Aquatic Plant Management Plan for McDill Pond, Portage County, Wisconsin

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Photo: UWSP Center for Watershed Science & Education

Prepared by Paul Skawinski, Regional AIS Technician,

Golden Sands RC&D Council, Inc.

Photo: Paul Skawinski

Photo: Paul Skawinski

McDill Pond APM Committee Members:

Dave Enerson – board member

John Jones – board member

Jim Tanguay – District member

Jack Negaard – board President

Krista Olson – board member

The McDill Pond APM Committee included the McDill Lake District President, three board members, and one District member. The committee was created to address concerns related to the management of McDill Pond, and offer input toward the creation of this aquatic plant management plan.

Special thanks to:

Scott Provost, Water Resources Management Specialist, Wisconsin Department of Natural Resources

Buzz Sorge, Lake Management Planner, WDNR

Amy Thorstenson, Regional AIS Specialist, Golden Sands Resource Conservation and Development Council, Inc.

Nancy Turyk, Water Resource Scientist, UW-Stevens Point Center for Watershed Science & Education

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An aquatic plant management plan (APM) is a dynamic document that needs to incorporate the desires of the community and the needs of the ecosystem, while still serving as a tool for adaptive management. Citizen feedback and public informational meetings provide the discussion necessary to develop such a plan. Not only does the exotic plant growth need to be addressed, but other topics like excess nutrients and shoreland buffer zones are also important to the health of McDill Pond. This plan is designed to be a dynamic document, requiring annual evaluation to support adaptive management.

I. Background on Development of McDill Pond's APM:

Golden Sands Resource Conservation & Development Council, Inc (RC&D), the Wisconsin Department of Natural Resources (WDNR), UW-Stevens Point (UWSP) Center for Watershed Science & Education (CWSE), the Izaak Walton League, and the McDill Lake Protection & Rehabilitation District worked cooperatively to produce this aquatic plant management plan. Golden Sands RC&D organized the meetings and produced the plan. WDNR provided technical expertise and financial assistance. The public is invited to all APM meetings to provide community input, and to learn about the complex ecosystem of McDill Pond.

The above-mentioned groups met six times between January 2008 and October 2008. Presentations were given by Nancy Turyk, Water Resource Scientist, UWSP Center for Watershed Science & Education; Scott Provost, Water Resources Management Specialist, WDNR; and Amy Thorstenson, Regional AIS Specialist, Golden Sands RC&D. Additional support at the meetings came from Buzz Sorge, Lake Management Planner, WDNR. These experts provided information regarding aquatic ecosystems and management options for McDill Pond.

The McDill Lake Protection & Rehabilitation District distributed a survey to the landowners around McDill Pond to assess their opinions and values regarding the pond. Roughly 130 surveys were sent out; 52 surveys were returned (40% return rate). The majority of respondents felt that the water quality in McDill Pond is "poor", and has declined since they moved to the area. They also indicated that "weeds" and "algae scum" are the primary problems facing the pond.

II. Goals of the McDill Pond APM

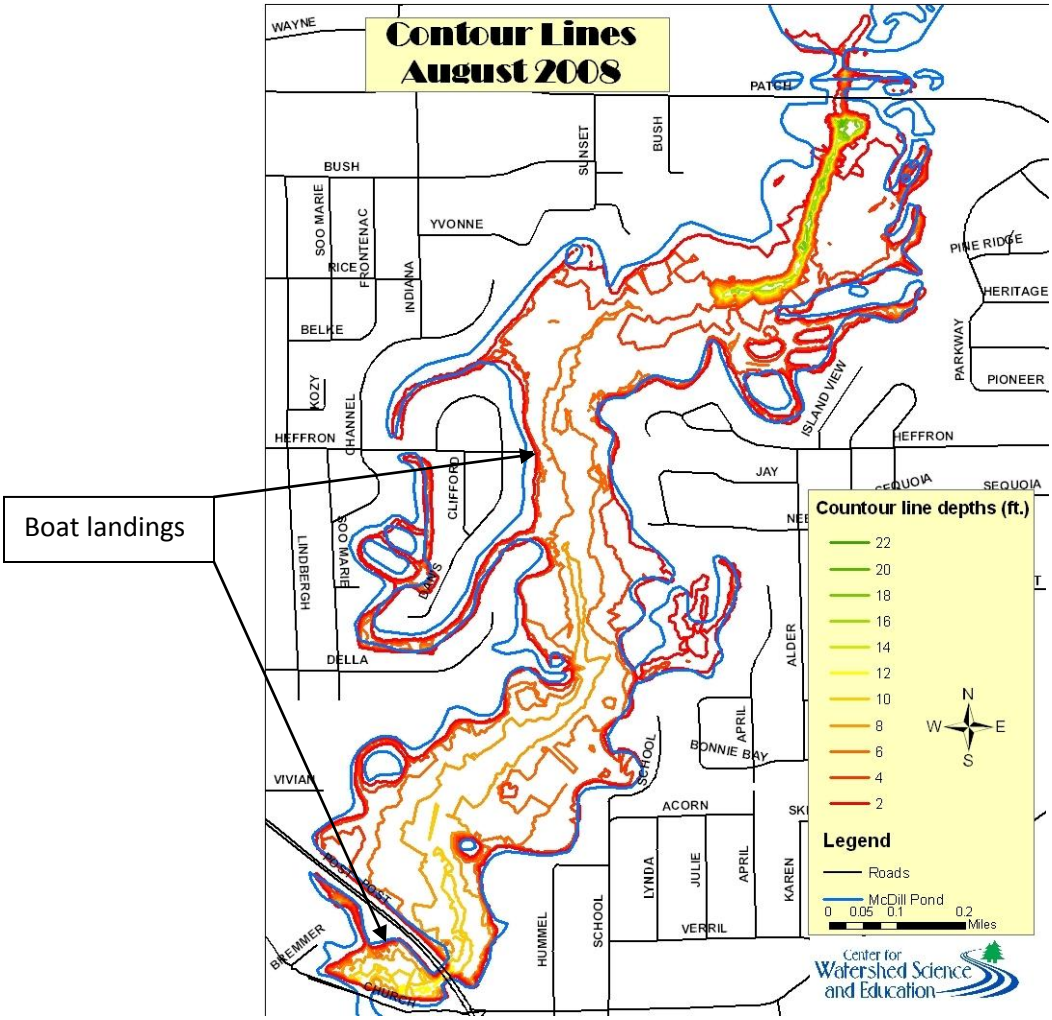
The McDill Pond APM Committee developed seven goals for the aquatic plant management plan.

1) **Improve the water quality of McDill Pond (less algae, less nuisance-level vegetation).**
2) **Improve the quality of fishing in the pond.**
3) **Accommodate all recreational uses, including boating, fishing, swimming, and wildlife watching.**
4) **Educate and inform the community about APM planning activities.**
5) **Promote the protection and expansion of native aquatic plants.**
6) **Prevent the introduction of exotic plants in the future.**
7) **Decrease the abundance of the invasive plants Eurasian watermilfoil and curly-leaf pondweed.**

Description of McDill Pond and its Watershed

McDill Pond is an impoundment of the Plover River, located mostly between Post Road (Business Hwy 51) and Patch Street in Stevens Point, Wisconsin. It covers 261 acres, with a maximum depth of about 20 feet, according to the 2008 CWSE aquatic plant survey. Water enters the pond via the Plover River, groundwater inflow, surface runoff, and precipitation. The watershed, shown in figure 2, covers 120,922 acres. McDill Pond is moderately recreated by boaters and fishermen. A small kayaking and canoeing outfitter exists just upstream from Patch Street in Iverson Park, which offers short touring trips across McDill Pond. The fishery in the pond consists mainly of panfish, largemouth bass, and northern pike.

Figure 1. Depth contours of McDill Pond. (WDNR, 2008)

