Management of aquatic plants in Wilson Lake 2001-2006

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Kusel, Wilson, Round Lakes Protection and Rehabilitation District

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1. Abstract

Aquatic Biologists, Inc. was retained by the Kusel, Wilson, Round Lakes Protection and Rehabilitation District during March 2001 to provide assistance in developing a management plan that addressed aquatic plant management issues in Wilson Lake. Since 1999, the primary management concern for residents of Wilson Lake has been control of Eurasian watermilfoil (*Myriophyllum spicatum).* This exotic aquatic plant very quickly reached nuisance levels in the lake – spreading from a single location near the south boat landing to nearly lake-wide distribution in two years' time. Aesthetic values, recreational uses, and ecological health had become significantly reduced by the predominance of this rapidly growing exotic plant.

Drastically reducing Eurasian watermilfoil and maintaining it at sub-nuisance levels in a manner that encourages recovery of native plant communities was developed as primary goal for Wilson Lake. Several common plant management techniques were given consideration, including benthic barriers, biological control agents, draw-downs, herbicide treatments and mechanical harvest. Impacts on native aquatic plants, potential for low dissolved oxygen levels and/or algae blooms, program effectiveness, water-use restrictions and costs were issues given consideration when formulating this plan.

Based upon these management concerns and upon review of available literature, annual treatments with 2,4D were proposed as the most viable management program through 2006. If 2,4D treatments are not effective in meeting the stated goals, whole lake treatments using fluridone or tryclopar – possibly in conjunction with a lake draw-down – may be pursued. Annual monitoring that includes water quality assessment and aquatic plant surveys will evaluate program effectiveness and provide direction for future management efforts.

2. Introduction

2.1 Watershed and lake characteristics

Wilson Lake is located in the forested hills of Waushara County, Wisconsin. This 81-acre lake is divided into two basins of nearly equal size. The east basin has a maximum depth of 5 feet and an average depth of 3 feet. The west basin has a maximum depth of 16 feet and an average of 6. The primary water source is groundwater seepage. There is one spring feeding into the lake along the west shore, and one small outlet on the north end of the lake, which eventually drains into the Pine River (Figure 1). A dam at this outlet has raised the lake level approximately one foot. The waters of Wilson Lake are clear and moderately fertile. Bottom substrates are predominantly organic muck with some areas of sand. The shores of Wilson Lake are approximately 75% upland forest and 25% swamp forest and alder thicket. Additional lake data are shown in Table 1.

Table 1. Wilson Lake physical data.

	East Basin	West Basin	Whole Lake
Max Depth (ft)	5	14	14
Mean Depth (ft)	3	6	4.4
Area (acres)	42.2	38.5	80.8
Volume (ac-ft)	127	231	358
Volume (gals)	41,402,000	75,306,000	116,708,000

Wilson Lake has two public boat launches on the east basin, and one resort / campground facility on the west basin. An aeration system was placed in the Wilson Lake in (1988) to prevent winter fish kills, and has been in continuous operation since then. The aeration system has also accelerated decomposition of organic sediments – increasing the average depth of the lake by two feet. Wilson Lake is heavily developed with summer cottages and

permanent residences. Two separate management units govern Wilson Lake – the Springwater Improvement Association and the Kusel, Wilson, Round Lakes Protection and Rehabilitation District, which has taxing authority.

