10 days. Reward has use restrictions including 1 day for swimming and 14 days for drinking or irrigation.

2,4-D (2,4-dichlorophenoxyacetic acid) — 2,4-D is a systemic herbicide which interferes with normal cell growth and division. Plants begin to die within a few days of liquid formulation treatments, and within a week to 10 days when granular formulations are used. The aquatic formulations of 2,4-D are only effective on certain species of aquatic plants. It is most commonly used to treat Eurasian watermilfoil. The timing and the dosage rate of an application is important to avoid impacting native plant species. Because it also impacts several desirable species including bladderwort, water lilies, and watershield, care should be taken to ensure that only the target nuisance plant species are present before treatment or that the dosage is low enough to protect natives. 2,4-D products have no swimming or fish consumption restictions, but treated water should not be used for irrigation until herbicide residues as less than 1 ppm.

Fluridone — Fluridone is an herbicide that inhibits the plant's ability to make food. Without that ability, the plant dies. The visual symptom of the effects of fluridone is bleaching of the terminal buds, or growing points, on the plant. This herbicide requires at least 30 to 45 days of contact time to kill the plant. This prevents problems with low dissolved oxygen in treated areas. Fluridone is rapidly diluted and best used in larger treatment areas, generally 5 acres or more in size, preferably on a whole-lake basis. Prior to treatment there should be good flow data for the proposed treatment area. Rates of inflow, outflows, and ground water sources should be known prior to treatment. Without this information, applied material can be quickly flushed from a system or ren-

dered ineffective. There are questions about the long term impact of Fluridone on water quality and fisheries since most available information is anecdotal. Fluridone can be used for a range of plant control, from species specific control to general control. Fluridone achieves its selectivity by the use of varying dosages. High treatment dosages control a wide variety of aquatic plants, while low dosages maintained over long periods of time have been used to control Eurasian watermilfoil with minimal impact on native plants. A couple of important plant species, specifically naiads and elodeas are highly susceptible to Fluridone. Lakes with an abundant amount of susceptible species should carefully evaluate the use of Fluridone. Fluridone has no use restrictions except for irrigation. Irrigation restrictions range from 7 to 30 days.

Trichlopyr — Trichlopyr is a newly-approved herbicide which kills the entire plant, and is effective at treating Eurasian watermilfoil. Trichlopyr is more suited to moving water applications than slow-acting herbicides such as fluridone. Trichlopyr has a 120-day use restriction for irrigation.

Conclusion— Chemical treatment may be conducted on School Section Lake. Treatments may be undertaken by individuals or the district with WDNR approval. Native aquatic plant beds should not be chemically treated without a thorough review of the existing conditions. Changing plant conditions that create new shoreline nuisances may warrant chemical treatment of exotics. Swimming beaches may be treated with contact herbicides. **Any other chemical treatments conducted on School Section Lake should only target exotic species, Eurasian watermilfoil, curly-leaf pondweed, and filamentous algae.**

- Swimming beaches (public and multiple-resident beaches) may be treated with contact herbicides to provide safe swimming conditions.
- There may be consideration given to treating Eurasian watermilfoil and curly-leaf pondweed with the appropriate herbicides. Chemical treatment of the remaining plant communities would not be advised on School Section Lake. It should be remembered that destruction of any native plant species populations will increase potential problems from Eurasian watermilfoil.
- Treatments should be planned to treat early enough in the season to eliminate the nuisance with the least amount of herbicide and before the native plants have been impacted by dense growths of nuisance plants.
- Proposed chemical treatments should be developed based on the current nuisance conditions.
- If conducted, curly-leaf pondweed treatments should be planned to try to prevent the production of turions, an important method of reproduction for the plant. These treatments would allow native plants a better opportunity for growth in the area.

HARVESTING

Harvesting of aquatic plants in lakes is governed by WDNR under Wisc. Admin Code NR109. Harvesting is another lake management tool that is frequently used to control aquatic plants. Plants are cut off about five feet below the surface and conveyed to shore where they are then trucked to a disposal site. Harvesting aquatic plants removes biomass from the lake as well as nutrients. In

the past, the presumption was that eventually plant growth in a lake with harvesting would cease to be a problem when nutrients have been removed. However, a lack of plant growth after harvesting will not normally be seen because incoming nutrients from the watershed will usually offset any nutrients removed during harvesting (Engel, 1990). The remaining plant material, that material below the cutting depth, will continue its life cycle. The decomposing material will contribute to the sedimentation in the lake, however, wind and wave action will move the material into deposition zones: usually the deep hole.

Harvesting should only be done in waters deeper than three feet. Harvesting should not be done in shallower areas because it will increase damage to the equipment, will disrupt bottom sediments and plants, and will open up lake sediments to invasion by exotic plant species.

Shoreline pickup programs can help control floating plant material (floaters) and plant debris, however, they are labor, and time intensive. They are very difficult to eliminate once the residents are used to the pickups. Debris that includes rocks, sticks, gravel, or other such material will damage the equipment. When plant debris is on shore, the equipment must go up to shore to retrieve it, disrupting the sediments and rooted plants in the process. Harvesters are very large pieces of equipment that are highly susceptible to wind and waves, and are difficult to maneuver. This increases the chances for damage to riparians' piers and boats. If a shoreline pickup program continues to be used, plant debris should be placed on the ends of piers for retrieval.