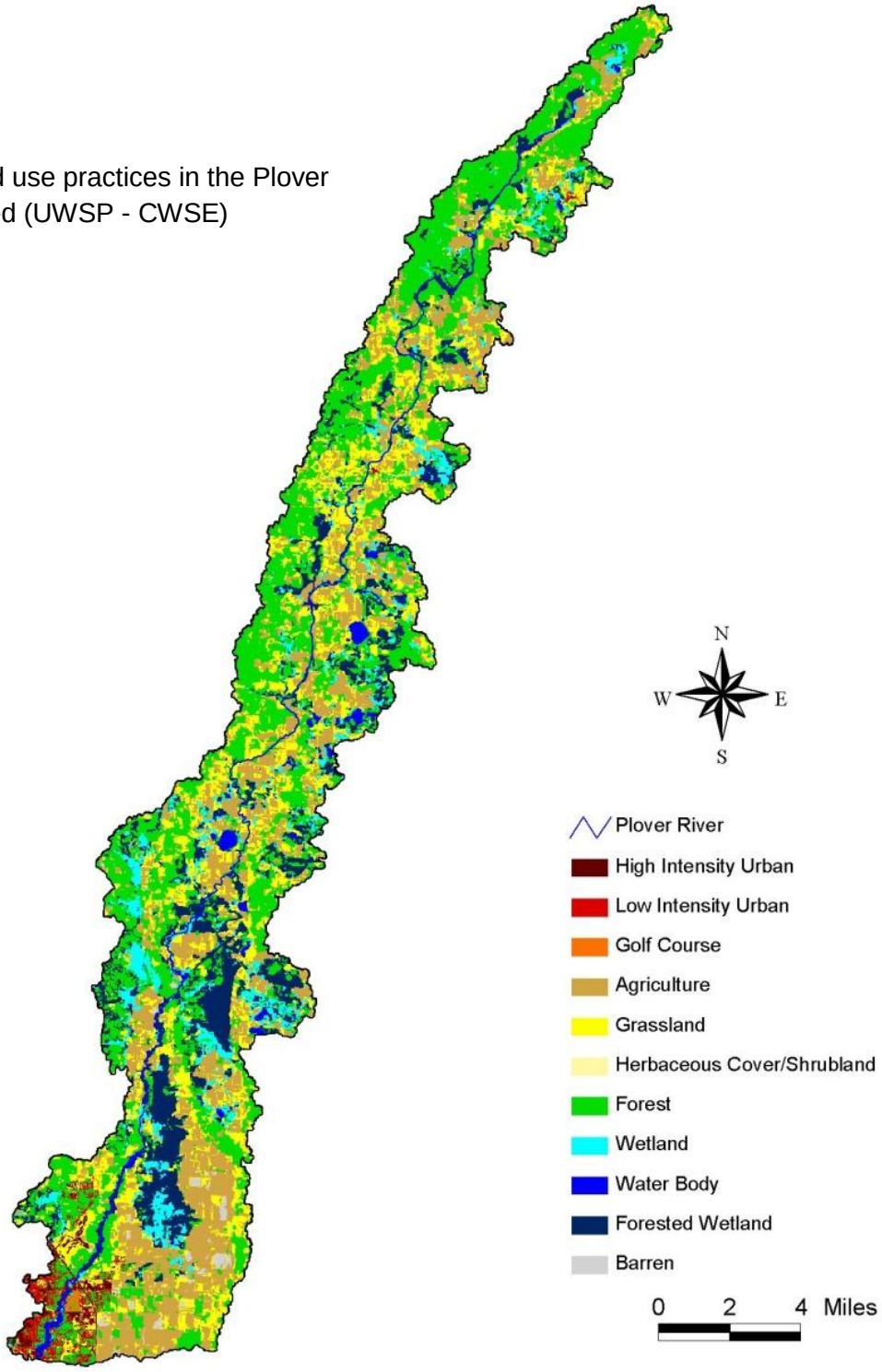


Two boat ramps exist on McDill Pond, and two parks offer shoreline access. The Green Circle Trail also runs along part of the pond. Land use around the pond is primarily residential, but land upstream from the pond is mostly agriculture.

The sandy soils of this watershed allow excess nutrients to quickly penetrate to groundwater, creating the possibility of algae blooms and nuisance-level plant growth. Sandy soils have a low capacity to filter out nutrients as water passes through them, due to their high permeability and low adsorption ability.

Figure 2. Plover River watershed. (UWSP Environmental Task Force, 2002)

Figure 3 - Land use practices in the Plover River watershed (UWSP - CWSE)



Water Quality and Quantity

Figure 4 – Average water clarity of McDill Pond, 2003 (UWSP-CWSE)

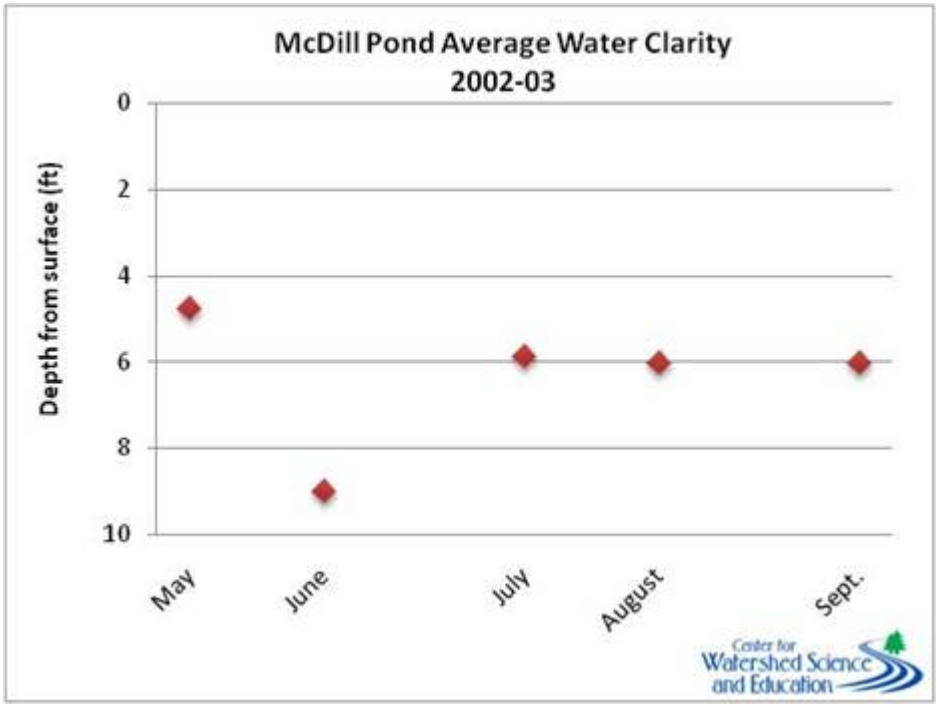
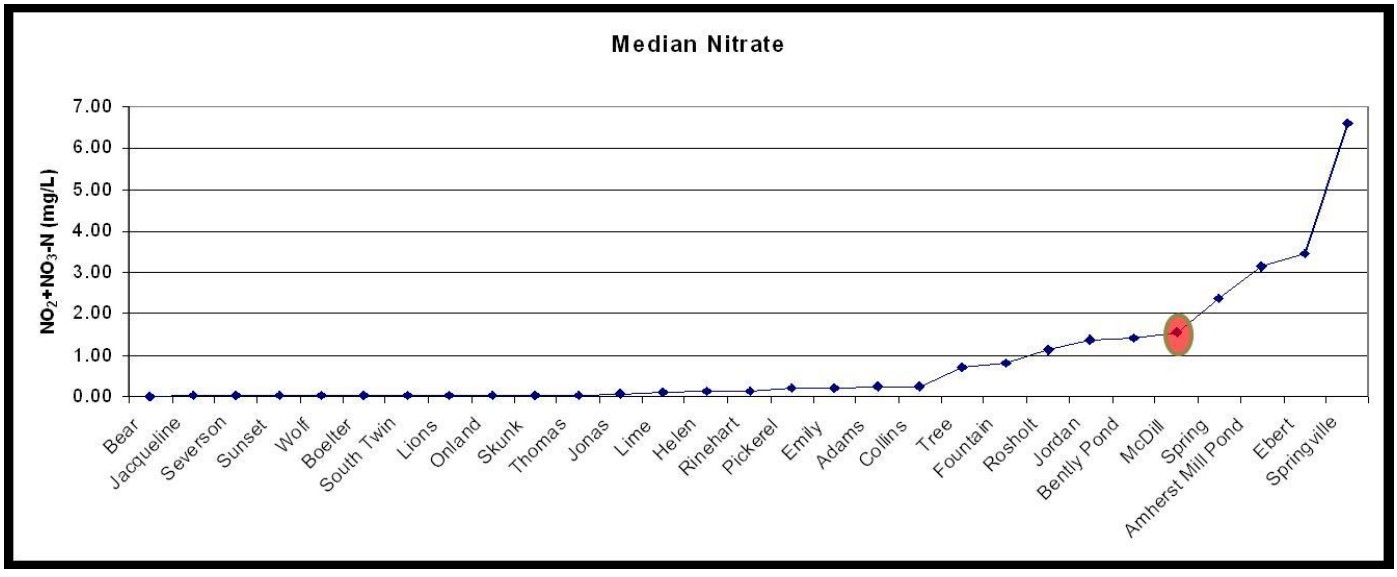
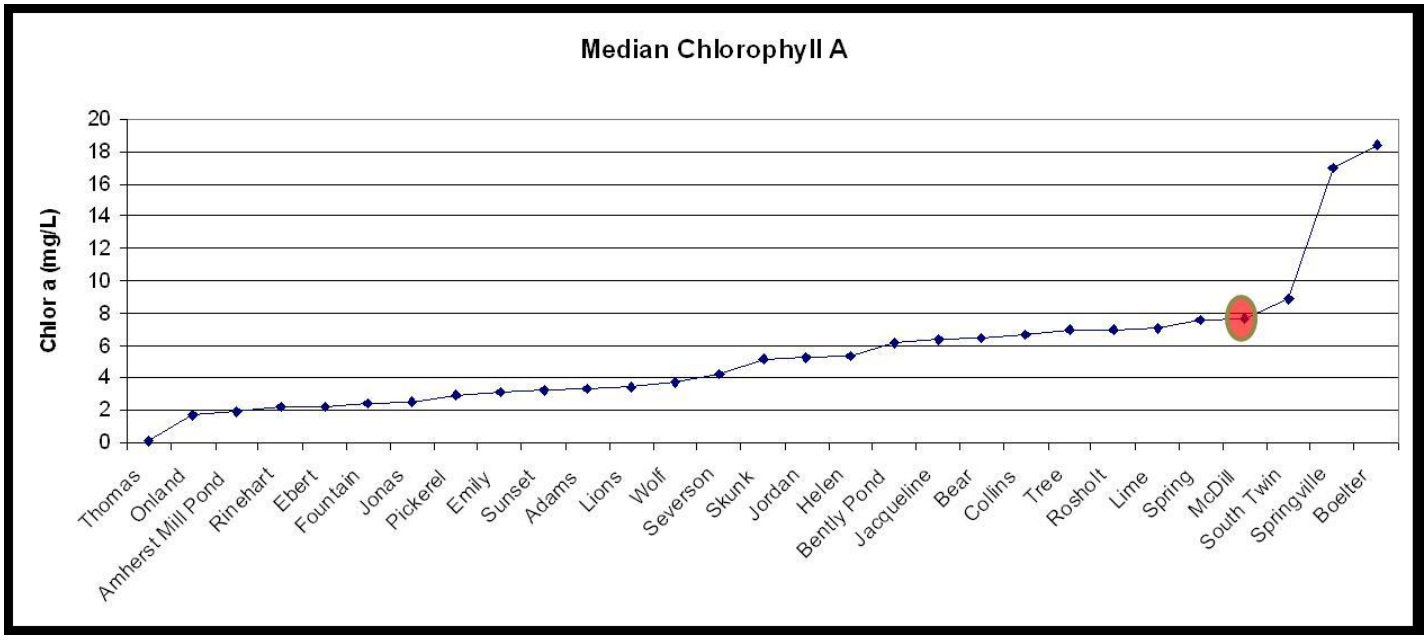


Figure 5. Median nitrate level in McDill Pond and other Portage County lakes, 2003 (UWSP-CWSE)