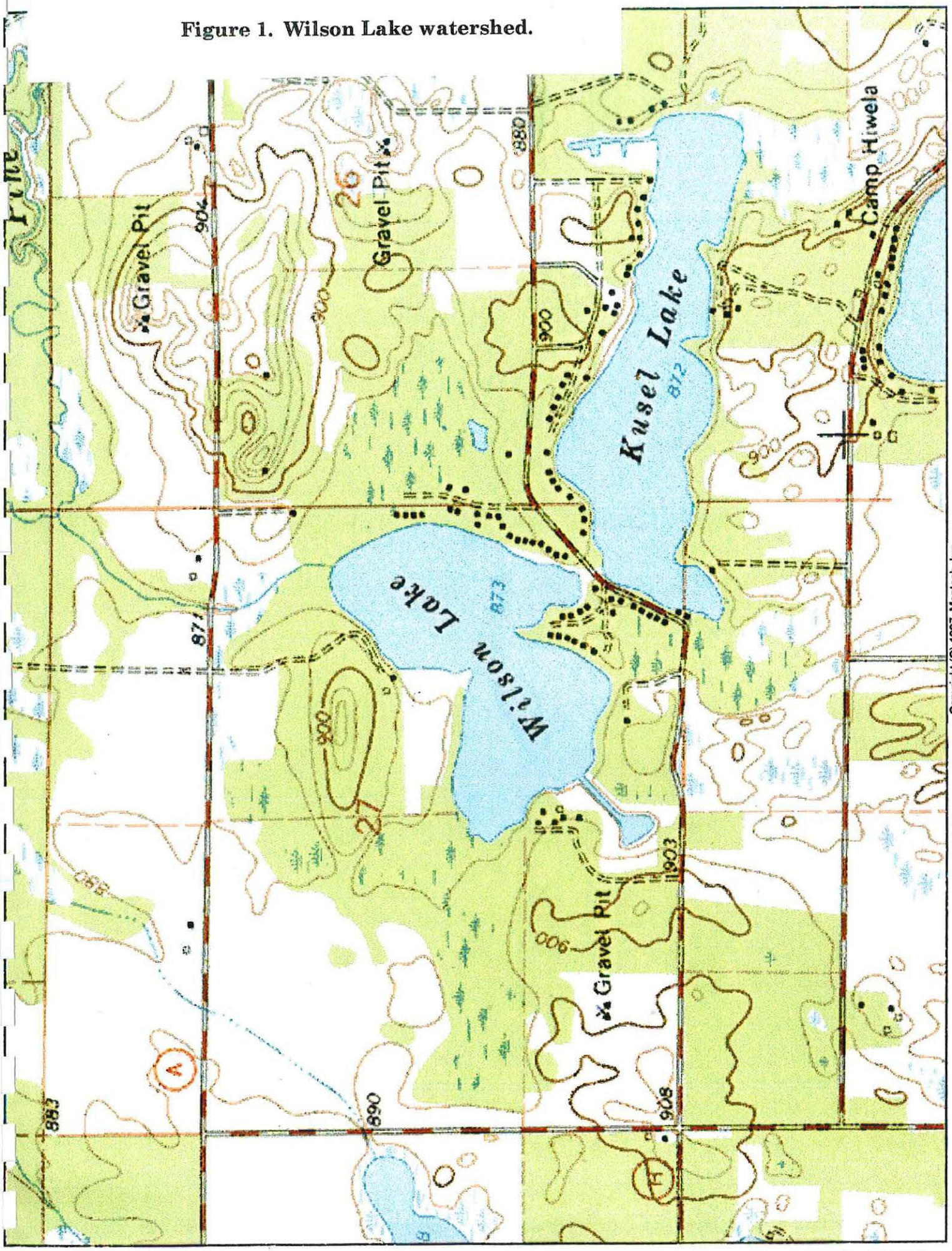
2.2 Management concerns

Since 1999, the main management concern of these lake management organizations with regard to Wilson Lake has been the control of Eurasian watermilfoil (*Myriophyllum spicatum*). This aquatic plant is an exotic invader that very quickly reached nuisance levels – spreading from a single location near the south boat landing to nearly lake-wide distribution in two years' time. Aesthetic values, recreational uses, and ecological health had become significantly reduced by the predominance of this rapidly growing plant. Therefore a goal was established to drastically reduce Eurasian watermilfoil within the lake, and to maintain it at sub-nuisance levels. Understanding the value of native aquatic plants in maintaining water quality and ecological health, the lake management organizations intend to pursue this goal in a manner that will allow re-establishment of these native species.

2.3 Purpose of work

The purpose of this report is to outline a management plan that will meet these goals. In so doing, the lake's management history and the results of the aquatic plant survey conducted in 2000 are presented, the potential impacts of Eurasian watermilfoil and several common control methods are discussed, and management issues specific to Wilson Lake are considered, before a course of action is proposed.

Figure 1. Wilson Lake watershed.



3. Management History

3.1 Studies

Several studies relating to aquatic plant management have been conducted on Wilson Lake and neighboring Kusel and Round Lakes. *Kusel, Wilson and Round Lakes Feasibility Study Results and Management Alternatives* summarizes the results of a one-year study conducted by the Office of Inland Lake Renewal in 1975. This study included measurement of groundwater flow and nutrient transport, sediment depths, water quality, algal densities, and macrophyte species composition and abundance. Excessive macrophyte densities, shallowness, and sewage system failure were listed as management concerns. This report recommended researching shoreline usage/development restrictions, dredging, weed harvesting, herbicide treatment, and aeration as management options.

The *Final Report on the Kusel, Wilson and Round Study, Waushara County Wisconsin* was prepared by Environmental Resource Assessments in 1977. This report summarizes an extensive and thorough research project conducted on the three lakes. Watershed characteristics, biological surveys, limnology and water chemistry profiles, and sediment characteristics were studied. The plant survey conducted on Wilson Lake found macrophytes growing to a depth of 12 feet (the maximum depth at that time) and occurring in 75% of the lake basin. At least 17 species were identified.

The *Wilson Lake Management Plan* prepared by Donahue and Associates in 1980 identified goals of improving aesthetic, recreational and environmental values, as well as improving water quality for Wilson Lake. Abundant weed growth and sediment accumulation were listed as the primary management concerns. The feasibility of several management options were discussed. Dredging and weed harvesting were recommended as the most viable options.

During May 2000 Aquatic Biologists, Inc conducted another aquatic plant survey. Methods, results and conclusions from this survey are presented in detail in the next section of this report.

3.2 Programs

Several programs geared at managing aquatic plants have been implemented on Wilson Lake over the years. The dredging program recommended in the *Wilson Lake Management Plan* would have been quite expensive and was apparently not attempted. The *Kusel, Wilson and Round Lakes Feasibility Study Results and Management Alternatives* report gives reference to dredging having been tried in Wilson Lake prior to 1974, however. No noticeable improvements were made from this effort, according to the report.

In 1988 an air injection-type aeration system was installed in Wilson Lake In response to low dissolved oxygen levels. This system employs 17 diffusers spaced around the lake basin, and is operated year-around. The system has apparently been successful in elevating dissolved oxygen levels in the lake. As a by-product, organic sediment decomposition has accelerated – increasing lake-wide depths an average of two feet. No noticeable reduction in macrophyte density has occurred from the increased depth, though.

The *Wilson Lake Management Plan* states that Wilson Lake has a history of herbicide and weed cutter use. The only herbicide treatment in DNR records, though, is a 7.75 acre 2,4D treatment conducted in 2000 to control Eurasian watermilfoil.

4. 2000 Plant Survey

During March of 2000, Aquatic Biologists, Inc. was retained by the Wilson Lake Association to conduct an aquatic plant survey on Wilson Lake. Field work for this survey was conducted on May 8 – 10, 2000. The purposes of this survey were to provide information needed for permitting of aquatic plant management efforts, to map the extent of Eurasian watermilfoil, and also to provide baseline data for evaluating the impacts and effectiveness of aquatic plant treatments.