Harvesting of fish lanes can open up areas so game fish can feed upon panfish. It also helps increase the size of panfish that remain, and can increase the size of the predator fish (Nichols, 1988).

Harvesting can reduce the recreational boating's impact on aquatic plants by opening navigation lanes and lessening the amount of plants that are cut off by boating activities.

Recreational use in dense milfoil beds, winds, and waves can create large amounts of "floaters" that can increase the spread of milfoil. Collection of the floaters as part of a harvesting program can help minimize the spread of the nuisance. Plant fragments that are not removed from a lake can settle into new areas and spread the problem. This creates a greater problem on lakes which do not conduct chemical shoreline treatments for Eurasian watermilfoil.

Harvesting can also cause problems if it is not done properly. Machines that are not properly maintained can discharge gas, oils and grease into lakes. Cutting too close to shore or into the bottom sediments can disrupt fish spawning and nursery areas. The sediments are also very damaging to the harvesting equipment and will increase maintenance costs significantly. Attempting to operate the equipment in shallow water (less than three feet deep) will disrupt the sediments and aquatic plants.

Harvesting is non-selective, that is, it harvests all plants in its path. Areas with native plants should be avoided whenever possible. In an area with a mix of plant species, including Eurasian watermilfoil, harvesting favors the species that grow quickly. Because this is usually Eurasian watermilfoil, it

leads to re-harvesting areas often over the summer season. Harvesting also removes fish, turtles and invertebrates.

In a mixed plant bed with both Eurasian watermilfoil and natives, cutting above the native plants will open up more sunlight to the understory, will encourage the native plant growth, and will remove any flowering portions of the Eurasian watermilfoil.

Because of the increasing concern of the role seeds play in the spread of Eurasian watermilfoil, areas dominated by Eurasian watermilfoil should be harvested early enough to prevent seed development.

Harvesting is a very costly management alternative. Purchase of equipment can exceed $120,000 in capital costs. State grants are eligible to lakes which harvest a minimum of 30 acres, and have adequate public access.

Conclusion—Harvesting has been shown to be effective at improving recreational use by controlling nuisance species on School Section Lake. Landowners should be encouraged to remove floaters from their shorelines. Material can be mulched or used in plant beds.

- Harvesting should be used to remove large stands of Eurasian watermilfoil and curly-leaf pondweed that have topped out.
- Harvesting may be used to cut boat lanes through dense vegetation to provide access.
- Harvesting should begin with the boat lanes to ensure access for riparians, then work should begin on large dense stands of exotic plants.
- The program should emphasize reducing nuisances rather than clear cutting.

LOCAL ORDINANCES AND USE RESTRICTIONS

Lake use ordinances have long been used to control activities on lakes. Local communities may adopt ordinances to protect public health, safety and welfare. Any proposed ordinances are sent to the DNR for review to be sure they comply with State Statutes. Ordinances must address issues that threaten public health, safety and welfare. Once approved by DNR, communities may then finalize and enforce the ordinances.

Historically, public health, safety and welfare was interpreted to mean peoples' physical issues associated with using the lake. Speeding and reckless use endanger lives and are usually controlled through local ordinances.

Recently there has been a growing realization that the lake's health has a bearing on public welfare. Lake use activities conducted in inappropriate areas of lakes can be very damaging to the lake ecosystem. Spawning habitat can be destroyed. Wildlife can be chased away. Aquatic plant communities can be disrupted, shifting the communities to plants less beneficial than the original.

With the state's acceptance of the environmental health premise, communities are looking at lake use zoning. Some have shoreline zones that are no slow wake. Others have restricted some or all of the lake to no-motors. Protection of specific species or valuable areas can be achieved by developing an ordinance to minimize intrusions.

Costs associated with ordinance development depends upon the problem, potential solutions, municipal cooperation, and municipal legal reviews. Grants are available through the WDNR to assist with the cost of developing ordinances.

It is important to keep in mind the following in the development of ordinances:

- Any proposed ordinance must have prior review by the WDNR.
- An ordinance must not discriminate on a particular craft, ie, if motors damage an area, all motors should be restricted not just ski boats.
- An ordinance must be clearly understood and posted. Buoys (which must also be approved by the DNR) should warn boaters of areas to avoid.
- Any ordinance should address a particular problem. If boating damages a sensitive area of the lake, allowing boats in the area on alternating days does not achieve the protection sought.
- An ordinance must be reasonable and realistic. An ordinance that creates a slow no wake zone that affects all of the lake area less than three feet deep may not be enforceable. The general public could not know the extent of that area. A more reasonable approach would be to review the desired area and develop a plan based on a specific distance from shore. Buoys could then be used to identify that area.
- Any proposed ordinance should be studied to ensure that it does not aggravate a different problem. For example, many communities have shoreline slow no wake zones that exceed that of state law. On a small lake, enlarging that shoreline zone may provide more resource protection. It may also further concentrate other lake use activities such as skiing into an area too small to be safe.
- Any attempts to restrict lake use should be weighed along with the social and economic impacts. It is well documented that those most involved with lakes and lake protection are those same people who spend the most time on or around lakes. They either live on or have easy access to a lake. It is very difficult to convince outsiders that lake quality is a concern or that funds should be spent because they do not have a personal involvement. They have other priorities. Reducing public use of a lake will have a direct affect on their involvement and possibly their social and economic concern about a lake.
- Lake ordinances should be developed to protect health or safety, not to restrict a specific user group.
- Ordinances should reference, not duplicate state laws.