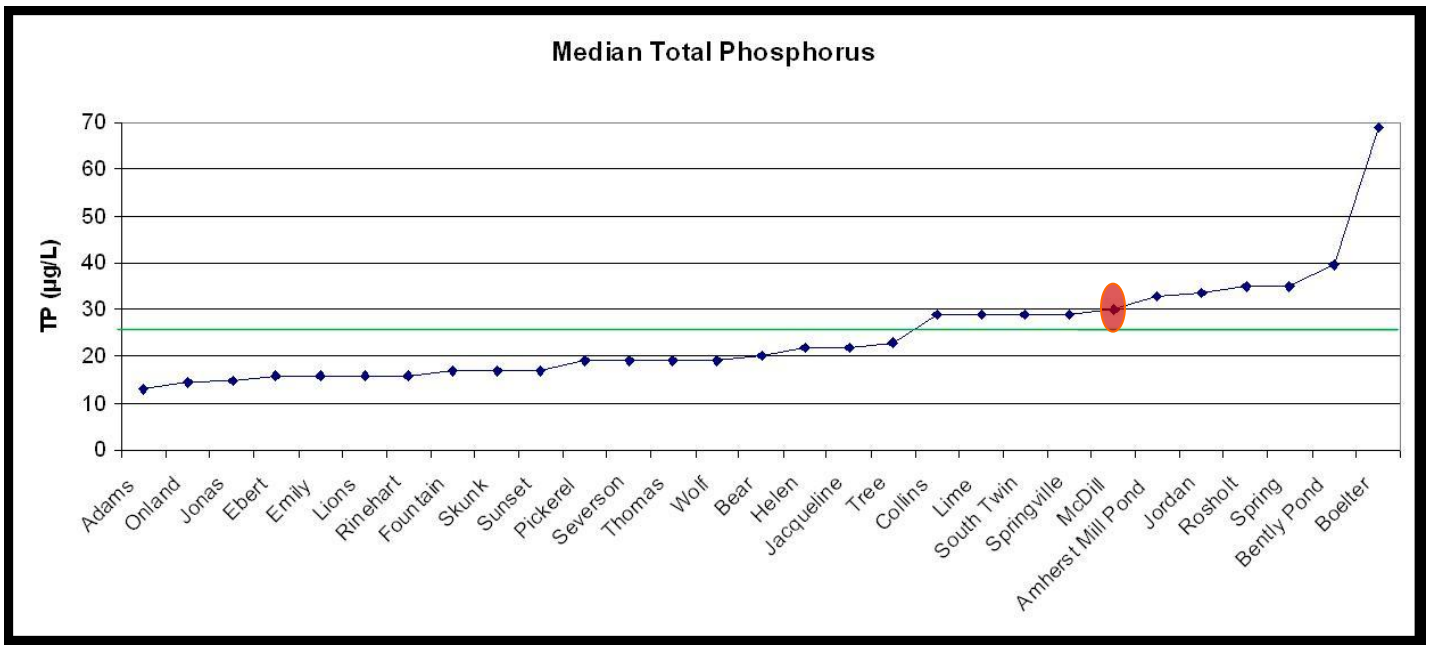
Nitrate levels indicate input of fertilizers or leaking septic systems in the watershed. Nitrate is one of the most important nutrients for plant growth.

Figure 6. Median chlorophyll-A measurements in McDill Pond compared to other Portage County lakes. (UWSP-CWSE, 2003)



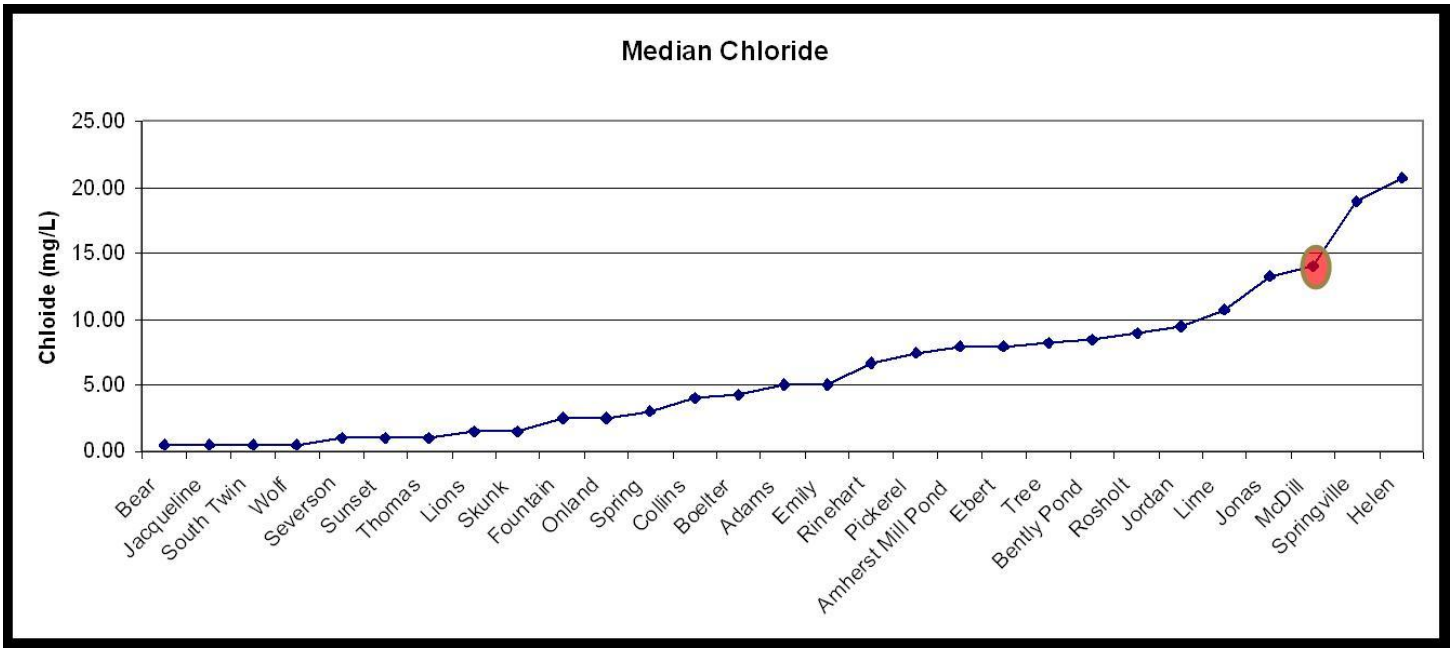
Chlorophyll-A measures the amount of algae in the water. Chlorophyll-A levels generally increase as nutrient input increases.

Figure 7. Median total phosphorus measurements in McDill Pond compared to other Portage County lakes. (UWSP-CWSE, 2003)



Phosphorus is the primary nutrient affecting algae and plant growth in the majority of Wisconsin's lakes. Major sources include waste from humans and animals, soil erosion, runoff, fertilizers, and detergents. McDill Pond's value of 30ppb classifies the Pond as eutrophic, which means that it is a very fertile lake, with ample nutrients to support an abundant plant community. Eutrophic lakes are very productive (high amount of plant and animal biomass), often contain large rough fish populations, and are susceptible to algae blooms. The average total phosphorus concentration in Wisconsin impoundments is 65ppb, so McDill is still well below average for an impoundment.[1]

Figure 8. Median chloride measurements in McDill Pond compared to other Portage County lakes. (UWSP-CWSE, 2003)



Chloride is measured to indicate the possibility of contamination from human or animal waste, road salt, or fertilizers. Chloride is not naturally occurring in Wisconsin, except in limestone deposits.

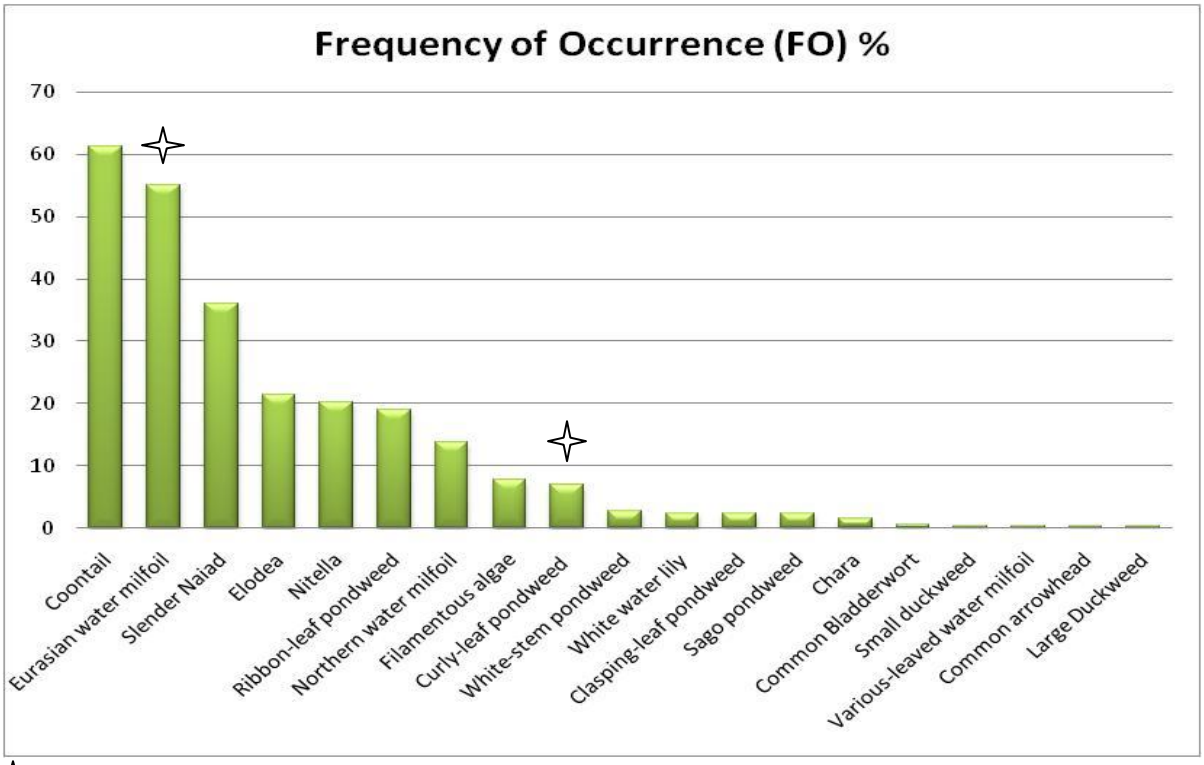
Aquatic Plants of McDill Pond

(UWSP, Robert Freckmann Herbarium)

Table 1: Aquatic plants of McDill Pond.