4.1 Methods

Prior to collecting plant data, a series of twelve transects were mapped out on the lake. The lake was divided into two basins and a temporary buoy was placed in the center of each basin. From each buoy transects were mapped out every 60 degrees (Figure 2). Plant samples were collected at four plots along each of the twelve transects. Plots were established by estimating a 10-foot diameter circle around the anchored boat. The circular plot was then divided into four quarters, with each quarter representing a quadrant. Plants were collected in each quadrant by tossing out a tethered short-toothed rake and hauling it into the boat. A total of 192 quadrants were sampled. From each quadrant, all plants collected were identified to *genus*, and to *species* whenever possible. Data were recorded separately for each quadrant. A separate data sheet was used for each transect. Additional visual observations were made to verify the extent of Eurasian watermilfoil growth.

4.2 Results

A high diversity of aquatic plants was found in Wilson Lake, including at least 22 different species (Table 2). Eurasian watermilfoil was most abundant – comprising 29.2% of the plants collected, and was most widely

distributed – found in 66.7% of quadrats. Next most abundant were bushy pondweed (*Najas flexilis*), musk grass (*Chara spp.*), and Illinois pondweed (*Potamogeton illinoensis*), with percent compositions of 39.6, 39.1 and 20.3, respectively (Figure 3).

Table 2. Results of the aquatic plant survey conducted on Wilson Lake During May, 2000.

Species		Percent Frequency	Percent Composition
Eurasian Water Milfoil	*Myriophyllum spicatum*	66.7	29.2
Bushy Pondweed	*Najas flexilis*	39.6	17.4
Musk Grass	*Chara ssp.*	39.1	17.1
Illinois Pondweed	*Potamogeton illinoensis*	20.3	8.9
Common Waterweed	*Elodea canadensis*	10.9	4.8
Flatstem Pondweed	*Potamogeton zosteriformis*	10.4	4.6
no plants found		7.8	-
Coontail	*Ceratophyllum demersum*	7.3	3.2
White Water Lily	*Nymphaea odorata*	6.8	3.0
Northern Water Milfoil	*Myriophyllum sibericum*	6.3	2.7
Watershield	*Brasenia schreberi*	3.6	1.6
Small Pondweed	*Potamogeton pusillus*	3.1	1.4
Stonewort	*Nitella spp.*	2.6	1.1
Water Stargrass	*Zosterella dubia*	2.6	1.1
Hardstem Bullrush	*Scirpus acutus*	2.1	0.9
Green Algae spp.	*Lyngbya spp.*	1.0	0.5
Horse Hair Algae	*Pithophora spp.*	1.0	0.5
Green Algae spp.	*Spirogyra spp.*	1.0	0.5
Water Celery	*Vallisneria americana*	1.0	0.5
Green Algae spp.	*Cladophora spp.*	0.5	0.2
Spadderdock	*Nuphar variegata*	0.5	0.2
Floating Leaf Pondweed	*Potamogeton natans*	0.5	0.2
White-stem Pondweed	*Potamogeton praelongus*	0.5	0.2
Bladderwort	*Utricularia vulgaris*	0.5	0.2

Figure 2. Sampling transects and quadrants from the 2000 plant survey.