Conclusion—Lake use ordinances may be considered for School Section Lake, however, they should be carefully developed and studied to ensure that they address the problems without undue restrictions and that they will actually be enforced.

Chapter VII

PLANT MANAGEMENT PLAN

GOALS AND OBJECTIVES

The goals of the District, that is, broad statements of long range desires, are outlined below. The goals are followed by objectives to be used to accomplish each of the goals.

The District's goal is to work toward the preservation of aquatic systems that includes water quality, fisheries, and wildlife, while minimizing the conditions resulting from aquatic nuisances and to preserve and maintain recreational uses of School Section Lake. To achieve the goal, the development of this plan is one component of an effort that has included water quality monitoring, aquatic vegetation surveys, dredging, educational activities, and watershed improvement activities.

The District desires to:

- Maintain and acquire harvesting equipment as needed.
- Continue to improve the operation and efficiency of the harvesting program.
- Restore native plant communities and ecologically valuable areas.
    - —Encouraging landowners to protect native species.
    - —Using chemical treatments in shoreline areas if needed.
    - —Minimize fragments of aquatic plants.
    - —Aggressively respond to re-infestations of exotic species.
    - —Harvest where necessary to maintain navigational areas.
- Preserve and enhance the natural lake environment by:
    - —Educating landowners and lake users in lake ecology.
- Work with the Town, County and State governments to:
    - —Review existing ordinances, and if necessary, develop and enforce ordinances to protect School Section Lake.
    - —Continue to improve the watershed to protect School Section Lake.
    - —Identify and expand local educational efforts to improve the public's understanding of lake issues
    - —Encouraging community participation in lake management activities.
- Conduct in-lake management activities with the long-range goal of minimizing management to the extent possible by:
    - —Conducting year-end evaluations as to the success of plant management activities and the community reaction to the activities.
    - —Tracking annual progress of lake management activities.
    - —Conduct water quality monitoring efforts to assist in the documentation of results.

RECOMMENDATIONS

Lake Map

Because of the previous dredging activities, the lake map available for School Section Lake, is no longer accurate. Because many lake management activities depend on the use of a good quality map, it is recommended that the District contract to have a new map developed. The District may apply for a planning grant to assist with the project.

Water Quality Monitoring

The District should continue with the UW Extension Program water quality monitoring program on School Section Lake. A volunteer monitor should be found to collect secchi disk readings at least every two weeks. This task could be included as a responsibility of a harvester operator. Another option for monitoring is the US Geological Survey water quality, or similar program to determine the nutrient concentrations in School Section Lake.

The District should provide the data to WDNR to allow access by individuals and agencies for review and analysis. At a minimum the data should be compiled into a database to facilitate the use of the information.

Hand Controls

Riparians should be encouraged to use the least intensive method to remove nuisance vegetation. This could include minimal raking and pulling. NR109 allows landowners to remove plants from an area up to 30 feet wide without a permit. The 30-foot area includes the swimming and pier areas. Landowners may manually remove Eurasian watermilfoil and curly-leaf pondweed from the remainder of their shorelines without a permit, without the use of auxiliary power. Removal of native plants beyond that allowed in the 30-foot area, will require a WDNR permit. If screens are considered by individuals, a WDNR permit will be required.

Riparians should be encouraged to allow native plants to remain. This will help prevent infestation of the areas by Eurasian watermilfoil or curly-leaf pondweed. The native plants will also help stabilize the sediments.

The District should encourage landowners to use hand controls to manage the aquatic nuisances. Small swimming areas can be manually cleared without damaging the resource. The District may wish to consider acquiring rakes and cutters to loan to lake residents. Another idea the District may consider is to match energetic teens seeking summer help with those physically unable to do hand clearing.

The District should inform landowners about the importance of keeping their shorelines free of floating plant debris. Wave action can carry plant fragments into new areas, possibly aggravating nuisance conditions. Plant debris can be used in mulch piles or gardens.

Education and Information

The District should take steps to educate property owners regarding their activities and how they may affect the plant community in School Section Lake. Informational material should be distrib-

uted regularly to residents, landowners, and lake users and local government officials. A newsletter to landowners and residents should be part of the annual plant management budget. Topics should include information relating to lake use impacts, importance and value of aquatic plants, land use impacts, etc. Information on shoreline restoration and plantings can be provided. Publications are available that list sources of plants and methods of creating buffers. Other issues that should be addressed may include landscape practices, fertilizer use, and erosion control. Existing materials are available through the WDNR and the UWEX. Other materials should be developed as needed.

The District should also enlist the participation of the local schools. The schools could use School Section Lake as the base for their environmental education programs. Some schools have a mandatory community service requirement that may be tapped to assist with lake management activities. Regular communication with residents will improve their understanding of the lake ecosystem and should lead to long term protection.

The District should inform residents about the lake management activities that are undertaken and the reasons behind the activities.

Watershed Controls

The District should work to improve the quality of water runoff into School Section Lake, especially with the redevelopment of residential areas. All areas of the watershed should be toured regularly for identification of new problems.

The District should work with the Town officials to encourage rigid enforcement of erosion control in the watershed and consideration of lake-friendly methods of development and road construction.