Submerged plants	**Free-floating plants**
Ceratophyllum demersum - coontail	*Cladophora, Spirogyra spp.* – filamentous algae
Chara spp. – muskgrasses	*Lemna turionifera* - turion duckweed
Elodea canadensis – Canadian waterweed	*Lemna minor* - small duckweed
Myriophyllum sibiricum - common watermilfoil	*Nuphar variegata* - bullhead pond lily
Myriophyllum spicatum - Eurasian watermilfoil	*Nymphaea odorata* - white water lily
Najas flexilis - slender naiad	*Polygonum amphibium* - amphibious smartweed
Nitella spp, - stoneworts	*Spirodela polyrhiza* - large duckweed
Potamogeton epihydrus - ribbon-leaf pondweed	*Wolffia borealis* - northern watermeal
Potamogeton praelongus - white-stem pondweed	*Wolffia brasiliensis* - Brazilian watermeal
Potamogeton crispus - curly-leaf pondweed	*Wolffia columbiana* - common watermeal
Potamogeton amplifolius - large-leaf pondweed	**Emergent plants**
Potamogeton foliosus - leafy pondweed	*Sagittaria latifolia* - broadleaf arrowhead
Potamogeton nodosus - long-leaf pondweed	*Schoenoplectus tabernaemontani* – softstem bulrush
Potamogeton zosteriformis - flat-stem pondweed	*Sparganium eurycharpum* – giant bur-reed
Stuckenia pectinata - sago pondweed	*Typha latifolia* – broad-leaf cattail
Zosterella dubia - water stargrass	

Figure 9. Frequency of occurrence of most plant species found in McDill Pond. (UWSP-CWSE, August 2008)



✧ Exotic species

A total of 16 submergent plant species, 9 free-floating species, and two emergent species were found in McDill Pond during the 2008 CWSE plant survey. Additionally, 39 shoreland species of plants were found. Five species were determined to be at nuisance levels: Coontail, Eurasian watermilfoil (EWM), curly-leaf pondweed (CLP), slender naiad, and filamentous algae.[4] This survey was completed in June, when CLP is most abundant.

Aquatic plants are essential to a healthy lake ecosystem. They provide shelter and food to fish, invertebrates, reptiles, amphibians, and waterfowl. A diverse community of aquatic plants can preserve water quality by reducing erosion and sedimentation, removing nutrients from the water, and reducing algae growth. Native plants can also prevent exotic species from establishing themselves in the lake. However, exotic plants will often outcompete the native plants that offer so many benefits, and the entire ecosystem can suffer. McDill Pond is highly infested with two exotic invasive aquatic plants—CLP and EWM.

Current distribution of Curly-leaf pondweed and Eurasian watermilfoil

Figure 10. 2008 distribution of CLP

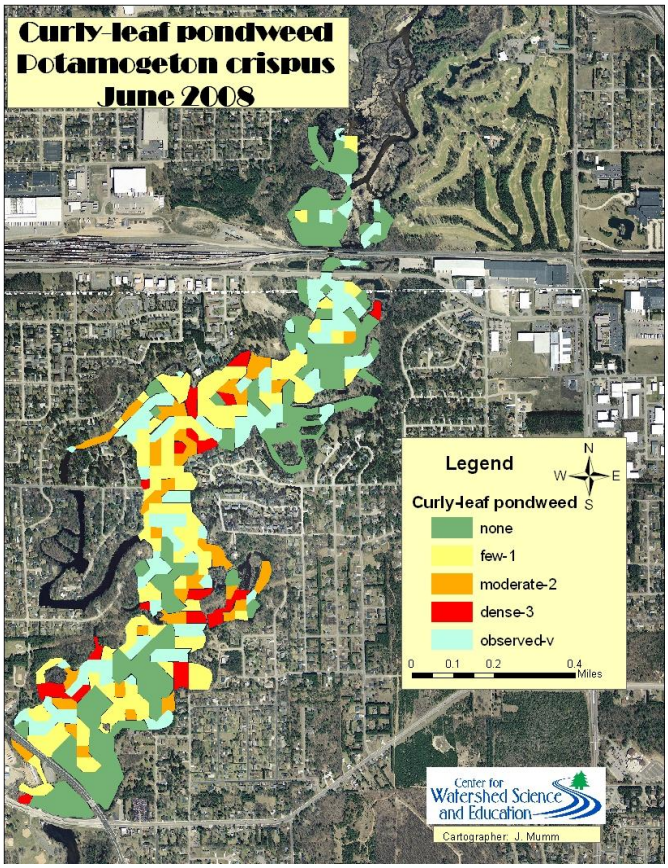
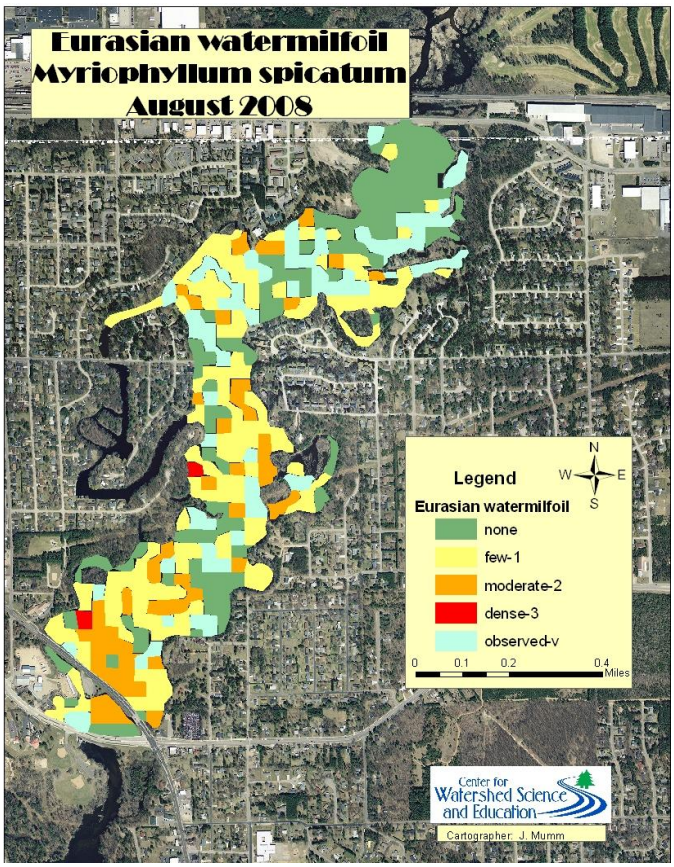


Figure 11. 2008 distribution of EWM



VI. Historical Aquatic Plant Treatments – these treatments were targeting nuisance plant growth as a whole, not specifically exotic plants.

1950s – Mechanical harvesting

1959-1962 – Pond drained. Dredging in places, plants burned

1966-1967 – Plants reach nuisance levels again

1967-1981 – Herbicides used to control plants

1982-1991 – Mechanical harvesting resumes, goal to remove phosphorus

1991 – Minor drawdown, dredging of sediment-trapping areas

1992 – APM recommends mechanical harvesting and responsible riparian land use practices

1996 – Harvester summary = 21% milfoils, 61% CLP

June/July 2002 – Dredging, unrelated to plant control. 147,000 cubic yards removed to create sediment trap

2004 – Plant survey via Portage County EWM studies

- Milfoils found more abundant than CLP
- Milfoils and CLP in the top five most abundant plants
- Recommendation – “targeted harvesting”

2006 – Tested “targeted harvesting” in specified locations through special permit under Deb Konkel, WDNR

- Avoided spawning areas
- Results after one season unimpressive. Need longer application to fully evaluate
- Less vigorous growth in summer. Group was able to manage it earlier

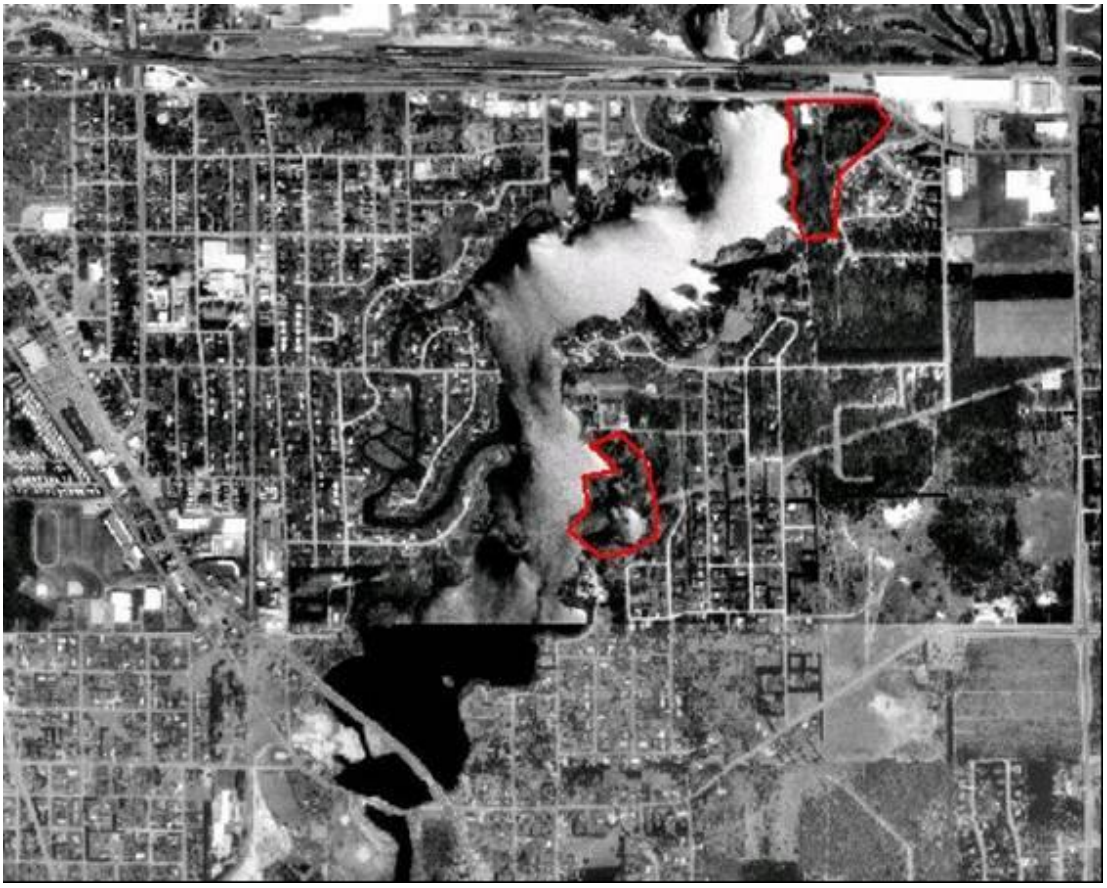
Table 2. Aquatic herbicide use 1967-1982.