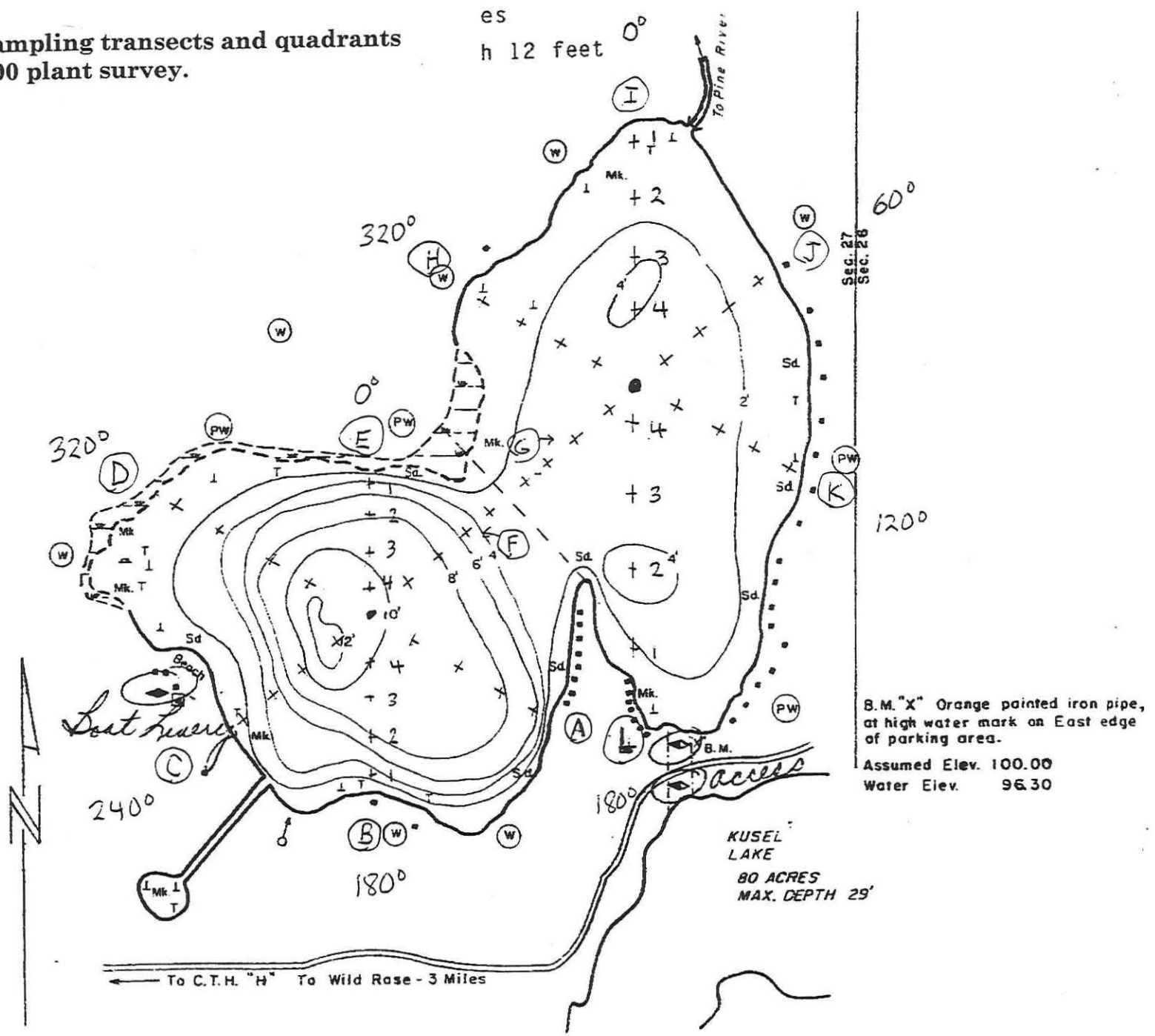
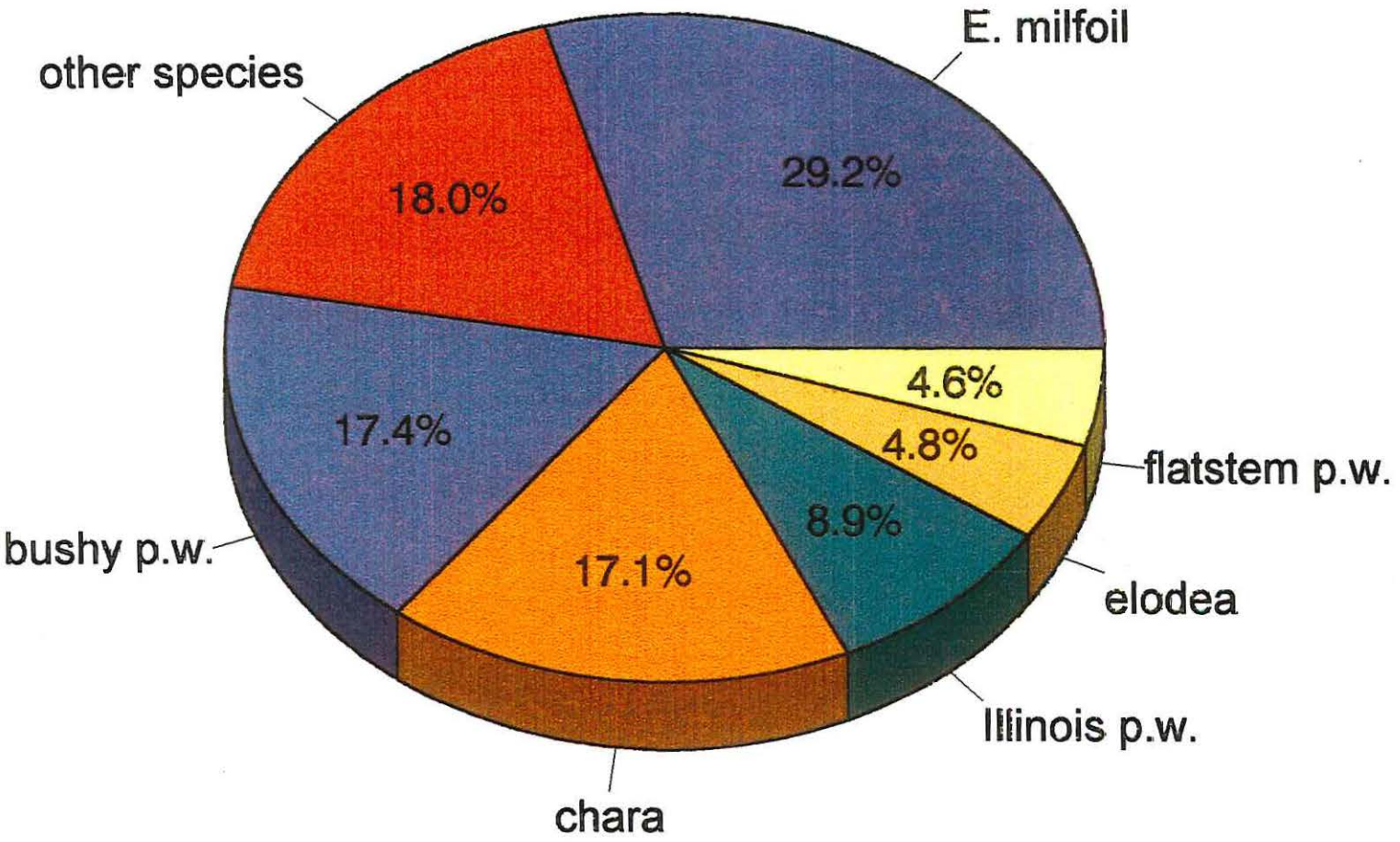


Figure 3. Wilson Lake plant species composition



Musk grass and Eurasian watermilfoil were the only plants found in all twelve of the transects (Table 3). Bushy pondweed was found in eleven transects. The next most widely distributed plants were common waterweed (*Elodea canadensis*), Illinois pondweed and flatstem pondweed (*Potamogeton zosteriformis*), which were each found in nine transects.

Visual observations further reveal that Eurasian watermilfoil can be found throughout most of the lake basin (Figure 4). The plant is most dense in the west basin and the southern end of the east basin. Elsewhere in the lake it occurs in scattered clumps.