Land Use Planning

The District should take an active role in land use planning decisions in the Town. Development proposals should be analyzed with the lake in mind and revised if necessary to protect the lake from damaging runoff. Long range planning should also involve the District to ensure that future development includes lake protection.

Storm Water Planning

The District should review any new development proposals in the watershed to ensure that the lake will not be damaged by changes in flows or quality of stormwater. The District may consider applying for grants to assist with land use and storm water planning. The District may assist the County and Town to develop and implement storm water ordinances. Another option to consider is the use of phosphorus-free or no phosphorus fertilizers. Some communities are considering fertilizer restrictions to protect their lakes.

Ordinances

The District may consider the development of ordinances, working with the Town to implements and enforce. It should be noted that passing an ordinance does not in and of itself, correct a problem. Enforcement is a key component of any ordinance development.

Chemical Treatment

- The District may continue to use chemicals to control nuisance plants in the shoreline areas. Treatments should minimize the effects on non-target plants. Care should be taken to avoid treating too much plant material at a time. Earlier, rather than later season treatments will accomplish this. Waiting until there are high densities to treat could place undue stress on the fish community by reducing oxygen concentrations post-treatment.
- Swimming areas may be treated with non-selective, contact herbicides to provide safe swimming conditions.
- Target species for chemical treatment may include: Eurasian watermilfoil, curly-leaf pondweed and coontail. Curly-leaf pondweed treatments should be conducted very early in the season.
- Areas which are chemically treated should not be harvested. Harvesting shortly after chemical treatment will negate the affect of the chemical treatment. An early season chemical control may be followed by late season harvesting.

WDNR Administrative Rule NR 107 should be consulted for the specific requirements for conducting a treatment. The following are some of the steps that should be followed by the District when preparing to conduct chemical treatments.

- Complete and submit the WDNR permit application forms. Include treatment map, area sizes and name and addresses of all affected riparian landowners.
- Contact licensed firm to coordinate proposed treatment.
- When treatment areas will be greater than 10 acres, a public notice should be placed in the local paper informing the public about the proposed treatment. This will also inform those who may be using the public beaches.
- Provide a copy of the WDNR application to any riparian landowner who is adjacent to the proposed treatment areas. This may be done by newsletter, or box drops.
- At the time of treatment, WDNR-approved yellow posting signs must be posted in and adjacent to treatment areas, at least every 300 feet. The signs must indicate what chemical has been used, and any use restrictions and must remain posted for at least the time of any restrictions.
- Current administrative codes should be reviewed annually to ensure compliance.

Harvesting

- The District may continue to use harvesting to provide relief from nuisance conditions.
- Harvesting should not be done in areas that are treated with herbicides, until later in the season.
- Any harvesting done should be carefully planned to avoid native plants as much as possible.
- No harvesting should be done in shallow waters less than three feet deep.
- Incidental cutting of native plants is allowed, however, large areas of primarily native plants should not be harvested.
- Eurasian watermilfoil areas should be “topped”, that is, the top 4 or 5 feet of plant material (or to the depth of the Eurasian watermilfoil canopy) should be harvested, cutting above any native plants. This will allow light to reach the natives and will encourage their growth.
- Educational efforts should be developed to inform the public about the benefits of a comprehensive plant management program, that gives equal consideration to fish and wildlife, while reducing recreational nuisances and unsafe situations.
- Equipment should not be overloaded to ensure safety for operators, and to help fragments from falling from the harvester. Off-load sites should be regularly raked and cleaned of plant material.
- Operators should take advantage of wind direction, cutting upwind of topped-out plants. Plant fragments will collect on the topped-out plants, allowing for easier collection, and minimizing shoreline debris.

WDNR Administrative Rule NR 109 should be consulted for the specific requirements for conducting harvesting. The following are some of the steps that should be followed by the District when preparing to harvest.

- Complete WDNR permit application forms. Include map, area sizes and name and addresses of all affected riparian landowners.
- Current administrative codes should be reviewed annually to ensure compliance.
- The District should concentrate harvesting efforts on Eurasian watermilfoil, curly-leaf pondweed, and coontail. Efforts should be made to eliminate “shading” of lower growing native plants and to reduce floaters.
- Daily records should be kept documenting loads, maintenance, downtime, and other pertinent information. The District should stress to the operators the importance of keeping accurate records.
- The District should provide operators with a copy of the harvesting permit and be sure it is read and understood, to ensure compliance with its provisions.
- Harvesting operators should be trained to identify target plant species. This would ensure the operators would know to avoid areas with high numbers of pondweeds that should not be cut.
- Operators should not cut plants in less than three feet of water.
- The District may continue its current harvesting schedule.
- Any fish or turtles that may be harvested with the plants should be returned to the lake.

- Avoid areas with spawning fish.
- Disposal of cut plants may continue to be disposed of locally.
- The District should try to hire experienced operators.
- The District should provide comprehensive training in equipment operation, maintenance, and safety.
- The District should summarize its harvesting records into an annual report.
- The District should review the plant management plan and operations every three to five years.
- The District should distribute informational materials to its members that include such topics as proper lawn and garden practices, land use impacts and the importance and value of aquatic plants.