Herbicide	Date	Acres Treated	Chemical Amount
Sodium arsenite	Jul-67	7	90gal
Diquat	Jun-68	6	12gal
Diquat	Jul-68	1.1	3gal
Diquat	Aug-68	2	3gal
Aquathol	Aug-68	2	50lbs
Diquat	Jun-69	10	20gal
Diquat	Jul-69	2	5gal
Aquathol K	Jul-70	2	22.5gal
Aquathol	Jul-70	0.5	150lbs
Diquat	Jul-70	5	10.5gal
Diquat	Aug-70	2	2gal
Aquathol K	Jun-71	17	16gal
Copper sulfate	Jul-71	11.1	60lbs
Aquathol Plus	Jun-72	21	70gal
Aquathol Plus	Jul-73	9.4	70gal
Aquathol Plus	Jul-73	11	400lbs
Aquathol Plus	Jun-74	36	100gal
Aquathol K	Jun-75	18	30gal
Diquat	Jun-75	38	27gal
Aquathol K	Jun-76	20	30gal
Copper sulfate	Jun-76	15	100lbs
Diquat	Jun-77	20	35gal
Diquat	Jun-78	25	46gal
Diquat	Jun-79	25	40gal
Cutrine Plus	Jun-69	25	40gal
Cutrine Plus	Jun-80	25	30gal
Diquat	Jun-80	25	30gal
Diquat	Jun-81	25	29gal
Aquathol K	Jun-81	25	30gal
Cutrine Plus	Jun-81	25	40gal
Cutrine Plus	Jun-82	27	25gal
Aquathol K	Jun-82	27	25gal
Diquat	Jun-82	27	23gal

VII. Amphibians of McDill Pond

Five species of amphibians were found in or around McDill Pond during the 2003 Portage County Lakes Study. These include American toad, green frog, northern leopard frog, gray tree frog, and spring peeper. Two species of reptiles were also found in the survey, which included snapping turtles and painted turtles. Spiny softshell turtles and wood turtles have been documented historically, both of which are threatened species in Wisconsin. The primary areas of amphibian habitat are shown in Figure 12.

Figure 12 - Areas of amphibian habitat (UWSP-CWSE)



VIII. Survey of Residents' Opinions

A survey was sent out to all of the residents of the McDill Lake District by the McDill Pond Aquatic Plant Management Committee. Of about 130 surveys distributed, **52** were returned—a 40% return rate. Not every question on every survey was

answered. Every survey respondent owned or rented land on the pond, and lives there year-round. The average respondent has lived on McDill Pond for about 20 years.

A. Water Quality

When asked about water quality in McDill Pond, 75% of respondents felt that it has declined since they started living on the pond. Zero of them felt that it has improved. Also, zero respondents felt that the water quality is “excellent” or “very good”. 87% felt it was “fair” or “poor”. “Algae scum” (65%) and “weeds” (79%) were said to be the biggest problems related to water quality in McDill Pond. When asked for the likely factors that contributed to these problems, 54% said “fertilizer use”, 23% said “herbicide/pesticide use”, 17% said “soil erosion”, and 15% indicated that “development pressure” was a factor.

B. Fishing

The average respondent has fished in McDill Pond for over 20 years. 9% of respondents felt that the fishing is currently “excellent” or “good”; 37% felt it is “average”, and 54% said “fair” or “poor”. None thought the fishing had improved in recent years, but 70% felt it had declined. Respondents indicated that the following issues contributed to the decline: “Fertilizer use” (54%), “herbicide/pesticide use” (31%), “livestock agriculture” (23%), “development pressures” (19%), and “vegetable agriculture” (15%). These responses seem to indicate an understanding of the relationship between excessive nutrient input, excessive vegetative growth, and the possibility of a decline in fishery quality.

C. Wildlife

The resident survey also asked for input on the value of wildlife and wildlife habitat. 54% of respondents said it was “very important” to them, 30% said “somewhat important”, 10% said “not very important”, and 6% chose “not important”. 76% of respondents felt that the current wildlife habitat in and around the lake was “excellent” or “good”, while only 24% felt it was “fair” or “poor”. One person felt that the quality of wildlife habitat near the pond has improved in recent years, while 40% felt it had declined. The remainder did not recognize a change. When asked which factors may have influenced a decline in habitat quality, the three most popular answers were “fertilizer use” (33%), “development pressures” (30%), and “livestock agriculture” (13%).

D. Aquatic Plants

The respondents were asked to rate their familiarity with issues related to native aquatic plants and lake ecology. 16% said “not at all familiar”, 36% said “slightly familiar”, 38% said “moderately familiar”, and 10% said “very familiar”. 65% respondents agreed that native aquatic plants help to maintain the health of McDill Pond; 13% disagreed with that statement. In contradiction, when asked if abundant floating and emergent native plants are signs of an *unhealthy* lake, 70% of respondents agreed, while 13% disagreed. 55% agreed that removal of native aquatic plants is harmful to the lake’s health; 22% disagreed.

According to 40% of respondents, native aquatic plants are weeds and should be removed; an equal number disagreed with that statement. Another question in this section was “which statement best describes your opinion of a desirable amount of plant growth in McDill Pond?” The primary response was “moderate growth – just the right amount for fish and wildlife” (67% of responses). 13% said “light growth – very little, less than optimum for fish and wildlife”. 60% of respondents agreed that native aquatic plants add to the scenic beauty of a lake; 33% disagreed. 35% of respondents felt that native plants reduce the economic value of the lake in the long term; 40% disagreed.

These results suggest that about half of the residents around McDill Pond have a good understanding of lake ecosystems and plant ecology, while the other half needs more education.

To evaluate the effort of the residents to prevent introductions of aquatic invasive species (AIS), the survey asked if they clean their boat and trailer. Of the 34 that answered the question, 62% said “yes, all the time”, 24% said “yes, some of the time”, and 15% said “no, never”. This is a critical issue to address if future AIS infestations are to be prevented.

When asked about several management tools for Eurasian watermilfoil, 67% agreed that an aquatic plant harvester is an acceptable tool (27% disagreed); 63% agreed that a winter drawdown is acceptable (17% disagreed); and 71% agreed that chemicals are acceptable tools (21% disagreed).

E. Shoreline

54% respondents felt that removal of native aquatic plants increases shoreline erosion, 35% disagreed. Asked if lake shorelines are more beautiful when lawns are turf grass and mowed to the lake edge, 17% agreed, while 73% disagreed. This perception, of course, needs to change if nutrient runoff into the pond is to be effectively reduced. 86% of the residents indicated that they use fertilizer on their property, at an average of 34.4 feet from the water. Ideally, residents would not apply fertilizers within 35 feet of the water, and that 35 feet would be occupied by a diverse community of native plants. The respondents were asked if lake shorelines are more attractive when they have an abundance of native plants; 65% agreed, while 21% disagreed. Describing the location where their property meets the lake, 51% responded “undeveloped natural landscape”, 26% said “rock riprap”, 9% said “retaining wall”, another 9% said “lawn”, and 4% said “landscaped trees and shrubs”. Figures 13 and 14 show the width of shoreline vegetation around McDill Pond.

Figure 13. Shoreline habitat survey map

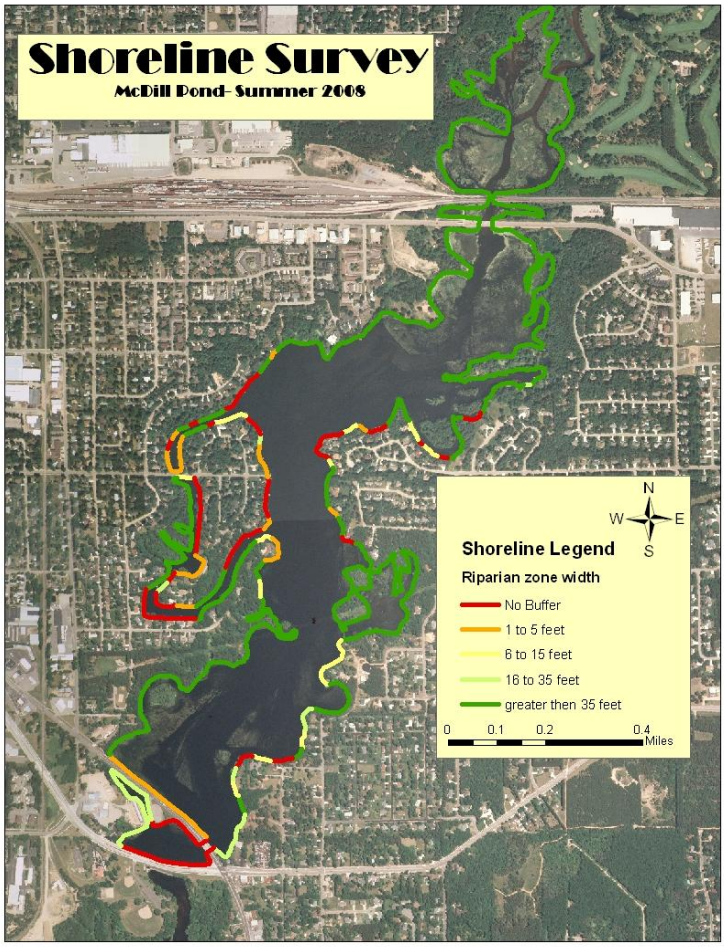
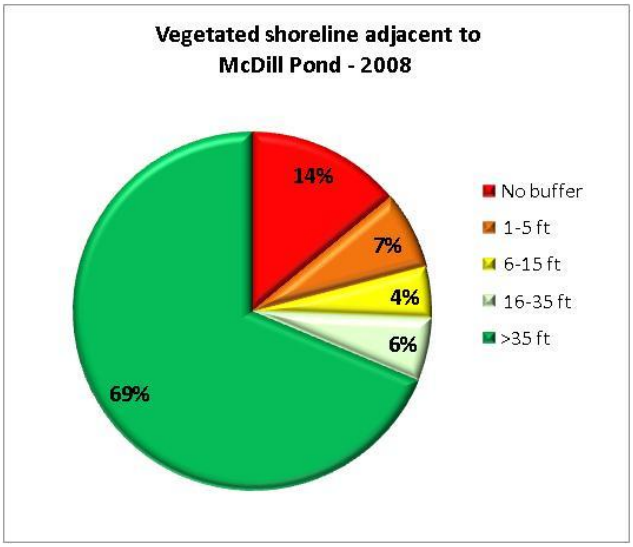