4.3 Ecological values

Table 4 lists the habitat value of Lake Wilson's aquatic plants (from Nichols and Vennie, 1991). The lake's diversity of plants provide a variety of foods and cover for waterfowl, as well as cover, spawning and feeding habitat for fish.

Valuable components of the lake's ecosystem are the remaining beds of hardstem bulrush (*Scirpus acutus*), spadderdock (*Nuphar variegata*) and white water lily (*Nymphaea odorata*) and watershield (*Brasenia schreberi*). These emergent and floating-leaf plants provide cover for waterfowl, as well as high value foods. Bulrush and water lily beds are also important feeding areas for fish, and nursery areas for juvenile bass and panfish. Plants such as bulrushes and water lilies also improve water quality by capturing runoff-borne nutrients and sediments, and by acting as wave barriers that prevent shoreline erosion. These types of habitat are often destroyed in lakes - inadvertently by boat traffic and deliberately by shoreline property owners seeking "clean" frontage.

Table 4. Habitat values of aquatic plants found in Wilson Lake.

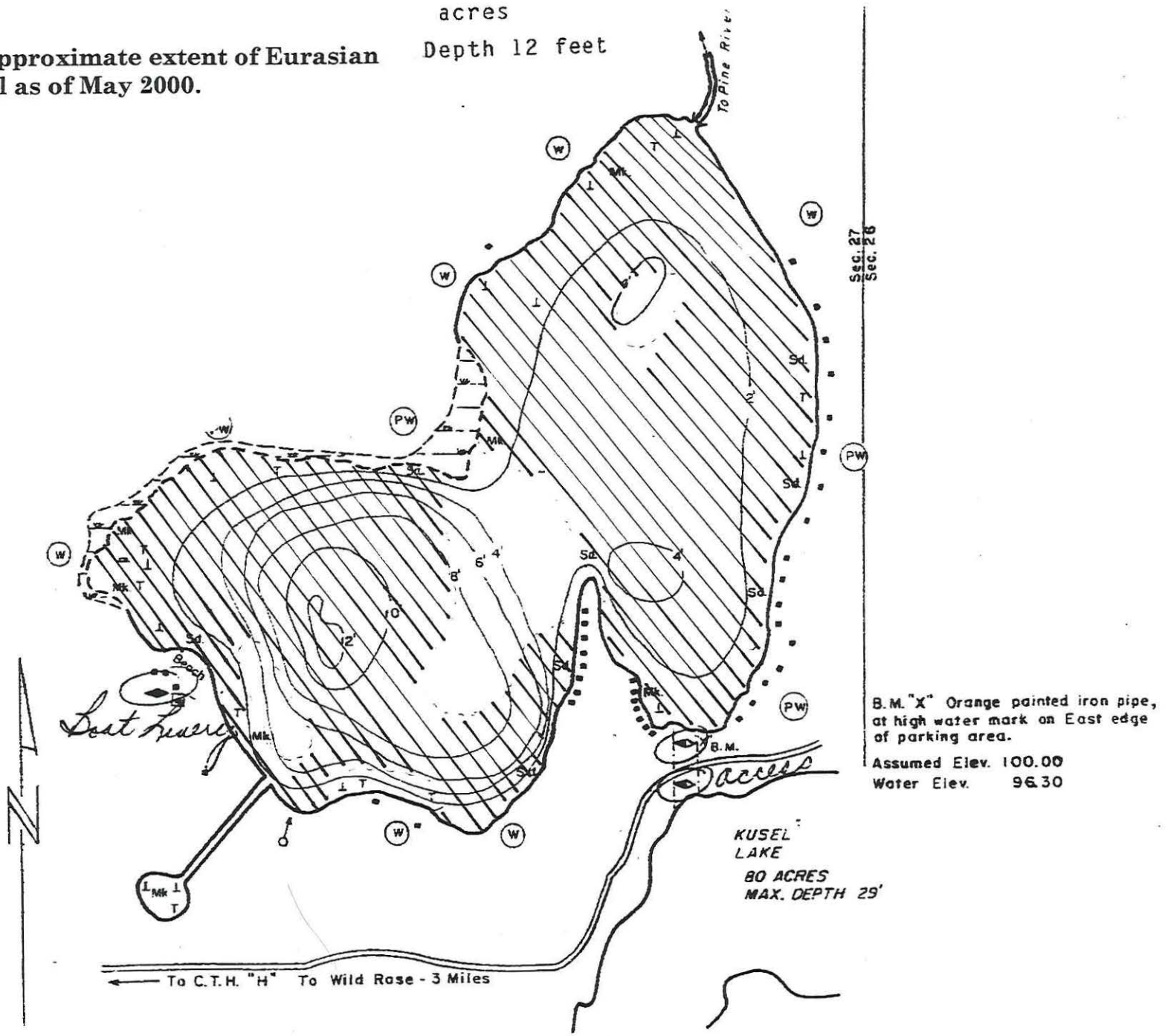
Species:		Waterfowl		Fish		
Common name	Scientific name	food	Cover	food	cover	spawning
Bladderwort	*Utricularia vulgaris*			x	x	
Bushy Pondweed	*Najas flexilis*	x		x	x	
Coontail	*Ceratophyllum demersum*	x	x	x		x
Common waterweed	*Elodea canadensis*	x				
Eurasian Water Milfoil	*Myriophyllum spicatum*			x	x	
Flatstem Pondweed	*Potamogeton zosteriformis*	x				
Floating Leaf Pondweed	*Potamogeton natans*	x				
Hardstem Bullrush	*Scirpus acutus*	x	x	x	x	
Illinois pondweed	*Potamogeton illinoensis*	x			x	
Musk Grass	*Chara spp.*	x				
Northern Water Milfoil	*Myriophyllum sibericum*	x				
Small Pondweed	*Potamogeton pusillus*	x				
Spadderdock	*Nuphar variegata*	x		x	x	
Water celery	*Vallisneria americana*	x		x	x	
Water Stargrass	*Zosterella dubia*				x	x
Watershield	*Brasenia schreberi*	x			x	
White Water Lily	*Nymphaea odorata*	x		x	x	
White-stem pondweed	*Potamogeton praelongus*	x		x	x	

Equally valuable are Wilson Lake's diverse submergent plant species. Many of these provide excellent feeding, spawning and nursery areas for fish, as well as foods for waterfowl. Unfortunately virtually all of the submerged species found in Wilson Lake are threatened by Eurasian watermilfoil.