General Recommendations

The District staff should continue to harvest areas of the lake on an as needed basis, prioritizing the areas as follows:

—Harvest curly-leaf pondweed beds as early as possible to minimize turion production.
—Harvest to remove tops of Eurasian watermilfoil to prevent seed production and to open native understory to sunlight.
—Early in the summer season the focus should be on removing topped out Eurasian watermilfoil/curly-leaf pondweed beds.
—Harvest main navigational and fishing channels.
—Harvest outside pier zones to provide access.

Emphasis of the program should be to harvest plants necessary to facilitate recreational use and to minimize the impacts on native plants.

Staff needs to make sure that cutter bars are kept out of the sediments and to cut at least one foot above the native plant beds, being especially careful where Muskgrass tends to dominate the plant community. Nuisance aquatic plants, especially Eurasian watermilfoil, will likely expand their range if this recommendation is not followed.

Public acceptance and continual support are critical components to a successful program. Continue to harvest outside the piers to allow for satisfactory recreational use and public satisfaction. Harvesting should focus on removal of top portions of plants, approximately 3 feet down, or to the top of the native plants, which ever is less. This will allow light to reach the native understory. If chemical treatment is not used, harvesting may be used to relieve the nuisances up to the pier zone area as long as access is not restricted by depth.

Staff should concentrate harvesting efforts on the Eurasian watermilfoil areas (especially to help reduce the amount of floaters that may be caused by boaters). Eurasian watermilfoil should be harvested before a canopy begins to form if possible. There should be no harvesting of areas that are primarily desirable native plant species, especially when native pondweeds are in seed.

Staff should work to reduce the amount of “floaters” and if they do occur, be sure they are removed immediately. Equipment should be operated so that cut plant material does not fall off the harvester. Deep water areas of Eurasian watermilfoil that need to be harvested for access purposes should be cut to depths between five and six feet to prevent boating activity from cutting plants.

Off-load areas should be kept free of plant debris. Any debris in the lake should be removed each time the harvester unloads.

Comprehensive and detailed records should be kept documenting:

1. Date
2. Hours worked - including harvest and down time
3. Loads harvested - including plant types and densities
4. Areas harvested - located on a map
5. Weather conditions
6. Other relevant information

Schedule For Harvesting

The District may follow their present harvesting schedule. A review of past harvesting records in conjunction with a pre-harvest survey should be conducted each spring to determine which areas need attention and which areas are undergoing a change from the previous year. If plants become a nuisance in mid-May, begin harvesting but note previous recommendations, especially with regard to fish spawning areas.

Since most of the harvesting is done outside the pier zone, spawning habitat should not be impacted. Near-shore areas, especially those with fish spawning habitat, should not be harvested prior to June 1st of each year.

The productivity of the harvesting effort depends on the density of the plants, weather, operator skill, etc. A 450 cubic foot capacity harvester can be expected to harvest an acre in 2 1/2 to 5 hours.

Harvested Fish & Wildlife

Care should be given to returning any captured fish and turtles to the lake. If fish are caught in quantities of more than a few per area, the harvesting crew should take the following actions:

1. Reduce the operating speed of the harvester to give fish a chance to flee.
2. If that does not help, then reduce cutting depth and see if problem is resolved.
3. If fish are still being harvested, refrain from cutting area and consult with WDNR or private consultant for further recommendations.

Off-Loading and Disposal Sites

Current disposal practices should continue. Care should be taken to keep lake areas adjacent to disposal sites clean of cut vegetation. Staff should be instructed to remove any vegetation debris immediately upon off-loading the harvester. Cut material should not be left on the conveyors overnight. Off load sites are shown on Figure 6. Harvested plant material is taken to a farm field on the Southwest side of the lake.

Operator Training

The District should try to hire experienced operators. The District should conduct comprehensive training in equipment operation, maintenance and safety. Employees should be trained in the identification of the plants in School Section Lake. This will help protect beneficial plant beds and will ensure accurate documentation of changes that may occur in the aquatic plant community as a part of their daily program.

Maintenance Program & Downtime

Maintenance should be done regularly to prolong the life of the equipment. The focus should be on preventive methods, rather than reactive. The District should use synthetic, biodegradable hydraulic fluids in the harvester to reduce the adverse impacts to the lake from spills. In the event this is not possible, a small spill kit should be acquired to immediately and efficiently deal with any spills that may occur.

The District should follow the manufacturer's recommended equipment maintenance. Unless otherwise indicated, to extend the life of the equipment, daily maintenance should include checking engine oil and pump fluid levels prior to use each day. Oil and filters should be changed regularly. A grease gun should be kept on board each piece of equipment and operators should grease every 2 hours while running, taking extra care to grease joints and pivot areas that operate below the water line.

Employee Safety

The District should regularly review safety measures with the staff. It is especially important that staff wear life preserves at all times while on the harvesters.

Contingency Plans

The District should be prepared for changing aquatic plant conditions that may fall outside the recommendations in this Plant Management Plan. While the final determination will be permitted by WDNR, developing local consensus on possible solutions is often needed. In evaluating whether to treat or harvest a "new" nuisance condition, the following should be considered:

- ***Are the plants native or exotic species?***
  If unsure, consult WDNR or an aquatic plant specialist to determine the species.

- ***Is the area in shallow or deep water?***
  This quickly limits some of the options. Harvesting, for instance, cannot be used in water less than 3 feet deep.