Figure 14. Shoreline habitat survey chart



The amount of surface runoff from mowed lawns is typically at least 10 times higher than that of wooded areas. Some lawns will shed up to 6% of total precipitation on average. Wooded areas have many advantages to reduce runoff, including a canopy (which can reduce rainfall impact and increase evaporation), more organic matter in the soil (which quickly absorbs water), and increased soil permeability (which allows faster infiltration)[2]. Grass can tend to lie down on the ground during rainfall events, forming a sheet that catches and transports water downslope.

F. Decision-Making

The final question on the survey asked who should be involved in management decisions for McDill Pond. The responses included “lake association members” (51), “local government” (32), “county government” (19), “clubs & associations” (17), “local watershed residents” (14), and “state government” (11).

IX. McDill Pond Aquatic Plant Management plan for control of Eurasian watermilfoil, curly-leaf pondweed, and other nuisance-level plant growth.

The focus of the McDill Pond aquatic plant management plan is to reduce the abundance of nuisance-level vegetation in the pond, including two exotic species, Eurasian watermilfoil and curly-leaf pondweed. This is to be done while minimizing the effect on native species and the ecosystem balance. A multiple-treatment approach was agreed upon by the McDill Pond APM Committee. No one approach will work uniformly, and adaptive management must be ongoing, as monitoring efforts continue to reveal new information. Each of the treatment methods has specific guidelines for use to optimize success and keep human or ecosystem risk to a minimum. This plan addresses the following considerations:

- Maintain the health of the McDill Pond ecosystem and of humans.
- As much of the native aquatic vegetation be left in place as possible to provide sufficient food and habitat for aquatic biota. A severe reduction in vegetation in the pond would negatively impact the entire ecosystem, causing events like algae blooms and fishery decline.
- Herptiles (reptiles and amphibians) require suitable land to hibernate in late fall. Therefore, a drawdown should reach final pool level before October 1, to reduce mortality.
- Chemicals such as 2,4-D can be dangerous to aquatic biota and to humans if applied improperly. Proper application also maximizes effectiveness against the target plant. An experienced, certified chemical applicator can help assure safety and increased efficacy.

Physical limitations in McDill Pond may be a factor in plant control method selection.

- Areas with springs that will not freeze
- Areas that cannot be reached with a harvester
- Current produced by the Plover River

A. Major Guidances of the McDill Pond Aquatic Plant Management Plan:

- 1. Water level manipulation
- 2. Manual removal
- 3. Biological control
- 4. Mechanical harvesting
- 5. Non-point source nutrient control
- 6. Herbicide treatments

- 7. Planting of native species
- 8. Bottom barriers
- 9. Dredging
- 10. Allelopathy
- 11. Areas of special consideration

1. Water level manipulation:

Water level manipulation is a proven and effective tool for aquatic plant management. Different water level fluctuation scenarios can be used to achieve different results. Therefore, it is necessary to understand what specific goals are to be achieved before pursuing this option. Due to the lake-wide effects of this action, considerable planning and thorough participation of all interested parties must be completed before any water level manipulation action is taken.

Partial water level drawdowns during the growing season are used on other impoundments across the country to re-invigorate stands of high-quality emergent vegetation. This is an option on any impoundment. However, with this brings risk of unwanted colonization of exotic species such as purple loosestrife and others. Care must be taken when planning any water level fluctuation.

A winter drawdown freezes out plants that cannot withstand freezing (see table 4). EWM is one of them. Many native plants tolerate freezing well by producing seeds that can withstand freezing, and some even require it for germination. This method is employed throughout the colder climates of the U.S. as a tool for EWM control. However, it can have detrimental effects to non-target species as well, so it should not be employed unless EWM is one of the most dominant and abundant species in the Pond.

Drawdowns can affect reptiles and amphibians if the final winter pool level is not achieved by October 1st. It is only to be done when all other management options have been deemed insufficient. Winter drawdowns can also affect the spawning of certain fish species. Fish species that spawn early in spring may be affected. A future drawdown will require more planning beyond the scope of this aquatic plant management plan.

All non-emergency drawdowns for aquatic plant management need to be permitted by WDNR and must have an Environmental Assessment completed. The process also includes a public comment period; therefore it is necessary to being planning very early in the year and have all parties notified of the intention. The socio-economic impacts can also be significant, which is why it becomes incumbent on the applicant to provide adequate information to the public and garner public support.

APM Guidances:

- Planting of native species during low water should be explored. Use of seeds from native stock from the pond can be conducted with approval from the WDNR. These types of projects can be done as a community or conservation group activity. This provides inexpensive labor and builds community support for the enhancement of the Pond.

- Due to design limitations, the dam can only accommodate a complete (12-foot) drawdown for the winter. Therefore, winter drawdowns on McDill Pond will be permitted no more than once every 10 years, due to the stress on the ecosystem caused by a 12-foot reduction in water level. However, if research shows that fish and other wildlife are not impacted, the allowable frequency may be increased. The partners of this plan should work together to gather the needed data for a complete evaluation of the impacts of such an extensive action.

- A 12-foot drawdown has a significant impact on the aquatic, riparian, and terrestrial ecosystems in and around McDill Pond, and will only be permitted again in the future if the landowners display serious effort. A drawdown should not be considered an option until all other options have been attempted and dismissed.

Table 3. Effect of drawdown on common lake plants of McDill Pond[3]

	Drawdown Type	
Submerged plants	Effect of Winter	Effect of Summer
Ceratophyllum demersum - Coontail	D	V
Chara spp. - Stoneworts	I	V
Elodea canadensis – Canadian waterweed	V	V
Myriophyllum sibiricum - Common watermilfoil	V	V
Myriophyllum spicatum - Eurasian watermilfoil	D	V
Najas flexilis - Slender naiad	I	V
Nitella spp, - Stoneworts	-	-
Potamogeton epihydrus - Ribbon-leaf pondweed	V	-
Potamogeton praelongus - White-stem pondweed	-	-
Potamogeton crispus - Curly-leaf pondweed	D	–
Potamogeton amplifolius - Large-leaf pondweed	V	-
Potamogeton foliosus - Leafy pondweed	-	-
Potamogeton nodosus - Long-leaf pondweed	-	-
Potamogeton zosteriformis - Flat-stem pondweed	V	-
Stuckenia pectinata - Sago pondweed	I	-
Zosterella dubia - Water stargrass	-	-
Free-floating plants		
Lemna turionifera - Turion duckweed	V	V
Lemna minor - small duckweed	-	-
Nuphar variegata - Bullhead pond lily	-	D
Nymphaea odorata - White water lily	-	V
Polygonum amphibium - Amphibious smartweed	-	I
Spirodela polyrhiza - Large duckweed	D	-
Wolffia borealis - Northern watermeal	-	-
Wolffia brasiliensis - Brazilian watermeal	-	-
Wolffia columbiana - Common watermeal	-	-
Emergent plants		
Sagittaria latifolia - broadleaf arrowhead	-	-
Schoenoplectus tabernaemontani – Softstem bulrush	I	-
Sparganium eurycharpum – giant bur-reed	-	-
Typha latifolia – broad-leaf cattail	V	V

I = increase D = decrease -- = insufficient data V = variable effect

2. Manual removal:

Physical removal of nuisance plant growth is possible by hand or with a rake, and is often very effective when the entire root system is removed. Hand-pulling is very species-selective, and is perfect for areas where there are many native plants mixed in with EWM or CLP. Some lake associations arrange for the harvesting operators to pick up piles of hand-harvested plants from docks, as a way to facilitate hand-pulling efforts. Optionally, EWM and CLP make excellent fertilizer or mulch for gardens or flower beds. Hand-pulling of exotic species does not require a permit, and can be done anytime during the year. However, hand-pulling of native species can only be done in a path less than 30 feet wide, and this path must extend out from that person's shoreline property. Any other removal of native species requires a permit.

APM Guidances:

- Hand-pulling of exotic species does not require a permit, and can be done anytime during the year.
- Hand-pulling of native species requires a permit when removal is wider than a 30-foot path.
- Proper training in identification of Eurasian watermilfoil is encouraged, so that native watermilfoils are not accidentally removed.
- Pulled plants must be removed from the water.

3. Biological control:

Eurasian watermilfoil (*Myriophyllum spicatum*) can be controlled by *Euhrychiopsis lecontei* weevils under the right conditions. These weevils are small insects that eat the tips, stems, and leaves. The adults lay eggs on the tips of the stems, and the larvae burrow into the stem, compromising the health and vigor of the plant. *E. lecontei* weevils are native to McDill Pond, previously inhabiting the northern watermilfoil (*Myriophyllum sibiricum*) found there. The weevils feed only on watermilfoils, but tend to develop a preference for EWM. Weevils can be reared in a lab and released into the pond to increase the population size.