4.4 Management implications

While Wilson Lake's clear, shallow water and rich organic sediments are capable of supporting an abundance of rooted aquatic plants, these plants

Figure 4. Approximate extent of Eurasian watermilfoil as of May 2000.



play a vital role in maintaining water quality. The green "blankets" formed by aquatic plants help reduces suspension of sediments from waves and boat wakes. They also tie up a significant amount of the available nutrients in the lake. Without these rooted plants, the plant community would shift to a predominance of planktonic algae, and the lake would take on a "pea soup" appearance for much of the summer. These factors emphasize the importance of developing a management plan that will both have minimum impacts on existing native plants and will allow recovery of native plants into areas colonized by Eurasian watermilfoil.

5. Eurasian Watermilfoil

5.1 Description

Characterized as an aggressive, opportunistic plant, Eurasian watermilfoil is an exotic species originating from Europe and Asia. It is now found in many areas of the U. S. Its distribution in Wisconsin is primarily in the central and southeast regions, but it is spreading northward (Borman, et.al., 1997). The plant represents a substantial threat to the ecological and recreational value of Wisconsin's Lakes. Because Eurasian watermilfoil grows quickly to the water surface and forms very dense canopies that block sunlight, it aggressively displaces nearly all native aquatic plant species. This has been attributed to significant declines in the habitat diversity of lakes. The dense canopy and surface mat formations of Eurasian watermilfoil can also form a nearly impenetrable barrier to boaters and swimmers. Eurasian watermilfoil infestation has also been linked to declines in fishery quality, invertebrate abundance and water quality (Pullman, 1993).

5.2 The threat

The main threats of Eurasian watermilfoil in Wilson Lake are recreational impairment, the loss of high value native plant species and subsequent losses

of valuable fish and wildlife habitat, and dispersal of Eurasian watermilfoil from Wilson Lake to other area lakes as a result of heavy recreational use.

6. Control Methods

6.1 Physical removal

Boat-mounted mechanical weed harvesters have been occasionally employed to control Eurasian watermilfoil. Mechanical harvest is not a recommended control method for waters that are not completely dominated by Eurasian watermilfoil, however. Eurasian watermilfoil can reproduce by fragmentation (Borman, et.al. 1997), and the free-floating plant matter left from cutting operations can accelerate dispersal of the plant. Mechanical harvest does offer several distinct advantages, though. Harvested plant matter can be removed from the lake system, eliminating the possibility of low dissolved oxygen due to bacterial decomposition. The possibility of algae blooms due to nutrient release is also greatly reduced. There are no water use restrictions following mechanical harvest either. A disadvantage of mechanical weed harvest is that it is not species selective. While cutting does not typically kill plants, there is little evidence to suggest that cutting can induce a shift back to native species. In the process of removing plants, weed harvesters also kill substantial numbers of fish, reptiles, amphibians and invertebrates (Shardt, 1999). Perhaps the greatest drawback of a mechanical harvest program is the cost. Cost / benefit analyses conducted by the Florida Department of Environmental Protection found that mechanical harvest of nuisance weeds cost 41.7 times as much as fluridone treatments to achieve the same level of control (Shardt, 1999). Given these considerations, employing a mechanical weed harvester would be a poor choice for Wilson Lake.

6.2 Benthic barriers

Bottom barriers and sediment blankets will completely prevent Eurasian watermilfoil growth all season long. DNR permits are required to place these materials in public waters. This management approach is commonly discouraged by the DNR, however, because benthic barriers inhibit the growth of all rooted plant species and do little to restore littoral habitats. Other disadvantages include the need for semi-annual removal and cleaning, and a high material cost (Jester, et.al., 1999). These factors make benthic barriers a technique with limited application for Wilson Lake.

6.3 Biological controls

Two insect species have been associated with Eurasian watermilfoil decline, the milfoil weevil (*Euhrychiosis lecontei*) and a chironimid, *Crycotopus myriophylli*. Very little research has been done on *Crycotopus*; thus it is not considered a management option at this time. The milfoil weevil though, has been unsuccessfully tried in Wisconsin lakes. A 12-lake study called the "Wisconsin Milfoil Weevil Project" conducted by the Wisconsin Cooperative Fishery Research Unit – UW Stevens Point and the Wisconsin DNR, was designed to evaluate the effectiveness of the milfoil weevil in controlling Eurasian watermilfoil. The milfoil weevil is a native species that is widely distributed throughout Wisconsin. At natural densities, the milfoil weevil appeared to have no significant impact on Eurasian watermilfoil. However, some studies suggested that at artificially elevated densities, the weevil could affect a decline in the plant (Lester, et.al., 1999).

The Wisconsin Milfoil Weevil Project involved stocking milfoil weevils into the study lakes in quantities calculated to bring densities to the levels prescribed for controlling Eurasian watermilfoil. Follow up monitoring, however, found no significant increase in milfoil weevil densities in any of the lakes, and no significant decline in Eurasian watermilfoil density in any of

the lakes. Due to these findings, milfoil weevil stocking is not considered a viable management option.

The challenges of using biological control vectors are that they must be capable of producing the desired level of control and, where native plant restoration is desired, be entirely species specific (Pullman, 1993).