- ***Is the condition impeding or preventing recreational use, or is something else a factor?***
  Access channels may be created either by harvesting or chemical treatment. However, if water depth prevents access during a drought, chemical treatment will not open up boating access. In this instance chemical treatment may eliminate a filamentous algae that is causing odor problems.

- ***Is the situation creating unsafe conditions?***
  Dense, stringy weeds in a beach area, for instance, could create dangerous conditions for young swimmers.

- ***Will the considered option improve the situation long term, short term, or both?***
  The short term solution may eliminate the problem this summer, but make it worse in future years, while the long term solution may be the best over the long haul.

- ***Is the considered option detrimental to fish, wildlife, or humans?***
  If it is, maybe there are other options to solve the problem that would be safer.

- ***Will the considered option increase invasion by other nuisance species?***
  Consider whether the option will create “bare” lakebed that will quickly be invaded by weedy species, or whether the option will protect desirable vegetation while removing the nuisance.

Chapter VIII

PLAN REASSESSMENT / FINDING OF FEASIBILITY

The district will review or contract to review, the plant populations of School Section Lake every five years. A summary of the past years harvesting operation should be developed annually to facilitate comprehensive review of the entire program. The management plan will also be reviewed every three to five years.

The District's program is sufficient to meet the needs of the community.

The District is capable of maintaining an efficient, effective program.

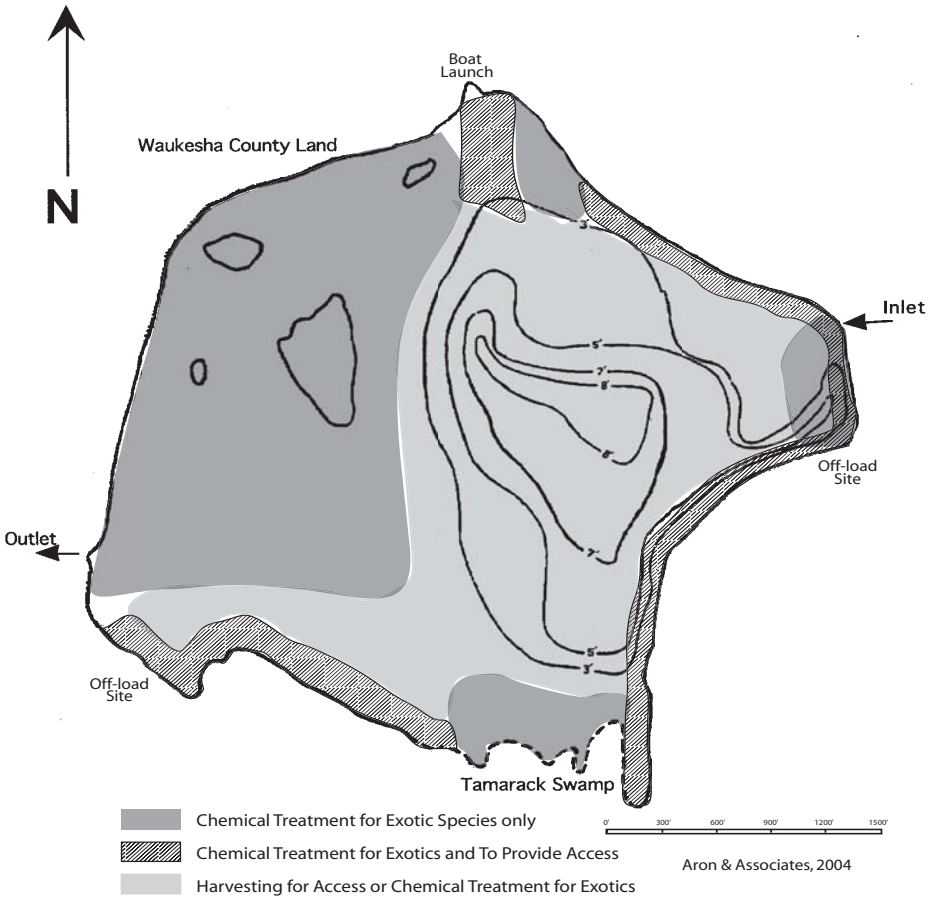
The current equipment is reaching the end of its expected lifespan. The District may obtain new equipment to replace the existing the equipment as needed.

The development of this plan finds that is environmentally and economically feasible for the School Section Lake Management District to continue to operate and maintain an aquatic harvesting program. This plan also recommends that a cost share grant be awarded to the district to support the replacement of equipment when needed.