Weevils require a natural shoreline consisting of leaves and other natural vegetative debris for overwintering. Manicured lawns do not provide suitable overwintering habitat. Thus, for weevils to be effective, there must be suitable habitat nearby.

Considerable research is being conducted in other lakes located in Portage County. This research will evaluate what conditions are needed for weevils to thrive that may help lake managers better utilize weevils for EWM control. The partners in this plan may participate with UWSP and other agencies to assist in this research.

Purple loosestrife can also be controlled with biocontrol. This well-established application uses *Galerucella* beetles that feed on the leaves and stems of purple loosestrife. Abundant *Galerucella* beetle populations can readily defoliate a stand of purple loosestrife. Galerucella beetles should be the primary control method considered if purple loosestrife becomes established in McDill Pond.

APM Guidances:

- In the event that pioneer colonies are detected, rapid response is needed to prevent spreading. Contact the WDNR or Golden Sands RC&D if purple loosestrife is thought to be found.
- Where biocontrol may be an option—areas too shallow for harvesting, and those with suitable habitat—surveys of natural weevil populations should be conducted to provide baseline data for the decision-making process.
- Proper habitat should be maintained around any area where weevils are present or released. Bare sand or mowed lawns will not support weevil populations. Woods, prairies, or unmowed grasses will support weevils.

4. Mechanical harvesting:

Mechanical harvesting of aquatic plants can be effective at removing nutrients from the water and clearing lanes for fish or recreational convenience. Use of a harvester is non-selective—it cannot target a single species in a stand of plants. Removing native plants can open up areas to quick invasion by exotic species. Improvements due to harvesting are only short-term, but it can be very beneficial when employed at the correct time. Cutting curly-leaf pondweed early in the spring, prior to seed formation, can help reduce CLP growth. EWM spreads mainly by fragmentation, so running a plant harvester through it should be avoided.

Impoundments generally have a large amount of nutrients in the system, due to the settling of sediments and associated nutrients. Particularly when stirred up, those sediments can release the nutrients, making them readily available to plants or algae. The potential for relatively warm water temperatures also makes impoundments more prone to nuisance algae growth. Removal of plants from the system will remove associated nutrients as well, reducing the amount of nutrients available to algae.

APM Guidances:

- McDill Lake District should monitor nutrient levels and track weights in the harvested plant material to calculate seasonal nutrient removal. These data will aid in long-term management strategies such as nutrient controls.
- Harvesting may only occur in areas deeper than 3 feet.
- The plant material that is harvested must be removed from the pond. This removes nutrients from the water, allowing less to be available to fuel plant or algal growth.
- CLP should be targeted early in the season, prior to development of turions (seeds).
- Beds of EWM must be avoided in order to reduce risk of fragmentation.
- Harvesting is mainly to be used to maintain navigational lanes and fish travel lanes.
- A plant tissue sampling program should be developed to monitor nutrient removal.

5. Non-point source nutrient control:

The Lake District should consult with the City of Stevens Point to reduce stormwater input. Installation of bioswales could be an option. Landowners can restore shorelines with native plants. Residents throughout the urban area of the watershed can install rain gardens, which would be very effective at reducing nutrient input to the pond. Phosphorus and nitrogen fertilizers should be reduced or eliminated from use throughout the watershed. These two components are the most important plant nutrients, and they can cause explosions of plant growth or algae blooms. Consulting with the City to enact a ban on phosphorus-containing fertilizers is recommended,

since nutrients do not only originate from lakeshore properties. These nutrients often arrive from non-lakeshore properties, carried by storm sewers to the pond. All of the management efforts could be for naught if nutrient controls are not included as a major component of the efforts.

The Lake District should also work with the Portage and Marathon County Land and Water Conservation Departments (LWCDs) to identify and remedy nutrient sources in the watershed outside of the urban areas. LWCDs can apply for grants from the WDNR and other agencies to possibly fund projects that identify sources and then apply for WDNR Targeted Runoff Management grants to fund the physical remediation of nutrient sources.

APM Guidances:

- A workshop in 2009 should be scheduled to familiarize landowners with shoreline restoration ideas.

- Lake district members should work with partners to pursue watershed-wide nutrient reduction.

6. Herbicide treatments:

Herbicides are an effective option to remove nuisance plant growth. Some chemicals are species-selective, others are not. The appropriate chemical will be one that targets the nuisance plant growth specifically, and does not unintentionally impact many native plants. Removal of native plants would open up bare ground for exotic species to invade.

Herbicides must be applied at the correct time and correct dosage to be effective. Once EWM reaches the surface, it slows its growth and is less susceptible to some chemical treatments. A licensed professional is usually required to apply herbicides. Early spring, while the plant is first actively growing, is the best time to treat the exotic species EWM and CLP. The plants are readily absorbing and transporting nutrients throughout their systems as they are recovering from winter, and are very susceptible to herbicide treatments. Moreover, many native plants are not yet actively growing, which provides an excellent opportunity to treat the exotics without the risk of damage to native plants. Protection of native plants is vital to control EWM and CLP re-growth. The major treatments of the year are to take place during this period.

However, impoundments often have their highest flows at this time of year. Higher flow results in a shorter retention time, allowing less time for the chemical to contact the plant. The pellet form of 2,4-D requires a 14-day contact time. Later in the season when the flow generally decreases, the plants are less susceptible to chemicals. The

McDill Lake District should work with the chemical applicator and WDNR to decide the most effective time to apply chemical treatments.

Selection of the most effective chemical treatment.

Many chemical treatment options exist, and it is critical to select the one that is most effective for this specific lake, and best accomplishes this lake's specific goals.

Table 4. Pros and cons of various chemical treatments

2,4-D (Pros)	**2,4-D** (Cons)
Highly effective on EWM	May cause oxygen depletion
Can be used in synergy with Endothall for early-season treatments	Monocots are not affected, including curly-leaf pondweed
Comes in granular or liquid form	Toxic to aquatic fauna if applied at improperly high dosage
Does not affect monocots	
Can be selective depending on concentration and seasonal timing	
Endothall (Aquathol) (Pros)	**Endothall (Aquathol)** (Cons)
Effective on EWM and CLP	Kills many native pondweeds
Can be selective depending on concentration and seasonal timing	Not as effective in dense vegetation
Can be combined with 2,4-D or copper treatments	Toxic to aquatic fauna if applied at improperly high dosage
Diquat (Reward) (Pros)	**Diquat (Reward)** (Cons)
Effective on EWM	Broad-spectrum, may impact native pondweeds, Elodea, and coontail. Toxic to many natives at the concentration needed to kill EWM.
Fast-acting	Toxic to aquatic invertebrates
Limited toxicity to fish and other fauna	Ineffective in cold or turbid water
	Contact herbicide, does not work as a systemic at label-prescribed rate
Fluridone (Sonar, Avast) (Pros)	**Fluridone (Sonar, Avast)** (Cons)
Effective on EWM	EWM has shown elsewhere in the U.S. to develop resistance
Has minor effect on Dissolved oxygen levels	Requires long contact time, which McDill does not have
Applied at low concentration	Affects many native plants found in McDill Pond, at concentration needed to control EWM
Low toxicity to aquatic fauna	

Glyphosate (Rodeo) (Pros)

Effective on floating and emergent plants (i.e. purple loosestrife)

Non-toxic to most aquatic animals at recommended dosages

Glyphosate (Rodeo) (Cons)

Ineffective in turbid water

No controlling effect on submerged plants

Contains phosphorus

Inexpensive terrestrial form (RoundUp) is inappropriate for shorelines due to lethality to herps

Triclopyr (Renovate) (Pros)

Effective on emergent and floating plants

Results in 3-5 weeks

Low toxicity to aquatic animals

No recreational use restrictions following treatment

Triclopyr (Renovate) (Cons)

Negative impact to some native plants

Breaks down quickly in UV(sun) light

Copper compounds (Cutrine Plus) (Pros)

Reduces algae growth, increases water clarity

No recreational restrictions following treatment

Copper compounds (Cutrine Plus) (Cons)

Copper accumulates and persists in sediment

Short-term results (2 weeks)

Toxicity to invertebrates and fish may be caused after extended use

APM Guidances:

- Chemicals are only to be used on exotic species, and only in areas where hand-pulling is not feasible.

Chemical treatments:

Approved locations for chemical treatment in 2009 and in subsequent years will be determined by recent aquatic plant surveys prior to treatment.

Contact Herbicides:

Contact herbicides affect only the plant tissue in contact with the chemical. These are typically fast-acting and are often used on annual plants (e.g. CLP). Plants that regenerate from roots, tubers, or rhizomes (perennials) can be harder to manage with contact herbicides because the foliage is often killed but not the roots. Herbicides that contain Endothall (Aquathol, Hydrothol), Glyphosate (Rodeo, RoundUp), or Diquat (Reward) are typical contact herbicides.

Systemic Herbicides:

These are herbicides that are absorbed by the plant through leaves or roots, and travel throughout the plant, interfering with growth or nutrient uptake. Systemic herbicides can be much more effective on perennials (e.g. EWM) than contact herbicides because the herbicide can kill the roots, preventing re-growth. Commonly used aquatic systemic herbicides are 2,4-D (Navigate, Weedar 64) and Triclopyr (Renovate).

Algaecides:

Algaecides are used to control nuisance algae. They work on-contact and kill a wide range of algae species. Some blue-green algae (cyanobacteria) are somewhat resilient and may not be affected, whereas most green algae are easily controlled. Algae treatments can be effective but often the relief is short-lived. Areas where algae are treated can often be re-colonized because of wind-blown mats translocating from other untreated areas. Other concerns are long-term use of copper-containing algaecides, because copper toxicity may build up in the sediments that may affect important components of the lake ecosystem. Algaecides should be avoided in McDill Pond.