6.4 Treatment with 2,4D

Perhaps one of the most well researched aquatic herbicides on the market, 2,4D (*Navigate*®, *Aquakleen*®), has long been accepted as a safe and effective treatment for Eurasian watermilfoil. 2,4 D is an organic, biodegradable herbicide. Applied at a rate of 100 – 150 lbs. per surface acre, it is highly selective. According to the product label, the native species found in Wilson Lake that may be affected by this product at this rate are northern milfoil (*Myriophyllum sibericum*) and coontail. Spadderdock and white water lily may be affected at higher rates. As a granular herbicide, 2,4D can be applied directly upon growths of Eurasian watermilfoil; which further aids in species selectivity. Water use restrictions are also minimal for this product. There are no restrictions on fish consumption and lawn watering, a one-day restriction on swimming and a 14-day restriction on watering food crops. The primary drawback of 2,4D is that two or three treatments may be required in one season to achieve desired control. Because of the nature of granular applications, complete eradication of Eurasian watermilfoil is seldom expected. The most realistic management approach usually involves aggressively treating Eurasian watermilfoil for two to three years to drastically reduce the density of the plant, then conducting limited annual treatments to keep it at sub-nuisance levels. The cost per-acre of 2,4D treatments ($320/acre for *Navigate*®, $360/acre for*Aquakleen*® based on materials costs for treating at a rate of 100 lbs./acre) are reasonable. Given the widespread distribution of Eurasian watermilfoil in Wilson Lake and the

fact that much of the growth is scattered though, probably make treating all of the Eurasian watermilfoil in the lake an unrealistic goal. These considerations would make 2,4D treatments a practical short-term control method for dealing with those areas of the lake where Eurasian watermilfoil is creating the greatest nuisance.

6.5 Treatment with fluridone

Fluridone (*Sonar*®) has been widely used and well researched in the states of Florida and Michigan as a tool for controlling Eurasian watermilfoil. It is gradually gaining acceptance in Wisconsin as well. One of the most important research findings about Fluridone is that it is almost entirely selective to Eurasian watermilfoil when applied at low (<10ppb) concentrations. Studies conducted in controlled environments on early season applications of fluridone to Eurasian watermilfoil along with *Elodea, Chara, Vallisneria, Najas* and *Potamogeton spp.* found >90% control of Eurasian watermilfoil at 5ppb concentrations with no negative impacts on the other species. Musk grass *(Chara spp.)* and bushy pondweed *(Najas spp.)* actually increased in biomass at concentrations as high as 20ppb (Netherland, et.al., 1997). Likewise, studies conducted on Michigan lakes found that early season treatments of fluridone at levels between 5 and 10ppb provided excellent Eurasian watermilfoil control with minimal non-target species impacts (Getsinger, 1998). Another advantage of fluridone is that there are no restrictions on swimming and fishing following treatment. The disadvantages of liquid fluridone treatments are that they must be applied on a whole lake basis. However, due to the very low concentrations of fluridone needed, the entire lake could be treated with only 9.7 quarts of product. This equals a material cost of $7500 (March 2001 prices). The extensive amount of management planning and monitoring required for whole lake treatments though, would elevate the cost considerably. None-the-less, a fluridone treatment may be considerably less expensive in the long

run than a series of multiple annual 2,4D treatments. Given the limitations of 2,4D, fluridone may also be a much more effective management option.

6.6 Other herbicides

Diquat (*Reward*™, *Weedtrine D*®) has been used for temporary selective control of Eurasian watermilfoil. Applied at low rates, Diquat will cause Eurasian watermilfoil to drop out of the water column in 10 – 14 days, with little effect on most native species. Unfortunately Eurasian watermilfoil will quickly recover – requiring multiple annual treatments to achieve desired control (Pullman, 1993). While such treatments would be economical for Wilson Lake, they would likely do little for long term control of Eurasian watermilfoil.

Another herbicide called tryclopar (*Renovate*™) may hold promise for selective control of Eurasian watermilfoil. Apparently similar in both chemical nature and efficacy to 2,4D, this liquid herbicide could be applied on a large scale to achieve a high level of control. Though not currently labeled for aquatic use, registration is expected sometime in 2001. Use of this product in Wilson Lake may warrant further research.

6.7 Lake drawdown

Drawdowns, where possible, are commonly employed as a method of aquatic plant control. Drawdowns have also been proposed for Wilson Lake as a means of reducing organic sediment accumulations in the shallows. Further investigation is required to determine the extent that Wilson Lake could be drawn down, and the amount of lake bed that would be affected by a drawdown. This method may be able to control significant areas of Eurasian watermilfoil growth. It may also significantly reduce lake volume – effectively reducing treatment costs.

7. Management Considerations

7.1 Impacts of low D.O.

Winter fish kills may occur in heavily vegetated waters because ice cover seals of the lake from atmospheric oxygen. However fish kills can occur in summer in response to herbicide applications as well – particularly during hot, calm weather (Schmidt, 1976). During warm weather bacterial decomposition of dead plant matter – and subsequent B.O.D. – is greatly enhanced. The oxygen saturation level of water also decreases as temperature increases. Given the fact that Wilson Lake is aerated makes this an unlikely occurrence. None-the-less, some precautions should be taken.

Precautionary measures may include conducting partial herbicide treatments at appropriately spaced time intervals, using herbicides that cause gradual die-back of target plants, treating before plants reach maturity, and treating during cooler times of year when dissolved oxygen levels are higher.

7.2 Effects on non-target aquatic plants

The Lake Management Organizations recognize the value of native aquatic plants in Wilson Lake in terms of maintaining excellent water quality, providing habitat for fish and wildlife, and enhancing the lake ecosystem as a whole. It is understood that every effort should be made to minimize impacts on non-target species when a control method is implemented.