Chapter IX

PLAN RECOMMENDATIONS SUMMARY

- The District should continue the water quality monitoring program.
- The District should compile the water quality data into a spreadsheet.
- The District should have a new lake depth map developed.
- Harvesting needs should be determined each year and re-evaluated regularly to efficiently manage the nuisance conditions.
- No harvesting should be done in the conservancy areas.
- Harvesting efforts should emphasize providing public access and safe recreational use.
- Staff should keep cutter bars and paddle wheels out of the sediments. Any harvested areas should have at least one foot of plant material remaining to stabilize the lake bottom.
- Harvesting operators should be trained to identify “good” plants. This will allow the operators to avoid areas with high number of pondweeds that should not be cut.
- Every effort should be made to reduce the amount of floating plant debris, especially milfoil fragments, in order to reduce opportunities for establishment in other areas.
- Deep water areas of Eurasian watermilfoil that need harvesting should be cut to a depth of five to six feet to prevent boating activities from cutting plants.
- All harvesting should be confined to the areas lake-ward of the pier line. Shoreline nuisances should be handled by individual property owners.
- Comprehensive and detailed records should be kept detailing where harvesting takes place, number of loads, and types of plants being harvested, maintenance and downtime.
- Any harvested fish or other wildlife should be returned to the lake. If large numbers of fish are being harvested, the staff should take immediate steps to prevent the fish harvest.
- The District should distribute informational materials regularly to residents on such topics as proper lawn and garden practices, land use impacts and the importance and value of aquatic plants.
- Natural shorelines and conservancy areas should not be harvested except to provide navigational access for riparian landowners.
- The District should maintain off-load sites and the surrounding lake areas in a clean, debris-free manner.
- Purple Loosestrife in the area should be eradicated. Selective chemical treatment of Eurasian Water Milfoil may be conducted where needed to control the spread of the plant.
- Property owners should restrict the use of hand controls and bottom barriers to the control of Eurasian watermilfoil and curly-leaf pondweed. Landowners should minimize the size of any areas that are cleared. Comply with current rules and regulations (NR 109).
- The District may consider acquiring hand rakes and cutters to loan to property owners for localized control.



Harvesting Priorities

* Base havesting proirities on existing nuisance conditions. Evaluate regularly.
* Check access to public boat launch.
* Check pier zone areas (from outside end of piers outwards).
* Check deep water areas on NE, E and S end of conservancy area. Keep milfoil "topped".
* Check deep water areas on E side of conservancy area.

Figure 9 Plant Management Plan for School Section Lake, 2004

GLOSSARY

acid

Corrosive substances with a pH of less than 7.0.

acid rain

A polluting rain in which sulfur oxides from fossil fuels react with water vapor in the environment to form sulfuric acid.

adaptation

Any structure, the means an organism has to make them more likely to survive.

aerobic

Processes requiring oxygen.

algae

Microscopic organisms/aquatic plants that use sunlight as an energy source (e.g., diatoms, kelp, seaweed). One-celled (phytoplankton) or multicellular plants either suspended in water (Plankton) or attached to rocks and other substrates (periphyton). Their abundance, as measured by the amount of chlorophyll a (green pigment) in an open water sample, is commonly used to classify the trophic status of a lake. Algae are an essential part of the lake ecosystem and provides the food base for most lake organisms, including fish.

algal bloom

Population explosion of algae in surface waters. This may be caused by an increase in nutrients.

alkalinity

The ability of water, or other substances, to absorb high concentrations of hydrogen ions. Substances with a pH greater than 7.0 are considered alkaline. Low alkalinity is the main indicator of susceptibility to acid rain.

ammonia

A form of nitrogen found in organic materials and many fertilizers.

anaerobic

Living or occurring without air or free oxygen.

annual

A plant that completes its life cycle in one year or one season.

annual turnover

This is when the lake mixes entirely from top to bottom.

aquatic

Organisms that live in or frequent water.

aquatic invertebrates

Aquatic animals without an internal skeletal structure such as insects, mollusks, and crayfish.

aquatic plants

Plants that grow and live in water. They may be floating, submerged or emergent.

asexual

Reproducing by fragmentation, turions, tubers, and/or other vegetative structures.

benthic zone

The bottom zone of a lake.

benthos

Organisms living on, or in, the bottom material of lakes and streams.

biomass

The total quantity of plants and animals in a lake. It indicates the degree of a lakes system's eutrophication or productivity.

blue-green algae

Algae that are associated with problem blooms in lakes. Some produce chemicals toxic to other organisms.

bog

An area characterized by soft, water-logged soil with mosses and other vegetation as the dominant plants.

calcium (Ca++)

The most abundant cation found in Wisconsin lakes. Its abundance is related to the presence of calcium-bearing minerals in the lake watershed. Reported as milligrams per liter (mg/l) as calcium carbonate (CaCO3), or milligrams per liter as calcium ion (Ca++).

cation

This refers to chemical ions that carry a positive charge. Some cations present in lakes are calcium (Ca++), magnesium (Mg++), potassium (K+), sodium (Na+), ammonium (NH4+), ferric iron (Fe+++) or ferrous iron (Fe++), manganese (Mn++), and hydrogen (H+).

chloride (Cl-)

Is considered an indicator of human activity. Agricultural chemicals, human and animal wastes, and road salt are the major sources of chloride in lake water.

chlorophyll

A green pigment found in plants that is necessary for the process of photosynthesis.

clarity

Secchi disc is an 9-inch diameter plate with black and white painted sections that is used to measure water clarity (light penetration). The disc is lowered into water until it disappears from view. It is then raised until just visible. An average of the two depths, taken from the shaded side of the boat, is recorded as the Secchi disc reading. The readings should be taken on sunny, calm days.

conductivity (specific conductance)

Is the waters ability to conduct an electric current.

cultural eutrophication

Eutrophication that happens as a result of human activities when increased nutrients in runoff water drains into lakes.

decompose

Breakdown of organic materials to inorganic materials.

dissolved oxygen (DO)

The amount of free oxygen absorbed by the water and available to aquatic organisms for respiration.

diversity

Number of species in a particular community or habitat.

drainage basin

The total land area that drains toward the lake.

drainage lakes

Lakes fed primarily by streams and with outlets into streams or rivers. They are more subject to surface runoff problems but generally have shorter residence times than seepage lakes. Watershed protection is usually needed to manage lake water quality.