APM Guidances:

- The areas that can be chemically treated will be determined by the 2009 aquatic plant survey. Before the plant survey is completed, the distribution of surviving EWM will be unknown.
- Systemic herbicides should only be used for EWM control on McDill Pond in early-season treatments when water temperatures are near 60°F. Surviving colonies of EWM will be treated early in the season with a selective herbicide.
- Contact herbicides should only be used for CLP control on McDill Pond in early-season treatments when water temperatures are near 60°F and before turions (reproductive structures) are formed. Treatment after turions are viable will not be productive for long-term control.
- Some systemic and contact herbicides can be applied together for synergistic reasons. Using these two together ultimately uses less herbicide and has shown to deliver excellent results. As more research becomes available, the Lake District should investigate the most efficient and safe manner of synergistic herbicide use.

7. Planting of native species:

Planting of native plant species around McDill Pond is strongly encouraged. This will serve many benefits, including:

- Reduced runoff and nutrient load into the pond
- Increased fish and wildlife habitat
- Increased weevil habitat
- Increased competition against exotic species
- Improved aesthetics

8. Bottom barriers:

Bottom barriers are not a viable option. They are expensive, require a great deal of maintenance, and occlude native species and fish habitat. When the barrier is removed, a bare area is left behind that is readily invaded by EWM and CLP.

9. Dredging:

Dredging is not a viable option for aquatic plant management. It is very destructive, and is not species-selective. Disturbing the substrate in this way opens up a large area of bare substrate; invasive species like EWM or CLP will quickly colonize these areas. Dredging is also very expensive, and is not practical due to the depth required to preclude plant growth in McDill Pond.

10. Allelopathy:

Research suggests that certain native plants like needle spikerush (*Eleocharis acicularis*) can inhibit surrounding plant growth by allelopathy, which is where a plant releases a chemical into the nearby soil that prevents other plants from succeeding. Allelopathy is a relatively new technique that is yet to be proven effective for large-scale control, but it is a possible incentive to preserve native emergent species in near-shore areas. At this time, it is not a viable option for McDill Pond due to the scarcity of needle spikerush in the Pond.

11. Areas of special consideration

Some areas around McDill Pond have been determined to be particularly sensitive to disturbance. These areas should be designated as Sensitive Areas according to NR107 or “Critical Habitat Areas”. Within sensitive areas, special considerations apply for aquatic plant management.

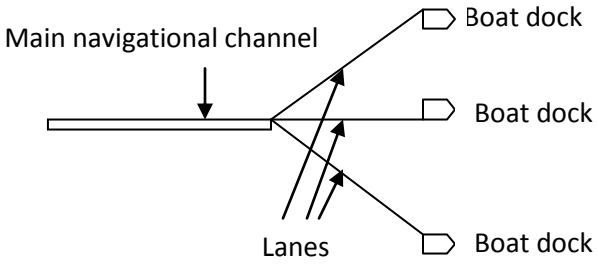
APM Guidances:

- **Manual**:
  Ongoing management for exotic species must be employed. Manual removal must be attempted before other methods in sensitive areas. A training session needs to be held in 2009 to familiarize landowners and volunteers with aquatic plant identification and proper hand-pulling techniques. Monitoring teams need to be developed to keep tabs on changes in the aquatic plant community. Monitors and landowners must show a strong effort in hand-pulling and preventing the pond from returning to its pre-drawdown state.

- **Biocontrol**:
  Biological control potential should be considered in sensitive areas before using chemical control or mechanical harvesting. Partners need to stay abreast on current biocontrol research for possible techniques that may be employed in McDill Pond.

- **Harvesting**:
  Harvesting is only permitted to provide access to riparian landowners’ docks. A main navigational channel can be harvested, as well as several smaller lanes to connect the channel to the individual docks (Figure 15). This is permitted for all species. The potential for biocontrol in these areas should be examined before harvesting.

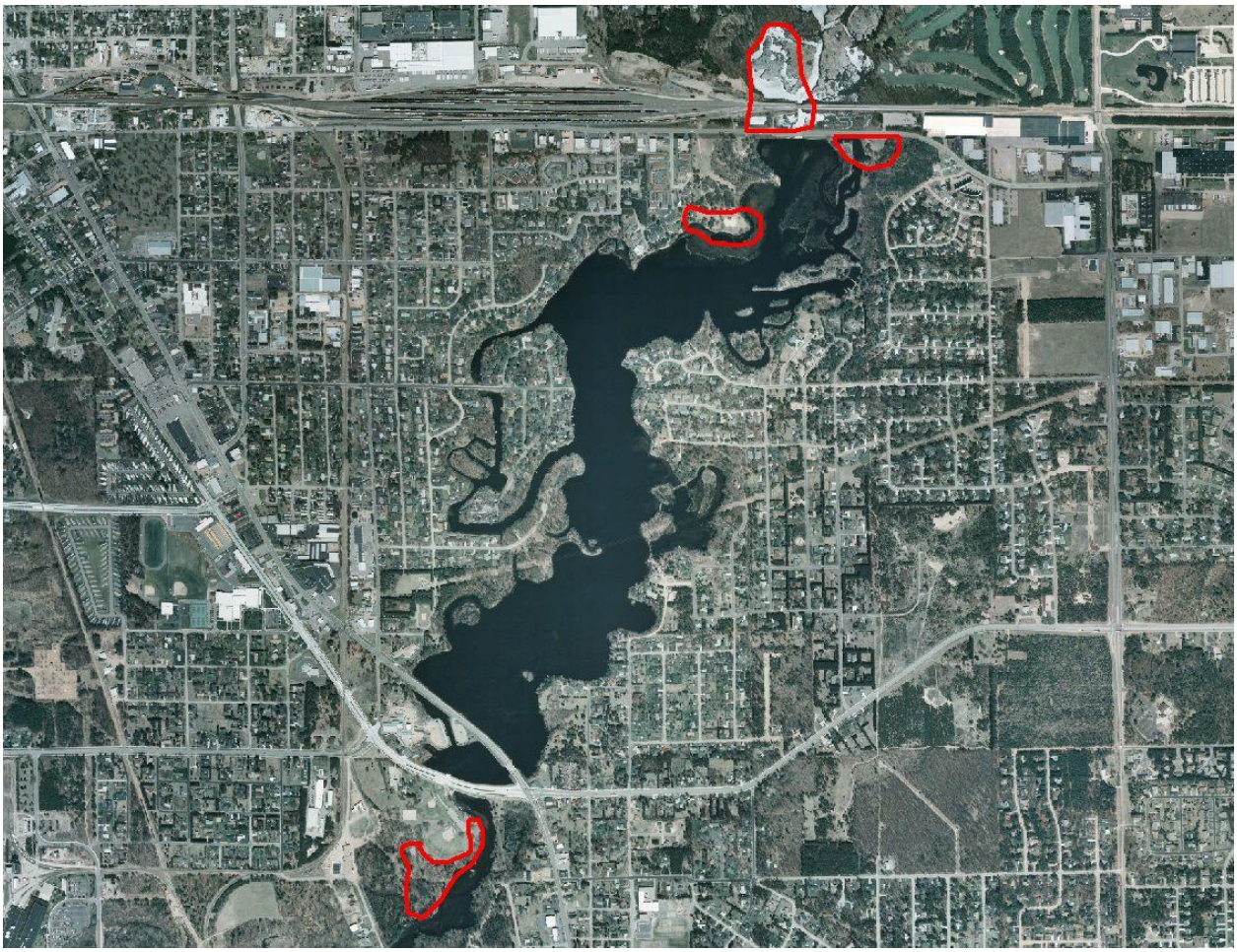
Figure 15. Diagram of permitted harvesting technique in sensitive areas.



- **Chemical**:
  Only limited treatment areas will be permitted in areas of special consideration (figure 16), and no emergents may be treated chemically.

- **Drawdown & Water Level Flux**:
  Potential periodic minor (1-2ft) water level fluctuations in spring can encourage native plant growth in sensitive areas along shorelines. Some species like lake sedge need a flux in water level to germinate.

Figure 16. Areas of special consideration



B. Monitoring and Annual Review

This is one of the most important components in this plan. Continuous monitoring of the aquatic plant community is required. A constant input of information regarding results of each management option is crucial to understanding how management might

be improved in the future. Grant funding may be available to assist with aquatic plant survey expenses when a private entity is employed to conduct the survey.

- Annual plant surveys should be conducted using the WDNR point-intercept method, as the 2008 survey was conducted by the UWSP-CWSE. These results should be reviewed annually.
- Dates of harvesting, a map of harvested areas, and an estimated volume of removed plants are required for annual plan review.
- Dates of chemical treatments are also required for review, as well as water temperature of the treated areas, maps of pre-treatment EWM distribution and chemical application areas, and amount and method of chemical application.
- All partners involved with this plan should work together in the most transparent manner to build trust. Communication to all people is instrumental in bringing a plan's objective to fruition. In addition to building trust and partnerships, all people involved should realize that the pond is an integral part of the community and needs community-wide support. McDill Pond is there for everyone and it needs to be everyone's responsibility to protect and enhance it.
- The McDill Lake Protection & Rehabilitation District should schedule a review of this entire plan on an annual basis, in the fall of each year. Doing so in the fall of the year should allow an effective review of the management efforts conducted on McDill Pond that year.
- APM plan options may be modified under extenuating circumstances with discussion from the public and WDNR.

Table 5: Schedule of Implementation of important events

Management	Date	Responsible Party
Native plants workshop	Winter 2009	Lake District
Submit chemical permit	Done by March of the year of treatment	Lake District
Aquatic plant survey (Opportunity for grant funding)	May 2009, 2010… (ongoing)	WDNR, Lake District
Plant ID workshop	May 2009. Further workshops as needed	Lake District and RC&D
APM plan review	Fall 2009, 2010… (ongoing)	WDNR, Lake District, RC&D, Isaak Walton League, community
Water quality and plant monitoring	Ongoing	Lake District, community
Harvesting	Ongoing as needed	Lake District

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4. University of Wisconsin – Stevens Point Center for Watershed Science & Education. “McDill Pond Aquatic Plant Survey” (PowerPoint presentation). 7 October 2008.