7.3 Nuisance algae blooms

Given the large amount of nutrients contained in a massive growth of Eurasian watermilfoil, a sudden die-off can free up nutrients that may lead to nuisance algae growth. This is a valid concern for Wilson Lake. The same methods used to reduce the likelihood of fish kills, however, may suffice for

preventing nuisance algae blooms. A gradual dieback of milfoil will often allow native plants to respond and utilize available nutrients.

7.4 Water use restrictions

Use restrictions placed on waters treated with herbicides typically involve fish consumption, swimming, irrigation and animal watering. Because of the recreational uses of the lake, a desirable treatment plan will have little or no water use restrictions, particularly for fish consumption and swimming.

7.5 Costs

Wilson Lake is small and property ownership is limited. Management budgets are correspondingly limited. If any treatment plan is implemented, it will need to be practical, effective and economical.

8. Proposed Action

Based on considerations discussed in this report, the following course of action have been adopted by the Lake District: During June and July 2001, 2,4D treatments will be conducted on Wilson Lake for the selective control of Eurasian watermilfoil. Those areas presenting the greatest nuisance will be targeted. A large-scale treatment permit will be sought from the DNR so that treatments can be conducted beyond 150 feet from shore.

During July 2001, the Lake District will apply for funding from the DNR's small-scale Lake Planning Grant Program to conduct follow up surveys. Contingent upon funding from the grant program, an aquatic plant survey will be conducted in the fall of 2001 that duplicates the survey conducted in 2000. Routine water quality tests, including secchi depth, dissolved oxygen, total phosphorus and chlorophyll *a* concentration will also be done. This

survey will evaluate two years of 2,4D treatments and their effectiveness in controlling Eurasian watermilfoil and restoring native plant communities.

The results of this survey will be used to evaluate the effectiveness of 2,4D treatments in meeting project goals. If it does not appear that 2,4D treatment are meeting stated goals, or if it does not appear that 2,4D treatments will meet these goals within several years, other management options will be considered and discussed. This discussion, along with plant survey results, will be presented in a year-end report.

If 2,4D treatments are providing nuisance relief they will be scheduled again through 2006, as needed. Contingent upon grant funding, annual plant surveys and water quality analysis will be conducted to monitor effectiveness.

If warranted, a feasibility study of other management options will be conducted in 2002. Management options that may be explored include fluridone and tryclopar whole-lake treatments, and lake draw-downs. Funding for this study will also be sought from the DNR's small scale planning grant program.

Given conditions specific to Wilson Lake, the widespread growth of Eurasian watermilfoil in the lake, and the likelihood of new Eurasian watermilfoil control methods becoming available, it is difficult and perhaps inappropriate to outline a firm long range course of action for Wilson Lake. Based on available information and lake-specific management concerns, however, the Lake District believes this report proposes the most realistic plant management plan for Wilson Lake through 2006.

Table 5. 2001 Timeframe of plant management activities.

Date	Project
June - July 2001	conduct 2,4D treatments
July 2001	apply for grant money
September 2001	conduct plant survey
November 2001	year-end report and evaluation

9.0 Reference Citations

Aron, Kathy. 1998. Potters Lake Demonstration Sonar Treatment, 1998 Year end report. Aron & Associates. Wind Lake, Wisconsin.

Becker, George C. 1983. *Fishes of Wisconsin* University of Wisconsin Press, Madison.

Borman, Susan, Robert Korth, and Jo Temte. 1997. *Through the Looking Glass – A Field Guide to Aquatic Plants.* Wisconsin Lakes Partnership, University of Wisconsin, Stevens Point.

Fasset, Norman C. 1940. *A Manual of Aquatic Plants.* University of Wisconsin Press, Madison.

Getsinger, K.D. 1998. *Selective control of Eurasian watermilfoil using fluridone.* May, 1998. Focus 10,000 – Minnesota's Lakeside Magazine.

Jester, Laura L., Daniel R. Helsel and Michael A. Bozek. 1999. *Wisconsin Milfoil Weevil Project – Wilson Lake Final Report.* University of Wisconsin – Stevens Point.

Moore, P.D., and S.B. Chapman, 1976,1986. *Methods in Plant Ecology.* Blackwell Scientific Publications. Oxford, England.

Needham, James G., and Paul R. Needham. 1962. *A Guide to the Study of Fresh-water Biology.* Holden-Day, Inc. Oakland, Claifornia.

Netherland, M.D., K.D. Getsinger, and , J.D. Skogerboe. 1997. *Mesocosm evaluation of the species-selective potential of fluridone.* Journal of Aquatic Plant Management, 35: 41-50.

Nichols, Stanley A., and James G. Vennie. 1991. *Attributes of Wisconsin Lake Plants.* Wisconsin Geological and Natural History Survey.

Premo, B.J., T.R. Betterson, J.A. Gracki, C.D. McNabb, and K.G. Harrison. 1999. *Evaluation of the use of Sonar in Michigan,* October 1999. Michigan Environmental Science Board, Lansing, Michigan.

Pullman, Douglas G. 1993. *The Management of Eurasian watermilfoil in Michigan.* The Midwest Aquatic Plant Management Society. Vol. 2, Ver. 1.0.

Schmidt, James C. and James R Kannenberg. 1976, 1998. *How to Identify and Control Water Weeds and Algae.* Applied Biochemists. Milwaukee, Wisconsin.

Schardt, J. 1999. *Maintenance Control and Vibrant Fisheries.* Summer, 1999. Aquatics Magazine.

Winterringer, Glen S. and Alvin C. Lopinot. 1966. *Aquatic Plants of Illinois.* Illinois State Museum and Illinois Department of Conservation.