ecosystem

A system formed by the interaction of a community of organisms.

epilimnion

The epilimnion is the warm upper layer of a lake when the denser, colder water is on the bottom during stratification.

erosion

Movement of soil by water and wind.

eutrophication

The process by which lakes and streams are enriched by nutrients which results in increased plant and algae growth.

exotic

A non-native species of plant or animal that has been introduced.

filamentous algae

Algae that forms filaments or mats attached to sediment, weeds, piers, etc.

food chain

An arrangement of the organisms in an ecological community according to the order of predation in which each uses the next, usually lower, member as food source.

groundcover

Plants grown to keep soil from eroding.

habitat

The place where an animal or plant lives; its living and non-living surroundings.

herbicides

Chemicals designed to kill a variety of undesired plant species.

hydrologic (water) cycle

The process by which the earth's water is recycled. Atmospheric water vapor condenses into the liquid or solid form and falls as precipitation to the ground surface. This water moves along or into the ground surface and finally returns to the atmosphere through transpiration and evaporation.

hydrology

Study of the distribution, circulation, and properties of water.

hypolimnion

The lower, more dense, colder waters on the bottom of stratified lakes is the hypolimnion.

impervious surface

Ground cover that does not allow for infiltration of water, such as roads and parking lots, and increases the volume and speed of runoff after a rainfall or snow melt.

limiting factor

The nutrient or condition in shortest supply relative to plant growth requirements. Plants will grow until stopped by this limitation; for example, phosphorus in summer, temperature or light in fall or winter.

limnology

The study of inland lakes and waters.

littoral

The near shore shallow water zone of a lake, where aquatic plants grow.

macrophytes

Refers to plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects.

marl

White to gray accumulation on lake bottoms caused by precipitation of calcium carbonate ($CaCO_3$) in hard water lakes. Marl may contain many snail and clam shells, which are also calcium carbonate. While it gradually fills in lakes, marl also precipitates phosphorus, resulting in low algae populations and good water clarity.

metalimnion

This is the thin layer in a stratified lake that lies between the hypolimnion and the epilimnion.

non-point source

A source of pollution that comes from a variety of sources instead of a pipe.

nutrients

Elements or substances such as nitrogen and phosphorus that are necessary for plant growth. Large amounts of these substances promote excessive plant growth.

pH

The numerical value used to indicate how acid or alkaline a solution is. The number refers to the number of hydrogen ions in the solution. The pH scale ranges from 1 to 14 with 7.0 being neutral. Acid ranges from 0 to 6. Alkaline ranges from 8 to 14.

phosphorus

Key nutrient influencing plant growth in more than 80% of Wisconsin lakes. Soluble reactive phosphorus is the amount of phosphorus in solution that is available to plants. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particulate form.

photosynthesis

The process by which green plants create food and oxygen.

phytoplankton

Microscopic plants and algae found in the water.

plankton

A small plant organisms and animal organisms that float or swim weakly through the water.

point source pollution

Air or water pollutants entering the environment from a specific point such as a pipe.

pollution

The contamination of water and other natural resources by the release of harmful substances into the environment.

ppm

Parts per million.

retention time

(Turnover rate or flushing rate) The average length of time water resides in a lake. This can range from several days in small impoundments to many years in large seepage lakes.

runoff

The portion of rainfall, melted snow, or irrigation water that flows across the land surface or through pipes and eventually runs into lakes and streams.

seepage lakes

Lakes without a significant inlet or outlet, fed by rainfall and groundwater. Seepage lakes lose water through evaporation and groundwater moving on a down gradient. Lakes with little groundwater inflow tend to be naturally acidic and most susceptible to the effects of acid rain. Seepage lakes often have long residence times and lake levels fluctuate with local ground water levels. Water quality is affected by groundwater quality and the use of land on the shoreline.

thermocline

Stratification is the layering of water due to differences in density. Water's greatest density occurs at 39 ×F (4 ×C). As water warms during the summer, it remains near the surface while colder water remains near the bottom. Wind mixing determines the thickness of the warm surface water layer (epilimnion), which usually extends to a depth of about 20 feet. The narrow transition zone between the epilimnion and cold bottom water hypolimnion) is called the metalimnion or thermocline.

trophic state

Eutrophication is the process by which lakes are enriched with nutrients, increasing the production of rooted aquatic plants and algae. The extent to which this process has occurred is reflected in a lakes trophic classification or state: oligotrophic (nutrient poor), mesotrophic (moderately productive), and eutrophic (very productive and fertile).

turbidity

Degree to which light is blocked because water is muddy or cloudy.

turnover

Fall cooling and spring warming of surface water increases density, and gradually makes temperature and density uniform from top to bottom. This allows wind and wave action to mix the entire lake. Mixing allows bottom waters to contact the atmosphere, raising the water's oxygen content. However, warming may occur too rapidly in the spring for mixing to be effective, especially in small sheltered kettle lakes.

watershed

The land area draining into a specific stream, river, lake or other body of water. These areas are divided by ridges of high land.

wetlands

Low-lying lands in which the soil is saturated with water at some time during the year.

zooplankton

Microscopic or barely visible animals that eat algae. These suspended plankton are an important component of the lake food chain and ecosystem. They are the primary source of food for many fish.

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